Strengthening the Resilience of Climate-Smart Agricultural Systems and Value Chains in the Union of Comoros

Part I: Project Information

GEF ID
10997

Project Type
FSP

Type of Trust Fund
LDCF

CBIT/NGI
CBIT **No**
NGI **No**

Project Title
Strengthening the Resilience of Climate-Smart Agricultural Systems and Value Chains in the Union of Comoros

Countries
Comoros

Agency(ies)
UNDP

Other Executing Partner(s)
National Directorate of Agricultural Strategies and Livestock

Executing Partner Type
Government

GEF Focal Area

Climate Change

Taxonomy

Focal Areas, Climate Change, Climate Change Adaptation, Private sector, Innovation, Small Island Developing States, Livelihoods, Climate resilience, Least Developed Countries, Adaptation Tech Transfer, United Nations Framework Convention on Climate Change, Nationally Determined Contribution, Land Degradation, Sustainable Land Management, Sustainable Livelihoods, Sustainable Agriculture, Improved Soil and Water Management Techniques, Sustainable Fire Management, Income Generating Activities, Sustainable Pasture Management, Restoration and Rehabilitation of Degraded Lands, Food Security, Influencing models, Convene multi-stakeholder alliances, Demonstrate innovative approache, Strengthen institutional capacity and decision-making, Stakeholders, Private Sector, SMEs, Individuals/Entrepreneurs, Local Communities, Type of Engagement, Consultation, Information Dissemination, Partnership, Participation, Beneficiaries, Civil Society, Community Based Organization, Academia, Trade Unions and Workers Unions, Non-Governmental Organization, Communications, Public Campaigns, Awareness Raising, Behavior change, Gender Equality, Gender Mainstreaming, Gender-sensitive indicators, Women groups, Sex-disaggregated indicators, Gender results areas, Participation and leadership, Capacity Development, Access to benefits and services, Capacity, Knowledge and Research, Knowledge Generation, Professional Development, Training, Targeted Research, Learning, Adaptive management, Indicators to measure change

Sector

Mixed & Others

Rio Markers

Climate Change Mitigation

Climate Change Mitigation 0

Climate Change Adaptation

Climate Change Adaptation 2

Duration

60 In Months

Agency Fee($)

848,580.00

Submission Date

4/13/2022

A. Indicative Focal/Non-Focal Area Elements

Programming Directions	Trust Fund	GEF Amount($)	Co-Fin Amount($)
CCA-1	LDCF	8,932,420.00	46,214,494.00
	Total Project Cost ($)	**8,932,420.00**	**46,214,494.00**

B. Indicative Project description summary

Project Objective

Increase the climate resilience of key agricultural value chains through innovation, diversification and strengthened capacities to sustainably improve the livelihoods of smallholders and contribute to the national economy

Project Component	Financing Type	Project Outcomes	Project Outputs	Trust Fund	GEF Amount($)	Co-Fin Amount($)
1. Systemic, institutional and individual capacities for climate-resilient agriculture	Technical Assistance	Outcome 1. Enhanced capacity of national institutions and actors involved in agricultural development to guide, plan, supervise and implement climate-resilient practices	1.1 Capacity development plans elaborated and implemented to increase the institutional skills required to plan, develop, disseminate, and support the adoption of climate-resilient agricultural practices among smallholder farmers, and value chains actors 1.2 Training packages developed and delivered by CRDEs to farmers and agriculture value chain actors to enable the implementation of climat risk reduction measures. 1.3 Guidance plans and tools to support the adoption of climate-resilient agriculture are designed, assessed, and disseminated.	LDCF	797,794.00	9,690,000.00

2. Diversification of climate-resilient value chains	Technical Assistance	Outcome 2. Increased resilience of agricultural actors through the identification and promotion of new climate-resilient value chain options with good prospects for profitability, increased access to national and international market information and equitable benefit sharing.	2.1 Identification of climate-adapted agricultural varieties and livestock breeds to develop climate resilient and profitable value chains, 2.2 Support INRAPE to characterize new climate-adapted Comorian agrobiodiversity products and enforce quality con-trol measures and protocols, including for export products 2.3 Web and mobile trading platforms developed to connect agricultural pro-ducers and buyers in national and international markets and ensure timely access to market information for climate resilient agricultural products 2.4 Awareness campaign conducted to enhance understanding by institutional and private actors of the sector of the climate change risks and adaptive measures. 2.5 Negotiation and signature of agree-ments ensuring fair benefit sharing among actors in climate-resilient value chains	LDCF	797,794.00	19,000,000.00

3. Implemen-tation of climate-resilient practices in targeted interventio n areas	Investme nt	Outcome 3. Increased adoption of climate-resilient practices and crops/varieties by smallholder farmers and value chains actors facilitated by support systems and adequate provision of inputs and resources	3.1 Agronomic approaches and practices (e.g. water and soil conservation, crop diversification, mixed production sys-tems, fodder cultivation and conserva-tion, protective structures) developed and piloted by CRDEs to reduce climate vulnerability of the agricultural sector. 3.2 financial products developed and made accessible to smallholder farmers to support the adoption of climate-resilient practices 3.3 Local supply of agricultural inputs, small-scale equipment and climate-resistant varieties seeds developed. 3.4 Agricultural practices to strengthen agriculture and pastoral resilience, in-cluding the provision of climate-adapted crop varieties and breeds, implemented 3.5 Incentives (traceability and certifica-tion) in place to foster the adoption of climate resilient and sustainable prac-tices across traditional and new value chains.	LDC F	6,062,582.00	14,460,134.00

4. Knowledge Management, Monitoring-Evaluation, and Gender and PWDs' Inclusiveness	Technical Assistance	Outcome 4. Improved development, management and dissemination of knowledge related to adaptation of the agricultural sector to climate change to support the replication of climate-resilient solutions among CRDEs, nationally and in the region.	4.1 Lessons learned from the project interventions are documented and disseminated 4.2 Agro-climatic knowledge for climate adaptation developed through strengthened monitoring and research-action involving farmers 4.3 Tools for experience and knowledge-sharing among CRDEs and actors in value chains are developed and operationalized 4.4 Gender and PWDs action plans based on comprehensive analyses are implemented, monitored, and evaluated to promote an inclusive approach to the adoption of a climate-resilient agriculture.	LDCF	848,897.00	753,635.00
				Sub Total ($)	**8,507,067.00**	**43,903,769.00**
Project Management Cost (PMC)						
				LDCF	425,353.00	2,310,725.00
				Sub Total($)	**425,353.00**	**2,310,725.00**
				Total Project Cost($)	**8,932,420.00**	**46,214,494.00**

Please provide justification

C. Indicative sources of Co-financing for the Project by name and by type

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Recipient Country Government	Government of Comoros	In-kind	Recurrent expenditures	2,293,300.00
GEF Agency	UNDP	Grant	Investment mobilized	200,000.00
Recipient Country Government	Government of Comoros / Ministry of Agricul-ture, Fisheries, Environment, Tourism and Handi-craft (PIDC, PREFER, PASAICV, GCF-Water)	Public Investment	Investment mobilized	29,721,194.00
Recipient Country Government	Government of Comoros/ Ministry of Maritime and Air Transport (Connectivity Project)	Public Investment	Investment mobilized	14,000,000.00
			Total Project Cost($)	**46,214,494.00**

Describe how any "Investment Mobilized" was identified

The investments mobilized as co-financing are resources committed for the period of implementation of the GEF project by the implementing partner, the GEF agency itself (UNDP in this case) and by other non-GEF sources and which are essential to achieve the objectives of the project. Outcomes of these grant projects serve as ‘in-kind’ activities to support the GEF project. The amounts have been accounted for taking into account the budgeted costs of the planned interventions that will directly contribute to the expected results of the GEF project, excluding recurrent costs, for the period corresponding to its implementation.The investments mobilized are presented in Table 4. Externally funded baseline projects, and in the paragraph on Baseline projects expected for the 5-year project implementation period (2023-2028) (under Section 2. Baseline scenario and associated baseline projects) which details contributions to the project activities and outputs. While baseline projects include ongoing and planned activities/initiatives taking place during the project period (e.g. business-as-usual scenario, taking place without GEF funding) that contribute to the project objective, baseline projects identified as potential “co-financing” are non-GEF funded initiatives for which appropriate supporting evidence is available (such as project documents) and for which a co-financing letter will likely be obtained to be submitted for CEO Endorsement Request.

D. Indicative Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)	Total($)
UNDP	LDCF	Comoros	Climate Change	NA	8,932,420	848,580	9,781,000.00
				Total GEF Resources($)	**8,932,420.00**	**848,580.00**	**9,781,000.00**

E. Project Preparation Grant (PPG)

PPG Required **true**

PPG Amount ($)

200,000

PPG Agency Fee ($)

19,000

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)	Total($)
UNDP	LDCF	Comoros	Climate Change	NA	200,000	19,000	**219,000.00**
				Total Project Costs($)	**200,000.00**	**19,000.00**	**219,000.00**

Meta Information - LDCF

LDCF **true**

SCCF-B (Window B) on technology transfer **false**

SCCF-A (Window-A) on climate Change adaptation **false**

Is this project LDCF SCCF challenge program?

false

This Project involves at least one small island developing State(SIDS).

true

This Project involves at least one fragile and conflict affected state.

false

This Project will provide direct adaptation benefits to the private sector.

true

This Project is explicitly related to the formulation and/or implementation of national adaptation plans (NAPs).

false

This Project has an urban focus.

false

This Project covers the following sector(s)[the total should be 100%]:*

Agriculture	90.00%
Natural resources management	0.00%
Climate information Services	5.00%
Costal zone management	0.00%
Water resources Management	5.00%
Disaster risk Management	0.00%
Other infrastructure	0.00%
Health	0.00%
Other (Please specify:)	0.00%
Total	100%

This Project targets the following Climate change Exacerbated/introduced challenges:*

Sea level rise	Change in mean temperature	Increased Climatic Variability	Natural hazards
false	**true**		**true**

	true	
Land degradation	Costal and/or Coral reef degradation	GroundWater quality/quantity
true	false	false

Core Indicators - LDCF

CORE INDICATOR 1	Total	Male	Female	% for Women
Total number of direct beneficiaries	98,188	48,898	49,290	50.20%

CORE INDICATOR 2	
Area of land managed for climate resilience (ha)	7,568.00

CORE INDICATOR 3	
Total no. of policies/plans that will mainstream climate resilience	8

CORE INDICATOR 4		Male	Female	% for Women
Total number of people trained	24,433	12,107	12,326	50.45%

Part II. Project Justification

1a. Project Description

1) Global environmental and adaptation problems, root causes and barriers that need to be addressed

Geography: The **Union of the Comoros** is a small island state of volcanic origin located off the eastern coast of Africa, in the North of the Mozambique Channel, a maritime area of the South West Indian Ocean. The land area of the three islands is 1,862 km^2 (Ngazidja 1,148 km^2, Ndzuani 424 km^2, Mwali 290 km^2) and the exclusive economic zone of the Comoros covers a total area of 160,000 km^2. Due to the volcanic origin of the archipelago, the continental shelf is very narrow and covers only 900 km^2 for the three islands, isolated from each other by deep sea trenches. The topography is varied, including an active volcano, generating various ecogeographic zones with a rich diversity of forests, agricultural and coastal ecosystems which shelter a significant biodiversity. This rich biodiversity provides essential ecosystem services to the people of Comoros, especially to poor communities in rural areas, including providing food through agriculture, fishing, pastoralism and the collection of natural products, medicinal plants, fodder, firewood and timber and tourist assets.

Population and demographic pressure: The population of Comoros is estimated at 869,595 in 2020, for a density of 467 inhabitants/km^2, of whom 29.16% live in urban areas (2019 est.). The population of Comoros is characterized by its extreme youth, nearly 50% being under 15 years old for a median age of 20.4 years. High population pressure, combined with poor economic development, inappropriate land use planning and practices, especially on steep slopes, have resulted in soil degradation and erosion, reduced productivity, and placed intense pressure on natural ecosystems, thus exacerbating the poverty of rural communities whose livelihoods depend on agriculture and natural resources. A study carried out by FAO in 2011 estimated that 57% of agricultural land was degraded, with degradation rates of 50% in Ngazidja, 52% in Mwali and 57% in Ndzuani.

Socio-economy[1]: Gross domestic product (GDP) is 2.6 billion (2017 PPP$[2]) and gross national income (GNI) per capita is 3 099 (2017 PPP$) (2,300 for women and 3,885 for men). Although classified as a lower middle-income country, the Comoros remains behind on many dimensions of development, with 37.3 of Comorians living in multidimensional poverty and 42.4% living below the national poverty line. The value of the Human Development Index (HDI[3]) of 0.554 in 2019 (0.519 for women and 0.583 for men) ranks the country at 156th out of 189 countries. It is lower than the average for countries in the medium human development group (0.631), and higher than the average for countries in sub-Saharan Africa (0.547). The Gender Development Index, which measures inequalities in health, education, and access to economic resources between men and women, is 0.891 for 2020.

Agriculture including fishing and livestock are the main activities of the rural population. Agriculture accounted for 47.7% of the country's GDP in 2017, employs 80% of the country's labour force, and constitutes the major part of exports, which underscores its importance to Comoros economy. In 2019[4], the cash crops accounted for over 67% of exports: clove - 32.5% ($ 25 million), vanilla - 10.5% ($ 8.06 million), ylang-ylang - 23.8% ($ 18.3 million). Despite agriculture's importance to the economy, the country imports roughly 70% of its food; rice, the main staple, and other dried vegetables account for more than 25% of imports.

The economy of Comoros is hampered by a number of constraints, including *i*) the narrow base of export income that rests heavily on three cash crops (vanilla, cloves and ylang-ylang), *ii*) the small size of domestic markets, the geographic dispersion of the islands, remoteness and poor links with regional and global export markets and inadequate transport links, *iii*) the small size of cultivable areas which limits production capacity, prevents any economy of scale,

and reduced the Comoros's hold on markets and in the face of international competition, *iv*) the country's near total dependence on imports of petroleum products since 96% of electricity (2016 est.) is produced from fossil fuels while 4% comes from hydropower, *v*) insufficient capacities and low degree of specialization of labourers, *vi*) lack of transformation capacity for agricultural products and of phytosanitary controls which reduce opportunities to access external markets, and *vii*) the aging of the agricultural workforce due to the rural exodus of young people who perceive the agricultural profession as unattractive, if not degrading. These barriers lead to considerable extra costs in energy, infrastructure, transport, and supply of inputs. Women face an even greater adaptation challenge due to customary rules that restrict their access to agricultural land. The export earnings of the Comoros are also vulnerable to the effects of climate change, including natural disasters such as cyclones, floods and fires.

COVID-19 pandemic. In Comoros, from 3 January 2020 to 16 March 2022, there have been 8,072 confirmed cases of COVID-19 with 160 deaths, reported to WHO[5].

Socioeconomic impacts of the pandemic**.** The Comoros is a small island developing state, fragile, highly dependent on remittances from the diaspora and external aid. The economy is weakly diversified, made up of small and fragmented markets, dependent on international trade and whose business fabric is dominated by informal MSMEs. As a SIDS relying heavily on importations, increase in raw materials and freight costs have a disproportionately higher impact on the Comoros islands. The country is therefore very sensitive and vulnerable to economic, climatic and health shocks. Expected at 4.4% in 2020, economic growth was only 0.2%. It had averaged 2.7% per year from 2015 to 2019 and should be around 2.2% in 2021 according to the Central Bank of the Comoros. Public finances have been affected by the pandemic due to additional spending related to health and business support measures, lower domestic revenues due to tax measures to help businesses and households, the slowdown in international trade, and a reduction in the trade balance due to the drastic drop in exports. In 2022, despite a weak recovery, several risk and uncertainty factors remain, including the appearance of new variants, the persistence of supply chain problems, and the global crisis linked to the war in Ukraine.

The Emerging Comoros Plan (PCE) developed and validated in 2019 constitutes the reference strategic framework for the country's development. Its implementation had started in 2020 but was hampered by the Covid-19 pandemic. The government had to focus most of its efforts and resources on the health response to mitigate the socio-economic effects of the pandemic. A study of the impact of Covid-19 on the economic and social development of the Comoros[6] includes recommendations for adjusting the operationalization plan of the PCE.

While the health situation has been relatively well under control and the spread of the virus in the Comoros seems contained so far, economic activity has slowed down sharply, mainly affecting tourism and trade, and the socio-economic impacts are significant. The island of Mwali, which had to be put in total confinement for a few weeks, was even more severely affected. **The agricultural sector** suffered the repercussions of the pandemic a year after the impacts of Cyclone Kenneth which hit the Comoros in 2019. These include i) a 41% decrease in exports (BCC, 2020) which directly affected the incomes of farmers and economic operators within cash crop export value chains, including income losses of around 67% in the cash crop sector (vanilla, ylang-ylang, cloves) following the reduction in exports in 2020; (ii) a difficult supply of inputs for food crops and poultry production due to border closures; iii) weak growth in demand and prices in 2020, and lower incomes of agricultural households, due to the limitation of inter-island trade due to restrictions, weak demand for hotels and restaurants and absence of the diaspora. The pandemic has reinforced *inequalities*, especially to the detriment of young people, women and marginalized populations who live in rural areas, but also groups who hold precarious jobs in the informal sector and who live from day to day. The effects of the pandemic have increased the difficulties in selling agricultural products and the consequent losses for small farmers, thus increasing their vulnerability.

Climate. The Comoros have a humid subtropical climate, with a hot and humid season from November to May, and a cooler dry season, from May or June to October. According to current data from World Clim reported in Bourgoin et al. 2017, the rainfall in the rainy season is 1296 mm in Ngazidja, 1926 mm in Ndzuani and 1263 mm in Mwali. In the dry season, Ngazidja gets about 211 mm, Ndzuani 462 mm and Mwali, 275 mm. An analysis published in 2016[7]

evaluated the average annual losses caused by earthquakes, floods and tropical cyclones suffered by Comoros at $5.7 million, of which 64% are caused by cyclones and 35% by floods. The residential sector had suffered 80% of the losses.

Natural hazards. The Comoros are vulnerable to various types of hazards including i) hydrometeorological (tropical storms and cyclones, floods, rising ocean waters, ii) geophysical (volcanic eruptions, earthquakes, landslides), iii) biological (epidemics) and iv) technological (accidents and shipwrecks)[8]. Weak disaster preparedness and response capacity aggravate the country's vulnerability. Given the high vulnerability of individuals and communities, these hazards often cause human losses, destruction of property, environmental degradation and affect strategic infrastructure and means of communication.

Comoros' vulnerability to climate change. The Country is particularly vulnerable to climate change, like other Small Island Developing States (SIDS). Due to its location and topography Comoros is among the most climate vulnerable countries in the world, and 54.2 percent of the population live in at-risk areas. The climate risk index of 25.33 for the year 2019 places the Comoros 16th (out of 180) of the countries most at risk[9]. This value is mainly attributable to the passage of Cyclone Kenneth in April 2019 while the longer-term climate risk index, for the period 2000-2019, is 90.00 corresponding to the 97th rank.

Analyzes of meteorological data showed a gradual decrease in rainfall, an upward trend in annual temperature and sea level rise, and increased aridity. Over the last 40 years, the proportion of dry versus wet years has steadily increased, going from 20% dry years to 80% wet years for the decade 1971-1980 to 80% of dry years for 20% wet years for the decade 1991-2000. A decrease in rainfall of 30% and an increase in the annual average temperature of 0.9°C are reported for the last few years. Due to its volcanic origin, the country has very few watersheds and aquifers, and a low natural water storage capacity. The Comoros are therefore extremely vulnerable to the amplification of rainfall variability linked to climate change, especially since the rural population is entirely dependent on rainwater harvesting. Models predict an increase in the annual average temperature, as well as increasing and intensifying risks associated with climate change, such as sea level rise, floods, droughts, and cyclones.

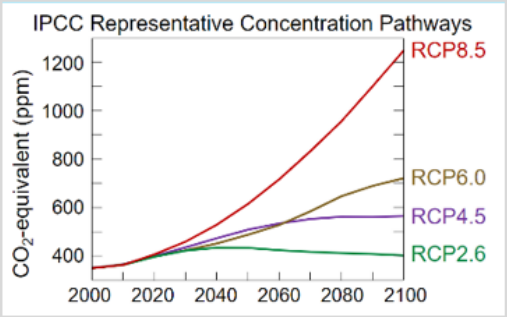
Impacts of climate change. The previously described changes related to increased temperature, decreased rainfall, more frequent tropical storms, and heat waves, and causing a disruption of the two major seasons will lead to reduced agricultural and fishery production. The rise in sea level, combined with coastal erosion, threatens coastal ecosystems, coastal groundwater, coastal forests, equipment, and infrastructure, especially roads, and most coastal communities. Combined with anthropogenic pressures (deforestation, land degradation, sand extraction, inappropriate agricultural practices, etc.) exerted on natural resources, these hazards are likely to strongly compromise the development efforts undertaken by the country in recent years and worsen the vulnerability of already fragile ecosystems and populations. The country's vulnerability to climate change is also linked to poverty, which is more prevalent in rural areas, unemployment which particularly affects young people and women, and high demographic growth. The results of vulnerability analyses carried out in the Comoros[10] show that the sectors most vulnerable to climate change are agriculture and biodiversity (very high vulnerability), forestry, coastal areas, fishing, water resources, health, and economic and social infrastructure (high vulnerability). Based on models' predictions, the economic growth of the Comoros is likely to become more precarious. Without ambitious measures, the cost of climate-related impacts was estimated in 2014 at US$ 836 million by 2050, or an average annual cost until 2050 of US$ 23 million[11]. The lack of preparation of its institutions to face the climate threat and the biodiversity crisis, the high level of poverty and the economy's dependence on unsustainable and undiversified agriculture combine to make the Comoros particularly vulnerable to the global and local environmental degradation.

Impact of climate change on natural disaster risks**.** The effects of climate change in Comoros are increasing the frequency of extreme weather events such as cyclones, prolonged heavy rainfall, droughts, sea level rise, floods, and landslides. Thus, over the past thirty years, an increase in the frequency and severity of storms, floods and landslides has been recorded. During the rainy season, strong winds and tropical cyclones affect the Comoros, causing significant material and human damage. The average annual frequency affecting the country varied from 1 cyclone every 2 years between 1911 and 1961, to 1.3 cyclone per year from 1967 to 1976, and 0.7 cyclone per year between 1987 and 2019. Volcanic risk in the Comoros is essentially linked to the Karthala, an active volcano located on Ngazidja, the most populated island where the main socio-economic infrastructures of the country are found. While eruptions used to occur once

every 11 years on average, four eruptions have occurred since 2005. Although the possibility that climate change is influencing the frequency of volcanic eruptions is raising research interest, a link between the two phenomena cannot currently be assumed. Two of these recent eruptions were explosive of the phreato-magmatic type and caused ash fallout which sealed the ground and aggravated the runoff during heavy rains, leading to landslides and floods.

Projections for the Comoros climate variables based on future RCP climate scenarios. Climate projections (temperature and precipitation) are based on the IPCC greenhouse gas (GHG) emission scenarios. In its fifth assessment report, the Intergovernmental Panel on Climate Change (IPCC) introduced Representative Concentration Pathways (RCP) scenarios to model the future climate for the years 2000-2100 on the basis of four assumptions concerning GHG emissions. RCP 8.5 is the most pessimistic, nonetheless probable since it corresponds to maintaining current levels of GHG emissions (See Table 1).

Table 1. Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathways (RCP) scenarios

	Scenario	Type of scenario	Expected mean increase in global T (°C)
	RCP 2.6	Significant reduction in GHG emissions	1.5 – 2
	RCP 4.5	Mitigation of GHG emissions where radiative forcing is stabilized before 2100	2.7
	RCP 6.0	Mitigation of GHG emissions where radiative forcing is stabilized after 2100	3.5
	RCP 8.5	Extreme scenario where GHG emissions increase	4.5

Temperature. The values in the table show a gradual increase in the average temperature between scenarios in the short (2030) and medium (2050) terms, yet a larger long-term (2100) increase of up to 5.2 degrees compared to the 2014 reference year – such differences being reflected in the minimum and maximum temperatures.

Precipitations. Historical trends for annual precipitation over the period 1931-2011 show a very small positive average increase although with great interannual variability due to the influence of global phenomena such as El Niño. The projections for average annual precipitation show an oscillating pattern over time under both scenarios, but increasingly variable as shown by increased gaps between lowest and highest values. Seasonal projections predict a reduction in precipitation during the dry season from June to November and an increase during the rainy season, particularly the months of December to February.

Sea level. The impact on sea-level shows a steady and similar rise in the short and medium term under both scenarios, but a sharper increase in the long term where both scenarios show values that are more clearly differentiated, the RCP 8.5 scenario leading to sea level rise of up to one meter.

Table 2. Mean projections for essential climate variables and impact on sea level based on future climate scenarios RCP 4.5 and 8.5 in 2030, 2050 and 2100. Data from the WB Climate Knowledge Portal[12].

Climate variables	Scenario	Reference	Projections		
	RCP	2014	2030	2050	2100
Mean Temperature (°C)		25.9-26.6			
	4.5		26.1-27.0	26.5-27.6	27.1-28.4
	8.5		26.3-27.1	26.8-27.9	28.5-31.1
Minimum Temperature (°C)		23.3-23.9			
	4.5		23.5-24.3	23.9-24.8	24.4-25.6
	8.5		23.6-24.4	24.2-25.2	25.9-28.3
Maximum Temperature (°C)		28.4-29.0			
	4.5		28.6-29.4	29.0-30.0	29.5-30.8
	8.5		28.7-29.5	29.2-30.3	31.0-33.4
Precipitation (mm)		888.3-1550.0			
	4.5		791.7-1584.2	813.8-1553.6	780.5-1689.2
	8.5		802.3-1584.4	788.2-1530.0	740.5-1627.7
Sea-level rise (m)	ref: 2007	-0.02 - 0.07			
	4.5		0.11-0.17	0.23-0.32	0.51-0.68
	8.5		0.11-0.18	0.25-0.33	0.72-0.96

Vulnerability of the agricultural sector to climate change.

According to the NAPA[13], the agricultural sector is most exposed to climate risk in the Comoros where small farmers are the group most vulnerable to climate change. The expected impact of climate change on the agricultural sector has mainly been described in terms of biophysical risks associated with projections of increased temperatures, reduced and changing patterns of precipitation, and sea level rise. Agriculture is already experiencing significant difficulties due to the increase in temperature, the change in rainfall and the intensity of the rains. The country is also exposed to the multiplication and aggravation of the violence of cyclones, which causes a decline in yields and disrupts the food security of families. Hazard plans (floods, droughts, sea level rise) have been developed by the General Directorate of Civil Security. These projections predict that i) the effects of drought will affect more the north and northeast coast of Ngazidja, ii) the effects of sea level rise will be felt mostly along the coasts of Mwali and Ndzuani, particularly on the Bimbini peninsula, as well as other areas regularly flooded by high tides on the three islands, and iii) that the risks of soil erosion are greater in the North, East and South of Ngazidja, and West, East and South of Ndzuani. In addition to these forecasts, the effects of drought were also observed on the southeast coast of Ndzuani. This expected impact was described in the IOC Acclimate project report (2011) and the Second National Communication on Climate Change (2012). Annual field crops, grown without tree cover, on bare soil and without the addition of organic matter, would be more vulnerable to water erosion and would be the most exposed to climatic hazards. Food crops grown under forest cover would be a form of agroforestry that is more resistant to climate change. The cash-crop monocultures that occupy part of the coastal zone (coconut palms and ylang-ylang) and low-lying areas (clove and vanilla trees) will be threatened by the rise in sea level and the intrusion of sea water into the coastal groundwater.

Effects of climate change on agroecosystems and agricultural practices as experienced by smallholder farmers

As part of the development of the concept note, interviews were conducted with farmers on their experience of the effects of climate change on their practice and production. The information gathered from them is presented in the following. The most frequently mentioned effects are listed according to the frequency of mention, although several of these effects are directly related to each other: (i) Lengthening of the dry season which increases water stress and frequency of droughts, and make traditional crop calendars inadequate, (ii) Intensification of the rains over short periods, leading to erosion of agricultural land, frequent flooding of plots and falling of flowers and flower buds, (iii) Emergence of new pests and diseases, (iv) Decrease in the numbers of bees and other pollinating insects, (v) Increased frequency and extent of bush fires, (vi) Decrease in Comoros agrobiodiversity, and (vii) Higher frequency of strong winds and cyclones.

(i) The lengthening of the dry season is the dimension of the effects of climate change that is perceived by farmers as the one that affects them the most. While the dry and rainy seasons alternated over periods of approximately 6 months, the rainy season is now shifted by at least 2 months and lasts only 3 to 4 months, thus increasing water stress and droughts. As a corollary, **the inadequacy of traditional cropping calendars** leads to difficulties in planning.

Unsuccessful and delayed seedlings. This shift disrupts the crop calendar, especially since agriculture in the Comoros is mainly rainfed, i.e. it depends entirely on rainfall for water supply. During the usual sowing period for vegetable crops, the soil does not contain enough water to ensure germination and sowing must therefore be delayed. Lack of control over a cropping calendar adjusted to changing meteorological parameters leads to the loss of part of the seeds, which import[14] cannot be renewed in the short term. Part of the seedlings is thus lost due to the lack of an independent seed supply. At the end of the cultivation period, tomatoes, cucumbers and cabbages whose sowing has been delayed have not reached their maturity and the harvest thus loses in quantity and quality. These economic losses affect producers even more as they depend on vegetable crops for rapid gains, compared to cash crops.

