Concept Note

Increasing Agricultural and Ecosystem Resilience through Ecosystem-based Adaptation Agroforestry

Burundi, Lesotho, Malawi, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe | United Nations Environment Program (UNEP)

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GREEN CLIMATE FUND

Concept Note

The Green Climate Fund (GCF) is seeking high-quality projects or programmes.

Accredited entities may choose to submit a concept note, in consultation with the relevant national designated authority, to present the proposed project or programme idea in order to receive early feedback and recommendation.

Project/Programme Title:	Increasing Agricultural and Ecosystem Resilience through Ecosystem-based Adaptation Agroforestry
Country/Region:	Sub-Saharan Africa
Accredited Entity:	UN Environment
National Designated Authority:	Burundi, Lesotho, Malawi, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe

Please submit the completed form to fundingproposal@gcfund.org[1]

A. Project / Programme Information	
A.1. Project / programme title	Increasing Agricultural and Ecosystem Resilience through Ecosystem-based Adaptation Agroforestry
A.2. Project or programme	Project
A.3. Country (ies) / region	Burundi, Lesotho, Malawi, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe
A.4. National designated authority(ies)	Ministry to the presidency in charge of planning and good governance, Burundi; Ministry of Energy, Meteorology, and Water Affairs, Lesotho; Environmental Affairs Department, Malawi; Ministry of Tourism and Environment Affairs, Swaziland; The Vice President's Office, Tanzania; Ministry of Finance, Planning and Economic Development, Uganda; National Planning Department, Zambia; and Ministry of Environment, Water and Climate Change, Zimbabwe. *For names and titles of NDAs please see Annex 1.
A.5. Accredited entity	UN Environment
A.6. Executing entity / beneficiary	Executing Entity: World Agroforestry Center, World Vision, CRS, CARE Beneficiary: 1,125,000 small-scale farm families
A.7. Access modality	Direct ☐ International ☒
A.8. Project size category (total investment, million USD)	Micro (≤10) ☐ Small (10<x≤50) ☒ Medium (50<x≤250) ☐ Large (>250) ☐
A.9. Mitigation / adaptation focus	Mitigation ☐ Adaptation ☐ Cross-cutting ☒
A.10. Public or private	public
A.11. Results areas *(mark all that apply)*	*Which of the following targeted results areas does the proposed project/programme address?* Reduced emissions from: ☐ Energy access and power generation (E.g. on-grid, micro-grid or off-grid solar, wind, geothermal, etc.) ☐ Low emission transport (E.g. high-speed rail, rapid bus system, etc.) ☐ Buildings, cities, industries and appliances (E.g. new and retrofitted energy-efficient buildings, energy-efficient equipment for companies and supply chain management, etc.) ☒ Forestry and land use (E.g. forest conservation and management, agroforestry, agricultural irrigation, water treatment and management, etc.)

[1] CN-UNEP-201704-UNEPCN0002

	Increased resilience of: ☒ Most vulnerable people and communities (E.g. mitigation of operational risk associated with climate change – diversification of supply sources and supply chain management, relocation of manufacturing facilities and warehouses, etc.) ☒ Health and well-being, and food and water security (E.g. climate-resilient crops, efficient irrigation systems, etc.) ☐ Infrastructure and built environment (E.g. sea walls, resilient road networks, etc.) ☒ Ecosystems and ecosystem services (E.g. ecosystem conservation and management, ecotourism, etc.)
A.12. Project / programme life span	5 years
A.13. Estimated implementation start and end date	Start:1 Jan 2018 End: 31 December 2023

B. Project/Programme Details

The Fund requires the following preliminary information in order to promptly assess the eligibility of project/programme investment. These requirements may vary depending on the nature of the project/programme.

B.1. Project / programme description (including objectives)

Problem Description

Sub-Saharan Africa (SSA) **is one of the most vulnerable regions in the world to climate change** (IPCC, 2014). Approximately 62% of the population of SSA is employed in agriculture (IFAD, 2011), and in 2014 it was estimated that 75% of those in rural areas were living in extreme poverty (less than 1.90$/day) (OPHI, 2014).

Rain-fed agricultural systems, which account for over 95% of farmed land in SSA[2], are particularly vulnerable (Serdeczny, 2015). The resilience of the small-scale subsistence farmers is directly tied to the **health and resilience of the land** they cultivate. Small-scale farmers manage over 80% of the land in SSA, and they provide 80% of the food supply (FAO, 2012).

Sub-Saharan Africa faces massive impacts from climate change particularly with regards to agricultural production. Climate change projections for this region point to a warming trend, particularly in the inland subtropics; frequent occurrence of extreme heat events; increasing aridity; and changes in rainfall—with a particularly pronounced decline in southern Africa and an increase in East Africa. Sub-Saharan Africa's already high rates of under-nutrition and infectious disease can be expected to increase compared to a scenario without climate change. Particularly vulnerable to these climatic changes are the rain-fed agricultural systems on which the livelihoods of a large proportion of the region's population currently depend. As agricultural livelihoods become more precarious, the rate of rural–urban migration may be expected to grow, adding to the already significant urbanization trend in the region.

Climate Change in Sub-Saharan Africa

In the low-emission scenario RCP2.6 (representing a 2 °C world), African summer temperatures increase until 2050 at about 1.5 °C above the 1951–1980 baseline and remain at this level until the end of the century. In the high-emission scenario RCP8.5 (representing a 4 °C world), warming continues until the end of the century, with monthly summer temperatures over Sub-Saharan Africa reaching 5 °C above the 1951–1980 baseline by 2100.

[2] http://www.iwmi.cgiar.org/issues/rainfed-agriculture/summary/

In southwestern Africa, the shift toward more arid conditions due to a decline in rainfall (Fig. 2) is exacerbated by temperature-driven increases in evapotranspiration (see Figure SOM 3). By contrast, the higher aridity index in East Africa is correlated with higher rainfall projected by global climate models, which, however, is uncertain and not reproduced by higher-resolution regional climate models. While High rainfall savannas can be replaced by forests in less than 20–30 years (Bond and Parr 2010).

In many parts of rural Sub-Saharan Africa, groundwater is the sole source of safe drinking water (MacDonald et al. 2009). Most of Sub-Saharan Africa has generally low permeability and minor aquifers, with some larger aquifer systems located only in the Congo, parts of Angola and southern Nigeria (MacDonald et al. 2012). Groundwater recharge rates have been projected to decline by 30–70 % in the western parts of southern Africa and to increase by around 30 % in some parts of East and southeastern Africa for both 2 and 3 °C warming above pre-industrial levels (Do¨ll 2009).

Agricultural Impacts

The IPCC states with high levels of confidence that the overall effect of climate change on yields of major cereal crops in the African region is very likely to be negative, with strong regional variation (Niang et al. 2014). ‘‘Worst-case’’ projections (5th percentile) indicate losses of 27–32 % for maize, sorghum, millet and groundnut for a warming of about 2 °C above pre-industrial levels by mid-century (Schlenker and Lobell 2010). Using output from 14 CMIP3 GCMs and applying the crop model DSSAT, Thornton et al. (2011) estimate mean yield losses of 24% for maize and 71% for beans under warming exceeding 4 °C. Over the past 30 years, climate change has reduced food production between 1-5% per decade across the globe.

Maize, which is one of the most common crops in Sub-Saharan Africa, has been found to have a particularly high sensitivity to temperatures above 30 °C within the growing season. Geographically, the majority (~90 %) of currently cropped maize area is projected to experience negative impacts. Crop yield losses in these areas are mostly mediated through shortened cropping seasons and heat stress during the crop’s reproductive period (Thornton et al., 2009; Cairns et al., 2012). These projections are robust, thus suggesting that adaptation of maize production should be a priority for many African countries.

Rosenzweig et al. (2014) find maize yield decreases of additional 10–20 % in other Sub-Saharan regions if nitrogen stress is considered. Not considering nitrogen stress results in higher model disagreement but still an overall negative trend of 5 to 50 %. Cassava appears to be more resistant to high temperatures and unstable precipitation than cereal crops (Niang et al. 2014). Similarly, multiple-cropping systems appear to reduce the risk of crop failure compared to single-cropping systems (Waha et al. 2012).

Each day in a growing season spent at temperature above 30 °C reduces maize yields by 1% compared to optimal, drought-free rainfed conditions (Lobell et al. 2011). The annual average temperature across Sub-Saharan Africa is already above the optimal temperature for wheat during the growing season (Liu et al. 2008), and it is expected to increase further. The sharp declines in crop yields that have been observed beyond certain thresholds are mostly not included in present process-based agricultural models (Ro¨tter et al. 2011).

Moreover, climate extremes can alter the ecology of plant pathogens, and higher soil temperatures can promote fungal growth that kills seedlings (Patz et al. 2008). Such effects are as yet not represented in modeling studies. Similarly, the effect of CO fertilization remains uncertain but important: Depending on crop type and region, assuming positive CO fertilization may even reverse the direction of impacts.

Livestock production in Sub-Saharan Africa is also vulnerable to climate change. Livestock is an important source of food (such as meat and milk and other dairy products), animal products (such as leather), income, or insurance against crop failure (Seo and Mendelsohn 2007). Livestock is vulnerable to drought, particularly where it depends on local biomass production (Masike and Ulrich 2008), with a strong correlation between drought and animal death (Thornton et al. 2009). Available range-

land may be reduced by human influences, including moves toward increased biofuel cultivation, veterinary fencing, increasing competition for land and land degradation (Morton 2012; Sallu et al. 2010).

The challenges facing small-scale farmers are exacerbated by land degradation, which affects more than 65% of land in many African countries. Land degradation erodes the productivity of farming systems, thereby reducing incomes and food security, and it reduces the resilience of ecosystems and populations. In SAA, land degradation accounts on average for an estimated 7% annual loss of the agricultural GDP or close to USD 4 billion.

The scale and intensity of the problem will continue to escalate in the coming decades, with the population of SSA expected to reach 1.8 billion people, many millions of whom will have joined the middle class and adopted meat and dairy-rich diets. Current projections show that **at least twice as much food** will have to be produced per year by 2050 to meet that demand.

