Funding Proposal

FP187: Ouémé Basin Climate-Resilience Initiative (OCRI) Benin

Benin | Food and Agriculture Organization of the United Nations (FAO) | Decision B.33/08

9 August 2022

GREEN CLIMATE FUND

A

Contents

Note to Accredited Entities on the use of the funding proposal template

- Accredited Entities should provide summary information in the proposal with cross-reference to annexes such as feasibility studies, gender action plan, term sheet, etc.
- Accredited Entities should ensure that annexes provided are consistent with the details provided in the funding proposal. Updates to the funding proposal and/or annexes must be reflected in all relevant documents.
- The total number of pages for the funding proposal (excluding annexes) **should not exceed 60**. Proposals exceeding the prescribed length will not be assessed within the usual service standard time.
- The recommended font is Arial, size 11.
- Under the GCF Information Disclosure Policy, project and programme funding proposals will be disclosed on the GCF website, simultaneous with the submission to the Board, subject to the redaction of any information that may not be disclosed pursuant to the IDP. Accredited Entities are asked to fill out information on disclosure in section G.4.

Please submit the completed proposal to:

fundingproposal@gcfund.org

Please use the following name convention for the file name:

"FP-[Accredited Entity Short Name]-[Country/Region]-[YYYY/MM/DD]"

A. PROJECT/PROGRAMME SUMMARY

A.1. Project or programme	Project	**A.2. Public or private sector**	Public
A.3. Request for Proposals (RFP)	*If the funding proposal is being submitted in response to a specific GCF Request for Proposals, indicate which RFP it is targeted for. Please note that there is a separate template for the Simplified Approval Process and REDD+.* Not applicable		

A.4. Result area(s)

*Check the applicable GCF result area(s) that the overall proposed project/programme targets below. For each checked result area(s), indicate the estimated percentage of **GCF and Co-financers' contribution** devoted to it. The total of the percentages when summed should be 100% for GCF and Co-financers' contribution respectively.*

	GCF contribution	**Co-financers' contribution[1]**
Mitigation total	Enter number %	Enter number %
☐ Energy generation and access	Enter number %	Enter number %
☐ Low-emission transport	Enter number %	Enter number %
☐ Buildings, cities, industries and appliances	Enter number %	Enter number %
☒ Forestry and land use	20 %	Enter number %
Adaptation total	Enter number %	Enter number %
☒ Most vulnerable people and communities	20 %	40 %
☒ Health and well-being, and food and water security	30 %	30 %
☐ Infrastructure and built environment	Enter number %	Enter number %
☒ Ecosystems and ecosystem services	30 %	30 %

A.5. Expected mitigation outcome *(Core indicator 1: GHG emissions reduced, avoided or removed / sequestered)*	*- 1,783,633 tCO2-eq*	**A.6. Expected adaptation outcome** *(Core indicator 2: direct and indirect beneficiaries reached)*	*6 million (50% women)*	
			330,000 direct beneficiaries (3% of total population) with 50% women	*5,670,000 indirect beneficiaries (47% of total population) with 50% women*
			3%	*47%*
A.7. Total financing (GCF + co-finance[2])	US$ 35, 314,576 USD	**A.9. Project size**	Small (Upto USD 50 million)	
A.8. Total GCF funding requested	US$ 18, 453, 795 USD *For multi-country proposals, please fill out annex 17.*			

[1] Co-financer's contribution means the financial resources required, whether Public Finance or Private Finance, in addition to the GCF contribution (i.e. GCF financial resources requested by the Accredited Entity) to implement the project or programme described in the funding proposal.
[2] Refer to the Policy of Co-financing of the GCF.

A.10. Financial instrument(s) requested for the GCF funding	*Mark all that apply and provide total amounts. The sum of all total amounts should be consistent with A.8.* ☒ Grant Enter number ☐ Loan Enter number ☐ Guarantee Enter number ☐ Equity Enter number ☐ Results-based payment Enter number		
A.11. Implementation period	*6 years (72 months)*	**A.12. Total lifespan**	*20 years*
A.13. Expected date of AE internal approval	*This is the date that the Accredited Entity obtained/will obtain its own approval to implement the project/ programme, if available.* *4/13/2021*	**A.14. ESS category**	*Refer to the AE's safeguard policy and GCF ESS Standards to assess your FP category.* B
A.15. Has this FP been submitted as a CN before?	Yes ☒ No ☐	**A.16. Has Readiness or PPF support been used to prepare this FP?**	Yes ☐ No ☒
A.17. Is this FP included in the entity work programme?	Yes ☒ No ☐	**A.18. Is this FP included in the country programme?**	Yes ☒ No ☐
A.19. Complementarity and coherence	*Does the project/programme complement other climate finance funding (e.g. GEF, AF, CIF, etc.)? If yes, please elaborate in section B.1.* Yes ☒ No ☐		
A.20. Executing Entity information	*The Government of Benin acting through the Ministry of Livelihood and Sustainable Development (MCVDD) and the Ministry of Agriculture, Livestock and Fisheries (MAEP)* *The Food and Agriculture Organization of the United Nations (FAO)* *Fonds National pour l'Environnement (FNEC)*		

A.21. Executive summary (max. 750 words, approximately 1.5 pages)

Climate projections indicate that **temperatures in the Upper and Middle Ouémé Basin of Benin have steadily increasing since the 1960s, and will continue to rise during the rest of this century, by as much as 5 ºC**. Predictions concerning rainfall vary, but all point toward longer period of droughts and more frequent dry spells (in particular in Upper Ouémé), shorter rainy seasons with a late onset and the potential disappearance of the short rainy season in the Middle Ouémé. Changes in temperature, rainfall patterns, and shifts in seasonality require agricultural adaptation with an efficient management of natural resources including soil and water, vegetation cover to reduce risks of damages caused by floods and flash floods (in particular in Middle Ouémé), improve agricultural productivity and enhance the climate resilience and adaptation of the 6 million Beninese living in the Ouémé Basin.

The Ouémé Basin is a key area for agriculture production, which is Benin's main economic sector. This sector employs 61% of Ouémé population, out of which 85% are smallholders. Main crops (annual and perennial) produced in the area include maize, cassava, yam, cashew. The sector is particularly vulnerable to climate change but also has

an important mitigation potential, representing almost half of Benin emissions. Increasing intensity and frequency of extreme weather events are impacting the livelihoods of small-scale farmers, agro-ecosystems are becoming more vulnerable and less productive, poverty and food insecurity are increasing particularly in Middle Oueme and the transition zone of Glazoue[3]. As a result, farmers turn to unsustainable and high carbon practices such as clearing of forest land and natural habitats to establish new fields, slash and burn technique and wood extraction for the production and sale of charcoal – thereby increasing pressure on the biophysical environment, reducing productivity and enhancing exposure to climate-related risks and climate change vulnerability. Without GCF support to implement a low carbon integrated climate-resilient management (ICRM) approach in the Upper and Middle Ouémé, the vicious cycle of climate change induced natural resources and community livelihood degradation will continue to threaten the population of the whole Ouémé Basin.

The proposed **Ouémé Basin Climate-Resilience Initiative** (OCRI) project aims to scale up prioritized climate resilient agriculture and low emission agroforestry practices, build waterworks to reduce soil erosion and run-off, and overall improve land and water management in 95,000 ha (including 89,680 ha from GCF and 5,320 ha through MAEP co-finance via IFAD funded projects) and to reduce 330,000 small scale farmers' vulnerability to increasing climate disturbances and extreme weather events, in the **Ouémé Basin** through implementing a mix of hard and soft climate-resilient measures. The project will ensure that a climate-resilience and low emission pathway is adopted by systematically addressing the barriers to promoting long-term change. The project will develop and scale-up the adaptive and productive capacity of agro-ecosystems and of smallholder farmers in selected rural communities in the Upper and Middle Ouémé river basin. The project will also play a role in reducing vulnerability bottlenecks, by enhancing climate-resilient value chains for crops with major socio-economic and/or ecologic impacts (maize, cashew, shea, mangoOCRI will unlock access to finance for the scaling up of climate-resilient land management and agriculture by partnering with strategic entities such as the Direct Access Entity Fonds National pour l'Environnement (FNEC), the National Fund for Agricutural Development (FNDA) as well as key micro-finance institutions. Finally it will mainstream climate change adaptation in local and regional development plans in order to support the sustainability of the interventions. This will result in the establishment of a resilient agriculture and food production system based on Sustainable Natural Resources (soil, water, vegetation) management in the Ouémé Basin. The implementation of the project will lead to a total carbon balance of – 1,783,633 tCO_2-eq over over 20 years.

To achieve this, the project comprises 3 complementary components, which will be implemented in 5 municipalities: Copargo, Djougou in the Upper Ouémé ; Glazoué in the Upper-Middle Ouémé ; and Zogbodomey and Zagnanado in the Middle Ouémé. The project will be implemented over a six-year period at a total cost of USD 35, 314,576.

Component 1. Low carbon, climate Resilient Crop production enhanced and Ecosystem services restored in the Upper and Middle Ouéme This component will support the enhancement of the Ouémé basin agro-ecosystems resilience to climate change impacts (for maize, cassava, cowpea, chillies, okra, green vegetable, tomatoes, yam, shea, mango and cashew), involving activities such as rain water harvesting and restauration of degraded land and river banks with trees planting. The component will also support capacity development of key stakeholders including famers, facilitators and master trainers using the Farmer Field School (FFS) approach. The activities will include on-farm traditional and innovative prioritized practices and techniques for low carbon climate-resilient agriculture (CRA), including the use of diversified drought-tolerant crop varieties, conservation farming, rainwater conservation, micro-dams, agroforestry, improved water management, as well as ecosystem restoration, water-source and riverbank protection. Training on these techniques will be supported by the Training of the Facilitators (ToF) in FFS to ensure the continuation of trainings beyond the project's lifespan.

Component 2. Climate-resilient and gender-sensitive value chains, supporting farmers' livelihoods in the Upper and Middle Ouémé. Targeted interventions will be developed in partnership with MAEP and IFAD to strengthen the following agriculture products value chains: maize, cashew, shea and mango. These value chains were identified as already part of the agro-systems in the target areas; moreover, they can be strengthened for a better resilience and productivity under climate change conditionsand have strong market potential within and outside of Benin. The scope of project will be extended to other crops highly valued locally, for example cassava, cowpea, chillies, okra, green vegetable, tomatoes, yam. These products were selected as: i) they are currently grown on the project sites and are part of the local diet; ii) locally-relevant and resilient varieties or techniques to address the climate stressors identified are available; iii) they can be produced by smallholders (providing some training and technical support); iv) there is a market demand - especially for those crops which value chains will be strengthened; and v) they do not pose threats to the local environment (in alignment with risk category B). The strengthening of the selected value chains will include training in marketing and finance for farmers and cooperatives and developing networks between farmers and sellers. The project will support building the business case for climate resilient agriculture and food production using a market value chain approach. By demonstrating the economic benefits and market opportunities to private sector stakeholders,

[3] Food insecurity is especially prevalent in Middle Oueme, affecting 10 to 20% households – and over 20% in Glazoue. See WFP, Analyse Globale de la Vulnerabilite et de la Securite Alimentaire (AGVSA), Republique du Benin, 2017.

and by securing the support from micro-finance institutions (MFI) through the collaboration with the **National Agricultural Development Fund (FNDA)**, farmers will be supported to sell climate-resilient agriproducts, as well as access to financial tools and incentives like micro-credits at lower interest rates and with 50% guarantee from FNDA to support and scale up their economic activities. The introduction of appropriate tools on climate resilience assessment and monitoring will be key in providing the evidence for climate-resilient and sustainable increased productivity of the technologies promoted by the project in the beneficiary communities. FAO has secured the support of the Ministry of Agriculture, livestock and fisheries (MAEP) as co-financier through IFAD funded projects to this component given the strong complementarities between OCRI and MAEP interventions, and IFAD's experience in enhancing farmers' access to MFIs. MAEP has agreed to provide co-financing of USD 12,634,280.

Component 3. An enabling institutional and financial environment established to promote and upscale low carbon climate-resilient land and water management in Benin's Basins. This component will support the development of an enabling environment for strengthened governance, finance and knowledge to support climate-resilient management in the Oueme Basin. Through this component, a multi-stakeholder platform (the OCRI platform) will be set up to coordinate, under the leadership of MCVDD, on-the-ground Integrated Climate Resilient Management (ICRM) in the Ouémé Basin in coordination with the Project Management Unit (PMU). These interventions will be supported in the long-term through the strengthening and climate-proofing of the existing Ouémé Master Plan (Schema Directeur d'Amenagement et de Gestion des Eaux du Bassin de l'Oueme – SDAGE). This plan will serve as an umbrella under which the local development plans (plans de developpement locaux – PDL) will be revised to mainstream climate change adaptation at the municipal level. The OCRI platform (governance mechanism) will blend the conditions to leverage responsible and sustainable investments from public and private stakeholders across the Ouémé Basin. For this purpose, it will be linked to the **Direct Access Entity Fonds National pour L'Environnement (FNEC).** FNEC uses its resources to finance climate-resilient and environmental projects in Benin. Its financial strategy will be strengthened to leverage more funding specifically financing climate change-related projects. Under Component 3, FNEC has also committed resources to provide grants as co-financing to farmers' cooperatives and local organisations that will benefit from OCRI's intervention that wish to further implement climate-resilient agriculture and ecosystem restoration activities in the Oueme Basin: it is envisaged that three micro-project in the targeted communes will be supported during the project duration. A roadmap to maintain and replenish FNEC's fund after the project closure will be developed to ensure the long-term availability of finance towards ICRM in the Oueme Basin. Moreover, during the project time, FNEC's capacity to design, identify, implement and monitor climate change related projects will be enhanced, thereby strengthening its capacity as an accredited entity.

Knowledge capitalized and disseminated will foster replication and scaling-up of climate-resilient agro-ecosystems across the five municipalities, and beyond. The monitoring and evaluation (M&E) of progress and impact will be embedded at community level via the selection of local facilitators who will be empowered to conduct local monitoring and keep track of the restoration and adoption of the technological package, whereas the OCRI platform will facilitate governance and institutionalization of project interventions. The project will also reach out to other basins' authorities in Benin (i.e. Mono, Niger and Volta Basins) to invite them on training sessions and showcase the benefits of ICRM across the Oueme Basin. Gender and social protection safeguards will be integrated, especially via the increased participation of women in sustainable livelihoods related activities. Project activities will be sustained and replicated over time in other localities by ensuring the targeted beneficiaries have the know-how, ownership, motivation and instruments to sustainably maintain and keep investing in the activities introduced by the project.

The EX-ACT analysis was conducted and results show a positive environmental impact due to the implementation of the project's activities, The implementation of the project will increase the mitigation potential of the area resulting in the sequestration of 1,783,633 tCO_2-eq over 20 years.

All references to MCVDD and MAEP as executing entities shall be and shall be interpreted as references to the Government of Benin acting through MCVDD and MAEP, as the case may be. FAO and MCVDD will function as the Executing Entities for the GCF proceeds. FNEC, which is a legal entity which operates under the aegis of MCVDD, has agreed to provide co-financing and will be executing entity for the activity it co-finances. MAEP and MCVDD will also be executing entities for the activities they co-finance. Care will be taken that different departments within MCVDD and MAEP are involved in project implementation (see implementation arrangements, section B.4The Project Management Unit will ensure coordination among Ministries and EEs, and the other project-implementing partners, as well as coordination with local and regional bodies. EEs will collaborate with other partners from civil society, community based-organisations and private companies.

The project has an estimated economic rate of return of about 18%. At a 10% Discount Rate it has a Net Present Value of USD 69 million and costs per beneficiary of about USD107. As a funding development partner, the Government of Benin has requested that FAO function as the Accredited Entity and as one of the Executing Entities for the project.

B. PROJECT/PROGRAMME INFORMATION

B.1. Climate context (max. 1000 words, approximately 2 pages)

Benin is a Low Middle Income developing country of West Africa, extremely vulnerable to climate change, and is listed as Least Developed Country in the Department of Economic and Social Affairs[4]. In Benin, the Ouémé Basin, which hosts approximately half of the population, is key for agriculture and food production sector. Key crops produced in this area are maize, cassava, cowpea, chillies, okra, green vegetable, tomatoes, yam, shea, mango and cashew. The Ouémé River is also the most important of the country, draining parts of north, centre and southern Benin; its basin covers an area of more than 47,218 km^2, straddling 48 communes spread over eight departments of Benin. The Basin supports the livelihoods of 6 million people and contributes to 65% of the national agricultural production. However, recurrent and increasing droughts, heavy rains, floods, flash floods and shifting rainfall patterns, which have been registered since the 1970s in the Upper and Middle Ouémé Basin[5], are increasingly threatening the livelihoods of millions of vulnerable people, depending on the goods and services of the Ouémé Basin ecosystems. This is particularly the case of the communities living in the municipalities of Copargo, Djougou (Upper Ouémé), Glazoué (transition zone), and Zogbodomey and Zagnanado (Middle Ouémé). The municipalities were identified as highly exposed to climate change, and their population highly vulnerable to climate change (see Annex 2, FS, Section 4&5).

1. Emission profile of Benin

Benin has published its Intended National Determined Contribution (INDCs) under the Paris Agreement in June 2017, which highlights the country's emission profile and intentions in terms of decarbonising its economy and investing in climate change resilience. The INDC indicates that Benin's total GHG emissions amounts to approximately 14.1 Mega ton CO2 Equivalent (Mt CO2 eq), that is approximately 1.5 ton CO2 eq per capita in 2012, without Land Use, Land-Use Change, Lands and Forestery (LULUCF). These emissions come from the sectors of energy (47.4 %), **agriculture (45.9%),** waste (5.0 %) and industrial processes (1.6 %). Considering LULUCF, the balance of GHG emissions (14.9 Mt CO2 eq) and absorptions (50.3 Mt CO2) shows globally that Benin remains a GHG sink with a net absorptive capacity of 35.4 Mt CO2 in 2012, this means that its GHG emissions are largely offset by the absorption of CO2 on the level of its forest cover. Even tough Benin remains a sink, its capacity of carbon sequestration is declining falling from (52.0) Mt CO2 eq in 1995 down to (41.3) Mt CO2 eq in 2005, that is a decrease of 20.6 %, and to (35.4) Mt CO2 eq in 2012, that is a decrease of 32.0 %.

In terms of projection of greenhouse gas emissions, in the BAU case, the tendency of overall emissions (without LULUCF) reveals an increase rate of 172.8% over the period 2012-2030 rising from 14.1 Mt CO2 eq to 38.5 Mt CO2 eq (Figure 1).The total of aggregate cumulative GHG emissions without any intervention over the period 2021-2030 is close to 306.1 Mt CO2 eq (without LULUCF).They would come up to 27.4% from the agriculture sector. Benin is committed to reduce its GHG emissions. Overall, excluding the forestry sector, Benin plans to reduce cumulative greenhouse gas emissions by 49.49 Mt CO2e, a reduction of 16.17% compared to the status quo scenario on the period 2021 to 2030. This could be achieved through: i) implementing improved farming techniques; ii) implementing soil fertility- maintaining techniques on a cultivated area; and iii) promoting sustainable irrigation schemes.

Furthermore, the implementation of the measures envisaged in LULUCF would contribute to increase its cumulative sequestration capacity of 32 Mt CO2 eq over the period 2021- 2030 including 76.6% of conditional contribution, by limiting deforestation (23.9 Mt CO2 eq) and creating planted forests (8.1 Mt CO2 eq). Lowering the annual rate of deforestation would make it possible to reduce the cumulative emissions due to the sector of forestry by 110 Mt CO2 eq over 2021-2030 period including 80% of conditional contribution and 20% of unconditional contribution. This could be achieved through: i) Protecting and preserving existing natural and planted forests to reduce deforestation rate; and ii) implementing reforestation.

To achieve its emission reduction targets or potential, Benin will need support in terms of technology transfer, capacity building, National resources (public funds and private investments) will also need to be supplemented by the external financial support (bilateral or multilateral). The estimated overall cost for the implementation of the mitigation-related measures is of USD 6,042.33 million.

[4] https://www.un.org/development/desa/dpad/least-developed-country-category/ldcs-at-a-glance.html

[5] Sonneveld B. G. J. S, et al. (2012). The impacts of climate change on crop production in West Africa: an assessment for the Ouémé River Basin in Benin. Water Resour Manage 26: 553-579

2. Historical climate trends in Upper and Middle Ouémé

Temperatures trends over the period 1961-2009 in the Upper Ouémé Basin show a steady increase, at 2.2° C for the maximum temperatures, and 1.6° C for the minimum temperatures. Similar trends are observed in Middle Ouémé, based on data from 1953 to 2016, with an overall increase of the maximum temperatures by 1.40° C, and of the minimum temperatures by 2.5 ° C[6] (Figure 1&2). In the Middle Oueme, the analysis of observed thermal values trends (maximum, mean and minimum) over the last sixty years, indicates an overall increasing temperature trend of 0.025°C/year (linear regression). In the Upper Oueme Basin, a higher temperature increasing trend of 0.039°C/year was observed over the last forty years in the synoptic station.

Figure 1: Annual temperature trend at Djougou and Copargo, in the Upper Ouémé Basin

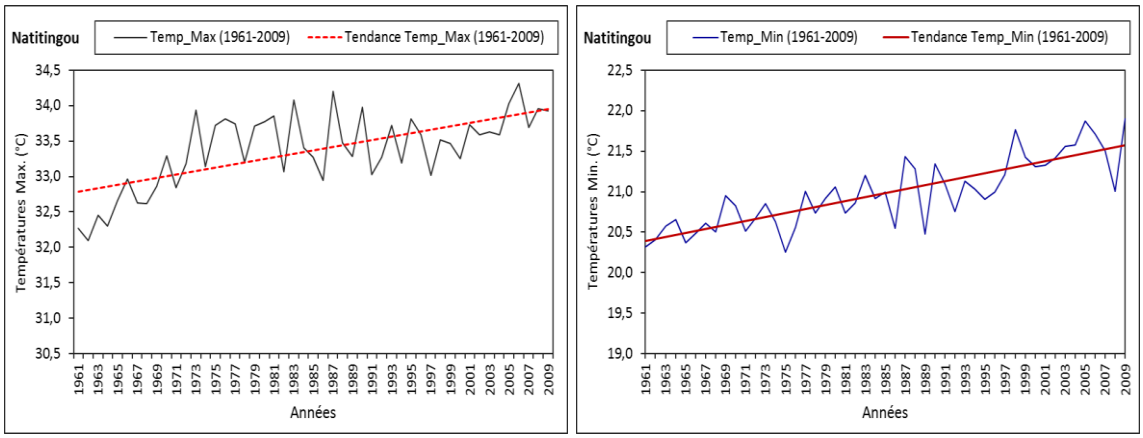
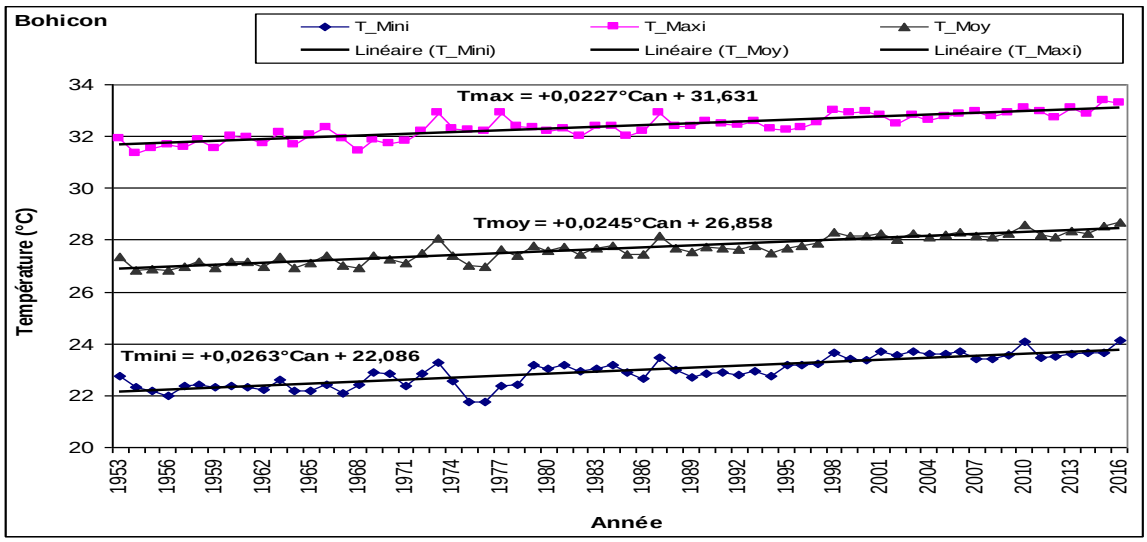


Figure 2: Annual temperature trend in the project areas in the Middle Ouémé Basin (Glazoue, Zogbodomey and Zagnanado)

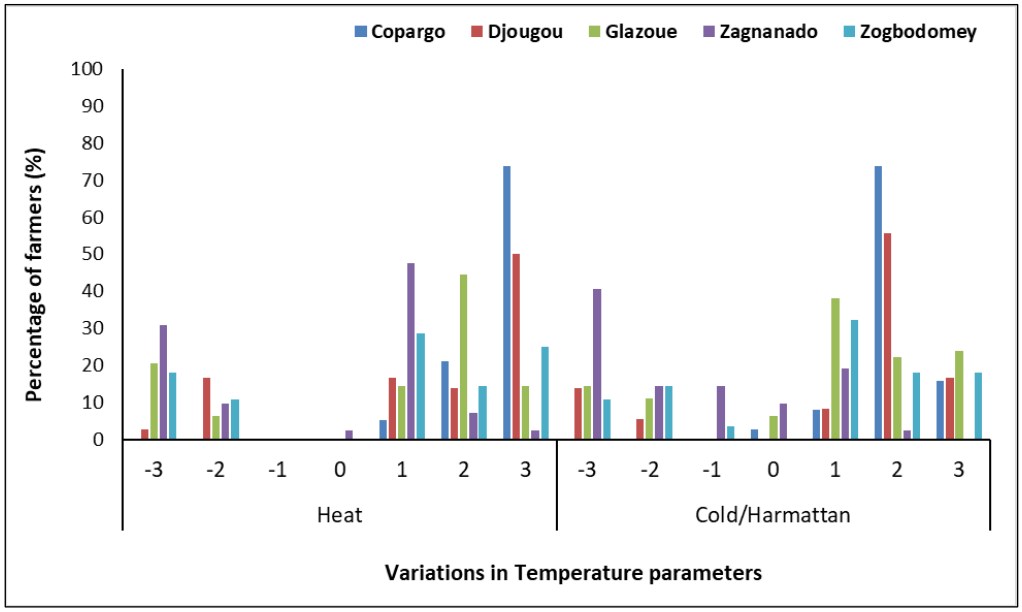


Changes in temperature parameters (heat and cold/harmattan) have been noticed by farmers in all the five communes of the Oueme basin[7]. According to surveyd farmers, temperature has increased during dry seasons, leading to more frequent heat waves and droughts than historically (±10 to 20 years ago, based on memory recollection) observed. The respondents confirmed that temperature has significantly increased between slight and high (+1 to +3) in all the communes with the order Copargo > Djougou > Glazoue > Zogbodomey > Zagnanado (Figure 3). These observations are consistent with scientific data indicating higher historical increases of temperatures in Upper Oueme compared to Middle Oueme.

[6] Benin, 2nd National Communication on Climate Change, 2011

[7] Akponikpè PBI (2022) Climate change and Environmental Impact study in the Oueme-basin (Benin): Update of literature and Analysis of the perceptions of climate change and farmers adaptive strategies. FAO Consultancy report, Fev-March 2022.

Figure 3: Farmers perceptions on the changes in temperature parameters5



With regards to changes in precipitations, the historical (1930-2011) spatio-temporal variability of the annual rainfall over the Oueme basin, shows that the highest rainfall (1200-1500 mm/year) occurs in the southern regions of the basin, compared to the northern regions (800-900 mm/year) (fig. 3). In the upper basin, the highest precipitations during the year are recorded in July, August and September, while January, February, November and December are the months with less or no rainfall. The historical (1963-2000) analysis of the Simple precipitation intensity index (SDII) from the CLIMDEX database (https://www.climdex.org/access/) shows that the SDII varies in average from 13 to 16 mm/year in the Upper part of the basin (Djougou), from 13-15 mm/year for Glazoue and from 13-15 mm/year for the middle part of the basin. In general, the historical trend of the SDII is not fix and show a sinusoidal pattern. M'po et al. (2017) found no trend of the SDII over the Oueme basin, except at the Bonou outlet (lower basin) and other few stations where an increasing trend is observed, while much decreasing trends of the annual total precipitation (PRCPTOT) in the basin is observed.

Although there is a scarcity of certainty based on scientific data regarding changes in precipitation, group discussions and individual interviews with farmers confirm that rainfall amount, intensity and frequency have significantly decreased in the Oueme basin (Figure 4). Farmers indicate that there were some relatively less frequent rainfall events with high intensity over a short time that cause on-farm flooding, lasting for about 1-2 weeks, and making farming activities very difficult. In addition, the rainfall pattern, bimodal in the past in the Southern part (middle Oueme, Glazoue), is now perceived to be unimodal, with only one rainfall season instead of two.

Figure 4: Farmers' perceptions on the changes of rainfall parameters (Decreased (-3 High, -2 moderate, -1 slight), 0 (no change), Increased (+1 slight, +2 moderate, +3 High)

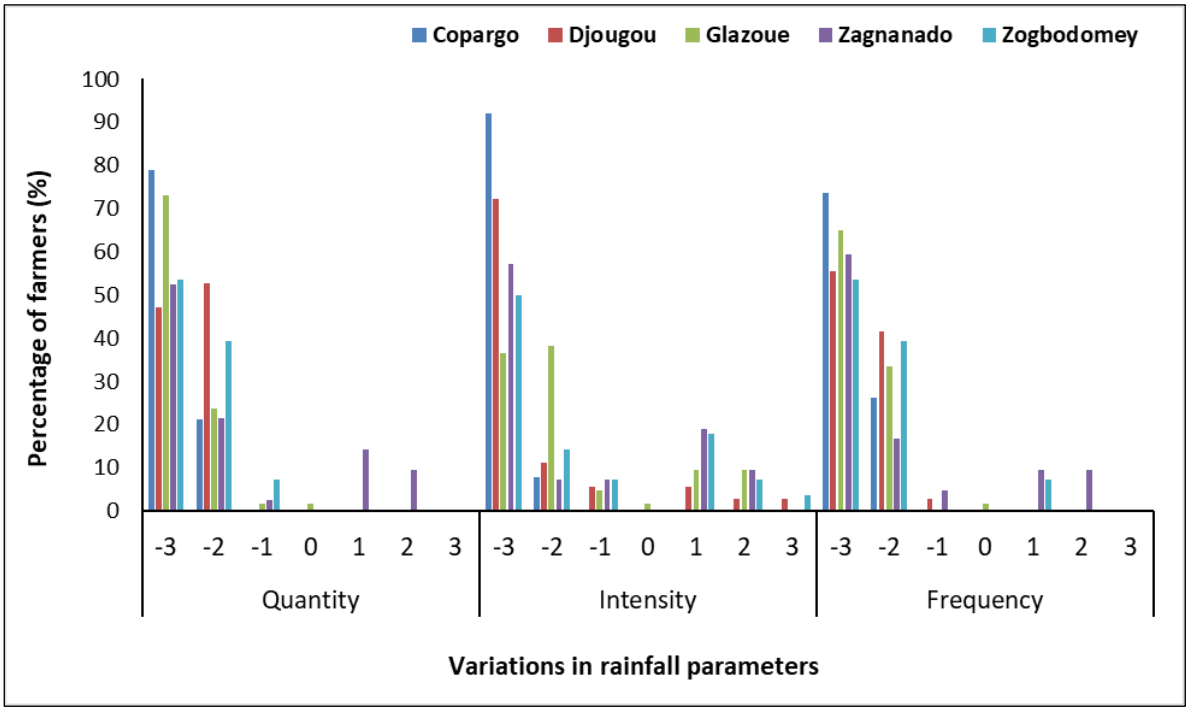
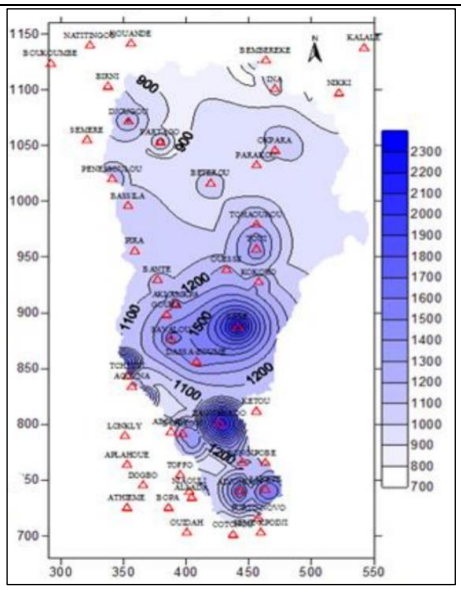


Figure 5: Spatio-temporal variability of the annual rainfall over the Oueme basin from



Source of data: *Observed climate data from Meteo Benin*
Period: *1930-2011.*
Source graph : *Alamou et al., 2016*

Flooding: increased frequency of climate extremes in Benin has been observed since 1951, has caused more frequent droughts and flooding[8]. Droughts have intensified, particularly in 1970-1980s, and rains have intensified by 100 mm/h enhancing soil erosion and intensifying the impacts of floods[9]. In particular, erratic violent rains increase the frequency

[8] Project GCP/GLO/207/ITA, Project for the Strengthening of National Capacities for Monitoring Water Resources with a Focus on Agricultural Management, 2009
[9] UNDP; Beninese Ministry of Environment and Nature Protection (2008)

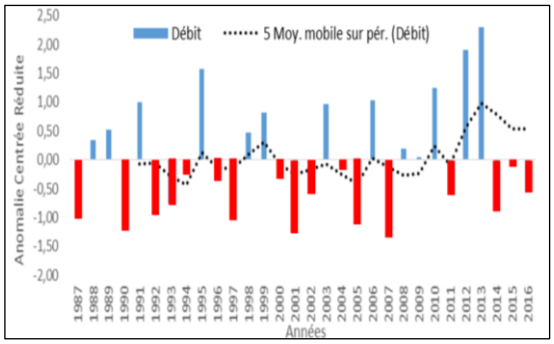
and magnitude of flash floods with significant losses and damages. The increased frequency of extreme weather events in Benin has negatively impacted livelihoods and damaged infrastructure. Indeed, the years 1985, 1988, 1991, 1995, 1997, 2008, 2009, 2010, 2012, 2013 and 2019 were characterized by major floods: the 2010 floods have been particularly devastating given their spatial extent (55 communes affected out of the 77 of the country) and the number of people affected (680,000 people). This depicts a highly increased flooding frequency reaching one flooding event every three years during the last three decades.

In the upper valley, Olivier et al. (2017)[10] on the basis of a frequency analysis of the flows of the Oueme at Béterou showed that the maximum rains responsible for the frequent floods are rain events with a return period greater than five years, with amount values greater than 39.2 mm. The corresponding flows are of the order of 459 and 628 m3/s. In the middle valley, the recurrent floods observed are caused by maximum daily rainfall amounts between 25.0 and 38.2 mm with respective return periods of 2 years and 3 years. Similarly, the frequent river floods are caused by floods with peak flows between 746 and 1160 m3/s, i.e. flows with return periods between 2 and 5 years[11]. In economic terms, the impact of the 2010 floods was estimated at more than 127 billion CFA francs and a decline in the GDP growth rate of around 0.8 points (Benin, 2011). It is estimated that the floods resulted in a drop of the GDP growth rate of around 0.8 points12. Interviews indicated that floods are occurring more frequently and are more intense than they used to be, leading to significant crop and vegetable losses.

Dry spell periods The historical (1986-2016) rainfall data were analysed for three different locations/regions of the basin: (i) Djougou (Upper Oueme), (ii) Glazoue (upper Oueme) and (iii) Zagnanado (middle Oueme). The analysis reveals that about 50% (15-17 over 31) of the years were found to be dry in all the three regions. Glazoue (south upper Oueme basin) was found to have the highest number of dry years and the lowest SRI (hottest year). In general, all the three regions shared at least 1992, 1996, 2000, 2002, 2006 and 2006 as dry years. Dry years have also been experienced more recently and more frequently over the past few years, as indicated during farmers' interviews.

Water resources Analysis of the inflow water anomalies in the middle/lower Oueme showed high variations with the extreme negative observed in 1990, 1997 and 2007, and the extreme positive ones in 1995, 2012 and 2013 (fig. 6). Such data are not available for the Upper Oueme region.

Figure 6: . Anomalies of the inflow water rates at the Oueme basin (lower basin).



Source of data: Historical data from Benin-Meteo
Period: 1987 to 2016
Source of graph: Cocker et al., 2019

Strong winds: According to Benin NDCs, strong winds are also expected to increase with climate change.
Overall, field interviews cross-checked with scientific data tend to confirm that farmers in the Upper and Middle Oueme are increasingly affected by droughts, dry spells (especially in Copargo and Djougou), floods (especially in Zagnando and Zogbodomey), heat waves and strong winds, which have become more frequent, especially over the recent years.

[10] Olivier, K., Wilfrid, V. E., & Jean-Marie, D. Caractérisation Des Risques Hydroclimatiques Dans Le Bassin Versant De L'Ouémé A L'exutoire De Bétérou Au Bénin (Afrique De L'ouest). European Scientific Journal May 2017 edition Vol.13, No.15 p 101-118

[11] Seidou, S., Ouassa, P., Atchade, G. A., & Vissin, e. W. (2021). Caracterisation Des Risques Hydroclimatiques Dans La Basse Vallee De L'Oueme Au Benin (Afrique De L'Ouest). *International Journal of Progressive Sciences and Technologies*, *25*(2), 334-348.

[12] UNDP ; Beninese Minitry of Developement and economic analysis 2014
https://info.undp.org/docs/pdc/Documents/BEN/SAP%20Rapport_Provisoire_cc_ressources_eau.pdf

In addition, farmers note the delayed rainfall seasons, and the end of the bimodal rainfall season (in Glazoue). These have increasingly negative impacts on crops and vegetables production in the project target areas as will be explained in the following sections. More information on climate change trends is available in Annex 2 Section 3.

3. Climate change projections

The Upper and Middle Ouémé Basin have experienced steady increase in temperatures since the 1960s; and this trend will continue under climate change conditions. Projections in both project areas indicate a general upward trend in daily temperatures, of 1 to 3°C for the 2035- 2064 period, and 1 to 5°C for the 2070-2099 period[13]. With regards to precipitations, climate models indicate that mean annual rainfall is likely to increase until mid-21st century, then decline until the end of the century in the Ouémé Basin[14]. It is also predicted, based on the RCP4.5 scenario, that the main rainfall season, which takes place between March/April to November in the Upper and Middle Ouémé, will become shorter, and the dry season longer; a decrease in rainfall is expected during the two-three months corresponding to the start of the main rainy season. In addition to this, in the Middle Ouémé[15], models indicate a decrease of precipitation in the months corresponding to the start of the short rainy season. Another study from Essou and Brisette (2013)[16] also indicates a decrease in daily precipitation for the 2035-2064 and 2070-2099 periods, but an increase in monthly precipitation: the study suggests that the number of rainy days, thereby the length of the rainy seasons, will decrease in the future but not the amount of rain falling over the whole season. The Middle Ouémé short rainy season will be more affected with a 25% to 50% drop in daily precipitations during the beginning of the short season, leading to its gradual disappearance. Conversely, models predict more frequent heavy rainfall episodes during the middle and end of the rainy seasons in the Upper and Middle Ouémé Basin[17]. In other words, climate change will lead to an increased frequency of extreme rainfall events and an increased occurrence and intensity of floods during the middle and end of the rainy seasons, affecting in particular the Middle and Lower Ouémé Basin because of overflows of the Ouémé River. It is important to note that these shifts in the main and short rainy seasons in Benin have already been observed, including in the Ouémé Basin[18] (Table 1).

Table 1: Variability of average rainfall patterns in Benin between the 1985-2014 and 2018-2050 periods (future projection obtained from the RCP4.5 scenario); (significance of the results at thresholds of 5% according to the Student's Test).

	Dec	Jan	Fev	Mar	Avr	Mai	Jun	Jui	Aou	Sep	Oct	Nov
Copargo	-	-	-	-	-	-	-	-	-	+	+	-
Djougou	-	-	-	-	-	-	-	-	-	+	+	-
Glazouè	-	-	-	-	-	-	-	+	+	+	+	+
Zagnanado	-	-	-	-	-	-	-	-	+	+	+	+
Zogbodomey	-	-	-	-	-	-	-	-	+	+	+	-

A more recent analysis of the future climate (2020-2050) by M'po et al. (2017)19, in the Oueme basin confirmed that in general, under the RCP 4.5 projection scenario, rainfall is projected to decrease, whereas the trend will somehow stay constant for RCP 8.5. In average, the annual rainfall will decrease significantly by 1.33 mm according to RCP 4.5, whereas the trend is expected to significantly increase by 1.89 mm based on RCP 8.5 (Lawin et al., 2019). (fig. 5). However, analysis of the future (2015-2050) total annual precipitation by M'po et al. (2017), showed no clear trend for RCP 4.5 scenario but a decreasing trend for the RCP 8.5. Specifically, these clear decreasing trend (RCP 8.5) is also shown with the future climate trends per stations (Djougou and Glazoue-Save for upper Oueme and Zagnanado for middle Oueme) (M'po et al., 2016).

[13] Gilles RC Essou and Francois Brissette, 2013, ''Climate Change Impacts on the Ouémé River, Benin, West Africa''

[14] Government of Benin (2011) Benin: Second National Communication on Climate Change

[15] To note that the Upper Ouémé area is characterized by a single rainy season, from March to November with a peak in July/ August; while Middle Ouémé has two rainy seaons, which peak in June and September.

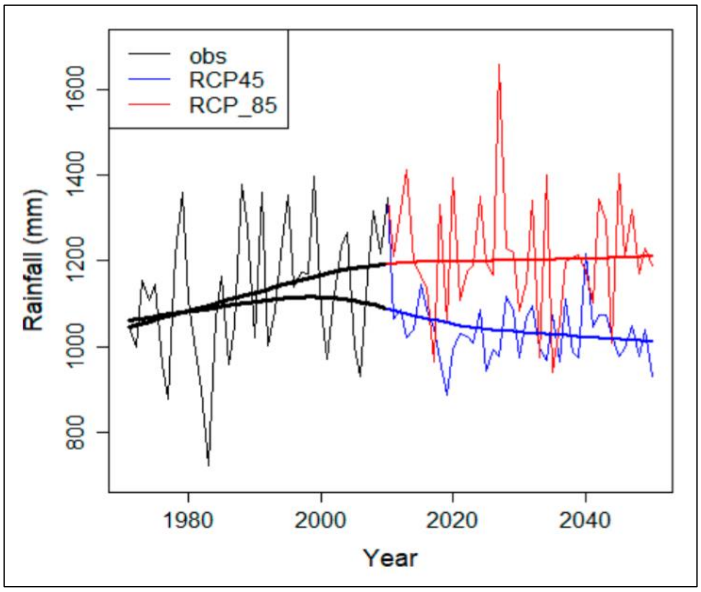
[16] Gilles RC Essou and Francois Brissette, 2013, ''Climate Change Impacts on the Ouémé River, Benin, West Africa''

[17] Gnangle C. P., et al. (2011). Tendances climatiques passes, modelisation, precipitations, et adaptations locales au Benin. Climatologie, vol. 8.

[18] Baudoin M-A., Cuni Sanchez A. and Fandohan B. (2014). Small scale farmers' vulnerability to climatic changes in southern Benin: The importance of farmers' perceptions of existing institutions. Mitigation and Adaptation Strategies for Global Change, 8(19): 1195-1207. DOI : 10.1007/s11027-013-9468-9

[19] M'Po, Y.N.T.M.; Lawin, A.E.; Oyerinde, G.T.; Yao, B.K.; Afouda, A.A. Comparison of Daily Precipitation Bias Correction Methods Based on Four Regional Climate Model Outputs in Ouémé. Hydrology 2017, 4, 58–71.

Figure 7: Variation of the average annual rainfall from observations (1971-2005) to projections (2020-2050) based on the Representative Concentration Pathways RCP 4.5 and 8.5, using MPI-ESM-LR/REMO2009, ICHEC-EC-EARTH/ RACMO22T, CCCma-CanESM2_CCCma/ CanRCM4 and



Source of data: *Bias-corrected of 4 downscaled GCMs data. All the 4 belong to the CORDEX Africa (AFR-44).*
Period: *Past (1971-2005) and future (2020-2050)*
Source graph: *Lawin et al., 2019*

Regarding dry spell periods, no trend is observed under the RCP. 4.5 scenario, while an increasing Consecutive Dry Days (CDD) trend will be observed in the future according to the RCP. 8.5. On the contrary, a decreasing trend of the CWD is under that same RCP. 8.5. Regarding evapotranspiration, analysis of the climate change effects (2030-2049) on these trends using the REMO model with the older SRES scenarios (B1 and A1B, comparable to the new RCP 4.5 and RCP 6.0, respectively (Danvi et al., 2018), showed that the surface runoff will increase by 54-65% (7-12 mm), as well as water yield, while evapotranspiration is likely moderately increase. Cocker et al. (2018) in the lower valley, observed a high rainfall variability, with serious consequences on the inflow rate and availability of water in the basin. For example, for a 100% rainfall water received within the lower Oueme basin, about 31-78% is lost as evapotranspiration, 20-68% is used for ground water recharge and only 0.2-1% flows. For Sintondji et al. (2013), runoff, actual evapotranspiration and the total groundwater recharge represent 7.8 %, 73 % and 18.8 %, respectively of the total annual rainfall at Save outlet of the Oueme catchment (near Glazoue). The potential evapo-transpiration (PET) will significantly increase by 4.51 mm and 4.92 mm according to the RCP 4.5 and RCP 8.5, respectively (Lawin et al., 2019).

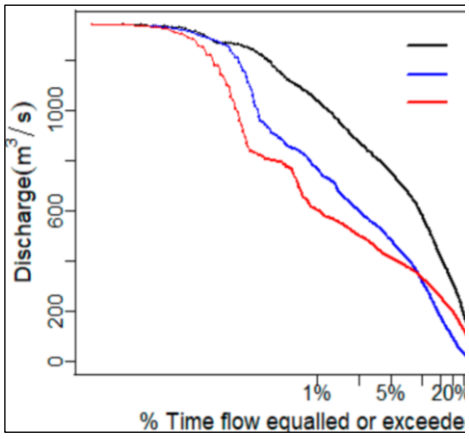
Climate change events in the Upper Ouémé Basin have negative impacts in the Middle Ouémé Basin, and lower areas. While both Upper and Middle Ouémé are experiencing hotter and more arid climate, with late and heavy rains, long periods of heat, and prolonged periods of dry spells[20], more irregular rainfalls with an increase in climate events such as torrential rains and higher temperatures, already observed in the upper catchment, lead to strong erosion of the river banks, and more frequent floods in the lower areas. More information of climate change projections is available in Annex 2 Section 3.

