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Report no. 46111-MG

PROJECT APPRAISAL DOCUMENT

ON A

**PROPOSED GRANT FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND**

IN THE AMOUNT OF US\$5.9 MILLION

TO THE

REPUBLIC OF MADAGASCAR

FOR AN

IRRIGATION AND WATERSHED MANAGEMENT PROJECT

September 30, 2008

**Agriculture and Rural Development
Sustainable Development Department
Country Department AFC01
Africa Region**

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MADAGASCAR
Irrigation and Watershed Management Project

CURRENCY EQUIVALENTS
(Exchange Rate Effective May 2008)

Currency Unit	=	Ariary (MGA)
1 MGA	=	US\$0,00047
SDR	=	US\$1.48620
US\$	=	SDR 0.67286

FISCAL YEAR
January 1 - December 31

ABBREVIATIONS AND ACRONYMS

ASC	Agricultural Service Center
AFD	Agence Française de Développement
APO	Agricultural Professional Organization
BV	<i>Bassin versant</i> (Watershed Management)
BV-PI	<i>Bassin versant – Périmètre irrigué</i> (Watershed Management – Irrigation Scheme)
CAS	Country Assistance Strategy
DAIR	<i>Direction de l'Appui aux Investissements Ruraux</i> (Directorate for Rural Investment)
CDP	Communal Development Plan
CSC	Communal Support Centre
DFB	Directorate for Finance and Budget
NPCU	National Program Coordination Unit
DRDR	<i>Direction Régionale de Développement Rural</i> (Regional Directorate for Rural Development)
DSI	Department of Information Systems
DTA	Decentralized Territorial Authorities
FERHA	<i>Fonds d'Entretien de Réseaux Hydro Agricoles</i> (Irrigation Maintenance Fund).
FMG	Malagasy Franc
(F)WUAs	(Federation of) Water Users Associations
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GELOSE	<i>Gestion Locale Sécurisée</i> (Community Management)
GoM	Government of Madagascar
IDA	International Development Association
MAEP	Ministry of Agriculture, Animal Husbandry and Fisheries
MDAT	Ministry of Decentralization and Land Development
MEEF	Ministry of Environment, Water and Forest Resources
MEM	Minister of Energy and Mines
NAP	National Action Plan
O&M	Operation and Maintenance
PC	Performance Contract
PLOF	Local Land Occupation Plan

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PN/BV-PI	<i>Programme National Bassins Versants – Périmètres Irrigués</i> (National Irrigation and Watershed Management Program)
PMU	Project Management Unit
PRSF	Poverty Reduction Strategy Framework
PSRP	Poverty Reduction Strategy Paper
R/D	Research-Development
RDFB	Regional Directorate for Finance and Budget
RDP	Regional Development Plan
RPMU	Regional Project Management Unit
SLM	Sustainable Land Management
TT	Tranoben'ny Tantsaha – Chambers of Agriculture
UNCCD	United Nations Convention to Combat Desertification
WB	World Bank
WUA	Water Users Association
WDP	Watershed Development Plans
WMP	Watershed Master Plan

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Country Director :	Ruth Kagia
Sector Manager:	Karen Mcconnell Brooks
Task Team Leader:	Ziva Razafintsalama

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MADAGASCAR
Irrigation and Watershed Management Project

GEF Project Brief
Africa Regional Office
AFTAR

Date: September 30, 2008 Country Director: Ruth Kagia Sector Director/Manager: Inger Andersen/ Karen Mcconnell Brooks Project ID: P074086 Lending Instrument: Adaptable Program Loan	Team Leader: Ziva Razafintsalama Sectors: Irrigation and drainage (50%); Agro- industry (30%); Crops (20%) Themes: Other rural development (P); Other trade and integration (S) Environmental screening category: Full Assessment
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Global Supplemental ID: P088887 Lending Instrument: Specific Investment Loan Focal Area: Land Degradation Supplement Fully Blended?: No	Team Leader: Ziva Razafintsalama Sectors: Irrigation and drainage (50%); Agro- industry (30%); Crops (20%) Themes: Rural markets (P); Other trade and integration (S)
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Project Financing Data

Loan Credit Grant Guarantee Other:
Global Environment Facility (US\$m): 5.90
For Loans/Credits/Others:
Total Bank financing (US\$m.): 30.00 (approved in November 2006)
Proposed terms:

Financing Plan (US\$m)

Source	Local	Foreign	Total
BORROWER/RECIPIENT	00.00	00.00	00.00
INTERNATIONAL DEVELOPMENT ASSOCIATION	23.58	06.42	30.00
GLOBAL ENVIRONMENT FACILITY	05.73	00.17	05.9
LOCAL COMMUNITIES	04.24	00.16	04.4
Total:	33.55	06.75	40.3

Borrower:

Government of Madagascar: Ministry of Economy, Finance and Budget
B.P. 61
Antananarivo 101
Madagascar
Tel: 261 20 22 382 86 Fax: 261 20 22 34530

Responsible Agency:

Ministry of Agriculture, Livestock and Fisheries
B.P. 301
Anosy
Antananarivo 101
Madagascar
Tel: (261-20)-22-27227 Fax: (261-20)-2226561
info@maep.gov.mg

GEF Estimated disbursements (Bank FY/US\$m)									
FY			2009	2010	2011	2012	2013	0	0
Annual			0.6383	1.4425	1.9502	1.2090	0.660	0.00	0.00
Cumulative			0.6383	2.0808	4.0317	5.2407	5.900	0.00	0.00
Project implementation period: January 30, 2009 – December 31, 2012 Expected effectiveness date: January 30, 2009 Expected closing date December 31, 2012									
Does the project depart from the CAS in content or other significant respects? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <i>Ref. PAD A.3</i>									
Does the project require any exceptions from Bank policies? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <i>Ref. PAD D.7</i>									
Have these been approved by Bank management? <input type="checkbox"/> Yes <input type="checkbox"/> No									
Is approval for any policy exception sought from the Board? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No									
Does the project include any critical risks rated “substantial” or “high”? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <i>Ref. PAD C.5</i>									
Does the project meet the Regional criteria for readiness for implementation? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <i>Ref. PAD D.7</i>									
Project development objective <i>Ref. PAD B.2, Technical Annex 3</i> The development objective of the project is to sustainably increase agricultural productivity in four high potential watershed areas and their associated irrigation schemes.									
Global Environment objective <i>Ref. PAD B.2, Technical Annex 3</i> The global environmental objective of the project is to improve the environmental sustainability of land management practices in four targeted watersheds areas.									
Project description [<i>one-sentence summary of each component</i>] <i>Ref. PAD B.3.a, Technical Annex 4</i> The GEF project is fully complementary with the IDA-financed project that was approved in November 2006 and that has three technical components covering major strategic orientations: (i) Development of Commercial Agriculture, (ii) Irrigation Development and (iii) Watershed Development. The fourth component is Program Management. In accordance with the 'growth poles' approach, the project proposes four similar sub-projects in the four regions concerned (Annex 1). The GEF project will focus on two of the three technical components that are financed under the IDA operation – development of commercial agriculture and watershed development. Development of Commercial Agriculture aims at improving access to markets and supporting the development of commercial agriculture value chains respecting principles of sustainable land management and providing demand-based support to private investment. Watershed Development aims at sustainably managing watersheds including irrigated agriculture, preserving the natural heritage, benefiting from the production potential of the natural resources and contributing to improved living conditions and incomes of the rural population. The Project Management component aims at managing and using resources in accordance with the project's objectives and procedures, and putting in place a policy framework that is favorable to scaling up of the project at the national level.									
Which safeguard policies are triggered, if any? <i>Ref. PAD D.6, Technical Annex 10</i> The following safeguard policies are triggered: Environmental Assessment, Natural Habitats, Pest Management, Involuntary Resettlement and Forests.									
Significant, non-standard conditions, if any, for: <i>Ref. PAD C.7</i>									

Grant effectiveness:

- None

Covenants applicable to project implementation:

- ensure that operational modalities of management and replenishment of FERHA (Fonds d'Entretien de Réseaux Hydro Agricoles) be defined by November 30, 2008; after consulting with the Bank and
- ensure that: (i) a draft law to harmonize the irrigation related legal framework, including but not limited to Law 90-016 and subsequent implementation texts with the provisions of the Program be prepared by November 30, 2008; and (ii) the relevant implementation texts be adopted by September 30, 2009, after consulting with the Bank.

A. STRATEGIC CONTEXT AND RATIONALE

A.1. Country and Sector Issues

1. **Background.** Madagascar is one of the poorest countries in the world, with per capita income of about USD 320 per year (2007). The economy is basically rural, with agriculture as one of the main engines of economic development. The poor represent about 69 percent of the total population, which is 77 percent of the rural population.

2. The new government in place since 2002 has moved to restore public services and macroeconomic stability after the contested elections of 2001. GDP growth rebounded to 9.8 percent in 2003 from a 12.7 percent plunge a year before and continued to grow at an average rate of about 5 percent per year between 2004 and 2006. Economic growth in 2007 of 6.3 percent was driven by strong secondary sector growth but agricultural growth was disappointing. The country was hit by six tropical storms/cyclones in the first four months of 2007 leading to exceptional rains in most parts of the country, while a drought continued to affect the south of the country. These storms contributed to heavy flooding in populated and cultivated areas throughout the country, including the capital region, the northwest, west and southeast regions. In 2008, there was another round of cyclones that devastated farm, transport and tourist infrastructure in key areas of the country.

3. **Poverty Reduction Strategy Framework.** The government has put in place the Madagascar Action Plan (MAP), a development plan for 2007–12 that is the second-generation Poverty Reduction Strategy. The MAP envisages accelerated and better-coordinated reforms and outlines the strategies and actions that will ignite rapid growth. “Rural development and a green revolution” and “cherish the environment” are two of the core eight commitments of the MAP. The specific objectives with respect to rural development are (i) to increase agricultural value-added (through, inter alia, Agricultural Service Centers), (ii) diversify rural activities (focusing on support to producers' organizations among other activities), (iii) launch a sustainable green revolution through integrating environmental dimensions in agricultural activities and (iv) promote market-oriented activities through strengthening farmers' organization and investment in infrastructure. The MAP Commitment to “cherish the environment” focuses on reducing natural resource degradation through better land use practices. This GEF project, in collaboration with its equivalent IDA project, and their results indicators are closely aligned with these MAP objectives.

4. As previous approaches to irrigation development have failed due to continued upland degradation making investments in irrigation schemes unsustainable, the Government is now pursuing a more integrated and holistic approach with the *National Program of Watershed Management and Irrigation Improvement* adopted in October 2006, where agricultural development takes into account land management issues at the watershed scale. Additionally, the project is in line with the new *National Program for Rural Development*, among whose pillars is the improved management and use of natural resources and the protection of natural production factors and ecosystem functions. The operation will also dovetail with the implementation of the IDA-financed *Third Environmental Program*, with which a MOU has been established, as well as with the National Forestry Law which seeks to protect watersheds, promote reforestation, combat wild fires, and protect natural habitats and biodiversity. Furthermore, the project directly contributes to the implementation of the UNCCD National Action Plan and will address priorities under the National Biodiversity Strategy and Action Plan and UNFCCC NAP and NAPA.

5. **Agriculture, Rice and Irrigation.** Agriculture remains the foundation of Madagascar's domestic economy. It contributes about one third of the total GDP and 40 percent of total exports. About three quarters of the population depend on agriculture for their livelihood. About one-half of Madagascar's land area is cultivable, but little more than 5percent of the land is currently under crops, with a large part of the cultivated area under irrigation (about 40 percent). Performance of the sector has been disappointing in recent years, despite the liberalization of the economy, the sharp devaluation of the exchange rate and the privatization of state enterprises. The under-performance of the agricultural sector is a major cause of the deep poverty in rural areas. Farming systems are still very traditional. Two-thirds of all rural households live at subsistence level and yields are generally very low. Weak infrastructure hampers the transport of produce, whether for export or for the domestic market. Agricultural productivity is also hampered by the poor access to agricultural technology, inputs and other agricultural services. Extension services are all but lacking. Only 1.5 percent of Madagascar's small farmers have access to credit, and a mere 5 percent of total lending goes to agriculture. Traditional land tenure systems do not give farmers sufficient security.

6. Rice represents nearly 70 percent of agricultural production and accounts for 48 percent of total calorie consumption. Rice production has increased by 1.2 percent per annum since the 1980s but average paddy yield at the national level remains low (about 2.6 t/ha). Annual production of paddy rice has virtually stagnated over the past ten years, stabilizing between 2.3 and 3.0 million tons. Area planted to paddy has increased by only 0.4 percent per year from 1970 to 2004; yields have increased by 0.7 percent per year, much slower than in other major rice producing countries. With an annual population growth of 2.7 percent, production per person has fallen from 275 kg/person in 1970 to 179 kg/person in 2004. Rice farming techniques are largely traditional and use of inputs is the exception in many places. Fertilizer use has remained stagnant at 10 kg/ha on average, as compared to 14 kg/ha in sub-Saharan Africa, and 291 kg/ha in Indonesia. The vast difference in prices between wet and dry season is explained by the lack of fluidity in movement of goods from production areas to the markets due to a poor road infrastructure and lack of management capacity of storage facilities by farmers. On average, 28 percent of the paddy production is marketed (750,000 t), but rice sales are highly concentrated. In 2001, the top 10 percent of rice farmers (by value of sales) accounted for 73 percent of total national rice sales. These farmers sold on average 2.2 tons per household. An estimated 48 percent of rice farmers did not sell any rice in 2001.

7. Irrigation occupies an important place in the agricultural sector, supplying water to more than one million hectares, or 40 percent of cultivated lands (as compared to 6 percent on average in sub-Saharan Africa). It is estimated that 85 percent of the active farming population are directly or indirectly employed by the irrigation sector. Since the 1950s, irrigation has benefited from public investment. However, the impact of these efforts on rural incomes is mixed, and sustainability is far from certain. The rapid degradation of infrastructures requires frequent rehabilitation, and many schemes are caught in a vicious circle of poor yields, low capacity of water users to pay for Operation and Maintenance (O&M), and rapid degradation of the schemes. Weak capacity to pay is accompanied by low willingness to pay, reinforced by institutional weakness of Water Users' Associations (WUAs) and a lack of support from local authorities. Moreover, erosion of upstream watersheds is weighing heavily on cost of maintenance of downstream irrigation schemes.

8. **Land degradation, natural resources and land development.** Land degradation is one of the most serious and widespread problems for the agricultural sector in Madagascar. The

degradation dynamics in the uplands and lowlands are often linked and reinforcing each other. With the stagnation of yields in the irrigated lowland areas and demographic growth, farmers extend their agricultural activities on the hillsides. Upper watershed land use is often based on extensive and unsustainable management practices, the most important being lack of erosion control and lack of soil fertility management on agricultural plots, slash and burn agriculture (*tavy*), and the frequent burning of pastures. Land degradation is also caused by deforestation for agricultural purposes. These practices not only contribute to the degradation and low productivity of uplands but also impact lowland agriculture significantly. Upland soil erosion and water surface run-off also causes sedimentation for downstream infrastructure, contributing to the reduction of cultivated area under irrigation, local flooding of rice paddies in the rainy season and water shortages in the dry season. The impact on the overall production landscape has therefore seen such **global costs** as increased carbon emissions and declining ecosystem services such as water provisioning and filtering, habitat fragmentation and destruction leading to loss of above and below ground biodiversity, and reduced carbon storage capacity. Climate change is expected to exacerbate the trend. Recent analytical work supported by the World Bank suggests that the signs of climate change are becoming increasingly visible through changes in climate variability and the exposure to cyclones.

9. The need to adopt an approach to agricultural intensification that reaches beyond mere rehabilitation of infrastructure has been confirmed by the Economic and Sector Work “*Madagascar – Rural and Environment Sector Review (2003)*”. The list of constraints to increasing productivity includes access to finance, inputs, markets and equipment, problems associated with land degradation and sedimentation, and lack of maintenance of irrigation infrastructure. Past experience thus strongly emphasizes the need to adopt an integrated approach to agricultural intensification in Madagascar’s watersheds. The approach being adopted in the IDA/GEF project (i) aims to establish an appropriate incentive and financing framework for efficient operation and maintenance of irrigation infrastructure, as well as for the mitigation of damage caused by the frequent hurricanes that affect the country; but also (ii) addresses a wide range of issues in agricultural development as well as soil and water conservation in upper watersheds.

A.2. Rationale for Bank involvement, relation to Country Assistance Strategy and GEF eligibility

10. The Government of Madagascar requested World Bank (WB) and Global Environmental Facility (GEF) funding for an Irrigation and Watershed Management Project to accelerate economic growth in rural areas, through an integrated effort aimed at increasing productivity in high potential production zones (benefiting from public irrigation systems). The WB has played a unique role among the donor community in Madagascar, with the largest portfolio in terms of commitments and disbursements, and is seen as the lead GoM partner for poverty reduction. The IDA-financed part of the project was approved in November 2006 and made effective in April 2007. Since that time, implementation has been getting off the ground slowly due to the complexity of the project and the negative impact of the cyclones in early 2008. This GEF project is part of the GEF-SIP umbrella, a regional strategic multi-donor program designed to scale up the area of African cropland, rangeland, and woodland under sustainable management.

11. The Bank has a comparative advantage in funding this operation due to its active role in the support for reforms in the irrigation sector. Specifically, privatization of public and parastatal irrigation organizations in the early 1990s, rationalization of public expenditure for the maintenance, transfer of the management of irrigation schemes to WUAs and capacity building

have been supported by past investment operations. More recently, the Bank supported the Government in the establishment of the *Fonds d'Entretien de Réseaux Hydro Agricoles (FERHA)*, the Irrigation Maintenance Fund).

12. The Country Assistance Strategy (CAS) for Madagascar is designed to support the implementation of Madagascar' Action Plan (MAP) which has the objective to reduce poverty by half in ten years. The World Bank's Country Assistance Strategy for FY07-11 supports the areas of the MAP that have the highest priority and those where the Bank Group has a comparative advantage. The Country Assistance Strategy (CAS) continues the Bank Group's focus on removing bottlenecks to sustainable and shared growth, anchored in good governance, with corresponding improvements in welfare indicators. The specific sets of results supported by the Country Assistance Strategy are organized around two main pillars. The first concentrates on activities that will help remove constraints to investment and growth in rural and urban areas. The second brings together activities geared toward improving the scope and quality of service delivery. Madagascar is eligible for GEF support. It ratified the United Nations Convention to Combat Desertification (UNCCD) in 1997, the Convention on Biological Diversity in 1996, the United Nations Framework Convention on Climate Change in 1999, and is a contracting party to the Ramsar Convention on Wetlands since 1999. GoM has also prepared and submitted a UNCCD National Action Plan in 2001, and a National Action Program for Climate Change Adaptation in 2006.

A.3. Higher level objectives to which the project is contributing

13. The proposed project constitutes a key element of the Bank's strategy in Madagascar, and will contribute to achieving the priority objectives of the MAP. In recognition of the fact that growth in Madagascar will be derived from the country's unique natural resources and from the transformation of its natural products, and in accordance with the vision outlined in the MAP, the project would contribute to developing a diversified and rich natural resource base that will contribute to the creation of products with high value added. More specifically, the project aims to turn around a vicious cycle of low productivity, deferred maintenance and poor water management into a virtuous cycle of increased productivity, full cost recovery and acceptable O&M. It would thus contribute to creating favorable conditions for accelerated agricultural and rural growth in a number of clearly identified high potential rural growth poles.

14. The proposed project will be part of the GEF-SIP, a priority program of TerrAfrica, which was launched by NEPAD and focuses on regional partnership, knowledge generation and dissemination, as well as investment development and donor alignment. The project is consistent with the GEF Operational Program 15, concerning the mitigation and prevention of land degradation. It will promote sustainable land management across the watersheds that create long-term global environmental benefits within the context of agricultural development, ecosystem services creation and preservation, protection of primary habitats, as well as rural livelihood improvement. The operation will support both Strategic Objectives (SO) of the focal area: (i) *an enabling environment will place SLM in the main stream of development policy and practice at regional, national and local levels*, and (ii) *Mutual benefits for the global environment and local livelihoods through catalyzing SLM investments for large-scale impact*. In addition, all three Strategic Programs (SP) are addressed with this project: (i) *supporting sustainable agriculture and rangeland management*; (ii) *supporting sustainable forest management in production landscapes*; and (iii) *investing in new and innovative approaches in sustainable land management*. This project will create synergies with other focal area objectives especially adaptation to climate change, biodiversity conservation in production landscapes, and reduction

in pollution and sedimentation of international water bodies. The project will also directly contribute to the execution of the National Action Program for Climate Change Adaptation, NEPAD's EAP (Action Plan for the Environment Initiative) and CAADP (Comprehensive Africa Agriculture Development Program). In addition, UNDP and WB as Terrafrica partners have started exploring modalities to collaborate to support the development of a national SLM Investment Framework.

B. PROJECT DESCRIPTION

B.1. Lending Instrument

15. The proposed GEF project is part of an overall program approach to watershed management and irrigation development that includes IDA financing and other donor financing. The GEF support for this operation comes in complement to the already-approved first phase of 12 year IDA APL. An APL which provides the GoM with the necessary flexibility to implement the program in accordance with preferences and capacities of users groups. It also lays adequate foundations for scaling up of the project's activities on the basis of lessons learned from earlier phases. The first phase of the IDA APL was approved in November 2006 and made effective in April 2007.

16. The content of the subsequent phases of the IDA APL are not yet known at this stage, and will be determined by the lessons learned from the experience during the first phase. The three phases provide the Bank with the possibility to support the long-term GoM's national Irrigation and Watershed Management program, while at the same time providing incentives for achieving the program's development objectives.

B.2. Program Objectives and Phases

17. **Government's National Irrigation and Watershed Management Program (PN/BV-PI).** The Government's National Irrigation and Watershed Management Program (PN/BV-PI) is a central part of the MAP and Government strategy for the development of agriculture. The global objective of the PN/BV-PI program, as formulated in the BV-PI Policy Letter of the Government is *to sustainably improve the living conditions and incomes of rural populations in irrigation schemes and their surrounding watersheds and the management of natural resources.*

18. The PN/BV-PI covers all medium- and large-scale irrigation schemes in the country, and will include both newly prepared (including the proposed Irrigation and Watershed Management project) as well as on-going operations that will gradually be retro-fitted into the national program and its institutional framework. The PN/BV-PI will be supported by all interested donors. The French Development Agency (AFD), the African Development Bank (AfDB), the European Union, USAID, the Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), Kreditanstalt für Wiederaufbau (KfW), Organization of the Petroleum Exporting Countries (OPEC), the Japanese International Development Agency (JICA) and a number of NGOs are all operating in the irrigation sector and/or the National Irrigation and Watershed Management Program (annex 2 presents a detailed list of current and expected donors).

19. **Proposed APL-funded program (the Program): objectives and phases.** The Program will support the implementation of the Government's PN/BV-PI in six of the country's main irrigation zones and associated watersheds (six "sites"). Four of these have been included in the project (APL-1): Lac Alaotra (Sahamaloto), Marovoay, Andapa and Itasy. The sites that will be

added for inclusion in the Program's future phases will be selected on the basis of experience of the first phase. Overall, the six sites will require the rehabilitation of about 66,000 ha of irrigated perimeters and the management of about 200,000 ha of watersheds. The objective of the Program is *to sustainably improve the living conditions and incomes of rural populations in six main irrigation sites and their surrounding watersheds, and the management of natural resources*. This is the same as the Government's PN/BV-PI but applied to six sites. Its *global environmental objective is to improve the environmental sustainability of land management practices in four targeted watersheds*.

20. The focus of GEF support under the Program will be to promote the sustainable development of the watersheds' resource base through an integrated watershed management (WSM) approach with innovative, long-term approaches to deal with complex natural resources management issues (such as fire use, deforestation, and unsustainable farming practices). With that, GEF will support the development goals of local communities and secure global environmental benefits. GEF will also emphasize capacity strengthening in sustainable land management, and identify successful processes and outcomes and disseminate lessons learned in order to strengthen the National Program and facilitate its scaling up. Annex 3 shows both the Program's expected final impact and the milestones and outcomes which will be used to monitor development and implementation progress.

B.3. Project Development Objectives and Key Indicators.

21. In the context of the broader APL objectives described above, the development objective of the Project (the first Phase of the Program) is *to establish a viable basis for irrigated agriculture and natural resources management in four main irrigation sites and their surrounding watersheds*: (i) Andapa (Sava Region), (ii) Marovoay (Boeny Region), (iii) Itasy Region, and (iv) Lac Alaotra (Alaotra Mangoro Region). A detailed description of the project zones is included in Annex 1 and Annex 16.

22. The *global environmental objective* of the project is to improve the environmental sustainability of land management practices in four targeted watersheds.

23. **Triggers.** Triggers for moving to the second phase of the APL include attainment of the following targets:

- Watershed Master Plans (WMP, including Scheme Development Plans (SDP) and Watershed Development Plans (WDP)) and associated Performance Contracts executed satisfactorily¹;
- an acceptable institutional mechanism for the funding of non-transferable irrigation infrastructure (FERHA) established and operational;
- private sector investments in agriculture increased as evidenced by disbursements under the matching grant mechanism;
- Agricultural Service Centers (ASCs) established and operational in the four project sites;
- *guichets fonciers* established and operational in the four project sites.

24. Specific information on what is implied in attaining the triggers is presented in Annex 18.

25. The project is being implemented in four rural 'growth poles' – four zones characterized by medium- and large-scale public irrigation where a number of conditions have been met for a

¹ Watershed Master Plans, Scheme Development Plans, Watershed Development Plans and Performance Contracts and are discussed in annex 4.

rapid kick-off of growth, including relatively easy access by road, and better access to finance, inputs, markets and equipment. A more reliable access to water puts a high premium on the use of productivity enhancing inputs, provides more flexibility, diversity, reliability, quality and product uniformity to satisfy the requirements of markets, and enables farmers to capture higher seasonal prices. In addition, the sites are similar in the sense that institutional issues such as a clarification of roles and responsibilities through irrigation management transfer represents a high priority for improving performance of irrigated agriculture.

26. The first phase covers about 21,780 ha of irrigation schemes (out of a total of 66,000 ha for the sites to be included in the IDA-funded APL in six sites). Direct beneficiaries include about 30,000 smallholder households producing irrigated and rainfed crops, and farmers' groups and private operators providing services, selling products and performing various functions in the value chain. The four sites meet a number of conditions for rapid growth, including relatively easy access to markets for outputs and inputs and good agricultural development potential. However, they are also suffering from severe institutional weaknesses for the management of the irrigation perimeters and significant upstream watershed degradation. Correcting these weaknesses in support of fast and sustainable development will be one of the main objectives of the project, thus building a strong base for the subsequent phases of the Program.

27. *Project total cost* is estimated at US\$40.3 million, to be financed by: (i) IDA: US\$30.0 million (74 percent of total cost); (ii) GEF: US\$5.9 million (15 percent); and beneficiaries: US\$4.4 million (11 percent). The expected *project outcomes* include (i) dissemination of innovative technologies and equipment to 30,000 beneficiary households through extension, capacity strengthening and targeted cost sharing, (ii) improved management of about 21,780 ha of irrigation infrastructure through investments in rehabilitation, training and institutional reforms, (iii) 20 percent increase of land area under sustainable land management and 15 percent improved vegetation cover as a percentage of the baseline in targeted watershed areas (iv) improved management of about 8 sub-watersheds through capacity strengthening and investment in watershed infrastructure and sustainable watershed management, and (v) increased government support for sustainable agricultural intensification in irrigated and rainfed areas through increased public expenditures.

B.4. Project Components

28. The IDA-financed project comprises three technical components covering major strategic orientations: (i) Development of Commercial Agriculture, (ii) Irrigation Development and (iii) Watershed Development. The fourth component is Program Management. In accordance with the 'growth poles' approach, the project proposes four similar sub-projects in the four regions concerned (Annex 1). A more detailed description of the components and activities is attached in Annex 4. The GEF funding is mainly directed towards two technical components: (i) the development of commercial agriculture, and (ii) watershed development, as well as the program management component. Information on GEF funded activities within the components can be found in the Incremental Cost Analysis (Annex 15).

Component 1: Development of Commercial Agriculture

(US\$12.46 million, including an IDA contribution of US\$7.45 million, a GEF contribution of US\$2.50 million, and a beneficiaries' contribution of US\$2.51 million)

29. The objective for this component is *to lay the foundations for improved market access and sustainable intensification and diversification of irrigated and rainfed agricultural systems in the project's watersheds.*

30. The '*Development of Commercial Agriculture*' component includes the project area as a whole: both irrigated and upland or *tanety* areas. Its specific objective will be achieved through an approach focused on market-driven demand, agricultural technology development and dissemination, private sector initiative and vertical integration of supply chains, as well as promotion of partnerships among stakeholders (including public-private partnerships, PPP). The component aims at improving, all along the targeted supply chains:

- Access to market and marketing systems in order to reduce costs and increase farm gate prices
- Added value through diversification into higher added value products and agro-processing
- Capacities of farmers, farmers groups and professional organizations
- Agricultural productivity through better access to extension, improved technology integrating SLM principals, inputs, and credit

37. The component includes two sub components: one involving activities that largely depend on public/ collective initiative; the other one depending essentially on demand from stakeholders:

- (i) *Support to agricultural services. (US\$7.14 million, including an IDA contribution of US\$5.15 million, a GEF contribution of US\$1.97 million, and a beneficiaries' contribution of US\$0.02 million)*

The sub-component aims at improving **access to markets** and supports the **development of commercial agriculture value chains**, through innovative technologies for sustainable production, storage and processing, and a stronger **enabling environment** at the site level. The project is funding services, work, equipment, training and operational costs. Activities can be adjusted to specific needs of each site, and include the following (a) support to the development of dynamic market-driven supply chains, particularly by *creating and strengthening links between producers and markets*, (b) building up of farmers capacities and *strengthening professional organizations*, as well as establishing Agricultural Service Centers (ASC), and (c) dissemination of technologies for sustainable agricultural intensification and diversification in lowlands and uplands, including *support and advisory services* for the implementation of agro-ecological and agroforestry techniques in the upper parts of the watersheds. These services have already begun as part of the IDA project that has been effective since April 2007 and are being provided by strategic partners and specialized service providers. The GEF funding will contribute in assuring that intensification and diversification of agricultural production is based on agro-ecological principles. To this end, high quality technical assistance is provided. GEF support will be adjusted to specific environmental conditions of the four project zones. Capacity strengthening of farmers and technicians in agroecological techniques and principles is receiving priority, as well as the testing and adaptation of techniques in farmers' fields.

- (ii) *Support to private investment. (US\$5.32 million, including an IDA contribution of US\$2.3 million, a GEF contribution of US\$0.53 million, and a beneficiaries' contribution of US\$2.49 million)*

This sub-component is providing demand-based support to private investment by operators, farmers and farmer groups at all levels of the agricultural activity. The sub-projects funded under this sub-component are essentially private in nature and are initiated upon request by a farmer, a farmer group or a private sector operator. They are initiated by the latter, with financial support from the project if government considers them a priority and wants to promote them. Project support is being provided to priority new investments through a cost sharing mechanism according to a pre-established positive/negative list. Private operators have been selected to be responsible for implementing the sub-projects and related activities according to procedures approved by the project. Sub-projects include investment in collective storage, market research and supply chain development, technical and managerial advisory services, new technology demonstration and dissemination (including agro-ecological cultivation techniques), support to seed production, private distribution networks for inputs and equipment and microfinance institutions, and support to contract farming and integrated sub-projects initiated by commercial or agro-industrial partners and involving small scale producers. The project is taking a gender sensitive approach and specifically supports vulnerable groups in their demands. In addition to investment in infrastructure and equipment, sub-projects include studies and market tests and research, extension and advisory services, applied research, training, and study tours. IDA is financing activities linked to the production of big commercial crops, such as rice, off-season vegetable crops, and others, whereas GEF funding will be directed towards i) cropping systems that apply agro-ecological principles, ii) fruit tree cultivation as part of agroforestry system developments, iii) livestock production and with it support sustainable fodder production, and the integration of livestock and cropping systems, and iv) fire-less upland cropping system as alternative to the slash-and-burn practices of cultivation.

38. These GEF activities will contribute to achieving the SIP Result 1 and Result 3 (See annexes 3 & 4 for more details). The financing modalities are described in further detail in Annex 4. Implementation responsibilities are detailed in Annex 6. Eligibility criteria for activities funded under this component include the willingness to cover part of the associated costs and to commit to develop and implement a capacity strengthening plan. More detailed information of GEF funded activities can be found in Annexes 4 and 15.

Component 2: Watershed Development

(US\$4.33 million, including IDA funding of US\$1.82 million; GEF contribution of US\$2.42 million, and beneficiaries' contribution of US\$0.09 million)

39. The objective of the component is *to lay the foundations for sustainable management of watersheds including irrigated and rainfed agriculture, the conservation of the natural heritage, and improved productivity of the natural resources.*

40. As part of the IDA-project already underway, this component is adopting an integrated and participatory approach to watershed management to make rural populations more accountable and encourage them to manage land and natural resources on a more sustainable manner. Thus, the component contributes to: (i) protect watersheds by reducing erosion and

sedimentation; (ii) increase the productivity and sustainability of agricultural production based on agroecological and agroforestry technologies; and (iii) strengthen the management of natural resources to improve the environment and living conditions. The GEF financing here would concentrate on investments with *long-term environmental impacts*, and support to *SLM groups*.

41. The project is financing the following sub-components:

- (i) *Planning and capacity building for sustainable management of watersheds, (US\$4.33 million, including IDA funding of US\$1.82 million; GEF contribution of US\$2.42 million, and beneficiaries contribution of US\$0.09 million)* including (a) preparation, as part of Watershed Master Plans, of Watershed Development Plans in the four project areas; (b) preparation of participatory plans for managing approximately eight sub-watersheds (each of about 10-500 km²); (c) support to communication and negotiation platforms, (d) training and capacity strengthening of SLM groups; (e) support to improvement of land tenure security; and (f) the establishment of an integrated SLM knowledge and information system. IDA funding has contributed to the development of Watershed Master Plans and is supporting land tenure security through the installation of inter-communal 'Land Tenure Windows'. GEF funding will address longer-term environmental and land degradation issues through a participatory and integrated approach. The focus will be on technical assistance, training and capacity strengthening for sustainable land use alternatives, support to environmental communication, and the establishment of a national SLM database.
- (ii) *Sustainable investments in watersheds, (US\$1.20 million, including IDA funding of US\$0.57 million; GEF contribution of US\$0.54 million, and beneficiaries contribution of US\$0.09 million)* including (a) determining, through participatory negotiations, local strategies for controlling erosion, arresting gullies and reducing the sediment load of river runoff. The project will finance investments in strategic anti-erosion works (through, among others, biological methods and technologies); and (b) interventions on communally owned land to improve plant cover, reforestation and pastures through strengthened technologies and management transfer of natural resources. IDA is in charge of (a) above and GEF will provide its support to (b).

42. Eligibility criteria for support under this component include the severity of land degradation, and the willingness of stakeholders to cover part of the associated investment costs.

43. An MOU, one per Project Area, has been signed by MAEP through the National Irrigation and Watershed Program and the Ministry of Environment, Water, Forests and Tourism (MinEnvEFT) through the Third Environment Program (EP3) to ensure adequate integration in all project areas, of the project. The MOU specifies in detail the activities that will be financed by each program. These activities will contribute to achieving SIP Results 1, 2 and 3 (see Annexes 3 & 4 for more details)

Component 3: Program Management

(US\$4.43 million, including IDA funding of US\$3.45 million and a GEF contribution US\$0.98 million)

44. The objective of this component is *to manage and use resources in accordance with the project's objectives and procedures, and to put in place a policy framework that is favorable to*

upscaling of the project at the national level. This component finances the following sub-components:

- (i) *Management of the project (US\$1.89 million, including IDA funding of US\$1.51 million; and a GEF contribution of US\$0.38 million), including (a) provision of technical assistance, training, office equipment and vehicles, minor office upgrading works, auditing and evaluation studies, and incremental operating costs in support of project management; (b) overall project planning, quality oversight, procurement, financial management, and monitoring of project activities; and (c) outsourcing of quality oversight through independent financial and technical audits, and evaluation of project activities. Project management encompasses all four target watersheds as well as national level coordination. GEF funding will contribute to this sub-component by reinforcing the technical assistance already being provided.*
- (ii) *Support to national policies, (US\$0.48 million, including IDA funding of US\$0.36 million; and a GEF contribution of US\$0.12 million) including (a) provision of technical assistance, studies, training, information campaigns, exchange visits and workshops for the development of major national policies, regulations, and plans considered critical to the Government's National Irrigation and Watershed Management Program; (b) provision of support to emerging professional groups, in particular the *Plateforme Consultative de Riz* and the *Association Malgache de Producteurs de Semences*; and (c) provision of support to prepare a multi-partner SLM investment development framework, in collaboration with UNDP. IDA is financing (a) and (b) above and GEF will finance (c).*
- (iii) *Monitoring and evaluation. (US\$2.06 million, including IDA funding of US\$1.58 million; and a GEF contribution of US\$0.48 million). This involves data collection and reporting on key performance output and impact indicators, including targeted data collection, surveys, participatory assessments and mid-term and final evaluations. GEF funding will contribute to the project monitoring and evaluation system by financing the satellite images and their interpretation to monitor, among others, the global and environmental indicators.*

45. The scope of this sub-component would be national. The improved policies are expected to benefit all key operators and producers involved in the sub-sector. The GEF funded activities will contribute to achieving the SIP Result 4. For more details see Annexes 4 and 15.

B.5. Lessons Learned and Integrated into the Project Concept

46. The design of the project is based on lessons drawn from evaluations² of programs and projects in the irrigation sub-sector that were often unsuccessful. Despite significant investments in the rehabilitation of irrigation infrastructure, there has been little diversification to higher valued added crops, and sustainability has been questionable because of lack of maintenance. Some of the reasons for the failure identified by the different studies are lack of market access (remoteness leading to high transport costs); lack of access to extension services and input supply; failure to take upstream watersheds into account; unclear responsibilities; weak

² This comprises, among others (i) Madagascar – Rural and Environment Sector Review (WB, 2003), (ii) Watershed Management Operations: Approaches, Challenges and Emerging Lessons (WB/ARD, 2006), (iii) Madagascar: The Impact of Public Spending on Irrigated Productivity, 1985- 2004 (WB, 2004), (iv) ICR PPI-2 (WB, 2000), (v) *Agriculture, Pauvreté Rurale et Politiques Economiques à Madagascar* (Minten et al, 2003), and (vi) Review of Madagascar's Rice sub-sector (Bockel, 2002).

stakeholder capacity; land tenure constraints; non-respect of commitments by users and Government; and indiscipline and impunity.

47. The conditions of success identified by these same studies include the following:

- (i) *An integrated approach* that contributes to increased productivity and incomes in irrigation schemes *and* surrounding watersheds, safeguards natural resources in watersheds, improves the provision of agricultural extension and inputs, and actively supports emergence of a private sector.
- (ii) *A conducive economic environment* including a price policy for products and inputs, market access in terms of road infrastructure and information; promotion of the private and associative sectors for marketing of products and supply of inputs; access to appropriate and efficient agricultural services; and access to rural finance.
- (iii) *An unambiguous institutional framework* with clear responsibilities in accordance with policies such as decentralization and legislation (land, water and forestry codes) for farmers and their associations; communes, inter-communes and regions; decentralized Government services; and agencies and private operators.
- (iv) An approach that emphasizes *capacity strengthening* of all stakeholders to help them play their respective roles and responsibilities.
- (v) *A participatory approach, coordinated decisions and respect for commitments*, including stakeholders with established and acknowledged rights and obligations, adequate resources and capacities, who fully participate in decision-making; incentives and mechanisms in place to encourage appropriate behavior and respect for commitments made; and interfaces for cooperation and dialogue in accordance with decentralization policies.

Experience with implementation to date

48. Since the launch of the IDA project in April 2007, the Implementation Status Report (ISR) ratings of the project from the start have been "satisfactory" for both Implementation Progress (IP) and Project Development Objective (PDO). The commitment from the Government and the MAEP staff to launch the project and to work with the other development actors in the project sites has been noted. There is a high level of expectation within the country on the project and a lot of goodwill to see it become a success. The project is designed to be fully aligned with the existing structures and institutional entities in the four sites through working with the regions, the decentralized MAEP staff and the relevant local management committees.

49. The project implementation structure is in place as the Steering Committee at the national level and the regional steering committees (CORES) are already operational. However, these still need strengthening as regards planning, execution, coordination, communication and M&E. At the level of the four sites, the project management teams are in place and there is a good dynamism to get activities going although the teams lack the proper work tools and methods. The supervision missions to date have focused on providing support to the project to organize immediate training for the regional teams on project planning, budgeting, implementation, and M&E so as to strengthen their capacity from the outset.

50. Due to lack of experience with implementing an IDA-funded project through the Government structure, rather than through a PIU, the Project is facing challenges in executing

project activities, especially with respect to the critical watershed master plans which are being finalized. As foreseen under the Project, the capacity of the MAEP staff has to be built to plan, execute and coordinate a complicated project such as the Irrigation and Watershed Development Project. The project is recruiting strategic partners for each site to support the DRDR in implementing field activities.

B.6. Alternatives considered and Reasons for Rejection

51. A number of alternatives were considered and rejected in project design:

- (i) *Develop the program as a Sectoral Investment Loan (SIL).* However, it was felt that the investment part of the project requires a flexible implementation mechanism with an appropriate incentive framework that can respond to different preferences and capacities of stakeholders.
- (ii) *Splitting the project into three separate projects – (i) an agricultural productivity project focusing on irrigation and agricultural services; (ii) a community based natural resource management project focusing on watershed management and decentralization; and (iii) a land reform project focusing on implementation of the recent economic and sector work findings.* However, it was felt that this design would fail to capture evident synergies and create implementation gaps.
- (iii) *Putting in place a sector-wide multi-donor approach similar to the Third Environmental Program.* However, discussion with other donors suggested that more flexible donor collaboration, possibly in preparation for close collaboration thereafter, was more appropriate.
- (iv) *Expanded focus on complementary rural development activities like rural finance reform, and land administration.* However, it was felt that this would exacerbate project complexity and create implementation risks.
- (v) *Reduction in the geographic scope of the project to three areas.* However, this would not minimize complexity and would be at odds with the government's scaling up objective; and
- (vi) *Designing the project to respond to the government's nascent decentralization program,* transforming the project into a multi-sectoral, rather than agricultural operation. It was felt that the policy, institutions and disbursement mechanisms associated with decentralization were not yet sufficiently clear and mature.

C. IMPLEMENTATION

C.1. Partnership Arrangements

52. The project is a blended operation between GEF and IDA. It contributes to the National Irrigation and Watershed Management Program, for which the GoM has prepared a policy letter (see Annex 18). The National Program is also supported by Agence Française de Développement (AFD) and other donors (see Annex 2).

53. In each of the four project areas, the project works with regional partners. These include PLAE in Marovoay, WWF in Andapa and Durell in Lac Alaotra for watershed activities; and BAMEX and CHT/CTHA for marketing and business promotion activities.

54. The project benefits from the Memorandum of Understanding signed between the National Irrigation and Watershed Management Program and the multi-donor Third Environmental Program to ensure coherence and synergies between activities in the lower and upper watersheds.

55. The conceptual design of the ASCs and “guichets fonciers” has been elaborated in close collaboration with FAO, EU and AFD. The EU is providing significant support to MAEP in the establishment and capacity strengthening of ASCs.

56. This project is part of the *Strategic Investment Program for Sustainable Land Management in Sub-Saharan Africa* (SIP) program, the goal of which is to support sub-Saharan countries in improving natural resource-based livelihoods by reducing land degradation, in line with MDGs 1 and 7. This will particularly enhance the opportunity of mutual learning via regional knowledge sharing, by exchanging targeted analytical work, and by harmonizing, if advantageous, M&E approaches. In that context the two global environmental indicators of the project (increased vegetation cover and increased area under SLM), are among the key performance indicators of SIP. This will create complementary information and be of direct benefit to both programs. Emphasis on mutual learning via regional knowledge sharing will be through drawing linkages with the recently completed World Bank supported Medium Sized Project *Institutional Strengthening and Resource Mobilization for Mainstreaming Integrated Land and Water Management Approaches into Development Programs in Africa*; the UNDP-GEF funded *Stabilizing Rural Populations through the Identification of Systems for Sustainable Management and Local Governance of Lands in Southern Madagascar*, and the UNEP regional project *Addressing Land-based Activities in the Western Indian Ocean*.

C.2. Institutional and Operational Arrangements

57. The project is being implemented under the responsibility of the Ministry of Agriculture, Livestock and Fisheries. A national Project Steering Committee and Regional Monitoring Committees have been established at the national level and in each of the four project areas.

58. *The National Steering Committee* is chaired by the SG of the Ministry of Agriculture, and includes representatives from:

- other central ministries involved at SG level - Ministry of Decentralization and Land Development (MDAT), Ministry of Environment, Water, Forests and Tourism,

Ministry of Finance and Budget, Ministry of National Education and Scientific Research, Ministry of Economy, Industry and Trade - to ensure consistency of project actions with national policies;

- the Chairperson of the Permanent Steering Team of the Rural Development Action Plan,
- the main professional organizations such as the Chamber of Agriculture and associations/forum involved in the main value chains such as the « Rice Platform ».