Climate Change Vulnerabilities

The IPCC describes defines Vulnerability to Climate Change as Exposure x Sensitivity – Adaptive Capacity.

Rural small-scale subsistence farmer households in sub-Saharan Africa are among the most vulnerable populations in the world. This is so because of the persistent food insecurity, high poverty levels, low savings and economic diversity, as well as their land-based subsistence, and exposure to climate change impacts.

In East Africa, heavy rainfall may increase soil erosion, while in Southern Africa drier conditions will lead to reduced groundwater recharge, higher evapotranspiration, loss of soil moisture. Both areas will experience higher temperatures which will decrease crop yields and stress livestock as well as more extreme climate events and changes to the growing season which will increase crop losses for farmers who are not prepared to cope with these chagnes.

By implementing locally-appropriate agroforestry systems, microclimates can be created which will decrease temperatures (crop yields have been shown to increase by X% in the shade of fertilizer trees) for crops and livestock, create fodder for times of stress for livestock, increase yields through natural fertilization, increase biodiversity (insects and bees necessary for ecosystem health and ultimately crop production), generate sustainable fuelwood, increase ground water infiltration, and stabilize soils, increase soil moisture retention; all contributing to greater ecosystem health.

Increased crop yields, increased on-farm diversity in the form of tree fruit products, apiculture, fodder for livestock, and increased fuelwood for consumption and sale will all contribute to greater productivity and therefore income, as well as greater diversity in the farmer's income sources and therefore security in times of specific crop or product failure; all contributing to greater resilience of the small-scale farmer.

Project Summary

The main objective of this proposal is to **increase the agricultural and ecosystem resilience of 1,125,000 vulnerable small-scale farm households**, covering an area of approximately **1,000,000 hectares**, and to enhance carbon sinks **across 8 counties through Ecosystem-based Adaptation**. Specifically, the project will make use of locally-appropriate agroforestry systems ("*EverGreen Agriculture*"), a highly cost-effective intervention.

The project will target[3]:

[3] Targets presented are a conservative 90% of the number determined by countries

60,000 households in Burundi (*Muyinga, Cankuzo, and Muramvya Districts*)
60,000 households in Lesotho (*Berea, Maseru, Mohale Hoek, Mokhotlong, Thaba-Tseka Districts*)
325,000 households in Malawi (*All districts*[4])
70,000 households in Swaziland (*Hhohho, Manzini, Lubombo regions*)
140,000 households in Tanzania (*Mtwara, Lindi, Masasi, Nachingwea Districts*)
275,000 households in Uganda (*Karamoja, Kyenjojo, Kyegegwa, Mubende, Kibale, Hoima, Masindi Districts*)
95,000 households in Zambia (*Mbeza, Muchila, Mporokoso, Moyo, Hamaundu, Chongwe East & South, Kapululwe Districts*)
100,000 households in Zimbabwe (*Beitbridge, Chivi, Buhera, Guruve, Gwanda Districts*)

Agroforestry (particularly the introduction of *faidherbia* and *gliricidia* species) can double and triple crop yields, particularly maize, while providing multiple co-benefits including microclimates of reduced temperature, bolster nutrient supply through nitrogen fixation and nutrient cycling, generate greater quantities of organic matter in soil surface residues, improve soil structure and water infiltration, increase greater direct production of food, fuel, fiber and income from products produced by the intercropped trees, enhance carbon storage both above-ground and below-ground, and induce more effective conservation of above- and below-ground biodiversity. The project will accelerate the adoption of agroforestry practices by massively out-scaling from within and among areas where these practices have already been successfully piloted, enhancing relevant frameworks and initiatives, and contributing significantly to national objectives and strategies, the African Union AFR100 initiative as well as the Paris Agreement and Sustainable Development Goals. Additionally, it aims to foster national movements that will transform agricultural practices across sub-Sharan Africa and will expand the adoption process to millions of additional vulnerable smallholder households beyond the project's life and scope.

A particular emphasis of the project will be its exceptional cost-effectiveness in delivering transformational impact: the investment sought from the GCF per household will **be less than $45 over the life of the project;** and the cost per ton of time-averaged carbon sequestered in the landscape will **be less than $0.82 USD/tco2eq** (see pre-feasibility study).

The project will support some of the most climate vulnerable communities in the region to improve the sustainability and resilience of farming systems, and increase household food security and adaptive capacity. It will take a multi-faceted, evidence-based approach to strengthening social, institutional and economic infrastructure, and will develop equitable agroforestry value chains to underpin the scaling-up process. At a national-level, the project will equip key stakeholders with surveillance and analytic tools to support strategic decision-making and comprehensive monitoring of the impacts of this project and related efforts.

Main Activities

Ecosystem-based Adaptation (EBA) uses biodiversity and ecosystem services as part of an overall adaptation strategy to help households and communities adapt to the negative effects of climate change at local, national, regional and global levels. Evergreen Agriculture and sustainable forestry are EBA methods, central to achieving sustainable climate change resilience, ecosystem health, and food security. **Evergreen Agriculture is an Agroforestry** approach which emphasizes the deliberate integration of trees and shrubs into farming and pastoral systems, which complement and enhance the sustainability, productivity and resilience of those systems through biological interaction. These practices can be easily adopted, practiced and scaled-up by vulnerable small-scale farmers. It focuses heavily on low-cost, rapid and proven effective technologies, such as Farmer Managed Natural Regeneration and the integration of leguminous 'fertilizer' trees into cropping systems to enhance soil fertility,

[4] *Villages will be listed in full proposal*

moisture retention, biodiversity and ultimately, food security.

Regreening is necessary for rural communities to adapt to the impacts of climate change across much of sub-Saharan Africa. It is the transformation of degraded landscapes, where productivity and resilience are restored and increased, through widespread adoption of Evergreen Agriculture and other sustainable land management practices. Trees that are integrated into farmlands provide many goods and services, and they sustain a green vegetative soil cover throughout the year. They bolster crop nutrient supply through nitrogen fixation and nutrient cycling, and replenish soil organic matter through leaf and twig litter. Their roots improve the structure of the soil and boost its ability to absorb and retain water, and the distributed shade they provide helps boost crop yields. In addition to increasing the sustainable productivity of crops, intercropped trees produce food, fuel, fibre and fodder, diversifying and increasing household incomes, increasing carbon storage above and below-ground, and conserving above and below-ground biodiversity.

The protection and management of naturally-regenerating trees and shrubs, from roots and seeds that are already present in the soil, known as **Farmer-Managed Natural Regeneration (FMNR**), has proven to be exceedingly effective as a very low-cost way to restore degraded land. The survival rate of regenerating flora is far higher than that of planted seedlings, and they generally require less maintenance and fewer (often no) inputs.

Due to its significant tangible benefits, millions of farmers have already adopted Evergreen Agriculture practices in countries ranging from Niger, Mali, Senegal, and Burkina Faso to Zambia, Tanzania, Malawi and Ethiopia. However, the counter-intuitive notion of incorporating trees and shrubs in crops to increase yields, and the lack of wide-scale promotion and support of the practice, has been a barrier to its more widespread uptake. Recent programming successes demonstrate clearly that large-scale adoption of Evergreen Agriculture practices is significantly more rapid and efficient where local community-based organizations and farmers' groups are supported with appropriate training, exposure and linkages.

In addition to FMNR and ANR, two other evergreen agriculture practices are gaining ground. One is the planting of the indigenous African acacia tree, *Faidherbia albida,* in crop fields at a density of 100-400 trees per hectare. This unique tree fixes nitrogen from the atmosphere. It defoliates at the beginning of the rains, depositing tons of nutrient-rich biofertilizer on the crop fields. It remains dormant during the cropping season, and thus doesn't compete with the crops growing in association with it. However, it provides the crops protection from wind and over-radiation stress, and it enables them to be much more resilient to drought and moisture stress. The species is endemic throughout the African continent, and is valued by farmers throughout Eastern and Southern Africa.

The second evergreen agriculture that is gaining ground is the establishment of fast-growing fertilizer and fodder shrubs at a high density in crop fields. These nitrogen-fixing shrubs are cut back to the ground before the crops are planted, providing an enormous quantity of nitrogen-rich biofertilizer to the fields as the farmers prepare the ground for maize and other crops. They also supply tons of fuel wood that ensures cooking energy security throughout the year, as well as a surplus for sale to the market. The key shrub species that are popular with farmers in Eastern and Southern Africa are Gliricidia sepium, Caliandra calothyrsus, Senna spectabilis, Tephrosia candida, Leucaena leucocephala, and several others.

The enormous potential for the scaling-up of FMNR, ANR, planted Faidherbia, and fertilizer shrubs, from millions to tens of millions of farm families, has been well-recognized by national governments, the African Union, Common Market for Eastern and Southern Africa, The Global Environment Facility, the World Bank, and many other international and national organizations. This project will demonstrate the value and practicality of massively scaling-up these solutions, thus launching a chain reaction that can lead to the viral spread of the practices among tens of millions of farm families

during the coming decade.

In many countries, good policy documents exist that support the scaling-up of these practices, but there is inadequate real impact being achieved on the ground. Accordingly, support to policy development will focus on strategic bottlenecks for implementation and on realizing the real incentives for land users to adopt. Policy support to the governments in each of the eight participating countries will reinforce capacity-building and scaling-up efforts, and seek to build synergies and complementarity with existing initiatives and programmes, enhance efficiencies, and increase effectiveness and inclusion of marginalised social groups.