4. Impacts of climate change on water, crops and value chains

Water
Climate change will increasingly affect water availability. The Oueme discharge flow water will decrease in the future (2020-2050) with probability of exceedance less than 10% compared to compared to the observed data (1971-2005) (fig. 6), with the peak discharge significantly decreasing by 6.58 m3/s under RCP 4.5. But RCP 8.5 reveals a non-significant increase by 1.59 m3/s (fig. 7).

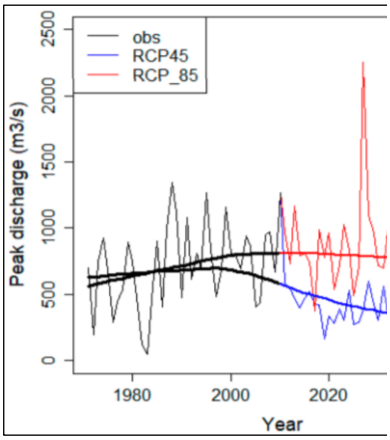
[20] INE (2018), "Analyse de la vulnérabilité et de l'adaptation au changement climatique des communautés et agroécosystèmes aux variations actuelles du climat et aux phénomènes météorologiques extrêmes", Rapport provisoire, 61p.

Figure 8: Variation of the observed flow duration compared to the future trends, from observations (1971-2005) to projections (2020-2050) based on the Representative Concentration Pathways RCP 4.5 and 8.5.



Source of data: *Bias-corrected of 4 downscaled GCMs data. All the 4 belong to the CORDEX Africa (AFR-44)*
Period: *Past (1971-2005) and future (2020-2050)*
Source graph : *Lawin et al., 2019*

Figure 9: Variation of the peak flow from observations (1971-2005) to projections (2020-2050) based on the Representative Concentration Pathways RCP 4.5 and 8.5.



Source of data: *Bias-corrected of 4 downscaled GCMs data. All the 4 belong to the CORDEX Africa (AFR-44)*
Period: *Past (1971-2005) and future (2020-2050)*
Source graph : *Lawin et al., 2019*

As underlined in a study conducted by Biao in 2017[21], more frequent extreme events such as extended droughts and shifts in the rainy season, with a late onset and concentration of rainfalls over the middle-end of the season, will increasingly decrease water availability at -20% to - 39% by 2080. With regards to the hydrological system, the Middle Ouémé will likely face reduced flow of temporary or seasonal rivers under the combined effect of the shorter rainy seasons, increased temperatures and silting[22]. Likewise, a study from Gilles RC Essou and Francois Brissette (2013)[23] has indicated an increase of mean daily temperatures in the Ouémé Basin, accompanied by a reduction in mean monthly flows of the river both in the dry and in the rainy seasons.

Concerning the hydrographic network, in the middle basin of the Ouémé, it is likely that temporary or seasonal rivers will have a reduced flow due to the combined effect of reduced rainfall and silting[24]. Moreover, increased length and frequency of dry seasons, and higher temperature and evapotranspiration especially in the Upper Oueme will have a negative impact on the availability of water resources. This is because of a reduction in the volumes of water accumulated in aquifers, natural or constructed reservoirs. Furthermore, increase in temperatures will lead to an increase in water consumption for irrigation and will reduce the capacity for drinking water supply and other uses. The quality of water resources will also be affected by climate change. Decreased run-off may lead to increased concentrations of contaminants in water due to reduced dilution capacity. In addition, increasingly intense floods may exacerbate erosion phenomena with river transport of high quantities of sediments, which will degrade the quality of surface water. The increase in temperature, together with the increase in phosphate concentration in natural or

[21] Biao, 2017 Assessing the Impacts of Climate Change on River Discharge Dynamics in Ouémé River Basin (Benin, West Africa)
[22] Biao, 2017 Assessing the Impacts of Climate Change on River Discharge Dynamics in Ouémé River Basin (Benin, West Africa)
[23] Gilles RC Essou and Francois Brissette, 2013, ''Climate Change Impacts on the Ouémé River, Benin, West Africa''
[24] Rapport Final, Profil du Bassin de l'Ouémé et caractérisation des sites pilotes (analyse des données) FAO, Direction du génie rurale 2009

constructed reservoirs, could favour the invasion of water hyacinth. This, in turn, will degrade the quality of the water by modifying its colour, odour and taste, due to the reduction in the level of dissolved oxygen. In some cases, this phenomenon could make the water toxic for humans, flora and fauna.

With regards to groundwater, Barthel et al. (2009) found a variation of 0.2 to 1.2 mm/month as recharge capacity of groundwater, with the maximum recharge usually observed in July-August. Under climate change scenario, the authors concluded that these trends decrease for the same period of study, with a maximum of 1.0 mm/month. As any fragile ecosystem, inland valleys of the Oueme basin are also sensitive to climate change and variabilities. For example, study conducted by Danvi et al. (2018) showed that a large portion of the cultivated lands of inland valleys within the studied watersheds in the Commune of Djougou are more sensitive to climate change, resulting in about 50% (145 mm) decreasing of the water yield (Fig. 8). However, soil and water conservation practices such as bunded fields can decrease the projected surface runoff up to 5% at Kpandouga, one of the watersheds located in the commune of Djougou (Danvi et al., 2018). Earlier, Worou et al. (2012) have also demonstrated that the use of bunded plots improves soil water content, the ponded water table, as well as rice grain yield.

Agriculture

Agricultural productivity in the Ouémé Basin will be increasingly negatively affected by climate change impacts. Agro-ecological areas in Upper Ouémé are particularly threatened by the expansion of desert areas, as climate change accelerates desertification and desert borders are gradually expanding towards the lower latitudes. As indicated in table 3 in Section B3 '' Climatic hazards, climate change impact on crops and effective adaptation measures by municipality Incread temperatures will lead to reduced soil fertility, reducted suitability of crop varirty'', increased temperatures are impacting, and will increaslingly impact, crop production. The rise in temperatures, especially in Upper Oueme, will lead to a disturbance of crops by shortening vegetative cycles, while early flowering can significantly destabilize ecosystems and reduce yields. Higher evapotranspiration and intermediate dry spells will also lead to shorter growing seasons. Soild fertility will be reduced and currently used seeds varieties may not be resilient to increasing temperatures and lack of rains. Increased tempertures could also increase the duration and intensity of wildfires[25].

At the same time, climate change impacts on water resources could result in a 40-60% reduction in the availability of water resources, further influencing food production in Benin[26.]. The agricultural production capacity in the highly agro-cultural southern zone is endangered by the depletion of useful nutrients in the soil because of increased frequency and intensity of torrential rains in the South. In Glazoue, Zagnanado and Zogbodomey (Middle Ouémé), the depletion of useful soil nutrients induced by floods is a high risk to agricultural productivity. Moreover, high rainfall surpluses and more frequent floods lead to swelling and washing of soils, which result in early rotting of crops. The late onset of the main rainy seasons will force a shift of the beginning of agricultural activities to April or May instead of March; while the short agricultural season in Middle Ouémé could completely disappear. In contrast to the start of the rains, the mid-season and the end of the rainy season show a significant increase in the amount of rainfall, leading to floods. Finally, all municipalities will need to concentrate their cropping calendar over a shorter period of time during the rainy season (due to prevalence of rain-fed agriculture – see below), and this may affect productivity if appropriate adaptation measures are not taken. In depth information of climate change impacts on agriculture and value chains (VC) is presented in Annex 2 Section 4.

Climate change is impacting the targeted value chains with negative effects on the various VC links, including production, harvest, processing and storage and, ultimately, sale. Detailed impacts (along with adaptation needs) are presented in Table 3 (Section B.3), highlighting, among others:

- yield losses because of increased evapotranspiration, water stresses, and soil fertility losses;
- grain conservation problems because of increased humidity at harvest;
- decreased sale price because of the lower quality of crops/ fruits/ vegetables as heat rises;
- damages fruits due to heavy rainfalls.

The projected impacts of climate change in the Upper and Middle Basin are likely to reduce food crop yields from 3 to 18 percent in 2050[27]. **More precisely, the following yield decreases are expected by 2050, for the main crops in Upper and Middle Ouémé Basin: -17% for cassava, -18% for cowpeas, -30% for maize, -3% for yam, -30% for**

[25] https://thinkhazard.org/en/report/29-benin/WF

[26] Climate Service Centre (2013)

[27] Lawin A. E. , Akponikpè P.B.I., Jalloh A., Nelson G.N., and Thomas T.S. (2013) Benin (Chap3) in Jalloh A., Nelson G.N., and Thomas T.S., Zougmoré R., and Roy-Macauley H. (Eds) West African Agriculture and Climate change: A Comprehensive Analysis, IFPRI, Washington USA, 408p https://www.ifpri.org/publication/west-african-agriculture-and-climate-change-comprehensive-analysis

chilies, green vegetables, okra and tomatoes[28] [29]. Note that similar projections are not available for mango, shea and cashew. However it is noted that cashew production, which is positively correlated with the number of rainy days[30], will also likely be negatively affected by the predicted shorter rainfall seasons. Furthermore, in the municipality of Glazoué (Upper-Middle Ouémé), for example, rain during January and December, violent winds and drought periods, intensified by climate change, have been found to affect cashew productivity negatively by causing flowers to dry and drop. Climate models also project the reduction of soil fertility and soil losses in the Ouémé Basin[31]. Overall, in all project sites, farmers are especially negatively beeing impacted by droughts and dry spells, which lead to production losses in food crops and key value chains (in particular in Upper Ouémé). Floods are also noted across all project sites, with a higher negative impact in Zogbodomey and in Zagnanado (Middle Oueme). Please refer to table 3 in Section B3 for further information.

5. Vulnerability and adaptive capacity of small-holders in Upper and Middle Ouémé

The population of Upper and Middle Ouémé does not have the capacity to adapt to climate change impacts and threats on livelihoods, agricultural productivity and water availability (see Annex 2, FS, Section 4 and 5). The municipalities of Copargo, Djougou (Upper Ouémé); Glazoué, Zogbodomey and Zagnanado (Middle Ouémé) are characterised by a high concentration of population and agricultural land. About 61% of the population in the Ouémé Basin rely on agriculture as main (and only) economic activity, which is essentially rain-fed subsistence farming in small farms. Poverty is significant in the project area (especially Bourgou, Donga, and Zou)[32] affecting respectively 53, 43 and 39% of households compared to 38% at national level[33].It is also an important driver of climate change vulnerability, which increases the propensity of individuals or households to be harmed by climate stresses and extremes. In return, climate change exacerbates poverty, particularly in less developed countries, forming poverty traps and annihilating poverty alleviation efforts[34]. Moreover, many rural households especially in the Middle Ouémé Basin do not produce enough food and income to meet their nutritional and income needs[35]. Field visits on the project sites have indicated limited capacity to adapt agricultural and production systems to current and future climate change impacts. While several adaptation projects have been conducted in Benin as described in Section 6, some in rural areas with positive results such as NAPA-1, the target municipalities have been neglected until now and have not yet been the subject of large-scale adaptation interventions.

Climate change challenges existing agricultural practices and calendars, through shifting seasonal patterns, increased temperatures, and more frequent extremes events, among others. Vulnerability in the agricultural sector is underpinned by existing practices. Like the rest of Benin, traditional family type of agriculture is the main economic activity, applied on small farms (often < 2 ha), oriented towards food crops. It is mainly rain-fed, semi-itinerant agriculture on burnt land, characterised by low productivity and low yields. Farmers use basic agricultural equipment, such as hoe, and the use of harnessed cultivation on some farms. The production system is a shifting cultivation system (crops are detailed above) involving large areas of uncultivated fallow land and high crop rotation. In addition to crops and vegetable, mango, cashew trees and / or of shea tree (Vitellaria paradoxa) of the agroecosystems constitute important sources of income for the producers. These trees are planted on the fields, in orchards or found in the wild (shea). Access to irrigation is limited: it is estimated that 14% or 360,000 hectares of arable land in the Ouémé basin can be irrigated. Despite this potential, only 1% of annually cultivated land is irrigated (SDAGE, 2013). Irrigation in the target area remains traditional and little modernised. As a result of low productivity, crops that are produced by rural communities in the Ouémé Basin are essentially used for direct consumption. If there is a surplus, it is sold wholesale to traders or on local markets, shortly after harvesting (due to limited storage capacity), at a very low price. It should also be noted that production costs have practically doubled in the project target area in comparison to ten years ago. This is because of climate change impacts which require the use of more fertiliser, adapted seeds, etc., compounded by inflation and overal increase of living costs in Benin – including increase cost of field labour (see Annex 19).

[28] Jalloh, Abdulai; Nelson, Gerald C.; Thomas, Timothy S.; Zougmoré, Robert and Roy-Macauley, Harold. 2013. West African agriculture and climate change: A comprehensive analysis. IFPRI Research Monograph. Washington, D.C. International Food Policy Research Institute http://dx.doi.org/10.2499/9780896292048

[29] Srivastava, A.K., Gaiser, T., Paeth, H. and Ewert, F., 2012. The impact of climate change on Yam (Dioscorea alata) yield in the savanna zone of West Africa. *Agriculture, ecosystems & environment*, *153*, pp.57-64.

[30] Balogoun, I., Ahoton, E.L., Saïdou, A., Bello, O.D. and Ezin, V., 2016. Effect of climatic factors on cashew (Anacardium occidentale L.) productivity in Benin (West Africa). *Journal of Earth Science and Climatic Change*, *7*, p.329.

[31] http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/127444/filename/127655.pdf

[32] See INSAE, Evaluation de la Pauvrete: Rapport final. 2014

[33] INSAE, Juillet 2020: Note sur la pauvrete en 2019.

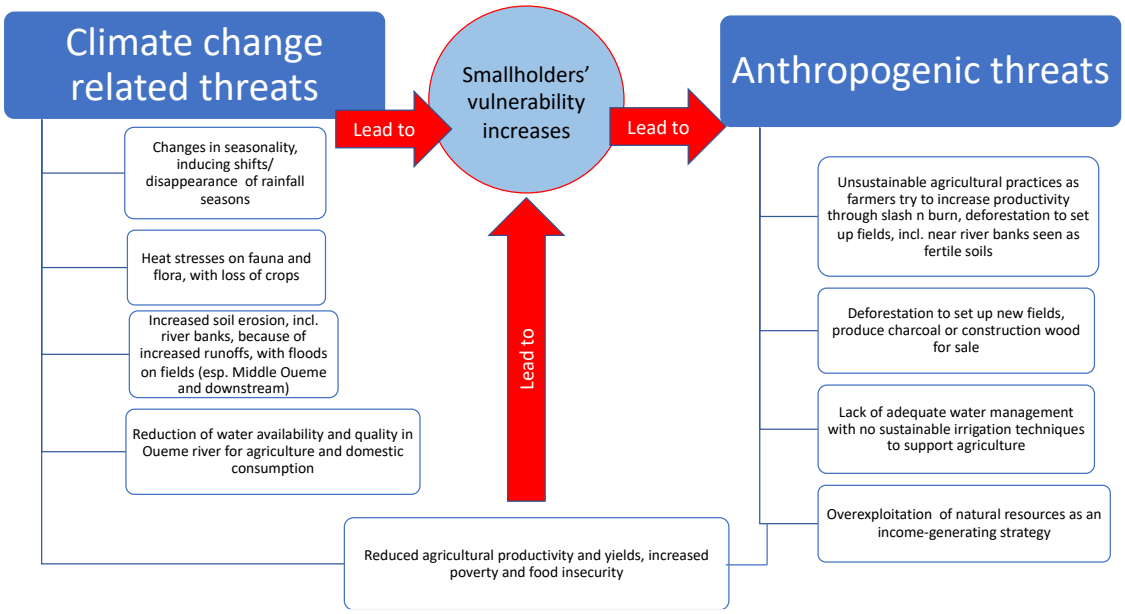
[34] Leichenko R. M. & Silva J. A. (2014). Climate change and poverty: Vulnerability, impacts and alleviation strategies. Wiley Interdisciplinary Reviews Climate Change 5(4). DOI: 10.1002/wcc.287

[35] Food insecurity is especially prevalent in Middle Oueme, affecting 10 to 20% households – and over 20% in Glazoue. See WFP, Analyse Globale de la Vulnerabilite et de la Securite Alimentaire (AGVSA), Republique du Benin, 2017.

In a nutshell, low yields, food insecurity and high poverty in the Upper and Middle Ouémé Basin, as well as a lack of capacity, and economic and financial opportunities to support small-scale, climate-resilient agriculture, drive the local communities towards unsustainable practices. The impacts of climate change on ecosystems combined with the population growth and related needs will lead to serious impact of forest resources in the Ouémé Basin. Non-climatic factors such as agricultural land expansion through slash and burn, inappropriate and unsustainable forest exploitation mainly through fuel wood usage and charcoal fabrication, hunting, interacting with climate stress, are likely to amplify the decline of the forest. These non climatic factors are, nontheless, being exarcerbated by climate change (Figure 10): as yields decline because of changing climate patterns, communities increasingly turn to over extraction of wood for charcoal production, illegal logging, and clearing of forest lands and natural habitats for agriculture. This further accentuates the ongoing depletion of the natural resources and land degradation, which is in turn exacerbated by lack of appropriate agriculture practices. In general and according to farmers, the non-climatic causes of vulnerability (deforestation, wildfire, soil erosion and degradation, as a result of intense agricultural activities and/or natural phenomenon), have significantly increased over the Ouémé basin during the past few years, compared to the historical observations in the five communes. Examples of these phenomenon as observed during the field visits are presented in Annex 2 (Section 4.3.4). Farmers confirmed the impacts of human activities and non-climatic factors as further exacerbating climate change effects[36]. In the context of climate change, a decline in ecosystem goods and services, which underpin agriculture production sustainability and livelihoods in the Upper and Middle Ouémé areas, leads to increased vulnerability to floods and flash floods especially in Middle Ouémé, water scarcity especially in Upper Ouémé, and reduced agricultural productivity in the whole Basin. This situation further drives the populations towards unsustainable practices to meet their food and agricultural needs, locking them into a vicious cycle.

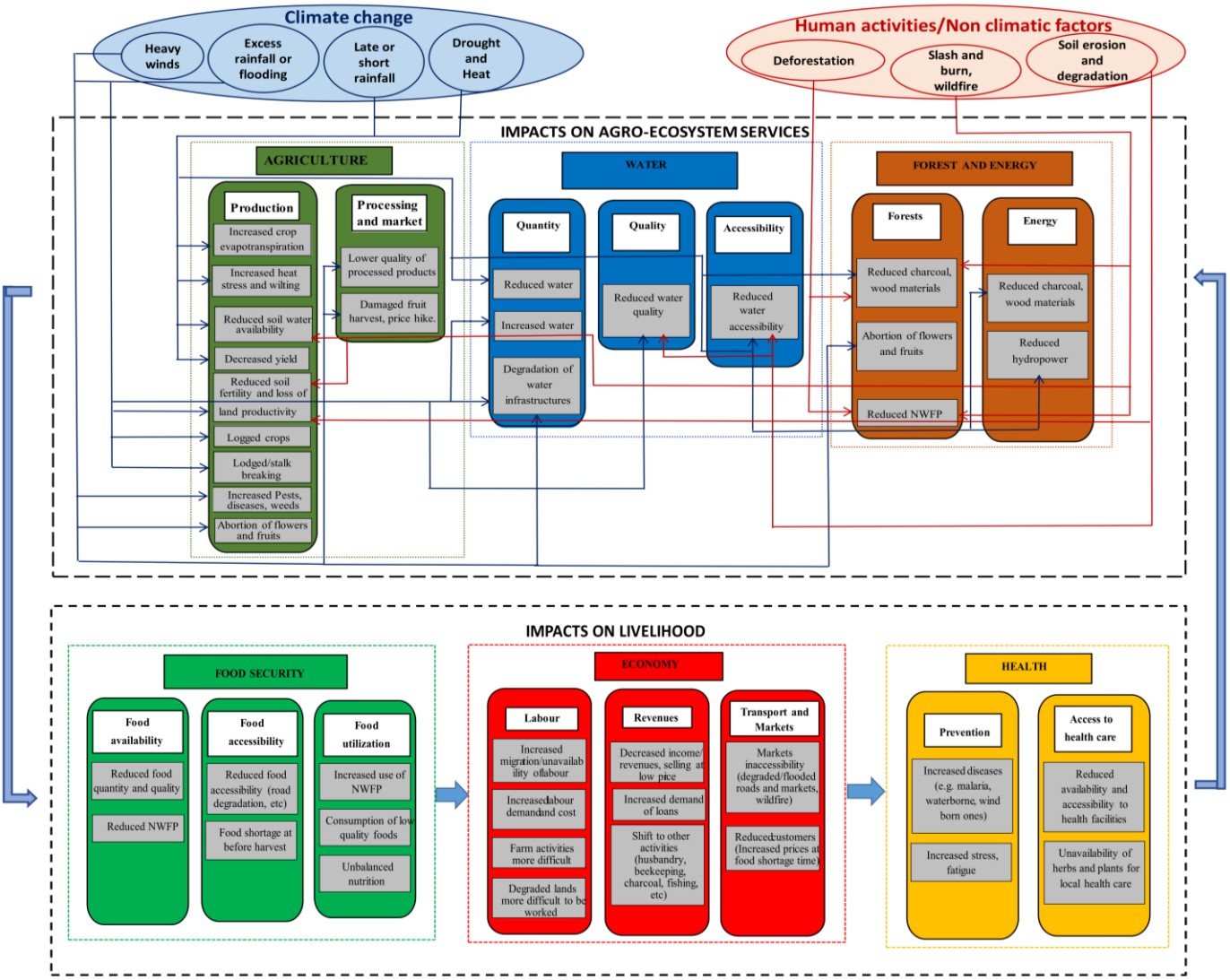
In order to directly address these climate change impacts, OCRI will put in place climate-resilient agriculture (CRA) techniques, including the use of diversified drought-tolerant crop varieties, conservation farming, rainwater conservation, micro-dams, agroforestry, improved water management, as well as ecosystem restoration, water-source and riverbank protection. These technologies aim at improving yields in light of losses and damags caused by climate change impacts by improving soil fertility, improve the resilience of the varieties used, improve water availability and protecting from increasing heat, floods and strong winds.

Figure 10: Vicious cycle



[36] Akponikpè PBI (2022) Climate change and Environmental Impact study in the Oueme-basin (Benin): Update of literature and Analysis of the perceptions of climate change and farmers adaptive strategies. FAO Consultancy report, Fev-March 2022.

Figure 11: Linkages of climate change, human activities and non-climate factors on ecosystem services and livelihood in the Ouémé river basin in Bénin



Impacts of COVID-19

Field missions indicated that the main COVID-19 impact took place during the beginning of the pandemic (March-June 2020) due to hard lock down measures implemented by the government. During that time, there was a scarcity or lack of agricultural labor due to restrictive measures preventing outside labor from coming to the production areas. With regard to the price of production inputs, the actors interviewed indicated that they had noted an increase in the price of inputs because of the restrictive measures through the closure of borders and the cordon sanitaire preventing the supply of inputs. Finally, several processing units had temporarily closed due to the volatility of raw nut prices and the lack of adequate financing. However, strong competition has been noted (in 2020 and 2021) between different buyers in local cashew markets, indicating the recovery in global demand, particularly in Europe and the United States. Please refer to Annex 19, Section 2.8 for more details on Covid-19 impacts.

6. Private sector engagement

Although valuable crops that can be grown as part of the agro-forestry and CSA practices like mango, cashew, shea and maize, are produced in the target areas and could increase climate change adaptation and uplift farmers out of poverty, the development of these value chains is currently hindered by several factors, affecting the demand and production side. On the buyer side the following companies and particulars are present on the project sites:

Table 1: Private sector engagement in the targeted value chains

Value chain	Zagnanado & Zogbodomey	Glazoué	Djougou & Copargo
Maize	Centre GBEMONTIN des sœurs, SOCIA-Bénin (Bohicon), Véto-Service, SODECO, transformation unit, local retailers, SOBEBRA	SOCIA-Bénin (Bohicon), Véto-Service, transformation unit, local retailers, ,	GAPA, SOCIA-Bénin (Bohicon), Véto-Service
Cashew	-	Benin-Cajou, CC Services et Kaid-deï-deï, Afokantan Benin Cashew, FLUDOR-Bénin, Tolaro Global S.A.S., Africa Negoce Industries, ZANCLAN	GAPA, Benin-Cajou, CC Services et Kaid-deï-deï, Afokantan Benin Cashew, FLUDOR-Bénin, Tolaro Global S.A.S., Africa Negoce Industries
Shea		FLUDOR-Bénin, Knar-Bénin, Afokantan-Bénin, Henhood, GAPA	FLUDOR-Bénin, Knar-Bénin, Afokantan-Bénin, Henhood, GAPA
Mango	Processing units, private wholesalers, Blues Skies	Processing units, private wholesalers	Processing units, private wholesalers

It should be noted that the mango market is not well organised and at the moment mangoes are sold on local markets.

FAO notes on the demand (buyer) side, a lack of communication between producers and buyers of agro-products, to discuss market needs and demands that could be met by the producers. The productivity of some products like mangoes can vary a lot in quantity and quality (because of climate change, limited water management capacity, and non-adapted agricultural techniques), which impairs buyers from planning ahead their buy. On the producer side, farmers are often not aware of the various potential buyers operating in their area, therefore relying on the same buyers without being able to negotiate prices. This is also because of a lack of organisation among smallholders, mostly working individually rather than in cooperatives. Finally, on the technical side, farmers are facing difficulties accessing quality seeds and tree seedlings; they lack the equipment for crop processing and storage (e.g. 97% of cashews are sold raw), collection and transport (mangoes are most often directly collected by the buyers on the field), packaging, marketing skills to prepare and label agro-products (see Table 2). In order to facilitate access to market, OCRI will ensure adquate production and quality levels in consideration of climate change impacts through CRA and waterworks/restoration activities, will provide support for cooperatives organisation, strenghten knowledge on market, negotiation and financial skills and work through existing networks with pre-identified buyers while also improving connection between producers and buyers. Letters of engagement from buyers interested in purchasing OCRI crops have been received from Africa Green Corporation. More information related access to market is available in Annex 19 Section 2. Smallholder farmers also face many difficulties accessing credits for agricultural investments, particularly for the more vulnerable groups of society, such as women and youth. The financing schemes tend to focus on Alternative Income Generating Activities, such as sale of transformation products, honey, etc, while the risk of investing in agricultural production is still perceived as high. As a result, micro-finance institutions have high requirements with regards to collateral, which smallholders can hardly meet. Furthermore, finance institutions are more reluctant to lend to individual farmers than to organised groups. An investigation conducted by MAEP[37] on the reason why many smallholder farmers in Upper and Middle Ouémé do not contract credits indicates, as main reasons: i) smallholders are scared and uncomfortable to be in debt without any guarantee; ii) high interest rates of credits; iii) lack of stable income, or income too low; iv) lack of knowledge of how to get a credit; and v) they have not thought about it (not aware of credit potential).

Limited access to credit impairs the full development potential of key value chains in Benin that could contribute to climate change adaptation and its sustainability. This is because at the start of the season producers often lack the money to buy inputs (improved seeds, fertilizers, pesticides) and to pay labour, especially for ploughing and maintaining crops. In the absence of financial means, producers resort to poor quality seeds (often taken from the previous harvest), use a limited quantity of inputs in production or poorly maintain their farms. Under these conditions, the products obtained are of poor quality which jeaopardize access to market and negotiation of prices. In some cases, products like mango rot on farms for lack of takers. Furthermore, with regards to transformation, limited funding impairs the acquisition of raw materials, the purchase of processing inputs, and access to improved technologies.

Despite these barriers, in terms of access to microcredit, the country benefits from a favourable institutional framework as the credit actors are structured around a consortium of 43 micro-credit institutions called “Alafia” . In addition, the Fonds National de Développement Agricole FNDA, a public entity, under the guardianship of the MAEP, facilitates access to loans from banks and MFIs (microfinance institutions) for producers through technical support (capacity

building via the Territorial Agricultural Development Agencies (ADTA), based at the communal level and quality review of loan application) for the preparation of financial plans to submit for credit acquisition. Through that support, farmers can access FNDA-supported loans from MFIs: FNDA will cover a guarantee of 50% of the loan value, which FNDA will repay to the MFI in case farmers are unable to; FNDA also ensures loan interest rate at 12% (while 'regular interest rate is at 18-24%). Please refer to Annex 19, Section 3 for details regarding FNDA support to OCRI farmers. The support FNDA has committed to provide to OCRI farmers will increase MFIs' confidency to provide loans to OCRI farmers, as indicated in Annex 19. The MFIs ONG SIA N'SON Microfinance and Bethesda partnering with FNDA and present in the Upper and Middle Ouémé have also signed letters of engagements confirming their support to project beneficiaries by facilitating access to credit.

Farmers and cooperatives could acquire the necessary production input, processing equipment and other input through micro-credits or loans, once they have increased access to these financial tools. The loan will then be reimbursed under preferential rate (through FNDA commitment) once they sell their high-quality product. The forms of credits that can contribute to the development of value chains are in particular credits for the maintenance of plantations (case of cashew nuts), credits intended for the acquisition of quality inputs (improved seeds, fertilizers, pesticides, seeds of maize varieties resilient to climate change), credits for ploughing and maintenance of crops, credits for storage, credits for coaching (coach for the benefit of producer cooperatives). At the level of the transformation link, the credits will not only be directed towards the acquisition of raw materials and inputs but also towards the improvement of the transformation process and support for the standardization of the quality of products (mango, shea in particular), capacity building of processing units, acquisition of modern processing equipment.Table 2: SWOT assessment of selected key value chains.

Strengths	**Weaknesses**	**Opportunities**	**Threats (including CC-threats)**
Cashew nuts			
- Favourable conditions especially in Upper Oueme and the transition area (Glazoue) - Prioritised for export by the Government of Benin. - Can be produced in orchards or within agricultural fields (agroforestry) to contribute to restoring soil fertility. - Combines well with locally-appreciated crops like maize, yam, cassava and sorghum. - Increasing global demand for cashew nuts. - There are regional cooperatives in Upper Oueme, which collect and sell cashews from municipal and village-based cooperatives - Improved plants are available (limited quantity)	- Limited organisation of farmers at local level - Limited price negotiation capacity - Limited productivity of cashew trees - Lack of processing equipment and technical capacity amongst most communities, particularly women, to add value to cashew nuts. - Lack of skills amongst local communities for developing businesses based on cashews. - Lack of storage facilities for nuts. - Widespread illiteracy among women and lack of decision-making power - Lack of relationships with trading companies, currently raw cashews are sold to Indian traders).	- Capacity amongst local communities for establishing cashew nut cooperatives. - Opportunity to cultivate in forested areas along Oueme River (to reforest) or on private land (agroforestry; intercropping; private/community plantations). - Potential to increase yield - Potential to improve local value through processing and storage. - Potential for international export through national companies. - Inter-cropping with cashew trees, maize, yam and sorghum has high market value, up to CFA 395,370/ha[38]. -	- Recurring fires in orchards - Influx of foreign capital for trading in raw nuts to the detriment of local processors[39] - Discriminatory socio-cultural norms that marginalize women; -Gender-based violence; - Women's time poverty *CC-related:* - Increased rainfall variability and droughts will lead to reduced cashew productivity[40] - rain during January and December, violent winds and drought will lead cashew flowers to dry and drop - Women's limited access to climate resilient technologies and practices - Post-harvest activities carried out by women affected by climate change with regards to quality of produce and access to clean water, fuel wood and drying and storing of produce
Shea			

[38] Crinot et al. (2015)
[39] Analysis of the Benin Cashew Sector Value Chain. African Cashew Initiative, 2010. Available at: http://www.africancashewinitiative.org/files/files/downloads/aci_benin_gb_150.pdf
[40] Balogoun, I., Ahoton, E.L., Saïdou, A., Bello, O.D. and Ezin, V., 2016. Effect of climatic factors on cashew (Anacardium occidentale L.) productivity in Benin (West Africa). *Journal of Earth Science and Climatic Change*, *7*, p.329.

- Prioritized for export by the Government of Benin. - Shea trees occur throughout the central and northern parts of the country, either within the forests or in cultivated fields. - Nuts can be processed as oil or butter; used in direct consumption or sold on local, regional and international markets. - Adapted to arid, less fertile soils - Natural regeneration - Tree lasts for 200 yrs - Local know-how for valorizing shea products among women - Important source of income as well as coping mechanism for women.	- Low price negotiating capacity among producers - Limited knowledge of production techniques (shea is often collected from wild trees) - Lack of processing equipment and technical capacity, particularly of women, amongst most communities to add value to shea. - Lack of skills amongst local communities for developing businesses based on shea nuts. - Widespread illiteracy among women and lack of decision-making power - Poor access of women to extension services. - Lack of storage facilities, especially for women, for nuts and processed products. - Lack of relationships with relevant traders (shea butter can be lost through spoilage if not sold on time).	- Resilient to climate change - Potential for strengthening capacity of local cooperatives. - Opportunity to produce shea nuts in forested areas or on agricultural land (intercropping). - Potential to improve add value locally through processing. - Potential for international export through national companies (to be identified by CCIB). - - High potential for women's involvement in shea cooperatives as the processing of shea nuts into oil and butter is typically a women's task.	- Shea trees are often cut down as part of land clearing process for agriculture (because its use if agroforestry system is not well known) - Sensitive to bush fire- - Discriminatory socio-cultural norms that marginalize women; -Gender-based violence; - Women's time poverty. *CC-related:* - Increasing aridity in the north of Benin as a result of climate change is predicted to decrease the recruitment of seedlings, which will affect the natural regeneration of shea tree populations[41]. Planting shea trees to maintain the production of shea nuts will thus become increasingly important - Women's limited access to climate resilient technologies and practices; -Post-harvest activities carried out by women affected by climate change with regards to quality of produce and access to clean water, fuel wood and drying and storing of produce
Mango			
- Market demand steadily increases especially for international market - It can be produced in orchards or in agroforestry system, associated with current crops like maize, sorghum or cassava. - Embedding mango plantations in the cultural habits of the population (as savings for retirement, and as a tool for securing land holdings) - Existence of well trained and supervised nurserymen - Suitability of the soil for mango production	- Farmers are not well-organised and sale is mostly done along the road where prices are subjected to buyers/ poor negotiating capacity - Production techniques are not well-controlled by the producers, therefore productivity is low, and the quality of the fruit is lacking - Poor accessibility to good quality plants - Lack of the practice of irrigation in the plantations - Insufficient or lack of advice and training on good practices in setting up and managing orchards, and on monitoring and maintaining mango orchards - Lack of skills at the level of actors (producers, supervisory staff) in harvesting techniques	- Mango collection and sale is a women-oriented activity - Given the increasing demand for mangoes on local to international markets, profits could be improved if production and processing techniques are better controlled - Availability of cultivable land and existence of possibility of extension of plantations - Agro-climatic conditions favorable to mango production - Socio-economic importance of mango as a source of income and food security - Existence of proven methods of controlling fruit flies - Current government policy favorable to the promotion of sectors - Enthusiasm of the State and certain TFPs to support the development of the mango sector - Existence of a National Development Strategy for Fruit Tree Cultivation in Benin	- Difficulties in accessing land and land tenure insecurity - Destruction of plantations by oxen; - Destruction of plantations for other crops (cotton, cashew nut) or for the manufacture of fuelwood; - Lack of adequate funding for the acquisition of packaging, storage and processing equipment; - Discriminatory socio-cultural norms that marginalize women; -Gender-based violence; - Women's time poverty. *CC-related:* - Mangoes are sensitive to pest attacks which tend to increase with climate change - Negative impacts of climatic extremes

[41] Glèlè Kakaï, R., Akpona, T., Assogbadjo, A.E., Gaoué, O.G., Chakeredza, S., Gnanglè, P.C., Mensah, G.A. and Sinsin, B., 2011. Ecological adaptation of the shea butter tree (*Vitellaria paradoxa* CF Gaertn.) along climatic gradient in Bénin, West Africa. *African Journal of Ecology*, *49*(4), pp.440-449.

	- Almost non-existence of phytosanitary products approved in Benin on mango, - Lack of control of pests or diseases (fruit flies, termites, anthracnose and physiological accidents) and emergence of Bacteria Black Spot (BBS) which can lead to large losses in orchards; and women's lack of access to inputs and extension service that can advise on use of fertilizers and pesticides - Widespread illiteracy among women and lack of decision-making power - Low knowledge and low compliance with quality standards; - No mastery of the different pruning techniques for the rehabilitation of old orchards; - Lack of windbreaks around the mango plantations; - Poor knowledge of alternatives to chemical control for organic mango production; - Lack of adequate packaging, transport and marketing infrastructure and equipment (absence of packaging stations and quality control service); - High concentration of production over a short period of the year		- Women's limited access to climate resilient technologies and practices; - Post-harvest activities carried out by women affected by climate change with regards to quality of produce and access to clean water, fuel wood and drying and storing of produce.
Maize			
- Most widely planted crop in Benin. - Many suitable soil - Production techniques well-known - Strong local, regional (Nigeria), and international demand for food crop and livestock. - Beneficiate from governmental support for production techniques and access to relevant seeds (from INRAB, DDAEP and ATDA/FNDA). - Staple food and used extensively as animal feed[42]. - Various improved varieties have been released in	- Basic production techniques using hoe for soil preparation - Women's limited access to tools and animal traction - Productivity is low at 700kg/ ha - Rural communities, particularly women, often lack proper facilities to store harvested maize and can therefore not wait until prices improve to sell maize. - Despite some local cooperatives, limited organisation of the value chains: individual producers sell directly to wholesalers, who are then selling on local and regional markets	- Maize yield can be increased further in Benin despite climate change[45]. - Maize production is already part of rotation culture, which is climate-resilient - Short-cycle seed varieties are available in Benin (from INRAB) and in the neighbour countries, where farmers are already buying these seeds (Burkina-Faso). - Domestic, regional and international demands is increasing	- Access to markets limited because of degradation of roads from extreme rainfalls *CC-related:* - New pests such as the fall army worm[46]. - Production affected by shift in rainfall patterns - Women's limited access to climate resilient technologies and practices - Post-harvest activities carried out by women affected by climate change with regards to quality of produce and access to clean water, fuel wood and drying and storing of produce

[42] Elbehri, A., J. Kaminski, S. Koroma, M. Iafrate, and M. Benali (2013), West Africa food systems: An overview of trends and indicators of demand, supply, and competitiveness of staple food value chains, In: Rebuilding West Africa's Food Potential, A. Elbehri (ed.), FAO/IFAD.

[45] Jalloh, Abdulai; Nelson, Gerald C.; Thomas, Timothy S.; Zougmoré, Robert and Roy-Macauley, Harold. 2013. West African agriculture and climate change: A comprehensive analysis. IFPRI Research Monograph. Washington, D.C. International Food Policy Research Institute http://dx.doi.org/10.2499/9780896292048

[46] FAO, 2017. Briefing Note on FAO Actions on Fall Armyworm in Africa. Available at: http://www.fao.org/3/a-bs183e.pdf

Benin [43] and these are adopted readily by farmers[44].	- No negotiating power for price among the producers - Widespred illiteracy among women and lack of decision-making power - Lack of processing equipment		

In addition to providing training on financial management and ensuring support from FNDA for loan repayment and preferential credit rates, the project will address the above-mentioned issues, together with the need for technical capacity strengthening for CRA, through the "Caisse de Resilience" approach. This approach includes three pillars: i) technical capacity, which is supported through training in farmer field schools; ii) financial support with the establishment of Village Savings and Loan Association (VSLA); and iii) social pillar as a methodology inspired from the Dimitra Clubs, where group members are trained and accompanied to discuss and address social or environmental issues that they consider as a priority for the community (see below 7. on gender inclusion). In particular, the VSLA approach, adopted by farming communities in many countries of the world, will be used to cope with these difficulties and facilitate the accompaniment of smallholder farmers in accessing microcredit.

Through the integration of the VSLA into the farmer groups already organized in FFS groups, this approach has proved extremely effective. The VSLA model creates self-managed and self-capitalized savings groups that use members' savings to lend small amount of money to each other. VSLAs are composed of between 15 and 30 members, groups of farmers large enough to create a pool of useful capital, and small enough to keep meetings manageable. Groups voluntarily come together to save and periodically grant small loans from those savings. Based on the experience in other countries, around 90% of groups continue to operate longer than five years after receiving training. On average they double their capitalization and average loan sizes. Around 80 % of the members are female. In addition, Please see Section 7.3.2 of the FS for further details on the VSLA approach.

Finally, the Farmer Field School (FFS)and Farmer Business School (FBS) approaches introduced by OCRI will also support income increase for the target farmers. FFS is a FAO well-known and tested approach based on long-term participatory training for experiential learning to improve farmer capacity to solve production problems in a sustainable way. FBS, follows the same methodology as FFS, with a particular focus on building the capacity of farmers to develop businesses, access to credit, cooperatives and increase market linkages.

With regards to the FBS approach, based on the experience of FAO and other organizations, a positive impact has been found worldwide in terms of improving economic conditions and income generation, by carrying out actions based on theFFS and FBS approaches. The FFS/FBS demonstrated its potential to enhance human, social, natural and financial capital of rural communities. Financial capital was enhanced through increased income and profits, savings and loans schemes, with a potential to reduce poverty.

A multi-country study in East Africa showed that participation in the FFS was associated with increased productivity and, on average, a 61% increase in household income[47]. A study in Kenya suggested that the FFS on tea increased family income and the number of income sources[48]. Increased income was also reported in studies from Ecuador[49],

[43] From 1970 to 2010, 36 maize varieties were released in Benin. Walker, T.S. and Alwang, J. eds., 2015. *Crop improvement, adoption and impact of improved varieties in food crops in sub-Saharan Africa*. CABI.
[44] Mahoussi, F.E., Adegbola, P.Y., Zannou, A., Hounnou, E.F. and Biaou, G., 2017. Adoption assessment of improved maize seed by farmers in Benin Republic. *Journal of Agricultural and Crop Research*, *5*: 32-41.
[47] Davis, K., Nkonya, E., Kato, E., Mekonnen, D. A., Odendo, M., Miiro, R., & Nkuba, J. (2012). Impact of farmer field schools on agricultural productivity and poverty in East Africa. World Development, 40(2), 402–413.
Waarts, Y., Ge, L., Ton, G., & Jansen, D. M. (2012). Sustainable tea production in Kenya; impact assessment of Rainforest Alliance and farmer field school training. LEI report 2012-043. The Hague: LEI, part of Wageningen UR.
[48] Waarts, Y., Ge, L., Ton, G., & Jansen, D. M. (2012). Sustainable tea production in Kenya; impact assessment of Rainforest Alliance and farmer field school training. LEI report 2012-043. The Hague: LEI, part of Wageningen UR.
[49] Cavatassi, R., González-Flores, M., Winters, P., Andrade-Piedra, J., Espinosa, P., & Thiele, G. (2011). Linking smallholders to the new agricultural economy: The case of the plataformas de concertación in Ecuador. Journal of Development Studies, 47(10), 1545–1573.

Ethiopia[50], Nepal[51], and the Philippines[52]. Another study investigated on the perceived impact of FB) approach on smallholder cocoa farmers in Ondo and Osun States, Nigeria. The results of the study indicated that the majority (87.5%) of the respondents confirmed that they benefited in marketing skills to a large extent after participated in FBS. Many FBS cocoa farmers experienced increment in their income after getting involved in FBS approach in the year 2011 to 2013. There was a significant difference between respondents' income before the year 2010 and income after intervention of FBS in year 2011 (t = -2.613, p =0.028), year 2012 (t = -3.012, p =0.016) and year 2013 (t = -3.012, p =0.022), respectively[53].

Referring specifically to Benin, the Section 2 of the Market Study carried out in March 2022 (Sodjinou, 2022) for OCRI project shows that for different products, 18%-54% of households is engaged in processing and trade. The study also shows the strengths and weaknesses of different value chains as well as barriers to acess to credit which imply that FBS also in the Bénin context have the potential to address frictions in the value chains and increase households' income. The OCRI project will carry out an impact study to compare economic/financial impact with the mentioned studies reported in the literature, which highlighted changes in cost, income or profit as a consequence of participation in the FFS/FBS. The FFS and FBS implementation will be strengthened by the promotion of the Dimitra Clubs approach and methodology detailed below.

7. Gender issues and inclusion

Women and men experience the impacts of climate change and extreme weather events differently, with women being particularly affected and disadvantaged by it due to their weaker access to and control over land, water, services and technology, and the heavy workload they shoulder inside and outside the household.

In the project area, women are involved in the production of crops, however, yields in women's fields are lower mainly because they operate with smaller plots and less access to small tools and animal traction, and have little access to extension services that can support them with advice on use of fertilizers, pesticides and irrigation technology. Women are also involved in forestry, mainly in collection of non-timber forest products (NTFP) and, in the project intervention area, in the collection and processing of shea nuts, locust bean fruits and vegetables, which are a source of income and a coping mechanism when other crops fail, particularly for female-headed households (FHH). They play a key role in processing, distribution and sales activities. However, on, the post-harvest activities carried out by women are often affected by the impacts of climate change with regards to the quality of the product and/or difficulties in access to clean water, fuel wood, and the drying and storing of produce. In addition, floods or droughts affect the availability of water for the household (HH) and exacerbate women's time burden as fetching water is considered women's responsibility. Overall, women in particular have limited access to climate-resilient technologies and practices to cope with extreme rainfall and floods and pressure on water sources during droughts. They are also affected by social and cultural norms and gender inequalities that affect their economic and decision-making capacities. At local level, there is also limited institutional, regulatory and governance capacities to address climate change impacts in the Ouémé watershed and to plan and implement climate-change measures that effectively address and respond to women's needs. These challenges have informed the design of corrective actions reflected in the Gender Action Plan, including for example in relation to developing institutional capacity for gender-budgeting and gender-responsive planning.

The success of climate change adaptation initiatives largely depends on the meaningful engagement of rural communities and how these initiatives address the root causes of gender-based discriminations and social exclusion. The Dimitra Clubs are a flagship community-driven and gender transformative approach pioneered by FAO to facilitate gender equality, people's empowerment and collective action in rural poverty reduction strategies and programs. The approach has achieved results in a variety of areas, including better nutrition, wider adoption of climate-resilient adaptation practices, enhanced gender equality and women's empowerment and improved inter and intra-ethnic dialogue for social cohesion and peace at community-level. Furthermore, the approach has stimulated changes in behaviors and discriminatory social norms that have led to an improvement in well-being outcomes such as better households' diets and sanitation practices as well as concrete advancements towards more gender equal relations and

[50] Todo, Y., & Takahashi, R. (2013). Impact of farmer field schools on agricultural income and skills: Evidence from an aid-funded project in rural Ethiopia. Journal of International Development, 25(3), 362–381.

[51] Regmi, P. P., Bahadur, G., & Bhattarari, H. P. (2014). Impact assessment of National Integrated Pest Management (NIPM) programin Nepal. Final report. Lalitpur: Nepal Development Research Institute.

[52] Sanglestsawai, S., Rejesus, R. M., & Yorobe Jr., J.M. (2015). Economic impacts of integrated pest management (IPM) farmer field schools (FFS): Evidence from onion farmers in the Philippines. Agricultural Economics, 46(2), 149–162.

