

**Document of  
The World Bank**

**GEF PROJECT BRIEF**

**ON A**

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

**IN THE AMOUNT OF USD 8 MILLION**

**AND**

**PROPOSED CREDIT  
IN THE AMOUNT OF  
US\$ 55 MILLION**

**TO THE**

**REPUBLIC OF MADAGASCAR**

**FOR AN**

**IRRIGATION AND WATERSHED MANAGEMENT PROJECT**

**March 24, 2006**

CURRENCY EQUIVALENTS  
(Exchange Rate Effective {date})

Currency Unit	=	Ariary (MGA)
SDR	=	US\$
US\$	=	SDR

FISCAL YEAR  
January 1 - December 31

**ABBREVIATIONS**

APO	Agricultural Professional Organization
BV	<i>Bassin versant</i>
BV-PI	<i>Bassin versant – Périmètre irrigué</i> (Watershed – Irrigation Scheme)
CAS	Country Assistance Strategy
DAIR	<i>Direction de l'appui aux investissements ruraux</i>
CDP	Communal Development Plan
CSC	Communal Support Centre
DGDR	<i>Direction générale de développement rural</i>
DRDR	<i>Direction régionale de développement rural</i>
DTA	Decentralized Territorial Authorities
FMG	Malagasy Franc
FWUA	Federation of Water Users Associations
GDP	Gross Domestic Product
GEF	Global Environmental Fund
GELOSE	<i>Gestion Locale Sécurisée</i>
GoM	Government of Madagascar
IDA	International Development Association
IS	Irrigation Scheme
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
PC	Performance Contract
PLOF	Local Land Occupation Plan
PN/BV-PI	<i>Program nationale bassins versants – périmètres irrigués</i>
PMU	Project Management Unit
PRSF	Poverty Reduction Strategy Framework
PSRP	Poverty Reduction Strategy Paper
R/D	Research-Development
RDP	Regional Development Plan
RPMU	Regional Project Management Unit
TT	Tranoben'ny Tantsaha – Chambers of Agriculture
WB	World Bank
WUA	Water Users Association

**MADAGASCAR**  
**Irrigation and Watershed Project**

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## **A. STRATEGIC CONTEXT AND JUSTIFICATION OF THE PROJECT**

### **1. National and Sectoral Context**

Madagascar is a biodiversity hotspot with significant cultural and socio-economic diversity. The economy is basically rural, with agriculture as one of the main engines of economic development. Per capita income is about USD 240 per year and the poor represent about 69 percent<sup>1</sup> of the total population, but they represent 85 percent of the rural population. The only category of households in Madagascar that have not experienced improvement in their living conditions since 1993 are households living mainly on agriculture.

#### *Poverty Reduction Strategy Framework*

The development objective of Madagascar, as defined in the Poverty Reduction Strategy Paper (PRSP, July 2003) is the promotion of a rapid and sustainable development in order to reduce poverty by half within ten years. It is organized around three strategic orientations: (1) restoring the rule of law and good governance; (2) foster and encourage broad-based economic growth; and (3) foster and encourage human and material security and increased social protection.

The second strategic orientation of the PRSP targets five general objectives: (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.

The section of the PRSP concerning agriculture essentially aims at "ensuring food security and making optimal use of resources" through five objectives: (i) to increase agricultural productivity and cultivated areas; (ii) to promote small-scale investments in rural areas and partnership between farmers' associations and the private sector; (iii) to promote agricultural and agro-food exports and improve their quality; (iv) to ensure transparent and rational management of resources to guarantee their sustainability; and (v) to facilitate producers' access to land capital. Each specific objective corresponds to an investment program grouping several clearly identified actions. Programs under the first objective include: development of irrigation schemes and surrounding watersheds.

#### *Agriculture, Rice and Irrigation*

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 and average paddy yield at the national level is low (about 2.4 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 0.44 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 a population growth of 2.7 percent per year, 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. 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. 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 lack of 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/household. An estimated 48 percent of rice farmers did not sell any rice in 2001.

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<sup>1</sup> Latest available figure on poverty rate published in 2001. However, it is estimated that the poverty rate increased to 73 percent as a result of the 2002 crisis.

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 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.

Extension services have also failed to have a significant impact on productivity levels, and have demonstrated to be unsustainable. Reasons for these past failures include (i) the approach was biased towards 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.

#### *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 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

#### *Past experience*

A recent World Bank report on the impact of public spending on the productivity of irrigation<sup>2</sup> confirms stagnant paddy productivity at the national level, but also found that overall investments in small-scale community irrigation schemes have had a positive localized impact on productivity. However, even on those schemes that have benefited from investments, an important yield gap remains and weak sustainability is identified as a key factor in the disappointing performance of irrigated agriculture. Recommendations include (i) promotion of green revolution and *agro-écologie* technologies in order to boost productivity beyond the existing level, and (ii) provide an appropriate incentive framework for operation and maintenance of irrigation infrastructure and establish financial mechanisms against hurricane damage.

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<sup>2</sup> Madagascar: The Impact of Public Spending on the Productivity of Irrigation Schemes (1985-2004)

The need to adopt an approach to agricultural intensification that reaches beyond mere rehabilitation of infrastructure has been confirmed by the ESW ‘Madagascar – Rural and Environment Sector Review (2003)’. Based on household interviews and econometric analysis, the report presents a comprehensive list of constraints to increasing productivity, including access to finance, inputs, markets and equipment, problems associated with land degradation and sedimentation, and lack of maintenance of irrigation infrastructure.

Global experience provides ample affirmation. A recent Bank report ‘Watershed management operations: Approaches, challenges and emerging lessons (ARD 2006)’ proposes a new approach to watershed management that distances itself from previous top-down approaches that are based on traditional engineering, towards a new paradigm involving an integrated and participatory approach. The approach proposes to build strong local institutions, and to address a wide range of goals across soil and water conservation and integrated rural development. The report recommends that future watershed management operations be very clear about their objectives, and that a long-term perspective be adopted.

The above findings have been reflected in the GoM Irrigation and Watershed Policy Letter that summarizes the Government’s policy objectives with respect to the development of irrigation. The Policy Letter advocates an integrated approach to irrigation development, including water management, environment, agricultural services provision and marketing. The proposed Irrigation and Watershed Project is a response to the policy objectives associated with irrigation development of the GoM.

## **2. Justification of World Bank participation and GEF eligibility**

The Government of Madagascar (GoM) has requested World Bank (WB) and Global Environmental Fund (GEF) support in the preparation and funding of an Irrigation and Watershed Project to accelerate economic growth in rural areas through an integrated effort aimed at increasing productivity in high potential production zones, identified in particular through the presence of large public irrigated areas. The WB has played a unique role among the donors community in Madagascar, with the largest portfolio in terms of commitments, and is seen as the lead partner of GoM for poverty reduction. The French Development Agency (AFD), the African Development Bank (AfDB), the Food and Agriculture Organization (FAO) and the Japanese International Development Agency (JICA) are all operating in the irrigation sector and/or the National Irrigation and watershed Program.

The proposed project constitutes a key element of the Bank’s strategy in Madagascar. It would contribute to creating favorable conditions for accelerated economic growth in rural areas through an integrated effort aimed at increasing agricultural productivity and diversification in a number of high potential rural growth poles. The cornerstone of this project would be the development of the vast under-exploited irrigation potential in Madagascar, most of which is in a poor state due to negligence of O&M and upstream watershed degradation. As past investments in the irrigation sector have not achieved the expected results, the project adopts an integrated management approach to establish a balance between investments in irrigation infrastructures, environmental protection measures, strengthening of local capacities, and technology transfer, based on international best practice. In order not to over-complicate project operations, the project will be implemented in four rural ‘growth poles’ – four zones dominated by large-scale public irrigation where a number of conditions have been met for a 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.

The Bank has played an 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 water users associations 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).

Madagascar is eligible for GEF support. It has ratified the United Nations Convention to Combat Desertification 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 and National Action Plan in 2001 under UNCCD.

### **3. Major objectives to which the project is contributing**

The objective of the current Country Assistance Strategy (CAS) is to support the implementation of Madagascar's PRSP. The three key priorities of the PRSP are: (i) improving governance; (ii) promoting broad-based social and economic growth; and (iii) providing security.

The present CAS refocuses the portfolio of WB to better adapt it to the objectives of the PRSP to eliminate the major constraints hampering growth while reaching largest possible number of beneficiaries. It proposes new projects in the area of transport, environment and governance, an integrated growth poles project, and an Irrigation and Watershed project.

The Irrigation and Watershed Project will contribute to achieving the priority objectives of GoM and WB through the promotion of broad-based economic growth, the second key priority of the PRSP.

The proposed project is consistent with the GEF OP15 objectives and strategic priorities. GEF support will help address critical land degradation issues especially in the upper watersheds that have significant influence on stagnant irrigated rice production and low upland productivity. It will encourage sustainable land management that promotes long-term benefits for agricultural production systems and rural livelihoods. At the same time, GEF funded activities will secure benefits of global environmental significance, such as the prevention of natural habitat loss, including forests or wetlands, contribute to biodiversity conservation, reduce carbon emissions from wide spread fire use and increase carbon sequestration through increased vegetation coverage. Through this engagement, GEF will strengthen the National Program for Watershed Management and Irrigation Improvement. It will directly contribute to the implementation of the UNCCD NAP and to most of its specific objectives, including a) the promotion of sustainable natural resources management, particularly forests, land and water, b) the promotion and adoption of improved farming techniques that respect the environment, c) the provision of support for a more profitable and sustainable management of pastures and associated livestock, and d) the support of an enabling environment of regulatory and financial incentives for local communities and the private sector to engage in activities that contribute to NAP implementation

The project proposes to intervene in four high potential agricultural production zones: (i) Andapa (Sava Region), (ii) Marovoay (Boina Region), (iii) Itasy Region, and (iv) Lac Aloatra (Alaotra Mangoro Region). A detailed description of the project zones is included in Annex 1.

## **B. PROJECT DESCRIPTION**

### **1. Funding instruments**

IDA Credit:	USD 55 million.
GEF Grant:	USD 8 million.
Beneficiaries:	USD 4.5 million

## **2. Objective of the Program**

The National Irrigation and Watershed Program (PN/BV-PI) is part of the PRSP. The proposed project is in accordance with 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 development of natural resources.

The Government has clearly defined its new medium-term development vision on Irrigation and Watershed Management, based on national policies regarding rural and agricultural development, which are at the centre of its development and poverty reduction strategy: (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 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.

The National Program will cover all major irrigation schemes in the country, and will include both newly prepared (including the proposed Irrigation and Watershed project) as well as on-going operations that will gradually be retro-fitted into the NP and its institutional framework. The NP is underpinned by an Irrigation and Watershed Policy Letter that describes the objectives of the GoM with respect to the development of irrigation schemes and surrounding watersheds. The Policy Letter also indicates the approaches needed to achieve the objectives.

The Irrigation and Watershed project responds to the National Program and to the Policy Letter. In the four project sites, it will focus on both software and hardware issues associated with agricultural intensification, including (i) marketing, input supply and agricultural services, (ii) irrigation infrastructure, (iii) sustainable land management, and (iv) support for national policies, with capacity strengthening a transversal issue. The project will do so by clarifying roles and responsibilities of stakeholders, including central and decentralized government, Region and Commune, farmers, (F)WUAs and private sector, and by putting in place a clear and unambiguous incentive framework for agricultural intensification.

GEF will contribute to the National Program by supporting the development of an integrated WSM approach with a long-term perspective through innovative 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 emphasize capacity strengthening in SLM, identify successful processes and outcomes and disseminate lessons learned in order to strengthen the National Program and to facilitate replicability and scaling up.

The project will include four large-scale public irrigation schemes (out of six in total) that cover 33,000 ha (out of 81,000 ha 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. In addition, the public schemes are all characterized by severe institutional weaknesses including a lack of clarity about roles and responsibilities, and by upstream watershed degradation. An approach that focuses on a limited number of sites initially is justified in view of the potentially complex integrated approach.

## **3. Development Objectives of the Project and Key Indicators**

*The development objective* of the project is to sustainably increase agricultural productivity in four high potential watershed and their associated irrigation schemes.

The *global dimension* of the project is to restore and maintain critical ecosystem functions in watershed areas by reducing and preventing land degradation.

*Intermediate results* are: (i) average increase in agricultural productivity in irrigation schemes and uplands in the four project sites by 50 percent; (ii) annual percentage of cultivated land under non-rice crops in the four project sites increased by xxx percent, and (iii) area under improved sustainable land management practices in the four project sites increased by xxx percent.

#### **4. Project Components**

The proposed project comprises three technical components covering three strategic orientations: (i) Agricultural Development, (ii) Irrigation Development and (iii) Watershed Development. A fourth component includes Program Management. In accordance with the ‘growth poles’ approach, the project proposes four similar sub-projects in the four regions concerned: Andapa, Marovoay, Itashy Region, and Lac Aloatra – Sahamaloto scheme (Annex 1). A more detailed description of the components and activities is attached in Annex 4.

The project concept is based on the following principles: (i) refocusing of the Government intervention on its core mandate; (ii) participatory approach based on demand from stakeholders; (iii) clarification of roles and responsibilities of all stakeholders, in accordance with national policies and in line with the principle of subsidiarity; (iv) contractualization of partnerships and service delivery, and (v) establishment of an appropriate framework for intensification of agricultural production.

##### ***Component 1: Agricultural Development.***

*(US\$20.1m, including IDA contribution of US\$18.8 million, GEF contribution of US\$1.3 million)*

*The objective of this component is to improve access to markets and to sustainably intensify and diversify irrigated and rainfed agricultural systems in the project’s watersheds.*

The ‘Agricultural Development’ component includes the project area as a whole: irrigated areas and upland or tanety areas. Its specific objective will be achieved through an approach focused on market-driven demand, 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, the following:

- 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, technology inputs, and credit
- Market and public infrastructure, particularly for land tenure.

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. The project will finance the following activities:

- (i) *Support to agricultural services and infrastructure.* The sub-component aims at promoting the development of agricultural production by improving access to innovative technologies for production, storage and processing of agricultural products, and by improving access to markets and by supporting the development of agricultural commercial value chains. Investment will aim at improving the enabling environment and providing *incentives*, in addition to *on-demand* support to investment projects by private initiative (see (ii) below). The project will provide resources to pay for the services, work, equipment, training and operational costs of such *incentive* investments. Activities will be adjusted to specific needs of each site, and will include the following (a) support to the development of dynamic market-driven supply chains,

particularly by creating and strengthening the linkages between producers and markets, (b) building up of farmers capacities and strengthening of professional organizations, as well as establishing agricultural service centers (CSA), (c) reinforcement of the offer of technologies for agricultural intensification and diversification, and (d) establishment of land tenure windows, as well as other critical infrastructures to improve transport, storage and marketing of agricultural products.

(ii) *Support to private investment.* The goal is to link, upscale and multiply the above mentioned *promotional and incentive* activities through support to *on demand* private investment by operators, farmers and farmers 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 will be provided to investments through a cost sharing mechanism according to a pre-established positive/negative list. Private operators will be responsible for implementing the sub-projects and related activities according to procedures approved by the project. The sub-component will support financially a wide range of sub-projects such as investment in collective storage, market research and supply chain development, technical and managerial advisory services, demonstration and dissemination of technologies, support to seed producing farmers, support to private distribution networks for inputs and equipment, support to microfinance institutions, and support to contract farming integrated sub-projects initiated by commercial or agro-industrial partners and involving small scale producers. In addition to investment in infrastructure and equipment, sub-projects will include studies and market tests and research, extension and advisory services (technical and managerial), applied research activities, training and study tours, etc.

*Interim results* are (i) increase by xxx in 7 years of the number of POs, unions, and federations of active producers, who are registered with a CSA, (ii) increase by xxx percent in 7 years of productivity of selected supply chains (rice, etc.), (iii) increase by xxx percent in 7 years of the volume of credit allocated to agricultural investment by MFIs and commercial banks, (iv) increase by xxx percent in 7 years in the share of agricultural production that is marketed by farmers, (v) increase by xxx percent in 7 years in the quantities of improved seeds and fertilizers sold to farmers, and (vi) signature of xxx contracts/partnership agreements between producers and private sector operators and delivery of a volume of xxx of produce under farming contracts.

*Critical assumptions* relate to (i) the capacity among producers and their organizations to respond to improved technologies and to establish linkages with the supply of extension and adaptive research services through CSAs, (ii) the willingness of private operators to invest directly in long term contractual relations with agricultural producers for developing and for diversifying product supply and meet market demand, and (iii) upkeep and strengthening of incentive government policies in favor of agricultural private sector.

Detailed implementation modalities for each group of activity in subcomponent 1 are specified in the table below:

Subcomponent	Implementation
Development of sustainable supply chains	Recruitment of one (or two) strategic partners, with DRDR contract
Capacity-building of producers and support to producers organizations	Recruitment of service providers by CSA
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
Improvement of public infrastructure, including establishing and operating CRIF and land tenure windows	By DRDR and communes with assistance from National Land Tenure Plan [Plan National Foncier (PNF)]

The financing modalities are described in Annex 4.

**Component 2: Irrigation Development.**

*(US\$31.0m, IDA funding of US\$ 31.0 million).*

*The objective of this component is to improve 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.*

The component will contribute to achieving the overall development objectives by improving the quality of irrigation services and O&M. In doing so, the component will help put in place a more favorable environment for agricultural intensification and diversification. The project will adopt a contractual approach that empowers stakeholders and clarifies their respective roles, and that will be based on the principle that investments in infrastructures *enhance* and at the same *are conditioned by* the performance of stakeholders. The instrument for clarifying and formalizing commitments and responsibilities is the Performance Contract that will be signed between the (F)WUAS, the Communes and Regions, and MAEP. Achievement of all performance indicators will pave the way for a subsequent phase of the Performance Contract. The component will also put in place an appropriate incentive framework for each stakeholder, based on transparency and accountability. E.g., O&M contracts will include specific performance indicators, and monetary incentives will be provided to achieve them.

The project will finance the following activities:

- (i) *Support to Irrigation Development.* 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 SDP and PC will provide the overall framework for support to agricultural intensification, including possible investments in the rehabilitation of irrigation infrastructure. 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, and .
- (ii) *Irrigation Investments.* Rehabilitation of irrigation and appurtenant infrastructure, including technical design studies, implementation of works and their supervision. As many as possible of these contracts will be (co-) signed by (F)WUAs.

Critical assumptions include that stakeholders are willing to pay for better irrigation service provision, and that a more reliable access to water leads to higher agricultural productivity which in turn leads to an improved capacity to pay. The main risks are that stakeholders are not willing or able to respect terms and conditions of the PC and that the project will not sign subsequent PCs.

*Intermediate results* are (i) increase in wet and dry season irrigated area by xxx ha, (ii) number of second phase Performance Contracts signed, and (iii) O&M costs recovered as percentage of overall O&M needs at 100 percent at the end of the project.

**Component 3: Watershed Development**

*(US\$10.0m, including IDA funding of US\$3.6 million; GEF contribution US\$6.4 million)*

*The specific objective of the component is the sustainable management of the watershed including irrigated schemes, to preserve the natural heritage, to benefit from the production potential of the natural resource, and therefore contribute to improved living conditions and incomes of the rural population*

An integrated and participatory approach to sustainable watershed management should make rural populations accountable and encourage them to manage land and natural resources in a sustainable manner. The aim of the component is to contribute: (i) to protection of watersheds by reducing erosion and sedimentation; (ii) to better productivity and to sustainability of agricultural production based on agroecological and agroforestry technologies, and; and (iii) better management of natural resources so as to generate environmental improvements and living conditions, as well as increase in productivity from various systems of land use to the benefit of local population. This component covers only long-term investment with environmental impact, and only community based groups or association will be eligible.

The project will finance the following activities:

- (i) *Planning and capacity building for sustainable management of watersheds, including* (a) preparing a master plan for managing (sub)watersheds at the four intervention areas; (b) preparing the participatory plans of operating approximately 30 watersheds associated with the irrigation scheme, and the area of which varies from about 10 sqkms to about 500 sq kms, and; and (iii) participatory planning and management of various natural resource areas inside the subwatersheds, the management of which will be transferred to user associations.
- (ii) *Sustainable investment in watersheds, including* (a) determining, through participatory negotiations, local strategies for controlling erosion, for arresting gullies and for reducing sediment quantity transported by floods. The project will finance investments in strategic anti-erosion works by among others biological methods and technologies; (b) Interventions on communally owned land to improve plant cover, establish reforestation and improve pastures through contracts for transfer of management of natural resources, and; (c) promoting sustainable and profitable agriculture hill sides (for example, agro-technical and agro-forest techniques). The description and financing of activities for promoting sustainable and profitable agriculture on hillsides is included in component 1 of the project.

*Impact indicators* are (i) xxx ha of catchment areas having benefited from management transfer and having been evaluated as satisfactory, (ii) xxx communes évaluées méritantes, et (iii) xxx watershed master plans prepared and adopted.

Critical risks include (i) farmers may not be interested in taking part in work outside their own fields. The project will adopt a participatory approach, including information campaigns and capacity strengthening; (ii) the handing over of land management rights to local community groups may be seen as a threat to free access to natural resources by some. The project will establish and strengthen communication and negotiation platforms.

#### ***Component 4: Program Management.***

*(US\$ 1.9million, including IDA funding of US\$1.6 million, and GEF contribution of US\$0.3 million)*

*The objective of this component is to use project resources in accordance with its purposes and procedures, to set up a political framework that is favorable to extending the project to the national level*

This component will finance the following activities:

- (i) 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.

- (ii) support to national policies, including (a) provision of 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 Program including a national policy for private input supply; and (ii) provision of initial technical assistance support to emerging professional groups, in particular the *Plateforme Consultative de Riz* and the *Association Malgache de Producteurs de Semences*.
- (iii) *Monitoring and evaluation*.

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

*Impact indicators* include (i) number of unqualified financial and technical audit reports, (ii) national policy on input supply adopted and implemented, (iii) National Irrigation and Watershed Program is part of the Mid-term Expenditure Framework of the MAEP.

## 5. Lessons integrated into the Project Concept

The design of the project is based on lessons drawn from the different evaluations<sup>3</sup> 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; lack of clarity in responsibilities (public sector, Regions, Communes, water users...); weak capacity of stakeholders; land tenure constraints (land/sharecropping); non-respect of commitments by users and Government; and indiscipline and impunity.

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

- (i) *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 that actively supports emergence of a private sector.
- (ii) *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 (including storage) and supply of inputs; access to appropriate and efficient agricultural services; and access to rural finance.

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<sup>3</sup> 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).

- (iii) *Unambiguous institutional framework* with clear responsibilities in accordance with policies (decentralization...) and legislation (land, water and forestry codes) for farmers/users and their associations; Communes, inter-communes and regions; decentralized Government services; agencies and private operators.
- (iv) An approach that emphasizes *capacity strengthening* of all stakeholders to help them play their role and take responsibility.
- (v) *Participatory approach, coordinated decisions and respect of commitments*, including stakeholders with established and acknowledged rights and obligations, with adequate resources and capacities, who fully participate in decision-making; incentives and mechanisms are in place encouraging appropriate behavior and respect of commitments made; interfaces exist for cooperation and dialogue in accordance with the decentralization policy.

## **6. Alternatives considered and Reasons for Rejection**

A number of alternatives have been considered:

- (a) 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 ESW findings. However, it was felt that this design would fail to capture evident synergies and create implementation gaps.
- (b) putting in place a sector-wide multi-donor approach similar to EP3. However, discussion with other donors suggested that more flexible donor collaboration, possibly in preparation for close collaboration thereafter, was more appropriate.
- (c) expanded focus on complementary rural development activities like rural finance reform, and land administration. However, the team felt that this would exacerbate project complexity and create implementation risks.
- (d) reduction in the geographic scope of the project to three areas. However, the team felt that this would not minimize any complexity and would be at odds with the government’s scaling up objective; and
- (e) designing the project to respond to the government’s nascent decentralization program, which would transform the project into a multi-sectoral, rather than agricultural operation. It was felt that the policy, institutions and disbursement mechanisms associated with decentralization are not sufficiently clear and mature.

## **C. IMPLEMENTATION**

### **1. Partnership Arrangements**

The project is a fully blended operation between GEF and IDA. The project is the IDA contribution to a National Irrigation and Watershed Program, for which the GoM has prepared a policy letter. The National Program is also supported by AFD. Other donors are expected to join. The project will sign an MOU with the EP3 program to ensure coherence and synergies between activities in the lower and upper watersheds.

The project will work through strategic partners in each of the four project areas for the implementation of project activities. These include PLAE in Marovoay, WWF in Andapa and Durell in Lac Alaotra concerning the watershed activities, and BAMEX and CTHT/CTHA concerning marketing and business promotion activities.

Linkages to other programs funded by the World Bank (PSDR, FID) and GEF will be established and approaches harmonized where possible, for instance with the WB supported MSP “Institutional Strengthening and Resource Mobilization for Mainstreaming Integrated Land and Water Management Approaches into Development Programs in Africa”. One of its project sites is in Madagascar working in a watershed in the highland area close to Antananarivo. The project has developed an integrated watershed management approach and has started its implementation. The methodologies, approaches and experiences will be taken into account during the preparation of the project implementation manual, especially in regards to designing the methodology of the WSM Master plans and participatory sub-watershed management plans. In addition, a linkage with the UNDP-GEF funded ‘Stabilizing Rural Populations through the Identification of Systems for Sustainable Management and Local Governance of Lands in Southern Madagascar’ will be established, experiences exchanged and approaches harmonized for the mainstreaming of SLM within sectors and policies.