Project Outputs and their linkages to GCF Outcomes

1. ***Communities have participated in project activity plan design and are equipped with the appropriate tools and training to institute locally-appropriate and scientifically-informed agroforestry interventions***

   EverGreen Agriculture (EVA) is a farmer or community-management approach which significantly and directly increases carbon sequestration in the landscape. Further, EVA has been shown to increase the productivity, reliability and resilience of primary crops to climate impacts, and to strengthen and diversify livelihoods. Accordingly, Output 1 will contribute directly to GCF Outcome M9.0 'Improved management of land or forest areas contributing to emissions reductions', and to GCF Outcome A7.0 ' Strengthened adaptive capacity and reduced exposure to climate risks'. The Activities necessary to deliver this output include:

   1.1 Verifying with stakeholders the outcomes of the Environmental and Social Vulnerability Assessments or Climate Vulnerability and Capacity Assessments, including community-level participatory mapping of vulnerabilities identified during proposal development;

   1.2 Establishing the participating households for the project, emphasizing the inclusion of female-headed households, youth and other marginalized groups;

   1.3 Designing interventions (including assessment and analysis) that ensure gender equality in the delivery of the program;

   1.4 Mapping tree cover of farmland and relevant community-managed areas, using the Collect Earth remote sensing tool;

   1.5 Verifying tree cover data from remote-sensing using randomized on-site surveys;

   1.6 Verifying tree, soil, and crop yield baselines, with training and technical backstopping from ICRAF;

   1.7 Identifying optimal tree species and agroforestry interventions given climatic, ecosystem, economic, soil, etc. conditions, with technical backstopping from ICRAF, with results to inform community-level participatory activity planning; and

   1.8 Facilitating the provision of appropriate tree seed, cuttings and/or seedlings (e.g. fertilizer trees, fruits, timber, fodder, etc.), including where appropriate the establishment of private and/or community-managed nurseries.

2. ***National and local-level decision-makers have increased evidence-based knowledge and tools to support strategic decision-making for climate resilience and accelerating the scaling-up of EverGreen Agriculture***

   The clear focus of Output 2 is on the delivery of GCF Outcome A5.0 'Strengthened institutional and regulatory systems for climate-responsive planning and development' and, within the context of policy and decision-makers, GCF Outcome A8.0 'Strengthened awareness of climate threats and risk-reduction processes'. However, by supporting the creation of a more favorable policy and planning environment for scaling-up EVA, it will also contribute indirectly to GCF Outcomes A7.0 'Strengthened adaptive capacity and reduced exposure to climate risks' and M9.0 'Improved management of land or forest areas contributing to emissions

reductions'. The Activities that will deliver this output include:

2.1 Develop stakeholder maps and together with identified stakeholders (national, local, community) develop activity plans during project inception for country-wide programming, ensuring early sensitization, consultation and inclusion of relevant policymakers, public administrators and community leaders during the planning and implementation phase, as well as linkages with complementary and planned national or district-level interventions

2.2 Use the Collect Earth tool to provide specific project targets and tree-cover baselines for each country, and deployed to monitor changes during and after the project implementation to continually inform local interventions

2.3 Conduct district and, where appropriate, national and/or community-level participatory reviews of (and build upon if necessary) forest area management plans, natural resource management plans, and agricultural sector and land use plans to uncover any previously unidentified barriers to the project intervention and support the development of relevant by-laws

2.4 Develop an M&E framework with appropriate government officials which draws on and contributes to scientific evidence of best practice and project impact, supports government and community participation in data collection and analysis, feeds-into relevant government data collection needs and ensures correlation of field-based data with remote sensing

2.5 Conduct training and capacity-building workshops with relevant national and local government, and community stakeholders on Collect Earth, Agroforestry science, field data collection and analysis, assessment and prioritization tools to support effective implementation and linkages with M&E

2.6 Facilitate exposure visits for decision-makers at all levels to demonstration plots, field days, and examples of established community adoption of EVA practices

2.7 Conduct a regional forum at the end of the first year of implementation, after the project mid-term review, and final assessment to communicate objectives, progress, results and stories from the field to policymakers, public administrators, the development community and small-scale farmers

2.8 Upon request, provide technical assistance to governments, institutions and other stakeholders to mainstream Evergreen Agriculture into national programmes

3. *Small-scale farmers and local government extension agents have increased capacity to implement climate change resilience strategies (e.g. EverGreen Agriculture, and re-greening)*

Output 3 will establish the learning mechanisms and structures to support the planning, uptake and continued practice of EVA at the local-level. Accordingly, it will contribute directly to GCF Outcome A8.0 'Strengthened awareness of climate threats and risk-reduction processes', A7.0 'Strengthened adaptive capacity and reduced exposure to climate risks', and M9.0 'Improved management of land or forest areas contributing to emissions reductions'. In addition, through its inclusion of local government and extension services, it will contribute to A5.0 'Strengthened institutional and regulatory systems for climate-responsive planning and development'. The Activities that will be implemented to deliver this output include:

3.1 Mapping and validation of appropriate institutions, local officials and extension workers for engagement

3.2 Conduct workshops with local government, extension and community stakeholders, emphasizing inclusion of women and men (including female-headed households and youth engaged in agriculture), to assess local knowledge, attitudes and practices, and develop contextually appropriate approaches to changing mindsets towards EVA, sustainable farming systems and value chains (i.e. re-greening mindset change)

3.3 Community-level participatory activity planning, emphasizing participation of female-headed households and youth, with technical backstopping and support

from ICRAF as contextually appropriate to complement indigenous knowledge, to identify optimal tree species and agroforestry interventions

3.4 Conduct Training of Trainers workshops (with a particular emphasis on female lead/champion farmers and extension workers), including needs assessment, sensitization and re-greening mindset change, gender responsive training, technical tools and optimal EVA practices, field data collection, and otherwise build the capacity of public, private and community-based rural advisory and extension services to support knowledge and practice of Evergreen Agriculture.

3.5 Undertake outreach program and develop partnerships with local schools and organizations to accelerate EVA scaling-up, including training of teachers and students in the benefits and practice of EVA, re-greening mindset change, and school-led demonstration plots.

3.6 Facilitate farmer-to-farmer visits, farmer field and business schools, citizen science and the support of experienced farmer-disseminators and community-based extension

3.7 Identify, and where necessary support the enhancement or establishment of, farm-based and community-based best-practice demonstration sites for contextually appropriate EVA practices

3.8 Support the strengthening of rural advisory services, which represent the best local benefit/cost ratios, and which have demonstrated delivery of quality services tailored to support the adoption of evergreen agriculture practices

3.9 Ensure, and where necessary provide basic appropriate transport and inputs for community-based and public extension agents, including bicycles or motorbikes

4. *Climate change adaptation and mitigation benefits of EverGreen Agriculture are communicated across multiple platforms and stakeholder groups*

Output 4 will disseminate information to a range of stakeholders regarding climate threats to small-scale farming systems and ways in which EVA and related approaches can mitigate them, thereby contributing directly to GCF Outcome A8.0 'Strengthened awareness of climate threats and risk-reduction processes'. In addition, it will ensure policymakers and others receive regular information and evidence briefs to support climate responsive planning, contributing to GCF Outcome A5.0 'Strengthened institutional and regulatory systems for climate-responsive planning and development'; and it will assist the advocacy, learning and capacity-building of extension workers and farmers to support the adoption and practice of EVA and related approaches, thereby contributing to GCF Outcome A7.0 'Strengthened adaptive capacity and reduced exposure to climate risks'. The Activities that will be implemented to deliver this output include:

4.1 Develop nested-scale communities of practice embracing CBOs, extension, research and private sector actors, including co-learning across networks

4.2 Develop local SMS/text Community of Practice groups to share lessons learned, and disseminate market, climate, weather and agronomic information in local languages

4.3 Facilitate the development and publication of newspaper, radio and other media articles on EVA success stories and best practices

4.4 Engage and disseminate findings from the project to relevant national and international forums, networks and committees, and post on existing relevant communication hubs and websites

4.5 Strengthen farmer and rural agroforestry entrepreneurship ‘social capital’ through various farmer, youth and women’s groups

4.6 Identify and empower EVA champions within communities, schools, organizations and local government to advocate for and promote the adoption and practice of EVA at scale

4.7 Synthesize project progress reports and success stories from the field biannually into concise information briefs and communicate to relevant policymakers, public administrators and the development community

4.8 Facilitate local, national and regional experience-sharing workshops

4.9 Customize existing or develop new implementation manuals and refine local extension manuals in gender and youth-sensitive vernacular language for evidence-based and contextually appropriate application of EVA practices

5. *Equitable value-chains and market linkages stimulate continued local investment in EverGreen Agriculture*

Output 5 will contribute to increased, diversified and more reliable livelihoods for participating farm households, thereby contributing directly to GCF Outcome A7.0 'Strengthened adaptive capacity and reduced exposure to climate risks'. Further, by increasing the livelihood incentives for farmers to adopt EVA, it will indirectly contribute to GCF Outcome M9.0 'Improved management of land or forest areas contributing to emissions reductions'. The Activities that will be implemented to deliver this output include:

5.1 Facilitate iterative (at inception, midterm and close) community-led mapping and analysis of relevant local value chains and markets linkages

5.2 Build the capacity of key value chain actors, including training on Agri-business or farming as a business, ensuring youth and women's participation and empowerment

5.3 Strengthen CBOs and existing farmers' groups and, where appropriate, support communities to establish farmers' groups, to facilitate bulking of agroforestry produce and inputs, local value chain development, and community-based extension this may also include facilitating the establishment of Village Savings and Loans Associations

5.4 Facilitate agroforestry business forums between small-scale farmers, market actors and government stakeholders

5.5 Support the development of existing, or where contextually appropriate new agroforestry value chains through technical and financial support, market linkages, standards and labelling, improved planting material, processing and storage, etc.

5.6 Facilitate development of on-farm and off-farm Natural Resource Based Enterprises (NRBEs) such as bee keeping and fruit grafting, with a particular emphasis on enterprises which are likely to deliver rapid benefits

5.7 Undertake a carbon feasibility study to determine the cost implications and potential benefits to participating communities under possible future carbon market scenarios

Many of the above programmed activities will support the delivery of multiple outputs. Each activity will be tailored and heavily contextualised to the specific circumstances and needs of each community within each respective participating country(see detailed country plans for further country-level information). Specifically, the project will take a community-led, highly participatory approach to activity planning, implementation and monitoring and evaluation with the participating communities.