Flowering delay and flower bud abortion. The shift in seasons also affects the flowering period of cash crop species and thus the crop calendar, especially for the manual fertilization of vanilla flowers and the harvest of ylang-ylang and clove flowers. The prolongation of the flower ripening period caused by the drought delays the collection of ylang-ylang flowers and the pollination of vanilla flowers and extends this period until the start of the heavy rains, causing significant losses. The change in rainfall also affects the yields of cash crops by the abortion of flower buds (ylang-ylang and vanilla) or even by the suppression of flowering (cloves) as observed for over 5 years in the Pomoni region. Producers on the islands of Ngazidja, Mwali and Ndzuani say this effect can lead to the loss of up to 75% of production. Some sites are affected more than others but the information available does not allow these variations to be clearly linked to meteorological parameters.

Decreased availability of water for irrigation. The decrease in rainfall, especially in the dry season, combined with the effects of deforestation on soils, water retention capacity, and recharge of groundwater, resulted in a decrease of water level of rivers (in Mwali and in Ndzuani) and therefore of the availability of water for irrigation. This effect occurred quite abruptly in the region of Shissiwani (covered by the CRDE of Pomoni, in Ndzuani) following the significant deforestation for the construction of the road connecting Dindri and Lingoni in 2018. The CRCCA project supported the construction of infrastructure to store water[15], but the number of infrastructures remains insufficient to ensure crop irrigation throughout the area served by the CRDEs. The support of the GCF - Water project provides for the construction of new structures, some of which are planned in the project intervention areas[16] without however reaching farmers' plots.

Increased predation by birds. The decrease in rainfall also affects birds, which, when thirsty, attack the young vanilla pods. The species which are associated with this damage include the Grand Comoro Bulbul[17] (*Hypsipetes parvirostris* -VU), the Blue-tailed Bee-eater (*Merops superciliosus superciliosus,* although known as insectivorous), and the Comoros Fody, endemic to Comoros (*Foudia eminentissima*).

Drying up of vanilla plants. Due to the lengthening of the drought period, the trees that make up the canopy in areas where vanilla is grown may lose their leaves. Optimal shade for vanilla is around 60%. Too much sunshine inevitably causes burns to the leaves and stems and can lead to the death of the vanilla plant. Plants cultivated under forest or under mango trees survive better.

(ii) The intensification of the rains over short periods and its direct consequences in terms of erosion of agricultural land, frequent flooding of plots, and falling of flowers and flower buds.

Flooding and water erosion of arable land. While the rainy season is shorter, the rain episodes are much more intense, frequently leading to flooding of cultivation plots and water erosion of the topsoil layer caused by runoff, which is accentuated by the slightest slope, by poor plowing practices and insufficient crop rotation and soil conservation practices.

Erosion. Monocultures, which consist of growing the same crop on the same plot, year after year, are widespread in the Comoros and increase the vulnerability of crops to climate change. Monoculture leads to a cascade of problems, reducing the organic content and nutrients in the soil, making it less productive over time and more vulnerable to water and wind erosion, favoring the establishment of diseases and pests that easily locate their host every season and thus cause devastating infestations. The loss of soil fertility increases reliance on the use of synthetic fertilizers and pesticides to control pests and diseases, such as fungi, insects, and other agricultural pests, with the associated risks for the health of users and the environment. However, the use of such chemicals in Comoros is limited by their unavailability and high cost.

Soil quality is also influenced by climate changes since organic matter content is sensitive to temperature, water availability in the soil and the amount of organic matter from crops.

The systematic adoption of soil conservation and restoration practices is particularly appropriate in the Comoros due to the rugged relief of a large part of its area. The practice of terraced cultivation by building stone walls or planting vegetation along the contour lines is initiated in a few sites but its adoption is hampered by the intensity of the work required, the insecurity of land tenure which discourages farmers to invest in their plot and their resistance to the adoption of new practices due to their older age profile and low level of education. The CRDEs teams are young and likely use a technical language with which the older farmers are not familiar.

Floods. Heavy rains cause rivers to overflow and flood plots located nearby, in particular in Djando (CRDE Mibani, Mwali), in the Shissiwani region (CRDE Pomoni, Ndzuani) where the problem is critical, and in the Bambao Mtsanga region (CRDE Bambao - Ndzuani). Heavy rains also destroy roads in rural areas that are built without ditches, including tracks that lead to fields, hampering the evacuation of produce to markets. The farmers are mobilizing to repair roads, but these efforts remain insufficient. The WB's IPDC project provides for the rehabilitation of rural roads in priority areas to enable production areas to be linked to markets, including in certain planned intervention areas of the new project[18]. Another effect of heavy rains is to abort clove flower buds.

(iii) The evolution of climatic conditions have favored the **emergence of new pests and diseases**, including the increased occurrence of fungal diseases in the rainy season, such as vanilla rust or fusarium which causes the rotting of vanilla vines and pods and other fungal diseases affecting vegetables, taro and bananas - especially when the soils are poorly drained. Climate change also amplifies the risk of the establishment of new potentially invasive species (diseases and pests), often introduced via seeds (seeds, cuttings and banana shoots) that are contaminated and not adequately controlled. The pest and disease species are known[19] and monitoring is carried out by INRAPE. However, the methods of control have yet to be developed and disseminated. The CRDEs are testing control methods and biological solutions (repellents) have given promising results. Training on plant health and biological control against new pests in Africa was provided to CRDEs by FAO and INRAPE in May 2021 as part of a project[20] and introduced trapping techniques with pheromones and biological control using repellent crops.

(iv) Farmers have observed a decrease in the number of bees and other pollinating insects, whose role is essential for all agricultural production. While undoubtedly due to loss of natural habitats through agricultural encroachment, uncontrolled bush fires for grazing and disease, this decrease is also linked to the effects of climate change. The development, survival and activity of pollinating insects are affected, which significantly impacts agriculture as they are a determining factor in the yields of many crops. A large study[21] of pollinating insects has linked the increasing frequency of unusually warm days, increasing local extinction rates, reduced colonization and site occupancy, and decreased species richness in an area, regardless of the change in land use or condition. Over the years, many projects have supported the development of beekeeping without real success commensurate with its potential. The PREFER project financed by IFAD (under implementation) supports the multiplication of beehives in other CRDEs in the country.

(v) Another effect associated with climate change is the increased frequency and extent of bush fires in the dry season, from May to December. These fires can be spontaneous or started by pastoralists and farmers who practice slash-and-burn agriculture. Herders do not cultivate fodder and depend entirely on fodder in the natural environment. However, this fodder is affected by the lengthening of the drought period. Herders then resort to these fires, despite being illegal, to improve the palatability of pasture grasses, especially in Ngazidja. Practiced in areas increasingly remote from human settlements, left unattended and uncontrolled, they extend over increasingly large areas, mainly affect vanilla plantations and are harmful to all the biodiversity of the affected forest areas, including pollinator species. Spontaneous fires caused by intense drought are increasingly frequent and devastate large areas. In 2020, four (4) bushfires devastated the entire Diboini CRDE area. In order to fight against these fires, the UNDP-GEF project "Strengthening the resilience of the Comoros to disaster risks related to climate change and variability" supported the plantation of ylang-ylang to increase the value of plots and thus encourage farmers to better watch and fight the spread of fires.

(vii) The decrease in Comoros-specific agrobiodiversity caused by the scarcity, or even the disappearance, of local species is due to diseases and the abandonment of local traditional varieties by farmers who have preferred introduced varieties that are more productive and resilient in the face of diseases such as Sigatoka, without ensuring the regeneration of local varieties. Yet, local varieties can be more resilient under certain conditions and to various current or future diseases, and the loss of this genetic diversity decreases the adaptation potential of the agricultural sector to the effects of climate change.

(vii) The increased frequency of strong winds and cyclones has destructive effects in particular on cloves, bananas, coconut palms (uprooted trees and broken branches), ylang-ylang (destroyed flowers and broken branches, thus delaying the production of new flowers which depends on well-developed branches), and on market gardening.

Effects of climate change on agricultural production

For the interviewed farmers, these changes have had the following impacts: lower annual yields and production, reduced quality of products, reduced annual income, and increased vulnerability of the rural population to potential health, economic, and environmental hazards. The national statistics available to support these observations are very limited. The only available data have been used to illustrate the evolution of yields for the main crops in Comoros from 1997 to 2004 (in tonnes/ha) and are presented in Table 3 (Source of data: National Directorate of Agricultural Strategy/ Ministry of Agriculture, Fisheries and Environment (Data for 1997 – 2002: IMF Mission, Data for 2004: FAO-2004 Agricultural Census Report). Despite the limited temporal coverage of agricultural statistics (data limited to the years 1997 to 2002 and 2004), a constant drop in annual production is observed for all cash crops (vanilla, ylang-ylang, cloves), vegetables and food crops. Crop yields measured in tonnes per hectare decreased from 14% to 58% between 1997 and 2004 and this decrease is likely linked to the effects of climate change. The drop in production, particularly observed for ylang-ylang, is consistent with the lower yields per hectare. However, the interpretation of these data is more complex due to the fluctuation of cultivated area, in addition to varying climatic conditions. Nevertheless, the apparent decrease in the yields of other agricultural crops is possibly attributable to increased drought and topsoil erosion. A decline in product quality such as a decrease in the vanillin content, and a reduction in the size of cloves, was reported by buyers but could not be verified by Comorian producers due to a lack of analytical capacity. It could be attributed to growing conditions that are increasingly unsuitable for the varieties being grown. The resulting socioeconomic

impact is related to a decrease in the production of cash, food and vegetable crops, and to reduced competitiveness of local crops compared to crops from competing countries. This leads to increased precarity of incomes for smallholder farmers, reduced supply and increased price of basic food products for local consumers, which translates in reduced accessibility of these products for vulnerable households.

Table 3. Evolution of the yields of the main crops in Comoros from 1997 to 2004 (in tonnes/ha)

CROPS	1997	1998	1999	2000	2001	2002	2004	Reduction rate 1997-2004
Cash crops								
Vanilla	7.976	7.654	7.053	6.831	6.045	5.812	5.399	32%
Ylang-Ylang	4.946	4.642	3.923	3.703	2.813	2.560	2.057	58%
Clove	4.920	3.294	3.062	3.647	2.176	2.432	2.522	49%
Food crop								
Banana	11.045	10.920	10.775	10.132	9.962	9.712	9.345	15%
Cassava	11.804	11.164	11.033	10.902	10.715	10.298	10.150	14%
Sweet potato	10.935	10.832	10.581	10.063	9.913	9.743	9.289	15%
Yam	6.597	6.391	5.821	5.498	5.069	4.967	4.620	30%
Taro	8.962	8.784	8.392	7.925	7.603	7.513	7.405	17%
Corn	4.497	4.102	3.903	3.542	3.092	2.875	2.280	49%
Vegetables								
Tomato	5.096	4.795	4.147	3.872	3.143	2.891	2.117	58%
Potato	10.642	10.064	9.875	9.569	9.123	8.762	8.430	21%

Source of data: National Directorate of Agricultural Strategy, Ministry of Agriculture, Fisheries and Environment (Data for 1997 – 2002: IMF Mission, Data for 2004: FAO-2004 Agricultural Census Report).

Vulnerability of livestock and poultry to the effects of climate change

Climate change is a major global threat to the sustainability of livestock systems. Temperature fluctuations are the climatic factor having the most impact on livestock production and animal welfare, in addition to other factors like relative humidity, direct and indirect solar radiation and wind speed influence feed and water availability, fodder quality and disease occurrence. Continuous exposure of the animals to heat stress compromises growth, milk and meat production and reproduction. The capacity of an animal to mitigate effects of increased environmental temperature, without progressing into stress response, differs within and between species[22]. Comparatively, small ruminants are better adapted to hot environments than large ruminants and have better ability to survive, produce and reproduce in harsh climatic regions. Goats have numerous advantages that enable them to maintain their production under extreme climate conditions, the main one being their higher capacity than other farm-raised ruminants to effectively convert some feed sources into milk and meat. In addition, goats emit less methane than other domestic ruminants[23]. It has been found that tropical breeds are more adaptive to hot climates than high-producing temperate breeds. Selection of thermotolerant breeds, through identification of genetic traits for adaptation to extreme environmental conditions including high temperature, will contribute to increase is the resilience of smallholder households to the effects of climate change. The review by Joy et al. 2020 which highlights such adaption within and among different breeds of small ruminants challenged by heat stress may support the selection of adapted breeds.

Poultry is widely owned by rural households in Comoros, who raise mainly local breeds through semi-intensive (about 1000 heads per henhouse) and traditional (3 to 5 adults and a few chicken) poultry farming. Semi-intensive breeding is done on the ground most often in small unit henhouses made of corrugated sheets and wire mesh to improve ventilation. The supply of quality feed at an affordable cost is a major constraint. In traditional poultry farming, birds are free-roaming and feed on wild grain, insects, or kitchen or harvest residues, without the supply of water to drink. Rural poultry production mostly serves to supplement other farming activities in poor rural communities and contributes significantly as a source of scarce animal protein and income. Very few poultry farmers have had specific training in poultry farming.

Climate change is a severe challenge to poultry farming due to its negative effect on chicken growth and productivity which mainly depend on climatic conditions such as temperature and humidity. When faced with heat stress, chickens reduce their feed intake to regulate their internal temperature which affects their growth and productivity[24], including egg production, weight, and quality, meat quality, semen quality, fertility and hatchability. Since high ambient temperature has an antagonistic effect on performance traits of the poultry, selection of birds for high performance has increased their susceptibility to heat stress.[25] Surveys conducted in Nigeria have shown that medium and large farms more easily adopt modern strategies such as air and water ventilation as well as the use of low energy lighting while many small farms stick to traditional practices such as the stocking of local breeds, and that farmers who have experienced heat-related losses are more likely to adopt modern practices and multiple adaptation strategies, thus stressing the importance of extension services and training for smallholder farmers. Where modern strategies are inappropriate due to farm size, efforts to breed faster growing more adaptable breeds (higher tolerance of heat stress) could be helpful[26]. Yet, environmental modifications (early heat conditioning, open sheds and cooling systems) and nutritional strategies (early feed restriction, electrolyte, vitamin and mineral balance) cannot fully address the special needs of heat-stressed poultry. Exploring effective strategies including selecting specific poultry breeds with higher thermo-tolerance and productivity is crucial in hot regions.[27]

The proposed LDCF project aims to address the above-mentioned issues as experienced by farmers, namely declining yields and quality of traditional crops related to inevitable impacts of climate change, the climate vulnerability of the agricultural sector due to its low diversification, and the lack of capacity of national institutions and value chains actors, including smallholder farmers, to develop, supervise and implement effective and profitable climate-adapted solutions that will provide decent and resilient livelihoods to actors involved. The long-term solution for addressing these climate change related issues under this project is as follows: Farmers and other actors in value chains are less vulnerable and more resilient to disruptions caused by climate change thanks to a

more diversified, adapted and profitable production, professional supervision encouraging the adoption of climate-smart practices, more autonomous supply of inputs, better risk management and better access to knowledge and training. The project will thus reduce dependence on imported food, and increase access to better quality, locally produced food.

The main **barriers** to achieving the long-term solution for reducing climate vulnerability of smallholders and major value chains are as follows:

Barrier 1. Insufficient capacities at different levels to plan and implement innovative agro-pastoral practices adapted to changing climatic conditions, oversee their adoption and train relevant parties.

(i) Limited capacities of CRDEs to provide local advisory, extension and agricultural support services to adapt practices to climate change: The weak capacities of CRDEs do not allow them to adequately fulfill their mandate, which is to supervise agricultural development, due to i) insufficient staffing caused by the constraint of hiring staff within the civil service, and ii) deficient skills. In some cases, the staff in place do not have the skills required to fulfill the functions entrusted to them (especially in the case of partisan recruitment) and certain profiles defined within CRDE staff - in particular planning and monitoring-evaluation - are not fulfilled. On the one hand, many technicians working in CRDEs are inadequately trained and have clearly insufficient technical capacities. On the other hand, technicians with adequate skills are available but are not recruited due to recruitment constraints within the public service. The CRDEs do not have the necessary resources to ensure the salary of the technicians who have acquired relevant work experience through their involvement in the CRCCA project. As a result, some CRDEs are not sufficiently operational, are understaffed and have insufficiently qualified staff. Continuing education opportunities for staff, especially to be better able to face the challenges of climate adaptation, are limited by the lack of a relevant curriculum in academic institutions. (ii) Insufficient capacities of the various actors responsible for planning, developing, disseminating climate-resilient practices is another key obstacle to their widespread adoption and implementation. Such capacity gaps exsit for the following actors and include: Insufficient technical capacity of state actors (DNSAE, regional directorates of Agriculture, CRDEs), local authorities (municipalities - mayors and councillors), non-state actors (national NGOs), and the private sector (especially for cash crops: collectors, vanilla preparers, exporters) to identify, develop and implement strategies and tools to oversee the adaptation to climate change of long-term agro-pastoral activities. (iii) The vulnerability of farmers is linked in particular to a lack of know-how and adaptive capacity and weak entrepreneurial capacities. Farmers and breeders have little mastery of sustainable cultivation techniques (soil preparation, organic fertilization, selection and access to adapted varieties, fodder cultivation, irrigation, pest and disease control), and lack the knowledge, know-how and models to adapt their practices on land that has lost its fertility, in unpredictable and restrictive hygrometric conditions, and to develop sustainable agriculture that strengthen climate resilience, including agro-pastoralism and agroforestry. The practices and calendars that have traditionally guided farmers are no longer adequate in the face of new climate conditions. The poor computer literacy and lack of openness to technological innovation of older farmers further limit their ability to adapt their practices to the challenges posed by climate change. (iv) There is insufficient technical knowledge and access to guidance /advice and information on technical pathways, technologies, infrastructure and markets to support the transition of agricultural systems to greater climate resilience based on healthier ecosystems. The traditional cropping calendar is inadequate; farmers still rely on predictions of elders based on unscientific practices, lack the knowledge for the identification and treatment of diseases and pests, and do not know enough about the diversification opportunities achievable in the Comoros. Short-term weather conditions are available and adequately cover the country, but the data is not translated into a crop calendar. Knowledge of parasite and disease infestations is insufficient and inadequately disseminated (mandate of INRAPE). Lack of information on prices (especially for cash crops) limits negotiating capacities. Access to information about market opportunities and requirements is inadequate.

Barrier 2. Lack of knowledge of alternative climate-adapted options with the potential to support a prosperous, diversified and equitable agricultural economy and insufficient political and private support for their adoption.

The vulnerability of Comorian agriculture to the effects of climate change is largely due to its lack of diversity and lack of knowledge and capacity to identify and develop alternative climate-resilient value chain options, and to assess their productive and commercial potential. In fact, the agricultural sector in Comoros is based on a narrow base limited to three cash crops and a few vegetable and food crops vulnerable to the effects of climate change. Furthermore, Comorian food products, which are mainly *de facto* organic[28], are more expensive than imported products despite the transport costs associated with imports. Imported food and vegetable crops, mainly from Tanzania and Madagascar, are grown industrially and therefore at lower cost. Consumers who can afford it prefer local products because they recognize the superior quality of organic terroir products. However, consumers with limited means are more likely to be reluctant or unable to buy it. The higher cost of local Comorian products is explained by the artisanal nature of the work, the remoteness of certain production areas which hamper access to local markets, and lack of access to market information for CRDEs, farmers, cooperatives, and other value chain actors. As a result, traditional agriculture is unprofitable, particularly in rural areas remote from urban markets, which limits young people's interest in this profession. Constraints to the fluidity of national markets, limited market connectivity (national and international), and lack of access to market information limit sustainable economic opportunities for smallholder farmers, due in particular to the country's insular nature, geographic remoteness, lack of reliable and regular transportation means between islands and suitable port infrastructure and lack of connection with reliable and predictable buyers. The profitability of agricultural activity is even more limited for smallholder farmers who are not integrated into cooperatives. They are therefore particularly vulnerable to other actors in the value chains who may take precedence in determining the conditions of production and the prices granted for the products, resulting in an inequitable sharing of profits. Another significant limitation to the profitability of Comorian agricultural products is the lack of processing and marketing capacities.

The diversification of agriculture through the development of new climate-resilient options that would give an edge in international markets, such as uniqueness of properties, is hampered by the lack of analytical capacity to perform the required characterization analyses. The Comoros agrobiodiversity, e.g. local coffee and ginger varieties, have unique characteristics that could be leveraged in niche markets. These characteristics must be documented and certified on the basis of biological and physico-chemical analyses which, currently, must be carried out by laboratories located in countries whose commercial interests may be in competition with Comorian interests, in addition to requiring complex logistics for the transport of samples to be analyzed.

Public and private investments for building the climate resilience of agricultural value chains and their diversification are limited due to the widespread negative perception of agriculture in Comorian society, coupled with the lack of awareness of its vulnerability to climate change and of its potential to evolve into a productive and resilient sector by decision-makers and investors disconnected from the reality on the ground. Another obstacle to improving the climate-resilience of agricultural practices is linked to the low attractiveness of agricultural activity for the younger generations who perceive the profession as obsolete and too risky because they do not have the assets or capital to deal with the risks inherent in adopting innovative agricultural practices. Faced with the urgency of daily needs, the elderly - who constitute a large part of the smallholders - are reluctant to adopt new practices because of resistance to change when facing new technologies, of too large gap between significant labor-intensive investments for soil conservation and restoration and other climate-adapted practices and the achievement of tangible effects, in a context where their livelihoods are precarious and known alternatives limited, leading them to pursue unsustainable land management practices for small short-term gains.

Barrier 3. Limited use of technologies and approaches to mitigate climate-related risks and low access to credit on appropriate terms to support smallholder farmers' shift towards climate resilient agricultural value chains.

The adoption of resilient agricultural practices and approaches is hampered by the weak capacity to manage risks and uncertainties generated by climate change which is linked to the lack of knowledge on alternative options (barrier 2), on risk management approaches and on agricultural practices that increase resilience to climate change. Low financial autonomy and the difficulty of access to credit on appropriate terms for farmers, especially for men, worsens

vulnerability to climate risks, and the culture of savings is insufficiently widespread in rural areas. Insufficient or lack of savings makes smallholder farmers very vulnerable to the effects of climate change since they do not have the resources to, for example, buy seeds for a second sowing following the failure of the first due to shifted or adverse weather conditions, or to purchase the equipment needed to adopt agricultural practices that increase climate resilience.

Lack of timely access to affordable agricultural inputs: Micro-irrigation equipment, tools, and seeds of varieties resilient to the new climatic conditions are difficult to access because they are imported and expensive. The lack of autonomous and timely local production of quality seeds and local supply of low-cost equipment maintains the dependence of farmers on external suppliers and results in prohibitive costs for the supply of suitable seeds, micro-irrigation equipment and with suitable tools

Lack of access to arable land due to the shortage and degradation of agricultural land and land tenure insecurity: Many plots are no longer fertile due to unsustainable soil management and support is needed to ensure restoration of soil fertility by techniques of soil conservation and restoration, agroforestry and agropastoralism, such as hedging. Also, the farmers who operate the state plots rent them out on the basis of an annual contract which allows them to cultivate them (about 10,000 KMF (≈ $ 23) per year). This situation is not conducive to the investments needed for the adaptation of agricultural practices.

ırrier 4: Limited consolidation and dissemination of knowledge on successful models and strategies (including developed by farmers) for the adaptation of ɡricultural practices to climate risks hinders their large-scale replication and limits the impact of efforts aimed at climate adaptation of agricultural value chains.
RDEs and national institutions concerned with climate adaptation of the agricultural sector do not have access to a sound knowledge base built from reliable data to ıpport expert advice to manage climate risks appropriately and integrate it into agricultural land development plans and other guidance tools to support farmers in eir decision-making. Farmers are thus left to resort to their traditional knowledge and non-adapted crop calendars and tools leading to inappropriate timing for ɡricultural works and maladapted practices, which results in a significant decrease and even a loss of yields.

Knowledge of climate-smart practices by all agricultural stakeholders is limited and not adequately recorded and disseminated. Also, the limited access of actors in agricultural value chains to appropriate information on agriculture, livestock, and climate prevents them from integrating climate risks into their decision-making. There is hardly any research being done in agriculture, and even less on the adaptation of the agricultural environment to climate change, whether by INRAPE, the University of the Comoros or the National Horticultural Center. In recent years, rare agricultural censuses have been carried out sporadically. There is currently no systematic monitoring of agricultural production at the national level, nor involvement of producers in the monitoring and evaluation of productions resulting from the adoption of new practices. Currently, the collection of agricultural data is limited to farmers supervised by CRDEs and to the production of CRDEs. Each CRDE collects data separately following a protocol defined by partners (through projects), so that the data cannot be compiled to give an overview of agricultural production in the country. The dissemination of knowledge developed by CRDEs is mainly through relay-farmers and limited to farmers in their territory and is not shared with all other CRDEs, even less so with other farmers, so that farmers who depend on poorly performing CRDEs have limited exposure to adaptation solutions that could improve the climate resilience of their agricultural activities. Capacities to develop and access best practices, information and technical know-how to support the development of guidelines for climate change adaptation in agriculture are nascent and need to be strengthened.

Barrier 5: Limited understanding of challenges and barriers specific to women and persons with disabilities (PWDs) in adopting practices that promote agricultural climate resilience. Limited understanding of women and PWDs specific challenges and barriers limits the design and implementation of appropriate measures to address them and adopt an inclusive approach when strengthening agricultural resilience. Statistics show that the agricultural sector employs more women than men in the Comoros (CDN 2021). According to an ongoing project[29], 75% of farmers in Mwali are women. However, although women work more than men, men are much more often the owners of agricultural land and cultural traditions reduce the participation of women in decision-making. Women are mainly responsible for food crops and market gardening and in poultry farming. They also work in cash crops but very little in their marketing. Gender-specific differences, needs, roles, climatic and socio-economic vulnerabilities and priorities regarding different tasks across agricultural

value chains have evolved in recent years, may vary among islands, and are not clearly documented. People living with disabilities (PWDs) are present in all communities but are mostly kept out so that they cannot earn a fair living, nor contribute to the economy and national growth. Although their representation within the population is not adequately documented in the absence of a comprehensive demographic census, it is estimated that over 60% of PWDs have never attended school and 67% are inactive[30]. Although new approaches and techniques that are less labor intensive are now available, PWDs are not encouraged to get involved in value chains. Lack of awareness of the obstacles to the integration of PWDs into agricultural value chains and their equitable access to the resulting benefits limits the development of solutions.

Such knowledge is essential for designing interventions where women and PWDs will be fully involved in all stages of the project, including those that involve decision-making and planning, capacity building that meets their specific needs, and concrete support for the application of climate-resilient agricultural practices. Also, women representation in governance bodies within CRDEs, cooperatives, unions, and other instances across the value chains is not representative of their actual participation in the sector. Without adopting a fully inclusive and participatory approach with particular attention to women, youth and PWDs, projects cannot ensure that vulnerable community members benefit equitably from the CRDEs extension services, such as demonstrations and close support for the adoption of climate-adapted practices and varieties that contribute to a sustainable development of agriculture in the future. A specific focus on women and PWDs and their economic empowerment is crucial for the sustainability of the long-term solution proposed by the project and, more generally, for the resolution of gender-related issues for a climate-resilient development.

2) Baseline scenario and associated baseline projects

Under the baseline scenario with business-as-usual, investments from the Government of Comoros and its development partners will have lifted several barriers to the performance of the agricultural sector, and provided a strong foundation on which to build. Yet, under this baseline scenario, all actors involved in planning and implementation in the agricultural sector will still lack the individual and institutional capacities, including the knowledge and tools required, to adapt agricultural practices to changing climatic conditions. These actors will continue to work in silos and will miss out on the benefits of working in partnership to address the multifaceted aspects of climate adaptation of the agricultural sector. Agricultural production will rest on the same narrow base of cash crops, food crops and market gardening, which yields will likely continue to decline due to the impacts of climate change, thus aggravating the country's dependence on lower quality food imports. Efforts to improve the marketing and profitability of agricultural products remain focused on a reduced number of cash crops whose vulnerability to climate change will continue to increase, which will only increase the precariousness of smallholder farmers who will not have alternative climate-resilient options and which will push the biggest landowners to increase the areas allocated to cash crops to the detriment of natural ecosystems and remaining forests. Productivity will continue to decline, and therefore national production and income, thus reducing the capacity of Comorian producers to negotiate on international markets.