[53] Adetarami, O., Alfred, S. D. Y., Fasina, O. O., Soetan, O. J. and Johnson, S.B. (2020). PERCEIVED IMPACT OF FARMER BUSINESS SCHOOL (FBS) APPROACH ON SMALLHOLDER COCOA FARMERS IN ONDO AND OSUN STATES, NIGERIA. International Journal of Agriculture and Rural Development, 23(2): 5143-5153.

roles between women and men. Through a gender transformative lens, the Dimitra Clubs' approach challenges gender discriminatory social norms and behaviors and tackles several forms of gender-based violence such as domestic violence and early marriage. In a nutshell, the Dimitra Clubs are informal community-led groups of rural women and men (young and less young) who come together on a voluntary basis to discuss and seek solutions for community problems, making use of their local capacities and resources. To improve access to information and communication exchange, the clubs are equipped with wind-up and solar-powered radios. In some countries the radios are also paired with cell phones. The clubs also partner with community rural radio stations to share their experiences with other villages. In a Dimitra Club, everyone's voice and capacities count and are valued regardless of age, ethnicity, socio-economic status, and disability/ability. It is a community engagement and inclusive approach, in the sense that the approach facilitates a process whereby rural communities participate as agents of change and decision-makers in relation to all aspects that affect their lives; this can be health, access to resources, girls' education and also climate change adaptation. Community engagement represents an important enabler in any development and humanitarian strategy to boost social inclusion, ensure community ownership and achieve impact at scale. The Dimitra Clubs also constitute a gender transformative approach as this approach seeks to bring about social change by challenging entrenched discriminatory social norms, attitudes and behaviours that are the root causes of gender inequalities and gender-based discriminations. These root causes represent structural impediments that hinder women (but also other marginalized groups), to become key actors in building the resilience against climate change.

8. Baseline projects and complementarities with OCRI

Several past and ongoing projects, programmes and initiatives focus on promoting climate-resilient, sustainable practices for land management (see FS, section 6.4). However, existing strategies and initiatives do not implement an integrated, climate-resilient approach to basin management in Benin, which considers the links between the upper, middle and lower basin areas, and significantly reduces the climate vulnerability of the population upstream to downstream. Moreover, they have not set up an enabling financial and institutional environment in Benin to ensure coordinated efforts and scaling up of investments in climate-resilient management. The proposed project will build on, scale up, and complement past and ongoing regional and national initiatives and projects as described below.

Table 2: Baseline projects and complementarities with OCRI

Baseline projects, budget and dates	**Synergies and/or complementarities with OCRI**
Enhanced climate resilience of rural communities in central and north Benin through the implementation of ecosystem-based adaptation (EbA) in forest and agricultural landscapes **UNEP-SAP** 2019-2024 USD 10 million [ongoing]	*Targeted area close to OCRI project: Dassa-Zome (site nearby Glazoue) and Djougou (same site)* Coordination between the SAP project manager and OCRI project manager – the former was contacted during the project development phase – will ensure there will be no overlapping or duplication of project activities in Djougou. During preliminary discussions with SAP project manager, multiple synergies and complementarities were identified between OCRI and this project. These are detailed in the Annex. The SAP project promotes CRA and sustainable water management under its Outcome 2. Field visits will be organised for OCRI beneficiaries (under activity 3.2.1 of OCRI) to showcase successful experience from the SAP project and promote the uptake of project interventions (e.g. in Dassa-Zoume and Djougou, which are SAP sites located in the Ouémé Basin). OCRI will also target different farmers than those receiving support from SAP. Successful SAP farmers in the Ouémé Basin will also be invited to annual municipal forums and OCRI symposium (organised under activity 2.2.2 and 3.2.2), which serve to connect farmers with traders, and promote innovation for adaptation. SAP aims to develop climate-resilient forest management plans under its Outcome 1, 2 of which will be for forests nearby the Ouémé River. OCRI will ensure the including these plans into the Ouémé Master Plan (SDAGE), which will be strengthened under activity 3.1.2. SAP reforestation will only take place within the existing protected forests, while OCRI targets buffer areas; therefore it will complement SAF, especially in Djougou. SAP project manager will also be invited as guest on OCRI platform, set up under Component 3, and at the project steering committee, to ensure synergies and avoid duplications. Finally, under the SAP project, knowledge products on EbA will be shared through EBAFOSA[54] under Outcome 3; opportunities to link EBAFOSA to OCRI platform will be explored (e.g. using EBAFOSA as the communication facility for OCRI).

[54] https://www.ebafosa.org/index.php/about-us/102-ebafosa/1144-ebafosa-report-2019-2

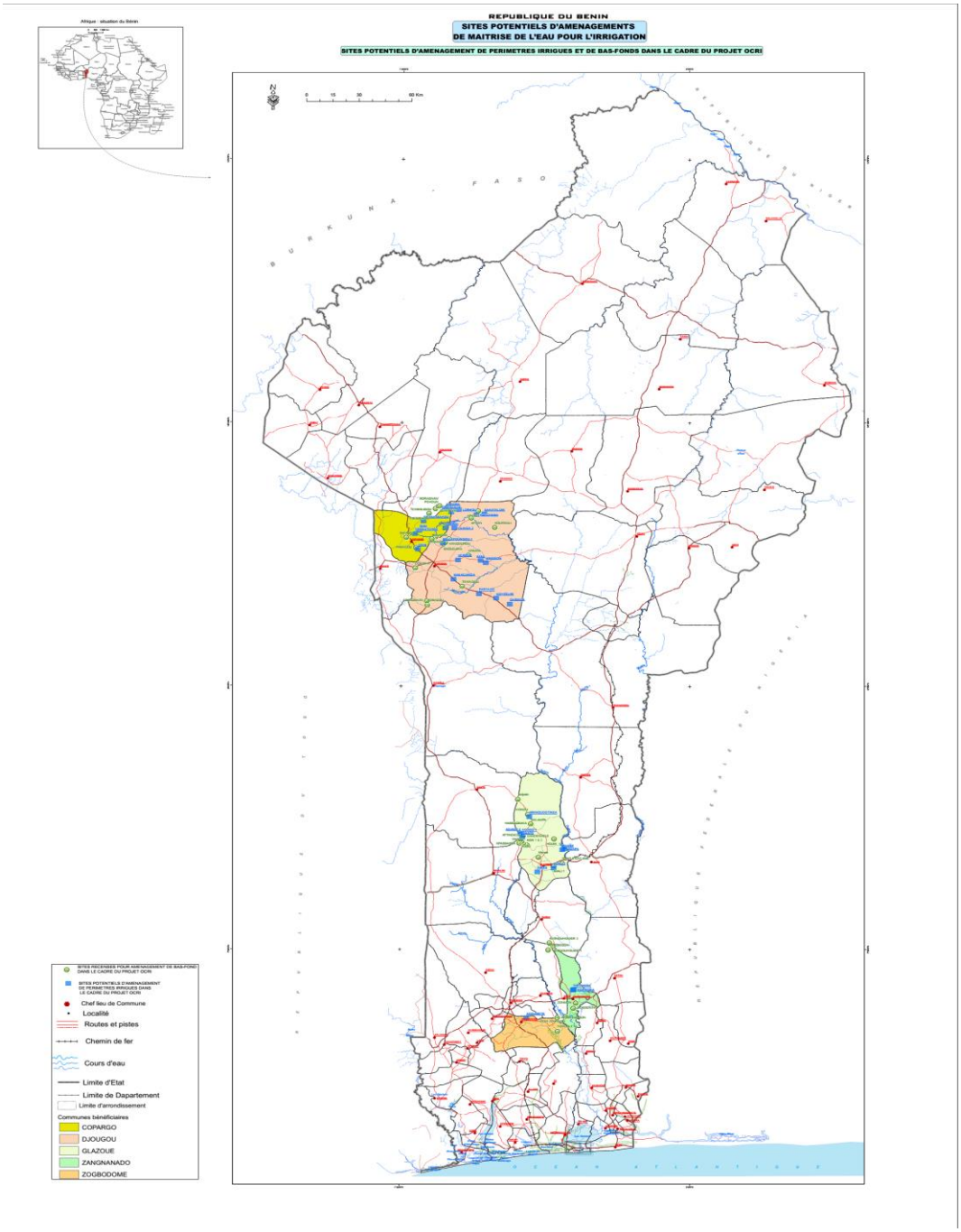
	It should also be noted that SAP will provide benefits to OCRI farmers, through reforestation and river banks restoration interventions in Upper/ Upper-Middle Ouémé (Djougou and Dassa-Zoume), which will benefit in particular communities located in the Middle and Lower Ouémé; while OCRI interventions in Upper Ouémé will also benefit downstream SAP beneficiaries of Dassa-Zoume.
Programme for Integrated Development and Adaptation to Climate Change in the Niger Basin (PIDACC/NB - FP092) **GCF-AfDB** 2018-2025 USD 209 million [ongoing]	*Targeted area overlapping OCRI project: n/a* This large-scale, regional project targets 9 countries located along the Niger Basin, including Benin (Malanville). Its objective is to improve the resilience of populations and ecosystems in the Niger Basin by managing natural resources sustainably. Improved natural resource management and land use, as well as reforestation are promoted to better manage the Niger Basin. OCRI will replicate the successful approach to rehabilitation / construction of small hydraulic infrastructure under PIDACC, comprising a number of small multi-purpose dams. These include the following: i) extension of dyke protecting the irrigated perimeters of Malanville, including the installation of flood protection structures through the construction of protective embankments, in particular along the river to protect the rice fields against inundation; and ii) building of community adaptation infrastructures (product storage facility, product processing units and market sheds). Moreover, exchange of experiences with the communities that are preparing their community-based climate change adaptation plans for sub-areas of the Niger Basin will inform the strengthening of the Ouémé Master plan (SDAGE) and municipal plans under OCRI, to ensure a comparable approach throughout the country. To facilitate synergies and exchange of experience, the PIDACC project manager will be invited as guest on OCRI platform and to the PSC.
Agricultural productivity and diversification project (APDP) World Bank – Phase 2[55] 2017-2023 Additional funding provided in 2017: USD 45 million [ongoing]	*Targeted area overlapping OCRI project: n/a* APDP will restore and improve productivity and value addition for selected value chains in Benin. The following interventions are implemented in the 12 Departments of Benin: (i) promotion of large-scale adoption of improved technologies (production, post-harvest, processing and storage), including climate-smart production systems, to reduce vulnerability of farming activities to climate change and weather vagaries of farming activities; (ii) development of production and market infrastructure to enhance productivity through efficient water management, reduction of post-harvest losses and better access to market through warehouses and other facilities; and (iii) support to value chain coordination and access to finance through sustainable use of the financial management instruments. OCRI will use the lessons learned and best practices on land irrigation and climate-smart agriculture to design its interventions. Moreover, synergies will be sought on phase 2 of APDP, to support relevant value chains and access to finance for agricultural cooperatives. To ensure this, APDP project manager will be invited as guest on OCRI platform.
Transforming Financial Systems for Climate (The "TFSC programme") **AFD** 2019-2026 USD 767 million [ongoing]	*Targeted area overlapping OCRI project: national level* This regional project aims to create a market for investments in climate technologies, especially sustainable energy, in 17 countries including Benin, by removing the financial and technical barriers faced by local finance institutions to enable borrowing by, mainly, the private sector. To this effect, TFSC will provide loans, via local finance institutions, to borrowers who want to invest in climate-resilient technologies. OCRI will seek ways to access TFSC support and increase the financial resources of FNEC. To facilitate knowledge exchange and synergies with TFSC, the project manager will be invited as guest on OCRI platform.

[55] http://documents1.worldbank.org/curated/en/500471486593559453/pdf/PIDISDS-APR-Print-P160029-02-08-2017-1486593555416.pdf

Support Project for the Development of Market Gardening (PADMAR) 2018 – 2025 IFAD ***Cofinancing project USD 500 000***	*Targeted overlapping OCRI project: Oueme and Zou (* Zogbodomey et Zagnanada) The overall objective of PADMAR, a USD 49.2 million project, is to contribute to the sustainable improvement of food production and security, to poverty reduction, and to increase the income of vegetable farms sustainably, while improving their resilience to the effects of climate change. PADMAR is circumscribed in the southern regions of Benin and intervenes in 7 departments out of 12 in the country, namely the Atlantic, Couffo, Littoral, Mono, Ouémé, Plateau and Zou. The following OCRI activities will be implemented in coordination and though financial support of IFAD: - activity 1.2.3 to promote CRA will be coordinated with PADMAR sub-component 1.1 improving access to improved agricultural input in Zogbodomey and Zagnanada
Agricultural Development and Market Access Support Project PADAAM IFAD 2020-2024 USD 1,971,797 ***Cofinancing project USD 1 750 000***	*Targeted area overlapping OCRI project: Middle Oueme (Glazoue area)* Project PADAAM is directly contributing to several interventions identified in OCRI, pertaining to engaging the private sector and strengthening value chains with intervention sites located in Middle Oueme. Under Component 2 of PADAAM, support to maize and cashew value chain will be provided through training for cooperatives, facilitating contacts between producers and buyers, improving market access, and providing processing equipment and storage/ post-harvest units to the cooperatives. All training material and knowledge products developed by PADAAM on value chains will be useful to contribute to OCRI's Output 2.2; it will constitute incentive for the private sector and finance institutions to invest in climate-resilient value chains in the Oueme Basin. Moreover PADAAM will support interventions to protect watersheds and improve water management, including in the Middle Oueme Basin, through planting trees like cashew trees and promoting irrigated horticulture, an activity also promoted by OCRI under its first component. Finally, PADAAM will facilitate access to seeds and agricultural inputs for maize in the Middle Oueme, and support climate change awareness in the area. The following OCRI activities will be implemented in coordination and though financial support of IFAD: - activity 1.1.1 to improve water mobilisation and management will be supported by PADAAM sub-component 2.2 to provide irrigation schemes for off-season agriculture in Glazoue - activity 1.1.2 to strengthen the Oueme banks will be co-financed by PADAAM's sub-component 2.3 and 4 through planting of nuts and fruits trees on the riverbanks - activity 1.2.3 to implement CRA will be coordinated with PADAAM's sub-component 2.1, which will organise training in FFS - activity 1.2.4 to improve access to quality inputs will be supported by PADAAM's sub-component 2.1 that will enhance access to quality inputs - activity 2.1.1 to train cooperatives on processing, packaging and sale of key agriproducts will be supported through PADAAM's sub-component 2.2 - activity 2.2.2 to connect and develop partnerhsips between producers and farmers will be cofinanced by PADAAM's sub-component 1.1 that will focus on maize producers and buyers.
Regional Programme for the Integration of Agricultural Markets – PRIMA IFAD 2021-2026 US$ 108.6 million ***Cofinancing project USD 10 384 280***	PRIMA aims to stimulate the regional markets in Benin (Djougou and Glazoue) and Togo, by supporting key agricultural products, through enhance productivity, access to processing and storage equipment, training for cooperatives and improved access to financial services. Although support to specific agriproducts will be determined based on market demands, PRIMA will likely include OCRI's supported crops with regional market potential, including cassava and vegetables. The following OCRI activities will be implemented in coordination and though financial support of IFAD: - activity 1.1.1 to improve water mobilisation and management will be supported by PRIMA's sub-components 2.1.3 and 2.2. which will set up anti-erosion infrastructure and promote sustainable water use for off-season agriculture in Djougou and Glazoue. - activity 1.1.2 to strengthen the Oueme banks will be complemented by PRIMA's sub-component 2.1.2, which will set up tree nurseries in the 2 municipalities - activity 1.2.3 to implement CRA will be cofinanced with PRIMA through its sub-component 2.1.2 providing training in agroforestry - activity 1.2.4 to improve access to quality seeds will also be supported by PRIMA sub-component 1.2.1

	- activity 2.1.1 and 2.1.2 to provide marketing and finance training to cooperatives will be done in cooperation with PRIMA's sub-component 1.3.3 and 1.3.4 ; as well as 1.3.5 which aims to increase access to financial services - activity 3.2.1 to increase awareness on climate change will be cofinanced by PRIMA through awareness raising campaigns organised under its sub-component 2.1.1
Renforcement des capacites dans les secteurs de l'energie, de l'agriculture, de la sylviculture et d'autres secteurs d'utilisation des terres pour une transparence accrue de la mise en oeuvre et le suivi de la CND CBIT (GEF) 2021-2024, USD 1,779,863	*Targeted area overlapping OCRI project: n/a* The CBIT (GEF) is a national-scope project aims to set up strong basis to enable Benin to implement a rigorous, transparent monitoring and evaluation (M&E) process of the implementation of its INDC. Hence, the project has three key targets: i) stronger, more efficient and transparent institutions; ii) improved capacity for GHG emission inventory; and iii) a robust M&E tool to monitor progress linked to implementation of the INDC (mitigation and adaptation). Reflection INDC's priorities, the focus of the project is on the Agriculture, Land Use and Forestry (ALUF) sector; capacity building interventions will target staff members of MCVDD and MAEP. Besides improved monitoring of GHG emission, CBIT will also enhance the capacity of the GoB to monitor and evaluate progress in the field of climate change adaptation. To achieve this, nationally relevant indicators will be developed, and a national adaptation M&E tool designed; trained staff members from MCVDD and MAEP will then be able to monitor the country's progress in achieving its climate change adaptation targets as defined in the INDC. FAO will consider the CBIT GEF project as parallel co-financing giving the complementarity of the intervention related to capacity building of national institutions.
Strengthening human and natural systems resilience to climate change through mangrove ecosystems conservation and sustainable use in southern Benin FAO – GEF	This is it a project to restore and sustainably management mangrove ecosystems in the coastal area of Benin (so not overlapping in terms of location with OCRI project). OCRI activities which are implemented upstream this GEF-project sites are expected to have positive impacts downstream (where the GEF 7 is located) – in terms of reduced flood risks in particular. FAO is exploring possibility of considering national activities related to capacity building as parallel co-financing.

Figure 12: Location of the target communities of the OCRI project



Intervention areas

The project will be implemented in 5 municipalities on Benin Republic: Copargo, Djougou in the Upper Ouémé ; Glazoué in the Upper-Middle Ouémé ; and Zogbodomey and Zagnanado in the Middle Ouémé. The Upper and Middle basins of the Ouémé river are situated between 7°00' and 10°30' N and 1°30' an 3°05' E. The selection of the targeted communes has been carried out via a vulnerability matrix evaluation based on the combined scoring of the (1) vulnerability (climate change, poverty level, population density), (2) the priority level set by the National Strategies (CDN – PANA PAG/PSDSA/PNIASAN), and the recent and current attentions of climate resilience building interventions and projects (current and previous).

B.2 (a). Theory of change narrative and diagram (max. 1500 words, approximately 3 pages plus diagram)

Through an innovative partnership with the Direct Access Entity FNEC, the FNDA, IFAD, MAEP and MCVDD, the establishment of a multi-stakeholder platform (for coordination of land restoration activities in the Oueme) and the development of a robust financial strategy (to provide funding for CRA and ecosystem restoration), the proposed project

will address current barriers (see Section B.1 and table below) to enhance the resilience of the population in the Ouémé Basin, reduce emissions and ensure activities persists over time. The OCRI project will break the vicious cycle in which vulnerable communities are locked (see Section B.1) that is causing increasing emissions and catalyze a shift towards low emissions integrated climate resilient management (ICRM) in the Upper and Middle Ouémé Basin; this will enhance the climate resilience, reduce emission, and improve livelihoods in the whole Ouémé Basin, with benefits in the upstream areas spreading to downstream areas. To initiate this transformative change, the OCRI project is comprised of three complementary Components, which will support the implementation, institutionalization and long-term funding of ICRM in the Ouémé Basin, reduce climate change vulnerability from Upper to Lower Ouémé Basin, reduce emissions, and facilitate the replication of ICRM beyond the project's sites.

The project includes the following 3 Components, which Outputs and Activities are presented in the Theory of Change (Figure 7) and described in Section B.3:

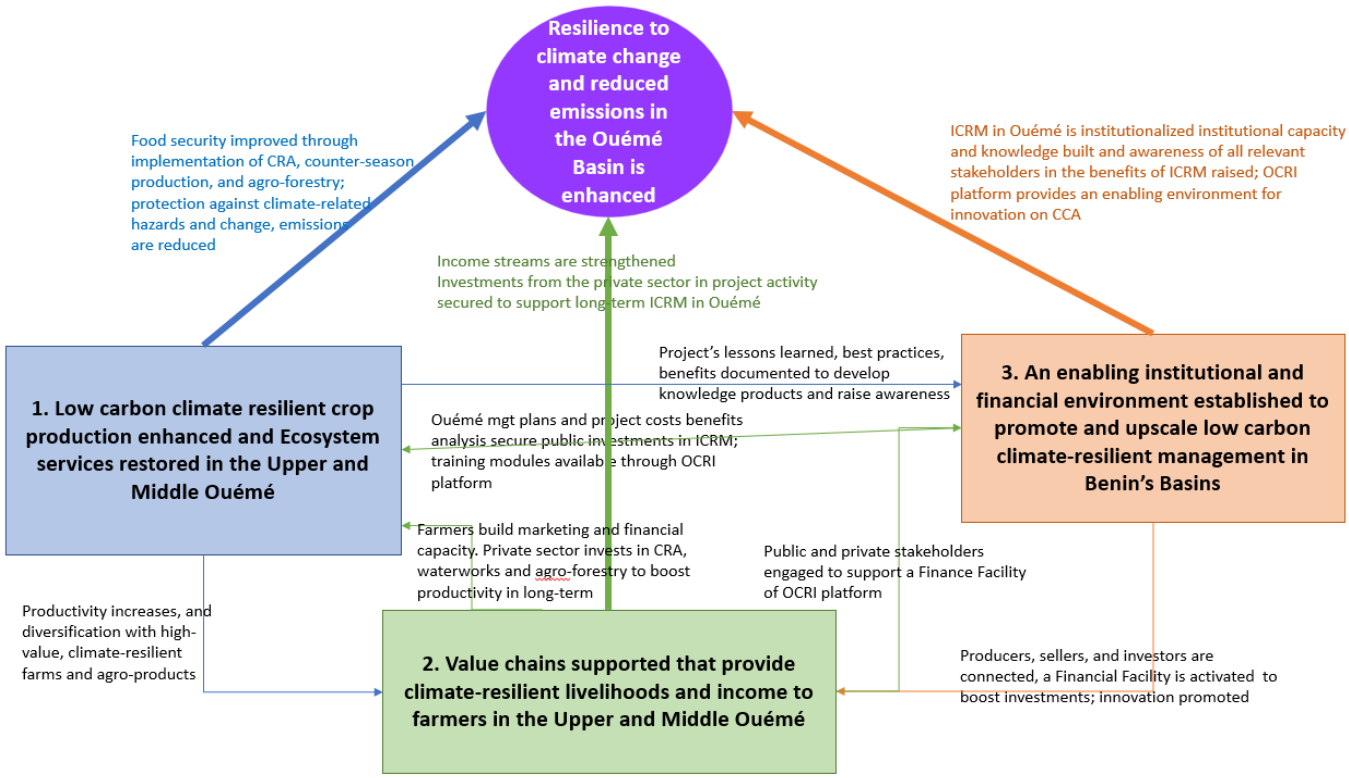
- COMPONENT 1. Low carbon climate Resilient Crop production enhanced and Ecosystem services restored in the Upper and Middle Ouéme (with government cofinancing). An integrated climate-resilient management (ICRM) implemented over 95.000 ha of land in the Upper and Middle Ouémé Basin provides benefits not only on project sites but in downstream areas as well. Floods are reduced especially in Middle and Lower Ouémé, soil erosion is limited, agricultural productivity is enhanced, water access secured especially in Upper Ouémé, and climate change vulnerability reduced in the whole Basin. This component will support reducing emissions by 1,783,633 tCO2-eq over 20 years.

  COMPONENT 2. Value chains supported that provide climate-resilient livelihoods and income to farmers in the Upper and Middle Ouémé (with government cofinancing). Combining the use and planting of diversified high-value adapted crops and trees and enhanced productivity under Component 1 to training in climate-resilient farm planning, marketing techniques, access to private sector and finance through support from the FNDA will secure farmers' livelihoods and diversify income streams despite climate change impacts. This income can be re-invested in CRA and waterworks for scaling up and expansion of the interventions. The demonstration of the significant environmental and economic benefits of project interventions will also unlock additional private investments to sustain CRA in the long-term, materialized under Component 3.

- COMPONENT 3. An enabling institutional and financial environment established to promote and upscale low carbon climate-resilient land and water management in Benin's Basins (with government cofinancing). The establishment of a multi-stakeholder coordination mechanism, to support on-the -ground tree planting and ecosystem restoration, CRA, supporting regulatory frameworks, and institutional capacity building will ensure the long-term implementation of ICRM in the Ouémé Basin. Moreover, FNEC's financial strategy will be revised and strengthened to specifically support climate-resilient projects in the long-term. During project's implementation, FNEC will provide fund as co-financing to cooperatives and organisations willing to implement CRA and ecosystem restoration in the Oueme. Finally, a strong communication and knowledge management strategy to compile, disseminate OCRI results and knowledge products beyond the 5 target municipalities will also support the replication of this approach in other areas, and basins of Benin. The upscale of OCRI interventions is also promoted through various awareness raising events, as well as a rigorous M&E system to demonstrate the environmental, social and economic benefits of the project.

The following diagram illustrates the relationship and complementarity between OCRI's three Components (Figure 13).

Figure 13: OCRI's 3 Components



Causal pathway of proposed interventions

The proposed OCRI project will effect a paradigm shift that results in enhanced climate resilience, low carbon emission and improved livelihoods for smallholders in the Ouémé Basin. This will be achieved through institutionalizing the implementation of ICRM in the Upper and Middle Oueme Basin, capacity building and unlocking access to finance for local farmers and cooperatives, operating in key value chains (namely shea, cashew, mango and maize) to sustainably continue the low carbon ICRM activities. Achieving this goal will reduce the climate vulnerability of the communities and assure the reduction of emissions from upper to lower Oueme in the long-term: vegetation cover will be restored to reduce flood and erosion risks, water access will be improved, productivity will be enhanced despite climate change impacts, and income will increase (see Business model in Annex 3). The project fully integrates gender equality principles to make sure that women and men benefit equally from the proposed interventions.

OCRI project is comprised of 3 components which will support the main goal.

The first intervention (Component 1) aims at restoring degraded land and riverbanks along the Oueme, using infrastructure, tree plantations and CRA, as well as improved soil and water management practices, with impacts over 95,000 ha. This component will not only promote climate change adaptation in the Oueme Basin, but also mitigation of CO2 emissions. Component 1 will restore soil and secure water access in the context of climate change, while increased ecosystem services will improve agricultural productivity currently jeopardized by climate change and buffer communities against climate change impacts. Currently, interventions under this component are undermined by the limited knowledge, among local communities, of the goods and services provided by restored ecosystems, and their

limited technical capacity to implement CRA. These barriers will be addressed by the proposed activities under Outputs 1.1 and 1.2.

Under Output 1.1, grey infrastructure will be built to capture run-off and rainfalls and enable irrigated agriculture; while degraded river banks and fields will be restored using tree planting to reduce soil erosion, provide shade, increase moisture and soil nutriment. Tree planting on field will favor value chain species, namely shea, cashew and mango. Note that all water and land management interventions were carefully selected, considering the watershed context of Upper and Middle Oueme. Although the impacts of climate change have many similarities in Upper and Middle Oueme Basin, there are specific impacts related to respectively, the predominance of strong erosion and degradation of the uppermost sub-catchment, and more frequent flooding in the middle valley. Hence, protecting the uppermost sub-basin through the promotion of soil and water conservation practices will contribute to increased water infiltration over a large area of the basin upstream with an expected substantial effect on the reduction of downstream flows and floods in the lower valley. Infrastructures to store water (such as micro-dams, weirs) (90%) or rehabilitation (96%), and in-field water harvesting/infiltration management (69%) will be especially implemented in the upper Oueme, which suffers from drier conditions because of climate change impacts. Development of irrigation perimeters will also be more targeted to the upper than middle Oueme to valorise the mobilized water and combat the drier climate effect. Protection of artesian boreholes will essentially be developed (97%) in the middle Oueme to better make use of the water resource and control flooding, which happen more and more often in this area. In-land valley management will be developed equally (50%) in both the upper and the middle Oueme.

Overall Output 1.1 will secure water access on field, rehabilitate degraded soil and protect plots against flood risks (Output 1.1). However, there is a risk that local communities cut down newly planted trees to use as fuel wood or timber. To reduce this risk, reforestation will essentially target individual plots (owned by farmers – promotion of agroforestry) as well as some very degraded riverbanks, which are located near the plots and can therefore be controlled by beneficiary farmers (against illegal logging, which can be reported to the local forest department). Reforestation will be implemented with local communities, through the FFS approach (Output 1.2), which will increase project ownership, while sensitization on the benefits of ICRM will be conducted through the FFS and more widely, under Output 3.3. The construction of water harvesting and retention infrastructure will induce a change of 1 ha from vegetated to non-vegetated land leading to an additional carbon emission of 115 tCO2-e over 20 years.

Output 1.1 will be complemented by, and support the implementation of CRA in Upper and Middle Oueme under output 1.2. This will be promoted using the FFS approach. CRA techniques have been selected based on best practices in Benin, to address existing and foreseen climate change impacts as well having mitigation results. The training will encompass climate resilient sustainable land and water techniques to ensure the rational and effective use of natural resources against climate change. Sustainable management of degraded agricultural landscape and basin areas is also key to reduce climate change vulnerability, improve agricultural productivity[56] and reduce emissions.

Such interventions contribute to CO2 reduction in a sustainable way as farmers are incentivised to manage their land sustainably (as it increases productivity), and contribute to Benin's mitigation efforts. In fact, as productivity increases thanks to the project intervention farmers will be less incentivised to carry out high emission practice and clear additional forest land to expand their agriculture production (see also the description of the vicious cycle in Figure 8). Currently, farmers in the project area practice full tillage, burn their crop residues and use low input. This production system results in low yield and high emission. Under this output, the beneficiaries with be trained to adopt the technic of non-tillage on 2 000 ha and the residue will no longer be burned. In addition, to significantly increase the yield, there will be an increase in input use. As a result, the improved agronomic practices will avoid the emission of 52 587 tCO2-e over the 20 years while the irrigation system will emit 115 tCO2-e over 30 years; the discontinuation of mineral fertilization will reduce 29,383 tCO2eq over the 20 years. When best practices are followed, the interventions are not expected to increase nitrous oxide or methane emissions in targeted areas. Green manure and species composition will create in-situ fertility through sustained and positive nutrient and carbon cycles, reducing the need for mineral fertilization. Uptake of project interventions by non-targeted farmers will lead to positive externalities and a reduction in GHG emissions when compared with current practices. GHG emissions associated with dam construction have already been accounted for in Ex-Act, and leakages are not expected.

The irrigation system will emit 623 tCO2-e over 20 years. The constructed dam will emit 115 tCO2-e over 20 years . In addition, currently, the project areas are highly degraded and fire is used on 20 percent of the land (16 800ha). With the project, 15 percent of the total land (12 600ha) will be planted with perennial crops (cashew) with improved residue

[56] GIZ, 2017. Adaptation de l'agriculture au changement climatique (PACC). Available at: https://www.giz.de/en/worldwide/31841.html

management. The project will also increase tree covers on 85 percent of total parkland (71 400 ha) (agroforestry combined with fruit trees). The improvement of tree density will increase carbon sequestration potential on this land. No residue will be burnt under the project. In addition, 9 000 ha of forest that is highly degraded will be restore to become a low degraded area. Thus, the agroforestry system on 84 000 ha will contribute to sequester 1 469 260 tCO2-e over 20 years while the improved forest management on 9 000 ha will sequester 232 518 tCO2-e during the same period.
Field missions during the project development phase have indicated farmers' interest to receiving technical support for agricultural production, thereby ensuring buy-in of the proposed interventions, which will support the implementation of CRA, agro-forestry and sustainable resource management in the Oueme Basin (Output 1.2). However, as indicated in Annex 8 (GAP), there is a risk that women do not fully participate to, and benefit from, the project's interventions, especially with regards to technical agricultural support. To ensure women are not left aside from the project's expected benefits, Dimitra club approach will be promoted through Output 1.2. By stimulating social dialogue and social mobilization, the implementation of the Dimitra Clubs methodology will allow the targeted communities to engage in a process to transform discriminatory gender and social norms that are at the root of gender inequality. Equal participation in FFS will also be promoted, all trainers will be sensitized and trained on gender awareness, community engagement and the Dimitra Clubs approach, and schools dedicated to women set up, to benefit them with labor-saving tools among others (see Annex 8).

All together, Output 1.1 & 1.2 will enhance crop production in the Upper and Middle Oueme. Farmers will benefit from increased agricultural productivity and reduced exposure to climate-related risks while contributing to reducing emissions (Outcome 1), which will incentivize the long-term implementation of CRA and sustainable land management in the Oueme Basin; the demonstration of OCRI's benefits (through sensitization under Component 2 & 3) will also facilitate project replication (including its adaptation and mitigation benefits) in other areas. In return, farmers will contribute to CO2 emission reduction beyond the project's lifespan. The training on CRA will particularly target key agro-products namely maize, mango, cashew and shea. The quality of these products will improve by using appropriate, and resilient production techniques. Component 2 will further support the development of robust value chains for these key products – that is Component 2 will add value to these agro-products by improving capacity for harvesting, processing, marketing and sale – so that they can be sold by local farmers and cooperatives to make profit. Shea, maize, cashew and mangoes were selected for this target support because: i) these crops, fruits and nuts are already produced in the target area; ii) the FS indicates their adaptation potential, providing the use of adapted techniques (CRA); iii) shea, cashew and mangoes in particular contribute to CO2 emission reduction, through reforestation; iv) they are among prioritized agricultural products by the GoB; v) there is a demand from domestic and international markets; and vi) there is currently few initiatives promoting these value chains. The total emission reduced from component 1 is 1,783,633 tCO2-eq over 20 years.

At the moment, the full development of maize, shea, cashew and mango value chains is impaired by a lack of technical and financial capacity (for production, harvest, processing, storage, and sale) as well as business skills amongst farmers and cooperatives in the Oueme Basin. While Component 1 will enable farmers to produce high-quality crops under climate change conditions, interventions under Component 2 will address the lack of capacity for marketing and sale, to boost profits. First, under Output 2.1, farmers will be organized into cooperatives around key value chains – namely shea, cashew and maize – using the FBS approach. This will enhance their capacity to work together (as cooperatives and unions) to negotiate sale prices, prepare high-quality agro-products which respond to market demands and expectations.

Second, access to finance will be unlocked in the Oueme Basin. Currently, a lack of access to finance impairs value chain development in Upper and Middle Oueme. In particular, access to loans and micro-credits for agriculture is limited in Benin (see Annex 19 Section 3 and barriers table). Such access would enable farmers' investments in agricultural inputs and quality seeds, labor support for harvesting, storage, processing and packaging equipment, among others. To address this issue, training on financial management will be organized through FBS to ensure farmers and cooperatives can meet MFIs' requirements for accessing micro-credits. FNDA will faciliate access to credit for OCRI farmers through the payment of 50% of the farmers' loans in case farmers or cooperatives cannot reimburse (which will reassure MFIs); and through ensuring lower interest rates on the loans (facilitating farmers' repayment). Technical assistance to develop bankable loan applicatin will also be supported by FNDA's partners, the ADTA, while FNDA will provide quality review of the loan application. Access to loans will finally be enhanced as VSLA will be established among the beneficiary communities. With a better access to loans, cooperatives can invest in CRA and relevant equipment to create added value to their agriproducts – beyond the project's lifespan. To further ensure a more efficient and profitable agriculture, the project will promote use of the innovative FarmTree App (see Annex FarmTree App). This App offers cost-benefits simulation of combining crops and trees on the fields, taking into account climate change and agro-ecological conditions. It is therefore a key tool to help agri-business planning and will be used, through OCRI

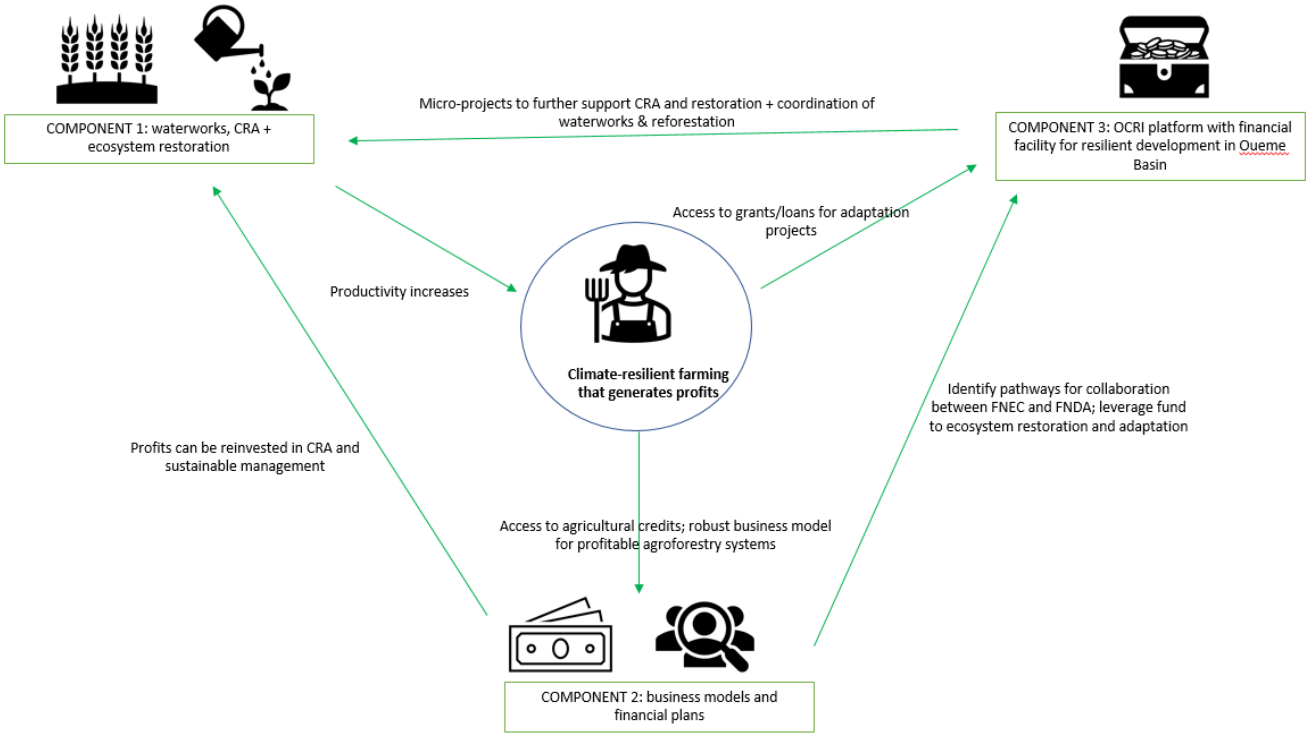
project, to identify best combination of trees, crops and vegetables that ensure high productivity, while responding to market demands.

Third, Output 2.2 will create a favorable environment for private sector investments in low carbon climate-resilient value chains. This will be done by demonstrating the socio-economic (e.g. returns on investment) and environmental benefits of the project (see business model in Annex 3). Information products underlying the economic benefits of CRA and land restoration – as demonstrated through the FarmTree App – will be specially packaged for the private sector organizations, including MFIs, agri-businesses, private donors and investors. Finally, match-making municipal forums that connect sellers and local, national and international buyers/ exporters will be organized to facilitate sale of shea, mango, cashew and maize in the five target municipalities. There is no risk of limited buyers for these key value chains as the chains were selected based on field mission, Benin's agricultural priorities, current production in the target areas, and a list of potential buyers for each value chains was prepared (see Section B.1 of the FP).

Outputs 2.1 & 2.2 together allow for the development of robust, climate-resilient value chains and income streams in the Upper and Middle Oueme Basin. In particular, Output 2.2 will reduce the risk that private sector does not support resilient value chains, through targeted sensitization messages and products, which highlight the added-value (especially return on investment) from CRA. Furthermore, the promotion of gender equity and women empowerment within Component 2 is key as there is a significant risk that women cannot fully participate to, and benefit from the development of robust value chains – especially due to cultural reason in the Middle Oueme (see Annex 8). Women in the Oueme Basin are currently engaged in different links of these value chains – for example processing maize into flour or shea into butter, or sale home, along the roads and in local small markets. However, women are often poorly organized, have less decision-making power than men, and are more burden to access micro-loan and credits to buy efficient agricultural and processing equipment (please see Annex 8 for additional information). To increase women's participation in climate-resilient value chain, women and women-led agribusinesses and cooperatives will be purposely targeted by capacity development initiatives and as recipients of equipment and storage facilities. Moreover, interventions to improve loan access will have a special focus on women's access to credit, who face issues due to their limited ownership of assets as collateral to access formal credit. Micro-credit opportunities will therefore prioritize women in the targeted area. In addition, in order to support their entrepreneurial potential, women farmers will be trained on financial management and business plan development. While the Dimitra Club sits under Component 1 to maximize the impact of FFS, its social dialogue and social mobilization effects are meant to be cross-cutting to all components. In particular, community discussion has proven effective in changing discriminatory social norms resulting in women's increased access to opportunities, voice and decision-making and better distribution of gender roles. Together and in dialogue with PSEA procedure and mechanisms, the Dimitra Club approach will also be used to discuss and address issues around gender-based violence, as indicated above.

The third intervention (Component 3) will ensure a long-term, enabling institutional and financial environment to support and sustain Outcomes 1 & 2 – including their adaptation and mitigation benefits – in the long-run. At the moment, there are limited technical and institutional capacities in Benin, and more particularly, the Oueme Basin to plan and implement gender-responsive low carbon ICRM in the Oueme Basin. Moreover, there is a lack of coordination among national, regional and local government entities to implement ICRM in the Oueme Basin and to foster climate-resilient value chain development. Such support and coordination need engagement and collaborative work from various sectoral institutions represented at the national, regional and local level. To enable this and address both barriers, the OCRI platform will be establish with a view to coordinate project interventions and land management efforts in the Oueme Basin, in the long-term (beyond the project's lifespan). Establishing a robust, long-lasting platform will tackle the existing risk that authorities in the target municipalities of the Oueme Basin cannot implement ICRM beyond the project's lifespan, because they lack the capacity or resources. This risk is also reduced as the project will develop tools to guide ICRM implementation: more precisely, the SDAGE and LDPs will be revised, using a participatory approach, to mainstream ICRM as well as gender concerns. These plans are key to guide future public investment and development initiatives in the Oueme Basin (beyond OCRi project).

Figure 14: Farmers benefiting from OCRI interventions



Capacity building of local authorities and extension service (making sure to train and involve women's extension workers) for adaptation planning will also be implemented to further create an enabling institutional and technical environment for adaptation in the Oueme Basin. Field missions have also confirmed the willingness and interest of local authorities in the Oueme Basin, including field agents and the OBA, to increase their capacity for implementing sustainable and resilient land and water management.

Beyond an adequate technical and institutional framework, the GoB also lacks financial resources to implement low carbon ICRM in the Oueme Basin. To address this gap and ensure long-term investments in ICRM and adaptation in Benin, the project will develop a strong partnership with FNEC, Benin's GCF accredited entity. FNEC is already supporting Benin's climate change related efforts through financing micro-projects or implementing larger projects funded by international funds; there are opportunities to leverage FNEC's resources to upscale ICRM in Benin. The project will collaborate with FNEC to identify additional financial streams, that could increase the fund's resources for supporting adaptation in Benin. Moreover, FNEC's capacity to develop, implement, monitor and report on, climate change related projects will be increased and 3 micro-projects on ICRM in the Oueme Basin will be selected and financed by FNEC (using its own resources), as well as monitored with support from FAO. This will strategically contribute to build FNEC's capacity for the design and implementation of climate change initiatives, and to tap into existing resources from public or private fund (e.g. Adaptation Fund). It will strengthen the role of FNEC as Benin's accredited entity for the AF and GCF, and as a key player supporting adaptation efforts in the country (Output 3.2). To foster large-scale awareness and knowledge of ICRM in the Oueme Basin and its benefits, all knowledge and best practices generated through the project and captured under various activities (2.1.3, 3.1.3) will be used to develop sensitization campaigns. This will contribute to address the existing lack of awareness of the benefits of ICRM in Benin; in particular, authorities for Benin's other basin areas – namely Volta, Niger and Couffo – will be invited for field visits on project sites to support project's replication and upscale. Finally, the OCRI symposium will be organized to showcase climate-resilient agricultural practices in the selected key value chains to local farmers, cooperatives, entrepreneurs, and private sector stakeholders and incentivize upscale of successful project interventions across Benin. These activities will ensure large-scale awareness of OCRI, as well as a robust institutional and financial environment for

upscaling ICRM – including its adaptation and mitigation benefits – across the country (Outcome 3), and supporting its continuity beyond the project.

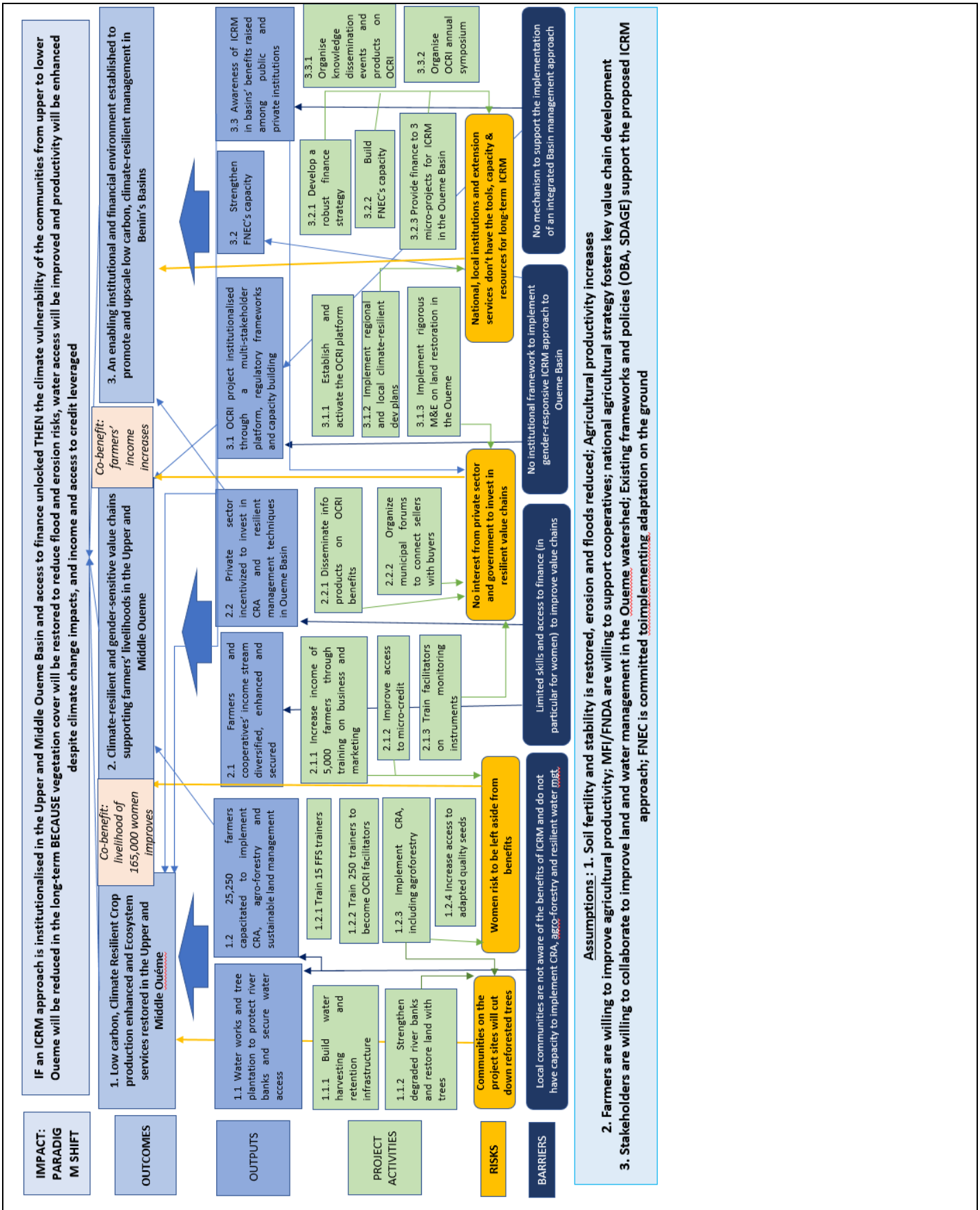


Figure 10: Project's theory of change

Barriers to adaptation and pathways to overcome them

Without grant financing, the GoB and impoverished rural communities in the Upper and Middle Ouémé Basin will not have the technical or financial capacity and knowledge to make the investments required to reduce the impacts of climate change. There are currently five main barriers to implementing ICRM in the Ouémé Basin, and significantly reduce the vulnerability to climate change. These barriers will be addressed in the project strategy, as indicated below.

