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Report No: PAD5263

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT  
ON A  
PROPOSED CREDIT

IN THE AMOUNT OF (SDR148.4) MILLION  
(US\$200 MILLION EQUIVALENT)

TO THE

REPUBLIC OF MADAGASCAR

FOR A

RURAL LIVELIHOODS PRODUCTIVITY AND RESILIENCE PROJECT

March 9, 2023

Agriculture and Food Global Practice  
Eastern and Southern Africa Region

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## CURRENCY EQUIVALENTS

(Exchange Rate Effective January 31, 2023)

Currency Unit =	Malagasy Ariary (MGA)
US\$1 =	SDR 0.74
US\$1 =	MGA 4,285.04

## FISCAL YEAR

January 1 - December 31

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## ABBREVIATIONS AND ACRONYMS

ACBP	Next Generation Africa Climate Business Plan
ADF	Agriculture Development Fund
AFD	French Development Agency ( <i>Agence Française de Développement</i> )
AfDB	African Development Bank
AWD	Alternative Wetting and Drying
BFM	Central Bank ( <i>Banky Foiben'i Madagasikara</i> )
BIANCO	Independent Anti-Corruption Bureau ( <i>Bureau Indépendant Anti-Corruption</i> )
BVPI	Irrigation Development and Watershed Management Project ( <i>Bassins Versants et Périmètres Irrigués</i> )
CASEF	Madagascar Agriculture Rural Growth and Land Management Project ( <i>Projet de Croissance Agricole et de Sécurisation Foncière</i> )
CCAP	Climate Change Action Plan
CE	Citizen Engagement
CERC	Contingency Emergency Response Component
COBA	Community-Based Organisation (Organisation de Communauté de Base)
CPF	Country Partnership Framework
CSA/Ae	Climate-Smart Agriculture/Agroecology
DA	Designated Account
DGA	General Directorate of Agriculture (Direction Générale de l'Agriculture)
DGE	General Directorate of Livestock (Direction Générale de l'Elevage)
DGR	Genie Rural Directorate ( <i>Direction du Génie Rural</i> )
DRAE	Regional Directorate for Agriculture and Livestock ( <i>Direction Régionale de l'Agriculture et d'Elevage</i> )
EFA	Economic and Financial Analysis
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
EX-ACT	Ex-ante Carbon balance Tool
FAO	Food and Agriculture Organization of the United Nations
FCS	Food Consumption Score
FDA	Agricultural Development Fund ( <i>Fonds de Development Agricole</i> )
FFS	Farmer Field School
FLID	Farmer-Led Irrigation Development
FOFIFA	National Center for Applied Research on Rural Development ( <i>Centre National de Recherche Appliquée au Développement Rural</i> )
FM	Financial Management
FNS	Food and Nutrition Security
FRERHA	Fund for the Rehabilitation and Maintenance of Hydro-agricultural Network
FSRP	Food Systems Resilience Program for Eastern and Southern Africa
GALS	Gender Action Learning System
GBV	Gender-Based Violence
GDEG	General Directorate of Environmental Governance
GDP	Gross Domestic Product
GEMS	Geo-Enabling initiative for Monitoring and Supervision

GEPP	<i>Gestion, Entretien, Preservation et Police</i>
GHG	Greenhouse Gas
GIZ	German Agency for International Cooperation ( <i>Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH</i> )
GM	Grievance Mechanism
GoM	Government of Madagascar
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
HCI	Human Capital Index
HCP	High Carbon Price Scenario
HDDS	Household Dietary Diversity Score
HLO	High-Level Outcome
JICA	Japan International Cooperation Agency
IA	Implementing Agency
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFDC	International Fertilizer Development Centre
IFPRI	International Food Policy Research Institute
IFR	Interim Financial Report
IPC	Integrated Food Security Phase Classification
IPF	Investment Project Financing
JICA	Japan International Cooperation Agency
LCP	Low Carbon Price Scenario
LMP	Labor Management Procedures
LUPS	Land Use Planning Schemes
MAPER	<i>Estimated Realistic Down Payment (Montant d'Apport Préalable Estimé Réaliste)</i>
M&E	Monitoring and Evaluation
MEDD	Ministry of Environment and Sustainable Development
MEF	Ministry of Economy and Finance
MG	Matching Grant
MinAE	Ministry of Agriculture and Livestock ( <i>Ministère d'Agriculture et d'Elevage</i> )
MIS	Management Information System
MMP	Management, Maintenance and Preservation
MoU	Memorandum of Understanding
NBS	Nature-Based Solutions
NDC	Nationally Determined Contribution
NPV	Net Present Value
O&M	Operation and Maintenance
PAD	Project Appraisal Document
PADAP	Sustainable Agriculture Landscape Project ( <i>Projet Agriculture Durable Par une Approche Paysage</i> )
PDO	Project Development Objective
PEM	Madagascar National Emergency Plan ( <i>Plan d'Emergence Madagascar</i> )
PFM	Public Financial Management
PIU	Project Implementation Unit
PMU	Project Management Unit
PIM	Project Implementation Manual

PN-BVPI	National Program for Irrigation Development and Watershed Management ( <i>Programme Nationale des Bassins Versants et Périmètres Irrigués</i> )
PPA	Project Preparation Advance
PPSD	Project Procurement Strategy for Development
RCP	Representative Concentration Pathway
RIUs	Regional Implementation Units
RLPRP	Rural Livelihoods Productivity and Resilience Project
RN	National Road ( <i>Route Nationales</i> )
RPIU	Regional Project Implementation Unit
RSC	Regional Steering Committee
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagemen Plan
SH	Sexual Harassment
SIGI	Social Institutions and Development Index
SILCs	Saving and Internal Lending Communities
SLM	Sustainable Land Management
SOC	<i>The Official Seed and Plant Material Control Service (Le Service Officiel de Contrôle des Semences et du Matériel Végétal)</i>
SOE	Statement of Expenditures
SRI	Sustainable Rice Intensification
TA	Technical Assistance
TOR	Terms of Reference
VMA	Voucher Management Agency
VSLA	Village Savings and Loan Associations
WBG	World Bank Group
WUA	Water User Associations
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development



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## DATASHEET

### BASIC INFORMATION

Country(ies)	Project Name	
Madagascar	Rural Livelihoods Productivity and Resilience Project	
Project ID	Financing Instrument	Environmental and Social Risk Classification
P175269	Investment Project Financing	Substantial

### Financing & Implementation Modalities

<input type="checkbox"/> Multiphase Programmatic Approach (MPA)	<input checked="" type="checkbox"/> Contingent Emergency Response Component (CERC)
<input type="checkbox"/> Series of Projects (SOP)	<input type="checkbox"/> Fragile State(s)
<input type="checkbox"/> Performance-Based Conditions (PBCs)	<input type="checkbox"/> Small State(s)
<input type="checkbox"/> Financial Intermediaries (FI)	<input checked="" type="checkbox"/> Fragile within a non-fragile Country
<input type="checkbox"/> Project-Based Guarantee	<input type="checkbox"/> Conflict
<input type="checkbox"/> Deferred Drawdown	<input type="checkbox"/> Responding to Natural or Man-made Disaster
<input type="checkbox"/> Alternate Procurement Arrangements (APA)	<input type="checkbox"/> Hands-on Enhanced Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
30-Mar-2023	29-Dec-2028

Bank/IFC Collaboration

No

### Proposed Development Objective(s)

To increase productivity and strengthen resilience of rural livelihoods in Targeted Areas in Madagascar.

### Components

Component Name	Cost (US\$, millions)
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Component 1: Promoting community-led restoration and management of watersheds in Targeted Areas	23.00
Component 2: Sustainable intensification and management of irrigation infrastructure and services	70.00
Component 3: Strengthening livelihood resilience and value chains	112.00
Component 4: Project management, monitoring and evaluation	20.00
Component 5: Contingent Emergency Response Component	0.00

### Organizations

Borrower:	Republic of Madagascar
Implementing Agency:	Ministry of Agriculture and Livestock (MinAE)

### PROJECT FINANCING DATA (US\$, Millions)

#### SUMMARY

Total Project Cost	225.00
Total Financing	225.00
of which IBRD/IDA	200.00
Financing Gap	0.00

#### DETAILS

##### World Bank Group Financing

International Development Association (IDA)	200.00
IDA Credit	200.00

##### Non-World Bank Group Financing

Other Sources	25.00
FRANCE: French Agency for Development	25.00

#### IDA Resources (in US\$, Millions)

	Credit Amount	Grant Amount	SML Amount	Guarantee Amount	Total Amount
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<b>Madagascar</b>	200.00	0.00	0.00	0.00	200.00
National Performance-Based Allocations (PBA)	200.00	0.00	0.00	0.00	200.00
<b>Total</b>	<b>200.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>200.00</b>

#### Expected Disbursements (in US\$, Millions)

WB Fiscal Year	2023	2024	2025	2026	2027	2028	2029
<b>Annual</b>	7.13	12.60	17.86	26.27	42.51	56.95	36.69
<b>Cumulative</b>	7.13	19.73	37.59	63.86	106.37	163.32	200.00

#### INSTITUTIONAL DATA

##### Practice Area (Lead)

Agriculture and Food

##### Contributing Practice Areas

Environment, Natural Resources & the Blue Economy, Water

##### Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

#### SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	● Substantial
2. Macroeconomic	● Moderate
3. Sector Strategies and Policies	● Moderate
4. Technical Design of Project or Program	● Substantial
5. Institutional Capacity for Implementation and Sustainability	● Substantial
6. Fiduciary	● Substantial
7. Environment and Social	● Substantial
8. Stakeholders	● Substantial
9. Other	



10. Overall

● Substantial

**COMPLIANCE****Policy**

Does the project depart from the CPF in content or in other significant respects?

☐ Yes ☒ No

Does the project require any waivers of Bank policies?

☐ Yes ☒ No**Environmental and Social Standards Relevance Given its Context at the Time of Appraisal**

E & S Standards	Relevance
Assessment and Management of Environmental and Social Risks and Impacts	Relevant
Stakeholder Engagement and Information Disclosure	Relevant
Labor and Working Conditions	Relevant
Resource Efficiency and Pollution Prevention and Management	Relevant
Community Health and Safety	Relevant
Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Currently Relevant
Cultural Heritage	Relevant
Financial Intermediaries	Not Currently Relevant

**NOTE:** For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).



## Legal Covenants

### Sections and Description

In accordance with the FA, recipient shall establish no later than six (6) months after the Effective Date, and thereafter maintain two Regional Project Implementation Units (RPIUs) within the PIU, with mandate, composition and resources acceptable to the Association.

### Sections and Description

In accordance with the FA, PIU to acquire, install and customize an accounting software no later than three (3) months after the Effective Date.

### Sections and Description

In accordance with the FA, PIU shall no later than three (3) months after the Effective Date recruit an internal auditor, with terms of reference, qualifications and experience satisfactory to the Association.

### Sections and Description

In accordance with the FA, recipient to establish no later than six (6) months after the Effective Date, and thereafter maintain throughout Project implementation, two Regional Steering Committees

### Sections and Description

In accordance with the FA, recipient shall establish no later than three (3) months after the Effective Date, and thereafter maintain throughout Project implementation, a Project Steering Committee

### Sections and Description

In accordance with the FA, recipient shall establish no later than one (1) month after the Effective Date, and thereafter maintain the Project Implementation Unit (PIU) within the Ministry of Agriculture and Livestock.

### Sections and Description

In accordance with the FA, PIU shall no later than six (6) months after the Effective Date, recruit an external auditor for the Project, in accordance with the Procurement Regulations.

### Sections and Description

In accordance with the FA, each RPIU shall recruit no later than six (6) months after the Effective date a regional financial management specialist, with terms of reference, qualifications and experience satisfactory to the Association.

### Sections and Description

In accordance with the FA, recipient shall adopt no later than one (1) month after the Effective Date, and thereafter maintain at all times during Project implementation, an operations manual for the Project ("PIM") in form and substance acceptable to the Association

### Sections and Description

In accordance with the FA, PIU shall no later than one (1) month after Effective Date recruit and Environmental Specialist, a Social Specialist and a SEA/SH Specialist with terms of reference, qualifications and experience



satisfactory to the Association.

**Conditions**

Type Disbursement	Financing source IBRD/IDA	Description In accordance with the FA, no withdrawal shall be made until PIU recruits an external accounting firm to maintain records and produce adequate financial reports for purposes of Part 2 of the Project, with terms of reference, qualifications and experience satisfactory to the Association.
Type Disbursement	Financing source IBRD/IDA	Description In accordance with the FA, no withdrawal shall be made under Category (2)(a) until and unless the Recipient has: (i) adopted the Cash Transfer Manual in form and substance satisfactory to the Association; (ii) entered into a Payment Agreement with at least one Payment Agency, under terms and conditions satisfactory to the Association.
Type Disbursement	Financing source IBRD/IDA	Description In accordance with the FA, no withdrawals shall be made under Category (2)(b) until and unless the Recipient has: (i) adopted the Voucher Manual in form and substance satisfactory to the Association; and (ii) recruited at least one Voucher Management Agency through a VMA Agreement under terms and conditions satisfactory to the Association.
Type Disbursement	Financing source IBRD/IDA	Description In accordance with the FA, no withdrawals shall be made under Category (2)(c) until and unless the Recipient has: (i) adopted the Grant Manual in form and substance satisfactory to the Association; and (ii) for the payment of Matching Grants, entered into a Payment Agreement with at least one Payment Agency, under terms and conditions satisfactory to the Association.



## I. STRATEGIC CONTEXT

### A. Country Context

**1. Development prospects in Madagascar remain fundamentally constrained by limited infrastructure and human capital, slow structural transformation, poor governance and acute exposure to shocks.** Madagascar is one of only six countries in the world where real income per capita has been on a declining trend over the last 60 years, and the only country within that group that did not face prolonged civil wars or armed conflicts. Even during the 2013-2019 upturn, which was supported by a return to political stability, the reopening of key export markets, and the reengagement of donors, real gross domestic product (GDP) growth only averaged about 3.5 percent, which barely surpassed population growth. Sectors where Madagascar is considered to have strong comparative advantage such as textiles, agribusiness and tourism contributed marginally to the recovery, while agriculture, which is by far the largest source of employment, saw stagnant output and declining productivity.<sup>1</sup>

**2. Amid stalled growth, poverty in Madagascar remains pervasive and deeply entrenched.** Among the poorest countries in the world, Madagascar is poorer today than it was at independence. The average Malagasy is more than 40 percent poorer in 2020 than in 1961.<sup>2</sup> Due to downside pressures from the global pandemic, climate shocks and the fallout from Russia's invasion of Ukraine, the poverty rate reached a new record high of 81 percent of the population (estimated at US\$1.90 per day in 2011 Purchasing Power Parity), up from 77.6 percent in 2012 and 68 percent in 2001.<sup>3</sup> Among the highest in the world, this equates to more than four in five people living in poverty. By comparison, this ratio far exceeds the global average (10 percent) and the regional average (40.4 percent). At this pace, Madagascar remains well off track in achieving Sustainable Development Goal 1 and all but a handful of the other goals by 2030.

**3. The poorest among the population of 28.4 million are concentrated in rural areas, where four in five Malagasy reside.** While urban poverty has decreased over time, poverty in rural Madagascar has remained persistently high. Between 2005 and 2012, the urban poverty rate fell from 41 percent to 30 percent. Over the same period, the rural poverty rate increased from 77 percent to 80 percent.<sup>4</sup> Today, four in five rural Malagasy live on less than US\$ 2.10 per day. Not surprisingly, social indicators associated with poverty—infant mortality, life expectancy, illiteracy, malnutrition and access to services (for example, clean water, improved sanitation services, and electricity)—are disproportionately lower in rural areas.

**4. Madagascar's Human Capital Index (HCI) ranks near the bottom globally.** Slightly lower than the SSA average, Madagascar's HCI (0.39) in 2020 is the same as it was a decade earlier.<sup>5</sup> This effectively means that a child born today in Madagascar will be only 39 percent as productive as an adult than if he or she had enjoyed complete education and full health.<sup>6</sup> Among key drivers, food systems are increasingly fragile and fundamentally failing to provide not only sufficient calories to sustain the island nation's growing population, but also nutritious and healthy diets. Imports of food staples such as rice and edible oils have grown substantially in recent years amid declining per capita production. In turn, Madagascar has one of the world's highest rates of chronic malnutrition, with four out of every ten children under five

<sup>1</sup> Systematic Country Diagnostic (SCD) Update. World Bank. April 2022.

<sup>2</sup> *ibid.*

<sup>3</sup> Madagascar: Public Expenditure and Institutional Review - Boosting Infrastructure and Social Service Delivery. World Bank. Forthcoming.

<sup>4</sup> Madagascar Country Program Evaluation, World Bank, February 2021.

<sup>5</sup> World Bank (2020). Human Capital Index. Human Capital Project. February 2020.

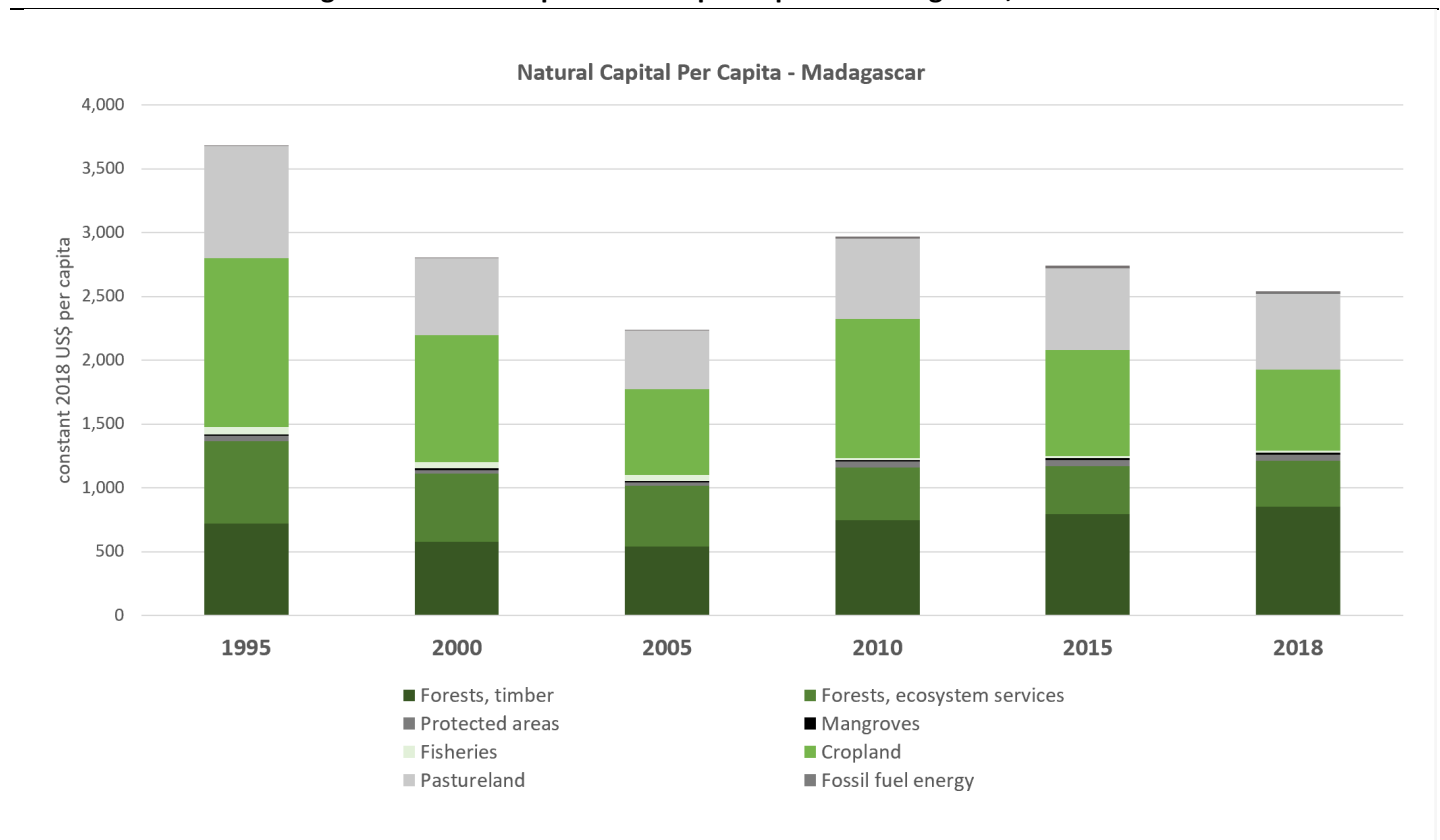
<sup>6</sup> Systematic Country Diagnostic (SCD) Update. World Bank. April 2022



years of age affected by stunting. Living conditions remain difficult, with a low rate of access to electricity, in particular, especially among rural communities (10.9 percent).<sup>7</sup>

**5. Among 22 of 146 countries in which wealth per capita decreased between 1995 and 2018, Madagascar is beset by low productivity of the country's natural resource base and relatively high population growth.** Total wealth, defined as the sum of natural, produced, and human capital and net foreign assets, increased by 91 percent between 1995 and 2018.<sup>8</sup> However, because population grew by 94 percent during the same period, total wealth per capita, the measure of sustainability of growth, decreased by 2 percent. Low productivity of the country's natural asset base largely drove the decline in total wealth per capita. Produced capital per capita remained mostly constant, and human capital per capita increased over the period between 1995 and 2018. Thus, the decrease in total wealth per capita was driven by a decline in natural capital wealth per capita (Figure 1). While rich in natural assets—including the longest coastline in Africa, substantial fisheries, unique biodiversity and forests, abundant agricultural land, and micro-climates suitable for a range of high-value crops, and appreciable surface water and groundwater resources—Madagascar has been unable to leverage this wealth for sustained economic gain. Moreover, demographic, and other pressures have accelerated exploitation and rapid depletion of the country's natural resource base on which the rural poor depend for livelihoods.

**Figure 1. Natural Capital Wealth per Capita in Madagascar, 1995-2018**



Source: World Bank. 2021. The Changing Wealth of Nations 2021: Managing Assets for the Future. Washington, DC: World Bank.

<sup>7</sup> World Development Indicators (WDI), World Bank (2020.)

<sup>8</sup> World Bank 2022. *Madagascar Country Environmental Analysis - Promoting Green, Resilient, and Inclusive Development*.



**6. The COVID-19 pandemic hastened the deepest recession since 2002 and reversed nearly a decade of steady albeit modest gains in poverty reduction.** The initial impact of the COVID-19 crisis was severe, with the collapse of export earnings and private investment leading to a contraction of GDP by 7.2 percent in 2020, the strongest in the last two decades. A second wave of the pandemic in 2021 and continued border closures have delayed recovery, with growth estimated by the World Bank at 1.8 percent in 2021.<sup>9</sup> Overall, per capita income fell by about 10 percent between 2019 and 2021, representing the most intense economic shock since the crises of 1991 and 2002. Additionally, several consecutive seasons of below-average rainfall in recent years fueled a severe food crisis in the Grand South and Southeast regions, with an estimated 2.23 million, or 39 percent of people across the region's 16 hardest-hit districts, facing acute food insecurity through March 2023.<sup>10</sup>

**7. Russia's invasion of Ukraine has placed further downside pressures on Madagascar's post-pandemic economic recovery.** It is expected to have a noticeable impact, particularly through slowing demand from key trading partners (especially the European Union, which absorbs 32 percent of the country's exports)<sup>11</sup> and rising international oil prices, which are expected to lead to a deteriorating trade balance and growing pressure on public finances. Higher international oil prices are also expected to fuel a widening trade deficit (refined petroleum products account for 5.1 percent of GDP). The impact of higher fertilizer<sup>12</sup> and food prices, particularly those for wheat, corn, and edible oil, is expected to be more modest, given their relatively low share in overall imports and household spending. Against this backdrop, growth was projected to slow down to 2.6 percent in 2022, while the poverty rate was projected to remain close to 81 percent, nearly twice the average of Sub-Saharan African countries.<sup>13</sup>

**8. Madagascar is highly vulnerable to climate shocks.** Due to its location, topography, and socioeconomic conditions, it is highly exposed to extreme weather events, especially cyclones, flooding, and drought. The island country's extensive coastline and location in the Indian Ocean make it especially prone to cyclones. The 2019 World Risk Report<sup>14</sup> ranked Madagascar at 17 out of 171 countries in terms of exposure to natural disasters. A catastrophe risk modeling study estimated that Madagascar faces average annual losses of US\$100 million from cyclone and flood combined hazards and that every year, there is a 10 percent probability that damages will exceed US\$240 million and a 5 percent probability that they will exceed US\$600 million.<sup>15</sup> Growing fragility of ecosystems and depletion of the country's natural resource base amplifies the country's vulnerability. Unsustainable use of ecosystem services relates to weak governance, population growth, widespread poverty, uncertain land tenure, and economic instability.<sup>16</sup> According to the country's key documents submitted to the United Nations Framework Convention on Climate Change (UNFCCC),<sup>17</sup> environmental degradation, high poverty rates, food insecurity and lack of adaptation capacity (access to key assets, infrastructure and

<sup>9</sup> World Bank. 2020. Madagascar Economic Update, June 2022: Navigating Through the Storm.

<sup>10</sup> Madagascar IPC Acute Food Insecurity Snapshot, May 2022.

<sup>11</sup> Ibid, Madagascar Economic Update. 2022.

<sup>12</sup> Fertilizer prices have tripled since early 2020 and remain volatile, putting a stable supply of fertilizer out of reach of most small farmers.

<sup>13</sup> Ibid, Madagascar Economic Update, 2022.

<sup>14</sup> Eckstein, D., Kunzel, V., Schafer, L., & Wings, M. 2019. Global Climate Risk Index 2020. Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2018 and 1999 to 2018. Bonn: Germanwatch.

<sup>15</sup> World Bank. 2016. *Disaster Risk Profile: Madagascar*. Washington, DC: World Bank.

<sup>16</sup> IMF, 2022. Technical Assistance Report: Climate Macroeconomic Assessment Program. IMF Country Report No. 22/342

<sup>17</sup> Madagascar's Intended Nationally Determined Contributions (2015), Third National Communication (2017), Forest Reference Emissions Level (FREL, 2018), National Adaptation Plan (NAP, 2021) and Adaptation Communication (AdCom, 2022).



services) are at the core of the country's vulnerability to climate risks. These risks and their impacts have a high economic and fiscal impact, inhibiting the economy's ability to grow and improve social conditions.<sup>18</sup>

**9. Climate change is expected to increase the frequency and intensity of hydrometeorological disasters with adverse effects on key sectors of the Malagasy economy, especially agriculture.** Climate change scenarios predict an increase in mean temperatures in the range of 1.3 °C (RCP 4.5) to 1.6 °C (RCP 8.5) by 2050 and 1.7 °C (RCP 4.5) to 2.9 °C (RCP 8.5) by 2080.<sup>19</sup> Rainfall patterns are changing. Changes in rainfall patterns are projected all along the country. Models tend to predict an increase in average precipitation over the west coast and a decrease in the northern, central and eastern regions of the country.<sup>20</sup> Reduced precipitation, over the central and east coastal regions, is accompanied by increased length of dry spells. The duration of dry spells is projected to increase by 70 days a year (median value) in a moderate climate change scenario (RCP 4.5).<sup>21</sup> In the Lake Alaotra region, excessively dry years have been the most problematic in the last 20 years. On the other hand, projections show that the intensity of cyclones may increase by 46 percent and their trajectory would tend to move northward.<sup>22</sup> According to Madagascar's 2016 National Determined Contributions (NDC)<sup>23</sup> and the 2021 National Adaptation Plan (NAP),<sup>24</sup> climate change generates significant impacts on water, land, ecosystems, infrastructure and agriculture and rural livelihoods. All these resources and sectors are fundamental factors for the agri-food system.