## **2. Institutional and Operational Arrangements**

The project will be implemented under the responsibility of a national Project Steering Committee and Regional Monitoring Committees established in each of the four project areas.

*The National Steering Committee* will be chaired by the Minister of Agriculture and will include representatives from :

- (i) The other central ministries involved (Ministry for Decentralization and Land Management, Ministry for the Environment, Water and Forests, Ministry for Energy and Mining, Ministry for Economy, Finance, and Budget, Ministry for National Education, Scientific Research, Ministry for Trade) to ensure consistency of project actions with national policies;
- (ii) The four regions involved – Heads of Region, Chairpersons of GTDR, to ensure integration of project actions at regional/ commune level with national strategies and programs;
- (iii) The main professional organizations such as the Chamber of Agriculture and and<sup>4</sup> associations/ forums for main value chains involved such as the « Rice Forum ».

The National Steering Committee will be supported by DGDR at MAEP. I will be responsible for (i) annual programming of project activities (approval of the work plan and budget), (ii) monitoring implementation and results, including 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 will meet twice a year.

*Regional Monitoring Committees* will be established in each of the four project areas. I 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 both national strategy and policy, and regional development priorities and programs; (ii) preparing and validating detailed work plans and budgets at

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<sup>4</sup> The Working Group for Rural Development **Le Groupe de Travail de Développement Rural (GTDR)** is made up of five local stakeholder groups (OPA, Private sector decentralized authorities and projects/ programs). Its duties 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.

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.

**The general coordination** of the project will be ensured by the General Department for Rural Development (DGDR) at MAE, as follows:

- DGDR will ensure project ownership at national level;
- Regional Director for Rural Development (DRDR) will be responsible for project ownership of project actions in their respective areas.
- To help them in such a task, the project will finance recruitment (i) at national level of an international technical assistant (operations), advisor to DGDR, and (ii) at regional level of four national technical assistants (operations), advisors to DRDR for implementing the project actions.
- Finally, DGDR and DRDR will select in their respective units a staff who will provide support for coordination and project monitoring.

**The project financial management** will be ensured at national level by the Department for Administration and Finance at MAEP and, at regional level, by the DRDR finance director. The project will recruit a financial management agency that will provide technical financial management assistance to MAEP's Finance Director. The project will also recruit, at each DRDR, a national financial manager, under contract, who will be full time in charge of financial management of the project. This person will work closely with MAEP DAF and will benefit from support from project financial TA.

**Procurement** will be ensured, at central level, by PRMP and, at regional level, by units involved at DRDR. The project will recruit a national technical assistant who is a specialist in procurement, and who will provide technical assistance to the PRPM, and (ii) at the level of each region, an additional staff, under contract, who will be full time in charge of project procurement. This staff will work closely with PRMP and will benefit from the project support in procurement TA.

**Technical assistance.** Recruitment of TA – international (1) and national (7) – will be done under two separate contracts (one for financial and procurement management, and one for operational assistance) with specialized firms who will assume the responsibility for the work of each TA and of the team as a whole. The International « Operations » TA will be in charge of (i) advising DGDR and their assistant and DRDRs/ their assistants regarding operational strategy, project implementation and monitoring of the project; (ii) training and supplying operational support to MAER staff involved in its implementation. The National « Operations » TA who are recruited at the level of DRDRs will be 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 TA in financial management and in procurement will be responsible for (i) advising DCF and PRMP, and (ii) providing technical support to DRDR staff involved and ensuring service quality. The financial officials (4) and the procurement officials (4) at region level will be contracted on an individual basis.

### **3. Monitoring and Evaluation of Outcomes**

The responsibility for project monitoring and evaluation will be under the Director for Information Systems (Directeur des Systèmes d'Information or DISE) of the Ministry of Agriculture. He will be assisted by an international specialist that will be associated with the DGDR (Direction générale du développement rural). The project will use the Management Information System (MIS) developed by the World Bank Project PSDR for the monitoring of physical progress and financial transactions. Independent monitoring and evaluation will be undertaken by qualified service providers at a yearly

interval, starting in year 2 of the project. Two external evaluations, one at mid-term and one at the end of the project, will be done to measure the impacts of the project. The analysis and the recommendations from these evaluations will be used for scaling up of activities and replication of good practices at the national level.

The monitoring and evaluation system is developed around three building blocks:

- 1) An internal monitoring system under the Ministry of Agriculture (executed by DISE) in collaboration with the staff of DGDR at the national and regional level in order to assure harmonization and coherence of monitoring between the different programs of the Ministry. This function can be delegated or sub-contracted to other entities, either for an entire component (for example PE3 for the watershed management component) or for the activities at the regional level (for example GTDR for each of the sites)
- 2) A participatory monitoring and evaluation system at each of the four sites. This will allow assuring improved ownership and sustainability of activities by the beneficiaries. It will also facilitate to integrate beneficiaries in the definition, collection and analysis of indicators and allow for corrective measures in case the intermediary objectives are not reached.
- 3) A collective monitoring system that invites other actors to participate in the collection and analysis of the project indicators (for example GTDR has a set of regional indicators for the regional development plans, where project indicators can be associated with)

In addition, remote sensing (RS) and geographic information system (GIS) techniques will be used to capture diagnostic information on watersheds and establish the baseline for project indicators by the time of project effectiveness. RS and GIS will also be used to monitor and evaluate changes resulting from project interventions. Information collected during the M&E process will feed into the establishment of watershed management master plans and participatory plans at the sub-watershed level.

#### **4. Sustainability and replicability**

The project will strive for institutional sustainability by embracing the government's strategy of decentralization and contribute to capacity strengthening of local and regional institutions. Sustainability of development activities beyond project lifetime is an important project objective and is expected to be achieved by improving the enabling environment for agricultural production and marketing. This will be done through targeted support to infrastructure improvement, facilitating access to information and markets, and the vertical integration of the value chain. Building capacity of farmers and strengthen professional organizations as well as the establishment of agricultural service centers will be important pillars for sustainability. The integration with the private sector, the facilitation to access credits and the support to obtaining land rights will empower farmers and other stakeholders of the local economy to engage actively in their development beyond the project support.

Sustainable irrigation management will depend on the extent to which the project manages to convert the vicious cycle of low productivity, inadequate O&M, high population pressure on uplands and high erosion and sedimentation, into a virtuous cycle of increased productivity, adequate O&M, reduced pressure on the uplands and reduced erosion and sedimentation. Increased productivity on lowlands and uplands, and sustainability are interdependent. Irrigation development will focus much of their activities on capacity building and on the definition and clarification of roles and responsibilities for the management of the irrigation schemes. The project will employ a demand-driven, participatory approach to building local capacity for water users association through contract plans that will allow WUA to maintain management and financial demands in regard to irrigations schemes after the project has ended. The project recognizes very clearly the importance of well-established and functioning organization of the irrigation schemes, as without them the rehabilitated infrastructure will most likely not be properly maintained. An adequate system of carrots and sticks will be put in place that will provide stakeholders with incentives to assume responsibility for operation and maintenance of

irrigation assets. A major lesson from past experience is that Communes and Regions need to be directly involved in irrigation management to ensure adherence to agreed principles. The project will therefore make sure that local authorities fully internalize the importance of irrigation for poverty reduction, regional growth, food security and fiscal sanity. A further lesson learned from past experience is that schemes that depend on pumps for their water supply transcend the institutional and possibly financial capacities of local populations. The project will therefore only gravity schemes.

As upper watershed land degradation is impacting downstream infrastructure and livelihoods in all four project sites (see technical Ax 15 on land degradation in the Brief), it is of ultimate importance to establish the connection between these two areas with an integrated watershed management approach. The project will analyze and intervene in a targeted way to address land degradation issues, especially erosion, that impact irrigation schemes. It will also address rural development issues of the upper watershed by developing and promoting economically interesting opportunities that are based on sustainable land management. On the ground results of agro-ecological and agroforestry techniques, including pilot demonstrations and on-farm adaptation combined with the improved training and extension services will help farmers in planning with longer-term perspectives. This will reduce pressure on the natural resources and provide a window to actively engage in the preservation of the currently threatened natural habitats by collaborating with the conservation organizations on the ground.

The project will develop innovative and integrated approaches for agricultural development and land management at the watershed level. Being part of the National Program of Watershed Management and Irrigation Improvement, the project will interact actively with other participating donors and projects, which will facilitate the exchange of experiences. Successful project outcomes and lessons learned can be disseminated through the National Program and replicated in other regions. The fact that the project will work in four distinct sites will allow for replication of lessons learned within that specific region taking into account the 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.

Financial sustainability will be enhanced by assisting communities to connect to credit institutions, which is still a major missing link in the rural financial sector. In the irrigation sector financial sustainability will be achieved through the development and implementation of *Performance Contracts* that outline the mutual responsibilities of stakeholders in management and maintenance and cost recovery for the sustainable financing of the scheme. Financial assistance for private or communal sub-projects for agricultural development will be based on a cost-sharing mechanism, which will include a list of list of eligible/non eligible activities, selected on the basis of their potential contribution to project/government objectives. Eligible sub-projects that are submitted by beneficiaries will clearly relate to agricultural production and management of natural resources, and will be co-financed by stakeholders exclusively in cash, either under own capital, or under micro credit. Project contribution will be from 20 to 80% of total cost, depending on the public good nature and on the degree of poverty of the beneficiaries.

## **5. Critical risks and possible controversial aspects**

The potential risks of the project are:

- (a) risks are particularly related to the irrigation component. Specifically, there is a risk that farmers are not willing to pay for the full costs of irrigation services (including maintenance), even though they have indicated in the Scheme Development Plan that they prefer rehabilitation of irrigation infrastructure, and even though they have agreed to the associated O&M costs. The project intends to mitigate this risk through (i) adopting a contractual approach that confers

maximum responsibility to (F)WUAs and that reviews progress on key performance indicators annually; (ii) work with the (F)WUAs to follow-up on fee payment; (iii) involving Communes and Regions in the management of irrigation schemes to help (F)WUAs putting in place an appropriate incentive framework; (iv) improving linkages in supply and marketing chains to increase farmers' income and improve their capacity to pay.

Another risk associated with the irrigation component is that cyclone damage undermines sustainability of the irrigation schemes. The project will help operationalize the Irrigation Maintenance Fund that has been established by MAEP, and that will undertake cyclone damage repair works.

Potentially controversial is the fact that the project intends to put in place clear carrots *and* sticks for sustainable irrigation management. This will require up-front buy-in and commitment from all levels. The (F)WUA will be responsible for taking action against defaulters, that may include legal court action against defaulters, closing down irrigation water supply, and imposing of financial penalties.

- (b) a second series of risks are associated with the functioning of ASC, and the willingness of farmers to pay for private extension services. An associated risk is that private operators are reluctant to sign contracts directly with producers' organizations. The project will provide technical assistance to ASC to make sure that quality services are being delivered. It will also strengthen capacities of private service providers. Finally, the project will work directly with producers' organizations to make sure that their needs are being responded to by extension providers.
- (c) The success of the project will depend to a large extent on the emergence of sustainable supply chains, where each of the operators makes an acceptable profit. Free hand-outs of inputs would undermine this. The Government has committed to prepare a fertilizer policy. The policy is likely to fully commit to private service providers for import and distribution of inputs (fertilizer, seeds and agro-chemicals), and to no longer engage in free hand-outs. This policy is supported by the entire donor community in Madagascar. It is important that the government maintains its commitment, even if private sector (weary after years of government intervention) does not step in immediately. The project will continue, in collaboration with other donors, the dialogue with the GOM.
- (d) A fourth risk is associated with sustainable land management in the upper watersheds, in particular the risk that farmers are not willing to take part in work outside their own fields to combat land degradation and erosion. The project will therefore promote transfer of land management responsibility (GELOSE) to local communities. The project will also adopt a participatory approach, including information campaigns and capacity strengthening.

## **6. Credit conditions and agreements**

## **D. APPRAISAL SUMMARY**

### **1. Economic and financial analysis**

#### **Summary of Benefits and Costs:**

*Project benefits.* The project would generate benefits through increased productivity, both horizontally and vertically, in both irrigated lowlands and rainfed watersheds. Foreign exchange gains are associated with the reduced need for imports of rice and non-rice crops. By promoting sustainable supply chains, the project will also contribute to farmer income through higher farm gate prices due to quality improvements. Private operators involved in the supply chains will also benefit from improved quality and higher prices through higher incomes. Additional benefits accrue from a reduction of sedimentation in irrigation infrastructure and a reduction of maintenance cost. Further benefits (improved hydrological services, reduced population pressure on marginal land) will not be monetized.

*Beneficiaries* include about 30,000 smallholder households producing irrigated crops, about 40,000 households producing rainfed crops, and farmers' groups (e.g., producing seeds) and private operators providing services, selling products and performing various functions in the value chain.

*Financial analysis*

*Economic analysis*

*Sensitivity analysis*

*Fiscal impact*

### **2. Technical**

Irrigation investment operations have a mixed experience in Madagascar. While investments were generally justified in terms of increase in production, sustainability has been far from sure. The project will focus 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 will invest 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. The project will thus adopt a three-pronged strategy -- (i) increase production and farmers' income, (ii) put in place mechanisms for sustainable maintenance of irrigation infrastructure, and (iii) reduce irrigation maintenance costs. The strategy is based on the experience of the BV-Lac project in PC15/Marianana (Lac Alaotra) and the GTZ-funded project in Marovoay.

Extension is a critical ingredient to increase agricultural productivity. The PNVA project (completed in 1999) adopted a 'training and visit' approach that resulted in increased productivity, but with limited sustainability and high staff costs. Based on international experience, the project will support a demand-driven approach to extension services that are, ultimately, to be provided by private service providers on a commercial basis. Establishment of ASC will be supported by the project to bring together supply of and demand for extension services.

Agricultural value chains in Madagascar are characterized by weak linkages between actors. Agricultural marketing has not traditionally been part of irrigation development, despite the fact that many of the benefits of irrigation (higher quality, more uniform products, possibility to more precisely target harvest dates) are more relevant in a market environment. Based on the experience of similar projects in West Africa, the project intends to capture the synergies between markets and irrigated

agriculture to improve quality and value, and increase farm gate prices through targeted investments in linkages between operators in the chain.

Watersheds form integrated spatial management units with irrigation schemes. Failure to address synergies between the two has led to missed opportunities and reduced returns on investments. The project proposes 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.

### **3. Fiduciary**

*Procurement*

*Financial management*

### **4. Social analysis**

Degradation of agricultural production systems in the irrigation schemes and in the watersheds has led to reduced agricultural production and consequently to increased poverty. Especially the degradation in the watersheds has been dramatic and would over-time largely lead to the abandonment of many of these agro-ecosystems. The project has as objective to sustainably increase agricultural production and diversification and revenues in the four selected irrigation schemes and in the associated watersheds. Agro-ecological agricultural practices, which have the potential to triple agricultural production of a variety of crops, will be promoted in the watersheds to increase production and income, but also to reduce or stabilize manmade erosion, increase soil fertility, improve vegetation cover and reduce bush fires. The project will also contribute to increased land security in both production systems.

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).

The project will strengthen the Water Users Associations (WUAs) in order to improve the management and maintenance of the irrigation schemes. The project will also establish or strengthen communication and consultation platforms (CCPs) in the watersheds (WUA representatives will be part of these platforms) to improve the management of natural resources and develop sustainable agricultural systems in the watersheds. It is expected that these project activities will have a positive environmental and social impact on the sustainable use of the natural resource base and reduce the impacts on the downstream irrigation schemes, which would have a positive impact on poverty reduction in both production systems.

### **5. Environmental analysis**

Madagascar is a mountainous country with a relatively low population density. Madagascar's economy is mainly a rural, natural resource based economy with few industries and services. The country has abundant land and water resources, which are only partly developed, and has biodiversity resources of global significance. The country is regularly exposed to the destructive forces of cyclones and heavy rains. Many of the rural people are very poor. Some large rice producing irrigation schemes have been constructed over the last fifty years. These irrigation schemes have not delivered the promise of high yields and increased incomes for various reasons, of which some are insufficient maintenance, heavy sediment loading as a consequence of upstream erosion and flooding. These irrigation schemes have attracted migrants from other parts of the country. A part of the farmers have land in the irrigation schemes and often also have land in the watersheds surrounding the irrigation schemes. Other farmers have only land in the surrounding watersheds. Madagascar has a high natural erosion rate, as a consequence of its soil types and heavy rainfall, often linked to cyclones. This high

natural erosion rate has been exacerbated by deforestation of erosion prone fragile soils, frequent bush fires and unsustainable agricultural practices in the watersheds, which made most of the watershed soils infertile and marginal for agricultural and livestock production. Livestock grazing makes it necessary to frequently burn low quality pastures, which lead to strongly aggravates land degradation and manmade erosion in the watersheds. 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 upper and lower watersheds in three of the selected 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 Lake Alaotra Ramsar site. In Itasy agriculture is practiced on very steep slopes, which are in other places are obligatory kept under a forest cover to minimize erosion. Slash and burn agriculture is still practiced mainly at the Andapa site. These unsustainable agricultural practices together have exacerbated the already high natural erosion rates. Downstream irrigation schemes have been over time exposed to increasingly severe sedimentation and flooding, severely hampering irrigated rice production and increasing poverty. The impact of the environment on the agricultural production systems is severe. This situation was made worse by the absence of adequate maintenance of these schemes.

The Madagascar Irrigation and Watershed Management Project has as an objective to reverse this trend by rehabilitating, improving the management of and increasing the production in the existing irrigation schemes in the four selected project sites and by stabilizing or reversing land degradation in the watersheds through the promotion of more sustainable and higher productive agro-ecological practices. It is expected that these agro-ecological practices will reduce soil erosion and over time will reduce sedimentation in the downstream irrigation schemes. On a short term basis it is expected that these agro-ecological practices will significantly increase agricultural production of traditional and new crops in the watersheds and reduce poverty. One of the requirements for increased production will be the integration of agriculture and livestock (use of dung as fertilizer and organic soil conditioner). It is also expected that intensified agricultural practices will reduce or stabilize agricultural expansion and reduce the pressure on the remaining high biodiversity resources in the upper watersheds and on the marshlands in Lake Alaotra.

It is expected that the project will have mostly beneficial environmental and social impacts. One of the project components is the watershed management component, which would normally be the Environmental and Social Management Plan (ESMP). The environmental and social management measures have been almost fully integrated into the project component designs. The beneficial environmental and social impacts have been demonstrated by the Regional Environmental and Social Assessment (RESA) prepared by the borrower. The main positive environmental impact will be the improvement in environmental services of the watersheds through the adoption of agro-ecological production systems and improved management of pastures, which will stabilize or reduce erosion rates, and increase agricultural production and incomes.

However, intensified agricultural production needs more inputs in the form of chemical fertilizers and pesticides. The borrower has 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.

Irrigation schemes in Madagascar are 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) has included measures to reduce these diseases in order not to impair the production capacity of the farmers and improve their quality of life.

The major potential environmental risk would be that through the success of the project by increasing agricultural production in the watersheds, the influx of migrants from other areas of Madagascar

would be stimulated. These migrants would increase the already high pressure on land in the four project watershed areas, which could lead to further deforestation in the high biodiversity sites, and further clearing of reed lands in Lake Alaotra for rice production. The increased influx of migrants into the fragile watersheds could also lead to increased use of steep hills for agricultural production, which could again increase erosion rates. This is why land zoning and the empowerment of farmers and farmer's groups to manage these lands are of fundamental importance. The transfer of land management to these groups would regulate the natural resource base of the watersheds to newcomers and facilitate improved sustainable management of these resources.

## 6. Safeguard Policies

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

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. The project activities itself will have mostly positive environmental and social impacts. Environmental management measures are almost completely integrated into project design. As explained above the project will through the adoption of intensified agro-ecological practices, integration of agriculture and livestock and improved pasture management try to contain the agriculture frontier and reduce pressure on the high biodiversity sites in the upper watersheds (see above). However, increased use of fertilizers and pesticides will have negative impacts on the Lac Alaotra Ramsar site, Lake Itasy, the mangrove habitats in the Maravoay area and the Lokoho River in Andapa. In many areas river and lake water is used for drinking purposes.

The following World Bank Safeguard Policies were triggered:

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

**Environmental Assessment, Natural Habitat and Forests.** To address these Safeguard Policies the borrower prepared a Regional Environmental and Social Assessment (RESA) and a Pest and Pesticide Management Plan (PPMP) both disclosed at the project sites, in the country and in the Infoshop in Washington prior to appraisal. Agro-ecological production systems and improved pasture management will be promoted in the watersheds, including on the degraded and deforested soils. Sites where large amounts of sediments originate and which affect the downstream irrigation schemes will have priority. By preparing and implementing a land use zoning plan and transferring the management of land in the watersheds to communities it is expected to change the watershed from an open access natural resource to a regulated access natural resource, where migrants cannot any longer settle freely. Through intensification of the watershed agricultural systems and a change to higher productive and less erosion prone agro-ecological practices it is 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.

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

The project will also finance sub-projects, such as check dams, anti-erosion structures, small irrigation dams, markets or other structures. These sub-projects will be screened for environmental and social impacts by the Technical Secretariat of the Matching Grant Mechanism, to be financed under the project and identify if a RAP and/or a small EA study as part of the feasibility will be needed.

**Pest Management.** The Pest Management Policy OP/BP 4.09 has been addressed through the preparation and disclosure of the Pest and Pesticide Management Plan (PPMP) by the borrower. This 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 pesticides used for malaria control in the project areas. This PPMP will also promote the development and establishment of Integrated Pest Management Practices (IPM).

**Involuntary Resettlement.** The Involuntary Resettlement Safeguard Policy has been addressed through the preparation and disclosure of a Resettlement Policy Framework (RPF) by the borrower. It is expected that resettlement, land acquisition or that people will lose access to traditional natural resources will occur at a limited scale. If this will be the case a Resettlement Action Plan (RAP) will be prepared to ensure that people are fully compensated (replacement costs) and will not be worse before the project intervened. Sub-projects will be screened and it will be identified if a RAP will be required (see also under Environmental Assessment).

**Safety of Dams.** The Safety of Dams Safeguard Policy is not triggered. The project will rehabilitate an irrigation reservoir (take out the sediment). 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.

**Analysis of alternatives.** Feasible alternatives are the no project alternative and the project 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 negative impacts on the globally significant biodiversity sites and over-time eventually likely abandonment of these agro-ecosystems. The alternative without the watershed management component would leave the irrigation systems exposed to large sediment loads, which would endanger the investments made in the irrigation schemes.

**Public consultation.** Public consultation has been carried out on the Terms of Reference of the Regional Environmental and Social Assessment and on the draft report. This is conform OP 4.01. Public consultation has also been carried out during the preparation of the RPF. This is conform OP 4.12.

**Borrower capacity and Implementation and monitoring of ESMP.** The borrower's capacity to supervise the implementation and monitor the implementation of the Environmental and Social Management Plan (ESMP) has to be strengthened. One of the Technical Assistance to financed under the project needs to be qualified in environmental and social management and will be responsible for the adequate implementation and monitoring of the implementation of the ESMP as part of his or her responsibility.

Parts of the ESMP will be implemented by service providers under contract. If needed the capacity of these service providers will be strengthened.

**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 the capital and in the Infoshop in Washington prior to appraisal.

**7. Status of Preparation (Checklist)**

**8. Conformity (Checklist)**

## **MADAGASCAR: Watersheds - Irrigated Perimeters (BV-PI) Management Project**

### **Annex 1: NATIONAL, SECTORAL AND PROGRAM CONTEXT**

(Second version - 26 November 2005)

#### **A. National and Sectoral Context**

The Island of Madagascar covers a total area of 588.841 km<sup>2</sup>. The population, estimated at 16.4 million inhabitants in 2003, is increasing at an annual rate of about 2.8%. Nearly 78% 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 about USD 240: poverty affects about 69%<sup>5</sup> of the total population and 85% of the rural population. Households that live mainly on agriculture is the only category whose economic situation has not improved since 1993.

#### ***Poverty Reduction Strategic Framework***

The development objective for Madagascar as defined in the Poverty Reduction Strategic Framework (PRSF/PRSP, July 2003), is to promote a rapid and sustainable development with the aim to reduce by half the poverty rate within ten years. It is organized around three strategic orientations: (1) restoring the rule of law and a well governed society; (2) foster and encourage broad-based economic growth; and (3) foster and encourage systems for ensuring human and material security and enlarged social protection. The second strategic orientation of the PRSF/PRSP targets five general objectives: (i) to reach an economic growth rate of 8 - 10% per annum; (ii) to increase the level of investment to 20%; (iii) foster the dynamism of the private sector so that it participates in an investment rate of 12 - 14% to the investment rate; (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.