Suitability of the Intervention

Climate resilience is dependent upon healthy ecosystems, especially for the world's poorest and most vulnerable communities. Healthy ecosystems foster greater climate resilience of farm households and their communities. It can also dramatically increase carbon storage in the landscape in ways that are highly beneficial to agricultural production and the livelihoods of the poor. In a situation of inappropriate land use practices and falling productivity, compounded by climate change, farmers and other land users initially move to the next available piece of productive land, often driving deforestation - or driving populations into urban slums. The **mismanagement of land** has already led to several food security crises, to reduced access to (fuelwood) energy, poverty, conflict and forced migration.

Land degradation costs an estimated USD 40 billion annually worldwide. Severely degraded land puts vulnerable rural populations at extreme risk to the impacts of

climate change. It can be costly to reclaim, and it no longer provide a range of ecosystem functions and services, resulting in a loss of production and many other environmental, social, economic and non-material benefits that are critical for climate resilience and development. More and more forests which provide valuable carbon sequestration services are being converted into agricultural lands. Land degradation, land use change, deforestation and forest degradation represent 24% of greenhouse gas emissions globally, and they are by far the main source of emissions in most African countries. They also have a negative impact on the resilience and adaptive capacity of ecosystems and populations in the face of climate change.

The good news is that in the 10 years between 2000 and 2010 carbon stocks on agricultural land increased by 4.6% or about 200 mtC per year. Specifically, carbon storage on agricultural land in Brazil increased 14%, in Indonesia it increased more than 9%, and in India by 7%. **Agroforestry is a now recognized as a fundamental key to making agriculture part of the solution to greenhouse gas emissions**, and a necessary tool if we are to achieve carbon neutrality by 2050.

National Context: Burundi, Lesotho, Malawi, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe

While each of the eight participating countries have unique aspects to their agricultural and socio-economic vulnerabilities, and their policies and strategies for addressing the impacts of climate variability and change, there is also significant commonality.

Each of the countries have economies and populations which are reliant on small-scale rain-fed agriculture, and which are already experiencing significant negative impacts and loss from increasingly frequent and intense extreme weather events, unreliable precipitation and increasing temperatures. These impacts are exacerbated by increasing deforestation, degraded landscapes and unsustainable agricultural practices.

The respective governments of each country have developed contextually appropriate climate change policies, strategies and action plans and, while none of the countries has contributed significantly to global GHG emissions, each has committed through their respective NDCs to mitigation targets. In all cases, participating governments have highlighted their priority for adaptation actions which enhance the resilience and adaptive capacity of their population, while providing significant mitigation co-benefits, and that the extent to which these actions can be implemented will depend on the availability of external technical and financial support. See section D.1 for detailed linkages to national strategies.

Contributions to Global Goals beyond the Scope of the Project

The project will promote the 2030 Agenda for Sustainable Development, in particular SDG 1, SDG 2, SDG 5, SDG 13 and SDG 15, by supporting **8 African countries** to massively scale-up evergreen agriculture and the regreening of farm landscapes for the enhancement of climate change adaptation, food security, and livelihoods. **Six of the eight participating countries are LDCs**.

Many of the goals of the **2030 Agenda for Sustainable Development** are linked and cannot be addressed in isolation of each other. For the vast majority of vulnerable small-scale farmers across Sub-Saharan Africa, food security, rural poverty, gender inequality, land degradation and climate change are inextricably linked, and each can only be effectively tackled through programmes or approaches which recognise and address the connections between these issues.

This project will contribute substantively to the achievement of SDG1: End poverty in all its forms everywhere (specifically including targets 1.1, 1.2, 1.4, 1.5, 1a and 1b); SDG2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture (specifically including targets 2.1, 2.2, 2.3, 2.4, 2a and 2c); SDG5: Achieve gender equality and empower all women and girls (specifically including targets 5.1, 5.5, 5a and 5c); and SDG13: Take urgent action to combat climate change and its impacts (specifically including targets 13.1, 13.3, 13a and 13b). Further, the 2030

	Agenda for Sustainable Development recognises the importance of the conservation and sustainable use of terrestrial ecosystems (Goal 15) and of reversing land degradation and achieving Land Degradation Neutrality (LDN) by the year 2030 (target 15.3). The Sustainable Development Target 15.3 is also at the heart of the United Nations Convention to Combat Desertification (UNCCD), and is central to many African countries' Nationally Determined Contributions (NDC) to the UN Framework Convention on Climate Change. The project also fully aligns with Aichi biodiversity targets 14 and 15 of the Strategic Plan for Biodiversity, 2011-2020, which seek to enhance the benefits to all from biodiversity and ecosystem services. The role of healthy soils in addressing climate change and ensuring food security was a major focus of the 21st Conference of the Parties on climate change in Paris. Over 100 countries ratifying the UN Framework Convention on Climate Change (UNFCCC) highlighted the importance of the land sector, that covers agriculture and forestry, in their Intended Nationally Determined Contributions (INDC). This project will contribute to the implementation of the **Nationally Determined Contributions** of participating countries.
B.2. Background information on project/programme sponsor	**UN Environment** United Nations Environment Programme, an accredited entity of the Green Climate Fund, and longtime implementing entity for the Global Environment Facility, was established in 1972 and has been a lead organization in setting the global environmental agenda ever since. UN Environment has extensive experience in the design and implementation of initiatives that promote Ecosystem-based Adaptation, delivering both adaptation and mitigation benefits, and has championed tools and methodologies this project relies on at a national and global-level, including Vulnerability Impact Assessments, Natural Capital Accounting, and others. Its core business focuses on designing and implementing initiatives that address the negative impacts of climate change through the sustainable use and conservation of ecosystems. Particularly, UN Environment offers expertise on large-scale ecosystem-based adaptation to enable countries to build climate resilience over large productive landscapes. These initiatives consequently build the climate-resilience of rural communities and facilitate the development of sustainable natural resource-based (green) economies. UN Environment possess a demonstrated and strong convening power, uniting governments and policy makers at regional and global levels towards common environmental objectives and has a long history of supporting sustainable policy change. UN Environment will act as the accredited entity, global coordinator and support policy change capacity building efforts for this project. **The World Agroforestry Center** The World Agroforestry Center (ICRAF) has, over the past four decades, established itself as the world authority on appropriate agroforestry interventions for specific ecosystems and agro-ecological zones under varying climatic conditions. ICRAF, through its Evergreen Agriculture Partnership (EVAP), is a world leader in methodologies for incorporating trees into farming systems to maximize adaptation and social co-benefits, and demonstrating positive impact with scientific evidence. **World Vision** World Vision (WV) is a humanitarian organization dedicated to working with communities in 100 countries by tackling the root causes of poverty and injustice. WV's size, experience and approach positions it uniquely for implementing complex, community-driven programs at scale. Scaling-up programs build on existing presence and resources in the region, utilizing networks of Area Development Programs, each covering 10,000-50,000 households, and each supporting multiple overlapping development programs over a period of 15-20 years. WV has demonstrated expertise in climate change adaptation and mitigation, with a particular focus on FMNR.

	WV has, for almost a decade, actively promoted FMNR as an effective, low cost, scalable approach to land restoration and sustainable agricultural intensification. It has successfully pioneered FMNR approaches in climate change mitigation projects, including Africa's first large-scale a/reforestation Clean Development Mechanism (CDM) project (Humbo - also 2nd in the world, and first in Africa), the world's first Gold Standard a/reforestation voluntary carbon project (Soddo), and the world's first regional FMNR scaling-up project (FMNR for East Africa). **CARE International** CARE International (CARE) is a global development organization with focus on addressing the root causes of poverty. CARE has a large country footprint and extensive programme management capacities, working in 90 countries around the world and supporting 880 poverty-alleviation and humanitarian aid projects to reach more than 72 million people. CARE Climate (leading engagement on this project for CARE) is CARE's global centre for climate advocacy, climate change adaptation for resilience, sustainable small-scale agriculture in a changing climate, and climate finance strategy and partnerships. **Catholic Relief Services** Catholic Relief Services (CRS) is a humanitarian relief organisation which helps millions of small-scale farmers worldwide recover from natural disasters and civil strife, build resilient farming systems, and grow them into agro-enterprises that engage successfully with markets. CRS's *Pathway to Prosperity* approach helps farmers build sustainable livelihoods through a phase-by-phase process. CRS currently has 116 agriculture projects in 38 countries, and is the largest implementing partner of USAID Food for Peace programs world-wide. Further details on Programme Sponsors are available in Annex 2.
B.3. Market overview	The project will result in a major increase in the farm production of a number of key agricultural commodities as a result of the adoption of evergreen agriculture practices. The project will therefore work vigorously with farmer organizations and producer groups (focusing on women and youth) to create more sustainable and fair market linkages for these agro products developed and promoted as climate smart. It will engage with the established marketing networks in the scaling-out areas in the provinces and local regions to build their absorptive capacity for the increased volume of key products that will be produced by farmers. **Market** For the majority of African countries, the agricultural sector still provides a relatively large share of GDP but productivity in the sector has lagged considerably behind that of other continents and the potential that Africa can reach in the sector. While on average agriculture employs 65 percent of Africa's labor force it accounts for about 32 percent of gross domestic product, reflecting the relatively low productivity in the sector. On average agriculture sales generate 23.6% of the households' income in our sample of countries at the national level, 9.5% for urban households and 28.3% for rural households. **Products** The key production increases will be experienced for **honey, maize, fruit tree products (such as mango and papaya), sustainable fuelwood, livestock fodder, dairy products (milk, cheese), and timber**. The project will therefore conduct an inventory of traders and processors dealing with these commodities in each out-scaling location, and it will analyze the current value chains for each commodity. It will then

dialog with the traders and processors to alert them to the expected increases in production from project activities. The project will provide local farmers associations and producer groups with better pricing information on the commodities, and assist them to negotiate optimum prices with the traders and processors for these products.