**10. Women, youth and people with disabilities are especially vulnerable amid high levels of gender inequality.** Madagascar's population is estimated at 28.91 million,<sup>25</sup> of which more than half are women and 60 percent are under the age of 25. Women earn an average of 34 percent less than men and female-headed households have a higher incidence of extreme poverty than male-led ones.<sup>26</sup> The population 15 years and younger accounts for more than half of the residents living in extreme poverty.<sup>27</sup> Natural disasters, including pandemics, have a disproportionate impact on women, young persons, and persons with disabilities, especially in rural areas, due to their heavy reliance on agricultural-related sources of income. Cultural norms and beliefs, prevailing gender roles and unequal gender power relations in Madagascar influence access to the health, food and nutrition, education, property, infrastructure, basic services (for example, water and agriculture extension), and employment, often placing women and youth at an economic and social disadvantage. Women have limited participation in decision-making related to issues affecting their well-being and that of their families, communities and surrounding environment. Women in Madagascar are also victims of gender-based

<sup>18</sup> Following IMF, 2022, under a climate-adjusted macroeconomic scenario that includes all humanitarian and reconstruction needs after a disaster, and assuming the government fully covers these needs, debt would quickly become unsustainable and exceed 85 percent of GDP by 2040.

<sup>19</sup> Collins, M., R. Knutti, J. Arblaster, J.-L. Dufresne, T. Fichet, P. Friedlingstein, X. Gao, W.J. Gutowski, T. Johns, G. Krinner, M. Shongwe, C. Tebaldi, A.J. Weaver and M. Wehner, 2013: Long-term Climate Change: Projections, Commitments and Irreversibility. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

<sup>20</sup> Government of Madagascar, 2021. National Adaptation Plan.

<sup>21</sup> IMF, 2022. Technical Assistance Report: Climate Macroeconomic Assessment Program. IMF Country Report No. 22/342.

<sup>22</sup> Government of Madagascar, 2016. National Determined Contributions (NDC); and GFDRR, 2011. Vulnerability, Risk Reduction, and Adaptation to Climate Change.

<sup>23</sup> Government of Madagascar, NDC, 2016. Available at:

<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Madagascar%20First/Madagascar%20INDC%20Eng.pdf>

<sup>24</sup> Government of Madagascar, 2021. National Adaptation Plan.

<sup>25</sup> WDI, 2021.

<sup>26</sup> Kellum, J., H. Randrianarimanana, L.M. Andrianavosoa, S. Telingator. 2020. USAID/Madagascar Gender Analysis Report. Prepared by Banyan Global.

<sup>27</sup> World Bank. 2014. Face of Poverty in Madagascar: Poverty, Gender, and Inequality Assessment. <http://documents.worldbank.org/curated/en/2014/03/19548476/face-poverty-madagascar-poverty-genderinequality-assessment>.





violence (GBV), which is widespread and broadly accepted as part of a woman's life.

## B. Sectoral and Institutional Context

**11. Farming, fishing and forestry remain the backbone of Madagascar's economy.** An estimated four in five people, mostly subsistence farmers, rely on agriculture for their livelihoods. About the same ratio lives below the poverty line of US\$1.90 per day. Also, 78 percent of Malagasy households practice agriculture, with 71 percent practicing livestock keeping and 18 percent fishery. Most households (68 percent) practice mixed farming; the most common being mixed crop-livestock systems (61 percent), followed by crop-livestock-fish systems (10 percent) and mixed crop-fish systems (1.5 percent). Most are subsistence farmers, with only 17 percent focused on cash cropping and 27 percent on industrial agriculture. At the same time, smallholder farmers are also responsible for most of the commercial agricultural produce in the country. They sell on average 25 percent of their production and produce 45-90 percent of commercialized production for crops such as vegetables, peanuts, sugar cane, vanilla, coffee, fruits, and spices, the latter tree crops among the country's top agricultural exports. Rice dominates crop production, but not enough is produced to satisfy domestic consumption needs.<sup>28</sup>

**12. Despite the agriculture sector's massive socio-economic footprint, sustained growth has been elusive.** For a sector that accounts for 70 percent of total employment, its share of total exports (37 percent) and GDP (29 percent) is markedly limited. Agricultural labor productivity is very low—significantly lower (US\$369.6) than the average for Sub-Saharan Africa (US\$1,526) in 2019—and has fallen by 31 percent since 1991.<sup>29</sup> Despite favorable land and water resources and strong growth potential, agriculture has failed to step up—as it has elsewhere in Africa, Asia, and across the developing world—as a driver of structural economic transformation and growth.<sup>30</sup> Environmental degradation, land tenure issues, low productivity, limited access to key infrastructure and services (such as irrigation, storage/post-harvest management, food processing facilities and connectivity of production centers with markets) and gender inequality, all exacerbated by climate change impacts, are among critical bottlenecks handicapping the sector's resilience and sustainability.

**13. Rural landscapes are affected by a downward spiral of poverty and associated depletion of natural capital and ecosystem services.** Widespread use of traditional slash-and-burn agriculture degraded soils, induces erosion and downstream siltation of watercourses and irrigation schemes, and contributes to broadscale land and water degradation. In addition, high population growth and limited economic opportunities outside of subsistence agriculture drive an ever-increasing demand for new agricultural land, fueling deforestation, accelerating land use change, and inciting the rapid depletion of the country's natural capital (soils, pasture, and forests) at an accelerated pace.<sup>31</sup> In return, this depletion undermines the provision of ecosystem services on which so many rural poor depend. These include provision of food

28 INSTAT 2021. Troisième recensement général de la population et de l'habitation (RGPH-3). Rapport thématique sur les résultats du RGPH-3 Theme 16: Menages agricoles à Madagascar. Institut National de la Statistique.

29 World Development Indicators (accessed December 1, 2022)

30 Beyond sector-specific factors, the importance of subsistence agriculture in the economy is largely related to the lack of economic opportunities in the formal sector. Job creation in industry and services has not been sufficient to support a more structural transformation of the sector, unlike countries such as Bangladesh or Rwanda, which have seen the share of agricultural employment decline and the productivity of the sector increase. This lack of structural transformation in Madagascar contributes to maintaining a low-productivity, largely shock-prone subsistence agriculture sector and hinders the modernization of the sector and the mobilization of productive investments.

31 World Bank. 2018. The Changing Wealth of Nations 2018: Building a Sustainable Future. Washington, DC: World Bank and World Bank. 2021 The Changing Wealth of Nations 2021: Managing Assets for the Future. Washington, DC: World Bank.



and wood-fuel, hydrological services to downstream water users (for example, irrigation systems, domestic water supply systems, and hydroelectric power producers), erosion control, carbon storage, and the preservation of the island's unique biodiversity. In 2018, the total annual cost of land degradation for Madagascar was estimated at US\$1.7 billion or 23 percent of the country's GDP.<sup>32</sup> Losses in crop production due to erosion and land degradation over the last three decades are estimated at US\$4.1 billion, with a yearly average of US\$141.4 million, equivalent to 5 percent of agricultural GDP.<sup>33</sup>

**14. Restricted land access and insecurity of land tenure remains a key bottleneck to rural sector development and poverty reduction in Madagascar.** Inheritance remains the primary means of access to land ownership, which has led to a marked decline in the average plot size per rural households.<sup>34</sup> Tenure security is important not only for agricultural production. It also allows people to diversify their livelihoods by using their land as collateral, renting it out, or selling it. Tenure issues affect the everyday choices of poor rural women and men, such as which crops to grow and whether crops are grown for subsistence or commercial purposes. They influence the extent to which farmers are prepared to invest in the long-term well-being of their land or to adopt new technologies and innovations. Lack of secure land tenure exacerbates poverty and has contributed to social instability and conflict in many parts of the world. In 2005, Madagascar embarked on an unprecedented land reform consisting of decentralizing to communes the competence of formalizing the property rights on non-titled but occupied croplands. In 17 years, the 500 communes<sup>35</sup> equipped with decentralized Land Offices delivered 808,000 land certificates,<sup>36</sup> of which 70 percent were supported in the scope of the World Bank-funded Madagascar Agriculture Rural Growth and Land Management Project (CASEF/P151469 and P166133).<sup>37</sup> The National Land Program placed a greater emphasis on women's land rights; however, sensitization outreach insufficiently targeted women or women-headed households, and most land certificates have been issued in the husband's name. Overall, only 23 percent of land is titled solely in the name of women. Social stability and improved access to credit are reportedly the main drivers of beneficiaries' motivation for obtaining land certification. The recently revised 2022 Land Law allows the full legal value of land certificate to be used as collateral when mortgaged to microfinance institutions. Based on the experience to date, it is expected that the mass distribution of land certificates will lead to increased land-related investment in the coming decade.

**15. As the main staple crop, rice dominates Madagascar's agriculture economy.** Rice production accounts for 70 percent of the country's total agricultural production, 40 percent of the island's cultivated area, and virtually all its irrigated land.<sup>38</sup> High annual rainfall (1,200 mm per year and above) and abundant freshwater resources generally underpin favorable conditions for water-intensive rice production across much of the country, from the rainfed central highlands to the irrigated and terraced lowlands and semi-flooded coastal zones. It is estimated that four of five Malagasy agricultural households grow rice, relying on family labor and mostly on small holdings.<sup>39</sup> Most cultivate primarily for subsistence, are chronically food insecure, and generally lack basic services such as improved water sources and electricity. A mere 20 percent of production is marketed as surplus. Women in Madagascar make a significant

<sup>32</sup> UNCCD (United Nations Convention to Combat Desertification). 2018. Country Profile of Madagascar. Investing in Land Degradation Neutrality: Making the Case. An Overview of Indicators and Assessments. Bonn, Germany: UNCCD.

<sup>33</sup> World Bank 2022. Madagascar Country Environmental Analysis (report number pending).

<sup>34</sup> In the years between the General Agricultural Censuses (Recensements Généraux de l'Agriculture, RGA) of 1984 and 2004-200, average plot sizes declined from 1.2 ha to 0.91 ha.

<sup>35</sup> Out of 1695 Communes forming the national territory.

<sup>36</sup> Compared to 679,000 land titles issued by the central State land services in 125 years

<sup>37</sup> Between 2018 and 2022, CASEF-supported communes distributed some 600,000 land certificates.

<sup>38</sup> World Bank. 2020. Unlocking the potential of irrigation schemes in Madagascar

<sup>39</sup> World Bank. 2018. *Madagascar: Scaling up Smallholder Inclusion in Value Chains: Insights from the Rice and Dairy Sector*. Washington, D.C.



contribution to rice farming, processing, and marketing but only have limited access to productivity-enhancing technical knowledge and innovations that can reduce their labor and provide them with additional income. While on par with much of Sub-Saharan Africa, rice productivity in Madagascar is markedly lower (2.7 tons per ha) than the world average (4.7 tons per ha in 2018) and many times lower than in East Asia (6.97 tons per ha). Small-scale schemes account for roughly 86 percent of total land under controlled water management; medium (13 percent) and large-scale schemes (0.4 percent) account for the rest.<sup>40</sup> Insufficient maintenance and upkeep of irrigation infrastructure and weak management capacity among user groups plague many irrigation schemes.

**16. Rice is essential to the country's food and nutrition security.** Madagascar is among the countries with the highest per capita consumption of rice globally. Consumed three times per day and with an estimated annual per capita consumption of 120 kg—more than twice the world average (53 kg) and above many other major rice-producing countries such as China (77 kg)—rice accounts for more than half of the average household daily caloric intake. While malnutrition is high across the country, for most children it is a result of dietary patterns more than poverty. Poverty and acute malnutrition are the most widespread in the south of Madagascar, but the highest rates of chronic malnutrition can be found in the rice-producing regions where dietary diversity is low. To address these challenges, critical investments are needed to strengthen the productivity and diversify food system and to catalyze improved nutritional outcomes at household and community levels, particularly among women and youth.

**Figure 2. Paddy Production vs. Production per Capita**



Source: Ministry of Agriculture and Livestock (*Ministère d'Agriculture et d'Elevage, MinAE*)

**17. Madagascar's per capita production of rice has been declining amid growing rice imports.** National production

<sup>40</sup> Ibid.



is insufficient to meet domestic demand and covers about 85 percent of consumption requirements on average.<sup>41</sup> Paddy rice production declined from 4.7 million tons in 2010 to 4.2 million tons (-10 percent) in 2019 (Figure 2). In 2020, per capita production was 156 kg, down from 230 kg in 2010.<sup>42</sup> According to the Ministry of Industry, Trade and Handicrafts, domestic utilization of paddy rice in Madagascar is about 3.9 million tons, whereas domestic production is 3.5 million tons. To fill this gap, the country relies on subsidized imports, estimated at 420,000 tons of paddy rice equivalent in the 2020/21 marketing year, slightly below the previous five-year average.<sup>43</sup> With domestic production buffeted by pest outbreaks, climate shocks, and market disruptions associated with the COVID-19 pandemic, rice imports during the 2021-22 marketing year are believed to have reached previous records not seen for more than a decade. Moreover, the rising costs of food, fuel, and fertilizers stemming from Russia's invasion of Ukraine have weighed increasingly on the Government's food import budget and fiscal balance.

**18. The deterioration and neglect of existing irrigation systems have contributed to the stagnation of rice production.** Over the last decade, rice production per capita has markedly declined as irrigation schemes have deteriorated. However, the demand for rice has increased with population growth and a dietary shift towards rice and away from more expensive and more nutritious foods. This has resulted in excess demand being met through growing rice imports, which have roughly doubled over this period. Poor irrigation infrastructure performance is driven by damages due to cyclones and heavy storms and by gradual siltation of intakes and canal systems due to ongoing deforestation in the watersheds coupled with lack of sand traps in their design and lack of proper maintenance. These trends increasingly undermine the capacity of producers to manage water resources effectively and efficiently and thus remain productive while managing climate risks. Survey findings indicate that water user associations (WUAs), mandated to ensure sustainable irrigation management, are widely prevalent and relatively active but are insufficiently supported. Other constraints include low seed quality, constrained irrigation water availability, low fertilizer affordability and levels of use,<sup>44</sup> improper leveling of paddies, and poor crop husbandry practices. It is estimated that as much as 40 percent of irrigated schemes are not under active production. A 2020 study by the World Bank<sup>45</sup> estimated that Madagascar's total command area for irrigation is 2.15 million ha spread across roughly 12,000 irrigation schemes. Small and medium-scale schemes cover about 86 percent of this area, and 950,000 ha, or 44 percent, are traditional farmer-built schemes. These schemes, which produce over 85 percent of Madagascar's rice output, are the key to the country's food security. This output is about 75 percent of the rice consumed in Madagascar, with the remainder coming from large schemes, other production systems (for example, rain-fed uplands), and increasingly, imports.

**19. Underdeveloped and poorly maintained road networks severely undermine the development of dynamic and competitive agriculture markets, incentives among rural communities to invest, and sustained rural growth.** The country's transport network is grossly underdeveloped and ranks low across most indicators. Despite being the backbone of Madagascar transport sector, good roads are scarce, with a road density of 5.4 km per 100 km<sup>2</sup> of land, among the

<sup>41</sup> Coady, D., P. A. Dorosh, and B. Minten. 2009. "Evaluating Alternative Policy Responses to Higher World Food Prices: The Case of Increasing Rice Prices in Madagascar." *American Journal of Agricultural Economics* 91 (3): 711–722.

<sup>42</sup> Based on a forthcoming IFPRI study commissioned by the project, rice imports, which averaged 172,000 tons per year in 2010-12 (6 percent of supply), increased to an average of 532,000 tons (18.3 percent of supply) in 2017-19. Given the population growth of 2.7 percent per year over 2010-19, per capita supply fell from an average of 133 kgs per person per year in 2010-12 to 110.6 kgs per person per year in 2017-19, a decrease of 2.6 percent.

<sup>43</sup> *ibid.*

<sup>44</sup> Sub-Saharan Africa has an average fertilizer application rate of 22 kilograms per hectare, compared to a world average seven-times higher (146 kg per ha). Some countries, such as China and Chile, are closer to 400 kg per ha. Source: World Bank 2022. *A transformed fertilizer market is needed in response to the food crisis in Africa*. Available at <https://blogs.worldbank.org/voices/transformed-fertilizer-market-needed-response-food-crisis-africa>

<sup>45</sup> World Bank. 2020. *Unlocking the Potential of Irrigation Schemes in Madagascar*.



lowest in Sub-Saharan Africa and the world.<sup>46</sup> Of the 32,000 km of roads in Madagascar, there are 11,000 km of national roads (*routes nationales*, the rest being regional and local roads), of which 6,000 km are paved. About 40 percent of paved national roads are in fair to poor condition, requiring periodic maintenance, while most of the unpaved national roads require rehabilitation. Over 70 percent of regional and local roads are in poor condition. The Rural Accessibility Index, measured by the share of the rural population who live within 2 km of an all-season road, is 11.4 percent (among the lowest globally), which means that 17 million rural residents are left unconnected.<sup>47</sup> Poor market connectivity, particularly during the rainy season, represents a major bottleneck for the sector's development and the growth of efficient domestic food markets<sup>48</sup> and food security. Road quality indicators have shown a pronounced downward trend since 2013 due to lack of investment in maintenance, rehabilitation, and improvements. During the rainy season, many roads are not passable, further isolating rural communities and jeopardizing their livelihoods. Limited access to electricity<sup>49</sup> also constrains the use of water pumps as well as storage, processing, and cold chain infrastructure that can help reduce postharvest losses.

**20. Women's labor force participation is high in Madagascar; however, their employment options are often limited to vulnerable and informal sectors.** Women's labor force participation is high at 83 percent and close to the 89 percent for men. However, 90 percent of all working women are self-employed and 87 percent are employed in vulnerable work; these figures are higher than the 86 percent and 80 percent of men who are self-employed or in vulnerable work, respectively.<sup>50</sup> Women's limited employment options are reflected in their lower earnings, which were found to be 34 percent lower than that of men in the 2014 Poverty Assessment for Madagascar.<sup>51</sup> The share of women and men engaged in agriculture has been decreasing over the past years and, as of 2019, stood at 60 percent for women and 68 percent for men. Women's productivity in agriculture is hampered by their limited access to inputs, resources, and information. Notwithstanding their disadvantages in the sector, women farmers are more likely to adopt climate-smart agricultural practices than men farmers when they have access to resources.<sup>52</sup> A gender assessment undertaken during the preparation of the proposed operation revealed a gender gap in the participation of women in local and community organizations due to women's higher burden of household responsibilities. The assessment also revealed that men play a leading role in all aspects of the rice value chain, distributing work to other family members as needed, with women being primarily responsible for processing and marketing and other postharvest tasks that only require the use of easy-to-handle tools.

**21. Madagascar's high vulnerability to climate change poses acute risk to its food systems and food security.** Current and projected changes in temperature, precipitation and frequency of extreme events have a significant impact over key factors influencing the agri-food system's performance and development. Food systems encompass the entire range of

<sup>46</sup> World Bank. 2022. *How new roads are changing lives in Madagascar*. Available at <https://blogs.worldbank.org/nasikiliza/how-new-roads-are-changing-lives-madagascar>

<sup>47</sup> World Bank. 2018. *Madagascar: Spatial Analysis of Transport Connectivity and Growth Potential*. June 2018.

<sup>48</sup> Significant spatial price differences exist among the different regions in Madagascar. Regions far from the major producing centers are characterized by the highest average rice prices. These include the regions in the South—Anosy (+18 percent), Androy (+26 percent) and Atsimo Atsinanana (+15 percent)) and in the North (Diana (+24 percent) and Sava (+22 percent). Relatively higher prices are also seen for imported rice in those regions. International Food Policy Research Institute (IFPRI), *Recent Developments in Madagascar's Rice Sector and Policy Options* (forthcoming).

<sup>49</sup> An estimated 33.7 percent (15 percent on grid) of the population have access to electricity, compared with an average 48.4 percent for Sub-Saharan Africa in 2020, which places the country in the list of the top 13 access-deficit countries in the world

<sup>50</sup> Data for 2019. World Bank Madagascar Gender Assessment, "Unlocking Women and Adolescent Girls' Potential: Challenges and Opportunities for Women and Adolescent Girls' Empowerment in Madagascar," upcoming report.

<sup>51</sup> Ibid.

<sup>52</sup> Ibid.



actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded.<sup>53</sup> Underinvestment in infrastructure, roads, agriculture research and innovation, extension, and other assets has undermined the ability of rural communities who rely on farming to mitigate, cope with, and recover from climatic shocks. In view of climate change scenarios, investments in climate adaptation are critically needed to reduce impacts on ecosystems, water, agriculture and productive infrastructure and services.<sup>54</sup> Madagascar is ranked near the bottom of the list of 182 countries ND-GAIN Index (2020) as one of the most vulnerable (162) to climate change impacts and with low readiness (175) to improve its resilience.<sup>55</sup> Climate impacts will likely exacerbate existing vulnerabilities and inadequacies in the country's food system while introducing additional burdens on the capacities of institutions and new dimension of risk diverse sectors critical to the food system (such as water, infrastructure, etc.). Madagascar has both a great need for investment and innovations to improve readiness and a great urgency for action. Given the current and future climate-related production risks, a shift toward a more diversified production and a climate-responsive agri-food system will be needed to increase resilience to climate shocks and mitigate their adverse effects.

**22. Climate change is expected to have a significant influence on the ecology and distribution of tropical ecosystems.** With rising temperatures and increased frequency and intensity of extreme hydro-meteorological events, riverine systems and water resources are increasingly at risk of being disrupted and altered, contributing also to structural changes in plant and animal populations. Increased temperatures, droughts and floods can also affect succession in forest systems and thus increase the incidence of invasive species, all of which affect ecosystems. In addition to these climate-related drivers, low agricultural productivity and population growth might motivate unsustainable agricultural practices resulting in increased deforestation, fires and soil erosion. In turn, soil erosion, along with heavy precipitation and storms, facilitate the occurrence of landslides, threatening human lives, infrastructure and natural resources. Under Representative Concentration Pathway (RCP) 6.0, species richness is expected to decrease almost all over Madagascar. In the regions of Sofia and Alaotra-Mangoro, the reduction in biodiversity ranges from 20 percent to 50 percent by 2080. It is important to keep in mind that model projections exclude any impacts on biodiversity loss from human activities such as land use, which have been responsible for significant losses of global biodiversity in the past and are expected to remain its main driver in the future. In recent years, Madagascar's vegetation has experienced profound disturbances due to population pressure and increasing demand for firewood as well as agricultural land, leading to high rates of slash-and-burn activities, which are one of the main drivers behind deforestation. The country has lost 3.89 million ha of tree cover between 2001 and 2019, which is equivalent to a 23 percent decrease of national forest area.<sup>56</sup> Climate change will likely introduce shifts in agroecologies, affecting ecosystems, biodiversity and crop production.

**23. Climate change impact on precipitation patterns and hydro meteorological events affects water availability and quality.** Assuming a constant population level, multi-model median projections suggest a decrease of 13 percent (RCP2.6)

<sup>53</sup> FAO 2018. Sustainable Food Systems: Concept and Framework.

<sup>54</sup> Variations in rainfall and temperature in some regions, interacting with other stressors, have already led to Climate change-induced variability of agricultural (crop and livestock) production can interfere with food and nutrition security by creating instabilities in food availability, access, and utilization. Marked shifts in rainfall patterns and curtailed cropping seasons have already adversely effected yields in some regions. Recent evidence of the prolonged nature of dry periods over southern Madagascar suggests the need to place increasing emphasis on livelihood diversification activities to mitigate the negative impacts of future extreme climate events.

<sup>55</sup> Accessed on February 15, 2023 via <https://gain.nd.edu/>

<sup>56</sup> Extract from GIZ, 2020. Climate Risk Profile: Madagascar. Also in line with the country's NDC and NAP.





and 15 percent (RCP6.0) in per capita water availability by the end of the century. When accounting for population growth, per capita water availability for Madagascar is projected to decline more dramatically, up to 78 percent under both RCPs by 2080 relative to the year 2000. Projections of future water availability from precipitation vary depending on the region and scenario. As for the changes in precipitation patterns, water availability is projected to decrease by up to 25 percent in the north and east of Madagascar under RCP6.0. The intensification of cyclones and floods will also have important consequences on the availability and quality of water resources due to landslides and likely impacts on infrastructure. The main user of water resources in Madagascar is the agriculture sector, covering 96 percent of total water subtraction. Even if Madagascar is rich in water resources, climate change impacts and the increasing demand for food by a rapidly growing population highlights the urgency to invest in technologies and measures that improve water-use efficiency. Regarding water resources, Sofia and Alaotra-Mangoro are priority regions for climate change adaptation in the NAP.<sup>57</sup>

**24. Climate change is expected to significantly affect key agri-food sector infrastructure through extreme weather events.** Higher temperatures and more frequent or intense hydro meteorological events lead to the degradation and even destruction of infrastructure. This will entail higher maintenance and replacement costs as well as a cascade of effects in the case of agrifood value chains and the agri-food system as a whole.<sup>58</sup> Erosion and excessive sedimentation can lead to enormous infrastructure maintenance costs because of damages to water reservoirs, irrigation ditches, roads and bridges. It is estimated that only half of the area equipped for irrigation is drained. According to FAO's Aquastat Country Profile, the rehabilitation / modernization of existing perimeters; the development of efficient irrigation structures; and capacity development of WUAs and technicians are priorities for the irrigation sector, ever more urgent in the face of climate change.<sup>59</sup> In addition, roads across the country are in very poor condition. Most are unpaved and difficult to access, especially during the rainy season. With limited connectivity to other regions or villages, rural farming communities have difficulty accessing agricultural inputs and services and getting their products to market. Expected annual damages to roads and railway assets are estimated around 0.2 percent of GDP in Madagascar under the current climate. Investments are needed to build climate-resilient irrigation systems and road networks.<sup>60</sup>

**25. The Government of Madagascar (GoM) remains committed to achieving food self-sufficiency and boosting rural sector growth and resilience.** Sustained productivity and sector growth would have significant impacts on the well-being of millions of Malagasy, particularly those in the poorest and most vulnerable households, who spend the largest share of their income on food. The GoM's vision under the National Emergency Plan (*Plan d'Emergence Madagascar, PEM* for 2019-2023) prioritizes achieving self-sufficiency in rice production to strengthen the country's food security. In particular, the PEM calls for new investments to intensify and expand rice production via the rehabilitation of existing irrigation schemes and the buildout of 100,000 ha of new irrigated areas. This vision builds on the GoM's decades-long strategic priorities for the rice sector, as outlined in its National Strategy for the Development of the Rice Sector 2016-2020 (*Stratégie Nationale du Développement Rizicole*). Among priority actions, it aims to (a) promote research and technology development, (b) strengthen agricultural extension services, (c) upgrade rural infrastructure and improve market connectivity, and (d) enhance rice sector governance. In addition, Madagascar's NDC aims to contribute to its climate targets in part by promoting broadscale adoption of improved farming techniques such as Sustainable Rice Intensification

<sup>57</sup> Government of Madagascar, 2021. NAP.