Recent or soon-ending relevant baseline projects. With the support of its development partners, the Government of Comoros has invested substantial amounts to strengthen the agriculture sector through various interventions. Several investments will provide a solid foundation on which to build to achieve the expected outputs and outcomes in the new GEF7 project. The most relevant intervention to this new project is the UNDP-LDCF project to strengthen the adaptation and resilience capacities of the agricultural sector to climate change in the Comoros (CRCCA). Main achievements include the operationalization of an agro-meteorological system to disseminate agricultural notices to farmers, the construction of infrastructure and the provision of the necessary equipment to strengthen the adaptation and climate resilience capacities of the agricultural sector, including three greenhouses for vegetable production, supply of adapted seeds, construction of water collection and storage infrastructures, the introduction of farm animal breeds (goat, cattle and poultry) that are more resistant to diseases and more productive and the establishment of pilot livestock farms, and the supply of tools to farmers and equipment to

operationalize six Rural Economic Development Centers (CRDE) covering six regions and 29 vulnerable communities. The CRCCA project supported the construction of infrastructure to store water[31], but the number of infrastructures remains insufficient to ensure crop irrigation throughout the area served by the CRDEs.

Projects focusing on the three traditional cash crops -ylang-ylang, cloves and vanilla- have been implemented with the support of development partners (ACEFER project - UNDP/Enhanced Integrated Framework/WTO, Programme Filière Durable Ylang – AFD /USAID /various donors, and FYDAFE project - AFD/EU) and enabled to pilot energy-efficient distillation equipment, structure producer groups from the three traditional sectors into cooperatives and strengthen the capacities of various actors in the value chains, including business and marketing capacities to increase international competitiveness, raise producers' awareness and elaborating technical sheets for the organic-Comoros certification of vanilla, and set up a price observatory for vanilla and clove. FAO and UNDP interventions have provided the foundations to relaunch the poultry subsector through improved profitability and local competitiveness of poultry farming with an adapted chicken variety and household-level capacities to increase poultry farming. Several climate-adapted techniques have been piloted in a pilot farm school established in one of the CRDEs targeted by this project on Mwali island through a collaboration of UNDP and the South African Agricultural Research Council. This project enabled piloting several approaches that will be further implemented in the new project, including the use of a locally-made biopesticide, pest and disease management, field irrigation systems, composting units and post harvesting / agro-processing techniques. Also, a digital exchange-sharing platform specific to CRDEs was set up by the recent UNDP project "Promotion of Green Economy and Recovery from the impact of COVID-19 in Comoros". Bilateral support from the Japanese government from 2021 to 2023 to build INRAPE's capacities through the construction of a multidisciplinary laboratory for quality control, supply of equipment, and staff capacity building will provide a foundation to project interventions aiming at strengthening national capacities to characterize, certify and label unique Comorian varieties for the benefit of the people of the country.

Baseline projects expected for the 5-year project implementation period (2023-2028). The proposed project will build on baseline initiatives that address underlying causes of vulnerability to climate change in Comoros. These baseline projects are listed in Table 1, some of which represent potential baseline co-financing projects for the proposed LDCF project.

Table 4. Externally funded baseline projects.

Project title	Project sites	Donor	Date
Integrated Development and Competitiveness Project (PIDC)	Ngazidja : Maweni et Cembenoi; Ndzuani : Ouani	World Bank	2019 to 2024
Family Farm Productivity and Resilience Support Project (PREFER)	48 villages in the 3 islands	IFAD	2017 to 2025
Project to Support Integrated Food Systems and Value Chains (PASAICV)	n.d.[32]	AfDB	2022 to 2027
Green Climate Fund/UNDP project (GCF-Water)	15 areas on the 3 islands comprising 103 villages, selected for their climate vulnerability	GCF	2019 to 2027
Inter-Island Connectivity project	Nationwide	World Bank	2022 to 2027

More recently, the government recognizes the need to tackle major obstacles to the performance of the agricultural sector, and will continue to invest over the next 5 years in new projects to address them. The contribution of these investments, with a strong focus on the infrastructure needed to ensure access to national and regional markets, and sustainable access to water, to the project outcomes over the 5-year project period (2023-2028) is estimated at US$ 47,214,494.

Government investments through MAFETH in-kind contribution is estimated at US$ 2,293,300. This estimation for the 5-year project implementation period is based on the expected provision of the following services: premises for the project coordination unit (PCU) @ $15,000; premises of the 8 CRDEs @ $240,000; water and electricity for CRDEs and PCU premises @ $19,300 and $52,000; hydraulic infrastructures for the use of CRDEs: 4 *ecotanks*[33] @ $37,000, 3 impluvium[34] @ $900,000, 14 tanks[35]@ $500,000, 32 greenhouses[36] @ $530,000.

As the donor agency, UNDP's co-financing contribution will amount to $200,000. UNDP funds will, among other things, contribute to develop the capacities of the DNSAE and its branches at island level to increase its capacity to manage GEF resources effectively and efficiently and ensure the achievement of project expected results. This support is required to fill the gaps identified in the HACT micro-assessment carried out in 2020 and which concluded that the level of risk is high. Government investments through MAFETH projects are estimated at US$ 30,721,194. These include the following projects: (i) WB Integrated Development and Competitiveness Project (PIDC) whose implementation is scheduled for 5 years from 2019 to 2024, aims at promoting business development, supporting actors in the value chains, and the development of micro, small and medium-sized enterprises and relevant actors of value chains in agriculture, tourism and associated sectors in the Comoros (Co-financing amount estimated at US$ 5,000,000). This project will contribute to the new project's outcomes through strengthening institutional capacities for the development of agricultural value chains, structuring value chains for agro-industry development including livestock, poultry, vegetables and fruits, strengthening capacities of three CRDEs, providing infrastructure for connectivity and market access including poultry cold units, fruit storage, and rural road rehabilitation, and supporting business start-ups. (ii) IFAD's Family Farm Productivity and Resilience Support Project (PREFER) whose implementation is scheduled for 8 years from 2017 to 2025 (including extension) and whose objective is to help

35,000 vulnerable smallholder farmers improve agricultural production and their capacity to cope with climate change, increase their income and strengthen food and nutrition security (Co-financing amount estimated at US$ 3,000,000). (iii) AfDB's Project to Support Integrated Food Systems and Value Chains (PASAICV) for nutrition security and resilient livelihoods whose implementation is scheduled for 5 years from 2022 to 2027, aims at improving food system by promoting sustainable investment in fisheries, agriculture and livestock. Interventions under Component 2 which relate to integrated development of agriculture and livestock through strengthening systemic and institutional capacities and improvement of production systems are likely to contribute to the new project Outcomes 1 and 2 (Co-financing amount estimated at US$ 5,000,000). (iv) The Green Climate Fund/UNDP project (GCF-Water) whose implementation is scheduled for 8 years from 2019 to 2027, aims at strengthening a climate-resilient water supply and irrigation in 15 vulnerable areas in Comoros through integrating climate monitoring and forecasting in water resource management and implementing climate-resilient infrastructure and technologies for a reliable water supply despite climate-related events such as drought, cyclones, storms and saline intrusion related to increased sea level. The support of the GCF - Water project provides for the construction of new structures, some of which are planned in the project intervention areas[37] without however reaching farmers' plots. This project achievements, consolidated by hydraulic infrastructure constructed through UNDP's projects CRCCA and "Enhancing Agricultural Capacity" and AFD AFIDEV project will be crucial to the successful implementation of the new project (Co-financing amount estimated at US$ 16,721,194). The cofinancing contribution of the Government investments in improving inter-island connectivity, and with regional and international markets through the Ministry of Maritime and Air Transport project has been estimated at US$ 14,000,000. This project funded by the World Bank will improve institutional capacities and infrastructure to increase accessibility and comptetitiveness of transportation including access roads to ports.

3) Proposed alternative scenario

The proposed project will work towards the long-term solution and address the above-mentioned barriers in conjunction with and adding value to the baseline scenario interventions. The project objective is "to increase the climate resilience of key agricultural value chains through innovation, diversification and strengthened capacities to sustainably improve the livelihoods of smallholders and contribute to the national economy". This will be achieved through four outcomes under four interlinked components as illustrated in the preliminary Theory of Change diagram in Figure 1.

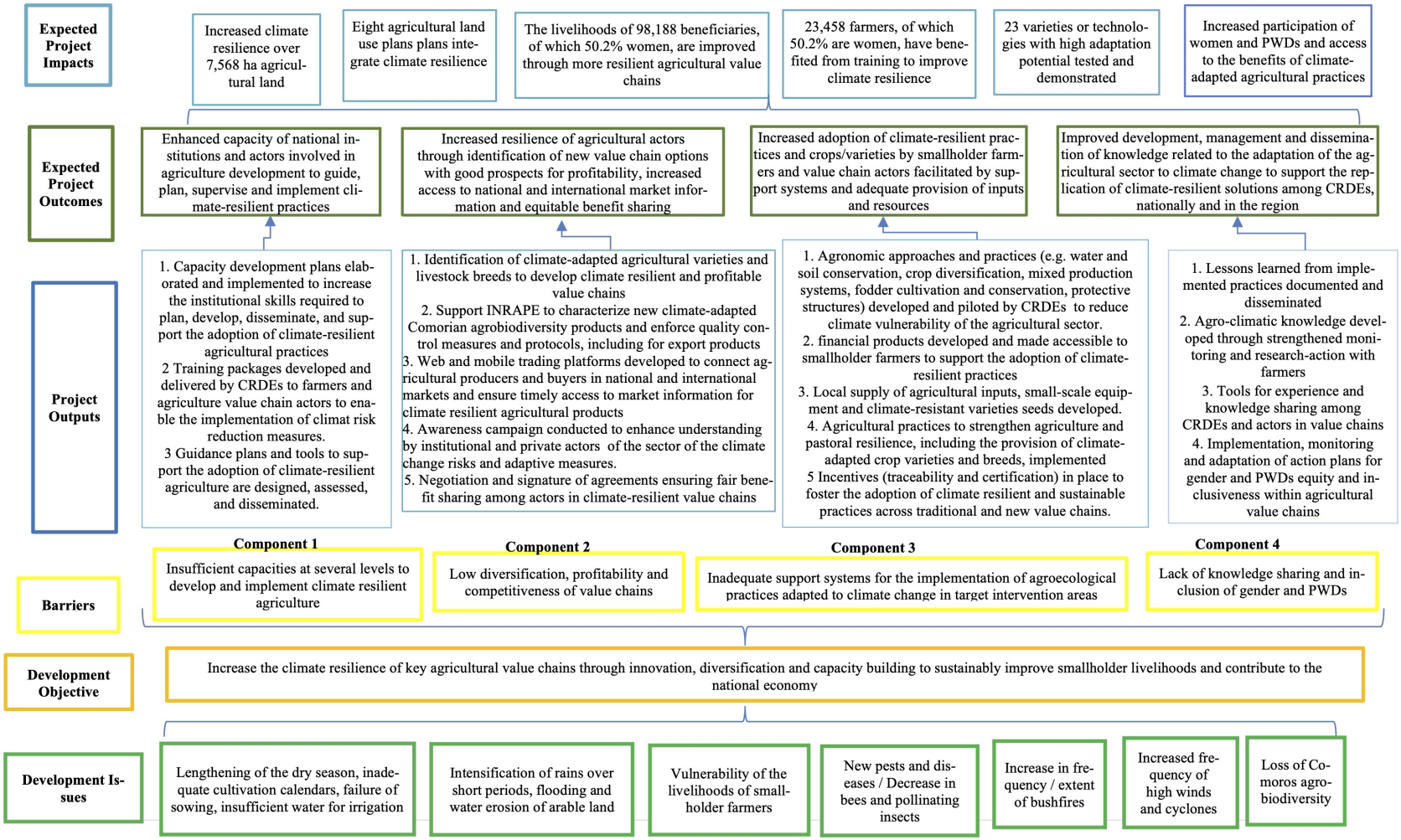


Figure 1: Preliminary theory of change diagram

The theory of change aims at removing the barriers related to i) Insufficient capacities at institutional (CRDEs, DNSAE, local authorities) and individual levels (smallholder farmers and other value chain actors) to plan and implement innovative agro-pastoral practices adapted to changing climatic conditions, oversee their adoption and train relevant parties; ii) Lack of knowledge on alternative climate-adapted options with the potential to support a prosperous, diversified and equitable agricultural economy; iii) Limited use of technologies and approaches to mitigate climate-related risks and low access to credit on appropriate terms to support smallholder farmers' shift towards climate resilient agricultural value chain; iv) Limited consolidation and dissemination of knowledge on successful climate-adapted models and strategies which limits their impact and large-scale replication; and v) Limited understanding of challenges and barriers specific to women and persons with disabilities (PWDs) in adopting practices that promote agricultural climate resilience. These barriers will be addressed as follows:

1. Developing the capacities of national institutions, and especially of CRDEs, to address the climate challenge and integrate a focus on climate resilience into the tools and plans that support and frame agricultural development on the ground, to disseminate climate adaptation solutions in target sites and across the country and to support and oversee the adoption of these solutions, and developing the capacities of smallholder farmers and other value chain actors to adapt their practices to increase the climate resilience of agroecosystems. Planning and decision-making tools will be developed and updated by national institutions with strengthened capacities to support climate adaptation. As a result, national institutions and actors involved in agriculture development have the capacity to guide, plan, supervise, and adopt practices that are resilient to the impacts of climate change and eight agricultural land use plans corresponding to the areas supported by the target CRDEs and climate-adapted agricultural calendars updated annually will be available to guide the choices of farmers.

2. Reducing the country's dependence on a narrow base of climate vulnerable cash crops heavily dominated by external markets on which Comoros has little hold, and where smallholder farmers do not receive their fair share of the benefits generated by the value chain. The second outcome will be achieved through the analysis and selection of a number of alternative value chain options whose climate suitability, properties or biochemical profile, and profitability in national and/or international markets will have been thoroughly assessed before their promotion to farmers and other value chain actors.

The project will seek on the one hand, to increase the climate resilience of the value chains of 19 crops commonly grown in the Comoros and, on the other hand, to diversify the options of climate-resilient value chains through the climate and economic assessment of 9 new crops for a total of 28 crops. The target crops currently cultivated include the three (3) cash crops: vanilla, ylang-ylang, cloves; the five (5) main food crops: banana, cassava, sweet potato, yam, taro, and eleven (11) most commonly grown vegetables/fruits: tomato, cabbage, cucumber, lettuce, pepper, carrot, eggplant, potato, beans, watermelon, spinach; and. The nine (9) crops for potential development of new climate resilient value chains include ginger, low caffeine coffee, native bananas and yams, nutmeg, aloe, Indian borage, vetiver, turmeric. The criteria for proposing these new crops include their hardiness in the current climatic conditions in the Comoros, their low occupation in terms of land area, and the possibility of developing agricultural value chains through processing and marketing aimed at export markets. The possibility of adding various aromatic and medicinal plants growing in Comoros will be investigated under the PPG phase. The climate risks for all these species will be assessed as part of the project preparation (PPG phase) based on future climate scenarios and available information from tools such as Ecocrop.

Learning to manage climate-related risks will contribute to make the sector more attractive for young people and foster adoption of new practices supporting climate adaptation by elders. Developing or consolidating web and mobile platforms to connect agricultural producers to reliable buyers and access market information will help maximize revenues from the sale of climate-resilient products and, through agreements for the equitable sharing of profits within value chains, to ensure decent incomes for smallholder farmers. As a result of outcomes 1 and 2, smallholder farmers will be better able to cope with the climate-related risks and uncertainties and develop climate-resilient agriculture in target areas as they will i) have a better understanding of strategies, approaches and

practices to mitigate climate-related risks, ii) have access to new climate-adapted value chain options which climate suitability and profitability will have been carefully assessed, and iii) which development will be supported by adequate decision-making tools and plans. Having a timely access to relevant information on climate and markets will enable them to adapt their practices in the field, and to negotiate prices that allow for decent livelihoods.

3. Building on the results of the first two outcomes, the third outcome focuses on investments for the implementation of climate-adapted agricultural practices on the ground. Farmers will apply climate-smart agroecological practices and approaches in their plots and use protective structures and micro-irrigation systems that contribute to reduce the vulnerability of agriculture to the climate change risks such as increased water stress and drought due to the lengthening of the dry season, and soil erosion and flooding due to the intensification of rains over short periods. Access to suitable financial products, an adequate supply of low-cost agricultural inputs such as tools and seeds of climate-adapted varieties, and the introduction of incentives to encourage their adoption by farmers and other actors in the value chain together will support the sustainable adoption of farming practices and crops/varieties that build climate resilience. Traceability and certification processes provide incentives for the adoption of climate-smart and sustainable practices, thus giving access to added value related to specific markets. The implementation of agricultural solutions that strengthen climate-resilience contribute to increase agroecosystems capacity to whitstand the effects of climate change through reduced vulnerability to extreme weather, climate-induced erosion (related to heavy rains), bushfires, emergence of new pests and diseases, loss of pollinators and of agrobiodiversity.

4. The capture and dissemination of new knowledge on best practices and innovations for climate adaptation that will be developed through the project interventions will enable their replication within and outside target sites, and across CRDEs in the country. By improving inclusiveness through understanding the specific challenges faced by women and PWDs in contributing fully to the climate adaptation of the agricultural sector, women and people with disabilities will have equal access to information and benefits resulting from the support provided by the project, both in terms of awareness-raising, training, access to adapted tools, and support for adopting climate resilient practices.

Brief description of project outcomes and outputs

Component 1. Systemic, institutional and individual capacities for climate-resilient agriculture includes one outcome: **Outcome 1. Enhanced capacity of national institutions and value chain actors involved in agriculture development to guide, plan, supervise and implement climate-resilient practices.** The strategy for achieving outcome 1 is based on 3 outputs related to capacity development (i) of the institutional actors responsible for developing climate-adapted solutions and of CRDEs responsible to provide extension services to support their adoption, and (ii) of smallholder farmers, collectors and retailers to help them cope with the risks and uncertainties related to climate change, and (iii) through the development of guidance tools to support the adoption of climate-resilient practices. The development of institutional capacities will facilitate the replication of the lessons of this project to the whole agricultural community and will allow the continuous adaptation of tools and approaches to the evolution of the climate.

1.1 Capacity development plans elaborated and implemented to increase the institutional skills required to plan, develop, disseminate, and support the adoption of climate-resilient agricultural practices among smallholder farmers, and value chain actors. In 2013, the government established a network of sixteen (later expanded to nineteen) Rural Economic Development Centers (CRDEs) in rural areas of the country to supervise rural development programs for the improvement of the economy through the production and environmental protection sectors. CRDEs are local support structures for farmers responsible for providing services adapted to their needs to strengthen the resilience of agricultural systems and value chains. The CRDEs are in particular responsible for training farmers, providing technical extension services, support and advice to producers, supervising professional organizations, ensuring the collection and management of data, providing support to improve rural populations' access to agricultural inputs and supporting the development of basic infrastructure (eg hydraulics, supply, etc.). CRDEs will therefore be key beneficiaries of the project's capacity building interventions and will be at the centre of the project interventions to support small agricultural enterprises and other value chain actors. The rationale for the selection of target intervention areas is presented in section 1b. Project Map and Coordinates.

Strengthening the capacities of CRDEs will require a significant involvement of the public administration to support the recruitment of staff with adequate training meeting the profiles defined for CRDEs and ensure their continuing training and include aspects of adaptation to climate change in the training curriculum for agricultural technicians (University of Comoros and National Horticultural Center): a) Redeployment of institutional staff: Faced with the recruitment constraint within the public service, the project will advocate with the authorities within the ministry and the national and regional directorates and the Governorates of each island for the redeployment of staff from the administrations towards the CRDEs. The Regional Directorate is responsible for proposing the assignment of technicians to the CRDEs and the ministry is responsible for their recruitment. b) The project will support the definition of criteria for the selection of candidates for the assignment of personnel to CRDEs to ensure that they have the capacity to fulfill the responsibilities of the personnel (Director, Accountant Manager, Administrative Assistant and Technicians of the Center) as defined in Article 14 of Decree No. 13-015 relating to the status of Rural Economic Development Centers (CRDE). For each of these positions, the project will provide details on the requirements and skills required and will specify the need to work in rural areas. c) The project will support the establishment of a continuous training system and promote self-training focused on adaptation and resilience to climate change for CRDE staff. The project will work with institutions that provide training (National Horticultural Center and UdC) in order to include these themes in their curricula. Also, online resources are available (*fr.csa.guide*) to facilitate self-training in climate-smart agriculture on the CGIAR (*Consultative Group on International Agricultural Research*) and CCAFS (*Climate Change, Agriculture and Food Security*) websites. Modules have also been developed by FAO and are available in French. d) The project will support the development of a training of trainers' program (namely in collaboration with FOFIFA and FIFAMANOR of Madagascar), which will target technicians within the staff of CRDEs who have more capacities in the most relevant areas. The trainings will cover different themes relating to climate-smart agriculture, including the selection and production of suitable seeds. e) The project will support the strengthening of the skills of CRDEs in communication and their essential role as extension centers focused on the development, evaluation, demonstration and dissemination of improved and climate-resilient agricultural practices to farmers, and their support throughout their adaptation to new techniques and approaches as well as in the traceability process through digital platforms and technological solutions.

This output is also focusing on strengthening the capacities of the other parties responsible for planning and supporting the implementation of climate-adapted agricultural practices, namely the National Directorate of Agricultural and Livestock Strategies (DNSAE), local authorities, NGOs and the private sector. Based on assessments of capacity development needs, the project will support the strengthening of the technical capacities of state actors (DNSAE and regional directorates for Agriculture), local authorities (municipalities, including the mayor and councillors), NGOs (including DAHARI, ARAF, Initiative Développement, Ngochao, 2 Mains, GAD, Mesha, and the Jeune Chambre Internationale), and the private sector (especially in relation to cash crops including collectors, vanilla preparers, exporters) to identify vulnerabilities to climate change in agricultural and pastoral activities, and develop and implement long-term adaptation strategies, through training, dissemination of knowledge through various media, and the development of action research involving these actors. (b) The project will support the development of the capacity to develop and update agricultural land use plans and agricultural calendars through the establishment (composition, terms of reference and resources) of a multidisciplinary working committee in charge of to develop and update the agricultural calendar on an annual basis and based on meteorological data and the analysis of the vulnerabilities of the various segments of the targeted sectors.

1.2 Training packages developed and delivered by CRDEs to farmers and agriculture value chain actors to enable the implementation of climat risk reduction measures. To achieve this output, the project will target local farmers, men, women, youth, and people with disabilities (PWDs), working individually or within cooperativeswith a special consideration given to facilitating attendance by women and PWDs. Capacity development needs will be assessed during the preparation of the project document (PPG). The trainings will be organized by the CRDEs who will also ensure the demonstration of climate-adapted practices within their plots, and will be provided by relay farmers, to build the capacity of farmers to understand and assess the effects of climate change on the condition of plots, crops and livestock, and to identify appropriate measures to improve it. Where appropriate, training will take advantage of the digital platform of the CRDE network, which aims, among other things, to facilitate access to online trainings on climate-smart agriculture and the digital transition.

Measures to improve climate resilience may include: i) improvement of soil condition to restore or increase productive capacity and counter erosion; ii) selection of new climate-resilient agricultural crops and varieties, and livestock options, suitable to local weather and soil condition of the plots (identified under the output 2.1 and in line with guidance provided in the agricultural land use plans under the output 1.3) and to the needs and interests of farmers; iii) adoption of practices (such as agroforestry, hedging, associated crops, agropastoralism) that strengthen the climate resilience of agriculture and livestock, and identified under the output 3.1.

In accordance with a national strategy to encourage actors to further specialize within value chains, training will also address aspects of processing, marketing and packaging of agricultural products. The climate change impacts on these segments of the value chains will be assessed to identify vulnerabilities and required adaptation mesures to increase their climate resilience, and develop/implement related trainings.

To further reduce the vulnerability of smallholder farmers in the context of climate change, the project will equally support the establishment or strengthening of local farmers cooperatives and improve their capacities in governance, microfinance and micro-entrepreneurship. To contribute to the financial sustainability of the climate-responsive solutions proposed under the project, trainings will include the development of business models that integrate the depreciation cost of inputs (e.g. infrastructure) into the price determination of products.

1.3 Guidance plans and tools to support the adoption of climate-resilient agriculture are designed, assessed, and disseminated on the basis of the analysis of the climatic and socio-economic vulnerability of each of the sectors of the targeted value chains, and include agricultural land use plans, crop calendars, advice sheets on varieties and agricultural practices for adapted varieties including for market gardening, cash crops, food crops, fodder, and for agroforestry including hedging (*embocagement*). To achieve this output, the project will undertake: (a) Climate and socioeconomic vulnerability analysis for all sections of targeted value chains. In order to identify the main issues affecting the value chains of targeted cash crop and market gardening and to better define the interventions needed to strengthen their resilience, the project will involve the value chains actors to document and assess climate, environmental, and socioeconomic vulnerability in all sections of the value chains. The vulnerability assessment will integrate the results of the assessments conducted by the CGIAR for tomatoes, bananas and manioc crops based on exposure to several factors related to climate change[38]. As part of the vulnerability analysis, the project will develop value chain climate risk profiles. Assessments of the impacts of climate change often focus on production while neglecting the other components of value chains. However, successful adaptation requires thinking about how climate change will affect all aspects of the value chain. It is proposed to carry out this reflection with the stakeholders concerned by following the approach of climate risk profiles[39]. Discussions will take place with value chain actors, i.e. producers, collectors, cooperatives and exporters, including the local populations involved, on their perception and experience of climate change and its impact on cultivation, harvesting, storage, transportation and processing of products. These discussions will also involve support and supervision structures for agricultural production in the field (CRDE) to consolidate understanding of the risks and effects/impacts of climate change on the different segments of the value chains. These consultations will help identify the individual and institutional actions and capacities needed at each level for the design and adoption of effective climate change adaptation measures, such as climate-smart agriculture practices or access to innovative information/communication tools or technologies that facilitate their adaptation. Solutions will be identified for each segment of the value chains – inputs, production, collection, storage, processing and marketing – to increase the adaptive capacity of value chain actors to climate change. This exercise will make it possible, among other things, to identify the most vulnerable actors (men-women-young people-people with disabilities) within each of the value chains. In addition, the review will document the land tenure situation of cultivated plots as well as governance, gender and inclusion issues in order to identify the challenges to tackle so that value chains are resilient, inclusive, sustainable and that the benefits are equitably accessible and distributed among the different actors, as between men and women.

(b) Agricultural land use plans within the areas supported by each of the CRDEs: The project will support planning for optimal land development that takes into account projections of climate change and its impacts, as well as the potentials and vulnerabilities of current and new crops using the FAO Ecocrop tool[40]. This planning will build on existing plans for individual plots (approximately 75% of smallholder farmers have developed climate-adapted land use plans for

their individual plots, with the support of CRDEs, that take soil and climate into account) and knowledge, including studies carried out by CGIAR as part of the development of an IFAD project. Such plans will integrate the planning carried out for protected areas under the UNDP-GEF project and the planning carried out for the Mwali Island Biosphere Reserve with support from AFD. (c) Crop calendar: Development of an agricultural calendar adjusted to new weather conditions, supplied and updated on an ongoing basis according to the acquisition of new knowledge. (d) Operating plans: The project will support the parties concerned to develop or update plans for agricultural and agro-pastoral operations at the individual, cooperative and CRDEs levels. (e) Online tool: The project will support the development of an online tool to provide advice to farmers and disseminate knowledge on climate-smart agro-ecological practices on the basis of knowledge and best practices developed in the Comoros by CRDEs, farmers and other stakeholders in the sector[41]. The feasibility of enhancing the efficiency of the real-time dissemination of agrometeorological forecasts by contracting the dissemination of messages to individual operators to telephone companies will be assessed.

Component 2. Diversification of climate-resilient value chains includes one outcome: **Outcome 2. Increased resilience of agricultural actors through the identification and promotion of new climate-resilient value chain options with good prospects for profitability, increased access to national and international market information and equitable benefit sharing.** To achieve outcome 2, the project will support interventions to identify new value chain options which climate-resilience, profitability on national and/or international markets, and social acceptability will have been carefully assessed and validated with the support of CRDEs and INRAPE strengthened expertise. To achieve result 2, the project will support interventions aimed at identifying new value chain options whose climate resilience, uniqueness of components or properties, profitability in national and/or international markets and social acceptability will have been carefully assessed and validated with the support of the CRDEs and the enhanced expertise of INRAPE. Increased awareness of actors within national institutions, policymakers and private sector investors not only on the challenges posed by climate change to Comorian agriculture, but also on the potential brought by a diversity of new adapted value chains to the country's climate and environmental conditions, and by agricultural practices that will make it possible to increase the resilience of traditional crops, will promote the political support needed to make the changes, particularly at the level of the CRDEs, and mobilize the investments required from the private sector to develop value chains. Equity in benefit sharing between value chain actors and decent incomes are essential elements for the sustainability and replicability of the solutions developed under the project and will be ensured through the above-mentioned investments, political support and negotiation. and the signing of agreements between value chain actors ensuring the equitable sharing of benefits. Access to market information will enable value chain actors to position supply in relation to existing markets and negotiate appropriate prices commensurate with the quality and uniqueness or rarity of the products offered. Benefits to smallholder farmers will be optimized through developing product processing and marketing capacities, and improving CRDEs' capacities to organize the distribution and the marketing through fairs, as inspired by Diboini CRDE's successful experience, and promoting the multiple advantages of organic and fair-trade agriculture on the local and national scene and promoting the quality and specificity of Comorian products on the national, regional and international markets. This component will build on the contributions of co-financing projects aiming at eliminating obstacles in the commercial circuits (building on the achievements of co-financing partners for road rehabilitation, including Sima -Moya and other rural roads (BafD, PIDC-BM, AFIDEV-AFD).