The PRSF/PRSP implementation programs concerning agriculture will essentially aim at "ensuring food security and making optimal use of resources", through five objectives: (i) to increase agricultural productivity and cultivated areas; (ii) to promote small-scale investments in rural areas and partnership between farmers' associations and the private sector; (iii) to promote agricultural and agro-food exports and improve their quality; (iv) to ensure transparent and rational management of resources to guarantee their sustainability; and (v) to facilitate producers' access to land capital. Each specific objective corresponds to an investment program regrouping several clearly identified actions. Programs under the first objective include: development of irrigated schemes and surrounding watersheds.

#### ***Agriculture, rice, and irrigation***

Rice represents nearly 70% of agricultural production and accounts for 48 percent of total calorie consumption. Rice production has only increased by 1.2% 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. Until recently, the vast difference in prices between wet and dry season was explained by the lack of fluidity in movement of goods from

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<sup>5</sup> Latest figure available on poverty rate, in 2001. However, it is estimated that this poverty rate increased to 73%, following the 2002 crisis.

production areas to the markets due to a lack of road infrastructure and lack management capacity of storage facilities by farmers. On average, 28% 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.

Irrigation occupies an important place in the agricultural sector, supplying water to more than one million hectares, or 40% of cultivated lands (as compared to 6% on average in sub-Saharan Africa). Irrigated crops represent 15% of GDP, whereas 70% of agricultural production and 88% of rice production originate from irrigated agriculture. It is estimated that 85% 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.

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***

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 (*agro-écologie*) have demonstrated that it is possible to achieve the dual objective of higher productivity and reduced soil degradation and erosion.

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 should be 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 Commune<sup>6</sup>.

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.

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) will be established in the regions. These DSCs will be 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. A first DSC will be established in January 2006 in Itasy Region.

### ***Land tenure security***

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.

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.

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) training. This policy is being implemented under the National Land Management Program, which is already supporting, on pilot basis, several decentralized land management experiences, with support from several donor agencies.

## **B. Lessons learned**

Previous attempts to boost agricultural production through investments in irrigation infrastructure have been unsuccessful, in particular with respect to the sustainability of the investment. The *reasons for these failures* 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.

The majority of Malagasy farms only derived meagre profit the intensification technical options proposed, and average yields are still below the actual potential. Tradition, risk aversion, etc., only partially explain the failure of agricultural intensification. Other factors may be mentioned, such as: (i)

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<sup>6</sup> MDAT, July 2005: Review of local development programs in Madagascar, Document n°2 – Towards a national decentralization support policy.

low adapted response capacity of agricultural research-development at the request of farmers and their low level of organization and participation in the development process; (ii) poor counselling and technical support services (access and quality); (iii) land insecurity and inequitable sharing of profits, particularly by sharecroppers; and (iv) low tolerance of potential technologies to shocks. At the level of counselling support services, lessons from failures of the popularization (i.e. PNVA) including, among others: (i) an approach excessively focused on technical offer, (ii) poor consideration of demand and economic concerns, (iii) excessively centralized, with low regional identity, (iv) incompetent extension workers, (v) interventionist/rigid approaches and low level of partnerships and empowerment of beneficiaries, and (vi) unrealistic projections of public support capacities in terms of human resources and financial sustainability.

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

The *BV-PI integrated approach* is a “win-win” approach, which, at the same time helps to increase productivity and incomes in irrigated perimeters and surroundings watersheds, conserve natural resources in watersheds, limit erosion and therefore damages and silting up in the irrigated perimeters as well as reducing needs for maintenance and rehabilitation of the latter.

An *attractive economic environment* implies: (i) a policy on prices of agricultural products (rice?) and inputs; (ii) access to markets in terms of isolation, information, promotion of the private (competition) and associative sector for marketing (including storage) and supply of inputs; (iii) access to efficient technico-economic agricultural services adapted to local needs; and (iv) access to funding/credit.

*Clear institutional framework*: clear institutional responsibilities in line with Government policies (decentralization...) and (land, water codes, forestry...) regulations for producers/users and their associations; the districts, inter-communal and regions; decentralized services of the State; specialized agencies and authorities (ANDEA, etc.); and private operators.

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

The improvement of infrastructures of irrigated perimeters and establishment of sustainable mechanisms for funding their maintenance will not be enough to increase rice production beyond about 3.5 t/ha, which is still low compared to the technical potential. Hence, promotion of intensification of rice production systems in IPs (SRA/SRI), including areas with poor control over water resources (poly-adapted varieties). 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 less cost; (ii) improvement of infiltration, efficient management of water on slopy lands; (iii) sustainable improvement of soil fertility and productivity on slopy lands; and (iv) indirect contribution to sequestration of carbon and reduction of the greenhouse effect. Finally, diversification of agricultural production systems, including off-season production, geared towards high value-added sectors, and local improvement of quality productions will help to improve the income and living conditions of farmers, as well as facilitating their greater participation in the funding of maintenance of hydro-agricultural infrastructures.

*Addressing local or regional diversities* in terms of natural, social, economic and physical resources is essential for ensuring sustainable and appropriate agricultural development by local partners. Success in the duration of a program largely depends on its level of replication and ownership of the progress themes by target groups: consequently, restructuring the rural world and strengthening dialogue and decision-making capacity of the peasant community constitute the cornerstones of actual participation.

The Irrigation infrastructures are highly sensitive to *damages caused by cyclones*. This risk should be incorporated into the investment costs, and the resources and mechanisms for ensuring sustainable management and maintenance of infrastructures should be mobilized and put in place. Concerning rehabilitation of hydro-agricultural irrigation schemes, the first challenge is efficiently taking into account in the decision-making process, *real costs of irrigation, its social acceptability and its protection*. To ensure a reasonable level of commitments in terms of resources, progress should no doubt be looked for in optimization of the farming systems in place given the existing conditions (at less cost) of access to water and land, and appreciation of the products, rather than in prior search for total control of water.

### **C. National Watersheds – Irrigated Perimeters Management Program**

The *National Watersheds – Irrigated Perimeters Management Program* (PN/BV-PI) is part of programs under the PRSF/PRSP aimed at reducing rural poverty through sustainable improvement in the living conditions and incomes of rural populations in irrigated perimeters and surrounding watersheds, and efficient development of natural resources.

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 irrigated perimeters and surrounding watersheds (farmers, water users, professional associations, districts and inter-communities, regions, central State); (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 everybody respects their commitments.

One of the key objectives of the first phase of the PN/BV-PI, of which the project, funded by IDA and FEM constitutes a major part, is to put in place a clear and attractive institutional environment as well as the necessary 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.

### **D. Project Zones**

#### ***Marovoay***

The Marovoay plains is a rice production zone of prime national importance, situated in the Boina Region, about 80 km South-East of Mahajanga town. 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 20<sup>th</sup> Century for off-season rice production (once the water-level has dropped). To the gravity systems fed by derivation and storage dams on the watercourse have been added perimeters supplied through pumping from River Betsiboka. The perimeter is divided into 13 completely independent irrigation sectors, fed from a great number of different sources. The entire system is obsolete, irrational and inefficient. 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.

The State assumed responsibility for the servicing, maintenance and rehabilitation of irrigation schemes (and part of the pumps) until recently. Presently, State funds for maintenance of structures considered as 'non transferable' are uncertain. Restructuring into users associations, unions of associations and federations has not resulted in the establishment of an adequately operational mechanism for obtaining a physical and financial sponsorship for works they are supposed to finance. The contract plan signed with the federation for the period 2001-2003 was not renewed and funds programd for 2004 were reallocated. The submersion of perimeters by waters from the river requires annual rehabilitation of the irrigation systems, thus making the maintenance expensive and the overall economic profitability uncertain.

The main watershed serving the Marovoay irrigated perimeters is that of River Betsiboka, whose hydrology is determined by phenomena occurring some hundreds of km from the site. 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, silting-up and destruction of protection and distribution structures alongside irrigated perimeters.

### ***Itasy***

Itasy Region, with Lac Itasy in the centre, is situated about 100 km to the West of Antananarivo. All irrigated perimeters 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, due to the lack of a complex structure considered as non-transferable. The region offers great potential for agricultural production, given the natural fertility of (volcanic, basal and alluvial) soils and favourable climate for agricultural diversification.

The high concentration of population in the zone (107 inhabitants/km<sup>2</sup> on the average) has caused problems of gradual over-exploitation of upstream tanety of irrigated perimeters. The deforestation of watersheds caused by annual bushfires, uncontrolled exploitation of the tanety for rain-fed crops and grazing of zebus, causing major problems of erosion and silting-up of the rivers, irrigation systems and rice farms in the irrigated perimeters situated upstream.

Although most of these perimeters benefited from projects implemented from 1998 to 2000 (project PPI 2), they are currently facing serious problems as regards the functioning of the irrigation and drainage systems, due either to erosion of Watersheds or lack of maintenance of the systems, or conception or choking of the structures that are no longer adequate, given the change in the flow regime of the rivers (increase in flood flow and reduction of dry-weather flow). Hence, 30 - 50% of the perimeters are no longer adequately irrigated. Given these problems, the 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 upstream sectors of the irrigated perimeters.

### ***Andapa***

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 tanety, 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 boarded in the North-East by Marojejy National Park, in the South-East by Anjananaribe South Special Natural Reserve, the only forest zone of the basin where tree cutting is still authorized, though regulated.

From 1962 - 1997, the Andapa basin 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. Besides, the agricultural component focussed on development of rice farms on a total area of 4400 ha, introduction of double season rice cultivation, measures aimed at improving collection and marketing, and a popularization and diversification program. In 1979, the State Company "Andapa Mamokatra" took over as the organization in charge of the Andapa basin development project. The impact of the project was severely judged in 1998, during the evaluation of the action of EDF, 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 total disorganization of the AWUs; (iv) failure of intensification attempts.

### ***Lac Alaotra –Sahamaloto Irrigated Perimeter***

The Lac Alaotra watershed forms a vast depression of around 1.750 km<sup>2</sup>, 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 km<sup>2</sup> (free water surface) and around 550 km<sup>2</sup> 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 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 case history of the zone is marked by structures intervention of the mixed company SOMALAC (1962-1981) which constructed the hydro-agricultural facilities, then popularization, processing and marketing activities. Transformed into a socialist enterprise from 1982 to 1991, SOMALAC, accompanied by implementation of intensification projects, ensured the maintenance of irrigation systems and coordination of the rehabilitation works carried out between 1984 and 1989, with notably the creation of water users associations (1989-1991).

The watershed supplying Sahamaloto irrigated perimeter stretches over an area of 356 km<sup>2</sup>. The irrigated perimeter has a developed area of 6400 ha, of which 80% is cultivated when the rainfall conditions are favourable. The area is gravity, supplied by a storage dam, whose reservoir was constructed in 1957. The initial storage capacity of 26 million m<sup>3</sup>, was gradually reduced to about 13-14 million m<sup>3</sup>. The perimeter was fully rehabilitated in 1988-1989, including the construction of a new intake tower, to increase the volume of storage water to 18 million m<sup>3</sup>. Emergency repair and rehabilitation works were initiated in 1998-1999, but some works could not be completed, due to defaults on the part of the enterprise carrying out the works.

The 12 federated WUAs of the irrigated perimeter, with a total of 1800 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. On the other hand, 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% of amounts voted.

### **F. Rehabilitation of hydro-agricultural Infrastructures in the Project Zones**

The definition of a priority investment program demands that we define the ranking criteria for determining priority interventions. The following three levels are defined. *Level 1* intervention consists in resolving the problems that are of capital importance to the entire area. The rehabilitation of infrastructures classified 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 perimeters during raining season lost through faulty 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 do not concern primary infrastructures: control dam and diversion sills, supply channels, *caput-mortuum* canal, main drainage systems, or flood protection dyke.

*Level 2* intervention consists in acting on structures or mechanisms 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.

*Level 3* intervention consists in acting on the structures with a view to boosting agricultural production either by improving water control (irrigation and drainage), or increasing the cultivable perimeter of a season so far unexploited. It involves earth roads whose state hampers the marketing of agricultural production, works on secondary canals, and eventually tertiary canals.

Table 1 presents the estimated costs of rehabilitation works, including the Sahamaloto perimeter of Lac Alaotra – a reserve site. These costs are borne by the enterprise, i.e. the manual contribution by the user is not included in the estimates.

It is important not to focus solely on total amounts. Hence, the major budgetary orientations presented in this table are as follows: (i) by adding the Sahamaloto perimeter at Lac Alaotra, a reserve site, 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% concerns priority 1 works, 27% priority 2, and 8% priority 3; (iii) on the other hand, for the Sahamaloto perimeter at Lac Alaotra, 71% concerns priority 3 works; 29% priority 2, and 0% priority 1; (iv) for all eventual intervention zones, 50% concerns priority 1 works, 28% priority 2, and 21% priority 3.

It should also be noted that the Marovoay pumping stations and their primary system, whose pluri-annual rehabilitation falls under priority 1 – without it being considered as a technical recommendation – accounts for 50% of the total rehabilitation budget for the Marovoay zone. On the other hand, the Ampary perimeter (90 ha) of Itasy zone which should normally be included, is not included.

It is proposed that the project should not totally finance the rehabilitation of works that the users should cater for in the future. The contribution of users will be equal to that should pay in the future for management and maintenance of these structures. In that regard, the envelope 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 1. 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 Aloatra	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

World Bank				
Project	Sector Issue Addressed	Impl. Status	Performance Ratings	
			(IP)	(DO)
Third Environment Programme	Biodiversity	Active	MS	MS
Rural Energy	Climate Change	Proposed		
Other Agencies				
Environment Program Support Project	UNDP	CEO approved		
Participatory Community-based Conservation in the Anjozorobe Forest Corridor	UNDP	CEO approved		
Wind and Hydro Energy Market Development	UNEP	Proposed		
BV-LAC	AFD	Active		
Bassins versants	AFD	Proposed		
Basse Mangoky	AfDB	active		
Bassins versants (titre à vérifier)	JICA	active		
ACORD	EU	active		
Energie Andapa/Sambava (titre à vérifier)	GTZ	proposed		

## MADAGASCAR: Watershed Management Project (BV-PI)

### Annex 3: RESULT AND MONITORING FRAMEWORK

#### A. Result Framework

Overall Objective of National Program BV-PI																																
Improve on a sustainable basis rural population living conditions and incomes in watersheds including irrigated schemes and better use of natural resources																																
Development Objective of Project BV-PI	Result Indicators	Use of Result Information																														
Sustainable improvement of agricultural productivity in four high potential watersheds and irrigated schemes	<ul style="list-style-type: none"> <li>• Increased average productivity of irrigated rice in the project areas (MT/ha): <table style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;"><u>From 2006</u></th> <th style="text-align: center;"><u>to 2013</u></th> </tr> </thead> <tbody> <tr> <td>Andapa</td> <td style="text-align: center;">xxx</td> <td style="text-align: center;">xxx</td> </tr> <tr> <td>Marovay</td> <td style="text-align: center;">xxx</td> <td style="text-align: center;">xxx</td> </tr> <tr> <td>Lac Alaotra</td> <td style="text-align: center;">xxx</td> <td style="text-align: center;">xxx</td> </tr> <tr> <td>Itasy</td> <td style="text-align: center;">xxx</td> <td style="text-align: center;">xxx</td> </tr> </tbody> </table> </li> <li>• Increased average productivity of rain fed rice in project areas (MT/ha): <table style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;"><u>From 2006</u></th> <th style="text-align: center;"><u>To 2013</u></th> </tr> </thead> <tbody> <tr> <td>Andapa</td> <td style="text-align: center;">xxx</td> <td style="text-align: center;">xxx</td> </tr> <tr> <td>Marovay</td> <td style="text-align: center;">xxx</td> <td style="text-align: center;">xxx</td> </tr> <tr> <td>Lac Alaotra</td> <td style="text-align: center;">xxx</td> <td style="text-align: center;">xxx</td> </tr> <tr> <td>Itasy</td> <td style="text-align: center;">xxx</td> <td style="text-align: center;">xxx</td> </tr> </tbody> </table> </li> <li>• Percentage increase in non rice Area /overall area out to production for the two seasons in irrigated areas in 7 years</li> <li>• Percentage increase in area operated in counter season /overall area in irrigated schemes in 7 years</li> <li>• 30% in area of land under sustainable management<sup>7</sup> in 7 years in targeted project intervention areas</li> </ul>		<u>From 2006</u>	<u>to 2013</u>	Andapa	xxx	xxx	Marovay	xxx	xxx	Lac Alaotra	xxx	xxx	Itasy	xxx	xxx		<u>From 2006</u>	<u>To 2013</u>	Andapa	xxx	xxx	Marovay	xxx	xxx	Lac Alaotra	xxx	xxx	Itasy	xxx	xxx	<p>Year 1 : confirm zero status</p> <p>Year 3 : confirm Progress after rehabilitation of irrigation systems, and adjust support strategy if required</p> <p>Year 7 : measure project impact</p>
	<u>From 2006</u>	<u>to 2013</u>																														
Andapa	xxx	xxx																														
Marovay	xxx	xxx																														
Lac Alaotra	xxx	xxx																														
Itasy	xxx	xxx																														
	<u>From 2006</u>	<u>To 2013</u>																														
Andapa	xxx	xxx																														
Marovay	xxx	xxx																														
Lac Alaotra	xxx	xxx																														
Itasy	xxx	xxx																														
Overall Environment Objective of Project BV-PI	Result Indicators																															
Reconstitute and maintain the functions of critical ecosystems in targeted watersheds by reducing and preventing soil degradation	<ul style="list-style-type: none"> <li>• 30 % reduced burnt areas in target areas in 7 years.</li> <li>• 25% increase in vegetation cover <sup>8</sup></li> </ul>																															

<sup>7</sup> Index made up of (a) managed reforestation area ; (b) improved pasture area ; (c) reduced bushfire area ; (d) reduced deforestation area and marsh destruction areas ; (e ) area of sloping land operated under profitable and sustainable production system (agro ecological or agro forest techniques).

<sup>8</sup> including reforested area, and area with improved biomass production in agricultural, pastoral and agroforestry systems

Interim Results	Result Indicators	Use of Results Monitoring
<p><b>Result 1 : Agricultural Development</b></p> <p>Intensification, marketing, and diversification of buoyant agricultural clusters in project target areas</p>	<p><b>Result 1 :</b></p> <ul style="list-style-type: none"> <li>• Number of OPs, unions and federations of active producers recorded among CSA</li> <li>• % increase in volume of credit allocated to agricultural investment by MFIs and commercial banks in 7 years.</li> <li>• % increase in ratio of agricultural production marketed by local households in 7 years</li> <li>• % increase in quantity of (a) improved seeds and (b) fertilizers sold to agriculturists in 7 years</li> <li>• Number of contracts signed and executed between producers and agro industrial distributors and volume of products marketed through this channel.</li> </ul>	<p><b>Results 1-3 :</b></p> <p>Year 1-2, 4, 6 : monitor progress of indicators on an annual basis</p> <p>Year 3 and 5: assess and adjust component strategy if required ; integrate investment funds in FDL/FDA</p> <p>Year 7 : assess lessons for extending program at national level</p>
<p><b>Result 2 : Irrigation Development</b></p> <p>Better control, use, and sustainability of irrigated schemes targeted through infrastructure rehabilitation, incentive systems, and capacity building among Water User Associations.</p>	<p><b>Result 2 :</b></p> <ul style="list-style-type: none"> <li>• Increase in area irrigated in rainy season and in dry season (ha)</li> <li>• 100% signing second phase performance contracts with WUAs</li> <li>• 100% of operating and maintenance funds covered by fees collected in irrigated schemes</li> </ul>	
<p><b>Result 3 : Watershed Management</b></p> <p>Make target watershed populations accountable and urge them to manage soils and natural and water resources in a sustainable way.</p>	<p><b>Result 3:</b></p> <ul style="list-style-type: none"> <li>• 20% of targeted watershed areas under legally transferred management systems</li> <li>• 40% of target communes assessed as ‘green communes’</li> <li>• 1 Master watershed management plan per project site developed and adopted</li> <li>• 30 participatory sub-watershed management plans developed and adopted</li> </ul>	
<p><b>Component 4 : Program Management</b></p> <p>Use of Project resources complying with agreed objects and procedures, and setting up a policy framework that is favorable to extending the program to the national level</p>	<p><b>Result 4 :</b></p> <ul style="list-style-type: none"> <li>• Satisfactory financial and technical audits</li> <li>• National input and seed Policy adopted and implemented</li> <li>• Program BV/PI clearly in keeping with MAEP medium term expenditure framework</li> </ul>	<p><b>Result 4 :</b></p> <p>Review financial audits on an annual basis</p> <p>Years 3, 5, 7 : Technical Audits and adjustments</p>

**B. Arrangements for Results Monitoring**

	Target Values								Data Collection and Reporting		
Outcome Indicators	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	YR7	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
Average productivity in irrigated rice in project areas (MT/ha) : Andapa Itasy Lac Alaotra Maroavay Overall increase in % of rice productivity	0%	5%	10%	20%	30%	40%	50%	50%	On an annual basis, Annual Progress Reports and Fourth Quarter Reports (T4)	Samples	DRDR and TA
Average productivity in rain fed rice in project areas (MT/ha) Andapa Itasy Lac Alaotra Maroavay Overall increase in % of productivity	0%	5%	10%	20%	30%	40%	50%	50%	On an annual basis, Annual Progress Reports and Fourth Quarter Reports (T4)	Samples	DRDR and TA
Increase in non rice /rice surface	40%	50%	50%	50%	60%	60%	60%	60%	Years 3, 5 and 7	Satellite picture	Contracted
40% in area of land under sustainable management <sup>9</sup> in 7 years in targeted project intervention areas	0%	0%	5%	15%	20%	30%	35%	40%	Years 3, 5 and 7	Satellite picture	Contracted
30 % reduced burnt areas in target areas in 7 years.	0%	0%	3%	10%	15%	20%	25%	30%	On an annual basis	EP3 Appraisal Reports	DGEF/CI/Jariala
25% increase in vegetation cover <sup>10</sup>	0%	0%	0%	5%	10%	15%	20%	25%	Years 3, 5 and 7	Satellite picture and PS checking	Contracted
<b>Results Indicators for Each Component</b>											
Component one : Number of OPs, unions and federations of active producers recorded among CSA/district									On an annual basis, Annual Progress Reports and Fourth Quarter Reports (T4)	Registers of CSAs	CSA

<sup>9</sup> 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 (agro ecological or agro forest techniques).

<sup>10</sup> including reforested area, and area with improved biomass production in agricultural, pastoral and agroforestry systems

Andapa Itasy Lac Alaotra Maroavay											
Increase in volume of credit allocated to agricultural investment (%)									On an annual basis	Data from MFIs and banks	DGDR and TA
Increase in ratio of agricultural production marketed by local households (%)									Years 3, 5 and 7	Survey	Contracted



<b>Component four :</b> Satisfactory financial and technical audits									On an annual basis (financial) Years 3, 5 and 7 (technical)	Audit Reports	World bank supervision mission
National input and seed policy adopted and implemented									On an annual basis	Approved Policy Reports	World bank supervision mission
Program BV/PI clearly in keeping with MAEP medium term expenditure framework									On an annual basis	MAEP Budget	World bank supervision mission

## MADAGASCAR: Watershed Management Project

### Annex 4: DETAILED PROJECT DESCRIPTION

(Fourth Version – 15 February 2006)

#### A. Project Objective, Outcomes and Components

*The project development objective is to increase agricultural production in a sustainable way in the four high development potential watersheds and the related irrigated schemes.*

The *project results* are: (i) average 50% increase in agricultural production both in irrigation and in rain fed in the four project sites, (ii) **xxx** percent increase in 7 years in non rice growing area/ overall area put into production for both seasons in irrigated areas, (iii) **xxx** percent increase in 7 years in counter season operated area/ overall area in irrigated schemes, and (iii) **xxx** percent increase in area of land under sustainable land management<sup>11</sup> in the four project sites.

The global environment objective is to restore and maintain critical ecosystem functions in watersheds by reducing and preventing land degradation. The interim results are (a) **xxx** percent reduction in burnt surfaces, (b) **xxx** ha reforested and revegetated .

The project concept is based on the following principles: (i) refocusing the Government action on its state mandate; (ii) participatory approach based upon beneficiary request; (iii) clarifying beneficiary roles and responsibilities, in line with national policies and in accordance with subsidiarity principle; (iv) establishing contracts for partnerships and service provisions, and (v) establishing an incentive framework for intensifying beneficiary agricultural production.

The proposed project includes three technical components covering three strategic orientations: (i) agricultural development, (ii) irrigation development, (iii), watershed development, and (v) program management. In line with the « integrated rural poles » approach, the project proposes four similar subprojects in the four regions involved: Andapa, Marovoay, Région Itasy, and Lac Alaotra – the Sahamaloto irrigation scheme (Annex 1).

The four sites have been selected based on their accessibility, availability of agricultural services and potential for increased productivity through improved water management. In addition, public irrigation schemes are characterized by serious institutional weakness, lack of transparency as regards partner roles and responsibilities, and degrading watersheds. The rationale is for an approach which will be set over a number of sites that was initially limited in view of the integrated approach which is potentially complex.