<sup>58</sup> Extract from GIZ, 2020. Climate Risk Profile: Madagascar. Also in line with the country's INDC and NAP.

<sup>59</sup> FAO Aquastat, 2016. Country Profile: Madagascar.

<sup>60</sup> IMF, 2022. Technical Assistance Report: Climate Macroeconomic Assessment Program. IMF Country Report No. 22/342.



(SRI) and Alternative Wetting and Drying (AWD), promoting adoption of CSA technologies and practices, and improved water resources management. Launched in June 2022, the National Agricultural Development Plan for Food Self-Sufficiency in Madagascar aims to accelerate the development of the agricultural sector to achieve food self-sufficiency and improve the daily lives of the most vulnerable. The proposed project interventions also align with the recently approved national strategy to promote nutrition-sensitive agriculture.

### **C. Relevance to Higher Level Objectives**

**26. The project is aligned with the World Bank Group's (WBG) FY23 to FY27 Country Partnership Framework (CPF) for Madagascar (forthcoming) and the World Bank's Twin Goals of reducing extreme poverty and promoting shared prosperity.** Broadly, the new CPF aims to increase per capita income in an inclusive manner by creating jobs and growing incomes, ensuring that growth is more inclusive and sustainable, and strengthening resilience to future shocks. The project will support all three of the CPF's High Level Outcomes (HLO): (i) HLO-1: Improving economic activities for increased incomes; (ii) HLO-2: Improved human capital outcomes by strengthening food systems and reducing stunting; and (iii) HLO-3: Enhanced resilience against shocks by strengthening natural resource management. It will contribute to these objectives by (a) improving agriculture productivity and access to market opportunities, which is the best means to increase rural household incomes; (b) promoting food system and dietary diversification for healthier communities; and (c) rehabilitating watersheds, restoring degraded landscapes, and strengthening natural resource management for more climate resilient food systems and agriculture-based livelihoods. Together, these investments will advance the World Bank's twin goals by reducing poverty in rural areas and promoting shared prosperity. The project also aligns with the GoM's PEM (2019-2023). As envisioned, the project will help further the PEM's Commitment 12, which focuses on actions to sustainably achieve productivity gains, improve household nutrition, and improve access to domestic markets. It is also aligned with the national action plan on food self-sufficiency released during the national conference on food self-sufficiency in June 2022.

**27. The project's strategic orientation follows a multi-sectoral, sub-national and spatially integrated approach.** In line with the CPF, the Aloatra-Magoro and Sofia regions were selected due to their high potential for increasing food production, rural incomes, and economic growth. The project's selective, sub-national geographic footprint has been in part guided by and will be spatially and technically coordinated with other sectors like transport, nutrition, and information and communications technologies (ICT) to ensure resilient service delivery and growth preservation and to deliver more impactful, more sustainable development outcomes. In line with the CPF, the project will prioritize areas with high unrealized production potential and in proximity to secondary cities and where ongoing or planned road infrastructure upgrades will enhance market connectivity and create opportunities for income growth and rural sector transformation.

**28. The World Bank is also well placed to make the most of available development resources to strengthen the productivity and resilience of rural livelihoods and Madagascar's food systems.** In particular, it can leverage its broad portfolio of multi-sector investment projects as well as its power to convene public and private stakeholders to identify investment synergies that maximize development impact, including those involving other development partners. It can also draw on the International Finance Corporation (IFC) to leverage private sector support, for example, in enhancing access to mechanization, agro-processing technologies, and strengthening input supply markets adapted to climate smart and agroecological practices. More broadly, the WBG is committed to advancing the Mobilizing Finance for Development





agenda in several ways. The approach includes targeted public investments in research and infrastructure and the enabling policy environment necessary to leverage private sector investment by agribusinesses in priority value chains, the leveraging of private sector and trust-funded carbon financing, and the leveraging of IFC and the Multilateral Investment Guarantee Agency expertise in public-private collaboration and guarantees to help de-risk prospective commercial investments.

**29. The project has been prepared in synergy with relevant World Bank-funded and other donor projects.** Project preparation is being closely coordinated to build upon and leverage past, ongoing, and downstream investment across the WBG Sustainable Development and Human Development practice groups' operational footprint, with an aim to ensure complementarities and to maximize development gains. Among operations informing the Project's design are the Irrigation Development and Watershed Management Project (P074086), Connecting Madagascar for Inclusive Growth (P173711)<sup>61</sup> and Connectivity for Rural Livelihood Improvement Project (P166526), and the GEF Sustainable Landscape Management Project (P154698 and AF/P176449). Relevant partner projects include the Rice Productivity Improvement, Watershed and Irrigated Perimeters Management Project and the Project for Rehabilitation of Irrigation System in South-West of Alaotra Lake, financed by the Japan International Cooperation Agency (JICA). The project will also benefit from operational synergies with Improving Nutrition Outcomes Using the Multiphase Programmatic Approach/Phases 1 and 2 (P160848 and P175110), the National Connectivity Program (P179176) and CASEF (P151469 and AF/P166133) via its support to Madagascar's pioneering land reform. The project will also benefit from close operational synergies with the Regional Food Systems Resilience Program for Eastern and Southern Africa (P178566) and associated investments in strengthening agricultural research and innovations development systems; mobilizing digital technologies to improve access to market information, e-extension, and other decision-making support tools; and improving the sector's enabling environment that will attract and catalyze higher levels of private investments.

**30. The project is also aligned with flagship WBG strategic initiatives and climate priorities.** The project contributes directly to the World Bank Africa Strategy 2019-2023, in support of the region's transformation, and the World Bank Climate Change Action Plan (CCAP) 2021–2025.<sup>62</sup> The CCAP outlines a strong commitment to improving the planning and implementation of interventions to address climate-related risk more robustly and systematically through the World Bank's Green, Resilient, and Inclusive Development approach including through nature-based solutions (NBS). NBS in agriculture and food production can enhance ecosystem functions in landscapes affected by agricultural practices and land degradation; improve water availability and quality, productivity of crop systems, and livestock health and contribute to benefits for soil health; carbon sequestration, biodiversity, and climate resilience. The project will also advance the World Bank's commitment to the Next Generation Africa Climate Business Plan (ACBP).<sup>63</sup> The ACBP aims to implement climate-smart policies and programs designed to scale up integrated landscape approaches on 60 million ha and to facilitate CSA adoption by 28 million farmers. The project also supports advancement of the WBG Gender Strategy (FY16–23),<sup>64</sup> which aims to enhance human development outcomes, improve economic opportunities, and remove

<sup>61</sup> In Alaotra Mangoro region, 6 of 11 schemes to be rehabilitated under the Project are situated along the RN3a, several sections of which are being rehabilitated under World Bank-financed transport projects, including P173711 and P166526. Another four schemes are situated along the RN44, also under rehabilitation. The project will also finance the rehabilitation of some 200 km of feeder roads in this area. For Sofia, 8 of 11 schemes are situated along the RN6, rehabilitation of which will be supported under the upcoming connectivity Multiphase Programmatic Approach. Another 3 schemes are located along the RN31, 100km of which is being financed by the World Bank.

<sup>62</sup> World Bank group. 2021. "World Bank Group Climate Change Action Plan 2021–2025: Supporting Green, Resilient, and Inclusive Development." World Bank Group, Washington, DC.

<sup>63</sup> World Bank. 2020. The Next Generation Africa Climate Business Plan: Ramping Up Development-Centered Climate Action. World Bank, Washington.

<sup>64</sup> World Bank Group gender strategy (FY16-23): gender equality, poverty reduction and inclusive growth. Washington, D.C : World Bank Group

barriers to asset ownership, especially among women, youth, and marginalized populations. Finally, by catalyzing the development of long-term resilience to shocks, the project, across its interventions, supports 3 of 4 pillars of the Global Crises Response Framework: a) Protecting People and Preserving Jobs to help mitigate the medium- to long-term impact of crises (Components 2 and 3); (b) Strengthening Resilience to be better prepared for any future crisis and challenges (Components 1-3); and (c) Strengthening Policies, Institutions and Investments for Rebuilding Better (Component 4).

**31. The project will directly address gender gaps in the agriculture sector and in line with the CPF objectives and the World Bank Gender Strategy.** These gaps were identified in the gender study commissioned during the preparation phase in the regions of intervention. Given the demographic importance of women and youth in Madagascar and the numerous challenges they face, the CPF recognizes these challenges and places gender as a cross-cutting area in all the HLOs, with specific attention to closing gender gaps in HLO2: Improved human capital outcomes by strengthening food systems and reducing stunting. In line with this goal, this project will address the identified gaps that impede women and youth's access to limited labor market and productive assets, further trapping them in poverty, and making them particularly vulnerable to external shocks, violence, and discrimination. The project is aligned with the World Bank Gender Strategy (FY16-FY23), particularly, in its focus on increasing women's access to inputs, resources and information, increasing the productivity of women farmers and improving their participation in local and sector-specific decision-making.

**32. The project will support the GoM and its priorities as they relate to improving the productivity, resilience and sustainability of the country's agri-food systems, and thus, its food security.** The project will catalyze the sustainable intensification of rice production in Madagascar by prioritizing the rehabilitation and upgrading of existing irrigation infrastructure,<sup>65</sup> while strengthening the organizational and resource management capacity of actors and institutions in strategic watersheds and agri-food value chains. Project investments will also aim to enhance farmer connectivity to input and output markets via digital technologies and road infrastructure upgrades. At the household level, investments will aim to enhance water use efficiency, catalyze uptake of CSA/Agroecology technologies, innovations and practices, and diversify production systems for improved livelihood resilience and nutrition outcomes. To address binding constraints to rice intensification and food systems diversification, the project will seek to identify the most promising technological and institutional innovations through dedicated support to research for field testing, adoption, and validation by farmers before scaling up. Robust monitoring and evaluation (M&E) of activities will generate lessons and empirical evidence that will help to generate new data, fill knowledge gaps, and inform the design of downstream investments. These priorities are highlighted in the country's updated INDC (2022) and NAP (2021).

## II. PROJECT DESCRIPTION

### A. Project Development Objective

**33. The Project Development Objective (PDO) is to increase productivity and strengthen resilience<sup>66</sup> of rural**

<sup>65</sup> A 2020 World Bank study found that the estimated average rehabilitation cost of US\$ 1,200 per ha offered a higher return on investment compared to the construction of new schemes based on an estimate of US\$8-10,000 per ha. The same study found that building new schemes is not economically profitable while rehabilitation or modernization has a strong economic justification particularly when coupled with intensification measures.

<sup>66</sup> Resilience in this context refers to 'climate resilience' through adoption of climate-smart technologies/practices and 'economic resilience' through diversification into non-rice crops and through increased access to markets.

livelihoods in Targeted Areas in Madagascar.

**34. PDO-level indicators.** The PDO indicators are the following:

- Direct project beneficiaries (number of households)

***Outcome 1: Increased productivity and resilience***

- Increased rice production in the project intervention areas (%)
- Farmers adopting climate-smart/agroecology technologies, innovations, and practices (number)

***Outcome 2: Improved Market Access***

- Increased volume of marketed surplus of target crops in project-supported areas (%)

***Outcome 3: Improved landscape management***

- Increased landscape area (watersheds, schemes) under sustainable management practices (Ha)

## **B. Project Components**

**35. The project is an Investment Project Financing (IPF) of US\$200 million (IDA) and US\$25 million French Development Agency [Agence Française de Développement], AFD) co-financing,<sup>67</sup> structured around three core technical components that support (a) community-led restoration and management of watersheds in target areas, (b) sustainable intensification and improved management of irrigation infrastructure and services, and (c) strengthening of value chains and livelihoods. The fourth and fifth component will cover project management activities and provide for a Contingent Emergency Response Component (CERC) to enable a rapid response in the event of a crisis.**

**36. Project interventions will be strategically oriented via an integrated landscape management and market-led approach and will focus on targeted market catchments in two regions with high agriculture potential, Alaotra-Mangoro and Sofia, where ongoing World Bank support to transport upgrades and land reform, among other investments, is expected to enhance access to markets and secure land tenure among rural farming communities. Through a more holistic and systems-based approach to rural development, one that recognizes the interdependence of farming communities and the ecosystems on which their livelihoods depend and the critical role that market and land tenure security play in catalyzing and sustaining their investments, the project will facilitate investments in productive infrastructure and CSA/Ae technologies and practices. Policy-related bottlenecks described earlier that dampen farmer incentives and, in turn, undermine sustainability of investments will be addressed via a complementary technical assistance (TA) activity and with objective to evaluate the performance of public programs and expenditures and identify reforms with scope to improve sector development outcomes and food security.**

**37. Component 1: Promoting community-led restoration and management of watersheds (US\$23.0 million, of which US\$20.45 million IDA equivalent and US\$2.55 million AFD).** This component aims to ensure the conservation and

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<sup>67</sup> AFD co-financing will be a joint financing and aligned with that of PADAP (P154698). It will be structured in accordance with the World Bank – AFD framework agreement (13/06 /2018) under the “joint financing” modality. AFD funds will be available in July 2023 for initial disbursement and will cover all project components except for the Contingent Emergency Response Component (CERC) component.



sustainable development of watersheds combating erosion and restoring ecological services that preserve and support the sustainability of agricultural investments. The component will be implemented jointly by MinAE and the Ministry of Environment and Sustainable Development (MEDD) at the central and local levels. The choice of watersheds and irrigated perimeters is guided by i) the state of the infrastructures and their potential for production, ii) the state of the watershed significantly impacting the project intervention perimeters, iii) the continuation of activities support on agroecology/climate-smart agriculture initiated by previous projects. In this context, in addition to the perimeters West of the lake Alaotra, the project will study the means of supporting other functional perimeters such as the case of PC15 Marianina Valley. Support for the improvement of agricultural techniques on agricultural land cultivated by farmers at the lower side of the watersheds, such as actions to protect against erosion on bare land that directly threatens agricultural activities and irrigation infrastructure can begin without waiting for the development and/or update of Local land Use Planning Schemes (LUPS). This component will support Pillar 3 of the World Bank's Global Crisis Response Framework (GCRF), which focuses on building long-term resilience, complementing operations across the four pillars that will also contribute to resilience-building. Component 1 will be composed of three sub-components.

**38. Sub-component 1.1: Development and/or update of localized Land Use Planning Schemes (US\$0.8 million, of which US\$0.7 million IDA equivalent and US\$0.1 million AFD).** One or more localized Land Use Planning Schemes (LUPS) will be developed (or updated) for each project area. This territorial planning tool will ensure integration of the project interventions. An ecosystem index tool will ensure that actions related to biodiversity and ecosystem services are strongly linked to the project's productive activities. The development or updating of the LUPS will be based on the mobilization of decentralized services, local authorities, associations, groups, and populations. They will be developed in coherence with the Land Use Planning at the communes or regional level when they exist. The improving of techniques on already cultivated agricultural lands at the bottom of the slopes can be started before the LUPS are developed. Similarly, the bare lands that overhang and directly threaten the agricultural activities and the irrigation infrastructure could be also part of the early actions. The development of local LUPS provides an opportunity to establish mechanisms for multiple stakeholders from across sectors and communities to build a shared vision, reconcile competing objectives over land use, and jointly plan and implement integrated LUPS and livelihood initiatives. These actions will facilitate the restoration of resilient landscapes by integrating climate-informed interventions into local LUPS that will help mitigate the adverse impacts of climate-induced hazards.

**39. Sub-component 1.2: Reforestation and erosion control in watersheds (US\$17.2 million, of which US\$15.29 million IDA equivalent and US\$1.91 million AFD).** Gully erosion imposes serious negative impacts on agricultural activities as well as on irrigation and related water storage infrastructures and must be effectively controlled. Water sources are threatened by the loss of forest cover and exacerbated by the impact of climate change. Thus, protection activities in the upper watersheds will focus on promoting landscape and forest restoration with a focus on reforestation for both protection and production (that is, agroecology and agroforestry). The experience of the ongoing soil erosion control programs (*Programme de Lutte Anti-Erosive, or PLAÉ*) will be considered in the implementation of project's anti-erosion activities. Protection activities will include the establishment of new firebreak, especially agricultural firebreaks in areas highly exposed to fire. Local structures, such as Community-based Associations (COBAs) and local committees against fire collaborating with MEDD may contribute to implementation of this subcomponent. Selection of species for afforestation and erosion control will consider community needs in energy and firewood, timber, and fruit produce while generating higher income. The ecological suitability of different species will be examined, such as soil conditions, to provide the best chance of survival and to avoid invasive species. Native species, which often grow more slowly, will also



be planted in consultation with communities, and positive biodiversity outcomes will be promoted by identifying species and areas that increase wildlife habitat or can provide ecological corridors.

**40. The cash and land-for-trees approach will be adopted to ensure the success of reforestation activities and their sustainability.** The reforestation protocol and agreements with each of the project stakeholders (commune, group members, and project team) will clearly identify the sequence of the planned activities, as well as the commitments at the beginning of the campaign. This approach will ensure the security and long-term management of collective and individual plantations by providing financial incentives to the farmers for at least three years. The cash and land for trees approach involves planting that will be sustained via payments for labor-intensive works and will be accompanied by mechanization, where feasible. Subsequently, once the planting is done, a person or community (that is, COBAs) will be considered as the ‘owner of the reforested land’ and they will receive a financial incentive per tree count per year upon verification that the tree survives and that the plot is well maintained with firebreaks. The project will develop a manual to ensure consistent understanding of the cash and land-for-trees approach. The amount of the incentive will be defined in the manual and the payment will extend for a maximum of three years after the planting. Where conditions permit, the project will encourage community-led investments via the facilitation of the issuance of a land certificate on cropland planted with trees, with support from local land offices. The project will create awareness and provide information targeting women and men to ensure greater participation of women farmers and increase their share in land tenure. The project will support local land offices to improve their capacity for issuing land certificates solely in the name of a woman farmer or jointly with her husband. The project will also seek gender equity and minimum representation of women in Local Recognition Committee members, as well as in Local Land Office agents’ recruitment. Land certificate format will be designed to allow joint inscription of spouses. Implementation of community-based watershed protection plans and reforestation activities—with aim in part to reduce erosion and safeguard water security against climate change-related risks—combined with incentives such as land certifications that will promote participation of women farmers, will contribute to positive climate adaptation and mitigation outcomes.

**41. Sub-component 1.3: Promoting agroecological practices (US\$5.0 million, of which US\$4.45 million IDA equivalent and US\$0.55 million AFD).** The project’s integrated landscape approach highlights the need to preserve the connectivity of the natural ecosystems. Agroecology enables the deployment of innovative practices that are locale-specific and optimize the use and management of natural resources (soil, water, and biodiversity). It is based on interactions between livestock, agroforestry, production diversification, and technical, social innovations and market linkages to preserve interactions between different ecosystems within a landscape.<sup>68</sup> The sub-component will support the dissemination of agroecological practices specific to different areas of the landscape/watershed (for example, wooded slopes, highland, lowlands, and rice fields) based on the existing and new analyses. These practices will ensure food security and stable income for producers through extension support to producers and cooperatives, dissemination of seeds and tools adapted to climate smart agriculture/agroecology practices (via vouchers, under Sub-component 3.1), and close monitoring and evaluation of interactions between various zones, livelihood systems, and adaptation practices. The project will thus support studies to define dissemination practices and methods, in line with the other components of the project. A dedicated ‘research and development’ activity will regularly monitor farm and landscape/watershed

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<sup>68</sup> Promotion of integrated agroecological practices not only helps to protect, restore and improve agriculture and food systems in the face of climate shocks and stressors, but also helps to sustain and enhance ecosystem services, including the restoration degraded soils, with a spillover effect on food security, resilience and sustainable livelihoods holistic approach to resilience by generating diverse pathways for incremental and transformational change towards more sustainable farming and food systems while also ensuring environmental sustainability.



performance and document, learn from, and promote evidence-based best practices. This activity will also entail the identification of women's producer groups and cooperatives and assessments of their specific needs. This will aid appropriate integration of gender considerations such as women's role in family nutrition, time use and limited access to tools and adapted practices in all training provided to producers and cooperatives, seed dissemination and provision of tools and adapted practices.

**42. Component 2. Sustainable intensification and management of irrigation infrastructure and services (US\$70 million, of which US\$62.23 million IDA equivalent and US\$7.77 million AFD).** Climate scenarios and climate change impact assessment detailed in the sectoral context section, together with growing trends in food demand, point out to a reduction of per-capita water availability and higher costs of operation, maintenance and replacement of irrigation infrastructure. With aim to improve water management capacity among communities and water use efficiency, this component will focus on the resilience and long-term sustainability of irrigation and related water storage infrastructures such as the Sahamaloto dam, by rehabilitating and improving degraded infrastructure and setting up structures for the management, maintenance and preservation (*gestion, entretien, preservation et police* - GEPP) of hydro-agricultural networks. Madagascar's adaptation priorities outlined in the 2021 NAP call for strengthening the performance and sustainability of existing irrigation systems.<sup>69</sup> The applicable texts for the GEPP are based on the Law 2014-042<sup>70</sup> and its implementing decree, which distinguishes between the different types of irrigation schemes management. Some major structures (reservoir dams, embankments, and so on) are not transferable to WUAs for safety reasons; these are the so-called strategic works. The law distinguishes between *partner schemes*, which include both strategic works and works transferred to WUAs and Federations, and *autonomous schemes* where all works are transferred to WUAs. It also provides for the establishment of a management body at the regional level which is an extended structure for the implementation of the contract plan which shares the responsibilities of the state and the WUAs and federations for the GEPP of the *partner schemes*. Most of the cost of maintaining strategic structures must be provided by the state (central and region) due to the public good nature of investments, with minimal participation from the federations. All maintenance of the transferred works must be taken care of by the federations and WUAs. The law provides for the establishment of a special fund which will ensure the state's share in the financing of GEPP operations of the strategic works. This fund is called FRERHA (Fund for the Rehabilitation and Maintenance of Hydro-agricultural Networks). So, to enhance the performance, resilience and sustainability of irrigation infrastructure and services in the face of current crises and projected climate change impacts, thereby supporting Pillar 2 (that is, preserving jobs) and Pillar 3 (that is, strengthening resilience) of the GCRF, Component 2 will consist of two sub-components.

**43. Sub-component 2.1: Rehabilitation of hydro-agricultural infrastructure (US\$65.0 million equivalent, of which US\$57.78 IDA and US\$7.22 AFD).** The project will support the rehabilitation of irrigation infrastructure covering approximately 30,000 ha in the two selected regions: Alaotra-Mangoro (26,000 ha) and Sofia (4,000 ha). According to the NAP, these regions are very relevant in terms of water resources management due to its high climate risk. Feasibility studies were carried out during the preparation of the project showing significant potential in these two regions for increased water-use efficiency and contribution to the climate-resilience of staple crops, and for livelihood's diversification. Average farm size is 1.06 ha and 1.76 ha respectively (totaling 28,000 families and 150,000 people), rehabilitation costs US\$ 1,730 per ha and US\$ 2,592 per ha, with average internal rates of return of 31 percent and 13

<sup>69</sup> Government of Madagascar, NAP, 2016.

<sup>70</sup> Law N° 2014-042 of January 09, 2015 governs the Reclamation, Management, Maintenance, Preservation and Policing of Hydro-Agricultural Systems.





percent respectively. To ensure the participation of the WUAs and federations in the detailed design stage, there will be 2-3 rehabilitation scenarios, each specifying the corresponding investment and maintenance costs. These scenarios will take into consideration current and projected climate change impacts and incorporate climate considerations to reduce identified vulnerabilities and potentially enhance resilience. The commitment of WUAs for the rehabilitation will be ensured by means of member contributions based on an estimated prepayments also known as MAPER (*Montant d'Apport Préalable Estimé Réaliste*). The MAPER is a form of contribution from the beneficiary users to the works, to be paid in full before the maintenance works commence, into a bank account in the name of the federation/WUA. This sum will not be used for rehabilitation work, and will remain available for future periodic maintenance work, repair of cyclonic damage, and renewal of components of structures with a limited lifespan. The full payment of the MAPER and the commitment of the WUA/federation on the scenario retained at detailed design stage and on the corresponding maintenance costs will be a prerequisite for the start of the works.

**44.** For the elaboration of detailed design, bid documents, and construction supervision, two consulting services, one per region, will be selected to ensure competition, high quality of designs, and a consistent approach. Environmental and social impact assessments and associated management planning will be carried out in parallel to ensure that risk management and the scheme rehabilitation are integrated into the LUDS covering the upstream watershed management activities. The construction phase in the schemes will take place during years 2- 4 of the project to have at least 1 year of guarantee from the contractors in the event of default and to be able to ensure appropriate training of the WUAs and federations in MMP. These training will also be used to strengthen the knowledge base of participants on climate change and adaptation strategies. This sub-component will also finance the rehabilitation of Sahamaloto dam, and more specifically, the studies and works for (a) increasing the storage by rehabilitating and raising the crest of the spillway, (b) carrying out extraordinary maintenance of the dam and appurtenant structures, (c) installing a new monitoring system, and (d) implementing a long-term reservoir sediment management strategy.

**45. Sub-component 2.2: Management, Maintenance and Preservation (MMP) of hydro-agricultural infrastructure (US\$ 5.0 million equivalent, of which US\$4.45 IDA and US\$0.55 AFD).** As indicated in the climate change impact assessment, the higher frequency and intensity of extreme events will have a significant influence in management, maintenance and preservation costs. Increased capacity to manage such costs is essential for climate resilience. This will involve the development of a regional decree to define the strategic works of each region, taking into consideration the current and projected impacts of climate change. A firm or NGO will be recruited to provide TA support through collaboration agreements with the regional directorates of the ministry (Regional Directorate for Agriculture and Livestock [*Direction Régionale de l'Agriculture et d'Élevage*, DRAE]).

**46. For the autonomous schemes as well as for the transferred part of the partner schemes,** the project will (a) support the municipal technical services and the DRAE (training, equipment, and so on); (b) train the WUA and Federation on the use and monitoring of the MMP for each scheme; (c) set up/reinforce WUAs (maps, equipment, and so on); (d) support the WUA for the approval of the regulation of each scheme; and (e) plan, organize, and implement routine and periodic maintenance actions (based on annual work plans determined by the General Assembly). The TA will also assist the WUAs/federations with the opening of accounts where members of the Federations/WUAs will deposit their membership dues. It will also develop a WUA grants manual for the project's support on a decreasing basis of the WUAs for the periodic maintenance of their schemes. In addition, the project will contract a consulting firm that will provide administrative, audit and advisory services to the WUAs. Through specific training in technical management, community



protection and monitoring, WUAs will enhance their knowledge base on climate change and climate impacts, while gaining the capacity and the social and economic resilience required to adapt to circumstances brought about by climate change related to water resources and irrigation infrastructure.