59. The National Steering Committee is supported by a technical secretariat under the responsibility of the National Program Coordination Unit at MAEP. It is responsible for (i) annual programming of project activities and approval of the work plan and budget, (ii) monitoring implementation and results, in particular the analysis and approval of activity reports and financial and operational audits, and (iii) recommending corrective measures that may be necessary. The National Steering Committee meets twice a year.

60. **Regional Monitoring Committees** have been established in each of the four project areas. They are chaired by the Head of the Region and made up of members of GTDR³. The Regional Monitoring Committee is supported by the GTDR's Technical Secretariat, and is responsible for (i) ensuring consistency of project actions with both national strategy and policy, and regional development priorities and programs; (ii) preparing and validating detailed work plans and budgets at the regional level; (ii) reviewing project progress and performance, and the implementation of corrective measures if necessary. The Regional Monitoring Committee meets twice a year.

61. **The overall coordination** of the project is ensured by the National Program Coordination Unit (NPCU) at MAEP, as follows:

- The National Program Coordination Unit is responsible for project coordination at national level;
- The Regional Director for Rural Development (DRDR) is responsible for project coordination and project investments in their respective regions.
- To help them in these tasks, the project has financed the recruitment of an international technical assistant for operations at the national level, and (ii) four national technical assistants, as advisors to the Regional Director for Rural Development for operations at the site level.
- The NPCU and DRDR have selected from within their respective units one staff member who provides support for coordination and project monitoring.

62. **The project financial management** is the responsibility, at the national level, of the Directorate of Finance and Budget (DFB) from MAEP (through PNBVPI) and, at regional level,

³ The Working Group for Rural Development (Groupe de Travail de Développement Rural, GTDR) is made up of five local stakeholder groups (farmers organizations, private sector, decentralized authorities, NGOs, and projects/ programs active in the region). Its activities include: (i) developing and updating regional development plans, (ii) updating regional data bases; (iii) establishing regional development indicators and their monitoring; (iv) organizing meetings for exchanging information related to rural development; (v) preparing and monitoring rural development programs/ projects in the region.

of the DRDR Department of Finance and Budget (RDFB). The project has recruited a specialized national financial management and procurement agency that provides technical financial management assistance to MAEP's Finance Director. The project has also recruited, for each of the four sites, a regional Chief accountant, who works closely with the DRDR and who is in charge of financial management. This person works closely with MAEP's Department of Administration and Finance and reports to the national financial management and procurement agency.

63. MAEP's Directorate of Finance and Budget is responsible for: (i) consolidation of work programs and budgets; (ii) maintenance of records and accounts for all transactions made at the central level; (iii) timely preparation of quarterly Interim Financial Reports (IFRs), consolidated project financial statements and other required reports; and (iv) cash management and replenishment applications for the Designated Account. The Regional Department of Finance and Budget at each of the four sites manages disbursements from the "Regional Accounts", maintain records and accounts for all transactions related to the regions, and prepares financial and other basic information on project management/monitoring as required by the MAEP Financial Directorate.

64. *Procurement* is ensured, at central level, by the Person Responsible for Public Procurement (PRMP) of MAEP and, at regional level, by relevant units of the DRDR. The project has recruited (i) a national financial management and procurement agency that provides technical assistance to the PRPM, and (ii) at the level of each region, an additional staff, under contract to the national agency, which is full time in charge of project procurement. This staff work closely with the PRMP and benefit from the project support in procurement technical assistance at the national level.

65. *Technical assistance.* Recruitment of technical assistance (TA) has already been done under two separate contracts (one for financial and procurement management, and one for operational assistance) with specialized firms. The international "Operations" TA is in charge of (i) advising the NPCU and DRDRs on operational strategy, project implementation and monitoring; and (ii) training and operational support to MAEP staff involved in project implementation. Four national "Operations" TAs are posted at the level of DRDRs to advise and support them in project implementation and ensure coordination of all project components at the regional level. National consultants in financial management and in procurement are responsible for financial management and procurement and for providing technical support to DRDR staff. The four financial and four procurement consultants at the regional level are responsible for financial management and procurement at the regional level. They have been recruited under one contract with the national level financial management and procurement specialist, and report to the national specialists.

C.3. Monitoring and Evaluation of Outcomes/Results

66. Monitoring and Evaluation (M&E) is the responsibility of MAEP's Department of Information Systems (DSI). A specialized project M&E system and procedures for data collection and reporting has been prepared to the satisfaction of IDA. M&E is based on direct reporting by institutions involved in project implementation, relevant data collected on a systematic basis for other purposes, participatory assessments, user satisfaction and income surveys, and targeted data collection (among others through satellite photos), as established in the project implementation manual. DSI will commission two evaluations of project output and

impact indicators, at mid-term and at completion. The project has already established a baseline as of mid-2007. The results framework is presented in Annex 3.

C.4. Sustainability and Replicability

67. Sustainability of project investments will be achieved in the following manner:

- (i) In linking soil and water management in upstream watersheds to irrigation, the project contributes both to more profitable rainfed agriculture, *and* more sustainable and cost-effective irrigation management. In so doing, the project seeks to set off a cycle of increased productivity, higher income and improved capacity to pay for irrigation services.
- (ii) In view of the experience in Madagascar, priority is being given to capacity and institutional strengthening. The project will not establish new institutions, but builds on GOM's priorities and on what has already been established. Investments are being done only where conditions associated with institutional performance and governance have been met.
- (iii) Client demand, contribution in cash or in kind and ownership is the determining factor in deciding to go ahead with investments in agriculture, irrigation and watersheds.
- (iv) Past experience provides abundant confirmation that irrigation schemes that depend on pumping are not sustainable. The project therefore selects irrigation sites that depend on gravity flow only.

68. Successful project outcomes and lessons learned can be disseminated through the National Program and replicated to other regions. The fact that the project is working in four distinct sites will allow for replication of lessons learned within each region, taking into account local specificities and conditions. If successful, the project will also have a good potential for transferability to other countries in the Africa region. Dissemination of good practices and successful approaches would be essential in facilitating the scaling-up process. A detailed replication strategy would be proposed after the mid-term evaluation of the project.

C.5. Critical risks and Possible Controversial Aspects

69. The potential risks of the project are presented in the table below.

Table 1: Critical risks and mitigation measures

Risks	Risk rating	Risk Mitigation Measures
Operational		
Failures of communities to cooperate in integrated watershed management approaches	Moderate	<ul style="list-style-type: none"> • The project supports communities to obtain benefits from WSM activities, through obtaining matching grants, land rights, and by developing economically beneficial activities
Low rates of adoption of SLM technologies, and low capacity of communities to adopt technologies	Moderate	<ul style="list-style-type: none"> • The project builds on already tested and adapted technologies • The project develops a sliding scale for matching grants; with proportionally

		<p>higher grant money for activities with higher public service values</p> <ul style="list-style-type: none"> • The project invests in capacity strengthening of project participants
<p>Policy GoM does not follow a sound seed and fertilizer policy based on private providers, as well a favorable environment for private agrobusiness development.</p>	Moderate	The implementation of the GoM fertilizer and seed policy is a covenant under the project.
<p>Country Level: Audit may not be conducted in compliance with international auditing standards due to: weak capacity of the accounting profession in Madagascar, and; ii) inadequate number of skilled and experienced auditors at the “Chambre des comptes” in particular.</p>	S	The FM aspect of this project has been entrusted to a Financial Management Agency (FMA) acquainted with Bank procedures, and the audit will be carried out by the international accounting firm recruited under the ongoing Irrigation and Watershed Management Project. The quality of the audit conducted so far is satisfactory.
<p>2- Control Risk Funds flow Risk of non availability of communities participation;</p>	S	Community Contribution to Sub Projects will be in labor and in kind. Financial contribution is not required.

C.6. Credit conditions and covenants

70. **Effectiveness conditions:** None

71. **Legal Covenants**

- The Government will ensure that operational modalities of management and replenishment of FERHA be defined by November 30, 2008; after consulting with the Bank, and
- The Government will also ensure (i) that a draft law to harmonize the irrigation related legal framework, including but not limited to Law 90-016 and subsequent implementation texts with the provisions of the Program be prepared by November 30, 2008 and (ii) that the relevant implementation texts be adopted by September 30, 2009, after consulting with the Bank.

72. **Disbursement conditions:** no withdrawal shall be made for any Sub-Project Matching Grant under Category 2, unless: (i) a Sub-Project Agreement has been signed between the relevant Implementing Institution and the Sub-Project Beneficiary, in terms and conditions satisfactory to the World Bank;

D. PROJECT BRIEF SUMMARY

D.1. Economic and Financial analysis

Summary of Benefits and Costs:

73. *Project benefits.* For each watershed, two types of benefits were identified: (i) additional agricultural production in irrigated perimeters and uplands or *tanety* areas and (ii) reduced situation and avoided cyclone damages to irrigation infrastructure. The benefits were quantified and valued using hypotheses on (i) delay and increment in generating additional agricultural production in irrigated areas (manly paddy) and uplands (mainly cassava, maize, and tomatoes) and (ii) delay and increment in reducing siltation and damages, and (iii) rent values associated with increased productivity and reduced O&M costs. The results are presented in the table below. The gross benefit value of the project is US\$62 million.

74. *Economic Analysis.* For the purpose of the economic analysis, the Irrigation and Watershed Management Project has been divided in four watersheds that were assessed separately: Marovoay, Itasy, Andapa and Lac Alaotra. For each watershed, the economic costs have been regrouped in (i) investment costs (public commercial agriculture development, irrigated perimeters, watershed development, and project management); (ii) physical contingencies, and (iii) incremental recurrent costs. The results are presented in the table below, and detailed in Annex 9. The higher economic costs for Marovoay come from its irrigation component which involves a larger area than in the other watersheds.

Table 2: Economic Costs per Watershed

<i>Type of Costs, Present Value (\$' 000)</i>	<i>Marovoay</i>	<i>Itasy</i>	<i>Andapa</i>	<i>Alaotra</i>	<i>Total</i>
Commercial Agricultural Development	2,763	2,585	2,528	2,185	10,061
Irrigated Perimeters	4,510	1,944	1,465	3,392	11,311
Watershed Development	2,714	1,279	2,463	885	7,342
Project Management	1,529	1,529	1,529	1,529	6,116
Physical contingencies	1,095	566	507	946	3,113
Recurrent Costs	1,736	820	824	1,505	4,885
Total	14,347	8,722	9,316	10,442	42,827

75. The calculation of the Net Present Values (NPV) and Economic Rates of Return (ERR) for each watershed show (see table below) show that Marovoay is by far the most economically valuable watershed, with an estimated ERR of 28 percent. As a whole, the project is likely to increase the welfare of the country by about US\$19 million corresponding at an ERR of 17 percent.

Table 3: Economic benefits, NPV and ERR per Watershed

<i>Watershed Benefits/Costs (Present Value, \$'000)</i>	<i>Marovoay</i>	<i>Itasy</i>	<i>Andapa</i>	<i>Lac Alaotra</i>	<i>Total</i>
Well Irrigated Areas Production	25,833	6,675	3,846	5,503	41,857
Partially Irrigated Areas Production	2,121	3,072	3,081	1,419	9,694
Tanety Production	1,536	4,079	2,150	266	7,876
Siltation Reduction in Irrigation systems	43	171	70	27	310
Avoided Cyclone Damages in Irrigation systems	947	485	420	279	2,130
Project Cost (investment and recurrent)	12,611	7,903	8,492	8,937	42,827
Net Present Value NPV	17,867	6,579	1,076	-1,441	19,041
Economic Rate of Return (ERR)	28%	20%	12%	7%	17%

Sensitivity analysis

76. The variables that most influence the project outcome include (i) the producer price of paddy; and (ii) the ability of WUAs and the government to maintain irrigation infrastructure beyond the project life (including whether a cyclone hits the structures). If producer price falls below 15 cents next year (compared to 20 cents now) and stays at this level, the project will not be profitable. If WUAs do not maintain productivity on irrigated areas more than 7 years after the project or if a cyclone hits Marovoay's 16,000 hectares of irrigated perimeters after four year of project implementation without being repaired, the project's NPV drops to zero. The main beneficiaries of the project (farmers) should therefore pay the incremental recurrent costs to maintain the infrastructure as well as for insurance mechanisms.

D.2. Technical

77. Irrigation investment operations have had a mixed experience in Madagascar. While investments were generally justified in terms of increase in production, sustainability has been far from sure. The project focuses on increased production and higher value, but in particular on translating higher income into better maintenance of infrastructure through capacity strengthening and improving governance of hydraulic assets. In addition, the project invests in upper watersheds to promote sustainable land use practices, which is expected to deliver higher production of rainfed agriculture, while at the same time reducing sedimentation and thus maintenance costs. Based on international experience, the project supports a demand-driven approach to extension services that are, ultimately, to be provided by private service providers on a commercial basis. Establishment of Agriculture Service Centers is being supported by the project as a platform to bring together supply and demand for extension services.

78. Watersheds form integrated spatial management units with irrigation schemes. Failure to address synergies between the two has lead to missed opportunities and reduced returns on investments. The project aims to address productivity of agriculture in both irrigated low lands and rainfed watersheds, while capturing the environmental externalities associated with more sustainable land use and management. The integrated design of the project is based on similar projects in Madagascar financed by FAO and AFD, and on an Africa Land and Water Initiative pilot project in Anjepy.

D.3. Fiduciary

79. *Procurement:* The third Country Procurement Assessment Review (CPAR) for Madagascar was conducted in November 2002, followed by a workshop in June 2003 for the validation of a joint CPAR/CFAA action plan to ensure rapid implementation of procurement reforms. Key elements of these reforms are: (i) revision of the draft procurement code to ensure transparency, simplify procedures, and comply with international standards, (ii) establishment of effective procurement institutions to ensure that the new regulations will be adequately applied, and to provide sufficient oversight and control; and (iii) adequate training and capacity building to ensure the sustainability of the procurement reforms. A new procurement code was enacted in July 2004 and regulations are in application. The World Bank ascertained that the deficient features identified in the 2003 CPAR have been properly addressed.

80. A remaining area of concern is the Government's cumbersome and overly bureaucratic approval process for contract signing, which causes unnecessary delays. In addition, insufficient procurement planning contributes to delays in project implementation which results in slow disbursement. To mitigate the risk of delays, proper prerequisites for the use of Bank standard bidding documents, including evaluation reports for National Competitive Bidding procedures (NCB) have been agreed upon with Government during negotiations.

81. A Procurement Capacity Assessment of the MAEP, including training needs and arrangements, was conducted as part of the project preparation. On the basis of the initial assessment, an action plan was drafted to address areas where MAEP needs to be strengthened. This includes (i) a specific section on procurement in the Project Implementation Plan (ii) improved filing organization of procurement-related documents (including in the regional offices); (iii) procurement training sessions for project staff; (iv) the recruitment of technical assistance to help MAEP handle the project procurement load, and (v) the financing of independent procurement and technical audits on a regular basis.

82. *Financial management:* The overall conclusion of this review carried out during the pre-appraisal mission is that the DFB (through PNBVPI) and RDFB continue to maintain a sound financial management system in line with the requirements of the OP/BP 10.02. The financial management risk is assessed as being moderate. The GEF-financed project will use the same Chart of accounts and the current models of IFRs that have been used for IDA-financed project. The models of IFRs are presented in the existing accounting manual of procedures.

83. To mitigate risks raised by the weak capacity of the accounting profession and the Auditor General Office (Chambre des Comptes) the audit of the project financial statements, including GEF grant, has been entrusted to an international auditing firm recruited under the ongoing Irrigation and Watershed Management Project supported so far by IDA financing. The terms of reference of the audit have already been reviewed by the financial management specialist of the Bank to ensure the adequacy of the audit scope. The audit reports will be submitted to IDA not later than six months after the end of each fiscal year. No significant problems have been encountered so far in terms of audit covenants: all audit reports related to Bank financed projects in Madagascar have been received in due time.

D.4. Social analysis

84. The large rice producing irrigation schemes constructed over the last fifty years have attracted migrants from other parts of the country. Some of the farmers who have landed in the irrigation schemes also often also have landed in the watersheds surrounding the irrigation schemes. Other farmers have only landed in the surrounding watersheds. Degradation of agricultural production systems in the irrigation schemes and in the watersheds has led to reduced agricultural production and consequently to increased poverty. Degradation in the watersheds, in particular, has been dramatic and may over time lead to abandonment of the land. The project aims to sustainably increase agricultural production, diversification and revenues in the four sites. Agro-ecological agricultural practices, which have the potential to triple agricultural production, are being promoted in the watersheds to increase farmers' income, but also to reduce or stabilize man-made erosion, increase soil fertility, improve vegetation cover, and reduce bush fires. The project is also expected to contribute to increased land security in both production irrigated and watershed systems.

85. The project is examining carefully the position of sharecroppers in the irrigation schemes, where share cropping is most common. It aims to ensure that the capacity of the private operators is not strengthened at the expense of smallholders, marginalizing vulnerable groups.

86. The project is working towards strengthening WUAs in order to improve the management and maintenance of the irrigation schemes. It will also establish or strengthen communication and consultation platforms in each watersheds (which will include WUA representatives) to improve the management of natural resources and develop sustainable agricultural systems. It is expected that these activities will have a positive environmental and social impact on the sustainable use of the natural resource base and reduce siltation on the downstream irrigation schemes, which in turn would have a positive impact on poverty reduction in both production systems.

D.5. Environmental analysis

87. Madagascar is a mountainous country with a relatively low population density. The country has abundant land and water resources, which are only partly developed, and biodiversity resources of global significance. Madagascar has a high natural erosion rate, as a consequence of its soil types and heavy rainfall, often exacerbated by cyclones and heavy rains. This high natural erosion rate has been exacerbated by deforestation of erosion prone fragile soils, frequent bush fires (many of which linked to livestock grazing) and unsustainable agricultural practices in the watersheds, which made most of the watershed soils infertile and marginal for agricultural and livestock production. This pattern of severe land degradation has lead over the years to reduced agricultural production and increased poverty. This, together with increased land scarcity in the four high potential sites, has increased the pressure on the watersheds and has lead to increased deforestation and pressure on the globally important biodiversity resources in the watersheds in three project sites: Marojejy National Park, the South Anjanaharibe Special Reserve, and the Makira Conservation Site, all located in the upper watersheds around the Andapa irrigation scheme; the Ankarafantsika National Park located in the upper Maravoay watershed; and the Lac Alaotra Ramsar site. In Itasy, agriculture is practiced on very steep slopes, which are in other places kept under a mandatory forest cover to minimize erosion. Slash and burn agriculture is still practiced, particularly in Andapa. These unsustainable agricultural practices have exacerbated the already high natural erosion rates and led to sedimentation and flooding of downstream irrigation schemes, severely hampering irrigated rice production and increasing

poverty. The impact of the degraded environment on the agricultural production systems is significant. This situation was made worse by the absence of adequate maintenance of the schemes.

88. The project seeks to reverse this trend by rehabilitating and improving the management of the existing irrigation schemes, as well as by stabilizing or reversing land degradation in the watersheds through the promotion of more sustainable agro-ecological practices. These improved practices should, over time, reduce soil erosion and sedimentation in the downstream schemes. Over the short term, it is expected that these improved practices will significantly increase agricultural production of traditional and new crops in the watershed areas, and thereby help reduce poverty. One of the requirements for increased production will be the integration of agriculture and livestock (such as use of dung as fertilizer and organic soil conditioner). It is also expected that intensified agricultural practices will reduce or stabilize agricultural expansion and thus reduce the pressure on the remaining high biodiversity resources in the watersheds.

89. The project is expected to have mostly beneficial environmental and social impacts, as demonstrated by GoM's Regional Environmental and Social Assessment (RESA). The main positive environmental impact will be the improvement of environmental services of the watersheds through the adoption of agro-ecological production systems and better management of pastures, which will stabilize or reduce erosion rates.

90. Intensified agricultural production may require increased use of chemical fertilizers and pesticides. GoM has thus prepared a Pest and Pesticide Management Plan (PPMP) to mitigate the health and environmental impacts of increased pesticide use. It is at present not clear if farmers will be able to afford and maintain the financing of increased inputs.

91. Irrigation schemes in Madagascar are the main sources of waterborne diseases, such as malaria and urinary and intestinal bilharzia and diarrhea. The four selected project sites are no exception. The Environmental and Social Management Plan (ESMP) which already exists, includes measures to reduce these diseases in order not to impair the production capacity of the farmers and improve their quality of life.

92. The major potential environmental risk posed by the project would be the potential attraction of an influx of migrants from other areas of Madagascar should the project be successful in increasing agricultural production in the watersheds. These migrants would increase the already high pressure on land in the four project watershed areas, which could lead to further deforestation of the sites, increased use of steep hills for agriculture production, and further clearing of reed lands in Lac Alaotra for rice production. Land zoning, transfer of land management to existing social groups, and empowerment of farmers and farmer's groups to manage these lands will therefore be of fundamental importance during project implementation.

D.6. Safeguard Policies

93. The Safeguard Policy issues raised by the project have been briefly discussed above and below and are further detailed in Annex 10.

94. The project has been categorized as a Category A project, since three of the project sites are located in areas with globally important biodiversity resources, which increases the reputational risk for the Bank. As stated above, the project activities themselves will have mostly positive environmental and social impacts, with environmental management measures fully

integrated into project design. However, increased use of fertilizers and pesticides may have negative impacts on the Lac Alaotra Ramsar site, Lac Itasy, the mangrove habitats in the Maravoay area and the Lokoho River in Andapa. In many areas, river and lake water is also used for drinking purposes.

95. The following World Bank Safeguard Policies were triggered:

Table 4: Safeguard Policies Triggered by the Project

Safeguard Policies Triggered by the Project	Yes	No
<u>Environmental Assessment</u> (OP/BP/GP 4.01)	[X]	[]
<u>Natural Habitats</u> (OP/BP 4.04)	[X]	[]
<u>Pest Management</u> (OP 4.09)	[X]	[]
<u>Cultural Property</u> (OPN 11.03, being revised as OP 4.11)	[]	[X]
<u>Involuntary Resettlement</u> (OP/BP 4.12)	[X]	[]
<u>Indigenous Peoples</u> (OP 4.10)	[]	[X]
<u>Forests</u> (OP/BP 4.36)	[X]	[]
<u>Safety of Dams</u> (OP/BP 4.37)	[]	[X]
<u>Projects in Disputed Areas</u> (OP/BP/GP 7.60)*	[]	[X]
<u>Projects on International Waterways</u> (OP/BP/GP 7.50)	[]	[X]

96. **Environmental Assessment, Natural Habitat and Forests.** As part of preparation of the IDA project, the Government prepared a Regional Environmental and Social Assessment (RESA) which has been disclosed at the project sites, at the national level, and in the Infoshop in Washington prior to appraisal. Agro-ecological production systems and improved pasture management will be promoted in degraded and deforested soils in the watersheds. Sites where large amounts of sediments originate and which affect the downstream irrigation schemes will be given priority. By preparing and implementing a land use zoning plan and transferring the management of land in the watersheds to communities it is expected that land use will change from an open access situation to a regulated access natural resource, where migrants cannot any longer settle freely. Intensification of the watershed agricultural systems and a change to higher productive and less erosion prone agro-ecological practices it also expected to reduce the pressure on the globally important biodiversity resources in the upper watersheds. This approach satisfies the Environmental Assessment Safeguard Policy OP/BP 4.01, Natural Habitat Safeguard Policy OP/BP 4.04 and the Forests Safeguard Policy OP/BP 4.36.

97. The project also finances sub-projects, such as check dams, anti-erosion structures, small irrigation dams, markets or other structures. These sub-projects are screened for environmental and social impacts by the Technical Secretariat of the Matching Grant Mechanism (to be financed under the project), that will also identify if a Resettlement Action Plan (RAP) and/or a small Environmental Assessment study will be needed as part of the feasibility analysis.

98. **Pest Management.** GoM has addressed the requirements of the Pest Management Policy OP/BP 4.09 by preparing and disclosing a Pest and Pesticide Management Plan (PPMP) acceptable to IDA. The PPMP includes a number of actions which will reduce the exposure of the farming community to pesticides used in the agricultural production systems as well as

* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas

pesticides used for malaria control in the project areas. The PPMP will also promote the development and establishment of Integrated Pest Management Practices (IPM).

99. **Involuntary Resettlement.** GoM has also met the requirements of the Bank's Involuntary Resettlement Safeguard Policy (OP/BP 4.12) by preparing and disclosing a Resettlement Policy Framework (RPF). It is expected that any potential resettlement, land acquisition or loss of access to traditional natural resources will occur at a limited scale. Should this happen, a Resettlement Action Plan (RAP) will be prepared to ensure that people are fully compensated (at replacement costs) and will not be worse off than before the project intervened. Sub-projects will be screened to identify whether a RAP will be required (see also Environmental Assessment, above).

100. **Safety of Dams.** The Safety of Dams Safeguard Policy is not triggered. The project will rehabilitate a scheme that is served by an irrigation reservoir. At the same time the safety of the dam (less than <15 meter) will be inspected and if needed brought up to international dam safety standards.

101. **Analysis of alternatives.** Feasible alternatives are (i) to not implement the project; or (ii) to implement it without a watershed management component. The "no project" alternative would allow further deterioration of the irrigation schemes and the watersheds with consequent negative impacts on poverty, agricultural production, and globally significant biodiversity sites. The alternative "without watershed management" would leave the irrigation systems exposed to large sediment loads, which would endanger and potentially undermine the investments.

102. **Public consultation.** Public consultations have been carried out on the Terms of Reference of the Regional Environmental and Social Assessment, on the draft report, as well as during the preparation of the RPF. This is in conformity with the requirements of OP 4.01 and OP 4.12.

103. **Borrower Capacity and Implementation and Monitoring of the ESMP.** The Borrower's capacity to supervise and monitor the implementation of the Environmental and Social Management Plan (ESMP) is being strengthened. One of the Technical Assistants hired under the project is qualified in environmental and social management and is already in charge of the adequate implementation and monitoring of the ESMP. Depending on the need, some of the ESMP activities will be implemented by contracted service providers.

104. **Disclosure.** The Regional Environmental and Social Assessment, the Pest and Pesticide Management Plan and the Resettlement Policy Framework have been disclosed at the four project sites, in Antananarivo, and in the Infoshop in Washington prior to appraisal.

D.7. Policy Exceptions and Readiness

105. The project requires no exceptions to Bank policy.

Annex 1: National, Sectoral and Program Context
Madagascar: Irrigation and Watershed Management Project

A. National and Sectoral Context

1. The Island of Madagascar covers a total area of 588,841 km². The population, estimated at 16.4 million inhabitants in 2003, is increasing at an annual rate of about 2.8 percent. Nearly 78 percent of the population lives in the rural area. The country is characterized by major biodiversity and considerable cultural and socio-economic diversity. The economy is essentially rural-based and agriculture remains the main engine of economic development. Per capita income is US\$290. Poverty affects 68.7 percent of the total population and 73.5 percent of the rural population.

Poverty Reduction Strategic Framework

2. The government has put in place the Madagascar Action Plan (MAP), a development plan for 2007–12 that is the second-generation Poverty Reduction Strategy. The MAP envisages accelerated and better-coordinated reforms and outlines the strategies and actions that will ignite rapid growth. “Rural development and a green revolution” and “cherish the environment” are two of the core eight commitments of the MAP. The specific objectives with respect to rural development are (i) to increase agricultural value-added (through, inter alia, Agricultural Service Centers), (ii) diversify rural activities (focusing on support to producers' organizations among other activities), (iii) launch a sustainable green revolution through integrating environmental dimensions in agricultural activities and (iv) promote market-oriented activities through strengthening farmers' organization and investment in infrastructure. The MAP Commitment to “cherish the environment” focuses on reducing natural resource degradation through better land use practices.

3. MAP's goal is also to ensure that the country develops in response to the challenges of globalization and in accordance with the national vision “*Madagascar Naturellement*” defined by the President in November 2004. It states that Madagascar will be a newly industrialized country with maximized competitiveness by 2020. The core of growth will be derived from the country's unique natural resources and from the transformation of its natural products. The vision aims to develop a diversified and rich natural resource base (agriculture, livestock, fisheries, and mining) that will contribute to the creation of products with high value added such as essential oils, agri-business, pharmaceuticals, and mining products. A broader impact of growth and a progressive redistribution of its benefits will help reduce poverty substantially. Madagascar will be known worldwide for the beauty of its rich and well-protected biodiversity and its environment will be cherished and protected and used in a wise and responsible way to enhance development. The Malagasy people, both in rural and urban areas, will be healthy and well-educated, will be active participants in the development process and will be gainfully employed in agriculture, industry and the provision of services. Education and health will be accessible to the population and infrastructure will be developed allowing for free movement of goods and people.

4. As previous approaches to irrigation negatively affected the environmental systems in upper watersheds, the Government is now pursuing a more integrated and holistic approach with the *National Program of Watershed Management and Irrigation Improvement* adopted in October 2006, where agricultural development takes into account land management issues at the

watershed scale. Additionally, the project is in line with the new *National Program for Rural Development*, among whose pillars are the improved management and use of natural resources and the protection of natural production factors and ecosystem functions. The operation will also dovetail with the implementation of the *Third Environmental Program*, with which a MOU has been established. Its activities also fit together with the National Forestry Law which seeks to protect watersheds, promote reforestation, combat wild fires, and protect natural habitats and biodiversity. Furthermore, the project (i) directly contributes to the implementation of the UNCCD National Action Plan, and (ii) addresses priorities under the National Biodiversity Strategy and Action Plan and UNFCCC NAP and NAPA.

Agriculture, rice, and irrigation

5. Rice represents nearly 70 percent of agricultural production and accounts for 48 percent of total calorie consumption. Rice production has only increased by 1.2 percent per annum since the 1980s and average paddy yield at the national level is still low (about 2.4 t/ha). Annual production of paddy rice has virtually stagnated for about ten years, stabilizing between 2.3 and 3.0 million tons. Area planted to paddy has increased by only 0.44 percent per year from 1970 to 2004; yields have increased by 0.71 percent per year, much slower than in other major rice producing countries. With population growth of 2.7 percent per year, production per person has fallen from 275 kg/person in 1970 to only 179 kg/person in 2004. Rice farming techniques are largely traditional and use of inputs is the exception in many places. E.g., fertilizer use has remained stagnant at 10 kg/ha on average, as compared to 14 kg/ha in sub-Saharan Africa, and 291 kg/ha in Indonesia. Vast differences in prices between wet and dry season are explained by the lack of fluidity in movement of goods from production areas to the markets due to a lack of road infrastructure and lack management capacity of storage facilities by farmers. On average, 28 percent of the paddy production is marketed (750,000 t). Rice sales are highly concentrated. In 2001, the top 10 percent of rice farmers (by value of sales) accounted for 73 percent of total national rice sales. These farmers sold on average 2.2 tons/household. An estimated 48 percent of rice farmers did not sell any rice in 2001.

6. Irrigation occupies an important place in the agricultural sector, supplying water to more than one million hectares, or 40 percent of cultivated lands (as compared to 6 percent on average in sub-Saharan Africa). Irrigated crops represent 15 percent of GDP, whereas 70 percent of agricultural production and 88 percent of rice production originate from irrigated agriculture. It is estimated that 85 percent of the active farming population are directly or indirectly employed by the irrigation sector. Since the 1950s, irrigation has benefited from public investment. However, the impact of these efforts on rural incomes is mixed, and sustainability is far from certain. The rapid degradation of infrastructures requires frequent rehabilitation, and many schemes are caught in a vicious circle of poor yields, low capacity of water users to pay for O&M, and rapid degradation of the schemes. Weak capacity to pay is accompanied by low willingness to pay, reinforced by institutional weakness of the WUA and a lack of support from local authorities. Moreover, erosion of watershed upstream is weighing heavily on cost of maintenance of irrigation schemes.

7. Extension services have failed to have a significant impact on productivity levels either, and have demonstrated to be unsustainable. Reasons for these past failures include (i) the approach was biased in favor of technical messages, (ii) inadequate consideration of the demand for extension services and the economic constraints that farmers face ; farmers were considered more as the objects than as the subjects of extension services, (iii) the approach was too centralized, with inadequate attention for regional variation, (iv) inadequate capacity of extension

agents, (v) unrealistic expectations about the volume of public (human and financial) resources available.

Natural resources, soil development and role of communes

8. One of the basic problems of the rural and agricultural sectors is the rapid degradation of natural resources, particularly watersheds. The stagnation of yields in irrigation areas and demographic growth lead to an extension of rain-fed crops on hill slopes (*tanety/tavy*), often by removing the forest cover and by replacing it with inappropriate farming practices. Unproductive pastures are degraded by frequent passage of bushfires. As a result, soils are increasingly degraded and fragilized, and even low levels of runoff lead to high levels of erosion that cause damage to downstream assets, reduce the lowland area under irrigation through sedimentation, wet season flooding and dry season droughts. In addition, there are important implications in terms of biodiversity loss and declining buffering and regulatory ecological services. More sustainable land management practices have demonstrated that it is possible to achieve the dual objective of higher productivity and reduced soil degradation and erosion.

9. Communes and Regions are responsible for land use planning and play an important role in providing land tenure security: the communes should therefore be at the centre of all natural resources management and watershed development initiatives. The Communes have been established to provide a number of basic services to the populations (role of public service provider) and to act as the engine of development on its territory. To that end, the capacities of the Communes is being strengthened in the following areas: (i) initiating development within the Commune, including: (a) support for the elaboration and monitoring of Communal Development Plans (CDP), (b) financing of investments; (ii) implementation of their specific mandate, including: (a) implementation of responsibilities in the area of education, health, water, sanitation, and maintenance of infrastructures that have been transferred to them by the central Government, (b) technical assistance in the area of economic development and management of natural resources, (c) land tenure policy (land tenure counters), and (d) the integration of intercommunal priorities in the development policies of the Commune⁴.

10. Tenure security through delivery of formal documents is important because it can lead to better use of land and it facilitates improved fiscal resources. Traditional leasing arrangements, currently outlawed in Madagascar, provide an environment that is non-conducive for investments in productivity.

11. Given the importance of the responsibilities entrusted to communes and the low level of human and financial resources at their disposal to meet these challenges, it is indispensable to put in place a support mechanism. The Ministry of Decentralization and Land Use Planning (MDAT) has put in place a program for strengthening the capacities of Communes in administrative and financial management. To that end, *District Support Centres* (DSCs) are being established in the regions. These DSCs are responsible for: (i) training elected officers and staff of the Communes in budget/financial management and administrative procedures associated with project implementation (procurement, etc.); (ii) establishing the necessary budget/financial management and administrative tools; and (iii) technical assistance for management and monitoring of the activities of the communes.

⁴ MDAT, July 2005: Review of local development programs in Madagascar, Document n°2 – Towards a national decentralization support policy.

Land tenure security

12. Madagascar has a high demand for land tenure security, as evidenced by the many requests for land title deeds (which the present system is incapable of meeting), and the development of an informal local system of “petits papiers” that is highly solicited to record transactions.

13. Specifically, situations of high tenure insecurity exist concerning those farmers cultivating land in former AMVR, ZAF, colonization areas or indigenous reserves that are often the subject of competitive claims, and farmers who cultivate as sharecroppers or tenants. Either category is widespread in the irrigation schemes in the intervention areas of the project, as evidenced by the diagnostic studies. The unofficial nature of these rights weakens particularly the functioning of WUAs and O&M of irrigation schemes.

14. To meet the high demand for land tenure security, the Government recently adopted a Land Policy Letter, which is organized around 4 strategic orientations: (i) restructuring / modernization of land services; (ii) decentralization of land management; (iii) revision of land regulations and (iv) capacity strengthening. This policy is being implemented under the National Land Tenure Program that is already supporting, on pilot basis, several decentralized land management experiences with support from several donor agencies.

B. Lessons learned

15. Previous attempts to boost agricultural production through investments in irrigation infrastructure have been unsuccessful, in particular with respect to the sustainability of the investments. Despite modest increases in yield levels on those schemes that have benefited from investments, a weak institutional environment and high O&M costs have undermined capacity and willingness to pay O&M charges. In addition, only 10 percent of irrigation schemes have benefited from investment, and modest yield increases have not been visible in terms of national averages. The *reasons for low yields and weak sustainability* are notably: (i) lack of market opportunities (isolation, unattractive prices); (ii) lack of access to advice and inputs; (iii) failure to take into account watersheds upstream; (iv) lack of clarity in responsibilities and capacities of the different public, associative and private partners; (v) non-respect of commitment by both users and the State; and (vi) indiscipline and impunity.

16. The majority of Malagasy farmers only benefited marginally from the technological options proposed, and average yields are well below the actual potential. Tradition and risk aversion only partially explain the failure of agricultural intensification. Other factors can be mentioned, such as: (i) weak capacity of agricultural research to respond to request of farmers, as well as their low level of organization and participation in the development process; (ii) poor extension services (in terms of access and quality); (iii) land tenure insecurity and inequitable sharing of profits, particularly by sharecroppers; and (iv) low tolerance of potential technologies to climate shocks. At the level of extension services, lessons from failures (i.e. PNVA) include, among others: (i) an approach excessively focused on technical solutions, (ii) poor consideration of demand and economic concerns, (iii) excessively centralized, with low regional identity, (iv) capacity constraints of extension workers, (v) interventionist/rigid approaches and low level of partnerships and empowerment of beneficiaries, and (vi) unrealistic expectations of public support in terms of human resources and financial sustainability.

17. The conditions of success include: (i) an integrated approach to irrigated agriculture and surrounding watersheds; (ii) conducive economic environment; (iii) clear responsibilities, in conformity with Government policies and strategies (poverty reduction, decentralization, agricultural, environmental and land policy, etc.); (iv) fully responsible partners with adequate capacities; (v) clear and unambiguous commitments corresponding to the capacities of each of the parties, contracted freely and knowingly; and (vi) mechanisms to ensure respect of commitments made that are applied systematically.

18. The BV-PI integrated approach is a “win-win” approach, which at the same time helps to increase productivity and incomes in irrigation schemes and surroundings watersheds, conserve natural resources in watersheds, limit erosion of slopes and sedimentation in irrigation schemes, thereby reducing the need for maintenance and rehabilitation of the latter.

19. An attractive economic environment implies: (i) a policy on prices of agricultural products and inputs; (ii) access to markets in terms through roads, information, promotion of private sector and producers’ organizations for marketing (including storage) and supply of inputs; (iii) access to efficient extension services well adapted to local needs; and (iv) access to finance.

20. *Clear institutional framework*: clear institutional responsibilities in line with Government policies and regulations for producers/users and their associations, communes, inter-communes and regions, decentralized public services, specialized agencies and authorities (ANDEA, etc.), and private operators.

21. *Participatory approach, concerted decisions and respect of commitments made*: actors with clear and acknowledged rights and obligations, and adequate resources and capacities, participating fully in decision-making; incentives and mechanisms ensuring responsible ownership and respect of commitments made; interfaces for dialogue and communication; and equitable access to resources, especially for the most vulnerable population groups.

22. The improvement of irrigation infrastructure and the establishment of sustainable mechanisms for funding O&M will not be enough to increase rice production beyond about 3.5 t/ha, which is still low compared to the technical potential. Promotion of intensification of rice production systems in IPs (SRA/SRI), including in areas with poor control over water, will need to be undertaken. Moreover, the *agro-ecological techniques* of seeding and planting on permanent plant cover (SCV) developed by the *Groupement Semis Direct Madagascar (GSDM)*, supported by CIRAD, are opening new prospects for sustainable and profitable agriculture on slopes. The environmental advantages of SCV techniques include: (i) erosion control, soil conservation and regeneration of soil fertility at reduced cost; (ii) improvement of infiltration, efficient management of water in the upper watersheds; (iii) sustainable improvement of soil fertility and productivity in the upper watersheds; and (iv) indirect contribution to sequestration of carbon and reduction of the greenhouse effect. Finally, agricultural diversification, including off-season production of higher value-added crops will help improve incomes and living conditions of farmers, and facilitate their greater participation in the financing of O&M of irrigation schemes.

23. *Addressing local or regional diversity* in terms of natural, social, economic and physical resources is essential for ensuring sustainable and appropriate agricultural development. Success in the duration of a program largely depends on its level of ownership by target groups:

consequently, strengthening dialogue and decision-making capacity of the peasant community constitute the cornerstones of sustainability.

C. National Irrigation and Watershed Management Program

24. The *National Irrigation and Watershed Management Program* is part of a program under the PRSF/PRSP that aims at reducing rural poverty through sustainable improvement in the living conditions and incomes of rural populations in irrigated perimeters and surrounding watersheds, and efficient management of natural resources.

25. The Government has clearly defined its new medium-term vision of the management of BV-PI, based on national policies on rural and agricultural development and the decentralization policy, which is at the centre of its development and poverty reduction strategy. This approach requires: (i) clear responsibilities for each of the actors in the management of irrigation schemes and surrounding watersheds (farmers, water users, professional associations, districts and inter-communities, regions, central Government); (ii) effective participation of rural populations in diagnosis of problems and identification of options; (iii) co-management of PI and BV by all the actors concerned; and (iv) incentives and efficient mechanisms to ensure that all stakeholders respect their commitments.

26. One of the key objectives of the first phase of the PN/BV-PI, of which the IDA/GEF funded project constitutes a major part, is to put in place a clear and attractive institutional environment as well as adequate capacities at all levels, with a view to attaining the Government's vision and objectives. For its implementation, the project will adopt a flexible approach adapted to the reality in the field and evolution of capacities of the institutions, which will be gradually strengthened with a view to their empowerment.

27. The project will engage in the development of agricultural production, irrigation development and watershed management. IDA funding will focus on commercial agricultural development, irrigation infrastructure development and management, and finance some critical watershed interventions, that are directly linked to the irrigation schemes (e.g. treatment of specific erosion spots etc.). GEF-SIP will contribute in developing and implementing innovative agricultural approaches and activities directed towards sustainable land management, especially in the upper watershed areas, and the lake and marsh zones downstream of the irrigation schemes as these areas are highly vulnerable to degradation. Natural resources management issues are complex, need specific attention, and have to be addressed with a long-term vision, especially in view of increased climate variability, in order to strive for an overall sustainable development of the watershed.

28. This blended operation is a targeted investment under the GEF-SIP umbrella, a regional strategic multi-donor program designed to scale up the area of African cropland, rangeland, and woodlands under sustainable management. The SIP is a priority program of TerrAfrica, which was launched by NEPAD and focuses on regional partnership, knowledge generation and dissemination. The GEF-SIP funded activities will secure global environmental benefits, namely the preservation of globally significant ecosystems (primary forests, marshes and lakes), the prevention of natural habitat loss, conservation of endemic biodiversity, the reduction of carbon emissions from wide spread fire use especially on rangeland, cropland and forested land, and the increase of above and below-ground carbon sequestration through increased vegetation coverage and improved agricultural practices.

D. Project Zones

Marovoay

29. The Marovoay plains is a rice production zone of prime national importance, situated in the Boeny Region, about 80 km South-East of Mahajanga. The Marovoay river is a tributary on the right bank of the Basse Betsiboka, in the upper delta of the river. Subjected to quasi-complete submersion during the annual flooding of the Betsiboka, the development of the valley started in the early 20th Century for off-season rice production (once the water-level has dropped). Later extensions to the gravity systems included schemes supplied through pumping from the Betsiboka. The scheme is divided into 13 completely independent irrigation sectors, fed from a great number of different sources. The system faces serious O&M challenges. The submersion of schemes by waters from the river requires annual rehabilitation of the irrigation infrastructure, thus making O&M expensive and the overall economic profitability uncertain. For a total area of about 20,000 ha, an estimated area of 12,000 ha was cultivated in 2004. Beneficiaries of all plots developed during the successive programs were mainly immigrant populations from other regions of the country. The percentage of sharecroppers is today very high.

30. Until recently, the central Government was responsible for O&M of the irrigation schemes and pumps. Presently, public funds for maintenance of structures considered as 'non transferable' are unreliable. Restructuring into WUAs and federations of WUAs has not resulted in the establishment of an adequately O&M. The Performance Contract signed with the federation for the period 2001-2003 was not renewed and funds earmarked for 2004 were reallocated.

31. The main watershed serving the Marovoay irrigated perimeters is that of River Betsiboka, whose hydrology is determined by phenomena occurring some hundreds of km upstream. Sub-watersheds of River Marovoay and its tributaries supply a major part of the system: their sources are mainly in the zone of Ankarafantsika National Park, where human activities are controlled. Finally, all around the plain, small lateral watersheds with mainly intermittent flows do not constitute a source of irrigation water supply but have a major impact in terms of erosion, sedimentation and destruction of protection and distribution structures alongside irrigated perimeters.

Itasy

32. Itasy Region, located around Lac Itasy, is situated about 100 km to the West of Antananarivo. All irrigation schemes in Itasy (*Grappe du Lac Itasy* 1 980 ha, Ifanja 1900 ha, Mangabe 270 ha, Analavory 140 ha, Ampary 90 ha, Antanimenakely 80 ha – or a total of 4460 ha) are presently classified as autonomous perimeters, as complex 'non-transferable' infrastructure is absent. The region offers great potential for agricultural production, given the natural fertility of volcanic, basal and alluvial soils and its favorable climate for agricultural diversification.