#### B. Component 1: Agricultural Development

*(US\$20.1m, including IDA contribution of US\$18.8 million, GEF contribution of US\$1.3 million)*

*The objective for this component is to improve market access and to sustainably intensify and diversify irrigated and rainfed agricultural systems in the project's watersheds.*

The 'Agricultural Development' 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 by subcomponent 3.2. Its specific objective will be achieved by favoring an

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<sup>11</sup> Index made up of (a) managed reforestation area ; (b) improved pasture area ; (c) reduced burned area ; (d) reduced deforestation area and marsh destruction areas ; (e ) area of sloping land operated under profitable and sustainable production system (agro-ecological or agroforestry techniques).

approach focused on demand by buoyant markets, initiative by private operators and vertical integration of clusters through promoting partnerships among actors, including public private partnerships (PPP).

The component will aim at improving, all along the targeted supply chains, the following:

- Market access : marketing infrastructure, price information system;
- Marketing system to reduce costs and increase on farm prices ;
- Added value through diversification of productions in favor of speculations with more added value and transformation ;
- Productivity on operating through access to guidance, inputs, and credit.

The estimates of targeted areas in terms of rice intensification and sustainable diversification in rain fed production (agro ecological, etc.) and counter season (including private irrigation) are as follows:

	PI (ha cultivated)	Rain fed/ Agro-cultivation	Counter-season cultivation	Targeted Households	
	RBME /a	RMME	Ecological (ha)	season (ha)	(estimate)
Itasy	4,300	5-7,000	2,450	3-5,000	10,000
Sahamoloto	6,000	2-3,000	350	250-500	10,000
Marovoay	15,860	4,500	550	500	10,000
Andape	3,150	5-7,000	900	2-3,000	10,000
<b>TOTAL</b>	<b>29,310</b>	<b>16,500-21,500</b>	<b>4,250</b>	<b>5-8,000</b>	<b>40,000</b>

/a: Rehabilitated physical areas (see RDC-IRAM study) x use intensity.

RBME = rice with good water control / RMME= rice with poor water control)

Direct beneficiaries from the agricultural development component are:

Area	Itasy	Sahamaloto	Marovoay	Andapa
Number of communes	10	3/8?	9	12
Number of targeted farmers/ operators	10,000	5-10,000	10,000	10,000
Number of grassroots OPA	75-150	75-150	75-150	75-150
Number of unions	12-15	7-10	11-13	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	9-15	12-20
Areas under seed multiplication	50	30	70	40
Inputs Suppliers	3	3	3	3
Equipment Suppliers	2	2	2	2
Blacksmiths/mechanics (2/commune)	20	16	18	24
Agro-industrial and commercial operators	45	45	28	28

*Interim results* are (i) increase by xxx in 7 years of the number of POs, unions, and federations of active producers, who are registered with a CSA, (ii) increase by xxx percent in 7 years of productivity of selected supply chains (rice, etc.), (iii) increase by xxx percent in 7 years of the volume of credit allocated to agricultural investment by MFIs and commercial banks, (iv) increase by xxx percent in 7 years in the share of agricultural production that is marketed by farmers, (v) increase by xxx percent in 7 years in the quantities of improved seeds and fertilizers sold to farmers, and (vi) signature of xxx contracts/partnership agreements between producers

*Critical risks* include : (i) capacity among producers and their organizations to meet technologies supply and to and to manage the support-guidance scheme ; (ii) the will among private operators to invest directly in long term contractual relations with agricultural producers; et (iii) maintaining and strengthening incentive policies from the State in favor of agricultural private sector.

### **Sub-component 1.1: Support to agricultural services and infrastructure.**

The aim in this subcomponent is to foster the development of agricultural production by implementing innovative technologies for production, storage and processing of agricultural products, by improving access to markets, and by supporting the development of commercial agricultural supply chains. Investment under this subcomponent will be 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. The project will finance 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 will recruit for each site one or several professional service providers for promoting market-driven supply chains. The project will as much as possible use 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 CHTT and CTHA. Such service providers will be 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 operators, who are eligible, 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.
- (b) *Building the capacities of farmers and strengthening of professional organizations,* as well as the establishment of agricultural service centers (CSA). The project will seek at building professional and institutional capacity among farmer organizations (OPA, GIE, TT, etc.), their federations. The project will finance the establishment of CSAs as an interface, at district level, between supply and demand in support guidance services demand. Each CSA will include a small technical team and platform (decision making body) grouping farmer organizations, the private sector, the government, the local authorities and the strategic partners at district level. The project will finance light work for rehabilitating offices, equipment and traveling means, training and CSA operating (staff and operating fees, etc.), among the 5 CSAs in the BVPI area, as well as operating and the platform.
- (c) *Strengthening the offer of technology for production and valorization of agricultural products.* particularly technologies geared at stimulating intensification of rice cultivation on irrigated perimeters, promoting the adaptation of agro-ecological cultivation techniques<sup>12</sup> to sustainable rain-fed production systems and diversification of production systems for targeted and priority supply chains, including for livestock production. The project will support: (i) service providers for adaptive research and dissemination of improved technologies identified as priorities by the partners, and (ii) the reinforcement of capacities of regional public services for seed quality control and phyto-and zoo-sanitary control.
- (d) *Land tenure windows and public infrastructure.* The project will finance the setup of (inter)commune land tenure windows in charge of what follows : (i) recording the acknowledgement of ‘non titled property rights’ and land tenure transactions (inheritance, sale, transfers,...); (ii) regularizing rights regarding land ‘which have become State-owned land’ ; (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 will subcontract the implementation of four land tenure windows (one in each intervention area) with the National land Program. It will also fund some public infrastructure that is critical for improving the flow, storage and marketing of agricultural

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<sup>12</sup> Cette composante comprend toutes les activités d’appui à l’intensification et à la diversification des systèmes de production agricoles à finalité productive, alors que la composante 3 inclut les activités agroécologiques dont la finalité, à court terme, est de restaurer les ressources naturelles voir environnementales.

products and, in particular, of marketable surpluses which are expected because of project interventions.

The sub-component will be implemented as follows. The project main implementing body will be DRDR. Detailed implementation modalities for each activity group in subcomponent 1 are specified in the table below:

Subcomponent	Implementation
Development of sustainable supply chains	Recruitment of one (or two) strategic partners, with DRDR contract
Capacity-building of producers and support to producers organizations	Recruitment of service providers by CSA
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
Improvement of public infrastructure, including establishing and operating CRIF and land tenure windows	By DRDR and communes with assistance from National Land Tenure Plan [Plan National Foncier (PNF)]

### **Sub-component 1.2: Support to Private Investment.**

The specific objective in this subcomponent is to link and upscale the *incentive and promotional activities* financed under subcomponent 1 (promoting commercial supply chains, strengthening POs, dissemination of technologies and research-development, building of critical public infrastructure) through support of *on demand* private investment by operators, farmers and farmers organizations at all levels of the supply chains. To such an end, the project will finance, under a cost sharing mechanism, the following individual or collective initiatives and sub-projects:

- |  |   |
|--|---|
| Support to marketing chains              | <ul style="list-style-type: none"> <li>• Market surveys, cluster surveys, developing quality and certification management systems; commercial/market trials</li> <li>• Infrastructure for grouping, storage and post-harvest treatment</li> <li>• Integrated projects for setting up contract-based agriculture systems to the benefit of small scale producers</li> </ul>  |
| Support to input and equipment providers | <ul style="list-style-type: none"> <li>• Establishing/extending networks for distributing inputs and equipment ;</li> <li>• Technical and management guidance (for example, technical and material capacity building among farmers in charge of seeds).</li> </ul>  |
| Support to productive investment         | <ul style="list-style-type: none"> <li>• Technical guidance and extending micro finance networks</li> <li>• Adaptive, agricultural, and agro industrial research (varieties, technologies and production and processing equipment) ;</li> <li>• Introduction/testing new agricultural production techniques (agro ecological techniques ...)</li> <li>• Awareness raising and demonstration campaign (inputs, equipment ...)</li> <li>• Rehabilitated seed production;</li> <li>• Reforestation and improvement of degraded soils.</li> </ul> |

The modalities of the cost sharing mechanism for financial assistance to private, individual or collective investment sub-projects corresponding to the broad objectives of the BVPI Project, are described below.

The project's implementation manual will include a list of eligible/non eligible activities, selected taking account of their potential contribution to project/government objectives. Eligible activities will

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 will be form of 20 to 80% of total cost, depending on the public good nature and to the degree of poverty of the beneficiaries. Proposals will be selected by a decision making body at regional level (Comité de Sélection, to be set up within GTDR). This committee will be in charge of approving requests for subsidy (see Annex 6, and the Projects’s Implementation Manual).

### C. Component 2: Irrigated Schemes

(US\$31.0millions including funding of US\$ 31,0 millions from IDA).

*The objective of this component is to improve 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... The aim of the component is to rehabilitate irrigation schemes which cover about 30, 000 hectares.*

The component will contribute to achieving the overall development objectives by improving the quality of irrigation services, thus creating an environment that is more favorable to using inputs, agricultural technologies and marketing. In so doing, the project will help initiate a virtuous circle for increased productivity, improved capacity for paying for O&M, and improved irrigation service provision. The project will adopt a contract based approach that empowers stakeholders and clarifies their respective roles, and that will be based on the principle that investments in infrastructures *enhance* and at the same time *are conditioned by* the performance of stakeholders. The instrument for clarifying and formalizing commitments and responsibilities is the annual Performance Contract (CP) that will be signed between the (F) WUAS, the Communes and Regions, and MAEP. Signed contract will systematically include a payment provision which will partly depend on achievement of agreed performance indicators.

Critical assumptions include that stakeholders are willing to pay for better irrigation service provision, and that a more reliable access to water leads to higher agricultural productivity which in turn leads to an improved capacity to pay. The main risks are that stakeholders are not willing or able to respect terms and conditions of the PC and that the project will not sign subsequent PCs. Positive environmental effects include reduced pressure, through intensification, from populations on fragile land and, therefore, reduced degradation, erosion, and sedimentation. Negative environmental and social impacts include increased use of agricultural chemical products and limited movement after construction of irrigation infrastructures.

The areas targeted as regards work for rehabilitating irrigated schemes, as well as beneficiaries are as follows:

Area	Rice PI (ha)	Households targeted in area
Marovoay	15,860	10,000-12,000
Anadapa	2,525	5,000
Itasy	3,919	10,000
Sahamaloto	6,400	5,000
<b>Total</b>	<b>26,316</b>	<b>30,000-32,000</b>

Source: Study on capacity building; estimates based on average size of exploitation under irrigation

Expected *intermediate results* are (i) increase in wet and dry season irrigated area by xxx ha, (ii) 100% second phase Performance Contracts signed with (F)WUAS, and (iii) 100% of management and maintenance costs covered through fees collected in targeted irrigation schemes.

### ***Subcomponent 2.1: Support to Irrigation Development***

The project will finance technical assistance and surveys for mobilizing and building the capacity among stakeholders in the four large irrigated schemes; it will include:

- (a) Participatory preparation of a *Project Development Plan* (PDP) which identifies a long term vision on the performance in the scheme puts forward specific measures for materializing such a vision, and which identifies costs for management, maintenance, and associated investment. PDP will also describe planning for implementing the investment and rehabilitation work proposed (if required), and will identify the roles and responsibilities of each and every actor.
- (b) Participatory preparation of a *Plan Contract* that will be signed between (F)AUEs, the Commune, the Region and MAEP. The CP will identify the commitments of each actor, and proposes an annual work plan for implementing them, as well as performance indicators. Communes and (F) AUEs will prepare a seasonal list of all water users in the project. Commitments may include (i) for (F)AUEs : management and maintenance cost recovery which is sufficient for sustainable financing of the scheme, recruiting of an executive director and a recovery agency regarding fees, establishing an abatement committee for deciding on non payment for management and maintenance, (ii) for Communes and Regions : active support to observance of bylaws among (F)AUEs, rehabilitation of critical inter commune roads, and payment for deficit in collecting fees for management and, and (iii) for MAEP : implementing rehabilitation work agreed in SDP, and support to compliance of (F)AUEs rules.
- (c) Monitoring and evaluation of agreed performance indicators, annual PC evaluation and design as well as conduct of an annual satisfaction survey among users.
- (d) mobilization and capacity building among actors in implementation of PC, including, (i) (F) AUEs: preparing a budget and an annual work plan, evaluating results for previous year; decision on a bonus to the executive director, as well as developing and materializing a strategy for recovering management and maintenance fees; (ii) for Communes and Regions: preparing and delivering on PDP and PC; and support to mobilizing water users.
- (e) Surveys, including on capacity among water users. The survey will provide advice on amounts to be paid in terms of management and maintenance fees that may be asked for on a reasonable basis from agriculturists.

The project will also finance office materials and operating fees, vehicle cost and operating, workshops, training, and study tours and exchange visits.

The specific outcomes of the mobilization subcomponent include an annual PDP and six annual CPs, annual evaluations of CPs, and capacity building and survey on paying capacity among agriculturists.

Mobilization and capacity building among actors will be assigned to an international consultant. A contract will be signed for preparing a PDP and a CP, and as regards capacity building and support to each and every actor in achieving a PDP and a CP. PC annual evaluation will be made based on indicators agreed on by a CP Monitoring Committee.

Procurements will include (i) recruiting international consultant service provisions for preparing a PDP and a CP, mobilizing and building capacity among actors, and surveys, and (ii) various goods and services.

### ***Subcomponent 2.2: Investment in Irrigation***

This component will finance detailed draft project surveys, technical assistance, and rehabilitation work which were agreed in the CP. It will include the following activities:

- (a) Detailed draft project surveys on work agreed in CP, including preparing procurement documents. Works will be so designed as to resist to next cyclone damages.
- (b) Rehabilitating irrigation infrastructures and intra-irrigation scheme as per agreed in CP over 30, 000ha or irrigated schemes.
- (c) Non transferable infrastructure maintenance work. It will be financed on a tapering rate, with most FERHA increasing over time.
- (d) Supervising rehabilitation work. The work will be assigned to a consultancy firm in charge of preparing the detailed survey of draft projects.
- (e) Surveys, including the one for determining and updating the management and maintenance fees in each of four sites, as well as the nature and the magnitude of cyclone damages in irrigated schemes.

The specific outcomes of the irrigation development component include detailed surveys on draft projects, procurement documents, rehabilitation work, capacity building, and surveys.

Preparing the detailed surveys on draft projects and supervising rehabilitation work will be assigned to a national consultancy firm for the whole project life. The consultant will also be in charge of overseeing the work. Rehabilitation work will be commissioned to a national contractor. In order to streamline the procurement procedures, the project will sign with a contractor in each of four sites a multiyear framework agreement which will determine unit prices and a proceeding for annual price revising.

Procurements will include (i) recruiting service provision by national consultants for preparing detailed surveys of draft projects and overseeing rehabilitation work, (ii) recruiting national contractors for rehabilitation work, and (iii) surveys.

***Component 3: Watershed Development.***

*(US\$10.0million, including IDA funding of US\$ 3.6 million; GEF contribution US\$6.4 million)*

*The specific objective of the component is to enhance watershed protection and upland productivity to improve rural livelihoods through the sustainable management of soils and natural resources.*

A participatory and integrated approach to sustainable land management should encourage local population to take responsibility and engage in the sustainable management of their natural resources. The component tries to promote the profitable development of watersheds based on environmental improvements, which should create improved impacts on both, the watersheds and the irrigation schemes. Direct impacts will be 1) reduced erosion, sedimentation and destructive flooding of irrigation schemes, 2) increased agricultural production under agro-ecological cropping techniques (see component 1), 3) improved management of common natural resources with environmental benefits and improved land use productivity, and 4) improved income of rural population through agro-ecological production activities

Beneficiaries will be closely associated to planning, implementing and monitoring of the developed watershed plans based on sustainable land management.

The aim of this component is to transform upland agricultural production systems through the adoption of sustainable and profitable production techniques. Provided that any agricultural development should be depending on markets, the promotion of sustainable and profitable agriculture is included in component 1 (Agriculture Development), as well as in the economic impact indicators. Conversely, environmental impact indicators are included in the present component 3.

Critical risks include (i) farmers may be hesitant in participating in activities outside their own fields, as they fear not to directly benefit from environmental improvements. To avoid this, the project will adopt a participatory approach, including information campaigns and capacity strengthening. Results are expected to appear only gradually and relatively slowly. The project will also contribute in cost sharing to that end. (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.

*Impact indicators* are (i) surface of number of **hectares** of uplands under a management transfer system (transfer de gestion: translation?) considered satisfactory a, (ii) Percentage of target communes considered deserving, (iii) Number of master watershed management plans developed and adopted.

### ***Subcomponent 3.1: Planning and capacity strengthening for sustainable watershed management***

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 will adopt a flexible approach that will allow modifying activities according to needs, on-going programs and collaboration potentials with partners.

The watershed management planning is done in three steps:

- (iii) 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 km<sup>2</sup> for Sahamaloto/Lac Aloatra, 500 km<sup>2</sup> for Itasy, 1,000 km<sup>2</sup> for Andapa, and 1,100 km<sup>2</sup> 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 schemes.<sup>13</sup>
- (iv) The second step involves the development of participatory WSM plans for the approximately 30 sub watersheds associated with the irrigation schemes covering an area of between 10 km<sup>2</sup> to about 500 km<sup>2</sup>.
- (v) The third step refers to the participatory planification with community based organization of management and use of the common pool resources within the watershed

The project will finance the following activities:

- (a) Preparation of WSM plans: The project will finance technical assistance to prepare one WSM plan for each of the four project zones, which will include:
  - (i) Zoning and description of land use systems, ecosystems, settlements, institutions and partners.
  - (ii) Strategic analysis of erosion problems (as the main source of downstream sedimentation) and of natural resource degradation;
  - (iii) A specific and detailed analysis of defining project activities for instance: who should do what and how etc. (taking into account existing partners in the area)
  - (iv) Establishing a baseline for monitoring and evaluation of component results.
- (b) Preparation of a participatory WSM plan at sub watershed level in collaboration with the communities
  - (i) *A participatory zoning* of sub-watersheds will be done to determine the optimal land use according to, (a) topography along a gradient from downstream to upstream, (b)

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<sup>13</sup> 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 km<sup>2</sup>.

- 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 then
- (ii) *Participatory plans* for sustainable sub-watershed management. .
- (c) Support to existing or new communication and negotiation platforms with the aim to
    - (i) Provide the various stakeholders and partners (communes, farmer organizations, NGOs, etc.) with platforms for information exchange, and communication
    - (ii) Discuss, negotiate, and validate participatory WSM plans ;
    - (iii) Negotiate conflict settlement.
    - (iv) To support already existing environmental platforms that are active in the project zones
  - (d) Training and capacity strengthening of community based organizations for natural resources management local and regional staff:
    - (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 maker associations.
    - (iii) Specific training to local and regional staff (NGOs, technical government services) in techniques such as participatory planning methods or agro-ecological techniques
  - (e) Provision of support to community based *natural resource management groups* (e.g. GELOSE), The project would finance
    - (i) The process for managing and preparing natural resource management plans between the community based organizations, the commune and the technical service involved, including the preparation of the TORs
    - (ii) Technical assistance to put in place a monitoring and evaluation system for the NRM plans.

### ***Subcomponent 3.2: Investment in watershed protection and improved land management***

Depending on the various WSM plans, a menu of investments eligible for subsidies will be provided, and specific conditions and limits (positive and negative lists) established, from which local populations may select investment they consider appropriate for their specific needs. In principle, only investments with long-term environmental impacts, and only community groups or association's grassroots groups or associations will be eligible. Specific conditions will include co-financing (in kind or in cash), institutional capacity among groups, and the confirmation of social and technical validity of the proposals.

The project will finance the following activities:

- (a) **Strategic erosion control.** The "hot spots" of erosion will be identified through strategic and participatory analyses conducted under subcomponent 1, 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. In principle, associations of water users in irrigated schemes should participate in planning of erosion control measures and should pay part of costs. Such strategic anti-erosion works will actually be part of the hydro-agricultural works. 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). The identification of hotspots will be done with the aid of satellite images (that will be used to establish the project baseline and that will provide the basis as well for the Master watershed management plan development). In addition, local stakeholders will be consulted and verification will be done on the ground.

- (b) **Increase of vegetation cover on community land** . The project will 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 a improved management of land under secured land tenure arrangements (GELOSE).
- :
- (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 campains 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.
- (c) **Promotion of sustainable and profitable upland agriculture**. The development of profitable and sustainable agriculture is included in Project Component 1 (Agricultural Development). Support in component 1 is especially provided through research, technical assistance, and through ‘matching grants’ and addresses especially the productive land at the bottom of the hillsides in proximity to roads and markets. Nevertheless, some of the upland areas contribute considerably to the erosion problem and/or threaten areas with high biodiversity value. Sometimes these extensive upland farming practices do not even allow farmers to achieve satisfactory incomes. These farming practices are mostly found in remote and marginal areas and it is unlikely that these agricultural practices might benefit from support provided under component 1. However, it is, possible to develop agricultural production systems in these areas that are productive and profitable (e.g., through agroforestry , horticultural techniques). The project will support farmers that engage in marginal agricultural operations in the development of sustainable and profitable production systems. The areas and eligibility criteria will be developed in the WSM plans. .

#### **Component 4 Program Management**

*The objective of this component is to use project resources in accordance with its purposes and procedures, to set up a political framework that is favorable to extending the project to the national level. Financing in subcomponent will involve preparing national policies and conducting surveys supporting the Government National Program for Watersheds and irrigation.*

*Interim results include (i) all financial and technical audits which are satisfactory, (ii) the national input and seed policy which is adopted and implemented, and (iii) BV/PI Program which is clearly written in the framework of MAEP medium term expenditures.*

<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
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***Sub-Component 4.1: Project Management***

This subcomponent will focus on project management by financing technical assistance, training, supplying office and vehicles, small work for office rehabilitation, audits and assessment studies, and project management related operating costs.

It will also conduct overall planning, quality control, procurement, financial management, and monitoring the project activities. It will also subcontract quality control to independent technical and financial audits, and project activity assessment. It will also design and implement a communication strategy and disseminate key messages to beneficiaries and partners.

Project management will involve the four targeted watersheds, as well as the national level.

***Sub-Component 4.2: Policy Support***

This subcomponent will finance technical assistance, surveys, training, information campaign, exchange visits, and workshops for developing major national policies, regulation, and plans deemed as predominating for the Government National Plan for watershed and irrigation. Such activities should among others include the following:

- The national policy for private input supply (including fertilizers)
- Policy and legislation for privatizing seed centers, and support to seed certification.
- Criteria and standards for main export markets (in particular, rice)
- Sustainable financing of watershed management and irrigation maintenance.

The scope of the subcomponent will be nationwide. The new policies will have impacts which are beneficent on activities by main stakeholders (producers, distributors) in the sub sector. It will also finance technical assistance to emergent professional groups, in particular PC Rice, and the Malagasy Association of Seed Producers.

***Sub-Component 4.3: Monitoring and Evaluation***

This sub-component finances, at the national level, collection of data and reporting on key performance output and impact indicators. This will include compilation of relevant data collected for other purposes, collection of targeted data, surveys, participatory assessments and mid-term and final evaluations. At a minimum, the data presented in Annex 3 will be collected on an annual basis. The sub-component will finance technical assistance, capacity strengthening, data sources (e.g., satellite photos) and office equipment and vehicles. An annual progress report will be produced, as well as an evaluation at mid-term and at completion.

**Implementation Device**

*Subcomponent 4.1: Project Management*

Because of experiences in Africa and in Madagascar, no Project Implementation Unit is provided for. Instead, strengthening MAEP existing units is provided for, as well as those in four regions (see Annex 6 for detailed description)

At national level, project management will be conducted as follows:

MAEP will ensure overall project implementation. A Steering Committee made up of other ministries involved (MENVEF, MDAT, MENRST, and MICDSP), the four Region heads, 'EPP/PADR, and representatives of private sector will meet twice a year to approve the annual working plan (PTA) and to assess overall project progress. The committee will be chaired by MAEP SG.

DGDR will assume overall responsibility for coordination, technical and political project aspects, including daily management and national coordination policy. DGDR will be supported by an international technical assistant, who would be the leader for the technical assistant pool required for the project. Such position will be co financed by IDA and AFD.

Procurement activities will rest on overall responsibility of PRPM (Personne Responsable for procurement) at MAEP, who is assisted by a national technical assistant. The PRPM will approve any contract exceeding the threshold of xxx before signing by DRDR or its delegated representative. This will ensure close harmonization with public procurement procedures and capacity building among MAEP procurement.

Financial management will be under overall responsibility of MAEP Directorate of Finance and Budget. Similar to procurement, the director of such department will overall be responsible for project financial management and will be assisted by a national technical assistant.

Monitoring and Evaluation will be the responsibility of MAEP Director of Information System (DISE) who is assisted by the international technical assistant at DGDR level. For integrating monitoring of physical and financial achievements, the project will be based on Integrated Management System (IMS) developed by PSDR. Independent technical audits will be conducted on an annual basis, starting on the second year of the project. Assessment of project impacts will be subcontracted to qualified firms. Regarding some watershed indicators, the project will use the data provided by EP 3 under a convention signed with MAEP.

At regional level, project management will be conducted as follows:

A regional monitoring committee, chaired by the region head, including members from GTDR groups (Elected people, Producer Organizations, private Sector, State Devolved Units, and Development Projects/ NGOs) will be responsible for reviewing the regional pTA and its compliance with PRDR and PDRs, and with monitoring the progress of project activities.