**47. For the non-transferred part of the irrigation schemes (or strategic works such as dams, dikes main drains and access roads),** maintenance will be provided via state/region funding. The project will facilitate the development and signature of a 'contract-plan' for each scheme defining the financing sources for the GEPP. At the regional level, the project will finance multi-year framework works contracts for the maintenance of these strategic structures on a degressive basis during the five-year implementation of the project. It should be noted that these works will only be intended to ensure the maintenance of structures not retained in the rehabilitation schemes or already rehabilitated (not for those to be rehabilitated, for example, Sahamaloto). At the central level, technical support and training will be provided to the Directorate of Rural Engineering (DRE) with aim to supervise and monitor regional strategic works. A multi-year contract will be signed with a specialized body that will carry out periodic inspections in accordance with international standards, at the request of and under the direction of the unit set up at the DRE.

**48. Component 3: Strengthening livelihood resilience and value chains (US\$112.0 million, of which US\$99.56 million IDA equivalent and US\$12.44 million AFD).** The climate scenarios and the climate change impact assessment as outlined earlier confirmed the urgent need to scale-up climate-smart technologies and practices along priority agri-food value chains. With the aim to mitigate climate risks and catalyze needed adaptation of food systems, Component 3 will finance climate-smart investments and promote diversified food systems, incomes and diets for more productive, resilient and healthy communities and livelihoods. Interventions under this component will benefit from and be closely coordinated with those under Component 1 to maximize complementarities and optimize the benefits of the project's integrated, landscape approach.<sup>71</sup> In addition to projected climate change impacts, the proposed activities are designed to address the key constraints faced by smallholder farmers and value chain stakeholders by facilitating the adoption of climate-informed innovations and practices so critical to catalyzing needed transition to a more resilient and sustainable agri-food system for the country. This component will advance Pillar 1 of the GCRF by helping to strengthen agricultural and food production and by supporting producers to alleviate food insecurity. Component 3 will consist of three subcomponents.

**49. Sub-component 3.1: Promoting climate-smart and nutrition-sensitive agriculture technologies, practices and interventions (US\$72.0 million, of which US\$4.45 million IDA equivalent and US\$0.55 million AFD).** With an aim to raise crop yields, strengthen resilience of farm-based livelihood systems, and improved household-level nutritional outcomes, this sub-component will promote investments in the deployment and adoption of Climate Smart Agriculture/Agroecology (CSA/Ae) and nutrition-sensitive innovations and technology packages among smallholder farmers and cooperatives in targeted areas.<sup>72</sup> The proposed CSA/Ae packages respond to the current and projected impacts of climate change and intend to maximize productivity and climate resilience, as well as environmental co-benefits (including GHG emissions reduction), with particular attention to improved soil and water management, integrated nutrient management,

<sup>71</sup> Landscape restoration and watershed management investments under component 1 represent a critical foundation upon which the future growth and long-term sustainability and resilience of food production systems and rural livelihoods depend.

<sup>72</sup> Climate-smart agriculture (CSA) is an approach that helps guide actions to transform agri-food systems (AFS) towards green and climate resilient practices. It aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible.

See <https://www.fao.org/climate-smart-agriculture/en/>





increased input-use efficiency, improved crop mix and sequence, agroforestry and silvo-pasture systems. See Annex 3 for a more detailed description of CSA/Ae packages and potential co-benefits.<sup>73</sup> The project will develop a manual and mobilize a Voucher Management Agency (VMA) to manage an input voucher scheme, controlled by MINAE and used within the ministry's financing mechanism. The VMA will ensure the capacity building of MINAE team from the beginning of the contract to strengthen the mechanism and ensure its sustainability. The vouchers distributed under this subcomponent will be used by beneficiaries (including those supported under Sub-component 1.2) to source improved seeds (including biofortified black beans rich in zinc and iron), cuttings (such as cassava and bio-fortified orange-flesh sweet potato), fertilizers (including organic and agroecological fertilizers), plant protection (for example, bio-pesticides such as *Bacillus Thuringiensis*), livestock and animal nutrition/health products, tools/equipment, beekeeping equipment and so on. from selected private input suppliers (that is, agro-input dealers). Participating agro-input dealers will be vetted, registered and trained to provide extension support directly to smallholder farmers and cooperatives to facilitate their optimal adoption; special attention will be given to increase the capacity of agro-input dealers to provide extension support tailored to the particular needs of women smallholder farmers.

**50.** Under this sub-component, the project will also mobilize two TA contracts, one for each region, with aim to provide support to farmers/farming cooperatives for the setup and management of farmer field schools (FFS) and community garden demonstration plots. These will be used to facilitate training on CSA/Ae packages and pre-sale and after-sales marketing and extension services by agro-input dealers. In the regions where youth and women cultivate vegetable during off season, the TA will assist with the development of the value chain. To facilitate income and dietary diversification and improved nutritional outcomes, project interventions under this sub-component will place special emphasis on promoting homestead and community vegetable gardens, fruit tree orchards, integration of small ruminant and poultry farming, and beekeeping, for higher consumption of nutrient-dense foods. In collaboration with the National Office of Nutrition (*Office National de Nutrition*), the project will promote, at community and household levels, culinary recipes adapted to each region. Prioritized value chains include among others, irrigated and rainfed rice, maize, black-eyed beans, sweet potatoes, fruits and vegetables, and livestock (poultry, small ruminants, beekeeping and dairy farming). A community and behavior change program, such as the Gender Action Learning System (GALS), will be supported to increase uptake and utilization of vouchers by women farmers and promote more equitable sharing of household responsibilities. Under this sub-component, the project will seek to leverage productive partnerships with private sector suppliers of quality seeds, fertilizers, and other inputs and providers of input and marketing credit.<sup>74</sup> The TA will also promote village saving and loan association (VSLA) programs among targeted communities. VSLA programs have proven to be an excellent tool to promote financial literacy while improving access to more affordable credit.

**51. Sub-component 3.2: Strengthening value chains via Matching Grants (US\$16 million, of which US\$14.22 million IDA equivalent and US\$1.78 million AFD).** Climate change impacts and increasing food demand call for action to strengthen the productivity, resilience and sustainability of agri-food value chains. The problem of food loss and waste will be significantly exacerbated by climate change. Therefore, improvements in post-harvest management, food

<sup>73</sup> Annex 2, detailing the GHG Balance of the Project, is based on the Economic and Financial Analysis. The EFA and the GHG Balance apply models to simulate the likely performance and feasibility of the project interventions from the perspective of potential beneficiaries and the whole society. Annex 3 distinguishes the CSA packages contribution to climate change adaptation and mitigation.

<sup>74</sup> For example, the project team has been exploring a potential collaboration with mining company Ambatovy and its national distributor International Raw Materials to develop domestic markets for their by-product ammonium sulphate, which has been shown via field trials to significantly increase yields on upland rice and horticulture production.



processing and commercialization are vital for the agri-food system's resilience and sustainability. Access to adequate assets and services is fundamental at each stage of the value chain to ensure the capacity of the agri-food sector to address the challenges posed by climate change and capture potential opportunities. Through Matching Grants (MGs), this sub-component will support climate-smart<sup>75</sup> subproject investments by farmer cooperatives, seed producers, agro-processors, traders, agro-equipment manufacturers and machinery suppliers, and other value chain actors (groups or individuals). Eligible groups will be encouraged to include women as members, additionally, women-led farmer groups will be identified and provided with needed capacity support to increase their access to MGs. Eligible investments include but are not limited to the purchase and/or leasing of farming equipment, irrigation pumps and related materials, construction of storage infrastructure, post-harvest processing (for example, milling and drying) technologies, and food processing units. The matching grant program will be administered by the Agricultural Development Fund (*Fonds de Développement Agricole*, FDA) and will build on FDA's experience in administering similar programs in recent years, including under the GEF Sustainable Landscape Management Project (PADAP, P154698 and AF/P176449). The project will mobilize TA to provide institutional capacity-building support to FDA and technical backstopping to grantees to optimize the delivery of subprojects. A matching grant manual comprising three windows (small, medium and large) is under preparation. MGs will prioritize the mobilization of productivity-enhancing and labor-saving mechanization equipment, storage facilities, value addition processing and FLID. The project will prioritize subprojects that respond to the main climate change impacts and national priorities for climate action (mainstreaming key considerations and incentives for climate action into the MGs Operation Manual and the subcomponent TA). The project will also support beneficiaries in preparing high-quality matching grant applications. During project preparation, the Project Implementation Unit (PIU) mobilized a FLID diagnostic highlighting strong growth potential at the national level and, more specifically in the two target regions of Alaotra-Mangoro and Sofia (especially along the eastern shore of Lake Alaotra and stretching along the RN31 near Port Berge and Mampikony in Sofia). Additional scoping studies will be mobilized to identify more high potential areas with favorable market access and water resources to inform more precise targeting of FLID interventions.

**52. Sub-component 3.3: Development of climate-resilient rural road infrastructure (US\$24 million, of which US\$21.34 million IDA equivalent and US\$2.66 million AFD).** Assessment of the climate threat indicates that taking action to climate-proof road infrastructure is highly relevant to reduce maintenance costs over time. In addition, good roads are critical for optimizing the performance of agri-food markets. Upgrading road networks that connect people to markets while also making roads greener and more resilient to the impacts of climate change provide multiple economic benefits and co-benefits. Good roads also facilitate the access to inputs, technical advice and other incentives that facilitate the adoption of climate-smart/agroecology technologies and practices among farmers and value chain stakeholders. This sub-component will finance upgrades to feeder roads, small bridges and other rural market infrastructure to improve the accessibility of production areas to processing and consumption centers, and downstream end markets. Complementing activities under sub-component 3, will target infrastructure upgrades that further improve the competitiveness, resilience and sustainability of supported agri-food value chains. This will ultimately support food and nutrition security. Aligning with the project's spatial approach, feeder roads in proximity to project-supported irrigation schemes and those connecting key market sheds to important downstream markets, especially strategic secondary cities, will be prioritized. The activity will ensure the development of climate-resilient infrastructure that is designed and built in a way that anticipates, prepares for, and adapts to changing climate conditions. Informed by the experiences under the CASEF

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<sup>75</sup> The climate smartness of subproject investments refers to CSA priorities of sustainably increasing productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible.



project, this sub-component will also support the development of decentralized, community-driven mechanisms for road maintenance. The project will provide training and equipment to the communes and regions to allow them to conduct regular feeder road maintenance works.

**53. Component 4: Project Management and Monitoring and Evaluation (US\$20.0 million, of which US\$17.78 million IDA equivalent and US\$2.22 million AFD).** This component will support all aspects of project management and M&E. It will fund activities relating to project startup; M&E; knowledge management; communications; and compliance with fiduciary, procurement, environmental, and social requirements including corporate commitments (such as citizens' engagement activities). It will finance environmental and social impact assessments, project management reporting, administration and logistical support for project implementation, including knowledge and learning. In light of the project's integrated landscape management approach and strategic spatial development orientation, this component will also support evaluations studies for the project; knowledge and learning for government staff, communes and civil society representatives to learn from community-based approaches implemented regionally and globally; and a geo-spatial platform for monitoring the activities of the projects (number, type, and geo-location of infrastructure built, type/presence/size of livelihoods activities, and so on). The resulting knowledge base will support the advancement of the GCRF's Pillar 4: Strengthening Policies, Institutions and Investments for Rebuilding Better. This component will also finance the operational costs related to the establishment of inter-ministerial steering committees at national and regional levels for the strategic guidance of the project and will cover the costs for consultants recruited by the project to support ministry staff.

**54. Component 5: Contingent Emergency Response Component (US\$0 million).** A Contingent Emergency Response Component (CERC) with zero allocation may be used to contribute to an emergency response through the timely implementation of activities in response to an eligible national emergency. The CERC could also be used to channel additional funds should they become available as a result of the said emergency.

**55. The CERC mechanism will be further defined in a CERC Operations Manual attached to the Project Implementation Manual (PIM), which include triggers and conditions for the use of funds.** This manual will clearly outline (a) any structures or institutional arrangements for coordinating and implementing the CERC; specific activities which may be included; eligible expenditures, financial management arrangements; procurement methods and procedures; documentation required for withdrawals; a description of the environmental and social assessment and management arrangements; and an Emergency Action Plan. Should the CERC be triggered, all expenditures will be made in accordance with paragraph 11 of the IPF Policy and ESF requirements and reviewed and accepted by the World Bank before any disbursement is made. In accordance with paragraphs 11 and 12 of the IPF Policy, this component would provide immediate, rapidly disbursing support to finance goods (positive list agreed with the Government), works, and services needed for response, mitigation, and recovery and reconstruction. Operating costs that are eligible for financing would include the incremental expenses incurred for early recovery efforts arising from the impact of a major crisis.

### C. Project Beneficiaries and Intervention Areas

**56. The ultimate beneficiaries of the project are farmers (with special attention to women and youth), households and communities that will benefit from improved food production and higher output, improved access to productive inputs, and the more sustainable management of the natural resources on which their livelihoods depend.** The project will also benefit institutions responsible for seed production, research institutions, and technical services responsible for



delivering specific services and inputs to rural households that will benefit from capacity building and equipment. Staff from sector ministries at the national and local level will also benefit from capacity building, as will service providers (for studies and civil work). Many more will benefit indirectly from co-benefit reductions in GHG emissions, improvements in hydrological services, and the protection of habitats and biodiversity. Institutions that will benefit from TA, capacity building, and grant-funded activities include the National Center for Applied Research on Rural Development (*Centre National de Recherche Appliquée au Développement Rural*, FOFIFA), FIFAMANOR [*Fiompiana Fambolena Malagasy Norveziana, in Malagasy*], the National Center for Environmental Research [*Centre National de Recherches sur l'Environnement*], the General Directorate for Meteorology [*Meteo Madagascar*], agriculture universities and training centers, in addition to MinAE departments (for example, SOC [*Le Service Officiel de Contrôle des Semences et du Matériel Végétal*], DRAE, DPV [*Direction d'Appui à la Production végétale, or the Plant Protection Directorate*], DAPA [*Direction d'Appui à la Production Animale, or Directorate of Animal Production*], DSV [*Direction des Services Vétérinaires, or the Veterinary Services Directorate*]). MEDD departments such as the regional directorates for Environment and Sustainable Development, the National Office for Climate Change and REDD+, the Direction for Economic Environmental Management, and the National Office for the Environment also count among indirect beneficiaries. The project will also reach many other stakeholders who will benefit indirectly from reforestation and restoration of degraded landscapes, improvements to ecosystem services, and rehabilitation of rural road infrastructure.

**57.** Given the project's strong gender focus, the project aims to have at least 40 percent among direct beneficiaries to be women and sets specific targets under various component activities. While women's labor force participation is high in Madagascar, 87 percent are employed in vulnerable work and 60 percent are engaged in agriculture. Their higher share of household responsibilities leads to: an unequal distribution of tasks in the rice value chain where women are mainly responsible for tasks that require the use of easy-to-handle tools; lower access to land tenure security (only 23 percent of women own land in their names; lower productivity and access to capital; and decreased engagement in community activities, impacting their ability to participate in community-decision making (women allocate only 4 percent of their time to community activities during the rainy season and no time at all during the dry season).

**58. Intervention areas.** The project will intervene in two regions, Alaotra-Mangoro and Sofia, both critical to national food production and having high agriculture growth potential. Both also benefit from major road improvement investments, including the RN44 and the RN31 with scope for transformation impact via improved access among rural communities to input and output markets and more efficient market arbitration of food product flows between deficit and surplus zones. Project interventions will benefit an estimated 150,000 households, among which 35,000 farmers, via the adoption of CSA/Ae technologies and practices. The project will prioritize the rehabilitation of 30 000 Ha of irrigated perimeters benefiting approximately 300 000 direct beneficiaries and more than 30,000 ha of watersheds. The project will also facilitate FLID investments covering another 900 ha across the two target regions. To mitigate risks, the implementation of project activities will be sequenced and stepwise in the two selected regions based on specific technical, operational, and institutional readiness criteria.

- (a) **Alaotra-Mangoro.** Long Madagascar's principal rice basket, climatic conditions in the Alaotra sub-region (districts of Amparafaravola, Ampatondrazaka and Andilamena) are favorable for rice cultivation and double or even triple cropping. The region is the second most important rice producing region of Madagascar after the Sofia/Boeny regions. Public policies have long favored rice cultivation and Alaotra produces the largest rice surplus in Madagascar, in terms of kilocalories per capita. About 89 percent of households in Alaotra-Mangoro practice



agriculture. Still, nearly one-third of the region's cultivable area remains unexploited. Land under rice cultivation and associated revenues are major determinants of household well-being. With the average plot of less than 1 hectare, most households are poor. Approximately 55 percent of households have some form of land title or are in the process of obtaining one. While rice dominates production, tubers, vegetables, legumes, fruits and poultry farming is widespread. Freshwater fishing is practiced by more than half of the municipalities in the Region along with rice-fish farming. The region is also characterized by its richness in natural resources (e.g., the lake basin is classified as a Ramsar site) However, these assets do not reflect the economic and nutritional situation of the population. Alaotra-Mangoro is characterized by a high prevalence of chronic malnutrition among children under 5 years old, reaching 47 percent, while the national average is 42 percent.<sup>76</sup> Nearly 36 percent of households have a poor Food Consumption Score (FCS).<sup>77</sup>

- (b) **Sofia.** For agriculture, only 29 percent of arable land in the Sofia region is under cultivation. The region is the first national producer of black-eyed beans and the second national producer of vanilla. Cattle and goat breeding is also widespread in the region, representing 13.6 percent and 16 percent, respectively, of national herd. Rich ecosystems, an extensive coastline and abundant rivers and streams are favorable for fishing and rice-fish farming, widely practiced in the region. Despite these advantages, the prevalence of food insecurity is among the highest in the country at 42.7 percent. Approximately 59 percent of households have a low FCS. The dietary diversity score is also low (5.5).<sup>78</sup> Only 9.9 percent of the population has access to improved drinking water if the national average is 27.7 percent. These situations can be explained by several factors related to food production. On average, it takes approximately three hours for farmers to reach market hubs to sell their agricultural production. This isolation also leads to limited access to inputs and market information.

#### D. Results Chain

**59. The theory of change underlying the project design is oriented around two primary PDO-level outcomes:** (a) increased productivity and strengthened resilience. Progress in achieving the PDO will be measured by tracking changes in rice production, volumes of marketed surplus of target crops, and land area under sustainable management practices in the project intervention areas. These outcomes are expected to contribute directly to the three HLOs as articulated by the CPF: (ii) HLO-1: Improving economic activities for increased incomes; ii) HLO-2: Improved human capital outcomes by strengthening food systems and reducing stunting; and iii) HLO: Enhanced resilience against shocks by strengthening natural resource management. The project's spatial approach, in line with the CPF—with the aim to maximize synergies across project interventions and with other World Bank-financed investments in road infrastructure, nutrition, and land reform and the project's emphasis on enhancing access to agriculture finance, markets, and land security—will support more robust and more sustainable development outcomes.

<sup>76</sup> MICS, 2018. INSTAT, UNICEF. Enquête par grappes à indicateurs multiples (MICS) Madagascar. 2018

<sup>77</sup> WFP, 2014. WFP, 2014. Analyse Globale de la Sécurité Alimentaire et Nutritionnelle, et de la Vulnérabilité (AGSANV)

<sup>78</sup> ENSOMD, 2013. INSTAT. Enquête Nationale pour le Suivi des Objectifs du Millénaire pour le Développement (ENSOMD).



**Figure 3. Theory of Change**



## E. Rationale for Bank Involvement and Role of Partners

**60. The public sector, through interventions under this project, can design and implement effective interventions.** The project will seek to improve efficiency across target value chains by addressing critical coordination failures in irrigation infrastructure and market failures, and by financing public goods. The project will follow the approach of tackling the cause of market failure rather than supplanting the market, thereby promoting private sector-led growth and competitiveness and rural development. The project will deliver training, grants, and other tools that incentivize the adoption of sustainable land management practices by farmers in targeted watersheds. The benefits of proposed public interventions are projected to be more than the costs, which include the costs of policy development, administration, monitoring, enforcement, and compliance. At the same time, the interventions will drive productivity gains in the irrigated perimeters and within the associated watersheds that increase beneficiaries' private benefits.

**61. Value added of WBG support and role of other partners.** The World Bank's involvement is supported for several reasons. First, investments in infrastructure rehabilitation will require the level of resources that the World Bank is well placed to help mobilize (including through co-financing arrangements with other bilateral partners such as AFD). Second, the World Bank's approach to working with and through Government systems and procedures helps ensure that this is a government-led process, which is essential to the long-term sustainability of the investments. Thirdly, the World Bank support will bring global experience and expert knowledge to bear upon several aspects of the project including the rehabilitation of irrigation infrastructure, the design of agricultural input support schemes, and the approaches to strengthen the output marketing of target value chains for the selected beneficiary groups as well as expertise and



practical experience in rendering natural assets more productive through integrated landscape management and NBS. The World Bank support will also coordinate with partners to optimize synergies with other programs and investments in Madagascar financed by the World Bank and other donors. Examples include (a) supporting applied adaptive research on soil fertility and the use of ammonium sulfate as a chemical fertilizer in collaboration with Ambatove,<sup>79</sup> leading fertilizer suppliers and research institutes such as AfricaRice and FOFIFA; and (b) a proposed shared learning program with the JICA focus on integrated watershed restoration and management and agroecologie. Lastly, the project through the mobilization of public investments provides a platform to engage with and provide support to the private sector on a broad range of market growth opportunities, for example, related to inputs supply (sub-component 3.1), manufacture and supply of agriculture and agro-processing machinery (subcomponent 3.2), and agro-finance.

**62. The World Bank has notable experience in supporting agricultural irrigation investments in Madagascar,** including the 2006-2018 implementation of Irrigation Development and Watershed Management Project (P074086) and the GEF Sustainable Landscape Management Project (PADAP, P154698 and AF/P176449). The World Bank's support, in coordination with other technical and financial partners, has also focused on improving the management framework for irrigated areas and the policy and enabling environment for improved irrigation infrastructure maintenance and upkeep. To support the set-up and implementation of the project, the World Bank is also relying on a broad range of analytical studies which strengthen its technical expertise in the agricultural sector, and in particular rice. This includes the 2019 Country Economic Memorandum, which featured the rice sector, and the *Realizing the Potential of Irrigated Perimeters in Madagascar* study,<sup>80</sup> which fills gaps in knowledge of irrigated perimeters, and their performance and offers guidelines for a strategy to improve rice productivity. It also includes scoping studies support by Project Preparation Funds covering rice markets, Nutrition-sensitive agriculture, gender in agriculture, digital agriculture, agri-finance/vouchers, CSA, and FLID.

**63. The World Bank is also well positioned to assist Madagascar in addressing climate vulnerabilities and adapting to climate change.** Agricultural transformation, economic growth and shared prosperity in Madagascar will be increasingly undermined if vulnerabilities to climate change are not addressed. Climate impacts are already being felt and are expected to escalate significantly, causing many low-capacity countries like Madagascar to be even more vulnerable. Given the climate sensitivities of multiple engines of growth, agriculture, natural capital, and infrastructure, the urgency for countries to ramp up climate-smart development at scale and across the growth spectrum is an imperative. Climate benefits or costs will be accounted for in economic analysis using the shadow price of carbon. The World Bank's ACBP provides a platform to further galvanize climate action by prioritizing its focus on the region's core development challenges and priorities. It calls for countries to seize the opportunity to scale-up climate resilience to grow their economies and reduce poverty, redouble efforts to increase energy access across the region, and take advantage of sustainable and innovative approaches to leapfrog into greener development pathways.<sup>81</sup>

## F. Lessons Learned and Reflected in the Project Design

**64.** The technical design of the project has also been informed by the experience gained and lessons learned from

<sup>79</sup> Ambatovy is a major industrial operation mining and refining nickel and cobalt in Madagascar. Ammonium sulfate is a byproducts of the company's mining operation that has shown potential via field research to boost yields for rice and other crops.

<sup>80</sup> World Bank. 2020. *Realizing the Potential of Irrigated Parameters in Madagascar*.

<sup>81</sup> "World Bank. 2020. *The Next Generation Africa Climate Business Plan: Ramping Up Development-Centered Climate Action*. Washington, DC: World Bank."



previous GoM and World Bank-financed activities in Madagascar, and elsewhere. The project design seeks to build upon upstream investments and align with existing interventions by the World Bank and others. This includes the GoM's flagship National Program for Irrigation Development and Watershed Management (*Programme Nationale des Bassins Versants et Périmètres Irrigués*, PN-BVPI). PN-BVPI was supported by several donors including the World Bank through the BVPI IDA (P074086), the first phase of a planned three-phase, twelve-year Adaptable Program Lending Operation. PN-BVPI-IDA aimed to increase rice productivity in four irrigation schemes and their associated watersheds in the central and northern regions of Madagascar, while highlighting the importance of focusing on upstream investments in watershed management to reduce the negative downstream impacts on irrigation infrastructure such as weirs that clog from excessive siltation. PADAP, building on lessons from the Environment and Agriculture programs in Madagascar was the first integrated landscape project in Madagascar and emphasized the importance of integrated landscape management to achieve better development and ecological outcomes. The experience from PADAP demonstrated the value of the landscape approach and the value of land use planning; given the extent of investments needed across a landscape, it also demonstrated that more resources should be brought to bear within fewer target areas. Notable design features and lessons learned from these and other upstream investments include the following:

- **Projects promoting rice cultivation should give priority to both modernization of irrigation infrastructure and intensification and adaptation of rice cultivation.** Without rehabilitation and effective O&M of the irrigation infrastructure, irrigation water availability decreases, leading to a decrease in yields. Irrigation is a key part of the package of sustainable intensification activities that includes the promotion of improved inputs (for example, climate-resilient seeds and fertilizers), climate-smart practices (for example, SRI and efficient water and nutrient management) and paddy-levelling, among others, to achieve significant yield gains. Crop rotation (legumes and off-season horticulture) greatly improves yields in rice fields with poor water control and in rainfed rice systems, accounting for most of the rice area cultivated.
- **Harnessing synergies is needed with other WBG and partner investments.** The project recognizes that learning from and adapting lessons from past and ongoing investments in the rice sector by the World Bank, other donors, non-governmental organizations, and so on is essential for implementation success. Also, past and recent experience in Madagascar, as elsewhere, suggests that optimization of resources and efficiencies can be gained via multi-sector coordination with World Bank teams managing operations on water; health and nutrition; finance, competitiveness and innovation; and transport.
- **Effective upstream watershed/landscape management contributes to positive downstream impacts.** Productivity of irrigation infrastructure is diminished without measures to reduce siltation from deforestation and forest degradation. Additionally, ecosystem services such as water infiltration and biodiversity habitat are enhanced through healthy upstream ecosystems and can contribute to long term output gains as well as positive climate impacts.
- **Food and nutrition behavioral change communication is crucial to ensure positive nutrition outcomes.** Regardless of whether the pathway to improved nutrition goes via diversified production or improved incomes for accessing nutritious food at markets, diets do not automatically improve without nutrition knowledge and cooking and preservation skills. Thus, any agricultural activities intended to improve nutrition must be accompanied with a nutrition behavioral change component targeting the same beneficiary households. The production of agroecological crops (for example, legumes and orange-fleshed sweet potato) can substantially improve nutritional household-level outcomes.
- **Enhancing market access among smallholder farmers is critical to the sustainability of project investments.** Facing myriad uncertainties with often limited capacity to manage adversity, smallholder farmers are typically risk averse.