A Note on Market Data - Local and even national data on market prices for the products associated with this intervention and traded at the rural level is extremely hard to obtain. Data is typically not kept, highly variable given local and seasonal conditions and occasionally is not obtained through cash purchases but through barter systems. Never-the-less the following attempts to define the market context for the identified products.

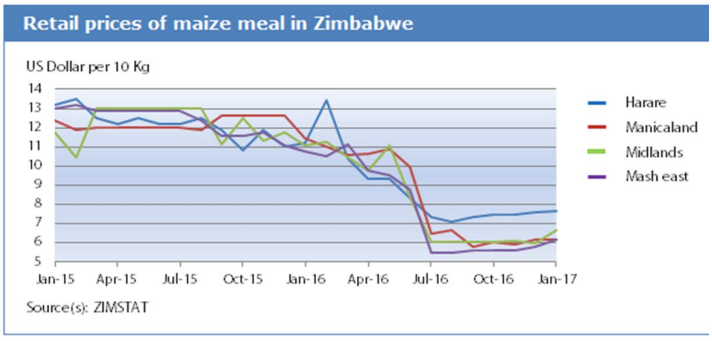
Honey

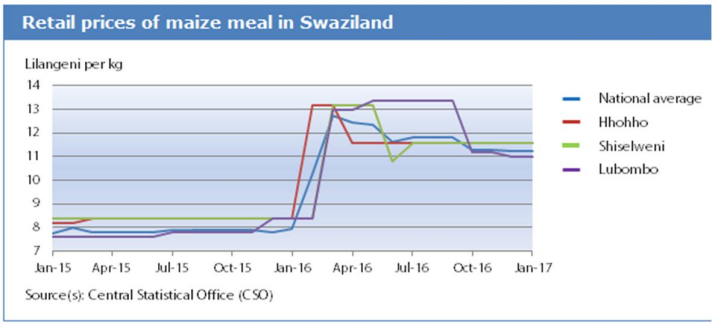
The project will also work towards developing niche markets for ecologically produced and climate resistant new products and agro technologies. An example of such a niche product is acacia tree honey. The national and international demand for honey in African markets and in more developed countries is expanding rapidly. Honey produced by the key acacia tree species (particularly from *faidherbia albida*) enjoys premium prices. The project will assist farmers in obtaining more technical knowledge on honey production and honey markets to facilitate them to install bee hives on their farms, which would be a key new source of income for many evergreen agriculture practice adopters. It will also provide farmers information on prices and market opportunities for selling their surplus honey. Data is difficult to obtain however, honey can range in price from 4-9 USD per kilo across sub-Saharan Africa.

Maize

Tight regional supplies continued to sustain generally higher year-on-year maize prices. However, the favourable production outlook for the 2017 harvests stemmed price rises and contributed to some declines. In **Swaziland**, maize meal prices in January were still well above their year-earlier levels due to the impact of the 2015/16 drought on local supplies. In importer **Zimbabwe**, prices of maize meal strengthened slightly in January, although they remained well below their levels a year earlier. In **Malawi**, maize prices were reportedly stable or decreased in January with the continuation of Government sales, humanitarian assistance and imports. In **the United Republic of Tanzania**, prices of maize continued to increase in February reaching record to near-record levels in all monitored markets as the upward pressure from the below-average *vuli* production was compounded by concerns over the performance of the *msimu* harvest, to be gathered from May in central and southern uni-modal rainfall areas, due to early season dryness in some areas. In **Uganda**, prices of maize levelled off in February as the recently-completed second season harvest increased supplies. Prices, however, remained at record to near-record levels due to a reduced 2016 cereal production compounded by sustained demand from neighbouring countries.

Prices range from $ 0.66 cents to $1 USD/kg, across sub-saharan Africa with lows experienced in Zimbabwe and highs in Swaziland.

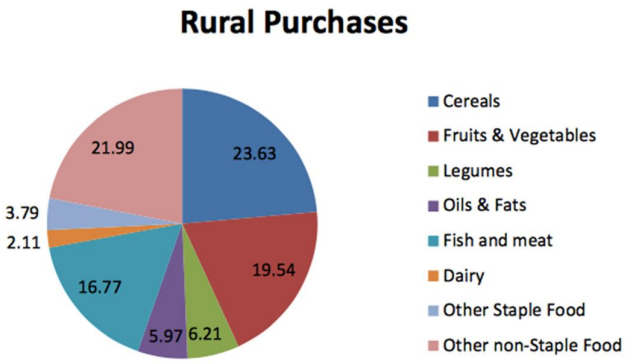




Tree Fruits

Tree fruits are another class of niche products whose farm production will be increased due to the project. These include both conventional fruits such as mangoes and avocadoes, as well as numerous local tree fruits harvested from the trees that farmers are naturally regenerating through FMNR. In those project locations where it is projected that farmers will be harvesting substantive additional quantities of fruits, a value chain analysis will be conducted and markets identified – either for fresh fruit production or processed fruits (jams, jellies, dried fruit packets). Farmer associations and groups will be provided with this information as well as technical assistance in fruit processing, and assistance in entering local and national fruit product markets.

Maize and Fruits account for the bulk of rural agricultural trade in sub-Saharan Africa.



Source: UNDP

Indigenous Products

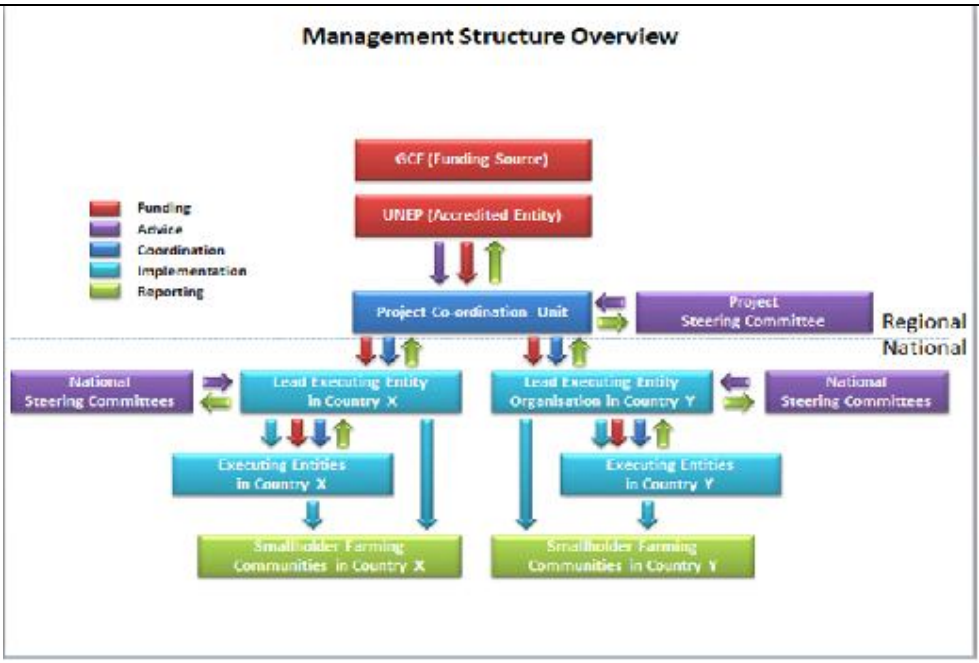
Indigenous products for which there is a well-established local demand and familiarity include products such as medicines (numerous species), building materials, and handicrafts (particularly furniture). The feasibility and commercial viability of these natural resource- based businesses will also be assessed.

The project will take a phased approach to the development of markets and value chains for the various natural resource-based products. The initial part of the project will prioritize the development of value chains for locally marketed products, while during the latter part of the project emphasis will be given to identify opportunities and promote investment in the products that can be exported to international markets.

Fodder

Fodder can be produced and stored for sale during times of hardship. Exact market data is highly variable but recent studies note that fodder sales have contributed to

	annual income increases of 25% in Nigeria for example (CGIAR, 2017). *Fuelwood* Fuelwood in rural areas is often consumed on-farm, until enough surplus is generated for sale. In SSA, nine out of ten people—around 760 million individuals—rely on firewood and charcoal as their primary source of energy for cooking, heating and other uses. Price information is not available.
B.4. Regulation, taxation and insurance	The project's activities will only result in positive environmental or social effects and are thus not expected to require an EIA or Environmental Impact Summary (EIS). The project has been classed as 'low risk' category based on an analysis using UNEP's Environmental, Social and Economic Review Note (ESERN) tool (ESERN review template in Annex 3). The need for licensing or permits is not expected. The project will have the most structural impact when working with farmers to provide them with agricultural inputs. Inputs supplied will be locally-appropriate (in agro-environmental, social and economic terms) and therefore will likely not require any additional permitting. Any introduction of new varieties or technologies will be carried out in consultation with local and national authorities and with communities. With respect to the taxation of the requested project grant, Section 7 of the Convention on the Privileges and Immunities of the United Nations provides inter alia that the United Nations, including its subsidiary organs, is exempt from all direct taxes, except charges for utilities services, and is exempt from customs duties and charges of a similar nature in respect of articles imported or exported for its official use. For the specific activities promoted by the project, neither permits nor licenses are required but will be subject to the consensus and approval of participating communities. For goods and services procured directly by executing entities in country, the standard national taxation rate is applied.
B.5. Implementation arrangements	The **United Nations Environment Programme (UN Environment)** will be the Accredited Entity for the project responsible and accountable to the GCF for implementing and reporting on this project as well as for all financial management and environmental and social safeguard adherence. UN Environment will work with the **World Agroforestry Center (ICRAF)** as a key Executing Entity responsible for research, monitoring and data collection, and scientific and technical guidance and quality assurance. ICRAF will also Chair the Project Coordination Unit and will be responsible for linking the outcomes of the project with the global context in pursuit of a scalable paradigm shift. UN Environment will also work with key national institutions, NGOs, CSOs and grassroots organizations which will implement the on-the-ground activities with small-scale farming communities and local stakeholders across the 8 participating countries.