33. The high concentration of population in the zone (107 inhabitants/km² on average) has caused problems of gradual over-exploitation of tanety located upstream of the irrigation schemes. The deforestation of watersheds caused by annual bushfires, uncontrolled exploitation of the tanety for rain-fed crops and grazing of zebus, causes problems of erosion and silting-up of the rivers and irrigation systems.

34. Although most of these schemes benefited from projects implemented from 1998 to 2000 (project PPI 2), they are currently facing serious problems due to a combination of erosion of the upper watersheds and lack of maintenance of the systems. In addition, storage infrastructure has been silted up and is no longer adequate, also given the change in the flow regime of the rivers (increase in flood flow and reduction of dry-weather flow). Hence, 30 - 50 percent of the perimeters are no longer adequately irrigated. Given (or as the origin of) these problems, WUAs have stopped collecting maintenance fees for several years, since a greater part of the users have refused to pay as they are no longer benefiting from water control. The actions of the WUAs are limited to maintenance works carried out by interested users, i.e., in most cases, those of the downstream sectors of the irrigated perimeters.

Andapa

35. The Lokoho watershed at Andapa, situated in the Sava Region at about 100 kms South West of Sambava, is formed by three concentric landscapes: (i) the first covers a vast plain of crops, 18,000 ha, drained by 4 main rivers whose confluences form River Lokoho at the exit of the basin; (ii) the second is constituted by tanyaty, at the periphery of rice farms, marked by a diversity of annual crops (mainly rain-fed rice) on cleared forest (tavy) or planted fallow lands, as well as coffee and vanilla crops; (iii) the third, at an altitude of over 900 m is distinguished by a denser tree cover. The basin is bordered in the North-East by Marojejy National Park, in the South-East by Anjananaribe South Special Natural Reserve, which is the only forest zone of the basin where tree cutting is still authorized, though regulated.

36. From 1962 - 1997, the Andapa basin has benefited from a development program funded by EDF. The project comprised an infrastructure component, which included the road linking Andapa and Sambava, drainage of the basin, internal network of access roads, development of the main waste water outfall of the basin and construction of a pumping station. The agricultural component focussed on development of rice farms on a total area of 4,400 ha, introduction of double season rice cultivation, measures aimed at improving collection and marketing, and an extension and diversification program. In 1979, the public company "Andapa Mamokatra" took over as the organization in charge of the Andapa basin development project. The impact evaluation of the project in 1998 was severe, particularly: (i) failure of pumping irrigation on the Ankaïbe perimeter (2,100 ha); (ii) lack of maintenance of structures on all perimeters developed by the project; (iii) the total disorganization of the AWUs; (iv) failure of intensification attempts.

Lac Alaotra –Sahamaloto Irrigation Scheme

37. The Lac Alaotra watershed forms a vast depression of around 1,750 km², with an average altitude of between 750 and 770 m, surrounded by eroded hills. The lake (a Ramsar site) is shallow and surrounded by swampy marshes. It covers an area of about 220 - 250 km² (free water surface) and around 550 km² with surrounding marshes. The watershed serves about 80,000 ha of rice farms, of which 30,000 ha are developed. The watersheds are subjected to strong man-made pressure. Deforestation, overgrazing (with bushfires) and increasing pressure from rain-fed crops have seriously degraded the fragile soils on the slopes, already marked by numerous lavaka. The effects are silting-up of beds of rivers and dams, degradation of derivation and protection of facilities.

38. The history of the zone is marked by interventions of the public company SOMALAC (1962-1981) which constructed the irrigation facilities, and was responsible for extension, processing and marketing activities. Morphed into a socialist enterprise from 1982 to 1991,

SOMALAC ensured the maintenance of the irrigation system, supervised rehabilitation works carried out between 1984 and 1989, with notably the creation of water users associations (1989-1991). These efforts were accompanied by the implementation of projects aiming to intensify agriculture.

39. The watershed supplying Sahamaloto irrigation scheme stretches over an area of 356 km². The irrigation scheme has a developed area of 6,400 ha, of which 80 percent is cultivated when the rainfall conditions are favorable. The area is supplied by a storage dam constructed in 1957. The initial storage capacity of 26 million m³, was gradually reduced to about 13-14 million m³. The scheme was fully rehabilitated in 1988-1989, including the construction of a new intake tower, an increase in the volume of storage water to 18 million m³. Emergency repair and rehabilitation works were initiated in 1998-1999.

40. The 12 federated WUAs of the irrigated perimeter, with a total of 1,800 members, are physically participating in the construction of secondary canals, thus contributing to the maintenance costs of the primary system and operational costs of the office of the federation. Contribution in cash for the maintenance costs at the charge of the WUAs (secondary systems) varies from one WUA to the other, but remains generally weak, with recovery rate rarely exceeding 60 percent of amounts voted.

E. Rehabilitation of hydro-agricultural Infrastructures in the Project Zones

41. The definition of a priority investment program demands that ranking criteria be defined for determining priority interventions. The following three levels are defined. *Level 1* interventions consist of those works that would resolve problems that are of capital importance to the entire area. The rehabilitation of infrastructures in this category helps to ensure: (i) access to water resources by protecting the headwork and primary structures that are indispensable for supplying the second system; (ii) access to cultivated land by rehabilitating cultivated schemes during raining season lost through dysfunctional drainage; and (iii) protection of property, by protecting the structures against floods or a strategic structure. The non-intervention of Level 1 blocks the functioning of the system. Hence, in most cases the interventions concern primary infrastructure: control dam and diversion offtakes, supply channels, main canals, main drainage systems, or flood protection dyke.

42. *Level 2* interventions consist in structures that block access to water or access to land or protection of assets of part of the network: secondary or upstream/downstream links. The non-intervention of Level 2 makes it impossible for part of the users to cultivate or harvest. It concerns mainly secondary systems, sections of the main canals or additional structures on the main canal (floodgates, control structures), secondary canals and secondary drainage systems.

43. *Level 3* interventions consist in structures that would boost agricultural production either by improving water control (irrigation and drainage), or increasing the cultivable area. It involves earth roads whose state hampers the marketing of agricultural production, works on secondary canals, and eventually tertiary canals.

44. Table 1 presents the estimated costs of rehabilitation works, including the Sahamaloto scheme of Lac Alaotra. The costs are those borne by the contractor; the manual contribution of the user is not included in the estimates.

45. It is important not to focus solely on total amounts. Hence, the major budgetary allocations presented in this table are as follows: (i) by adding the Sahamaloto perimeter at Lac Alaotra, the total budget is tripled, from USD 5.8 million to USD 17.6 million; (ii) for the three priority intervention zones (Marovoay, Itasy and Andapa), 65 percent concerns priority 1 works, 27 percent priority 2, and 8 percent priority 3; (iii) on the other hand, for the Sahamaloto perimeter at Lac Alaotra, 71 percent concerns priority 3 works; 29 percent priority 2, and 0 percent priority 1; (iv) for all possible intervention zones, 50 percent concerns priority 1 works, 28 percent priority 2, and 21 percent priority 3.

46. It should also be noted that the pumping stations in some of the blocks in the Marovoay scheme, and their primary system, whose rehabilitation falls under priority 1, accounts for 50 percent of the total rehabilitation budget for the Marovoay zone.

47. The project will not totally finance the rehabilitation of works that the users should cater for in the future. The contribution of users will be equal to what they should pay in future for O&M of these structures. In that regard, the envelope that the project will allocate to rehabilitation works will be calculated by deducting the annual amounts users should pay for management and maintenance in the future.

Table 5: Cost of rehabilitation works on hydro-agricultural irrigation schemes

Site	Number of Perimeters	Surrounding area in ha	Level 1 Works in million MGA	Level 2 Works in million MGA	Level 3 Works in million MGA	Total Works in million MGA
Marovoay	13	21 290	2 755	1 640	549	4 944
Itasy	6	3 590	2 468	371	91	2 930
Andapa	3	1 650	200	281	53	534
Sub-total 1		26 530	5 423	2 292	693	8 408
Site installations & miscellaneous @ 20%			1 085	458	139	1 682
Studies and supervision @ 15%			976	412	125	1 513
Total 1 in million Ariary			7 484	3 162	957	11 603
Total 1 in thousand USD			3 742	1 581	479	5 802
Lac Alaotra	1	6 400	-	4 985	12 162	17 147
Sub-total 2		3 2930	5 423	7 277	12 855	25 555
Site installations & miscellaneous @ 20%			1 085	1 455	2 571	5 111
Studies and supervision @ 15%			976	1 310	2 314	4 600
Total 2 in million Ariary			7 484	10 042	17 740	35 266
Total 2 in thousand USD			3 742	5 021	8 870	17 633

Annex 2: Major Related Projects Financed by the Bank and / or Other Agencies
Madagascar: Irrigation and Watershed Management Project

Table 6: Major Related Projects Financed by the Bank and/or other agencies

World Bank				
Project	Sector Issue Addressed	Impl. Status	Performance Ratings	
			(IP)	(DO)
Third Environment Program	Biodiversity	Active	MS	MS
Rural Development Support Project	Agriculture and Rural Development	Active	S	S
Community Development Project	Community Development	Active	S	S
Rural Transport Project	Transport	Active	MU	MU
Integrated Growth Poles	Growth	Active	S	S
Other Agencies				
Projet de Mise en Valeur et de Protection des Bassins Versants du Lac Alaotra (BV-Lac)	AFD	Active		
Projet d'Appui à la Fédération d'AUE de la Vallée Mariana et PC 15	AFD	Active		
Projet d'Appui à la Diffusion de Techniques Agro-Ecologiques à Madagascar	AFD	Active		
Projet de Réhabilitation du Périmètre du Bas Mangoky	AfDB	Active		
Programme de Lutte Antiérosive (PLAE II)	German Cooperation	Active		
Développement Rural et Aménagement des bassins Versants dans le Lac Alaotra	JICA	Active		
Projet Haut Bassin du Mandrare	IFAD	Active		
Projet de Promotion des Revenus Ruraux	IFAD	Active		
Programme d'Appui aux Collectivités et Organisations Rurales pour le Développement du Sud (ACCORDS)	European Union	Active		
Projet de Développement Rural SAHA	Swiss Cooperation	Active		
Eco-Regional Initiative (ERI)	USAID			
Business and Market Expansion (BAMEX)	USAID	Active		
Participatory Community-based Conservation in the Anjozorobe Forest Corridor	UNDP	CEO approved		
Wind and Hydro Energy Market Development	UNEP	Proposed		
Projet d'Appui à la Valorisation des Bassins Versants et des Périmètres Irrigués	FAO	Active		

Table 7: National Irrigation and Watershed Management Program

Phases	Pilot and Preparation		Launching (2007-1012)		Consolidation (2011-2015)		Extension (2015-2022)		Total	
	Ha	Coût 10 ⁶ U.S.\$	Ha	Coût 10 ⁶ U.S.\$	Ha	Coût 10 ⁶ U.S.\$	Ha	Coût 10 ⁶ U.S.\$	Ha	Coût 10 ⁶ U.S.\$
Objectives	Preparation of the National Policy Letter Irrigation and Watershed Management		Test of integrated irrigation and watershed management in new projects (gradual adjustment of preparation phase projects)		Learning lessons, implementation of adjusted strategies in the same project areas.		Implementation of the Irrigation and Watershed Management approach at the national level			
Analamanga	200	0,33	21 900	34,8	18 000	9,0	29 400	69 500	52,8	
Vakinankaratra	70		9 250	12,0	16 338	12,0	14 000	39 588	31,4	
Itasy			12 660	16,4	15 300	9,1	14 000	42 030	32,4	
Bongolava			11 000	11,0	22 000	11,0	22 000	55 000	33,0	
Haute Matsiatra			17 000	25,0	18 000	9,0	18 000	53 000	43,0	
Amoron'i Mania			8 400	11,0	14 338	11,0	12 000	34 738	28,0	
Vatovavy-Fitovinany			11 400	14,0	20 338	14,0	18 000	49 738	37,0	
Ihorombe			3 500	3,5	7 000	3,5	7 000	17 500	10,5	
Atsimo-Atsinanana			8 800	11,5	15 338	11,5	13 000	37 138	29,5	
Atsinanana			6 000	8,0	8 000	4,0	8 000	22 000	16,0	
Analanjiroro	1 500	22,2	10 000	15,0	10 000	5,0	10 000	31 500	47,2	
Alaoatra-Mangoro	3 870	10,0	29 400	37,6	27 700	22,2	24 500	85 470	88,8	
Boeny			29 070	63,0	24 450	21,4	22 950	76 470	102,7	
Sofia			27 000	38,0	40 000	20,0	49 600	116 600	92,1	
Betsiboka			6 000	6,0	12 000	6,0	12 000	30 000	18,0	
Melaky			11 300	17,6	10 000	5,0	10 000	31 300	27,6	
Atsimo-Andrefana	5 000	19,0	18 000	41,0	0	0,0	1 000	24 000	60,5	
Androy			0	0,0	0	0,0	500	500	0,3	
Anosy	5 400	12,6	6 500	9,0	8 000	4,0	8 000	27 900	29,6	
Menabe			18 000	31,0	10 000	5,0	10 000	38 000	41,0	
Diana			7 500	10,0	10 000	5,0	31 500	49 000	72,2	
Sava			8 650	11,0	12 050	8,3	10 000	30 700	24,3	
non régionalisé (*)	2 700	18,6						2 700	18,6	
Total	18 740	82,7	281 330	426,4	318 850	196,0	334 050	964 370	936,4	
FAO	Pilot Project	270	0,3					270	0,3	
AFD	BV Lac	3500	16,0	BVPI HP-SE	9350	18,8		9350	18,8	
IDA				BVPI phase 1 (a)	21780	30,0		65830	85,0	
GEF						6,0	BVPI phase 3(c)	24550	18,0	
BAD	Bas-Mangoky	5000	11,0	PDAIM	5000	10,0		10000	21,0	
KFW	PLAE	-	5,0						5,0	
FIDA	PPRR -	6900	27,1	PAD2M	3800	13,5		10700	40,6	
OPEP	PHBM et		15,7						15,7	
JICA	PC23	370	1,5	PC23	9500	10,0		9870	11,5	
UE	ACORDS	2700	5,6					2700	5,6	
Autres			0,5					Autres	0,5	
Total		18740	82,7		49430	88,3		112220	238,0	

(*) Projects of relevance to a number of regions (PLAE, GSDM, ACORDS)
 (**) or expression of interest

Annex 3: Results Framework and Monitoring and Evaluation
Madagascar: Irrigation and Watershed Management Project

1. Performance indicators are linked directly to the CAS goal of promoting broad-based social and economic growth, and in particular (i) to reach an economic growth rate of 8 - 10 percent per annum; (ii) to increase the level of investment to 20 percent; (iii) promote the vitality of the private sector so that it participates in an investment rate of 12 - 14 percent; (iv) to open up Madagascar's economy to greater competition with a view to reducing costs and improving quality; and (v) foster the willingness of the population to participate.
2. Overall monitoring of the project's implementation, as well as assessing the development impact of the project is under the responsibility of the Department of Statistics and Information (DSI) under MAEP. It is supported by technical assistance. A specialized project M&E / management information system has been prepared and approved by the Bank, as well as the procedures for data collection and reporting. M&E is based on direct reporting by institutions involved in project implementation (MFI, MEF, ASC farmers and WUAs), relevant data collected on a systematic basis for other purposes, participatory assessments, user satisfaction surveys (e.g., in irrigation schemes), income surveys, and targeted data collection (among others through satellite photos), as established in the project implementation manual. DSI will commission two evaluations of project output and impact indicators, at mid-term and at completion. The project has already established a baseline. The output of the M&E will provide sufficient evidence in linking periodic and annual monitoring with subsequent annual project planning activities so that M&E data are interpreted and used as an instrument for project planning.
3. The project has established Regional Monitoring Committees in each of the four project areas that are chaired by the Head of the Region and made up of members of GTDR. The Regional Monitoring Committee is supported by the GTDR's Technical Secretariat, and is responsible for (i) ensuring consistency of project actions with project objectives and work plan, national strategy and policy, and regional development priorities and programs; (ii) preparing and validating detailed work plans and budgets at the regional level; (ii) reviewing project progress and performance, and the implementation of corrective measures if necessary. The Regional Monitoring Committee meets twice a year.
4. Similarly to what is already being done for IDA funded activities, the MAEP will be responsible for submitting to IDA semi-annual progress reports on the GEF activities under the project. Progress reports will focus on (a) key performance outcome, output and input indicators as indicated in the Results Framework; (b) progress in procurement; (c) progress in implementation works; (d) progress on technical assistance and training; (e) status of disbursements from the credit; (f) progress on community sensitization and mobilization, in particular with respect to the Performance Contracts; (g) work plan for the next six months.
5. An internal mid-term review will be conducted jointly by MAEP and IDA during the third year of project implementation. To facilitate this review, MAEP will prepare a mid-term evaluation and will summarize the findings in a detailed report that will be submitted to IDA no later than 3 months before the review. The mid-term evaluation and review would take stock of project implementation progress, constraints and recommendations for improvement, and would assess the Results Framework indicators in the light of actual achievements on the ground and propose improvements. No later than 6 months after the credit closing date,

MAEP will provide to IDA a project Implementation Completion Report (ICR). The completion report would include: original and revised project targets and actual achievements; project impact assessments focusing on results; and performance of project management and IDA in fulfilling their respective obligations under the credit. The project outputs and outcomes relevant to SIP will be periodically shared with the SIP M&E coordination desk, where data on portfolio progress will be synthesized, aggregated and annually reported. The SIP M&E system will be used for investment and program improvement, mutual learning, accountability purposes, progress reporting to GEF Council, enhancing stakeholder participation, and consolidating African leadership on the SLM agenda. The project can also benefit from SIP M&E support tools.

A. Results Framework

Program/APL Objectives	Program Outcome Indicators	Use of Program Outcome Information																														
To sustainably improve the living conditions and incomes of rural populations in six main irrigation sites and their surrounding watersheds, and the management of natural resources.	<ul style="list-style-type: none"> Increased average productivity of irrigated rice in the project areas (MT/ha): <table border="1"> <thead> <tr> <th></th> <th>Baseline</th> <th>End of</th> </tr> </thead> <tbody> <tr> <td>Andapa</td> <td>2.0</td> <td>3.5</td> </tr> <tr> <td>Marovay</td> <td>2.0</td> <td>3.5</td> </tr> <tr> <td>Lac Alaotra</td> <td>3.5</td> <td>5.0</td> </tr> <tr> <td>Itasy</td> <td>3.0</td> <td>4.5</td> </tr> </tbody> </table> Increased average productivity of rain fed rice in project areas (MT/ha): <table border="1"> <thead> <tr> <th></th> <th>Baseline</th> <th>End of project</th> </tr> </thead> <tbody> <tr> <td>Andapa</td> <td>1.5</td> <td>2.25</td> </tr> <tr> <td>Marovay</td> <td>1.5</td> <td>2.25</td> </tr> <tr> <td>Lac Alaotra</td> <td>1.5</td> <td>2.25</td> </tr> <tr> <td>Itasy</td> <td>1.5</td> <td>2.25</td> </tr> </tbody> </table> non rice area in irrigated schemes as a percentage of overall cultivated area over two seasons increased by 25 percent increase in area under production in irrigated schemes during the dry season increased by 25 percent 		Baseline	End of	Andapa	2.0	3.5	Marovay	2.0	3.5	Lac Alaotra	3.5	5.0	Itasy	3.0	4.5		Baseline	End of project	Andapa	1.5	2.25	Marovay	1.5	2.25	Lac Alaotra	1.5	2.25	Itasy	1.5	2.25	<p>Year 1 : establish baseline</p> <p>Year 4 : confirm progress after implementation of project activities, and adjust intervention strategy if required</p> <p>Year 12 : measure project impact</p> <p>Report to SIP: - contributes to SIP PDO Phase 1 indicator of % increased cropland productivity</p>
	Baseline	End of																														
Andapa	2.0	3.5																														
Marovay	2.0	3.5																														
Lac Alaotra	3.5	5.0																														
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Lac Alaotra	1.5	2.25																														
Itasy	1.5	2.25																														
Project Development Objective	Project Outcome Indicators	Use of Project Outcome Information																														
To establish the basis for viable irrigated agriculture and natural resources management in four main irrigation sites and their surrounding watersheds: (i) Andapa (Sava Region), (ii) Marovoay (Boeny Region), (iii) Itasy Region, and (iv) Lac Alaotra (Alaotra Mangoro Region).	<ul style="list-style-type: none"> Dissemination of innovative technologies and equipment to 30,000 households through extension, capacity strengthening and targeted cost sharing, Improved management of about 21,780 ha of irrigation infrastructure through investments in rehabilitation, training and institutional reforms Improved management of about 8 sub-watersheds through capacity strengthening and investment in 	<p>Year 1: establish baseline</p> <p>Annually: confirm progress after implementation of project activities, and adjust intervention strategy if required</p> <p>Report to SIP: Contributes to SIP Indicators of IR 1 (1.1), IR2 (2.2), IR 3 (3.1, 3.2, 3.3), and IR4 (4.1,</p>																														

	<p>watershed infrastructure</p> <ul style="list-style-type: none"> Increased government support for agricultural intensification in irrigated and rainfed areas through increased public expenditures. 	4.2, 4.3)
Global Environmental Objective	Outcome Indicators	
Improve the environmental sustainability of land management practices in four targeted watersheds	<ul style="list-style-type: none"> Increase in land area under sustainable management as a percentage of baseline, in targeted project intervention areas Increase in vegetation cover as a percentage of baseline 	<p>Year 1: establish baseline</p> <p>Annually: confirm progress after implementation of project activities, and adjust intervention strategy if required</p> <p>Report to SIP: Contributes to SIP Indicators of SIP Long-term Program Goal 3 and 4.</p>

Intermediate Outcomes	Intermediate Outcome Indicators	Use of Intermediate Outcome Monitoring
<p>Result 1: Development of Commercial Agriculture</p> <p>Intensification, marketing, and diversification of selected agricultural value chains in project target areas with increased utilization of demand driven SLM technologies</p>	<ul style="list-style-type: none"> Five ASC established that are able to deliver SLM advisory services to land users 50 OPs, unions and federations of active producers having registered with ASC Matching Grants fully disbursed 5,000 HH trained in agro-ecological cropping practices 40 percent increase of communities adopting SLM options in targeted areas compared to baseline 	<p>Results 1-3 :</p> <p>APL 1: monitor progress indicators on an annual basis</p> <p>End of project:</p> <ul style="list-style-type: none"> assess and adjust component strategy if required. assess lessons for extending program at national level
<p>Result 2: Irrigation Development</p> <p>Better management of targeted irrigated schemes through infrastructure rehabilitation, improved institutional framework, and capacity building of Water User Associations.</p>	<ul style="list-style-type: none"> 21,780 ha irrigation area rehabilitated 30 WUAs trained 100 percent of operation and maintenance funds covered by irrigation service fees collected Four Performance Contracts satisfactory executed FERHA established 	<p>Report to SIP:</p> <p>Result 1: contributes to SIP Indicators of IR 1 (1.1), IR 3 (3.1, 3.2, 3.3)</p> <p>Result 3: Contributes to SIP Indicators of IR 1 (1.1), IR 2 (2.2), IR 3 (3.1, 3.2, 3.3)</p>
<p>Result 3: Watershed Development</p> <p>Enhanced capacity of stakeholders in the four watersheds to manage natural resources in sustainable manner, accounting also for climate variability and change</p>	<ul style="list-style-type: none"> Four WDP and eight participatory sub-watershed management plans developed and adopted 60 community SLM groups trained and supported 145 hotspot erosion control interventions realized Five guichets fonciers operational Integrated Management Information System for SLM established 60 percent change in SLM applications adopted by land users, against baseline data 	
<p>Result 4: Program Management</p> <p>Use of Project resources in compliance with agreed objectives and procedures, and setting up a policy framework that is favorable to extending the program to the national level.</p>	<ul style="list-style-type: none"> 100 percent unqualified financial and technical audits National fertilizer strategy and legal guidelines for implementation of seed policy implemented NIWMP incorporated into MAEP's medium term expenditure framework Timeliness and adequacy of annual 	<p>Result 4:</p> <p>Review financial audits on an annual basis</p> <p>Years 4: Technical Audit and adjustments</p> <p>Report to SIP: Contributes to SIP indicators of IR 2</p>

<p>National enabling environment more conducive to SLM up-scaling.</p> <p>Effective oversight, monitoring of project activities, policy guidance and lessons learned.</p>	<p>work plans and reports (including M&E reports, expenditure and accounting reports)</p> <ul style="list-style-type: none"> • National level multi-partner, multi-sector SLM investment framework is established and under implementation 	<p>(2.1, 2.2) and IR 4 (4.3, 4.4, 4.5, 4.6)</p>
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Performance Milestones and APL 2 triggers				
Priority Area	Performance Milestones 1 (end of first year)	Performance Milestones 2 (end of second year)	Performance Milestones 3 (end of third year)	Performance Milestones 4 (end of fourth year)
Agricultural Development	<ul style="list-style-type: none"> Value chains supported by project identified in all four sites Training curriculum in agro-ecological technologies prepared Regional partners recruited TOR and business plans for ASCs prepared in all sites Matching Grant operational. 	<ul style="list-style-type: none"> 5 ASCs established in all project areas 3,000 households trained in agro-ecological technologies Matching Grant disbursed 30 percent 	<ul style="list-style-type: none"> 4,000 households trained in agro-ecological technologies Matching Grant disbursed 60 percent 	<ul style="list-style-type: none"> private sector investments in agriculture increased as evidenced by disbursements under the matching grant mechanism; ASCs established and operational in the four project sites.
Irrigation Development	<ul style="list-style-type: none"> TA for WUA mobilization recruited Scheme Development Plans (as part of WMP) prepared in all four sites Maintenance costs study conducted in all four sites FERHA study completed 	<ul style="list-style-type: none"> 10 WUAs established and trained in all four sites Recruitment TA technical studies Technical studies completed in all four sites Inventory transferable infrastructure completed Legal framework revised 	<ul style="list-style-type: none"> Performance contracts signed in all four sites Recruitment of contractor for rehabilitation O&M fee recovery in accordance with PC FERHA established 20 WUAs established and trained in all four sites 	<ul style="list-style-type: none"> Scheme Development Plans and Performance Contracts executed satisfactorily. Acceptable institutional mechanism for the funding of non-transferable irrigation infrastructure (FERHA) established and operational;
Watershed Development	<ul style="list-style-type: none"> SLM groups established Watershed Development Plan (as part of WMP) study launched in all four sites Regional partners recruited 	<ul style="list-style-type: none"> Watershed Development Plan (as part of WMP) adopted in all four sites Participatory sub-watershed management plans developed in all four sites Training curriculum for SLM groups developed 3 <i>guichets fonciers</i> established. 	<ul style="list-style-type: none"> Participatory sub-watershed management plans adopted SLM groups trained in all four sites according to curriculum erosion control interventions realized in all four sites in accordance with Watershed Master Plan 4 <i>guichets fonciers</i> established 	<ul style="list-style-type: none"> <i>guichets fonciers</i> established and operational in the four project sites. Watershed Development Plans executed satisfactorily

B. Arrangements for Results Monitoring and Evaluation

	Target Values				Data Collection and Reporting				Responsibility for Data Collection
	Baseline	YR1	YR2	YR3	YR4	Frequency and Reports	Data Collection Instruments		
Outcome Indicators									
Number of beneficiaries having benefited from innovative technologies and equipment	0	0	10,000	20,000	30,000	On an annual basis, Annual Progress Reports and Fourth Quarter Reports	Base data and annual reports	DRDR	
Irrigated area under improved management	0	0	0	10,500	21,780	On an annual basis, Annual Progress Reports and Fourth Quarter Reports	User satisfaction surveys	Outsourcing	
Number of watersheds having benefited from improved watershed management	0	0	4	6	8	On an annual basis, Annual Progress Reports and Fourth Quarter Reports	User satisfaction surveys	Outsourcing	
Increased public expenditures for agricultural intensification in four main irrigation sites and their surrounding watersheds	0%	0%	0%	0%	10%	Year 4	Approved budget	DRDR	
Increase in land area under sustainable management ⁵ in targeted project intervention areas, as a percentage of baseline	0%	0%	5%	15%	20%	Year 4	Satellite picture	Outsourced	
Increase in vegetation cover ⁶ (as a percentage of baseline), in targeted project intervention areas	0%	0%	3%	10%	15%	Year 4	Satellite picture and PS checking	Contracted	
Results Indicators for Each Component									
Component one :									
Number of ASC established	0		5			Once, year 2, annual progress report	Registers of ASCs	DRDR	
Number of POs, unions and federations of active producers having registered with ASC	0	10	20	30	50	On an annual basis, Annual Progress Reports and Fourth Quarter Reports	Registers of ASCs	ASC	
Number of HH trained in agro-ecological cropping practices	0	1,000	3,000	4,000	5,000				
Matching Grant disbursement (%)	0	10	30	60	100				
Increase in communities adopting SLM	0%	0%	10%	20%	40%	On an annual basis, Annual Progress Reports and Fourth Quarter Reports	Base data and annual reports	DRDR	

⁵ Index made up of (a) managed reforestation area ; (b) improved pasture area ; (c) reduced bushfire area ; (d) reduced deforestation area and marsh destruction area ; (e) area of sloping land operated under profitable and sustainable production system (agroecological or agroforestry techniques).

⁶ including reforested area, and area with improved biomass production in agricultural, pastoral and agroforestry systems

Component two : Irrigation area rehabilitated (ha)	0	0	0	0	10,500	21,780	Last two years	Base data and Satellite picture	DRDR
Number of WUAs trained	0	5	10	20	100	30	Annually, annual progress reports	Annual project reports	DRDR
Percentage of operation and maintenance funds covered by fees collected in irrigation schemes as percentage of what was agreed in CP	0			100		100	Year 3 and 4, annual progress reports	Annual project reports	DRDR
Number of Performance Contracts signed	0			4	4	4	Year 3 and 4, annual progress reports	Annual project reports	DRDR
FERHA established	No			Yes/No			Year 3	Annual project reports	NPCU
Component three : Number of watershed master plans and participatory sub-watershed management plans developed and adopted	0		4	4	8		On an annual basis	Annual project reports	DRDR
Number of SLM groups trained and supported	0	0	20	40		60	On an annual basis	Annual project reports	DRDR
Number of hotspot erosion control interventions realized	0	20	60	80		100	On an annual basis	Annual project reports	DRDR
	0	8	24	32		40			
	0	1	3	4		5			
Number of <i>guichets fonciers</i> operational		1	3	4		5			
Integrated Knowledge and Information system for SLM	Yes/no	Yes/no	yes/no				Year 1, 2 (progress evaluation), year 3 (established), annual progress reports	Annual reports	DRDR
60 percent change in SLM applications adopted by land users	0%	5%	20%	40%		60%	On an annual basis, Annual Progress Reports and Fourth Quarter Reports	Base data and annual reports	DRDR
Component four : Number of unqualified financial and technical audits	0%	100%	100%	100%		100%	On annual basis (financial); Year 4 (technical)	Audit Reports	World bank supervision mission
National input and seed policy implemented	Yes/no						Once at the beginning of project	Approved Policy Reports	GoM negotiation team
Program BV/PI incorporated into MAEP's medium term expenditure framework	Yes/no	Yes/no	Yes/no	Yes/no		Yes/no	On an annual basis	MAEP Budget	World bank supervision mission
Timeliness and adequacy of annual work plans and reports (including M&E reports, expenditure and accounting reports)	Yes/no	Yes/no	Yes/no	Yes/no		Yes/no	On an annual basis		
Country SLM Investment Framework	Yes/no	Yes/no	yes/no				Annual progress reports	Annual reports	DRDR

Annex 4: Detailed Project Description
Madagascar: Irrigation and Watershed Management Project

1. The proposed GEF project is part of an overall program approach to watershed management and irrigation development that includes IDA financing (already approved in November 2006) and other donor financing. This program approach is described in detail here, with specific reference to the joint IDA-GEF financing elements. The GEF project includes two technical components covering two strategic orientations: (i) development of commercial agriculture, and (ii) watershed development. A third component is related to program management. In accordance with the “integrated rural poles” approach, the project proposes four similar subprojects in the four regions involved: Andapa, Marovoay, Itasy, and in the Lac Alaotra area, the Sahamaloto irrigation scheme (Annex 1). The GEF project is different to the already-approved IDA financing which covers an additional component – irrigation development. GEF funding will focus on sustainable agriculture based on innovative techniques and approaches, soil conservation techniques and watershed development.

A. Project Objective, Outcomes and Components

2. The project development objective is to establish the basis for viable irrigated agriculture and natural resources management in four main irrigation sites and their surrounding watersheds: (i) Andapa (Sava Region), (ii) Marovoay (Boeny Region), (iii) Itasy Region, and (iv) Lac Alaotra (Alaotra Mangoro Region).

3. The expected *project results* include (i) dissemination of innovative technologies and equipment to 30,000 beneficiary households through extension, capacity strengthening and targeted cost sharing, (ii) improved management of about 21,780 ha of irrigation infrastructure through investments in rehabilitation, training and institutional reforms, (iii) improved management of about 8 sub-watersheds through capacity strengthening and investment in watershed infrastructure and sustainable watershed management, and (iv) increased government support for sustainable agricultural intensification in irrigated and rainfed areas through increased public expenditures.

4. The global environmental objective of the project is to improve the environmental sustainability of land management practices in four targeted watersheds. The interim results are (i) 20 percent increase in area of land under sustainable management in targeted project intervention areas (as a percentage of baseline), and (ii) 15 percent increase in vegetation cover (as a percentage of baseline)

5. The project concept is based on the following principles: (i) clear responsibilities for each of the actors in the management of irrigation schemes and surrounding watersheds (farmers, water users, populations and their associations, Communes and Inter-communities, Regions, central Government); (ii) effective participation of the population (male and female) and all stakeholders (including vulnerable groups) in the diagnosis of problems and identification of options; (iii) co-management of irrigation schemes and watersheds by all the actors concerned; and (iv) adequate incentive systems and efficient mechanisms to ensure that all respect their commitment.

6. The GEF-SIP intervention will support the advance of sustainable land management (SLM), especially in upper watershed areas that are highly vulnerable to degradation and where natural resources management issues are complex in order to develop viable agricultural intensification in the lowlands and the uplands, to prevent encroachment into sensitive upper watershed areas, and to help stabilize deteriorating upland catchments. In addition, the operation will help leverage policy reforms and align stakeholders in order to drive larger uptake of SLM practices in the key watersheds and elsewhere in the country.

7. The four sites have been selected based on their accessibility, availability of agricultural services and potential for increased productivity through improved water management. At the same time, public irrigation schemes are characterized by serious institutional weaknesses, lack of clarity with respect to roles and responsibilities of stakeholders, and watershed degradation.

B. Project Components:

Component 1: Development of Commercial Agriculture

(US\$12.46 million, including an IDA contribution of US\$7.45 million, a GEF contribution of US\$2.50 million, and a beneficiaries' contribution of US\$2.51 million)

8. The objective for this component is to lay the foundations for improved market access and sustainable intensification and diversification of irrigated and rainfed agriculture in the project's watersheds.

9. The 'Development of Commercial Agriculture' component involves the project area as a whole: irrigated schemes and upland or *tanety* areas. In upland areas, it is part of a coherent framework which is 'Watershed Development' proposed in subcomponent 3.2. Its specific objective will be achieved through an approach focusing on market-driven demand, agricultural technology development and dissemination, initiative by private operators and vertical integration and coordination of selected supply chains by promoting partnerships among actors, including public private partnerships (PPP).

10. The component aims at improving, all along the targeted supply chains:

- Access to market and marketing systems in order to reduce costs and increase farm gate prices;
- Added value through diversification into higher added value products and agro-processing;
- Capacities of farmers, farmers groups and professional organizations;
- Agricultural productivity through better access to extension, improved technology integrating SLM principles, inputs, and credit.

11. The estimates of targeted areas in terms of rice intensification and sustainable diversification in rain fed production (agro-ecological, etc.) and dry season (including private irrigation) are presented in Table 1:

Table 8: targeted areas in terms of rice intensification and sustainable diversification in rain fed production (agro-ecological, etc.) and dry season (including private irrigation)

		PI (ha cultivated)	Rain fed/ Agro-cultivation	Counter-season cultivation	Targeted Households
	RBME /a	RMME	Ecological (ha)	season (ha)	(estimate)
Itasy	5,660	5-7,000	2,450	3-5,000	8,000
Sahamoloto /b	6,400	2-3,000	350	250-500	6,900
Marovoay	6,070	4,500	550	500	6,500
Andapa	3,650	5-7,000	900	2-3,000	7,700
TOTAL	21,780	16,500-21,500	4,250	5-8,000	29,100

/a: Rehabilitated physical areas (see RDC-IRAM study) x use intensity. RBME = rice with good water control; RMME= rice with poor water control.

/b: irrigation infrastructure rehabilitation is focusing on Sahamaloto, but activities to promote agricultural production target a larger area (8 communities), including Anony and a part of Amparafaravola.

12. Direct beneficiaries from the agricultural development component are presented in Table 2:

Table 9: Direct beneficiaries from the agricultural development component

Area	Itasy	Sahamaloto	Marovoay	Andapa
Number of communes	10	5	5	9
Number of targeted farmers/operators	8,000	6,900	6,500	7,700
Number of grassroots OPA	75-150	30-60	30-60	75-150
Number of unions	12-15	7-10	4-6	12-15
Number of federations (district level)	2	1	1	1
Active CSAs	2	1	1	1
Seed producers/producer groups (GPS)	10-20	5-10	4-6	12-20
Areas under seed multiplication	50	30	30	40
Input Suppliers	3	3	3	3
Equipment Suppliers	2	2	2	2
Blacksmiths/mechanics (2/commune)	20	10	10	18
Agro-industrial and commercial operators	45	45	12	28

13. *Intermediate results* are (i) ASCs established in each of the four sites, (ii) increase by 50 of the number of POs, unions, and federations of active producers who have registered with an ASC, (ii) 5,000 households trained in agro-ecological cropping practices, (iv) increase in private sector investments in agriculture as evidenced by full disbursement of the matching grant, and v) 40 percent increase of communities adopting SLM options in targeted areas compared to baseline. GEF funding will contribute to assuring that intensification and diversification of agricultural production will be based on sustainable land management principles. GEF will contribute to training and support of households engaging in sustainable cropping practices and participate in the matching grants for agro-ecological and agroforestry activities.

14. *Critical risks* include: (i) capacity among producers and their organizations to meet technologies supply and to manage the support-guidance scheme ; (ii) the will among private operators to invest directly in long term contractual relations with agricultural producers; (iii) maintaining and strengthening incentive policies from the State in favor of agricultural private sector; (iv) low rates of adoption of SLM technologies due to low capacity in project staff and communities; (v) high vulnerability to climatic extremes and associated impacts.

Sub-component 1.1: Support to agricultural services.

(US\$7.14 million, including an IDA contribution of US\$5.15 million, a GEF contribution of US\$1.97 million, and a beneficiaries' contribution of US\$0.02 million)

15. The aim in this subcomponent is to lay the foundations for the development of commercially oriented agricultural production by implementing innovative technologies for sustainable production, storage and processing of agricultural products, by improving access to markets, and by supporting the development of commercial agricultural supply chains. Investments under this subcomponent are targeted at improving the enabling environment and providing incentives (in addition to on-demand support to investment projects by private initiative to be funded under subcomponent 2). This includes the promotion of sustainable and profitable agriculture on hillsides and in lowlands (for example through agro-ecological and agroforestry techniques). The project takes a gender sensitive approach and also specifically supports vulnerable groups in their demands. The project finances the services, work, equipment, training and operational costs of such public investment and of the activities corresponding to the core public responsibilities. Activities will be adjusted to specific needs on each site, and may include the following:

- (a) *Support to the development of commercial agricultural supply chains.* The project has already recruited or is recruiting for each site one or several professional service providers for promoting market-driven supply chains. The project uses as much as possible the existing schemes for supporting the private sector and agribusiness which are already operating in Madagascar, such as the network of “business centers” set up by the BAMEX project and/or interprofessional technical support centers, such as CTHT and CTHA. Such service providers are responsible for the following activities : (i) market research and surveys for national and export markets, as well as thematic studies in storing, processing, packaging, post-harvest treatment and quality management, (ii) R/D on improving technical itineraries for production, conservation, and valorization, (iii) helping eligible operators prepare documents for submission of sub-projects to the matching grant mechanism and to the banking system, and (iv) developing partnership contracts between producers and operators for the marketing and processing of targeted products. GEF will not contribute to this activity.
- (b) *Strengthening the capacities of farmers and professional organizations,* as well as the establishment of agricultural service centers (ASC). The project aims to build professional and institutional capacity among farmer organizations (OPA, GIE, TT, etc.), and their federations. The project finances the establishment of ASCs as an interface, at district level, between supply and demand to support the provision of on demand advisory and extension services. Each ASC includes a small technical team and platform (decision making unit) grouping farmer organizations, the private sector, the government, the local authorities and the regional partners at district level. The project finances civil works for office rehabilitation, equipment and travel costs, training and ASC operating costs (staff and operating expenses), for the 5 ASCs in the

BVPI area, as well as operating costs for the platform. GEF will provide targeted training of farmers' organizations, and facilitate farmers exchange visits to assure that SLM principles are mainstreamed within the agricultural activities.

- (c) *Strengthening the supply of technology for production and valorization of agricultural products*, in particular technologies geared at promoting intensification of rice cultivation on irrigation schemes, promoting the adaptation of agro-ecological cultivation techniques to sustainable rainfed production systems and diversification of production systems for targeted and priority supply chains, including livestock production. The project supports: (i) service providers for adaptive research and dissemination of improved technologies identified as priorities by the partners, and (ii) the strengthening of capacities of regional public services for seed quality and phyto- and zoo-sanitary control. A distinction is made between (a) the more productive land at the bottom of the hillsides that lends itself more easily to intensification compared to some of (b) the traditional agricultural upland systems that depend on slash-and-burn practices (tavy). These upland systems, found in marginal and remote areas of the upper watersheds, are often based on deforestation, thus threaten biodiversity, degrade soil productivity quickly due to burning practices and short fallow periods, and contribute to erosion. Often these farming practices do not allow farmers to achieve satisfactory incomes. However, it is possible to develop sustainable agricultural production systems that can be productive and profitable (e.g. through agroforestry, agro-ecological and horticultural techniques). The improvement of these systems will need more time and effort than for the systems downstream, and needs intensive on-farm technology development work in order to develop sustainable and profitable farming practices. Most of GEF financing in this sub-component will be used under this line of activities. GEF will fund the service providers for adaptive research and dissemination, and provide training and capacity strengthening not only to farmers, but also to the regional public technical services.

16. The project's main implementing body will be DRDR. Detailed implementation modalities for each activity group in subcomponent 1 are specified in the Table 3.

Table 10: Detailed implementation modalities

Subcomponent	Implementation
Development of sustainable and market-driven supply chains	Recruitment of regional partners by DRDR
Capacity-building of producers and support to producers organizations	Recruitment of service providers by ASC
Applied research and technology dissemination	Recruitment of one or several service providers (FOFIFA, TAFA, ONG, etc.), in a competitive way and under contract with DRDR

Sub-component 1.2: Support to Private Investment.

(US\$5.32 million, including an IDA contribution of US\$2.3 million, a GEF contribution of US\$0.53 million, and a beneficiaries' contribution of US\$2.49 million)

17. The specific objective in this subcomponent is to link, extend and upscale the *incentive and promotional activities* financed under subcomponent 1. This will be achieved through support of *on demand* private investments by operators, farmers and farmers organizations at

all levels of the supply chains. To this end, the project will finance, through a matching grant, individual or collective initiatives and sub-projects as presented in Table 4.

Table 11: Individual or collective initiatives and sub-projects

Support to marketing chains	<ul style="list-style-type: none"> • Market surveys, supply chain analysis, development of quality and certification management systems; commercial/market trials • Infrastructure for grouping, storage and post-harvest treatment • Integrated projects for setting up contract-based agriculture systems to the benefit of small scale producers
Support to input, credit and equipment providers	<ul style="list-style-type: none"> • Establishing/extending networks for distributing inputs and equipment ; • Technical and management advisory services (for example, technical and managerial capacity building for seed producers). • Technical support and extension of micro finance networks • Technical support for the development and implementation of new products (e.g., weather insurance)
Support to productive investment	<ul style="list-style-type: none"> • Adaptive, agricultural, and agro-industrial research (varieties, technologies and production and processing equipment) ; • Introduction, dissemination and on-farm development of new agricultural production techniques (agroforestry and agro-ecological techniques, etc.); • Awareness raising and demonstration campaign (inputs, equipment, etc.) • Rehabilitation/development of quality seed production; • Reforestation and improvement of degraded soils.