When information and market outlets are scarce and remote, farmers lack the needed incentives to produce anything beyond their household needs. When markets are assured and farm-gate prices are favorable, farmers will readily take up and maintain their investments in productivity-enhancing technologies and practices needed to increase their yields and produce a marketable surplus. Thus, improving farmers' access to downstream markets and services is critical to ensuring the sustainability of project investments.

- **Project implementation via existing structures within MinAE enhances ownership and sustainability.** The project will prioritize the secondment of public officials from the relevant institutions such as Genie Rural and the DREAs to enhance opportunities to strengthen human resource and institutional capacities across the ministry, so critical to the sustainability of investments, service delivery, and long-term sector performance.
- **Promoting gender-sensitive outcomes.** Experience suggests it is important to include in project design specific activities and analytics that support gender equality not only in terms of creating jobs and incomes for women, but also to help them overcome social barriers that exclude them. Village Savings and Loan Associations (VSLAs) and Saving and Internal Lending Communities (SILCs) present important vehicles to advance women's economic empowerment, especially by providing access to informal credit and capital. Evidence also suggests that female rice farmers might find better income-generating options in other agricultural activities such as rice parboiling, byproducts, and other types of agro-processing. Such opportunities, in turn, lead to increased investments in health and nutrition, education, and resilience for women and households.

**65. The project aims to maximize collaboration with partner organizations that are actively engaged in Madagascar's rural sector.** These include the International Fund for Agricultural Development (IFAD), the African Development Bank (AfDB), AFD (as project co-financier), the European Union, the Food and Agriculture Organization (FAO) of the United Nations, the United States Agency for International Development (USAID), the German Agency for International Cooperation (GIZ), and JICA, among others.

## I. IMPLEMENTATION ARRANGEMENTS

### A. Institutional and Implementation Arrangements

**66. MinAE will have the responsibility for the overall coordination of the project.** The project coordination and management will be structured around a PIU at the national level and two Regional Project Implementation Units (RPIUs) to be co-located in the two regional capitals of Ambatondrazaka (Alaotra-Mangoro) and Antsohihy (Sofia). The RPIU's will be housed within the DRAEs to optimize project ownership, coordination, and the implementation of activities.

**67. The Project Steering Committee will ensure strategic guidance and oversight during project implementation.** It will be chaired by MinAE (General Directorate or higher) and will include representatives of the ministries in charge of environment (MEDD), and finance (Ministry of Economy and Finance [MEF]); of farmers organizations (for example, WUAs and COBA, *Tranoben'ny Tantsaha*/farmers group) and private sector associations; and of representatives of the two targeted regions. At the regional level, two Regional Steering Committees (RSCs) will be established and will convene twice per year in the regional capital cities. Each RSC will be chaired by the region's Governor (or his/her representative) and will ensure consistency of project activities with regional development policies and planning and will monitor project progress. The committees will comprise representatives from the ministries in charge of trade and industry, transport and meteorology, water, environment, land and decentralization.



**68. The PIU will be based within MinAE.** The PIU will be composed of staff drawn from MinAE but could be strengthened by consultants depending on the capacity and availability of MinAE staff for each of the required positions. The national PIU will be composed of project coordinator, operations officer, procurement specialist, FM specialist, accountant, internal auditor, M&E Specialist, environment and social risk management specialist, and technical specialists (irrigation, environment, value chain development, road infrastructure, socio-organization, agri-finance, and in the GBV) and MEDD representatives. Two MEDD representatives will be tasked to ensure robust operationalization of the project's integrated landscape approach. The PIU will manage the project's day-to-day activities, project M&E, communications, and policy dialogue. It will be responsible for all procurement, disbursement, accounting, financial and technical reporting, and M&E of the project, including the environment and social aspects and ensuring the auditing of the project accounts. Each of the RPIUs will include a regional coordinator, procurement assistant, FM assistant, M&E Assistant, technical specialists (including irrigation infrastructure, environment, value chain development, socio-organization, agri-finance, land tenure, and GBV), environmental and social risk management specialist and others to be defined. The RPIUs will be responsible for the day-to-day implementation of activities at the regional level. Duties will include planning, quality oversight, procurement, disbursement, financial and technical reporting, and project M&E, including the environment and social risk management aspects. The RPIUs will report to the PIU at the national level and their respective RSCs.

**69. To ensure ownership and sustainability, several MinAE and MEDD departments will play a key role in the project implementation.** The General Directorate of Environmental Governance (GDEG) at the central level, in collaboration with the MEDD's Regional Directorates of Environment and Sustainable Development will be involved in the implementation and strategic supervision of Component 1. MinAE will develop a Memorandum of Understanding (MoU) with MEDD to clarify the responsibility of each entity in the project implementation. An environment specialist from MEDD will oversee the Component 1 activities within the national PIU. The Genie Rural Directorate (Direction du Génie Rural, DGR)<sup>82</sup> will supervise the implementation of Component 2. Component 3 will be supervised by the General Directorate of Agriculture (Direction Générale de l'Agriculture, DGA) and those General Directorate of livestock (Direction Générale de l'Elevage, DGE). At regional level, MINAE regional directorates, DRAE<sup>83</sup> will be coordinating project implementation.

**70. The proposed implementing arrangement is structured based on the lessons learned from the BVPI project and the ongoing GEF Sustainable Landscape Management Project (P154698 and AF/P176449).** MinAE has experience implementing World Bank-financed projects. However, to ensure efficiency MinAE staff will be supported by consultants. The underlying principles of this arrangement are (a) strengthening the existing capacity within MinAE to avoid the creation of ad hoc arrangements that could dissolve after project closure, (b) capitalizing on existing structures that meet the requirements of the World Bank to avoid unnecessary additional administrative burden, and (c) ensuring maximum ownership and involvement by stakeholders in project implementation.

**71. The DGA of MinAE and the GDEG of MEDD will oversee project interventions.** The PIU will be based within the DGA, will be staffed primarily by consultants, and will ensure constant interactions and close collaboration with the GDEG of MEDD. Decentralized units in the regions will be set up to prepare the project and be closer to the local population. The project will also build on existing initiatives, such as the FDA (*Fonds de Développement Agricole*), FOFIFA, Genie Rural and other stakeholders in the rice sector (for example, the Rice Observatory, PNC-Riz (*Plateforme Nationale de*

<sup>82</sup> Direction du Génie Rural, in charge of irrigation schemes development

<sup>83</sup> Direction Régionale de l'Agriculture et de l'Elevage: represents MinAE at region levels.



*Concertation Riz*), AfricaRice, International Fertilizer Development Centre, and the Africa Plant Nutrition Institute). It was agreed to strengthen existing partners and providers and to further support the capacity of local staff.

## B. Results Monitoring and Evaluation Arrangements

**72. The project will develop a system for monitoring, evaluating, disseminating, and communicating project achievements.** The project will have a robust M&E system to track and evaluate project progress toward the PDO, provide useful information for project management, and document and share project learnings. The system will build on MinAE's existing M&E and knowledge management systems and will be guided by a project knowledge management strategy and M&E manual—both to be developed at project start-up. The (Geo-Enabling initiative for Monitoring and Supervision) GEMS/KOBO toolbox will be used to supplement the project market information system. The latter will collect real-time and geotagged data, including data that can be used in carbon accounting and understanding changes in carbon sequestration in soils and on land.

**73. Monitoring and Evaluation (M&E) System.** The project will develop a manual of procedures for M&E and knowledge management covering M&E arrangements. The M&E system will generate regular, real-time data directly from project beneficiaries to allow for flexibility and mid-course correction. The PIU will have primary responsibility for M&E through a dedicated team, which will include (a) an M&E Specialist based in the national PIU, who will oversee overall M&E implementation; and (b) two regional-level M&E specialists to monitor project-related. The overall M&E system is guided by the project's results framework. It will use smart-phone technology and a web-based Management Information System (MIS) to support efficient data collection, aggregation and analysis to enhance transparency and allow for real-time monitoring of project progress, and to facilitate rapid corrective actions. All results will be disaggregated by gender (women and youth), as shown in the results framework. Internal monitoring will be carried out by the M&E specialist using the dashboard developed for this purpose. A survey will be conducted in the first year of the project to collect baseline data and verify the targets presented in the Results Framework. Periodic activity reports will be produced as required (each calendar semester). Joint supervision and monitoring missions, a midterm review, a final review, a completion report, and specific or thematic studies will be organized during the project implementation period.

**74. Geo-Information System (GIS) to support the MIS:** The project's MIS will provide data on key project inputs, outputs and progress. This will include the tracking of financial and physical progress in project implementation. The PIU will regularly review and analyze these data to report on progress, assess performance and identify issues for follow-up action. The M&E system will include a GIS system to map all expected infrastructure to be rehabilitated. This GIS system is expected to provide real-time data regarding the progress of the work and will assist the World Bank in remote supervision. The GIS system will also map out activities of other donors in the same communes to support coordination and collaboration. The PIU will hire a GIS specialist for the management of this portal. The GIS system will have a publicly accessible portal and dashboard that will provide information on overall project progress and the status of key results indicators, as well as detailed subproject, commune and province-level data.

**75. Evaluations and assessments.** A baseline study will be conducted at the start of the implementation and at project closing to evaluate qualitative and quantitative aspects of project results. Several studies will be undertaken in particular to enhance understanding of key aspects of the project, including: (a) economic analysis of selected completed subprojects, including an assessment of the impact on income from the investments made under the various sub-components; and (b) technical and maintenance reviews of the quality of infrastructure works and maintenance. A



sample of completed subprojects under 2.1 and 3.2 will be visited by teams of engineers including from Genie Rural to assess the quality of construction and ongoing functionality and identify maintenance issues; and (c) beneficiary perception surveys of the project via third-party monitoring will also be conducted on an annual basis to ensure satisfaction among beneficiary communities with the works. These beneficiary surveys will be disaggregated by women and youth (boys and girls) and conducted in a manner that is gender sensitive. The studies will ensure a gendered analysis, documenting good practices for ensuring women's involvement in the activities. Work will commence on these studies in year two so results are available for the Mid-Term Review to inform mid-course corrections as needed.

### C. Sustainability

**76. The sustainability of the project will be ensured through its strategic integrated, multi-sectoral, and spatial approach to development and its limited geo-graphic footprint that aims to harness synergies with ongoing investments by the World Bank and others.** One of the key lessons from past project experience and from other donors was that investments in the rehabilitation of downstream irrigation infrastructure would never be sustainable without considering upstream drivers of deforestation and erosion and farmers' incentives to maintain their investments in productivity-enhancing and resilience-strengthening innovations. The synergies brought about by simultaneous investments in agriculture and forestry and across the upstream watersheds will ensure that investments and improved techniques downstream will be less affected by sub-optimal land uses upstream, rendering them more sustainable. At the same time, investments, improved techniques and improved natural resources management upstream will be less affected by the pressure from communities moving further upland into the watershed because of increasingly unproductive lands downstream. The sustainability of the project can be divided into the following:

**77. Institutional sustainability.** As the implementing agency for the project, MinAE through its technical departments and agencies will support the project's implementation. This includes the the DRAEs, DSV, DPV, FOFIFA, and Genie Rurale. Through their direct involvement in the project's implementation, they will gain new skills in project management, oversight, and coordination that will support overall improved governance and sustainability. At the regional and commune levels, technical capacity for planning, budgeting and implementation, and collaboration across institutions will pave the way for improved institutional coordination for decentralized development. All three technical components will support and strengthen community-based associations (including WUAs, Federations), cooperatives and micro-enterprises in the project areas through access to agri-finance (vouchers, MGs) and technical assistance.

**78. Sustainability of infrastructure.** With regard to the myriad types of infrastructure to be rehabilitated by the project, sustainability will be assured through various forms of beneficiary commitments based on pre-conditions to be verified before the works will commence. For example, for small basic infrastructure or small works under subcomponent 2.2, as a pre-condition for approval of a grant, WUAs will be required to confirm that they have secured a budget and have developed an O&M plan for annual maintenance. For the rural feeder roads under subcomponent 3.3, an O&M plan will be required from the as part of the selection process of the dams to be rehabilitated.

**79. Economic sustainability.** All investments under sub-components 2.2, 3.2 and 3.3 will be screened for return on investment, and all investments supported by MGs under sub-component 3.2 will be screened for cash flow and economic viability; also, the economic sustainability of investments under sub-component 2.1 and 3.3 will be monitored regularly as part of the project results framework.



**80. Social sustainability.** The project's strong emphasis on inclusive planning processes, awareness campaigns and the various capacity building activities for social empowerment with a specific focus on women and youth are expected to build trust between different groups, support the integration of those who have been excluded or marginalized from decision-making, and build social resilience of people against future shocks (climate, health pandemics, economic).

#### IV. PROJECT APPRAISAL SUMMARY

##### A. Technical, Economic and Financial Analysis

**81. Given its integrated approach and broad scope of activities as diverse as rehabilitation of irrigation infrastructure, TA to WUAs, promotion of climate and nutrition-sensitive agriculture, the provision of input vouchers and MGs, and support to cooperative development, the project will require strong spatial coordination and careful sequencing.** The project will be anchored in the ministry in charge of Agriculture, which has experience with the World Bank through the implementation of agriculture investment projects. These include the Rural Development Support Project (P051922 and AF/P111984), Irrigation and Watershed Management Project (BVPI, P074086), Madagascar-Irrigation and Watershed Management Project – PHRD (P128831), Agriculture Growth and Rural Land Management Project (CASEF, P151469 and AF/P166133), and GEF Sustainable Land Management Program (PADAP, P154698 and AF/P157909). MinAE will be responsible for coordinating project implementation by working closely with local governments (that is, regions and districts) and other project stakeholders.

**82. The Theory of Change proposed by the project implies the generation of diverse direct and indirect benefits.** Key benefits expected from the project implementation include the following:

- **Increased benefits for farmers (with special attention to women and youth), households and communities in areas covered by the project.** The implementation of CSA/Ae technologies and practices at farm level (vouchers), in line with rehabilitation of irrigation infrastructure and watershed restoration, would contribute to increase yields and climate resilience. Moreover, the project support to investments in processing and commercialization activities (through MGs), seeks to increase rural households' income, improve livelihoods diversification, and ultimately enhance FNS.
- **Reduced costs. The project would reduce costs at various levels of implementation.** O&M costs of irrigated areas are expected to decrease in irrigated areas due to rehabilitation and improved governance. Along the value chain, the project would likely generate additional savings, such as reduced produce losses and transaction costs, owing to investments in productive infrastructure and facilitation of key services.
- **Enhanced access to services generates broader economic opportunities.** Benefits associated with better infrastructure and increased income include generation of employment in and outside the agriculture sector, along the value chains.
- **Institutional benefits** are expected to arise from the support to WUAs. The project will provide TA and capacity-building support to strengthen communities' ability to operate and maintain their rehabilitated irrigation systems and other new and rehabilitated infrastructure and facilities. Furthermore, the project support to community-led watershed management would further enhance local capacities to take informed decisions towards a more resilient and sustainable development pathway.



**83. The ex ante economic and financial analysis (EFA) confirms that the project is economically and financially viable.** Initial estimates confirmed that the Theory of Change proposed by the project would bring a positive impact from the perspective of the society. The analysis is a cost-benefit assessment of cash flows over a 20-year period, including all incremental costs and benefits generated by the project implementation.

**84. The economic internal rate of return (EIRR) for the base case scenario is 13 percent and the net present value (NPV) is US\$166.67 million, using a 6 percent economic discount rate.** The baseline scenario corresponds to the incremental analysis of net benefits, derived from the financial streams of investment models promoted by the project, valued at economic prices. The investment models were developed (based on current investment operations in the focal areas) to capture the vast majority of costs and benefits linked to the project's theory of change. The results of the assessment indicate that the project is not only financially viable—looking at financial indicators per investment model—but also economically feasible with a positive economic net present value (ENPV) and EIRR superior to the economic discount rate.

**85. The EIRR for the project is higher when considering climate co-benefits.** The project contributes to the provision of climate resilience benefits and co-benefits, some of which are already integrated into the financial analysis of the project (such as increased yields, economic diversification, and reduced losses). The climate co-benefits included in the economic analysis correspond to the economic valuation of GHG emission reduction. The project would generate global economic benefits by a net reduction of GHG emissions in the amount of approximately 3.93 million of tCO<sub>2</sub>e in a 20-year period of analysis. Following the World Bank guidelines on economic assessment of climate change mitigation co-benefits, the economic analysis includes a Low Carbon Price Scenario (LCP) and a High Carbon Price Scenario (HCP). Under the LCP, the EIRR for the entire project is 25 percent and the ENPV is approximately US\$300.33 million. Under the HCP, the EIRR is 34 percent and the ENPV is approximately US\$434.04 million.

**86. Sensitivity analysis.** The robustness of these indicators was tested with a sensitivity analysis based on switching values for costs and benefits. The switching values for cost increments are 21 percent, 16 percent and 10 percent under the HCP, LCP, and baseline scenarios, respectively. The switching values for reductions in benefits are 26 percent, 18 percent and 11 percent under the HCP, LCP, and baseline scenarios, respectively. These indicators confirm that the project represents an economically worthwhile investment from the perspective of society. Table 2 summarizes the economic performance of the project under the three scenarios.

**Table 2. Summary of economic indicators (US\$)**

<b>Economic Performance Indicators (20-Year Period of Analysis)</b>	<b>Baseline Scenario</b>	<b>LCP</b>	<b>HCP</b>
ENPV (USD, discount rate 6%)	166,671,010	300,331,440	434,039,664
EIRR (%)	17	25	34
Switching value for benefits (%)	-11	-9	-28
Switching value for costs (%)	10	16	22

## **B. Fiduciary**

### **(i) Financial Management**

**87. Overall, the FM arrangements that are to be applied in managing the project were assessed as adequate (will**





meet the World Bank's minimum requirements under the World Bank Policy and Directive) and the FM residual risk was assessed as **Substantial**. The FM assessment was conducted<sup>84</sup> to evaluate whether the project meets the minimum FM requirements according to the World Bank Policy and Directives. The assessment was conducted at MINAE where the PIU is being established during the preparation. The PIU will apply some of the FM systems applied by World Bank-funded projects implemented by MinAE. The substantial risk was mainly attributed to the public financial management (PFM) weaknesses particularly in the budgeting and disbursement mechanism, the decentralization of the project and the limited experience of the PIU.

**88. In addition, the following project FM arrangements are proposed.** The PIU will rely on FM staff recruited based on Terms of Reference (TOR) agreed with the World Bank and will use adequate accounting software to record the project's financial transactions. For the project and in accordance with the applicable regulation,<sup>85</sup> the PIU will use the Designated Account (DA) denominated in US dollars at the Central Bank of Madagascar opened for the PPA to receive the funds of the follow-on project from the World Bank. The IDA funds will be disbursed on transactions basis using the following methods: reimbursement, advances, direct payments, and special commitments. The PIU will prepare quarterly unaudited interim financial reports (IFRs) and provide such reports to the World Bank within 45 days of the end of each calendar quarter. The project financial statements will be audited annually by a private auditor recruited with an agreed TOR. The project audit report will be submitted to the World Bank no later than six months after the end of each fiscal year.

## **(ii) Procurement**

**89. The project procurement risk is Substantial.** The PIU does not have experience with the World Bank's New Procurement Framework. The project will address any procurement capacity gaps by training the PIU's procurement officers, who have already been involved in the implementation of similar projects and have demonstrated considerable understanding of World Bank procurement procedures. The World Bank will continue to provide coaching and continuous hands-on support to the PIU.

**90. Procurement under the project will be guided by** the World Bank Procurement Regulations for IPF Borrowers, fourth edition, dated November 2020; "Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants," dated October 15, 2006 and revised in January, 2011 and as of July 1, 2016; and other provisions stipulated in the Financing Agreements, using the Standard Procurement Documents (SPDs) accompanying the Procurement Regulations. Originally prepared to support the set-up of the PPA, the project's procurement manual will be updated on an ongoing basis as needed based on and in accordance with these documents.

**91. All works, goods, and non-consulting services will be procured in accordance with the requirements set forth or referred to in Section VI, Approved Selection Methods: Goods, Works, and Non-Consulting Services of the Procurement Regulations.** All consulting services will be procured in accordance with the requirements set forth or referred to in Section VII, Approved Selection Methods: Consulting Services of the Procurement Regulations, as well as according to the Project Procurement Strategy for Development (PPSD) and the Procurement Plan approved by the World

<sup>84</sup> The assessment was carried out in accordance with the Directives and Policy for IPFs issued on September 30, 2018 and the World Bank Guidance on FM in World Bank IPF Operations issued on February 28, 2017.

<sup>85</sup> Decree No. 2015-1457, amended by Decree No. 2016-1160, defining the modalities of opening, management and regularization of transactions on the Project accounts opened at the World Bank.



Bank. With the World Bank guidance and support, the PPSP was developed during project preparation. A summary of the PPSP is provided in Annex 1.

**92. The PPSP and the project-level Procurement Plan covering the first 12-18 months of project implementation were submitted and approved by the World Bank on January 31, 2023.** The Procurement Plan specifies for each contract (a) a brief description of the activities/contract, (b) the selection methods and the market approach options to be applied, (c) the estimated cost, (d) time schedules, (e) the World Bank's review requirements, and (f) any other relevant procurement information. Any updates of the Procurement Plan shall be submitted for the World Bank's approval with the corresponding update in the PPSP. The project will be using the World Bank's online procurement planning and tracking tool, Systematic Tracking of Exchanges in Procurement, to prepare, clear, and update its Procurement Plan and to carry out all procurement transactions.

### C. Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

### D. Environment and Social

**93. Environmental risks and impacts.** The project will bring significant benefits to the communities in the target regions through the provision of enhanced services, TA and sectoral coordination, and improvements to agriculture infrastructure, the rehabilitation/construction of feeder roads, access to MGs, improved market connectivity, and other investments to unlock agribusiness potential. Although the impacts of the project are likely to be positive, these activities carry several risks that are mainly generated by the activities under Components 1, 2 and 3. The rehabilitation of existing dams (such as the Sahamaloto dam), reservoirs, and irrigation infrastructure, rural feeder roads and small bridges, and the upgrading of market and postharvest infrastructures, which cover mostly small to medium scale civil works, will more than likely generate adverse site-specific risks and impacts to the occupational health and safety of workers during construction and operational phases; increased levels of dust and noise and community health and safety risks from, in particular, the risk of pollution to surface water and groundwater sources during dredging of channels; and the generation of solid and liquid waste. In addition, Component 3, through the promotion of farmers' increased use of fertilizers, could cause adverse health effects linked to improper use, storage and disposal, and contribute to the degradation of surface water and groundwater quality. However, based on an initial review of project activities, the potential adverse risks and impacts on human populations and/or the environment are not likely to be significant and will be site specific.

**94. Social risks and impacts.** It is expected that project activities will have positive social impacts by financing rural infrastructure investments, irrigation infrastructure, community markets, and feeder roads. However, the proposed project activities to be financed through Components 2 and 3 on improving agriculture infrastructure, and rehabilitation/construction of feeder roads may include medium-scale civil works. These activities are likely to induce some social risks and impacts that are however mostly temporary, predictable and/or reversible. Labor influx and associated risk and impacts can be a point of concern, especially on community health (including the risk of



transmission of diseases such as sexually transmitted diseases, as well as the transmission and propagation of COVID-19) and sexual exploitation and abuse (SEA)/sexual harassment (SH). No irreversible social risks related to land access or cultural heritage are anticipated. No physical displacement is expected for the project; however, there will be a risk of land acquisition and temporary displacement during the works. The MG program risk might be the inadequacy of criteria of eligibility which could lead to the exclusion of eligible persons or constrained access among marginalized groups such as women and youth. The project will establish an effective and efficient Grievance Redress Mechanism (GRM). The GRM will be central to risk mitigation efforts and will help manage grievances from communities or by parties who feel that are or will be adversely affected by the project. The project-level GRM will serve as an avenue for communities to channel their concerns. The client will be supported to establish an accessible, effective, and efficient GRM with the capacity to receive and respond to grievances in local languages and on time. The GBV/SEA-SH risk is assessed as substantial. In line with the recommendation of the GBV/SEA-SH Good Practice Note, specific GBV/SEA-SH measures will be applied during project implementation. Measures to be taken will include, but are not limited to, (a) development and implementation of a GBV/SEA-SH action plan; (b) a requirement that the project includes clauses on workers' conditions and management, child protection, and GBV/SEA-SH prevention in all contracts (code of conduct); and (c) the reinforcement of the grievance redress mechanism (GRM) to ensure that any incident related to GBV/SEA-SH will be addressed in an effective manner with sufficient social sensitivity.

**95. Mitigation and risk management.** To limit these risks, the project has developed (a) an Environmental and Social Commitment Plan; (b) an Environmental and Social Management Framework; (c) an Integrated Pesticide Management Plan; (d) a Resettlement Policy Framework (RPF); (e) a Stakeholder Engagement Plan (SEP); (f) a Labor Management Procedures (LMP); (g) GRM as part of SEP and the LMP; and (h) a model of Environmental and Social Management System for financial intermediaries. These environmental and social instruments were validated and published in-country and on the World Bank's external website on February 14, 2023. The project will also support the following activities as part of a dam safety action plan in compliance with World Bank's standards: (a) establishing a Dam Safety Panel (PoE) to review and advise the client on studies, from terms of reference elaboration to final design review, and works to be carried out; (b) elaborating the dam safety plans, including instrumentation, operation and maintenance (O&M), emergency preparedness, construction supervision and quality assurance; and (c) providing capacity building and training in the area of dam safety for the dam operator and other stakeholders.

**96. Risk management monitoring.** The M&E systems of the project will include monitoring of Environmental and Social Standard (ESS) impacts and measures. The PIU as the implementing agency (IA) for the project, with the guidance of its environmental and social risk management specialists and with support of the World Bank, will be responsible for the preparation of the relevant environmental and social assessment documents (ESIA, ESMPs, RAPs), or other appropriate risk management tools. Monitoring checklists will be prepared based on mitigation plans.

**97. Social inclusion, gender equality and citizen engagement (CE).** The project will emphasize approaches that maximize outreach and participation of communities and broader public awareness of project activities. In addition to the two indicators monitoring CE progress (that is, *grievances registered related to delivery of project benefits satisfactorily redressed reaching 100 percent in year 4* and *number of participatory monitoring actions processed to the satisfaction of project beneficiaries*), the project will also develop specific activities to solicit beneficiaries' feedback and maximize stakeholder engagement. To this end, specific activities will be outlined in the SEP. Infrastructure improvements and vouchers and grants supporting agriculture production support and livelihood and income



diversification opportunities will be identified through demand-driven processes. Participatory assessment and planning approaches will ensure that all groups, including those that are historically marginalized such as women and youth, are engaged in planning and decision-making processes. In accordance with the Environmental and Social Standard (ES10) and the guidelines for citizen involvement in projects throughout the preparation and implementation processes, the project will further promote citizen participation and the establishment of a process for processing community feedback. These aspects will be included in the Stakeholder Mobilization Plan, which will also include the establishment and operationalization of a project GRM. Local authorities will present final plans and advise on the selection of grant proposals that will be financed under the project to close the feedback loop.