Barriers	**How to be addressed by project**
Technical capacities	
The communities of Upper and Middle Ouémé Basin have limited technical and material capacity and awareness on how to implement, climate-resilient agricultural and water management practices that improve productivity in the agricultural landscapes while, at the same time reducing the negative effects of climate change, including erosion, floods and flash floods, especially in downstream areas. The Baseline Study (included in Annex 2) conducted in the project sites of Upper and Middle Ouémé indicates a lack of hydro-agricultural technologies implemented to cope with the impacts of climate change. As a result, farming communities face a chronic deficit of mobilization of water resources, which impairs the promotion of promising adaptive economic activities such as irrigated agriculture and off-season horticulture. Effective irrigation systems are almost non-existent and there is no control of water, for example through water retention infrastructures or micro-dams; when such structures exist, they are obsolete because of the absence of capacity, at the local level, for sustainable water management and maintenance of waterworks. (see Waterworks Feasibility: Annex 17 for an assessment of existing irrigations schemes and water infrastructure in the target areas). With regards to agricultural practices in the Ouémé Basin, they are characterized by the use of basic tools and low mechanization. Extensive, rainfed agriculture dominates, which is very sensitive to climate variability and extremes like droughts and late onset of rainfalls. The use of climate-resilient production technologies is very limited on project sites, with a low adoption rate of improved seeds and a low use of on-farm rainwater harvesting techniques. This is because, on the project sites, there are no integrated water management and climate-resilient agriculture – including agroforestry projects – projects therefore farmers, who have not received adequate training and are not aware of the climate benefits of CRA, present low levels of adaptation capacity.	Under Component 1 of the project, communities will be trained (through FFS) to implement CRA, agro-forestry and water management; waterworks will also protect their land and home against floods (especially in Middle Ouémé) and facilitate water access and retention in the desiccated soils (especially in Upper Ouémé). Likewise, a detailed resilience and adaptive capacity assessment will be carried out to improve targeting and identification of context-specific solutions to enhance communities' resilience. Moreover, under Component 3, awareness raising events, and radio broadcasts will contribute to disseminate knowledge of climate change and resilient practices; training modules will also be available on the OCRI platform.
Financial capacities	
The communities have restricted/ no access to micro-credit or other financial support (from the government or the private sector) to invest in climate-resilient practices, improve their productivity, access market, and boost their profits (see Annex 19 Section 3). Although there are financial institutions and schemes to provide micro-finance for smallholders, the agricultural sector remains under-financed. Smallholder farmers also face many difficulties accessing credits for agricultural investments, particularly for the more vulnerable groups of society, such as women and youth. The financing schemes tend to focus on Alternative Income Generating Activities, such as sale of transformation products, honey, etc, while the risk of investing in agricultural production is still perceived as high. As a result, micro-finance institutions have high requirements with regards to collateral, high interest rates and short payback periods, on top of their administrative fee – which smallholders cannot	Under Component 2, in partnership with MAEP/IFAD, the project will facilitate access to finance via trainings for cooperatives. Farmers and cooperatives will learn how to plan their field (TreeFarm App), and to grow resilient, high-value products; they will also be trained on marketing techniques to boost their sale, and financial management to access credits and re-invest in their activities. The project will support access to credit from MFIs through the facilitation provided by FNDA. Communication products on the economic benefits to invest in CRA and ecosystem restoration will be disseminated to private sector institutions to encourage investment in the project. A roadmap to increase FNEC's resources will be developed under Component 3, to further enhance access to fund in the long-term, as a replenishment strategy will be developed. Moreover, farmers and buyers will be linked through biannual municipal forums, and through the OCRI platform, to facilitate sale of climate-resilient agriproducts responding to market demands.

meet. Furthermore, finance institutions are more reluctant to lend to individual farmers than to organised groups. An investigation conducted by MAEP on the reason why many smallholder farmers in Upper and Middle Ouémé do not contract credits indicates, as five main reasons: i) smallholders are scared and uncomfortable to be in debt; ii) high interest rates of credits; iii) lack of stable income, or income too low; iv) lack of knowledge of how to get a credit; and v) they have not thought about it (not aware of credit potential).	
Institutional coordination	
Land or water management in the Ouémé Basin is not implemented according to an integrated climate-resilient approach. Therefore degradation of the natural capital is observed. There is lack of capacity and resources invested in restoration and protection of critical ecosystems (especially along the Ouémé River) and in CRA, with a view to improve livelihoods and resilience on the whole Ouémé Basin; there is no coordinated efforts among relevant stakeholders in environmental management, agriculture and water to support such an approach. Climate change and ICRM is not yet integrated into local development plans (LDPs) and regional strategies in the Ouémé Basin; in addition, the Ouémé Master Plan (SDAGE), which promotes integrated water management, is underfinanced and few interventions are currently implemented. Mainstreaming adaptation into development plans would inform and guide public interventions and investments towards climate-resilient development. Another weakness is the lack of coordination mechanism or platform to facilitate the coordination of public and private stakeholders in climate resilient water management, agriculture, and agri-markets. For example, a platform including the Ministry of the Livelihood and Sustainable Development (MCVDD), the Ministry of Agriculture, Livestock and Fisheries (MAEP), the National Fund for the Environment and Climate (FNEC), FNDA, the Ouémé Authority, farmers' cooperatives and finance organisations would support coordinated efforts towards ICRM in the Ouémé Basin, that generate benefits for all parties. On the contrary, a siloed approach to development prevails in the target areas of the Ouémé Basin, where projects and development initiatives tend to focus on a single sector like agriculture or water access, without integrating climate change concerns or basin-specific considerations – as interventions implemented upstream have impacts on downstream communities and landscapes. As a result of these limitations, agricultural landscapes in the Ouémé Basin are not resilient to climate change and the communities are increasingly vulnerable to water scarcity, droughts, shifts in seasonality and floods.	Under component 3, the OCRI platform will be established to provide a space where national and local governmental agencies join their efforts to improve management in the Ouémé Basin. The ICRM will also be institutionalized through the Ouémé Master Plan (SDAGE), and implemented through the LDP of the 5 project municipalities. Developing/ integrating ICRM in the municipal plans will also ensure public funding are invested in climate-resilient interventions in the future. Local extension officers will be trained to implement ICRM. Under component 1 such strategies of protection and restoration, sustainable adapted production will be implemented and farmers will be trained to do so.

The government of Benin and its local extension services do not have the knowledge and technical capacity to implement an integrated basin-level management approach, and therefore cannot provide the necessary technical support to the local population. The institutional, regulatory and governance capacity to plan and implement this approach in a coordinated, complementary or synergetic way is missing. As underlined in Section 6 of the FS (Annex 6), there is a limited mainstreaming of climate change concerns, especially into local and regional development plans. While, at the national level in Benin, there is an ongoing process to integrate climate change adaptation into relevant policies and strategies, at the local level, there is limited integration of integration of climate change into local development plans prepared by the municipalities. This is because of limited technical and financial capacity among local-level government staff (described above) and limited availability of climate change-related information, including on the benefits of adaptation (further described below). Consequently, municipalities and communities do not receive support for the design and implementation of locally appropriate climate change adaptation interventions.	Under Component 3, local extension, forest and water officers will be trained to implement ICRM in the basin, including the resilient plans developed in the 5 target municipalities, which they will contribute to develop. They will also be trained under the ToF programme under Component 1 to disseminate their knowledge on CRA, agro-forestry and waterworks to other local officers/ farmers, thereby multiplying the expected project beneficiaries after project completion.
Awareness	
The government of Benin and the private sector are not aware of the socio-economic benefits to implement an integrated sustainable climate-resilient approach for the management of basin. In other words, there is no incentive for the private sector and agri-businesses to invest in climate-resilient value chains as their benefits are not demonstrated yet. Benin's economy is mainly based on agriculture, trade, and transport to and from neighboring countries. Despites improvements on the economic front, the average economic growth rate is 4.2% over the period 2006-2015 . This growth rate is insufficient to combat poverty in a sustainable manner. Moreover, the population does not have the financial capacity to overcome poverty, provide sufficient food for the household, and invest in climate-resilient technologies, infrastructure, or equipment. This is particularly the case in the project intervention areas, where the economic and socially vulnerable targeted populations is further threatened by climate change impacts. The public sector, within its very limited capacity, is the main actor responsible for promoting agriculture, irrigation, and drainage in Benin, while investments from the private sector in the field of irrigation, for example, are almost non-existent as there are few incentives at present. Indeed, there is yet no clear demonstration of the socio-economic and environmental benefits to implement ICRM in basin areas in Benin. While climate change is partly integrated into agricultural research (for instance at the National University of Agronomy in Porto Novo), programmes are focused on improving agricultural productivity under existing climatic conditions rather than focusing on future changing climatic conditions. Finally, there is no platform where information about climate change impacts in Benin and best adaptation practices are stored and shared with policy- and decision-makers. As a result, there is a lack of user-friendly information to inform policies, plans, and appropriate CRA interventions in the agriculture; and demonstrating strengthening the socio-economic benefits of this approach. Such demonstration could incentivise public and private investments in project interventions. The potential of the project to maintain agricultural productivity despite climate change, and to increase the acreage of production of	Under component 2 & 3, the economic and environmental benefits of project interventions will be carefully monitored (using an innovative App), compiled, packaged into targeted knowledge products, and shared, in particular towards governmental institutions and the private sector. This will incentivize future investments in resilient farming activities. In addition, all knowledge products and project's data, training modules, lessons learned and best practices for ICRM in watershed will be shared on OCRI's online portal. Field visits and awareness-raising events will also be organised for the communities surrounding the project's sites, in order to showcase the benefits of restored and protected ecosystems along the Oueme River. Finally, field visits and training sessions will be organised for other basin authorities in order to promote replication of OCRI approach across Benin's watersheds.

high value crops and trees (see Economic Analysis, Annex 3) would also secure future investments from farmers and cooperatives that would maintain the project beyond its lifespan.	

B.2 (b). Outcome mapping to GCF results areas and co-benefit categorization

Fill in the GCF results area table below to map each project/programme outcome identified in section B.2(a) to the contributing GCF results area(s) by referring to the description of eight results areas provided in the guidance note.

Outcome number	GCF Mitigation Results Area (MRA 1-4)				GCF Adaptation Results Area (ARA 1-4)			
	MRA 1 Energy generation and access	**MRA 2** Low-emission transport	**MRA 3** Building, citiies, industries, appliances	**MRA 4** Forestry and land use	**ARA 1** Most vulnerable people and communities	**ARA 2** Health, well-being, food and water security	**ARA 3** Infrastructure and built environment	**ARA 4** Ecosystems and ecosystem services
Outcome 1: Low carbon, Climate Resilient Crop production enhanced and Ecosystem services restored in the Upper and Middle Ouéme	☐	☐	☐	☒	☒	☒	☐	☐
Outcome 2: Climate-resilient and gender-sensitive value chains supporting farmers' livelihoods in the Upper and Middle Oueme	☐	☐	☐	☐	☒	☒	☐	☐
Outcome 3: An enabling institutional and financial environment established to promote and upscale low carbon, climate-resilient management in Benin's Basins	☐	☐	☐	☒	☒	☐	☐	☐

Co-benefit number	Co-benefit					
	Environmental	**Social**	**Economic**	**Gender**	**Adaptation**	**Mitigation**
Co-benefit 1: *livelihood of 165,000 women improves*	☐	☐	☐	☒	☐	☐
Co-benefit 2: *farmers' income increases*	☐	☐	☒	☐	☐	☐

B.3. Project/programme description (max. 2500 words, approximately 5 pages)

The proposed interventions will contribute to achieve the GCF Fund-Level impacts: A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions, A2.0 Increased resilience of health and well-being, and food and water security, and A4.0 Improved resilience of ecosystems and ecosystem services. For example, the communities of Upper and Middle Ouémé, which were identified as highly vulnerable to climate change (see FS, Section 5), will benefit from OCRI interventions that will restore agricultural landscape and river banks and reduce soil erosion, leading to less floods and flash floods in Middle and Lower Ouémé ; agroforestry and CRA, along with waterworks will contribute to restore soil moistures and fertility, which are reduced by higher temperatures, evapotranspiration (especially in Upper Ouémé) and water staggering on field (especially in Middle Ouémé); finally the integrated climate resilient management approach will restore and increase the production of ecosystem goods and services, to benefit the whole population of the Ouémé Basin.

Several GCF outcomes for adaptation will also be achieved through the proposed project, namely:

- A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development
- A7.0 Strengthened adaptive capacity and reduced exposure to climate risks
- A8.0 Strengthened awareness of climate threats and risk-reduction processes

In addition, the proposed project will achieve one GCF outcome for mitigation:

- M9.0 Improved management of land or forest areas contributing to emissions reduction.

Project description

The project objective is to enhance the climate resilience of the communities living in the Ouémé Basin of Benin, while contributing to the GHG emission reduction objectives of the country. This will be achieved through the implementation of three complementary Components in the Upper and Middle Ouémé areas. Overall, project interventions were designed based on the results of extensive field missions conducted in 2019, 2020 and 2022. The results of the missions have been used to prepared the project's annexes, in particular Annex 2, 17 and 19. The project's Components will directly address climate change impacts on key value chains. Table 3 proposes a range of CRA practices that have been identified as successful in the different communes and that can be implemented and improved to support agriculture and productivity in particular for the selected VCs as part of OCRI. These examples were drawn from the field mission, and the final selection of CRA strategies most adapted according to site specific context will be conducted during the FFS activities (please refer to Annex 2 Section 7.2 and 7.3 for more information).

Table 3: **Climatic hazards, climate change impact on crops and effective adaptation measures by municipality**

	Climate change events in Upper and Middle Ouémé				
	Upper Oueme		**Middle-Oueme**		
	Copargo	**Djougou**	**Glazoué**	**Zogbodomey**	**Zagnanado**
	Climatie change events -Irregular rainfall -Shift in the agricultural calendar - Heavy wind - Early drying of rivers	**Climatie change events** - Drought - Late arrival of rain - Early drying of rivers	**Climatic change eventse** -Rain delay -Drought -Early arrival and end of rain -Heat -Heavy wind -Excessive rainfall causing flooding of the lowlands	**Climatie change events** -Late/short rainfall -Imbalanced distribution of rainfall -Heavy wind -Flooding -Early drainage of lowlands	**Climatiechange event** -Drought -Late arrival of rain -Irregular rainfall - Long harmattan duration -Early drainage of lowlands -Flooding
Climate change impacts of the above mentioned events on OCRI VCs and adaptation measures					

Maize	**CC impact on crops** -Low germination rate -Seedling wilt -Dwarf development of plants -Poor cob development	**CC impact on crops** -Low germination rate -Seedling wilt - Dwarf development of plants -Poor cob development	**CC impact on crops** -Worm development - Dwarf development of corn plants	**CC impact on crops** -Low emergence after germination -Plant wilt -Yellowing of leaves -Development of parasitic attacks from inside the plants	**CC impact on crops** -Low emergence after germination -Plant wilt -Yellowing of the leaves -Development of parasitic attacks from inside the plants
	Adaptation measures -Crop rotation and association -Adoption of short cycle and resistant varieties - Zai - No tillage	**Adaptation measures** -Crop rotation and association - Adoption of short cycle and resistant varieties - Zai - No tillage	**Adaptation measures** - Crop rotation and association - Adoption of short cycle and resistant varieties - Zai - No tillage	**Adaptation measures** -Drainage -Adoption of high-yielding and CC-resistant seeds -Lowland maize production - No tillage	**Adaptation measures** -Drainage -Crop diversification -Adoption of high-yielding and CC-resistant seeds -Lowland maize production - No tillage
Mango	**CC impact on crops** Low fruit development (+ fruit acidity / Glazoue)				
	Adaptation measures - Pruning - Mechanical control - Adoption of grafted plants -Windbreak installation - Zai	**Adaptation measures** -Pruning -Mechanical control -Adoption of grafted plants (Kent and Amelie) Windbreak installation - Zai	**Adaptation measures** - Pruning - Mechanical control - Adoption of grafted plants (Kent and Amelie) -Windbreak nstallations - Zai	**Adaptation measures** -Artificial watering / Irrigation under half-moon -Mulching around the plants to conserve moisture - Zai	**Adaptation measures** -Artificial watering / Irrigation under half-moon -Mulching around the plants to conserve moisture -Agroforestry: association with crops - Zai
Cashew nut	**CC impact on** crops-- -Low nut development -Early blooming of flowers	**CC impact on crops** -Low nut development	**CC impact on crops** - Low nut development	**Impact CC on crop** Development of pests causing low nut size	**CC impact on crops** Development of parasites causing low nut size
	Adaptation measures -Pruning, Thinning, Foliage -Adoption of grafted plants -Windbreak installations - Zai				
Shea nut	**CC impact on crops** Low nut development (except in Zogbodomey and Zagnanado)				
	Adaptation measures - Orchard maintenance - Biological control -Weeding - Zai	**Adaptation measures** - Orchard maintenance - Creation of shea parks - Biological control - Zai	**Adaptation measures** - Orchard maintenance - Creation of shea parks -Biological control - Zai	**Adaptation measures** Orchard maintenance - Creation of shea parks - Biological control - Zai	**Adaptation measures** - Orchard maintenance - Creation of shea parks - Biological control - Zai
Vegetable crops	**Impact on crops** - Plant wilt -Weak growth of vegetables -Poor fruit development	**Impact on crops** -Plant wilt -Weak growth of vegetables -Poor fruit development	**Impact on crops** -Development of worms especially in cabbage -Weak growth of vegetables (carrots, leafy vegetables) -Attack on chilli and tomato leaves	**Impact on crops** -Plant wilt -Low emergence after germination for carrot and cabbage -Low emergence after transplanting -Yellowing of the leaves	**Impact on crops** -Plant wilt -Low emergence after germination for carrot and cabbage -Low emergence after transplanting -Yellowing of the leaves

	Adaptation measures -Short cycle seeds -Targeted watering -Mulching -Crop rotation -Targeted irrigation -Off-season production - No tillage	**Adaptation measures** - Short cycle seeds - Targeted watering - Mulching - Crop rotation - Targeted Irrigation/Targeted Hand Irrigation - Off-season production	**Adaptation measures** - Short cycle seeds - Targeted watering - Mulching - Crop rotation - Targeted Irrigation/Targeted hand Irrigation - Off-season production - No tillage	**Adaptation measures** - Adoption of seed of improved varieties resistant to the effects of CC - Gravity drainage - Targeted irrigation -Installation of dikes - No tillage	**Adaptation measures** -Adoption of seed of improved varieties resistant to the effects of CC -Raised boards -Construction of dikes for water control -Gravity drainage -Targeted irrigation - No tillage

Table 4 Climate change impacts on value chains: Processing, conservation, and sales[Error! Bookmark not defined.]:

		Climate Threats	***Climate change impacts and Adaptation strategies***		
	Crops	**1-Drought, heat 2-Late/shorter rainy season 3-Excessive rainfall/flooding 4-Heavy wind**	**Climate change impacts (**Threats #)	**Adaptation measures (promoted under OCRI Component 2)**	**Measures expected impact**
Upper and Middle Oueme (All communes)	Maize (staple crop)	1, 2, 3, 4	Grains humid at harvest and deteriorate/spoil fast (1,3), Lower quality of processed products (1,2,3), Heavy rain hampers access to fields and markets compromised (3), Price hikes (3)	Drying stocking practices organized processing, & sale	Stable quality capture of higher prices make up for reduced production
Upper and Middle Oueme	Vegetables	1,3	*Poor quality fruit products (1, 2 & 3)* *heat affects products conservation (1)* *Price hikes (3)*	Organized packaging, & sale	Stable quality capture of higher prices make up for reduced production
Upper and Middle Oueme (Glazoue-Savalou)	Cashew (nuts)	1, 2, 3, 4	Damaged fruit harvest (1,2,3,4) small, broken nuts (1,2,3,4) humid nuts fast deteriorate (3), heat affects fruits conservation (1) Price hikes (3) *Low quality fruits (1,2,3,4)*	Ventilated storage, organized packaging, & sale Marketing and finance capacity building	Stable quality capture of higher prices make up for reduced production
Upper Oueme (Djougou-Copargo)	Mango	1, 2, 3, 4	*Heat affects fruits conservation, rapid deterioration of fruits (1)* *Reduced shelf life (1,2)* *Price hikes (3)* *Shea nut acidity (3)* *Harvest delayed (3)* *Low quality fruits (1,2,3,4)*	*Ventilated* storage *organized processing, & sale* Marketing and finance capacity building	*Stable quality* *capture of higher prices make up for reduced production*
Upper Oueme (Djougou-Copargo)	Shea	1, 2, 3, 4	*Nuts humid at harvest* *Low quality fruits (1,2,3,4)*	Drying organized processing, & sale Marketing and finance capacity building	*Stable quality* *capture of higher prices make up for reduced production*

Please note that a detailed market study was conducted to support the project, it includes a detailed review of mode and business cycles for the target crops. Section 3 of the market study (Annex 19) focuses on access to credit for farmers, including barriers/ problems faced by farmers. The barriers analysis also integrates the point of view of MFIs, which have been interviewed. Both farmers' and MFIs' interviews demonstrate an interest to provide/ access agricultural credits, providing training and support to farmers, and improvements to the production side as failure is a key cause for the none-repayment of the credit.

Based on the field missions and market analysis, the following interventions were designed within OCRI to specifically address the barriers to agricultural credit access:

Barriers to credit access	**Solution proposed by OCRI**
MFIs are more reluctant to provide loans to individual farmers than to farmers organised in efficient cooperatives	Support and training to organise and register farmers into local, municipal and regional cooperatives to organise the production and sale, and to develop business,

	finance/ access to credit, and marketing skills (Output 2.1)
MFIs have indicated that farmers often lack financial education, have limited capacity to put together bankable business plans, and to provide regular repayment	Busines and financial management training to ensure farmers develop bankable business plans; close follow up of OCRI farmers (through FNDA) to ensure they implement their financial and business plans (developed through FBS) and that they are following their scheduled loan repayment (Output 2.1)
MFIs and farmers indicate the difficulties for farmers to provide the required collaterals for a loan	FNDA will provide a guarantee covering 50% of the loan amount for OCRI farmers, quality control of loan application, and reduced interest rate (Output 1.2)
MFIs and farmers are aware of the negative effects of climate change on crop yields; changes in rainfall patterns and other climatic parameters have already caused lack of credit repayment	Technical training on increasing productivity and producing quality products – especially for maize, mangoes, cashews and shea nuts (Output 1.2)
MFIs and farmers are aware of the negative effects of climate change on crop yields; changes in rainfall patterns and other climatic parameters have already caused lack of credit repayment	Provide high-quality, climate-resilient seeds from national institutes (Output 1.2)
MFIs and farmers are aware of the negative effects of climate change on crop yields; changes in rainfall patterns and other climatic parameters have already caused lack of credit repayment	Training on climate-resilient production techniques ensuring pest control, irrigation, protection against strong winds and extreme rainfalls, among others (*Output 1.2*)
Farmers and MFIs are worried of a lack of credit repayment	Create bi-annual forums to connect producers/ cooperatives with wholesalers/ retailers to develop market opportunities, facilitate crop sale, and negotiate price and contracts (*Output 2.2*). This will not only enhance revenue but also ensure stable and increased income to repay credit
Farmers in the target communes have access to limited financial services for agriculture	Provide FNEC grants to finance the implementation of climate-resilient agricultural and ecosystem restoration micro-projects (Output 3.2)

Component 1 Low carbon climate Resilient Crop production enhanced and Ecosystem services restored in the Upper and Middle Ouéme

To enhance climate-resilience and reduce emissions on the Ouémé Basin, an ICRM approach – including waterworks, agroforestry and CRA – will be implemented in selected municipalities of the Ouémé Basin to provide benefits not only on project sites but in downstream area as well. Floods will be reduced, soil erosion limited, access to water improved, agricultural productivity enhanced, and as such climate change vulnerability and impacts reduced. There are 95,000 ha of degraded lowland[57] and riverbanks area in the Upper and Middle Ouémé which can be restored and made climate-resilient through overall improved soil and water management, including waterworks and agroforestry on the riverbanks (Output 1.1) and CRA (Output 1.2); including the 5,320 ha under the MAEP projects funded by IFAD. The target area for OCRI (95,000 ha) was selected because it can be subjected to surface water mobilization through micro-dams, water retention of variable size, and water management (soft and hard) infrastructures to enable climate-resilient agriculture, agroforestry, and counter-season horticulture, in the context of climate change, while at the same time improving water filtration in soils and vegetation cover to buffer communities against floods, heat and water scarcity. This estimation (95,000 ha) takes into account soil erosion problems and risks in the area.

Within this target 95,000 ha, the project will set up the following:

- 30 new surface water collection structures are built: 8 in Copargo, 11 in Djougou; 8 in Glazoue; 2 in Zangnanado; 1 in Zogbodome

- 23 surface water collection structures are rehabilitated: 5 in Copargo, 7 in Djougou; 10 in Glazoue; 1 in Zangnanado

- 680ha of irrigated plots are established: 200 ha in Copargo, 170 ha in Djougou; 160 ha in Glazoue; 25 ha in Zangnanado; 125 ha in Zogbodome

- 14 water sources are protecter: 2 in Copargo; 14 in Zangnanado; 42 in Zogbodome

- 44 artesian boreholes are built

- A total of 9,000 ha of degraded land are reforested including: 1,500ha in Copargo; 1,750ha in Djougou; 300ha (OCRI) and 680ha (MAEP) in Glazoue; 600ha (OCRI) and 1,360 (MAEP) in Zagnanado; and 850ha (OCRI) and 1,960ha (MAEP) in Zogbodome

This is based on the results from the various field missions conducted during the project development phase, related to area available within each commune, need for water access or water protection infrastructure, and degraded riverine forests to be restored.

Please note that all project interventions for waterworks, reforestation and CRA will take place on land that either belong to the Government of Benin and is managed by the target municipalities (letters from municipalities have been received in this regads)) or that belong to the beneficiary farmers. Please refer to Section 1.8 of Annex 2 for details on land tenure systems in Benin.

A vulnerability assessment was conducted on each project site during the FP development phase (see Annex 2 Sections 4 and 5). Its results will be refined with a site specific assessment of resilience in the project sites to be undertaken at the start of the project using the SHARP tool. This will aim to increase the understanding of the prevailing livelihood conditions of smallholders, as well as their resilience and adaptive capacity levels. The tool will serve to identify the main areas of vulnerability in the selected municipalities. The results will support the targeting and decision-making on which of and where the proposed waterworks and CRA are most needed and identify who need them the most. The results will also support the refinement of the M&E strategy and set a project baseline for key M&E indicators with primary up-to-date data.

CRA and agroforestry

CRA and agroforestry techniques will be implemented to increase productivity of maize, cassava, cowpea, chillies, okra, green vegetable, tomatoes, yam, shea, mango and cashew. As indicated in the table 3, most suited CRA practices have been identified for each commun based on climatic hazards and climate change impact on crops as well as their strengths and weaknesess. Although in general farmers tend to use similar adaptation measures in Upper and Middle Oueme, some of them are context-specific based on different climate hazards. For instance, for vegetal crops Zagnanado farmers included adaptation measures such as raised boards and construction of dikes for water control, as it is more affected by flodding; while Diougou, among other adaptation measures farmers included short cycle seeds and targeted watering/irrigation, which are CRA practices more adapted to dry spell, drought and heat. CRA practices

[57] Lowlands are defined as "inland valleys, flat or concave with temporary or perennial flow axes, which are flooded for periods of at least several days of the year, and in which soils with hydromorphic characteristics and a relatively small catchment area are found" (APRM / Direction Génie Rural, 2010).

indicated in the Table 3 will be further fine tuned at the inception phase of the FFS sessions, through a community vulnerability assessment, which is the first FFS activity to update the adaptation measures based on the specific current farmer needs. FAO has vast experience in working on CSA practices all over the world and in Benin and, particularly for Benin, has developed the CSA guidebook[58] which identifies the key CSA practices that have proven to be successful in Benin, as per figure below. The results of this guidebook has been considered, toghether with field missions carried out in the target areas, to prioritize the CSA best practices in OCRI.

. These options were identified and assessed for their degree of acceptance by small scale farmers in Benin[59]. Agroforestry and the diversification of crop varieties will be implemented to ensure a broader source of crop resilience to the uncertain occurrence and effects of extreme weather events[60]. The development of agroforestry systems will be considered through the design of dynamic vegetation models that integrate both net primary production and forest yield approaches. This would allow on the one hand to calibrate and adjust the biogeochemical processes (regulation of greenhouse gases) and biophysical processes (regulation of water and energy) to be implemented for sustainable management of agricultural ecosystems, forests, and on the other hand to simulate forest biomass, primary and food production, the water and nutrient cycle, the effects of fires, insect infestations and extreme events, the evolution of biodiversity as well as climate feedbacks. Water-holding capacity of soil will improve, and soil erosion will be reduced. The agroforestry systems to be promoted by OCRI projects are briefly presented in Table 5.

Table 5: Agroforestry models to be promoted by OCRI

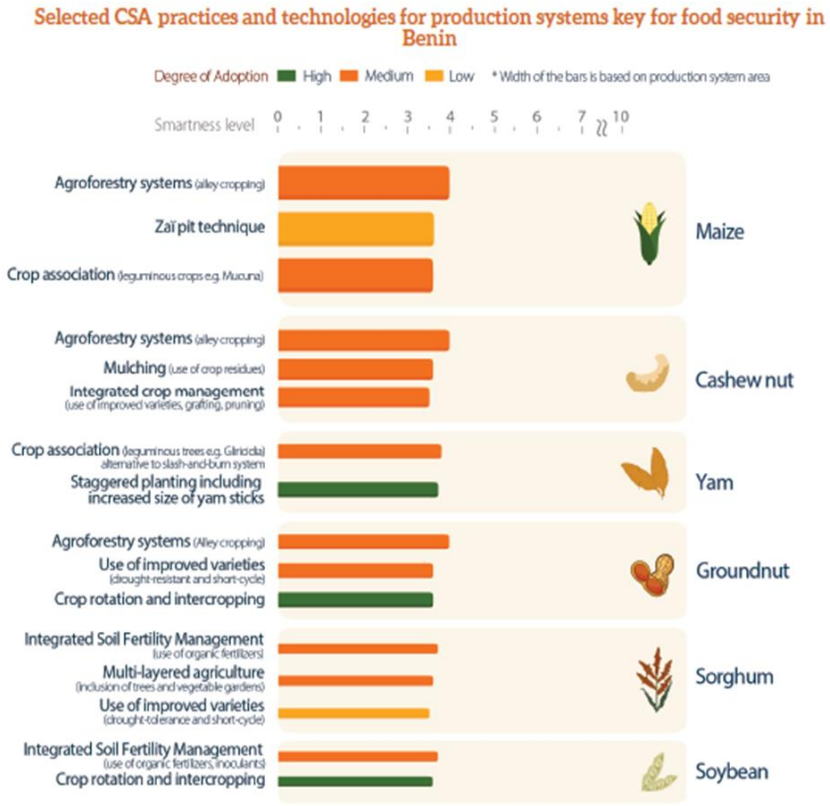
Baseline cover	After-project cover
Cropped dryland: • Maize 56% • Tubers (Manioc) 21% • Cowpea 18% • Vegetables 5% • Fertilisation: 25 kg NPK (fertiliser); 50 kg NPK (manure) / ha*y • Farmer type: subsistence	**Agroforestry:** • Baseline crops + inputs + • Mango 5% • Cashew 5% • Shea 5% • Fodder tree 5% • Farmer type: semi-commercial

These techniquesresult in reduced surface runoff and enhances soil moisture, which in turn improve productivity of **maize, cassava, cowpea, chillies, okra, green vegetable, tomatoes, yam, shea, mango and cashew** (see details of practices in the FS, Section 7). 130 FFS will be implemented per target municipality (spread between selected villages), each lasting 4-to-5 months (following length of the growing season).

[58] https://www.fao.org/3/CA1323EN/ca1323en.pdf

[59] FAO, ICRISAT, CIAT. 2018. Climate-Smart Agriculture in Benin. CSA Country profiles for Africa series. International Center for Tropical Agriculture (CIAT); International Crop Research Institute for the Semi-Arid Tropics; Food and Agriculture Organization of the United Nations (FAO). Rome. Italy. 22 p.

[60] Ratnadass A, Fernandes P, Avelino J & Habib R. 2012. Plant species diversity for sustainable management of crop pests and diseases in agroecosystems: a review. *Agronomy for Sustainable Development.* 32: 273–303.



Agroforestry and CRA systems also directly contribute to reducing emissions through no tillage practices and discontinuation of biomass burning; better residue management practices; reduce deforestation caused by agriculture expansion caused by low productivity; and increase carbon sequestration through enhancing existing tropical moist deciduous forest area, improving vegetation coverage and soil quality by planting trees

The activities under component 1 will support reduce emissions as follows: (a) improved CRA practices to enhance agricultural productivity, including the development of small irrigation system, corresponding to emission reduction by 52 587 tCO2eq over 20 years; (b) Strengthening degraded river banks and restoring perennial parkland land with additional trees and SLM/SFM practices, resulting in a direct reduction in emissions of approximately 1 469 260 tCO2 equivalent (tCO2eq) over 20 years (per year which corresponds to 73 463 tCO2eq per year). Additional reduction in emissions of approximately 29,383 tCO2eq over 20 years is expected from phasing out mineral fertilization; and (c) improving the management of degraded forest over an area of 9 000 ha, which is subject to severe anthropic pressure, contributing to a reduction emission by 232 518 tCO2 eq over 20 years.

Overall, Component 1 of the project is expected to create a carbon sequestration result of 1,783,633 tCO_2eq over 20 years compared to baseline. Consent to intervene in project targeted areas have been provided by the 5 municipalities.

<u>OUTPUT 1.1 Waterworks and tree plantation to protect river banks and secure water access</u>

Please refer to Annex 2, FS, Section 7, as well as Annex 17 for specificities of the waterworks and their location. An O&M plan is also presented in Annex 2, section 8.

Under this Output, ecosystem goods and services in the Ouémé Basin will be restored and enhanced: floods and water scarcity risks will be reduced, and small scale irrigation facilitated, soil fertility and moisture will be improved, tree cover increased, hence enabling climate-resilient agriculture (CRA) and ecosystems restoration. The following activities have been identified as best solution to the adaptation problems in the Upper and Middle Ouémé :

1.1.1 Build water harvesting and retention infrastructures: (target of 680 ha irrigated land plus 1,320 ha with MAEP co-financing).(Executing entities: FAO & MAEP) The project will subcontract relevant local companies to build hard and soft infrastructures such as micro-dams (length of 100 to 150m, to capture 30,000 m^3 to 80,000 m^3 of water, in line with FAO safeguards for risk category B), dykes, wells and surface boreholes, as well as 'soft' contour ploughing, and stone lines that can easily be reproduced and maintained by the communities (see training under Activity 1.2.3). These

infrastructures will enable CRA (see Output 1.2), in a context where water scarcity is increasing and seasonal shifts affect the agricultural calendar, especially with the late onset of the main rainy season, and the disappearance of the short rainy season in Middle Ouémé. Water retention will also enable counter-season horticulture, a women-oriented activity, as well as facilitate recharge of underground water. The waterworks and their localisation have been pre-identified in Annex 17 - Feasibility waterworks; this preliminary study will be refined, reviewed and adjusted, during the project inception phase (year 1), to confirm the specific location and type of the waterworks (**s**election criteria are provided in the Annex 17). Simple adaptation techniques, like contour and mulching, that also contribute to improve water retention especially in drought- and flood-prone areas, like Upper and Middle, as demonstrated in previous projects, will be promoted on all project sites (also to be determined during the project inception phase). This activity will support reducing emission as a result of reduced tillage, better residue management practices and no burned residue on improved annual cropland with irrigation.

1.1.2 Strengthen degraded river banks and restore land with trees. *(target of 5,000 ha plus 4,000 ha with MAEP co-financing)(*Executing entities: FAO, MAEP, MCVDD). Well functional riparian forest provides essential goods and ecosystem services of multiple benefits (such as shelter for pollinators, wild animals, medicinal plants, Non Wood Forest Products) to local communities. This will reduce risks of erosion during heavy rainfall events, which become more frequent especially during the middle and end of the rainy seasons; and improve water recharge for boreholes. This activity will especially focus on Upper Ouémé and contribute to reduce flood risks in Middle and Lower areas, and as such will also support protect the FAO GEF project currently under development. The exact locations of the sites will be selected during the inception phase through selection criteria already identified (see feasibility study section 8.1.2). In areas where the FFS are not close to the river, trees will be planted by workers hired by the project on river banks and fields to restore vegetation coverage, reduce flood risks due to heavy rainfalls falling on bare land, restore fertility, provide shade and keep moisture in a context where heat stresses and evapotranspiration increase. The restoration of river banks using climate-resilient and high value tree species was identified as a best practice on the UNEP SAP and PADAAM projects; the OCRI project will replicate good practices from these projects to upscale reforestation along the Oueme River (please refer to sections 7 and 8 of the feasibility study for a list of best practices and lessons learnt). Reforestation sites will be determined at project onset and related land and tree tenure practices assessed and enhanced. In line with Benin national forest resources (including riparian forest) management policies and regulations, river banks restoration and protection will be enhanced. This activity will specifically target degraded river banks. Moreover, trees will be planted on farmers' field to restore vegetation coverage and diversify income stream (Component 2).

Tree planting activities will directly contribute to reduce Benin's GHG emission, thereby supporting the achievement of INDC's goal. The restoration of degraded riverbanks and fields with agroforestry systems (Activity 1.1.2) will contribute to deepening the existing carbon sinks through the plantation of fruit trees and the increase in the density of parkland. This activity contributes to sequester 1 469 260 tCO2-eq over 20 years (which corresponds to 73,463 tCO2eq per year). In addition, the overall improved management on 9 000 ha of degraded forest supported by the project sequesters 232 518 tCO2-eq.

This activity will be coordinated by the MCVDD and its local branches, through the OCRI platform (see component 3). Planting sites will be selected based on their level of degradation (where tree density is less than 25 trees/ha), interest for the restoration and of tree cover is acknowledge by the local communities and tree the related goods and services have proven socio-economic value for the local communities and the Ouéme basin ecosystems. Tree nurseries will be set up through activity 1.2.4 (see below).

<u>OUTPUT 1.2 25,250 farmers capacitated to implement climate resilient agriculture, agro-forestry and sustainable land management over 95,000 ha</u>

Under climate change conditions, agricultural productivity in the Ouémé Basin is projected to decline by 25%. Under this Output, 25,250 selected farmers will be trained through the FFS approach, and implement (on their own field) CRA and agroforestry, to restore soil fertility, retain moisture, provide shade; CRA will focus on maize, cassava, cowpea, chillies, okra, green vegetable, tomatoes, yam, shea, mango and cashew, which are the main cultures in the target area**;** irrigated agriculture and counter-season horticulture will be implemented, supported by the water schemes set up under output 1.1.

Agroforestry, using cashew, mango and shea trees, will not only stabilise soil, especially along the riverbanks, and improve water retention – thereby reducing risks of flood in the Middle and Lower Ouémé – but it will also support new income streams for the beneficiary communities. Indeed, high-value tree species grown using climate-resilient techniques (CRA and agroforestry) will be planted along the Ouémé River and on fields, as well as other indigenous species, to improve crop productivity and support sustained income – to be valued under Component 2 of the project. Agroforestry will also support increase carbon sequestration and reducing emissions from additional tree planting and no tillage.

The proposed project will use the FFS approach as key methodology for field activities, in conjunction with the Dimitra Clubs approach. The FFS approach ensures a continuous process for updating the information base needed to cope with climate impacts. It is considered the most appropriate approach to implement ground-based activities with farmers on climate change adaptation and mitigation as it is flexible, focused on learning by doing, it responds to farmer needs, it is context-specific, it helps farmers to organize collective action (i.e. for natural resource management), it focuses on farmers' decision-making and helps the community to develop adaptation plans. Due to its flexibility, innovation, adaptive capacity to different contexts, the FFS approach fits very well to cope with climate change. Based on identified local community priorities and farmer needs related to climate stresses and climate threats on production and natural resources, the approach aims at find out context-specific solutions. Starting from a community needs assessment, which is the basis of the FFS curriculum development, FFS farmer experiment different options in the field and adopt those which are more promising to face climate unpredictability and impact.

The methodological alliance between FFS and the Dimitra Clubs has been tested in DR Congo, Mali, Niger and Senegal, mainly in the framework of climate-smart and resilience projects. This alliance has led to promising results in terms of improved access to information and knowledge about climate-smart agricultural practices and innovations as well as enhancing the leadership and empowerment of rural women. The FFS enable Dimitra Clubs' members to access technical knowledge by adopting more sustainable agricultural practices and better seeds varieties, improve their management of natural resources and develop better marketing skills. This valuable knowledge and experience that arises within the FFS is discussed within Dimitra Clubs that facilitate the scaling-up and broader application of these practices at community-level, particularly among the most marginalized groups such as rural women and youth.

The combination between FFS and Dimitra Clubs enhances community participation, inclusion, gender equality and the adoption of more sustainable agricultural practices, thus making it more possible to effectively contribute to improve livelihoods and reduce rural poverty. The Dimitra Clubs improve rural women and men's capacities to organize, express their needs, exchange information, and influence decision-making processes. Thanks to this approach, rural women have improved their access to services, information and resources and enhanced their leadership, voice and participation in decision-making processes at different levels (households, organizations and communities). As the gender dimension is inherent within the Dimitra Clubs' approach, this methodological alliance enables rural women farmers to enhance their capacities and knowledge on improved agricultural techniques so that they can become better farmers and enhance their yields while also enhancing their leadership and organizational capacities, crucial to influence decision-making processes.

The Dimitra Clubs allow women to get together and discuss issues that are important to them. The results of these discussions are also showcased at village meetings with the presence of the whole community, including men and village chiefs. This mechanism enables women's voice to be heard and recognized at community level.

Integrating climate change adaptation and mitigation into a FFS curriculum begins when FFS Master Trainers and Facilitators introduce the FFS programme to the community and the subsequent ground working activities which take place. During the preparatory stage, the Baseline Climate Change Community Vulnerability Assessment is carried out, through a Community Resource Mapping exercise with the community. The assessment includes site specific consideration on the community exposure and sensitivity to weather stresses, based on the analysis already carried out at formulation stage. Baseline assessment exercises are used to identify site specific adaptation strategies and options to be included in Field Studies (through comparison among plots) and Special Topics (specific topics to be deepen) and to be integrated in the curriculum. Regardless of the field studies that are chosen, it is important to include the collection of weather information as part of the FFS activities, including the use of thermometers and rain gauges, which are critical, simple and cheap, and tools to be used by farmer to monitor key variable of weather patterns. At the end of the FFS learning process, the community develops its adaptation plan based on its own experience and taking lessons learned from experimentations in the field.

Low carbon climate resilient management of the targeted crops and trees identified in the formulation phase in the intervention areas, will be adapted to the different sites and improved through the FFS trainings in order to increase communities' resilience and to develop specific value chains (see component 2).

Some examples of field studies and special topics on climate change adaptation and mitigation to be integrated into the FFS curriculum are: Seed germination; Mulching and mulches; Moisture stress during the growing season; Responding to an increasingly uncertain start to the growing season with seed priming and dry seed; Site specific Adaptive Varieties – temperature and moisture stress tolerant and early maturing varieties; Impacts of extreme weather threats; Traditional knowledge on predictors of climate events; income and carbon sequestration; Improving nitrogen fertilizer management and production; Reducing emissions from enteric fermentation; Sequestering carbon in agricultural and forestry systems.

1.2.1. Train 15 FFS Master Trainers and facilitators (women and men).

Selection (see feasibility study section 8.1.2 for selection criteria) and training of 15 existing FFS Master Trainers (mix of agronomy, forest, land and water experts) (at least 30% women). Four training sessions (one week x session) are organized to refresh and update the Master Trainers on the FFS methodology and on the key technical issues needed by the project. These Master Trainers will conduct the trainings of facilitators (ToFs), which are described in the following activity.

Training of Master Trainers will include also basic finance and business matters – particularly related to farm management. As Master Trainers have an agronomic background profile, during the training of facilitators (see activity 1.2.2) they will be supported by external subject experts on financial/business matters, similarly this external support will be provided to facilitators during the implementation of FFS.

Master Trainers and selected Facilitators (see activity 1.2.2), will create a network/association to operate as technical business advisors to secure the future scale up and sustainability of the project. Specifically, the network/association will assure the support of the future activities linked with the financial facility (see component 3), which will provide financial support to maintain the network. The mechanism will be formalized through agreements during the project implementation to assure the sustainability of the support.