DRDR, which represents MAEP at regional level, will be responsible for all project activities at regional level. It will be assisted by a procurement specialist in financial management, both also appointed by the Minister, who will prepare and certify respectively all procurement and financial management documents before submission for signing to DRDR. Such three positions will be staffed on a competitive basis, through a selection process that is open to civil servants and candidates external to the Civil Service. Procurement and financial management specialists, though on the chain of command are below DRDR, will be under direct functional responsibility of PRPM and DFB. DRDR team will be assisted by a technical assistant who will be in charge of building their capacities, supervising contracted work, goods and services delivered, and helping them plan and monitor activities at regional level.

The project will be implemented at two levels: (a) essential functions such as formulating and approving policies and regulations, facilitating for agricultural services, quality and norms control, and issuing land titles will be the responsibility of State (MAEP, Region, etc.); (b) all other goods, work, and services will be subcontracted under the responsibility and signing of DGDR (at national level) and of DRDR (at regional level).

#### *Subcomponent 4.2: Support to Policy Formulation*

DGDR, with support from the Technical assistant, will be responsible for this subcomponent. Surveys, as well as preparing policies and regulations, will be subcontracted to qualified firms. DGDR will be

responsible for organizing consultative workshops with professional associations and other stakeholders for formulating and finalizing the policy proposals (e.g., PC Rice, Fertilizer distributor Association or Seed Producer Association).

**Annex 5 : Project Costs**

## **Annex 6 : Implementation Arrangement**

### **MADAGASCAR : Projet Bassins Versants – Périmètres Irrigués (BV-PI)**

#### **Annexe 6 : DISPOSITIF INSTITUTIONNEL ET DE MISE EN ŒUVRE**

(17 février 2006)

#### **I. PRINCIPES DIRECTEURS.**

Le projet BV-PI s'inscrit dans le cadre de la stratégie de réduction de la pauvreté du gouvernement et des grandes politiques nationales. Sa mise en oeuvre doit donc être pleinement cohérente avec le cadre institutionnel national et avoir comme objectif explicite de renforcer les capacités des institutions concernées, à tous les niveaux.

La mise en oeuvre du projet sera guidée par les principes institutionnels suivants:

- (i) Le recentrage de l'action de l'Etat sur ses fonctions régaliennes et le transfert de l'Etat vers le secteur privé de fonctions à caractère économique ou social (formation, alphabétisation, animation, conseil...);
- (ii) La déconcentration des services de l'Etat en soutien a la fois des structures décentralisées et du secteur privé;
- (iii) La responsabilisation de toutes les parties prenantes, en accord avec les politiques nationales et dans le cadre du principe de subsidiarité ;
- (iv) Un appui aux populations et opérateurs économiques largement fourni la demande ; La décentralisation, avec un nouveau partage des responsabilités entre l'Etat et les collectivités décentralisées ; et
- (v) La contractualisation des services financés par l'Etat dans le cadre de Partenariats Public-Privé (PPP).

La mise en œuvre du projet se situe à quatre niveaux : national, régional, intercommunal/district et local.

- *Niveau central.* Le MAEP sera responsable de la maîtrise d'ouvrage générale du projet, en concertation avec les autres ministères centraux concernés pour assurer la cohérence des actions du projet avec les grandes politiques nationales.
- *Niveau Régional.* Les DRDR seront responsables de la mise en œuvre de la plus grande partie des activités du projet. En effet, le niveau régional est le niveau opérationnel ou est assurée (i) la cohérence et la planification des activités du programme et (i) la mise en œuvre de certaines activités d'appui ou d'investissement lourd (réhabilitation des grands périmètres) au niveau des quatre bassins versants cibles.
- *Niveau intercommunal/district.* Ce niveau interviendra pour la mise en œuvre de certaines activités du projet demandant une coopération intercommunale (gestion de grands bassins versants et des grands périmètres irrigués; appui a la production agricole (CSA) ; guichet foncier ;

- *Niveau local* : Niveau principal de mise en œuvre du projet au niveau des communautés de base et des opérateurs économiques.

## II. MODALITES DE MISE EN ŒUVRE DU PROJET

### A. Pilotage et suivi stratégique.

Il sera assuré par un *Comite de Pilotage National* et des *Comites de Suivi Régionaux* établis dans chacune des quatre zones du projet.

***Comite National de Pilotage.*** Il sera présidé par le Ministre de l'Agriculture et inclura des représentants :

- (iv) Des autres ministères centraux concernés (Ministère de la Décentralisation et de l'Aménagement du Territoire, Ministère de l'Environnement, des Eaux et Forêts, Ministère de l'Energie et des Mines, Ministère de l'Economie, des Finances et du Budget, Ministère de l'Education Nationale, de Recherche Scientifique et Technique, Ministère du Commerce, EPP/PADR), pour assurer la cohérence des actions du projet avec les politiques nationales ;
- (v) Des quatre régions concernées – Chefs de Régions, Présidents du GTDR, pour assurer l'intégration des actions du projet au niveau régional/communal avec les stratégies et programmes nationaux ;
- (vi) Des principales organisations professionnelles telles que la Chambre d'Agriculture et <sup>14</sup>les associations/plateformes des principales filières concernées telles que la « Plateforme Riz ».

Le Comite National de Pilotage sera appuyé par un Secrétariat Technique assuré par la Direction Générale du Développement Régional (DGDR) du MAEP. Il sera responsable (i) de la programmation annuelle des activités du projet (approbation du programme d'activités et du budget), (ii) du suivi de sa mise en œuvre et de ses résultats, y-compris en particulier de l'analyse et approbation des rapports d'activités et des audits financiers et opérationnels ; et (iii) de la recommandation de mesures correctives qui pourraient éventuellement s'avérer nécessaires. Le Comité National de Pilotage se réunira deux fois par an.

***Comites de Suivi Régionaux.*** Un Comite de Suivi sera établi dans chacune des quatre zones du projet. Il sera présidé par le Chef de Région et composé des membres du GTDR. Le Comite de Suivi sera appuyé par le Secrétariat technique du GTDR. Le Comite de Suivi Régional aura la responsabilité (i) d'assurer la cohérence des actions du projet à la fois avec les politiques et stratégies nationales et avec les priorités et programmes de développement de la région ; (ii) de préparer et de valider les programmes d'activités et budget détaillés du projet au niveau de la région ; (ii) de la revue des progrès et des performances du projet et de la recommandations de mesures correctives si nécessaires. Il se réunira deux fois par an.

### B. Maîtrise d'Ouvrage Générale du Projet.

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<sup>14</sup> **Le Groupe de Travail de Développement Rural (GTDR)** est composé de cinq collèges d'acteurs locaux (OPA, Secteur privé, autorités décentralisées, services déconcentrés et projets/programmes). Ses attributions incluent : (i) l'élaboration et l'actualisation des schémas régionaux de développement rural, (ii) l'actualisation des référentiels régionaux ; (iii) l'établissement d'indicateurs de développement régional et leur suivi ; (iv) l'organisation de réunions de travail, d'échange et d'information sur le développement rural ; (v) la préparation et le suivi des programmes et projets de développement rural dans la région.

**La coordination générale** du projet sera assurée par la Direction Générale du Développement Rural (DGDR) du MAEP, de la façon suivante :

- La DGDR assurera la maîtrise d'ouvrage du projet au niveau national ;
- Les Directeurs Régionaux du Développement Rural (DRDR) seront responsables de la maîtrise d'ouvrage des actions du projet dans leurs zones respectives.
- Pour les aider dans cette tâche, le projet financera le recrutement (i) au niveau national : d'un assistant technique (opérations) international, conseiller du DGDR ; et (ii) au niveau régional: de quatre assistants techniques (opérations), conseillers des DRDR pour la mise en œuvre des actions du projet. De plus, une provision sera constituée pour permettre le recrutement d'une assistance supplémentaire ponctuelle, si nécessaire.
- Finalement, le DGDR et les DRDR sélectionneront dans leurs services respectifs un staff qui sera chargé, à plein temps, de les aider dans leur tâche de coordination et du suivi du projet.

**La gestion financière** du projet sera assurée au niveau national par la Direction Administrative et Financière du MAEP et au niveau régional par le directeur financier de la DRDR. Le projet financera (i) le recrutement d'un assistant technique internationale spécialiste en gestion financière qui sera placé auprès du Directeur Central Financier du MAEP ; (ii) le recrutement, au niveau de chaque DRDR d'un gestionnaire financier national, contractuel, qui sera chargé à plein temps de la gestion financière du projet. Ce cadre travaillera en liaison étroite avec le DAF du MAEP et bénéficiera de l'appui de l'AT financier du projet.

**La passation des marchés** sera assurée au niveau central par le PRMP et au niveau régional par les services concernés des DRDR. Le projet financera (i) le recrutement d'un assistant technique international spécialiste en passation des marchés qui sera placé auprès du PRMP ; et (ii) au niveau de chaque région d'un cadre supplémentaire, contractuel, qui sera chargé à plein temps de la passation des marchés du projet. Ce cadre travaillera en étroite collaboration avec le PRMP et bénéficiera de l'appui de l'AT passation des marchés du projet.

**Assistance Technique.** Le recrutement des AT – internationaux (3) et nationaux (4) – sera fait dans le cadre d'un contrat unique global avec une firme spécialisée qui assumera la responsabilité du travail de chacun des AT et de l'équipe dans son ensemble. L'AT international « Opérations » sera le chef de cette équipe et sera spécifiquement chargé (i) de conseiller le DGDR et son assistant et les DRDR/assistants sur la stratégie opérationnelle, la mise en œuvre et le suivi du projet ; (ii) de former et d'apporter un soutien opérationnel au personnel du MAEP impliqué dans sa mise en œuvre. Les AT nationaux « opérations » recrutés au niveau des DRDR seront chargés de conseiller et d'appuyer les DRDR dans la mise en œuvre du projet dans leurs zones respectives et d'assurer la coordination de toutes les composantes du projet au niveau régional. Les AT internationaux spécialistes en gestion financière et en passation des marchés auront pour responsabilité de (i) conseiller le DCF et le PRMP ; et (ii) apporter un appui technique au personnel concernés des DRDR et assurer la qualité de leurs services. Les responsables financiers (4) et de passation de marché (4) au niveau des régions seront contractés individuellement.

## **C. Mise en œuvre des Composantes.**

### **Composante 1 : Développement Agricole.**

**Sous-Composante 1.1 : Environnement incitatif.** Le maître d'ouvrage sera le DRDR. Les activités seront mises en œuvre de la façon suivante :

- *Appui aux filières.* Cet appui (mobilisation des acteurs, revue stratégiques des opportunités et contraintes du marché et des chaînes de valeur, identification et mobilisation des acteurs, identification et analyse de sous-projets productifs) sera apporté par un ou plusieurs opérateurs professionnels recrutés, dans chaque zone, par les DRDR. Les priorités et le programme de travail de ces prestataires seront définis en consultation avec les CSA et plateformes locales et régionales, et validés par les GTDR. Ils seront en particulier responsables (i) des études de filières pour les marchés national ou à l'exportation, ainsi que des études sur le stockage, la transformation, le conditionnement et la conservation des produits, (ii) d'aider les opérateurs éligibles à formuler les dossiers pour soumission au projet ; (iii) le développement de contrats de partenariat entre producteurs et opérateurs des filières pour les produits ciblés ; (iv) renforcer la capacité professionnelle et institutionnelle des organisations paysannes à la base (OPA, GIE, TT, etc.), de leurs fédérations, et des services régionaux d'appui à la structuration et à la professionnalisation.
- *Renforcement de l'offre de technologies potentielles.* Ces activités seront la responsabilité du Centre de Services Agricoles (CSA) qui sera mis en place dès le début du projet dans chaque site du projet. Le personnel (contractuel) du CSA sera recruté de façon compétitive par le DRDR. Les programmes de recherche adaptative et diffusion de technologies agricoles appropriées seront définis par les « plateformes agricoles locales et régionales », avec l'aide du CSA, ainsi que l'amélioration des itinéraires techniques de production, conservation et valorisation. Ils seront approuvés par le GTDR. Ils seront exécutés par un ou plusieurs prestataires de services (privés, ONG, autres...), recrutés de façon compétitive (mieux disant), dans le cadre d'un contrat pluriannuel avec le DRDR. Le projet financera la formation et apportera un appui technique aux CSA. La rémunération de ces partenaires stratégiques sera en partie basée sur leur performance.
- *Guichets Fonciers.* Les DRDR seront responsables de la mise en place de Centres de Ressources et d'Informations Foncières (CRIF) dans leurs régions respectives (dans deux des quatre zones du projet, le CRIF de Soavinandriana étant déjà créé, et une agence foncière déconcentrée de Marovoay déjà existant), en fonction des spécificités et besoins de chaque zone. Les communes concernées seront responsables de l'établissement des Guichets fonciers associés à chacun des CRIF. Pour ce faire, les DRDR et les communes recevront les conseils et l'assistance du Plan National Foncier (PNF). A titre indicatif, le projet appuiera le montage de 1-2 guichets fonciers par site d'intervention. Les DRDR seront responsables des activités et du bon fonctionnement des CRIF et les communes de celles de leur GF, en particulier du recrutement des personnels nécessaires et du financement des structures.
- *Infrastructures publiques de mise en marché :* Elles seront sélectionnées en collaboration avec les Communes concernées<sup>15</sup> qui en assureront le fonctionnement et l'entretien. Elles seront réalisées à l'entreprise, par appel d'offres et sous contrat avec le DRDR.

### ***Sous-Composante 1.2 : Appui à l'Initiative Privée.***

L'appui à l'initiative privée se fera, à la demande des promoteurs, par un financement par le projet à frais partagé (« matching grant »). Les modalités du financement régional sont présentées à l'appendice... et résumées ci-dessous.

Dans chaque zone du projet, le projet identifiera:

- *Une liste d'activités éligibles.* Cette liste sera une liste positive (négative) d'activités choisies pour leur contribution aux objectifs du projet/GOM.
- *Un organe de décision au niveau régional : le Comité de Sélection sera issu du GTDR.* Le GTDR (ou une sous-section) approuvera l'octroi de la subvention aux activités/sous

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<sup>15</sup> Le projet ne financera pas les investissements déjà pris en compte par d'autres programmes tel que le FID.

projets qui lui seront présentes, après analyse et sur recommandation de son Secrétariat Technique. Une revue externe des sous projets/activités financés dans le cadre de cette sous-composante sera entreprise deux fois par an.

- *Un Partenaire stratégique.* Un partenaire stratégique sera recruté par appel d'offres par le DRDR et aura pour responsabilités principales : (i) d'identifier et d'analyser les opportunités du marché ; (ii) de sensibiliser et mobiliser les opérateurs privés et investisseurs potentiels ; (iii) de faciliter la préparation par les candidats d'un dossier de factibilité ; (iv) de faciliter leur accès à un organisme financier ; et (v) de procéder à l'analyse technique et financière des sous-projets présentes au projet;
- *Des intervenants spécialisés mobilisés au coup par coup,* si nécessaire, recrutés par le DRDR (sur recommandations du partenaire stratégique) pour des études stratégiques de marché/filières, etc..., soit par les promoteurs privés eux-mêmes (le projet offrira si nécessaire une aide à la préparation des sous-projets).
- *Un relais du partenaire stratégique au niveau local : les CSA :* Le partenaire stratégique situé au niveau régional se reposera sur les CSA pour la prospection et la mobilisation au niveau local. Il établira avec les CSA des contrats annuels précisant les modalités de collaboration et les résultats attendus.

L'aide du projet dans le cadre de cette sous-composante sera accordée aux activités identifiées comme prioritaires par le Gouvernement : investissements, technologies et conseil. Seuls les intrants et équipements agricoles associés à la diffusion de technologies nouvelles (e.g. conservation, agriculture écologique) bénéficieront de subventions et ce de façon temporaire (un ou deux ans au plus pour un même bénéficiaire). Dans aucune circonstance le projet ne financera des intrants déjà couramment utilisés par les producteurs et financés par les institutions de micro finance. Le taux de subvention sera fixé sur la base de la nature « bien public » et des bénéficiaires-cible (« merit good ») des activités<sup>16</sup>. Il est proposé les taux de subventions suivants :

↑ % de bien public	40%	80%
	20%	40%
	→ % de « merit good »	

Le financement des bénéficiaires se fera en espèces, apport personnel et crédit bancaire, sauf dans le cas des activités de protection (afforestation, enherbement de parcelles ou amendement de sols dégradés) par des bénéficiaires clairement identifiés (voir composante 3) ou leur contribution pourra être en nature.

**Les opérateurs et activités éligibles.** Le projet fera des subventions partielles aux opérateurs privés suivants<sup>17</sup> :

<sup>16</sup> Par exemple des communautés situées dans des zones très enclavées et n'étant que très peu intégrées dans le marché/ne dégagent que peu de surplus commercialisable.

<sup>17</sup> Ces opérateurs doivent justifier d'une existence effective d'au moins deux années avant d'être éligibles.

- Organisations professionnelles agricoles et agro-industrielles ;
- Groupements de producteurs (agriculteurs, éleveurs, forestiers...);
- Communautés rurales ;
- Commerçants et transformateurs de produits agricoles ;
- Entreprises agro-industrielles ;
- Producteurs de semences (associations et individuels) ;
- Distributeurs d'intrants et d'équipements agricoles ;
- Réseaux de micro finance

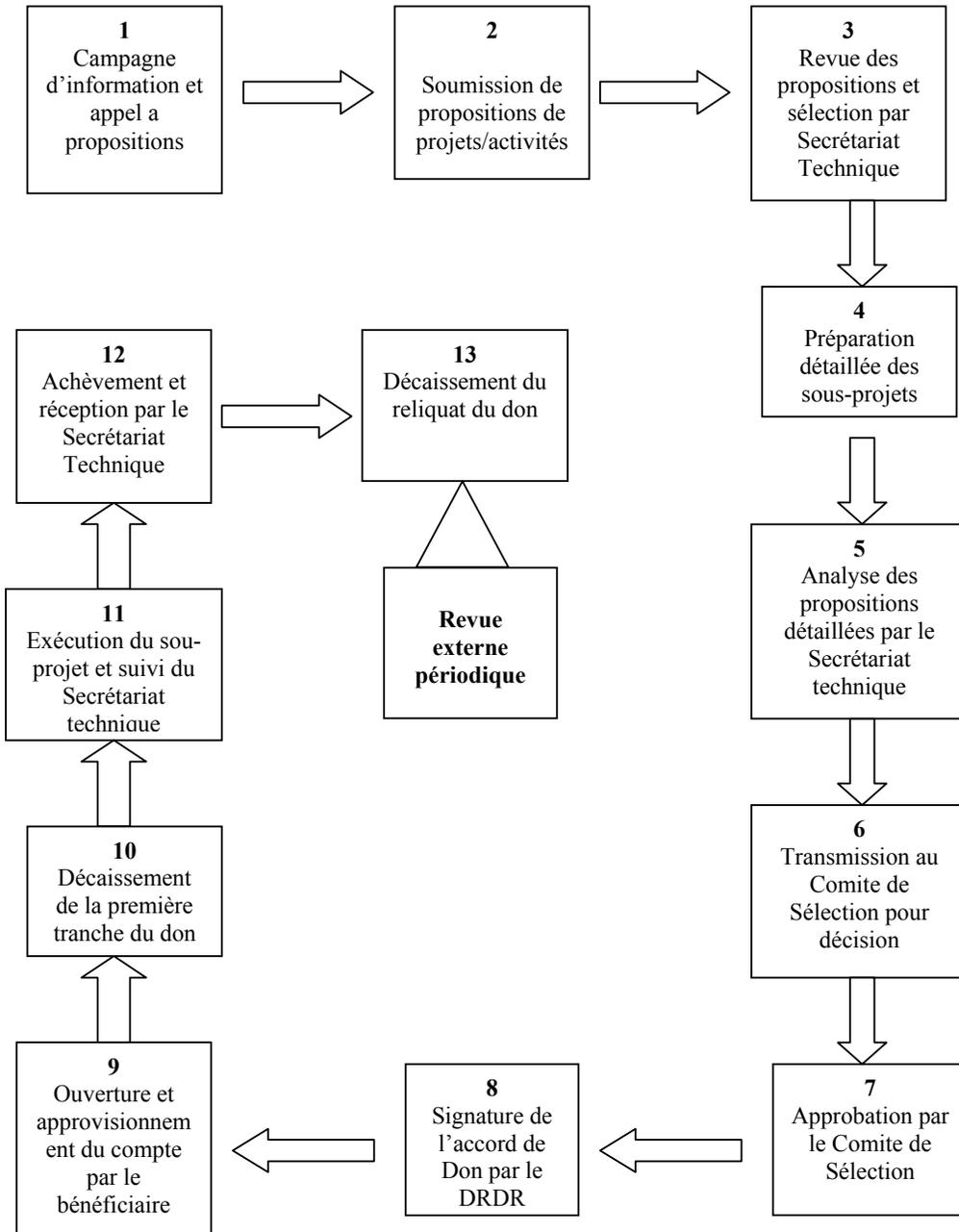
Les activités éligibles seront clairement liées à la production agricole et à la gestion des ressources naturelles (liste positive indicative et liste négative spécifique), dans les domaines suivants :

- Appui a la mise en marché : Etudes de marche, études de filière, développement de systèmes de gestion de la qualité et de certification ; envois-test ;
- Appui a l'innovation : - Recherche adaptative spécialisée, agricole et agro-industrielle (variétés, technologies et équipement de production et de transformation) ;
  - Introduction de nouvelles techniques de production agricole (techniques agro-ecologiques...);
  - Campagne de sensibilisation et de démonstration (intrants, équipements...)
- Appui a la gestion : - Conseil technique et de gestion<sup>18</sup>.
- Appui a l'investissement : - Réhabilitation/établissement de capacités de production semencière ;
  - Magasins de stockage ;
  - Etablissement/extension de réseaux de distribution d'intrants et d'équipement ;
  - Extension de réseaux de micro finance ;
  - Projets integres de mise en place de systèmes d'agriculture contractuelle au profit de petits producteurs ;
  - Afforestation et amendement de sols dégradés.

**Processus de mise en œuvre du financement à frais partagé.** Il est résumé dans le schéma ci-dessous :

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<sup>18</sup> Il est envisagé que les Fédérations/Unions d'AUE aient la possibilité de recruter si elles le désirent, avec l'aide d'une subvention dégressive de la part du FDA, des conseillers agricoles (agronomie, gestion des réseaux...).



## Composante 2 : Développement de l'Irrigation.

La composante sera mise en oeuvre sous la responsabilité des DRDR. Elle comporte deux sous-composantes.

**Sous-Composante 2.1. Appui à l'Irrigation.** Les activités de cette sous-composante incluent (i) la sensibilisation et mobilisation des agriculteurs des périmètres et de leurs associations ; (ii) le diagnostic participatif des potentialités des périmètres et des options de gestion de l'eau et de réhabilitations ; (iii) la sélection de l'option retenue pour la mobilisation et utilisation de la ressource en eau ; et (iv) la préparation d'un contrat-plan entre toutes les parties concernées : usagers, Région

(DRDR) et communes. Le DRDR recrutera un bureau d'étude d'envergure internationale pour la mise en oeuvre de ces activités sur l'ensemble des quatre zones du projet.

La gestion des périmètres réhabilites sera assurée conformément au cadre institutionnel en vigueur : (i) la DRDR sera responsable du fonctionnement et de l'entretien des infrastructures hydro-agricoles non transférées et de la mobilisation des financements correspondants ; (ii) les AUE seront responsables du fonctionnement et de l'entretien des infrastructures transférées, et donc de la mobilisation des financements nécessaires auprès de leurs membres (redevances) ; (iii) les communes, propriétaires des ouvrages hydro-agricoles transférés, seront co-responsables, avec les AUE, de leur entretien et devront donc apporter à ces dernières l'appui nécessaire. Elles seront aussi responsables de l'entretien des pistes intra-périmétrales. Ces trois intervenants --région, communes, AUE—ne pourront cependant mobiliser la totalité des ressources nécessaires que progressivement. En effet, cela demandera : (i) l'augmentation de la production et productivité agricole (capacité à payer) et (ii) la mise en place de mécanismes efficaces pour la mobilisation des ressources financières (redevances, impôts fonciers, FERHA). Les ressources du projet fourniront temporairement la subvention d'équilibre nécessaire. Le contrat-plan définira clairement les obligations de toutes les parties dans ce domaine.

***Sous-composante 2.1. Investissements dans l'Irrigation.*** La DRDR sera responsable de la maîtrise d'ouvrage des travaux de réhabilitation des périmètres. Dans chaque région, les activités nécessaires seront sous-contractées à :

- (i) un bureau d'études national pour la conception et mise en oeuvre des travaux de réhabilitation des infrastructures, y compris les études techniques et la surveillance des travaux, et
- (ii) un entrepreneur pour la réalisation des travaux.

Les (F)AUE seront signataires de tous les contrats directement liés aux activités leur concernant, et seront co-responsable de la sélection et de l'évaluation des intervenants. Ils devront approuver la bonne réalisation des travaux avant les paiements aux entreprises.