18. The implementation modalities of the cost sharing mechanism for financial assistance to private - individual or collective - investments corresponding to the broad objectives of the BVPI project is outlined in the implementation manual. The manual includes a list of eligible/non eligible activities, selected on the basis of their potential contribution to project/government objectives. Eligible activities clearly relate to agricultural production and management of natural resources sub-projects that are presented by beneficiaries, and co-financed exclusively in cash, either under own capital, or under micro credit. Project contribution ranges from 20 to 80 percent of total cost, depending on the public good nature of the investment and to the degree of poverty of the beneficiaries. Proposals are selected by a decision making body at regional level (*Comité de Sélection*, set up within GTDR). This committee is in charge of approving requests for subsidy (see Annex 6, and the Project's Implementation Manual). Whereas IDA will finance matching grants for the main crops rice and off-season irrigated crops, among others, GEF will support agro-ecological initiatives in lowlands and uplands, agroforestry and fruit tree production, integrated livestock production,

and targeting the improvement of upland agricultural systems that are based on fire use (e.g. tavy).

19. These activities will contribute to achieving the SIP result 1 (SLM applications on the ground are scaled up in the country-defined priority agro-ecological zones), and result 3 (commercial and advisory services for SLM are strengthened and readily available to land users). The activities are rooted in the SIP components 1 and 3 (more specifically the subcomponents 1.2, 1.3, 1.4, 1.5 and 3.2). In addition, IDA funds will specifically support the SIP sub-component 3.3 and 3.4 and 3.5). More detailed information of GEF funded activities can be found in the Incremental Cost Analysis (Annex 15).

Component 2: Watershed Development.

(US\$4.33 million, including IDA funding of US\$1.82 million; GEF contribution of US\$2.42 million, and beneficiaries contribution of US\$0.09 million)

20. The objective of the component is *to lay the foundations for sustainable management of watersheds including irrigated and rainfed agriculture, the conservation of the natural heritage, and improved productivity of the natural resources.*

21. A participatory and integrated approach to sustainable land management should encourage local population (male and female) to take responsibility and engage in the sustainable management of their natural resources. The component aims to contribute to (i) the protection of watersheds by reducing erosion and sedimentation; (ii) increased productivity and sustainability of upland systems (including cropping, agroforestry, forestry, and pastoral systems), (iii) improved management of natural resources to generate environmental benefits, (iv) improved access to land and user rights.

22. Critical risks include (i) farmers may be hesitant to participate in activities outside their own fields, as they fear not to directly benefit from environmental improvements. Where possible, on-site improvements that produce upland and lowland benefits are promoted (which are expected to be numerous due to advanced degradation status of the land). In addition, other incentives such as support to land tenure security will be favored. Only in cases with a distinct disconnect between upland and lowland activities, the project may seek to pilot other available and innovative incentive systems (e.g. payments for environmental services). The project will remain flexible with the response depending on the analysis and the feasibility of implementing the various solutions; (ii) the handing over of land rights to local community groups could be perceived by some as threat to free access to natural resources. The project will establish and strengthen communication and negotiation platforms. By forming networks of community groups, local communities will be in a stronger position to withstand outside interference; (iii) high vulnerability to climatic extremes and associated impacts. The project will draw on analytical activities on mapping climate related vulnerabilities and also conduct targeted risk screening for relevant activity lines to identify risk mitigating options, where necessary. These include higher standards for irrigation and erosion control devices, and production technologies that include soil and water conservation measures, in order to counter a future increase in the incidence of extreme weather events such as cyclones and droughts.

23. *Intermediate outcomes* are (i) four watershed development plans (as part of WMPs) and eight participatory sub-watershed management plans developed and adopted, (ii) 60 SLM groups trained and supported (including the support for 32 contracts of delegated land use rights (GELOSE) provided, (iii) number of hotspot erosion control interventions realized (100 small, 40 medium, 5 large), (iv) five *guichets fonciers* operational (v) integrated knowledge

and information system for SLM established, and (vi) 60 percent change in SLM applications adopted by land users, against baseline data. GEF will finance the participatory sub-watershed management plans, the training of and support to the 60 SLM groups that will lead to the adoption of SLM applications, and the establishment of an integrated knowledge and information system for SLM.

24. GEF contribution will complement IDA funding by addressing longer-term environmental and land degradation issues at the watershed level, that negatively impact lowland and upland agricultural production systems as well as global environmental goods and services. GEF funding will be used to address these land degradation issues through a participatory and integrated approach to a broader operation and scale up SLM practices on the ground. Building upon recent knowledge acquired on climate risks in the country, it will strengthen integrated land use planning, reinforce upstream and downstream linkages, promote environmental sustainability in watershed development, build-up local capacity and promote the use of technologies to improve agriculture productivity while conserving natural habitats. The activities funded by GEF are described in detail in the subcomponents below.

Subcomponent 2.1: Support to Watershed Management

(US\$3.13 million, including IDA funding of US\$1.25 million; and a GEF contribution of US\$1.88 million)

25. The watersheds in the four project zones are very different in terms of geography, climate, biodiversity, population density, land use, productive potential, ongoing development programs, availability of potential partners, etc. The following description of the component and the various activities is an overall description. The project is adopting a flexible approach that allows modifying activities according to needs, on-going programs and collaboration potentials with partners who are already working in the project areas.

26. Planning of watershed management is done in three steps:

- (i) The first step is preparing a watershed management plan for the watershed areas adjacent to the irrigation schemes in the in the four project zones (about 400 km² for Sahamaloto/Lac Alaotra, 500 km² for Itasy, 1,000 km² for Andapa, and 500 km² for Marovoy). The “large” irrigation schemes consist of groups, clusters or sectors of schemes, each associated with a sub-watershed. The WSM plan will cover all the sub-watersheds that are directly associated to the irrigation schemes⁷.
- (ii) The second step involves the development of participatory WSM plans for the approximately eight sub watersheds associated with the irrigation schemes covering an area of between 10 km² to about 500 km².
- (iii) The third step refers to the participatory planning of sub-basin development and management within larger watersheds, which will be undertaken by user associations of local communities.

27. As part of the program approach, IDA is funding the preparation of the WSM plans in the four project zones, and the improvement of land tenure security. GEF will finance the

⁷ The exception is Lac Alaotra area in which the project targets one single scheme, so one single sub watershed in a group of irrigated schemes and a watershed of about 1,800 km².

participatory zoning and planning of subwatersheds, the support to communication and negotiation platforms, the training of SLM groups and technical staff, and the development of an integrated knowledge and information system for SLM.

- (a) at the level of watersheds - the project finances technical assistance to prepare one WSM plan for each of the four project zones, which includes :
 - (i) Zoning and description of land use systems, ecosystems, settlements, institutions and partners, including climate risks.
 - (ii) Strategic analysis of erosion problems (as the main source of downstream sedimentation) and of natural resource degradation;
 - (iii) A specific and detailed analysis to identify responsibility for the implementation of project activities, while taking into account existing partners in the area
 - (iv) Establishing a baseline for monitoring and evaluation of component results.
- (b) at the sub-basin level – the project finances technical assistance to facilitate preparation of:
 - (i) a *participatory zoning* of sub-watersheds to determine the optimal land use according to (a) topography along a gradient from downstream to upstream, (b) current land use and land rights, (c) diagnosis of soil fertility and soil production potential, (d) location and characteristics of water sources and streams, and (e) origin and pathways of erosion, and
 - (ii) *Participatory plans* for sustainable sub-watershed development and management.
- (c) Support to existing *communication and negotiation platforms* with the aim to
 - (i) Involve stakeholders and partners (communes, farmer organizations, NGOs, etc.) in information exchange and communication
 - (ii) Discuss, negotiate, and validate participatory WSM plans ;
 - (iii) Negotiate conflict settlement.
 - (iv) Support of environmental platforms in the project areas
- (d) Training and capacity strengthening of SLM groups, and of local and regional staff in, among others:
 - (i) Environmental awareness raising campaigns for local communities.
 - (ii) Training and/or strengthening of farmer organizations in natural resource management by providing technical assistance for instance for example, for cattle herders or charcoal makers and their associations.
 - (iii) Specific training to local and regional staff (NGOs, technical government services) in techniques that are required for the implementation of the component, such as participatory planning methods or agro-ecological techniques.
- (e) *Improvement of land tenure security*: The project contributes to the implementation of the National Land Tenure Program (PNF) and finances the setup of (inter)communal land tenure windows in charge of the following activities : (i) recording the acknowledgement of ‘non titled property rights’ and land tenure transactions (inheritance, sale, transfers, etc.); (ii) regularizing land rights; (iii) securing secondary rights (sharecropping and tenant farming) in particular on PI and negotiated agreements (GELOSE) for sustainable management of resources on some key watershed space. The project subcontracts the implementation of four land tenure windows (one in each

intervention area) in close consultation with the PNF. The project also supports communities in obtaining community-based land rights (e.g. GELOSE) and will provide for technical assistance to support the preparation of natural resources management plans within the framework of GELOSE.

- (f) *Integrated Knowledge and Information System for SLM* ; This activity aims at capitalizing existing national and international SLM knowledge, at collecting relevant information on technical SLM options, and at establishing a national database on SLM. The activity can draw on the capacity and framework developed under TerrAfrica. This activity will furthermore substantially contribute to information distribution and communication under component 1 and 3.

Subcomponent 2.2: Sustainable investment in watersheds

(US\$1.20 million, including IDA funding of US\$0.57 million; GEF contribution of US\$0.54 million, and beneficiaries' contribution of US\$0.09 million)

28. Depending on the WSM plans that have been prepared, a menu of investments eligible for project support is being prepared, and specific conditions (positive and negative list) will be prepared, from which local populations may select investments they consider appropriate for their specific needs. In principle, investments with long-term environmental impacts, and community based groups or associations will be eligible. Specific eligibility conditions include co-financing (in kind or in cash), institutional capacity among groups, and the confirmation of social and technical validity of the proposals. Additional support will be provided in a competitive way, i.e., depending on the targets that stakeholders agree to set for themselves, and the level of their achievement.

- 29. The project finances the following activities, of which activities in (a) is funded by IDA, and activities in (b) by GEF:

- (a) *Strategic erosion control.* Erosion “hot spots” are being identified through strategic and participatory analyses conducted under subcomponent 1. Through negotiations, local strategies are being developed for controlling erosion, arresting gullies and reducing the quantity of sediments transported to downstream irrigation areas. The project finances the establishment of *strategic anti-erosion works* including through works, and biological methods and techniques. Works are being built favoring use of local manpower. In principle, WUAs in irrigated schemes should participate in planning of erosion control measures and should pay part of costs. Many of these strategic anti-erosion works will actually be part of the irrigation investments. Examples are: construction of retention structures (fascines) in combination with vegetative interventions for halting gully and lavaka erosion; and revegetation and protecting river banks and planting of anti-erosion hedges (vetiver, fodder crops, and multi purpose shrubs).
- (b) The project finances all aspects of *reestablishing vegetation cover* to reduce erosion to improve the land use productivity of the upper watersheds and to support the communities in an improved management of land under secured land tenure arrangements:
 - (i) Improved pasture management, including the cessation of fire use, planting of fodder grasses and fodder banks, establishment of drinking

- points for cattle, rotational grazing, and keeping cattle in stables for manure collection.
- (ii) Awareness raising campaigns that address destructive traditional practices such as fire use for pasture and agriculture, and providing support in developing technical alternatives with a participatory approach. (this will be complementary to activities conducted under Environment Program (EP3))
- (iii) Reforestation and revegetation of degraded land, including the restoration of natural vegetation, support to community or private reforestation
- (iv) Provision of support to protect natural forests and its biodiversity, and natural habitats such as marshes and lakes.

30. These activities will contribute to achieving SIP Result 1: SLM applications on the ground are scaled up in country-defined priority agro-ecological zones; Result 2: effective and inclusive dialogue and advocacy on SLM strategic priorities, enabling conditions, and delivery mechanisms established and ongoing; and Result 3: commercial and advisory services for SLM are strengthened and readily available to land users. The activities are also rooted in the SIP Component 1: Supporting on-the-ground activities for scaling up (1.2., 1.4., 1.5.), Component 2: Creating a conducive enabling environment for SLM and more specifically the sub-components (2.4., 2.6., 2.8.), and Component 3: Strengthening commercial and advisory services for SLM (3.1., 3.2.).

Component 3: Program Management

(US\$4.43 million, including IDA funding of US\$3.45 million; GEF contribution US\$0.98 million)

31. The objective of this component is to manage and use resources in accordance with the project's objectives and procedures, and to put in place a policy framework that is favorable to up-scaling of the project at the national level.

32. *Intermediate results* include (i) all financial and technical audit reports are unqualified, (ii) national strategy on fertilizer supply and legal guidelines for the application of new seed legislation adopted and implemented, (iii) Program BV/PI incorporated into MAEP's medium term expenditure framework, (iv) national multi-partner, multi-sector SLM investment framework in the BVPI program context is established and under implementation. GEF will support project management and monitoring and evaluation to assure that the environmental global objective is well mainstreamed in the project, and will provide support to establish and implement the national SLM investment framework.

33. The GEF funded activities will contribute to achieving the SIP result 4: targeted knowledge generated and disseminated and monitoring established and strengthened at all levels. They are also rooted in the SIP component 4 and more specifically in the subcomponents 4.4. and 4.5.

Table 12: targets of component 4

<i>Output Indicators</i>	<i>Targets by Project Year</i>				
	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3 - Mid-term review</i>	<i>Year 4</i>	<i>End-of-Project</i>
Project management advisors and equipment procured and mobilized	100%	100%	100%	100%	100%
SIG operational in all four watersheds and national level	75%	100%	100%	100%	100%
Baseline survey completed	100%	---	---	---	---
Independent technical and financial audits completed:					
Financial	100%	100%	100%	100%	100%
Technical	0%	100%	100%	100%	100%
At least five policies/studies completed and discussed with key stakeholders	0	1	2	2	5

Sub-Component 3.1: Project Management

(US\$1.89 million, including IDA funding of US\$1.51 million; and a GEF contribution of US\$0.38 million)

34. This sub-component supports the project management through the provision of technical assistance, training, office equipment and vehicles, minor office upgrading works, auditing and evaluation studies, and incremental operating costs in support of project management.

35. The sub-component comprises overall project planning, quality oversight, procurement, financial management, and monitoring of project activities. It includes quality oversight through independent financial and technical audits, and evaluation of project activities. Finally, the sub-component allows the design and implementation of a communication strategy to disseminate core project messages to beneficiaries and partners of the project. GEF will contribute to the funding of the technical assistance.

36. Project management encompasses all four targeted watersheds as well as national level coordination.

Sub-Component 3.2: Policy Support

(US\$0.48 million, including IDA funding of US\$0.36 million; and a GEF contribution of US\$0.12 million)

37. This sub-component provides technical assistance, studies, training, information campaigns, cross visits and workshops for the development of major national policies, regulations, and plans considered critical to the Government's National Irrigation and Watershed Management Program. These include, among others:

- National strategy on fertilizer supply adopted and implemented
- Legislation and policy for privatization of seed centers, and support to seed certification
- Norms and standards for key export markets (particularly rice)
- Sustainable financing of watershed management and irrigation maintenance
- Feasibility studies to expand the national program to new watersheds

- National level multi-partner, multi-sector SLM investment framework in the BVPI program

38. The sub-component also provides initial technical assistance support to emerging professional groups, in particular the *Plateforme Consultative de Riz* and the *Association Malgache de Producteurs de Semences*.

39. The scope of this sub-component is national. The improved policies are expected to benefit all key distributors and producers involved in the sub-sector.

40. The two projects of the World Bank and the UNDP under the GEF-SIP Madagascar program will elaborate a Country SLM Investment Framework (CSIF) as a common output of the two operations. This investment framework will be designed to cover all SLM interventions in the country across sectors and multiple donors. These efforts will contribute to scaling up SLM to achieve the objectives of the country's UNCCD NAP, as well as NEPAD's Comprehensive African Agriculture Development Program (CAADP) and Environment Action Plan. GEF financing will focus on the elaboration of the CSIF.

Sub-Component 3.3: Monitoring and Evaluation:

(US\$2.06 million, including IDA funding of US\$1.58 million; and a GEF contribution of US\$0.48 million)

41. This sub-component provides technical assistance and capacity strengthening to the Department of Statistics and Information (DSI) under MAEP that will be responsible for project M&E and assessment of development impact. This is done on the basis of a specialized project M&E / management information system, as well as procedures for data collection and reporting. In its collection of relevant data, DSI depends on direct reporting by institutions involved in project implementation (MFI, MEF, ASC farmers and WUAs), systematic data collection for other purposes, participatory assessments, regular user satisfaction surveys (e.g., in irrigation schemes), income surveys, and targeted data collection (among others through satellite photos), as established in the project implementation manual. The data that will be collected and monitored include those presented in Annex 3.

42. DSI will commission two evaluations of project output and impact indicators, at mid-term and at completion. The output of M&E would provide sufficient evidence in linking periodic and annual monitoring with subsequent annual project planning activities so that M&E data are interpreted and used as an instrument for project planning. In addition, the outcome of user satisfaction surveys will form an input into the determination of any merit payments to consultants providing technical assistance to the (F) WUAs.

43. Regional Monitoring Committees will be established in each of the four project areas that will be chaired by the Head of the Region and made up of members of GTDR. The Regional Monitoring Committee will be supported by the GTDR's Technical Secretariat, and will be responsible for (i) ensuring consistency of project actions with project objectives and work plan, national strategy and policy, and regional development priorities and programs; (ii) preparing and validating detailed work plans and budgets at the regional level; (ii) reviewing project progress and performance, and the implementation of corrective measures if necessary. The Regional Monitoring Committee will meet twice a year.

44. GEF funding will contribute to the project monitoring and evaluation system by financing the satellite images and their interpretation to monitor the global and environmental indicators in order to assess impact of project activities on land degradation, carbon sequestration, biodiversity, habitat protection, and area under SLM. In addition, a community-based monitoring system will be supported. GEF funds will further contribute to the technical assistance to M&E, to technical audits and the project evaluation, and to the environmental safeguard monitoring.

Annex 5: Project Costs

Madagascar: Irrigation and Watershed Management Project

NOTE: This annex presents the total financing for the IDA and GEF parts of the project including the Irrigation Development component which is being funded only by IDA.

Project Cost By Component and/or Activity	Local US \$million	Foreign US \$million	Total US \$million
Component 1: Development of Commercial Agriculture	9.90	1.69	11.59
Component 2: Irrigation Development	11.78	2.08	13.86
Component 3: Watershed Development	3.41	1.17	4.58
Component 4: Program Management	2.58	1.15	3.73
PPF	0.59	-	0.59
Total Baseline Cost	27.67	6.09	34.35
Physical Contingencies	1.38	0.37	1.75
Price Contingencies	4.00	0.30	4.30
Total Project Costs^a	33.64	6.76	40.40
Interest during construction			
Front-end Fee			
Total Financing Required	33.64	6.76	40.40

Project Cost By Component and Financier	IDA	GEF	Communitie s	Borrowe r	Total
Component 1: Development of Commercial Agriculture	7.45	2.50	2.51		12.46
Component 2: Irrigation Development	15.67		1.80		17.47
Component 3: Watershed Development	1.82	2.42	0.09		4.33
Component 4: Program Management	3.45	0.98			4.43
PPF	1.61				1.61
Total Financing Required	30	5.90	4.4		40.30

^a Identifiable taxes and duties are US\$4.68 million, and the total project cost, net of taxes is US\$35.72 million. Therefore, the share of project cost net of taxes is 88 percent

Annex 6: Institutional and Implementation Arrangements

Madagascar: Irrigation and Watershed Management Project

1. For the purposes of this document, the institutional and implementation arrangements for the joint IDA-GEF project are presented. GEF financing will be focused only on the development of commercial agriculture and the watershed management components, as well as the program management.

A. Project Implementation

2. The project concept is based on the following principles: (i) clear responsibilities for each of the actors in the management of irrigation schemes and surrounding watersheds (farmers, water users, populations and their associations, Communes and Inter-communes, Regions, central Government); (ii) effective participation of the population in the diagnosis of problems and identification of options; (iii) co-management of irrigation schemes and watersheds by all the actors concerned; and (iv) adequate incentive systems and efficient mechanisms to ensure that all respect their commitment.

3. The project is implemented at four levels: National, Regional, Intercommune/district and Local.

- *National.* MAEP is responsible for the overall implementation of the project, in full consultation with the other Ministries at the national level that are involved in order to ensure that project activities are consistent with national policies.
- *Regional.* The DRDR are responsible for the implementation of a large part of project activities. The Region is the operational level that ensures (i) coherence and planning of the project activities, and (ii) implementation of certain support or investment activities (e.g., rehabilitation of large irrigation schemes) at the level of the four project sites.
- *Intercommune/District.* This is the level responsible for the implementation of those activities that require collaboration at the intercommunal level (e.g., management of watersheds and large irrigation schemes, ASC, *guichets fonciers*).
- *Local:* Main level for the implementation of the project at the level of grassroots communities and economic operators.

B. Implementation Arrangements

Steering Committee and Guidance

4. The *National Steering Committee* (NSC) at the national level, to be chaired by the General Secretary of MAEP and supported by a technical secretariat; the said NSC shall ensure coherence of Project activities with national policies under the National Irrigation and Watershed Management Program; and shall be responsible for: (A) approving the programming of Project activities and approval of Annual Work Plans and Budgets, (B) monitoring Project implementation and results, including in particular the analysis and approval of activity reports and financial and operational audits, and (C) formulating

recommendations of corrective measures that may be necessary to ensure the efficient carrying out of the Project and the achievement of the objectives thereof; and

5. ***The Regional Monitoring Committee (RMC)*** at the regional level, one per Project Area, each composed by GTDR and headed by its respective Head of the Region; each such RMC shall ensure consistency of Project activities with both, the NIWMP and policy and regional development priorities and programs; and shall be responsible for: (A) validating detailed work plans and budgets at the regional level; and (B) reviewing Project progress and performance, and formulation and implementation of corrective measures that may be necessary in order to ensure the efficient carrying out of the Project and the achievement of the objectives thereof; and

Implementation of Project Activities

6. ***The overall coordination*** of the project is ensured by the National Program Coordination Unit (NPCU) at MAEP. The Director of NPCU reports to the NSC, responsible for oversight and approval of annual reports and work plans. The overall coordination involves:

- NPCU ensures project ownership at national level;
- Regional Director for Rural Development (DRDR) is responsible for project ownership of project investments in their respective areas.
- To support the implementation of these tasks, through the IDA funding, the project has financed the recruitment (i) at national level, of an international technical assistant (operations), advisor to NPCU, and (ii) at regional level of four national technical assistants (operations), advisors to DRDR for implementing project investments.
- Finally, NPCU and DRDR have selected in their respective units one staff member who provides support for coordination and project monitoring.
- The NPCU is also responsible for the implementation of project activities at the national level, including capacity building at Ministry level, support to national policies and strategies, etc.

7. ***The project financial management*** is ensured at national level by the Department for Administration and Finance at MAEP and, at regional level, by the DRDR finance director. The project has recruited under the ongoing Irrigation and Watershed Management Project supported by IDA a national financial management and procurement agency that provides technical financial management assistance to MAEP's Finance Director. The project has also recruited at each DRDR a national financial manager, who is under contract with the DRDR and who is in full time charge of financial management of the project. This person works closely with MAEP DAF and benefits from support from project financial TA at the national level.

8. ***Procurement*** is ensured, at central level, by PRMP and, at regional level, by relevant units of the DRDR. The project has recruited (i) a national financial management and procurement agency (same as the above mentioned financial TA) that provides technical assistance to the PRPM, and (ii) at the level of each region, an additional staff, under contract,

who is full time in charge of project procurement. This staff works closely with PRMP and benefits from the project support in procurement TA.

9. **Technical assistance.** Recruitment of TA – international (1) and national (7) – has been done under two separate contracts (one for financial and procurement management, and one for operational assistance) with specialized firms. The International “Operations” TA is in charge of (i) advising NPCU and their assistants and DRDRs/their assistants regarding operational strategy, project implementation and monitoring of the project; (ii) training and providing operational support to MAEP staff involved in project implementation. The National “Operations” TAs who are recruited at the level of DRDRs are in charge of advising and supporting DRDRs in project implementation in their respective areas and of ensuring coordination of all project components at regional level. National TAs in financial management and in procurement are responsible for financial management and procurement and for providing technical support to DRDR staff. The four financial and four procurement consultants at region level are responsible for financial management and procurement at the regional level. They have been recruited under one contract with the national level financial management and procurement specialist, and will report to the national specialist.

Implementation of Project Components

Component 1: Development of Commercial Agriculture.

Sub-component 1.1: Support to agricultural services.

10. The DRDR is responsible for the implementation of this component. The project activities are being implemented as follows:

- *Support to the development of commercial agricultural supply chains.* This support includes identification and mobilization of operators, strategic review of market and value chains opportunities and constraints, identification and analysis of productive sub-projects and will be provided by regional partners recruited in each zone by the DRDR. The priorities and work plan of these partners is being defined in consultation with the ASC and local platforms, and approved by the GTDR who are responsible for (i) administration of the matching grants; (ii) support to eligible operators in the preparation of sub-project proposals; and (iii) strengthen capacities and provide technical assistance to the ASC. Remuneration of the partners is partly based on performance.
- *Building the capacities of farmers and strengthening of professional organizations,* as well as the establishment of agricultural service centers (ASC). These activities are implemented under the responsibility of the ASC. The contractual staff of the ASC are recruited by the DRDR.
- *Strengthening the supply of technology for production and valorization of agricultural products* are being defined by the afore-mentioned platforms, with assistance from the ASC. They are approved by the GTDR and implemented by one or more service providers (private sector, FOFIFA, ONG, others) that are being recruited competitively on the basis of a multi-year contract with the DRDR.

Sub-component 1.2: Support to Private Investment.

11. Support to private investment is done through matching grants that are provided on a demand-driven basis to individuals or groups. In each zone, matching grants operate as follows:

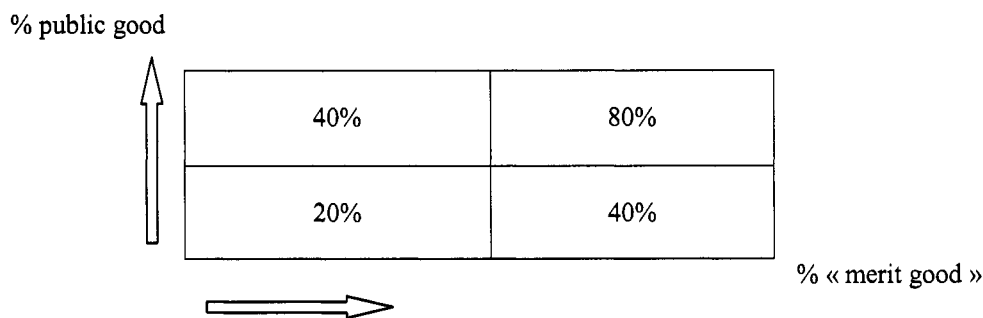
- *A list with eligible (positive and/or negative) activities* is prepared, based on the contribution that these activities will make towards achieving the project's objectives.
- *The GTDR appoints a Selection Committee at the regional level.* The GTDR approves the request for matching grants after analysis and following a recommendation from the Selection Committee. An external review will be conducted twice a year.
- *A regional partner* is recruited by the DRDR and has the following responsibilities (i) identify and analyze market and value chains opportunities; (ii) awareness raising and mobilization of private operators and potential investors; (iii) facilitate the preparation of sub-project proposals by individuals or groups; (iv) facilitate their access to a financier; and (v) conduct a technical and financial analysis of the sub-projects that request a matching grant.
- *Specialized service providers will be recruited by the DRDR on an as-needed basis to conduct strategic market and value chain studies.* These studies can be conducted either by the demander or by a service provider following competitive bidding.
- *A network of regional partners* at the regional level is being compiled by the ASC. The network, with the ASC, will sign multi-year contracts that specify the modalities and the expected results.

12. Matching grants are being provided to activities that have been identified as priority by the Government: investments, technologies and advice. Inputs and technologies will only, and temporarily (one or two year for the same beneficiary), be supported if they are necessary for the dissemination of innovative technologies (e.g. conservation, agro-ecological technologies). The project will under no circumstances finance inputs that are already widely available and used by the producers and financed by micro finance institutions.

13. Financial public support can be justified by the proportion of "public good" of the investment (roads, information, etc) and therefore by the assumption that leaving these investments to the private sector would lead to under-investment from a public resource allocation point of view.

14. Financial public support can also be justified for those beneficiaries that don't have the means to invest themselves -- vulnerable groups, etc. -- but where public support can help to lift these groups out of poverty and to take care of themselves: small productive investments (e.g., rice mills, oil press, etc) for women's groups. This is what is understood by the "merit good" of the intervention, which is related more to the beneficiary than to the type of investment.

15. In order to reduce the number of subsidy levels for activities supported by the project, the following table is proposed:



16. The beneficiary contribution is paid fully in cash, either from own means or through credit, except for environmental protection activities (forestation, revegetating farmers' fields or reclamation of degraded soils) by clearly defined beneficiaries (see component 3), where the contribution can be in kind.

17. Eligible operators and activities. The project partially subsidizes the following private operators⁸ :

- Professional agricultural and agro-industrial organizations;
- Producers' organizations (crop, livestock, forestry, ...);
- Rural communities;
- Commercial agricultural operators and agro-processors;
- agro-industrial companies ;
- seed producers (associations and individuals) ;
- Distributors of inputs and agricultural equipment;
- Micro finance networks.

18. Eligible activities are clearly associated with agricultural production and with management of natural resources (a specific positive and negative list) as presented in table 13.

Table 13: eligible activities matching grant

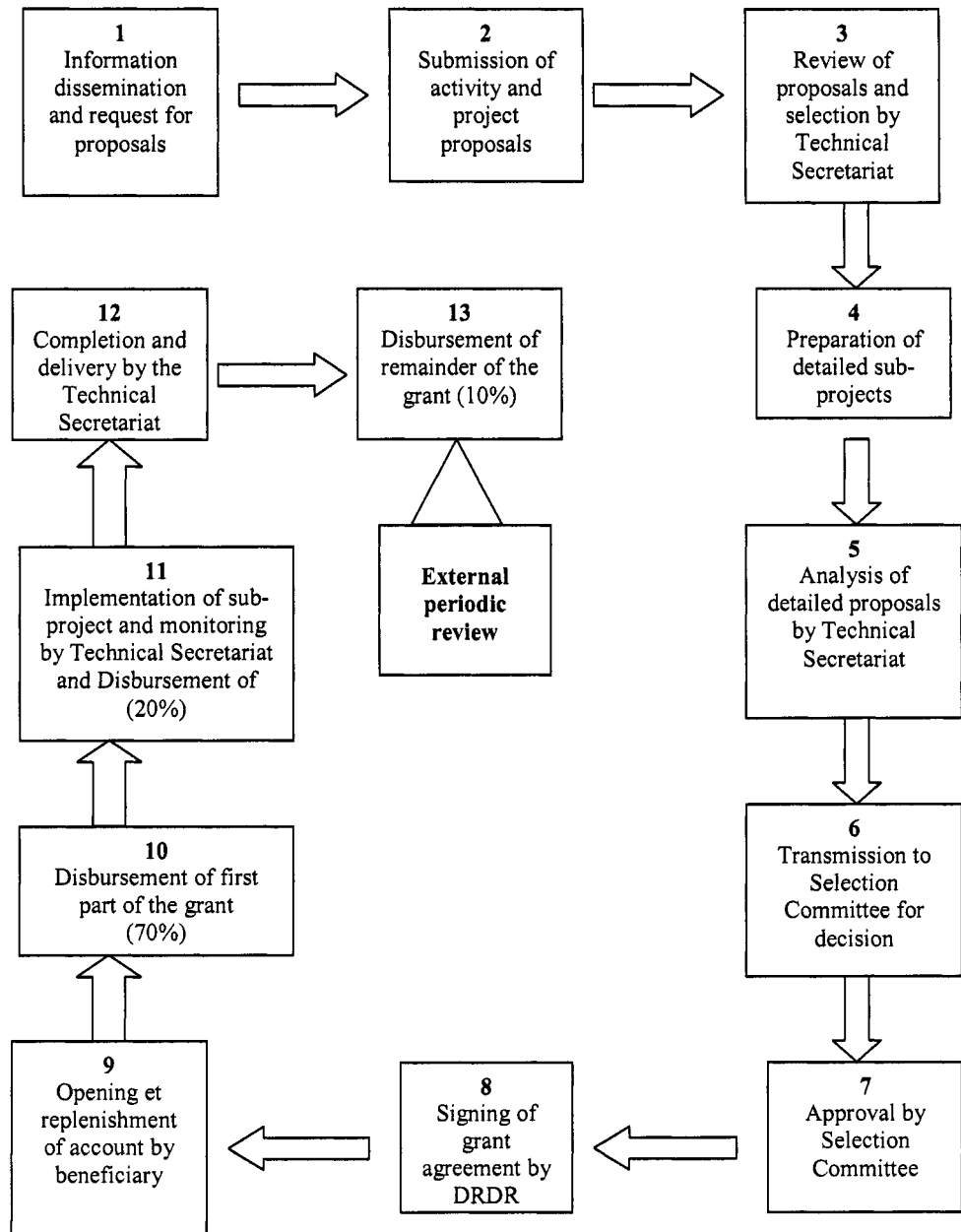
Support to marketing	<ul style="list-style-type: none"> • Market studies, value chain studies, development of quality management and certification, testing of samples;
Support to innovation	<ul style="list-style-type: none"> • Adaptative agricultural and agro-industrial research (varieties, technologies and production and processing equipment); • Introduction/test of new agricultural production techniques (ex. agro-ecological) ; • Awareness raising and demonstration (inputs , equipments) • Development of new micro-finance products (e.g., weather insurance)
Support to management	<ul style="list-style-type: none"> • Technical and management advice (e.g., strengthening of technical and substantive capacities of seed farmers) ; • Technical advice and extension of micro-finance networks
Support to investments	<ul style="list-style-type: none"> • Rehabilitation of seed production; • Storage and harvest infrastructure;

⁸ These operators need to prove their existence during at least two years before being eligible.

	<ul style="list-style-type: none"> • Establishment/extension of input and equipment distribution networks; • Integrated projects for the implementation of contract farming between private investors and smallholder producers; • Forestation reclaiming of degraded soils.
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Funds under the Matching Grant are disbursed as indicated in figure 1.

Figure 1: Matching Grant disbursements



Component 2: Irrigation Development

19. This component is implemented under the responsibility of the DRDR. There are two sub-components.

20. ***Sub-Component 2.1: Management of Irrigation Schemes.*** Activities in this sub-component include (i) awareness raising and mobilization of irrigation farmers and their associations; (ii) participatory diagnostic of options for management and rehabilitation of the irrigation scheme (Scheme Development Plan or SDP); (iii) selection of the preferred option for the mobilization and utilization of water resources; and (iv) preparation of a Performance Contract between water users, Region, communities and MAEP. The DRDR has recruited an international consultant who, with support from a national consultant, is implementing the above activities in the four project zones.

21. The rehabilitated irrigation schemes is managed in accordance with the relevant institutional framework (see table 14): (i) DRDR is responsible for the operation and maintenance of non-transferable irrigation infrastructure and for the mobilization of financial resources; (ii) (F)WUAs are responsible for operation and maintenance of transferred irrigation infrastructure, and for the mobilization of adequate financial resources among the water users through O&M fees; (iii) the Communes are the owners of transferred irrigation infrastructure, and will be co-responsible, with the WUA, for maintenance. They will need to provide adequate assistance to the (F)WUAs. They will also be responsible for the maintenance of roads within the schemes. However, the three stakeholders — Region, Communes, WUA — will only be able to collect adequate funds progressively. This will require: (i) increasing agricultural production and productivity, which will improve the capacity to pay and (ii) implementation of effective mechanisms for the mobilization of financial resources (O&M charge, land tax, FERHA). Project resources will temporarily provide financial incentives on a cost sharing basis. The Performance Contract will clearly define the obligations of all stakeholders.

22. ***Sub-component 2.2: Irrigation Investments.*** The DRDR is responsible for the implementation of the irrigation rehabilitation works. In each region, specific activities can be outsourced to (i) a national consultant for the technical studies and design of the works, including supervision of the works, and (ii) a contractor for the construction works. A single contract per region is signed with a consultant for the duration of the project.

23. (F)WUAs sign all contracts directly related to irrigation activities, and are co-responsible for the selection and evaluation of consultants and contractors. They will need to sign off on the completion of the works and payments to contractors.

Component 3: Watershed Development

24. The component includes, in each of the four project sites, (i) activities that aim to combat erosion and to conserve natural resources; and (ii) activities that aim to promote marketing and sustainable intensification of agriculture in watersheds (outside irrigation schemes) through the promotion of production systems and appropriate production technologies. Activities related to agricultural intensification and marketing will be implemented under component 1 “Agricultural Development” as described above. The sections below only relate to appropriate management and conservation of natural resources.

25. ***Subcomponent 3.1: Support to Watershed Management.*** The NPCU and the DRDR are responsible for the implementation of activities under this sub-component:

- Each DRDR is recruiting a regional partner responsible for (i) the mobilization and capacity strengthening of the local and regional consultation platforms; and (ii) participatory planning and implementation of the sustainable development and management of the various catchments.
- *Land registration offices* are being established by the respective communes. The DRDR and the communes are receiving technical assistance from the National Land Tenure Program (NLTP). The communes are responsible for the activities and the proper functioning of their Land Tenure Offices, and in particular of the recruitment of adequate staff and financing.

26. The first activities that the project has already launched included an intensive awareness raising and communication campaign to inform the populations of the watersheds, including irrigators, of the project objectives and to mobilize them with respect to its implementation.

27. ***Subcomponent 3.2: Investment in watersheds.*** The Watershed Development Plans include a number of investments that will be implemented as follows:

- (i) Strategic anti-erosion works that have been identified as priority in the Watershed Development Plans. They will be 100 percent financed by the project and implemented by private contractors contracted by the DRDR. In as far as possible, works will be implemented through local labor to promote the appropriation by the local population. The selection of contractors and payments made under the contracts will be certified by the involved communities.
- (ii) Establishment of zones under collective land management (*GÉLOSE*). The service provider under contract with the DRDR will be responsible for the facilitation of these activities. The DRDR will be responsible for satisfying the administrative requirements and the registration at the Land Tenure Offices. Necessary investments, as well as the running costs of the Land Tenure Offices, will be financed through Component 1;
- (iii) Dissemination of agro-ecological technologies that require distribution of special inputs and access to extension will be implemented through the regional partners that will be recruited by DRDR. Alternatively, in the case of adaptive research, activities will be implemented by service providers that are contracted by the DRDR under component 1.
- (iv) Appropriate productive investments (forestation, revegetation of land) that will be implemented by beneficiaries themselves and partially financed, on demand, through component 1.

28. Specific conditions regarding the participation of beneficiaries and the support that they will receive through the matching grant have been determined on the basis of an analysis that was conducted during the preparation of the Watershed Development Plans (nature of the interventions, capacity to pay), that takes into account similar programs under implementation in each of the four sites. As a general principle, beneficiaries will contribute a minimum of 20

percent to the investment costs (in kind or cash), with the exception of the strategic anti-erosion works (see (i) above) that will be fully paid for by the project.

Component 4: Program Management

29. ***Sub-Component 4.1: Project Management.*** Responsibility for the implementation and management of the project is assured by the NPCU at the national level and the DRDR at the level of each of the four project sites. The NPCU and the DRDR are in particular responsible for (i) the preparation of annual work plans and detailed budgets (at regional level, and consolidated at the national level); (ii) monitoring of implementation progress in accordance with the operations manual of the project; (iii) preparation of annual progress reviews that will be presented to the National Steering Committee and to the Regional Monitoring Committees; and (iv) conducting annual financial and technical audits. Specifically, the NPCU will be responsible for the organization of a bi-annual external technical audit of project operations.

30. The NPCU will sign a MOU with the National Land Tenure Program for the provision of strategic and technical support to the land tenure operations of the project.

31. **Monitoring and Evaluation.** Monitoring and evaluation is being conducted under the responsibility of the Director of Information Systems (DISE) of MAEP, who will be assisted by the international technical assistance located within the NPCU. In order to better integrate monitoring and physical investments, the project will adopt the Integrated Management System (SIG) developed by the PSDR. Independent technical audits will be conducted by service providers that will be qualified annually, beginning in the second year of the project. Two external impact evaluations will also be conducted: (i) at mid-term; and (ii) at the end of the project. The analyses and recommendations of these evaluations serve to extend the activities at the national level.

32. *Monitoring and evaluation consists of three separate but closely related systems:*

- (i) a system of internal monitoring conducted by MAEP under the responsibility of DISE in collaboration with NPCU staff at central and regional level so as to ensure harmonization and coherence in the monitoring of the various programs implemented by MAEP. However, this function can be delegated or outsourced to other entities either for an entire component (e.g., PE3 for the Watershed component) or for all activities at the regional level (e.g., GTDR for each site);
- (ii) a system of participatory evaluation at each of the four sites (which would allow for a better appropriation and internalization by beneficiaries) by directly involving the main beneficiaries (PO, (F)WUA, etc.) in the definition, collection and analysis of progress and impact indicators, and the identification of corrective measures in the event project objectives are not being achieved.
- (iii) a system of collaborative monitoring that invites other stakeholders to participate in the collection, interpretation and analysis of progress and impact indicators defined by the project (e.g. the GTDR disposes, in each of the four sites, of a regional rural development plan, and of a data base with indicators, and that has a mandate in

regional monitoring and evaluation. These GTDR could be directly involved in the monitoring and evaluation systems in each of the sites)⁹.

33. **Monitoring indicators.** Overall project monitoring is based on indicators that will form part of the Project Brief Document (see Annex 3), and on the implementation plan that was agreed during project negotiations. Specific achievements under each of the components will be measured more in detail with the aid of a series of more specific indicators. These indicators are grouped in two categories: (i) performance indicators that measure the resources [input indicators] that the project has allocated and the activities it has implemented [outputs indicators]; and (ii) impact indicators that measure the results that the project has achieved [outcome indicators] as well as its impacts. These different indicators will be defined before project negotiations.

34. **Integrated Management System (SIG).** The monitoring system will be integrated into an Integrated Management System (SIG) that not only allows for a close interconnection between the implementation of activities from identification to final delivery, but also and in particular for establishing a connection between technical and physical achievements and disbursements. The SIG also includes a procurement module that integrates the project procurement plan and the status of each of the procurement activities of the project.

35. **Sub-Component 4.2: Policy Support.** The NPCU of MAEP is responsible for the implementation of activities that aim to define national policies relevant for the agricultural/rural sector. That is the case for the definition of the operational modalities of management and replenishment of FERHA. The NPCU has competitively recruited the technical assistance that it needs, and is organizing necessary consultations with stakeholders at the national level (e.g. Consultative Platform for Rice, Fertilizer Producers' Association, Malagasy Association of Seed Producers).

⁹ Similarly, the PE3 through an MOU could be made responsible for monitoring and evaluation of the Watershed component.