1.2.2 Training of 250 Facilitators (at least 40% women)– that is 50 per selected municipality- will be trained. First, a training curriculum will be developed based on the key priorities of the Ouémé Basin. This activity will include a validation workshop, which involve technical experts and FFS Master Trainers. Secondly, according with the curriculum, the training material will be compiled and adjusted, covering the following thematic: FFS methodology, low carbon climate-resilient agriculture (CRA) for maize, cassava, cowpea, chillies, okra, green vegetable, tomatoes, yam; agro-forestry with shea, mango and cashew; sustainable land management (with focus on river banks); and construction and maintenance of small waterworks (as per operation and maintenance manual developed in Annex 2, Section 8). Key framework of FFS trainings will be the agroforestry approach which combines crops and trees producing a mutual benefit as the tree roots bring up water and nutrients from deep in the soil, their leaves add to the soil's organic matter, pruning from trees and shrubs can be used as mulch or to make compost. In addition, planting trees decrease land degradation and tree fruits are used for value chain purposes (see component 2) as well as providing mitigation co-benefits. CRA will focus on maize, cassava, cowpea, chillies, okra, green vegetable, tomatoes, yam, shea, mango and cashew. Different CRA technologies and agricultural practices will be locally adapted and adopted, such as construction of anti-erosion bunds along the contour lines; stabilization of anti-erosion bunds through the planting of agroforestry species including those that fix nitrogen ones; application of mulch using crop residues, practices of fertilizer micro-dosing; the zai techniques, cover crops; protection of water sources through the planting of adapted low water-consuming species.

FAO has already designed several training materials for FFS, including on Land and Water management and Climate Change, which will be easily adapted to the local context in Benin. The material will include 6 modules[61], with gender-sensitive chapters to ensure the full participation of women to agricultural activities (e.g. focusing on horticulture or processing of nuts and fruits); it will also comprise demonstration video. The training modules will be disseminated on the knowledge portal of OCRI platform (Activity 3.1.1) and regularly updated during the project lifespan, based on lessons learned from the project sites, new site specific technologies for CRA, and peer-to-peer review as the material will be disseminated through the OCRI platform and subject to expert examination. Finally, the modules on CRA will explain the various 'starter kits', with specific adaptation options and seed varieties, based on the needs and specificities of their farm (that will be distributed under Activity 1.2.3. Once the training modules are ready for use, 250 facilitators (50 per municipality) will be trained: the project will organize 10 Training of Facilitators (ToF), for a duration of 5 months each (sequential training - 1 week per month) to follow the entire production season. Each ToF will be attended by 25 facilitators. Based on the country capacity, more ToFs can be organized simultaneously in the various municipalities. Once trained, the facilitators will disseminate their new knowledge on field schools set up under Activity 1.2.3: each facilitator will implement 2-to-3 Farmer Field Schools (FFS) per year, lasting 4 to 5 months each. These facilitators will come from local extension services in forestry and agriculture, local rural irrigation and waterworks department of the Ministry of Agriculture, Livestock and Fisheries (MAEP), young educated community members and leads, technicians or members of agri-businesses. They will be chosen based on their willingness to become OCRI facilitators to continue the training beyond the project's lifespan.

[61] CRA technologies have been identified by FAO-Benin, and compiled in the following manual, which will be used to guide the trainings: FAO (2017). Pratiques et technologies pour une Agriculture Intelligente face au Climate au Benin.

The common selection criteria for facilitators are as follows: a) have agricultural training of some kind, formal or informal, or have some level of advanced skills, knowledge and experience in agriculture/forestry; b) be technically competent for the agroecosystem at hand; c) be available to facilitate the FFS process; d) be able to share experiences and connect well with other community members; e) have good people skills and an aptitude for informal and participatory ways of working; f) have at least some reading and writing skills; g) speak the local language; h) live in the local community; i) have a dynamic and confident personality. Priority in selection will be given to women to proactively ensure parity in representation among the facilitators.

1.2.3 Implement climate resilient agriculture, including agroforestry, to enhance agricultural productivity under climate change and reduce emissions (*MAEP cofinance)*. Farmers in the target sites will be trained and receive agricultural input. Training will take place in 650 farmer field schools (FFS) plus 360 FFS set up by MAEP, including 100 schools dedicated to women. The 250 facilitators trained under Activity 1.2.2 will disseminate the practices through the established FFS to a total of 16,250 farmers (25 farmers per FFS) – including at least 50% women – spread over the 5 target municipalities; an additional 9,000 farmers will be trained in the FFS set up by MAEP. Beneficiaries of the training activities will be selected based on the following criteria: vulnerability to climate change measured as a plot size <2 ha, their willingness to participate, their availability and their interest in developing climate-resilient farms; the sharing of same needs/priorities related to the production; and the strong motivation to follow the entire training cycle. These selection criteria will be further refine at project onset by FAO. 20 FFS per municipality will be dedicated to women, as they are more vulnerable to climate change; training will focus on vegetable production and counter-season horticulture, production, processing and storage of nuts, fruits and crops like cassava.
Training sessions will be tracked through attendance registers. In addition, a tool called "logbook" is used in which the facilitators summarize each day of animation session. Finally, at the beginning and at the end of each training cycle a knowledge test is carried out through incoming and outgoing questionnaires involving all participants, allowing to estimate the improvement of general knowledge and technical skills acquired by each participant. Also, a final evaluation is carried out for each FFS at the end of the training cycle.

The 16,250 training beneficiaries trained under the OCRI FFS will also receive farmer's starter kits, including small tools like spade, water can, trowels, wheelbarrow, as well as climate-resilient seeds. Selected based on demonstrated interest and capacity of the members, 150 FFS will receive an introduction to the key elements of the business. Although a special focus on business will be dedicated during the second cycle of FFS (see activity 2.1.1), key elements of finance, marketing and business management concepts will be introduced into the curricula of the first cycle of FFS, based on Farmer Business Schools modules. These modules include basic financial literacy, farm accounting, market plans and farm investment planning, with special focus on developing women's entrepreneurial capacity.. In parallel, linked to the FFS groups, the VSLA approach (Village Savings and Loan Associations) will be developed. The VSLA allows members to take out a loan and develop small income generating activities. It retrieves traditional ways of saving and manage small amount of money at group level and allows to consolidate and develop basic notions of business. When associated with Farmer Business Schools modules, it creates the initial conditions for improving farmers' capacities to develop small local development projects that they can later present to microcredit institutions (Component 2 and 3).

Key steps of setting up and operating VSLAs are: a) Preparatory phase (4-6 weeks): facilitators assess community needs, select beneficiary communities, provide background information to local leaders and select VSLA groups to be formed; b) intensive phase (14 weeks): VSLA groups receive training structured in six modules, during which members elect their leaders, draw up their internal rules and define procedures that will govern their activities. They learn how to manage the solidarity fund and share buying / savings and loan meetings; c) supervision phase (up to 36 weeks): it consists of a development phase and a maturity phase, each lasting approximately 18 weeks. The facilitator continues to assist the group by attending some meetings. At the end of the cycle, if the group chooses to enter a second cycle, an assessment is carried out to determine how well the organization should support it.

Introducing climate-resilient agriculture (CRA) through Activity 1.2.3 would contribute to shifting cropping practices on a variety of crops. Emissions will be sequestered from area undergoing additional tree planting to enhance tree cover through agroforestry practices and implementation of perennial fallow agroforestry system Emissions will be avoided from no tillage practices and discontinuation of biomass burning. The carbon balance of this activity corresponds to a reduction of emission by 52 587 tCO2-eq over 20 years.

1.2.4 Increase access of adapted quality seeds and plant propagation material. For tree seeds and propagation material (eg shea), the project will rely on MCVDD who has already established a national tree seed collection and supply unit. The project will strengthened the existing system by improving the technician's and farmers' knowledge on seed sources identification, mother trees selections, seed harvesting – cleaning – storage, control and certification of seed genetic and physiologic quality. Selected farmers will be organized into seed producer groups. Given that shea seeds are characterised as recalcitrant, particular actions will be developed to ensure that the seedling producers receives viable seeds. Further to propagation through seeds, farmers will be trained to apply Farmer Managed Natural

Regeneration (FMNR). This will also include grafting operations on farm to shortened the production cycle and enable the production of desired fruit straits.

For Mango, Cashew, annual crop and vegetable seeds and propagation material, the project will collaborate with *l'Institut National de Recherche Agricole du Benin (INRAB)* through the synergies that will be put in place by the OCRI with the MAEP projects financed by IFAD to prepare the technical descriptions of the varieties that will be procured for the farmers. MAEP confirmed that INRAB is already supporting their projects with aspects related to seed supply. Technical description

The project will also set up village nurseries for the production of quality seedlings; then, to produce tree seedlings, the project will build one tree nursery of 10,000 tree/year capacity in each target commune; the existing nurseries attached to the local Forest Department services will also be mobilised to grow additional tree seedlings as needed. This activity will benefit from the MAEP projects financed by IFAD experience on seed and seedlings supply. This will enable communities to continue climate-resilient farming beyond the project's cycle.

Component 2: Climate-resilient and gender-sensitive value chains, supporting farmers' livelihoods in the Upper and Middle Ouémé

Following the trainings in FFS (under Output 1.2), 100 best-productive farmers field schools, among the 150 which attended the training and set up the VSLAs (see activity 1.2.3) and the 100 FSS dedicated to women, with priority given to the ones (30) associated with the Dimitra Clubs, will be selected to participate in a second cycle of training in Farmer's Business Schools (FBS) in order to reinforce their business capacity, create or consolidate cooperatives and reinforce values chains. Each FBS will train 25 farmers, organised in cooperatives[62]. By investing in training on marketing techniques and access to finance – which will also be supported by MAEP through an additional 100 FBS and by reaching out to MFI through FNDA to secure provision of micro-loans to trained cooperatives – , the project will secure farmers' livelihoods and income streams, thereby reducing poverty, food insecurity and climate change vulnerability. The strengthening of agri-businesses and climate-resilient farms, combined with the demonstration of the project's economic benefits, through rigorous M&E, will also boost private sector's willingness to invest in CRA and ICRM in the Ouémé Basin, by providing resources to the FNEC for climate-resilient projects, under Component 3. Finally, trade agreements between farmers, agri-businesses, and sellers of agri-products will be facilitated through organizing match-making municipal forums in the project sites.

<u>OUTPUT 2.1 Farmers and cooperatives' income stream diversified, enhanced, and secured in the face of climate change</u>

As productivity improves under Component 1, and high-value products, including maize, shea, mango and cashew, become available for sale, farmers will be organised in cooperatives (or Farmer interest groups – FIGs), and capacitated through FBS to develop new income streams, and sell their processed, packaged products on the local and regional market, at best possible price. An innovative App – FarmTree App – will also be used to ensure climate-resilient farm plans that are cost-effective, profitable, while responding to the impacts of climate change; the App will also serve to demonstrate the economic benefits of sustainable land management and CRA in order to incentivise private sector investments (under Output 2.2 and 3.2). As packaged, well-marketed products create an added-value, private income will increase, enabling re-investment in project activities. Support to smallholder farmers and cooperatives, particularly women and women's cooperatives, will be provided though capacity building and technical assistance for accessing micro-credits that can be invested in CRA techniques, and equipment to increase the sale value of agriproducts. Women and women's cooperatives will be supported with capacity development on financial management and business plan development.

<u>2.1.1 Increase income of 5,000 farmers through training on business and marketing techniques and equipment using FAO farm business schools (FBS) methodology: 100 (2,500 farmers) FBS plus 100 (2,500 farmers) from MAEP co-financing</u>. The activity will train 5,000 farmers. The training will take place on the 100 most-productive FFS, with due consideration of gender considerations and ensuring that productivity criteria also take into account women's multiple roles and time burden. FBS will be conducted by FFS facilitators, with the support of Master Trainers and external experts on business and marketing management modules. FBS will be set up and farmers not yet organized in cooperative will be supported to set up cooperatives (approx. 100 cooperatives) around key value chains: mango, shea, cashew and maize. Cooperatives will be reinforced and consolidated to be able to be autonomous and well equipped to face the market challenges. The learning programmes will be designed to boost the productivity and profitability of these high-value products, by developing business and marketing skills among cooperatives, supply and demand, income/expenditure book and operating account. Processing, packaging and storing equipment for shea, cashew, mango and maize will be provided to the cooperatives in need, with priority given to women's cooperatives. Training

[62] The project will work with existing cooperatives, or will help organizing farmers into cooperatives for maize, shea, cashew or mango.

on processing, packaging, operational and financial feasibility, commercial negotiation, labeling and marketing of agri-products will also be provided to increase product value on local, regional and international markets. Specific attention will be given on improving women's capacity to add value to their products (e.g. shea butter by producing off-season or cassava flour) to reduce their work burden through use of labour-saving techniques and technology and to develop their entrepreneurial capacity. Processing and storing interventions will not only help farmers boosting their costs and sales, but also protect agri-products against climate change impacts, like floods, heat, and pests.

In addition to the establishment of cooperatives and the strengthening of the capacities of their members, the FIGs will be established to strengthen ties with the market and facilitate the marketing of products. Farmer Interest Groups (FIGs), independent group of farmers with a shared goal and interest, will be selected based on their demonstrated entrepreneurial capacity, and trained using the FAO/INRAE (Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement) Innovator Handbook which guides groups through the development of a business plan for their collective initiative. The handbook offers advice on consumer engagement, building markets, innovative finance, guarantees and certification, processing, packaging, logistics, formal registration of the group, advocacy and partnerships, input supply, and engagement with research. The idea behind this approach is that there is a diversity of market channels that can be pursued based on the identified products and markets (from own-consumption, to local markets, to national markets and to export). Willingness to buy OCRI products will be verified at the project start based on market analysis (see annex 19), summarized in Table 2 (SWOT assessment of selected key value chains). These FIGs will be trained to identify transparent intermediaries who can link them to export markets (e.g., organic juice producer in the south of Benin selling organic and fairtrade certified origin juice to the French Monoprix supermarket) as well as how to begin to develop these activities themselves. For those cooperatives that are most advanced, the project will support the hiring of a business coach' who can facilitate the cooperatives access to different markets and provide a marketing service to the farmers. This approach will effectively work like a business incubator as this incubator could also offer seed financing for the most promising ideas that emerge from each round of training.

FBS will be selected based on the following criteria: a)) FFS groups (or at least important number of members of the groups) which are already organized or connected with cooperatives or structured producer organizations; b) FFS groups which are producing the crop/tree included in the selected value chains and are willing and aware about the steps needed to sell products to the markets. Letters of interest to participate to the activities of the FFS have been received by cooperatives.

2.1.2 Improve access to micro-credit and investments for agriculture (*MAEP) cofinance*). The 2,500 farmers trained under Activity 2.1.1 will also receive training on financial management for cooperatives, and developing business plans to boost their financial profits (through better financial management) and to address current barriers in accessing micro-credits (see B.1 on barriers; as well as Annex 19 Section 3). This activity will improve farmers' access to finance tools like micro-credits or to access FNEC's resources, under Component 3; these fund can be invested in necessary equipment to boost their profitability, like processing equipment, storage, label for the products, a delivery truck, etc.

The main microfinance institutions in Upper Oueme and Middle Oueme - Association for the Promotion of Community-Based Savings-Credit (P.E.B. Co-BETSHEDA) and NGO SIA N'SON Microfinance, Savings, Credits Advice – ensured their availability to provide loans in supporting value chains of mango, cashew, shea and maize. In addition they will provide direct support to the project through the following services: a) provide expertise on credit products adapted to project beneficiaries; b) facilitate the conditions for granting loans; c) make credit managers available for awareness raising, orientation and training of beneficiaries.

Access to Finance will be facilitated by the FNDA and by Agence Territoriale du Developpement Agricole (ATDA). ATDA works with FNDA at the municipal level, to identify relevant projects that can receive agricultural micro-credits, and FNDA works closely with several MFI in Benin to ensure credit access to relevant farmers and cooperatives by). A letter of commitment from FNDA to cover 50% of OCRI's farmers loans, ensure low interest rates on credit, and provide quality control over loan application has been received in this regards. Please refer to Annex 2 Section 6 and 8 for further details on FNDA and ATDA as well as Annex 19 Section 3. Specific attention will be given to the possibility of micro-credit targeted at women and women's groups that provides innovative and alternative solutions to overcoming the lack of collaterals. financial training modules will be shared under the Finance Facility of OCRI platform, under Activity 3.1.2. A women-specific module will be developed to enable women's access to credit and buy equipment to support their activities in the processing of high-value nuts and crops.

In addition, among the 150 farmer groups which set up VSLA (see activity 1.2.3), the OCRI project will carry out an evaluation in order to retain the most efficient. Assessment criteria will be based on operational (organizational aspects) and financial performances.

1) Operational performances - analysis of the functioning of VSLAs: a) application of disciplinary measures (fines); b) mastery of roles and responsibilities by the members of the VSLA office; c) regularity of holding weekly meetings; d) quality of recording of financial data in the VSLA register by the secretary general; e)

stability of the office (number of members having left the office); f) cash management by the treasurer, g) management capacity; h) procedures for making decisions during meetings.

Financial performances: a) total amount purchases by all members during the cycle; b) total amount of assistance provided to members during the cycle; c) balance in the solidarity fund during the cycle; d) total amount of credits granted to members during the cycle; e) credit repayment rate.

2.1.3 Train facilitators (selected educated young) and national/local climate change experts (from relevant institutions eg MCVDD, MAEP) on the use of assessment and/or monitoring Instruments for Resilience (TreeFarm App are the identified tools).

The activity will train selected educated young facilitators and national/local climate change experts (from relevant institutions eg MCVDD, MAEP) on the use of assessment and/or monitoring Instruments for Resilience (TreeFarm App are the identified tools).

The FarmTree App enables climate-resilient agri-planning. It offers cost-benefits simulation of combining various crops and trees on the fields, based on climate change and agro-ecological conditions, and thereby enables a more efficient and profitable agriculture. The App will help farmers turn their field into a climate-resilient, high-profit landscape. The facilitators will train entrepreneurs and cooperatives on resilient farm planning methods (Activity 2.1.1); they will also use the App to provide on-the-field advises to individual farmers, who search ways to improve their profit. Moreover, through the App, the facilitators will collect evidence of the economic and environmental benefits of OCRI's interventions. These data will inform the development of information products geared towards the private sector, to incentivize investments in ICRM in the Oueme Basin (activity 2.2.1) and private sector contributions to climate-resilient projects (Output 3.2).

2 Facilitators per target municipality and 20 national and local experts from MCVDD and MAEP will be trained and equipped to use these assessment and M&E tools. Please refer to the feasibility study section 8.1.2 for selection criteria of the facilitators.

OUTPUT 2.2 Private sector incentivized to invest in climate resilient agriculture and resilient management techniques in Ouémé Basin

This Output aims to boost private and public sector investments in OCRI activity – to secure long-term climate-resilient management in the Upper and Middle Ouémé, thereby reducing climate change vulnerability – by demonstrating the significant environmental and economic impacts of CRA, creating an exchange platform for farmers and sellers to discuss market opportunities and demands, and facilitate trade contracts.

2.2.1 Disseminate information products packaged for private sector to demonstrate the socio-economic benefits of combined waterworks, climate resilient agriculture and agroforestry; this will target private sector institutions such as investors and credit organisations, processing compagnies or buyers of agri-products, in the field of agriculture. Information generated by the project – including data collected through the FarmTree App (activity 2.1.3) and the project's M&E under Activity 3.1.1 – will be specially packaged (by a communication specialist) for the private sector organizations, including MFIs, agri-businesses, private donors and investors. Potential investors will be identified with the help of MAEP, under Activity 2.2.1. Information brochures, flyers, and booklets will then be developed and distributed via mail and email. The data from the rigorous M&E on land restoration and the results from OCRI project will be carefully collected, compiled and shared via the OCRI platform, set up under 3.1. Knowledge products will be packaged for specific target groups and shared to relevant stakeholders via email, brochures, OCRI platform, etc. The purpose of this activity is to incentive private sector investments in CRA in the Oueme Basin, by demonstrating the project's benefits especially on value chains (mango, cashew, shea and maize) for which private sector has an investment interest; it will also convince MFI that loans supporting ICRM and CRA are profitable.

2.2.2 Organise municipal forums to connect female and male farmers and small businesses to local and regional buyers (MAEP cofinance). The municipal forum will be designed to include a match making function that helps all stakeholders in the forum find the best business match. Relevant buyers will be identified under Activity 3.1.1 using existing sale networks and connected to farmers through the OCRI platform. The bi-annual municipal forums will be opportunities for producers to showcase their innovative climate-resilient production practices, and their resilient products, as well as to conclude trade agreements between farmers and buyers of agri-products, or receive new demands for alternative products from the buyers, based on market demands. Successful farmers from the UNEP SAP project in the municipalities of Djougou (same project site than OCRI) and Dassa-Zoume (close to Glazoue), will be invited to participate to the forum and showcase their agricultural methods and products. These farmers will be invited to OCRI-organized municipal forums to demonstrate their climate-resilient agricultural techniques. Selection criteria for SAP farmer field will be: implementation of at least 3 new climate-resilient agricultural practices; visible land improvement

(e.g. reduced erosion); 1 sustainable irrigation scheme in place; +20% agricultural productivity; and +10% income. Letters of engagement from buyers interested in purchasing OCRI crops have been received.

Component 3: An enabling institutional and financial environment established to promote and upscale climate-resilient management in Benin's Basins

To further root the OCRI approach in the Ouémé Basin, and upscale it to other sites, Component 3 will support the establishment of a multi-stakeholder coordination mechanism and platform. The platform, managed by MCVDD, will coordinate the ICRM works. A communication strategy including newsletters and events will be designed for the platform, which will also provide an online portal where knowledge products such as training material developed under Component 1 & 2, and data demonstrating the benefits of project's interventions, will be uploaded. Information generated by the project – including data collected through the FarmTree App (activity 2.1.3) and the project's M&E under Activity 3.1.1 – will be specially packaged (by a communication specialist) for the private sector organizations, including MFIs and agri-businesses. These partners will be selected respectively based on their belonging to the ALAFIA for MFIs and Benin Chamber of Commerce for agri-businesses. A long-term strategy will be designed to ensure the platform's continuation beyond the project, especially to continue ICRM efforts in the Oueme Basin. Through the platform, regulatory frameworks will be developed, and capacity building implemented for local extension officers. This will root the OCRI approach within all development processes implemented in its target municipalities. To combine institutional strengthening with availability of finance, a roadmap to expand FNEC's resources, which are currently made up of green-taxes, fees and government fund, among others, will be developed. The roadmap will also detail how FNEC can use its resources to implement projects (who can apply and what projects are eligible) to ensure FNEC specifically supports climate change interventions. The goal is to unlock finance to implement ecosystem restoration and CRA in the Oueme Basin in the long-term. Therefore, FNEC will be linked to OCRI platform, as its key financial mechanism to implement climate-resilient initiatives. Together with the other communication products and events, the platform will also be used to raise awareness on the importance of a gender-responsive institutional and financial environment and to promote women's role and participation.

To ensure the long-term financial replenishment, FNEC's capacity will be enhanced; as DAE, building FNEC's capacity is key to unlock future climate finance in Benin. Finally, to ensure the continuation and upscale of the ICRM approach, awareness-raising events will be conducted; the project will also reach out to other Basin Authorities in Benin to showcase OCRI project's impacts. Indeed, Benin includes several basins: Oueme, Mono, Niger, and Volta. The Volta and Niger basins are transboundary and therefore managed by several countries through an inter-African agency.
- The National Committee of Mono Basin is a recent entity established in May 2021
- The Niger Basin Authority is a multi-country institution, created in 1964. It is in charge of integrated development planning in the Niger Basin
- The Volta Basin Authority is a multi-country institution.

<u>OUTPUT 3.1 OCRI project institutionalised through a multi-stakeholder platform, regulatory frameworks and capacity building</u>
There is currently no coordination mechanism that allows concerted efforts to sustainably manage Benin's basins and to share knowledge and best practices for upscaling resilient land, water and agricultural management in watershed landscapes. The OCRI multi-stakeholder platform will thus be established to connect all relevant stakeholders engaged in land planning in the Ouémé Basin. This includes representatives from MCVDD FNDA and MAEP (committed to support OCRI through signed cofinance letters), especially their local extension services for agriculture, waterworks and forest management; the Oueme Basin Authority (OBA); and FNEC (for the on-granting facility – also committed to support OCRI through signed letter). These stakeholders play a key role in local development planning; they will therefore be capacitated – through training and the development of local adaptation plans – for climate-resilient management in the Oueme Basin. This will support the replication of OCRI's approach beyond the five target municipalities. To ensure the platform's continuation beyond OCRI, the project will support obtention of a legal status for the platform as a decentralised governmental structure. A sustainability (financial) strategy will also be developed under OCRI.
The platform design will include a communication strategy to ensure the dissemination of knowledge, including on gender aspects, to support long-term ICRM in the Ouémé Basin, and beyond; and a sustainability strategy to support its continuation. The platform will be managed by MCVDD, with FAO support, in terms of capacity building for project coordination and on-the -ground implementation. FNEC will also be consulted to design the platform and define its specific role for financing, designing and implementing climate change projects. Women and women's organizations engagement in the platform will also be proactively promoted.
Another key step to ensure long-term governmental support to implement ICRM in the Ouémé Basin is to formally institutionalise the approach through local regulations and ensure their implementation; and to build local capacity for

implementing ICRM. These efforts will be conducted through the OCRI platform: members will be trained on climate change adaptation planning and participate to the revision of key development plans for mainstreaming ICRM. This is a pathway to ensure post-project's support through future public funding that target development initiatives in the Ouémé Basin. This, complemented with the strengthening of private finance investments in OCRI (see Output 3.2), will support the project's exit strategy, as well as its replication in neighbouring areas and beyond.

3.1.1 Establish and activate the OCRI platform ensuring adequate and meaningful participation of women and women's organizations at local and national level. The platform has three key functions: i) coordinate the ICRM interventions in the 5 target areas in coordination with the PMU ; ii) support the revision of key regulatory frameworks; and iii) build capacity for climate-resilient management in the Oueme. Moreover, the platform will disseminate new knowledge on the benefits from ICRM in basins, thereby contributing to the project's awareness-raising interventions (under Output 3.3) and include a sustainability strategy for long-term implementation and financing of OCRI (see Output 3.2).

The platform will be managed by MCVDD as EE, and include municipal representatives of the five target communes, as well as extension services from forest department, agriculture and waterworks; and the OBA. Their main responsibilities will be to coordinate the tree plantation, waterworks as other hard and soft anti-erosion infrastructure, and land restoration interventions in the 5 project sites (during the project) and beyond these target areas afterwards (e.g. following the guidance of the revised Oueme Master Plan). For this, they will receive technical support from FAO and training on gender-responsive climate change adaptation, ICRM in basin context, and gender-responsive resilient local planning. The design of the role, responsibility, legal status and composition of the platform will be done with MCVDD. To ensure smooth implementation during and after the project, FAO will provide technical support. The technical support will also enable local forest agents to implement the revised PDL (activity 3.1.3) and the OBA to implement the strengthened SDAGE (activity 3.1.2).

A communication strategy for the platform will be developed to facilitate interactions between the platform members, disseminate project-related information, best practices for CRA, raise awareness of climate change, and the socio-economic benefits of ICRM applied to basin areas, and organise the Annual Symposium (3.3.2). Best communication channels and packaging will be identified through a consultative process with communities and stakeholders. It will guide activities under Output 3.3

The platform will include a website (online portal) hosted by MCVDD, and newsletter will be sent on a regular basis to share relevant communication and knowledge information about the OCRI project to stakeholders in the public and private sector. Finally, a sustainability strategy will be developed to confirm the management of the platform at project's end. It is envisioned that MCVDD will fully take over, and that the government will cover the running/ operational cost of the platform. These costs could be covered through FNEC's financial resources, as the project will contribute to increase FNEC's fund under Output 3.2. A detailed financial plan for OCRI platform, along with role and responsibilities of key institutions including MCVDD, FNEC, FNDA and OBA, will be prepared under this activity.

3.1.2 Implement regional and local climate-resilient development plans in the Oueme Basin to ensure long-term investment in low carbon integrated climate-resilient management (ICRM) . The Ouémé Master Plan (SDAGE) will be the legal tool that institutionalises an ICRM approach in the whole Ouémé area. It will be revised using a participatory approach. This will be done through the OCRI platform: OBA will work with FAO, MCVDD and municipality representatives to improve and mainstream ICRM into the SAGE. these improvements will address the gaps identified in the FS (see Section 6.3), and the strengthened SAGE will be implemented by OBA (which capacity are strengthened under 3.1.1). Particular attention will be made to provide an integrated approach that considers and reduces climate change impacts from upstream to downstream areas of the Basin. The strengthened SDAGE will serve as the umbrella under which project activities linked to tree plantation and restoration of the riverbanks (Output 1.1) will take place and continue beyond the project. The coordination of these interventions is supported under 3.1.1.

Moreover, ICRM will be mainstreamed into the PDL of the 5 target municipalities. Climate-change management is currently under-considered in these plans. The existing LDP will be revised to mainstream the ICRM approach promoted under the Ouémé Master plan to guide future (post-project) local governmental investments in the Ouémé Basin, including reforestation and strengthening of the Oueme riverbanks. It will provide guidance for waterworks (and their maintenance) and other soft and hard adaptation technologies, including tree nurseries and tree plantations to protect river banks – needed to strengthen the Ouémé river banks at the municipality level, reduce flood risks and improve water access. The plans will be developed at project's end, based on project's results, lessons learned and best practices. The will be done using a participatory approach inclusive of local communities' interests. Again, this will be ensured using the platform as a coordination tool to bring together representatives of the municipalities, extension services and providing outreach to representatives of the target communities in the five municipalities. For example, the revised plans will ensure no conflicts are created or exacerbated around access to resources between farmers and herders.

The implementation of the plans – including reforestation along the Oueme riverbanks by local forest services and communities – will also be coordinated under the OCRI platform, beyond the project. To support this, members of the platform – OBA and extension officers – will be trained; the training will be extended to members of other basins' authorities (Volta, Mono and Niger) in order to support project upscale in other basins of Benin.

3.1.3 Implement rigorous M&E on land restoration in the Ouémé Basin. Staff members of MCVDD and MAEP, as well as extension officers from the forest department in the target municipalities – all members of the OCRI platform – will receive technical support from FAO to conduct rigorous gender-responsive M&E of the impacts of tree plantation among the Oueme riverbanks. Moreover, they will be capacitated to implement the SHARP tool (or similar resilience assessment approaches) during target training sessions. A field survey will take place afterwards to assess changes in the resilience and adaptive capacity levels of smallholders in the selected municipalities, resulting from the project's interventions. Staff members of MCVDD and MAEP who will receive technical support to monitor the impact of tree planting and riverbank restoration will be selected based on: (i) their effective involvement on forest and/or agriculture extension, (ii) familiarity with at least two of the five targeted communes, (iii) ability to communicated in the local language, (iv) participation of women will be highly encouraged. Finally, extension officers will be capacitated to provide advises on climate-resilient agriculture and adaptation to farmers living in their commune. To ensure this, training will be provided and ToRs of the extension workers will be adjusted to include financial/business/climate change continued support to the communities. Extension officers who will be capacitated to provided advises to farmers, will be selected based on: (i) their field experience on climate resilient agriculture, (ii) their duty station, which must be in one of five beneficiary communes (Copargo, Djougou, Glazoué, Zanghanado, Zgbodome), (iii) priority will be given to female extension officers.

OUTPUT 3.2 Strengthened FNEC's capacity to ensure continuous support to climate-resilient farming in the Oueme Basin

Under the OCRI platform, GCF fund will be used to strengthen FNEC's capacity to capture climate finance and to design, finance and implement climate change-related projects will be strengthened. Moreover, FNEC's fund (cofinance) will be used to finance climate-resilient micro-projects. These grants will be accessible to OCRI farmers and cooperatives through a call for micro-project proposal (based on current existing procedure within FNEC to call for micro-project proposals). FAO will work with FNEC to develop a project selection 'check-list', which ensure the selection of projects aligned with OCRI approach and gender-responsiveness; FAO will also strengthen FNEC's capacity to monitor the implementation of these micro-projects on the ground, produce detailed progress reports, and ensure financial transparency; training will also include gender-responsive budgeting. Finally, a replenishment strategy for FNEC (to increase its current resources, some of which will contribute to covering the operational costs of OCRI platform post-project) will also be developed to enable the continuation of climate-resilient agriculture and value chains beyond the project's lifetime.

3.2.1 Develop a robust financial strategy for FNEC.

A complete financial strategy to boost FNEC's resources and sharpen its focus on supporting climate change-related projects, will be developed with the FNEC and MCVDD. This strategy will include:

- a list of criteria (or checklist) that projects submitted to the FNEC must aligned with; criteria will ensure the prevalence of CC concerns in selected projects.
- eligible proponents.
- financial roadmap, with a view to increase FNEC's available resources to implement climate change-related projects, including disbursement modalities (at the moment, FNEC only provides grants but the possibility to add loans will be explored).

The financial roadmap will include pathways to increase the current green-taxes base that provides funding to FNEC, to leverage investments from the private sector (which will already be incentivized under Output 2.2), and to develop 'bankable' projects that can attract resources from international climate funds, including the Adaptation Fund (AF) and GCF, for which FNEC is a national accredited entity. Access to these funds will also be enhanced under Activity 3.2.2. Other pathways to mobilise climate funds at national and international level to replenish the Facility and ensure the facility remains operational to support ecosystem restoration and CRA initiatives will be explored.

The Roadmap will also ensure that climate change resilience remains the main focus of FNEC (which currently focuses on waste management and recycling projects).

The project is committed to verifying the institutional possibility of collaboration between the two funds FNEC and FNDA. Although each fund has its independence, a synergy between the two funds is envisaged to allow reciprocal advantages by sharing the experience and capacities of each other. This could be an avenue to explore to increase the resources available to the FNEC, particularly in terms of private sector involvement, expansion of access to credit

in the environmental sector, opening up of the possibility of financing projects that use an integrated agricultural-environmental approach.

3.2.2 Build FNEC's capacity to design, select, implement and monitor climate change-related projects
This capacity building will be supported by FAO.
GCF fund will be used to provide technical assistance and build FNEC's capacity to design bankable climate change projects, which can attract investments from private sector institutions (because of their demonstrated returns), or receive funding from national/ international funds and donors. At the end of the project, FNEC will have designed at least one fully-fledged Funding Proposal, with high potential to receive funding from international donors. GCF fund will support FNEC to develop such proposal (capacity building) and submit it to the most adequate fund by project's end[63]. Finally, training on gender-responsive budgeting will be provided to FNEC's members to ensure the use of fund will take into account women-specific needs and priorities.

3.2.3 Provide finance to 3 micro-projects that contribute to climate change adaptation and ecosystem restoration in the Oueme Basin – to the benefits of small-scale farmers (FNEC co-financing)[64]
This activity will be funded by FNEC. A call for proposal will be launched by FNEC (using its current procedures for *appel a projets*) and farmers' associations and cooperatives, trained in the FBS, will have the opportunity to submit proposals for micro-projects that focus on climate-resilient agriculture and ecosystem restoration and/or protection in the Oueme Basin. The call for proposal will be launched based on current FNEC's procedures and successful micro-projects will be selected by FNEC, based on the check-list that will be developed at project onset with FAO support(developed under 3.2.1). The check-list will ensure the selection of projects aligned with OCRI approach, with a strong climate change adaptation and ecosystem restoration angle, and gender-responsiveness; FAO will also strengthen FNEC's capacity to monitor the implementation of these micro-projects on the ground, produce detailed progress reports, and ensure financial transparency.

OUTPUT 3.3 Awareness of ICRM in basins' benefits raised among farmers and public and private institutions
There is limited knowledge in Benin of how to sustainably manage basin areas, while providing socio-economic benefits from upstream to downstream communities, and reducing climate change vulnerability. A lack of understanding of the environmental and socio-economic benefits of ICRM – which mixes waterworks with CRA and resilient land management adapted to upstream and middle basin areas – impairs investments opportunities from farmers, public and private institutions, in project interventions. Under this Output, and based on the communication strategy of the OCRI platform, all training material, knowledge and best practices generated through the project and captured under various activities (2.1.3, 3.1.3) will be used to develop sensitization campaigns on the environmental and socio-economic benefits of ICRM. In addition, field visits to OCRI project sites will be organised for Volta, Niger and Couffo Basin Authorities in Benin. This will support the upscale of OCRI in new areas. Moreover, innovative adaptation practices will be encouraged to further enhance the climate-resilience of farmers, and attract private sector investments in climate-resilient agriculture.

3.3.1 Organise knowledge dissemination events and products on OCRI including gender mainstreaming. This will include:
These events will include:- Farmers' field visits for neighbouring communities, during project's year 4 to 6, to showcase OCRI's results;
- Visits of other basin's authorities (Mono, Volta and Niger) in the Oueme Basin to showcase: i) on-the-ground project impacts; ii) operationalisation and functions of the OCRI platform; iii) revised regulatory framework for climate-resilient watershed management,
- Radio shows to broadcast information about climate change related risks in Upper to Lower Ouémé regions, including how mismanagement in the Upper and Middle Ouémé can increase risks of erosion and floods downstream[65]; information about SAP, OCRI projects and other similar initiative in the Ouémé Basin will be shared, as well as the lessons learned and best practices from these projects. The information will be prepared and packaged based on the communication strategy developed under Activity 3.1.1. Radio hosts will be trained and, if possible, the radio hosts trained under the SAP project will be used to broadcast information in the Ouémé Basin. Radio programs will be broadcast in local languages of the targeted municipalities as follows: Copargo (Taneka, Dendi, Lopa and Solla languages); Djougou (Dandi language); Glazoue (Mahi, Idatcha languages); Zagnanado (Fon, Mahi languages); Zogbodomey (Mahi, Fon languages). The radios and languages will be selected based on the following criteria: a) coverage capacity in the municipalities of the project (radio coverage); b) accessibility capacity from the whole

[63] Please note that activity 3.2.2 and related indicator only targets the capacity building of FNEC, not the actual approval of a Funding Proposal submitted by FNEC.

[65] Note that the project will make use of existing community-based radio which are accessible to OCRI farmers (wide outreach internet target areas) and use appropriate local languages. This will be determined during the project implementation by the communication expert

population involved in the project (radio access); c) understanding capacity, to include all communities and groups involved in the project (languages).
- Knowledge products to raise awareness of CCA in basins for governmental institutions including other basin authorities, agro-businesses and cooperatives, and smallholders in the whole Ouémé Basin. The products will be packaged adequately for the various audience – policy-makers, businesses and farmers – following the communication strategy developed under Activity 3.1.1. and also include specific messaging, lessons learned, best practice and results related to gender equality and the implementation of the GAP (Annex 8). The may include flyer, briefs for policy-makers, posters with simple design.

The selection process of the farmers that will participate in field visit will be based on the best performing FFS / FBS groups, in terms of field results (quantity and quality of best practices and technologies adopted) and demonstrated capacity in the management of VSLAs and cooperative activities. Lead farmers of these groups will be selected for these visits.

3.3.2 Organise OCRI Annual Symposium. The Symposium will be organised jointly by MCVDD and MAEP. The Symposium will be an opportunity for agribusinesses, entrepreneurs, and cooperatives (those trained under Output 2.1) to showcase their innovative climate-resilient practices and their benefits. During this participative symposium, participants will be invited to present project ideas to improve their productivity and the profitability of their business, in the context of climate change. Presenters will be selected based on the following criteria: a) quality of the innovative climate-resilience practice; b) potential benefits of projects, in terms of productivity and the profitability; c) market potential of the value chain.
Authorities of other basins in Benin will be invited to attend the symposium. Benin includes several basins: Oueme, Mono, Niger, and Volta. The Volta and Niger basins are transboundary and therefore managed by several countries through an inter-African agency.
- The National Committee of Mono Basin is a recent entity established in May 2021
- The Niger Basin Authority is a multi-country institution, created in 1964. It is in charge of integrated development planning in the Niger Basin
- The Volta Basin Authority is a multi-country institution.
Representatives of these 3 Basin Authorities will be invited to attend OCRI symposium

Table 6: funding source and executing entities of OCRI. References in this table to MCVDD or MAEP are to the Government of Benin acting through MCVDD or MAEP, respectively.

COMPONENT 1: Low carbon climate Resilient Crop production enhanced and Ecosystem services restored in the Upper and Middle Ouéme				
Output	**Activity**	**Sub-Activity**	**Funder**	**Executing Entity**
Output 1.1 Waterworks and tree plantation to protect riverbanks and secure water access	1.1.1. Build water harvesting and retention infrastructures (target of 680 ha irrigated land plus 1,320 ha with MAEP cofinancing)	1.1.1.1 Construction surface water storage structures or harvesting structures (Small earth dams, water rising structures, etc.)	GCF	FAO
	1.1.1. Build water harvesting and retention infrastructures (target of 680 ha irrigated land plus 1,320 ha with MAEP cofinancing)	1.1.1.2 Rehabilitate 23 old surface water collection structures	GCF	FAO
	1.1.1. Build water harvesting and retention infrastructures (target of 680 ha irrigated land plus 1,320 ha with MAEP cofiancing)	1.1.1.3 Development of small irrigated perimeters with full water control	GCF	FAO
	1.1.1. Build water harvesting and retention infrastructures (target of 680 ha irrigated land plus 1,320 ha with MAEP cofinancing)	1.1.1.4 Development for the protection of water sources (river, head of streams, artesian boreholes, etc.)	GCF	FAO

	1.1.1. Build water harvesting and retention infrastructures (target of 680 ha irrigated land plus 1,320 ha with MAEP cofinancing)	1.1.1.5 Support for waterworks guidance	GCF	FAO
	1.1.1. Build water harvesting and retention infrastructures (target of 680 ha irrigated land plus 1,320 ha with MAEP cofinancing)	1.1.1.6 Set up 1,320 ha of irrigated land in Glazoue and Djougou	MAEP	MAEP
	1.1.1. Build water harvesting and retention infrastructures (target of 680 ha irrigated land plus 1,320 ha with MAEP cofinancing)	1.1.1.7 Secure government support to coinvest in waterworks	MAEP	MAEP
	1.1.2 Strengthen degraded river banks and restore land with tree (target of 5,000 ha plus 4,000 ha with MAEP cofinancing)	1.1.2.1 Conduct detailed biodiversity analysis in Upper and Middle Ouémé to identify site specific locally-relevant and resilient tree species- conduct technical and hydrological studies to identify best site for the micro-dams	GCF	MCVDD
	1.1.2 Strengthen degraded river banks and restore land with tree (target of 5,000 ha plus 4,000 ha with MAEP cofinancing)	1.1.2.2 Set up 5 community tree nurseries and provide technical support to produce high-quality seedlings	GCF	MCVDD
	1.1.2 Strengthen degraded river banks and restore land with tree (target of 5,000 ha plus 4,000 ha with MAEP cofinancing)	1.1.2.3. Plant 5,000 ha of trees along degraded river banks and fields	GCF	MCVDD
	1.1.2 Strengthen degraded river banks and restore land with tree (target of 5,000 ha plus 4,000 ha with MAEP cofinancing)	1.1.2.4 Plant additional 4,000ha of trees in Glazoué, Zagnando and Zogbodomey	MAEP	MAEP
	1.1.2 Strengthen degraded river banks and restore land with tree (target of 5,000 ha plus 4,000 ha with MAEP cofinancing)	1.1.2.5 FAO provides Technical support to produce high-quality tree seedlings to enhance rural community resilience to climate change.	FAO	FAO
OUTPUT 1.2: 25,250 farmers capacitated to implement climate resilient agriculture, agro-forestry and sustainable land management over 95,000 ha	1.2.1 Train 15 Master Trainers and Facilitators (women and men)	1.2.1.1 Develop training courses	GCF	FAO

	1.2.1 Train 15 Master Trainers and Facilitators (women and men)	1.2.1.2 Select 15 Master trainers to train and capacity/ skills assessment	GCF	FAO
	1.2.1 Train 15 Master Trainers and Facilitators (women and men)	1.2.1.3. Implement 4 x 1-week training sessions	GCF	FAO
	1.2.2. Training of 250 Facilitators (at least 40% women)	1.2.2.1 Develop training curriculum and modules on CRA; agro-forestry; sustainable land management (with focus on river banks)	GCF	FAO
	1.2.2. Training of 250 Facilitators (at least 40% women)	1.2.2.2 Organise 10 training of facilitators sessions of a 5-month duration, to accommodate 25 facilitators per session (for a total of 250 facilitators trained)	GCF	FAO
	1.2.3 Implement CRA, including agroforestry, to enhance agricultural productivity under climate change and reduce emissions..	1.2.3.1 Set up 650 FFS and select training beneficiaries in areas not covered by MEAP; or beyond the MAEP project period. Each FFS will include 20 training sessions and involve 25 farmers (at least 40% women)	GCF	FAO
	1.2.3 Implement CRA, including agroforestry, to enhance agricultural productivity under climate change and reduce emissions..	1.2.3.2 Technical support, coaching and supervision to the implementation of 650 FFS	GCF	FAO

	1.2.3 Implement CRA, including agroforestry, to enhance agricultural productivity under climate change and reduce emissions..	1.2.3.3 Provide training to additional farmers in Glazoué, Djougou, Zagnando and Zogbodomey	MAEP	MAEP
	1.2.4 Increase access of adapted quality seeds and plant propagation material	1.2.4.1 Rehabilitate/build and operationalise 1 nursery per target municipality	GCF	MCVDD
	1.2.4 Increase access of adapted quality seeds and plant propagation material	1.2.4.2 Organise and support 1 seed producer group per municipality	GCF	MCVDD
	1.2.4 Increase access of adapted quality seeds and plant propagation material	1.2.4.3 Train technicians and farmers to collect, handle and dispatch shea seeds and to produce seedlings.	GCF	MCVDD
COMPONENT 2: Climate-resilient and gender-sensitive value chains, supporting farmers' livelihoods in the Upper and Middle Ouémé				
OUTPUT 2.1: Farmers and cooperatives' income stream diversified, enhanced, and secured in the face of climate change	2.1.1 Increase income of 5,000 farmers through training on business and marketing techniques and equipment using FAO farm business schools (FBS) methodology (100 FBS plus 100 from MAEP cofinancing)	2.1.1.1 Train 2,500 farmers organized in agribusinesses and cooperatives – including 33% women. Each FBS will include 20 training sessions and involve 25 farmers.	GCF	FAO
	2.1.1 Increase income of 5,000 farmers through training on business and marketing techniques and equipment using FAO farm business schools (FBS) methodology (100 FBS plus 100 from MAEP cofinancing)	2.1.1.2 FBS coached and supervised: coaching, reporting, monitoring & evaluation process, by a group of local focal points (FBS experts); 1 month per FFS, funded by the FBS funder	GCF	FAO
	2.1.1 Increase income of 5,000 farmers through training on business and marketing techniques and equipment using FAO farm business schools (FBS) methodology (100 FBS plus 100 from MAEP cofinancing)	2.1.1.3 Provide at least 15 small processing/ packaging/ storing units to cooperatives	GCF	FAO