The **Project Steering Committee** will be comprised of several representatives of key collaborating organisations, including UNEP, ICRAF, World Vision, CRS, and CARE, as well as the offices of the National Designated Authorities and possibly a member of GCF. It will provide advice on strategic decisions relating to the project's direction, coherence with national, regional and global contexts, and key aspects of monitoring and evaluation. It will convene at least biannually, either by teleconference or in person to deliberate.

The **Project Coordination Unit** will be comprised of a representative from each of the lead executing entities. ICRAF (through the Evergreen Agriculture Partnership Secretariat) will chair the Regional Project Coordination Unit. Members of the Project Coordination Unit will meet monthly, either by teleconference or in person, to discuss progress and resolve actions relating to policy coherence, project design and revision, implementation, monitoring and evaluation and reporting. Additionally, the Project Coordination Unit will hold virtual biannual "Project Coordination Forums" where institutional colleagues from other units or programmes within UN Environment and Executing Entities working in similar programming, research or policy areas will discuss potential synergies and complementarities between the project and their respective work streams. **National Project Coordination Units** will operate at the country-level and will be hosted by the Lead Executing Entity.

For each of the eight project countries, one of the collaborating iNGOs (World Vision, CRS, CARE or Self Help Africa) will be selected as "**Lead Executing Entity**". Selection will be based on relevant project management and implementation experience and capacity, and grassroots presence in the relevant country. Each Lead Executing Entity will be contracted directly by UN Environment through a Project Cooperation Agreement. The Lead Executing Entities will be responsible to UN Environment for coordinating project implementation, sound and appropriate use of funds as indicated for activities, monitoring the performance and activities of other implementing organizations within their respective countries, and for reporting on progress and results.

The Lead Executing Entities will contract professional services as necessary and appropriate to provide expertise related to the scaling-up activities across and within countries. These services will augment the expertise of the scientific, technical and implementing partner organizations. It will include, as appropriate, advice and training related to the adaptation and grassroots extension of best practices on evergreen agriculture, guidance on the tailoring of relevant knowledge for project partners including NGOs, CBOs, national and private extension services and in making relevant expertise available to local scaling-up efforts.

	A **National Steering Committee** will be established in each country, comprised of representatives of the relevant Lead Executing Entities (which will provide its secretariat), the Project Coordination Unit, the National Designated Authority, relevant national and regional governments, national implementing organisations and other key national stakeholders from relevant sectors. It will receive regular updates and reports from the Lead Executing Entity, and will provide strategic advice regarding opportunities to improve project efficiency, effectiveness and impact. All implementation arrangements are project specific and therefore pending approval of the project. All contracts issued by UN Environment will be in the form of a Project Cooperation Agreement (PCA). This document was reviewed and approved during UN Environment's accreditation to the GCF, and is in line with the Accreditation Master Agreement.

C. Financing / Cost Information

C.1. Description of financial elements of the project / programme

Please provide:

- *an integrated financial model in Section I (Annexes) that includes a projection covering the period from financial closing through final maturity of the proposed GCF financing with detailed assumptions and rationale; and a sensitivity analysis of critical elements of the project/programme'*

  The proposed financing instrument is grant and therefore projection from financial closing through final maturity is not applicable.

- *a description of how the choice of financial instrument(s) will overcome barriers and achieve project objectives, and leverage public and/or private finance*

  The proposed grant financing is adequate for the development of public basic services supporting the protection of livelihoods against climate variability – and would catalyze in the longer term the gradual development of a sustainable shift to climate resilient varieties, value-added services to directly support climate-resilient development planning and investments, with possible additional economic return (see Section D.2).

a breakdown of cost estimates for total project costs and GCF financing by sub-component in local and foreign currency and a currency hedging mechanism:

Component	GCF Funding Amount	Currency
Component 1	12.2	million USD ($)
Component 2	8.2	million USD ($)
Component 3	8.4	million USD ($)
Component 4	4.3	million USD ($)
Component 5	8	million USD ($)
Project Management	4	million USD ($)
Accredited Entity Fee	4.5	million USD ($)
Total	**49.8**	**million USD ($)**

C.2. Project		Financial Instrument	Amount	Currency	Tenor	Pricing

financing information	**Total project financing (a) = (b) + (c)**		.....	Options		
	(b) Requested GCF amount	(i) Senior Loans (ii) Subordinated Loans (iii) Equity (iv) Guarantees (v) Reimbursable grants * (vi) Grants *	 50	Options Options Options Options Options million USD ($)	( ) years ( ) years	( ) % ( ) % ( ) % IRR
		** Please provide detailed economic and financial justification in the case of grants.*				
		Total Requested (i+ii+iii+iv+v+vi)	.....	Options		
	(c) Co-financing	**Financial Instrument**	**Amount**	**Currency**	**Name of Institution**	**Seniority**
		Grant Options Options Options	45	million USD ($) Options Options Options	Various	Options Options Options Options
		Lead financing institution:				
	(d) Covenants					
	(e) Conditions precedent to disbursement					

D. Expected Performance against Investment Criteria			
Please explain the potential of the Project/Programme to achieve the Fund's six investment criteria as listed below.			
D.1. Climate impact potential *[Potential to achieve the GCF's objectives and results]*	*Expected tonnes of carbon dioxide equivalent (t CO_2 eq) to be reduced or avoided (Mitigation only)*	*Annual*	3.06 million tons CO2 per year
		Lifetime	61 million tons CO2 cumulative increase in landscape carbon stocks (25 year time horizon)
	• *Expected total number of direct and indirect*	*Total*	1,125,000 million (of which at least 50% are women)

	beneficiaries, disaggregated by gender (reduced vulnerability or increased resilience); • *Number of beneficiaries relative to total population, disaggregated by gender (adaptation only)*	*Percentage (%)*	The total combined population of the 8 participating countries is 145.36 million. This project will reach 1,125,000 million households. At an average of five persons per household the total population reached will be 5.62 million persons. This is 4% of population of the eight countries.	

D.2. Paradigm shift potential

[Potential to catalyze impact beyond a one-off project or programme investment]

This project has the potential to demonstrate how climate change objectives and food security objectives do not have to be at odds – even under the harshest of circumstances. It has the potential to be a signature example of paradigm-shift towards low-cost, lasting resilience for communities and ecosystems. One in which Africa is primed to lead the way.

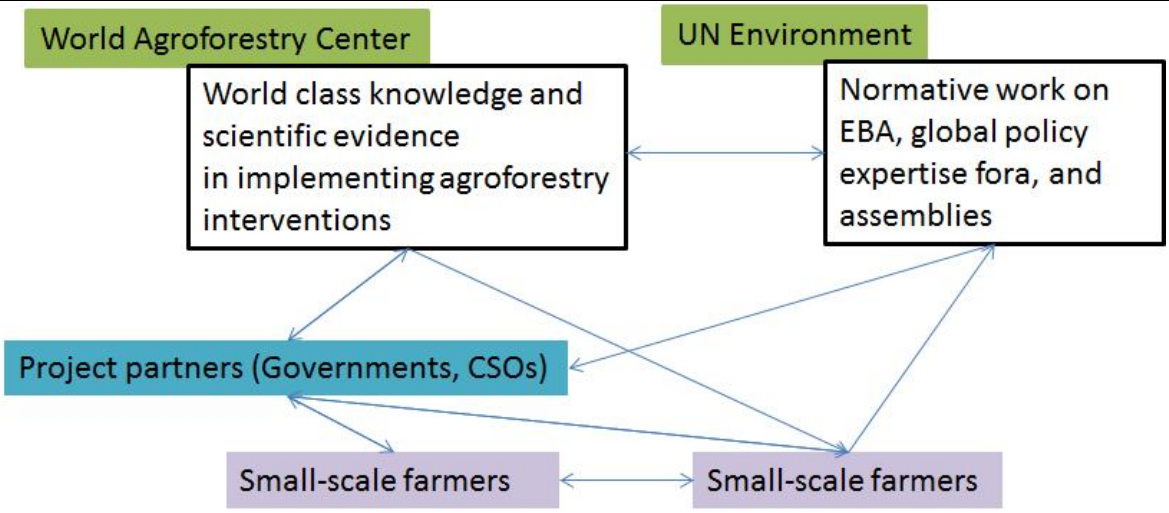
This project will create a movement of change in agricultural practices and sustainable land management that delivers on global ambitions such as the Sustainable Development Goals (see section C.1) and the Paris Agreement by combining food security with climate change adaptation and mitigation benefits. In particular, the project will demonstrate how countries can specifically deliver on their Nationally Determined Contributions in practical ways, at minimal to no cost to their GDP, while at the same time improving food security, resilience, and well-being for the most vulnerable citizens in their countries; the small-scale farmer. Practical benefits to farmers such as increased crop yields, increased on-farm biodiversity and products, increased fodder, increased nutritional diversity, increased incomes and increased resilience will encourage sustainability and uptake by neighboring farmers. Given the extremely high cost-benefit ratio of the intervention lends itself to mass replicability.

For example, what began as an experiment with a few willing farmers in 1983 in Niger Republic, was adopted by several million farmers, largely without external funding, and spread to 5 million hectares or approximately 50% of the nation's farmlands over a twenty year period. At an average density of 40 trees per hectare, some 200 million trees were regenerated and land was restored at an average rate of 250,000 hectares per year for twenty years with minimal and often no government or other external assistance. This Niger phenomena has inspired new movements in other West, East and Southern African countries and in many instances the uptake and spread of FMNR beyond the time and geographic limits of the projects which introduced FMNR.

While several of the partner organizations to this proposal have first-hand experience from their involvement in scaling-up FMNR, building small-scale farmer resilience to climate change and supporting the development of related value chains, Reij and Winterbottom 2015 distilled lessons learnt from successful re-greening 'movements' to propose six steps to effective scaling-up of re-greening. These steps provide a critical foundation for this proposal, but are not intended to be prescriptive. Rather, they represent a pragmatic approach to accelerating the spread of re-greening in line with this project.

Ultimately, the project aims to contribute to the knowledge base that supports effective climate change adaptation and resilience through dissemination of documented findings, lessons learned and case studies to a wide range of stakeholders (through a detailed communication strategy validated at project inception). The project facilitates iterative and improved knowledge generation, creation and sharing for collective learning among small-scale farmers, extension officers, government counter parts at the national level, and project partners.