2.1 Identification of climate-adapted agricultural varieties and livestock breeds to develop climate resilient and profitable value chains. A major focus of the project is to help famers shift from a few climate-vulnerable crops to a diverse selection of climate-resilient agricultural and livestock options that can support the development of profitable value chains. Diversification is an integral part of the strategy to build climate resilience, reduce risk and increase the chance of ultimate success. A more diverse array of crops/varieties is more likely to contain varieties that provide overall resilience to a farmer's field (or to the several fields of a farmers' group), as there is a greater chance of any one or a few of them having traits that enable them to adapt to a changing climate, or that confer resistance to new pests or diseases whose spread is favored by climate change. Diversifying farmers' sources of income and spreading harvests and revenues throughout the year will also contribute to strengthen farmers resilience to climate change.

This will be achieved by identifying new climate-adapted cash and garden crops and livestock options whose demand is strong on national or international markets, which only require small areas (thus reducing the risk of expansion of cultivated areas at the expense of natural forests), which production cycle is short, and which can be processed locally[42]. (a) As part of the PPG, a series of Comorian products will be examined including varieties endemic to the Comoros or which have become rare on a regional or global scale and products whose specificity is based on traditional production techniques that meet the requirements of agroecological cultivation[43]. For each variety, the review will focus on the identification of its soil and climatic requirements and their correspondence in the Comorian context, the investigation of distinctive assets in existing and potential markets and will also include an assessment of the interest of farmers, men, women and youth. (b) The project will also seek to strengthen the climate resilience of market gardening sectors targeting local markets in order to increase household self-sufficiency and food security, reduce the need to import lower quality products, while creating new jobs, especially for women and young people. The project will work with CRDEs to demonstrate and disseminate adaptation solutions whose effectiveness has been demonstrated within the framework of the CRCCA project and will develop solutions based on soil-less cultivation of short-cycle varieties, which can be grown on small areas in urban or peri-urban areas (where the majority of the Comorian population is concentrated), using hydroponic systems with reduced water and input requirements, and therefore attractive and more accessible for young Comorians.

The project will also contribute to strengthening the climate resilience of poultry and goat farming value chains targeting local markets through the identification and assessment of new climate-resilient breeds. Integrating the rearing of climate-resistant goat and poultry breeds into the family economy will help increase self-sufficiency and food security for families, reduce the need to import lower quality products, while creating new jobs accessible to women and PWDs.

For poultry farming, the project will support the development of the CRDEs' capacities to develop Kuroiler type breed chicken farming practices adapted to the Comorian climate, to demonstrate them, and to provide training to farmers. The project will build on a study conducted in 2019 by the Tanzanian company AKM Glitters on behalf of the Diboini/Hamalengo CRDE and UNDP-Comoros, to assess the situation of the poultry sub-sector in Comoros and recommend solutions adapted to the Comorian context and climate, with the intention of relaunching the subsector in the aftermath of the devastation caused by the cyclone Kenneth.

Goat and cattle breeding is practiced by many people in rural areas, especially young people and women. Goats generally possess high thermotolerance compared to large ruminants such as cattle that enable them to maintain their production under extreme climate conditions and to play an important role in mitigating and adapting to climate change, namely i) their higher capacity than other farm ruminants to effectively convert feed sources into milk and meat, ii) their lower methane emissions in comparison to other domestic ruminants. For the rearing of goats, the project will promote a sustainable intensification approach through the hedging technique (*embocagement*) which has long been proven in the Comoros, especially in Ndzuani and the building of goat sheds[44] to protect them from predation. By creating a balanced environment combining trees, culture -including fodder, compost, and livestock in an enclosed space where the composting of animal and plant waste enriches the bocage according to the logic of the circular economy, and by associating water and soil conservation measures (bunds, ponds, living hedges), this approach will mitigate the effects of heat stress and ensure a supply of quality fodder and thus improve the resilience of goat herds to the effects of climate change. This approach allows at the same time to address the problems linked to extensive agriculture and slash-and-burn agriculture still practiced in the Comoros, to mitigate soil erosion and degradation, to reduce the need for chemical fertilizers and to maintain biodiversity.

Through value chain analyses conducted for the climate adapted crops, varieties or breeds, the project will identify the options with favorable prospects for profitability. The value chains analyses will follow guidance provided in UNDP's "Toolkit for value chain analysis and market development integrating climate resilience and gender responsiveness"[45] and will support their promotion with CRDEs, farmers, cooperatives, and the private sector by publicizing the

successes of the new approaches by the beneficiaries (champions) themselves and by facilitating visits to demonstration plots and sites where new techniques have been successful. Communication approaches could use the contrast of “before and after” or “with and without” images. Messages targeting older farmers will be broadcasted through local radios and the project will include training of these older farmers in the use of phones and social media.

2.2 Capacity development plan elaborated and implemented to strengthen INRAPE’s capacities to characterize new climate-adapted Comorian agrobiodiversity products, and control the quality of export products. The project will build on the support provided by the Japanese government (source of co-financing) for the construction of a new multidisciplinary laboratory for INRAPE[46], which responds to the institutional assessments carried out as part of the UNDP project (2013-2016) for the development of a strategy to strengthen a sanitary and phytosanitary system (SPS) capable of supporting the development of the country's agricultural operations. The project will support the development of the capacities of this national laboratory so that the country has the necessary skills and equipment to carry out characterization studies independently and demonstrate the uniqueness of Comorian varieties, to certify and label them, and to preserve access to them for the benefit of the people of the country.

2.3 Web and mobile trading platforms developed to connect agricultural producers and buyers in national and international markets and ensure timely access to market information for climate resilient agricultural products. To enhance access to national markets, the project will build on the physical connectivity provided through WB co-financing for the rehabilitation of small ports to improve transportation between the islands, and on interventions carried out by development partners through projects aimed at improving the business climate. The GEF investment will focus on the development of a web and mobile trading platform to access market information and that connects actors in the agricultural value chains and agricultural service providers, processors, and buyers by taking advantage of the intervention of the International Trade Center (ITC) which set up a platform in Ndzuani to communicate price information of Comorian products to cooperatives (to be identified in the baseline). Support has been limited to Ndzuani so far because ITC targeted well-established cooperatives and avoid opportunistic ones set up to benefit from project support. The project will draw on this experience to replicate the successful interventions as well as the platform set up by UNDP to improve the competitiveness and accessibility of products and services. This platform can be used to provide agricultural advice and information by experts, and to offer services for the development of profitable agriculture. The connection of producers and traders makes it easier to find all the information on innovations and business opportunities in the agricultural and agrifood sector and facilitates the necessary dialogue to develop equitable benefit sharing agreements.

2.4 Awareness campaign conducted to enhance understanding by institutional and private actors of the sector of the climate change risks and adaptive measures. The project will carry out an awareness campaign targeting institutional and private actors involved in the agriculture sector, including smallholder farmers, and the general public, especially young people, on the ongoing and imminent devastating effects of climate change on agriculture and on new opportunities identified through the project interventions. The goals of the campaign will include demonstrating the potential revenue that can be generated to spark interest from young people and the private sector. This campaign will be conducted in collaboration with the chamber of commerce and business incubators. The awareness campaign will be an opportunity to promote the profession of farmer, by highlighting *champion farmers* and their success stories.

2.5 Negotiation and signature of agreements ensuring fair benefit sharing among actors in climate-resilient value chains. The project will identify and set up necessary processes and mechanisms required to ensure tangible and maximum benefits accrue to farmers through: (a) Dialogue facilitation between the private sector and representatives of local farmers to strengthen and formalize the links between these parties for the development of products that are integrated into value chains; (b) Development of business models (through which prices are determined) integrating the optimization of benefits for local farmers, rules for benefit sharing, and incentives to comply with the rules associated with targeted certifications. These models may provide for a contribution to the financing of CRDEs based on the user-pays principle; (c) Negotiation and signature of agreements with relevant actors in each value chain.

Component 3. Implementation of agroecological practices adapted to climate change in targeted intervention areas includes one outcome: **Outcome 3. Increased adoption of climate-resilient practices and crops/varieties by smallholder farmers and value chain actors facilitated by support systems and adequate provision of inputs and resources.** This outcome will be mainly the result of investments on the ground, following approaches to mitigate the risks associated with climate change, to develop a local, quality and low-cost supply of agricultural inputs, climate-adapted seeds, tools and small equipment to enable the adoption of climate-smart practices, and to support the implementation of a set of practices and approaches that strengthen the climate resilience of agricultural and livestock production. The strategy to achieve this outcome is based on initiating smallholder farmers to the concept of risk management, identifying approaches and practices whose effectiveness in reducing climate vulnerability has been demonstrated by CRDEs and supporting their adaptation by farmers, facilitating access to microcredit on terms adapted to the conditions of farmers, improving the local supply of agricultural inputs for increased adaptability, and developing incentives linked to effective and proven adoption of sustainable and climate-adapted production. To contribute to the sustainability of this outcome, the project will adopt an approach where any project contribution for protective structure (such as goat sheds, greenhouses and shade shelters) and equipment (such as micro-irrigation systems, small tools) will involve a counterpart (in-kind contribution as work) from the beneficiaries in order to promote ownership and maintenance. In addition, the income from part of the agricultural production linked to the use of the infrastructures will be allocated to the maintenance and renewal of the infrastructures. Maintenance will be carried out by an infrastructure management committee comprising users supervised by CRDE staff, such that the government should not have to invest further beyond the project for their replacement. The project will include training on maintenance and the importance of savings not only as a risk management strategy but also to ensure the maintenance and renewal of equipment and infrastructure that contribute to strengthen climate resilience of agricultural production.

3.1 Agronomic approaches and practices (e.g. water and soil conservation, crop diversification, mixed production systems, fodder cultivation and conservation, protective structures) developed and piloted by CRDEs to reduce climate vulnerability of the agricultural sector. The CRDEs will identify and pilot promising approaches to reduce the climate vulnerability of the agricultural activities of farmers in their territory. Successful practices will be promoted to farmers by relay farmers. Project interventions to better manage the risks associated with climate change will focus on: (a) raising awareness among farmers of the concept of risk management in the face of climate change and the adoption of sustainable strategies and practices that contribute to the health of agroecosystems and related services on which they depend (soil conservation, protection of pollinators, mixed production systems such as agroforestry, hedging[47] and agropastoralism); (b) diversification of agricultural production and sources of income for households and small farmers in their plots (e.g., new climate-resilient crops and poultry breeding); (c) investments in protective structures such as greenhouses, shade shelters and goat sheds, and (d) the adoption of approaches and practices whose effectiveness in reducing the vulnerability of agriculture and livestock to new climatic conditions has been demonstrated by pilot tests carried out by the CRDEs.

Approaches to be tested and piloted by CRDEs include : (i) Wherever appropriate, the project will encourage the development of agroforestry systems where various associations of cash crops, fruit, food crops or livestock will be tested. Agroforestry systems provide multiple economic, environmental, and social benefits in a context of climate change through the protection of crops, livestock, soils and rivers, the diversification and spreading out of agricultural income through short, medium and long-term production of food products, fodder, wood and other non-timber products, in addition to other significant benefits such as the creation of habitats for biodiversity, landscape improvement, as well as carbon sequestration. Agroforestry can play a crucial role in improving resilience to uncertain climates through microclimate buffering and regulation of water flow. Promoting diversity through agroforestry systems will also increase the availability of alternatives for birds and reduce predation on valuable crops (which is aggravated by extended droughts). (ii) Diversification of tree and shrub species and establishment of living hedges to reduce exposure to strong winds whose frequency is increased by climate change. (iii) The construction of goat sheds for farmers communities to protect animals from extreme weather conditions, hedging (*embocagement*) and agropastoralism to reduce climate vulnerability and reduce pressures on natural ecosystems, growing legumes as fodder in the *bocages,* growing and storing dry fodder (hay) and producing silage for livestock feed. (iv) Practices for improving the moisture holding capacity of the soil (organic mulch and gravel), the use of compost to

increase soil organic matter, and micro-irrigation to lengthen cultivation period and diversify the cultivated varieties. (v) Water and wind erosion mitigation by the adoption of practices that promote soil cohesion, such as the use of cover crops, compost and green manure, the use of soil conservation and restoration techniques such as the construction of stone walls and anti-erosion lines planted with vetiver. Vetiver is a beneficial, inexpensive, and easy-to-maintain means of protection. Thanks to its resilience capacity in a wide range of ecological and climatic conditions[48], vetiver is effective in preventing and combating soil erosion in a climate change context. Yet, its use is not known in the Comoros and it is currently difficult to find. (vi) To help maintain healthy populations of pollinators, the project will conduct an assessment of threats affecting them (e.g. bee parasites, bushfires[49] and pesticides such as neonicotinoids), identify control measures to be implemented, required resources, and actors to be mobilized.

3.2 Financial products developed and made accessible to smallholder farmers to support the adoption of climate-resilient practices. Project interventions will involve (a) raising smallholder farmers' awareness on savings and credit as a risk management approach, building on interventions planned under the WB PIDC project (identified as co-financing to this project) which aim to encourage savings in the SANDUKs micro-credit institution, and providing financial education; and (b) facilitating access to suitable financing through negotiations with local micro-credit institutions (SANDUKs) for the development of credit products adapted to the reality of farmers, i.e. credit at low rates tied to firm loan conditions to invest in climate-smart productive activities, and repayment schemes adapted to agricultural production cycles, thus contributing to reducing the risks for farmers' investments. Risk reduction measures (eg capacity building of micro-credit institutions, communication and marketing support) to be put in place will be examined within the framework of the PPG.

3.3 Local supply of agricultural inputs, small-scale equipment and climate-resistant varieties seeds developed. The project will help reduce dependence on external supplies and increase the autonomy and adaptability of farmers to climate change by: (a) strengthening CRDEs capacities to produce quality seeds of climate-adapted crops and varieties meeting the needs of farmers (for self-sustaining agriculture) and the needs of the target markets (for cash crops), and by supporting this production, (b) supporting artisanal microenterprises involved in the recycling of metal waste for the manufacture of tools and adapted micro-irrigation systems (recovery of metal waste and abandoned car wreck) to manufacture agricultural tools meeting the needs of smallholders, (c) improving the capacities of microenterprises currently involved in the artisanal making of low-cost drip irrigation systems to meet the needs of farmers and cooperatives involved in the project; (d) developing capacities to produce organic fertilizer and supporting this production. The capacity development needs and resources available to support trainings will be identified during the project preparation (PPG).

3.4 Agricultural practices to strengthen agriculture and pastoral resilience, including the provision of climate-adapted crop varieties and breeds, implemented. The project will provide support for the implementation of farm and agro-pastoral plans at the individual and cooperative levels (developed under Output 1.3) through the adoption of practices and approaches that strengthen climate resilience (as identified and demonstrated under the output 3.1), for the establishment of nurseries and seed reserves, for soil conservation and restoration activities, including composting and green manure, and for implementing micro-irrigation systems. The project will support the use of protective structures and the adoption of mixed systems combining livestock, agriculture, fodder cultivation and trees, including agroforestry, hedging (*embocagement*), agro-pastoralism, and soil conservation and restoration, helping to restore soil productive capacity and other ecosystem services (water, fodder, pollinators, and carbon capture) that contribute to climate resilience of agroecosystems. The solutions proposed by the project will be to reduce soil erosion and increase diversity within crop plots and agroforestry systems, which in turn, will reduce the vulnerability of agricultural systems to pests and diseases which occurrence is increased as a result of climate change (as presented in the section on Effects of climate change on the agroecosystem and agricultural practices as experienced by smallholder farmers - Part II: Project Justification, 1a. Project Description) as fields that support a variety of crops are less attractive to predatory insects. The project will contribute to halt agricultural encroachment at the expense of forests (mostly within protected areas) by improving the productivity of agricultural plots, by restoring plots where soil is degraded, by collaborating with the authorities responsible for protected areas[50] to ensure that agricultural activities within village terroirs are conducted in harmony with the conservation objectives of protected areas, and by promoting mixed systems such as agroforestry that promote biodiversity.

Under the PPG, the need to invest in infrastructure to channel water from structures set up by the UNDP-GEF CRCCA and UNDP-GCF projects to the plots of CRDEs and farmers will be assessed.

3.5 Incentives (traceability and certification) in place to foster the adoption of climate resilient and sustainable practices across traditional and new value chains. This will include the following: (a) Certifications. The introduction of incentives to encourage the adoption of high-quality standards including climate-smart practices and varieties, organic farming and fair trade, to access higher added value niche markets, will help encourage farmers to maintain practices that promote resilience to climate change and ensure the financial sustainability of these adaptation measures. The selected certification will define a set of criteria that will be integrated into specifications to be followed by the various actors involved in the various stages of the value chain. These criteria should include adaptation measures to ensure climate resilience. A national committee composed of independent experts will be responsible for verifying the compliance of the various stages related to production (including cultivation, harvesting, storage, processing, transport) with the requirements of the specifications for the product to be eligible for certification. The criteria to be met for certification will be distributed to the producers concerned. The project will support value chain actors to gain access to these certifications and will also support the integration of climate resilience into the certification processes set up as part of the projects supported respectively by the WB and AFD (source of co-financing) for cloves and vanilla in other intervention sites. (b) Transparency and technology. Technology (e.g. blockchain) is available and can be used to ensure transparency through product traceability at all stages of the value chain by tracking the social and environmental impacts of products at every stage of their value chain, from local farmers to consumers, and thus support certification process. The project will assess the relevance, applicability (with users) and profitability of using a platform (via an application) to track and verify that each step in the value chain throughout the production process, meets adaptation criteria that can make these value chains more climate resilient. Using this tool, each step in the process is verified and recorded with time, date and geolocation as a secondary means of verification. (c) Facilitating change. To reduce farmers' reluctance to change and improve the efficiency of the transmission of technical knowledge to illiterate farmers, the project will adopt a strategy to through demonstration at the level of CRDEs, close supervision and long-term follow-up ensured by relay farmers. This transmission will be supported by the production of illustrated technical sheets, and the organization of visits - by and for the farmers - of sites where successful practices have stood the test of time, such as the plots developed through embocagement in the Nioumakélé (Ndzuani). The relay farmers involved in such a scheme will be identified and remunerated by the CRDE and thus become key partners in providing local support to farmers. At the same time, the project will put in place incentives to make the sector more attractive to young people. (d) Improvement of the perception of the farming profession. In order to change the negative perception of the farming profession by young people, the project will support an awareness campaign led by young people involved in value chains which will highlight the potential medium and long-term benefits of this profession. The awareness campaign may be supported by spot messages in the media and on the packaging of commonly used agricultural products.

Component 4: Knowledge Management, Monitoring-Evaluation, and Gender and PWDs' Inclusiveness. This component will enable mainstreaming transversal issues of knowledge management and gender and PWDs inclusiveness into other project components and outputs focusing on knowledge and on gender. Knowledge management is critical not only for the achievement of the project's objective, but for the sustainability of achieved results and replicability of climate-resilient solutions. Documenting, analysing and addressing gender and PWD issues as cross-cutting elements will allow to develop inclusive solutions to the climate adaptation challenge in agriculture, and ensure that men, women and PWDs benefit equally from the project support and that the concerns and experiences of women and of PWDs are an integral part of the implementation and monitoring and evaluation of the project. Lessons and successful experiences will be captured through the participatory monitoring and evaluation as part of the project annual planning process, through the participatory development of agroclimatic knowledge involving actively farmers, CRDEs, and researchers in a co-learning process, and recording and disseminating successful experiences among CRDEs, and with other relevant stakeholders in the country and in the region.

Outcome 4 Improved development, management, and dissemination of knowledge related to adaptation of the agricultural sector to climate change to support the replication of climate-resilient solutions among CRDEs, and at national and regional scale. This outcome will be achieved through the following outputs:

4.1 .Lessons learned from the project interventions documented and disseminated. This will be achieved through the annual monitoring and evaluation of project achievements using the indicators of the strategic results framework, and the identification and dissemination of related learnings with project partners, including projects in areas aimed at strengthening the climate resilience of agriculture, in the Comoros and in the countries of the region. Along with capacity building of CRDEs, and interventions on knowledge development and improvement of access to information, the project will support the management of knowledge developed through participatory monitoring and evaluation (involving beneficiaries) of project interventions, including the development of climate-adapted agricultural practices and their adoption by farmers, the improvement of the climate resilience in all segments of the various value chains and the development of new value chans for climate-resilient crops.

4.2 Agro-climatic knowledge for climate adaptation developed through strengthened monitoring and research-action involving farmers. CRDEs must become a place of experimentation, development, demonstration, teaching and promotion of new climate-adapted practices and crops and thus be at the heart of the generation and dissemination of technical knowledge allowing to adapt the agricultural sector. This learning and dissemination mechanism must also be deployed outside the CRDEs and set up within the plots of farmers who are experimenting with new approaches, techniques and varieties in order to involve them in the monitoring and evaluation of the results of these innovations and thus encourage their appropriation of successful approaches. Knowledge development may be based on interventions such as the following: (a) *Contribution to the national database on agricultural yields and production developed by the FAO.* This will involve training technicians within CRDEs on data collection, the use of GPS and entering observations into the database at the level of each CRDE, and the compilation of simple statistics to generate and disseminate technical knowledge and enable the agricultural sector to adapt to climate change. (b) *Action-research programs involving farmers.* This will involve establishing the necessary partnerships with INRAPE, the UdC including the University of Patsy (Ndzuani), the National Horticultural Center of Mvouni (Ngazidja), the CRDEs, relay farmers and farmers to carry out participatory action-research programs to generate new technical knowledge to adapt the agricultural sector to climate change. The possibility of associating one or more regional institutions to support research and training will be explored during the PPG (University of Reunion, National Center for Applied Research in Rural Development (FOFIFA[51]) (Madagascar) and CGIAR (Réunion).

4.3 Tools for experience and knowledge-sharing among CRDEs and actors in value chains are developed and operationalized. This will include the following: (a) The project will recruit a communication officer to coordinate the sharing of information through the development of short, practical guides in the form of booklets or illustrated sheets for farmers to record best practices and facilitate their adoption and follow-up in the local communities served by the targeted CRDEs as well as in all the CRDEs. (b) The project will support the experience-sharing mechanism among CRDEs and between CRDEs and farmers through a platform specific to CRDEs (under development with the support of a Comorian office). The project will support the consolidation of the digital platform set up within the CRDE network to, among other things, facilitate the exchange of information and the sharing of experiences between all actors in the value chains and create bridges between different segments, namely between producers and buyers. (c) The project will support the production of an online newsletter to share information relating to the adaptation and climate resilience of the agricultural sector, including activities and events linked or not to the project, including thematic articles, reports and interviews produced by CRDEs teams.

4.4 Gender and PWDs action plans based on comprehensive analyses are implemented, monitored, and evaluated to promote an inclusive approach to the adoption of a climate-resilient agriculture. During the PPG, an exhaustive gender analysis will be carried out to document gender issues in the agricultural sector and identify specific gender barriers. Based on this analysis, a gender action plan will be developed to be implemented, monitored, and evaluated as part of the project. Also, an analysis of the issues related to people living with disabilities (PWDs) in the agricultural sector will be carried out to identify the barriers specific to PWDs and to develop an action plan to increase their inclusion in the efforts to adapt the agriculture sector to climate change. The

adoption of an inclusive approach towards gender, PWDs and youth to improve equity in value chains and access to income-generating activities, will involve the following: (a) The project will seek to improve income equity within value chains and improve the involvement of women, especially the elderly, and PWDs, in income-generating agricultural activities by promoting small scale family farming (e.g., family garden near the house, poultry farming). The project will promote the adoption of a more inclusive approach in identifying solutions designed within families. (b) The importance of demonstrating new practices and varieties will be essential to increase the motivation of young family members to support older ones. The development of specialized professions within value chains, such as the production of seeds, artisan scrap metal workers, or manufacturing biodegradable packaging, will diversify the types of jobs accessible to different segments of society. (c) In certain sites, according to their will, the project could support groups and associations to set up cooperatives (dairy, food, market garden cooperatives) or to strengthen their capacities allowing certain sections of the value chain to be integrated within of the cooperative, for example collection or processing, and improve profitability for all members of the cooperative.

4) Alignment with GEF focal area strategies

The project is aligned to the GEF-7 Adaptation Strategy that is to strengthen resilience and reduce vulnerability to the adverse impacts of climate change in least developed countries and support their efforts to enhance adaptive capacity. This PIF was formulated in compliance with LDCF guidelines and aligned with the LDCF/SCCF Results Framework for the period 2018-2022[52]. More specifically, the project is in line with Objective 1: Reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaptation / Outcome 1.1 Technologies and innovative solutions piloted or deployed to reduce climate-related risks and/or enhance resilience.

5) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing

Under the baseline scenario, most actors involved in planning and implementation in the agricultural sector still lack the individual capacities and required institutional support, including the knowledge and tools required, to adapt agricultural practices to changing climatic conditions. These actors continue to work in silos and miss out on the benefits of working in partnership to address the multifaceted aspects of climate adaptation of the agricultural sector. Agricultural production rests on the same narrow base of cash crops, food crops and market gardening, which yields will likely decline due to the impacts of climate change, thus aggravating the country's dependence on lower quality food imports. Efforts to improve the marketing and profitability of agricultural products remain focused on a reduced number of cash crops whose vulnerability to climate change continue to increase, which keeps aggravating the precariousness of smallholder farmers who do not have alternative options and which pushes the biggest landowners to increase the areas allocated to these crops to the detriment of natural ecosystems and remaining forests. Productivity continues to decline, and therefore national production, thus reducing the ability of Comorian producers to negotiate on international markets.

Under the alternative scenario, national institutions and actors involved in agriculture development have the capacity to guide, plan, supervise, and adopt practices that are resilient to the impacts of climate change. Eight agricultural land use plans to the areas supported by the target CRDEs and climate-adapted agricultural calendars updated annually are available to guide the choices of farmers. Through intersectoral institutional partnerships, enhanced support is provided to all value chain actors and farmers in adapting their agricultural activities to climate change. The Comorian commercial supply of agricultural products is based on an expanded range of profitable value chains integrating sustainable and climate-smart agroecological practices that are competitive in local, national and international markets and which feasilibility has been demonstrated. Farmers apply climate-smart agroecological practices and approaches in their plots and value chain actors use climate-adapted infrastructure. Their vulnerability to the effects of climate change is reduced through their understanding and adoption of risk management strategies and enhanced adaptability through increased local supply of agricultural inputs such as seeds for adapted varieties, and small equipment (eg for microirrigation) and tools. Traceability and certification processes are in place and provide additional incentives for the adoption of climate-smart and sustainable practices, thus giving access to added value related to specific markets. The dissemination of

new knowledge on best practices and innovations for climate adaptation developeded through the project interventions supports their replication within and outside target sites, across CRDEs in the country. Women and people with disabilities have equal access to information and benefits resulting from the support provided by the project, both in terms of awareness-raising, training, access to adapted tools, and support for adopting climate resilient practices.

Global benefits: GEF funding will incrementally contribute to addressing several key environmental challenges and related barriers to climate change adaptation of the agricultural sector in Comoros, focusing on smallholder farmers and value chain actors in vulnerable areas supported by eight CRDEs. In these areas, the project will reduce the climate vulnerability of more than 98,188[53] people and strengthen the climate resilient management of 7,568 hectares of agricultural land.

6) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

Intended impact: The project will secure the livelihoods of a minimum of 98,188 local people, of which 50.2% are women, including collectors, and retailers, through increased adaptation, productivity, and diversification of value chains occupying a favorable position in a niche market with high added value. The project will contribute to the development of the capacities of 24,433 people, of which 50% are women, including 28 people at lne ministries, 63 extension service officers in CRDEs, 6 staff in the hydrometeorological and disaster risk management agency, 88 small private business owners, 10 professors in academic institutions, 228 commune staff, 502 NGO members, and 23,458 farmers.

Adaptation benefits will include the enhanced adaptation of 28 crops to climate change, improved management of 7,568 ha of land. An important benefit of this project will be to improve the supply of local, healthy, affordable and quality food products and thus reduce dependence on imported food products of lower quality and ensure greater resilience of this food supply in the face of climate change.

7) Innovation, sustainability and potential for scaling up

Innovation. The project is innovative for the Comoros as it addresses climate resilience and adaptation across all sections of key value-chains. The project will develop new value chains for climate-resilient crops / varieties and poultry breed, which are in high demand on national or international markets, with limited needs in terms of cultivation area, with a short production cycle, and which can be processed locally, to reduce the environmental impact of agriculture and optimize benefits to local farmers. The development of new value chains in Comoros will reduce the country's dependence on the three traditional cash crops which yields have been significantly impacted by climate change and which cultivation and processing aggravate the vulnerability of natural ecosystems to climate change. The project will introduce new practices such as improved agroforestry systems integrating climate resilience, agropastoralism as a mixed production system including growing and storing fodder, production of livestock feed to cease overexploitation of climate vulnerable natural vegetation, and soil erosion control through cover crops and anti-erosion lines planted with vetiver. Another innovation in Comoros is the development of local supply of agricultural inputs to reduce dependence on costly and time-consuming imports, including the production of seeds of climate-adapted varieties to increase the adaptive capacity of farmers to climate change disrupting cropping calendars. The project will introduce new technologies such as microirrigation, greenhouses, shade shelters, and goat sheds that will contribute to control growth conditions and mitigate the effects of extreme weather. The project will enable the country to position itself favourably in international niche markets by introducing a system relying on technology to certify the origin of products, adherence to climate-smart agroecological practices and organic farming standards, and the fair and equitable sharing of benefits among value chain actors. The project will also rely on digital platforms as an innovation to better align productions with the absorption capacities of the markets and thus reduce the risk of producers.