**98. Gender.** A gender assessment undertaken during the preparation of the proposed operation revealed gender gaps in women's: i) participation in the rice value chain including their low access to agricultural inputs/technologies, lower yields and profits as well as lower access to financing; ii) limited access to land ownership due to customary rights and patriarchal system and limited information regarding their rights and processes; and, iii) heavier household burden and norms that limit their ability to participate in productive activities outside of the home, thus, limiting their participation in local and community organizations (WUAs, producer groups, cooperatives, etc.) and their access and control of resources. The project will address this gender gap by: i) identifying women's producer groups and cooperatives and assessing their specific needs (Component 1); ii) integrating gender considerations such as women's role in family nutrition, time use and limited access to tools and adapted practices in all training provided to producers and cooperatives, seed dissemination and provision of tools and adapted practices (Component 1); iii) training and capacity building of agro-input dealers engaged to provide extension support to smallholder farmers and cooperatives on gender and working with women smallholder farmers (Component 2); iv) encouraging groups that are eligible for MGs to have women members and providing needed capacity support to women-led farmer groups to increase their probability of obtaining MGs (Component 3); and, v) supporting the delivery of a community mobilization and behavior change program, such as the Gender Action Learning System (GALS) to increase uptake and utilization of vouchers by women farmers and promote more equitable sharing of household responsibilities (Component 3). The project's Results Framework includes indicators that measure changes in productivity (rice yields) of women farmers, their adoption of resilience-enhancing technologies and practices, and their access to vouchers and MGs. The Results Framework also includes indicators to measure the number of women receiving land certificates and holding leadership/decision making positions in WUAs or producer groups.

**99. Climate change as a cross-cutting priority.** The project has a very explicit design to facilitate climate adaptation and strengthen climate resilience, acknowledging that climate change will continue to exacerbate the country's development challenges. Studies show that investing in climate change adaptation can save more than it costs, factoring in the costs of climate-induced crises, disaster relief, and recovery. Across Sub-Saharan Africa as a whole, spending of US\$15 billion on agricultural and food system adaptation could save an estimated US\$201 billion annually. Extreme weather and climate change will continue to jeopardize economic growth and development in Madagascar, with anticipation of more intense and frequent climate-driven disasters in coming decades. Climate change risks will be mitigated through the project by: (a) ensuring infrastructure is constructed in an energy-efficient manner; (b) providing access to water using climate-friendly technology; (c) considering landslide risks in the location of infrastructure; (d) supporting CSA practices; (e) promoting diversification of livelihood options that reduce dependence on natural resources; (f) carrying out reforestation activities to meet household needs for wood for energy and construction; and (g) mobilizing forest restoration activities to restore ecological functions of watersheds such as



groundwater recharge. The projects will contribute to mitigation through avoided emissions due to improved nutrient and soil management, improved irrigation water management, and ensuring climate smartness of commodity value chain interventions (for example, promoting climate resilient and energy efficient infrastructure and technology). The Ex-Ante Carbon-balance Tool (EX-ACT) and EX-ACT Value Chain tools will be used to carry out a detailed GHG assessment over the lifetime of the project. The estimated GHG emission/sequestration will be priced using a low and high shadow price of carbon and incorporated into the economic analysis, to account for the environmental externalities using the World Bank guidance document (2017).

**100. GHG accounting.** The World Bank uses EX-ACT to estimate the impact of agricultural investment lending on GHG emissions and carbon sequestration. EX-ACT is a land-based appraisal system for assessing a project's net carbon balance—the net balance of tons of CO<sub>2</sub> equivalent (tCO<sub>2</sub>eq) of GHGs that were emitted, or carbon sequestered as a result of project interventions—compared to a “without project” scenario.

## V. GRIEVANCE REDRESS SERVICES

**101. Grievance Redress.** Communities and individuals who believe that they are adversely affected by a project supported by the World Bank may submit complaints to existing project-level grievance mechanisms or the World Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed to address project-related concerns. Project affected communities and individuals may submit their complaint to the Bank's independent Accountability Mechanism (AM). The AM houses the Inspection Panel, which determines whether harm occurred, or could occur, as a result of Bank non-compliance with its policies and procedures, and the Dispute Resolution Service, which provides communities and borrowers with the opportunity to address complaints through dispute resolution. Complaints may be submitted to the AM at any time after concerns have been brought directly to the attention of Bank Management and after Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's Grievance Redress Service (GRS), please visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the Bank's Accountability Mechanism, please visit <https://accountability.worldbank.org>.

## VI. KEY RISKS

**102. Overall project risk rating is *Substantial* after mitigation measures.** The overall project implementation risk is rated as *substantial* given Madagascar's volatile political and economic situation, substantial procurement-related risks, the disruptive nature of reforms at national and local levels, the risk of political interference and elite capture, the technical challenges faced by the project due to weak fiduciary and human resources capacity, the elevated levels of insecurity and fragility, and the current uncertainty on economic recovery. Potential risks are identified, and their ratings are listed in the following paragraphs, along with proposed measures to mitigate their impacts during project implementation. The experiences gained, challenges encountered, and lessons learned during the preparation and subsequent implementation of other projects have been instrumental in identifying these risks and mitigation measures.

**103. Political and Governance risk rating is *Substantial*.** Between 2009 and 2014, Madagascar experienced the last of



several political crises that severely weakened its institutions and governance. With the democratic transition of power in 2019, Madagascar has further reinforced a stabilized political environment conducive to continued development efforts, though the country still suffers from poor governance. It is nonetheless expected that potential volatility following the COVID-19 crisis and potential changes in government counterparts at both political and technical levels may induce some delays in implementation. The project's use of participatory planning and performance-based contracts will help to mitigate these risks.

**104. Technical Design of the project risk is rated as *Substantial*.** The technical design is complex given the multiple financing activities which include the distribution of vouchers and MGs, grants to WUAs and federations to support maintenance works, rehabilitation of irrigation and rural road infrastructure, and other related mobilization, capacity building, and sensitization activities. These risks will be mitigated through: (a) the project's provision of needed technical assistance to key implementing agencies such as FDA; (b) decentralized and dedicated technical oversight of project interventions by the RPIUs; and (c) a project design that builds upon and scales up more than a decade of experience derived from the implementation of similar projects while introducing more recent innovations based on learnings from ongoing multi-sector World Bank-financed projects in Madagascar and similar operations in other countries.

**105. Institutional Capacity for Implementation and Sustainability ratings rating is *Substantial*.** Having one PIU at the national level and two RPIUs at regional level, each supported by inter-ministerial steering committees, will help address the complexity of the design through streamlining the activities of the project and ensuring implementation capacity at the regional level. Successful project implementation will require close and continuous coordination between MinAE, MEDD, and MEAH, which has been facilitated the preparation of the project. However, this could be high risk for the project if this coordination weakens. Several risk mitigation measures will be put in place: (a) a decree establishing the inter-ministerial committees and the project coordinating units; (b) key PIU staff have been recruited including a project coordinator, a procurement specialist, an FM specialist, an environmental specialist and a social specialist; and (c) missions, technical discussions, appraisal, and the work plan for the first 18 months of the Project have been conducted jointly with participating ministries. Even with all these mitigation measures, the potentiality of limited commitment or ownership of the institutional arrangements could delay the project activities. Residual risks will be mitigated by reinforcing technical and fiduciary capacity of the PIU, strengthening implementation capacity at the regional level, and enabling effective coordination across line ministries. Therefore, the residual risk rating is maintained as Substantial, to be revisited at every Implementation Status and Results Report stage to assess the rating and success of the mitigation measures.

**106. Fiduciary risk is *Substantial*.** The substantial risk is mainly attributed to the weaknesses particularly in public financial management budgeting and disbursement mechanisms, the decentralization of the project, and the limited experience of the PIU. These risk will be mitigated by (a) the PIU's recruitment of a regional financial assistant to support each RPIU; (b) adoption of the project implementation manual (PIM) including the FM procedures manual no later than one month after effectiveness; (c) development of financial management procedures for the management of the various subsidies and cash transfers under the project; (d) recruitment of an accounting firm to support grant recipients in management, accounting and financial reporting; (e) acquisition of adequate accounting software for MinAE; and (f) recruitment of an internal auditor within three months after the effectiveness date to oversee the adequacy of the internal control system of the project. The procurement risk is also rated substantial because of the limited experience of the new PIU with World Bank-financed projects and several mitigations measures have been put in place including:



the PIU hiring an experienced procurement officer); capacity building and training workshops for fiduciary staff at MinAE and MEDD and continuous coaching and hands on support from the World Bank.

**107. The environmental and social risk classification is *Substantial*.** While the project is expected to have positive social impacts, the substantial rating is related to high prevalence of GBV in project areas and considerable potential for environmental impacts related to the civic works. The project is adopting several mitigation measures to address social risks including the development of a GBV action plan, hiring a GBV specialist within the PIU in addition to an environment and social specialist. The rehabilitation and expansion of existing irrigation infrastructure, rehabilitation of feeder roads and small bridges, and rehabilitation and upgrading of market and post-harvest infrastructures, which all include small-to medium-scale civil works, will likely generate (a) adverse site-specific risks and impacts to the occupational health and safety of workers during construction and operational phases; (b) increased levels of dust and noise and community health and safety risks from, particularly the risk of pollution to surface and groundwater sources during dredging of channels; and (c) solid and liquid waste. In addition, under sub-component 3.1, the promotion of farmers' increased use of fertilizers could cause adverse health effects linked to improper use, storage, and disposal and contribute to the degradation of surface and groundwater quality. However, the potential adverse risks and impacts on human populations and/or the environment are not likely to be significant and will be site specific.

**108. Stakeholder risk is *Substantial*.** These risks include (a) insufficient community and other stakeholder engagement (including the potential exclusion of vulnerable individuals or groups such as women and youth); (b) elite capture of project benefits; (c) the exclusion of vulnerable groups or individuals from project benefits due to poorly designed, disseminated, or nontransparent beneficiary selection processes or eligibility criteria. These risks will be mitigated via robust implementation of the SEP and close supervision of GRM processes.

## **The project M&E developments**

### **Developing a manual of procedures for M&E and knowledge management**



## VII. RESULTS FRAMEWORK AND MONITORING

### Results Framework

COUNTRY: Madagascar

Rural Livelihoods Productivity and Resilience Project

#### Project Development Objectives(s)

To increase productivity and strengthen resilience of rural livelihoods in Targeted Areas in Madagascar.

#### Project Development Objective Indicators

Indicator Name	PBC	Baseline	End Target
<b>Increased productivity and resilience</b>			
Increased rice production in the project intervention areas (Percentage)		0.00	30.00
Farmers adopting climate-smart/agroecology technologies, innovations, and practices (Number)		0.00	35,000.00
of which, women farmers (Percentage)		0.00	40.00
<b>Improved market access</b>			
Increased volume of marketed surplus of target crops in project-supported areas (Percentage)		0.00	25.00
<b>Improved landscape management</b>			
Land area under sustainable landscape management practices (CRI, Hectare(Ha))		0.00	61,000.00
<b>Direct project beneficiaries</b>			





Indicator Name	PBC	Baseline	End Target
Direct project beneficiaries (number of households) (Number)		0.00	150,000.00
of which female-headed (%) (Percentage)		0.00	25.00

### Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline	End Target
<b>Promoting community-led restoration and management of watersheds in target areas</b>			
Number of local Land Use Planning schemes developed and implemented (Number)		0.00	30.00
Area of watershed protected (including reforestation, agroforestry, agroecology, stabilized Lavaka) (Hectare(Ha))		0.00	30,000.00
Number of land certificates issued with support from project activities in the target areas (number) (Number)		0.00	7,000.00
of which, issued to women (%) (Percentage)		0.00	25.00
<b>Sustainable intensification and management of irrigation infrastructure and services</b>			
Area provided with new/improved irrigation or drainage services (CRI, Hectare(Ha))		0.00	31,000.00
Recovery rate of the irrigation systems managed by Water User Associations (Percentage)		0.00	80.00
Percentage of women members of WUA or producer groups holding leadership/decision making positions (Percentage)		0.00	30.00
Annual budget for maintenance of strategic works by the Government in the Target Areas (US\$/year) (Amount(USD))		0.00	250,000.00
<b>Strengthening livelihood resilience and value chains</b>			
Number of producer associations or groups structured or		0.00	500.00



Indicator Name	PBC	Baseline	End Target
revitalized by the Project (Number)			
Number of farmer beneficiaries of vouchers (Number)		0.00	165,000.00
of which female (%) (Percentage)		0.00	40.00
Number of beneficiaries of matching grants (Number)		0.00	10,000.00
of which female (%) (Percentage)		0.00	30.00
Irrigated area via-micro irrigation systems delivered via the project (ha) (Hectare(Ha))		0.00	1,000.00
of which adopted by female (Percentage)		0.00	40.00
Marketing infrastructure constructed or rehabilitated (Number)		0.00	20.00
Feeder roads rehabilitated by the project (Kilometers)		0.00	150.00
Increase in Household Dietary Diversity Score (HDDS) (Percentage)		0.00	20.00
<b>Project Management and Monitoring and Evaluation</b>			
Grievances registered related to delivery of project benefits satisfactorily redressed reaching 100 percent in year 4 (Percentage)		0.00	100.00
Number of participatory monitoring actions processed to the satisfaction of project beneficiaries (Number)		0.00	10.00



**Monitoring & Evaluation Plan: PDO Indicators**

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Increased rice production in the project intervention areas	This is the percentage increase in average yield of irrigated rice cultivation at beneficiary households level in each targeted region, Alaotra Mangoro and Sofia. Yield is the ratio between production and area.	Baseline, Mid-term and at the end of the project.	DRAE of each regions	Household survey	PIU/consultants
Farmers adopting climate-smart/agroecology technologies, innovations, and practices	Adoption refers to a change in practice or a change in the use of a technology promoted or introduced by the project. This indicator shows the cumulative number of farmers adopting climate-smart agriculture (CSA) technologies and practices.	Quarterly	Follow-up sheet on technologies and practices adopted by farmers supported by the project.	Counting	PIU
of which, women farmers					
Increased volume of marketed surplus of target crops in project-supported areas	Percentage increase in the marketed surplus of rice and other dominant crops production in the regions supported by the project.	Baseline, Mid-term and at the end of the project.	Household survey in the regions of interventions .	Household survey.	PIU/Consultants
Land area under sustainable landscape management practices	The indicator measures, in hectares, the land area for	Quarterly	Sustainable Management	Counting	PIU



	which new and/or improved sustainable landscape management practices have been introduced. Land is the terrestrial biologically productive system comprising soil, vegetation, and the associated ecological and hydrological processes; Adoption refers to change of practice or change in the use of a technology promoted or introduced by the project; Sustainable landscape management (SLM) practices refers to a combination of at least two technologies and approaches to increase land quality and restore degraded lands for example, agronomic, vegetative, structural, and management measures that, applied as a combination, increase the connectivity between protected areas, forest land, rangeland, and agriculture land.		Practices Monitoring Tool		
Direct project beneficiaries (number of households)	This indicator measures the cumulative number of rural	Quarterly	Beneficiary tracking tool	Counting	PIU



	<p>producer households in the targeted regions that benefit from project support.</p> <p>NB: The following are considered indirect beneficiaries:</p> <ul style="list-style-type: none"> <li>- Users of rehabilitated feeder roads (transporters, students, producers from surrounding municipalities, etc.);</li> <li>- Institutions, economic operators and other organizations involved in the project.</li> </ul>				
of which female-headed (%)					

#### Monitoring & Evaluation Plan: Intermediate Results Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Number of local Land Use Planning schemes developed and implemented	This indicator counts the cumulative number of validated local Land Use Planning schemes that will define the measures to be taken for the restoration of forests and landscapes in	Quarterly	Validated local Land Use Planning schemes.	Counting the number of validated local Land Use Planning schemes.	PIU



	degradation and the promotion of biodiversity.				
Area of watershed protected (including reforestation, agroforestry, agroecology, stabilized Lavaka)	The indicator measures the cumulative area of protected watersheds through reforestation, agroforestry, agroecology, lavaka stabilization and other means for sustainable land management (SLM).	Quarterly	Monitoring tool for the implementation of the watershed management plan.	Counting the areas of protected watersheds recorded in the monitoring tool.	PIU
Number of land certificates issued with support from project activities in the target areas (number)	Land certificates will be awarded to community members who are actively involved in reforestation and watershed restoration activities. This indicator counts the number of land certificates distributed as part of the project in its areas of intervention. The development of bushfire fighting techniques is one of the measures that accompany land certificates.	Quarterly	Land Certificate Distribution Tracking Tool.	Counting the number of land certificates distributed as part of the project.	PIU
of which, issued to women (%)					
Area provided with new/improved irrigation or drainage services	This indicator measures the total area of land provided with irrigation and drainage services under the project, including in (i) the area provided with new irrigation	Quarterly	Monitoring tool for the rehabilitation of irrigated perimeters, Reports from	Counting/estimation of the areas concerned	PIU



	and drainage services, and (ii) the area provided with improved irrigation and drainage services, expressed in hectare (ha).		the contractors implementing the works, and the firms contracted to control work progress.		
Recovery rate of the irrigation systems managed by Water User Associations	This is the average fee recovery rate of restructured/revitalized WUAs of rehabilitated perimeters supported by the project in each targeted region. The WUA Bureau will be responsible for collecting fees from its members. These fees fall within the framework of MAPER, which is a form of contribution by beneficiary users to the maintenance works.	Quarterly	Registry of fee payments within the restructured WUAs of the rehabilitated perimeters.	Counting the members of each WUA who made the fee payment and calculation of the rate with the collected data.	PIU
Percentage of women members of WUA or producer groups holding leadership/decision making positions	This indicator measures the average participation rate of women in decision-making in the WUAs supported by the project in each targeted region.	Quarterly	List of bureau members of the restructured WUAs within the rehabilitated	Counting the number of women holding leadership/decision making positions in the list of bureau members of each WUA and calculating the	PIU





			perimeters.	percentage.	
Annual budget for maintenance of strategic works by the Government in the Target Areas (US\$/year)	Budget for maintenance of strategic works by the Government with a yearly degressive project contribution.	Annual	DRAE	Consultation of supporting documents and calculation of the amount disbursed each year at the regional level.	PIU
Number of producer associations or groups structured or revitalized by the Project	This indicator counts the cumulative number of farmers' organizations (new farmers' organizations set up by the project) or revitalized (already existing farmers' organizations, restructured by the project)	Quarterly	Progress report from regional PIU, the PIU technical team and implementing partners.	Counting the number of concerned associations from the reports.	PIU
Number of farmer beneficiaries of vouchers	This indicator counts the cumulative number of producers benefiting from vouchers distributed by the project. The project plans to subsidize at least two production cycles. A beneficiary could benefit from two successive subsidies (two cycles) but will be counted as a single beneficiary (duplicate to be avoided).	Quarterly	Voucher tracking sheet, activity report of the voucher mechanism implementation agency.	Counting the number of producers benefiting from vouchers.	PIU



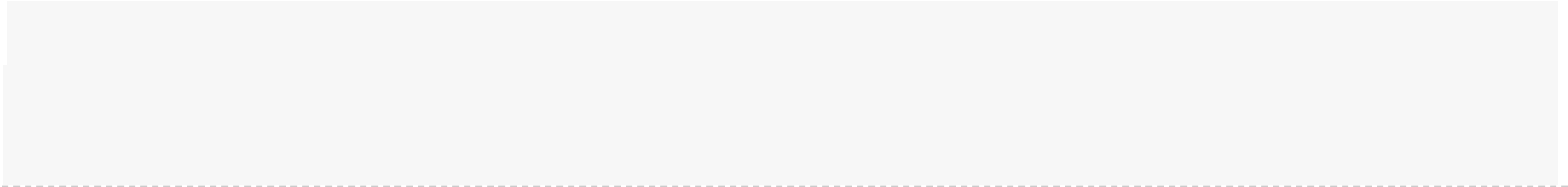
of which female (%)					
Number of beneficiaries of matching grants	This indicator counts the cumulative number of producers benefiting from Matching Grant financed by the project. Beneficiaries can include voucher recipients and other producers (individual or group) who do not need vouchers but specific materials. A beneficiary can be the recipient of both voucher and matching grant and will be counted as a single beneficiary (duplicates to be avoid).	Quarterly	Matching grants monitoring sheet, progress report from the matching grants mechanisms implementation agency.	Counting the number of producers benefiting from matching grants.	PIU
of which female (%)					
Irrigated area via-micro irrigation systems delivered via the project (ha)	This indicator shows the cumulative area of plots irrigated by the different types of micro-irrigation (FLID system) under the project.	Quarterly	Micro irrigation monitoring sheet	Counting the total areas benefiting from micro-irrigation.	PIU
of which adopted by female					
Marketing infrastructure constructed or rehabilitated	This is the cumulative number of market infrastructures built or rehabilitated as part of the project and where work	Quarterly	Acceptance report of the infrastructures built or rehabilitated,	Counting the number of infrastructures built or rehabilitated.	PIU



	have been finalized.		Report from the companies in charge of the construction or rehabilitation , Report from the firms in charge of control and surveillance of work progress.		
Feeder roads rehabilitated by the project	This is the total length of the roads built or rehabilitated by the project. It includes maintenance and access roads.	Quarterly	Acceptance report of the feeder roads built or rehabilitated, Report from the companies in charge of the construction or rehabilitation , Report from the firms in charge of	Counting the number of roads built or rehabilitated.	PIU



			control and surveillance of work progress.		
Increase in Household Dietary Diversity Score (HDDS)	This indicator measures the average rate of increase in the level of household consumption of food groups over the past 24 hours (household dietary diversity score).	Quarterly	Household survey report.	Household survey, and HDDS calculation.	PIU
Grievances registered related to delivery of project benefits satisfactorily redressed reaching 100 percent in year 4	This indicator measures the degree of satisfactory resolution of complaints registered during the implementation of the project. All registered complaints should be resolved with satisfaction by year 4 at the latest.	Quarterly	Monitoring and Evaluation Report on the resolution of registered complaints.	Counting the number of complaints registered along with the number of registered complaints corrected with satisfaction.	PIU
Number of participatory monitoring actions processed to the satisfaction of project beneficiaries	This is the number of follow-ups of project activities involving beneficiaries and other stakeholders. Participatory monitoring includes monitoring of activities during field visits and steering committee meetings at regional and national level.	Quarterly	M&E report on participatory monitoring of project activities.	Counting the number of participatory follow-ups.	PIU





## Annex 1: Implementation Arrangements and Support Plan

### Detailed FM and Disbursement Arrangements for the Project

1. FM assessment was conducted to evaluate whether the Project implementing entities responsible for FM aspects meets the minimum FM requirements as per World Bank Policy and Directive. The FM assessment was carried out in accordance with the Directives and Policy for IPFs issued on September 30, 2018, and the World Bank Guidance on FM in World Bank IPF Operations issued on February 28, 2017. The assessment was conducted at MinAE. Among several donors-funded projects that the MinAE is overseeing by serving in the steering committee, there are the following ongoing Bank-financed projects: PADAP (P154698 and P157909)<sup>86</sup> and CASEF (P151469 and P166133),<sup>87</sup> and FSRP (P178566).<sup>88</sup> The implementation of PADAP and CASEF is done by different stand-alone implementing agencies which are not involved in the preparation of the new project. MinAE has established a new PIU for this proposed project during the preparation phase.

**Table 1.1: Risk and mitigation measures**

Risk	Risk Rating	Risk Mitigating Measures Incorporated into Project Design	Residual Risk
<b>Inherent risk</b>	S		S
<i>Country level:</i> MAE's system mirrors the Central level PFM system and its weaknesses resulting in the risk of lack of transparency and accountability in the use of public funds.	S	The country's PFM systems are assessed as weak. The GoM is committed to implement further reforms of the country's PFM systems (with support from the development partners).	S
<i>Entity level:</i> FM requirements not met, weak FM capacity	S	The PIU has recruited FM staff (one finance officer and one accountant) based on TOR agreed with the Bank, to perform FM tasks. The staff of the regional units will be recruited no later than 3 months following effectiveness.  The Bank will provide the staff with adequate training on FM and disbursement procedures.  The staff's performance will be assessed annually by the PIU's coordination.	M
<i>Project level:</i> The resources of the Project may have been distracted due to weak control environment.	S	The PIU will comply with the internal control processes as set out in the PIM once adopted.	S
<b>Control Risk</b>			
<i>Budgeting:</i> Weak budgetary execution and control leading to budgetary overruns or inappropriate use of project funds.	S	The PIM will spell out the budgeting and budgetary control arrangements to ensure appropriate budgetary oversight.	S

<sup>86</sup> PADAP has been effective since October 2017- financed by COFN C1540 of 25 million EUR, IDA 5979 of US\$65 million, overall disbursed at 53 percent in October 2022, closing date: August 1, 2023.

<sup>87</sup> CASEF has been effective since September 2016 - Financed by IDA 57750 amounting to US\$53 million and IDA D4320 amounting to US\$52 million (additional financing) – disbursed at 61 percent - closing in June 2024.

<sup>88</sup> FSRP has been effective since August 2022, financed IDA 71570 of US\$79 million, IDA E0830 of US\$79 million, not yet disbursed, closing date: June 29, 2029.