	2.1.1 Increase income of 5,000 farmers through training on business and marketing techniques and equipment using FAO farm business schools (FBS) methodology (100 FBS plus 100 from MAEP cofinancing)	2.1.1.4 Train and equip additional cooperatives for post-harvest, processing, storing and sale of agriproducts in Glazoue, Zogbodomey, Djougou and Zagnanado	MAEP	MAEP
	2.1.2 Improve access to micro-credit and investments for agriculture	2.1.2.1 Develop training material addressing current barriers to credit access	GCF	FAO
	2.1.2 Improve access to micro-credit and investments for agriculture	2.1.2.2 Organise 5 training sessions for each FBS to train 2,500 farmers	GCF	FAO
	2.1.2 Improve access to micro-credit and investments for agriculture	2.1.2.3 Establish Village Savings and Loans Associations to foster low-threshold small loan provision	GCF	FAO
	2.1.2 Improve access to micro-credit and investments for agriculture	2.1.2.4 Improve access to financial services for farmers in Glazoue and Djougou	MAEP	MAEP
	2.1.3 Train facilitators (selected educated young) and national/local climate change experts (from relevant institutions eg MCVDD, MAEP) on the use of assessment and/or monitoring Instruments for Resilience (FarmTree App are the identified tools) .	2.1.3.1 Select 10 facilitators (2 per target municipality) and 20 experts from MCVDD and MAEP (national and municipal services) to be trained on the tools	GCF	FAO
	2.1.3 Train facilitators (selected educated young) and national/local climate change experts (from relevant institutions eg MCVDD, MAEP) on the use of assessment and/or monitoring Instruments for Resilience (FarmTree App are the identified tools) .	2.1.3.2 Equip them and train facilitators through 1 x 5-day training session in Cotonou	GCF	FAO
OUTPUT 2.2: Private sector incentivized to invest in climate resilient agriculture and resilient management techniques in Ouémé Basin	2.2.1 Disseminate information products packaged for private sector, and organise field visits to demonstrate the socio-economic benefits of waterworks, CRA and agroforestry	2.2.1.1 Develop information products packaged for private stakeholders and finance institutions	GCF	FAO

	2.2.1 Disseminate information products packaged for private sector, and organise field visits to demonstrate the socio-economic benefits of waterworks, CRA and agroforestry	2.2.1.2 Disseminate financial products via the OCRI platform, flyers and booklets distributed, etc.	GCF	FAO
	2.2.1 Disseminate information products packaged for private sector, and organise field visits to demonstrate the socio-economic benefits of waterworks, CRA and agroforestry	2.2.1.3 Field visit in each project municipality for private stakeholders (including MFI, wholesaler, export companies, etc.) to showcase the benefits of project activities	GCF	FAO
	2.2.2 Organise municipal forums to connect female and mele farmers and small businesses to local and regional buyers	2.2.2.1 Further Identify relevant buyers in each municipal to invite to the forums	MCVDD	MCVDD
	2.2.2 Organise municipal forums to connect female and male farmers and small businesses to local and regional buyers	2.2.2.2 Liaise with the GoB and municipal authorities to provide support to the forums and to facilitate trade agreements between men and women farmers and buyers	MCVDD	MCVDD
	2.2.2 Organise municipal forums to connect female and male farmers and small businesses to local and regional buyers	2.2.2.3 Organize bi-annual forums (5 in total, from project Y3)	MCVDD	MCVDD
	2.2.2 Organise municipal forums to connect female and male farmers and small businesses to local and regional buyers	2.2.2.4 Ensure partnerships between farmers, processing companies and buyers in Glazoue, Zogbodomey and Zagnanado	MAEP	MAEP
COMPONENT 3: An enabling institutional and financial environment established to promote and upscale low carbon climate-resilient management in Benin's basins				
OUTPUT 3.1: OCRI project institutionalised through a multi-stakeholder platform, regulatory frameworks and capacity building	3.1.1 Establish and activate the OCRI platform ensuring adequate and meaningful participation of women and women's organizations at local and national level	3.1.1.1 f Further Identify relevant stakeholders to participate on the platform, including their roles and responsibilities	GCF	FAO
	3.1.1 Establish and activate the OCRI platform ensuring adequate and meaningful participation of women and women's organizations at local and national level	3.1.1.2 Design the platform operational strategy and multi-stakeholder coordination mechanism	GCF	FAO

	3.1.1 Establish and activate the OCRI platform ensuring adequate and meaningful participation of women and women's organizations at local and national level	3.1.1.3 Design the platform's financial and communication strategies – including an online portal to be hosted by MCVDD	GCF	FAO
	3.1.1 Establish and activate the OCRI platform ensuring adequate and meaningful participation of women and women's organizations at local and national level	3.1.1.4 Disseminate all training modules, knowledge products, and project's lessons learnt and best practices on the platform's online portal	GCF	FAO
	3.1.1 Establish and activate the OCRI platform ensuring adequate and meaningful participation of women and women's organizations at local and national level	3.1.1.5 Ensure government support to OCRI platform	MCVDD	MCVDD
	3.1.2 Implement regional and local climate-resilient development plans in the Oueme Basin to ensure long-term investment in ICRM	3.1.2.1 Organise participatory workshop to discuss options for strengthening the SDAGE	GCF	FAO
	3.1.2 Implement regional and local climate-resilient development plans in the Oueme Basin to ensure long-term investment in ICRM	3.1.2.2 Revise the Operational Management Plan with all relevant stakeholders and validate through a workshop	GCF	FAO
	3.1.2 Implement regional and local climate-resilient development plans in the Oueme Basin to ensure long-term investment in ICRM	3.1.2.3 Organise 1x5-day training sessions on ICRM targeting extension officers and OBA staff members	GCF	FAO
	3.1.2 Implement regional and local climate-resilient development plans in the Oueme Basin to ensure long-term investment in ICRM	3.1.2.4 Revise local development plans	GCF	FAO
	3.1.3 Implement rigorous M&E on land restoration in the Ouémé Basin	3.1.3.1 Organize 1x 5-days training workshop to train 20 officers on M&E techniques with FAO support	GCF	FAO

	3.1.3 Implement rigorous M&E on land restoration in the Ouémé Basin	3.1.3.2 Train 10 extension officers to provide advises on climate-resilient agriculture	GCF	FAO
	3.1.3 Implement rigorous M&E on land restoration in the Ouémé Basin	3.1.3.3 Conduct mid-term evaluation	GCF	FAO
	3.1.3 Implement rigorous M&E on land restoration in the Ouémé Basin	3.1.3.4 Conduct end of project evaluation	GCF	FAO
	3.1.3 Implement rigorous M&E on land restoration in the Ouémé Basin	3.1.3.5 Carry out a project impact assessment study	GCF	FAO
OUTPUT 3.2: Strengthen FNEC's capacity to ensure continuous support to climate-resilient farming in the Oueme Basin	3.2.1 Develop a robust financial strategy for FNEC	3.2.1.1 Review FNEC's existing financial strategy and identify gaps and opportunities to expand it	GCF	FAO
	3.2.1 Develop a robust financial strategy for FNEC	3.2.1.2 Organise consultations with FNEC and MCVDD to discuss best options for increasing FNEC's resources	GCF	FAO
	3.2.1 Develop a robust financial strategy for FNEC	3.2.1.3 Organise validation workshop with GoB to validate the financial strategy	GCF	FAO
	3.2.1 Develop a robust financial strategy for FNEC	3.2.1.4 Through consultation with FNEC, identify relevant criteria to facilitate the selection of relevant climate change adaptation projects to be financed through FNEC's resources	GCF	FAO
	3.2.2 Build FNEC's capacity to design, select, implement and monitor climate change-related projects	3.2.2.1 Conduct a detailed assessment of FNEC's capacity to design, implement and monitor climate change-related projects	GCF	FAO
	3.2.2 Build FNEC's capacity to design, select, implement and monitor climate change-related projects	3.2.2.2 Design training modules and train 5 members of FNEC (2x1-week training)	GCF	FAO

	3.2.2 Build FNEC's capacity to design, select, implement and monitor climate change-related projects	3.2.2.3 Provide regular support to FNEC to design a bankable climate change project to submit to the AF or GCF	GCF	FAO
	3.2.3 Provide finance to 3 micro-projects that contribute to climate change adaptation and ecosystem restoration in the Oueme Basin to the benefits of small-scale farmers (FNEC financed)	3.2.3.1 Open call for proposal	FNEC	FNEC
	3.2.3 Provide finance to 3 micro-projects that contribute to climate change adaptation and ecosystem restoration in the Oueme Basin to the benefits of small-scale farmers (FNEC financed)	3.2.3.2. Review received projects and select, contract and finance the successful ones	FNEC	FNEC
OUTPUT 3.3: Awareness of ICRM in basins' benefits raised among farmers and public and private institutions	3.3.1 Organise knowledge dissemination events and products on OCRI including gender mainstreaming	3.3.1.1 Organize 5 field visits for 100 farmers per municipality (5), living in neighboring communities that did not directly beneficiated the project	GCF	FAO
	3.3.1 Organise knowledge dissemination events and products on OCRI including gender mainstreaming	3.3.1.2 Organise 1 x 1-week visit for representatives of Benin's other basins	GCF	FAO
	3.3.1 Organise knowledge dissemination events and products on OCRI including gender mainstreaming	3.3.1.3 Synergise with SAP project to train 10 radio broadcasters to disseminate climate change related information and organize radio broadcast with local radio in each municipality	GCF	FAO
	3.3.1 Organise knowledge dissemination events and products on OCRI including gender mainstreaming	3.3.1.4 Develop and package knowledge products on the projects, according to the needs of each targeted group	GCF	FAO
	3.3.1 Organise knowledge dissemination events and products on OCRI including gender mainstreaming	3.3.1.5 Organise sensitization campaings on CC in Glazoue and Djougou	MAEP	MAEP
	3.3.2 Organise OCRI Annual Symposium	3.3.2.1 Identify relevant participants from agri-business (producers, sellers, manufacturer, etc.) and policy-makers to attend the symposium	GCF	MCVDD
	3.3.2 Organise OCRI Annual Symposium	3.3.2.2 Organise 1 symposium per year from project Y2, with support from MCVDD and MAEP	GCF	MCVDD

	3.3.2 Organise OCRI Annual Symposium	3.3.2.3 FAO supports OCRI Annual Symposium	FAO	FAO

B.4. Implementation arrangements (max. 1500 words, approximately 3 pages plus diagrams)

Project Governance Structure

Accredited Entity (AE): FAO

FAO will serve as the Accredited Entity (AE) for the Project. FAO as the AE will be responsible for project implementation and administrative oversight and technical supervision, corporate management for GCF intervention, project reporting, and project completion and evaluation in accordance with the detailed provisions outlined in the GCF policies as well as Accreditation Master Agreement (AMA) and Funded Activity Agreement (FAA) to be entered into between FAO and the GCF should this funding proposal be approved by the GCF Board. As such, FAO will be responsible for overall management of the Project, including: i) All project evaluation aspects; ii) Administrative, financial and technical supervision throughout implementation of the Project; iii) Supervision of effective management of funds to achieve the results and objectives; iv) Quality control of Project monitoring and reporting to the GCF; v) Project closure and evaluation. The FAO will assume these responsibilities in line with the detailed provisions listed in the Accreditation Master Agreement (AMA) between FAO and the GCF.

As Accredited Entity of the Project, the FAO's supervising role will be attributed to the FAO Regional Office for Africa (RAF), located in Accra with support by the Office of Climate Change, Biodiversity and Environment (OCB) and other technical divisions located FAO headquarters in Rome (HQ), as required. To perform the AE functions, FAO will set up a dedicated FAO-GCF Project Task Force (PTF) comprising relevant staff from the FAO Country Office in Benin, the FAO Regional Office for Africa, and FAO Headquarters. Members of the PTF will perform the necessary supervision and oversight functions, including supervision and backstopping missions during the entire implementation period, as required. The project supervision function will remain independent of the Executing Entity functions performed by FAO Benin. The above-mentioned segregation of responsibilities within FAO will ensure that the Organization can independently and effectively perform the types of Accredited Entity functions. FAO will contract with MCVDD to act as co EE.

Executing Entities (EE):

FAO: FAO is one of the executing entities of GCF proceeds. FAO and MCVDD will set up the Project Management Unit (PMU) and local Project Implementation Unit (LPIU) in the Upper and Middle Ouémé. FAO will establish a Farmer Field School (FFS) Technical Unit technically and methodologically backstopped by FAO, based in MAEP, that will provide technical advise on the implementation of agriculture activities. This Technical Unit will be chaired by MAEP. FAO will ensure strong coordination of implementation of project activities with MAEP and MCVDD. National partners will be contracted as procured parties by FAO in accordance with FAO's procurement rules (Manual Section 507). FAO has been established its Office in Benin in 1977. Since then it has implemented projects in the country in all areas of relevance to FAO and funded by partners such as GEF.

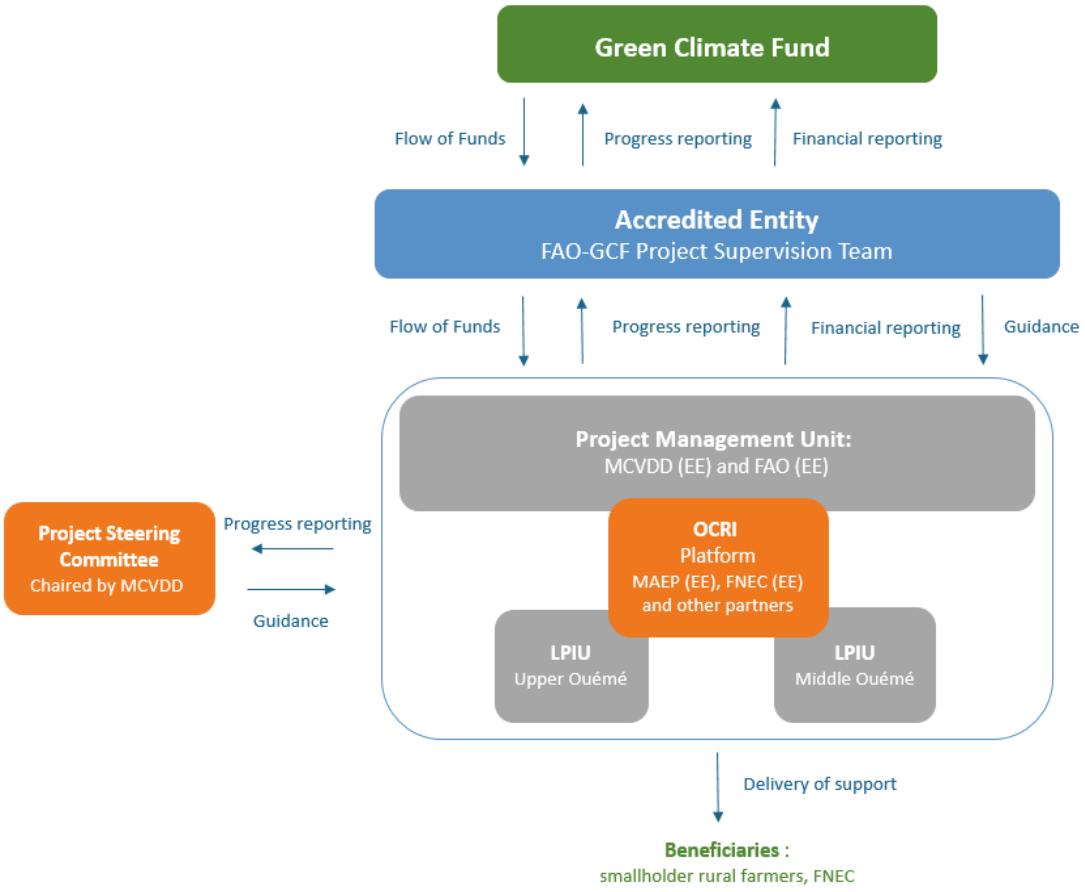
MCVDD: The Government of Benin, acting through MCVDD, is one of the executing entities of GCF proceeds. MCDDV will be an executing entity to whom FAO will transfer funds through the applicable modality, which foresee all necessary provisions for monitoring and supervision, including regular supervision missions, third-party regular spot checks and audits to ensure financial management, procurement and other. MCVDD will work with project-financed staffs, project-recruited subject-matter specialists, to deliver support to targeted beneficiaries in the field. On behalf of the client-country, MCVDD will receive project-financing and technical support, including capacity building and access to knowledge and information to implement the project. As agreed during the stakeholder consultation stage, MCVDD retains the leadership role in hosting the PMU at central level and has the core mandate to implement land restoration (including protection of Ouémé water sources through tree planting on the banks, and waterworks) as well as the rigorous project M&E using the FarmTree App. A capacity assessment of MCVDD has been carried out in 2018.

MCVDD houses the NDA; it is in charge of developing and implementing national policies on environmental issues, climate change, reforestation, ecosystem restoration, urban development and coastal protection. It is the nodal ministry for all matters relating to climate change and coordinates implementation of the National Action Plan on Climate Change (2008). This Ministry has extensive experience in executing donor-funded projects on natural resources management, reforestation and forest and water management including 'Projet de Gestion des Ressources Naturelles' (PGRN) and 'Projet Bois de Feu' phase 1 & 2.. More recently, MCVDD has been involved in the execution of the GCF UNEP SAP project. MCVDD will chair the PMU and the SC.

FNEC: the FNEC will co-finance the OCRI project and be executing entity for the activities it cofinances. FNEC has been, since 2003, a financial instrument placed under the supervision of the MCVDD. FNEC is semi-autonomous legal entity from MCVDD. Its creation responds to a need to support and finance initiatives related to environmental protection and climate change. Using different sources of funds, in particular green taxes, FNEC opens call for project proposal to a large array of proponents including NGOs, local associations, cooperatives and private sector organisation. The projects must be aligned with FNEC's strategy and list of project theme; these are only funding through grants. FNEC has been accredited with the Adaptation Fund since 2011; and with the GCF as Direct Access Entity since 2019. FNEC will also receive technical support to strengthen its mandate.

MAEP: The Government of Benin, acting through MAEP, will be the executing entity for the activities it cofinance through IFAD resources. MAEP capacity assessments has been performed in 2018. MAEP intervenes through the Directorate of Rural Engineering (DGR) which is egally controlled by MAEP and the Lowlands Unit under its supervision, the Directorate of Livestock, the Directorate of Fisheries and the Directorate of Forestry and Natural Resources (DFRN) legally controlled by MCVDD. The MAEP, with these local delegations - at the village level - is the institution responsible for agricultural and pastoral hydraulics, water and soil conservation, aquaculture, forest management and reforestation.

Figure 15: Implementation arrangements OCRI. References in this figure to MCVDD or MAEP are to the Government of Benin acting through MCVDD or MAEP, respectively.



Project Management Unit (PMU)

A PMU will be set up by FAO and MCVDD. It will be established with office space procured by the MCVDD. A National Project Coordinator (NPC), responsible for project implementation and coordination with all project stakeholders, and operational leadership of the PMU, will be recruited based on a competitive process; his recruitment will be validated by FAO and MCVDD. The PMU will be responsible for providing support to the implementation of day-to-day activities at the national/central level in close coordination with the EE. Under the leadership of the NPC, the PMU will also coordinate with the LPIUs and Focal Points the implementation of activities at sub-regional level and ensure these are aligned with the implementation of activities in the five municipalities. The PMU full-time staff will include: (i) National

project coordinator; ii) local office manager; iii) project assistant; and iv) Procurement and Finance Officer. In addition, the following expertise will be mobilsed to support project implementation: i) International Chief Technical Advisor; ii) Environmental and Social Safeguarding Expert; iii) IT Communication Specialist; (iv) Gender Specialist; and (v) Monitoring Specialist. The PMU will be advised by the FFS Technical Unit based in MAEP with regards to the agriculture activities. PMU will report to FAO as AE and the Steering committee chaired by MCVDD.

Local Project Implementation Unit

MCVDD and FAO-Benin will initially jointly form the Project Implementation Units at two levels: (i) the national-level Project Management Unit (PMU); and (ii) two Local Project Implementation Units (LPIUs) for the Upper Ouémé and for the Middle Ouémé, part of the OCRI platform. The LPIUs will comprise government staff members, whose capacity will be strengthened under Component 3, and project-recruited staff. FAO will also provide technical and administrative support to the government and the LPIUs. This arrangement will ensure that a) high and quality technical standards are adhered to; b) project delivery can proceed securely and efficiently despite the complex governance framework; and c) government partners play a leading role in project delivery and capacity development.

Two LPIUs will serve as operational arms of the PMU, located in the Upper and Middle Ouémé, each headed by a Project Technical Director (PTD), recruited based on a competitive process by MCVDD. The two LPIUs will be under the supervision of MCVDD. Each LPIUs is headed by a Project Technical Director (PTD). They are recruited based on a competitive process by MCVDD. The PTD will supervise the day-to-day project operations in each LPIU, liaising with the Focal Point in each municipality. The location of the LPIU offices will be jointly identified in coordination with the Agriculture and Environment departments and the communes to ensure synergies and liaison among all stakeholders. LPIU staff will include GoB staff – which will be capacitated under Component 3 – and project subject-matter specialists (local), including: (i) Water Management Specialist; (ii) Environmental Specialist; (iii) Agronomist; (iv) FFS Specialist. The LPIUs will be 'attached' to the OCRI platform (set up under Component 3). LPIUs will be in charge of stakeholder coordination in their area, knowledge dissemination, field implementation with the municipal Focal Points, and M&E of results. The LPIUs may procure services of NGOs/CBOs or specialized structures with the necessary expertise to implement specific activities (e.g. construction of micro-dams), in line with FAO procurement procedures. The Ouémé Basin Authority (OBA) will also be involved once operational, but through the OCRI platform and the project steering committee (PSC), and will be included in the project's capacity-building efforts.

Project Steering Committee

The steering committee will provide guidance and recommendation to the PMU. The primary functions of the PSC will be: (i) aligning project activities with GoB policies and priorities; (ii) ensuring coordination of the project among departmental government partners and with partners in the communes; (iii) providing project implementation oversight; (iv) approving annual work plans and budget, and reviewing project progress; and (vi) guiding the resolution of implementation challenges. The PSC will meet twice a year or can be convened by the Chairperson, at the request of the EEs and on an ad-hoc basis, to discuss key oversight and/or implementation issues. The Chair will have the authority to invite other experts as the need arises. Minutes of PSC meetings will be made publicly available and circulated to all Committee members and project stakeholders. They will also be posted on the OCRI Platform site and the FAO website. The PSC (chaired by the Director General of the MCVDD and co-chaired by FAO) will comprise representatives from: MCVDD (NDA); MAEP; Ouémé Basin Agency (OBA); Ministry of Planning and Development (MoPD); Ministry of Finance; CCIB; IFAD; the relevant ATDA and DDAEP, FNDA, FNEC, FADeC and FNEDD, PNOPPA-Benin, mayors of the 5 municipalities. The project coordinator of the GCF SAP project will be invited as guest during the PSC to ensure synergies between the 2 projects.

Local Level Governance Structure

Each municipality will assign a Project Focal Point, based within the municipality offices, to oversee and monitor the implementation of the project activities in its municipality. The Focal points will liaise with the Mayor and local staff members from the local Agriculture, Water and Environment Technical Departments, as well as farmers organisations and project beneficiaries. The primary functions of the Focal Points will be: (i) ensuring project coordination with national government partners and among commune partners; (ii) monitoring project implementation at municipal level, identify problems or conflict and provide early resolution; (iii) participating in all supervision missions as well as ad-hoc missions, and (iv) reviewing AWPB and project progress at municipal level. The Focal Points will liaise closely with the PMU and the LPIUs to ensure effective and timely implementation and support them to overcome any challenges on the ground.

International/ National Technical Assistant Specialists

The project will recruit long-term and short-term international Chief Technical Advisor (CTA) and short-term experts, who will be based at the PMU and support the LPIUs to carry out specific sub-regional and local field activities. They will be responsible for liaising with FAO-led technical departments and for capacity development of EE and Service Provider staff. They will include: (i) Climate Change Specialist; (ii) Landscape Restoration Specialist; (iii) Water Engineer; (iv) FFS Specialist; (v) Capacity Development Specialist; (vi) Agroforestry Value Chains and Agribusiness

Development Specialist; and (v) GIS Monitoring Specialist. International Technical specialists, such as a Lead Safeguards Advisor (LSA) from FAO will be contracted from Rome and/or around the world, on either a long-term or an ad hoc basis to support the implementation activities, safeguards compliance, the elaboration of ComDev/ICT, technical materials and training on FFS and/or CRA. FAO's Divisions which will provide technical assistance are Forest Policy and Resources Division (FOA); Climate Change, Biodiversity and Environment - Climate risks team (OCB); Land and Water Division (NSL); Food and Nutrition Division (ESN); Plant Production and Protection Division – FFS group (NSPCD).

OCRI Platform

Under Component 3, the OCRI Platform will be established. Platform participants will be selected according to their capacity to generate local changes and will be empowered and trained on dissemination of CRA techniques in close collaboration with food value chain actors. The OBA, MAEP and MCVDD, local communes, CSOs and community leaders, including private sector will be directly involved in the planning, implementation, M&E and knowledge-dissemination. In addition, the Ministry of Finance, CCIB, FNEC and FNDA will be invited to join the platform; more specifically, FNEC's involvement in the platform will ensure long-term funding; synergies between FNEC and FNDA will also be sought to increase the resources available to FNEC. The platform will be a forum for developing public-private partnerships and will seek synergies and complementarities with ongoing and future initiatives. Other partner initiatives and players will be identified in the inception phase together with the specific approaches and tools that will be adopted in a participatory manner. A Memorandum of Understanding will be signed by key partners and initiatives, and a financial strategy developed to sustain the OCRI platform beyond the project.

Flow of Funds

FAO as the accredited entity (AE) will receive the funds from the GCF at HQ level. The Government of Benin, acting through MCVDD, will be an executing entity to whom FAO will transfer funds through the applicable modality, which foresee all necessary provisions for monitoring and supervision , including regular supervision missions, third-party regular spot checks and audits to ensure financial management, procurement and other management requirements are in line with agreed standards and practices.

MCVDD has been assessed in order to gauge its handling capacity and a mitigation plan has been agreed upon to tackle shortcomings. MAEP will execute the activites it co-finances.

FAO, The Host Country and FNEC in their role of EEs will manage project financial expenditures against budgets and execute payments.

Partners expected to receive GCF proceeds through funds transfer in accordance with FAO's procurement rules are organizations involved in the Project implementation as procured parties. Procured parties will be contracted in accordance with FAO rules and regulations of procuring goods and services (e.g. FAO Manual Section 507).

Agreements

FAO will sign a project agreement (to be considered as subsidiary agreement) with the Host Country, covering: i) the Host Country obligations; ii) the role of the Host Country acting through MCVDD and MAEP for the implementation of the project; and iii) the in-kind co-financing to be provided by MCVDD and MAEP. The Project Agreement will be signed by the Host Country, acting thorugh one or more Ministries, who will sign the Project Agreement on behalf of the Government. A separate execution and co-financing agreement will be signed by FAO and FNEC. This agreement will also be a subsidiary agreement.

B.5. Justification for GCF funding request (max. 1000 words, approximately 2 pages)

A grant of USD 18 453 795 is sought by the GoB to invest in climate change adaptation and enable a paradigm shift towards ICRM implemented in Benin's basin areas.

Benin's adaptation and mitigation needs cannot be addressed through government expenditure alone. As a low middle income country, Benin has limited resources available for adaptation and mitigation measures to address the effects of climate change. The prospect of GCF financing has already been a stimulus for the NDA, MAEP and MCVDD to work with FAO to understand how climate-change scenarios are going to affect ecosystems in water catchments, and the agricultural sector and what the implications will be for the country's economy. GCF support will be instrumental for enhancing the climate resilience of vulnerable communities and their ecosystems in the Upper and Middle Ouémé River Basin. This project is fully aligned with Benin's INDC. The implementation of the INDC requires approximately USD11.6 billion, of which USD 8 billion needs to come from conditional shares[66]. Apart from its revenues from the port of Cotonou (which represent the most of Benin´s GDP), the GoB budget is heavily dependent on

[66] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Benin%20First/CDN_BENIN_VERSION_ANGLAISE.pdf

international grants or loans that focus on transport infrastructure. As a result, the NDC is underfunded and relies for 69% of its budget on conditional (international support) contributions.

Benin has already benefited from a UN readiness program on GCF[67] that has helped to strengthen national capacity and reinforce the mandate of the NDA and line ministries, including mainstreaming climate change in national policies and accessing climate finance. The prospect of GCF support has led to a commitment by the GoB to allocate USD 3,000,000 in co-financing to this project. Without the prospect of GCF support, it would be impossible to mobilize the resources from these stakeholders into a program with the outreach and potential impact offered by this project.

Benin's social and economic development challenges further exacerbate the vulnerability of its population. The Gross National Income per capita (purchasing power parity) for 2018 is USD 870, and approximately 50% of the country's population lives below the poverty line (Poverty Data World Bank). Over 50% of its population lives in rural areas and about 10% of its population are undernourished. The vulnerability of rural households is further compounded by their dependence on a fragile/deteriorating natural resource base which will worsen with climate change. Given this scenario, the GCF funding will support the incremental climate-change cost gaps borne by smallholder farmers to maintain or enhance their productivity in a changing climate. GCF financing in this project can work to turn these constraints into an opportunity to provide evidence of how a decentralized process initiative such as OCRI can provide benefits at scale across the Upper and Middle Ouémé Basin and motivate increases in budgetary allocations for adaptation measures in the future.

GCF support will be instrumental for establishing climate-resilient land-use planning and management as the central paradigm for promoting climate resilience in broader national, regional and local policymaking and planning. By providing an opportunity to incentivize and scale up the measures to be implemented through the OCRI project, and the OCRI platform in particular, the project will add momentum to Benin's current efforts to transition towards resilient, inclusive development. Given the GoB's ongoing process of decentralization, the project also represents an opportunity to establish capacities on climate-resilient land-use planning and management, and to mainstream climate-change adaptation into regional and local strategies and plans.

The GCF support is noteworthy in terms of the catalytic impact it will have in bringing together cross-sectoral landscape-level climate-resilient planning initially across 5 municipalities with potential to replicate across the whole Oueme Basin. Successful demonstration of this **landscape-scale, ecosystem-based approach** in the 5 municipalities will provide a model for adoption in other parts of the country. Improved planning at the regional and local level will promote **improved coordination between upstream and downstream communities**, ensuring that a holistic management approach is promoted that takes into consideration the inter-connectedness of ecosystems and land-use systems.

A robust Financial strategy will be developed for FNEC to crowd-in public financing and mobilize community-level investments for climate-resilient land use. Government co-financing in the project (under Component 3) demonstrates the government's commitment to invest in climate-resilient land use. Improved extension modules and support, knowledge dissemination and demonstrable activities will encourage CBOs and farmers to invest in improved practices. However, at the moment, such investments from farmers and cooperatives is not yet possible, as their agricultural productivity is low, even in decline because of climate change impacts; moreover, they face several barriers to access finance and invest in climate-resilient interventions (see barriers, presented in the project ToC). FNEC's strengthened financial strategy will leverage opportunities for the private sector to become engaged in climate-resilient value chains, and strengthen coordination with the public sector, farmers and agribusinesses. Access to microcredits and public funds will be facilitated to support projects and initiatives pertaining to ecosystem restoration and CRA. Through FNEC, innovative funding will be sought to further support ecosystem restoration. Pathways to replenish the FNEC's resources will be identified during the project, including the development of project Funding Proposals. Results of the financial and economic analysis for this project also show that the project investments in capacity-building, wider dissemination of climate-resilient farming systems, technical information provided to farmers, increased knowledge, and mobilization of players across the agricultural value chains have the potential to leverage additional investments in resilience-building activities by households associated with access to credit and public/ private investments.

GCF support will contribute to increase FNEC's capacity as Benin's DAE. Under Component 3, FNEC's capacity to access innovative funding for adaptation in the Oueme Basin will be enhanced. First, the project will seek to increase FNEC's resources, through an expansion of its green-tax base and leveraging of private finance. Moreover, capacity building for FNEC will focus on: assessing projects that are submitted to access financial resources based on several resilience criteria that will be developed during the project; strengthening FNEC's capacity to monitor the implementation of successful projects, and to disburse fund and ensure fiduciary management; and enhancing FNEC's capacity to develop it-self bankable climate change-related projects that can be financed by international fund and

[67] http://www.gcfreadinessprogramme.org/benin-gcf-readiness-programme

donors. These capacity building interventions will not only ensure the sustainability of OCRI's financial resources, but also strengthen the position of FNEC as an accredited entity in Benin that can attract international climate fund.

The grant financing requested from the GCF is needed to make this project viable; additional cofinancing from MAEP through IFAD funded projects has also been mobilized, especially to support Component 2 of the proposed project. The project includes considerable support for public goods, as well as technical assistance and capacity building geared toward unlocking investment in climate-resilient agriculture during and beyond the project implementation period. Although the project will generate economic benefits for farmers through this support, this does not constitute the type of government investment that would directly generate financial returns and thus enable repayment of (even a concessional) loan. In addition, the support the project provides to farmers is largely geared toward improving their capacity to adopt CRA and ICRM practices, while also strengthening the extension, advisory and financial services that enable farmers to adopt and sustain climate-resilient approaches to farming. Project activities will not crowd-out private investment by beneficiary farmers, but rather act as a catalyst to unlock additional investment in climate resilient agriculture. Given this, as well as the poverty and vulnerability status of the farmers targeted by the project, grant financing is considered to be the appropriate level of concessionality.

B.6. Exit strategy (max. 500 words, approximately 1 page)

The water and soil conservation investments will be **maintained by the local extension services, farmers and cooperatives, who will receive adequate trainings; maintenance costs will be mainstreamed into the local development plans (revised under Activity 3.1.3), and supported through public fund during and after project's implementation.** The project-supported soil and water conservation measures and structures are durable and made from locally available materials, and thus operations and maintenance (O&M) costs – see Annex 2, FS, Section 8 – will be sufficiently modest that they can cover such costs beyond project closure – particularly given the anticipated increases in revenue due to project-supported practices, and the potential for further public and private investments in project interventions. In a nutshell, project interventions will be ensured in the long run by: i) transferring skills to farmers, cooperatives and extension services to continue project's interventions; ii) strengthening income streams through climate-resilient farm planning with low-cost CRA techniques to produce crops and high-value agriproducts ; iii) institutionalizing the OCRI project through an innovative multi-stakeholder platform and regulatory frameworks; iv) strengthening value chains for the commercialisation of resilient agriproducts; and v) leverage further public and private fund by demonstrating the significant environmental and economic benefits of the project and by increase FNEC's capacity to finance and implement climate change initiatives. As FNEC's capacity to develop and implement bankable climate change-related projects will be enhanced, its position as Benin's national accredited entity for the AF and GCF will be strengthened.

1. Building capacity in CRA, finance and marketing

OCRI will promote the implementation of CRA and agroforestry, supported by hard and soft waterworks that will easily be maintained by the beneficiary farmers and local extension services. A ToF approach is adopted to ensure the availability of facilitators – some of which will be extension service officers – in each target municipality, who will disseminate the training to farmers, using FFS and FBS. Efforts will be made to ensure equal representation of women among facilitators, by proactively reaching out to women extension officers, including gender parity clauses in the service providers' contracts, vacancy announcement and calls for facilitators. The training will focus on maintaining the waterworks and building soft, easy-to-maintain water retention structure like contour lines, so that fields are protected against floods and water available for irrigation. Training in CRA and agroforestry will contribute to increase and diversify agricultural productivity, using improved, climate-resilient seeds and tree varieties, supported in the long-term by the establishment of nurseries and farmer seed groups in the target municipalities. Farmers' trainings will also focus on financial management and business plans, to facilitate access to credit; and on marketing techniques to develop profitable climate-resilient agribusinesses, that can re-invest in CRA and waterworks for resilient management in the Ouémé Basin. Coaching on finance will be provided with support from FNDA and ATDA; they will provide quality control to ensure the financial plans developed by the trained cooperatives are aligned with MFI's requirements; moreover, FNDA will ensure the support from several MFI to provide credits to relevant cooperatives that improve their productivity and added-value of their agriproducts. Increased productivity, enhanced added-value for agriproducts, and improved access to finance – which will also be facilitated by the strengthening of FNEC's financial strategy – will support the long-term implementation of ICRM in the Oueme Basin. Finally, a training on resilience assessment and monitoring will be also carried out to increase the capacity of stakeholders to measure and track resilience and adaptive capacity, and to demonstrate the benefits of this approach (Activity 3.1.4). This will also contribute to the M&E strategy of the project.

2. A cost-effective approach which generates benefits beyond project's sites

Economic sustainability is achieved through the project's support for viable, cost-effective climate-resilience measures that provide tangible benefits. As shown in the financial analysis (Annex 3), all of the proposed investments related to the land-based interventions are financially attractive from a land-user perspective. The recurrent costs associated with continued use of project-promoted farming, water management and agro-forestry models are modest and can be covered by beneficiary households through increased cash flows due to the project interventions. Moreover, the use of a low-cost phone App, FarmTree, will enable bankable, climate-resilient planification in farms, which combines the best crops, trees and farming techniques given the agro-ecological environment, climate change impacts, and based on cost-benefit estimation on the market value of agriproducts. Finally, investments in ICRM in Upper and Middle Ouémé through OCRI project will also yield benefits in the Lower Basin, as riverbanks will be restored, water retention in soil improved, and flood risks significantly reduced. These benefits will be monitored through the project's M&E system, to showcase the advantages of an ICRM in other basin areas and further promote upscaling of project interventions. Upscale will further be supported by inviting authorities from other Benin's basin areas to observe project impacts and implementation modalities (OCRI platform and financial facility), as well as offer them training on ICRM approach for watershed areas.

Finally, the project has mobilized cofinaning from the GoB (USD 3,000,000), FAO (USD 1,039,001), FNEC and MAEP through IFAD (USD 12,634,280).

3. An innovative multi-stakeholder platform providing solid roots for OCRI

The OCRI platform will be key to institutionalise project interventions, through a multi-stakeholder coordination mechanism, the mainstreaming of ICRM in the SDAGE and LDPs, capacity building, a wide communication strategy and an innovative financial strategy for FNEC (see 5. for details). The project's reforestation and waterwork activities will be conducted through the OCRI platform.To ensure this, a sustainability strategy for the platform will be developed, and fund mobilise from the GoB and through FNEC. Long-term investments from public and private funds will be further supported by the demonstration of the project's environmental and economic benefits, through rigorous M&E using the FarmTree App. The OCRI platform's online portal will support the dissemination of this information, packaged into relevant knowledge products. The training material for CRA, farm marketing and financial management will also be available on OCRI's online portal. This will support project upscale in the whole Ouémé Basin or other basins. Finally, representatives of other basin's authorities, like Mono Basin, will be invited to witness the operational platform and its achievements, in order to motivate replication.

4. Support to climate-resilient value chains to strengthen and create new income streams

The ICRM approach implemented to the Upper and Middle Ouémé Basin, will combine waterworks, CRA and agroforestry to enhance ecosystem services, and increase agricultural productivity. One of the interventions to achieve this, will be planting of trees along the river and on fields, to protect soil against erosion, facilitate water retention, retain moisture, provide shade and restore fertility. In addition, the project has carefully select tree species – mango, shea, cashew – which are resilient to the impacts of climate change, and also provides valuable fruits and nuts, for which there is a local, national and international market demand. The selection of tree species has been informed by a market analysis conducted as part of the project's FS (Annex 2) and includes: shea, cashew and mango trees. The diversification of agriculture – crops and agroforestry – towards high-value products, combined with building capacity to process, package and sell (marketing) these products on the local and regional market will boost farmers' profits, thereby generating new income streams that can be re-invested in project interventions. Sale agreements between producers and buyers will also be sought during the bi-annual municipal forum. The value chain oriented approach is aligned with, and supported by MAEP since early 2000, with the view to increase quality, efficiency and profits within the agricultural sector. In addition, the project will support the establishment of farmer saving schemes – or VSLA – in the beneficiary communities. This will ensure funds remain available to farmers beyond the project's lifetime. These schemes, along with training on financial management, will facilitate access to credit. This will also support high-profit value chains: loans can be used to tackle current issues linked to the poor quality of agro-products, limited harvesting capacity, lack of storage and processing tools. This can be done by using microcredits to invest in the necessary tools, labour and equipment to strengthen the production, storage and sale links of the selected value chains.

5. A Financial strategy for FNEC to leverage funds from public and private institutions

By raising the productivity from selected crops, diversifying agriculture towards high-value agriproducts, and strengthening their value chains through trainings in marketing, processing and business, the project will attract investments from the private sector in sustainable agriculture and agroforestry. All economic and environmental benefits from the project will be rigorously monitored, captured, compile and disseminated as knowledge products, packaged for various stakeholders including investors and MFI, with which the project will engage to secure micro-credits to beneficiary farmers. The strengthened financial strategy of FNEC under Component 3 of the project will ensure long-term investments in climate resilient agricultural development, while at the same time reducing climate

change vulnerability in Benin's main basins. FNEC has already committed fund during the project, to support 3 micro-projects that contribute to climate change adaptation in the Oueme Basin. A roadmap to ensure the facility's replenishment will be produced and a full-scale funding proposal will be developed with FNEC to ensure a first replenishment of the fund.

Finally, the project will leverage opportunity to be replicated in other basins of Benin. Indeed Benin include 4 basins: Oueme, Mono, Volta and Niger; the latter two are cross boundary basins, therefore their managing authorities are multi-country. Authorities of these three additional basins will be invited to attend training sessions on ICRM approach to watershed areas. Moreover, they will join field visits in the Oueme Basin to observe concrete benefits of the project as well as the functioning of the OCRI platform and its financial facility (through FNEC); they will also receive regular newsletter on the project impacts and achievements; and invited to attend the annual OCRI symposium.

C.FINANCING INFORMATION

C.1. Total financing

(a) Requested GCF funding (i + ii + iii + iv + v + vi + vii)	Total amount	Currency
	18, 453, 795	million USD ($)

GCF financial instrument		Amount	Tenor	Grace period	Pricing
(i)	Senior loans	Enter amount	Enter years	Enter years	Enter %
(ii)	Subordinated loans	Enter amount	Enter years	Enter years	Enter %
(iii)	Equity	Enter amount			Enter % equity return
(iv)	Guarantees	Enter amount	Enter years		
(v)	Reimbursable grants	Enter amount			
(vi)	Grants	US$ 18, 453, 795			
(vii)	Result-based payments	Enter amount			

(b) Co-financing information	Total amount	Currency
	16, 860, 781	million USD ($)

Name of institution	Financial instrument	Amount	Currency	Tenor & grace	Pricing	Seniority
MCVDD	In kind	3,000,000	million USD ($)	Enter years Enter years	Enter%	Options
MAEP(IFAD)[68]	Grant	12,634,280	million USD ($)	Enter years Enter years	Enter%	Options
FAO	In kind	1,039, 001	million USD ($)	Enter years Enter years	Enter%	Options
FNEC	Grant	187,500	million USD ($)	Enter years Enter years	Enter%	Options

(c) Total financing (c) = (a)+(b)	Amount	Currency
	35,314,576	million USD ($)

(d) Other financing arrangements and contributions (max. 250 words, approximately 0.5 page)

The proposed project will receive parallel financing from other projects, as follow:

- GCF Project SAP05 Benin: USD2,020,000
- CBIT: USD50,000

C.2. Financing by component

Component	Output	Indicative cost Options	GCF financing		Co-financing		
			Amount Options	Financial Instrument	Amount Options	Financial Instrument	Name of Institutions
Low carbon climate Resilient Crop production enhanced and Ecosystem services restored	1.1.Waterworks and tree plantation to protect river banks and secure water access	USD 16,633, 276	USD 8,507,635	Grants	USD 644,801	In kind	FAO
					USD 7,480,840	Grants	MAEP (IFAD)

[68] As per co-financing letter, co-financing from MAEP is via three projects financed by IFAD (see table 1) through a mix or loans and grants from IFAD to the Government. Resources from the Government to the project activities targeting project beneficiaries will not involve any repayments from project beneficiaries.

in the Upper and Middle Ouéme	1.2.25,250 Farmers capacitated to implement climate resilient agriculture, agro-forestry and sustainable land management	USD 4,742,300	USD 3,627,900	Grants	USD 1,114,400	Grants	MAEP (IFAD)
Climate-resilient and gender-sensitive value chains, supporting farmers' livelihoods in the Upper and Middle Ouémé	2.1.Farmers and cooperatives' income stream diversified, enhanced, and secured in the face of climate change	USD 4,797,975	USD 1,634,135	Grants	USD 3,163,840	Grants	MAEP (IFAD)
	2.2.Private sector incentivized to invest in climate resilient agriculture and resilient management techniques in Ouémé Basin	USD 1,196,000	USD 510,000	Grants	USD 336,000	In kind	MCVDD
					USD 350,000	Grants	MAEP (IFAD)
An enabling institutional and financial environment established to promote and upscale climate-resilient management in Benin's Basins	3.1.OCRI project institutionalised through a multi-stakeholder platform, regulatory frameworks and capacity building	USD 5,076,775	USD 2,606, 575	Grants	USD 2,470,200	In kind	MCVDD
	3.2. Strengthened FNEC's capacity to ensure continuous support to climate-resilient farming in the Oueme Basin	USD 327,000	USD 139,500	Grants	USD 187,500	Grants	FNEC
	3.3.Awareness of ICRM in basins'	USD 858,150	USD 574,950	Grants	USD 21,200	Grants	MAEP (IFAD)

	benefits raised among farmers, and public and private institutions				USD272,000	In kind	FAO
Project management & maintenance	PMU	USD 1,6,83,100	USD 863,100	Grants	USD 193,800	In kind	MCVDD
					USD 122,200	In kind	FAO
					USD 504,000	Grants	MAEP (IFAD)
Indicative total cost (USD)		USD 35, 314,576	USD 18, 453,795		USD 16, 860,781		

C.3 Capacity building and technology development/transfer (max. 250 words, approximately 0.5 page)

C.3.1 Does GCF funding finance capacity building activities?	Yes ☒ No ☐
C.3.2. Does GCF funding finance technology development/transfer?	Yes ☒ No ☐

The project hinges strongly on the capacity building component – to individual farmers, agribusinesses and cooperatives, and government agencies. The GCF will invest USD 6,625,025 to support capacity building. This will cover: i) refreshing 15 Master trainers under Activity 1.2.1 ii) training of 250 facilitators under Activity 1.2.2; iii) training of 25,250 farmers on CRA and waterworks maintenance under Activity 1.2.3; iv) set up and train seed producer groups under activity 1.2.4; v) training of farmers organised in agribusinesses and cooperatives on business, finance and marketing under Activity 2.1.1 & 2.1.2; vi) training of 30 facilitators on the FarmTree App [*also contributing to technology transfer*] under Activity 2.1.3; and vii) training of policy-makers and extension officers on ICRM, mainstreaming of adaptation within LDP, and to support project implementation and M&E under Activity 3.1.2 and 3.1.3. Trainings on the FarmTree App for local extension services and selected farmers will also support technology transfer in Benin. The App will enable the GoB to carefully monitor the environmental and economic benefits of CRA, agroforestry and waterworks to understand cost-benefits of the approach and leverage additional investments in project interventions. Moreover, at the farm level, the App will inform agricultural planning, to strengthen productivity and cash flow from climate-resilient agricultural businesses.

D. EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA

This section refers to the performance of the project/programme against the investment criteria as set out in the GCF's Initial Investment Framework.