A central tenant of the project design is making the **scientific expertise housed at the World Agroforestry Center readily available, and rapidly accessible to small-scale farmers and project partners**. **Moreover, peer-to-peer learning among small-scale farmers is a foundational element of the project design**. Finally, UN Environment will integrate and disseminate lessons learned into various international and regional policy for a (e.g. EBAFOSA). At times knowledge and learning will be communicated directly to SSF (e.g. through text message groups) and at other times knowledge will be packaged and realized through partners. Learning will also take place in the reverse flow, channelling ground realities back up to the scientific and policy experts for review and study.



Monitoring and Evaluation resources will be positioned such that M&E can scale up during periods of increased shocks or stresses (e.g. an El Nino event) to generate more precise knowledge on how communities cope with such shocks and stresses, how well the various agroforestry interventions perform, and ultimately feed back into project design and to contribute to the international knowledge base on how localized adaptation efforts respond to global events.

Action Research will underpin project learning, providing continuous feedback, decision-support and quality assurance to the project. **M&E will take place each year, and lessons learned and compared across the countries will be fed back into programme design at the start of each year**. Action research will focus on -

a) formative evaluation: monitoring of project design in the initial phases;
b) planned comparisons: testing efficacy of alternative interventions or controls against predetermined indicators of outcome success;
c) process evaluation: monitoring for analysis and performance management; and
d) summative evaluation: evaluating results of project activities against targets ensuring that information is analysed, disseminated and used by project stakeholders in a timely manner.

Baselines will be established and tools, derived from (2) above, will be adapted to effectively monitor and evaluate programme impacts temporally and spatially on household food security, adaptive capacity and mitigation at varying scales across agro-ecological zones. This data will be analysed and used at a number of levels to improve implementation and allow continual refinement of community and household interventions.

A variety of approaches will be used to ensure effective learning, including:

a) **Intra consortium learning** (between participating communities, governments, and project partners)

- The Project Coordination Unit will capture key learnings to ensure that evidence and effective innovations are shared between implementing organisations and other key stakeholders in each of the countries. Face-to-face meetings will be used to share and discuss results at the project and national level.
- Inception workshops will be held in each country with implementing partners and other national stakeholders to capture existing local knowledge and ensure that contextually-appropriate best practices are incorporated into project planning and design.
- Technical partner organisations, including ICRAF and WRI, will continually refine and adapt the assessment, prioritisation and monitoring tools employed by the project, and will ensure appropriate scientific evidence and research findings inform and guide the iterative redesign and refinement of project activities.
- An end-of-project workshop in each country will contribute to the synthesis of project outcomes

	and findings, which will be documented and disseminated broadly in a variety of formats. b) **Stakeholder learning** (learning with the GCF) • Stakeholder communications, including milestone reporting and progress against the indicators will be communicated in line with programme partners' expectations. • Develop a long-term, shared vision for landscapes in question at national levels through an inclusive and participatory process aimed at generating knowledge that is salient, credible, and reliable to all stakeholders. Share data and communicate plans widely, via ICTs where feasible, and taking into consideration the information channels and literacy levels of men and women. Pursue strategies that empower women and others to share their viewpoints and innovations. c) **External and Global linkages** (with wider research/ development practice) • Case studies from the project will be identified and documented to demonstrate the impact of the GCF's investment in restoring landscapes, building resilience and adapting to climate change. • Regular media releases provided and posted on the websites of partner organisations, and on the Evergreen Agriculture Partnership site, CGIAR, the FMNR Hub, Global Alliance on CSA and Africa CSA Alliance websites.
D.3. Sustainable development potential *[Potential to provide wider development co-benefits]*	Under the following headings the project will target the following co-benefits **Environmental Co-Benefits** • Restoration of approximately 1 million hectares of degraded and climate vulnerable ecosystems (at no additional cost but equating to approximately $ 45/ha) • Enhanced soil quality, reduced soil erosion, enhanced soil fertility, enhanced soil moisture retention • Enhanced on-farm biodiversity primarily in the form of additional tree products (fodder, fruit, nuts, edible leaves and traditional medicines) and increased ecosystem services from bees, birds, insects and wildlife, • Enhance water infiltration, and soil moisture • Increased sustainability in fuelwood practices • reduce erosion from water runoff and wind, and progressively accumulate organic matter through leaf-litter to replenish top soil and improve its structure. **Social Co-Benefits** • Nutritional diversity enhanced through on-farm crop diversity • Nutritional diversity enhanced through increased income for purchase of additional food stuffs • Market linkages developed and fortified • Reduces marginalization of SSF by placing them at the center of related national policy debates • Project also substantially improves SSF decision making capacity and strengthens farmer associations for greater impact at district and regional levels • Contributes to safeguarding farmer investment from extreme weather events (see feasibility study) and safeguards farmers on –farm investments on a seasonal basis by providing reliable climate-information for planting, etc. • In places where national policies or local bi-laws are established or reinforced, the project will contribute to the reduction of land tenure insecurity and possibly even displacement. It may also reduce migration flows of the most impoverished into urban slum areas • inclusive/participatory approaches and shared management plans for sustaining natural resources will ensure greater availability of fodder and improved crop yields, while increasing community cohesion and reduce conflict between pastoralists and smallholder farmers **Economic Co-Benefits** • Establish and/or strengthen community-based farmer marketing groups or associations, ensuring vulnerable smallholder farmers have access to bulk purchasing of inputs and marketing of farm produce access to markets, information and extension support. It will also build the capacity of farmer groups to assess market opportunities • Engage with other value chain actors and develop appropriate equitable value chains, resulting in strengthened regional markets and increased livelihood opportunities for participating smallholder farmers • Fertilizer subsidy costs to government reduced • Framework established for potential future linkages with carbon markets which could bring

	significant additional revenue communities should carbon markets rebound • Fodder made available for livestock which reduces loss of livestock and increases health of livestock **Gender Co-Benefits** • Project will target 50% female headed household rate among beneficiaries – for a total of approximately 5,625,000 direct female beneficiaries • Project will make a significant effort to identify female lead champion farmers where cultural context and farmer capacity allows • Under Output 5 female-led entrepreneurship and Village Savings and Loan Associations will be promoted • Travel time for girls for fuelwood is likely to be reduced (it is not possible to give a figure for this at this time given the various national and landscape differences of the project sites)
D.4. Needs of recipient *[Vulnerability to climate change and financing needs of the recipients]*	The ND-Gain Country Index uses the equation for Vulnerability as described in the 4th IPCC Assessment Report as follows: Exposure X Sensitivity – Adaptive Capacity = Vulnerability Within the context of the ND-Gain Index thirty-six (36) indicators contribute to the measure of vulnerability. Each indicator comes from a public data source. Below are the rankings of the participating countries out of the total 182 countries ranked in the index: Country — Rank Burundi 181 Lesotho 169 Malawi 144 Swaziland 151 Tanzania 149 Uganda 174 Zambia 148 Zimbabwe 141 All participating countries to this proposal are in the bottom quadrennial of the index – i.e. they are therefore some of the most vulnerable countries in the world to climate change. Burundi is most vulnerable ranking second to last, while Zimbabwe is the least vulnerable of the 8 countries at 141 out of 182. (Further specific climate change impacts and details of the country's respective vulnerabilities please reference the feasibility study). By virtue of design the project targets the most vulnerable populations within these countries. For all the participant countries on average the percent of the population living on less than $3.10 USD per day is 73% while the percent of the population living on less than $1.90 USD per day is 52% and the rural population is above 78%. The project has pre-selected project sites comprising 20m hectares based on poverty and need, coupled with the ability to cost-effectively scale out to these areas, thereby enhancing the overall reach of the project. (Further details of community-level vulnerability are being developed in the Feasibility Study). The Africa Adaptation Gap Report demonstrate Africa is already committed to adaptation costs in the range of USD 7-15bn per year by 2020. These costs will rise rapidly after 2020, with higher levels of warming resulting in higher costs and damages. Africa's long-term adaptation costs are estimated at around USD 35 billion a year by 2050 and USD 200 billion a year by the 2070s. **Six of the 8 participating countries are Least Developed Countries.** None of the countries can cope with these impacts given their respective national current accounts. GDP growth for 6 of the 8 countries is below the SSA average of 3% annual growth. GNI per capita for 7 of 8 participating countries is below the Sub-Saharan Africa average, and well below world average. The Present Net Value of External Debt as given by the World Bank is 158%, 117%, 88% 63%, 61%, 59%, 51%, 15% for Burundi, Zimbabwe, Tanzania, Malawi, Uganda, Zambia, Lesotho, and Swaziland. Additionally, current account balances for 7 of 8 countries is below zero % of GDP hovering between -3.6 and -12% of GDP. The world bank monitors financial economic social and institutional needs through Country and Policy

Institutional Assessments (CPIAs). For all countries but Zimbabwe, there was either no change or a negative trend as compared to last review.

	Economic Management	Structural Policies	Social inclusion and equity	Public Sector management
SSA Average	3.3	3.2	3.2	3
Burundi	2.8	3.3	3.6	2.5
Uganda	4.2	4	3.7	3.1
Tanzania	4	3.7	3.7	3.3
Malawi	2.8	3.2	3.5	3.1
Lesotho	3.2	3.3	3.4	3.3
Zimbabwe	2.7	2.7	3.3	2.8
Zambia	3	3.7	3.3	3.2

Details of the socio-economic circumstances and needs of participating communities across each of the eight countries are being elaborated in feasibility study.

In response to the extreme scale and acute nature of poverty among small-scale farmers in the eight participating countries, the project will support over one million vulnerable households to adopt simple practices which significantly improve their food security, access to sustainable fuel, income generating opportunities and adaptive capacity. Further, it will build the awareness and capacity of government and institutions to support the scaling-out of this approach which can rapidly improve the socio-economic circumstances and climate vulnerability of the most marginalized segments of their populations, and can be undertaken with extreme and increasing cost-effectiveness.