		The budget follow-up will be documented in the quarterly IFR.	
<p><i>Accounting:</i> Reliable and accurate information not provided to inform management decision</p> <p>Unreliable or delayed reporting on the utilization of funds transferred under the sub-components 2.1 and 2.2</p>	S	<p>The PIUs will rely on qualified FM staff to ensure appropriate performance of the accounting and FM functions. They will be trained in World Bank requirements by the World Bank FM team.</p> <p>The PIU will rely on an external accounting firm to keep records and produce adequate financial reports related to projects implemented with the sub-component 2.1 and 2.2 funds. The IFR will include a section covering the progress of the implementation of various grants.</p>	M
<p><i>Internal Control:</i> Business process, role and responsibilities within the Project is not clear leaving to ineffective of control.</p> <p>Delay in the Project implementation due to unclear provisions in conventions with implementing partners.</p> <p>Loss of fixed assets, equipment, agricultural inputs.</p> <p>Lack of control on decentralized activities</p>	S	<p>The PIM will contain all the key internal control processes pertaining to the various project activities.</p> <p>The PIU will consider robust FM arrangements in the MoU with implementing partners.</p> <p>The fixed assets and inventories safeguard across the country, and property is clearly defined in the PIM.</p> <p>Each RIU will be supported by a qualified Financial Assistant to perform the FM tasks at regional level.</p> <p>The Internal auditor will periodically review the adequacy of the internal control and the compliance in practice.</p> <p>Procedures dealing specifically with the various grants (matching grants, vouchers) and cash transfers (the cash-and-land-for-trees approach of sub-component 1.2) planned in the project will be developed and submitted for validation by the Bank.</p> <p>The PIU will rely on an external accounting firm to keep records and produce adequate financial reports related to projects implemented with the sub-component 2.1 and 2.2 funds.</p>	S
<p><i>Funds Flow:</i> Inappropriate Funds arrangements may lead to non-financing of the Project activities to be financed, particularly for matching grants, vouchers and cash transfers.</p> <p>Delay and misuse of funds exacerbated by the nature of activities to be financed</p> <p>Fraud and corruption in work contracts and cash transfers.</p>	S	<p>The PIM will clearly set the authorization process regarding payment requests as well as the subsequent controls required, particularly for requests from the regions.</p> <p>The Project will use a voucher management agency for sub-component 3.1 activities and a payment agency for cash transfers under sub-component 1.2. The terms of reference relating to these services will be validated by the Bank and included in the PIM.</p> <p>A robust GRM will be developed under this project.</p>	M
<p><i>Financial Reporting:</i> The project may not be able to produce the financial reports required in a timely manner as required</p>	S	<p>The financial reporting processes will be facilitated by the utilization of appropriate accounting software. This will enable timely generation of financial information.</p>	M





for project monitoring and management			
<i>Auditing:</i> Delays in submission of audit reports. Poor quality of audit report	S	The external auditor, private audit firm, will be recruited early. The accounting software will lead to timely generation of quality reports.	M
<i>Governance and Accountability:</i> Possibility of corrupt practices including bribes, abuse of administrative and political positions, mis-procurement and misuse of funds etc., are a critical issue.	S	Robust FM arrangements, World Bank FM and procurement supervisions will be maintained. Effective internal control and internal audit arrangements will be in place.  In addition to the mechanisms set out in the Anti-Corruption Guidelines for fraud and corruption-related sanctionable practices, corruption grievances related to the project's activities could also be submitted and handled by <i>Bureau Indépendant Anti-corruption</i> (BIANCO) or other relevant domestic agencies in the national anti-corruption system.	S
Overall FM risk	S		S

### Specific FM arrangements

**2. Staffing.** The PIU has recruited one Financial Officer specialist and one Accountant during the preparation phase to perform the FM tasks at the central level. This staff will be maintained for the implementation of the follow-on project and their performance will be assessed annually. Each RIU will also be supported by one Finance Officer specialist to be recruited based on TOR agreed with the Bank. Such recruitment will be completed within six months following the effectiveness date. a qualified accounting firm will be hired to keep adequate records and produce financial reporting on behalf of component 2 beneficiaries. The World Bank will deliver a training session to the PIU staff to inform and clarify the World Bank requirements in terms of FM and disbursement no later than three months following the effectiveness date.

**3. Budgeting and planning.** Budget arrangements should be described in the FM procedures' manual. The PIU will prepare the annual budget of the project and will submit it the project' steering committee for approval in November of year N-1. The budget monitoring will be streamlined through the accounting software that will be acquired by the project. The periodic variance analysis will enable the timely identification of deviations from the budget. These reports will be part of the unaudited IFRs that will be submitted to the Association on a quarterly basis.

**4. Accounting and financial reporting.** The project will purchase accounting software and prepare accounting reports on a modified accrual basis. The accounting system will be maintained on a modified accruals cash basis with disclosure of commitments and will comply with the Malagasy General chart of accounts (*Plan Comptable Général* 2005) which is broadly in line with the International Accounting Standards/International Financial Reporting Standards. The accounting software will enable the PIU to record projects financial transactions, monitor the budget execution, prepare the financial reporting, register and manage assets, issue statements of expenditures (SOEs)required for disbursement purpose. The accounting records will reflect adequately the Project's structure in terms of components and sub-components and the source of funds.

**5.** The PIUs will prepare quarterly un-audited IFRs for the Project. The format of the report will be agreed with the World Bank. These IFRs will be submitted to the World Bank within 45 days after the end of the quarter to which they relate.

**6.** At the end of each fiscal year, the PIU will prepare annual financial statements of the Project which will be subject



to an external audit.

**7. Internal controls / FM procedures manual.** PIU prepared and submitted to the World Bank for review the draft PIM in January 2023. The PIM outlines specificities of the new project to be implemented as well as Bank requirements in terms of reporting and auditing, disbursement and flow of funds, the authorization process for payments as well as the subsequent controls to be undertaken, budgeting process, stock and assets management, accounting process, contracts' management. Procurement procedures applied by this Project will be in line with the World Bank procurement regulations. The PIM will deal with the practical arrangements for managing the co-financing. Specific procedures relating to (a) voucher system, (b) matching grant and (c) cash transfer will be developed and added to the PIM after validation. These specific procedures should be adopted before the disbursement of the concerned sub-components.

**8. Internal audit.** An Internal auditor (consultant) will be recruited by the PIU, based on TORs agreed with the World Bank, to continuously review the governance, risk management and control over the Project's activities. During the Project implementation, the IA will be required to conduct at least three reviews per year to confirm adequacy and adherence of internal controls and submit the reports to the project management, the steering committee, and a copy to the World Bank. The internal audit department within MinAE will also be involved in the project oversight, supported by this internal auditor.

**9. External Audit.** The project accounts will be audited annually. The audit report, the audited financial statements and the management letter will be submitted to the World Bank no later than six months after the end of each fiscal year. At the time of this assessment, there is no overdue audit report for the sector. The project will be audited by a private audit firm acceptable to the World Bank. The project will comply with the World Bank disclosure policy on audit reports.

**10. Flow of Funds - Disbursement arrangements.** The PIU will use the DA denominated in US dollars at the BFM, opened for the PPA, to receive funds of the follow-on project from the World Bank, in accordance with the applicable regulation.<sup>89</sup> Funds will be disbursed by IDA to the GoM, through a DA. Co-financing funds will be managed through a separate Designated Account. The use of this DA will be governed by the terms of the co-financing agreement and the practical terms of use will be developed in the PIM.

**11.** The secondary accounts, denominated in Ariary or US dollars opened during the preparation by the PIU at commercial bank will be maintained to pay project's expenditures. The use of the secondary accounts at RPIU level will be defined in the PIM.

**12.** Transaction-based disbursements will be used for this project. An initial advance of up to the ceiling of the DA and representing four months of forecasted project expenditures payable through the DA, will be transferred after project effectiveness. Subsequent disbursements will be made monthly against submission of the SOEs or other documents as specified in the Disbursement and Financial Information Letter. The project will be allowed to use direct payment, advance, reimbursement, special commitment as disbursement methods.

**13.** The project will use the voucher system in the implementation of sub-component 3.1 and will be supported by a voucher management agency in the implementation of activities. The project will use a payment agency in the monetary transfers necessary for the execution of sub-component 1.2. The terms of reference of these agencies will be developed in the PIM and validated by the Bank.

**14. Governance and accountability.** To prevent from possibility of corrupt practices including bribes, abuse of administrative and political positions, mis-procurement and misuse of funds, robust FM arrangements (effective internal control and IA arrangements) will be in place. In addition, the World Bank supervisions plan will be tailored to help mitigate

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<sup>89</sup> Decree No. 2015-1457, amended by Decree No. 2016-1160, defining the modalities of opening, management and regularization of transactions on the Project accounts opened at the Bank.



this risk. The PIM will clarify the World Bank directives on preventing and combating fraud and corruption in World Bank-financed projects<sup>90</sup>. Subject to the Anti-Corruption Guidelines and in accordance with the national anti-corruption laws and regulations corruption grievances related to the project's activities could be submitted and handled by BIANCO or other relevant domestic agencies in the national anti-corruption system.

**15. Supervision plan:** Based on the current overall FM risk, the Project will be supervised at least twice a year. The FM team will use an enhanced supervision approach and shall supervise the project on an ongoing basis through virtual means and site visits, when possible. The World Bank shall review the SOEs, expenditure, reports, supporting documents, internal and external audit reports, internal controls and the use of assets procured under the project. The FM team will consider feedback from stakeholders collected through the GRM in the periodic risk assessment. The FM team will work in close collaboration with the Procurement team, WFA and other task team members to identify and mitigate any issues during the supervision, including shortage of funds. Joint missions will be undertaken with the Procurement team to review fiduciary red flags. The World Bank will provide required training to the PIU/RIUs staff on the World Bank FM and disbursement procedures to make them familiar with these procedures and to ensure that the funds are used for the project purposes.

**16. FM Action Plan.** The FM Action Plan described below has been developed to strengthen FM arrangements.

**Table 1.2. Project FM Action Plan**

Remedial action recommended	Responsible Entity	Completion date
Adopt the PIM	PIU	1 months after effectiveness
Develop specific procedures for the voucher system, cash transfers and matching grants	PIU	Before disbursement for disbursement categories related to relevant sub-components
Recruit staff at the regional level: one financial management specialist, one financial assistant per region	PIU	No later than 6 months after implementation
Recruit an accounting firm to support matching grant recipients	PIU	Before disbursement for disbursement categories related to relevant sub-components
Recruit one qualified Internal Auditor (consultant) to support the PIU.	PIU	No later than 3 months after the effectiveness
Hire a qualified accounting firm to keep adequate records and produce financial reporting on behalf of the project beneficiaries (under component 2).	PIU	No later than 3 months after the effectiveness
Acquire adequate accounting software.	PIU	No later than 3 months after the effectiveness
Recruit an external auditor based on TOR agreed with the World Bank.	PIU	No later than 6 months after the effectiveness
Recruit payment agency for planned cash transfers activities	PIU	Before disbursement for disbursement categories related to relevant sub-components

## Detailed Procurement Arrangements for the Project

**17. Applicable rules and procedures.** This project will use the World Bank's New Procurement Framework, the procedures specified in the 'World Bank Procurement Regulations for IPF Borrowers' dated July 1, 2016 and updated in November 2020, (Procurement Regulations); and, the World Bank's Anti-Corruption Guidelines: 'Guidelines on Preventing and Combatting Fraud and Corruption' revised as of July 1, 2016, as well as provisions stipulated in the Financing

<sup>90</sup> Bank Directive - Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants (revised as of July 1, 2016).



Agreement. During its implementation, the Project will update a procedure manual based on and in accordance with these above-mentioned world Bank references.

**18.** All goods and non-consulting services will be procured in accordance with the requirements set forth or referred to in Section VI. Approved Selection Methods: Goods, Works and Non-Consulting Services of the Procurement Regulations, and the consulting services will be procured in accordance with the requirements set forth or referred to in Section VII. Approved Selection Methods: Consulting Services of the Procurement Regulations, as well as according to the PPSD and the Procurement Plan approved by the World Bank.

**19. Institutional arrangement for procurement.** The PIU will be responsible for the project fiduciary aspects. The Project will strengthen its procurement capacity by training their procurement team who has already assisted in the implementation of the PPA, and of the preceding similar Project. Additionally, the World Bank's procurement team will provide coaching and continuous hands-on support to the project.

**20. Procurement risk assessment.** A procurement capacity assessment of the PIU to implement the project procurement activities revealed that they had not experience with World Bank Procurement Regulations. However, the Procurement Officer has previous experience in implementing operation under World Bank Procurement Regulations; and the PIU started to implement the PPA under the same regulations. The assessment concluded that overall procurement risk rating is Substantial.

**21.** The following mitigations measures are proposed: (a) training for their procurement team and procurement stakeholders within the Project team. The World Bank's procurement specialist will provide training to all project staff involved in procurement activities needs; (b) the World Bank's procurement specialist will assist, coach, and provide continuous handholding support to the project staff; (c) the PPSD was developed with a fit-for-purpose approach and methods to address the project's objective and specificity.

**22. Brief summary of the PPSD.** Given the specificity of the project, the market analysis concluded that Rehabilitation works of hydro-agricultural networks (works and consulting services), Implementation of the landscape management and restoration plan, Design and administration of the voucher system, Implementation of support-advice mechanisms for producers divided into 2 lots, Structuring, revitalization, training, support, capacity building of AUE or FAUE, Development of landscape management and restoration plans will use international open competition. Purchase of motorcycle, due to their quantity and the expected quality, is planned to be executed with UNOPS. The full PPSD providing the detailed approach to market and methods justification is annexed to the project package.

**23. Procurement Plan.** The draft Procurement Plan for the first 12 to 18 months was finalized on January 31, 2023. The Procurement Plan will be updated by PIU at least on an annual basis to reflect actual project implementation needs. The project will be using the World Bank's online procurement planning and tracking tools, Systematic Tracking of Exchanges in Procurement (STEP), to prepare, clear, and update its Procurement Plan and to carry out all procurement transactions.

**24. Frequency of procurement supervision.** In addition to the prior review carried out by the World Bank, a supervision mission will be conducted every six months and a post-procurement review will be conducted on an annual basis.



## Annex 2: Greenhouse Gas (GHG) Balance

### Background and Methodology

1. In its 2012 *Environment Strategy*, the World Bank adopted a corporate mandate to conduct GHG emissions accounting for investment lending. The quantification of GHG emission is an important step in managing and ultimately reducing GHG emission. The World Bank adopted the EX-ACT, which was developed by the FAO in 2010 to assess the impact of agricultural and rural development investment lending on GHG emission and carbon sequestration. EX-ACT allows the ex-ante assessment of a project's net carbon-balance, defined as the net balance of CO<sub>2</sub> equivalent GHG that would be emitted or sequestered as a result of project implementation compared to a *without project scenario*. EX-ACT estimates the carbon stock changes (emissions or sinks), expressed in equivalent tons of CO<sub>2</sub> per hectare and year.

2. The RLPRP is a World Bank funded project that seeks to “increase the productivity and resilience of rural livelihoods and strengthen integrated landscape management among targeted areas in Madagascar.” The Project will be implemented in a six-year timeframe, starting in FY 23, and has a capitalization period of fourteen years (in total, the assessment considers a 20-year period). Project interventions are organized into five Components:

- a) Component 1: Promoting community-led restoration and management of watersheds in target areas (US\$23 million).
- b) Component 2: Sustainable intensification and management of irrigation infrastructure and services (US\$70 million).
- c) Component 3: Strengthening livelihood resilience and value chains (US\$112 million)
- d) Component 4: Project Management and Monitoring and Evaluation (M&E) (US\$20 million).
- e) Component 4: Contingency Emergency Response Component (CERC) (US\$0 million).

3. The analysis set forth will use EX-ACT to assess the GHG impacts associated with the activities contemplated in the proposed Project, mainly those implemented under Component 2.

### Application of EX-ACT

4. **Project boundaries.** The project will increase productivity and promote climate resilience and commercialization for smallholder farmers through the application of CSA/Ae technologies and best practices in key activities along the value chain of the project focal areas. The GHG Balance is in line with the EFA of the Project. Therefore, the assessment takes into account the net GHG emissions likely generated by the investment models applied in the EFA. Table 2.1 summarizes the main characteristics of investment models supported by the Project.

**Table 2.1. List of investment models/technological packages supported by the Project**

Component /	Models category	Hectares	Land use WOP	Land use WP
C1.1	Lavaka stabilization	400	Degraded moist tropical forest	Other land (non-vegetated)
C1.1 linked to C3	Cash/land for trees	2,800	Degraded moist tropical forest	Afforested / Reforested moist tropical forest
C1.2 linked to C3	Agroecological blocs - multi-strata system	4,000	Degraded system	Multi-strata system
C1.2 linked to C3	Agroecological blocs - including livestock	4,000	Degraded system	Non-degraded system
C2 linked to C3	Irrigated rice CSA	15,000	Conventional system - rice	CSA system
C2 linked to C3	Irrigated roots, tubers and vegetables CSA	15,900	Conventional system - staple crops	CSA system
TOTAL		42,100		



**5. The GHG accounting considers the following projected interventions with implications on GHG fluxes:**

- the transition from conventional to climate resilient and sustainable models. The approximate area and dynamics (initial, without project and with project) of diverse land uses is included in Table 1 and detailed in the following sections.
- the likely trends of inputs utilization (fertilizers and pesticides), energy consumption and construction of new infrastructure, based on the changes in production intensity and efficiency gains, which are relevant aspects of CSA/AE technologies and practices.

**6. Data source.** The main sources of data used to carry out the analysis include information generated mainly through relevant ongoing investment projects (from World Bank and other partners in Madagascar, such as the FAO and IFAD) and the experience of MinAE, as executing entity, together with local partners. These inputs provide, amongst others, a detailed assessment on the investment models promoted by the project.

**7. Basic assumptions.** Madagascar has a tropical climate and moist regime. Taking into consideration the project focal area, LAC soil is the dominant soil type. The timeframe of Project implementation is 6 years and the capitalization phase is 14 years, thus the analysis period is set for a total of 20 years. Dynamics of evolution are assumed to be linear for most of the variables. The analysis applies default “Tier 1” coefficients from EX-ACT version 9.2. The construction of ‘with-out project situation’ and ‘with project situation’ trajectories is based on average technical references.

**8. Annual crops.** The technical guidelines proposed for annual crops incorporate “improved agricultural technologies and practices” that contribute to GHG mitigation, while supporting climate resilience enhancement. The EX-ACT basic frame for accounting the improved agricultural technologies and practices for annual crops production include: tillage management; input of organic material; and, residues management. Table 2.2 summarizes the main assumptions applied to the management options for annual crops. Through the Project investments, over 15,900 hectares of annual crops will be subject to such improved agricultural technologies and practices. For this area, there is no land use change involved (annual crops remaining annual crops).

**Table 2.2. Management options for annual crops.**

Model type	Tillage management	Input of organic material	Residue management
Climate smart technologies and practices	Reduced tillage	Medium carbon input	Retained
Conventional production	Full tillage	Medium carbon input	Burned

**9. Rice.** The technical guidelines proposed for rice systems include the broad-scale adoption of improved farming techniques such as SRI and AWD. Through the Project investments, over 15,000 hectares of rice systems will be subject to such improved agricultural technologies and practices. For this area, there is no land use change involved (annual crops remaining annual crops).

**10. Perennial systems.** As part of Component 1, the Project seeks to implement watershed protection activities, such as the development of agroecological blocs. The Project intends to develop at least 8,000 hectares of agro ecological blocs in sub-watersheds. The EFA and the GHG Balance assumes that half of this target, 4,000 hectares, would





correspond to agroforestry – multi-strata systems. For the GHG Balance, it is assumed that the area has a transition from degraded land to agroforestry – multi-strata systems (reduced tillage and medium carbon input).

**11. Livestock and grassland.** The project will support increased productivity and climate resilience of livestock systems. The project is expected to support diverse systems but to keep in line with the EFA, the GHG Balance is assessing incremental livestock heads for chicken and goats. In the EFA, for modeling purposes, local breed chicken rearing is linked to the vouches system. In the EFA, goat farming and commercialization is linked to MGs. Due to the characteristics of this model, it is also linked to the development of agroecological blocs, under Component 1 - contributing to watershed protection. The changes in number of animal heads are shown in Table 2.3. The total area of grassland associated with goat farming is 4,000 hectares.

**Table 2.3. Livestock and grassland management.**

Livestock	Head number - Star / Without Project	Head number - With Project
Local breed chicken rearing for income diversification		1,828,800
Goat farming and	108,997	114,138

**12. Land use and land use change.** The evolution of land use per category is summarized in Table 2.4. Remaining agriculture area, but now applying climate-smart technologies and practices accounts for 30,900 hectares. Grassland remaining grassland, but with improved management, reaches 4,000 hectares. Degraded land transitioning to agroforestry multi-strata systems corresponds to 4,000. About 2,800 hectares of degraded forest land would be afforested / reforested through Cash/Land for trees interventions promoted by the Project – Component 1.1. Also under Component 1.1, at least 400 hectares of lavakas will be subject to stabilization activities.

**Table 2.4. Evolutions of land use /category (hectares)**

WITHOUT PROJECT	Forest	Annual	Perennial	Flooded rice	Grassland	Degraded land	Other land	Total area (ha)
Forest	0	0	0	0	0	0	0	0
Annual cropland	0	15,900	0	0	0	0	0	15,900
Agroforestry	0	0	0	0	0	0	0	0
Flooded rice	0	0	0	15,000	0	0	0	15,000
Grassland	0	0	0	0	4,000	0	0	4,000
Degraded land	0	0	0	0	0	7,200	0	7,200
Other land	0	0	0	0	0	0	0	0
<b>Total area without project (ha)</b>	<b>0</b>	<b>15,900</b>	<b>0</b>	<b>15,000</b>	<b>4,000</b>	<b>7,200</b>	<b>0</b>	<b>42,100</b>

WITH PROJECT	Forest	Annual	Perennial	Flooded rice	Grassland	Degraded land	Other land	Total area (ha)
Forest	0	0	0	0	0	0	0	0
Annual cropland	0	15,900	0	0	0	0	0	15,900
Agroforestry	0	0	0	0	0	0	0	0
Flooded rice	0	0	0	15,000	0	0	0	15,000
Grassland	0	0	0	0	4,000	0	0	4,000
Degraded land	2,800	0	4,000	0	0	0	400	7,200
Other land	0	0	0	0	0	0	0	0
<b>Total area with project (ha)</b>	<b>2,800</b>	<b>15,900</b>	<b>4,000</b>	<b>15,000</b>	<b>4,000</b>	<b>0</b>	<b>400</b>	<b>42,100</b>

**13. Inputs.** The main inputs considered in this GHG analysis are agricultural inputs (such as fertilizers and others) as well as energy consumption and infrastructure.





**14. Agricultural inputs.** The available technical guidelines in crop production include the use of improved seeds, fertilizers and pest control management. The amounts (tons per year) of fertilizers are linked to the investment models applied to the EFA. Data is available per hectare for a number of annual and perennial crops. The Project will provide technical support to make a safe and efficient use of inputs adapted to CSA/Ae practices.

**15. Productive infrastructure.** The project design takes into account the rehabilitation of roads (150 kilometers) and irrigation infrastructure (30,000 hectares of medium-large schemes). Initial estimates of emissions from construction materials / activities are included in this GHG Balance. Emissions accounting related to energy consumption are detailed below.

**16. Energy consumption linked to the investment models supported through voucher and/or MG schemes.** As part of the PDO of increasing productivity and climate resilience, the models proposed by RLPRP seek for efficiency gains throughout the systems – this is the case of energy consumption. There is limited data on energy use for every model in the baseline, without-project and with-project situation. Then, it is assumed that any likely increase in energy consumption from the baseline/without project situation, compared to the with-project situation, will be compensated by the fact that the technologies and practices proposed contribute to higher efficiency of inputs use per unit of production – including the consideration of avoided losses along the systems.

**17. Energy consumption linked to rehabilitated irrigation systems and roads.** The rehabilitation of irrigation schemes would have an impact in energy consumption. However, there is limited information to assess the balance. Rehabilitation of irrigation schemes would bring a net positive effect due to the reduction of water waste. Road rehabilitation will generate important energy savings. The GHG accounting for RLPRP includes an initial assessment of potential GHG emissions reduction based on data from the World Bank 'Connecting Madagascar for Inclusive Growth Program' (P173711), approved in March 2022. We apply an adjusted coefficient of reduced emissions per kilometer of road rehabilitated. The logic behind energy savings from road rehabilitation is that users would require less time and fuel to complete their trip. To estimate net emissions, the assessment takes into consideration probable sources of increased energy consumption such as a greater number of users or trips frequency. The RLPRP would support the rehabilitation of 150 kilometers of roads. Energy consumption linked to investment subproject models are considered in the EFA. As part of the PDO of increasing productivity and climate resilience, the models proposed by RLPRP seek for efficiency gains throughout the systems – this is the case of energy consumption. There is limited data on energy use for every model in the baseline, with-out and with project situation. Then, it is assumed that any likely increase in energy consumption from the baseline/without project situation, compared to the with-project situation, will be compensated by the fact that the technologies and practices proposed contribute to higher efficiency of inputs use per unit of production – including the consideration of avoided losses along the systems and the choice of inputs adapted to CSA/Ae practices.

## **Results**

**18. Net carbon balance.** A GHG appraisal of the Project was carried out using the EX-ACT, which quantifies the net carbon balance with regard to tCO<sub>2</sub>e, resulting from GHGs emitted or sequestered during the project implementation and capitalization period (20 years) compared to the without-project scenario. The project leads to a reduction of 4.7 tCO<sub>2</sub>e emissions annually and per hectare, when compared to a business-as-usual baseline scenario. After 20 years, and for the whole Project area, GHG mitigation benefits would amount to a reduction of 3.39 million tCO<sub>2</sub>e. The main results of this GHG analysis are summarized in Table 2.5.



**19. Carbon sources and sinks.** The main GHG emissions come from livestock, followed by inputs and infrastructure. The sequestration benefits come principally from improved management of grassland and cropland.

**Table 2.5. Results of the ex ante GHG analysis in tCO<sub>2</sub>-eq**

<b>Project name</b>	WB RLPRP	<b>Project duration (in years)</b>		<b>Total area (ha)</b>	42,100	<b>Global warming potential</b>	
<b>Continent</b>	Eastern Africa	<b>Implementation</b>	6	<b>Mineral soil</b>	42,100	<b>CO<sub>2</sub></b>	1
<b>Country</b>	Madagascar	<b>Capitalization</b>	14	<b>Organic soil</b>	0	<b>CH<sub>4</sub></b>	34
<b>Climate</b>	Tropical	<b>Period analysis</b>	20	<b>Waterbodies</b>	0	<b>N<sub>2</sub>O</b>	298
<b>Moisture</b>	Moist						

GROSS FLUXES				SHARE PER GHG OF THE BALANCE					AVERAGE ANNUAL EMISSIONS		
In tCO <sub>2</sub> -e over the whole period analysis				In tCO <sub>2</sub> -e over the whole period analysis					In tCO <sub>2</sub> -e/yr		
PROJECT COMPONENTS	WITHOUT	WITH	BALANCE	CO <sub>2</sub> BIOMASS	CO <sub>2</sub> SOIL	N <sub>2</sub> O	CH <sub>4</sub>	ALL NON-AFOLU EMISSIONS*	WITHOUT	WITH	BALANCE
Land use changes											
Deforestation	0	0	0	0	0	0	0	0	0	0	0
Afforestation	0	-647,700	-647,700	-425,519	-222,181	0	0	0	0	-32,385	-32,385
Other land-use	0	-392,012	-392,012	-38,133	-353,879	0	0	0	0	-19,601	-19,601
Annual	581,700	387,063	-194,637	0	-187,556	7,596	-14,678		29,085	19,353	-9,732
Cropland											
Perennial	0	-941,672	-941,672	-922,533	-19,139	0	0		0	-47,084	-47,084
Flooded rice	2,678,501	2,025,318	-653,183	0	0	0	-653,183		133,925	101,266	-32,659
Grasslands & Livestock											
Grasslands	0	-142,120	-142,120	0	-142,120	0	0		0	-7,106	-7,106
Livestock	401,559	449,282	47,723			25,105	22,618		20,078	22,464	2,386
Forest mgmt.	0	0	0	0	0	0	0		0	0	0
Inland wetlands	0	0	0	0	0	0	0		0	0	0
Coastal wetlands	0	0	0	0	0	0	0	0	0	0	0
Inputs & Invest.	1,571,128	565,596	-1,005,532		0	202,835		-1,208,366	78,556	28,280	-50,277
<b>Total emissions, tCO<sub>2</sub>-e</b>	<b>5,232,889</b>	<b>1,303,755</b>	<b>-3,929,134</b>	<b>-1,386,186</b>	<b>-924,874</b>	<b>235,536</b>	<b>-645,243</b>	<b>-1,208,366</b>	<b>261,644</b>	<b>65,188</b>	<b>-196,457</b>
<b>Total emissions, tCO<sub>2</sub>-e/ha</b>	<b>124.3</b>	<b>31.0</b>	<b>-93.3</b>	<b>-32.9</b>	<b>-22.0</b>	<b>5.6</b>	<b>-15.3</b>	<b>-28.7</b>			
<b>Total emissions, tCO<sub>2</sub>-e/ha/yr</b>	<b>6.2</b>	<b>1.5</b>	<b>-4.7</b>	<b>-1.6</b>	<b>-1.1</b>	<b>0.3</b>	<b>-0.8</b>	<b>-1.4</b>			

+ = Source / - = Sink

Results presented here include GHG fluxes on mineral and organic soils

See further down for detailed results on organic soils

\* Includes fisheries, aquaculture and inputs & investments that are not included in the AFOLU definition.