### **Composante 3 : Développement des Bassins Versants.**

La composante inclut (i) des actions visant à la lutte anti-érosive et la conservation des ressources naturelles ; et (ii) des actions visant à la commercialisation et de l'intensification soutenable de l'agriculture dans les bassins versants (hors périmètres irrigués) par la promotion de systèmes de cultures et de pratiques culturales adaptées. Les activités « intensification/commercialisation agricoles » seront exécutées selon les modalités de la Composante 1 « Développement de l'Agriculture » décrites ci-dessus. Les paragraphes qui suivent ne concernent que les activités s'adressant spécifiquement à la bonne gestion/conservation des ressources naturelles.

***Sous-Composante 3.1 : Appui à la Gestion des Bassins Versants.*** La DGDR et les DRDR seront responsables de la mise en oeuvre des activités de cette sous-composante :

- La DGDR recrutera une assistance technique de niveau international pour la préparation du schéma directeur d'aménagement des bassins versants dans chacune des quatre zones du projet (un schéma par zone d'intervention) ;
- Chaque DRDR régional recrutera un partenaire stratégique qui sera chargé (i) de la mobilisation/renforcement des plateformes de concertation locales/régionales ; et (ii) de la planification participative et à la mise en oeuvre d'actions d'aménagement et de gestion durable des différents sous- bassins versants.

- Des protocoles d'accord seront passés entre le MAEP et le MINENVEF pour assurer la bonne intégration de leurs actions respectives dans la zone du projet. De même, des protocoles d'accord seront passés entre le partenaire stratégique/DRDR et CIREEF et ANGA.

La première des activités du projet dans ses zones d'action sera d'entreprendre une campagne intensive de communication pour informer les populations des bassins versants, y-compris celles des périmètres irrigués, des objectifs du projet et les mobiliser pour la mise en œuvre de ses activités.

**Sous-composante 3.2 : Investissements dans les Bassins Versants.** Les plans d'aménagement des sous-bassins versants comporteront différents types d'interventions qui seront exécutées comme décrit ci-dessous.

- (i) Des ouvrages anti-érosifs stratégiques identifiés comme prioritaires dans les schémas directeurs des bassins versants. Ils seront financés à 100% par le projet et exécutés par des entrepreneurs privés sous contrat avec le DRDR. Dans la mesure du possible, les ouvrages seront construits en faisant appel à la main d'œuvre locale pour favoriser l'appropriation par la population. La sélection des entreprises et les paiements qu'elles reçoivent devront être certifiés par les communautés concertées.
- (ii) L'établissement de zones de gestion collective (GELOSE, etc...). Le prestataire de service sous contrat avec la DRDR sera responsable de la facilitation de ces activités. La DRDR sera responsable de la délimitation et l'inscription de ces zones au Guichet Foncier. Les investissements nécessaires seront financés à frais partagé (voir Composante 1) ;
- (iii) Des activités de diffusion de technologies agro-écologiques impliquant la distribution d'intrants spécialisés et l'accès au conseil correspondant : elles seront mises en œuvre par le partenaire stratégique recruté par le DRDR (ou, s'il s'agit d'activités de recherche et développement, par les prestataires de services contractés par les DRDR dans le cadre de la composante 1) ;
- (iv) Des investissements productifs adaptés (reboisements, ensemencement de parcelles...) qui seront exécutés par les bénéficiaires eux-mêmes et partiellement financés, à leur demande, avec l'appui de la Facilité d'Appui au Secteur Privé.

Les conditions spécifiques concernant la participation des bénéficiaires et l'appui du FDA seront déterminés sur la base des analyses menées dans le cadre de la préparation des plans d'aménagement des bassins versants (nature des interventions, capacités à payer) et en prenant en compte les programmes similaires déjà en cours d'exécution sur chaque site. Un principe de base sera cependant l'obligation des bénéficiaires à participer aux coûts d'investissement avec une contribution minimum de 20% (en nature ou en espèces), sauf pour les ouvrages anti-érosifs stratégiques mentionnés dans (i) ci-dessus qui seront payés à 100% par le projet.

#### **Composante 4 : Appui Institutionnel et Gestion du Projet**

**Sous-Composante 4.1 : Appui Institutionnel.** La DGDR du MAEP sera responsable de la mise en œuvre des activités visant à la définition de politiques nationales dans le secteur agricole/rural. Ce sera en particulier le cas pour la définition des modalités opérationnelles de la gestion et du financement du FERHA qui devront être adoptées avant le ..... Pour ce faire, elle recrutera de façon compétitive l'assistance technique dont elle aura besoin et organisera les consultations nécessaires avec ses partenaires nationaux (e.g. Plateforme Consultative de Riz, Association des Producteurs d'Engrais, Association Malgache de Producteurs de Semences).

**Sous-composante 4.2 : Gestion du Projet.** La responsabilité de la mise en œuvre et de la gestion du projet sera assurée par la DG au niveau national et les DRDR au niveau de chacune des quatre régions (voir Section B ci-dessus). La DG et les DRDR seront en particulier responsables (i) de la préparation

des programmes annuels d'activités et des budgets détaillés (régionaux et consolidés au niveau national) ; (ii) du suivi de la mise en oeuvre en accord avec le manuel de procédures du projet ; (iii) de la préparation des revues annuelles d'avancement à présenter au Comité de Pilotage National et aux Comités de Suivi Régionaux ; et (iv) de la mise en oeuvre des audits financiers et techniques annuels. En particulier, la DG sera responsable de l'organisation d'un audit technique externe des opérations du FDA tous les six mois.

Le DG signera une convention avec le PNF pour que ce dernier fournisse un appui stratégique et technique aux opérations foncières entreprises dans le cadre du projet.

**Suivi et Evaluation.** Le Suivi et Evaluation sera sous la responsabilité du Directeur des Systèmes d'Information (DISE) du MAEP, assisté par l'assistant technique international placé au niveau du DGDR. Pour intégrer le suivi des réalisations physiques et financières, le projet se basera sur le Système Intégré de Gestion (SIG) développé par le PSDR. Des audits techniques indépendants seront conduits par des prestataires de services qualifiés sur une base annuelle à partir de la deuxième année du projet. Deux évaluations externes des impacts du projet seront aussi réalisées : (i) à mi-parcours ; et (ii) à la fin du projet. Les analyses et recommandations de ces évaluations serviront à l'extension des activités du projet à l'ensemble du territoire national.

*Le système de « Suivi –Evaluation » s'articulera autour de trois modalités :*

(i) Un système de suivi interne conduit par le MAEP sous la responsabilité de la DISE en collaboration avec le staff de la DGDR au niveau central et au niveau régional (pour assurer une harmonisation et une cohérence dans le suivi des différents programmes sous la tutelle du MAEP). Cette fonction pourra toutefois être déléguée ou sous contractée à d'autres entités soit pour l'ensemble d'une composante (ex. PE3 pour la composante bassins versants) soit pour les activités au niveau régional (ex. GTDR pour chaque site) ;

(ii) Un système de suivi et évaluation participatif au niveau des quatre sites (permettant d'assurer une meilleure appropriation et une pérennisation des activités par les bénéficiaires) faisant intervenir les principaux bénéficiaires (OP, AUE, etc.) dans la définition, la collecte, l'analyse des indicateurs et la détermination des mesures correctives dans le cas où les objectifs intermédiaires ne sont pas atteints.

(iii) Un système de suivi collaboratif qui demande aux autres intervenants de participer à la collecte, au traitement et à l'analyse des indicateurs définis par le projet (e.g. les GTDR qui disposent chacun d'un plan régional de développement rural et d'un référentiel régional assortis d'indicateurs et dont le mandat comporte la fonction de suivi et d'évaluation pourraient être associés dans le dispositif de suivi et évaluation au niveau des sites)<sup>19</sup>.

**Les indicateurs de «suivi ».** Le suivi global du projet est basé sur les indicateurs qui seront confirmés durant la préparation et inscrit dans le Document d'Evaluation du Projet (voir Annexe 2) et le plan d'exécution du projet qui sera validé durant les négociations. Les réalisations de chaque composante seront toutefois mesurées de façon plus fine par une série d'indicateurs plus spécifiques. Les indicateurs de chaque composante seront groupés en deux catégories : (i) les indicateurs de performance mesurant les moyens mis à disposition par le projet [input indicators] et les activités mises en oeuvre [outputs indicators] ; et (ii) les indicateurs d'impacts mesurant les résultats directement obtenus par le projet [outcomes indicators] ainsi que les impacts. Ces différents indicateurs de composante seront développés et validés avant les négociations.

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<sup>19</sup> Au même titre, le PE 3 à travers une convention de collaboration pourrait être chargé du système de suivi et évaluation de la totalité de la composante bassins versants.

***Système Intégré de Gestion (SIG).*** Il est prévu d'intégrer le système de suivi dans le SIG qui permet non seulement de faire un suivi rapproché de l'exécution des activités depuis leur formulation jusqu'à leur réception mais aussi et surtout d'effectuer la liaison entre la réalisation technique et physique des activités et le décaissement. Le SIG comporte également un module « passation de marché » qui intègre le plan de passations de marché (PPM) du projet et l'état d'avancement de chaque activité de passation de marché en liaison avec les activités.

## **Annex 7: Financial Management and Disbursement Arrangements**

## **Annex 8: Procurement Arrangements**

## **Annex 9: Economic and Financial Analysis**

## **Draft PAD Annex 10: Safeguard Policies Issues**

### **Madagascar Irrigation and Watershed Management Project**

#### **Environmental Assessment Category and Safeguard Policies triggered**

1. The Madagascar Irrigation and Watershed 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 Lake Alaotra Ramsar site) and will lead over time to abandonment of many rural areas.

3. The only feasible project alternative is the presently chosen project design. The present project will address in an integrated manner the land degradation in four major irrigation schemes and their associated watersheds and reduce 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 Lake 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 stimulate 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. These agro-industries 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: Environmental and Social Management Plan**

<b><u>Potential Environmental and Social Impacts</u></b>	<b><u>Proposed Mitigation Measures</u></b>	<b><u>Responsible Agencies</u></b>	<b><u>Cost Estimate US\$</u></b>
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	DGDR, DRDR	Cost to be integrated in project management
Presently bad organization and management of watersheds	Preparation of Watershed Master Plan with clear responsibilities and actions to improve watershed 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	DGDR, DRDR, WUAs, CCPs, GSDM	Cost to be estimated by components

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

	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, DGDR, Ministry of Environment	Cost to be estimated by component
Increase in cattle grazing areas and increased erosion risks	Definition of grazing areas through Zoning of watershed and Master Plan	DRDR CCPs, CSA	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	CSA, 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 of new road access	Environmental Assessment of proposed roads: Analysis of alternative routes	ONE, ANGAP, Environnemental NGOs	Cost of 4 studies US\$ 80,000
Risk of exclusion of vulnerable groups with regard to access to and the division of water	Development of a water and land resources management plans on the level	DRDR, WUAs, CCPs, Federation of WUAs,	Costs to be integrated in

and land	of a sub-watershed and irrigation schemes; Conflict management mechanism: CCPs	Farmer's Organizations, Communes, Districts,	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, CSA,	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 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**

## **Annex 12: Documents in Project File**

## **Annex 13: Statement of Loans and Credits**

## Annex 14: Incremental Cost Analysis

### *MADAGASCAR: Irrigation and Watershed Management Project*

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:

- (a) Identify the baseline,
- (b) Describe what would happen if the baseline is implemented,
- (c) Indicate the costs of the baseline,
- (d) Describe the alternative scenario,
- (e) Describe the expected benefits under the alternative scenario,
- (f) Report the cost of the alternative, and
- (g) The incremental cost.

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.

#### **I. Component 1: Agricultural Development**

*The objective of this component is to improve access to markets, and to sustainably intensify and diversify irrigated and rainfed agriculture in the watersheds of the project.*

##### **(a) Baseline:**

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, farmers groups and professional organizations, (d) agricultural productivity through better access to extension, technology inputs, and credit, (e) market and public infrastructure, particularly for land tenure. 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. The project will finance the following activities.

##### **(b) Expected results under the baseline scenario:**

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: 18,800,000 USD (IDA)**

**(d) GEF alternative scenario (OP15):**

GEF funding will contribute to assuring that intensification and diversification of agricultural production will be based on agro-ecological 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 agro-biodiversity within the cropping systems and reduce pressure on natural habitats, and thus secure important global environmental benefits. Funding will be used to assure that high quality technical assistance is provided and adjusted to the specific environmental conditions of the four project zones. Furthermore, the GEF grant will be used for training of technicians and farmers in the agro-ecological techniques and principles, and for the testing and adaptation of these techniques in farmers' fields.

**(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"><li>• Improved local capacity (technicians, extension agents and farmers) in implementing agro-ecological farming techniques</li><li>• Improved agricultural production based on<ul style="list-style-type: none"><li>○ Technical improvement through agro-ecological and agroforestry techniques.</li><li>○ Improved soil fertility management and nutrient recycling through organic matter management,</li><li>○ Improved protection of soils through soil coverage and erosion control with vegetative measures</li><li>○ Increased agro-biodiversity through increase of locally adapted varieties, crop diversification (annual and perennial)</li><li>○ Improved crop rotation and integrated pest management</li></ul></li><li>• Diversification of agricultural production system</li><li>• Improved ecological resilience of agricultural system, with improved resistance to climate variability</li></ul>	<ul style="list-style-type: none"><li>• Increase in carbon sequestration (soil carbon, above-ground carbon: cover cropping, relay cropping, agroforestry)</li><li>• Increase in agro-biodiversity and below-ground biodiversity (through improved soil organic matter status)</li><li>• Reduced environmental degradation and pressure on natural habitats for agricultural fields (deforestation) due to satisfactory and increased agricultural production on existing fields; resulting in<ul style="list-style-type: none"><li>○ Reduced carbon emissions</li><li>○ Protection of ecosystem and possible restoration of ecosystem integrity</li></ul></li></ul>

**(f) GEF Alternative costs:** 20,100,000 USD (IDA + GEF)

**(g) Incremental cost:** 1,300,000 USD GEF. The incremental cost will finance the technical assistance to the project, training of technicians and farmers, and adaptation of new techniques through on-farm research.

**II. Component 2: Irrigation Development**

*The objective of this component is to improve 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:**

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:**

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:** 31,000,000 USD (IDA)

**(d) GEF alternative scenario (OP15):**

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)**

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.

**(f) GEF Alternative costs:** 31,000,000 USD (IDA + GEF)

**(g) Incremental cost:** 0 USD GEF

### **III. Component 3: Watershed Development**

*The specific objective of the component is to enhance watershed protection and upland productivity to improve rural livelihoods through the sustainable management of soils and natural resources.*

**(a) Baseline:**

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

The project will finance technical assistance to prepare a *master plan for watershed management* 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. In addition, a *participatory zoning* will be undertaken 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.

The project will also *invest in watershed protection*. The planning will have identified the “hot spots” of erosion 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:**

Successful implementation of this component will result in 4 master watersheds plans and 30 participatory sub-watershed plans that provide a diagnosis of natural resources and activity plans 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.

**(c) Baseline cost:** 3,600,000 USD (IDA)

**(d) GEF alternative scenario (OP15):**

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. Agricultural support under Component 1 will mostly likely be oriented towards the productive land at the bottom of the hillsides in proximity to settlements, irrigation schemes, roads and markets. Nevertheless, large parts of the upland areas do not lend themselves to quick and profitable investments.

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. They are mostly found in remote and marginal areas and it is

not very likely that the concerned stakeholders might benefit from support provided under component 1.

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: a) environmental awareness raising campaigns, b) training and capacity strengthening in alternative sustainable NRM practices according to stakeholders' needs, c) provision of support to community to obtain land rights (GELOSE) and of technical assistance to prepare natural resource management plans, and d) provision of support to environmental and other communication and negotiation platforms that influence natural resources management at the watershed level.

Interventions will be targeted at two main activities: a) interventions to increase of vegetation cover on communal land, including 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; and b) support development of alternative and sustainable upland agriculture based on fire-less practices, perennial crops and agroforestry technologies.

### 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>
1.3. Support to environmental communication platforms	<ul style="list-style-type: none"> <li>• Information exchange between stakeholders</li> <li>• 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</li> <li>• Allows for coordinated interventions within the project area on environmental and rural development activities</li> </ul>	<ul style="list-style-type: none"> <li>• 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</li> </ul>
1.4. Awareness campaigns, training and capacity strengthening on environmental issues	<ul style="list-style-type: none"> <li>• Improved knowledge and capacity in regards to land degradation impacts as well as existing alternatives by               <ul style="list-style-type: none"> <li>○ Rural population</li> <li>○ Local and regional staff (technical services, NGOs)</li> </ul> </li> <li>• Newly created or reinforced NRM farmers groups or associations with improved capacity</li> </ul>	<ul style="list-style-type: none"> <li>• 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)</li> </ul>
1.5. Support to community based natural resources management initiatives	<ul style="list-style-type: none"> <li>• Secured community land rights will provide incentives for improved NRM practices</li> <li>• Established management plans provide communities guidelines on volumes for extraction, management practices, and inform on long-term productivity of resources</li> <li>• Stimulates environmental stewardship of communities</li> <li>• Will improve productivity and profitability of NR use.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain ecosystem's integrity through sustainable extraction and harvest of products from natural habitats</li> <li>• Protect biodiversity by maintaining habitats</li> <li>• Avoided deforestation due to community land rights (avoided carbon loss)</li> </ul>

<u>Activities</u>	<u>Direct impact and local environmental benefits</u>	<u>Global environmental benefits</u>
2.2. Revegetation of communal land (pastures, reforestation, protection of natural forests)	<ul style="list-style-type: none"> <li>• Planted fodder grasses and improved pasture management will contribute to <ul style="list-style-type: none"> <li>○ improved cattle nutrition and productivity</li> <li>○ regeneration of vegetation</li> <li>○ reduced sheet erosion</li> </ul> </li> <li>• Reforestation will contribute to improved <ul style="list-style-type: none"> <li>○ Fuelwood and construction wood supply</li> <li>○ Erosion control</li> </ul> </li> <li>• Regeneration of natural vegetation will <ul style="list-style-type: none"> <li>○ provide multiple products for extraction (fuelwood, medicinal plants, wild fruits and other food plants)</li> <li>○ reintroduce native biodiversity within production landscape</li> </ul> </li> <li>• Protection of natural habitats will contribute to <ul style="list-style-type: none"> <li>○ Biodiversity conservation of many endemic and endangered species</li> <li>○ Protect ecosystem regulatory services and functions</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Improved above and below ground carbon sequestration (fodder grasses, reforestation)</li> <li>• Avoided carbon loss (pasture fires, deforestation, reduced forest product extraction)</li> <li>• Regeneration of native vegetation increases above and below ground biodiversity</li> <li>• Reduced pressure on primary forests, leads to improved protection of <ul style="list-style-type: none"> <li>○ biodiversity</li> <li>○ important environmental regulatory services such as water source protection (Marovoay)</li> </ul> </li> </ul>
2.3. Promotion of sustainable and profitable agriculture in the upper watersheds.	<ul style="list-style-type: none"> <li>• Develop alternative farming techniques to slash-and-burn practices, through agro-ecological techniques, improved nutrient cycling and targeted inputs, agroforestry and horticulture</li> <li>• Diversified agricultural production</li> <li>• Improved land productivity</li> <li>• Improves livelihood of poor, marginalized population</li> <li>• Reduces pressure on forests, and protects biodiversity</li> </ul>	<ul style="list-style-type: none"> <li>• Increase in biodiversity (below-ground) and agrobiodiversity</li> <li>• Reduced pressure on forests and avoided deforestation and carbon loss</li> <li>• Improved carbon sequestration in soils and through agroforestry</li> <li>• Improved carbon productivity through improved soil management</li> <li>• Avoided carbon loss through deforestation, burning of fallow vegetation for cropping</li> </ul>

(e) **GEF Alternative costs:** 10,00,000 USD (IDA + GEF)

(f) **Incremental cost:** 6,400,000 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.

#### IV. Component 4: Project Management

*The objective of this component is to use project resources in accordance with its purposes and procedures, to set up a political framework that is favorable to extending the project to the national level, and to monitor and evaluate project progress*

**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:** 1,600,000 USD (IDA)

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

GEF funding will contribute to the project monitoring and evaluation system by financing the establishment of a GIS database, 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 developed.

#### **(d) 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 indicators	<ul style="list-style-type: none"> <li>Improved understanding of the underlying causes, processes and dynamics associated with land degradation</li> <li>Environmental information system and environmental indicators</li> <li>State-of-the-Art knowledge will be available at local level</li> </ul>	Quantification of environmental benefits <ul style="list-style-type: none"> <li>to be included in economic analysis of the project</li> <li>Inform global community, policy makers, research, and development communities on project outcome.</li> </ul>

**(e) GEF Alternative costs:** 1,900,000 USD (GEF + IDA)

**(f) Incremental cost:** 300,000 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

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
Agriculture Development	Baseline	18,800,000	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 result 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)	20,100,000	<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"> <li>• Reduced carbon emissions</li> <li>• Protection of ecosystem and possible restoration of ecosystem integrity</li> </ul>
	<b>SLM Increment</b>	<b>1,300,000</b>		

Component 2	Category	Estimated Expenditures (US \$)	Local Benefit	Global Benefit
Irrigation Development	Baseline	31,000,000	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)	31,000,000	<p>Significant environmental benefits on irrigation schemes will be created through GEF incremental funding under component 1, 3 and 4.</p> <p>Reduced sedimentation of irrigation infrastructure</p> <ul style="list-style-type: none"> <li>• Reducing O&amp;M costs</li> <li>• Improving irrigation water availability.</li> </ul>	
	<b>SLM Increment</b>	<b>0</b>		

Component 3	Category	Estimated Expenditures (US \$)	Local Benefit	Global Benefit
Watershed Development	Baseline	3,600,000	<p>Reduced sedimentation through strategic erosion control</p> <p>WSM master plan and participatory planning improves knowledge base on resources and local development goals and needs</p>	<p>Some global benefits:</p> <p>Improved knowledge and decision making on sustainable management of natural resources and biodiversity protection</p> <p>Reduced land degradation (upland soil loss through erosion, lowland agricultural surface loss through sedimentation) yields in increasing carbon sequestration of productive landscape</p>
	With GEF Alternative (SLM)	10,000,000	<p>Improved coordination and collaboration between environmental and rural development stakeholders and/or organizations</p> <p>Improved local capacity to encounter land degradation with alternative land use</p> <p>Secured community land rights</p> <p>Management plans for sustainable use and extraction of NR</p> <p>Improved landscape productivity of communal land: pastures, reforestation plots and protection of natural habitats</p> <p>Improved productivity in fragile upper watersheds of private agricultural land through agro-ecological techniques.</p>	<p>Significant global benefits:</p> <p>Improved information, knowledge and decision-making on global environmental benefits through local actions.</p> <p>Protect globally significant ecosystems (forests, wetlands, lakes)</p> <p>Maintain ecosystems' functional integrity (e.g. protection of water sources) through habitat preservation</p> <p>Protect biodiversity within natural habitats.</p> <p>Avoid deforestation, burning of pastures, fallow vegetation, over-extraction of forest products and thus avoid carbon loss</p> <p>Improve carbon sequestration in soils and above-ground through agro-ecological techniques, agroforestry, reforestation and regeneration of natural vegetation</p>
	<b>SLM Increment</b>	<b>6,400,000</b>		

<b>Component 4</b>	<b>Category</b>	<b>Estimated Expenditures (US \$)</b>	<b>Local Benefit</b>	<b>Global Benefit</b>
Project Management	Baseline	1,600,000	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)	1,900,00	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
	<b>SLM Increment</b>	<b>300,000</b>		
<b>TOTAL</b>	Baseline	55,000,000		
	With GEF Alternative (SLM)	63,000,000		
	<b>SLM Increment</b>	<b>8,000,000</b>		

## **Annex 15: Technical Annex Land Degradation in Madagascar**

### **Land degradation in Madagascar**

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

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 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.