	Objective	Capacity strengthening plan	Monitoring indicators
Government	<ul style="list-style-type: none"> • Definition of criteria and categorization of infrastructure into transferable and non-transferable • Rehabilitation of transferable and non-transferable infrastructure in connection with hand-over of ownership to regions or communes. • Technical assistance by DRDR to regions for planning, contracting and supervision of operation and maintenance works of non-transferable infrastructure • Technical assistance by DRDR to communes for planning, contracting and supervision of operation and maintenance works of transferable infrastructure by (F)WUA • Establishment of FERHA, preparation of operational manual, determination of payment of O&M fees by users • Establishment of mechanism for rapid implementation of cyclone damage repairs • Implementation of accompanying measures: fiscal policy, road access, tenure security, safety, agricultural research, respect of the rule of law. • Coordination with other national programs and partners 	<ul style="list-style-type: none"> • Outsourcing, contracting and supervision of works • Contract management and procurement • Planning, preparation and M&E of annual work plans • Participatory knowledge transfer • Financial management • Technical aspects of O&M 	<ul style="list-style-type: none"> • Number of people trained • Quality of rehabilitation: <ul style="list-style-type: none"> ○ User satisfaction ○ Cost-efficiency ○ Quality of works
Region	<ul style="list-style-type: none"> • Ownership and O&M of non-transferable infrastructure • Preparation of contracts for rehabilitation of transferable and non-transferable infrastructure. • Management of FERHA and recovery of funds according to state guidelines • M&E of (F)WUA for O&M of transferable infrastructure and recovery of O&M fees. • Legal support to (F)WUA 	<ul style="list-style-type: none"> • Outsourcing, contracting and supervision of works • Contract management and procurement • Planning, preparation and M&E of annual work plans • Collection of O&M fees • Legal issues • Financial management • Technical aspects of O&M • Asset management 	<ul style="list-style-type: none"> • Number of people trained • Number of O&M contracts signed • Quality of support provided: <ul style="list-style-type: none"> ○ User satisfaction ○ Quality of O&M: <ul style="list-style-type: none"> ○ Satisfaction of users ○ Number of days between defect and repair ○ Equity of water distribution ○ Adequacy of water supply ○ Efficiency of water supply
Commune	<ul style="list-style-type: none"> • Ownership of transferable infrastructure, collection of O&M fees • Collection of property tax • M&E and training of (F)WUA (organizational audit, accounting, quality of maintenance works, recovery of O&M fees) • Transfer of management of transferable infrastructure to 	<ul style="list-style-type: none"> • Participatory diagnostics • Fiscal issues, land taxes and land tenure • Outsourcing, contracting and supervision of works • Contract management and procurement • Planning, preparation and M&E of annual work plans 	<ul style="list-style-type: none"> • Number of people trained • Property tax collected • FERHA fees collected • Preparation of CDP • Quality of support provided: <ul style="list-style-type: none"> ○ User satisfaction

	Objective	Capacity strengthening plan	Monitoring indicators
	<p>(F)WUA</p> <ul style="list-style-type: none"> Collection of FERHA fees for the Region. 	<ul style="list-style-type: none"> Financial management Technical aspects of O&M Asset management 	<ul style="list-style-type: none"> Number of people trained Number of O&M contracts signed Quality of O&M: <ul style="list-style-type: none"> Satisfaction of users Number of days between defect and repair Equity of water distribution Adequacy of water supply Efficiency of water supply
(F)WUA	<ul style="list-style-type: none"> Operation and maintenance of transferred infrastructure Collection of O&M fees of transferable and non-transferable infrastructure. Advise to members on input supply, training, marketing and credit. Mobilization of contribution of members to rehabilitation works. Responsibility for O&M of transferred infrastructure, preparation of annual maintenance plans, recruitment of service providers. 	<ul style="list-style-type: none"> Participatory diagnostics O&M, organization, transparency, democracy, management and administration of Outsourcing, contracting and supervision of works Planning, preparation and M&E of annual work plans Financial management Technical aspects of O&M 	

Table 14: Irrigation and Watershed Management institutional framework

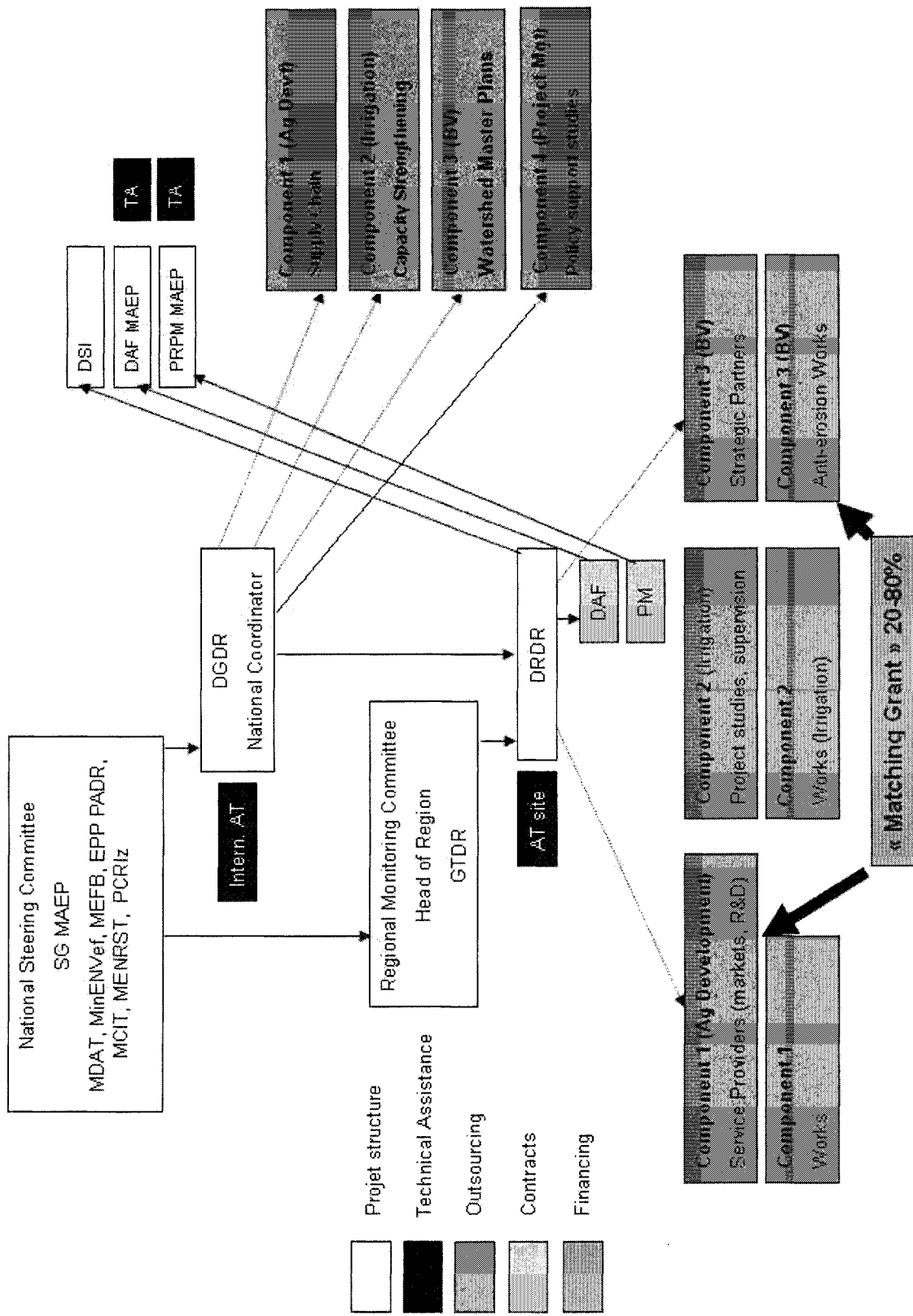


Figure 2: Institutional framework Irrigation and Watershed Management Project

Annex 7: Financial Management and Disbursement Arrangements

Madagascar: Irrigation and Watershed Management Project

Introduction

1. In accordance with Bank policy and procedures, the financial management arrangements of the DFB (ie PNBVPI) and RDFB (within the Ministry of Agriculture, Livestock and Fisheries) responsible for the FM aspect of this Project (GEF and IDA financing) have been assessed in order to determine whether they are acceptable to the Bank. This review is rather an update since the FM system of these entities has already been assessed in the context of the ongoing Irrigation and Watershed Management Project (IDA financing). The main conclusion of our review is that DFB and RDFB financial management systems meet IDA requirements [see Paragraph D (Q) of the PAD].

Summary Project Description

2. The proposed lending instrument for this program would be a three-phase, twelve year APL (mid FY07 – FY19). The first phase (APL1) is expected to be completed over a four-year period (mid FY07 – mid FY11), However, for consistency purposes with the GEF grant, the Association proposes to amend the IDA financing and extend the Closing Date of the Agreement to December 31, 2012. APL1 aims to assist the GoM to implement innovative approaches in support of sustainable investments in agricultural productivity in both irrigated and rained areas, and consists of the following components which are described in more details in the paragraph B4 of the PAD: i) Development of Commercial Agriculture; ii) Irrigation Development; iii) Watershed Development and; iv) Program Management. A more detailed description of the components and activities is attached in Annex 4. Information on GEF funded activities within the components can be found in the Incremental Cost Analysis (Annex 15). The funding instruments for APL1 are as follows: \$ US 30 million from IDA, USD 5.9 million from GEF and \$ US 4.5 million from local communities.

3. This project is being implemented by the National Program Coordination Unit (NPCU) at the national level and the Rural Development Regional Directorates (DRDR) at the regional level. The FM assessments have taken this into consideration.

Country issues

4. The World Bank's CFAA/CPAR, completed in 2003, and some diagnostic works carried out over the last three years by the Bank and other donors, identified a range of weaknesses and issues hampering the performance of Madagascar's budget and expenditure management system. To address these issues, the government has developed in 2004, 2005, 2006 and 2007 in conjunction with all key development partners, a priority action plan for public finance reform.

5. While overall implementation progress of the reform program is encouraging, significant efforts remain to be done to strengthen internal and external control systems. The deficiency of the control system is perceived throughout the whole expenditure circuit of budget execution, and especially on the control of salary payment and on delivery of goods and services to the administration. Moreover, the control agencies neglect the quality control of budget management as they are more concerned about irregularities and mismanagements. With regard to external audit, the main weakness is the lack of adequate number of skilled and experienced auditors at the "Chambre des comptes" commensurate with the complexity and

increased number of missions to be undertaken. As a result, significant delays have been noted regarding the presentation of the budget execution laws to the Parliament. To mitigate risks in public expenditure management, the World Bank, through the Governance and Institutional Development Program (PGDI), and a number of donors continue to support Government's public finance reforms reflected in its annual priority action plan.

6. Regarding the accounting profession, some positive developments have been noted over the last three years. However, a number of local accounting firms continue to operate below the international standards. To improve the capacity and the competitiveness of local auditing firms, the following measures have been taken while auditing Bank/IDA financed projects: i) obligation for local auditors to enter into partnership with international accounting firms; ii) effective participation of the international accounting firm in audit fieldworks and submission of audit report signed by the international audit firms. An accounting and auditing ROSC is presently underway to identify clearly both issues and actions to be taken to strengthen the capacity of the accounting profession in Madagascar.

7. The use of country systems still remains risky for Madagascar due to some fiduciary weaknesses that require much more time for their solving. To address this issue, and after exchanges of views with the borrower it was agreed to (i) entrust the FM aspects of this project to PNBVPI which has experience from the ongoing IDA project (ii) use partially the country system and (iii) establish transitional financial management system arrangements while the sector/national fiduciary systems are being strengthened.

FM Risk Assessment and Mitigation

8. The following table identifies the risks that the project management may face, and provides the measures to be taken to mitigate them:

Risks	Risk rating	Risk Mitigation Measures	Condition of Effectiveness (Yes/No)	Residual Risk rating
1- Inherent Risk				
Country Level. Audit may not be conducted in compliance with international auditing standards due to: weak capacity of the accounting profession in Madagascar, and; ii) inadequate number of skilled and experienced auditors at the "Chambre des comptes" in particular.	S	These issues are being addressed through the ongoing PFM reforms supported by IDA (through the Governance and Institutional Development Project) and other donors. The audit of the project financial statements will be carried out by the international accounting firm recruited under the ongoing Irrigation and Watershed Management Project. Its contract includes already the audit of the GEF grant.	NO	M
Entity Level The use of the national	M	Development partners continue to	NO	L

<p>system still remains risky due to some fiduciary weaknesses that require much more time for their improvement.</p> <p>Project Level</p> <p>Communities may not have capacity to implement subprojects.</p>	M	<p>support the GoM priority action plan for public finance reforms in the area of public financial management.</p> <p>In the meantime, a Financial Management Agency has been recruited to handle the FM aspect of this project and assist DFB and RDFB in this area.</p> <p>Organization of training session(s) for communities to strengthen their capacity in FM area and ensure proper application of procedures described in the PIM.</p>	NO: This training must be done prior to transfer of funds to communities	L
Overall Inherent Risk	M			M
2- Control Risk				
<p>Budget</p> <p>No major risk</p>	L			L
<p>Accounting</p> <p>No major risk</p>	L			L
<p>Internal Controls</p> <p>Procedures described in the PIM may not be followed properly by communities and grants may not be used for purposes intended (implementation of subprojects)</p>	M	<p>Strengthening the capacity of communities in managing subprojects and funds.</p> <p>Regular audit carried out by the Internal Audit Department (IAD) complemented by the annual audit conducted by qualified external auditors</p> <p>Semi annual supervision missions including review of the use of funds will be carried out by IDA.</p>	<p>NO (see above)</p> <p>NO: To be indicated in IAD annual work program</p> <p>NO</p>	L
<p>Funds flow</p> <p>Risk of non availability of communities participation</p>	S	<p>Up- front contribution will be required from Community for commercial agricultural Sub-Projects funded by IDA</p> <p>Community Contribution to environmental Sub-Projects funded by GEF will be in labor and in</p>	NO: To be indicated in the PIM	M

		kind. No Financial contribution is required.		
Financial reporting No major risk	L			L
Auditing No major risk	L			L
Overall Control Risk	M			L
OVERALL RISK RATING	M			L

Strengths, Weaknesses and Action Plan

9. The DFB (PNBVPI) and RDFB financial management is strengthened by the following salient features:

- Existence of an organizational structure defining clearly the lines of responsibilities and authority that exist, and are appropriate for planning, directing and controlling operations;
- existence of qualified and skilled accounting staff very knowledgeable with Bank procedures;
- adequate internal control system including suitable authorization procedures, appropriate segregation of duties and responsibilities, reliable budgeting system, and adequate measures for safeguarding assets; MAEP also has an Internal Audit Department in charge of the internal audit functions
- use of an accounting system in compliance with generally accepted accounting standards and IDA requirements, and providing reliable and timely information;
- appropriate documentation of the policies and procedures applied by the project, covering management of finances, accounting, procurement and financial reporting;
- use of an integrated computerized system facilitating the management of project operations and capable of producing in a timely manner all relevant information required for managing and monitoring project activities, and appraising project's overall progress towards the achievement of its objectives.

10. With regard to weaknesses, no major deficiencies have been noted so far in the project financial management system.

Institutional and Implementation arrangements (see Section C (K) and Annex 6 of the PAD)

Budgeting

11. Each Directorate/Department/Service within MAEP prepares its own budget and submits it to DFB/PNBVPI for consolidation. The MAEP budget request is therefore presented to the Ministry of Finance for discussion and decision-making in conformity with the defined calendar. Since FY 2005 the Government has set up a task force to assist key

sector ministries (including MAEP) in the preparation of their program budget in order to improve the quality of their submissions. The accounting software already in place facilitates significantly budgetary management.

Accounting Policies and Procedures

12. The project applies budgetary execution procedures actually in place within the MAEP (ie: preparation of expense commitment form by the DFB, verification of this request by the Expenditure Commitments Oversight Directorate, execution of the transactions by the project, determination of the exact amount to be paid upon reception of final bills, preparation of payment order and payment after appropriate verification of the validity of the transactions) and provides the Budget Directorate of the Ministry of Finance with monthly statement of commitment and payment drawn under the project credit lines.

13.

he DFB and RDFB (DRDR- Department of Financial & Budget) is using an accounting system in compliance with “generally accepted accounting standards”/PCOP (*Plan Comptable des Opérations Publiques*) and IDA requirements. This system operates on a decentralized basis with the four regions concerned and uses standard book accounts (journals, ledgers and trial balances) to enter and summarize transactions. Revenue is recorded when cash is received, while expenses and related liabilities are recorded when incurred, especially upon receipt of goods, works and services. Each RDFB maintains separate financial records for all transactions under its responsibility and sends, on a monthly basis, the balance sheet to the DFB for consolidation. The DFB, at the central level, is in charge of timely production of: monthly trial balances for the ACCT (*Agence Comptable Centrale du Trésor*), quarterly FMRs and annual financial statements.

14. The existing Chart of accounts and models of IFRs already reflect resources from GEF and components/activities to be financed under this grant. They allow the production of financial reports in compliance with IDA/project requirements.

15. To ensure timely production of financial information required for managing and monitoring project activities, the DFB and RDFB is using a computerized system implemented by a consultant. To avoid double data capture, this system allows for extracting efficiently all required information from the Data Base ORACLE presently in place and used by the MAEP for recording commitments, “liquidations” and settlement orders.

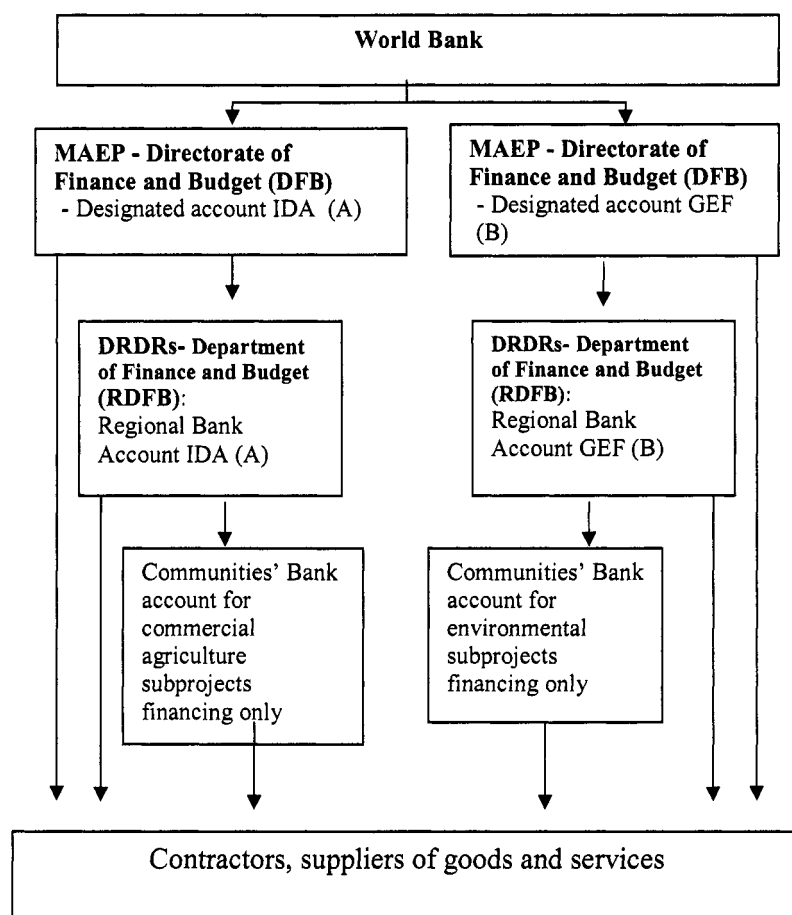
Internal Control and Internal Audit

16. The PNBVPI has a good internal control system: proper authorization of transactions, adequate separation of duties, reliable budgeting system, and adequate measures for safeguarding assets. In addition a financial management manual is available describing clearly the lines of responsibilities and authority that exist with appropriate segregation of duties, the tasks to be performed by each member of staff, documentation to be used, and controls to be applied. This manual provides also a detailed description of: i) the configuration of the financial management and accounting system, and the models of reports to be produced. The project accounting staff is qualified, acquainted with national FM system and Bank procedures, and has relevant experience in accounting.

17. To ensure efficient use of credit and grant funds for the purposes intended and consistent application of procedures on procurement, financial management, disbursement, the MAEP Internal Audit Department plays the role of internal auditors. They report directly to the Steering Committee and make sure that all issues identified during the internal audit are addressed quickly to improve the project performance.

Flow of Funds and Disbursement arrangements

18. The flow of funds from IDA, GEF and local Communities is presented as follows:



Disbursement from IDA credit, GEF Grant and Communities participation

19. For the implementation of Watershed Management Project the following bank accounts will be opened in local commercial banks under conditions satisfactory to IDA:

- Designated Account A to be managed by DFB: Denominated in \$ US, disbursements from the IDA credit will be deposited on this account to: i) finance 100 percent of all categories of expenditures agreed with IDA and indicated clearly in the Annual Work

Programs , Budgets, and Procurement Plans for IDA-funded activities; ii) replenish Regional Bank Account A managed by RDFB.

- Designated Account B to be managed by DFB: Denominated in US \$, disbursements from the GEF grant will be deposited on this account to i) finance 100 percent of all categories of expenditures agreed with IDA and indicated clearly in the Annual Work Programs, Budgets, and Procurement Plans for GEF-funded activities ii) replenish Regional Bank Account B managed by RDFB;

19. While disbursing proceeds from grant accounts, IDA may: i) reimburse the recipient for expenditures paid from the recipient's resources; ii) advance grant proceeds into the Designated accounts opened in a commercial bank acceptable to IDA; iii) make a direct payment to a third party; iv) enter into special commitments in writing to pay amounts to a third party in respect of expenditures to be financed out of the grant proceeds, upon the borrower's request and under terms and conditions agreed by IDA and the recipient. The accounting manual of procedures describes in details the application steps and requirements for requesting a reimbursement, a direct payment for third party, and applying for a special commitment.

20. To ensure prompt payment of contractors/suppliers operating in the regions, the borrower may open two regional bank accounts in a local commercial bank to be managed by each RDFB:

- Regional Bank Account A : Denominated in local currency (MGA) , disbursements from the Designated Account A (IDA Credit) will be deposited on this account to: finance 100 percent of all categories of expenditures agreed with IDA and indicated clearly in the Annual Work Programs, Budgets, and Procurement Plans for IDA-funded activities in the regions .
- Regional Bank Account B: Denominated in local currency (MGA) , disbursements from the Designated Account B (GEF Grant) will be deposited on this account to finance 100 percent of all categories of expenditures agreed with IDA and indicated clearly in the Annual Work Programs, Budgets, and Procurement Plans for GEF-funded activities in the regions;

21. The initial advance paid to each regional bank account would represent funds covering no more than 30 days estimated expenditures based upon submission of satisfactory budgeted work plans. Subsequent payments will be based on SOEs submitted by RDFB after appropriate authorization and approval by the DFB. The RDFB will submit at least monthly expenditure reports indicating sources and uses of funds and justifying the use of funds, and accompanied by reconciled bank statements.

22. To implement subprojects and ensure timely payment of contractors/suppliers, a Community bank account will be opened in a local commercial bank to receive transfer of funds from:

- IDA to finance demand-based sub-projects submitted by communities at all levels of the commercial agricultural value chain activity. Eligible sub-projects include support to marketing chains, support to inputs, credit and equipment providers, and support to

productive investment). The community account receiving from IDA will be used for micro-projects with the purpose of commercial agriculture only.

Or

- GEF to finance all aspects of reestablishing vegetation cover to reduce erosion to improve the land use productivity of the upper watersheds and to support the communities in an improved management of lands under secured land tenure management. Eligible sub-projects include pasture management, reforestation and revegetation, of degraded land,, etc. The community account receiving funds from GEF financing will be used for micro-project with the purpose of land management, soil fertility, and innovative technologies for environmentally-friendly agriculture.

24. The transfer of funds to these community bank accounts would be made as follows: i) 70 percent upon signature of the contract/convention between BVPI and Communities; ii) 20 percent based on physical progress (at least 50 percent of the goods/services have been delivered/rendered) after appropriate authorization and approval by DFB/RDFB; 10 percent after final reception. Community contribution to Sub-projects will be in labor or in kind.

25. The Designated Account would be replenished on the basis of documentary evidence provided to IDA by DFB (see below paragraph "*Designated account*"), justifying the payments of expenditures that are eligible for financing under the credit.

26. All supporting documents will be retained by the project (DFB, RDFB) and communities, and made available for review by periodic Bank supervision missions, internal and external auditors. The accounting manual describes in details all procedural aspects regarding financial management (payments, replenishment, accounting, reporting and internal controls).

Disbursement Arrangements

27. *Method of Disbursement:* The DFB/PNBVPI will follow the transaction-based disbursements procedures (traditional mode) outlined in the Bank's Disbursement Handbook.

28. *Minimum of Application Size:* The minimum application size for direct payments, to be withdrawn directly from the Credit Account, and special commitments is 20 percent of the amount advanced to the related Designated Account.

29. *Use of Statements of Expenditures (SOEs):* Disbursements will be made against Statement of Expenditures (SOEs) certified by DFB for contracts and other expenditures not requiring the Bank's prior review. All SOE supporting documentation will be kept by the DFB/PNBVPI and made available for review by Bank supervision missions and internal and external auditors.

30. *Designated Accounts:* Payments from the IDA Credit and GEF will be administered by the DFB/PNBVPI from two separate Designated Accounts which will be opened in the Commercial Bank on terms and conditions acceptable to IDA. The authorized allocation for the Designated Account covering IDA's contribution will be US\$2,500,000 million covering IDA's share of four (4) months of estimated expenditures. The initial deposit will be limited to US\$1,250,000 million and subsequent advances may be made as the need arises. The ceiling

for the designated account under the GEF grant shall be US\$400,000. The DFB will be responsible for preparing disbursement requests. The Designated Accounts will finance all project eligible expenditures inferior to 20 percent of the authorized allocation, and replenishment applications would be submitted at least on a monthly basis. Further deposits by IDA into the Designated Accounts will be made against withdrawal applications supported by appropriate documents.

Financial Reporting

31. To monitor project implementation, the DFB/PNBVPI will produce the following reports that should be prepared in compliance with international accounting standards:

- **Annual financial statements** comprising: i) Summary of Sources and Uses of Funds (by components/project activities/credit category and showing all sources of funds); ii) Project Balance Sheet; iii) the Accounting Policies Adopted and Explanatory Notes; iv) a Management Assertion.
- **Quarterly FMRs:** The FMRs include financial reports (IFRs) , physical progress reports and procurement reports to facilitate project monitoring. The FMRs should be submitted to IDA within 45 days of the end of the reporting period (quarter).

32. The form and content of quarterly FMRs and annual financial statements has been determined during project appraisal and already agreed during the negotiations of the ongoing Irrigation and Watershed Management Project supported so far by IDA financing. Models of these reports are presented in the project accounting manual of procedures.

Information Systems

33. The Irrigation and Watershed Management Project (IWMP) is using an integrated financial management system capable of recording and producing in a timely manner all financial reports required for managing and monitoring project activities. This computerized system in particular facilitate: annual programming of activities and project resources, record-keeping (general accounting and cost accounting), financial and budgetary management, fixed assets management, procurement management, follow-up on project implementation progress, preparation of project financial statements and quarterly Financial Monitoring Reports as required by the Bank/IDA.

Auditing

34. The project financial statements will be audited annually by an international private accounting firm acceptable to IDA, in accordance with International Standards of Auditing. The auditing firm has already been recruited under the ongoing IWMP. The auditors will be required to: (i) express an opinion on the project financial statements; (ii) carry out a comprehensive review of the internal control procedures and provide a management report outlining any recommendations for their improvement. The audit report will be submitted to IDA not later than six months after the end of each fiscal year. The terms of reference of the audit has already been reviewed by the financial management specialist of the Bank/IDA to ensure the adequacy of the audit scope, drawing special attention to particular risk areas identified so far.

Audit Report	Due Date
1- Project specific financial statements	Within six months after the end of each financial year.

Supervision Plan

35. A supervision mission will be conducted twice a year to ensure that strong financial management systems are maintained for the project throughout its life. Our input to FM rating will be indicated in the Implementation Status and Results Report (ISR). Periodic review will be also carried out when needed to ensure that expenditures incurred by the project remain eligible for IDA funding.

Table A. Allocation of Grant Proceeds

Category	Amount of the Grant Allocated (expressed in USD)	Percentage of Expenditures to e Financed
(1) Goods, consultants' services, and training	3,640,000	100%
(2) Sub-Project Matching Grant	2,260,000	100% of amounts disbursed
Total	5,900,000	

GEF Estimated disbursements (Bank FY/US\$m)									
FY			9	10	11	12	13	0	0
Annual			0.6383	1.4425	1.9502	1.2090	0.6600	0.00	0.00
Cumulative			0.6383	2.0808	4.0317	5.2407	5.9000	0.00	0.00

Annex 8: Procurement Arrangements
Madagascar: Irrigation and Watershed Management Project

A. General

1. Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated May 2004, and revised in October 2006; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004 and revised in October 2006, and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the Grant, the different procurement methods or consultant selection methods, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.
2. **Advertisement:** A General Procurement Notice will be published in UN Development Business and Development Gateway Market (dgMarket) and will show all International Competitive Bidding (ICB) for goods and works and major consulting service requirements. Specific Procurement Notices will be issued in Development Business and dg Market and at least one newspaper with nationwide circulation for ICB contracts and before preparation of shortlists with respect to consulting contracts above US\$200,000, in accordance with the *Guidelines*
3. **Procurement of Works:** Works procured under this project would include: small works related to activities undertaken within Matching Grants.
4. **Procurement of Goods:** Goods procured under this project would include equipment for the treatment and exploitation of satellite pictures and software for geographic information system. The procurement will be done using the Bank's SBD for all ICB and National SBD agreed with or satisfactory to the Bank and with any special requirements specific to the Project. To the extent practicable, contracts shall be grouped into bid packages estimated to cost the equivalent of USD250, 000 or more and would be procured through International Competitive Bidding (ICB) procedures. For contract estimated to cost less than USD250,000, equivalent per contract, procurement of goods may be carried out through National Competitive Bidding (NCB) procedures and purchase of small furniture estimated to cost less than USD30,000 will be conducted through prudent shopping procedures.
5. **Direct Contracting** for goods may be used in exceptional cases, such as for the extension of an existing contract, standardization, proprietary items, spare parts for existing equipment, and urgent repairs and emergency situations, according to paragraphs 3.6 and 3.7 of the Guidelines. The items to be procured through Direct Contracting would be agreed on in the procurement plans.
6. **Selection of Consultants:** The project will finance the contracting of consultancy services for technical assistance, financial and technical audits, specialized advisory services for assistance to the implementation of sub-projects and natural resources management teams, and capacity building. Firms will be recruited on the basis of the Quality and Cost Based

Selection (QCBS) method, using the Bank’s Standard Request for Proposals. Selection based on consultants’ qualifications (CQS) can be used for the recruitment of training institutions and for assignments that meet criteria set out in para 3.7 of the Consultant Guidelines. Single source selection (SSS) can be used to contract firms for assignment that meet criteria set out in para 3.9 to 3.13 of the Consultant Guidelines and for the purpose of very small assignments referred in para 3.10 of the Consultant Guidelines, and for which the contract estimated costs do not exceed USD100,000. Specialized advisory services would be procured through Individual Consultants Selection (ICS), based on the qualifications of individual consultants for the assignment in accordance with the provisions of paragraphs 5.1 through 5.3 of the Consultant Guidelines.

7. **Community participation in procurement:** Community participation in Procurement would be based on AFR Guidelines – Simplified Procurement and Disbursement Procedures for Community-Based Investment. This would comprise a broad spectrum of activities related to watershed management and irrigation. Procurement is described in the Project Implementation Manual.

Operating Costs would not be financed by the Grant

8. **Review by the Bank of Procurement Decisions .** The thresholds for prior review by Bank are specified in the procurement plans. Table 1 shows (i) the proposed thresholds for the different procurement methods, and (ii) the proposed initially-agreed thresholds for prior review by the Bank. The Bank will preview procurement arrangements proposed by the Borrower for the items specified in the procurement plans for their conformity with the Grant Agreement and the applicable Guidelines. Any procurement item not specified for prior review may be subjected to a post-review of the procurement process.

Thresholds for Procurement Methods and Prior Review

Expenditure Category	Contract Value Threshold (US\$)	Procurement Method	Contracts Subject to Prior Review (US\$)
Works (related to Matching Grants activities)		shopping	No prior review
Goods	250,000 or more 50,000 or more and less than 250,000 Less than 50,000	ICB NCB Shopping	All
Consultant Services - Firms	100,000 or more Less than 100,000 Less than 100,000	QCBS CQS SSS	All (US\$0.8Mio) All (US\$0.480Mio)
Consultant Services - Individuals	50,000 or more Less than 50,000 Less than 50,000	ICS SSS	All (US\$0.15Mio) All

B. Assessment of the agency's capacity to implement procurement

9. Procurement activities are carried out by the National Program Coordination Unit (NPCU) at national level and Directions Régionales du Développement Rural (DRDR) at regional level. These units are MAEP departments and properly staffed; the procurement function under Unité de Gestion des marchés Publics (UGMP) is staffed by Procurement Officer and diverse civil servants.

10. An assessment of the capacity of the Implementing Agency to implement procurement actions for the project has been carried out on October 2005 and remain valid The assessment reviewed the organizational structure for implementing the project and the interaction between the project's staff responsible for procurement and the Management's relevant central unit for administration and finance.

11. The key issues and risks concerning procurement for implementation of the project have been identified and include the phasing of activities to be undertaken and possible emerging of emergency cases. The corrective measures which have been agreed are the close follow-up of the agreed procurement plan and activity scheduling. A procurement action plan will be fine tuned quarterly and the main procurement plan will be up-dated accordingly.

12. The overall project risk for procurement is Average.

C. Procurement Plan

13. The Borrower, at appraisal, developed a procurement plan for the implementation of IDA financed activities which provide the basis for the procurement methods. This plan was approved on June 30, 2006 and is available at the NPCU office. It is also be available in the project's database and in the Bank's external website. The Procurement Plan will be updated in agreement with the Project Team annually or as required to reflect the actual project implementation needs and improvements in institutional capacity. The Procurement Plan for GEF funded activities was also developed during project appraisal and finally approved on September 09, 2008 by the Bank.

D. Frequency of Procurement Supervision

14. In addition to the prior review supervision to be carried out from Bank offices, the capacity assessment of the Implementing Agency has recommended annual supervision missions to visit the field to carry out post review of procurement actions.

E. Details of the Procurement Arrangements Involving International Competition

1. Goods, Works, and Non Consulting Services

(a) List of contract packages to be procured following ICB and direct contracting:

1	2	3	4	5	6	7	8	9
Ref. No.	Contract (Description)	Estimated	Procurement Method	P-Q	Domestic Preference (yes/no)	Review by Bank (Prior /	Expected Bid-Opening	Comments

		Cost (US\$)				Post)	Date	
NONE								

(a) ICB contracts estimated to cost above US\$500,000 for works and US\$250,000 for goods per contract and all direct contracting will be subject to prior review by the Bank.

(c) List of other contract packages

1	2	3	4	5	6	7	8	9
Ref. No.	Contract (Description)	Estimated Cost (US\$)	Procurement Method	P-Q	Domestic Preference (yes/no)	Review by Bank (Prior / Post)	Expected Bid-Opening Date	Comments
Component 4: Program management								
GEF-G01	Equipment for treatment and exploitation of satellite pictures	87,000	Shopping	No	No	Post	July 2008	2 contracts
GEF-G02	SIG software	70,800	Shopping	No	No	Post	July 2008	2 contracts

2. Consulting Services

(a) List of consulting assignments with short-list of international firms and sole sourcing.

1	2	3	4	5	6	7
Ref. No.	Description of Assignment	Estimated Cost (US\$)	Selection Method	Review by Bank (Prior / Post)	Expected Proposals Submission Date	Comments
Component 1: Development of commercial agriculture						
GEF-A02	Agriculture researches by FOFIFA Services	146,000	Sole source	Prior	August 2008	FOFIFA & TAFE are Gov research agencies
GEF-A06	Annual agricultural training held with TAFE services	332,000	Sole source	Prior	Nov. 2008	
Component 3: watershed development						
GEF-C03	Implementation of sub-projects	558,000	QCBS	Prior	Sept. 2008	-4 contracts for 3 years
GEF-C08	Elaboration of GDT database	70,000	ICS	Prior	July 2008	-
Component 4: Program management						

GEF-D01	Preparation of GDT	80,000	ICS	Prior	July 2008	-
GEF-D02	technical audit	102,000	QCBS	Prior	Oct.2011	
GEF-D03	Project evaluation	136,000	QCBS	Prior	Oct.2011	

(b) Consultancy services estimated to cost above US\$100,000 per contract and single source selection of consultants (firms) and of individual consultants assignments estimated to cost above US\$50,000 will be subject to prior review by the Bank.

(c) Short lists composed entirely of national consultants: Short lists of consultants for services estimated to cost less than US\$100,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

(d) List of other consulting assignments

1	2	3	4	5	6	7
Ref. No.	Description of Assignment	Estimated Cost (US\$)	Selection Method	Review by Bank (Prior / Post)	Expected Proposals Submission Date	Comments
Component 1: Development of commercial agriculture						
GEF-A01	Support to CBO	48,000	QCBS	Post	July 2008	Multiple contracts
GEF-A03	Researches and development services	467,000	QCBS	Post	Jan. 2009	Multiple contracts
GEF-A04	Regional training of technicians	200,000	CQS	Post	July. 2008	Multiple contracts
GEF-A07	Other regional training	465,000	CQS/ICS	Post	July 2008	Multiple contracts
Component 3: Watershed development						
GEF-C01	Implementation /facilitation of consultation Platforms	130,000	CQS/ICS	Post	Jan. 2009	Multiple contracts
GEF-C02	Implementation of sub-projects 2008	130,000	QCBS	Post	July 2008	4 contracts
GEF-C04	CBO training	95,000	ICS	Post	July 2008	Multiple contracts
GEF-C05	Local staff training	115,000	CQS	Post	July 2008	Multiple contracts
GEF-C06	Support to natural resources management team	176,000	QCBS	Post	July 2008	Multiple contracts
GEF-C07	Communication	80,000	ICS	Post	July 2008	Multiple

						contracts
Component 4: Program management						
GEF-D04	TA for IGS	21,000	ICS	Post	August 2008	
GEF-D05	Short-term Technical assistance	77,700	QCBS	Post	July 2008	Multiple contracts
GEF-D06	M&E services	50,000	QCBS	Post	July 2008	Multiple contracts

Annex 9: Economic and Financial Analysis
Madagascar: Irrigation and Watershed Management Project

A. The Irrigation and Watershed Management Project

1. The Malagasy government is preparing a new irrigation program based on a watershed approach in order to increase agricultural productivity and farmer income in selected rural areas. These two objectives should be reached through a mix of software and hardware investment in agricultural service improvement, irrigation scheme development and upper watershed protection.

2. The World Bank will support this program by financing, together with the Global Environment Facility (GEF) and the private sector, direct investments in three areas: (i) commercial agricultural development to better link farmers to markets for inputs and credits and introduce agricultural technology in irrigated areas and tenets, for a total of US\$12.9 million (baseline costs plus taxes); (ii) irrigation development in the lower watershed to rehabilitate physical infrastructure (such as water intakes, dikes, canals, and drainage systems) and financial infrastructure¹⁰, for a total of US\$17.5 million; and (iii) watershed management in the upper watershed to promote more sustainable land management for a total of US\$5.2 million. From the point of view of the economic analysis, these three components represent one integrated package and cannot be treated separately. A fourth component will support the project management for a total of US\$4.9 million, including the Project Preparation Fund.

3. Overall, the project will cost US\$40.5 million (including physical and price contingencies), of which 74 percent will come from IDA (US\$30.0 million), 15 percent will come from GEF (US\$6.0 million), and 11 percent will come from the private sector (US\$4.5 million). GEF will support the watershed development (component 3), and the private sector will support the development of commercial agriculture (component 1).

4. The project will target 30,500 hectares of cultivated area in four watersheds with potential for agricultural development: *Marovoay*, in the Northwest, and *Lac Alaotra* (the Sahamalato scheme), in the Middle East, the two rice granaries in the country, and *Itasy* in the mid-West and *Andapa* in the North. The objective will be to sustainably and significantly increase agricultural production in these areas.

5. The total irrigated area of these four watersheds represents 71,800 hectares, a third of which will be concerned by the project (21,800 hectares), also constituting eight percent of the irrigated schemes area (300,000 hectares), and 2.25 percent of the country's total irrigated area¹¹ (1 million hectares). Some of the irrigated perimeters, like Lac Alaotra and Marovay, are over 1,000 hectares; others, like Itasy, are between 100 and 1,000 hectares; the rest, like Andapa, are under 100 ha. All 21,800 hectares are already equipped with concrete irrigation

¹⁰ Mainly the Fonds d'Entretien et de Réhabilitation Hydro-Agricole (FERHA) for the part of the irrigation infrastructure that benefits the national public, and Water User Associations (WUAs) for the others.

¹¹ In Madagascar, indeed, more than one million hectares, or 40 percent of all cultivated lands, are irrigated, and produce less than 3 million tons per year (300 grams a day per capita), nearly half of the daily energy intake. The bulk of these irrigated lands, 800,000 hectares or 70 percent of the total irrigated area, are very small in terms of average superficies (a few hectares), and are not equipped with irrigation infrastructures such as concrete dams, water intakes or line-canals. Consequently, water control is low and so is the paddy yield. These 20,000 or so perimeters built by farmers in almost every lowland area of the country are called traditional irrigated areas or micro/village perimeters; they are not irrigated perimeters in the sense given by this study. The remaining portion covers 300,000 hectares, or around 30 percent of the irrigated areas, and is equipped with infrastructure meant to improve water management and thus intensify production (i.e. improve productivity). The infrastructure was built by the State during the colonial era at the very beginning of the twentieth century and was maintained by it until the liberalization of the sector in 1984.

infrastructure, but only 60 percent are considered irrigated areas; the other 40 percent, mostly located downstream from the irrigated areas, are not irrigated year-round.

6. The project will finance the rehabilitation of irrigation infrastructure in the 60 percent of the schemes that are well-irrigated, and will finance the introduction of agricultural technologies (such as improved varieties) in the other 40 percent, which should help raise productivity without improving water control over the year. On the irrigated area, the project will develop off-season cropping (mostly tomatoes and potatoes) on 4,700 of the 21,800 hectares of irrigated perimeters targeted by the project, mostly in Itasy and Andapa.

7. The project will also develop rainfed agricultural production in the lower part of the four watersheds (the first hillsides or tanety surrounding the irrigation systems) on around 7,700 hectares, less than 10 percent of the rainfed cultivated area (45,000 ha), through the introduction of agroecological techniques such as tillage and zero plowing. The objective of developing agro-ecology is to increase on-site productivity and decrease off-site siltation. Indeed, as the intervention will target the first hillsides around the systems, it is expected that erosion control will lead to decreased siltation.

Table 15: Areas and Beneficiaries of the Project

Watershed	Irrigated Areas (ha)	Partially-irrigated Areas (ha)	Off-season Irrigated (ha)	Agro-ecology on Tanety (ha)	Beneficiaries (households)
Marovay	3,670	2,400	200	2,000	18,120
Itasy	2,060	3,600	3,000	2,400	25,915
Andapa	2,150	1,500	1250	1,500	14,851
Lac Alaotra	6,000	400	250	1,800	30,676
Total	13,880	7,900	4,700	7,700	89,562

8. The project investment cost will be around \$1,330 per hectare for the four-year period of project implementation, or about \$330 per hectare per year. This represents an increase of almost 4.5 times the investment of the last 20 years, which was about \$1,500 for that time period, or about \$75 per hectare per year (see section 2 of this annex).

9. The project will take place in rural areas where the vast majority of households live under the threshold of absolute poverty (less than US\$1 a day). The project will benefit about 90,000 households or, with an average of 5.5 people per household, around half a million people in a country that has a total population of about 20 million people.

10. The improvement in agricultural productivity will likely contribute to poverty alleviation for these people by yielding some benefits to farmers, laborers and consumers, including the poorer marginalized people that suffer from regular famines during “soudure” periods. Indeed, in Madagascar¹², increased irrigated paddy productivity is believed to be positively linked with an increase in real agricultural wages, a reduction in the number of the food insecure and a reduction of the paddy price to consumers.

¹² A doubling of rice yields leads to a reduction in the price of rice by 45 percent in the harvest period and by 20 percent in the lean season [Minten and Barret, 2005]. A one-percent increase in rice yields leads to a reduction of the number of the food insecure by 5 percent and reduces the length of the lean period by 2 months [Minten and Barret, 2005].

B. Public Spending and Irrigation Productivity in Madagascar

11. A World Bank ESW (P096045) entitled *Madagascar: The impact of public spending on perimeters productivity, 1985-2004*, has looked carefully at the impact of public spending on irrigation system productivity during the last twenty years, a period that started with a major regulatory shift – the liberalization of the rice sector – accompanied by an abrupt transfer of the operation and maintenance (O&M) of the medium-sized and large irrigation systems (irrigated areas equipped with infrastructure meant to improve water management and thus intensify production) from the State and State-owned enterprises to Water User Associations (WUAs).

12. A sample of 108 irrigation schemes that were given help to organize O&M, representing an area of 123,500 hectares and 400 WUAs, received US\$190 million, or half of public spending, through 25 irrigation projects (including 2 extension projects) financed by 11 donors¹³. These irrigation schemes represent around 60 percent of the irrigated areas of more than 50 hectares that were endowed with concrete infrastructure at the beginning of the period and represent around 11 percent of Madagascar's total irrigated lands (believed to cover around 1 million hectares). The beneficiaries were the about 100,000 water users, or around 600,000 people, and about 60 percent of the \$190 million was invested in hardware for irrigation infrastructure, while the other 40 percent was invested in software, mostly for capacity building of WUAs and, less importantly, for promoting agricultural technologies, such as chemical fertilizers, improved seeds, off-season crops, early rice transplanting, and the system of rice intensification (SRI) that was invented in Madagascar.

13. Overall, the investments resulted in increased system productivity¹⁴, from 1.5 at the beginning of the period studied to 2.4 tons of paddy equivalent per hectare, a 60 percent increase and a significant achievement in view of Madagascar's reputation for stagnant productivity (the FAO figures) and irrigation project failure. In these systems, paddy yield¹⁵ increased from 2.2 to 2.7 tons of paddy equivalent per hectare, contributing to 50 percent of the productivity increase, while the other 50 percent came from the increase in cropping intensity¹⁶, which grew from 0.6 to 0.8.

14. The latter improvement is a direct consequence of investment in the hardware (better infrastructure improves areas under irrigation) while the former is believed to be the indirect and combined result of investment in the hardware and in promoting agricultural technologies (better infrastructure allows better water control, which encourages the adoption of new methods that have a direct effect on yield).

15. This overall improvement in paddy productivity, when compared with the counterfactual situation – the situation without the investments of the past twenty years, including the ones devoted to repair cyclone damage – shows that without investments in irrigation infrastructure and in building the capacity of WUAs, the 123,500 hectares of irrigated perimeters would have produced, at the end of the studied period, 140,000 tons of paddy less than in the alternative situation. The difference between the two scenarios

¹³ The projects totaled US\$375 million but only US\$200 million were allocated to the surveyed perimeters; the other funding went to other perimeters or to irrigated areas that are not considered perimeters.