Uncertainty level	tCO <sub>2</sub> -e/yr	Percent
<b>Without</b>	261,644	34%
<b>With</b>	65,188	37%
<b>Balance</b>	-196,457	35%

**20. Sensitivity analysis.** The uncertainty, as calculated by EX-ACT, is 33 percent. This analysis was run using mostly tier 1 coefficients, which in some cases may provide over or underestimated values. It is a relevant source of uncertainty in the estimation of GHG emission/sequestration scenarios for the project.



## Annex 3: Summary of Climate Change Adaptation and Mitigation Benefits Generated by the Project

### Introduction

**1. Delimitation of climate benefits generated by the Project.** For each sub-component, Table 3.1 presents the most relevant Project activities that contribute to climate resilience (climate change adaptation and disaster risk management) and climate change mitigation (net reduction of GHG emissions). For each sub-component, the assessment includes an indication of the proportion of Project investments intended to enhance climate resilience and/or mitigate climate change.

**Table 3.1. Summary of Climate Change Benefits**

Component/Sub-component and activities	Climate resilience (climate change adaptation and disaster risk management)	Climate Change Mitigation
<b>Component 1: Promoting community-led restoration and management of watersheds in target areas (US\$23 million)</b>		
<b>Sub-component 1.1: Development of Local Development Plans (US\$0.8 million)</b>		
<p>Following the climate problem assessment, watersheds in Sofia and Alaotra-Mangoro regions are facing environmental degradation that exacerbates its vulnerability to climate change impacts. There are various factors leading to land degradation, including weak land use planning and management, as well as lack of incentives and capacities for improved management.</p> <p>One or more local Land Use Planning Schemes (LUPS) for each project area will be developed. This territorial planning tool will ensure complementarity and interdependence of interventions at the scale of the project intervention area. An ecosystem index tool will ensure that actions related to biodiversity and ecosystem services are strongly linked to the project's productive activities.</p>	<p>Improved land use planning and management, including special consideration to biodiversity and ecosystems services, will reduce the agri-food system's vulnerability to climate variability and climate change. The restoration and preservation of ecosystems services, in the face of a changing climate, will also ensure the sustainability of productive activities covered by the Project.</p> <p>The development of local LUPS provides an opportunity to establish mechanisms for multiple stakeholders from across sectors and communities to build a shared vision, reconcile competing objectives over land use, and jointly plan and implement integrated local LUPS and livelihood initiatives to build resilient landscape by integrating climate risk and impacts in local LUPS to reduce the negative impacts of climate-induced hazards such as floods, droughts, etc.</p>	<p>The development of LUPS will support land use changes from degraded to restored land (afforestation, reforestation, agroforestry systems). In the case of agriculture land, the LUPS will include measure to ensure a sustainable management, leading to a net reduction of emissions.</p> <p>The development of LUPS will provide the basis and facilitate the implementation of activities proposed under sub. Comp 1.2, such as afforestation through watershed Protection Plans and LUPS, eligible under 5.6: Agriculture: Forestry - GHG-emission reduction and carbon sequestration of the revised Joint MDB List of Eligible Mitigation Activities.</p>
<b>Sub-component 1.2: Reforestation and erosion control in watersheds (US\$17.2 million)</b>		
<p>In line with Sub-component 1.1, the project will finance watershed restoration activities based on the provision of incentives (cash / land for trees). These activities include: afforestation / reforestation upstream; agroforestry systems; firebreaks; and lavaka stabilization in key areas of the watersheds. The identification and selection of tree species will be based on ecological and social appropriateness (including native species</p>	<p>Watershed restoration activities provide multiple benefits, such as: reduced soil erosion and asolvation; increased water availability and quality; increased provision of forest services, such as timber, food, water and energy. Positive biodiversity outcomes will be promoted through the identification of species and areas that increase wildlife habitat or can provide ecological corridors.</p>	<p>The carbon sequestration potential of afforestation / reforestation upstream (2,800 hectares); agroforestry systems (aprox. 4,000 hectares) downstream; and lavaka stabilization (400 hectares) in key areas of the watersheds is included in the project's GHG Balance and the</p>



<p>where possible). The project will support the creation of nurseries to provide quality seedlings.</p> <p>Regarding land certification, the Project will implement awareness raising and information sessions for potential beneficiaries, as well as capacity building for local agents to promote and issue land certificates solely in the name of a women farmer or jointly with her husband. The project will also seek gender equity or minimum representativeness in the Local Recognition Committee and the Local Land Office agent recruitment. Land certificate format will be designed to allow joint inscription of spouses.</p>	<p>Land Administration Projects and studies in Madagascar indicate that land tenure security is an important condition to support long-term investments. Therefore, implementation and sustainability of watershed restoration activities is strengthened through land certification.</p> <p>The EFA considers some of these benefits directly, through investment models representing vouchers and MGs schemes. The EFA recognizes that the implementation and sustainability of the proposed investment models rely on the provision of ecosystem services. Due to data constraints, the economic analysis does not integrate all relevant ecosystem services supported by the Project at landscape level.</p>	<p>EFA.</p> <p>Reforestation/afforestation through watershed Protection Plans, eligible under 5.6: Agriculture: Forestry - GHG-emission reduction and carbon sequestration of the revised Joint MDB List of Eligible Mitigation Activities.</p>
<p><b>Sub-component 1.3: Promoting agroecological practices (US\$5.0 million).</b></p>		
<p>In line with sub-component 1.1 and 1.2, the project will support the identification and dissemination of agroecological practices adapted to the specificities of the different areas of the landscape/watershed aiming at environmental and socio-economic benefits (increased incomes and improved FNS). For this purpose, the sub-component includes the following activities:</p> <p>*Environmental and socio-economic studies to identify adequate practices and dissemination methods, in line with the other components of the project.</p> <p>*“Research and development” program associated with capacity building, technical assistance, implementation support, performance follow-up and knowledge management (documenting and transmitting best practices).</p>	<p>Promotion of integrated agroecological practices under this sub-component, not only help to protect, restore and improve agriculture and food systems in the face of climate shocks and stressors, but also helps to sustain and enhance ecosystem services, including the restoration degraded soils, with a spillover effect on food security, resilience and sustainable livelihoods holistic approach to resilience by paving the way to transformational change towards more sustainable farming and food systems while also ensuring environmental sustainability.</p> <p>The development of agroecological blocs aims to reinforce the integrated and sustainable management of watersheds and thus the provision of key ecosystems services.</p> <p>The implementation of agroecological blocs in Madagascar has proven its multiple benefits with particular interest in climate resilience and ultimately Food and Nutrition Security (FNS) and will ensure the project’s activities around landscape and watershed management are adapted to climate impacts.</p>	<p>Promotion of agroecological practices under this sub-component contributes to substantial reduction in net GHG emissions, eligible under 5.2: Agriculture: Carbon Sequestration of the revised Joint MDB List of Eligible Mitigation Activities. The carbon sequestration potential of agroecological blocs (aprox. 4,000 hectares) in key areas of the watersheds is included in the Project’s GHG Balance and the EFA.</p>
<p><b>Component 2: Sustainable management of irrigation infrastructure and services (US\$70.0 million).</b></p>		



<b>Sub-component 2.1: Rehabilitation of irrigation infrastructure (US\$65.0 million).</b>		
<p>According to key government documents (TNC, NDC, NAP), higher mean temperature, changes in precipitation patterns and increased frequency / intensity of extreme hydro-meteorological events – particularly floods and dry spells – will have significant impacts in water availability in Sofia and Alaotra-Mangoro. This is exacerbated by the growing demand for food. Therefore, improved water use efficiency (and water productivity) is a priority to ensure the sustainability of irrigation systems and ultimately for FNS.</p> <p>The project will support the rehabilitation of irrigation infrastructure covering an estimated 30,000 ha in the two selected regions: Alaotra-Mangoro (26,000 ha) and Sofia (4,000 ha). Feasibility studies have been carried during project preparation showing notable potential in these two regions for increased water-use efficiency and contribution to the climate-resilience of staple crops, as well as for livelihood's diversification. The Project will also provide TA to define and assess alternative rehabilitation scenarios, including climate change impacts and opportunities for increased climate resilience.</p>	<p>In combination with Component 1, Project investments under Component 2 aim at the sustainable provision of irrigation services. In the framework of integrated watershed and landscape management, and considering climate change scenarios, irrigation rehabilitation and improved management are relevant actions for climate change adaptation.</p> <p>Irrigation rehabilitation works and improved management aim to mitigate climate change impacts in the presence of different conditions such as soil type, crop type, salinity, and water availability, contributing to climate resilience outcomes.</p> <p>Under this subcomponent, the rehabilitation of water infrastructure will reduce inefficiencies in water use for irrigation and thus contribute to safeguarding water security against climate change-exacerbated hazards.</p> <p>All irrigation infrastructure investments will consider climate-resilient design considerations.</p> <p>The EFA takes into account the benefits of improved and climate-resilient irrigation infrastructure and services through investment models. A proportion of beneficiaries from voucher and Matching grants schemes (mainstreaming CSA technologies) would eventually access rehabilitated irrigation services, which in combination will contribute to climate resilience outcomes.</p>	<p>Investments in medium to large-scale irrigation schemes are expected to be, at least carbon neutral, if not supporting GHG emissions' reduction.</p> <p>Construction works would lead to increased GHG emissions but these are more than offset by projected energy savings (due to the reduce loss of water along the system).</p>
<b>Sub-component 2.2: Management, Maintenance and Preservation (MMP) of hydro-agricultural infrastructure (US\$5 million).</b>		
<p>The current and projected climate change impacts imply higher MMP costs. Increased capacity to manage such costs is essential for climate resilience. Thus, the Project will support the development of a regional decree defining the strategic works of each region, taking into consideration the current and projected impacts of climate change. TA will be</p>	<p>The Project investments to improve the management of irrigation systems, including a stronger participation and O&amp;M capacity of WUAs, would avoid future inefficiency as well as any potential misuse / overuse of water for irrigation. This is relevant to ensure that irrigation systems would contribute to climate resilience in the long-run.</p>	<p>Avoided misuse / overuse of water for irrigation, given improved MMP of hydro-agricultural infrastructure, complements the assumption of the GHG accounting that 'investments in medium to large-scale irrigation schemes are expected to be, at least carbon</p>



<p>recruited to support this sub-component in each region, as well as collaboration agreements with the regional directorates of the Ministry (DRAE).</p>	<p>The project's activities on building the capacity of WUAs will have a positive impact on water resource management. It includes enhancing producers' knowledge on climate change and capacity building/training on water efficiency, water resources management, and conservation technologies, infrastructures, etc., as well as awareness raising on climate risk/impact geared towards WUAs and Federations.</p>	<p>neutral, if not supporting GHG emissions reduction.</p>
<p><b>Component 3: Strengthening livelihood resilience and value chains (US\$112.0 million).</b></p>		
<p><b>Sub-component 3.1: Promoting climate-smart and nutrition-sensitive agriculture technologies, practices and interventions (US\$72.0 million).</b></p>		
<p>The climate scenarios and the climate change impact assessment in the sectoral context section confirm the urgent need to scale-up climate smart technologies and practices along priority agri-food value chains and regions. Besides the current and projected climate change impacts, the activities proposed also take into consideration the main constraints faced by smallholder farmers and value chain stakeholders to adopt climate smart approaches and transition towards a more resilient and sustainable agri-food system. Access to knowledge, inputs and financial resources are major constraints for climate action by smallholder farmers. This sub-component will promote investments in the deployment and adoption of CSA/Ae and nutrition-sensitive innovations and technology packages among smallholder farmers and cooperatives in targeted areas. The proposed CSA/Ae packages respond to the current and projected impacts of climate change and intend to maximize productivity and climate resilience, as well as environmental co-benefits.</p> <p>The project will mobilize a VMA to design and administer an input voucher scheme, adapted to CSA/Ae practices. Participating agro-input dealers will be vetted, registered and trained to provide extension support directly to smallholder farmers and cooperatives to facilitate CSA technologies and practices adoption (with particular attention to women smallholder farmers).</p>	<p>The vouchers distributed under this subcomponent will be used by beneficiaries to source CSA/Ae technology packages. These technologies and practices will contribute to climate resilience. CSA/Ae technology packages give special attention to propagation of adapted cultivars / breeds, improved soil and water management, integrated nutrient management, increased input-use efficiency, improved crop mix and sequence, agroforestry and silvo-pasture systems. The EFA integrates some of the CCA benefits generated by these CSA/Ae tech packages (through investment models proposed for the voucher scheme). The main direct benefits included in investment models are increased input-use efficiency leading to higher productivity, reduced losses, improved soil and water conditions, higher income and livelihoods diversification in comparison to the baseline/without project situation, in the face of the changing climate.</p> <p>CSA practices and investments in conjunction with landscape restoration and watershed management (component 1) as well as rural infrastructure investments (road/irrigation) will provide the pathway towards enhancing rural livelihoods productivity and resilience, while addressing environmental drivers of food insecurity, malnutrition, livelihood vulnerability.</p>	<p>Compared to the baseline and the without project situation, the CSA/Ae technologies and practices promoted by the project through the voucher scheme would generate net GHG emissions reduction.</p>





<b>Sub-component 3.2: Strengthening value chains via MGs (US\$16 million).</b>		
<p>Climate change impacts and the growing food demand call for action to strengthen the resilience and sustainability of agri-food value chains beyond production. The problem of food loss and waste will be significantly exacerbated by climate change. Therefore, improvements in post-harvest management, food processing and commercialization are vital for the agri-food system's resilience and sustainability. Access to adequate assets and services is fundamental at each stage of the value chain to ensure the capacity of the agri-food sector to address the challenges posed by climate change and capture potential opportunities.</p> <p>This sub-component will support via MGs climate-smart investment subprojects by farmer cooperatives, seed producers, agro-processors, traders, agro-equipment manufacturers and machinery suppliers, and other value chain actors. The aim of investment subprojects is to support the resilient and sustainable provision of key services along the value chain (i.e input supply, post-harvest management, value addition and commercialization). The MG schemes will be administered by FDA. FDA has previous experience in administering similar programs in recent years, including under the World Bank-financed GEF Sustainable Landscape Management Project (P154698 and AF/P176449). The project will mobilize TA to provide institutional capacity-building support to FDA and technical backstopping to grantees to ensure quality and achievement of the subprojects. The Project will ensure the definition and prioritization of investment subprojects that respond to the main climate change impacts and national priorities for climate action (mainstreaming key considerations and incentives for climate action into the MGs Operation Manual and the subcomponent TA).</p>	<p>The climate smartness of subproject investments refers to the same principle of CSA applied to other stages of agri-food value chains besides production (particularly at post-harvest, value addition and/or commercialization). Investments aim at: sustainably increasing productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible. These technologies and practices are in line with the typologies of activities generating CCB, set by the World Bank for a) the Agriculture, Fishing and Forestry sector, as well as for b) agro-industry, marketing and trade.</p> <p>The type of investments supported by MGs contribute with increased climate resilience of smallholder farmers, participating in strategic agri-food value chains. Access to high quality inputs, reduced food losses, increased incomes (from higher marketed volumes and/or prices – linked to improved post-harvest management and value addition) are benefits expected from investment subprojects. These benefits directly and/or indirectly contribute with the climate resilience capacity of smallholder farmers, and other key value chain stakeholders. The investment models developed for the EFA integrate most of these benefits in the form of higher efficiency and productivity, reduced losses and waste and higher income in comparison to the baseline/without project situation, in the face of the changing climate.</p> <p>Eligibility criteria for subprojects under MGs will also include the inclusion of CSA practices and technologies.</p>	<p>Compared to the baseline and the without project situation, the investment subprojects promoted by the RLPRP through the MG scheme would generate net GHG emissions reduction. In global, the implementation of CSA investment models, supported through subcomponents 3.1 and 3.2, would lead to a net GHG emissions reduction of 513,394 tons of CO<sub>2</sub>e in 20 years of assessment. See Annex 2 of the PAD (GHG Balance) and FY23 GHG QA for further details.</p>
<b>Sub-component 3.3: Development of climate-resilient rural road infrastructure (US\$24 million).</b>		
The climate problem indicates that taking action to climate-proof road infrastructure is	Upgrading road networks and infrastructure that connect people to markets are relevant	Investments in rural market infrastructure would not





<p>highly relevant to reduce maintenance costs overtime but this is also an important factor in the general performance and sustainability of agri-food systems.</p> <p>This sub-component will finance upgrades to feeder roads (150 kilometers), small bridges and other rural market infrastructure to improve the accessibility of production areas to processing and consumption centers, and downstream end markets. Complementing activities to improve road infrastructure, sub-component 3 will also target infrastructure upgrades that further improve the competitiveness, resilience and sustainability of supported agri-food value chains. This will ultimately support food and nutrition security. All upgrades include the climate proofing of infrastructure.</p> <p>Built on the ongoing CASEF project, this component will also support the development of decentralized, community-driven mechanisms for road maintenance. The project will finance the establishment of a road maintenance financing mechanism and will provide training and equipment to the “maître d’ouvrage” communes and regional directorates in charge of public works.</p>	<p>for FNS and climate resilience. Good roads also facilitate the access to inputs, technical advice and other incentives that facilitate the adoption of climate-smart technologies and practices among farmers and value chain stakeholders.</p> <p>The activity will prioritize climate-resilient infrastructure that is designed and built in a way that anticipates, prepares for, and adapts to changing climate conditions. These investments are in line with the typologies of activities generating climate-change co-benefits (CCB), set by the World Bank for transportation - rural roads.</p> <p>The EFA indirectly integrates the benefits of this sub-component, mainly through the investment models for vouchers and MG schemes.</p>	<p>generate considerable GHG emissions from construction works. These investments are more likely neutral or contributing with climate change mitigation due to the potential for food losses reduction. Detailed estimates are not included in the GHG Balance due to lack of accurate data. Investments in feeder roads rehabilitation (and small bridges) would results in a net reduction of GHG emissions (due to significant energy savings): - 1,293,908 tons of CO<sub>2e</sub> in 20 years of assessment. See Annex 2 of the PAD (GHG Balance) and FY23 GHG QA for further detail. The economic analysis includes the valuation of CCM benefits from road rehabilitation.</p>
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#### Annex 4: Gender Strategy

**1. Women's labor force participation is high in Madagascar; however, their employment options are often limited to vulnerable and informal sectors.** Women's productivity in agriculture is hampered by their limited access to inputs, resources and information. Notwithstanding their disadvantages in the sector, women farmers are more likely to adopt climate-smart agricultural practices than men farmers when these have access to resources. Women's land tenure security continues to be precarious notwithstanding the increased focus on promoting women's land rights in Madagascar's land reform program. Women continue to lack information about their land rights. As a result, only 23 percent of land is titled in women's names.

**2. A gender assessment undertaken during the preparation of the proposed operation revealed gender gaps in women's:** i) participation in the rice value chain including their low access to agricultural inputs/technologies, lower yields and profits as well as lower access to financing; ii) limited access to land ownership due to customary rights and patriarchal system and limited information regarding their rights and processes; and iii) heavier household burden and norms that limit their ability to participate in productive activities outside of the home, thus, limiting their participation in local and community organizations (WUAs, producer groups, cooperatives, etc.) and their access and control of resources.

**3. Improving women's productivity, strengthen their engagement in value chains and adoption of climate-smart practices:** The gender assessment revealed that men play a leading role in all aspects of the rice value chain, distributing work to other family members as needed, with women being primarily responsible for processing and marketing and other post-harvest tasks that only require the use of easy-to-handle tools. The project will address this gender gap by: i) identifying women's producer groups and cooperatives and assessing their specific needs (Component 1); ii) integrating gender considerations such as women's role in family nutrition, time use and limited access to tools and adapted practices in all training provided to producers and cooperatives, seed dissemination and provision of tools and adapted practices (Component 1); iii) training and capacity building of agro-input dealers engaged to provide extension support to smallholder farmers and cooperatives on gender and working with women smallholder farmers (Component 2); iv) encouraging groups that are eligible for MGs to have women members and providing needed capacity support to women-led farmer groups to increase their probability of obtaining MGs (Component 3); and, v) supporting the delivery of a community mobilization and behavior change program, such as the Gender Action Learning System (GALS) to increase uptake and utilization of vouchers by women farmers and promote more equitable sharing of household responsibilities (Component 3).

**4. Improving women's land tenure:** Lack of information at the individual and community level contributes to women's lower access to land. To ensure participation of women farmers and also increase their land tenure, the Project will support awareness raising and information sessions targeting women and men so that these are aware of women's land rights and process for the issuance of a land certificate; improve the capacity of land authority agents to promote and issue land certificates solely in the name of a women farmer or jointly with her husband; and prioritize the allocation of plots that do not have individual ownership to women-headed households (Component 1).

**5. Improve women's participation and leadership in local and community organizations:** The gender assessment found that, overall, women dedicate a negligible portion of their time to community activities (only 4 percent during the rainy season and no time at all during the dry season) and an almost equal portion of their time to household and productive tasks during the rainy season (34 and 33 percent, respectively) and more time to productive tasks during the dry season (42 and 33 percent, respectively). Conversely, men reserve time to participate in community and productive activities during the dry and rainy season (17 and 8 percent, respectively for community activities and 42



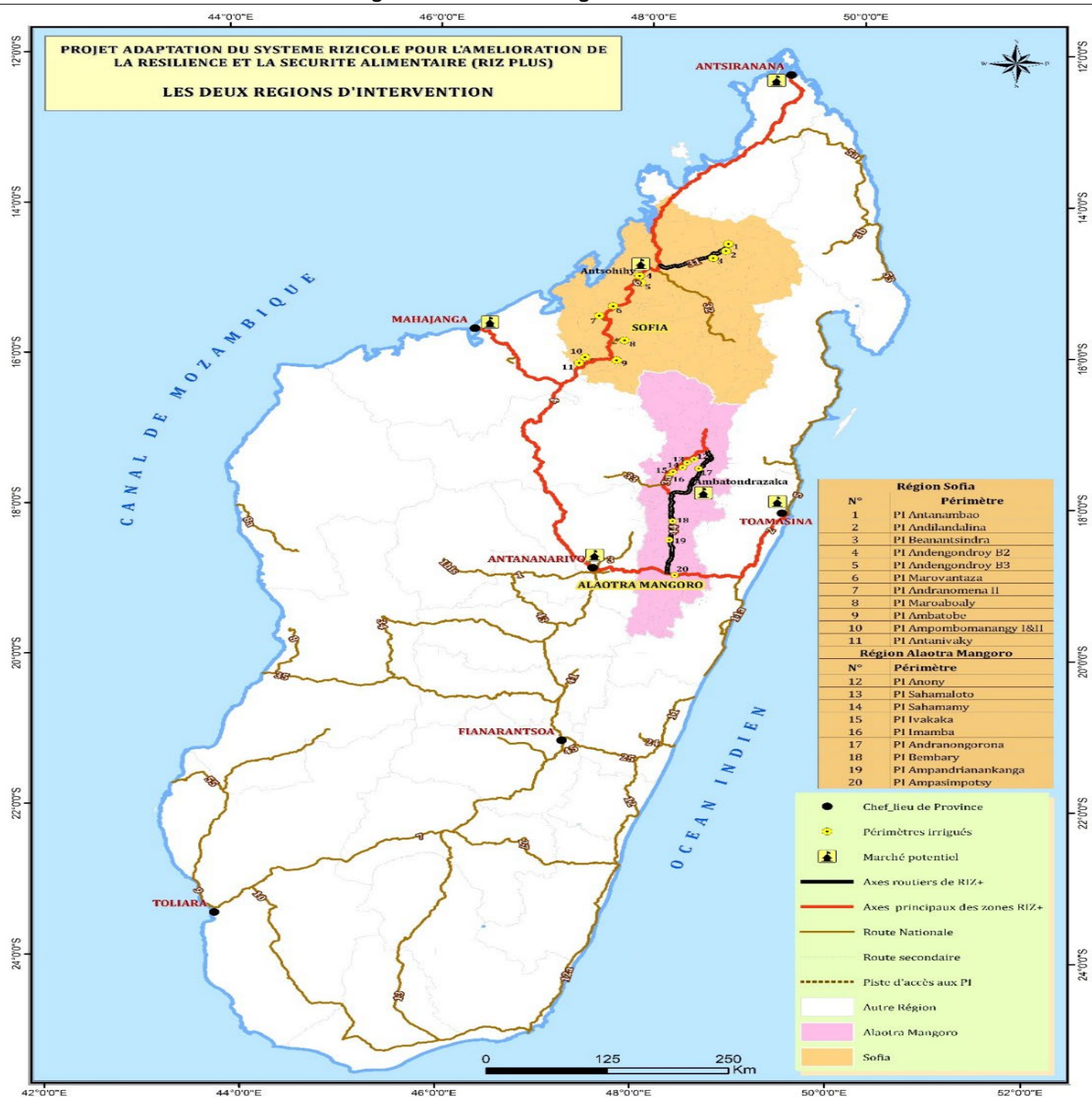
and 63 percent, respectively for productive activities). Men did not spend any time in household activities. Redistributing household tasks in a more equitable manner will allow women to participate in community activities. The project will support this by delivering a community mobilization and behavior change program, such as the Gender Action Learning System (GALS) to address norms that limit women's participation in WUAs, including promoting more equitable sharing of household responsibilities; increasing the participation of women and youth in the WUAs as well as in the community consultations during the construction of irrigation infrastructure; and, providing identified women leaders with leadership and personal development training (Component 3).

**6. The project's Results Framework includes indicators that measure changes in productivity (rice yields) of women farmers, their adoption of resilience-enhancing technologies and practices, and their access to vouchers and MGs.** The Results Framework also includes indicators to measure the number of women receiving land certificates and holding leadership/decision making positions in WUAs or producer groups.



## Annex 5: Maps

Figure A. Location of Irrigation Schemes



Source: GEIRCO 2022



Figure B. Map of Madagascar