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,

#### **1) Land degradation analysis across the four project sites**

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><b>Water management problems for irrigation</b></p> <ul style="list-style-type: none"> <li>• Inundation of rice fields</li> <li>• Lack of water</li> </ul>	<ul style="list-style-type: none"> <li>• Upland degradation – erosion – sedimentation                             <ul style="list-style-type: none"> <li>○ Lack of erosion control</li> <li>○ Reduced vegetation cover favors erosion and flash floods</li> <li>○ Reduced infrastructure water holding capacity</li> <li>○ Wasteful water mgt leads to water shortage end of season</li> </ul> </li> <li>• Government absence</li> <li>• Non-functional WUA</li> </ul>	<ul style="list-style-type: none"> <li>• Erosion control project PLAE (projet lutte anti-erosive) in Marovoay</li> </ul>	<ul style="list-style-type: none"> <li>• Support WUA for efficient irrigation scheme and water management</li> <li>• Rehabilitate damaged and non functional infrastructure</li> <li>• Promote sustainable upland management practices (erosion control, revegetation)</li> <li>•</li> </ul>
<p><b>Soil fertility loss and soil erosion</b></p> <ul style="list-style-type: none"> <li>• Loss of productive agricultural land</li> <li>• Yield decline</li> </ul>	<p><u>Land management</u></p> <ul style="list-style-type: none"> <li>• Unsustainable agricultural practices: tavy, insufficient nutrient replenishment (no fertilization, short fallows)</li> <li>• Lack of upland erosion control</li> <li>• Lavakas, gully erosion, land slides reduces surface of upland and lowland fields</li> <li>• Sedimentation of ag. land</li> <li>• Lack of irrigation water</li> <li>• Fallow burning</li> <li>• Pasture burning</li> <li>• Deforestation</li> </ul>	<ul style="list-style-type: none"> <li>• Erosion control project PLAE (projet lutte anti-erosive) in Marovoay</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• 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</li> <li>• Erosion control measures on field boundaries, natural terracing through planting of vegetative barriers</li> <li>• Cover cropping and mulching that provide soil coverage within agricultural fields</li> <li>• Prevention of fire and revegetation of pasture areas with improved ground cover</li> <li>• Reforestation with good growth of understory vegetation that protects soils</li> </ul>

	<p><u>Support services, market linkage and infrastructure</u></p> <ul style="list-style-type: none"> <li>• Lack of extension service and research support</li> <li>• Lack of marketing opportunities</li> <li>• Lack of credit institutions</li> <li>• Lack of land use planning</li> <li>• Lack of property rights (sharecroppers) impedes investments in land</li> </ul>	<ul style="list-style-type: none"> <li>• TO BE COMPLETED</li> </ul>	<ul style="list-style-type: none"> <li>• Improve agriculture extension and build local capacity to develop improved farming practices (including farmer to farmer extension)</li> <li>• Establishment of mechanisms of market information access</li> <li>• Processing of natural resources (agricultural products, forest products, fish)</li> <li>•</li> </ul>
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<b>Vegetation cover loss</b> (Reduced carbon stocks)	<u>Natural habitats</u> <ul style="list-style-type: none"> <li>• Primary forests (Andapa, Marovoay, Itasy)             <ul style="list-style-type: none"> <li>○ Deforestation: tavy</li> <li>○ Logging</li> <li>○ Charcoal production</li> <li>○ Fire wood collection</li> </ul> </li> <li>• Cutting and burning of marshes to create rice fields (Alaotra)</li> </ul> <u>Production landscapes</u> <ul style="list-style-type: none"> <li>• Burning of fallows degrades regenerating vegetation: loss of woody species</li> <li>• Burning of pastures: only most fire resistant species persist with low biomass (e.g. Aristida sp)</li> <li>• Overexploitation and accidental burning of reforestation plots</li> </ul>	<ul style="list-style-type: none"> <li>• Conservation organizations (forest service, park service ANGAP) do awareness campaigns, forest patrolling, monitoring of fire (under EP3)</li> <li>• 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)</li> <li>• Agricultural</li> </ul>	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. <ul style="list-style-type: none"> <li>• Promote and develop alternative land use and techniques without fire: agro-ecological techniques (cover crops, mulching plus targeted fertilization), increase soil carbon</li> <li>• Improve pasture management (plant fodder grasses, fodder banks), rotational grazing</li> <li>• Increase reforestation to take pressure of natural forests for charcoal, firewood production</li> <li>• Plant woody species for service wood (logs) to reduce pressure on natural forest</li> <li>• Encourage natural regeneration of native vegetation</li> <li>• Education campaigns on impacts of fire on ecosystem and landscape productivity</li> <li>• Train local capacity to prevent and control wild fire, community based fire control</li> <li>• Support population to obtain land rights to resources, and provide support to establish a management plan (GELOSE)</li> <li>• Participatory land use planning</li> </ul>
	<u>Support services</u> <ul style="list-style-type: none"> <li>• Absence of extension and research: alternative agricultural techniques not available at farm level</li> <li>• Lack of land tenure security favors tragedy of commons</li> <li>• La</li> </ul>	<ul style="list-style-type: none"> <li>• Decentralization takes up more responsibility in support to rural development</li> <li>• Private extension services through NGOs</li> <li>• Donor support (KFW) to land titling (Marovoay)</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>

<p><b>Biodiversity loss</b></p>	<p><u>Forests</u></p> <ul style="list-style-type: none"> <li>• Slash and burn agriculture (habitat loss)</li> <li>• Wood and NTFP extraction (logging, charcoal, firewood, NTFP such as orchids, tree ferns, etc.)</li> <li>• Hunting (lemur hunting Andapa)</li> </ul> <p><u>Production landscapes outside of forests</u></p> <ul style="list-style-type: none"> <li>• Fire kills off native plant species, replaced by exotic invasive species</li> <li>• Fire kills off woody native species (very weak regeneration capacity under frequent fires), replaced by herbaceous species</li> <li>• Loss of soil biodiversity from forest soil to depleted pseudo-savannah soils</li> </ul> <p><u>Wetlands and fresh water</u></p> <ul style="list-style-type: none"> <li>• Over extraction of fish</li> <li>• Marsh habitat loss through burning and drainage</li> <li>• Siltation of lakes (pollution, acidification)</li> <li>• Hunting in marshes</li> <li>• Invasive fish species</li> <li>• replace native fish</li> <li>• Invasive aquatic plants (eutrophication)</li> </ul>	<ul style="list-style-type: none"> <li>• Third Phase of National Environmental Action Plan (EP3), with mandate to protect biodiversity and habitats,</li> <li>• Durban Declaration in 2003: increase protected areas from 1.7 million ha to 6 million ha (or 10% of country surface)</li> <li>• 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</li> </ul>	<ul style="list-style-type: none"> <li>• 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</li> <li>• Promote partnerships and collaboration between environmental and rural development programs in the project sites (including communication and concertation platforms)</li> <li>• Develop fire-less land management practices that allow ultimately for regeneration of native species (above-ground and below-ground) within the production landscape.</li> </ul>
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## 2) Site description and land degradation at the four sites Marovoay, Lac Itasy, Andapa and Alaotra

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 <sup>2</sup>	6,400 ha		122,000
Marovoay	13 (according to independent irrigation sections? )		20,000 ha		
Andapa	1 SubWS (Lokoho), multitude of MWS	Total: 1040 km <sup>2</sup>	12,000 ha		
Itasy	4		4,460 ha		

	Climate	Altitude	Annual Rainfall	Rainfall days	Temp °C
Alaotra	Tropical temperate highland climate	750m	1100-1200	100-150	20 (15 – 27)
Marovoay	Sub-humid tropical climate	20 m	1500		
Andapa	Hot humid tropical climate	470m	> 2000	240	(19 – 25)
Itasy	Tropical highland climate	1220m	1350 - 1700		(7 – 27, 10-29)

### Marovoay

The Marovoay plain is a rice production zone of prime national importance, situated in the Boina 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 20<sup>th</sup> 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% 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.

The main watershed serving the Marovoay irrigation scheme is the Betsiboka watershed, one of the largest watersheds in Madagascar with an extension of 40,000km<sup>2</sup> 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.

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 results

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 tufts 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% of the woody species are endemic. The park is rich in birds with 129 species (74% endemic), reptiles with 70 species (87% endemic), and has 22 mammal species (74% endemic).

## **Lac Itasy**

The Itasy Region, with its Lac Itasy in the center, is situated about 100 km to the west of Antananarivo (See map in Annex 17). 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*<sup>20</sup> formation.

High soil fertility and established irrigation infrastructure, attracted immigrants. Population density is high in the region with 107 people/km<sup>2</sup> 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.

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.

Theoretically two rice crops can be cultivated, the first extending from July/Aug to Nov/Dec, and the second from Dec/Feb to April/Juin. 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% of the production compared to 10% of cash crops. Rice occupies 33% of the cultivated surface, mais and beans each 17% and potato 13%. 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.

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.

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, ferrallitic 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 enhance 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.

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<sup>20</sup> 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

There is a small surface of remaining primary forest left in the upper watershed of Ambohimananana 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.

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**

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.

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.

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.

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.

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.

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 montane rainforest (800–1400 m), high-altitude montane cloudforest (1400–1800 m), and high-altitude montane ccrub (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**

The Lac Alaotra watershed forms a vast depression of around 1,750 km<sup>2</sup>, 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 km<sup>2</sup> (free water surface) and around 550 km<sup>2</sup> 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 an 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.

The watershed supplying Sahamaloto irrigated perimeter stretches over an area of 356 km<sup>2</sup>. 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% of households crop on uplands and 26% 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 m<sup>3</sup> was gradually reduced to about 13-14 million m<sup>3</sup>. 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 m<sup>3</sup>. 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 m<sup>3</sup>/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.

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.

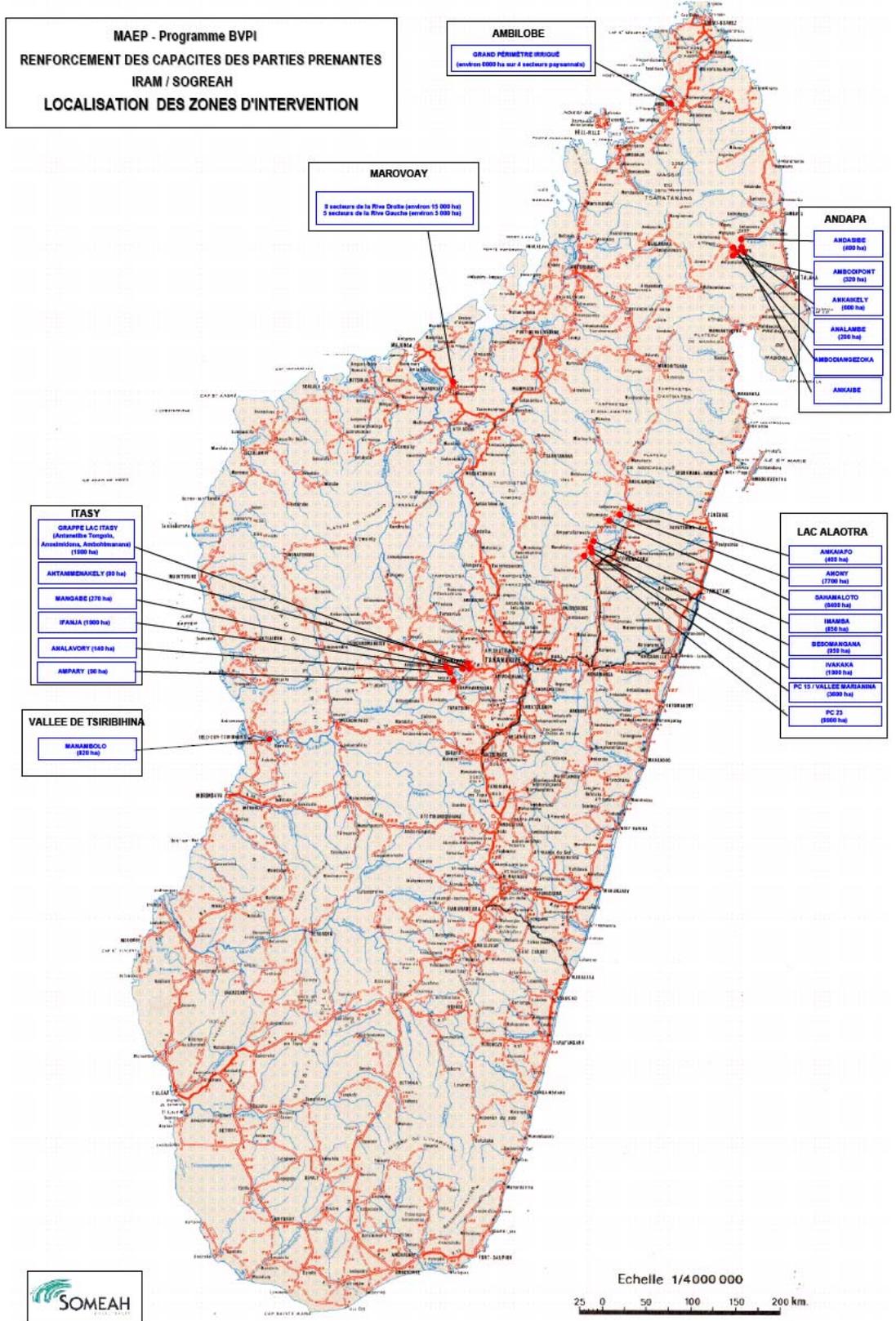
Alaotra has the largest wetlands in the country and is also a center of endemism. Three species are endemic to Alaotra, all of which are critically endangered: Alaotran gentle lemur *Haplemur griseus alaotrensis*, Alaotra little grebe *Tachybaptus rufolavatus* and Madagascar pochard *Aythya innotata*. 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 16: Madagascar at a Glance**

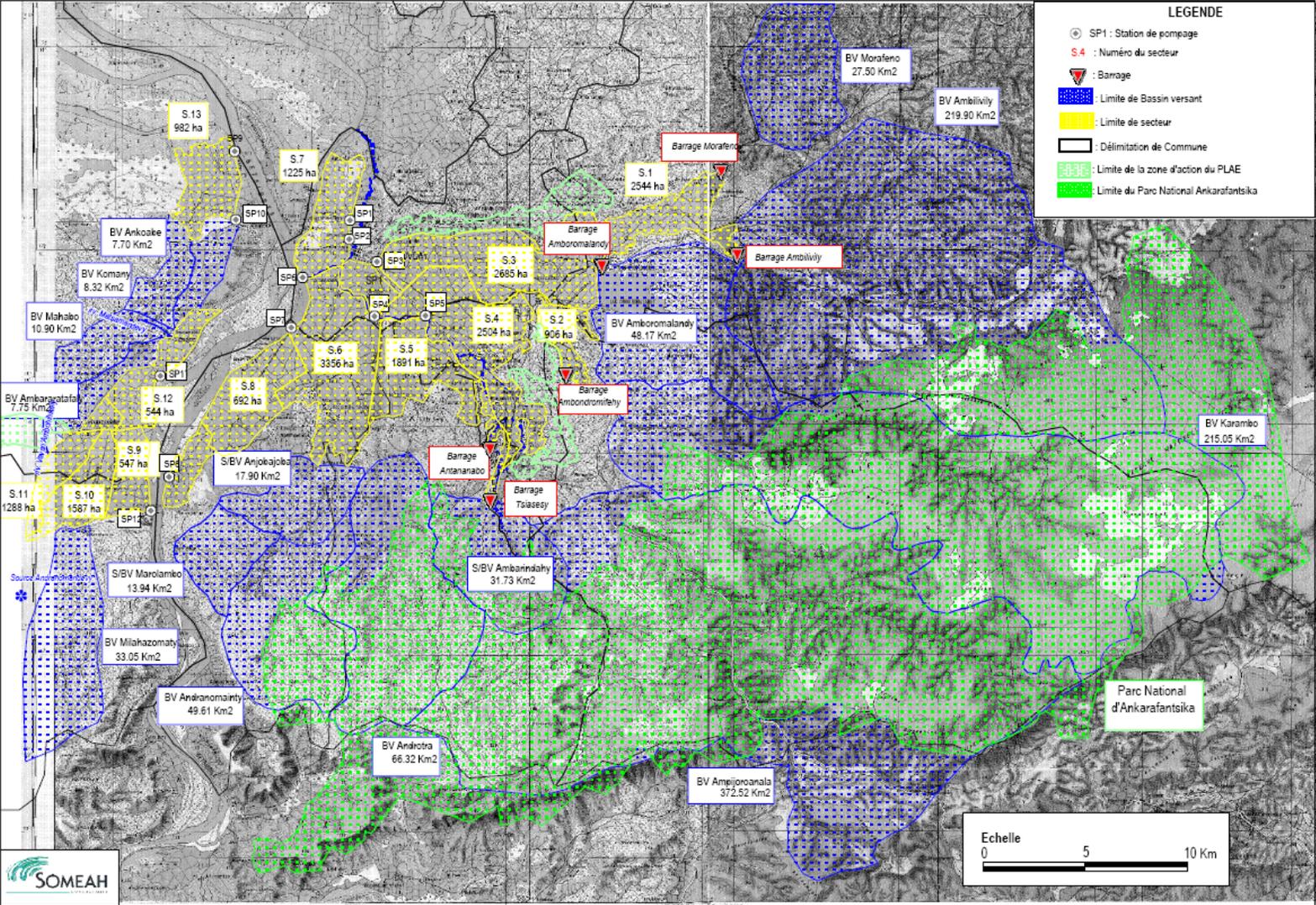
**Annex 17: Maps**  
**MADAGASCAR : Projet Bassins Versants – Périmètres Irrigués (BV-PI)**

- Carte 1 : Localisation des zones d'intervention du projet : Andapa, Marovoay, Itashy et Lac Alaotra – Périmètre de Sahamaloto
- Carte 2 : Périmètres et Bassins versants de Maravoay
- Carte 3 : Périmètres et bassins versants d'Andapa
- Carte 4 : Périmètres et bassins versants d'Itashy
- Carte 5 : Périmètres et bassins versant du Lac Alaotra

**Carte 1 : Localisation des zones d'intervention du projet : Andapa, Marovoay, Itasy et Lac Alaotra – Périmètre de Sahamaloto**

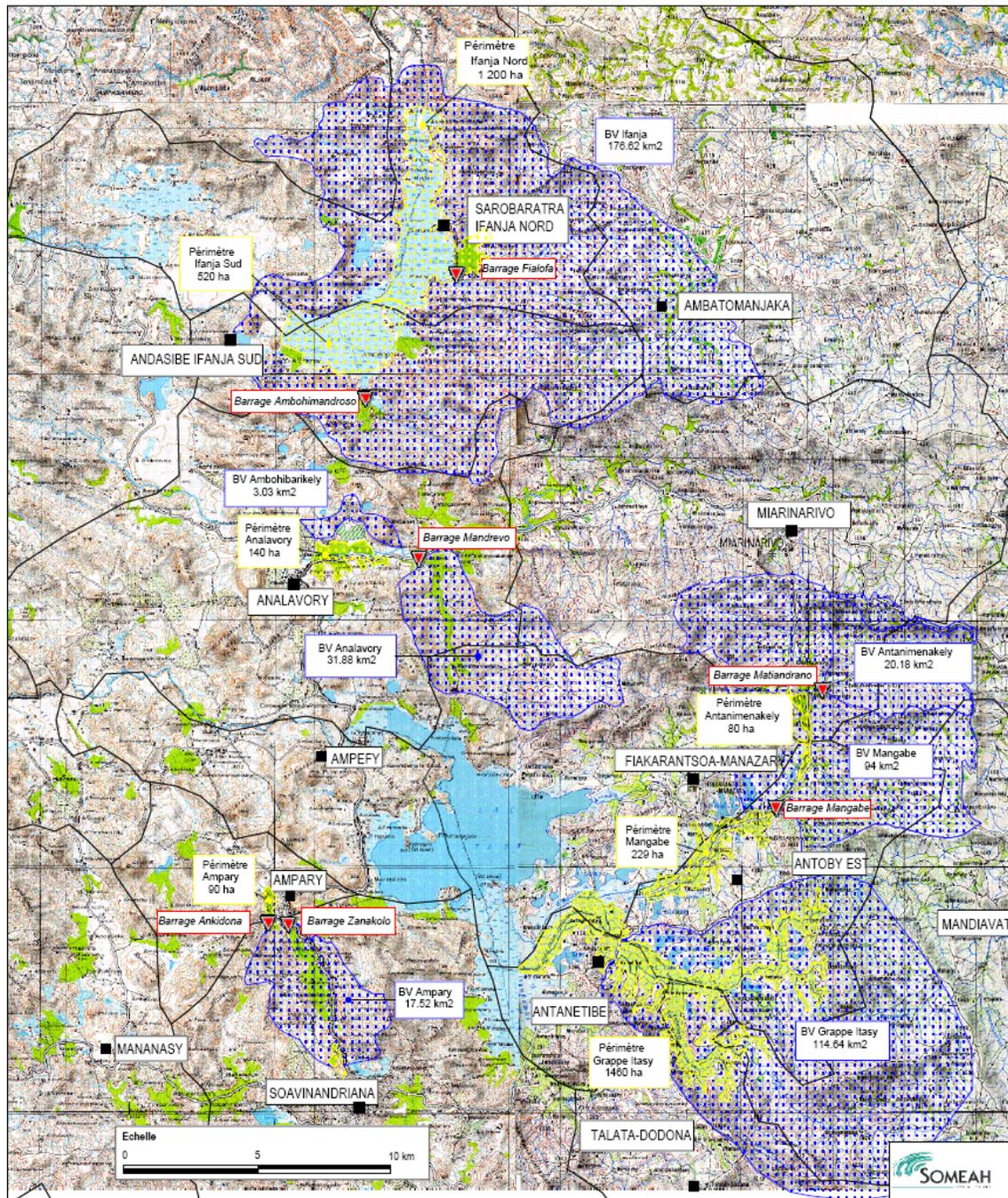


Carte 2: Périmètres et Bassins versants de Maravoay

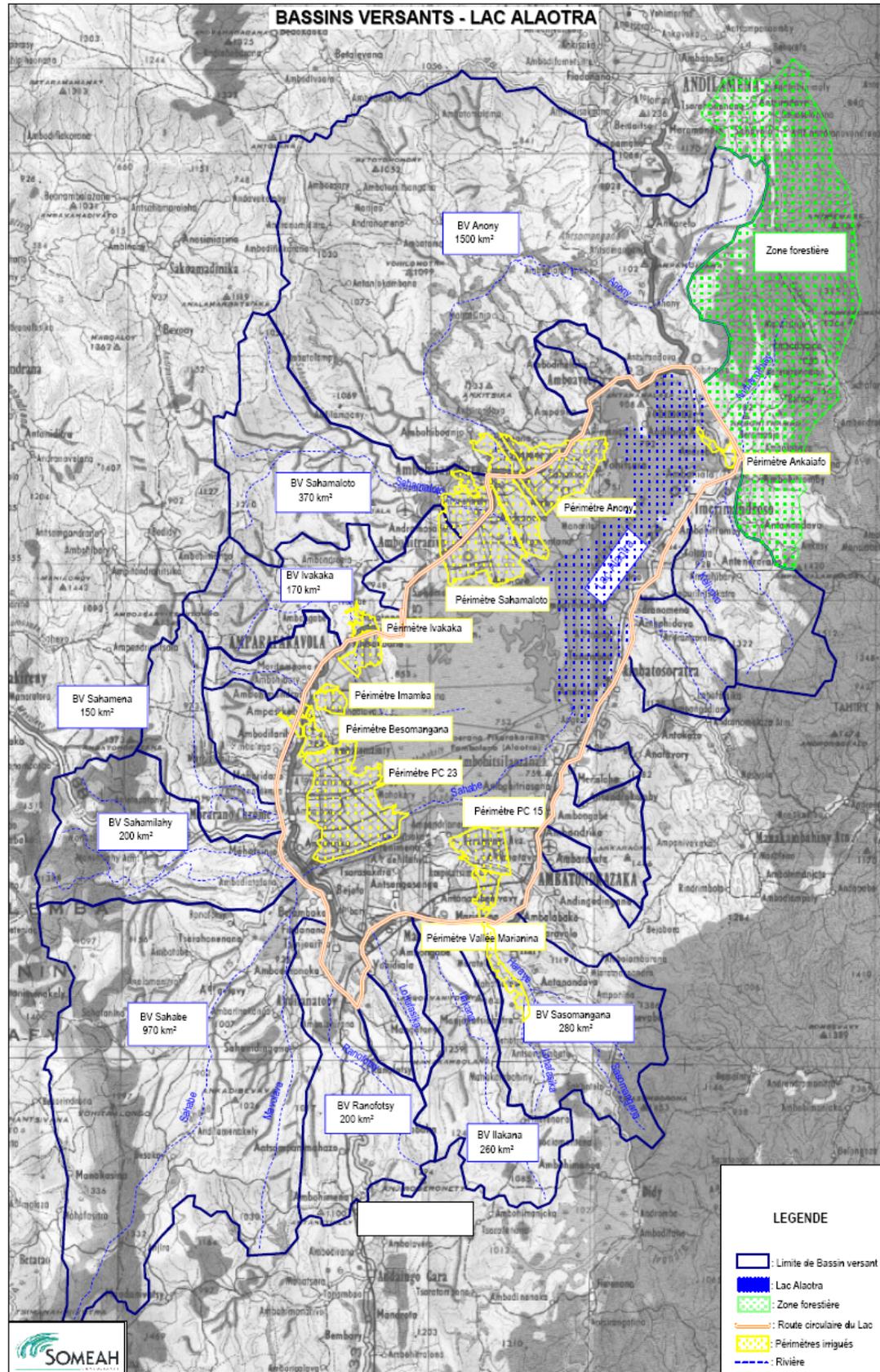




Carte 4 : Périmètres et bassins versants d'Itashy



Carte 5 : Périmètres et bassins versant du Lac Alaotra



## ANNEX 18: STAP REVIEW AND RESPONSE TO REVIEW

Project: **Irrigation and Watershed Management (Madagascar)**  
Country: **Madagascar**  
Project Title: **Irrigation and Watershed Management**  
STAP Reviewer: Professor Martin Williams ScD, University of Adelaide, Australia.  
Date: March 19, 2006

### ***Editorial comment***

The draft proposal shows many signs of hurried writing; certain sections are incomplete or missing altogether; many parts are poorly expressed, ungrammatical, replete with typographical errors, with occasional lapses into total obscurity. I shall comment as best I can, noting also that the proposal contains a great deal of repetition and could have been far more concise and a great deal more lucid. My major technical concerns are emphasised in bold.