¹⁴ The productivity of an irrigated perimeter, for a given year, is the ratio between its annual paddy production and the equipped area (the area that could be irrigated by the irrigation infrastructure if it was in perfect condition and sufficiently water-supplied).

¹⁵ For a given rice harvest (wet / dry season), the yield is the mean paddy weight per hectare. For non rice harvest, the mean paddy yield is given in tons of paddy per hectare, by cost-equivalency.

¹⁶ For a given year, the cropping intensity is the proportion of irrigated area. The cultural intensity has thus no unit and is between 0 and 2 in Madagascar, because of the wet/dry seasons.

translates into economic benefits for the country that represent a Net Present Value (NPV) of US\$200 million at a 10 percent discount rate or an *Economic Rate of Return* (ERR) of 18.5 percent.

16. Therefore, overall, the donor investments in the irrigation sector during the past twenty years, while seen as a failure, in reality have significantly improved country welfare, and, given what is known of the relationship between paddy productivity increases and poverty alleviation they have contributed to poverty alleviation in rural areas as well.

17. However, two factors helped limit the impact of these twenty years of investment in the irrigation sector to the lower bound of what was possible: cyclone damages and the somewhat poor functioning of the WUAs. Both kept cropping intensity improvement at a lower level than what was expected. Indeed, 20 percent of the hardware investment during the last twenty years was diverted from initial objectives to repair cyclone damages. The financing could have been used to expand the irrigated area and thus the cropping intensity. Moreover, WUAs have been losing, on average, 5 percent of the irrigated area each year because of a low O&M fee recovery rate. Therefore, an important part of the investment was used, in fact, to rehabilitate the former investment.

18. In addition, paddy yield improvement could also have been more important if compare with green revolution technologies achievement in other country such as Indonesia that share the same natural conditions than Madagascar and reached 4 tons per hectare. In the Madagascar case, tiny extension projects combined with relatively low producer prices (compared to fertilizer prices) could give a reasonable explanation of that relatively low improvement.

C. Basis of the Watershed Management Project Economic Analysis

19. The economic analysis is carried out separately for each of the four watersheds selected by the project because the initial conditions of the irrigation systems and upper watersheds are different along with the amount and balance between the three components that will be applied to each of the watersheds. The results are added to provide the economic analysis for the whole project.

20. The type and magnitude of the expected incremental economic benefits of the project depend on what would have been the situation in the absence of the project and on what the project will affect. Thus, the counterfactual situation is described and defended below before the different categories of expected benefits from the project are presented.

- *Counterfactual Situation (baseline)*

21. The baseline describes the evolution of paddy productivity in irrigated areas and uplands (tanety) in the four watersheds in the absence of the project. As far as paddy productivity is concerned, the economic analysis builds on the database assembled during the ESW, extracts cropping intensity, the paddy yield and the un-irrigated production, and simulates their progression over the next 25 years if no investment in the rehabilitation of infrastructure is realized (even if cyclones and floods occur during the period), no capacity building of local institutions is done, and no disaster risk financing mechanisms are put in place. The evolution of tanety production is estimated from data collected by the task team during project preparation.

Table 16: Production at the beginning of the project

Watershed	Irrigated Areas (tons)	Partially-irrigated Areas (tons)	Off-season Irrigated (tons)	Tanety (tons)	Total Paddy production (tons)
Marovay	9,151	3,584	300	11,887	12,735
Itasy	5,952	6,801	6970	9,389	12,752
Andapa	4,914	1,929	1090	7,820	6,843
Lac Alaotra	19,567	904	240	6,579	20,471
Total	39,583	14,504	8,600	35,675	52,801

22. In the four areas targeted by the project, paddy production in irrigated areas is currently at around 53,000 tons per year, or 2 percent of the estimated current national paddy production (around 2.8 million tons). More than two-thirds of the paddy production comes from well-irrigated areas, located upstream from the irrigation systems, as mentioned in the introduction, and one-third of the paddy production comes from partially-irrigated areas, located downstream from the irrigation systems. Almost 38 percent of the paddy production comes from the Sahamaloto perimeter located in the Aalotra watershed, which covers only around 28 percent of the irrigated areas concerned by the project. In addition to this paddy production, which comes from the 21,800 hectares of irrigation systems that will be targeted by the project, around 44,000 tons per year are produced on the 7,700 hectares of tanety located in the lowland parts of the watersheds and the 1,075 hectares of irrigated perimeters that are cultivated off-season and that will be targeted by the project. These so-called tanety and off-season irrigated productions are composed of 45 percent cassava, 13 percent sugarcane, 12 percent tomatoes, 10 percent maize and 6 percent rainfed rice. The remaining 14 percent are sweat potatoes, potatoes, bananas, peas and groundnuts.

Table 17: Productivity and Cropping intensity at the beginning of the project

Watershed	Irrigated Areas (tons)	Partially-irrigated Areas (tons)	Off-Season Irrigated (tons)	Tanety (tons)
Marovay	2.5	1.5	5	5.9
Itasy	2.9	1.9	10	3.9
Andapa	2.3	1.3	5	5.2
Lac Alaotra	3.3	2.3	5	3.7
Weighted Average	3	2	8	5

23. Paddy productivity in the irrigated areas is around 3 tons per hectare per year, with some variability between watersheds. Andapa has the lowest productivity, 2.3 tons per hectare per year, and Lac Alaotra has the highest, 3.3 tons per hectare per year.

24. In the partially-irrigated areas, productivity has been estimated, by hypothesis, at minus 1 ton per hectare compared to well-irrigated areas in the same watershed. This result is derived from the ESW: *The impact of public spending on perimeters productivity, 1985-2004* that shows a rough gain of 1 ton when water management is improved with investment in civil works.

25. Off-season irrigated productivity is at a weighted average of 8 tons per hectare, 10 tons per hectare for Itasy and 5 tons per hectare in the 3 other watersheds.

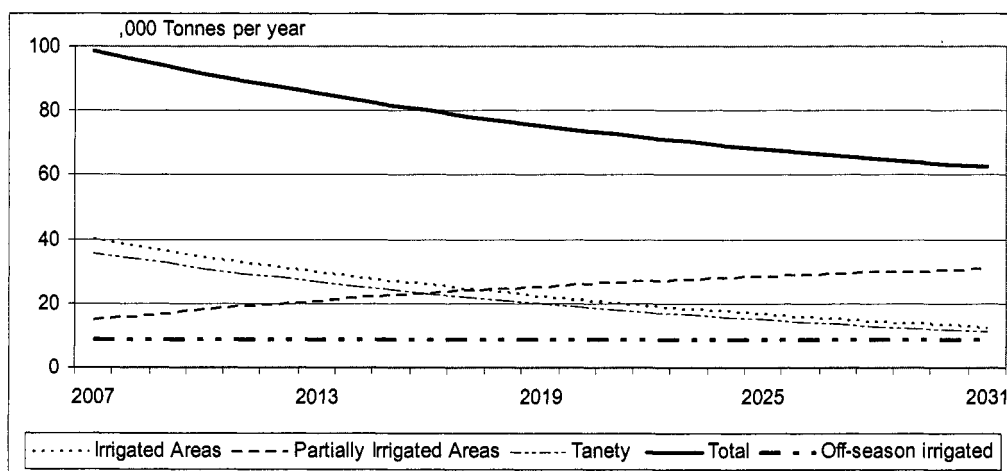
26. In the absence of the project, paddy productivity in partially-irrigated areas is likely to decline as well as the productivity of uplands, the former because of declining water control on well-irrigated upstream areas and the latter because of soil erosion and the related loss of nutrients. Off-season irrigated productivity and areas are likely to remain the same.

27. The analysis undertaken in: *The impact of public spending on perimeters productivity, 1985-2004* shows that, during the last twenty years, when any irrigation scheme does not receive investment in hardware and does not face any external shock, it on average loses around 5 percent of its irrigated area (cropping intensity) per year. The analysis also shows that this loss of 5 percent of irrigated area per year is quite homogeneous all over the country over the studied period. Therefore, if there is no investment in the irrigation systems, 5 percent of well-irrigated areas of these schemes will be transformed each year into partially-irrigated areas and will therefore show a productivity loss of around 1 ton per hectare per year. As far as tanety are concerned, in Madagascar, other analyses show that soil erosion is important and results in a productivity loss that can be estimated roughly at 5 percent per year.

28. The first analysis shows also that around 50 percent of the 123,500 hectares of irrigation systems studied were found to be sensitive to cyclonic floods during the last twenty years. The capital cost of these floods was US\$23 million for an area of 65,000 hectares, or US\$350 per hectare for the whole period and US\$17.5 per hectare per year. The amount was thus not used to directly improve productivity but to ensure that these 65,000 hectares would continue to be irrigated. As a result, they would have a much lower productivity than current levels¹⁷.

29. With all of this information about the irrigated areas and the diminution of uplands productivity without investment in the irrigation and watershed management project, the progression of production in the counterfactual situation can be reconstructed for the project's period itself as well as for the next 21 years so that the analysis would cover a total of 25 years (2007-2031). The evolution is shown below in figure 3.

Figure 3: “No Investment” Model of the Irrigation Systems and Tanety’s Production Evolution



¹⁷ By hypothesis, it is possible that, without any work, the downstream part of the watershed would have become non-irrigated and that the productivity loss would have been another 1 ton per hectare of partially-irrigated area after a cyclone.

30. Without the irrigation and watershed management project, the paddy production of the irrigated areas that would have been concerned by the project would decrease from around 54,000 tons per year at the beginning of the period to 43,000 tons by the end of the period (without taking into account the impact of cyclonic damages on productivity), or a loss of 21 percent. At the same time, the tanety production would decrease from 35,000 tons to 11,000 tons, or a loss of 69 percent. The loss in paddy production alone is equivalent to the milled rice consumption of 12,000 households for an entire year.

- *Origins and Order of Magnitude of Economic Benefits Associated with the Project*

31. The approach to estimating the economic benefits of the irrigation and watershed management project is mostly traditional. Most of the investment aims to provide the software and hardware infrastructure necessary to generate increased agricultural development, enabling the four watersheds to support greater productivity both in irrigated areas (well, bad and off-season) and in lowlands (tanety) around irrigation systems.

32. Thus, the economic benefits of the project are based on projected agricultural production increases in the four watersheds, compared with agricultural production in the situation without the project. This additional agricultural production will come from additional paddy from well- and partially-irrigated areas, potatoes and tomatoes that are cultivated off-season in irrigated areas, and from uplands where crops such as cassava and maize are cultivated.

33. Paddy productivity will increase in well-irrigated areas as a result of investment in irrigation infrastructure (software and hardware). The productivity increase will be mainly driven by cropping intensity improvement, and marginally by paddy yield improvement. Measured for a 20-year period and an area of 100,000 hectares (see section 2 of this analysis), the productivity gain was around 0.9 ton per hectare. With this project, one can expect an additional 1 ton per hectare (therefore an average productivity of 4 tons per hectare in the areas concerned by the project; see table 3) one year after investment in irrigation infrastructure because the project will focus on the rehabilitation of the upstream parts of the irrigation systems.

34. In partially-irrigated areas, paddy productivity will increase as a result of the introduction of agricultural technologies adapted to low water control situations (mainly using the rice variety called Sebota) combined with extension services and better access to credit. As a result, paddy yield will increase significantly without improving water management in these areas. Current experiments in the Lac Alaotra watershed show very promising results. With this project, the expected gain will be 1 ton per hectare one year after the introduction of the technology, meaning an average of 3 tons per hectare compared to 2 tons per hectare (see table 3).

35. Off-season, the area cultivated will increase by a factor of more than 4, from 1,075 hectares up to 4,700 hectares, and productivity will reach 10 tons by the end of the project in Andapa and Alaotra, and will reach 15 tons per hectare in Itasy.

36. Concerning the tanety surrounding the irrigation systems, the increased productivity of the other crops will come from better soil management, which will reduce nutrient depletion. The introduction of agro-ecological techniques will likely improve the average productivity of crops that are grown around the systems concerned by the project by 50 percent by the end of the project, meaning an average gain of 2 tons per hectare.

37. Additional benefits will come from the reduction of erosion in tanety, where agro-ecological techniques will be introduced. Soil erosion and their translation into scheme

siltation vary greatly from one region to another; therefore, the magnitude of the benefit will only be estimated through order of magnitude. As a hypothesis, soil erosion will be reduced by 5 tons per hectare 3 years after techniques have been introduced, which means that 0.45 tons of sediment will not have to be removed from the irrigated areas, at US\$2.50 per ton, or around US\$1 per hectare.

38. Additional benefits will come from soil erosion control and natural resource management (pasture and forests) in the upper parts of the watershed concerned by the project. This may help, in the medium term, to mitigate cyclone damage to irrigation infrastructure. For the last 20 years, the capital costs have been estimated at US\$17.50 per hectare of irrigation schemes. By hypothesis, with this project, one can expect to reduce capital cost in the irrigation schemes that are concerned by the project by an amount of US\$5 per hectare the first year after project completion, increasing by an additional US\$1 each year.

39. Consequently, the major categories of incremental economic benefit from the project will be (i) additional paddy production coming from improvement in cropping intensity in well-irrigated areas and in yield linked to introduction of new varieties in partially-irrigated areas, (ii) other additional crop production coming from a reduction in nutrient depletion, and (iii) lower O&M costs coming from a reduction in siltation and in cyclone damages.

Table 18: Categories and order of magnitude of expected incremental benefits

Category	Location	Origin	Increment
Paddy Productivity	well-irrigated schemes	Mainly cropping intensity	1 ton/ha/year after rehabilitation
Paddy productivity	partially-irrigated schemes	yield	1 ton/ha/year after introduction
Off-season irrigated	Well-irrigated schemes	Area and yield	5 tons per hectare after 3 years
Other Crops productivity	tanety	yield	2 tons/ha/year after 3 years
O&M reduction	all irrigated areas	Avoided tanety erosion	\$1/ha/year starting after 3 years after technology introduction
Avoided infrastructure damages repair	all areas	Avoided cyclone damages	avoided \$5 per hectare after 7 years

40. If there is a substantial production increase due to the project, there might be some foreign exchange gains related to a decrease in rice imports. However, it is very unlikely, as the areas that are targeted represent 3.5 percent of the national paddy production.

41. There might also be some positive externalities, such as reduced deforestation associated with improved paddy productivity in the irrigation systems or improved agricultural productivity in the upper watershed, but they will not be quantified (too difficult for results that are too meager).

D. Economic Costs

42. The watershed project's economic costs are composed of: (i) the full base costs of the public investment¹⁸ without taxes¹⁹ (from COSTAB – see Annex 5 and project files for more details) in agricultural development (component 1), (ii) the full cost of investment in irrigation development without taxes (component 2); (iii) the full base costs of investment in the watershed development without taxes (component 3); (iv) the full base-costs of project management without taxes (component 4); (v) physical contingencies that represent real costs and, unlike price contingencies, are included in project economic costs²⁰, and (vi) incremental recurrent costs.

43. Adverse environmental effects may represent major economic costs. As mentioned in Annex 10 of this PAD, the project has been classified as Category A. Negative externalities associated with irrigation infrastructure investments are believed to be fixed because they consist of rehabilitation of civil works. However, as stated in Annex 10, the success of the project in the watersheds that are concerned by the project might present a major environmental risk. Poor migrants from other parts of Madagascar might flock to the watersheds to demand their share of increased agricultural productivity, the expected outcome of this project, and therefore amplify soil degradation and deforestation. The costs of the project's environmental and social prevention needed to address this migration have been integrated into the various project components, as stated in Annex 10. Moreover, from a country perspective, this pressure might be assimilated by a transfer from the departing watersheds to the watersheds that are going to be targeted by the project and therefore being neutral. Therefore, these prevention costs will be used as a proxy for the negative social and environmental externalities.

44. Incremental recurrent costs are recurrent costs specifically generated by the project at completion. In this project, incremental recurrent costs are: (i) additional maintenance costs associated with investment in public infrastructure to support marketing chains in subcomponent 12, support to private investment; (ii) additional maintenance costs associated with irrigation infrastructure rehabilitation in subcomponent 22(b), rehabilitation of irrigation infrastructure; (iii) additional maintenance costs associated with erosion control (mainly retention structure and hedge works) in subcomponent 32(a), strategic erosion control; and additional natural resource management costs associated with pasture management and reforestation in subcomponent 32(b), reestablishment of vegetation cover.

45. In all four situations, the incremental recurrent costs have been estimated, by hypothesis, at 5 percent of the total cost of investment for 4 years without taxes. In table 4 below, they appear as a 21-year sum, in the last column.

46. The economic costs of project objective achievement are summarized for the four watersheds in table 4 below, which also shows the contribution of each of the major cost categories to the calculated aggregate present value of the project economic cost. The detailed calculations for each of the 4 watersheds are presented in Appendix 9.1. The calculations assume a real discount rate of 10 percent, a total life of public investment of 25 years, and use of foreign currency (US\$) at the border price level.

¹⁸ The part of investment in agricultural development (around 4.5 million, counted in the project's total costs) that is supported by the private sector is taken into account in that component's economic analysis. Benefits will indeed stay in the country.

¹⁹ Taxes as well as subsidies are transfer payments, not economic costs. When looking at the project from a society's viewpoint, a tax for the project entity is an income for the government. In this case, however, taxes will be paid by the project and will be considered then as benefits for the government.

²⁰ Physical contingencies represent an amount of US\$1.55 million, or 4 percent of the total investment cost of the project.

Table 19: Project investment and recurrent costs (US\$millions), all watersheds

Type of investment	PV (\$Thousands)	2007	2008	2009	2010	2011-2031
Commercial Agricultural Development	\$8,910	1,604	2,679	3,181	3,707	1,123
Irrigation systems	\$14,142	1,415	3,228	6,397	2,656	12,684
Watershed Development	\$4,072	855	959	1,402	1,365	1,838
Project Management	\$3,482	1,843	791	801	808	0
Physical contingencies	\$1,374	292	432	711	317	0
Total	\$31,979	6,009	8,088	12,492	8,852	15,644
Recurrent Costs	\$4,401	0	0	0	0	15644

47. In total, the present value of the irrigation and watershed management project's economic costs will be US\$32 million of which US\$27.6 million represent investment costs and US\$4.4 million represent recurrent costs. The bulk of the cost resides in commercial agricultural development and irrigation systems investments, which account for 72 percent of the project economic cost's present value. Investments in watershed management will represent only 13 percent of the project economic cost's present value, while costs of project management and physical contingencies will represent 15 percent.

48. Alaotra and Marovay will represent respectively 32 and 25 percent, while Andapa and Itasy each represent 21 percent of the total economic cost of the project (see table 5 below). The difference lies in component 2. This component's economic cost will be 2 times more important for Alaotra than for Itasy. In Alaotra, the high cost is explained by the importance of the civil works involved in the rehabilitation of the dam.

Table 20: Economic Costs per Watershed

Type of Costs, PV (\$thousand)	Marovay	Itasy	Andapa	Alaotra	Total
Commercial Agricultural Development	2,308	2,312	2,312	2,312	9,245
Irrigation Systems	3,390	2,815	2,138	5,799	14,142
Watershed Development	1,171	1,018	980	903	4,072
Project Management	836	882	882	882	3,482
Physical contingencies	323	313	250	488	1,374
Total	8,027	7,340	6,563	10,385	31,979
Recurrent Costs	1,119	703	692	1,887	4,401

49. Recurrent costs will be a significant part of the project economic cost's present value: 14 percent, representing a yearly flow of US\$0.75 million, immediately after project completion. The bulk of the recurrent costs will be generated by the incremental maintenance of the rehabilitated irrigation infrastructures (81 percent), followed by the incremental maintenance of erosion works and management of forest and pasture (12 percent).

50. The Lac Alaotra and Marovay watersheds will account for 68 percent of the recurrent cost of the project. The discussion about who will finance the recurrent costs and how is crucial given what has been learned with past irrigation projects, and will therefore focus on these two watersheds and will take place in the financial analysis section of this annex.

E. Economic Benefits

51. As stated in section 3, the incremental benefits of investment in the irrigation and watershed management project are likely to be threefold: (i) additional paddy production coming from improvement of cropping intensity in well-irrigated areas and improvement in

yields linked to the introduction of new varieties in partially-irrigated areas; (ii) additional production of other crops coming from the development of off-season irrigation production and from a reduction in nutrient depletion on tanety; and (iii) lower O&M costs coming from a reduction in siltation and in cyclone damages.

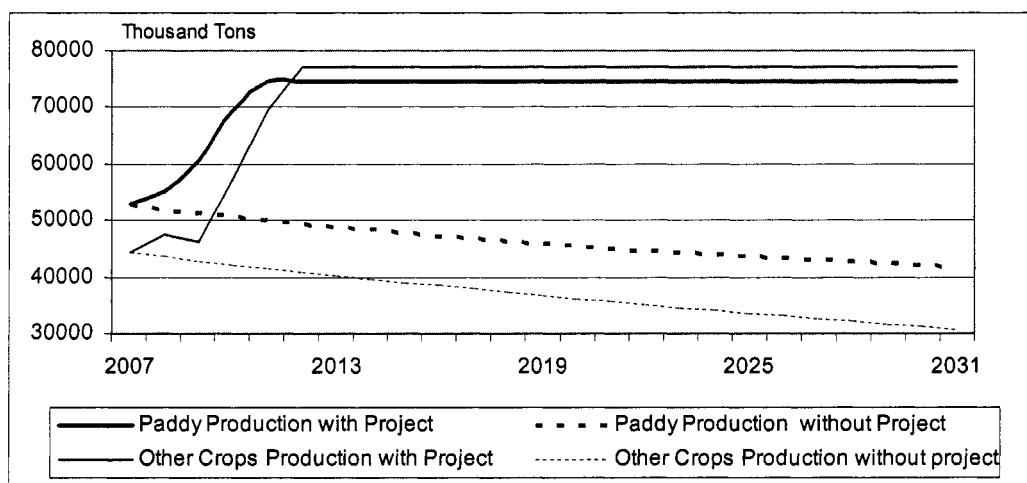
52. For each of these three categories, the amount of economic benefits that will be brought by the project depends of the unit rent or cost reduction associated with each category of benefits and their importance, as well as their pace of appearance in conjunction with project investment.

- *Incremental Agricultural Production*

53. Agricultural rent associated with additional crop production is the difference between the producer price and the cost of production under the new conditions. For paddy, the unit rents are taken at \$82 per ton in well-irrigated areas and at US\$81 per ton in partially-irrigated areas, with a paddy producer price at 20 cents (US\$) per kg. For the other crops, the unit rent is a combination of agricultural rent associated with cassava, tomatoes, beans and rainfed rice; it is taken at US\$70 per ton in irrigated areas and US\$71 per tons in tanety, reflecting the proportion of crops that are going to be grown with the project in each of the four watersheds.

54. The pace of production growth is given by the pace of investment during the project. For example, the pace of paddy production growth in well-irrigated areas is given by the distribution of investment of component 2 in each watershed: The production increase is the proportion of irrigation systems that have their infrastructure rehabilitated times the productivity increase that is associated with infrastructure rehabilitation (+1 ton per hectare).

Figure 4: Paddy Production With and Without Project



55. Under the conservative assumption that there will not be any productivity gain in paddy production in well- and partially-irrigated areas and in other crop production on tanety after project completion, the irrigated areas that are concerned by the project will produce 25,000 additional tons of paddy per year at project completion, 50 percent more than the current situation. In the tanety and off-season irrigated areas that are affected by the project, 27,000 additional tons of other crops will be produced, 60 percent more than the current situation.

56. The cumulated difference of production in the situation with the project compared to the situation without the project is 105,000 tons during the 4 years of project implementation, 55,000 tons of which are paddy, the equivalent of the annual consumption of 355,000 people or around 65,000 households.

- *Reduction in O&M costs associated with reduced siltation and avoided cyclone damages*

57. The hypotheses regarding the benefits linked to reduced erosion and reduced flood in irrigation systems are very conservative. The first benefits appear proportionally to tanety areas that benefit from the introduction of agro-ecology techniques and stay stable over time. The second, as mentioned earlier, appear beginning in year 8. The first benefit is US\$12.5 per hectare of tanety cultivated with agro-ecology techniques, one year after their introduction, being stable over time. The second is US\$5 per hectare for irrigation systems after 7 years, then growing at US\$1 per year to reflect the growing vegetation in the upper watershed and their better ability to absorb water and avoid floods in the downstream part of the watersheds.

Table 21: Composition of Gross Benefits, All Watersheds (2006 US\$thousands)

Gross Benefits	(US\$thousands, PV)	Percentage
Paddy production in well-irrigated areas	\$15,977	39%
Paddy production in partially-irrigated areas	\$3,973	10%
Off-season irrigated production	\$10,061	24%
Production of other crops on uplands	\$9,712	23%
Reduction of siltation in irrigated perimeters	\$653	2%
Avoided cyclone damages in irrigated systems	\$1,013	2%
Total	\$41,388	100%

58. The main economic benefits of the irrigation and watershed management project will come from the paddy production growth in both well- and partially-irrigated areas: This will represent 49 percent of the total benefit, under the conservative hypothesis that productivity won't increase under the influence of the project after project completion. The introduction of agro-ecology techniques on tanety and in irrigated areas to grow off-season crops will constitute 47 percent of the benefit of the project, bringing the total from additional agricultural production to 96 percent of the benefit of the project. The benefits associated with O&M reduction will represent the remaining 4 percent of the project's benefit.

59. Benefits might also be regrouped more or less by component: the increase in paddy production and off-season cropping in well-irrigated areas coming mainly from water management, and therefore component 2 (63 percent); the increase in paddy production in partially-irrigated areas as well as the growth of the production of other crops on tanety and the related reduced siltation in irrigation systems from agriculture services, and therefore component 1 (35 percent); and then the reduction of cyclone damages coming from watershed management (2 percent).

F. Results of the Cost-Benefit Analysis

60. Because of the weakness of the available data, the cost-benefit estimates presented below are necessarily imprecise and should be considered only in terms of order of magnitude, especially for recurrent costs, but also for benefits derived from agricultural production on tanety along with reduced cyclones damages. For the latter, the estimates are really conservative given the absence of data.

61. Using conservative estimates for the unit rent, the pace, and the quantity of benefits, as table 3 shows, the investment is likely to increase the welfare of the country by about US\$9.5 million, corresponding to an economic rate of return (ERR) of 14 percent, and is, therefore, justified from this point of view.

Table 22: Summary of Costs and Benefits, Present Values as of 2006 (\$ thousand)

Type of Benefit (\$ Thousand/year)	PV	2007	2008	2009	2010	2011-2031
Paddy in well-irrigated areas	15,977	0	273	693	1,374	56,715
Paddy in partially-irrigated areas	3,973	0	0	90	262	13,498
Off-season irrigated crops	10,061	0	0	229	663	34,183
Crops on tanety	9,712	0	0	205	548	35,855
Siltation reduction	653	0	13	39	65	2,021
Avoided cyclone damages	1,013	0	0	0	0	5,293
Project Cost (investment and recurrent)	31,979	6,009	8,088	12,492	8,852	15,644
Net benefits (ERR=14%)	9,409	-6,009	-7,802	-11,235	-5,940	131,920

62. At watershed level, these calculations show differences among watersheds (see table 8 below and detailed tables in appendix 9.1 at the end of this annex). Itasy shows greater ERR than the project as a whole (20 percent), while Marovay and Andapa show rates of return of 13 percent, respectively, and Lac Alaotra an 8 percent which is lower than the ERR for the project as a whole.

63. In the example of Marovay, the relatively low ERR is attributed to investment in agricultural development that concerns a relatively small area of off-season irrigation compared to the other watersheds (as shown in table 8 by the small PV of the third benefit) and by a relatively important investment in the irrigation development. Therefore, this watershed yields relatively less benefits than the other watersheds.

64. In the example of Lac Alaotra, the low ERR is explained by the relative importance of investment in irrigation infrastructure compared to the irrigated area that is concerned by the investment. It is also the result of conservative hypotheses regarding the improvement of paddy productivity.

Table 23: Comparison of costs and benefits between the four watersheds

Watershed Benefits/Costs (PV, Thousand \$)	Marovay	Itasy	Andapa	Lac Alaotra
Paddy Production in Well-irrigated Areas	\$3,968	\$2,391	\$2,235	\$7,382
Paddy Production in Partially-irrigated Areas	\$1,207	\$1,810	\$754	\$201
Off-season irrigated crops	\$428	\$6,422	\$2,676	\$535
Other Crops Production on Tanety	\$3,546	\$2,828	\$2,246	\$499
Siltation Reduction in Irrigation systems	\$170	\$204	\$127	\$153
Avoided Cyclone Damages in Irrigation systems	\$282	\$263	\$170	\$298
Project Cost (investment and recurrent)	\$8,027	\$7,340	\$6,563	\$10,385
Net Present Value (ERR)	1,574 (13%)	6,578 (20%)	1,645 (13%)	-1,4317 (8%)

65. The variables that influence the flow of project benefits the most are likely to be (i) the evolution of the paddy producer price, (ii) the efficiency of the WUAs in maintaining the rehabilitated canals, especially in Lac Alaotra, and (iii) the likelihood of cyclone damages combined with the existence or non-existence of a disaster-risk financing mechanism that will immediately repair cyclone damages.

66. The benefits have been calculated with a paddy producer price at 21 cents per kg. During most of the last twenty years, the producer price stayed relatively constant at 10 cents per kg. During the last two years, however, the producer price increased drastically, to more than 20 cents, inducing changes in farmer behavior that have started to regain interest in rice production. There is a risk that the price will shrink again. If the producer price falls below 17 cents per kg next year (compared to 20 cents per kg now) and stays at this level, the project will not be profitable.

67. The inability of WUAs to maintain the irrigation infrastructure was one of the reasons why irrigation projects were not able to maintain productivity gains long after irrigation infrastructure was rehabilitated: WUAs were losing on average 5 percent of the irrigated area of systems every year after the investment was made. As far as cyclone damages are concerned, the relatively important physical contingencies should be sufficient during project implementation to repair cyclone damages to infrastructure. After the project, repairs will depend on the FERHA or any disaster risk financing that could be set up during project implementation.

68. If WUAs do not maintain productivity on well-irrigated areas for more than 7 years after the project, or if a cyclone hits Marovay's 6,000 hectares of well-irrigated perimeters after four years of project implementation without being repaired, the project's NPV is zero.

69. The bottom line of this analysis is that, except from the evolution of the producer price, which is clearly outside the project's scope and can vary, the future flow of project benefits will be conditioned by the sustainability of investment in irrigation and, to a lesser extent, by the sustainability of investment in agro-ecology techniques in the lower parts of the watersheds and in natural resource management and erosion control in the upper parts of the watersheds.

70. The project's outcome will greatly depend on the sustainable financing mechanisms that will be put in place to increase the recovery rate of the O&M fee, to cope with cyclone damages and, to some extent, to pay the lower and upper watershed farmers for the environmental services they will provide if they maintain natural resources, and control erosion.

G. Financial Analysis/Fiscal Impact

71. The main winners in the irrigation and watershed management investment will be the local rural populations (around 90,000 households mostly living under the absolute poverty line) of the four watersheds (Marovay, Itasy, Andapa and Lac Alaotra), especially farmers producing paddy with good water control. Net benefits for farmers will be around US\$22.6 million (the sum of the four benefits accruing from additional agricultural production, less what is given to communes and to traders), or 51 percent of the present value of the project's benefits. The other net gainers of the project are the traders in agricultural products that will receive US\$11.8 million, or 26 percent of the present value of the project's benefits.

72. Under the conservative hypothesis that there will not be any additional fiscal revenues generated from the project other than the US\$8.5 million in taxes generated by the project investment plus the taxes along the value chain between paddy producers and consumers, the government is the main loser in this simple analysis because it does invest the bulk of the \$28 million of the project cost (part of which is supported by the beneficiaries) and receive a fiscal compensation of only \$8.5 million, or 19 percent of the total benefits, in return for its investment (11 percent for communes through additional production, and 8 percent to the central government through taxes associated with the project's investment).

73. WUAs will gain US\$1.7 million from the reduced costs of siltation and from some prevention of cyclone damages, but will also bear most of the project recurrent costs. An additional US\$4.4 million of recurrent costs will come both from irrigation rehabilitation maintenance and natural resource management in the upper watershed. Therefore, they will lose US\$2.7 million from the project. This cost, which will happen mostly after project completion, will represent a flow of around US\$0.75 million a year, or an additional US\$33 per hectare of well- and partially-irrigated areas where the project will intervene. Therefore, in order for the project to be sustainable, there will be the need to transfer US\$33 per hectare from irrigated agriculture farmers to WUAs so that the WUAs can pay for the additional maintenance cost. Given that the farmer will gain around US\$50 per additional ton of paddy and around US\$35 per additional ton of other crops produced, this option sounds feasible.

74. The existing low rates of O&M recovery and the relative failure of past projects to improve it mean that this project should work on institutional arrangement, involving, for example, the communes, and putting in place enforcement mechanisms to make sure that this transfer will happen. Taxes at the commune level are one possibility.

75. Cyclone damages on irrigation infrastructures are another type of recurrent cost that needs to be financed by project for sustainability reasons. Part of the project's benefit will be a certain amount of cyclone damage prevention through better management of the upstream part of the four watersheds; this is especially true for Marovay and Andapa. However, the improvements won't be enough to prevent major damages from particularly violent cyclones that might occur randomly during the next twenty years. Therefore, part of the farmers' net benefits should be transferred to finance insurance mechanisms at the WUA level (for transferable infrastructure) and to fund the FERHA (for non-transferable infrastructure).

H. Conclusions

76. In sum, the analysis shows that the expected incremental economic rents, based on several assumptions about the counterfactual pace of irrigation infrastructure degradation, soil erosion, and cyclonic damages, on the one hand, and the additional agricultural production, on the other hand, are robust enough to justify the proposed investments by the Malagasy government, even if the numbers themselves are not very high. However, assumptions on additional agricultural production are conservative, as well as the incremental benefit associated with them. Moreover, some benefits of new production, such as rent, which will be generated along the value chains between producers and consumers, have not been taken into account in this analysis.

77. The main beneficiaries will be the about 500,000 people that will see their income grow through gains in agricultural productivity. However, in order to make these gains sustainable, the project will have to put in place transfer mechanisms from these farmers (particularly those who work in the irrigation systems) to WUAs and to the FERHA in order to fund infrastructure maintenance and to insure them against cyclone damages. In addition to this first transfer, it is also possible to envisage payment for environmental services from WUAs to farmers to help prevent soil erosion in the lower and upper parts of the watersheds.

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Annex 9.1: Project Economic Costs, Economic Benefits and NPV per Watershed

Table 24: Marovoaya Watershed, Project Economic Costs (US\$ thousands)

Type of investment	PV (\$million)	2007	2008	2009	2010	2011-2031
Agricultural Development	2,308	398	762	808	922	241
Irrigated Perimeters	3,390	431	765	1,395	634	2,697
Watershed Development	1,171	254	264	399	391	473
Project Management	836	461	198	200	151	0
Physical contingencies	323	79	102	154	74	0
Total	8,027	1,623	2,091	2,956	2,171	3,410
Recurrent Costs	1,119	0	0	0	0	3,410

Table 25: Itasy watershed, Project Economic Costs (US\$ thousands)

Type of investment	PV (\$million)	2007	2008	2009	2010	2011-2031
Agricultural Development	2,312	402	760	806	928	281
Irrigated Perimeters	2,815	359	697	1,357	584	1,758
Watershed Development	1,018	214	238	352	341	459
Project Management	882	461	198	200	219	0
Physical contingencies	313	72	98	156	72	0
Total	7,340	1,508	1,991	2,871	2,144	2,498
Recurrent Costs	703	0	0	0	0	2,498

Table 26: Andapa watershed, Project Economic Costs (US\$ thousands)

Type of investment	PV (\$million)	2007	2008	2009	2010	2011-2031
Agricultural Development	2,312	402	760	806	928	281
Irrigated Perimeters	2,138	274	534	906	398	1,758
Watershed Development	980	214	238	337	319	420
Project Management	882	461	198	200	219	0
Physical contingencies	250	68	83	110	54	0
Total	6,563	1,418	1,813	2,360	1,919	2,459
Recurrent Costs	692	0	0	0	0	2,459

Table 27: Alaotra Watershed, Project Economic Costs (US\$ thousands)

Type of investment	PV (\$million)	2007	2008	2009	2010	2011-2031
Agricultural Development	2,312	402	760	806	928	281
Irrigated Perimeters	5,799	350	1,232	2,740	1,040	6,021
Watershed Development	903	174	219	313	314	407
Project Management	882	461	198	200	219	0
Physical contingencies	488	73	149	291	117	0
Total	10,385	1,460	2,558	4,350	2,618	6,709
Recurrent Costs	1,887	0	0	0	0	6,709

Table 28: Marovay, Summary of costs and benefits, NPV as of 2006 (US\$ thousands)

Type of Benefit (\$ Thousand/ year)	PV	2007	2008	2009	2010	2011-2031
Paddy in well-irrigated areas	3,968	0	77	183	348	13,914
Paddy in partially-irrigated areas	1,207	0	0	27	80	4,101
Off-season irrigation	428	0	0	10	28	1,455
Other Crops on tanety	3,546	0	0	77	208	12,988
Siltation reduction	170	0	3	10	17	525
Avoided cyclone damages	282	0	0	0	0	1,475
Project Cost (investment and recurrent)	8,027	1,623	2,091	2,956	2,171	3,978
Net benefits (ERR=13%)	1,574	-1,623	-2,011	-2,649	-1,491	30,479

Table 29: Itasy, Summary of costs and benefits, NPV as of 2006 (US\$ thousands)

Type of Benefit (\$ Thousand/year)	PV	2007	2008	2009	2010	2011-2031
Paddy in well-irrigated areas	2,391	0	44	106	205	8,480
Paddy in partially-irrigated areas	1,810	0	0	41	119	6,151
Off-season irrigation	6,422	0	0	146	423	21,819
Other Crops on tanety	2,828	0	0	62	166	10,350
Siltation reduction	204	0	4	12	20	630
Avoided cyclone damages	263	0	0	0	0	1,375
Project Cost (investment and recurrent)	7,340	1,508	1,991	2,871	2,144	2,498
Net benefits (ERR=20%)	6,578	-1,508	-1,943	-2,504	-1,211	46,307

Table 30: Andapa, Summary of costs and benefits, NPV as of 2006 (US\$ thousands)

Type of Benefit (\$ Thousand/year)	PV	2007	2008	2009	2010	2011-2031
Paddy in well-irrigated areas	2,235	0	43	106	200	7,784
Paddy in partially-irrigated areas	1,257	0	0	29	83	4,272
Off-season irrigation	2,676	0	0	61	176	9,091
Other Crops on tanety	2,246	0	0	49	131	8,249
Siltation reduction	127	0	3	8	13	394
Avoided cyclone damages	216	0	0	0	0	1,130
Project Cost (investment and recurrent)	6,563	1,418	1,813	2,360	1,919	2,459
Net benefits (ERR=13%)	2,194	-1,418	-1,768	-2,108	-1,316	28,460

Table 31: Alaotra, Summary of costs and benefits, NPV as of 2006 (US\$ thousands)

Type of Benefit (\$ Thousand/year)	PV	2007	2008	2009	2010	2011-2031
Paddy in well-irrigated areas	7,382	0	110	297	622	595
Paddy in partially-irrigated areas	201	0	0	5	13	1,583
Off-season irrigation	535	0	0	12	35	2,106
Other Crops on tanety	499	0	0	9	18	405
Siltation reduction	153	0	3	9	15	1,555
Avoided cyclone damages	298	0	0	0	0	5,750
Project Cost (investment and recurrent)	10,385	1,460	2,558	4,350	2,618	24,488
Net benefits (ERR=8%)	-1,317	-1,460	-2,445	-4,018	-1,914	595

Annex 10: Safeguard Policies Issues

Madagascar: Irrigation and Watershed Management Project

Environmental Assessment Category and Safeguard Policies triggered

1. The Madagascar Irrigation and Watershed Management Project has been classified as a "Category A" operation under the World Bank environmental screening procedures specified in OP 4.01. The package of safeguard documents prepared for the project comprises three primary reports: (i) the Regional Environmental and Social Assessment (RESA) containing an Environment and Social Management Plan (ESMP); (ii) the Pest and Pesticide Management Plan (PPMP), and; (iii) the Resettlement Policy Framework (RPF). The RESA, PPMP and RPF address the World Bank Safeguard Policies that are triggered by the project. The proposed activities for management and mitigation of the Project impacts are in compliance with the following World Bank Safeguard Policies: Environmental Assessment Policy OP/BP 4.01, Natural Habitat Policy OP/BP 4.04, Forests Policy OP/BP 4.36, Involuntary Resettlement OP/BP 4.12, and Pest Management OP/BP 4.09.

Analysis of alternatives

2. Land degradation in Madagascar has been extensive and dramatic. It has led to a significant reduction in agricultural productivity, exacerbation of rampant natural erosion by human caused erosion and widespread poverty of the rural population. The no-project alternative will lead to a deterioration of the existing situation, expansion of the area of low agricultural productivity leading to the destruction of globally important biodiversity resources (e.g. Marojejy National Park, the South Anjanaharibe Special Reserve, and the Makira Conservation Site all located in the upper watersheds around the Andapa irrigation scheme; the Ankarafantsika National Park located in the upper Maravoay watershed; and the Lac Alaotra Ramsar site) and will lead over time to abandonment of many rural areas.

3. The present project addresses in an integrated manner the land degradation in four major irrigation schemes and their associated watersheds and reduces the pressure on globally important biodiversity resources. The present project design has as objective to increase agricultural production in an environmentally and socially sustainable manner, stop the expansion of the agricultural area in the project sites through intensification and to reduce rural poverty, which is expected to lead to a reduced rural to urban migration.

Environmental and Social Impacts

4. The environmental and social impacts of the project are mostly positive. Environmental and social management measures are almost fully integrated into the design of the various project components. The promotion of agro-ecological production techniques are expected to increase agricultural productivity and increase farmer's incomes, and to stabilize or reduce erosion and land degradation, and over-time reduce sediment loading in the irrigation schemes. It is also expected that agricultural intensification in the watersheds will lead to reduced pressure on the high biodiversity sites in the upper and lower watersheds.

5. A major environmental risk will be the success of the project in the watersheds. Poor migrants from other parts of Madagascar might flock to the watersheds to demand their share of increased agricultural production. This might increase the land pressure to former

unsustainable levels and exacerbate human induced erosion and it might also increase deforestation in the globally important biodiversity sites in the upper watersheds and increase the clearance of reed marshes for rice production in the Lac Alaotra Ramsar site. Transfer of the management of these sub-watersheds to local farmer organizations will need to provide a social fencing system to prevent the entry of migrants from elsewhere.

6. Intensification of agricultural production normally goes hand in hand with increased use of chemical fertilizers and pesticides. To manage the health and environmental impacts of increased pesticide use, the borrower has prepared a Pest and Pesticide Management Plan (PPMP). This PPMP envisages strengthening the capacity of the Plant Protection Service on the Regional level (DRDRs) to increase the oversight and control of pesticide use and improve awareness among farmers and pesticide distributors. The PPMP also envisages strengthening the development and implementation of Integrated Pest Management (IPM) practices. Agro-ecological practices require more inputs: herbicides and fertilizers. The question is can farmers afford this? These agro-ecological practices reduce the risks for farmers during droughts. This makes the farmers less vulnerable to climate variability.

Environmental and Social Management Plan (ESMP)

7. Environmental and social management measures and their costs have been integrated into the various project components. An overview of these environmental and social management measures is presented in the table below.

Contractor EMP

8. The contractors who will be awarded the contracts for the rehabilitation of the irrigation schemes need to prepare their own Environmental Management Plans (Contractor EMPs). These EMPs need to specify how the contractors will handle occupational health and safety issues, in compliance with IFC Occupational Health and Safety Guidelines, during construction and how hydrocarbons (waste oils), solid and liquid wastes will be handled, where their workers will be housed, training and means to prevent HIV/Aids infections of their workers and local communities. The contractors should have a license to establish and operate the quarries and after use should rehabilitate these quarries to acceptable international standards. The establishment, operation and rehabilitation of the quarries should be negotiated with the local communities.

Agro-industries

9. The project will promote the use of agro-industries, such as rice mills and related processes, biodiesel production from Jatropha seeds, oil palm and groundnuts industries (crushing, oil refining, soap and meal production), cashew nut processing, fruit juice and pulp processing plants (citrus, mangoes and litchis). These agro-industries are essential for economic growth, but also could be very polluting. They therefore need to comply with applicable Madagascar pollution control standards or with applicable World Bank Group pollution guidelines as described in the Pollution and Prevention and Abatement Handbook (PPAH) and the IFC's Environmental, Health and Safety Guidelines. These guidelines are: Food and Beverage Processing Guidelines, Fruit and Vegetable Processing Guidelines, General Environmental Guidelines and Vegetable Oil Processing Guidelines. The standards which are the most stringent, would apply.