Sustainability. Financial sustainability: The adoption of new climate-adapted practices and cultures/varieties will help improve the resilience of the agricultural sector in a sustainable way beyond the project implementation period, provided that they are profit3able for the various actors of the value chain involved and that the risks are minimized. Interventions to increase profitability and minimize the risks associated with new practices and varieties/cultures are integrated

in the project, such as: i) preliminary market studies for any new crop or variety to be proposed to producers; ii) preliminary analyzes and pilot tests within the CRDEs' plots to ensure that any new variety or practice presented to farmers is effectively adapted to climatic conditions and guarantees sufficient yields to generate increased profits for farmers and other actors in the value chain; iii) support for the marketing of climate-adapted agricultural products based on a brand attesting to the origin of the products and their production standards based on climate-resilient practices, to develop or strengthen demand at local, national and international (as appropriate); iv) facilitation of dialogue and negotiation in value chains for equitable sharing of the sale of climate-adapted agricultural products and fair income for smallholder farmers; v) support for the creation or consolidation of agricultural cooperatives by building their entrepreneurial skills, access to market information, pooling of services to reduce production costs (e.g. purchase of agricultural inputs, mobilization of expertise in plant protection and to support organic and fair-trade certification procedures, improvement of digital platforms); and vi) negotiations with local micro-credit institutions (SANDUKs) for the development of credit products adapted to the reality of farmers and agricultural production cycles;

Training on the entrepreneurial approach for the value chain actors, namely farmers and cooperatives, will include the development of business models integrating i) a fraction of the depreciation of equipment and built structures (e.g. greenhouses, shade shelters, goat sheds, hay conservation sheds) into the determination of the selling price, and ii) an optimization of benefits for smallholder farmers in line with the profit-sharing principles of the targeted certifications, to ensure that that the income allows climate-resilient agricultural activities to continue beyond the project implementation period. Business models should also provide for a contribution to the financing of CRDEs on the basis of user-pays principles.

The project will also adopt an approach where any project contribution for infrastructure (such as goat sheds, greenhouses and shade shelters) and equipment (such as micro-irrigation systems, small tools) will involve a counterpart (in-kind contribution as work) from the beneficiaries in order to promote ownership and maintenance. In addition, the income from part of the agricultural production linked to the use of the infrastructures will be allocated to the maintenance and renewal of the infrastructures. Maintenance will be carried out by an infrastructure management committee comprising users supervised by CRDE staff, such that the government should not have to invest further beyond the project for their replacement.

The project also includes training on infrastructure maintenance and the importance of savings not only as a risk management strategy but also to ensure the maintenance and renewal of equipment and infrastructure that contribute to strengthen climate resilience of agricultural production.

Environmental sustainability. The agricultural sector of the Comoros is highly vulnerable to the impacts of climate change, including increased temperatures, reduced and changing patterns of rainfall, and sea level rise. Increasing the climate resilience of key agricultural value chains is a specific objective pursued by this project. This will be achieved through i) a climate and socioeconomic vulnerability analysis for all sections of targeted cash crop and market gardening value chains to identify the main issues affecting them and to better define the interventions needed to strengthen their resilience; ii) the participatory development of optimal agricultural land use plans that take into account projections of climate change and its impacts, as well as the potentials and vulnerabilities of current and new crops; iii) promoting the diversification of crops and integrated approaches whose environmental and socioeconomic benefits are multiple and sustainable such as embocagement, agropastoralism, and agroforestry. Land use and improved agro-sylvo-pastoral practices in the target rural landscape will be optimized to adapt to climate change conditions, and increased productivity and adoption of new varieties better adapted to current and future climate conditions will contribute to reduce agricultural encroachment at the expense of natural forests.

Social sustainability will be pursued through implementing effective participatory and inclusive processes with a focus on women, youth and PWDs, involving local users, technical services and authorities at all levels, for assessments, negotiations, decision-making, implementation, monitoring and evaluations, including extensive involvement of stakeholders at all levels for the agricultural planning process. It is expected that local actors will have better ownership of the decisions and planning made through a transparent and participatory approach. Greater involvement of local communities and equity of revenue and benefit sharing from value chains will be a key dimension of the third component.

Potential for scaling up. Thousands of smallholder farmers in Comoros need access to climate-smart agricultural practices to adapt to changing climatic conditions. To achieve this, scaling up mechanisms and approaches will be critically important. The project will include all the elements necessary for scaling-up its outputs and outcomes, first among the smallholder farmers supported by the target CRDEs, then across the areas supported by all CRDEs in the country, and finally in other countries in the region sharing similar challenges. Replication elements include i) developing a common vision through agricultural land use plans based on sound knowledge regarding the most sustainable, profitable and climate-resilient agricultural production options, shared and disseminated among stakeholders at all levels (output 1.3), including farmers who will implement the agricultural plans at the local level, CRDEs and relay farmers who will provide extension services including training, demonstration and inputs, technical services within communes who will provide support and supervision, and national institutions such as who will contribute to monitoring and knowledge development, ii) involving all actors in decision-making, planning, monitoring, evaluating and learning, iii) building capacities at all levels to ensure effective access to information, participation and implementation of recommended solutions by all stakeholders, including women, youth, PWDs and elders, iv) strengthening capacities of the CRDEs as extension centers to demonstrate new approaches, crops and technologies and to provide support and supervision to farmers, and involving relay-farmers to enhance knowledge transmission to a large number of smallholder farmers, which approach could be replicated across all country's CRDEs, v) developing incentives linking certification of products to climate-smart agricultural practices in a manner that is scalable and commercially viable, and vi) collecting and managing knowledge throughout the planning and implementation stages to replicate successful crops and techniques in other sites.

The possibility of using South-South cooperation mechanisms will be explored during the preparation of the project document (PPG).

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[1] Statistics are taken from the UNDP Human Development Report 2020. Country Profile Comoros.

[2] expressed in constant 2017 dollars converted using purchasing power parity (PPP) conversion rates

[3] The HDI is a synthetic indicator that reflects three basic dimensions of human development, life expectancy, the number of years of education and the standard of living assessed on the basis of gross national income per capita.

[4] https://oec.world/en/profile/country/com

[5] https://covid19.who.int/region/afro/country/km

[6] UNION DES COMORES. 2022. Étude de l'impact de la Covid-19 sur le développement économique et social des Comores : Perspectives pour la relance et l'Émergence.

Banque Mondiale. 2016. Profil de risque de catastrophe – Comores. Initiative d'évaluation et de financement des risques dans le Sud-Ouest de l'Océan Indien.

[8] PNUD. 2019. Diagnostic des capacités en matière de réduction de risque de catastrophe et adaptation au changement climatique.

[9] Eckstein, D. V. Kunzel and L. Schafer. 2021. Global Climate Risk Index 2021. Accessible from www.germanwatch.org/en/cri - The global climate risk index developed by Germanwatch quantifies impacts of extreme weather events.

[10] MAPETA 2021. id.

[11] MAPETA 2021. Contribution déterminée au niveau national (CDN actualisée). Rapport de synthèse. 2021-2030.

[12] https://climateknowledgeportal.worldbank.org/country/comoros/climate-data-projections-expert ; https://climateknowledgeportal.worldbank.org/country/comoros/impacts-sea-level-rise

[13] Ministère du Développement Rural, de la Pêche, de l'Artisanat et de l'Environnement. 2006. Programme d'Action National d'Adaptation aux changements climatiques (PANA).

[14] The seeds are imported from South Africa by a Comorian cooperative which ensures the supply of seeds and phytosanitary products for the whole country.

[15] including 2 tanks of 32 m^3, 7 micro-basins of 48-144 m^3 and 2 Ekotanks of 1030 m^3 in the territory of the CRDE of Hamalengo-Diboini (Ngazidja), 6 tanks of 150 m^3 in the territory of the CRDE of Sidjou (Ngazidja), 32 micro-basins of 10 m^3 in the territory of the CRDE of Mrémani (Ndzuani), 3 tanks of 60 to 150 m^3 and 1 micro-basin of 30 m^3 in the territory of the CRDE of Pomoni (Ndzuani), and 3 catchment areas of 400 m^3, 2 micro-basins of 10 m^3 in the territory of the CRDE of Fomboni (Mwali).

[16] A deep borehole and two reservoirs planned in Mboikou and Oichili (Ngazidja), and 4 impluvium under crater of 50,000m^3 in Hamanvou (Ngazidja), 44 micro-basins (25-50 m^3) for off-network irrigation and 35 water troughs for livestock in Nyoumakélé (Ndzuani) and 6 drinking troughs for livestock in Fomboni and Hoani (Mwali)

[17]classified as vulnerable according to the IUCN red list, endemic to the medium and high-altitude forests of Ngazidja

[18] In Ngazidja, roads must be rehabilitated to connect Ouzio, Ossao and Pandé over 6 km, Bandassamlini and Diboini over 7.5 km, and Mvouni, Mbabani and Oussivo over 2 km, and to Ndzuani, to link Mridjou and Gnamboimro over 11, 1 km and Koni, Djodjo and Houngouné over 6.3 km.

[19] Tomato leafminer, fall armyworm, whitefly, lethal corn necrosis, African cassava mosaic disease, banana fusarium

[20] FAO technical cooperation program supporting the government in finding sustainable solutions against pests and diseases in vanilla production and building capacity for control and optimal use of pesticides and pest control of plants.

[21] Soroye, P. Newbold T. et J. Kerr (2020) Science 367 : 685-688. Extensive study of 66 species of bumblebees in North America and Europe

[22] A. Joy, F.R. Dunshea, B.J. Leury, I.J. Clarke, K. DiGiacomo and S.S. Chauhan. 2020. Resilience of Small Ruminants to Climate Change and Increased Environmental Temperature: A Review. *Animals* 2020, *10* (5), 867; https://doi.org/10.3390/ani10050867.

[23] Darcan N. K. and N. Silanikove. 2018. The advantages of goats for future adaptation to Climate Change: A conceptual overview. Small Ruminant Research. Vol. 163: 34-38.

[24] Nyoni N., Grab S., Archer E. 2019. Heat stress and chickens: climate risk effects on rural poultry farming in low-income countries. Clim Dev 11: 83–90

[25] Kumar, M. P. Ratwan, S.P. Dahiya, A.K. Nehra. 2021. Climate change and heat stress: Impact on production, reproduction and growth performance of poultry and its mitigation using genetic strategies. J. Therm. Biol. 2021 97:102867.

[26] Liverpool-Tasie L.S.O., A. Sanou, J.A. Tambo. 2019. Climate change adaptation among poultry farmers: evidence from Nigeria. Climatic Change Vol 157: 527–544

[27] Nawab A., F. Ibtisham, G. Li, B. Kieser, J. Wu, W. Liu, Y. Zhao, Y. Nawab, K. Li, M. Xiao, L. An. 2018. Heat stress in poultry production: Mitigation strategies to overcome the future challenges facing the global poultry industry. J. Therm. Biol. 2018 Dec;78: 131-139.

[28] The use of pesticides is limited in Comoros due to their unavailability and high cost.

[29] PREFER project, quoted on March 13, 2022 in the Gazette des Comores.

[30] UNDP 2021, Country Programme Document

[31] including 2 tanks of 32 m^3, 7 micro-basins of 48-144 m^3 and 2 Ekotanks of 1030 m^3 in the territory of the CRDE of Hamalengo-Diboini (Ngazidja), 6 tanks of 150 m^3 in the territory of the CRDE of Sidjou (Ngazidja), 3 tanks of 60 to 150 m^3 and 1 micro-basin of 30 m^3 in the territory of the CRDE of Pomoni (Ndzuani), and 3 catchment areas of 400 m^3.

[32] Specific intervention sites are yet to be determined

[33] 4 *ecotanks* with a 30-year lifespan @ $220,000 each

[34] 3 impluvium with a 10-year lifespan @ $600,000 each

[35] 14 tanks with a 10-year lifespan @ $71,430 each

[36] 32 greenhouses with a 5-year lifespan @ $16,200 each

[37] A deep borehole and two reservoirs planned in Mboikou and Oichili (Ngazidja), and 4 impluvium under crater of 50,000m^3 in Hamanvou (Ngazidja), 44 micro-basins (25-50 m^3) for off-network irrigation and 35 water troughs for livestock in Nyoumakélé (Ndzuani) and 6 drinking troughs for livestock in Fomboni and Hoani (Mwali)

[38] Bourgoin C, Parker L, Martínez-Valle A, Mwongera C, Läderach P. 2017. Une évaluation spatialement explicite de la vulnérabilité du secteur agricole au changement climatique dans l'Union des Comores. Work Document No. 205. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Wageningen, Les Pays-Bas. Available from: www.ccafs.cgiar.org

[39] Mwongera C. Nowak A., Notenbaert A.M.O, Grey S., Osiemo J., Kinyua I. Lizarazo M. et E. Girvetz. 2019. Climate-Smart Agricultural Value Chains: Risks and Perspectives. in T.S. Rosenthal et al. (eds.) The Climate-Smart Agriculture Papers.

[40] ECOCROP is a software tool that identifies 2568 plant species for given environments and uses (food, fodder, energy, erosion control, industrial purposes) which also contains a library of crop environmental requirements.

1] The tool could present the following information: 1. Crop calendar indicating for each month what must be done for each crop (sowing, cultivation, flowering, ırvesting), taking into account current meteorological data and, if relevant, the various cultivation areas. 2. Agroecological practices sheets covering, as useful, the llowing subjects: a) Culture sheets (for all traditional and new crops supported by the project): botanical information, cultural practices, pests and diseases, ıysiological disorders (symptoms, possible causes, solutions); b) Cultivation without harmful pesticides: control methods, natural or low impact pesticides; c) Plot aintenance; d) Irrigation: practices to minimize water requirements, rainwater harvesting, manual watering systems and micro-irrigation; e) Fertilization: knowledge the nature of the soil, assessment of needs and different options for amending it; f) Composting: Preparation of various types of compost to meet different needs;

Seed production. 3. Diseases, pests, weeds and invasive alien species (IAS): Sheets on the main problems affecting crops, including new diseases and pests cently introduced or favored by climate change: a) identification of the problem: description of signs and symptoms, photos of the effects on the different plants fected by the pest or disease; b) advice for prevention and control (favorable conditions, screening, preventive measures, physical and biological control)

[42] For example, compared to clove and ylang-ylang which require large areas (6m x 6m) and which cannot be harvested for several years after planting, ginger can be grown on an area of 0.25m x 0.25m, pepper and coffee can be integrated into agroforestry systems, and all can be processed locally to create local added value.

[43] For example, endemic varieties of bananas, yams, aromatic and medicinal plants, low caffeine coffee, high vanillin vanilla, ginger, nutmeg, aloe vera, large thyme, vetiver, turmeric, Plectranthus both Cuban Oregano type and Indian Borage type

[44] *chevrières*

[45] https://www.adaptation-undp.org/resources/training-tools/toolkit-value-chain-analysis-and-market-development-integrating-climate

[46] National Research Institute for Agriculture, Fisheries and the Environment

[47] *embocagement*

[48] With its developed and resistant roots, vetiver protects embankments and terraces, fertilizes and improves soil structure, and fights against pollution, erosion and flooding. It tolerates acid or alkaline soils (with pH from 3.0 to 10.5), saline soils or soils with high levels of metals and resists extreme climatic variations such as prolonged drought, floods, submersions as well as extreme temperatures ranging from 14°C to 55°C. After being affected by drought, salinity and other adverse conditions, this plant has the ability to re-grow very quickly when conditions improve.

[49] Bushfires can be started by pastoralists and by farmers who practice slash-and-burn agriculture. Since herders do not cultivate fodder, they depend on natural fodder which is increasingly affected by the lengthening of the drought period. Herders thus resort to bushfires, despite being illegal, to improve the palatability of pasture grasses. Often left unattended and uncontrolled, they spread over large areas and are harmful to the biodiversity of the affected forest areas, including pollinator species.

[50] The protected areas of the Comoros have been delineated by integrating villages and agricultural lands within their boundaries.

[51] FOFIFA is Madagascar's main agricultural research organization and conducts research on coffee varieties in the region including the Comoros

[52] GEF Programming Strategy on Adaptation to Climate Change for the Least Developed Countries Fund and the Special Climate Change Fund and Operational Improvements July 2018 to June 2022. GEF/LDCF.SCCF.24/03, June 1, 2018

[53] Based on an average household size of 5.6 people. According to the 2017 General Population and Housing Census, the average household size in the Union of the Comoros is 5.4 people. This average is 5.0 people among the urban population and 5.6 people in rural areas.

1b. Project Map and Coordinates

Please provide geo-referenced information and map where the project interventions will take place.

Site selection: Interventions will target the local communities served by 4 CRDEs which have been supported under the UNDP-GEF-LDCF CRCCA project (GEF ID 4974) (Ngazidja: Hamalengo-Diboini and Sidjou; Ndzuani: Pomoni; Mwali: Mibani) to build on the results of the CRCCA project and continue strengthening these CRDES. The project will also target local communities served by four additional CRDEs (Ndzuani: Bambao Mtsanga and Bandramaji, Mwali: Mlédjélé, and Ngazidja: Cembenoi). The CRDEs of Bambao Mtsanga, Cembenoi, Mlédjélé and Bandramaji have received significant support for the construction of an irrigation network including water storage,and the inclusion of these communities will enable building synergies with interventions that develop such critical infrastructure for agriculture (GCF-UNDP project on water and FIDA's PREFER project).

The selection of CRCCA intervention sites had taken into account the following criteria that are still relevant: i) The level of vulnerability of the region, as identified by PANA and confirmed by a multi-stakeholder planning workshop; ii) the importance of agricultural activities in the region; iii) the links between vulnerability and climate risk factors, and the potential of the project for interventions in response to vulnerability; iv) the presence of community organizations and / or NGOs with solid experience working in the region to support implementation; v) the size of the population to ensure a significant impact in terms of beneficiaries; vi) the presence of projects supported by the Government and its development partners and addressing issues relevant to the project, with a view to constituting a baseline situation on which GEF funding will be based to generate global benefits of adaptation to climate change, in accordance with the incremental principle. The selection of the intervention sites also stems from a distribution of the CRDEs among development partners which has been agreed at a coordinating meeting of different partners (UNDP, BM, FAO).

Georeferenced maps of CRDE intervention areas where interventions will take place are presented in Annex A.

Georeferences of each CRDE:

Island	CRDE	Coordinates	
		Longitude	Latitude
Mwali	Mlédjélé	43.46555°	-12.17354°
	Mibani	43.77640°	-12.33909°
Ndzuani	Pomoni	44.40513°	-12.28013°
	Bandramaji	44.51462°	-12.35919°
	Bambao Mtsanga	44.51370°	-12.19574°
Ngazidja	Hamalengo-Diboini	43.27671°	-11.44729°
	Sidjou	43.41379°	-11.68060°
	Cembenoi	43.25771°	-11.68185°

2. Stakeholders

Select the stakeholders that have participated in consultations during the project identification phase:

Indigenous Peoples and Local Communities Yes

Civil Society Organizations Yes

Private Sector Entities Yes

If none of the above, please explain why:

In addition, provide indicative information on how stakeholders, including civil society and indigenous peoples, will be engaged in the project preparation, and their respective roles and means of engagement

Extensive consultations were carried out during the development of the PIF with the following stakeholders: National Directorate of Agricultural Strategies and Livestock, National Institute for Agronomic, Fisheries and Livestock Research, Regional Directorates of Agriculture, Rural Economic Development Centers, National Meteorological Agency, University of Comoros, National Horticultural Center, Private Sector (Chamber of Commerce, INNOV'LAB), Development Partners (IPDC Project, AFIDEV, PREFER-IFAD, GCF watershed, Catastrophe), Decentralized structures (Town Halls and Communes), Farmers / Herders. The consultations took place through workshops, meetings, interviews, and a questionnaire with farmers. The issues addressed by each of these consultations are presented in Annex E. Overall, they focused on the following aspects: Selection criteria for intervention sites, Risk assessment of the agricultural sector to climate variability, Evolution of the yield of the main crops in the agricultural chains, Proposals for measures to mitigate the effects of climate change on the agricultural sector, Capacity assessment of the DNSAE to pilot the project in relation to climate variability, Studies and initiatives implemented or in progress in relation to climate variability, Identification of institutional, technical and technological capacity building needs, Main vulnerability risks in the project intervention areas, Promotion of agricultural entrepreneurship especially for young people and women, Innovative prospects for marketing at national and regional levels, Main speculations of agricultural value chains and their vulnerabilities, Socio-economic impacts of climate change. Farmers were specifically consulted on their perception and experience of the effects of climate change in the agricultural and livestock sectors and on their practices.

In addition, provide indicative information on how stakeholders, including civil society and indigenous peoples, will be engaged in the project preparation, and their respective roles and means of engagement.

Table 5. Analysis of stakeholders and their roles relating to the project

Stakeholders	Project Interests and Potential Roles in Project Design / Preparation
Government institutions	
	MAPETA is responsible for the design, planning and implementation of national policies and s trategies on sustainable rural development and has a very general mandate for the conservati on and sustainable use of natural resources, including the sustainable land management. This ministry is also the focal point for all environmental conventions in the Comoros. The ministry is structured into five national directorates, namely Agricultural Strategies and Livestock, Envir

Ministry of Agriculture, Fisheries, Environment, Tourism and Handicrafts (MAPETA)	onment and Forestry, Fisheries Resources, National Waste Agency and National Research Institute for Agriculture, Fisheries and the Environment (INRAPE). The ministry has 98 positions, all branches combined. The Secretary General of MAPETA ensures the coordination and supervision of INRAPE which is directly concerned by the implementation of the project. The effectiveness of the ministry's action is limited by weak institutional capacities and lack of funding. As the GEF Executing Entity, the ministry will be the Implementing Partner for the project, through the DNSAE. It will play a critical role in the design and implementation of agricultural development and extension interventions to ensure that the project responds to national priorities and will be a key beneficiary for capacity development.
National Directorate of Agricultural Strategies and Livestock (DNSAE) / MAPETA	The DNSAE is responsible for questions relating to the organization and development of plant production, animal production and health, and veterinary and food controls. The DNSAE has the national mandate to ensure the promotion and development of agriculture, to ensure the development of policies and strategies, and to coordinate, program, promote, monitor and evaluate the activities of the various services. The DNSAE structure includes: (a) the Directorate of Agriculture and (b) the Directorate of Livestock with the animal health, veterinary public health, and animal production services. The organic framework of the Directorate provides for 14 departments and services: Departments of crop production, of crop and cash production, of mechanization and agricultural hydraulics, of plant protection, of certification and notification, of conservation and processing, of livestock, the veterinary public health service, Animal production service, Rural economy and statistics service, Sustainable soil management and land tenure service, Service in charge of farmers' organizations and agricultural credit, Agricultural inputs service and Support service. It is supported by the Regional Directorates in charge of Agriculture and in charge of Livestock on each of the islands. In the current context of constrained hiring in the public service, the management has only 15 officers and civil servants, some being mobilized for the coordination of projects or other functions. Staff gaps are filled by the assignment of contractual employees and volunteer interns, most of whom have recently graduated, and thus have the opportunity to gain concrete experience while providing management with the benefit of their knowledge. The DNSAE will assume the role of the project's implementing partner and provide leadership for its development and implementation, in particular to ensure the project's compliance with the country's priorities set out in national policy and strategy documents and to ensure the integration of learning and previous achievements in the design of the project. DNSAE will play a critical role in the design and implementation of agricultural development and extension interventions and will be a key beneficiary for capacity development. The DNSAE will house the proje

	ct development team and allocate appropriate workspaces, including water and electricity.
The Regional Directorates in charge of Agriculture and of the Environment at the level of the Islands	The Regional Directorates in charge of agriculture and in charge of the environment report to MAPETA and are linked to the national directorates in charge of the environment and agriculture. Their staff are directly appointed by ministerial order. The regional directorates will play an essential role in the design and implementation of agricultural development and extension interventions and will benefit from capacity development interventions. They will be informed of the project development and objectives and invited to participate in baseline surveys and workshops to identify priorities / strategies for interventions, to participate in identification and planning of interventions at the local level, including the selection of intervention sites at the local and village levels. They will also benefit from training on climate-resilient agriculture.
Rural Economic Development Centers (CRDEs) (CRDEs targeted by the project: Fomboni and Mibani in Mwali; Pomoni, Mrémani and Bambao Mtsanga in Ndzuani; Hamaleng o-Diboini, Sidjou and Cembenoi in Ngazidja)	The Union of the Comoros created the CRDE in 2013 by presidential decree (Decree No. 13-015 / PR) to supervise rural development programs for the improvement of the economy through the sectors of production and protection of the environment. To support agricultural development, the centers must (i) implement rural development programs to promote the economy through the productive and environmental protection sectors, (ii) train farmers and fishermen, (iii) ensure technical extension, (iv) supervise professional organizations and community development structures, (v) ensure data collection and management, (vi) provide advisory support to producers, (vii) provide basic support services for improving the working conditions of rural communities (genetic material, etc.), and (viii) support the development of basic economic infrastructure (access, hydraulics, supply, etc.). The CRDEs are under the technical supervision of the Ministry in charge of Agriculture and under the financial supervision of the Ministry in charge of Finance and Budget, administered by a Steering Committee, and managed by a Director assisted by an accounting manager, an administrative assistant, and a team of technicians. Most of these sixteen centers are hardly operational due to lack of staff and sufficient operating resources, and only the CRDEs which benefit from direct project support are able to at least partially fulfill their role of supporting producers. CRDEs are key beneficiaries of the project's capacity building interventions and will be at the centre of support interventions for farmers and small agricultural enterprises. The staff of the CRDEs targeted by the project interventions were closely associated with the preparation of the PIF and will be key players in all stages of project preparation within the framework of the PPG process.
Directorate General of Environment and Forests (DGEF) / MAPETA	The DGEF has a national mandate for the conservation and sustainable management of natural resources. The Directorate is structured into 4 departments: Natural resource management, Land use planning, Regulation and control, and Environmental education and documentation and is supported by the Regional Directorates in charge of Environment on each island. The Di

	and is supported by the Regional Directorates in charge of Environment on each island. The Directorate is also supported by 3 state agencies: the National Agency for Waste Management, the National Forestry Agency and the National Agency for Coastal Zones.
Geographic Information System (GIS) **Unit** of the DGEF / MAPETA, under the administrative supervision of the Secretary General of MAPETA	MAPETA's GIS Unit will provide support for the mapping of intervention sites as part of the development of agricultural land use plans within intervention sites. The GIS Unit will help identify project activities linked to the production of agricultural land use maps.
National Institute of Statistics, Economic and Demographic Studies (INSEED) / Ministry of Finance and Budget.	INSEED's mission is to design and coordinate the implementation of national statistics policy and its fields of application in the economic, demographic and social fields, as well as scientific and technical support for the management of the national economy. Recent FAO initiatives for the preparation of the General Agricultural Census have been carried out in collaboration with INSEED. The Institute will collaborate in the definition of project interventions for the establishment of the agricultural database.
Planning, Monitoring and Evaluation Department / MAPETA	This service within MAPETA is responsible for reviewing technical reports, progress, and evaluation of development projects. It will be kept informed of the development of the project document.
National Investment Promotion Agency (ANPI) / Ministry of Economy, Industry, Investment, responsible for Economic Integration	The ANPI is the main government institution responsible for promoting, facilitating, and monitoring national and international private investment. The agency will advise developers involved in the project interventions on regulatory compliance, provide guidance and support them through all processes.
National Directorate of Planning and Infrastructures / Ministry of Regional Planning, Urban Planning, in charge of Land Affairs and Terrestrial Transport	The National Planning and Infrastructures Department prepares and implements the national planning policy, which is part of the dynamic of sustainable development and energy transition, favoring more environmentally friendly modes and uses. This department is responsible for environmental impact studies for new infrastructures. Its role in the project implementation will be specified during the preparation process.
Land Service / General Administration of Taxes and Domains / Ministry of Finance, Budget and Banking Sector	The clarification of the land tenure system is essential to enable an effective land use planning in support of sustainable land management as well as any development policy for the Comoros, and to secure agricultural investments. The settlement of the land issue is a priority issue in improving climate-resilient agricultural practices and requires the support of the Land Service to support the resolution of land conflicts within the intervention sites, the regularization of

	land situations and regulation of agricultural land use planning programs. Its role in the implementation of the project will be specified during the preparation of the project.
Ministry of Finance, Budget and Banking Sector (MFB) **National Budget Directorate**	The National Budget Directorate is responsible for preparing the state budget and for preparing draft finance laws. The CRDEs are placed under the financial supervision of the MFB. This Directorate must authorize the disbursement relating to any financial registration in the finance law for agricultural development and will help identify the financial capacity building needs of the CRDEs to ensure their long-term operation.
National Planning Commission (CGP)	The CGP includes the General Direction for Programming and the Direction of Technical Coordination of Development Aid. The CGP designs, supervises and coordinates the development and monitoring of the economic and social development policy adopted by the Government in all sectors. The CGP is in permanent dialogue with all development partners (civil society, institutions state, NGOs, international organizations). It ensures the role of coordination of interventions. The Commission will be informed of the development and objectives of the project.
National Gender Commission / Ministry of Health, Social Protection and Gender Promotion	The National Policy of Equity and Gender Equality aims at several objectives, in particular the consistency of "removing obstacles of an economic and social nature" to promote the participation of the total population without distinction of sex in economic development and the fight against the degradation of natural resources. As such, the commissariat will interface with the project for the gender issues.
Local authorities and local government officials	
The town halls (*mairies*) and municipal councils of the municipalities concerned by the interventions of the project, including: Ngazidja: Itsandra-Hamavou, La Grille Nyouma Msirou, Washi ya mboini; Dimani, Domba, Wachili ya Djou. Ndzuani: Pomoni, Mremani, Babao Mtsanga; Mwali: Fomboni, Djando	The municipality provides local public services to meet the needs of the population and that are not, by their nature or their importance, the responsibility of the State. Mayors are elected by the population and administer municipal councils. They are the local authority for rural development within the territory under their jurisdiction. They must be informed and systematically involved in any intervention carried out within their municipality. The councils have standing committees or commissions, including committees for agricultural production, the environment and local development. Town halls play an essential role in resolving conflicts and mobilizing local communities. The town halls and their committees are the primary interlocutors of the project at the local level and have a direct connection with the farmers. They will be informed of the development and objectives of the project and invited to participate in baseline surveys and workshops to identify intervention priorities/strategies, to participate in the identification and planning of interventions at the local level, including the selection of intervention sites at local and village levels. Together with the regional agricultural and environmental departments, they will also benefit from training on climate-resilient agriculture.