I shall give only one example of the type of needlessly obscure writing that permeates this draft, but it serves to illustrate my concern:

*'The third step refers to the participatory planification with community based organization of management and use of the common pool resources within the watershed.'*

#### **1. Scientific and technical soundness of the project, including the degree of stakeholder involvement.**

In evaluating this proposal I will adopt a holistic approach to the following questions:

- Will the approach taken in the project proposal achieve the objectives of addressing land degradation?
- What are the risks and constraints associated with the approach?
- Is there any gap in the project? Are there any controversial aspects about the project?
- What aspects of the interventions proposed require further research?
- How will the model of sustainable use outlined in the project be developed?
- How effective will the proposed model be?
- Is there sufficient evidence in the document that the project offers the best long-term solutions?

This project aims to increase agricultural productivity in four watersheds through improved management of irrigation. (The actual wording used early in this proposal is as follows but needs to be improved: *'The development objective of the project is to sustainably increase agricultural productivity in four high potential watershed and their associated irrigation schemes'*).

The geographical focus is on four contrasting areas (Andapa, Marovoay, Itasy region and Lake Alaotra), each of which is well described in the final set of appendices, together with accompanying maps. The maps themselves are not easy to read and I would recommend that they be simplified and redrawn to show the salient features of each of the four localities. The reasons for selecting these four areas are well argued and the reasons for selecting no more than four are cogently presented. Since each area differs in climate, soils, land use history and processes of land degradation, the scope for replicating the outcomes in other areas is

necessarily limited, since the lessons learned in one area may not necessarily apply to other areas.

A common characteristic of each area is that erosion in the uplands is contributing to sedimentation in the lowlands, with serious consequences for irrigation through silting up of canals and concomitant wet season flooding. In addition, the uplands are often the regions of high biodiversity and in any event do not often provide an adequate level of income for farmers. There are therefore strong environmental, economic and social reasons for better watershed management, hence the project development objective of increasing agricultural production in the four selected watersheds and their associated irrigation schemes. The sites themselves were chosen because they were accessible, already had available agricultural services, and had high potential for increased agricultural output through integrated and more effective water management. Reduction and prevention of land degradation through reduction in burning and increased revegetation would contribute to the restoration of ecosystem functions in the watersheds, including fewer landslides and flash floods and reduced sedimentation downstream.

The project is based on five conceptual principles. These include enhanced devolution of Government action; local participation; clearer definition of the roles and responsibilities of local beneficiaries; fostering partnerships and provision of services; and a framework of incentives to assist local farmers to increase agricultural production.

The project is structured as follows:

- Component 1 deals with agricultural development.
- Component 2 deals with irrigation development.
- Component 3 deals with watershed development.
- Component 4 deals with project management.

**Component 1. Agricultural development.**

Rice provides some 70% of all agricultural production and half of total calories consumed but rice yields are very low and production has only increase by 1.2% since the 1980s despite a disproportionately greater increase in population in that time. Production of paddy rice has stagnated over the past decade. The primary aim of this component is to improve access to markets and to intensify and diversify irrigated and rain-fed agriculture in the four watersheds.

**Component 2. Irrigation Development.**

The focus here will be on sustainable management of irrigation infrastructure, especially important given the chequered history of past irrigation investment operations. The specific aim is the rehabilitation of irrigation schemes covering some thirty thousand hectares.

**Component 3. Watershed Development.**

The emphasis here will be upon protecting watersheds by implementing a variety of measures aimed at reducing upstream erosion and downstream sedimentation. A master plan will be prepared for each of the four watersheds.

#### **Component 4. Project Management.**

This component will provide technical assistance and equipment to support project management, as well as financial management and monitoring of inputs and outcomes.

#### **Stakeholder involvement.**

The number of stakeholders directly affected by the project would amount to some thirty thousand smallholder households producing irrigated crops and about forty thousand households producing rain-fed crops, together with farmers' groups and private operators. Since it is possible that some land acquisition and resettlement will be needed and that people may be denied access to traditional natural resources, it is vital that all parties are properly consulted and involved in any decisions made.

The proposal shows an awareness of the need for capacity strengthening of all stakeholders but apart from repeatedly stressing the need to clarify the roles and responsibilities of all stakeholders is devoid of detail as to how this capacity building and stakeholder participation are to be achieved in practice. The principles enunciated are sensible but what is needed is precise information on how they might be put into practice. Specifically, who, at the local and community levels, will be responsible? For example, how, precisely, will the project ensure the *effective participation of rural populations in diagnosis of problems and identification of options*? Over what time frame will the investments in infrastructures *be conditioned by the performance of stakeholders* as well contributing to enhance their performance?

The administrative structure identified in the proposal is as follows:

*The National Steering Committee will be chaired by the Minister of Agriculture and will include representatives from (a) the other central ministries involved (Ministry for Decentralization and Land Management, Ministry for the Environment, Water and Forests, Ministry for Energy and Mining, Ministry for Economy, Finance, and Budget, Ministry for National Education, Scientific Research, Ministry for Trade) to ensure consistency of project actions with national policies; (b) the four regions involved – Heads of Region, Chairpersons of GTDR, to ensure integration of project actions at regional/ commune level with national strategies and programs; (c) the main professional organizations such as the Chamber of Agriculture and associations/ forums for main value chains involved such as the « Rice Forum ».*

*The National Steering Committee will be supported by DGDR at MAEP. I will be responsible for (i) annual programming of project activities (approval of the work plan and budget), (ii) monitoring implementation and results, including 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 will meet twice a year. **Regional Monitoring Committees** will be established in each of the four project areas and will be chaired by the Head of the Region and made up of members of GTDR.*

## **2. Identification of the global environmental benefits and/or drawbacks of the project.**

The global environmental benefits that would accrue from minimising soil erosion, biomass burning and forest removal and through promoting agro-forestry and improved soil fertility are an increase in soil carbon storage and in soil and forest biodiversity, reduced carbon emissions and restoration of ecosystem integrity. Reducing forest loss in the upland watershed areas would ensure a more equitable flow regime in the rivers and an overall improvement in soil aggregate stability and water holding capacity. Further information is given in section 9, including a discussion of some potential drawbacks.

### **3. Project consistent with GEF goals, operational strategies, program priorities and relevant international conventions.**

The project has a number of aims that fall within the ambit of GEF Operational Programs #15 (Sustainable Land management) and #12 (Integrated Ecosystem Management). These global environmental objectives include the reversal of land degradation, reduction in biomass burning and an overall reduction in biodiversity loss.

The project is consistent with the aims of the International Convention to Combat Desertification in the dry sub-humid regions as well as with several other international conventions, notably those relating to biodiversity conservation and to climate change. Any increase in plant biomass through increased agricultural productivity in this impoverished environment will enhance carbon storage in growing plants and soils and will help to minimise soil loss through erosion by water and mass movement. An additional benefit would be to enhance the ability of ecosystems to adapt to future variations in climate.

The project aims to restore and maintain critical ecosystem functions in watershed areas by reducing and preventing land degradation, which is fully consistent with GEF goals. GEF support in minimizing soil loss from the upland areas will help to improve the present low levels of upland productivity, and, most importantly, will address the severe off-site effects of upland erosion, namely sedimentation in the irrigation schemes downstream.

*As the proposal states, Madagascar is eligible for GEF support. It has ratified the United Nations Convention to Combat Desertification 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, and has also prepared and submitted and National Action Plan in 2001 under UNCCD.*

### **4. Regional conservation context.**

Madagascar has high natural rates of erosion and these have been aggravated by deforestation of areas with weakly structured soils, leading to soil loss from raindrop impact, runoff erosion, tunnel erosion, gully erosion and landslides. Certain areas of primary forest are now suffering from encroachment for charcoal production.

The proposal authors note that increased deforestation in the watersheds is increasing pressure on *the globally important biodiversity resources in the upper and lower watersheds in three of the selected 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 Lake Alaotra Ramsar site. In Itasy agriculture is practiced on very steep slopes, which would normally remain under forest.

The Ankarafantsika National Park lies in one of the four project areas and covers 130,000 hectares; it is one of the last sizeable remnants of dry dense forest in NW Madagascar. *Over 92% of the woody species are endemic. The park is rich in birds, with 129 species (74% endemic), reptiles, with 70 species (87% endemic), and has 22 mammal species (74% endemic).*

The upper watershed of Ambohimana contains a small patch of primary *Uapaca bojeri* forest but it is suffering steady encroachment from landless sharecroppers. The proposal authors note that with its disappearance will go an opportunity *for very lucrative wild silk production, as the wild silk moth is native to these forests.*

The Lokoho watershed of Andapa is flanked by the Marojejy National Park, the Anjananaribe Special Natural Reserve and the Makira Special Natural Reserve. The recently established Makira Special Natural Reserve is the largest reserve in Madagascar and supports a very diverse fauna and flora, much of which are endemic to the area. The forest habitats of Marojejy shelter *an exceptionally rich and unique flora and fauna comprising 118 bird species, 11 lemur species, 149 reptiles and amphibians, 35 palms, and over 275 fern species, many of them endemic to the region and endangered.*

The Lake Alaotra basin contains the largest wetlands in Madagascar. The lake is home to some fifty species of birds, of which eight are endemic and threatened by habitat degradation. **There is a real concern that greater use of chemical fertilizers and pesticides may further degrade water quality, with adverse effects for all the biota, including humans.**

## **5. Scope for replication of the project.**

The four watersheds areas selected differ widely in terms of their climate, bedrock geology, topography, soils, vegetation cover and land use history. It will therefore be difficult to extrapolate experience gained in one area to a wider region unless the influence of local factors can be separated from those of more regional import.

A second possible limitation concerns farmer attitudes to participation in the project. Some may object to delegating or handing over land management rights to local community groups on the grounds of loss of free and traditional individual access to natural resources.

Many Malagasy farmers have derived very little individual benefit from past attempts to impose agricultural intensification upon them and for a variety of reasons have resisted such attempts. The quality of technical support and services provided will need to be such as to overcome farmer suspicion or inertia, and issues of land tenure will need to be dealt with fairly and energetically.

Provided the above concerns can be overcome reasonably expeditiously, there should be scope for replication. At this stage, it is hard to assess.

## **6. Project effectiveness and sustainability.**

The section on sustainability was left blank in the draft report sent to me but I shall nonetheless provide some general remarks. Any measures that help to increase the present very low yields from irrigated rice cultivation will benefit Malagasy rice growers. At present, seventy percent of agricultural production and eighty eight percent of rice production come from irrigated agriculture but irrigated crops provide only fifteen percent of GDP. In addition, seventy three percent of national rice sales come from ten percent of all farmers and some forty eight percent of rice farmers had no sales in 2001. Best estimates are that some eighty five percent of the active farming population is involved in irrigation. Given its objectives, this project has considerable potential to be both effective and sustainable. However, its long-term success can only be gauged through an efficient system of monitoring in which inputs and outputs are measured and compared to a specified set of performance indicators. Both the French and English sections dealing with monitoring procedures are explicit on this point.

One possible concern is that the monitoring and evaluation procedures are conducted at a national level that may not always be sufficiently sensitive to local geographical and social variations. The composite indices are based on very general criteria and may not always offer the level of detail required at local land use planning level.

As a general comment, one can note that ecologically sustainable development requires that social and economic needs be met through maintenance of the life-support functions of ecosystems, both natural and humanly modified. Any action that systematically removes materials from a natural system at a rate faster than the ability of that system to produce a surplus will cause the system to become degraded. Likewise, any action that systematically adds substances to a natural system at a rate faster than the capacity of the system to absorb and recycle such materials will also lead to system impoverishment. Since the only source of an increase in net global primary productivity is via photosynthesis, maintenance of a resilient plant cover is the prerequisite for achieving sustainable land use and effective ecosystem management.

The only lasting guarantee that this project can fulfil these fundamental requirements lies in its ability to enhance the capacity of irrigation farmers to produce and market rice and other crops in a manner that enhances the capacity of the land to produce high crop yields over the long-term without damage to both natural and humanly modified ecosystems.

## **7. Consistency with operational strategies of other focal areas**

This project falls within the overall development objective of Madagascar's Poverty Reduction Strategic Framework (July 2003) which aims to reduce the poverty rate by half within ten years, in part by encouraging broadly based economic growth. It also comes within the Government's National Irrigation and Watershed Program and is of direct relevance to two emerging professional groups, namely, the *Plateforme Consultative de Riz* and the *Association Malgache de Producteurs de Semences*. Other international groups working in Madagascar and committed to poverty reduction are the French Development Agency, the African Development Bank, the Food and Agriculture Organization and the Japanese International Development Agency, all of which are operating in the irrigation sector and/or the National Irrigation and Watershed Program.

## **8. Linkages to other programs and action plans.**

The primary linkages are to the recently created National Irrigation and Watershed Programme that is now an integral part of Madagascar's Poverty Reduction Strategic Framework, promulgated in July 2003.

#### **9. Other beneficial or damaging environmental effects.**

In Madagascar as elsewhere in the tropical world, irrigation schemes are major sources of waterborne diseases, the effects of which may nullify any economic benefits. **Of particular concern is the parasitic fluke infestation schistosomiasis, the aquatic snail vectors of which live in stagnant or slowly flowing water. It would be useful to identify and cost the measures needed to eradicate the snails and their eggs from the irrigation canals. In particular, are there any naturally growing trees or shrubs whose leaves or berries are molluscidal and ovicidal without detriment to fish, birds and humans?**

The proposal authors consider that the social and environmental impacts of the project will be mostly beneficial, with an improvement in soil fertility, reduced sedimentation in canals and improved ecosystem health in the headwaters. **However, they do not address in any detail the potentially serious consequences (eutrophication, algal blooms, toxins in drinking water) of increased inflow of phosphate and nitrogen rich runoff into rivers, lakes and wetlands arising from increased use of chemical fertilizers to improve soil fertility.**

**Any measures to control erosion through an increase in surface cover, whether plant or mulch, are to be commended.** In areas of high intensity rain even a modest increase in surface grass cover can significantly reduce raindrop impact and runoff erosion. The physical measures introduced to minimise soil loss by overland flow should aim to reduce slope length and slope declivity. Hillside terracing, although highly labour intensive in the shorter term, is a proven means of reducing erosion in the longer term.

The proposal authors suggest that the development of agro-ecological agricultural practices has the potential to triple agricultural production of a variety of crops, and would therefore watersheds increase production and income in the upland catchments, while reducing erosion, increasing plant cover and soil fertility, and reducing biomass burning.

The proposal authors might indicate just how they plan to identify what they term hotspots of erosion. Unless the sites of highest sediment yield are targeted and monitored early in the project, many of the downstream problems will persist. **This should be given a very high priority.**

Two further potentially adverse environmental effects of a successful project are the strong possibility of human migration into the area, leading to increased pressure on natural resources, and pollution arising from the growth of food processing industries. If intelligently managed, these effects can be minimized but the latter will require an effective system of regular and objective monitoring.

#### **10. Mechanisms for participation and influencing project management**

The proposal makes frequent mention of the lack of participation by local farmers in past irrigation schemes and propose three prerequisites for ensuring more effective participation in the future. The first is an attractive economic environment with access to credit, an improved price policy, help with marketing and storage and access to agricultural services adapted to local needs. The second is a clear institutional framework and the third is full participation in decision making, with commitments respected by all parties to any agreement and equitable access to resources.

**The success of this project will depend to a considerable degree on the finesse and tenacity with which genuine participation is achieved and maintained.**

#### **11. Capacity building.**

The proposal suggests that elaborating and monitoring Communal Development Plans will help capacity development within the Communes involved in the project areas. It is not altogether clear how this will be done and by whom, but presumably it will be by the elected officers and staff of the Communes trained by the District Support Centres to be set up in the regions. the first of which should have been established in January 2006 in the Itasy Region. (Has this in fact occurred?).

A condition of any successful capacity building is **the degree of effective stakeholder involvement**, discussed at the end of section 1.

**A key element in building social capital among the farming communities is the high demand for security of land tenure** and for obtaining title deeds to land, which the existing system seems unable to do, resulting in a plethora of informal paper transactions.

#### **12. Innovativeness of the project.**

The novel aspect of this proposal is the integration between land use in the upland watersheds and in the lowlands. It may seem an obvious approach, but surprisingly few development projects attempt such integrated catchment management programmes.

#### **13. Potential for greatest impact and lessons learned from other similar projects.**

Previous efforts to increase agricultural production by investing in irrigation infrastructure have not proved particularly successful in Madagascar. Among the reasons cited for this failure were lack of marketing opportunities (isolation, low prices), lack of access to advice and inputs, failure to take into account sedimentation from the upper catchment areas, and ill-defined responsibilities of the various public and private partners. Additional reasons given were a lack of commitment by both users and the State and failure by water users to pay their dues, itself prompted by failure of many of the actual irrigation schemes to deliver the benefits promised to the irrigators.

Other lessons learned from past experience concern the high degree of land insecurity among Malagasy farmers, and inequitable profit sharing, notably among sharecroppers. Reasons for past failures in communicating to farmers the potential benefits of increasing agricultural productivity are summarized in the proposal as follows:

- *approach excessively focused on technical offers;*

- *poor consideration of demand and economic concerns;*
- *excessively centralized, with low regional identity;*
- *incompetent extension workers;*
- *interventionist/rigid approaches;*
- *low level of partnerships and empowerment of beneficiaries;*
- *unrealistic projections of public support capacities in terms of human resources and financial sustainability.*

However, a recent World Bank survey has found that investments in small-scale community irrigation schemes have led to increased productivity, although not at the level anticipated.

Land degradation is one of the primary causes of low agricultural yields in Madagascar, and there is growing recognition that sedimentation in the lowland irrigation areas is directly linked to accelerated soil loss from the uplands. This upland erosion stems from traditional methods of shifting cultivation (slash and burn agriculture), frequent burning of upland pastures and clearing of upland forests for cultivation. The consequences of this upland erosion are increased runoff and greater flooding during the wet season and decreased soil infiltration capacity and a reduction in base flow in streams and rivers, leading to water shortages in the dry season.

The Irrigation and Watershed Policy Letter of the Government of Madagascar recognizes the shortcomings of previous efforts at increasing agricultural productivity solely through top-down engineering approaches irrigation projects and advocates a more integrated approach to water management that takes into account safeguarding the headwater ecosystems, and better access to finance, markets and equipment for farmers. The Letter also emphasizes the need for an unambiguous institutional framework with clearly defined responsibilities for all parties concerned, from individual farmer to Government agencies.

## Response to STAP Review

### SCIENTIFIC AND TECHNICAL SOUNDNESS OF THE PROJECT

*Comment 1: The maps themselves are not easy to read and I would recommend that they be simplified and redrawn to show the salient features of each of the four localities.*

**Response:** We note a point well made, the attached maps are overly precise with much overlapped information of watershed areas, irrigation schemes and natural habitats. As printed in black and white and on a small format, the maps are indeed not very easy to read. The maps will be improved for the final Brief.

### STAKEHOLDER INVOLVEMENT

*Comment 2: The proposal shows an awareness of the need for capacity strengthening of all stakeholders but apart from repeatedly stressing the need to clarify the roles and responsibilities of all stakeholders is devoid of detail as to how this capacity building and stakeholder participation are to be achieved in practice. The principles enunciated are sensible but what is needed is precise information on how they might be put into practice. Specifically, who, at the local and community levels, will be responsible?*

**Response:** The project is committed to a participatory approach. The need and approach for capacity building varies considerably and will be adjusted according to the components and activities, but will include participatory learning, study tours and exchange visits, participatory monitoring and evaluation, and farmer field schools. What type of capacity building is needed is specified under each of the components and sub-components in Ax 4 of the Brief. In addition, how this will be done is specified for each of the components in Ax6.

### REGIONAL CONSERVATION CONTEXT:

*Comment 3: A real concern that greater use of chemical fertilizers and pesticides may further degrade water quality, with adverse effects for all the biota, including humans.*

**Response:** The project will favor the development and adoption of agro-ecological production systems that are based on the principles of nutrient mobilization, acquisition and recycling through plants and improved organic matter management. This will increase the nutrient availability within the system and reduce the need for chemical fertilizer. Use of chemical fertilizer will go along with precise advice on type, quantity and timing of fertilizer application to minimize the potential negative impacts. However, intensified agricultural production needs more inputs in the form of chemical fertilizers and pesticides. The borrower has prepared a Pest and Pesticide Management Plan (PPMP) to mitigate the health and environmental impacts of increased pesticide use which will be implemented through the project. For more detailed information consult Section D.5 and D.6 and Ax 10 of the Brief.

### SUSTAINABILITY OF THE PROJECT

*Comment 4: Sustainability section is missing*

**Response:** the Section on Sustainability that was missing in the draft Brief submitted to the STAP reviewer was added in the Brief under C4 and in the executive summary under section 3.

### **OTHER BENEFICIAL OR DAMAGING ENVIRONMENTAL EFFECTS**

***Comment 5:** In Madagascar as elsewhere in the tropical world, irrigation schemes are major sources of waterborne diseases, the effects of which may nullify any economic benefits. Of particular concern is the parasitic fluke infestation schistosomiasis, the aquatic snail vectors of which live in stagnant or slowly flowing water. It would be useful to identify and cost the measures needed to eradicate the snails and their eggs from the irrigation canals. In particular, are there any naturally growing trees or shrubs whose leaves or berries are molluscidal and ovicidal without detriment to fish, birds and humans?*

**Response:** Irrigation schemes in Madagascar are main sources of waterborne diseases, such as malaria, urinary and intestinal bilharzia and diarrhea. The four selected project sites are no exception. The Environmental and Social Management Plan (ESMP) has included measures to reduce these diseases in order not to impair the production capacity of the farmers and improve their quality of life (see D.5 and D.6 and Ax10 of the Brief.)

***Comment 6:** The proposal authors consider that the social and environmental impacts of the project will be mostly beneficial, with an improvement in soil fertility, reduced sedimentation in canals and improved ecosystem health in the headwaters. However, they do not address in any detail the potentially serious consequences (eutrophication, algal blooms, toxins in drinking water) of increased inflow of phosphate and nitrogen rich runoff into rivers, lakes and wetlands arising from increased use of chemical fertilizers to improve soil fertility.*

**Response:** see response above concerning fertilizers and pesticides. In addition, the project will not favor any extension of cropland surface into marsh land areas, but through intensification incite farmers to use the existing land. The project will also collaborate with conservation organizations, such as Durrell Wildlife Conservation Trust in Lac Alaotra, to minimize environmental impacts and to build awareness and capacity for an informed use of these inputs.

***Comment 7:** Any measures to control erosion through an increase in surface cover, whether plant or mulch, are to be commended.*

**Response:** One of the outcome indicators for the global environmental objective is the increase in vegetation cover, thus this comment goes to the heart of GEF interventions. Erosion control will be addressed in various ways with preference to use vegetative measures. This includes, among others, vegetative barriers to control gully erosions and lavakas, hedges and boundary plantings along agricultural fields, control of sheet erosion through improved pasture management, prevention of fire use, and reforestation with ground covering under storey. These interventions have been further specified in the land degradation annex (15) of the Brief in the root causes table, under measures still required.

***Comment 8:** The proposal authors might indicate just how they plan to identify what they term hotspots of erosion. Unless the sites of highest sediment yield are targeted and monitored early in the project, many of the downstream problems will persist. This should be given a very high priority.*

**Response:** This intervention of targeting hot-spots of erosion is addressed under component 3.2 (see Ax4). It has been further specified in the Brief that the identification of hotspots will be done with the aid of satellite images (that will be used to establish the project baseline and that will provide the basis as well for the Master watershed management plan development). In addition, local stakeholders will be consulted and verification will be done on the ground.

## **MECHANISMS FOR PARTICIPATION AND INFLUENCING PROJECT MANAGEMENT**

*Comment 9: The success of this project will depend to a considerable degree on the finesse and tenacity with which genuine participation is achieved and maintained.*

**Response:** Participatory approaches and processes will vary depending on components and activities as different sets of stakeholders will be involved and different outcomes are expected. For example, participatory processes will differ when addressing large scale watershed management issues with upstream and downstream populations, when organizing farmers within water user associations, or when organizing stakeholders along a value chain. Specialized service providers and partners will be selected for each of the task to assure to respond to specific needs. Participation of government services will also be favored by the project's support of the decentralization process. The preferred participatory mechanism is described in the project Brief for each of the components under Ax 6.

## **CAPACITY BUILDING.**

*Comment 10: The proposal suggests that elaborating and monitoring Communal Development Plans will help capacity development within the Communes involved in the project areas. It is not altogether clear how this will be done and by whom, but presumably it will be by the elected officers and staff of the Communes trained by the District Support Centers to be set up in the regions. the first of which should have been established in January 2006 in the Itasy Region. (Has this in fact occurred?).*

**Response:** Community capacity strengthening will not be done directly by the District Support Centers that will play a role in the identification and prioritization of capacity strengthening needs of Districts. The project will outsource capacity strengthening thus identified. The project will also recruit external expertise to provide support for the preparation of the Communal Development Plans. Establishment of the first District Support Center has been delayed until April.