Table 32: Environmental and Social Management Plan

<u>Potential Environmental and Social Impacts</u>	<u>Proposed Mitigation Measures</u>	<u>Responsible Agencies</u>	<u>Cost Estimate US\$</u>
Risk that project is badly implemented with as a consequence that the environmental situation will remain the same or get worse	Establish a monitoring and evaluation committee and system; Clear definition of roles and responsibilities of actors	NPCU, DRDR	Cost to be integrated in project management
Presently poor organization and management of Watersheds	Preparation of Watershed Master Plan with clear responsibilities and actions to improve watershed and irrigation management and land use zoning	DRDR, WUAs, Federation of WUAs, Farmer's Organizations, Communes, Districts, Communication and Consultation Platforms (CCPs)	Cost to be estimated by project management
Water shortages and water conflicts	Negotiations through WUAs and Communication and Consultation Platforms (CCPs); Adoption of less water consuming varieties; Change in agricultural practices; Develop other water resources: such as groundwater by using small pumps (a water permit will be needed for this)	DRDR, WUAs, CCPs, Communes, GSDM-CIRAD	Cost to be estimated by component
Risk of increased water abstraction	Development of water resources management plan on sub-watershed level for wet and dry season; Establishment of wet and dry season water rights	DRDR, WUAs, Federation of WUAs, Farmer's Organizations, Communes, Districts, CCPs	Cost of study: US\$150,000
River bank erosion, infrastructure degradation, significant river dynamics	Establishment of FERHA, river training, Agro-ecological practices: permanent vegetation cover	NPCU, DRDR, WUAs, CCPs, GSDM	Cost to be estimated by components

<u>Potential Environmental and Social Impacts</u>	<u>Proposed Mitigation Measures</u>	<u>Responsible Agencies</u>	<u>Cost Estimate US\$</u>
Risk of no-improvement or increased land degradation in case agro-ecological and agro-forestry techniques are badly implemented or maintained; Continued use or increase of bush fires	Improve design and implementation of agro-ecological and agro-forestry practices and strengthen capacity of farmers to use them and maintain them correctly; Control of bush fires condition to obtain a Subsidy	DRDR, CCPs, Farmers and Farmer's Organizations, NGOs, GSDM-CIRAD	Cost to be estimated by component
Increased pressure on cattle watering points and user conflicts	Develop a water resources management plan on sub-watershed level (see above); Create more water points for cattle and evaluate environmental impacts	DRDR, WUAs, Federation of WUAs, Farmer's Organizations, Communes, Districts, CCPs, Farmers	US\$150,000
Influx of migrants creating an increased pressure on the remaining globally important biodiversity sites	Transfer of management of communal land to farmer's groups (e.g. GELOSE) to close the natural resource to outsiders	ANGAP, DRDR, NGOs, CCPs	Cost included in component
Risk of soil and water pollution and impacts on human and animal health by herbicides, pesticides and fertilizers in case application practices are inadequate (herbicides for direct seeding) and through bacteriological contamination	Pests and Pesticides Management Plan; Training of farmers in pesticide use; Prohibition of certain dangerous products; Development and implementation of IPM practices; Training of farmers in composting techniques / biological control practices; Awareness creation with regard to health impacts defecation/urination in water bodies	DRDR, Plant Protection Service, Veterinary Service, ASC, WUAs, CCPs, Regional Health Services, Ministry of Environment	US\$500,000
Impact of malaria and intestinal / urinary bilharzia and diarrhea on productivity of farmers	Monitoring of prevalence rates every other year; Awareness creation; Mass treatment of groups at risk: e.g. school children, pregnant women; Provision of safe drinking water supply,	DRDR, WUAs, CCPs, Health Centers, Regional Health Services; Rural Water Supply and Sanitation Services, NGOs	US\$500,000

<u>Potential Environmental and Social Impacts</u>	<u>Proposed Mitigation Measures</u>	<u>Responsible Agencies</u>	<u>Cost Estimate US\$</u>
	washing facilities and latrines; Provision of impregnated mosquito bed nets; Environmental Management measures to Reduce breeding sites		
Impacts of civil works and sub-projects on protected species and on protected areas and other environmental and social impacts	Environmental Management Plan Contractor Environmental Assessment study to identify impacts; Conserve wetlands (Cyperaceae) and forest areas (Uapaca bojeri); Prepare Resettlement Action Plan if needed to compensate affected people	DRDR, Ministry of Environment, ONE, ANGAP, WUAs, CCPs Environmental NGOs	Cost of 6 studies US\$120,000
Risk of expansion of invasive species: small invading bushes, Typha spec. and other Invasive species, having an impact on Production	Evaluation of risks; Monitoring program	DRDR, NPCU, Ministry of Environment	Cost to be estimated by component
Increase in cattle grazing areas and increased erosion risks	Definition of grazing areas through the Watershed Master Plan and through the Zoning plan of watersheds	DRDR CCPs, ASC	Cost integrated in component
Increased risk of erosion with mechanization	Promote mechanization only on flat lands; Establishment of norms and training; On steep slope zero tillage practices	ASC, CCPs	Cost integrated in component
Risk of degradation of vegetation cover in the context of agricultural intensification	Establish protected zones through the Watershed Master Plan and through the Zoning plan of watersheds	DRDR, CCPs, Environmental NGOs	Cost integrated in component
Increased deforestation as a consequence of increased demand for land and for use as fuel	Definition of zones for reforestation in Watershed Master Plan and Zoning Plan and reforestation activities Transfer management to communities	DRDR, WUAs, Federation of WUAs, CCPs, Farmer's Organizations, Communes, Districts, Farmers	Cost integrated in component
Impact on Natural Habitat through the creation	Environmental Assessment of proposed	ONE, ANGAP,	Cost of 4 studies

<u>Potential Environmental and Social Impacts</u>	<u>Proposed Mitigation Measures</u>	<u>Responsible Agencies</u>	<u>Cost Estimate US\$</u>
of new road access	roads: Analysis of alternative routes	Environmental NGOs	US\$80,000
Risk of exclusion of vulnerable groups with regard to access to and the division of water and land	Development of a water and land resources management plans on the level of a sub-watershed and irrigation schemes; Conflict management mechanism: CCPs	DRDR, WUAs, CCPs, Federation of WUAs, Farmer's Organizations, Communes, Districts,	Costs to be integrated in component
Conflict risks with regard to access and use of financial resources	Conflict management mechanism: CCPs	DRDR	Cost to be integrated in component
Economic impacts on household as a consequence of the loss of land, loss of assets, or loss of access to natural resources (e.g. check dams, mini dams, anti-erosion structures, markets or other infrastructure)	Preparation and implementation of a Resettlement Action Plan (RAP); Compensation through full replacement Cost: Screening by Technical Secretariat Matching Grant Mechanism	Control by GoM; DRDR; Technical Secretariat Matching Grant Mechanism	Cost financed by GoM
Influx of migrants because of new economic opportunities with as a consequence increased land tenure conflicts and urban sprawl	Development Watershed Master Plan, land use zoning plans, and local land tenure plan; Transfer management of watersheds to Communities	DRDR, WUAs, CCPs, ASC,	Cost to be integrated in component
Impacts of Agro-industries	Environmental Assessment and adherence to Madagascar or World Bank Group Environmental, Health and Safety Guidelines and Guidelines in Pollution Prevention and Abatement Handbook	ONE; Ministry of Environment	Cost to be born by project sponsor

Resettlement Issues

10. In order to protect the rights of vulnerable groups and farmers who might lose land or income or lose access to other natural resources a Resettlement Policy Framework (RPF) has been prepared by the borrower. If certain project activities require resettlement, land acquisition or certain people lose income or access to natural resources a Resettlement Action Plan (RAP) will be prepared in compliance with the World Bank Policy on Involuntary Resettlement (OP 4.12) to ensure that these people don't become poorer than they were before the project intervened. A Resettlement Action Plan (RAP) or a small Environmental Assessment (EA) might be needed in case check dams, anti-erosion structures, mini dams, markets or other infrastructure will be built. The Technical Secretariat of the Matching Grant Mechanism, to be financed under the project, will screen sub-projects and identify if a RAP and/or a small EA study as part of the feasibility will be needed.

11. The project will look carefully into the position of share croppers in the irrigation schemes, where share cropping is more common and in the watersheds where share cropping is less common. The project will take care that the capacity of the private operators is not strengthened at the expense of the smallholders (marginalization of vulnerable groups).

ESMP Implementation and Monitoring

12. The implementation and the monitoring of the ESMP will need to be carried out per region. One of the Technical Assistance attached to the DRDR and to be financed under the project, needs to be qualified in environmental and social management issues and will be responsible for the implementation and monitoring of the implementation of the ESMP.

Communication Plan

13. Communication between the different project components is fundamental for an adequate implementation of the project and to build synergies. One of the Technical Assistance in the DRDR financed by the project needs to be responsible for the communication between the components, but also for communication with other regions and the national level and the media.

Annex 11: Project Preparation and Supervision
Madagascar: Irrigation and Watershed Management Project

	Planned	Actual
PCN review	June 28, 2004	June 28, 2004
Initial PID to PIC	October 22, 2004	October 22, 2004
Initial ISDS to PIC	August 25, 2004	August 25, 2004
Appraisal	June 6, 2006	June 6, 2006
Negotiations	September 13, 2006	September 14, 2006
Board/RVP approval	November 14, 2006	
Planned date of effectiveness	February 28, 2007	
Planned date of mid-term review	May 2009	
Planned closing date	August 31, 2011	

Key institutions and persons responsible for preparation of the Project:

Ministry of Agriculture, Livestock and Fisheries, Bruno Rakotomahefa, Rado Rakotondralambo

Bank staff and consultants who worked on the Project included:

Name	Title	Unit
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Rajaobelison		
Marie-Claudine Fundi	Language Program Assistant	AFTAR
Cynthia Faure	Team Assistant	AFMMG

Bank funds expended to date on Project preparation:

1. Bank resources: US\$1,250,567
2. Trust funds: 0
3. Total: US\$1,250,567

Estimated Approval and Supervision costs:

1. Remaining costs to approval: US\$18.000
2. Estimated annual supervision cost: US\$35.000

Annex 12: Documents in the Project File
Madagascar: Irrigation and Watershed Management Project

Bank Reports

- Aide-memoire - April 2004 mission
- Aide-memoire - July 2004 mission
- Aide-memoire - June 2005 mission
- Aide-memoire - March 2005 mission
- Aide-memoire - November 2005 mission
- Aide-memoire – June 2006 mission
- Aide-memoire – November 2007 mission
- Aide-memoire – February 2008 mission
- Aide-memoire – June 2008 mission

Preparation Studies - Working Papers

- Irrigation and Watershed Management Policy Letter
- Document de travail sur la Sécurisation Foncière, version provisoire, December 2005
- Renforcement des capacités des parties prenantes dans le projet Bassins Versants Périmètres Irrigués, July 2005
- Etude des Filières, December 2005
- Land Titles, Investment, and Agricultural Productivity in Madagascar, October 2005
- Land and Property Rights Review, Draft
- Synthesis of the Preparatory Studies on Intervention Sites – Lac Aloatra
- Synthesis of the Preparatory Studies by Intervention Site – Andapa site
- Synthesis of the Preparatory Studies by Intervention Site - Itasy site
- Synthesis of the Preparatory Study by Intervention Site - Marovoay Site
- Analyse Institutionnelle et Juridique du Programme Bassins Versants Périmètres Irrigués, October 2005
- Cadre de Politique de Réinstallation – March 2006
- Evaluation Environnementale et Sociale Régionale – February 2006
- Plan de Gestion des Pestes et des Pesticides – March 2006
- Irrigation and Watershed Development Policy on July 12, 2006

Annex 13: Incremental Cost Analysis
Madagascar: Irrigation and Watershed Management Project

1. This section discusses the incremental costs eligible for GEF funding for the “Irrigation and Watershed Management Project”, defined as the difference between the GEF alternative scenario and the IDA baseline. For each of the four components of the project, the section will:

- Identify the baseline,
- Describe what would happen if the baseline is implemented,
- Indicate the costs of the baseline,
- Describe the alternative scenario,
- Describe the expected benefits under the alternative scenario,
- Report the cost of the alternative and the incremental cost.

2. The relationship between the activities of each component and the environmental benefits generated is synthesized in the below tables. The Incremental Cost Matrix is reported at the end of the section. As most of the decisions, practices and technologies that the beneficiaries of the project will adopt cannot yet be determined, the analysis favors a qualitative approach.

Component 1: Development of Commercial Agriculture

3. The objective for this component is to lay the foundations for improved market access and sustainable intensification and diversification of irrigated and rainfed agricultural systems in the project’s watersheds.

(a) Baseline:

4. This component will promote agricultural development in lowland and upland areas. The aim will be to improve (a) access to market and marketing systems in order to reduce costs and increase farm gate prices, (b) added value through diversification into higher added value products and agro-processing, (c) capacities of farmers (male and female), farmers groups and professional organizations, and (d) agricultural productivity through better access to extension, improved technology, inputs, and credit. The component includes two sub components: one involving activities that largely depend on public/collective initiative; the other one depending essentially on demand from stakeholders.

(b) Expected results under the baseline scenario:

5. The results expected under this component will be the increase in number of producer organizations, unions, and federations of active producers, the increase in the volume of credit allocated to agricultural investments, an increase in the proportion of products marketed by local households, an increase in the quantity of seed and fertilizer sold to producers, and an increase in the number of contracts signed and executed between producers and the private sector, and an increase in the volume of products marketed in this way.

(c) Baseline cost: 9,960,000 USD (7,450,000 USD IDA and 2,510,000 USD Beneficiaries)

(d) GEF alternative scenario (OP15):

6. GEF funding will contribute to assuring that intensification and diversification of agricultural production will be based on sustainable land management principles. These are based on improved organic matter management through improved rotations, cover crops, improved fallows, agroforestry technologies and diversified and locally adapted varieties and crops. This will lead to improved above-ground and below-ground carbon sequestration, increase of agrobiodiversity within the cropping systems and reduce pressure on natural habitats, and thus secure important global environmental benefits. The GEF grant will be used for capacity strengthening of technicians, and farmers in agroecological techniques and SLM principles, and by supporting adaptive research and dissemination of improved technologies. For more details on activities see Annex 4. Special attention will be paid to upland systems that are based on slash-and-burn agriculture (tavy), which causes deforestation, threats to biodiversity, carbon loss and soil fertility loss. The improvement will need more time and effort than the systems downstream area that lend themselves better to agricultural intensification.

7. These activities will contribute to achieving the SIP Result 1: SLM applications on the ground are scaled up in country-defined priority agro-ecological zones, and Result 3: Commercial and advisory services for SLM are strengthened and readily available to land users. The activities are rooted in the SIP components 1 and 3 (more specifically the subcomponents 1.2, 1.3, 1.4, 1.5 and 3.2). In addition, IDA funds will specifically support the SIP sub-component 3.3 and 3.4 and 3.5).

(e) Expected local and global benefits under the GEF alternative (OP15)

<u>Activities</u>	<u>Direct impact and local environmental benefits</u>	<u>Global environmental benefits</u>
Technical assistance, training of technicians and farmers, and on-farm research of agro-ecological production techniques	<ul style="list-style-type: none"> • Improved local capacity (technicians, extension agents and farmers) in implementing agro-ecological farming techniques • Improved agricultural production based on <ul style="list-style-type: none"> ○ Technical improvement through agro-ecological and agroforestry techniques. ○ Improved soil fertility management and nutrient recycling through organic matter management, ○ Improved protection of soils through soil coverage and erosion control with vegetative measures ○ Increased agro-biodiversity through increase of locally adapted varieties, crop diversification (annual and perennial) ○ Improved crop rotation and 	<ul style="list-style-type: none"> • Increase in carbon sequestration, soil carbon, above-ground carbon (through cover cropping, relay cropping, agroforestry) • Increase in agrobiodiversity (through diversification) and below-ground biodiversity (through improved soil organic matter status) • Reduced environmental degradation and pressure on natural habitats for agricultural fields (avoided deforestation) due to satisfactory and increased agricultural production on existing fields; resulting in <ul style="list-style-type: none"> ○ Reduced carbon emissions ○ Protection of ecosystems

	<p>integrated pest management</p> <ul style="list-style-type: none"> • Diversification of agricultural production system • Improved ecological resilience of agricultural system, with improved resistance to climate variability • Available alternative farming techniques to slash-and-burn practices, through agro-ecological techniques, improved nutrient cycling and targeted inputs, agroforestry and horticulture • Reduction of pressure on forests, and protects biodiversity 	<p>and possible restoration of ecosystem integrity</p>
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GEF Alternative costs: 12,460,000 USD (IDA, Beneficiaries and GEF)

(f) Incremental cost: 2,500,000 USD GEF. The incremental cost will finance activities such as the technical assistance to the project, training of technicians and farmers, and adaptation of new techniques through on-farm research.

Component 2: Irrigation Development

8. The objective of this component is to lay the foundations for improved management, maintenance and sustainability of irrigation services provision in four large-scale irrigation schemes through rehabilitation of irrigation infrastructure, capacity strengthening of stakeholders and clarification of roles and responsibilities, and establishment of an appropriate incentive framework.

(a) Baseline:

9. The component will contribute to improving the quality of irrigation services and operation and maintenance (O&M) of the irrigation schemes. The project will finance the rehabilitation of irrigation and appurtenant infrastructure, including technical design studies, implementation of works and their supervision. In addition, the project will fund the participatory preparation of a Scheme Development Plan (SDP) and an annual Performance Contract (PC), negotiated between (F) WUAS, the Communes and Regions, and MAEP. The project will also provide support to stakeholders during implementation of the PC, including capacity strengthening, development of a strategy for mobilization of water users, annual evaluation of performance indicators and user satisfaction surveys.

(b) Expected results under the baseline scenario:

10. Expected results concern the rehabilitation of the irrigation infrastructure and improved capacity of water users association to operate and maintain the infrastructure. This will lead to increased surface of fields under irrigation for the rainy and dry season. In addition, a number of second phase Performance Contracts will be signed, and the O&M costs will be recovered as percentage of overall O&M needs at 100 percent at the end of the project.

(c) **Baseline cost:** 17,470,000 USD (15,670,000 USD IDA and 1,800,000 USD Beneficiaries)

(d) GEF alternative scenario (OP15):

11. IDA funding will be used for irrigation rehabilitation (infrastructure work) and capacity strengthening of water users associations for the management of the irrigation schemes. There will be no additional GEF funding to this component. Aspects of interests to GEF, such as environmental management in relation to agricultural improvement is covered under component 1 and the environmental management at the watershed or landscape level with global environmental impacts are found under component 3.

(e) Expected local and global benefits under the GEF alternative (OP15)

12. Environmental benefits with significant impact on irrigation schemes will be created through GEF incremental funding under component 1, 3 and 4. Reduced sedimentation of irrigation infrastructure (which reduced O&M costs) will be a result from overall GEF increment.

GEF Alternative costs: 17,470,000 USD (15,670,000 USD IDA and 1,800,000 USD Beneficiaries)

(f) Incremental cost: 0 USD GEF

Component 3: Watershed Development

13. The objective of the component is to lay the foundations for sustainable management of watersheds including irrigated and rainfed agriculture, the conservation of the natural heritage, and improved productivity of the natural resources.

(a) Baseline:

14. This component will finance the a) planning and capacity building for the sustainable management of watershed and b) investments for watershed protection.

15. The project will finance technical assistance to prepare a *watershed management plan* for each of the four project zones. It will include (i) zoning and description of land use systems, ecosystems, settlements, institutions and partners, (ii) strategic analysis of erosion problems for downstream sedimentation and natural resources degradation; (iii) a specific and detailed analysis to define project activities, and (iv) establishing a baseline for monitoring and evaluation of component results. The project will also support land tenure security through the installation of intercommunal 'Land Tenure Window, that assist in recording non-titled property rights, regularize land rights and secure secondary land rights.

16. The project will also *invest in watershed protection*. During the planning phase, 'hot spots' of erosion will be identified that have a significant impact on downstream irrigation infrastructure. Through participatory negotiations, local strategies will be developed for controlling erosion, halting gullies and reducing the quantity of sediments transported to downstream irrigation areas. The project will finance the setup of such *strategic anti-erosion*

works favoring biological methods and techniques. Possible mechanical works will be built, favoring local manpower.

(b) Expected results under the baseline scenario:

17. Successful implementation of this component will result in four Watershed Management Plans that will provide a diagnosis of natural resources and identify pathways of interventions for sustainable land and water management at the watershed level. In addition, hot-spot erosion will be identified, strategies developed for their control and erosion control works implemented preferably with the participation of concerned stakeholders. Through improved land tenure security, farmers will be more willing to invest into and protect their land from degradation.

(c) Baseline cost: 1,910,000 USD (1,820,000 USD IDA and 90,000 USD Beneficiaries)

(d) GEF alternative scenario (OP15):

18. GEF contribution will complement IDA funding by addressing longer-term environmental and land degradation issues at the watershed level, that negatively impact lowland and upland agricultural production systems as well as global environmental goods and services. Most important degrading land uses are pasture management based on periodic burning, extensive agricultural practices based on slashing (primary forest or fallow vegetation) and burning to produce food crops such as upland rice. Additional destructive forest extraction practices concern logging, charcoal production, firewood collection, over-extraction of NTFP, and hunting of lemurs and small mammals. These activities contribute to natural resource degradation, depletion of vegetation cover and biodiversity. (See also Annex 16 for land degradation analysis). Often, these extensive land use practices do not even allow farmers to achieve satisfactory incomes.

19. GEF funding will be used to address these land degradation issues through a participatory and integrated approach, and will provide technical assistance to develop land use alternatives that should encourage local population to take responsibility and engage in the sustainable management of their natural resources. The approach will include under sub-component 3.1: a) establishing a *participatory zoning* with the stakeholders at the sub-watershed level to determine optimal land use according to topography, current land use and land rights, diagnosis of soil fertility and soil production potential, location and characteristics of water sources and streams, and the origin and pathways of erosion; b) environmental awareness raising campaigns; c) training and capacity strengthening in alternative sustainable NRM practices according to stakeholders' needs; d) provision of support to environmental and other communication and negotiation platforms that influence natural resources management at the watershed level, and e) the establishment of an Integrated Knowledge and Information System for SLM. In addition, under sub-component 3.2., matching grants will be funded targeting interventions to increase vegetation cover on communal land and to a lesser extent on private land. This includes improved pasture management without fire, afforestation and reforestation, natural regeneration of native vegetation, and provision to protect natural habitats (forests, wetlands, lakes) and associated biodiversity.

20. These activities will contribute to achieving SIP result 1: SLM applications on the ground are scaled up in country-defined priority agro-ecological zones; result 2: effective and

inclusive dialogue and advocacy on SLM strategic priorities, enabling conditions, and delivery mechanisms established and ongoing; and result 3: commercial and advisory services for SLM are strengthened and readily available to land users. These activities are also rooted in the SIP Component 1: Supporting on-the-ground activities for scaling up (1.2, 1.4, 1.5), Component 2: Creating a conducive enabling environment for SLM and more specifically the sub-components (2.4, 2.6, 2.8.), and Component 3: Strengthening commercial and advisory services for SLM (3.1, 3.2).

Expected local and global benefits under the GEF alternative (OP15)

<u>Activities</u>	<u>Direct impact and local environmental benefits</u>	<u>Global environmental benefits</u>
1.2. Participatory watershed management plans	<ul style="list-style-type: none"> • Increased awareness of stakeholders on environmental issues at the watershed level and improved capacity of stakeholders for environmentally sensitive decision-making and planning that impacts environmental conditions at the watershed level positively, and at the same time provides local stakeholders with environmental services that improve land productivity and living conditions 	<ul style="list-style-type: none"> • Improved capacity of stakeholders to integrate the creation of global environmental benefits into their activities. This will result in the design and implementation of participatory watershed management plans where the creation of global environmental benefits at the watershed level will be consciously integrated (such as soil (carbon) protection, biodiversity conservation, water resources protection, increased carbons sequestration through SLM etc)
1.3. Support to environmental communication platforms	<ul style="list-style-type: none"> • Information exchange between stakeholders • Allows for harmonizing of approaches and creating synergies between donors and projects especially between environmental projects and development projects in areas with high biodiversity and natural habitats • Allows for coordinated interventions within the project area on 	<ul style="list-style-type: none"> • Improved information exchanges favors coordination and collaboration and allows for strategic decision making by various stakeholders to address global environmental issues, such as biodiversity conservation, habitat protection, and carbon sequestration

	environmental and rural development activities	
1.4. Awareness campaigns, training and capacity strengthening on environmental issues	<ul style="list-style-type: none"> • Improved knowledge and capacity in regards to land degradation impacts as well as existing alternatives by <ul style="list-style-type: none"> ○ Rural population ○ Local and regional staff (technical services, NGOs) • Newly created or reinforced NRM farmers groups or associations with improved capacity 	<ul style="list-style-type: none"> • Increased knowledge and awareness on global environmental issues at the local and regional level will allow for strategic decision making by various stakeholders (rural development, environment, private sector etc) to engage in SLM activities that create global environmental benefits (carbon sequestration, increase in agro-biodiversity)
1.5. Support to of community based land tenure security	<ul style="list-style-type: none"> • Secured community land rights will provide incentives for improved NRM practices • Established management plans provide communities guidelines on volumes for extraction, management practices, and inform on long-term productivity of resources • Stimulates environmental stewardship of communities • Will improve productivity and profitability of NR use. 	<ul style="list-style-type: none"> • Maintain ecosystem's integrity through sustainable extraction and harvest of products from natural habitats • Protect biodiversity by maintaining habitats • Avoided deforestation due to community land rights (avoided carbon loss)
1.6 <i>Integrated Knowledge and Information System for SLM.</i>	<ul style="list-style-type: none"> • Collection and diffusion of international and national knowledge will allow for an informed decision making on options of technologies to be tested and provides information and suggestions for adapting technologies to local conditions. • This will facilitate SLM 	<ul style="list-style-type: none"> • Increased availability of knowledge and awareness on SLM issues and options at the local, regional, national and international level will allow for up-scaling of SLM initiatives and stimulate innovations at the local level, which will contribute to the creation of global

	scaling up at the landscape level, and beyond at the national level	environmental benefits
2.2. Revegetation of communal land (pastures, reforestation, protection of natural forests)	<ul style="list-style-type: none"> • Planted fodder grasses and improved pasture management will contribute to <ul style="list-style-type: none"> ○ improved cattle nutrition and productivity, which enables improved crop and livestock integration ○ regeneration of vegetation ○ reduced sheet erosion • Reforestation will contribute to improved <ul style="list-style-type: none"> ○ Fuelwood and construction wood supply ○ Erosion control • Regeneration of natural vegetation will <ul style="list-style-type: none"> ○ provide multiple products for extraction (fuelwood, medicinal plants, wild fruits and other food plants) ○ reintroduce native biodiversity within production landscape • Protection of natural habitats will contribute to <ul style="list-style-type: none"> ○ Biodiversity conservation of many endemic and endangered species ○ Protect ecosystem regulatory services and functions 	<ul style="list-style-type: none"> • Improved above and below ground carbon sequestration (fodder grasses, reforestation) • Avoided carbon loss (pasture fires, deforestation, reduced forest product extraction) • Regeneration of native vegetation increases above and below ground biodiversity • Reduced pressure on primary forests, leads to improved protection of <ul style="list-style-type: none"> ○ biodiversity ○ important environmental regulatory services such as water source protection (Marovoay)

(e) **GEF Alternative costs:** 4,330,000 USD (IDA, Beneficiaries and GEF)

(f) **Incremental cost:** 2,420,000 USD GEF

Incremental costs will be occurring for awareness campaigns and information exchange, technical assistance to communities and local NGO and technical staff, participatory processes for innovation development, testing and adapting proposed technologies on

farm, dissemination of improved technologies, participatory monitoring of development processes.

Component 4: Project Management

21. The objective of this component is to manage and use resources in accordance with the project's objectives and procedures, and to put in place a policy framework that is favorable to upscaling of the project at the national level.

22. **Baseline:** Management of the project, including (a) provision of *technical assistance, training, office equipment and vehicles, minor office upgrading works, auditing and evaluation studies, and incremental operating costs* in support of project management, (b) overall project planning, quality oversight, procurement, financial management, and monitoring of project activities; and (c) outsourcing of quality oversight through independent financial and technical audits, and evaluation of project activities. Project management will encompass all four target watersheds as well as national level coordination. Project monitoring will be undertaken at internal and external levels. This component will also include support to national policies.

(a) **Expected scenario under the baseline scenario:** Successful implementation of this component will result in efficient implementation arrangements, effective oversight, monitoring and evaluation of project activities.

(b) **Baseline cost:** 3,450,000 USD (IDA)

(c) **GEF alternative scenario (OP15)**

23. GEF funding will contribute to the project monitoring and evaluation system by financing the satellite images and their interpretation to monitor the global and environmental indicators in order to assess impact of project activities on land degradation, carbon sequestration, biodiversity, habitat protection, and area under SLM. GEF will also contribute to the costs of technical assistance to M&E and the project implementation team, and the final evaluation of the project. On the policy support side, GEF will co-finance with other donors the development of the Country Strategic Investment Framework for SLM.

24. The activities will contribute to achieving the SIP result 4: targeted knowledge generated and disseminated and monitoring established and strengthened at all levels. They are also rooted in the SIP component 4 and more specifically in the subcomponents 4.4. and 4.5.

Expected local and global benefits under the GEF alternative (OP15)

<u>Activities</u>	<u>Direct impact</u>	<u>Local and global environmental benefits</u>
Designing and implementing a M&E system to monitor local and global environment	<ul style="list-style-type: none"> Improved capacity of project staff and improved understanding of the underlying 	Quantification of environmental benefits <ul style="list-style-type: none"> to be included in economic analysis of

indicators, and provision of support to project implementation team	<p>causes, processes and dynamics associated with land degradation</p> <ul style="list-style-type: none"> • Improved environmental information system and environmental indicators • State-of-the-Art knowledge will be available at local level 	<p>the project</p> <ul style="list-style-type: none"> • Inform global community, policy makers, research, and development communities on project outcome.
National level multi-partner, multi-sector SLM investment framework in the BVPI program context is established and under implementation	<ul style="list-style-type: none"> • Alignment of donors and stakeholders at local, regional and national level will be possible in regards of SLM approaches and SLM interventions. 	<ul style="list-style-type: none"> • Scaling up SLM will allow achieving UNCCD NAP and NEPAD's CAADP and EAP.

(d) GEF Alternative costs: 4,430,000 USD (GEF + IDA)

(e) Incremental cost: 980,000 USD GEF Incremental costs will cover the reinforcement of the M&E system with GIS and the participatory monitoring at the local level.

Incremental Cost Matrix

25. The incremental costs are calculated as the difference between the GEF alternative scenario and the IDA baseline scenario. The results are reported in the matrix below. As most of the decisions, practices and technologies that the beneficiaries of the project will adopt cannot yet be determined, the analysis favors a qualitative approach.

Component 1	Category	Estimated Expenditures (US \$)	Local Benefit	Global Benefit
Development of Commercial Agriculture	Baseline	9,960,000	Increase in producer organizations, increased credit allocation, improved agricultural production through increased input use (fertilizer, seeds, pesticides), improved agro-processing and marketing of products	Global environmental benefits are minor, and may results from reduced pressure on forests or marshes thanks to agricultural intensification especially in areas with still high forest cover such as Andapa
	With GEF Alternative (SLM)	12,460,000	<p>Improved local capacity (technicians, extension agents and farmers) in implementing agro-ecological farming techniques</p> <p>Improved availability of a wide range of agro-ecological technologies at farm level</p> <p>Increased agricultural productivity thanks to agro-ecological and agroforestry techniques (including improved rotations)</p> <p>Improved erosion control on upland fields thanks to vegetative measures</p>	<p>Significant global environmental benefits through:</p> <p>Increase in carbon sequestration (soil carbon, above-ground carbon: cover cropping, relay cropping, agroforestry)</p> <p>Increase in agro-biodiversity and below-ground biodiversity (through improved soil organic matter status)</p> <p>Reduced environmental degradation and pressure on natural habitats for agricultural fields (deforestation) due to satisfactory and increased agricultural production on existing fields; resulting in</p> <ul style="list-style-type: none"> • Reduced carbon emissions • Protection of ecosystem and possible restoration of ecosystem integrity.
	SLM Increment	2,500,000		

Component 2	Category	Estimated Expenditures (US \$)	Local Benefit	Global Benefit
Irrigation Development	Baseline	17,470,000	Rehabilitated irrigation infrastructure and well organized and fully functional water users associations	Global environmental benefits minor as people may concentrate to cultivate lowlands and abandon degrading upland practices
	With GEF Alternative (SLM)	17,470,000	Significant environmental benefits on irrigation schemes will be created through GEF incremental funding under component 1, 3 and 4. Reduced sedimentation of irrigation infrastructure <ul style="list-style-type: none"> • Reducing O&M costs • Improving irrigation water availability. 	
SLM Increment		0		

Component 3	Category	Estimated Expenditures (US \$)	Local Benefit	Global Benefit
Watershed Development	Baseline	1,910,000	Reduced sedimentation through strategic erosion control WSM master plan improves knowledge base on resources and local development goals and needs	Some global benefits: Improved knowledge and decision making on sustainable management of natural resources and biodiversity protection Reduced land degradation (upland soil loss through erosion, lowland agricultural surface loss through sedimentation) yields in increasing carbon sequestration of productive landscape.

With GEF Alternative (SLM)	4,330,000	Improved coordination and collaboration between environmental and rural development stakeholders and/or organizations	Significant global benefits: Improved information, knowledge and decision-making on global environmental benefits through local actions.
		Improved local capacity to encounter land degradation with alternative land use	Protect globally significant ecosystems (forests, wetlands, lakes)
		Secured community land rights	Maintain ecosystems' functional integrity (e.g. protection of water sources) through habitat preservation
		Management plans for sustainable use and extraction of NR	Protect globally significant endemic biodiversity within natural habitats.
		Improved landscape productivity of communal land: pastures, reforestation plots and protection of natural habitats	Avoid deforestation, burning of pastures, fallow vegetation, over-extraction of forest products and thus avoid carbon loss
		Improved productivity in fragile upper watersheds of private agricultural land through agro-ecological techniques.	Improve carbon sequestration in soils and above-ground through agro-ecological techniques, agroforestry, reforestation and regeneration of natural vegetation
SLM Increment	2,420,000		

Component 4	Category	Estimated Expenditures (US \$)	Local Benefit	Global Benefit
Project Management	Baseline	3,450,000	M&E system to monitor baseline activities Effective project management	Limited knowledge of land degradation, and ecosystem dynamics due to limited monitoring of ecosystem and land degradation processes
	With GEF Alternative (SLM)	4,430,000	Comprehensive mechanism established for monitoring of NRM SLM and land degradation processes and trends	Significant contribution in quantifying the impact of SLM on global environmental benefits
	SLM Increment	980,000		
TOTAL	Baseline	32,790,000		
	With GEF Alternative (SLM)	38,690,000 ²¹		
	SLM Increment	5,900,000		

²¹ This total project cost does not include the two PPF credits with a total of 1,610,000 USD that have been used for project preparation and as an advance to initiate project activities before project start.

Annex 14: Technical Annex Land Degradation in Madagascar
Madagascar: Irrigation and Watershed Management Project

Land degradation in Madagascar

1. Land degradation is one of the most serious and widespread problems for the agricultural sector in Madagascar. The degradation dynamics in the uplands and lowlands are often linked and reinforcing each other. With the stagnation of yields in the irrigated lowland areas and demographic growth, farmers extend their agricultural activities on the hillsides. Upper watershed land use is often based on extensive and unsustainable management practices, the most important being lack of erosion control and lack of improved soil fertility management on agricultural plots, slash and burn agriculture or *tavy*, and the frequent burning of pastures. Land degradation is also caused by deforestation for agricultural purposes, with consequence of increased carbon emissions, biodiversity loss and declining regulatory ecological services. These practices not only contribute to the degradation and low productivity of uplands but also impact lowland agriculture significantly. Upland soil erosion and water surface run-off is causing sedimentation for downstream infrastructure, contributing to the reduction of cultivated area under irrigation, local flooding of rice paddies in the rainy season and water shortages in the dry season

2. Despite Madagascar's important assets in irrigation infrastructure, past approaches have failed to achieve great success in boosting yields and reducing poverty in rural areas, mainly as they lacked an integrated approach. Today, yields for irrigated rice still remain low (~2.1t/ha), and are even lower for non-irrigated upland rice (~1.5t/ha) and slash-and-burn upland rice (~0.8t/ha). Next to poor maintenance of infrastructure and poor water management, vulnerability towards extreme events such as cyclone damages, environmental challenges, such as erosion and land degradation are paramount. The seriousness of the land degradation problems and interconnectedness between upland and lowland land use has been acknowledged by the recently created National Irrigation and Watershed Management Program (PN/BV-PI), which is part of the PRSP. The project will be part of the National Program that aims to combat rural poverty through sustainable improvement of the living conditions and incomes of rural populations in irrigation schemes and surrounding watersheds, and through the efficient and sustainable development of natural resources.

3. The project will focus its intervention on four large-scale public irrigation schemes (out of six in total) that cover 33,000 ha (out of 81,000ha in total). The four sites (Andapa, Marovoay, Lac Itasy and Lac Alaotra - Sahamaloto) have been selected on the basis of their accessibility, availability of agricultural support services and potential for increased productivity through improved water management. The land degradation analysis in respect to these four sites was done at two levels: 1) at the general level, looking at root causes of land degradation and their consequences across the four sites, and 2) at the site level, describing the specific conditions and problems at the local level,

Land degradation analysis across the four project sites

4. Land degradation analysis across 4 sites is summarized in the following table.

Table 1: Land degradation analysis across four sites: Marovoay, Andapa, Alaotra and Lac Itasy

Consequences of LD	Root causes of LD	Measures currently taken	Additional measures required
<p>Water management problems for irrigation</p> <ul style="list-style-type: none"> • Inundation of rice fields • Lack of water 	<ul style="list-style-type: none"> • Upland degradation – erosion – sedimentation <ul style="list-style-type: none"> ○ Lack of erosion control ○ Reduced vegetation cover favors erosion and flash floods ○ Reduced infrastructure water holding capacity ○ Wasteful water mgt leads to water shortage end of season • Government absence • Non-functional WUA 	<ul style="list-style-type: none"> • Erosion control project PLAÉ (projet lutte anti-erosive) in Marovoay • NGO support to farmer organization and farmer self-organization, which is not effective enough to encounter the determining, factors at landscape level. 	<ul style="list-style-type: none"> • Support WUA for efficient irrigation scheme and water management • Rehabilitate damaged and non functional infrastructure • Promote sustainable upland management practices (erosion control, revegetation)

Consequences of LD	Root causes of LD	Measures currently taken	Additional measures required
<p>Soil fertility loss and soil erosion</p> <ul style="list-style-type: none"> • Loss of productive agricultural land • Yield decline 	<p><u>Land management</u></p> <ul style="list-style-type: none"> • Unsustainable agricultural practices: tavy, insufficient nutrient replenishment (no fertilization, short fallows) • Lack of upland erosion control • Lavakas, gully erosion, land slides reduces surface of upland and lowland fields • Sedimentation of ag. land • Lack of irrigation water • Fallow burning • Pasture burning • Deforestation 	<ul style="list-style-type: none"> • Erosion control project PLAÉ (projet lutte anti-erosive) in Marovoay • Localized NGO support for sustainable agricultural development 	<ul style="list-style-type: none"> • Strategic erosion control for gully erosion, lavaka erosion, based on vegetative measures with eventually targeted structures, need for stakeholder participation at the geographic level that influence this type of erosion • Erosion control measures on field boundaries, natural terracing through planting of vegetative barriers • Cover cropping and mulching that provide soil coverage within agricultural fields • Prevention of fire and revegetation of pasture areas with improved ground cover • Reforestation with good growth of understorey vegetation that protects soils
	<p>Support services, market linkage and infrastructure</p> <ul style="list-style-type: none"> • Lack of extension service and research support • Lack of marketing opportunities • Lack of credit institutions • Lack of land use planning • Lack of property rights (sharecroppers) impedes investments in land 	<ul style="list-style-type: none"> • NGO/donor support, private sector investments at the local level • Decentralization efforts to support local communities in the respective efforts 	<ul style="list-style-type: none"> • Improve agriculture extension and build local capacity to develop improved farming practices (including farmer to farmer extension) • Establishment of mechanisms of market information access <p>Processing of natural resources (agricultural products, forest products, fish)</p>

Consequences of LD	Root causes of LD	Measures currently taken	Additional measures required
<p>vegetation cover loss (Reduced carbon stocks)</p>	<p><u>Natural habitats</u></p> <ul style="list-style-type: none"> • Primary forests (Andapa, Marovoay, Itasy) <ul style="list-style-type: none"> ◦ Deforestation: tavy ◦ Logging ◦ Charcoal production ◦ Fire wood collection • Cutting and burning of marshes to create rice fields (Alaotra) <p><u>Production landscapes</u></p> <ul style="list-style-type: none"> • Burning of fallows degrades regenerating vegetation: loss of woody species • Burning of pastures: only most fire resistant species persist with low biomass (e.g. <i>Aristida</i> sp) • Overexploitation and accidental burning of reforestation plots 	<ul style="list-style-type: none"> • Conservation organizations (forest service, park service ANGAP) do awareness campaigns, forest patrolling, monitoring of fire (under EP3) • Conservation NGO's provide support for alternative practices, diversification of activities to reduce pressure on natural resources (WWF, WCS in Andapa, Durrell Wildlife in Alaotra) • Agricultural NGOs and donor support for sustainable agricultural production 	<p>Improve carbon sequestration through improved agricultural techniques (soil carbon), agroforestry and reforestation and avoid carbon emissions through reduced fire use for deforestation, pasture burning, fallow burning, and marshland burning.</p> <ul style="list-style-type: none"> • Promote and develop alternative land use and techniques without fire: agro-ecological techniques (cover crops, mulching plus targeted fertilization), increase soil carbon • Improve pasture management (plant fodder grasses, fodder banks), rotational grazing • Increase reforestation to take pressure of natural forests for charcoal, firewood production • Plant woody species for service wood (logs) to reduce pressure on natural forest • Encourage natural regeneration of native vegetation • Education campaigns on impacts of fire on ecosystem and landscape productivity • Train local capacity to prevent and control wild fire, community based fire control • Support population to obtain land rights to resources, and provide support to establish a management plan (GELOSE) • Participatory land use planning
<p><u>Support services</u></p> <ul style="list-style-type: none"> • Absence of extension and research: alternative agricultural techniques not available at farm level <p>Lack of land tenure security favors tragedy of commons</p>	<ul style="list-style-type: none"> • Decentralization takes up more responsibility in support to rural development • Private extension services through NGOs • Donor support (KFW) to land titling (Marovoay) 	<ul style="list-style-type: none"> • Improve agriculture extension and build local capacity to develop improved farming practices (including farmer to farmer extension) • Support land tenure security (community based and private based) • Support to develop sustainable natural resources management and extraction plans with concerned communities. 	

Consequences of LD	Root causes of LD	Measures currently taken	Additional measures required
<p>Biodiversity loss</p> <p><u>Forests</u></p> <ul style="list-style-type: none"> • Slash and burn agriculture (habitat loss) • Wood and NTFP extraction (logging, charcoal, firewood, NTFP such as orchids, tree ferns, etc.) • Hunting (lemur hunting Andapa) <p>Production landscapes outside of forests</p> <ul style="list-style-type: none"> • Fire kills off native plant species, replaced by exotic invasive species • Fire kills off woody native species (very weak regeneration capacity under frequent fires), replaced by herbaceous species • Loss of soil biodiversity from forest soil to depleted pseudo-savannah soils <p><u>Wetlands and fresh water</u></p> <ul style="list-style-type: none"> • Over extraction of fish • Marsh habitat loss through burning and drainage • Siltation of lakes (pollution, acidification) • Hunting in marshes • Invasive fish species replace native fish • Invasive aquatic plants (introduction) 	<ul style="list-style-type: none"> • Third Phase of National Environmental Action Plan (EP3), with mandate to protect biodiversity and habitats, • Durban Declaration in 2003: increase protected areas from 1.7 million ha to 6 million ha (or 10 percent of country surface) • International Wildlife Conservation NGOs are very active in Madagascar and in project zones (WWF, WCS, CI, Durrell etc), work primarily on conservation but also on peripheral rural development issues 	<ul style="list-style-type: none"> • Support and complement conservation efforts (that focus on natural habitats such as forests, marshes) by developing livelihood alternatives and more specifically agricultural alternatives for sustainable management and use of natural resources • Promote partnerships and collaboration between environmental and rural development programs in the project sites (including communication and concertation platforms) • Develop fire-less land management practices that allow ultimately for regeneration of native species (above-ground and below-ground) within the production landscape. 	

Site description and land degradation at the four sites Marovoay, Lac Itasy, Andapa and Alaotra

5. As the four sites have different climatic and geographic conditions as well as different land use histories, a short description of the four sites with the most important issues of land degradation is provided hereafter.