The **prefects of the regions or prefectures concerned by the project interventions**: Ngazidja: Itsandra, Mboudé, Mitsamiouli, Dimani, Wachili Ndzuani: Sima, Domoni, Mremani Mwali: Center, Djando	The regions are administered by designated prefects who have an important role of political representation and who exercise, among other responsibilities, a certain influence in the management of resources, which will be necessary to support the project. They will be informed of the development and objectives of the project and invited to participate in baseline surveys and workshops to identify intervention priorities / strategies, to participate in the identification and planning of interventions at the local level, including the selection of intervention sites at local and village levels. Together with the regional agricultural and environmental departments, they will also benefit from training on climate-resilient agriculture.
Scientific and academic institutions	
The National Research Institute for Agriculture, Fisheries and the Environment (INRAPE) / MAPETA	The mission of INRAPE, created in 1995, is to design and implement applied research programs likely to address the problems encountered by smallholder farmers on agricultural, fisheries and environmental issues, including the monitoring of the sanitary and phytosanitary condition of national productions with regard to pests by resorting to modern techniques of plant protection. INRAPE provides expertise, advisory support and training, including on concerns regarding species introductions in the Comorian territory, and in the following areas: phytopathology; entomology; production of vitro-plants; control, analysis and monitoring of product imports and exports related to agriculture and environment, in particular phytosanitary products; analysis of water quality and all environmental parameters; expertise on estimating carbon stocks in mangroves. In the field of biosecurity, INRAPE is responsible for controlling and authorizing the importation of living organisms, animals or plants. INRAPE is also involved in field interventions to fight against plant pests. As part of project preparation, INRAPE will be informed of the development and objectives of the project and invited to participate in baseline surveys and workshops to identify intervention priorities / strategies. INRAPE will benefit from specific support to strengthen its capacities to carry out characterization studies of Comorian products to demonstrate the uniqueness of their properties and to certify them, and to carry out the necessary analyzes to ensure that the products intended for export meet the standards of the target markets.
University of the Comoros (UdC)/ Ministry of National Education and Vocational Training	The UdC, created in 2003 as a public higher education and research establishment, offers environmental training through the Faculty of Science and Technology. Training in agriculture is also provided in two schools annexed to the UdC and located in Ndzuani (Patsy University) and Mwali (Mwali Agricultural Institute). As part of the project, the UdC will contribute with the CHN, to design and deliver training programs for technicians and relay farmers on techniques an

	d approaches in climate-resilient agriculture, and to design and support participatory research programs involving farmers to develop and evaluate techniques and approaches in climate re silient agriculture. The UdC will be informed of the objectives and development of the project and invited to participate in workshops to identify intervention priorities / strategies.
Mvouni National Horticul tural Center (CNH)	The CNH in Mvouni (Ngazidja) provides technical and professional training which leads to the diploma of horticulture technician. In the project, the CNH will contribute, with the UdC, to desi gn and deliver training programs for technicians and relay farmers on techniques and approac hes in climate-resilient agriculture, and to design and support participatory research programs involving farmers to develop and evaluate techniques and approaches in climate resilient agri culture. The CNH will be informed of the objectives and development of the project and invite d to participate in workshops to identify intervention priorities/strategies.
National state and non-state agencies	
National Agency for Proje ct Design and Execution (ANACEP) / Min. of Finan ce, Budget and Banking S ector	ANACEP (formerly FADC) is the institution responsible for designing and monitoring develop ment projects in the Comoros. The agency has set up a platform for monitoring and evaluatin g project performance. The agency will be informed of the progress of the development and t he objectives of the project
National Agency for the P romotion of Investments (ANPI) / MAPETA	ANPI is the main government institution in charge of the promotion, facilitation, and monitorin g of national and international private investments. The agency will advise the promoters in th e interventions to promote the respect of the regulations by advising and will accompany the m in all the steps.
National Agency for Civil Aviation and Meteorology (ANACM) / Ministry of M aritime and Air Transport	ANACM monitors meteorology in the Comoros. Several weather stations provide the informati on needed to support agricultural activities. ANACM is a key partner for all climate-resilient ag ricultural planning activities, including agricultural land use plans and the development of the crop calendar. Under the project, ANACM will disseminate data from meteorological stations and provide technical assistance to integrate climate change projections into agricultural land use plans and the agricultural calendar. ANACM will be informed of the development and obje ctives of the project and invited to participate in baseline surveys and workshops to identify in tervention priorities/strategies, and to identify and plan interventions at the local level. .
National Vanilla Office (O NAV)	ONAV is a government body created in 2016 with UNDP and GEF support for the economic pr omotion of the vanilla industry, including the development of production techniques and techn ologies and the improvement of work conditions for producers, processors, and especially gat herers who are mostly women.
National Agency for the	The CNP Agency is the delegated manager of the National System of Protected Areas (PAs) o

Management of Protected Areas (Comoros National Parks - CNP) and **National Parks Co-Management Committees**	f the Comoros. Some intervention sites are located within or adjacent to a PA, including two (2) CRDEs in Mwali which is fully protected under the status of UNESCO Biosphere Reserve, the Pomoni CRDE in Ndzuani which adjoins the Ntringui National Park (NP), and two (2) CRDEs in Ngazidja: the Sidjou CRDE which is adjacent to the Karthala PN and the Cembenoi CRDE which is adjacent to the Mitsamiouli-Ndroudé NP. The CRDEs concerned are represented on the NPs co-management committees, which enables to harmonize agricultural and land use practices with the needs of the NP ecosystems. The Agency will be informed of the development and objectives of the project and invited, as well as the national parks co-management committees, to participate in baseline surveys and workshops to identify intervention priorities and strategies, in particular to ensure their compliance with the management and development plans of the concerned NPs.
Focal Points of Multilateral Environmental Agreements	
National Focal Points (NFPs) for Conventions on Climate Change, Land Degradation, and the Nagoya Protocol	These agreements cover various environmental and social issues related to climate-resilient agriculture for which the project seeks to develop solutions. The project must contribute to meeting the country's commitments under these conventions. The contribution of the NFP will ensure that the project is aligned with the orientations and with national priorities formulated under these conventions.
Civil society	
Local communities	
Farmers and herders	With the emergence of grassroots community organizations in the 1980s, the government signed agreements giving communities responsibility for environmental issues. Communities have since had real decision-making power and their authorization is necessary for most interventions in their land. Farmers and herders in the intervention sites are the key actors and direct beneficiaries of the project interventions. As part of the development of the project document (PPG), farmers, herders, women, men, youth and PWDs, will be invited to contribute to the identification of interventions to ensure that the project meets their priorities in terms of climate-resilient agriculture.
Opinion leaders in the community: notables, religious leaders (Imam, Hatu	At the village level, there are customary, religious and development structures whose members are appointed or elected. These people are always consulted by the authorities for interventions affecting the development of village lands. They are strategic partners for development-related activities and play an essential role to raise awareness of the importance of adopting climate-resilient agricultural practices and to disseminate new practices. Opinion leaders play an important role in participatory consultations and decisions. Religious and customary leaders enjoy great legitimacy. Highly respected, they are listened to by the populations and can act to transmit information to even the most remote villages and therefore of mobilizing communi

bes), young people, men and women, leaders in th e villages	to transmit information to even the most remote villages and therefore of mobilizing communities. The relative influence of religious and customary authorities differs between the islands and it will be necessary to take this into account when planning communication in each of the island s. In Ndzuani, religious structures have a larger impact than customary structures; in Ngazidja, customary structures have a larger impact than religious structures; in Mwali, customary and r eligious structures have an equivalent influence.
NGOs and local associations	
Indian Ocean Climate Net work - Comoros, Action G roup for Development, Na tional Women and Develo pment Network, Ulanga N gazidja, Jeune Chambre I nternationale, Maesha M utsamudu, Regional Asso ciation for the Developm ent of Agriculture and the Forestry Environment (AR AF), Dahari, Association 2 mains, Action Group for Development (GAD), Wo men's platform for sustai nable development and f ood security, Ngo'shawo, Global Platform for Wom en Entrepreneurs (GPWE) in Comoros	NGOs and environmental and development associations are key players in environmental awa reness, including on climate change, and the promotion of sustainable rural development in th e Comoros. These local associations, present in all the villages of the intervention sites, have been set up at the initiative of the population of one or more villages to address environmenta l and development issues. Village associations and NGOs are very active in the field of environ mental education and are essential actors in communities' awareness and mobilisation, in par ticular among women and young people. § the NGO Ulanga Ngazidja established since the 1990s is a network of more than 30 village a ssociations for the defense of the environment which contribute to community awareness, co mmitment and participation in the implementation of local environmental management plans. § Maesha Mutsamudu is a women association founded in 2003 which owns a field in Mpagé (Ndzuani) to grow vegetables following an ecological approach, including the production of se eds. § ARAF based in Ndzuani, gathering approx. 20 members with higher education in agriculture and the environment, carry out agricultural projects, train farmers on the risks associated with the use of chemical fertilizers, have expertise in composting techniques, environmental aware ness and education. § the Indian Ocean-Comoros Climate Network is an organization of young Comorians who wo rk for the protection of the environment and the fight against climate change. § the NGO 2 Mains works in the ylang-ylang, coffee and other sectors, on the development of l ow-carbon transformation method and mechanisms to benefit from the carbon market, § the Women, Sustainable Development and Food Security Platform was created in 2012 to pr omote the role of women in environment, climate change, agriculture and particularly in food security. § DAHARI has been very active in Anjouan in Mont Ntringui and in Shissiwani National Parks f

	or more than 10 years, supporting smallholder farmers and the sustainable use of natural res ources. § GAD has 27 years of experience in rural and community development, especially for commu nity structuring, awareness and supervision in sustainable agriculture and environment. § Ngo'shawo is a movement of young Comorians created in 2006 by university students to rai se youth's awareness of environmental protection and sustainable development, and to beco me their spokespersons in front of institutions. § The GPWE in Comoros promotes women entrepreneurship and financial autonomy
Community-Based organi zations (CBOs) Village development ass ociations, Unions of the Ndzuani and Mwali Water Committees, and the villa ge water committees	Community-based organizations are present in all villages of intervention sites and work in va rious fields including community and rural development, cultural events, and capacity building of community groups. The CBOs operate in the form of specialized committees, including villa ge committees relating to agriculture.
International NGOs involv ed in agricultural and rura l development, such as F airWild, OXFAM Internatio nal, CARE, Agronomists a nd Veterinarians Without Borders (AVSF)	International NGOs for agricultural and rural development play an essential role in setting acti ons for sustainable development in motion and support interventions to integrate sustainable rural development into practices and decisions. Although not represented in the Comoros, so me provide online training tools and modules. Their potential involvement in supporting the pr oject will be examined under the PPG. § FairWild for the sustainable use of plants in natural environments, § OXFAM International is a confederation of 20 independent charities around the world to co mprehensively tackle poverty and inequality; § CARE helps empower the poorest while aiming to protect their economic and social rights , especially through microfinance; § AVSF has professionals in agriculture, breeding and animal health since 1977 to help vulner able smallholder farming communities improve their living conditions, sustainably manage na tural resources, participate in the socio-economic development of their territory, defend their ri ghts and better recognize their role in society. AVSF is present in 18 countries including Mada gascar.
International institutions	The development partners of the Union of the Comoros in the field of rural and agricultural de velopment play an essential role in the development of collaborations making it possible to bu

FAO, IFAD, CGIAR, WB, AfDB, IDB, EU, AFD,	ild on the achievements and lessons of previous interventions and to establish synergies and complementarities for the implementation of the project. These partners will be consulted to document their recent, ongoing and planned interventions and to identify partnerships to be established and co-financing contributions to GEF funding.
Media	
Local and national radio and television broadcasting in the project regions, online newspapers, written press	Local media have a key role to play in several aspects of the project, including promoting the profession of farmer, raising awareness on the importance of adopting climate-resilient agricultural practices and disseminating the practices developed within the framework of the project. project and communication on the progress and challenges of the project.
National and international private sectors: Companies, private investors and SMEs related to agricultural products	
Union of Chambers of Commerce of the Comoros, Ndzuani, Mwali and Ngazidja Chambers of Commerce, Federation of the Comorian Private Sector, Comorian business movement, National Union of Comorian Traders, Employers' organization of Comoros companies, Global platform for women entrepreneurs, entrepreneurs	UCCIA, MODEC, SYNACO, OPACO, the Platform of Women Entrepreneurs and others, are public institutions of a professional nature, that have a legal status and autonomous management and deal with information, awareness-raising, and training of local stakeholders in issues relating to agriculture, trade, natural resource management, etc. As they are organized at island, country, and regional levels, they will play an important role in the implementation of the project. These institutions will be informed of the development and objectives of the project and invited to participate in baseline surveys and workshops to identify intervention priorities / strategies, to participate in the identification and planning of interventions at the local level.
Givaudan Foundation (Switzerland)	Swiss manufacturer of aromas, fragrances and cosmetic active ingredients, the world's largest company in the aromas and perfumery sector since 2007. Preliminary contacts have been established with this company and will have to be pursued as part of PPG activities to verify their interest in committing to the objectives pursued by the project and translate it into concrete interventions.
Preparers, collectors, traders and exporters of cash and food crops, and poultry.	They will be informed of the development and objectives of the project and invited to participate in baseline surveys and workshops to identify intervention priorities / strategies, participate in the identification and planning of interventions at the local level, including the selection of intervention sites at local and village levels. They will benefit from training on climate-resilient agriculture and on entrepreneurship and fair trade.

Telecommunications operators (Comoros Telecom and Telma)	Telecommunications operators play a major role in enabling the communications necessary for the transmission of meteorological information, on the markets, in raising awareness among farmers and in monitoring the activities of CRDEs.
Professional associations and unions (national and regional)	
National Union of Comorian Farmers (SNAC)	The SNAC brings together regional or national agricultural professional associations specialized by sector (market gardening, food crops, cash crops, poultry, milk). SNAC will be informed of the development and objectives of the project and invited to participate in baseline surveys and workshops to identify intervention priorities / strategies, to participate in the identification and planning of interventions at the local level.
National Federation of Farmers of the Comoros (FNAC)	FNAC is an agricultural organization with a smallholder character whose role is to promote Comorian agriculture through awareness-raising, training and support for agricultural stakeholders in the search for solutions to their difficulties in production, marketing and conservation of their production. FNAC will be informed of the development and objectives of the project and invited to participate in baseline surveys and workshops to identify intervention priorities / strategies, to participate in the identification and planning of interventions at the local level.

3. Gender Equality and Women's Empowerment

Briefly include below any gender dimensions relevant to the project, and any plans to address gender in project design (e.g. gender analysis).

A preliminary identification of the division of tasks between men and women shows that specific work is reserved for them according to the strenuous nature of the work. For example, plowing and all work using tools is done by men while sowing, watering, plant maintenance and marketing are done by women. Decisions on land use and livestock management are made equitably by men and women in households. The man manages the income from the sale of livestock while the woman is responsible for the marketing of market garden products and milk and manages the income. In Ndzuani, some women work independently from men in market gardening, doing all the work including plowing. In addition, the advent of mechanization, particularly tractors, enables women to free themselves from the contribution of men. Women have easier access to microcredits because, being owners of houses, land suitable for construction and family gold, they have the necessary guarantees to access credit.

Access to land in the Comoros is complex and falls under civil, customary and religious rights, where civil law prevails, particularly in urban areas. In inheritance contexts, the competition of these 3 sources of rights creates additional ambiguity to the detriment of women. Traditionally, a will is transmitted orally to the beneficiaries and is enforceable against third parties. However, in the absence of a written will, men increasingly assert Muslim law, the distribution of which benefits men who benefit from a greater share of the inheritance, contrary to the customary law. In addition, practices are different in rural and urban areas. In rural areas, customary laws still prevail, and the mother's property is transferred to her daughters upon her death. The superimposition of the 3 rights creates confusion and many disputes within families over questions of inheritance. In practice, everything that is built belongs to women as well as land intended for construction.

An exhaustive gender analysis will be conducted during the PPG phase, in accordance with standard UNDP procedure, to identify the differences, needs, roles and priorities of women and men regarding the various tasks involved across the value chains for key crops in the Union of the Comoros. Women will be direct and indirect beneficiaries of the resilience strategies promoted by this project. The participation of women in all stages of project design and implementation will ensure that their needs and constraints are considered and addressed. The results of the gender analysis will be integrated into the project design to ensure that gender-based differences are built into project activities as appropriate, and gender-disaggregated targets will be developed as indicators of the project’s progress towards objectives. Component 4 will be specifically designed for the mainstreaming of a gender perspective. Women will be involved at all stages of the project and fully integrated into the analysis of climate and socioeconomic vulnerability, the development of agricultural land use plans, all trainings, and support for strengthening or developing new value chains. The project will also strive to increase women representation in all governance bodies within CRDEs, cooperatives, unions and other instances across the value chains.

The focus on women and their economic empowerment is crucial for the sustainability of the long-term solution proposed by the project and, more generally, for the resolution of gender-related development issues. The project will contribute to the sustainability of the ecosystem services that women depend on for their livelihoods, which will reduce the burden of their domestic and productive tasks, and may eventually free up time that could be allocated to other activities.

Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment? Yes

closing gender gaps in access to and control over natural resources;

improving women's participation and decision-making; and/or Yes

generating socio-economic benefits or services for women. Yes

Will the project's results framework or logical framework include gender-sensitive indicators?

Yes

4. Private sector engagement

Will there be private sector engagement in the project?

Yes

Please briefly explain the rationale behind your answer.

The private sector will be solicited as an essential partner in this project, by participating in the assessment of the value chains in which they participate, with a view to improving their resilience to climate change and equity. The private sector will also be involved in interventions related to certification and in strengthening links with international markets.

The project will facilitate dialogue between the private sector and representatives of local farmers to strengthen and formalize the links between these parties for the development of products that fit into value chains and work jointly to strengthen the climate-resilience of farmers. In addition, UNDP support for the creation of a multifaceted digital platform within the CRDEs network aims to bring together rural development actors around a digital center of excellence and to set up a skills and resource sharing network to support the transition to climate-smart agriculture and reduce the digital divide in rural areas. This network will allow the sharing of agricultural techniques and technologies, skills, information, resources and experiences for a coordinated approach of the actors of the agricultural value chain, who engage on a daily basis in actions and projects aiming at the rural excellence, innovation, agricultural resilience and digital transformation at the service of the rural world, all in a perspective of accelerated ecological transition

5. Risks to Achieving Project Objectives

Indicate risks, including climate change, potential social and environmental risks that might prevent the Project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the Project design (table format acceptable)

IDENTIFIED RISKS AND CATEGORY	IMPACT	LIKELI-HOOD	RISK ASSESS.	MITIGATION MEASURES
ENVIRONMENTAL Due to its geographical location, fragile soils and volcanic activity (for Ngazidja), Comoros is prone to cyclones, heavy rains, landslides, long periods of drought, habitat disturbances, and floods. Climate variability and extreme events may lead to disruption of project implementation and destruction of agroecosystems and resources, including benefits accrued from the project.	High	Likely	**High**	This risk will be mitigated by reducing the vulnerability of agroecosystems to climate change and increase resilience to the effects of climate change. Climate change is a slow-acting risk and is constantly monitored in Comoros. The project will promote a risk management strategy based on crop diversification and adoption of practices promoting resilience such as agroforestry and hedging (embocagement), increased autonomy in the provision of seeds and seedlings for crops/varieties that are adapted to the evolution of climate conditions, preparing fodder reserves, promotion of techniques to extend the growing season such as greenhouses and micro-irrigation, and promoting savings and credit.
INSTITUTIONAL There is insufficient institutional capacity to support and supervise the development of new climate-resilient crops and varieties and the conversion of current practices to climate-resilient ones. Difficulties in recruiting the necessary staff within CRDEs to perform the essential functions of testing, piloting, demonstrating and disseminating innovations for climate adaptation due to limited staff, could hinder the effectiven	High	Likely	**High**	The project aims to improve the capacity of stakeholders in the development, dissemination and adoption of climate-resilient crops and practices in Comoros, including institutions such as the CRDEs, the National Directorate of Agricultural and Livestock Strategies. The PPG process will include a participatory capacity needs assessment with institutional partners, including DNSAE, CRDEs, and INRAPE, to identify priority capacity gaps that must be addressed as part of the project and clarify the focus of the various interventions to strengthen institutional capacities. Such analyses should enable the elaboration of proposals aiming at enhancing effectiveness and developing better synergies between the different institutions. The issue of recruiting permanent staff in institutions (vs trainees) will be raised to ensure that trainings gradually build up institutional capacities. The project will support the development of collaboration agreements with institutions such as INRAPE, University of Comoros and the Centre Nati

limited staff, could hinder the effectiveness of adaptation improvements developed through the project.				onal Horticole to support participatory research for the development, monitoring and assessment of innovative practices and varieties. Preliminary discussions with key institutions will be held to assess the feasibility of interventions suggested under output 1.1 (reallocation of staff within the directorates to positions in the CRDEs and improvement of the staff recruitment process according to clearly defined criteria).
ECONOMIC Falling international market prices for products developed through the value chains could reduce the benefits to the local farmers involved.	High	Moderately likely	Medium	Under Outcome 3, the project will support the development of sustainable value chains, focus on promising value chains whose potential in the project intervention sites will have been demonstrated through previous planning taking into account climate evolution and feasibility studies. As part of output 2.1, market studies for crop and livestock value chains will ensure that a market assessment is conducted for each product to reduce uncertainties and risks and to know the chances of success before generating hope and engaging local farmers. These market studies will have to be based on existing and recent data and focus at a minimum on the analysis of local supply for these products and in the country, and the analysis of demand by a market study at national, regional and international levels (depending on products). Facilitating dialogue and participating in certification at the international level will also help to mitigate this risk.
POLICY To achieve the ambitions of the Emerging Comoros 2030 Plan, decision-makers maintain a vision of agricultural development focused on unsustainable production centered on traditional value chains to maximize short-term gains rather than adopting the shift towards sustainable, diversified, climate-resilient agricultural production that benefits all agricultural actors, especially smallholder farmers.	Medium	Moderately likely	Low	As part of Output 2.4, the project will contribute to raise awareness of decision-makers, actors in value chains including private partners and smallholder farmers, and the general public with the objective of developing a broad understanding of the importance, potential, and vulnerability of the agricultural sector to the national economy and urgency of strengthening its resilience to climate change. Awareness campaigns will highlight the benefits associated with strengthening the climate resilience of the agricultural sector through demonstration and training on new climate adaptation practices and associated benefits. Under component 3, the project will support farmers in the implementation of climate-adapted practices. The interventions planned under Component 4 on communication and knowledge sharing will ensure wide dissemination of this information to raise awareness of these issues among a broad audience.
				An exhaustive gender analysis will be conducted during the PPG phase, in accordance with standard UNDP procedure, to identify the differences, needs, roles and priorities of women and men regarding the various tasks in

SOCIAL Discrimination against women in access to land could prevent them from benefiting equitably from the opportunities offered by the project. Access to land in the Comoros is complex and falls under civil, customary and religious rights. The ambiguity created by this situation is detrimental for women regarding inheritance in the absence of a written will. In such situation, the Muslim law prevails, and men benefit from a greater share of the inheritance, contrary to customary law.	Medium	Moderately likely	Low	volved across the value chains for key crops in the Union of the Comoros. Women will be direct and indirect beneficiaries of the resilience strategies promoted by this project. The participation of women in all stages of project design and implementation will ensure that their needs and constraints are considered and addressed. The results of the gender analysis will be integrated into the project design to ensure that gender-based differences are built into project activities as appropriate, and gender-disaggregated targets will be developed as indicators of the project's progress towards objectives. Component 4 will be specifically designed to mainstream a gender perspective. Women will be involved at all stages of the project and fully integrated into the analysis of climate and socioeconomic vulnerability, the development of agricultural land use plans, all trainings, and support for strengthening or developing new value chains. The project will also strive to increase women representation in all governance bodies within CRDEs, cooperatives, unions and other instances across the value chains.
SOCIAL The COVID-19 pandemic, especially with the recurring threat of new variants, could lead the government to adopt restrictive measures that will affect project implementation	Medium	Moderately likely	Low	Increased climate resilience of smallholder farmers in local communities and strengthening of partnerships with the private sector will secure incomes based on sustainable agricultural practices and contribute to the economic recovery of communities affected by COVID-19 while strengthening the productive resilience of the country. Project teams will be provided with required audio-visual equipment and adequate connectivity to enable distance working, coordination and supervision. All interventions requiring meetings, especially with vulnerable beneficiaries will be conducted in compliance with the appropriate sanitary measures. Furthermore, a specific COVID risk and opportunity analysis was conducted, and an action plan developed to address COVID-related risks.
OPERATIONAL Land use conflicts between different stakeholders limit the implementation of the solutions recommended by the project, in particular for territories that are included in protected areas, or other	Medium	Moderately likely	Low	As part of product 1.5, agricultural plans will be developed on a broadly participatory basis and will take into account the different land use plans and develop consensus on the harmonization of different uses. Furthermore, steering committees are established for each CRDE to plan, coordinate and implement the CRDE's actions in order to foster beneficiary ownership of the project's achievements. Each committee comprises representatives of the various entities mentioned in the decree establishing the CRDE such as the local authorities (prefecture and local councils), NGOs and

sites that could be coveted for the development of road or tourist infrastructure				E, such as the local authorities (prefecture and local councils), NGOs and producer groups. Consequently, the CRDE are developing, implementing and consolidating activities initiated by the CRCCA project and supported by UNDP.
SOCIAL Lack of openness of the targeted beneficiaries to the solutions proposed by the CRDE technicians within the framework of the project: The mistrust of smallholder farmers, in particular the older ones, difficulties with technical language and the low level of education, can reinforce resistance to change and hinder the adoption of climate-smart solutions. Also, sophisticated technology proposals such as blockchains are not necessarily accessible to all farmers, especially older people, thus widening the resilience gap for these people.	Medium	Moderately likely	Low	A preliminary identification of stakeholders carried out as part of the PIF and completed by an analysis of their role and interests as part of the PPG process will ensure the involvement of all the parties concerned in the development of the project and, later, in its implementation. The development and implementation of a stakeholder engagement plan will ensure that smallholder farmers, including older ones, are informed and integrated in all participatory planning and decision-making processes regarding the use of land and resources within community lands, which will ensure the integration of their priorities and concerns. A targeted communication plan will be developed and identify appropriate approaches to ensure that the project follows a fully inclusive approach in all interventions. Furthermore, the project will adopt an approach based on information, awareness-raising with the help of relay farmers, demonstrations within the CRDEs plots, and the establishment of incentives to promote voluntary adoption of climate-resilient approaches, seeds and crops. In addition, farmers are the first witnesses to the harmful effects of climate change and are looking for solutions to ensure their livelihood.

6. Coordination

Outline the institutional structure of the project including monitoring and evaluation coordination at the project level. Describe possible coordination with other relevant GEF-financed projects and other initiatives.