D.1. Impact potential (max. 500 words, approximately 1 page)

The project envisions increasing climate change resilience, enhancing food security and improving livelihoods and income streams in the Ouémé Basin of Benin. The potential of the project to contribute to the achievement of the GCF's objectives and result areas is described in Section H1. The project will contribute to the GCF Adaptation Impact: **Increased sustainable, climate resilient development**. Several GCF result areas will also be targeted, namely:

Most vulnerable people, communities and regions

Health and well-being, and food and water security

Ecosystem and ecosystem services

Sustainable land use, reforestation and forest management

1. Most vulnerable people, communities and regions

The OCRI project will be implemented in Benin. According to the UNDP Multidimensional Poverty Index, 66.8% percent of Benin's population lives in poverty. The low status in terms of human development for the country as a whole makes vulnerability to climate change particularly acute and constrains people's adaptive capacity and ability to be resilient. The intended beneficiaries of this project are 330,000 poor small farmers in 5 municipalities in the Upper and Middle Ouémé basin. Most of the households in the selected communes do not have a secure food supply[69]. Malnutrition of infants and young children is particularly serious in the communes of Djougou, Glazoué and Copargo. The majority of the population in the 5 municipalities are illiterate. The communities in the central and northern departments of Benin are particularly vulnerable to climate change. Rising temperatures, erratic and extreme rainfall events are major threats to livelihoods. During the past three decades, these regions have been affected by floods on several occasions. Infrastructure and crops were severely damaged by the floods, with agricultural losses of ~70% in some cases. In addition to floods, crops are also negatively affected by increased air temperatures. As a result of this, the yields of maize and sorghum – two staple crops in Benin – have already decreased in the project areas. Climate-change impacts will further reduce productivity in agricultural landscapes and forest ecosystems.

2. Health and well-being, and food and water security

The implementation of ICRM in the Upper and Middle Ouémé Basin, an approach combining climate-resilient agricultural practices, agroforestry and waterworks, will reduce exposure to climate change, improve access to food and water, and increase well-being in the target areas, as well as downstream, thereby indirectly benefiting the whole population of the Ouémé Basin (6 million people – SDAGE, 2013). Indeed, the restoration of riverbanks and ecosystems' goods and services in the Upper Ouémé Basin will contribute to reduce flood and flash flood risks in Middle and Lower Ouémé ; moreover, water availability will be improved in the target areas through soft and hard waterworks and agroforestry, to support agricultural activity. At least 66,000 households (330,000 small-scale producers (50% of whom are women), equivalent to the population of the selected 5 municipalities living in the basin area – see FS, Section 8.1.5) will have reduced vulnerability to climate change through i) expanding water access and improving water availability to enable irrigated agriculture (including counter-season) in a context where droughts are more intense and seasonality is shifting (from current 4,080 ha of existing irrigated agricultural plots to an additional 680 ha from GCF resources and 1,320 ha from MAEP cofinancing). This will result in reduced poverty and food insecurity in the Upper and Middle Ouémé, while exposure to climate-related risks will be reduced in the whole Basin.

3. Ecosystem and ecosystem services

The proposed ICRM approach of the project (which will affect 95,000 ha of land) considers the interactions between climate change impacts on water, crops and population, from upstream to downstream areas. It aims to combine interventions that restore ecosystems along riverbanks to reinforce their functions, while tackling the climate and non-climate causes of ecosystem degradation. As a result, ecosystem functions are restored and enhanced, thereby protecting the population against climate change impacts, while at the same time ensuring the production of goods and

[69] Food insecurity is especially prevalent in Middle Oueme, affecting 10 to 20% households – and over 20% in Glazoue. See WFP, Analyse Globale de la Vulnerabilite et de la Securite Alimentaire (AGVSA), Republique du Benin, 2017.

services that underpin agricultural production. These soft adaptation interventions are combined with small water infrastructure to ensure water capture, flow and recharge, as well as its sustainable management to enable agricultural activities. Finally, introducing new climate-resilient agricultural techniques, which also contribute to ecosystem restoration and protection, allows to sustain crop production while resorting the ecological functions that deliver critical services to humans in a changing climate.
The watershed approach strengthens the basin's ability to maintain its functions (stabilizing soils through vegetation, storing water or regulating the flow and providing socio-environmental services) in light of climate change impacts according to the characteristics of the agro-ecological zones. The up taking of climate resilient agricultural practices and protection of the ecosystems and water sources upstream indirectly benefit a larger part of the population located in the lower basin areas.

4. Sustainable land use, reforestation and forest management

Although the proposed project focuses on adaptation, its interventions will bring additional impact and benefits via carbon sequestration. This will be achieved through implementing sustainable land and water management, reforestation and climate-resilient agriculture under Component 1. These interventions will enhance the ability of agricultural landscapes and forest to sequester carbon. The implementation of the project will increase the mitigation potential of the area resulting in the sequestration of 1,783,633 tCO_2-eq over 20 years. With a total area of 95 001 ha, the carbon sequestered per hectare and per year will increase from 2.1 tCO_2-e in the baseline scenario to 3.5 tCO_2-e when the project is implemented which corresponds to a carbon balance of – 0.9 tCO2-eq sequestered per hectare and per year.
The benefits of the project will enable climate change adaptation, risk prevention and protection of lives, assets and livelihoods in the Ouémé Basin. **The expected total number of beneficiaries is 6 million people living in the Oueme Basin,** benefitting from reduced vulnerability to climate change and enhanced knowledge and understanding of climate change impacts and adaptation options. Out of this, the project will directly benefit 330,000 farmers, including 50% women. The project design team used national and locally available statistics as a secondary source of information to determine initial targets for beneficiaries, farmlands, pasturelands, waterworks and community infrastructure. This information was combined with information obtained through field visits, interviews and consultations to develop the project baseline.

Direct beneficiaries are people living in the basin areas of the five target municipalities, and who rely directly on agriculture as main activity. They will beneficiate from: i) the installation of waterworks to protect against floods and improve water acces; ii) training on CRA to improve productivity under climate change conditions; iii) ecosystem restauration and management to enhance the production of goods and services, protect against climate change impacts and enhance crop productivity; iv) financial and business training to boost profits in climate-resilient farms; v) improved access to finance to invest in their climate-resilient farms; and vi) enhanced understanding of climate change impacts and adaptation options in the Ouémé Basin.

Indirect beneficiaries will benefit from: i) protection against climate change impacts, in particular through reduced occurrence of floods through waterworks and reforestation on river banks in Upper and Middle Ouémé; ii) additional job opportunities in the value chains that will be supported by the project; iii) enhanced knowledge and understanding of climate change adaptation, through the awareness raising interventions supported by the project; and iv) strengthened governance system that promote integrated management in the Ouémé Basin, in the long-term; this will be insured through strengthening of the Ouémé Master Plan (SDAGE), revised Local Development Plans and improved capacity to mainstream adaptation into agriculture and development plans amongst local stakeholders.

D.2. Paradigm shift potential (max. 500 words, approximately 1 page)

Without the proposed project, low yields, food insecurity and high poverty in the Upper and Middle Ouémé Basin, as well as a lack of capacity, and economic and financial opportunities to support small-scale, low carbon climate-resilient agriculture, drive the local communities towards unsustainable practices, which underpin the vicious cycle represented in B.2. As a result, yields decline, natural resources are depleted and land degraded; the communities of Upper and Middle Ouémé are increasingly vulnerable to floods and flash floods especially in Middle Ouémé, water scarcity especially in Upper Ouémé, shifting rainfall seasons, and reduced agricultural productivity in the whole Basin.
The project will effect a paradigm shift that results in enhanced climate resilience, low carbon and improved livelihoods for smallholders in the Ouémé Basin. This will be achieved through three complementary components (described in B. 3).

The whole project is underpinned by an innovative, integrated approach for basin management, which will not only implement concrete, on-the-ground adaptation technologies in selected sites – which is often the case in agricultural development projects – , but also considers the rippling effects of climate change from upstream to downstream basin

areas, and how hard and soft adaptation technologies can be combined in the upper and middle catchment to also benefit the lower area. This comprehensive approach will be combined with the strengthening of climate-resilient value chains (namely cashew, mango, maize and shea) and the institutionalizing of ICRM in the Ouémé Basin, to ensure project's sustainability and replication. Moreover, regulatory frameworks will be strengthened, cooperatives supported, and finance unlock to provide continuous support to implementing ICRM in the Ouémé Basin. This will contribute to sustained reduced climate-related risks in the Basin, while diversifying and increasing income streams in the Upper and Middle areas. Finally, all project's knowledge products including training modules, toolkits, and M&E reports on the benefits of ICRM in basins, will be disseminated widely through a multi-stakeholder platform and other relevant communication channels. This, along with the organization of annual symposiums on adaptation technologies for basin areas, will contribute to upscale the project beyond its target areas.

The project meets the following GCF requirements:
- Potential for scaling up and replication: The project interventions are designed based on best practices and recommendations from past initiatives, supporting CRA and water management in Benin or similar countries. These interventions are also building on, complementing or upscaling other past and on-going projects, like the SAP Benin (see section B.1). The ICRM approach, which will be valorized in the Ouémé Basin, will be institutionalized through the OCRI multi-stakeholder platform, as well as regulatory frameworks; amongst these frameworks, the revised Ouémé Master Plan (SDAGE) will serve as an umbrella under which the local (municipal) development plans of all the municipalities located within the Ouémé, can be revised to mainstream the ICRM approach. The OCRI platform will also disseminate lessons learned and best practices from the project and cost-benefits assessments to incentivize public and private investments in CRA and waterworks. Training manuals on CRA and waterworks, on business and marketing techniques, on financial management will be made available on the OCRI platform. As the project's knowledge products and training material will be shared online and during organized events like symposium, municipal forums, sensitization campaigns, field visits, and radio broadcasts, it will facilitate replication within other non-beneficiary communities. Furthermore, the project will invite representatives of other basins' authorities to attend training sessions in ICRM, so that they can mainstream this approach into other watershed management plans; these representatives will also be invited to field visits on project sites to showcase the impacts of ICRM. Additional financial returns from the beneficiary farmers and improved access to micro-credit and financial tools will enable beneficiary agribusinesses, farmers and cooperatives to further invest in CRA and waterworks, thereby ensuring the continuation of project activities beyond its lifespan and potentially expanding to additional sites. This will also be supported as farmers' cooperatives will have increased access to micro-credit (to invest in the agribusinesses) and private sector is incentivize to invest in CRA (through Component 2).

The project waterworks, CRA and support to key value chains are fully aligned with existing plans and strategies in Benin, namely the SDAGE (waterworks), the Strategic Plan for the Development of the Agricultural Sector (PSDSA) and Plan National d'Investissements Agricoles et de Sécurité Alimentaire et Nutritionnelle (PNIASAN) (for CRA and value chains). This creates an additional potential for replicating and upscaling successful OCRI interventions through national investments, in other parts of Benin.

-***Innovation:*** Numerous adaptation technologies, successfully tested in previous projects (see Annex 2, FS, Section 7 and 8), such as drought-tolerant crop varieties, locally adapted food and cash crop species, agroforestry techniques, conservation agriculture, multiplication of quality seed and vegetable materials, rainwater collection systems, and composting will be implemented as part of the innovative practices and technologies introduced by the project in the 5 beneficiary municipalities. As such, the project is upscaling good practices among new communities. FFSs, lead farmers peer-learning, demonstration plots and evidence-based research will be adopted to ensure sustainable production intensification in a changing climate. Capacity development and technical trainings will support their implementation to enhance soil fertility and water conservation, agro-ecosystems restoration and improved food security of rural communities via the establishment of climate-resilient productive agro-ecosystems. Furthermore, the organizational and technical capacities of local community-based organizations will be strengthened with the objective of increasing and diversifying agricultural production in a changing climate. While other projects are promoting CRA and strengthening cooperatives, the OCRI project will combine this with waterworks in key areas of the Upper and Middle Oueme Basin. Specific infrastructure in the Upper Oueme will regulate water flows and reduce erosion, thereby reducing flood risk in the Middle and Lower Oueme areas. This will be enhanced by planting trees on the degraded Oueme banks. This Integrated Climate-Resilient (ICRM) approach to watershed management, combining strategic infrastructure with reforestation and sustainable land management practices, is new in the area. Most project only focus on improving agricultural productivity, sale and water access, without addressing flood problems at their source – specifically in upper basin areas.

In addition, the project will make use of innovative appropriate climate resilience assessment/monitoring tool that are cost-efficient (eg FarmTree) in the selected municipalities, as an innovative adaptation technology. Local facilitators

and extension officers will be trained to use the App for farm planning and M&E purposes. This App will not only ensure rigorous monitoring of the project's costs and benefits, and its impacts on ecosystems and nutrition; but it will also guide the planning of low carbon climate-resilient farms that produce agri-products through a combination of crops and trees, using varieties which are best sold on the local market. A letter from FarmTree company on FarmTree policy on legal tool access, copyright, intellectual property and due diligence, has been included in the proposal package. Moreover, the project will unlock finance for climate-resilient value chains in the Oueme Basin. Not only will new saving schemes – VSLA through FAO's *caisse de resilience* approach – be introduced (which have proven efficient in other West African countries but are not yet implemented in Benin), but also farmers' access to micro-credits and loans will be enhanced and secured. First, VSLA ensures financial resources which provide guarantees for accessing loans; second, signed commitment from FNDA to facilitate such access is a key support for the project, which demonstrate the government's commitment. Another innovation is the use of Dimitra clubs, by the project, to foster community engagement for empowerment, individual and collective agency as well as enhancing women's participation and leadership in decision-making processes represent key added values in this project. Finally, the project innovates by enhancing FNEC's capacity to support innovative climate change-related initiatives in the Oueme Basin; this will be Benin's first facility to provide financial and in-kind resources in support of innovative, climate-resilient activities that also contribute to restore and/or protect riverbank ecosystems while making small-sclae farmers climate-resilient. The financial resources from FNEC will be increased and re-oriented towards support for climate change-related projects. A concrete replenishment plan through public and private sector investments will be developed.

***- Potential for knowledge sharing and learning*:** This potential will be essentially supported through: i) a ToF approach and trainings in farmer's schools; ii) a rigorous M&E system; and iii) the OCRI platform with a robust M&E system and communication strategy. Firstly, under Component 1, facilitators will be trained on CRA, waterworks and agroforestry, and FFS established to enable the training of thousands of farmers in Upper and Middle Ouémé during the project; training interventions will continue after the project, supported by the trained local extension officers and facilitators. Moreover, the training modules will be made available through the OCRI platform. Secondly, under Component 2, a rigorous M&E using innovative Apps will be implemented by local officers and facilitators who will receive adequate training and equipment. For example, FarmTree App enables to capture the environmental, climate-change, nutrition, gender-responsive and economic benefits of the climate-resilient interventions. The data will be used to produce knowledge products on the project's benefits, that will be especially geared towards the private sector to incentivise investments. Thirdly, under Component 3, the OCRI platform will be designed to further catalyse the impact of the project. It is specifically set up to focus on knowledge-sharing, project M&E and governance, scale-up and institutionalisation of climate-resilience measures. The platform will use participation and proactive communication to institutionalise the project's innovative approaches and techniques. It will broaden the replication and dissemination of practices and knowledge to other vulnerable municipalities by documenting, capitalising and disseminating successful experiences and lessons learnt on the implementation of climate resilient practices, techniques and approaches. The OCRI platform will produce a multiplier and aggregation effect through participatory review of local development plans and capacity building. The Platform will also enable knowledge sharing through organising the annual OCRI symposium.

- ***Contribution to the creation of an enabling environment:*** The project's low carbon ICRM approach will transform current approaches that are largely restricted to single sectors and do not promote resilient basin management to reduce climate change impacts from upstream to downstream areas, while at the same time enhancing agricultural productivity and diversifying income streams. The OCRI project is promoting a shift away from conventional, siloed planning processes towards collaborative and cross-sectoral coordination between relevant departments (agriculture and water, through the OCRI platform) and with the private sector, to develop integrated solutions that include ecological and socio-economic considerations at the landscape level. The potential for integrated sustainable management and ecosystem restoration in basins to buffer climate change impacts and support local livelihoods is recognised as vital for providing adaptation benefits. Through the establishment of the OCRI multi-stakeholder platform and its financial facility (FNEC), the project enables sustained participation of public and private stakeholders into its interventions. Moreover, the project invests strongly in technical assistance and developing stakeholders' capacities, thereby ensuring project's ownership by local and national institutions at project's end. With this regards, FNEC's capacity to develop bankable projects and to implement and monitor them will be significantly improved, thereby unlocking access to climate finance in Benin.

Furthermore, the project will create an enabling environment for adaptation innovations and market development in selected, climate-resilient value chains. First, it will address existing barriers to credit access for smallholders, through capacity building interventions and reaching out to MFI to secure loans. Second, it will incentivize investments in its interventions (via FNEC) through a demonstration of the economic benefits of an integrated approach to planning and implementation of adaptation in basin areas, that combine waterworks with CRA and agroforestry. Third, the OCRI platform will provide an innovative space for national and local governmental agencies to implement ICRM. Finally, a

focus on market development for value-added products from agriculture will ensure that livelihood interventions are sustainable.

- Contribution to the regulatory frameworks and policies: The project will contribute to Benin's regulatory framework and policies especially at the local and regional level. The local authorities and extension services of the five target municipalities will be fully involved in the coordination and implementation of the activities, through the Local Project Implementation Units (LPIUs), which will be part of the OCRI platform. Extension services in water, agriculture and forestry (environment) will receive trainings on ICRM for basin areas, CRA and waterworks. They will be involved in the revision of the LDPs in the view to mainstream ICRM; and they will be capacitated to implement these revised plans. Moreover, the SDAGE will be strengthened to insure the promotion of an ICRM approach, that considers climate change impacts from upstream to downstream areas. The plan will service as an umbrella to guide the revision of the local development plans, in order to guide future public investments for local development towards climate-resilient management in basin areas. The project's scalability will be further enhanced by collaborating with ongoing initiatives on agricultural development, reforestation and sustainable forest management. For instance, the project is fully aligned with the Strategic Plan to Develop the Agricultural Sector (Plan Stratégique de Développement du Secteur Agricole – PSDSA), which provides strategic guidance for agricultural policies for the period 2017–2021. This plan aims to ensure sustainable food security in Benin by improving agricultural productivity, promoting climate resilience within the agricultural sector and strengthening value chains for selected crops and tree products. The proposed project's interventions on agriculture and value chains are closely aligned with the PSDSA, which will benefit from lessons learned from project interventions to upscale them across Benin.
Finally, as indicated in Annex 2, FS, Section 6, the proposed OCRI project is fully aligned with, and support, the implementation of Benin's INDC – through which Benin commits to implement adaptation action in three priority economic sectors: agriculture, water resources and forestry. Within these sectors, Benin aims to reduce the vulnerability of communities and ecosystems to climate change using appropriate measures.

D.3. Sustainable development (max. 500 words, approximately 1 page)

The project fully supports the implementation of SDGs in Benin, in particular SDG 2: End hunger, achieve food security and improved nutrition; SDG 3: Ensure healthy lives and promote well-being; and SDG 13: Take urgent action to combat climate change and its impacts. In addition, the following co-benefits are expected:

Environmental co-benefits: The ICRM approach implemented to basin, through a mix of soft and hard climate resilient interventions (intercropping, agricultural diversification, increased tree planting of agroforestry species, improved water recharge, protection of water sources, and soil improvements) will not only make the farms more climate resilient and productive. It will also restore land coverage and quality through agroforestry and reduced soil erosion, improve ecological functions and services of the ecosystems through agroforestry, sustainable management and water retention, enhance biodiversity, contribute to reduced deforestation through improving income streams and food security (thereby breaking the vicious cycle of overexploitation of the natural resources – see baseline problem in Section B.1), and enhance water reserves and availability. The project will intensify the provision of ecosystem services to support food security in the target areas, and to protect against climate-related risks like floods and flash floods in the whole Ouémé Basin. More precisely, overall reduction of soil erosion will take place over 95,000 ha.

Social co-benefits: The project will contribute to improve well-being, health and save lives of up to 6 million people living in the Oueme Basin of Benin. This will be achieved through enhancing food and nutrition security in the Upper and Middle Ouémé; and reducing floods, flash floods and water scarcity risks in the whole Ouémé Basin. Moreover, it will support women's empowerment through better access to key productive assets, income generation and vocational training; and overall diversify livelihood options and income streams for farmers, which constitute the vast majority of the population in the Ouémé Basin.

Economic co-benefits: The outcomes of the project will provide better and diversified livelihoods and production options for women, men and youth smallholder producers as well as a projected prevention of losses between 30% (for vegetables); 1-10% (for staple crops). Climate-resilient farms will be more efficient in terms of water conservation and input use, reinforcing the sustainability of agro-ecosystems, improving food, land and water security for rural households beyond those directly involved in the project. Another co-benefit will be that farmers' workload will be reduced (especially that of women), allowing for further income-generating or household activities. Improved access to financial services and inputs for small-scale producers (including women and youth) will contribute to increases in yields and value addition in a number of food value chains. Local communities will have better access to water for agricultural and livestock production. Increased agricultural productivity will reduce Benin's reliance on food imports and has the potential to increase the country's exports. The project has an estimated economic rate of return of about 20%. At a 10% Discount Rate it has a Net Present Value of USD 62 million, and costs per beneficiary of about USD132. Non-

quantifiable economic benefits include improved health due to increased food security and the ripple effect of the success of several groups on the local and national economy.
Gender-sensitive development impact: Gender-equality is a cr
oss-cutting theme within the project, which aims to ensure women´s full and effective participation. Capacity building, awareness raising and knowledge dissemination regarding the effects of climate change will be differentiated by gender; training modules that specifically targets women, for example on processing and selling high-value crops, fruits and nuts, will be implemented, and women's groups equipped with relevant processing tools. More precisely, the project will directly beneficiate to 165 000 women, who will have increased agricultural productivity and income, and/or be less vulnerable to climate change impacts. Women will also be challenged to develop innovative adaptation technologies through an annual award that will benefit at least one women's cooperative or agri-business every year. The gender-specific interventions promoted by the project will ensure equality to adapt to the impacts of climate change on a sustainable basis. The project includes a Gender Assessment and Action Plan (see Annex 8), which will operationalise gender-responsive adaptation actions through the project results framework.

D.4. Needs of recipient (max. 500 words, approximately 1 page)

Vulnerability

Benin's total population now stands at 12 million people, 52% of which live in rural areas, according to World Bank figures for 2018. According to the UNDP Multidimensional Poverty Index, 66.8% percent of Benin's population lives in poverty. The low status in terms of human development for the country as a whole makes vulnerability to climate change particularly acute and constrains people's adaptive capacity and ability to be resilient. The intended beneficiaries of this project are 330,000 poor small farmers in 5 municipalities in the Upper and Middle Ouémé basin. Most of the households in the selected communes do not have a secure food supply. Malnutrition of infants and young children is particularly serious in the communes of Djougou, Glazoué and Copargo. The majority of the population in the 5 municipalities are illiterate. The communities in the central and northern departments of Benin are particularly vulnerable to climate change. Rising temperatures, erratic and extreme rainfall events are major threats to livelihoods. During the past three decades, these regions have been affected by floods on several occasions. Infrastructure and crops were severely damaged by the floods, with agricultural losses of ~70% in some cases. In addition to floods, crops are also negatively affected by increased air temperatures. As a result of this, the yields of maize and sorghum – two staple crops in Benin – have already decreased in the project areas. Climate-change impacts will further reduce productivity in agricultural landscapes and forest ecosystems.

Financial, economic, social and institutional needs

Benin is a Low Middle Income developing country in terms of human development, ranking 163 out of the world's 188 countries[70]. The government debt-to-GDP ratio has been increasing over the past decade, and now stands at 41.5%, making it unfeasible for the GoB to allocate much of its budget to climate-change risk measures. There is a critical need in Benin for grant funding to finance technical assistance, training and other investments needed to change skills, knowledge, mind-sets, relationships and ways of working a managing natural resources and production in the face of climate change. Yet neither the domestic private sector, government nor multilateral financial institutions are currently in a position to provide grant resources for these kinds of public goods. The proposed project will enhance the climate-resilience of these vulnerable rural communities in Upper and Middle Ouémé Basin, with additional benefits in the Lower Basin. This will be achieved by using GCF resources to catalyse a shift to ICRM in the Ouémé Basin, thereby directly addressing the threats climate change poses to the livelihoods of these communities.

Benin's governance arrangements – whereby resources, policies, operations and expenditures are decentralized to the department level – imply that the capacity to meet the needs of the people of Benin to adapt to climate change must be developed at the departmental and municipality level. In recognition of this, the project includes regional (Oueme level) investments under Component 3 in coordination, monitoring tools, and knowledge systems to support ecosystem planning and adaptation. Moreover, through this project, the GCF will allocate more than 16 percent of its project resources to directly strengthening institutions and implementation capacity of the affected population through skill-building and technology transfer to farmers and the organizations working with them such as FFS, input suppliers, traders, and local savings banks (see Section C3). The economic, social and institutional needs that they respond to are described above in terms of vulnerability.

Finally, there is an investment gap in the Middle and Upper Oueme Basin for climate change adaptation and mitigation interventions. Currently, no project is supporting low carbon climate-resilient land and water management in the

[70] UNDP Human Development Report 2019.

watershed of Middle and Upper Oueme; while climate change adaptation projects tend to focus on the Southern part of Benin (including Lower Oueme Basin) - except for the new GCF SAP project. The impacts of projects implemented in the lower basin are impaired by climate change impacts in the Upper and Middle Oueme, in particular heavy rainfalls, soil erosion and silting, which lead to floods and flash floods in the lower basin. Therefore, the OCRI project will address the existing investment gap in Middle and Upper Oueme by implementing an ICRM approach that will not only reduce climate change vulnerability in the target sites but also along the whole Oueme Basin.

D.5. Country ownership (max. 500 words, approximately 1 page)

The proposed axes of intervention are aligned with the Benin INDC. Specifically, the adaptation measures of the INDC emphasize food and water security via implementation of climate-resilient practices and technologies. The activities proposed under the project are therefore a national priority and fall within PAG 2016 - 2021, the Benin INDC, NAPA and PSDSA 2025 and PNIASAN 2017 - 2021-2025. Interest in the project has also been demonstrated by the support of a large number of governmental and non-governmental organizations via projects/programmes on similar pilot initiatives that are synergistic and could be scaled up. The Ouémé watershed Masterplan (SDAGE, 2013), envisages:

- construction of small-scale dams and irrigation schemes for integrated and effective watershed management, similar to the implementation of climate-resilient practices promoted through the project;
- agricultural farmland management on the watershed, in adherence with the implementation and replication of practices and the promotion of sustainable livelihoods of climate-resilient agro-sylvo-pastoral ecosystems;
- restoration of agricultural land as planned through the dissemination of integrated land and water practices;
- integration of an adaptation dimension in the development plans and capacity development, aligned with governance and local support to communes.

The project has been developed in response to a request from MAEP in 2017, together with key stakeholders, including MAEP,MCVDD, FNEC, GCF/NDA, IITA, INRAB and especially local communities. The roles of the various institutions mentioned above in the management and implementation of the project are outlined in the Feasibility Study. The NDA is fully supportive of the project, as are MCVDD, MAEP and other stakeholders.

The Ouémé Basin Agency (OBA) will join the multi-stakeholder platform as main partner. OBA is a public scientific and social institution under the supervision of the Water Directorate. The mission of the Agency is to coordinate, plan and promote the valorization of water through sustainable management and rational use of the water resources of Ouémé Basin. It is responsible for: managing financial, material and human resources; managing inventories and fixed assets; developing and monitor budget execution; preparing the financial statements; tracking disbursements and replenishments of accounts; managing supplies and contracts; processing salaries and other employee benefits. As of yet, only the management committee has been established.

FNEC's capacity to design and manage climate change-related projects will be enhanced. FNEC is Benin's National Accredited Entity for the AF and the GCF. Through OCRI project, FNEC will receiving capacity building support from FAO to identify or design, implement and monitor climate change-related projects. Moreover, FNEC will be able to leverage additional resources through increased capacity to design and manage bankable funding proposal that will support the replenishment of the Facility. This will unlock future climate investments in Benin.

The project design phase consisted of an intensive stakeholder consultation process including FPIC consultation with indigenous communities, transparent communication and easy access to relevant information. The consultations ensured that the project is fully supported by the Government and inserted in the development priorities at national and municipal levels. Via the OCRI platform (see Component 3 in the project description) stakeholder consultations will be continued during the project implementation.

D.6. Efficiency and effectiveness (max`. 500 words, approximately 1 page)

The main objective of the project called the "Ouémé Climate Resilient Initiative" (OCRI) is to promote the climate resilience of landscapes and rural communities in the Upper and Middle Ouémé Basin in Benin. The project intends to enable the adoption and dissemination of adaptation and mitigation practices and technologies, to strengthen low carbon climate-resilient value chains, and to establish an integrated multi-stakeholder governance mechanism for climate-resilient management in the Ouémé Basin. On-the-ground interventions in CRA, agroforestry and waterworks are based on best practices for the basin context, as identified in past initiatives and through scientific literature (see FS, Section 7). Such practices are proven climate change adaptation and mitigation technologies to enhance high-value, vegetable production, and diversify agriculture production by integrating trees on annul crop land. To further support strengthened, diversified income streams under climate change, the project will promote use of an innovative farmers' App – FarmTree. This technology has been identified as the best, low-cost option to support climate-resilient crop and tree planning, while at the same time providing cost-benefits estimates to farmers.

However, the GoB does not have the financial and technical capacity, nor the knowledge, to implement the proposed interventions and initiate a paradigm shift towards resilient integrated management in the Ouémé Basin. The main financial constraints and obstacles to the implementation of climate change adaptation measures in the five municipalities are the high cost of investments, the difficult mobilization of financial resources from public and private sectors, and the lack of qualified human resources. The proposed financial model of OCRI will leverage the dissemination of proven low carbon climate-resilient practices and technologies, and lead farmers to generate productive and sustainable farming models. Technical assistance, knowledge dissemination adaptation and sustainable production will be streamlined from farm to landscape levels via capacity development, so that the objective of increased resilience of vulnerable smallholder farmers in the Upper and Middle Ouémé can be achieved.
These investments would not be possible without the project due to barriers such as limited know-how on adaptive practices. With the GCF funding, the successful demonstration of this area will attract more investments through this project, and will remove an entry barrier for other donors and the private sector to finance similar needs in the country. This will be further ensured by developing a robust, innovative financial strategy (under component 3): the strategy will expand FNEC's resources and provide loans and grants to cooperatives and small organisations in the Oueme Basin. The loans and grants will support CRA interventions that also promote ecosystem restoration and protection. Pathways to replenish the Facility at project's end will be identified in order to ensure its long-term efficiency.

Assessment was made of the net present value (NPV)[71]. The NPV determines the present value of net benefits by discounting the streams of benefits and costs back to the beginning of the base year. The analysis below is presented in more detail in the attached EFA (Annex 3) in Excel (single crop based projections, tab "Indicators for Proposal), where it is projected over 30 years. With a Discount Rate of 10%, the Net Present Value of the project (including investment costs) is of USD 69.4 million. This also means that for farmers, the interventions are economically viable, and therefore sustainable. The internal rate of return (IRR) of the project calculated over a period of 30 years amounts to 18%. These results do not take into account the non-quantifiable economic co-benefits (see Section D.3) or the ripple effect of the success of several groups on the local and national economy. Annex 4 also highlights the project's cost per beneficiary at US$ 107. Figure 13 shows the annual project cost-benefit balance. The project investment is of US$35,314,576, spread over six years. The project breaks-even after eleven years from project start. The annual project impact increases considerably after Year 10 to an annual improved production value of around US$ 30 million in Year 15, because by then trees start producing.

The impact farmers' income is calculated by dividing the annual project impact (in increased production value over the baseline) divided by the number of direct beneficiaries. If we assume a daily wage of FCFA 3000-5000 (~US$ 9, upper value is chosen; 250 working days per year), this will lead to an **additional employment of 2,800 jobs by year 10 after project start, and 8,900 additional jobs by year 30 after project start**.

The project will improve the livelihoods of the beneficiaries in the targeted project areas, by reducing vulnerability to climate change-related hazards, by enhancing agricultural productivity and income through climate-resilient practices and crops/trees diversification, and through saving schemes and facilitated loan (FNDA) and grants (FNEC) access. As a result, farmers will be able to increase trade sales. By the end of the project, farmers and local traders will have set up value chains for both vegetables and tree products, that will sustain beyond the project period. With the multi-actor coordination, knowledge management and M&E, local and national actors will also have the capacity to build on and expand the proposed innovations leading to climate-resilient farming. While farmers need to adapt their farming practices to climate change, at the same time they need to meet increasing quality standard requirements set by the private sector. Hence capacity building is required. The private sector requires a reliable supply from farmers for growth. Farmer cooperatives and women groups will be trained so that farmers have the knowledge and skills to produce the required quality and quantity of produce for the private sector in a timely manner, using sustainable, climate-resilient practices. To facilitate a market for smallholders, the OCRI platform will have a space for networking dedicated for farmers, cooperatives, sellers, and private sector; the latter will be able to suggest specific trainings for farmers in adhering to product requirements for the private-sector choice. Budget for training is allocated, the condition being secured offtake of farmer produce. Farmer extension workers in the private sector will be selected as trainers of trainers in an FFS.

[71] The NPV was calculated based on crop prices for 2022.

E. LOGICAL FRAMEWORK

*This section refers to the project/programme's logical framework in accordance with the **GCF's Integrated Results Management Framework** to which the project/programme contributes as a whole, including in respect of any co-financing.*

E.1. Project/Programme Focus

Please indicate whether this proposal is for a mitigation or adaptation project/programme. For cross-cutting proposals, select both.

☒ Reduced emissions (mitigation)

☒ Increased resilience (adaptation)

E.2. GCF Impact level: Paradigm shift potential (max 600 words, approximately 1-2 pages)

This section of the logical framework is meant to help a project/programme monitor and assess how it contributes to the paradigm shift described in section D.2 above by applying three assessment dimensions - scale, replicability, and sustainability.

Accordingly, for each assessment dimension (see the definition per assessment in the accompanying guidance note), describe the current state (baseline) and the potential scenario (target) and rate the current state (baseline) by using the three-point-scale rating (low, medium, and high) provided in the guidance note. Also describe how the project/programme will contribute to that shift/ transformation under respective assessment dimensions (scale, replicability and sustainability). In doing so, please refer to section B.2(a) (theory of change).

Assessment Dimension	Current state (baseline)		Potential target scenario (Description)	How the project/programme will contribute (Description)
	Description	Rating		
Scale	Farmers in the Upper and Middle Oueme Basin are very vulnerable to climate change impacts. These impacts result in soil fertility losses, land slides and floods, as well as reduced productivity. As a result, farmers – who have limited technical support for agriculture and low access to financial services – tend to clear additional land (e.g. forests) and set up fields near the Oueme river. These unsustainable	Low	The paradigm shift will involve a move away from unsustainable agricultural practices in the Oueme Basin of Benin. Technical support will be provided through FFS and FBS to scale up CRA and sustainable land and water management in the Upper and Middle Oueme Basin; and to enable access to financial services that can be invested in resilient VC crop production and sale. As productivity increases, and marketing of key VC products is boosted, farmers' behavior will change towards sustainable, climate-resilient and low-emission land and water management in the Oueme Basin.	The interventions of the project will contribute to reduce CO2 emission through reforestation and sustainable land management; they will directly benefit 330,000 farmers living in the five target municipalities, who will become less vulnerable to climate change impacts. In addition, agricultural financial services like micro-credits (from selected MFIs working with FNDA) and subsidies (from FNEC) will be scaled up and more accessible to farmers for investments in CRA and VCs.

	practices, aiming at providing new income (e.g. sale of wood/ charcoal) or finding more fertile fields (near the river bed), contribute to degrade land and increase GHG emission in Benin which, in turn, increase farmers' climate change vulnerability.			
Replicability	There is currently no ICRM approach to watershed management implemented in Benin; in particular, a land and water management approach that considers the rippling effects of upstream watershed management on downstream population and livelihoods, and that supports CRA, is not implemented. Therefore, replication is not yet possible. There are however some CRA techniques that are currently promoted in the Oueme Basin. The best practices will be replicated by the project, but as part of the ICRM overall approach, to ensure benefits (in terms of climate change impact reduction) for upstream to downstream population in the Oueme Basin.	Medium	The project will demonstrate the benefits of its ICRM approach, applied to the Oueme Basin. Technical support to farmers, investment in infrastructure, exchange visits for farmers and basin authorities, rigorous M&E of project impacts, and institutional strengthening will foster the replication of CRA in other communities/ sites, and of ICRM in other Basin of Benin (and possibly cross-boarder basins).	The CRA interventions will be informed by existing good practices and successful methods that were collected during the field visits in Benin. These CRA interventions will be combined with other measures for soil erosion control and water management, in order to ensure climate-resilient management in a watershed landscape. This ICRM approach has not been implemented yet in Benin, therefore lessons learned d will be carefully monitored and inform any efforts to replicate the work in other Basin areas within and outside of Benin.

Sustainability	The GoB is committed to promote adaptation within the agricultural sector, which is a key priority for the country. However, the current institutional framework in the Oueme Basin, coordination level, and technical capacity of local government do not support integrated water management in watershed landscape ; Climate change and ICRM are also not yet integrated into key local plans. And sensitisation and knowledge of this approach to climate change adaptation is low among public and private stakehodelrs. Therefore, sustainability is not yet possible.	Low	The paradigm shift will ensure the institutionalization of OCRI's approach in the Oueme Basin. This will be achieved by setting up a fully functional OCRI platform, building capacity among local extension services and stakeholders, and revising relevant regulatory frameworks to mainstream ICRM approach. In addition, the project benefits will be demonstrated on farmers' fields, which will sustain their interest in implementing CRA and sustainable land management. Benefits will also be captured through rigorous M&E and knowledge products will be disseminated, as well as field visits organsied to incentivize long-term behaviour changes for resilient, low-carbon land management in the Oueme Basin.	The project will work closely with regional and local authrotiries in the selected communes to build their capacity for ICRM, revise with them relevant development plans to guide future investments in the Oueme Basin, and facilitate the maintenance of project interventions like the waterworks. In addition, private sector actors like MFIs and agribusinesses will be informed of the benefits of project interventions in terms of increased agricultural productivity and enhanced crop quality. This will ensure their long-term engagement and parterships with OCRI farmers, to invest in the production of key VC crops.

E.3. GCF Outcome level: Reduced emissions and increased resilience (IRMF core indicators 1-4, quantitative indicators)

Select appropriate IRMF core and supplementary indicators to monitor project/programme progress. More than one IRMF (core and or supplementary) indicators may be selected as applicable for each GCF results area and project/programme outcome (as defined in the table in section B.2(b)). If IRMF indicators are unable to measure any given project/programme outcomes, project/programme-specific indicators should be developed under section E.5 (project/programme specific indicators).

GCF Result Area	IRMF Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions / Note
				Mid-term	Final[72]	
ARA1 Most vulnerable people and communities	Supplementary 2.1: Beneficiaries (female/male) adopting improved and/or new	Field reports Mid- and end-term project evaluation	0 male 0 female	100,000 men and 50,000 women actively plan for climate-	330,000 (of which 165,000 women) have adopted CRA and diversified	Trainings lead to the long-term behavior change, and adoption of CRA and sustainable land

[72] The final target means the target at the end of project/programme implementation period. However, for core indicator 1 (GHG emission reduction), please also provide the target value at the end of the total lifespan period which is defined as the maximum number of years over which the impacts of the investment are expected to be effective.

	climate-resilient livelihood options	Scorecard assessment of uptake of CRA and diversified income streams amongst project beneficiaries SHARP resilience assessment scores (report and data)		resilient agriculture	their income streams	management in the Ouémé Basin Support to CRA and value chains effectively lead to enhanced food security and income streams, so that farmers do not go back to unsustainable practices
ARA2 Health, well-being, food and water security	Supplementary 2.2: Beneficiaries (female/male) with improved food security	FAO and regional stat Project mid- and end-term evaluations Surveys of households in Upper and Middle Ouémé SHARP resilience assessment scores, including HDDS and FIES (report and data)	AGVSA report (2017): 10-20% household in Middle Oueme; >20% in Glazoue; and 5-10% in Upper Oueme	10,000 households, of which 2,500 are female-headed, are food-secured	66,000 households (of which 16,500 are female-headed) are food-secured	*Based on FAO, food-secured households are defined as households in which, at all times, physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and. healthy life, is insured.* *In Upper and Middle Oueme, approx. 25% of the households are headed by a woman; the average household size is 5 people* *Changes in baseline will be monitored through field surveys and during the project terminal reviews.* *Final target is determined based on the number of direct beneficiaries* The implementation of CRA and agroforestry effectively lead to increased productivity after project Y 2
ARA4 Ecosystems and ecosystem services	Supplementary 4.1: Hectares of terrestrial forest, terrestrial non-forest, freshwater and	GIS and satellite maps M&E reports using TreeFarm App	0	Restoration of 60 000 ha in Upper and Middle Ouémé	Restoration of 95 000 ha in Upper and Middle Ouémé	The ecosystems are not degraded to a point where they cannot be restored anymore

	coastal marine areas brought under resoration and/or improved ecosystems			of agricultural fields through CRA, agroforestry and sustainable management	of agricultural fields through CRA, agroforestry and sustainable management	Support to CRA and value chains effectively lead to enhanced food security and income streams, so that farmers do not go back to unsustainable practices Restoration of river banks and fields along the Upper and Middle Ouémé River lead to reduced exposure to climate risks in downstream areas
MRA4 Forestry and land use	Core 1: GHG emissions reduced, avoided or removed/sequestered	Biennial Update Reports (BUR) submitted to UNFCCC and available in UNFCCC platform	0	267 546 tCO2 sequestered (i.e. 89 182 tCo2 eq x 3 years)	535 092 tCO2 sequestered (i.e. 89 182 tCo2 eq x 6 years) 1 783 633 tCO_2-eq over 20 years	CO_2 emission reductions are estimated with FAO Ex-ACT tool CO2 emission reductions are estimated with FAO Ex-ACT tool; Project lifetime: 20 years Annual emission reductions: 89 182 tCO2-eq/yrLifetime emission reductions: 1 783 633 tCO2-eq over 20 years For more information on assumptions see GHG estimation report

E.4. GCF Outcome level: Enabling environment (IRMF core indicators 5-8 as applicable)

Select at least two relevant IRMF core (enabling environment) indicators to monitor and elaborate the baseline context and project/programme's targeted outcome against the respective indicators. Rate the current state (baseline) vis-à-vis the target scenario and select the geographical scope of the outcome to be assessed. Describe how the project/programme will contribute towards the target scenario. Refer to a case example in the accompanying guidance to complete this section.

Core Indicator	Baseline context (description)	Rating for current state (baseline)	Target scenario (description)	How the project will contribute	Coverage
Core Indicator 5: Degree to which GCF investments contribute to strengthening institutional and regulatory frameworks for low emission climate-resilient development pathways in a country-driven manner	There is no regional coordination body to facilitate a climate-resilient, integrated management of the Oueme Basin. The Ouémé Master Plan maisntreams climate change to some extend, however needs to be updated and effectively implemented The PDL do not mainstream adaptation	low	The project will strengthen regional and local institutions and development frameworks by building the capacity of local government stakeholders, improving existing development plans and ensuring the mainstreaming of adaptation concerns into these plans. The project will also set up the OCRI platform to promote the long-term implementation of ICRM in the Oueme Basin.	Project Component 3 is dedicated to establishing a robust institutional environment for climate-resilient development in the Oueme Basin. Project outputs include the strengthening of the Ouémé Master Plan and revision of PDLs to mainstream adaptation ; the design and operationalization of the OCRI platform to coordinate efforts and funding for ICRM in the Ouémé Basin; the training of staff members of MAEP, MCVDD, extension service officers and members of OBA and other basin authorities on ICRM	Multiple sub-national areas within a country
Core indicator 8: Degree to which GCF investments contribute to effective knowledge generation and learning processes, and use of good practices, methodologies and standards	Awareness of climate change appropriate responses is low among farmers and stakehodelrs, in particular at the local level. There is also low awareness of ICRM for watershed landscapes in Benin, as a way to reduce climate change vulnerability of upstream to downstream population.	low	The project will contribute to generate new kowldge supporting climate-resilient, low-emission development in watershed landscapes of Benin. Components 2 & 3 will carefully monitor project impacts and develop and disseminate knowledge products to support this learning process in Benin. In addition, the CRA technologies promoted under Component 1 are informed by existing best	The project's knowledge management strategy will ensure that all lessons and best practices are shared with target audiences, including (e.g.) other municipalities, Basin authorities, and farmers; as well as government institutions and donors that promote agriculture and VC in Benin.	National level (one country)

			practices in Benin or similar context.		
Core indicator 7: Degree to which GCF Investments contribute to market development/transformation at the sectoral, local, or national level	Farmers in selected VCs are not meeting quantity and quality production standards. They have low capacity for production, harvesting, storing, packaging and transporting crops to sale points. There is also a lack of structuration and organization within key VCs as farmers tend to sell their crops on an individual basis, just after harvest when prices are low.	low	The project will promote the development of climate-resilient, profitable VCs. Production will rely on climate-resilient, low-carbon technologies, farmers' organization and business skills will be enhanced and sale facilitated through regular contacts between producers and buyers. Market development will be further supported by public (FNEC) and private (MFIs) invetsments and/or support to CRA.	The project will support the government's efforts to boost key VC and to promote CRA to improve productivity and livelihoods in rural areas of Benin. Component 2 of the project will particularily focus on organisaing farmers and equipping them with the skills to access micro-finance, invest efficiently in the field, and boost their profits. Private sector institutions like MFIs will also be sensitized on the benefits of providing financial services for CRA.	Multiple sub-national areas within a country

E.5. Project/programme specific indicators (project outcomes and outputs)

The performance indicators for progress reporting during implementation should seek to measure pre-existing conditions, progress and results at the most relevant level for ease of GCF monitoring and AE reporting. Add rows as needed.