	No MWS	Size of WS	Rice plain (ha)	No Communes	No population
Alaotra	1 (Sahamaloto)	Total: 356 km ²	6,400 ha	8	107,900
Marovoay	13 (according to irrigation sections)	Size of communes: 5750 km ²	20,000 ha	10	175,000
Andapa	1 SubWS (Lokoho), multitude of MWS	Size of communes: 4280 km ²	12,000 ha	12	150,100
Itasy	4	Total: 1040 km ²	4,460 ha	12	227,700

	Climate	Altitude	Annual Rainfall (mm)	Rainfall days (number)	Av annual temp °C (av min-max)
Alaotra	Tropical temperate highland climate	750m	1100-1200	100-150	20 (15 – 27)
Marovoay	Sub-humid tropical climate	20 m	1540	90	28 (24.4 – 29.3)
Andapa	Hot humid tropical climate	470m	> 2000 (1800-2000 plain, 2500 hilltops)	240	(19.1 – 25.1)
Itasy	Tropical highland climate	1220m	1350 East 1700 West	--	(7.1 – 26.7) East (10.0-29.0) West

Marovoay

6. The Marovoay plain is a rice production zone of prime national importance, situated in the Boeny Region, about 80 km South-East of Mahajanga. The river Marovoay is a tributary on the right bank of River Basse Betsiboka, in the upper delta of the river. Subjected to quasi-complete submersion during the annual flooding of River Betsiboka, the development of the valley started in the early 20th Century for off-season rice production. Schemes supplied through pumping from River Betsiboka were added to the gravity systems fed by run-of-the-river and storage dams. The scheme is divided into 13 completely independent irrigation sectors, fed from a number of different sources. The entire system is facing serious O&M challenges. For a total area of about 20.000 ha, an estimated area of 12.000 ha was cultivated in 2004. Beneficiaries of all plots developed during the successive programs were mainly immigrant populations from other regions of the country. 90 percent of the people of 122,000 are immigrants. The ethnical diversity implies a weak social cohesion, which is limited to the village level. The percentage of sharecroppers is today very high. Until recently, GoM was responsible for O&M of irrigation schemes and pumps, but State funds for O&M of even 'non transferable' infrastructure are nowadays uncertain. Establishment of water users associations, unions of associations and federations has not resulted in the emergence of an adequate operational mechanism for sustainable O&M. The Performance Contract signed with the FWUA for the period 2001-2003 was not renewed and funds allocated for 2004 were reallocated.

7. The main watershed serving the Marovoay irrigation scheme is the Betsiboka watershed, one of the largest watersheds in Madagascar with an extension of 40,000km² whose hydrology is determined hundreds of kilometers upstream. During the rainy season, the irrigation scheme is submerged by the waters of the river, depositing sediments on the rice paddies. Whereas quality of these sediments used to have a fertilizing effect, the current sediment quality is reported to be coarser and less fertile. The submersion of perimeters as well as the high pumping costs requires annual rehabilitation of the irrigation systems, thus making the maintenance expensive and the overall economic profitability uncertain. The cultivation season can start once the water has receded from the plain. The main cropping season corresponds to the dry season from April to October. Water availability for irrigation is therefore critical and gets often scarce towards the end of the cultivation cycle. Sub-watersheds of the Marovoay River and its tributaries supply a major part of the irrigation system. Their sources are mainly located in the zone of the Ankarafantsika National Park, a primary forest located on the hillcrest. Finally, all around the plain, small lateral micro-watersheds with mainly intermitted flows, not contributing to the irrigation water, have major impact in terms of erosion, silting-up and destruction of irrigation infrastructure. As upland soils are very sandy, erosion and sedimentation of rice paddies and irrigation infrastructure are a widespread problem in Marovoay.

8. The main constraint for the irrigation scheme is lack of water. Silted up dams and canals have limited capacity to carry water late in the rainy season or supply water until

the end of the irrigation season. This results in inundations of rice fields after strong rains, and lack of irrigation water towards the end of the cropping season. As many of rice farmers are sharecroppers, they are hesitant to pay irrigation maintenance fees. Agricultural services are weakly developed in the region. There is only one cultivation cycle per year, which is dominated by rice. The use of fertilizer is insignificant and rice yields are overall low (1 to 1.5t/ha). Improved techniques such SRI are weakly adopted due to weak control of water and badly leveled rice fields. Often earth dams are damaged by cattle grazing in the paddy fields and often not repaired. In most cases, the upland population is not the same as the lowland rice growers, thus their interest is limited to prevent sedimentation. On the lower parts of the hillside, the PLAE project works in 10 out of 12 communes around the Marovoay plain, to install some erosion control works. The project takes a participatory approach and efforts are slowly translating in effective results.

9. Main degradation factors in the uplands are fire use on pastures, deforestation and slash-and-burn agriculture, illicit cutting of wood, and charcoal production. Most of the erosion comes from the extended pasture areas that are periodically burned. The fodder quality of these grasslands is very low and farmers burn the uplands for fresh regrowth. Through frequent burning, no woody species resist. The resisting grasses grow in tuffs and have very bad soil coverage. Thus, with each rain event sheet erosion at the large scale is happening. The Park Service ANGAP is working with surrounding communities and herders to diminish burning activities and to limit fire use to the early season fires. This has allowed to reduce fires to 300 ha in 2004 compared to 2000 and 3000 ha in the previous years. Further degradation is provoked through the deforestation and the traditional slash-and-burn agriculture or tavy. Farmers cut primary forests to cultivate upland rice. In addition, illicit wood cutting and charcoal production is threatening the primary forest. Since 2002 this forest is protected and known under 'Ankarafantsika National Park' covering 130,000 hectares. It is one of the last large forest remnants in Northwestern Madagascar of dry dense forest. Over 92 percent of the woody species are endemic. The park is rich in birds with 129 species (74 percent endemic), reptiles with 70 species (87 percent endemic), and has 22 mammal species (74 percent endemic).

Lac Itasy

10. The Itasy Region, with its Lac Itasy in the center, is situated about 100 km to the west of Antananarivo. The irrigation schemes do not have complex infrastructure and represent independent schemes: *Grappe du Lac Itasy* 1980 ha, Ifanja 1900 ha, Mangabe 270 ha, Analavory 140 ha, Ampary 90 ha, Antanimenakely 80 ha – or a total of 4460 ha. Four sub-watersheds can be distinguished associated with the irrigation schemes: grappe d'Itasy, Miarinarivo II, Ampary and Ifanja. The region offers great potential for agricultural production, given the natural fertility of volcanic, and alluvial soils and a favorable climate for agricultural diversification. Mean annual rainfall is between 1330 mm and 1575 mm. Nevertheless, part of the region harbors also the less productive ferrallitic soils that are prone to *lavaka*²² formation.

²² Lavaka, which can be translated from Malagasy as hole, is an extreme form of erosion that occurs in certain parts of Madagascar and can result in the collapse of entire hillsides

11. High soil fertility and established irrigation infrastructure, attracted immigrants. Population density is high in the region with 107 people/km² in average, reaching up to 200 people/km in the communes of Ampary and Sarobaratra Ifjana. Consequently, upland agriculture is very common and often extends over the entire hillside on the volcanic soils.

12. Rice productivity increased steadily from 2,4 t/ha in 1998 to 3,1 t/ha in 2003. This is due to improved cultural techniques such as improved weeding, SRI, improved direct seeding.

13. Theoretically two rice crops can be cultivated, the first extending from July/Aug to Nov/Dec, and the second from Dec/Jan to April/June. Yields are between 2.5 to 3 t/ha but can reach up to 6t/ha under SRI and good water management. With bad water management yields can be as low as 0.5 to 1 t/ha. Most important crops are rice, manioc, mais, sweet potato, beans and potato. Food crops make up 90 percent of the production compared to 10 percent of cash crops. Rice occupies 33 percent of the cultivated surface, mais and beans each 17 percent and potato 13 percent. Due to irregular water availability, farmers adjust their cropping cycle accordingly, thus cropping can be encountered around the entire year. Livestock production is most important and cattle is used for fieldwork, transportation, and as a monetary safety net.

14. Although most of these schemes benefited from projects implemented from 1998 to 2000 (project PPI 2), they are currently facing serious O&M problems of the irrigation and drainage systems, due to erosion of watersheds and lack of maintenance of the systems. Today, 30 - 50 percent of the schemes are no longer adequately irrigated. Given these problems, the Water User Associations (WUAs) have stopped collecting maintenance fees for several years, since a greater part of the users refused to pay. The actions of the WUAs are limited to maintenance works carried out by interested users. The problem of water resources management is common and a serious constraint for lowland production. Inundation of rice fields happens periodically during strong and heavy rainfall events. 1/3 of the schemes are under inundation risk. On the other hand, there is as problem of water shortage in the beginning of the rainy season, forcing farmers to wait for the accumulation of enough rainfall. This often delays planning which negatively influences the yields. In addition, climate variability during the cropping season with dry spells and inundations impacts yields negatively. Sedimentation of the irrigation scheme is at the origin of water management problems. In Ifanja-Anosibe, for instance, a large part of the irrigation canals are blocked with 2m of sand of a 12km of canal (Ambohimandroso-Antsira) diminishing irrigated area significantly.

15. The high population density in the zone has caused problems of gradual over-exploitation of hillsides. Agricultural production is extending in upland areas, without regards to steepness of slopes, with traditional agricultural practices and without efficient erosion control. Soil degradation is characterized by diminishing soil fertility and soil erosion resulting in declining crop yields. Upland degradation is an important issue that spreads across the entire zone of lac Itasy. The areas is very susceptible to erosion, from a soils perspective (volcanic soils are very fine and prone to erosion, ferallitic soils prone to

lavaka), deep slopes, little vegetation cover and lack of erosion control. Lavaka formation, next to gully erosion and surface soil erosion are very common. This is enhanced by frequent upland fires that lead to sparse vegetation cover. About one quarter of the landscape/WS present critical zones of degradation. Land slides and lavakas extend over 1050ha. The area under reforestation stagnates and even regresses where reforestation plots are destroyed by fire or overexploited for fuelwood use.

16. There is a small surface of remaining primary forest left in the upper watershed of Ambohimana which is a Tapia (*Uapaca bojeri*) forest. But this forest is disappearing progressively. Many of the landless farmers, cultivating lowland fields as sharecropper, don't produce sufficiently to cover the basic family needs. They look for additional fields in the uplands, as one of the options, and deforest the still available tapia forests. In addition, people collect firewood and produce charcoal from the forest. With it disappears also an economic opportunity for very lucrative wild silk production, as the wild silk moth is native to these forests.

17. The other important natural habitat is Lake Itasy. Sedimentation of lake diminishes its depth and creates floating islands. Fish productivity diminished from 25-35 t/year earlier on to 12-13 t/year today. To what extent this is due to siltation or overharvesting is not clear. Local rules for fish extraction have been established and some fisher associations were created. Their effectiveness in regulating fish population is not known.

Andapa

18. The Lokoho watershed of Andapa, is situated in the Sava Region about 100 km southwest of Sambava. A vast agricultural plain of 18.000 ha is drained by 4 rivers that merge into Lokoho River. The plain is surrounded by a concentric landscape with adjacent agricultural fields that are either upland rice fields based on slash-and-burn practices or agroforestry plots with vanilla and coffee as main crops. Above 900m altitude is the primary forest zone that is very extensive and vast. The basin is bordered in the North-East by the Marojejy National Park, in the South-West by Anjananaribe Special Natural Reserve, and in the South by the Makira Special Natural Reserve.

19. Andapa has a hot humid climate with a mean annual rainfall of over 2000mm distributed over 240 days. Mean temperature varies from 18,8C in July to 24.8C in January. This climate pattern allows for double cropping of rice.

20. From 1962 - 1997, the Andapa basin benefited from a development program funded by EDF. The project comprised an infrastructure component, which included a road connection between Andapa and Sambava, access roads within the basin, and drainage work within the basin in addition to the construction of a pumping station. An irrigation scheme of 4400 ha was established. Agricultural support services advised on double season rice cultivation, improved collection and marketing and a crop diversification program. In 1979, the State Company "Andapa Mamokatra" took over responsibility of the Andapa basin development project. The impact of the project

received an unsatisfactory rating in 1998 during the evaluation of the EDF project, particularly: (i) failure of pumping irrigation on the Ankaïbe perimeter (2100 ha); (ii) lack of maintenance of structures on all perimeters developed by the project; (iii) the weak capacities of the WUAs; and (iv) failed intensification.

21. The lowlands have a high potential for agricultural production with relatively good yields and with the possibility to having two crops per year. Out of 12,000 ha planted rice less than 2,000 are currently irrigated. The surface cultivated in the plain are estimated to be During the rainy season between 9,000 to 12,000 ha are cultivated with yields of 2 to 3.5 t/ha and in the winter season between 1,000 to 2,000 ha are cropped with yields of 1.5 to 2.5 t/ha. *Tavy* upland rice is cultivated on 2000 to 3000 ha with average yields below 1t/ha. Sedimentation seems not be as big of a problem such as in Itasy, Alaotra or Marovoay. Nevertheless, the loss of vegetation cover can provoke land slides that can create large quantities of sediments. In addition, steep riverbeds can swell very fast during big rain events and transport large amounts of sediments, which resulted in the currently silted-up irrigation structures. The plain is irrigated through small streams from small watersheds around the basin. This characteristic would support the idea to encourage and prioritize small hydrological infrastructure, which is easier to manage for the population, easier to maintain and which could have a significant impact on people's livelihoods.

22. The uplands are used through mixed agroforestry systems that contribute to stability in income through cash crops such as vanilla, coffee, clove, but also to sustainable upland management. More problematic for the environment is the *tavy* system that is based on slashing and burning either primary forest or fallow land. Deforestation is an important problem in the region, and is not efficiently enough stopped despite the creation of parks and reserves. One of the reason is that there are no efficient and for farmers feasible alternatives of upland rice cultivation available.

23. Marojejy National Park and Anjananaribe Special Natural Reserve have been supported from 1994 to 2004 by WWF with activities focusing on conservation, environmental training, and ecotourism. From 2000 to 2004 22 land rights could be transferred to local communities, allowing them to manage and extract products from the natural forests in the district of Andapa in the peripheral zone of the protected areas. The recently established Makira Special Natural Reserve, the largest reserve in Madagascar, is receiving support from WCS (Wildlife Conservation Society). WCS supports communities in the peripheral zone through agricultural advise, provides support for land rights etc. Marojejy harbors a remarkably diverse set of plants and animals, many of which are endemic to the area. This is due primarily to the wide range of habitats found on these mountain slopes. Biodiversity is extremely rich. The Marojejy National Park, for instance, with its high altitudinal range, rugged topography and varied microclimates, harbors four basic forest types: forest types: low-altitude evergreen rainforest (below 800 m), dense mountain rainforest (800–1400 m), high-altitude mountain cloud forest (1400–1800 m), and high-altitude mountain scrub (above 1800 m). The abundant forest habitats of Marojejy shelter an exceptionally rich and unique flora and fauna. 118 bird species, 11

lemur species, 149 reptiles and amphibians, 35 palms, over 275 fern species to give a few examples, many of the species being endemic to the region and endangered.

Lac Alaotra –Sahamaloto Irrigated Perimeter

24. The Lac Alaotra watershed forms a vast depression of around 1,750 km², with an average altitude of between 750 and 770 m, surrounded by eroded hills. The lake is shallow and surrounded by swampy marshes. It covers an area of about 220 - 250 km² (free water surface) and around 550 km² with surrounding marshes. The watershed serves about 80,000 ha of rice farms, of which 30,000 ha are developed. The watersheds are subject to strong population density. Deforestation, overgrazing (with bushfires) and increasing pressure from rain-fed crops have seriously degraded the fragile soils of slopes, already marked by numerous lavaka. The effects are silting-up of beds of rivers and dams, degradation of derivation and protection of facilities. The climate is a tropical temperate highland climate with a significant dry season from Mai to October. Mean annual temperature is 20C, with average maxima of 26 to 27C and a average minima of 14-15C. Mean annual rainfall is between 1100 and 1200 mm within 100-150 days.

25. The watershed supplying Sahamaloto irrigated perimeter stretches over an area of 356 km². The irrigated perimeter has a developed area of 6,400 ha, of which 80 percent is cultivated when the rainfall conditions are favorable. Average irrigated surface by household is 5.8ha, and only 13 percent of households' crop on uplands and 26 percent on baiboho. Average rice yields are estimated to be 3.5 t/ha. The area is supplied by a storage dam that was constructed in 1957. The initial storage capacity of 26 million m³ was gradually reduced to about 13-14 million m³. The scheme was fully rehabilitated in 1988-1989, including the construction of a new intake tower to increase the volume of storage water to 18 million m³. Emergency repair and rehabilitation works were initiated in 1998-1999, but some works could not be completed. The estimated sedimentation which is the major environmental threat for rice cultivation that enters yearly into the retention dam is 250,000 m³/year. Main erosion forms in the area are surface erosion, gully erosion and lavakas that come from upland areas that are frequently burned for pastures and have a sparse vegetation cover. The upper watershed is weakly populated. The zone of rice fields is located on the deltas of the lake between uplands and marshes, where also villages are located along the road, and where most of human activities is happening.

26. The entire watershed of Lac Alaotra has been designated as a RAMSAR site (722,500ha), with 19,971 ha of lake surface and 23,000 ha of marshes in 2003, formalizing the new regional and national commitment to conserving its biodiversity and maintaining the ecosystem functions through sustainable use and a regional organization representing all stakeholders has been created to coordinate wetland management. The entire lake and marshes will become a new type of protected area (IUCN Category VI) currently under development in Madagascar (*Site de Conservation*). Durrell Wildlife Conservation Trust is working in the lake region since 1986 doing research and catalyzing participatory grass-root efforts in protecting the marshes and lake resources with good success.

27. Alaotra has the largest wetlands in the country and is also a center of endemism. Three species are endemic to Alaotra, all of which are critically endangered: Alaotran gentle lemur *Hapalemur griseus alaotrensis*, Alaotra little grebe *Tachybaptus rufolavatus* and Madagascar pochard *Aythya innotata*. These two endemic bird species may already be extinct. Of the 50 water bird species recorded at the lake, a further 8 are Madagascar endemics. Six fish species are Madagascar endemics. The endemic fauna is threatened due to major environmental changes including habitat degradation, over-hunting, over-fishing, competition and predation by introduced fish species, siltation from erosion causing an acidification of the lake, pollution by human waste, fertilizers and pesticides and invasion of introduced aquatic plants.

Annex 15: APL Triggers

Madagascar: Irrigation and Watershed Management Project

1. Triggers for moving to the second phase of the APL include attainment of the following targets:
 - Watershed Master Plans (including Scheme Development Plans and Watershed Development Plans) and associated Performance Contracts executed satisfactorily;
 - an acceptable institutional mechanism for the funding of non-transferable irrigation infrastructure (FERHA) established and operational;
 - private sector investments in agriculture increased as evidenced by disbursements under the matching grant mechanism;
 - ASCs established and operational in the four project sites;
 - *guichets fonciers* established and operational in the four project sites.
2. It is agreed that achieving these triggers implies the following: *Watershed Master Plans (including Scheme Development Plans and Watershed Development Plans) and associated Performance Contracts executed satisfactorily:*
3. WMPs (including WDPs and SDPs), prepared with full stakeholder involvement, as evidenced by minutes of meetings, records, and development options that were prepared and presented to stakeholders.
4. WDP would include land use zoning plans, identification of irrigable and irrigated area, a local land tenure plan, identification and establishment of zones under collective land management and identification and establishment of zones for management transfer to communities, identification of strategic anti-erosion works, identification of possible agro-ecological technologies that require support, identification of appropriate productive investments (forestation, revegetation of land). It would also include support options to communication and negotiation platforms of stakeholders within watersheds, conditions regarding the participation of beneficiaries and the support that they will receive through the matching grant (nature of the interventions, capacity to pay). Satisfactory execution involves the implementation of the activities that the project has committed to.
5. SDPs would include a section presenting the vision of stakeholders with respect to irrigated agriculture, their objectives and the targets that they aim to achieve, constraints associated with the functioning of the irrigation scheme, as well as possible solutions, and commitments regarding operation and maintenance. Execution of the SDP involves the translation of key elements of the Plan into subsequent PCs for implementation.
6. PC prepared with full stakeholder involvement and approved by stakeholders, as evidenced by minutes of meetings and records. PCs would include sections on commitments from each of the stakeholders, including (F)WUA, Commune, Region, and MAEP. Commitments include full recovery of O&M costs, input use and yield levels, measures against defaulters and investment in rehabilitation of key infrastructure. Funds in support of the

implementation of the PC will be allocated in accordance with the level of ambition expressed in the targets, and based on the performance in previous years. Satisfactory execution would include full achievement of commitments by all stakeholders.

- *An acceptable institutional mechanism for the funding of non-transferable irrigation infrastructure (FERHA) established and operational:*

7. Identification, adoption and implementation of appropriate and sustainable financing and replenishment mechanisms, recruitment of staff, administrative and financial/accounting measures taken, and disbursements made.

- *Private sector investments in agriculture increased as evidenced by disbursements under the matching grant mechanism*

8. Preparation of a list with eligible (positive and/or negative) activities, Regional Selection Committee appointed by GTDR, external review conducted twice a year, and recruitment of a regional partner and specialized service providers. Satisfactory implementation implies full disbursement of the matching grant at the end of the project.

- *ASCs established and operational in the four project sites:*

9. Establishment of five ASC and platforms at district level, provision and rehabilitation of office space, purchase of equipment, coverage of operational expenses, recruitment of staff, and compilation of a network of regional partners at the regional level. Operational implies that there is a demand for the services provided as evidenced by the number of contracts between farmers and service providers that the ASC has facilitated.

- *Guichets fonciers established and operational in the four project sites*

10. Establishment of five “guichets fonciers” at district level, provision and rehabilitation of office space, purchase of equipment, coverage of operational expenses and recruitment of staff. Operational implies that land is being registered as evidenced by the annual progress in land registration.

11. Triggers for moving to the third phase of the APL include indicatively:

- Satisfactory management of irrigation schemes by WUAs and watersheds by sustainable land management groups with adequate support from Communes, Regions and MAEP
- Inclusion of the national Irrigation and Watershed Management Program into MAEP’s medium term expenditure framework;
- Full coverage of the costs of the National Program.
- Satisfactory project management;

Annex 16: Statement of Loans and Credits
Madagascar: Irrigation and Watershed Management Project

Project ID	FY	Purpose	Original Amount in US\$ Millions				Cancel.	Undisb.	Difference between expected and actual disbursements	
			IBRD	IDA	SF	GEF			Orig.	Frm. Rev'd
P103950	2008	MG-Governance & Inst. Dev. II TAL	0.00	40.00	0.00	0.00	0.00	39.78	0.00	0.00
P074086	2007	MG-Irrigation & Watershed Project (FY07)	0.00	30.00	0.00	0.00	0.00	25.66	2.20	0.00
P095240	2007	MG -Pwr/Wtr Sect. Recovery and Restruct.	0.00	10.00	0.00	0.00	0.00	6.81	5.37	0.00
P103606	2007	MG-Sust. Health System Dev. (FY07)	0.00	10.00	0.00	0.00	0.00	1.66	-1.16	0.00
P090615	2006	MG-MultiSec STI/HIV/AIDS Prev II (FY06)	0.00	30.00	0.00	0.00	0.00	19.90	12.09	0.00
P083351	2006	MG-Integ Growth Poles	0.00	129.80	0.00	0.00	0.00	78.19	3.99	-5.09
P082806	2004	MG-Transp Infrastr Invest Prj (FY04)	0.00	150.00	0.00	0.00	0.00	36.92	12.90	12.90
P074448	2004	MG-Gov & Inst Dev TAL (FY04)	0.00	30.00	0.00	0.00	0.00	0.67	-7.64	0.00
P074235	2004	MG-Env Prgm 3 (FY04)	0.00	40.00	0.00	0.00	0.00	13.54	8.27	0.00
P076245	2003	MG-Mineral Res Gov SIL (FY03)	0.00	32.00	0.00	0.00	0.00	7.36	-4.00	0.00
P073689	2003	MG-Rural Transp APL 2 (FY03)	0.00	80.00	0.00	0.00	0.00	29.74	15.91	16.87
P072160	2002	MG-Priv Sec Dev 2 (FY02)	0.00	23.80	0.00	0.00	0.00	4.36	-0.12	-3.95
P051922	2001	MG-Rural Dev Supt SIL (FY01)	0.00	89.05	0.00	0.00	1.23	8.67	-3.23	-3.23
P055166	2001	MG-Com Dev Fund SIL (FY01)	0.00	110.00	0.00	0.00	0.00	0.41	-81.92	-31.92
P052186	1999	MG-Microfinance (FY99)	0.00	16.40	0.00	0.00	0.00	4.14	-1.88	1.20
P001568	1998	MG-Community Nutrition II (FY98)	0.00	27.60	0.00	0.00	0.00	6.90	-14.54	0.97
Total:			0.00	848.65	0.00	0.00	1.23	284.71	- 53.76	- 12.25

MADAGASCAR
STATEMENT OF IFC's
Held and Disbursed Portfolio
In Millions of US Dollars

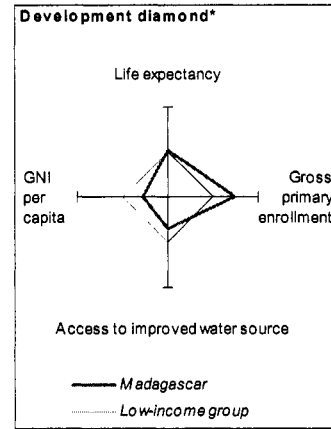
FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
1997	AEF GHM	0.46	0.00	0.00	0.00	0.46	0.00	0.00	0.00
1995	AEF Karibotel	0.19	0.00	0.00	0.00	0.19	0.00	0.00	0.00
	BFV-SocGen	6.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	BNI	0.00	2.09	0.00	0.00	0.00	2.09	0.00	0.00
2005	BNI	6.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	BOA-M	0.00	0.82	0.72	0.00	0.00	0.82	0.72	0.00
2004	BP Madagascar	0.00	3.51	0.00	0.00	0.00	0.00	0.00	0.00
	CREDIT LYONNAIS1	6.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total portfolio:		19.76	6.42	0.72	0.00	0.65	2.91	0.72	0.00

FY Approval	Company	Approvals Pending Commitment			
		Loan	Equity	Quasi	Partic.
2001	Besalampy	0.02	0.00	0.00	0.00
2006	IDA-IFC PCG	0.01	0.00	0.00	0.00
Total pending commitment:		0.03	0.00	0.00	0.00

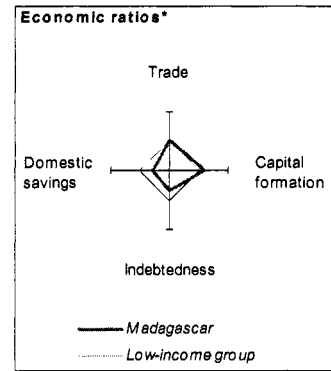
Annex 17: Country at a Glance

Madagascar: Irrigation and Watershed Management Project

POVERTY and SOCIAL	Madagascar	Sub-Saharan Africa	Low-income
2007			
Population, mid-year (millions)	19.7	800	1296
GNI per capita (Atlas method, US\$)	320	952	578
GNI (Atlas method, US\$ billions)	6.3	762	749
Average annual growth, 2001-07			
Population (%)	2.8	2.5	2.2
Labor force (%)	3.3	2.6	2.7
Most recent estimate (latest year available, 2001-07)			
Poverty (% of population below national poverty line)	..	..	..
Urban population (% of total population)	29	36	32
Life expectancy at birth (years)	59	51	57
Infant mortality (per 1000 live births)	72	94	85
Child malnutrition (% of children under 5)	37	27	29
Access to an improved water source (% of population)	47	58	68
Literacy (% of population age 15+)	..	59	61
Gross primary enrollment (% of school-age population)	139	94	94
Male	142	99	100
Female	137	88	89

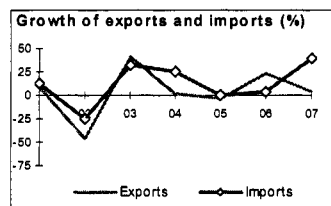
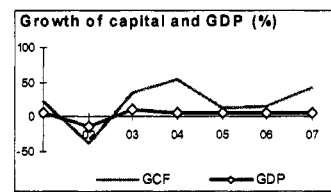


KEY ECONOMIC RATIOS and LONG-TERM TRENDS	1987	1997	2006	2007	
GDP (US\$ billions)	2.6	3.5	5.5	7.3	
Gross capital formation/GDP	10.1	12.8	24.8	29.2	
Exports of goods and services/GDP	16.6	21.9	29.7	24.7	
Gross domestic savings/GDP	4.2	4.7	13.6	9.9	
Gross national savings/GDP	4.4	7.3	16.0	11.3	
Current account balance/GDP	-4.8	-5.5	-8.7	-13.5	
Interest payments/GDP	4.0	2.6	0.4	..	
Total debt/GDP	143.0	115.6	26.4	..	
Total debt service/exports	50.3	28.7	4.0	..	
Present value of debt/GDP	..	..	11.5	..
Present value of debt/exports	..	..	37.8	..
1987-97 1997-07 2006 2007 2007-11					
<i>(average annual growth)</i>					
GDP	0.9	3.1	4.9	6.5	8.1
GDP per capita	-2.0	0.2	2.1	3.7	6.1
Exports of goods and services	4.3	14	23.8	4.2	26.1



STRUCTURE of the ECONOMY

(% of GDP)	1987	1997	2006	2007
Agriculture	36.2	31.5	27.5	26.5
Industry	13.7	13.4	15.3	15.0
Manufacturing	11.4	11.3	13.4	12.8
Services	50.1	55.0	57.2	58.4
Household final consumption expenditure	86.7	87.5	77.6	80.5
General gov't final consumption expenditure	9.1	7.8	8.8	9.6
Imports of goods and services	22.5	30.0	40.9	44.0
1987-97 1997-07 2006 2007				
<i>(average annual growth)</i>				
Agriculture	1.9	2.0	2.2	2.4
Industry	0.8	2.5	2.7	4.8
Manufacturing	0.1	2.5	2.7	4.8
Services	1.1	3.3	7.0	9.5
Household final consumption expenditure	1.3	2.6	-2.8	..
General gov't final consumption expenditure	-1.4	5.8	20.5	25.7
Gross capital formation	-0.6	13.0	15.1	42.7
Imports of goods and services	3.0	8.7	3.9	38.8



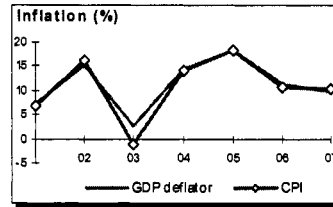
Note: 2007 data are preliminary estimates.

This table was produced from the Development Economics LDB database.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

PRICES and GOVERNMENT FINANCE

	1987	1997	2006	2007
Domestic prices				
<i>(% change)</i>				
Consumer prices	18.9	4.5	10.8	10.3
Implicit GDP deflator	23.0	7.3	11.3	9.5
Government finance				
<i>(% of GDP, includes current grants)</i>				
Current revenue	16.0	11.8	12.0	11.9
Current budget balance	8.7	0.9	0.8	0.4
Overall surplus/deficit	17	-5.6	-9.4	-9.6



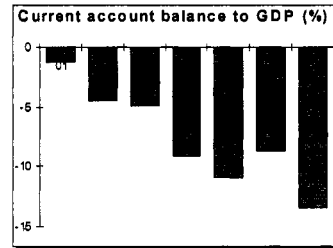
TRADE

	1987	1997	2006	2007
<i>(US\$ millions)</i>				
Total exports (fob)	329	507	982	1097
Coffee	34	64	51	34
Vanilla	89	10	48	30
Manufactures	65	346	905	1061
Total imports (cif)	409	802	1790	2,872
Food	52	49	..	..
Fuel and energy	55	117	377	429
Capital goods	102	146	225	282
Export price index (2000=100)	94	87	117	124
Import price index (2000=100)	89	103	161	162
Terms of trade (2000=100)	106	85	73	82



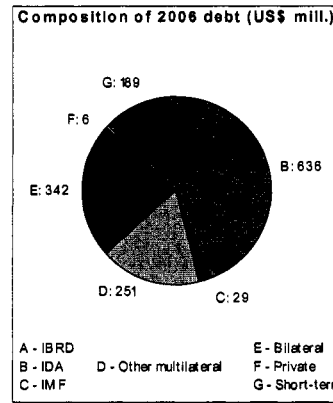
BALANCE of PAYMENTS

	1987	1997	2006	2007
<i>(US\$ millions)</i>				
Exports of goods and services	425	774	1646	1993
Imports of goods and services	552	1061	2,256	3,113
Resource balance	-127	-286	-610	-1,120
Net income	-149	-91	-80	-56
Net current transfers	154	182	214	188
Current account balance	-122	-196	-476	-988
Financing items (net)	191	250	508	1059
Changes in net reserves	-69	-54	-32	-71
Memo:				
Reserves including gold (US\$ millions)	25	280	532	602
Conversion rate (DEC, local/US\$)	213.8	1013.2	2,142.3	1873.9



EXTERNAL DEBT and RESOURCE FLOWS

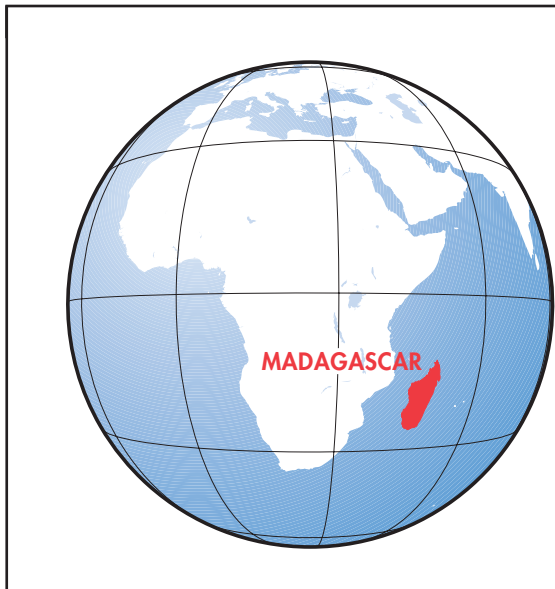
	1987	1997	2006	2007
<i>(US\$ millions)</i>				
Total debt outstanding and disbursed	3,668	4,099	1,453	..
IBRD	35	3	0	0
IDA	550	1,212	636	865
Total debt service	245	212	68	..
IBRD	4	4	0	0
IDA	6	18	28	6
Composition of net resource flows				
Official grants	66	566	2,543	..
Official creditors	273	219	235	..
Private creditors	-16	-1	-3	..
Foreign direct investment (net inflows)	3	14	230	..
Portfolio equity (net inflows)	0	0	0	..
World Bank program				
Commitments	138	177	108	114
Disbursements	93	130	178	198
Principal repayments	3	14	16	0
Net flows	90	116	162	198
Interest payments	7	9	12	6
Net transfers	83	107	150	192



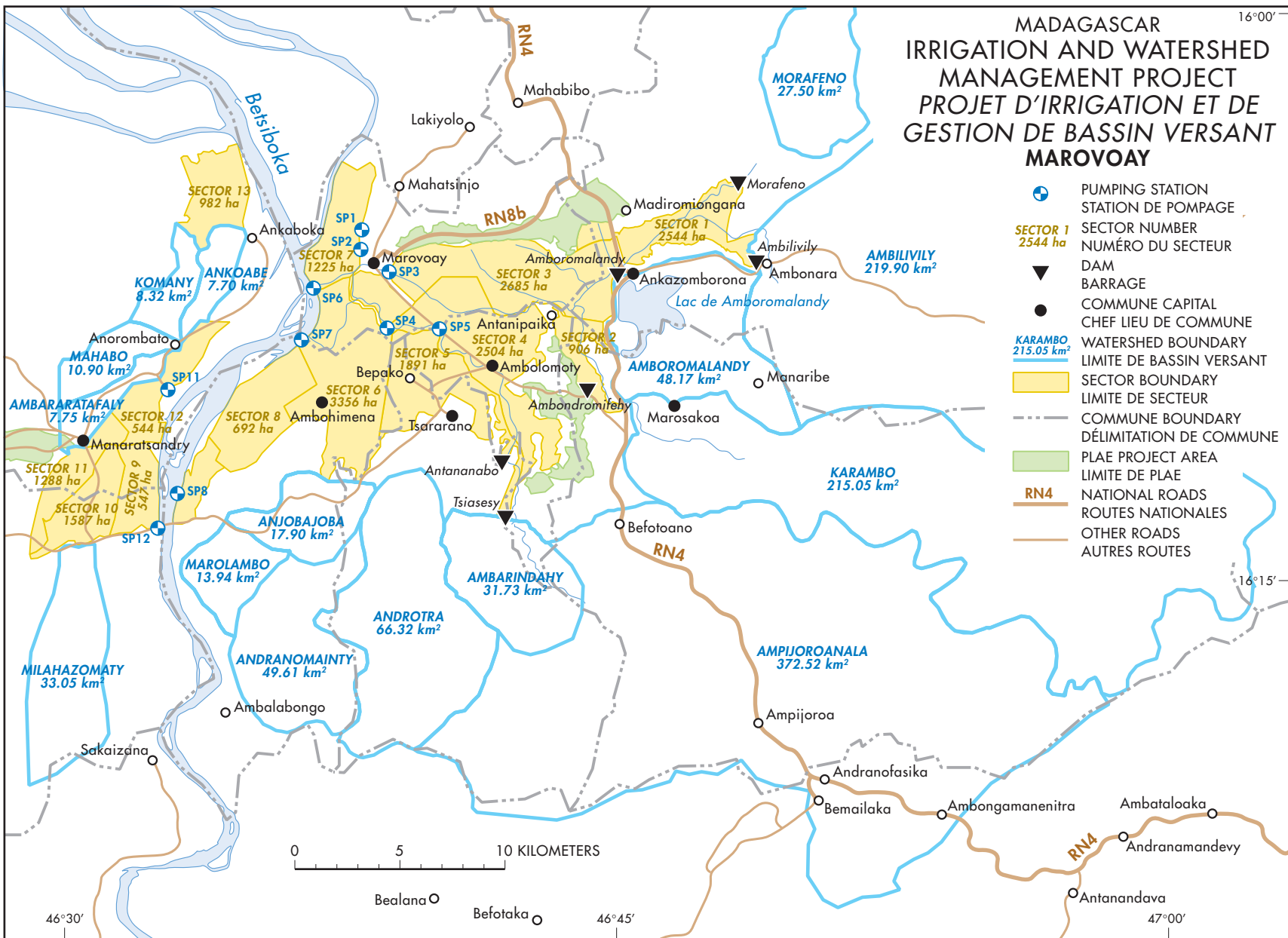
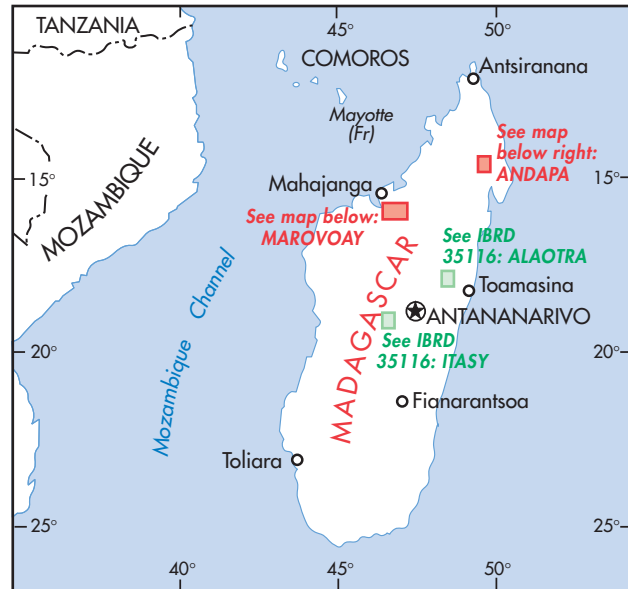
Note: This table was produced from the Development Economics LDB database.

Annex 18: MAP
Madagascar: Irrigation and Watershed Management Project

MAP SECTION

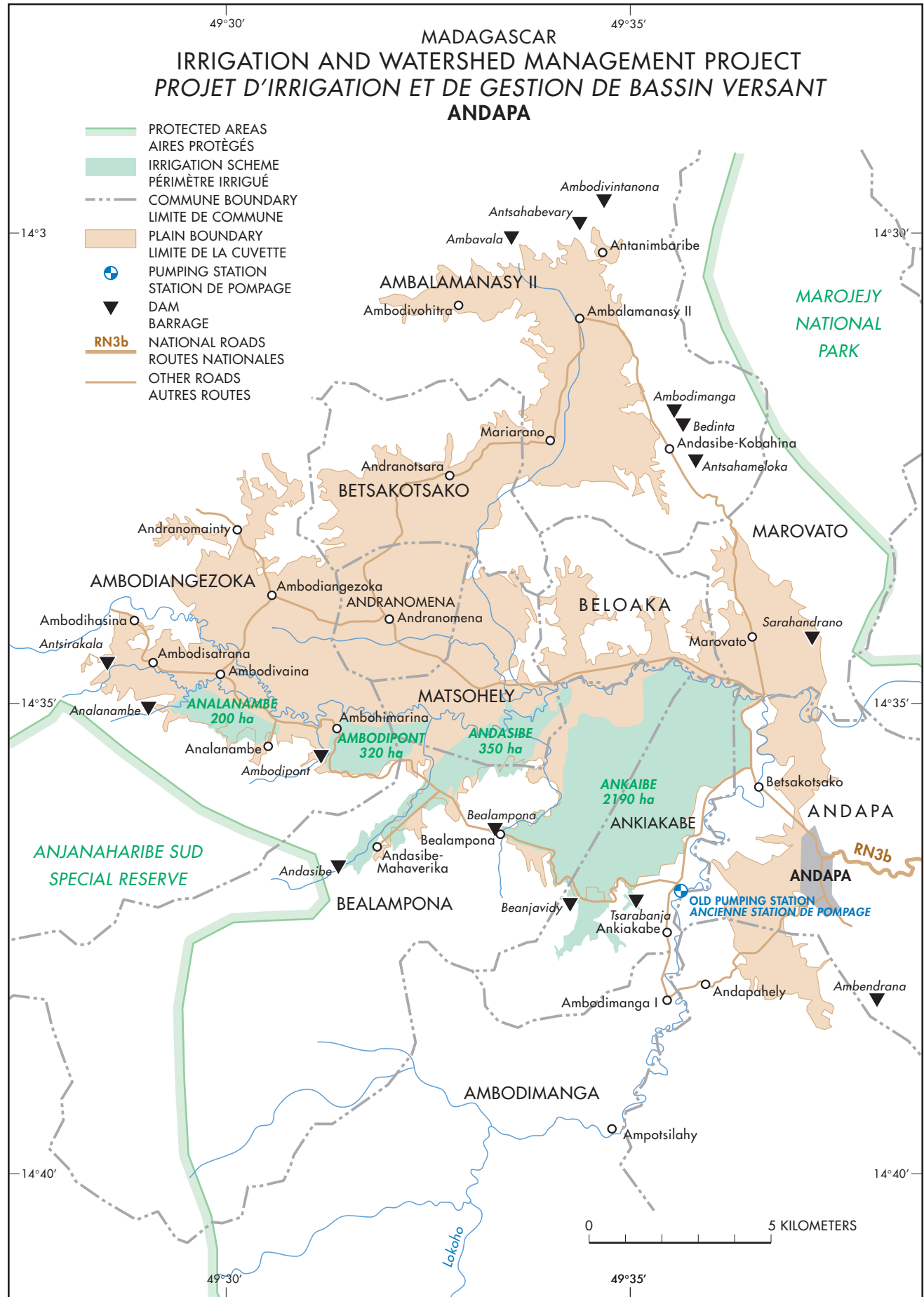


This map was produced by the Map Design Unit of The World Bank. The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.



MADAGASCAR IRRIGATION AND WATERSHED MANAGEMENT PROJECT PROJET D'IRRIGATION ET DE GESTION DE BASSIN VERSANT MAROVOAY

- PUMPING STATION
STATION DE POMPAGE
- SECTOR NUMBER
NUMÉRO DU SECTEUR
- DAM
- BARRAGE
- COMMUNE CAPITAL
CHEF LIEU DE COMMUNE
- WATERSHED BOUNDARY
LIMITE DE BASSIN VERSANT
- SECTOR BOUNDARY
LIMITE DE SECTEUR
- COMMUNE BOUNDARY
DÉLIMITATION DE COMMUNE
- PLAE PROJECT AREA
LIMITE DE PLAE
- NATIONAL ROADS
ROUTES NATIONALES
- OTHER ROADS
AUTRES ROUTES



MADAGASCAR IRRIGATION AND WATERSHED MANAGEMENT PROJECT PROJET D'IRRIGATION ET DE GESTION DE BASSIN VERSANT ANDAPA

- PROTECTED AREAS
AIRES PROTÉGÉS
- IRRIGATION SCHEME
PÉRIMÈTRE IRRIGUÉ
- COMMUNE BOUNDARY
LIMITE DE COMMUNE
- PLAIN BOUNDARY
LIMITE DE LA CUVETTE
- PUMPING STATION
STATION DE POMPAGE
- DAM
- BARRAGE
- NATIONAL ROADS
ROUTES NATIONALES
- OTHER ROADS
AUTRES ROUTES