Coordination and management arrangements will be finalised during the project preparation phase (PPG). The Implementing Partner for this project will be the Ministry of Agriculture, Fisheries, Environment. Tourism and Handicraft, which will delegate its implementing role for this project to the National Directorate for Agricultural and Livestock Strategies (DNSAE) which will provide overall leadership for the project, in close collaboration with the General Directorate of Environment and Forests (DGEF) and the island directions in charge of agriculture in Mwali, Ndzuani and Ngazidja. The DNSAE was HACT micro-assessed in 2020, which resulted in an overall High Risk rating. In light of this High Risk rating, and in line with UNDP's Policy and Operations Policies and Procedures to provide Full Country Office Support to National Implementation Modality (NIM), the Government of the Union of Comoros (through MAFETH and DNSAE) may request UNDP to provide execution support for specific services for the project. The arrangement will be further detailed during the PPG phase and will have to be approved by the GEF Secretariat. Different options for strengthening the DNSAE capacity will be explored during PPG. A Project Steering Committee will be established to provide guidance and assist with decision-making and will comprise individuals assigned to the following three roles: Project Executive, Beneficiary Representatives, and Development Partner. The Project Coordination Unit will be located within the premises of the DNSAE for maximum cooperation and synergies with other Government-led interventions related to agriculture. Close collaboration will be established with the General Directorate of Environment and Forests (DGEF) which is the lead implementing agency for the UNDP/UNEP/GEF supported project for Adapting water resource management in the Comoros to expected climate change, with the Commissariat Général au Plan which the lead implementing agency for the Agricultural Purchasing Center Project, with the Ministry of Maritime and Air Transport which is the lead implementing agency for the WB Connectivity Project, and with the Ministry of Employment and Youth which is the lead implementing agency for the Youth Jobs Fund and Job Facility Projects.

To build on specific achievements, and exchange relevant lessons/best practices/tools, specific linkages will be established with the following projects:

Initiative	Coordination with project
Strengthening the capacities of CRDEs for entrepreneurship and agriculture resilience in the Comoros (RECA-ERA) / FAO-AFD (2019-2023) *Support project for the development of export sectors and rural development* (AFIDEV) / AFD (2021-2025)	To achieve the output 1.1 related to strengthening CRDE's capacities, the project will coordinate (i) with FAO/AFD project interventions aiming at strengthening the managerial, technical and infrastructural capacities of CRDEs to improve the availability and inclusive access to agricultural advisory services with a view to developing rural entrepreneurship and climate-smart agriculture in the Comoros, and (ii) with AFIDEV project interventions aiming at providing support to CRDEs in the implementation and monitoring of actions in the field.
Ongoing FAO TCP intervention to support the preparation of a general agricultural census	To achieve the output 4.1.2 related to the development of agro-climatic knowledge required to support climate adaptation in the agricultural sector through the strengthening of agricultural monitoring and action-research, the project will build on FAO's work to conduct a general agricultural census which includes the establishmen

Ensuring a climate-resilient water supply (GCF-Water) / GCF (2019-2027)	O's work to conduct a general agricultural census which includes the establishment of an agricultural database. Also, this output will build on GCF-Water project's result related to the integration of climate risks into water resources management through climate monitoring and forecasting and enhanced water monitoring. This project's achievements related to climate-resilient infrastructure and technologies to manage and address water supply shortages due to drought and other climate change impacts will serve as a foundation to the new project Outcome 3 which focuses on implementation of climate-resilient approaches and practices in target sites.
Family Farming Productivity and Resilience Support Project (PREFER) / IFAD (2017-2025) *Biodiversity protection through effective management of the National Network of protected areas* / GEF-UNDP ID 10352 – PIMS 6257 (2022-2027)	To achieve the output *1.3 Agricultural production planning frameworks and tools are developed and disseminated*, under which agricultural land use plans will be developed for the areas supported by each target CRDE. The project will support planning for optimal land development that takes into account projections of climate change and its impacts, as well as the potentials and vulnerabilities of current and new crops. This planning will build on existing work, including studies carried out by CGIAR as part of the development of the IFAD project. Such plans will also integrate the planning carried out for protected areas under the UNDP-GEF project and the planning carried out for the Mwali Island Biosphere Reserve with support from AFD. The PREFER project supported by IFAD is implemented in 48 villages, 3 of which are in the intervention areas of the UNDP-GEF project: Mremani and Màhéli in Ndzuani and Mboini in Ngazidja.
Support project for the development of export sectors and rural development (AFIDEV) / AFD (2021-2025)	To achieve the output *2.2 INRAPE's strengthened human and technological capacities allow to characterize the specificity of Comorian agrobiodiversity products, and to ensure quality control to meet target markets' standards.* The project will build on the support provided by the Japanese government for the construction of a new multidisciplinary laboratory for INRAPE and by AFIDEV project to strengthen its capacities and develop a plant health research strategy, which responds to the institutional assessments carried out as part of the UNDP project (2013-2016) for the development of a strategy to strengthen a sanitary and phytosanitary system (SPS) capable of supporting the development of the country's agricultural operations.
Integrated Development and Competitiveness Project (PIDC) / WB (2020-2024)	This project expected results will contribute to several outputs under the new project, including strengthening institutional capacities for the development of agricultural value chains which will contribute to output 1.1 (CRDEs and government and institutional actors), and direct support to enterprises through business plans and capacity building which will contribute to the Outcome 3 related to the implementation of climate-adapted agroecological practices in target areas. This project interventi

	ons related to fruit and vegetable crops are implemented in the Maweni and Cembenoi CRDEs (Ngazidja) and in Ouani CRDE (Ndzuani) and interventions related to poultry breeding in Diboini and Simboussa CRDEs (Ngazidja), Nyumakele (Ndzuani), and Fomboni (Mwali).
Inter-Island Connectivity Project / WB (2022-2027) Support project for the development of export sectors and rural development (AFIDEV) / AFD (2021-2025)	To achieve the output 2.3 *Web and mobile trading platforms developed to connect agricultural producers and reliable buyers in national and international markets and ensure timely access to market information* the project will build on the interventions by several development partners to rehabilitate rural tracks and roads and port infrastructure to improve the fluidity of access to markets, including (i) the physical connectivity provided through WB co-financing for the rehabilitation of port infrastructure, and improved access to ports, and improve domestic air transportation to improve transportation between the islands, and (ii) AFD interventions as part of AFIDEV project to rehabilitate rural road infrastructure with high economic potential
Integrated Development and Competitiveness Project (PIDC) / WB (2020-2024)	Project interventions to better manage the risks associated with climate change as part of output *3.1 Agronomic approaches and practices (e.g. water and soil conservation, crop diversification, mixed production systems, fodder cultivation and conservation, protective structures) developed and piloted by CRDEs to reduce agriculture vulnerability to the effects of climate change*.will build on silage practices initiated under the CRCCA project, and interventions to raise smallholder farmers' awareness to savings and credit as a risk management approach will rely on interventions to encourage savings in SANDUKs in the PIDC WB project which intervention sites are indicated above.

7. Consistency with National Priorities

Is the Project consistent with the National Strategies and plans or reports and assesments under relevant conventions?

Yes

If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc

The Union of the Comoros made a very early commitment to planning adaptation measures. Adaptation to climate change has thus been integrated into public policy documents and national strategies: National Adaptation Programme of Action (NAPA 2006), National Communications (2002, 2012), Policy, Strategy and National Action Plan on Climate Change (2015) and NDC (2015, updated in 2021). The project will contribute to address two of the six priority sectors identified in the NAPA, food security and terrestrial ecosystems, through (i) enhancing the adaptive capacities of the institutions and individuals involved in the development of the agricultural sector including the farming communities and supporting the development, demonstration and transfer to communities of climate resilient agriculture strategies including the use of agro-meteorological tools, climate resilient inputs and climate resilient agriculture technologies, and (ii) enhancing the climate resilience of agroecosystems to climate change and variability by restoring the productive capacity of agroecosystems through approaches and practices that protect agrobiodiversity, improve soil fertility, reduce vulnerability to erosion, and promote the diversification of crops and integrated approaches whose environmental and socioeconomic benefits are multiple and sustainable. Land use and improved agro-sylvo-pastoral practices in the target rural landscape will be optimized to adapt to climate change conditions, and increased productivity and adoption of new varieties better adapted to current and future climate conditions will contribute to reduce agricultural encroachment at the expense of natural forests. As part of the participatory review of the NDC (2021-2030), the adaptation objectives to strengthen the country's resilience have been updated and the targets adjusted to 2030 for the sectors most vulnerable to climate change in the Comoros, starting with agriculture. The project will contribute to 2 of the 3 priority actions identified for the Agriculture and Livestock sector: Development of a resilient and climate-smart agricultural policy and, to a lesser extent, the development of agro-pastoral irrigation.The project is also aligned with the National Agricultural Investment Plan (NAIP) 2020-2024[1] developed with the support of the World Bank, FAO and IFAD. The NAIP provides a medium-term general policy framework for the coordination of all interventions carried out by development partners in the field of agriculture and aims for agricultural GDP growth of at least 6% by 2023. The project contributes to the objectives identified under four of the five pillars of the NAIP, in particular: I. Sustainable transformation of the agricultural sector: Strengthen the institutional framework for research, extension, collection and dissemination of information; II. Agricultural and food security: Improve the competitiveness of sectors by strengthening the professionalization and structuring of sectors, access to services, inputs and markets; III. Competitiveness of agricultural product chains: Explore opportunities in alternative chains, structure the value chains and encourage local processing; V. Sustainable management of land and the environment: optimize the management of land and rural space, encourage sustainable agricultural practices that respect the environment, resilient to climate change, to conserve natural resources such as soils and water that are dwindling under the combined effects of climate change, human pressure and unsuitable practices.The project supports the Government's priorities as evidenced by a statement by the Minister in charge of Agriculture in 2018 to GEF officials on the sidelines of COP24 to declare the government's will to develop a project on the resilience of agricultural value chains with the support of UNDP. Subsequently, the Government, through the Ministry of Agriculture, Fisheries, Environment, Tourism and Handicraft (MAPETH), requested the support of the GEF for the development of a project to address the challenges that remain, namely develop and implement climate-resilient agricultural value chains by building on the successes demonstrated in previous projects implemented by the Ministry to bring them to scale. UNDP has been designated as the preferred

institution to support the preparation of documents to be submitted for mobilizing financing from the Adaptation Fund. The project is also fully consistent with the Comoros Emerging 2030 Plan. One of the 5 bases of which is modernized agriculture for food security. The vision articulated in this plan is to "promote agricultural systems that are more productive and resilient to climate change, competitive and sustainable, integrating the resilience of rural communities".

Opportunity to support the country's green economic recovery and SDGs. The increase in decent and sustainable jobs, especially for young people and women, the improvement and diversification of a local food offer focusing on the quality and affordability (accessibility) of products for Comorian households, diversifying and improving the competitiveness of the agricultural sector in the face of international supply while reducing its environmental footprint, will help support the Comoros in the ecological transition initiated by the Government. Modernized agriculture is one of the five (5) pillars of the PCE and development adapted to climate change and resilient to natural disasters, one of the three (3) conditions for its achievement. One of the six structuring projects is the "Promotion and development of the agricultural sector". The post-pandemic analysis of the PCE has shown that agriculture is one of the priority growth sectors in the post-pandemic context and the design of the GEF project will contribute to achieving most of the priority investment recommendations for the agricultural sector, namely: 1) creation of a company for the production and importation of agricultural seeds; 2) creation of model farms; 3) development of agro-pastoral irrigation infrastructure; 4) creation of enterprises for the processing and marketing of agro-food products; 5) establishment of agro-food certification processes. The GEF7 project also supports the Government's"green recovery", the Comoros's adaptation goals set out under the National Adaptation Programme of Action (2016), and Intended Nationally Determined Contribution (2015). The project will contribute to achieving the following Sustainable Development Goals adopted by the country (SDG 1 to eradicate poverty, SDG 5 for gender equality, SDG 8 for decent work and economic growth, SDG 10 for reduced inequality within and among countries, SDG 12 for ensuring sustainable consumption and production patterns, namely through achieving the sustainable management and efficient management of natural resources for crop production, SDG 13 to strengthen the resilience and adaptation capacity of the most vulnerable regions, such as island states, to climate change, and as well as SDG 15 to preserve and restore terrestrial ecosystems, ensuring that they are used in a sustainable manner, fight against desertification, halt and reverse the process of soil degradation and end the depletion of biodiversity).

[1] Before the establishment of the PNIA, the country's last agricultural policy dated back to 1994.

8. Knowledge Management

Outline the knowledge management approach for the Project, including, if any, plans for the Project to learn from other relevant Projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

As part of Outcome 4.1 focusing specifically on knowledge management, the project will support the management of innovative knowledge acquired through the participatory monitoring and evaluation of project interventions involving beneficiaries, including on issues related to the the development of agricultural practices adapted to the climate and their adoption by farmers, the improvement of the climate resilience of all segments of the different value chains, and the development of new cash crops. Under Output 4.1.4, the project will specifically support experience-sharing among the country's CRDEs and among the various actors within value chains. The project Output 4.1.2 focuses on the development of agro-climatic knowledge through this approach and also through action-research carried out with the assistance of national specialists and farmers to monitor, evaluate and document the effectiveness of the innovations tested within their plots. Under Output 1.3, the project provides for the development and dissemination of tools to guide farmers and value chain actors in adapting their agricultural practices to climate change. Practical and succinct guides as digital tools and in the form of booklets or illustrated sheets will be developed for farmers to disseminate best practices and facilitate their adoption and monitoring in the local communities served by the targeted CRDEs as well as by the CRDEs supported by the WB and AFD, and across the country.

9. Environmental and Social Safeguard (ESS) Risks

Provide information on the identified environmental and social risks and potential impacts associated with the project/program based on your organization's ESS systems and procedures

Overall Project/Program Risk Classification*

PIF	CEO Endorsement/Approval	MTR	TE
High or Substantial			

Measures to address identified risks and impacts

Provide preliminary information on the types and levels of risk classifications/ratings of any identified environmental and social risks and potential impacts associated with the project (considering the GEF ESS Minimum Standards) and describe measures to address these risks during the project design.

Risk Description *(broken down by event, cause, impact)*	*Impact and Likelihood (1-5)*	*Significance* *(Low, Moderate Substantial, High)*	*Comments (optional)*	*Description of assessment and management measures for risks rated as Moderate, Substantial or High*
Risk 1: The Project could lead to adverse impacts on the human rights of the local communities as it might constrain traditional herding practices where animals are left to stray, and farming based on vulnerable crops or unsustainable practices. The project will assess and identify new options to support the adoption of sustainable farming practices and wh	I = 3 L =3	Moderate	Extensive livestock herding is practically non-existent in the Comoros and straying is prohibited in the areas served by the CRDEs. Although now very limited, the practice of stray breeding is still practiced by a few farmers and the planning of agricultural land use and promoting bocage may restrict access to land for this type of herder. The project will promote sustainable agroecological practices, including that of hedging to limit straying while enriching the soil. The project will encourage the conversion of traditional cash crops that are vulnerable to climate and which productivity and profitability has declined over the years to include more diversified climate resilient crops whose demand is strong on national and international markets, which require small areas, which production cycle is short, and which can be processed locally. At no time will the project approach be coercive and will rely instead on information, awareness-raising with the help of relay farmers, demonstrations within the CRDEs plots, and the establishment of incentives to promote voluntary adoption of climate-resilient approaches, seeds and crops. In addition, far	A socioeconomic assessment will be carried out as part of the PPG to establish the baseline situation of the farmers targeted by the project in order to assess the effects of the project on their livelihoods and identify the necessary adjustments to ensure they are positive. The project will systematically adopt a precautionary approach and, under Output 2.2, will include interventions to assess the profitability and climate adaptability of new options. Only crops whose profitability and climate-adaptability have be

sustainable farming practices and wh ich may lead to the conversion of far mers from cash crops to new crops, a nd bring changes to their practices an d land use patterns. Related to: Human Rights			mers are the first witnesses to the harmful ef fects of climate change and are looking for s olutions to ensure their livelihood. 80% of far mers associate the raising of goats or cows with their agricultural practices, and stall- or s hed-rearing is now practiced by 90% of breed ers who resort to breeding in stalls, goat shed s or in enclosures, mainly to avoid exposure t o extreme weather and the contagion of dise ases. In addition, current regulations prohibit straying to prevent the spread of disease and protect crops and natural vegetation. The proj ect will promote agropastoralism practices in tegrating goat and hen rearing and fodder cul tivation, by promoting the construction of goa t sheds associated with agricultural plots. No approach will be imposed. It is expected that the benefits of agropastoralism will significan tly exceed the opportunity costs of abandoni ng straying and that such benefits serve as a n incentive to adopt this new approach.	en tested and demonstrated in the CRDEs' plots will be presented to f armers and cooperatives, who will retain all decision-making power o ver the crops to be developed. In addition, in order to further redu ce the risk associated with the intr oduction of new crops into farmer s' plots, these will be introduced in rotation or in association, so that t he income of farmers will not be b ased solely on the yield of the intro duced varieties.
Risk 2: The Project may have inequita ble or discriminatory adverse impacts on affected populations, particularly i) for elders facing new technologies t hat may not be easily accessible to p eople who have little computer knowl edge, and ii) for the populations locat			Elders and Comorians from other regions or i slands of the country work with cooperatives without distinction of individual possessions. Indeed, cooperatives are based on social gro ups that share a strong capacity for work, a motivation for working the land, and the elder ly are included to benefit from their experienc e and knowledge. The use of cell phones and social networks is widespread among all seg ments and age groups of the population. The cooperative model that is currently imple mented in the Comoros is governed by OHAD A law (Organization for the Harmonization of Business Law in Africa) whose effectiveness	A targeted assessment of the pote ntial socioeconomic impacts of th e project on vulnerable population s, especially elders, will be conduc ted as part of the PPG process. M easures to avoid or mitigate identi fied risks will be incorporated in th e project design, such as building t

ed in the areas bordering the territory served by the CRDEs which are disadvantaged due to a certain inequity among supported areas. Inequity in access to improved varieties increases the risk of theft and vandalism in the plots of farmers who benefit from improved varieties. Related to: Human Rights	I = 3 L = 3	Moderate	has been proven in the African context to guarantee the rights of its members. In addition, under Outcome 1, the project will support the capacity building of cooperatives to ensure that the rules of equity between members are clearly formulated and respected. Integrating older farmers into agricultural cooperatives where members look out for each other's interests ensures equity among members who are bound by common interests and histories and often by family ties. These cooperatives also include young farmers who are more familiar with new technologies. Also the fact that Innov-Lab, a business incubation structure of the Chamber of Commerce, provides support to agricultural cooperatives ensures their proper management, which reduces the risk of discrimination based on age.	he capacities of CRDEs to provide the necessary support to strengthen climate resilience to all farmers within their area of intervention. Sharing mechanisms will be put in place within communities in the same territory to encourage the replication of successful experiences and share related knowledge and thus reduce the risk associated with the adoption of new varieties or practices.
Risk 3: In the process of developing agricultural land use plans for an optimal land use that takes into account climate change projections, the project may prevent stakeholders, including marginalized groups, from fully part	I = 2 L = 2	Low	The project will adopt a largely participatory approach to all planning and decision-making processes regarding the use of land and resources within community lands. A preliminary identification of stakeholders carried out as part of the PIF and completed by an analysis of their role and interests as part of the PPG process, a gender analysis and action plan and a PWD (people with disabilities) analysis and action plan will identify the appropriate means to ensure the involvement of all the parties concerned in the development of the project and, later, in its implementation, including planning processes. Approximately 75% of farmers already have plans for their individual plots that take soil and climate change into account. These plans were developed by the farmers with the support of the CRDEs. The agricultural land use pl	

icipating in decisions that may affect them Related to: Human Rights	L = 2		ans that will be developed at the scale of the CRDEs' territories will integrate these individual plans and will serve to guide, not impose, land use and the adaptation of all crops. According to current practices, the CRDEs work with farmer trainers who are responsible for supervising farmers and farmers' organizations who have plots within the CRDEs' intervention areas. Information on farmers covered by a CRDE is recorded in databases. All planning systematically involves cooperatives and farmer trainers to present the results of resilience and profitability analyzes before proposing a new crop or variety to farmers. As a result, this involvement and the databases significantly reduces the risks that some stakeholders could be excluded, or not effectively involved, from any agricultural planning process.	
Risk 4: There is a risk that duty-bearers may not have the capacity to meet their obligations in the Project, including i) the CRDEs, ii) the National Directorate for Agriculture and Livestock Strategies (DNSAE), and iii) the National Research Institute for Agriculture, Fisheries and Environment (INRAPE). Limited capacities for these duty-bearers who are responsible for identifying	I = 4	Substantial	i) CRDEs' capacities are limited due to insufficient staffing, a lack of stability and political interference in their governance structure, and lack of commitment from the State whose expected financial contribution is not effective; there is a risk that the achievements of the project will not be sustained or that transfer of knowledge to farmers and cooperatives will not be effective, ii) The DNSAE was rated as High Risk by the latest HACT assessment in 2020. This directorate works in close collaboration with CRDEs and acts as an interface between the CRDEs and the Ministry of Agriculture. If the vision of the project to strengthen the climate resilienc	A capacity assessment of CRDEs conducted by the UNDP CO is underway and will provide recommendations to address the gaps, including the governance issue. Additional capacity assessments will be conducted as part of the PPG to include all CRDEs targeted by the project. These recommendations will be taken into account to design appropriate interventions to strengthen the capacities of CRDEs to fulfil their mandate. As part of the PPG process, the recommendations of the HACT assessment of DNSAE will be reviewed and capacity building will be integrated into the design of the project to address the gaps that hinder th

measures and varieties to strengthen the climate resilience of agricultural production and for transferring relevant knowledge to farmers and other actors in the value chains could reduce the effectiveness of project interventions to identify and transfer knowledge to increase climate resilience. Related to: Human Rights	L = 4		e of value chains is not well understood by the Directorate, the latter will not be able to communicate it and obtain the support of the Ministry to bring about the changes planned in the framework of the project. iii) INRAPE'scapacities may be insufficient to carry out required research and play its primary role of supporting agricultural development. Any selection of a new variety to be introduced must be validated by INRAPE. The efficient and competent support of INRAPE is essential to prevent the selection of new varieties from leading to the introduction of unsuitable (climate-wise) or invasive varieties.	e achievement of its missions, namely in the framework of this project. As part of the PPG process, an exhaustive assessment of INRAPE's capacities will be carried out to identify the gaps that would prevent this institution from fulfilling its expected role in the development of climate resilient agriculture in the Comoros. As needed (namely due to the 'substantial' risk significance), an assessment of the impact of such capacity gaps will be integrated in the ESIA conducted shortly after project inception.
Risk 5: Political interference might get in the way of local communities, as rights-holders, to claim their rights. Related to: Human Rights	I = 3 L =3	Moderate	There is a risk of political interference in the CRDEs and in the processes of consultation and participation of local communities in project interventions. The inadequate assignment of administrators and technicians to CRDEs, namely in the context of political elections, reduces the effectiveness and relevance of project interventions aimed at supporting agricultural production. Consequently, local communities may not benefit as much from the project support and investments, namely, to improved and climate-resilient varieties or races, thus limiting their ability to adapt to climate change. However, informal social mechanisms (such as interventions by influential actors) are commonly used to promote inclusive processes with newly elected authorities and to limit this type of interference.	The project will include provisions to support advocacy for the redeployment of staff from the Directorate of Agriculture to the CRDEs and to ensure that the recruitment of new staff meets criteria relevant to the different roles required within a CRDE. The project will strengthen the governance system of the target CRDEs including the clarification of the roles of the stakeholders concerned, including that of local communities within decision-making bodies. The governance issue is addressed in the capacity assessment of CRDEs currently conducted by the UNDP CO.

Risk 6: There is a risk that the proposed Project would have adverse impacts on gender equality and/or the situation of women in their access to land and their capacity to benefit from project interventions. Related to: Gender Equality and Women's Empowerment	I = 3 L =3	Moderate	Agricultural tasks are shared between men and women according to the arduous nature of the work, and decisions on land use and livestock management are made equitably by men and women within households. Men are in charge of marketing cash crop products (vanilla, ylang-ylang and clove) and manage the income from the sale of livestock, while women are responsible for marketing and managing the income from the sale of garden products (market garden products and food crops). Access to land by inheritance is governed by a superposition of civil, customary and religious rights. Despite the precedence of civil law, the absence of a written will can give rise to conflicting situations when men assert Muslim law according to which the man benefits from a greater share of the inheritance, unlike customary law which still has precedence in rural areas and according to which the mother's property is transferred to her daughters upon her death. In addition, the project will develop and promote new crops and agricultural and technological practices that could generate greater interest among men than women.	A gender analysis will be conducted during the PPG phase, in accordance with standard UNDP procedure, to identify the differences, needs, roles and priorities of women and men regarding the various tasks involved across the value chains for key crops in the Union of the Comoros. Such analysis will document all aspects related to access to resources, technologies and knowledge by women and their ability to benefit equitably from the benefits generated by agricultural activities. An action plan will be developed to ensure gender equity in all project interventions.
				Shortly after project inception, an appropriately scoped ESIA will be conducted to assess, avoid or mitigate any potential negative impact of the project interventions on the ecosystem components of the intervention areas and adjacent areas (such as protected areas), including water resources, natural forests, and biodiversity. As part of the PPG process, an out

Risk 7: The Project might potentially cause adverse impacts to habitats as increased effectiveness and profitability of farming practices could attract a larger number of people to farming, including to new crops, and given land limitations, any extension is likely to take place at the expense of natural forests that provide essential ecosystem services, such as fertile soil and surface and groundwater supply. Related to: Sustainability and Resilience Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	I = 4 L = 3	Substantial	Deforestation rates in the Comoros have historically been very high and mainly linked to agricultural encroachment, especially on the islands of Ndzuani and Mwali where there is no longer any available agricultural land. In Ngazidja, abandoned land (formerly used by European settlers) is still available and can be restored, which will limit the risk of impact on natural ecosystems. The establishment of PAs and increased community awareness and involvement in ecological monitoring are already showing results in limiting activities that threaten natural forests. The national forest policy which advocates reforestation across the three islands also contributes to limiting this risk.	come indicator will be identified to allow monitoring of the impact of agricultural activities on adjacent natural ecosystems. Also, the project already includes measures to mitigate the impact of agricultural activities on adjacent ecosystems. The restoration of degraded agricultural lands to allow their development and thus limit encroaching on adjacent natural ecosystems should new farmers become involved in this activity. In order to diversify the value chains, the project will seek to develop new cash crops with limited area requirements (unlike ylang-ylang and clove), in order to reduce the risk of agricultural encroachment on natural ecosystems. The project will also promote agroecological approaches for soil enrichment and the use of fungicides compatible with organic farming criteria and will support the selection of varieties resistant to diseases and pests so as to limit the use of control methods that could impact adjacent natural ecosystems.
Risk 8: A few project sites are located within or adjacent to protected areas including two (2) CRDE in Mwali which is entirely protected under the status of UNESCO's Biosphere Reserve, the Pomoni CRDE in Ndzuani is adjacent to the Ntringui National Park (NP), and two (2) CRDE in Ngazidja: Sidjou-Idjikounzi CRDE which is adjacent to the			Within the framework of the UNDP-GEF PIMS 6257 project, land use plans for each of the PAs will be developed with the participation of local communities. These plans will specify, among other things, the boundaries of village lands and the activities permitted therein, which will provide a consensual reference to avoid any extension of agricultural activities to the detriment of forests and other natural ecos	The scoped ESIA to be conducted in the project early stages, will incl

Karthala NP and Cembenoi CRDE which is adjacent to the Mitsamiouli-Ndroudé NP. Consequently, these sites are located near areas which are home to vulnerable and endangered species. Project activities could pose risks to endangered species habitats if they lead to agricultural encroachment to the detriment of forest areas which are practically all included in national parks. Related to: Sustainability and Resilience Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	I = 2 L = 5	Moderate	ystems within PAs. The agroecological practices recommended in all the project intervention sites will protect the environment and help support the ecosystem services provided by the protected areas. Moreover, the CRDEs are members of the National Parks co-management committees, which facilitates the harmonization of practices and use of adjacent lands with the needs of protected areas (PAs). For Mwali Island, the governance structure for the process of designing a land use plan for the entire island (as part of a project supported by AFD) includes the various parties concerned, including responsible for PAs, CRDEs, farmers and the Ministry of Infrastructure.	ude an assessment of the potential impacts of project interventions on the ecosystem components of the project sites and adjacent areas (such as protected areas), including water resources, natural forests, and biodiversity. Measures to avoid or mitigate identified risks will be incorporated in the project design.
Risk 9: The Project may involve changes to the use of lands and resources that may have adverse impacts on habitats, ecosystems, and livelihoods. The project will include the construction of greenhouses and the installatio			Greenhouses, shade shelters and goat sheds are non-permanent structures that may temporarily, and over small areas, that may limit the land available for other uses and therefore their impact is expected to be minor. The only land use that could be limited or delayed (since these structures are temporary) by the presence of such infrastructure is the construction of houses. Also, the likelihood that cultivated areas will be expanded at the expense of natural habitats and ecosystems or livelihoods (other than agriculture) is at most moderately likely as any increase of cultivated land will be through restoration of degraded land or abandoned land by settlers. The area covered by shade shelters is 50 square meters or less. There are currently around 50 and the support provided to cooperatives and young farmers could increase this total to 150 more. The shade shelters are installed i	

n of shade shelters in the agricultural areas of the CRDEs and village *terroirs*, which will limit other potential uses of these areas. Related to: Sustainability and Resilience Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	I = 2 L = 3	Low	0-150 more. The shade shelters are installed in areas that are already dedicated to agricultural activity or in degraded areas whose potential alternative uses are very limited. There are currently 37 greenhouses which area is 600, 450 or 360 square meters. Through the support of the project, the number greenhouses could increase by a hundred. The greenhouses are systematically installed on degraded areas unsuitable for agriculture in their initial state. The project will encourage the construction of smaller greenhouses since they are less vulnerable to climatic hazards. The appropriate location for greenhouses, shade shelters and goat sheds will be determined in the agricultural land use plan, which will ensure that these constructions do not encroach on areas essential to local communities. The radius of impact of activities within the territories supported by the CRDEs is limited since the use of pesticides and chemical fertilizers is very limited in the Comoros, mainly due to their difficult access in terms of cost and availability.	
				Project development activities (PPG) will include the following assessments: - An assessment of tools, capacities, and effectiveness of border control against standards related to the introduction of pests, invasive species, diseases, and GMOs in order to identify the capacity building measures required and integrate them into the project. - An assessment of the capacities of INRAPE to detect pathogens, in