Project/programme results (outcomes/ outputs)	**Project/programme specific Indicator**	**Means of Verification (MoV)**	**Baseline**	**Target**		**Assumptions/ Note**
				Mid-term	Final	
Climate Resilient Crop production enhanced and Ecosystem services restored in the Upper and Middle Ouéme	*Changes in level of agricultural productivity* *Protection against climate-relayed risks*	Surveys amongst direct beneficiaries Surveys and stat in the Ouémé Basin to assess changes in risk exposure	<5% of households diversify production purposely	20,000 households have improved agricultural productivity	*66,000 households have improved agricultural productivity* *6 million people are less exposed to climate-related risks*	

		SHARP resilience assessment scores (report and data)				
Climate-resilient and gender-sensitive value chains, supporting farmers' livelihoods in the Upper and Middle Ouémé	*Changes in level of income* *Diversification of income streams towards climate-resilient high-value products*	Surveys amongst project beneficiaries SHARP resilience assessment scores (report and data)	Baseline on farmers' income TBC using SHARP tool at project onset	20,000 households have diversified their agricultural production	+10% income for project beneficiaries 66,000 households have diversified their agricultural production	Support provided to value chains is sufficient to incentive farmers and cooperatives to invest in new climate-resilient products The implementation of CRA and agroforestry effectively lead to increased productivity, which enables sale of agriproducts
An enabling institutional and financial environment established to promote and upscale climate-resilient management in Benin's Basins	*A fully-functional OCRI platform* *A robust financial strategy for FNEC*	*Scorecard assessment of OCRI platform* *Surveys amongst members of the platform* Review if the resources (amount + sources) available within FNEC to support projects	Governmental departments act in silos; public and private sector act independently; currently FNEC has between USD50-100,000 available every 2 years to finance climate change related projects	n/a	1 fully-functional and autonomous OCRI platform FNEC resources increasing by 20% (including investments from private sector) 1 full-scale project to replenish the Facility	Government, private sector, civil society and producer organizations are ready to overcome barriers for collaboration Green-tax can be expanded to increase FNEC's revenue Private sector is incentivised to invest resources in ICRM
Project/programme co-benefit indicators						
Co-benefit 1: *livelihood of 165,000 women improves*	*Women are satisfied by the support provided by the projects*	*Scorcards among women on their level of*	Baseline on women's perception of their livelihoods TBC	100,000 women with improved livelihoods	165,000 women with improved livelihoods	Women can fully, and equally participate to the project activities, thanks to the Dimitra approach promoted in each commune

		satisfaction with the project	using SHARP tool at project onset			
Co-benefit 2: *farmers' income increases*	*Changes in the level of income*	Surveys amongst project beneficiaries	Baseline on farmers' income TBC using SHARP tool at project onset	n/a	+10% income for project beneficiaries	Demands for value chain crops promoted by OCRI is significant enough to aobsorb new production Farmers and buyers are well-connected

E.6. Project/programme activities and deliverables

All project activities should be listed here with a description and sub-activities. Significant deliverables should be reflected in the implementation timetable. Add rows as needed.

Activity	Description	Sub-activities	Deliverables
1.1.1. Build water harvesting and retention infrastructures	The project will subcontract relevant local companies ti build hard and soft infrastructures such as micro-dams, dykes, cisterns and surface boreholes, as well as 'soft' contour ploughing, and stone lines that can easily be reproduced and maintained by the communities (see training under Activity 1.2.3). Each beneficiary village will receive 1 **micro-**dam, equipped with solar pumps and irrigation pipes, to feed agricultural plots under Output 1.2. Simple adaptation techniques, like contour and mulching, **will also** contribute to improve water retention especially in drought- and flood-prone areas, like Upper and Middle, as demonstrated in previous projects	Based on OCRI feasibility Study on waterworks: 1.1.1.1. Construction of surface water storage structures or harvesting structures (Small earth dams, water rising structures, etc.) 1.1.1.2 Rehabilitate 23 old surface water collection structures 1.1.1.3 3 Development of small irrigated perimeters with full water control 1.1.1.4 Development for the protection of water sources (river, head of streams, artesian boreholes, etc.) 1.1.1.5 Support for waterworks guidance 1.1.1.6 Set up 1,320 ha of irrigated land in Glazoue and Djougou 1.1.1.7 Secure government support to coinvest in waterworks	- 30 new surface water structures are built - 23 surface water collection structures are rehabilitated - 680ha of irrigated plots are established (GCF) + 1,320 ha (MAEP) - 14 water sources are built - 44 artesian boreholes are built - 5 micro-dams are built This will be verified through activity reports
1.1.2 Strengthen degraded river banks and restore land with tree .	This activity will especially focus on Upper Ouémé and contribute to reduce flood	1.1.2.1 Conduct detailed biodiversity analysis in Upper and Middle Ouémé to identify	-5,000 ha + 4,000 ha (MAEP/) of degraded river banks and fields are reforested -5 nurseries are built

	risks in Middle and Lower areas. Trees will be planted by workers hired by the project on river banks and fields to restore vegetation coverage, reduce flood risks due to heavy rainfalls falling on bare land, restore fertility, provide shade and keep moisture in a context where heat stresses and evapotranspiration increase. Reforestation sites will be determined at project onset. In addition, one community-managed tree nursery will be built in each beneficiary community, to accommodate 10,000 trees/year.	site specific locally-relevant and resilient tree species-conduct technical and hydrological studies to identify best site for the micro-dams 1.1.2.2 Set up 5 community tree nurseries and provide technical support to produce high-quality seedlings 1.1.2.3. Plant 5,000 ha of trees along degraded river banks and fields 1.1.2.4 Plant additional 4,000ha of trees in Glazoué, Zagnando and Zogbodomey (MAEP) 1.1.2.5 FAO provides Technical support to produce high-quality tree seedlings to enhance rural community resilience to climate change	This will be verified through activity reports
1.2.1 Train 15 FFS Master Trainers and facilitators (women and men)	15 existing FFS Master Trainers (mix of agronomy, livestock, forest, land and water experts) (at least 30% women) will be selected and trained. Four training sessions (one week x session) are organized to refresh and update the Master Trainers on the FFS methodology and on the key technical issues needed by the project. These Master Trainers will conduct the ToF, which are described in the following activity.	1.2.1.1 Develop training courses 1.2.1.2 Select 15 Master trainers to train and capacity/ skills assessment 1.2.1.3. Implement 4 x 1-week training sessions	15 Master Trainers are 'refreshed' (At least 30% women) This will be verified through review of training attendance list and 2 scorecard assessments (pre and post-training) of the trainer's capacity to train on CRA
1.2.2. Training of 250 Facilitators (at least 40% women)	The activity will train 250 trainers that is 50 per selected municipality – to become OCRI facilitators. First, a training curriculum will	1.2.2.1 Develop training curriculum and modules on gender-responsive CRA; agro-forestry; sustainable land	- Training modules integrating gender concerns are developed and adapted to local context - 250 facilitators are formed (at least 40% women) - All trainers are trained on gender-responsive and participatory approaches

	be developed based on the key priorities of the Ouémé Basin. This activity will include a validation workshop, which involve technical experts and FFS Master Trainers. Secondly, according with the curriculum, the training material will be compiled and adjusted, covering the following thematic : FFS methodology, climate-resilient agriculture (CRA); agro-forestry; sustainable land management (with focus on river banks); and construction and maintenance of small waterworks. Gender equality will be integrated throughout the curriculum. In addition, there will be specific modules and sessions on gender-responsive and participatory approaches to capacity development and community engagement including the Dimitra Clubs approach. The training modules will be disseminated on the knowledge portal of OCRI platform (Activity 3.1.1). Finally, the modules on CRA will offer various 'starter kits', with specific adaptation options and seed varieties, from which project beneficiaries can choose, based on the needs and specificities of their farm (to be distributed under Activity 1.2.2). Once the training modules are ready for use, 250 facilitators (50 per municipality) will be trained: the project will organize 10	management (with focus on river banks) water works 1.2.2.2 Organise 10 training of facilitators sessions of a 5-month duration, to accommodate 25 facilitators per session (for a total of 250 facilitators trained)	This will be verified through review of training attendance list and activity reports ; and 2 scorecard assessments (pre and post-training) of the Facilitators' learning through the modules

	Training of Facilitators (ToF), for a duration of 5 months each (sequential training - 1 week per month) to follow the entire production season. Each ToF will be attended by 25 facilitators. These facilitators will come from local extension services in forestry and agriculture, local rural irrigation and waterworks department of MAEP, young educated community members and leads, technicians or members of agri-businesses. They will be chosen based on their willingness to become OCRI facilitators to continue the training beyond the project's lifespan. Women's engagement will be proactively sought to promote equal participation.		
1.2.3 Implement climate resilient agriculture including agroforestry, to enhance agricultural productivity under climate change.	Training will take place in 650 farmer field schools (FFS), including 100 schools dedicated to women, including 30 dedicated to women associated with the 204 Dimitra Clubs; plus 225 FFS set up with MAEP cofinancing. The 250 facilitators trained under Activity 1.2.2 will disseminate the practices through the established FFS to a total of 16,250 farmers (25 farmers per FFS set up with GCF resources) – including at least 50% women – spread over the 5 target municipalities. There will be 130FFS through the project lifespan per target municipality (spread between selected	1.2.3.1 Set up 650 FFS and select training beneficiaries in areas not covered by MEAP; or beyond the MAEP project period. Each FFS will include 20 training sessions and involve 25 farmers (at least 40% women)1.2.3.2 Technical support, coaching and supervision to the implementation of 650 FFS 1.2.3.3 Provide training to additional farmers in Glazoué, Djougou, Zagnando and Zogbodomey	16,250 (GCF) plus 9,000 (MAEP) farmers are capacitated to implement CRA on their fields (including 50% women) This will be verified through review of training attendance list and 2 scorecard assessments (pre and post-training) to assess understanding and uptake of CRA among trained farmers) 204 Dimitra Clubs (3 per 68 villages) established and functioning

	villages). Each FFS will last 4-to-5 months (following length of the growing season). The 16,250 training beneficiaries will also receive farmer's starter kits, including small tools like spade, water can, trowels, wheelbarrow, as well as improved seeds. An additional 9,000 farmers will be trained with MAEPcofinancing.		
1.2.4 Increase access of adapted quality seeds and plant propagation material	First, the project will set up or rehabilitate nurseries for the production of quality seedlings; then, selected farmers will be organized into seed producer groups in order to multiply/ reproduce improved climate adapted seeds. This will enable communities to continue climate-resilient farming beyond the project's cycle.	1.2.4.1 Rehabilitate/build and operationalise 1 nursery per target municipality 1.2.4.2 Organise and support 1 seed producer group per municipality 1.2.4.3 Train technicians and farmers to collect, handle and dispatch shea seeds and to produce seedlings.	- 5 communal tree seed supply facilities established - 15 Communal Nursery managers trained every year on nursery technics related to targeted plants. - 5 tree seeds producer groups established and supported through training. This will be reviewed through activity reports
2.1.1 Increase income of 5,000 farmers through training on business and marketing techniques and equipment using FAOfarm business schools (FBS) methodology	The training will take place on the 100 most-productive FFS; FBS will be set up and farmers not yet organized in cooperative, will be: cooperatives (approx. 100 cooperatives) will be organised around key value chains: mango, shea, cashew and maize. The learning programmes will be designed to develop business and marketing skills among cooperatives. Processing, packaging and storing equipment for shea, cashew, mango and maize will be provided to the cooperatives in need. An additional 100 FBS will provide training to	2.1.1.1 Train 2,500 farmers organized in agribusinesses and cooperatives – including 33% women. Each FBS will include 20 training sessions and involve 25 farmers 2.1.1.2 FBS coached and supervised: coaching, reporting, monitoring & evaluation process, by a group of local focal points (FBS experts); 1 month per FFS, funded by the FBS funder 2.1.1.3 Provide at least 15 small processing/ packaging/ storing units to cooperatives 2.1.1.4 Train and equip additional cooperatives for post-harvest, processing, storing and sale of	- 2,500 farmers are trained by GCF and 2,500 by MAEP on business and marketing techniques - 15 small processing/ packaging/ storing units are distributed to cooperatives This will be verified through activity reports, review of training attendance list and capacity assessment (scorecard to assess understanding of business and marketing techniques among trained farmers)

	2,500 more farmers under the MAEP cofinancing	agriproducts in Glazoue, Zogbodomey, Djougou and Zagnanado	
2.1.2 Improve access to micro-credit and investments for agriculture	The 5,000 farmers trained under Activity 2.1.1 will also receive training on financial management for cooperatives, and developing business plans to boost their financial profits (through better financial management) and to address current barriers in accessing micro-credits (see B.1 on barriers; as well as Annex 19 Section 3). Training will be led by ADTA, and modules will be prepared with support from FAO coaches. A gender-specific module will be developed to enable women's access to credit and buy equipment to support their activities in the processing of high-value nuts and crops.	2.1.2.1 Develop training material addressing current barriers to credit access 2.1.2.2 Organise 5 training sessions for each FBS to train 2,500 farmers 2.1.2.3 Establish Village Savings and Loans Associations to foster low-threshold small loan provision 2.1.2.4 Improve access to financial services for farmers in Glazoue and Djougou	5,000 farmers are trained on financial planning and management (at least 50% women) This will be verified through review of training attendance list and capacity assessment (scorecard to assess understanding of financial planning among trained farmers) as well as operational and financial performances.
2.1.3 Train facilitators (selected educated young) and national/local climate change experts (from relevant institutions eg MCVDD, MAEP) on the use of assessment and/or monitoring Instruments for Resilience (TreeFarm App are the identified tools).	Train 10 facilitators (selected educated young) and 20 climate change experts (from relevant institutions eg MCVDD, MAEP) on the use of FarmTree App (at least 45% facilitator are women and at least 50% are youth)	2.1.3.1 Select 10 facilitators (2 per target municipality) and 20 experts from MCVDD and MAEP (national and municipal services) to be trained on the tools 2.1.3.2 Equip them and train them through 1x 5-day training session in Cotonou	10 facilitators are equipped with the TreeFarm App 20 CC experts from MCVDD and MAEP are trained on resilience monitoring tool (FarmTree App) This will be verified through attendance list and activity reports; and scorecard to assess participants' understanding and ability to use the Apps and tools
2.2.1 Disseminate information products packaged for private sector to demonstrate the socio-economic benefits of waterworks, CRA and agroforestry	This will target investors and credit organisations in the field of agriculture. The demonstration will be supported by the data and results produced with the FarmTree App under 2.1.3, and the M&E under Activity 3.1.4, which will conduct a rigorous monitoring of project's	2.2.1.1 Develop information products packaged for private stakeholders and finance institutions 2.2.1.2 Disseminate the products via the OCRI platform, flyers and booklets distributed 2.2.1.3 Field visit in each project municipality for private stakeholders (including MFI,	Flyers and manuals showcasing the economic benefits of waterworks, CRA and agroforestry are produced and disseminated This will be verified through activity reports

	interventions and impacts. This demonstration of project's benefits, combined with the financial and marketing training activities under Output 2.1, will improve access to public and private funds and credits for farmers, including from government-managed FNDA.	wholesaler, export companies, etc.) to showcase the benefits of project activities	
2.2.2 Organise municipal forums to connect farmers and small businesses to local and regional buyers	Relevant buyers will be identified and connected to farmers through these 'match-making' forums. The municipal forums will be organized twice a year, as opportunities for producers to showcase their innovative climate-resilient production practices, and their resilient products, as well as to conclude trade agreements between farmers and buyers of resilient agri-products, or receive new demands for alternative products from the buyers, based on market demands. Women and women-led cooperatives and agribusinesses will be invited o showcase their practices and products.	2.2.2.1 Further Identify relevant buyers in each municipal to invite to the forums 2.2.2.2 Liaise with the GoB and municipal authorities to provide support to the forums and to facilitate trade agreements between farmers and buyers 2.2.2.3 Organize bi-annual forums (5 in total, from project Y3) 2.2.2.4 Ensure partnerships between farmers, processing companies and buyers in Glazoue, Zogbodomey et Zagnanado	5 bi-annual forums are organised This will be verified through activity reports
3.1.1 Establish and activate the OCRI platform ensuring adequate and meaningful participation of women and women's organizations at local and national level	A first step to set up the platform will be to identify, through consultations, all relevant institutions and stakeholders to join the platform's coordination mechanism. Then the following elements of the platform will be designed: - Operational system including legal status, role and responsibility;	3.1.1.1 Further identify relevant stakeholders to participate on the platform, including their roles and responsibilities 3.1.1.2 Design the platform operational strategy, and multi-stakeholder coordination mechanism 3.1.1.3 Design the platform's financial and communication strategies – including an	- 1 signed agreements between OCRI platform members -1 fully-functional OCRI platform is established and operational, and has a legal status This will be verified through activity reports, OCRI's strategic documents, online portal and survey among the members of the platform to assess its functionality

	- A coordination mechanism to engage all relevant stakeholders to join efforts for ICRM in the Ouémé Basin (especially on the reforestation and small waterworks; and M&E of their impacts). - A communication strategy to disseminate project-related information, raise awareness of climate change and gender, and the socio-economic benefits of an ICRM applied to basin areas, and set up the Annual Symposium. - A financial strategy to ensure the continuation of the platform beyond the project.	online portal to be hosted by MCVDD 3.1.1.4 Disseminate all training modules, knowledge products, and project's lessons learnt and best practices on the platform's online portal 3.1.1.5 Ensure government support to OCRI platform	
3.1.2 Implement regional and local climate-resilient development plans in the Oueme Basin to ensure long-term investment in low carbon integrated climate resilient management	The Ouémé Master Plan (SDAGE) will be revised to address the gaps identified in the FS (see Section 6.3), and implemented by OBA. The revised Master Plan will integrate gender concerns The strengthened SDAGE will serve as the umbrella under which project activities linked to tree plantation and restoration of the riverbanks (Output 1.1) will take place. Moreover, ICRM will be mainstreamed into the PDL of the 5 target municipalities to guide future (post-project) local governmental investments in the Ouémé Basin. It will provide guidance for waterworks (and their maintenance) and other soft and hard adaptation technologies. Relevant staff members from OBA and local extension	3.1.2.1 Organise participatory workshop to discuss options for strengthening the SDAGE 3.1.2.2 Revise the Oueme Operational Management Plan with all relevant stakeholders and validate through a workshop 3.1.2.3 Organise 1x5-day training sessions on ICRM targeting extension officers and OBA staff members 3.1.2.4 Revise local development plans	- 1 validation workshop to validate the SDAGE and the LDPs strengthened to mainstream ICRM approach in watershed management - 10 extension officers (2 per municipality) and 5 members of OBA are trained to implement ICRM in the Oueme Basin - 5 members of other basin authorities are trained to implement ICRM This will be verified through activity report and list of participants to the validation workshop; scorecard assessment of stakeholders' understanding and capacity to implement ICRM in watersheds

	officers will be trained to implement the SDAGE and LDPs.		
3.1.3 Implement rigorous M&E on land restoration in the Ouémé Basin	10 Staff members of MCVDD and MAEP, as well as 10 extension officers (2 per site) from the forest department in the target municipalities will receive technical support from FAO to conduct rigorous M&E of the impacts of tree plantation among the Oueme riverbanks. Moreover, they will be capacitated to implement the SHARP tool (or similar resilience assessment approaches) during target training sessions. Finally, extension officers will be capacitated to provide advises on climate-resilient agriculture and adaptation to farmers living in their commune.	3.1.3.1 Organize 1x 5-days training workshop to train 20 officers on M&E techniques with FAO support 3.1.3.2 Train 10 extension officers to provide advises on climate-resilient agriculture 3.1.3.3 Conduct mid-term evaluation 3.1.3.4 Conduct end of project evaluation 3.1.3.5 Carry out a project impact study	10 staff members of MAEP and MCVDD, 10 extension service officers are trained on M&E and CRA 1 mid-term and 1 end of project evaluation reports This will be reviewed through attendance lists and scorecard assessment on understanding of M&E practices ; and review of the reports
3.2.1 Develop a robust financial strategy for FNEC	A long-term strategy and roadmap to strengthen and replenish FNEC's financial resources will be developed (through expanded the green-tax basis, leveraging private finance, and developing bankable projects); its resources will be re-oriented to specifically support climate-resilient initiatives (with the development of a checklist to facilitate the selection of relevant projects).	3.2.1.1 Review FNEC's existing financial strategy and identify gaps and opportunities to expand it 3.2.1.2. Organise consultations with FNEC and MCVDD to discuss best options for increasing FNEC's resources 3.2.1.3 Organise validation workshop with GoB to validate the financial strategy 3.2.1.4 Through consultation with FNEC, identify relevant criteria to facilitate the selection of relevant climate change adaptation projects to be financed through FNEC's resources	1 validation workshop to validate and formally adopt the strengthened financial strategy of FNEC This will be verified through reviewing the workshop participants' list, the Facility's roadmap, and survey among the members of the Facility

3.2.2 Build FNEC's capacity to design, select, implement and monitor climate change-related projects	GCF fund will be used to provide technical assistance and build FNEC's capacity to design bankable climate change projects, which can attract investments from private sector institutions (because of their demonstrated returns), or receive funding from national/ international funds and donors. At the end of the project, FNEC will have designed at least one fully-fledged Funding Proposal, with high potential to receive funding from international donors. GCF fund will support FNEC to develop such proposal (capacity building) and submit it to the most adequate fund by project's end. Finally, training on gender-responsive budgeting will be provided to FNEC's members to ensure the use of fund will take into account women-specific needs and priorities.	3.2.2.1 Conduct a detailed assessment of FNEC's capacity to design, implement and monitor climate change-related projects 3.2.2.2 Design training modules and train 5 members of FNEC (2x1-week training) 3.2.2.3 Provide regular support to FNEC to design a bankable climate change project to submit to the AF or GCF	- 1 fully-fledged funding proposal submitted to GCF or AF This will be verified through review of the proposal and training attendance list.
3.2.3 Provide finance to 3 micro-projects that contribute to climate change adaptation and ecosystem restoration in the Oueme Basin to the benefits of small-scale farmers	Provide finance to 3 micro-projects (that contribute to climate change adaptation and ecosystem restoration in the Oueme Basin – to the benefits of small-scale farmers (FNEC co-financing) This activity will be funded by FNEC. A call for proposal will be opened and farmers' associations and cooperatives, trained in the FBS, will be requested to submit proposals for initiatives that focus on climate-resilient	3.2.3.1 Open call for proposal 3.2.3.2 Review received projects and select, contract and finance the successful ones	- 3 micro-project implemented This will be verified through submitted proposals and results from the M&E process.

	agriculture and ecosystem restoration and/or protection in the Oueme Basin. The call for proposal will be launched based on current FNEC's procedures. To ensure the AE can oversee these projects in an appropriate fashion, FAO will work with FNEC to develop a project selection 'check-list', which ensure the selection of projects aligned with OCRI approach and gender-responsiveness; FAO will also strengthen FNEC's capacity to monitor the implementation of these micro-projects on the ground, produce detailed progress reports, and ensure financial transparency.		
3.3.1 Organise knowledge dissemination events and products on OCRI with full integration of gender.	This will include: - Farmers' field visits for neighbouring communities (100 farmers for each project site), during Y4-5 of the project, to showcase OCRI's results; - Field visits to project sites for 5 members of Benin's basin authorities (Volta, Niger and Mono) - Radio shows to broadcast information about climate change related risks in Upper to Lower Ouémé regions. The information will be prepared and packaged based on the communication strategy developed under Activity 3.1.1. Radio hosts will be trained and, if possible, the radio hosts trained under the SAP project will be used to broadcast	3.3.1.1 Organize 5 field visits for 100 farmers per municipality (5), living in neighboring communities that did not directly beneficiated the project 3.3.1.2 Organise 1 x 1-week visit for representatives of Benin's other basins 3.3.1.3 Synergise with SAP project to train 10 radio broadcasters to disseminate climate change related information and organize radio broadcast with local radio in each municipality 3.3.1.4 Develop and package knowledge products on the projects, according to the needs of each targeted group 3.3.1.5 Organise sensitization campaings on CC in Glazoue and Djougou	- 5 farmers' field visits are organised - 1 exchange visit for Benin's other basins authorities - Various knowledge products are produced This will be verified through activity reports and attendance lists for the visits

	information in the Ouémé Basin; - Knowledge products to raise awareness of CCA in basins for governmental institutions, agro-businesses and cooperatives, and smallholders in the whole Ouémé Basin.		
3.3.2 Organise OCRI Annual Symposium	The symposium will be targeting agri- businesses, entrepreneur, and cooperatives to showcase their innovative climate-resilient practices and their benefits.	3.3.2.1 Identify relevant participants from agri-business (producers, sellers, manufacturer, etc.) and policy-makers to attend the symposium 3.3.2.2 Organise 1 symposium per year from project Y2, with support from MCVDD and MAEP 3.3.2.3 FAO supports OCRI Annual Symposium	5 symposiums are organised This will be verified through activity reports

E.7. Monitoring, reporting and evaluation arrangements (max. 500 words, approximately 1 page)

Project monitoring and reporting

In its role as Accredited Entity, FAO (specifically the FAO-GCF project supervision team) will oversee and supervise the implementation of this project in accordance with the Accreditation Master Agreement (AMA) signed between FAO and the GCF. As per the GCF Monitoring and Accountability Framework, and in accordance with the AMA, FAO will provide the GCF with an Inception Report, Annual Performance Reports, an independent Mid-term Evaluation report, a Project Closure Report and an independent Final Evaluation report. FAO will also provide semi-annual and annual Financial Reports throughout project implementation.

Evaluation

In accordance with the AMA between FAO and GCF, the FAO Office of Evaluation will be responsible for the independent interim and final evaluations for OCRI. The evaluations will use a question-driven approach and according to the GCF evaluation criteria. The interim evaluation will be instrumental in contributing – through operational and strategic recommendations – to improve implementation, setting out any necessary corrective measures for the remaining period of the project. The final evaluation will assess the relevance of the intervention, its overall performance, coherence in climate finance delivery with other multilateral agencies, gender equity, innovativeness in results areas, as well as sustainability and scalability of results, and lessons learned. The evaluation should also assess the extent to which the intervention has contributed to the Fund's higher-level goal of achieving a paradigm shift to low-emissions sustainable development pathways and climate-resilient sustainable development in Benin. The evaluations will draw on different evaluation methods and tools. In addition to primary data collected by the evaluators and secondary national data, both interim and final evaluations will draw on the monitoring reports and activities prepared by project staff. Careful attention will be paid to the disaggregation of data, results and outcomes by gender. The project will include an impact evaluation. A budget of USD350 000 has been included to cover costs associated to the IE. Detailed IE design will be carried out during early implementation.

Responsibility for project-level monitoring will rest with a designated monitoring officer, located within the Project Coordination Unit. The PMU (established through the OCRI platform) will set up a monitoring system to be led by the monitoring officer. The monitoring system will serve to track and report on the project implementation overall, including the implementation of the outputs, outcomes and impacts detailed in the results framework, shown above in Section E Logical Framework. It will also track implementation of the project's Gender Action Plan and Environmental and Social Management Plan. Monitoring data will be stored, compiled and displayed in a dedicated module of the project MIS to be developed and deployed by the PMU. To ensure regular monitoring of on-the-ground interventions, the monitoring team will work with, and supervise, selected farmers and extension officers on the ground. This will contribute to ensure project ownership. They will be equipped with smart phone that includes an innovative app (FarmTree, *under development*) which captures the environmental, social, and economic performance of project interventions. The project's M&E methodologies, procedures, systems and design will be established within the inception phase of the project under activity 3.1.4.

Project monitoring officer will monitor AWPB implementation and the outputs that result from it, including those that are detailed in the results framework, on an on-going basis. They will use the data and information from this monitoring reported to them by project staff, project partners and beneficiaries to prepare the draft performance reports, which will in turn be sent to the Project Steering Committee and the FAO–GCF project supervision team (in its role as Accredited Entity). Using these inputs, the FAO–GCF project supervision team will bear overall responsibility for ensuring that all relevant reporting is provided to the GCF in a timely manner and in accordance with the formats and standards agreed by the two organizations and the GoB. The monitoring team will also share monitoring findings with the project management staff so that they may discuss implementation issues as they arise. This will take place in the form of knowledge-sharing events and briefings within the PMU, PMU and LPIU management teams.

F. RISK ASSESSMENT AND MANAGEMENT

F.1. Risk factors and mitigations measures (max. 3 pages)

Selected Risk Factor 1	**Weak collaboration between stakeholders**	
Category	Probability	Impact
Technical and operational	Medium	Medium

Description

Weak collaboration between stakeholders from different governmental ministries and departments; and from the private sector may negatively affect project implementation, result in limited information and knowledge-sharing on climate-resilience practices and technologies, and ultimately impairs the overall long-term project impact.

Mitigation Measure(s)

The GoB including the various stakeholders to be involved in the OCRI multi-stakeholder platform have been extensively consulted during the project design phase; all governmental institutions that will participate on the OCRI platform have review and validated the project. The OCRI platform will be designed, based on extensive consultations with stakeholders from public and private sector to identify best institutions to involve, along with their role and responsibilities on the platform. Participation on the platform will be on a voluntary basis, but encouraged through the demonstration of the project's benefits. The establishment of OCRI multi-stakeholder mechanism will be supported by FAO, which has experience in multi-stakeholder engagement processes, and this will ensure project ownership by Benin institutions. All together these interventions will lower the risk probability to Low.

Selected Risk Factor 2	**Quantity and quality of water availability downstream**	
Category	Probability	Impact
Governance	Medium	Medium

Description

The project will increase access to water and improve on-farm water supply through rainwater harvesting cisterns, and micro-dams for small-scale irrigation systems and ground water-recharge. This might lead to higher consumption of water resources, possibly affecting downstream water quantity and quality.

Mitigation Measure(s)

In light of increasing water scarcity due to climate-change hazards, the project will place a strong focus on water conservation and sustainable water management. The project will build ground water-recharge infrastructure to ensure that underground water is maintained and increased. Tree planting and soil improvement will result in increased water infiltration. These activities will offset the potential risks of water abstraction. Risk of water overuse especially in Upper and Middle Ouémé will be mitigated through trainings and awareness-raising of smallholder farmers on agricultural best practices and agro-ecology/agroforestry techniques. Mitigation measures will shift the risk probability towards 'Low'.

Selected Risk Factor 3	**Women implication**	
Category	Probability	Impact
Governance	Medium	Medium

Description

Women may not have fair access to benefits resulting from project interventions.

Mitigation Measure(s)

There is a risk that women will not have fair access to some of the project benefits, such as income from sale of crops, nuts and fruits. Women play a major role in agricultural production in Benin, but they often have limited access to land, agricultural inputs and micro-finance. As a result, Beninese women are disproportionately vulnerable to climate change impacts. The risk of unequal access to project benefits will be mitigated by developing women-oriented training modules promoting, for example, counter-season horticulture, and supporting women's groups with access to credit and equipment for processing and storage of high-value agriproducts. Women's groups will be trained on the processing

and marketing of crops and NTFPs in order to increase their income. In addition, all aspects of the project will be designed and implemented in a gender-sensitive manner, for example by disaggregating project indicators by gender to ensure that at least 50% of project beneficiaries will be women and by giving special consideration to women's voices during stakeholder consultations.

Selected Risk Factor 4 Limited technical and operational capacity		
Category	Probability	Impact
Governance	Low	Medium
Description		
Limited technical and operational capacity will reduce the efficiency and effectiveness of the project's implementation.		
Mitigation Measure(s)		
FAO experts are specialized on climate-change adaptation, CRA, agroforestry and waterworks; they will actively participate in project execution during the first 4 years, while building capacity within the GoB. If expertise is missing within FAO, national or international experts will be recruited to assist Executing Agencies and National Implementation Agencies or to cover gaps where national expertise is not available and to provide technical backstopping.		

Selected Risk Factor 5 Political instability and weak decentralization process		
Category	Probability	Impact
Governance	Low	Medium
Description		
The West African region is increasingly being destabilized by extremist groups that are slowly moving southwards from the Sahel. Benin has borders with four countries of which Burkina Faso, Niger and Nigeria are experiencing increased extremist activity. The 5 identified project municipalities are not in areas immediately threatened.		
Mitigation Measure(s)		
While the project's objective is not directly related to fighting extremist threats, its contribution to improving resilience and livelihoods will help reduce the risk of rising feelings of disaffection, which is one way in which extremist groups recruit members.		

Selected Risk Factor 6 Lack of market demands for agriproducts		
Category	Probability	Impact
Technical and operational	Medium	Low
Description		
Demand for certain crops and NTFPs on local markets may not be strong enough to absorb the increased supply.		
Mitigation Measure(s)		
There is a risk that the increased production of crops and other agriproducts will exceed the existing demand on local and regional markets. In the case of food crops, many farmers will use much of their increased production for their own consumption (similar conclusions supported by SAP project[73]). Training and equipment for processing and storing agriproducts will allow farmers to store excess production beyond to harvest season until market prices improve. For NTFPs such as cashew nuts and shea, the financial analysis conducted for SAP project indicates that the sale of NTFP products will be profitable and that overall demand for these products is strong. In addition, consultations between farmers cooperatives and local and buyers of shea and cashew, through the OCRI platform, will ensure that increased supply can be sold on local and regional markets. A Market analysis, conducted as part of the project development phase, identified key agri-products which will be supported by the project.		

[73] Farmers were interviewed for SAP project in March and August 2017 by a team of international and national consultants who conducted surveys in the local communities, including in Upper and Middle Ouémé .

Selected Risk Factor 7 Impacts on transhuman		
Category	Probability	Impact
Governance	Low	Low
Description		
The project could affect transhuman moves across Benin		
Mitigation Measure(s)		
There is a risk that transhuman's access to land will be altered because of project interventions on reforestation and land management. This risk essentially concerns Zogbodomey, which economy is based on agriculture and livestock. This risk will be mitigated by implementing most project interventions within demonstration plots and existing agriculture fields. The reforestation interventions that will take place on degraded river banks will be carefully located in areas that are not used as key transhuman corridors. All aspects of the project will be designed based on consultations with local communities, chiefs and authorities. They will be inclusive of the existing local dynamics, including known moves of pastoralist herders within Benin, so to avoid conflict or depriving people from their access to key resources. The government of Benin as well as the project's municipalities are also implementing social policies that promote shared spaces between farmers and herders, create social cohesion and mutual respects. The project will work closely with these governmental institutions not to create competitiveness, but rather emphasise complementarity between OCRI farmers and herders in the target project areas. This will be reflected in the local adaptation plans (or revised LDPs) support under Output 3.1 of the project.		

Selected Risk Factor 8 money laundering and countering the financing of terrorism		
Category	Probability	Impact
Governance	Low	Low
Description		
Risks of money laundering and countering the financing of terrorism		
Mitigation Measure(s)		
FAO includes in the project agreement signed between FAO and the Government of Benin clauses related to AML/CFT, as follows: a)The Government shall comply, and shall require all persons and entities engaged in its activities under the Project to comply, with all internal anti-money laundering, counter-terrorism financing laws, rules, and regulations; b) The Government confirms it has obtained sufficient undertakings from all persons and entities involved in its activities under the Project that they shall not engage in any prohibited practices; the Government undertakes and confirm that it shall comply with the substantive objectives of the GCF's Policy on Prohibited Practices; c) Consistent with numerous United Nations Security Council resolutions adopted under Chapter VII of the UN Charter, the Government and FAO are firmly committed to the international fight against terrorism and, in particular, against the financing of terrorism. It is the policy of the Government and FAO to seek to ensure that none of their funds are used, directly or indirectly, to provide support to individuals or entities: i) associated with terrorism, as included in the list maintained by the Security Council Committee established pursuant to its Resolutions 1267 (1999) and 1989 (2011); or ii) that are the subject of sanctions or other enforcement measures promulgated by the United Nations Security Council. This provision must be included in all agreements that may be concluded with third parties for the implementation of activities under the Project. During project implementation FAO, as AE, will ensure close monitoring and supervision through its offices in the regional office and HQ in order to ensure that the activities are implemented in full compliance with the signed project agreement.		

G. GCF POLICIES AND STANDARDS

G.1. Environmental and social risk assessment (max. 750 words, approximately 1.5 pages)

Overall, the environmental and social impacts of the project will be positive. The project is expected to improve the natural resources and agricultural land upon which farmers work, based on improved, climate-resilient agricultural practices and natural resources management, specifically water management across the basin. Better functioning ecosystems will positively affect human health and well-being in the long run. Socially, the project will engage women and youth through a Gender Action Plan that ensures proactive mainstreaming of women into all activities, empowering women with agricultural skills and knowledge. Livelihoods are expected to improve, based on increased adaptive capacities within the target 5 municipalities. Investments in waterworks, and agriculture technologies, and high-quality agricultural inputs used on-farm and off-farm are expected to reduce some of the adverse impacts of climate change on agricultural productivity and production in Benin. Furthermore, the project will incorporate special participatory training sessions and activities in farmer field schools and similar formats under Component 1 to ensure that farmers are able to proactively enhance their livelihoods in ways that would not have occurred in a “without project” scenario.
The Project has been classified as **moderate risk (Category "B")** and it is expected that the project activities will trigger the following Environmental and Social Safeguard Standards, namely ESS2 (*Biodiversity Ecosystem and Critical Habitats*), ESS3 (*Plant Genetic Resources for Food and Agriculture*), ESS5 (Pest and Pesticide Management), ESS7 (*Decent Work*), and ESS8 (*Gender Equity*), and ESS9 (Indigenous Peoples and Cultural Heritage). The main reason for this is the inequality in the labour market and presence of landless farmers in the project area who will be included in project activities to ensure no-one is left behind, and full inclusiveness of the project.

Overall, the cumulative project environmental and social impacts are expected to be positive, and generate series of opportunities for beneficiary communities, as the overall objective is to increase climate resiliency of the most vulnerable farmers in Benin. The project is expected to improve agricultural landscape and productivity, as well as the ecosystems underpinning rural livelihoods, by improving the farmers' climate-resilient agricultural practices and the natural resources management in the targeted areas, specifically water management techniques. The project will take into account inequality in the labour market and the presence of landless farmers in the project area; they will be included in project activities. More specifically, better functioning ecosystems, and greater and more collaborative stakeholder engagement and participation, will positively affect human health and well-being in the long run.

To comply with the core requirements of these standards and applicable national regulations in Benin, given that not all sub-activities (e.g. specific waterworks and CRA technologies, as well as all specific sites) can be identified during/by project appraisal, an environmental and social management framework (ESMF) has been prepared along with an environmental and social management plan (ESMP) to set forth the basic principles and priorities that the OCRI project will follow during project implementation once the physical footprints of the project activities have been formulated.

During project implementation stage, once the physical footprints of subproject activities are known, to ensure that the identified social and environmental risks and impacts are properly addressed in accordance and compliance with the FAO Standards and GCF Policies, all project activities will systematically undergo (i) a thorough screening, assessment, review, and clearance process, and (ii) elaborate a site-specific **Environmental and Social Management Plan (ESMP)** prior to the physical execution of project activities in each of the selected 5 municipalities. Hence, the elaboration of the ESMF has allowed a series of environmental and social risks and impacts to be identified, and an ESMP to be elaborated that includes a comprehensive implementation arrangement scheme to help implement the identified series of safeguards mitigation measures.

The implementation arrangements as they pertain specifically to environmental and social safeguards will be led by the Project Coordination Unit (PMU), which includes a solid environmental and social safeguards compliance unit, led at the central level by a Senior Environmental and Social Safeguards Officer (SESSO) and at local level, a 'duo' of an Environmental and Social Safeguards Officer (ESSO) and a Gender Mainstreaming Officer (GMO) in each of the Local PIU (LPIU). In addition to Safeguards and Gender mainstreaming, the PMU-team will be the recipient of all project-related Grievance Redress Mechanism (GRM) processes at both the central and local levels, as detailed in this ESMF.

G.2. Gender assessment and action plan (max. 500 words, approximately 1 page)

The full gender assessment and action plan is included as Annex 8. Please refer to this for details.

The gender assessment reveals that women in the project intervention zone have less access to secured land, fertilizer, extension services, capital for investments in income-generating activities and to information and decision-making processes, and therefore are less resilient to climate-change impacts than men. Women bear responsibility for most of

the household chores with little assistance from men, have low literacy levels, and face mobility barriers. As a result, they have low access to training and information.

Women have smaller plots (often on less fertile and more degraded land) and less access to tools and animal traction because family fields and male-owned land are given priority. Moreover, women and their fields are less targeted by extension services for assistance on use of fertilizer, improved agriculture techniques and irrigation technology. As a result, women have lower crop yields, less information on adaptation practices and less access to new technologies.

Women are major actors in post-harvest processing, distribution and sales activities, which are affected by climate-change events: product quality is declining because of difficulties drying and storing produce. Women's access to clean water and fuelwood is becoming increasingly difficult. These activities are underfunded in climate-change adaptation and response initiatives and in community development plans.

Women are involved in collecting Non-Timber Forest Products (NTFP); in the project intervention zone they collect and process Shea nuts, Locust bean fruits and vegetables, all sources of income and a coping mechanism when other crops fail. Although the forestry sector and forest management mechanisms are largely male dominated, some women have started tree nurseries. NTFP are important to women to overcome shocks, source fuelwood and food in response to climate-change induced crop loss.

While men opt for migration when drought or floods destroy household livelihoods, women are more limited because of their domestic responsibilities, traditional roles and gender-based division of labor. When men migrate, women have to cope with the post-disaster situation and take care of the household, generating enough income for food and the needs of the family. In climate-change-related disaster contexts an increase in gender-based violence has been documented. Increased conflicts concerning access to pastures, water and land will increase tensions and could lead to higher incidence of Gender Based Violence (GBV). Climate-change effects on crop yields and climate-change disasters will lead to higher household indebtedness, which may in turn contribute to more household-level tensions and an increase in GBV.

The Gender Action Plan proposes activities and targets for each project component and output, so that the project contributes to empowerment of women and girls through their participation, capacity-building, institutional and regulatory systems, gender-sensitive planning and development for improved management of land and forest areas, thus contributing to better adaptation to climate risks. By its end, the project will have achieved increased resilience, health and well-being, food and water security, and improved socio-economic conditions of women and girls through technical and financial assistance to gender-specific activities.

The proportion of females in the project team will be 30% for field workers and 20% for technicians; the aim is 50% participation by women (taking into account that some activities may be 100% female or male). The project will specifically target post-harvest activities and activities in NTFP that are mainly processed by women. Fuel-saving and reforestation are other subjects of project intervention and of particular interest of women.

G.3. Financial management and procurement (max. 500 words, approximately 1 page)

As Accredited Entity for the OCRI project, FAO will ensure that financial management and procurement of goods and services using GCF resources adheres to international standards and good practices. This includes financial management and procurement performed by MCVDD (as Executing Entity). An FAO-commissioned micro-assessment of MCVDD (which included an assessment of financial management and procurement policies and practices) identified the ministries as “low-risk” partners in this respect. This includes a low-risk rating specifically for procurement actions to be undertaken by MCVDD, which are done in line with the prevailing Public Procurement Law of the Government of Benin. To enable effective performance of financial management and procurement functions by the Executing Entity, the project will hire: (i) a finance officer, procurement officer and administrative officer to work in the PMU throughout the duration of the project; and (ii) administrative/finance officers in each of the LPIUs.

The FAO Technical Capacity Development Team (TCDT, as co-Executing Entity) will perform a range of supervisory and support functions in relation to financial management and procurement performed by MCVDD. These are geared toward ensuring all procurement is done in line with agreed standards and practices, and to minimize procurement-related risk. In addition, the FAO TCDT will directly manage a small proportion of the project budget to deliver Technical Assistance and other such services to the project. Financial management and procurement performed by this team will be guided by relevant FAO rules and regulations, as well as relevant provisions in the Accreditation Master Agreement (AMA) signed by FAO and the GCF. These rules and regulations were reviewed and deemed satisfactory by the GCF Secretariat and Accreditation Panel as part of FAO’s accreditation to the GCF.

FAO has deployed an Oracle-based Enterprise Resource Planning (ERP) system, the 'Global Resources Management System' (GRMS), which provides all FAO employees around the world with travel, human resources, procurement and finance functionalities. Using GRMS improves the flow of financial information, supports financial monitoring and reporting, increases transparency and visibility, and strengthens internal control. FAO maintains a Chart of Accounts which is used by the whole Organization and that allows for a separation of income and expenditure by donor and project and it provides a standardized coding structure that enables data to be recorded, classified and summarized to facilitate internal management and external reporting requirements.

Direct procurement by FAO is done in accordance with its Manual Section on "Procurement of Goods, Works and Services". To sub-contract the delivery of specific activities using Letters of Agreement, FAO operates in accordance with a specific Manual Section on "Letters of Agreement". Such services are managed under the FAO Procurement Service, which provides policy and operational support to FAO offices and staff undertaking these activities to ensure the Organization procures goods, works and services based on "Best Value for Money" principles. To sub-contract delivery for agreed results, FAO operates in accordance with its policy that governs the indirect implementation of FAO-led projects and programmes.

Financial management and procurement by MCVDD (as Executing Entity) will also be overseen and supervised by the FAO-GCF project supervision team. As per the provisions of the FAO Operational Partners Implementation Modality (OPIM), the FAO-GCF project supervision team will undertake regular supervision missions, and will recruit a qualified, internationally recognized auditing firm to perform regular spot checks and audits, to ensure financial management and procurement by the PMU and PPMUs are being performed in line with agreed standards and practices. This will be governed by the agreement to be signed between FAO and the Government of Benin before the project becomes operational.

G.4. Disclosure of funding proposal

☒ No confidential information: The accredited entity confirms that the funding proposal, including its annexes, may be disclosed in full by the GCF, as no information is being provided in confidence.
☐ With confidential information: The accredited entity declares that the funding proposal, including its annexes, may not be disclosed in full by the GCF, as certain information is being provided in confidence. Accordingly, the accredited entity is providing to the Secretariat the following two copies of the funding proposal, including all annexes:

- full copy for internal use of the GCF in which the confidential portions are marked accordingly, together with an explanatory note regarding the said portions and the corresponding reason for confidentiality under the accredited entity's disclosure policy, and
- redacted copy for disclosure on the GCF website.

The funding proposal can only be processed upon receipt of the two copies above, if containing confidential information.

H. ANNEXES

H.1. Mandatory annexes

☒	Annex 1	NDA no-objection letter(s) **(template provided)**
☒	Annex 2	Feasibility study - and a market study, if applicable
☒	Annex 3	Economic and/or financial analyses in spreadsheet format
☒	Annex 4	Detailed budget plan **(template provided)**
☒	Annex 5	Implementation timetable including key project/programme milestones **(template provided)**
☒	Annex 6	E&S document corresponding to the E&S category (A, B or C; or I1, I2 or I3): **(ESS disclosure form provided)** ☐ Environmental and Social Impact Assessment (ESIA) or ☐ Environmental and Social Management Plan (ESMP) or ☐ Environmental and Social Management System (ESMS) ☐ Others (please specify – e.g. Resettlement Action Plan, Resettlement Policy Framework, Indigenous People's Plan, Land Acquisition Plan, etc.)
☒	Annex 7	Summary of consultations and stakeholder engagement plan
☒	Annex 8	Gender assessment and project/programme-level action plan **(template provided)**
☒	Annex 9	Legal due diligence (regulation, taxation and insurance)
☒	Annex 10	Procurement plan **(template provided)**
☒	Annex 11	Monitoring and evaluation plan **(template provided)**
☒	Annex 12	AE fee request **(template provided)**
☒	Annex 13	Co-financing commitment letter, if applicable **(template provided)**
☒	Annex 14	Term sheet including a detailed disbursement schedule and, if applicable, repayment schedule

H.2. Other annexes as applicable

☒	Annex 15	Evidence of internal approval **(template provided)**
☒	Annex 16	Map(s) indicating the location of proposed interventions
☐	Annex 17	Multi-country project/programme information **(template provided)**
☐	Annex 18	Appraisal, due diligence or evaluation report for proposals based on up-scaling or replicating a pilot project
☐	Annex 19	Procedures for controlling procurement by third parties or executing entities undertaking projects financed by the entity
☐	Annex 20	First level AML/CFT (KYC) assessment
☐	Annex 21	Operations manual (Operations and maintenance)
☒	Annex 22	Assessment of GHG emission reductions and their monitoring and reporting (for mitigation and cross cutting-projects)[74]
☐	Annex X	Other references

** Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*

[74] Annex 22 is mandatory for mitigation and cross-cutting projects.