Risk 10: The introduction of climate-resilient varieties could lead to the introduction of species that could prove to be invasive or genetically modified organisms (GMOs), as well as plants carrying diseases and pathogens that could also become invasive. Related to: Sustainability and Resilience Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	I = 3 L = 3	Moderate	Animal imports only take place on the island of Ngazidja where sanitary control is carried out by INRAPE agents (veterinarians work at the port level). There are no imports of live animals in Mwali and Ndzuani islands. Although there is no quarantine, the risk of contagion of diseases remains limited since the breeding in stalls is now the norm. Control measures currently applied to prevent the introduction of invasive species and plant diseases include control according to established national standards and plant quarantine at the level of INRAPE, which must issue a certificate ensuring the safety of the plant material. In addition, plant and animal imports are made from suppliers approved by the State through the Comoros Agricultural Professionals Supply Center (CAPAC) which further reduces the risk of introducing invasives and diseases. Legislative measures prohibit the introduction of GMOs in the Comoros. Control is exercised by INRAPE at air and sea borders. However, deficiencies in seed labeling could allow the inadvertent introduction of GMOs that may not be detected by INRAPE.	of INRAPE to detect pathogens, in particular viral ones, and GMOs. - An evaluation of the possibility of setting up quarantine sites in Ngazidja in collaboration with the DNSAE to adequately meet the health standards and procedures determined by the national regulations. Also, the project will integrate the necessary precautionary measures in the event that new species should be introduced into the country or into a given environment, to avoid any introduction of invasive alien species, pest, disease, pathogen or GMO. Any introduction of alien species will be subjected to a risk assessment based on UNDP social and environmental standards and on the WTO standards which integrate concerns relating to the protection of human, animal, and plant health. To mitigate further the risk of introducing pathogens or invasive species or GMOs, the project will work in collaboration with INRAPE and the sanitary and phytosanitary services (SPS) of the DNSAE for the control and monitoring of imports and will deal with laboratories and producers recognized for the import of plant or animal species. The project will incorporate measures to limit the risk of introducing GMOs by requiring that the purcha

				se of seeds be made from recognized and reliable producers which may be specified in a modus operandi applicable to all CRDEs and all operators supported by the project. As part of the PPG, the need to strengthen control at the border will be assessed as well as the capacities of the structures in charge of exercising this control. This assessment will help to design capacity building activities to fill the gaps observed.
Risk 11: The Project will involve reforestation in specific areas, in line with land use and reforestation plans which could result in the introduction of unsuitable (climate-wise) or invasive species. Related to: Sustainability and Resilience Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	I = 2 L = 4	Moderate	The project will involve the planting of trees, or living hedges, for the delimitation of hedged farmland (bocage) outside forest habitats and will also promote agroforestry and the restoration of degraded agricultural plots, which will likely involve tree plantations. A process to limit the use of unsuitable (climate-wise) or invasive species is already imposed at the level of the CRDEs for the selection of fruit or forest plant species and includes a precise protocol and a list of species, elaborated as part of the CRCCA project in collaboration with the INRAPE.	Reforestation work will be carried out in accordance with land use plans developed at the island level (Mwali), for the country's protected areas, or for specific watersheds. The project will see to select species or varieties adapted to the climatic conditions projected in the years to come and to avoid any introduction of invasive alien species. Any introduction of alien species will be subjected to a risk assessment based on UNDP social and environmental standards and on the WTO standards which integrate concerns relating to the protection of human, animal, and plant health.
Risk 12: Varieties endemic to the Comoros will be investigated as regards their soil and climatic requirements, their distinctive assets in existing and potential markets and their interest to farmers, men, women and youth. Should research findings be positive, the			The project will support the development of national research capacities to be able to characterize varieties endemic to the Comoros and demonstrate, certify, and label the uniquene	

uld research findings be positive, the project might involve the utilisation of such varieties which properties are u nique and thus pose a risk to overexpl oitation of Comoros agrobiodiversity. Related to: Sustainability and Resilience Standard 1: Biodiversity Conservation and Sustainable Natural Resource Ma nagement	I = 2 L = 2	Low	ss of the agrobiodiversity of the Comoros. Th is will help to preserve access to it for the be nefit of the Comorian population. The project will put in place conservation me asures and sustainable management plans f or any species collected in the wild for exploit ation.	
Risk 13: The potential outcomes of th e Project are likely to be vulnerable to potential impacts of climate change which foresee decreased rainfall. The agricultural crops of the Comoros are mainly rainfed crops, there are hardly any crops irrigated from natural water sources, and the cultivation schedule is associated with rainfall, which incr eases their vulnerability to the effects of climate change. Furthermore, through the various agri cultural activities, the project is likely to involve the use of a significant am ount of water. Such impacts could be potentially significant in Mwali and N dzuani since they use surface water f or crop irrigation, while Ngazidja uses water from cisterns built specifically f or agriculture.Related to: Sustainability and Resilience Standard 2: Climate Change and Disa ster Risk, and Standard 8: Pollution Prevention and Resource Efficiency	I = 3 L = 5	Substantia l	The whole project is focused on reducing vul nerability to climate change. Interventions wil l include the development of individual and c ommunity farm plans in line with integrated a gricultural land use plans developed at the sc ale of CRDEs intervention areas to optimize s uitability of practices to soil and climate para meters and irrigation structures according to water availability and replenishment capacity in each site. The project will build on hydrauli c infrastructure for water retention construct ed as part of the CRCCA project in the interve ntion sites, such as tanks, large Ekotanks, an d micro-basins. The project will align its inter ventions with those of the ongoing 'GCF-Wate r' project which is building rainwater retention infrastructure (Ekotanks and impluviums) to supply water for agriculture and consumptio n, and which promotes the sustainable mana gement of water resources.	The project will carry out Environm ental and Social Impact Assessme nts (ESIA) of planned agricultural l and and water uses on local/neigh boring users and at the scale of th e watersheds where intervention si tes are located. The ESIAs will involve extensive co nsultation and participation with c oncerned stakeholders, including s mallholder farmers, local commun ities, water committees, and the N ational Parks Agency, to assess th e potential environmental impacts of the implementation of integrate d agricultural land use plans and f arm plans, namely as regards land and water use, on the surrounding lands and resources, including nati onal parks and biodiversity therein. The project will also promote wate r-saving approaches such as drip i rrigation and manual watering, gro und cover techniques to reduce ev aporation and agroforestry to incre ase shade in cultivated areas.
Risk 14: The construction and mainte				

Risk 14: The construction and maintenance of greenhouses could present safety risks for workers, especially in windy conditions when installing polyethylene. Greenhouses are from 3 to 4-meter high. The installation of a large greenhouse can mobilize up to 7 people, 2 of whom should climb into the frames to install the polyethylene, hence the risk of falling. The project could also potentially lead to occupational health and safety risks due to physical hazards to artisanal workers making small farming tools from waste metal. The risks of work accidents are linked to the use of tools and the risk of burns, especially when working with metal. The risks are considered relatively limited since the project will support around 60 craftsmen experienced in this type of work and the use of torches is rare. <u>Related to:</u> Sustainability and Resilience Standard 7: Labour and Working Conditions	I = 3 L = 3	Moderate	The impact is assessed as intermediate since a limited number of people are affected, and the injuries, if any, cannot have permanent consequences.	As part of the PPG, a targeted assessment of the risks related to workers' safety will be conducted for the different types of work in order to identify the precautionary measures to be put in place. The avoidance or mitigation measures will be integrated in the project design such as safety measures for all workers involved in the various works, training on occupational health and safety for supervisors and workers, and provision of the appropriate equipment for workers safety.
Risk 15: Child (teenager) labor is common practice for transportation, plowing, watering, and harvesting crops. This work is unpaid and contributes to family income. Such practice may not comply with national and international labor standards (i.e., principles and	I = 3	Substantia	According to Convention no. 138 of the ILO on the minimum age for admission to employment and work, the minimum age should not be lower than the age at which schooling is no longer mandatory, and in any case 15 years. However, children between the ages of 13 and 15 may be allowed to perform light work, as long as this does not adversely affect their health or safety, or their school attendance or participation in guidance or vocational training programs.	As part of the ESIA, the risks related to child labor and inadequate remuneration will be assessed. Avoidance and mitigation measures will be identified, including a minimum age and terms and conditions for employment in connection with project activities, as determined by the national law and consistent wit

standards of ILO fundamental conventions). Furthermore, the remuneration of daily agricultural workers does not generally meet ILO standards. Related to: Sustainability and Resilience Standard 7: Labour and Working Conditions	I = 3 L = 4	Substantial	According to Child Labor and Forced Labor Report for Comoros[1], children in Comoros are subjected to the worst forms of child labor, including in forced labor in agriculture. Childrен also perform dangerous tasks in domestic work. 23% of children between 5 and 14 years old are working, and children work in agriculture is related to production of manioc, beans, vanilla, cloves, and ylang-ylang and animal husbandry which are determined by national law or regulation as hazardous.	h the ILO Convention No 138, and included in an ESMP. The risks related to working conditions need to be considered within the project. All private sector entities that will be engaged throughout the project will undergo a private sector risk assessment to ensure they are in line with SES.
Risk 16: The development of agricultural land use plans could possibly result in economic displacement (e.g. loss of assets or access to resources due to land acquisition or access restrictions) Related to: Sustainability and Resilience Standard 5: Displacement and Resettl	I = 3 L = 2	Moderate	The project will not restrict or extend access to agricultural land but will rather seek to optimize its use in the perspective of the effects of climate change. The project will support the development of agricultural land use plans for an optimal land development that take into account projections of climate change and its impacts. Such plans will recognize the existing land occupation by farmers and work with them to optimize their land use. In the current tenure situation, 90% of farmers own the plot they cultivate. As owners, farmers have full decision-making powers over the use of their plot. A ministerial decree secures the use of plots within the state lands transferred to the CRDEs for the other 10%. The signing of a contract between the farmer and the CRDE ensures the use and security of a given plot. Consequently, the risk of physical displacement of farmers due to project interventions is very low, if any. Furthermore, the development of climate-responsive agricultural land use plans will follow a fully participatory process and will incorporate the farm plot plans that have been developed by the farmers themselves with the	A socio-economic assessment will be carried out as part of the PPG to establish the baseline situation of the farmers targeted by the project in order to assess the effects of the project on their livelihoods and identify the necessary adjustments to ensure they are positive. Before recommending any solution to farmers and other value chain actors, the project will systematically adopt a precautionary approach where the suitability of any new variety or technique and the feasibility of solutions will be tested and demonstrated in the CRDE's plots. An assessment of the potential en

ement			developed by the farmers themselves with the guidance of model farmers and agricultural advisers from the CRDEs. In the worst-case scenario, should a farmer not agree with and not apply the recommendations of the plan, the CRDE will cease providing support rather than imposing the adoption of its recommendations. For all the intervention sites located in whole or in part within a protected area, the project will work with the UNDP GEF PIMS 6257 project which plans to confirm the delimitation of village lands located within the protected areas. Therefore, the likelihood that the project interventions will lead to physical or economic displacement is expected to belimited..	vironmental and social impacts related to this planning process is integrated in the project design under output 1.3 to be conducted prior to the implementation of climate-resilient agricultural land use plans. An ESMP will be developed during implementation in parallel with the development of agricultural land use plans.
Risk 17: The project may result in the generation of organic waste resulting from the distillation of ylang-ylang flowers and the localized concentration of chicken and goat manure, and may result in pollution due to the use of pesticides. Also, the project could potentially lead to the release and/or use of hazardous chemicals by the INRAPE laboratory that the project will support. Related to:	I = 3 L = 4	Moderate	Project interventions will not result in an increase in the amount of organic waste associated with processing ylang-ylang flowers as they will encourage the diversification of culture types rather than the intensification of the production of traditional cash crops. However, support to poultry and goat raising may increase the production of manure, although this will be very local and very small areas will be affected. Hen manure is in high demand by farmers and sales are an important source of income. Goat manure is used to make compost and is also a source of income for farmers. . Chemical pesticides must be imported and not readily available in the markets and, moreover, their cost is prohibitive for the vast majority of farmers which restricts their use. A few farmers still use chemical pesticides although this use is decreasing due to the promotion of organic solutions. If used, they are in small	The appropriately scoped ESIA conducted shortly after project inception, will include an assessment of the potential pollution impacts associated with the use of chemical pesticides as part of the project interventions, and the potential pollution impacts associated with the use of chemical reagents by INRAPE for the analyses conducted in their laboratory related to the project interventions. Measures to avoid or mitigate any potential impacts of the project on the ecosystem components of the intervention areas and adjacent areas will be integrated in an ESMP. Besides, the project design will include specifications to ensure that

Related to: Sustainability and Resilience Standard 8: Pollution Prevention and Resource Efficiency			quantities and very locally. Current research work in the INRAPE laboratories involves the culture of plant meristems as well as a very small volume of analyzes limited to quality control. The chemicals used are plant growth hormones and no toxic chemicals are required for quality control analyzes[2]. However, the characterizations that will be carried out as part of the project may require the use of harmful chemical reagents, but these will necessarily be used in small quantities and their effects manageable.	any intervention carried out under the project will only use pesticides compatible with organic farming standards. The project will promote the use of compost and assess the suitability of recycling flower distillation waste and the two types of manure in the preparation of compost and various types of soil amendment.
Risk 18: The project could potentially lead to increases in vulnerability to climate change impacts. Should new varieties be poorly evaluated and/or practices poorly evaluated and/or poorly implemented, the project could lead to reduced yields and income for farmers and value chain actors. Related to: Standard 2: Climate Change and Disaster Risks	I = 3 L = 3	Moderate	Increasing the climate resilience of key agricultural value chains is the main objective of this project. This will be achieved through various vulnerability analyses, participatory planning taking into account projections of climate change and its impacts, as well as the potentials and vulnerabilities of traditional and new crops to optimize climate resilience of agricultural activities, development and promotion of approaches providing multiple and sustainable environmental and socioeconomic benefits.	Before recommending any solution to farmers and other value chain actors, the project will systematically adopt a precautionary approach where the profitability and climate-adaptability of any new variety or technique and the feasibility of solutions will be tested and demonstrated in the CRDE's plots with INRAPE's support (Output 2.2). Only crops whose climate resilience and profitability have been demonstrated will be presented to farmers and cooperatives. Besides, a socioeconomic assessment will be carried out as part of the PPG phase to establish the baseline situation of the farmers and cooperatives targeted by the project in order to assess the effects of the project on their livelihoods and identify adjustments needed to ensure they are positive.
			The low stone walls are low (max 80 cm) and	

Risk 19: The project will involve construction and infrastructure development including the construction of greenhouses, shade shelters, goat sheds, low walls, the development of anti-erosion lines, and micro-irrigation structures. These developments could have an impact on resource use. Related to: Standard 3. Community, Health, Safety and Security	I = 2 L = 4	Moderate	are built from local materials. The risk associated with their construction is expected to be very low, both in terms of safety for workers and in terms of material used. The installation of anti-erosion lines will be carried out in sites with moderate to steep slopes where stones are available and the level of risk associated with their installation is practically nil for both safety and resource use aspects. The construction of goat sheds and shade shelters less than 2 meter-high will use biodegradable materials and the risk involved in their construction is also very low, for both safety and resource use aspects. The development of infrastructure to bring water to the cultivation plots will be limited to the installation of water tanks on supports 3 meters high and the risk associated with these installations is expected to be low, both in terms of safety and in terms of material used. The building of greenhouses (discussed under risk #14) is likely to involve higher risks related to the height (from 3 to 4-meter high) of these structures.	The ESIA conducted shortly after project inception will include an assessment of the potential impacts related to the construction of low walls, greenhouses, shade shelters, goat sheds, the development of anti-erosion lines, and installation of micro-irrigation structures. For each of these structures, the assessment will include an identification of the safety risks related to their construction and an identification of the source of required materials and the impact on the environment related to construction and, when relevant, to dismantling them. Necessary processes and measures to avoid or mitigate potential impacts on environment and safety/health of project workers will be included in an ESMP.

	QUESTION 4: What is the overall project risk categorization?		
	Low Risk	☐	
	Moderate Risk	☐	
	Substantial Risk	þ	The project is expected to have positive impacts on agriculture and livelihoods resilience to climate change through promoting planning for climate change, diversification of crops, integration of climate-smart agroecological techniques and incentives for their adoption, capacity building especially for farmers and extensions centers (CRDEs), development of new knowledge, and support to sustainable livelihood options for rural communities within the territory of 8 CRDEs

			livelihood options for rural communities within the territory of 8 CRDEs. Nineteen potential risks have been identified for this project, 4 of which are assessed as Substantial, 12 as Moderate and 3 as Low. As a result, the project has been categorized as Substantial risk.		
	High Risk	☐			
	QUESTION 5: Based on the identified risks and risk categorization, what requirements of the SES are triggered? (check all that apply)				
	Question only required for Moderate, Substantial and High Risk projects				
	Is assessment required? (check if "yes")	þ			*Status? (completed, planned)*
	if yes, indicate overall type and status		þ	Targeted assessment(s)	Planned: Capacity needs assessments will be conducted for institutions involved in planning and overseeing agricultural activities, including CRDEs, INRAPE, and border control staff and customs officers; socioeconomic analysis of targets farmers, cooperatives ans other value chain actors; gender analysis; People with disabilities (PWD) analysis; stakeholder analysis; private sector risk assessment; child labor and work conditions assessment
			þ	ESIA (Environmental and Social Impact Assessment)	Planned (during implementation)
			☐	SESA (Strategic Environmental and Social Assessment)	
	Are management plans required? (check if "yes)	þ			
	If yes, indicate overall type		þ	Targeted management plans (e.g. Gender Action Plan, Emergency Respo	Planned: Gender Action Plan and comprehensive Stakeholder Engage

				nse Plan, Waste Management Plan, others)	ment Plan, Occupational health and safety plan, Waste management pl an, Water management plan, and ot her management plans to address significant risks identified through t he various targeted assessments t o be developed as part of the PPG process
			þ	ESMP (Environmental and Social Ma nagement Plan which may include ra nge of targeted plans)	Planned: ESMP to be developed du ring implementation in parallel with the development of agricultural lan d use plans
			þ	ESMF (Environmental and Social Ma nagement Framework)	Planned (during PPG)

	Based on identified risks, which Principles/Project-level Standards triggered?		Comments (not required)
	Overarching Principle: Leave No One Behind		
	Human Rights	þ	
	Gender Equality and Women's Empowerment	þ	
	Accountability	☐	
	1. Biodiversity Conservation and Sustainable Natural Resource Management	þ	
	2. Climate Change and Disaster Risks	þ	
	3. Community Health, Safety and Security	þ	
	4. Cultural Heritage	☐	
	5. Displacement and Resettlement	☐	
	6. Indigenous Peoples	☐	
	7. Labour and Working Conditions	þ	
	8. Pollution Prevention and Resource Efficiency	þ	

[1] https://www.dol.gov/agencies/ilab/resources/reports/child-labor/comoros

[2] According to the Head of the INRAPE laboratory consulted specifically on this subject.

Supporting Documents

Upload available ESS supporting documents.

Title	Submitted
6628 PRE-SESP_Comoros_Resilience_Project_JS_clean	

Part III: Approval/Endorsement By GEF Operational Focal Point(S) And GEF Agency(ies)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the Operational Focal Point endorsement letter with this template).

Name	Position	Ministry	Date
Mr. Youssouf Elamine Youssouf Mbechezi	Director General for Environment and Forests	Ministry of Agriculture, Fisheries, Environment, Tourism and Handicraft	6/22/2021

ANNEX A: Project Map and Geographic Coordinates

Please provide geo-referenced information and map where the project intervention takes place

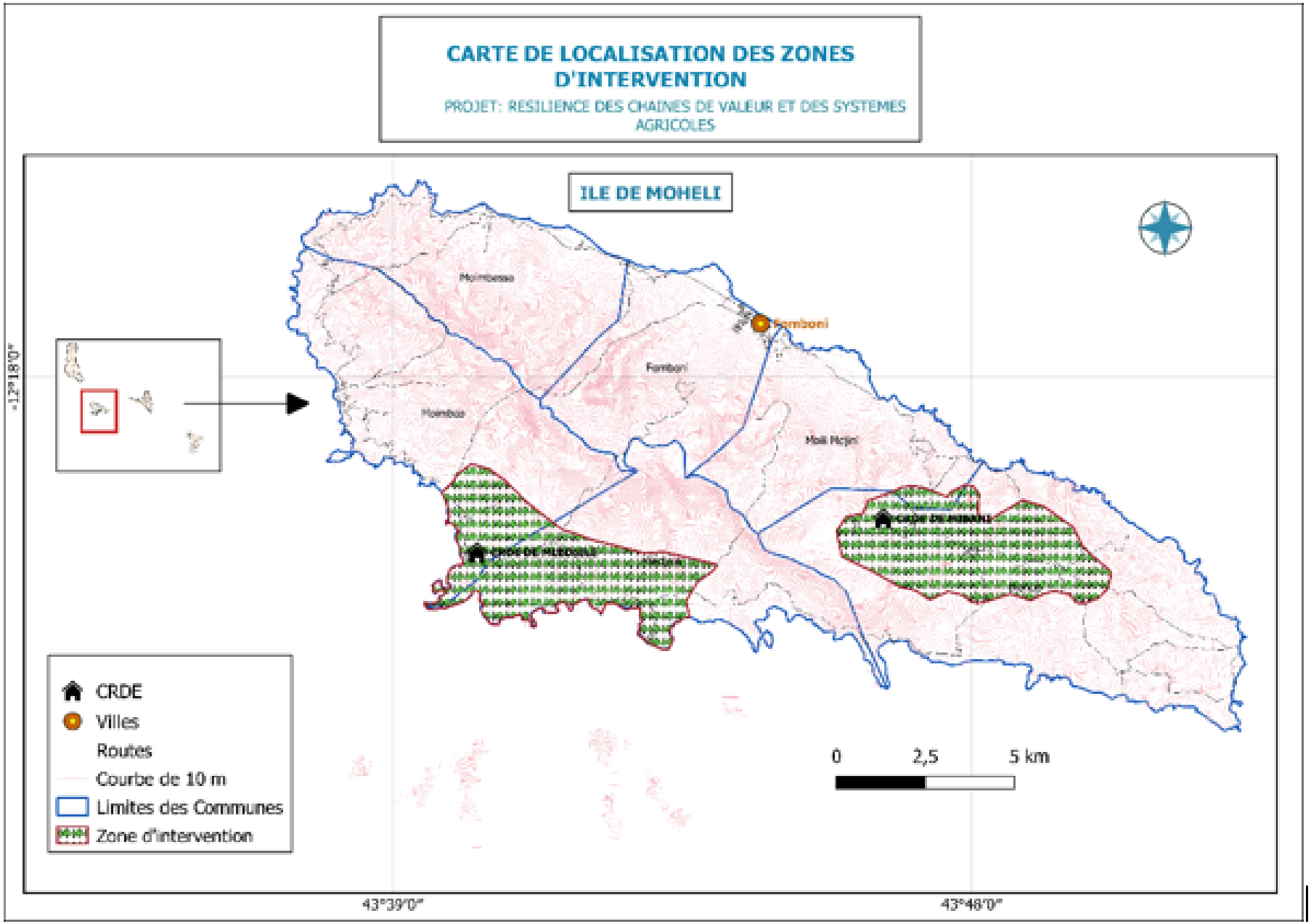

Figure 2. Location map of project intervention areas on Mwali Island

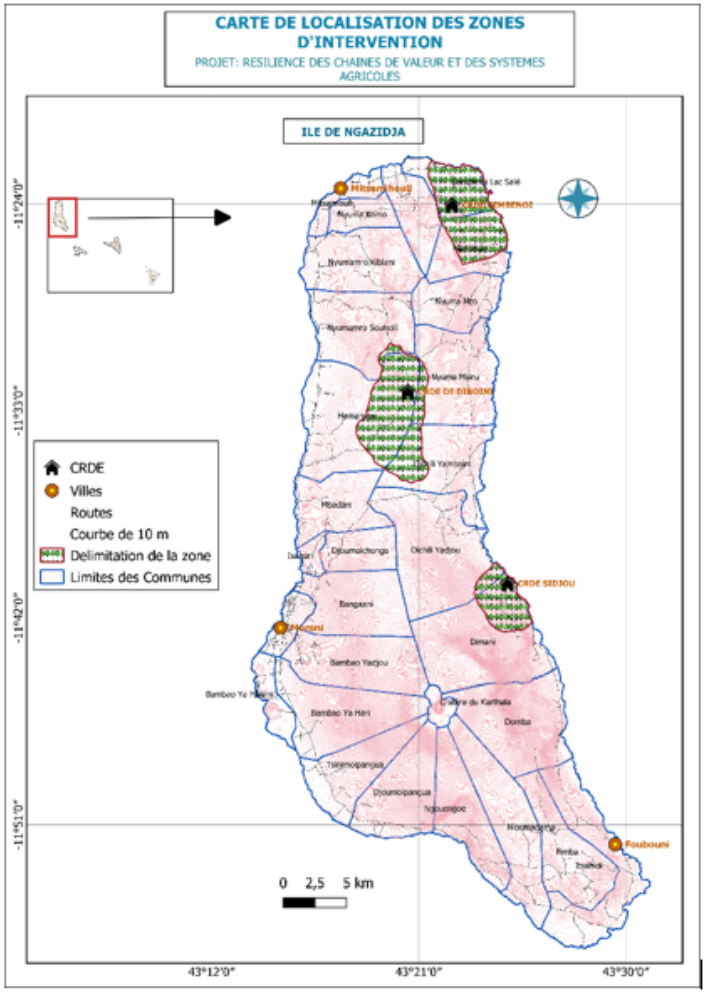

Figure 3. Location map of project intervention areas on Ngazidja Island

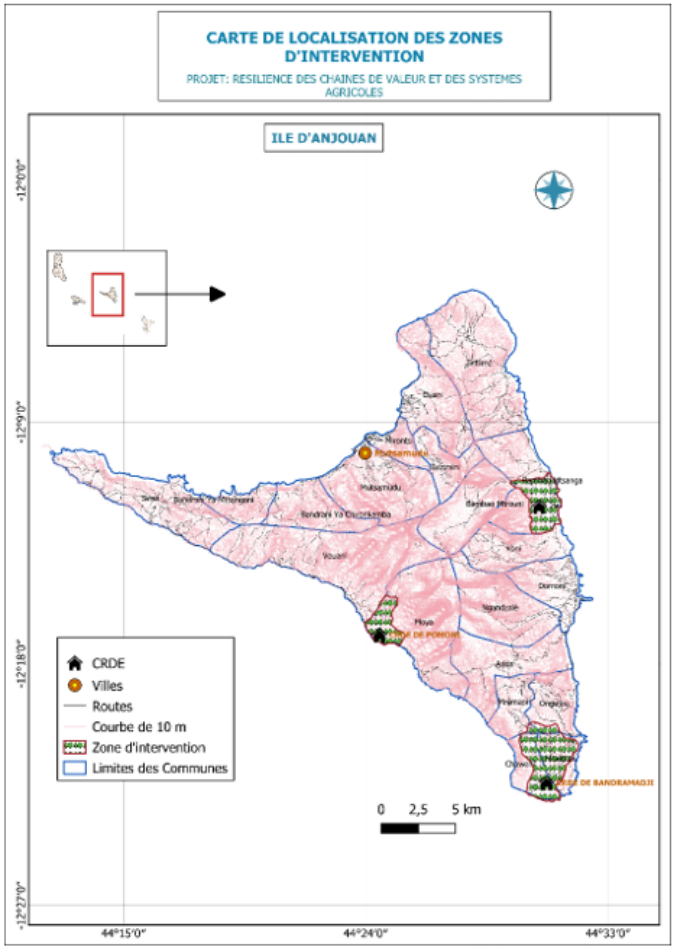

Figure 4. Location map of project intervention areas on Ndzuani Island

Georeferences of each CRDE

Island	CRDE	Coordinates	
		Longitude	Latitude
Mwali	Mlédjélé	43.46555°	-12.17354°
	Mibani	43.77640°	-12.33909°
Ndzuani	Pomoni	44.40513°	-12.28013°
	Bandramaji	44.51462°	-12.35919°
	Bambao Mtsanga	44.51370°	-12.19574°
Ngazidja	Hamalengo-Diboini	43.27671°	-11.44729°
	Sidjou	43.41379°	-11.68060°
	Cembenoi	43.25771°	-11.68185°