D.5. Country ownership

[Beneficiary country ownership of project or programme and capacity to implement the proposed activities]

In **Burundi**, the project contributes to 7 of the 12 priority projects identified in the Country's NAPA as well as contributes to the Food Security goal of Burundi's Vision 2025.

In **Lesotho**, the project addresses the top 2 priorities of the country's NAPA and directly addresses the Agriculture and Rural Economy component of the National Strategic Development Plan 2012/13 – 2016/2017.

In **Malawi**, the project targets all of the top 5 priorities in the country's NAPA and the 1st of Malawi's key priorities under its Growth and Development Strategy 2011 – 2016.

In **Swaziland**, the project contributes to the agricultural adaptation measures component of the Second National Communications to the UNFCCC and 4 of the 6 agricultural priorities under the National Development Strategy (2012).

In **Tanzania**, the project contributes to both the agricultural sector and forestry sector interventions as indicated in the country's NAPA, as well as the number one priority in the Development Vision 2025.

In **Uganda**, the project directly addresses the top 3 priorities, and greatly contributes to 6 of the total 9 priority projects of the country's NAPA. It also directly contributes to 2 of the 3 priorities in the country's Vision 2040.

In **Zambia**, the project directly addresses 2 of the top 4 priorities of the country's NAPA, and further advances the overarching goals of Zambia's Second National Biodiversity Strategy and Action Plan (NBSAP-2) 2015 – 2025.

In **Zimbabwe**, the project directly addresses the 2nd priority (of 4 total priorities) of the country's NAPA, and directly contributes to a vast majority of the priorities under the Comprehensive Agricultural Policy Framework (2012-2032).

D.6. Effectiveness and efficiency *[Economic and financial soundness and effectiveness of the proposed activities]*	The proposed GCF grant does not impact the national public debt of the country and will be instrumental to increasing the resilience of communities to climate extremes and variability. The primary objective is knowledge transfer. Private citizens without the means to secure similar trainings from private sector outlets are the primary beneficiaries. The initiative has been envisaged as a public service that will have benefits in multiple development sectors to build overall climate resilience, there is almost no risk of the investment crowding out private investments due to the limited disposable income available within the target group. The research base that supports this intervention and provides the knowledge base to be transferred has been acquired at very high costs over 40 years at the World Agroforestry Center. This grant, and the according concessional, makes ICRAF research actionable at the grassroots. The project is highly **Cost-Effective**, with a cost of **US$45 per beneficiary household** estimated at over five years, or $10 per year, and **US$0.82 per tCO2eq abated** (estimated over 25 years), resulting in a unique impactful investment at very little cost. **Economy:** Drawing on the protocols and standards of UNEP and key collaborating partners, the project will develop robust processes around salaries, procurement, budgeting and finance tracking to ensure project and administrative inputs achieve minimum responsible costs and are used only for designated purposes. All expenditure will be routinely audited, both internally and externally. **Efficiency:** The proposal has a clear Theory of Change and indicators to guide resource allocation towards activities that maximise benefits towards project objectives. Furthermore, the core focus of the project is scaling-up existing successful Evergreen Agriculture programmes, and integrating appropriate activities into existing complementary programmes. In both cases, implementation will build on existing relationships and infrastructure, utilize and/or share resources, and draw on recent experience, lessons and evaluations of the programmes of collaborating organisations, which have been implemented in the same or similar agro-ecological contexts and countries. Leveraging community structures and community-driven implementation will maximise efficiency and ensure delivery of value for money. The project emphasises using and enhancing the strengths of existing community and government organisations, with formation of new groups only where necessary. **Effectiveness:** UN Environment has significant programme experience in this area. In addition, the project will be guided by collaborating organisations through the Evergreen Agriculture Partnership which are internationally recognised experts in the fields of land restoration, climate adaptation and Evergreen Agriculture. The project will routinely monitor effectiveness via indicator tracking that is reported monthly and biannually, to ensure progress is achieved against objectives and allow flexibility and responsiveness during implementation. **Equity:** The project targets communities that are geographically and economically marginalised. Within this context, women and youth are specifically targeted as key participants and beneficiaries. Project processes pay particular attention to the needs and aspirations of communities' most vulnerable sub-groups and are designed to deliver gender-responsive activities. These steps help deliver the greatest benefit to the poorest and most vulnerable segments of already marginalised communities. **Expansion:** The project will demonstrate the cost effectiveness and significant impact of a highly scalable and replicable model; it will build the technical capacity of community lead farmers and extension workers and establish peer-to-peer learning platforms and a culture of exchange and dissemination of knowledge; and it will provide policy and decision-makers with the tools to support further scaling-out and expansion of the project. Further, project experience and lessons learned from evaluations will regularly inform government ministries in participating countries, and be disseminated widely

E. Brief Rationale for GCF Involvement and Exit Strategy
Our value proposition to the GCF is that we will be scaling-up evergreen agriculture practices in order to provide the maximum number of more resilient households and greatest landscape carbon storage. We aim to prove that the cost per household and per hectare in achieving this goal through evergreen agriculture is very much less expensive per HH/hectare than virtually any other practices of comparable impact. Most estimates of land restoration projects suggest a cost on the order of $1000/ha or more. This is often in the range of several thousand dollars per hectare. We intend to prove that such project investments can be less than $50 per hectare with the adoption evergreen agriculture practices, based on our analyses of the previous cases of large-scale adoption of these practices.

We are proposing to invest $50 million of GCF project funding in this enterprise, with an intention of scaling-out the adoption of the practices from areas where adoption has already occurred at scale. The GCF financing will be supplemented by the in-kind co-financing that will occur by building the scaling-up onto other projects currently being implemented by the participating organizations that are aligned with the GCF program. This will leverage add another $25 million from the in-kind resources of the other projects.

We have established a unique target for adoption in each of the eight countries. These indicative targets add up to 1,000,000 HHs/hectares. If achieved, this would provide GCF with a return on investment of $45 per HH/hectare and $0.82 per ton of additional landscape carbon accumulated.

There are currently a multitude of small and/or fragmented climate adaptation projects being implemented across Southern Africa, some of which are experiencing great success. Unfortunately, the collective impact of these isolated successes is insufficient to address the growing problems associated with the negative impacts of climate change. Further, these fragmented projects rarely learn from or build on the success of others, and are at a scale insufficient to attract the sustained concerted efforts of significant stakeholders from across relevant sectors, or to establish a movement.

This project is critically and urgently needed. It will catalyze the development of a movement to scale out a proven-effective farmer-driven approach to climate change resilience and sustainable agricultural intensification. But such an approach needs to be implemented at sufficient scale and accompanied by the establishment of the extension support, social infrastructure and appropriate market opportunities to become self-sustaining.

The project aligns with the objectives, expertise and capacity of each of the collaborating organisations - and requires the collective efforts of each party at the scale proposed by the project to achieve its intended goals. But, while each participating organisation is able to contribute resources to the project, they have insufficient collective financial capacity to undertake it without significant external support.

Governments of the participating countries recognise the need for the project, and its potential to contribute significantly to achieving the carbon emissions reduction goals of their respective NDCs, and to the livelihoods, food security and resilience of their populations. They intend to work collaboratively with the project, supporting its development and implementation, but do not have the financial resources necessary to fund it.

Similarly, the private sector, including commercial enterprises and impact investing institutions, recognise the potential of linking to the project to strengthen various product markets, and provide reliable high-quality supply chain opportunities. However, the anticipated financial returns which would be available to an investor are insufficient and too long-term to attract sufficient up-front private sector investment. Further, the principal focus of the project is land restoration, regreening and empowering small-scale farming communities. The constraints of up-front private sector investment would likely require significant realigning of the project activities away from its core objectives, and be contrary to the long-term interests of farming communities.

The institutions leading the development of this project understand the multitude of inter-related problems underpinning the vulnerability of poor smallholder farming communities in Southern Africa. They have worked with them at the grassroots for decades, learned from them, experienced significant success in overcoming their challenges, and have been instrumental in establishing similar movements in other parts of the African continent and the world. They know how the project needs to be designed and implemented to achieve its goals, but this design doesn't well align with the funding criteria of other available donors and funds.

This significant financial support can only come from the Green Climate Fund. The stated objectives of the GCF perfectly align to the intent of the project, ensuring that project activities can be designed to maximise impact, its processes and requirements fit well with the structure of the collaborating organisations and the necessary planning of the project, and the scale of available funding is sufficient to ensure the project realises its goals.

A significant focus of the project is to ensure sustainability beyond its implementation. The project is designed to up-scale existing practices into a mass movement, with the capacity of and tools available to communities and local service providers being sufficient to provide technical backstopping to the small-scale farmers in neighboring areas and across the region, thereby creating a paradigm shift in agricultural practice across the southern half of the continent. The proposed project has been designed in close consultation with and involvement of relevant government agencies and technical line departments, international agencies such as UN Environment and ICRAF, locally-based NGOs, and in collaboration with CSOs. It will be implemented with strong community, local government and national government participation, and most interventions will be farmer-led to ensure grassroots ownership and buy-in.

Building on this foundation, the project ensures that the investments as well as the results of the interventions are sustained beyond the project period through the following components and the respective project activities:

1. Combining traditional knowledge and practices with climate-resilient technologies and innovative practices

The project is designed to build upon the interest and knowledge of participating small-scale farm households to continue investing in core activities, by ensuring obvious and significant livelihood and quality-of-life-benefits are realised, without requiring excessive ongoing effort. The extensive collective experience of the Evergreen Agriculture Partnership's member organisations, which comprise some of the largest grassroots implementers working across Africa, is that adoption and continued practice of contextually appropriate Evergreen Agriculture practices has generally, within a 3-5 year period, resulted in increased yields and reliability of crops, improved availability of fodder and fuel-wood, and improved and diversified livelihood opportunities.
FMNR was first introduced to small-scale subsistence farmers in Niger in 1983. Today, some 1.2 million Nigerian farm families are still practicing FMNR across an area exceeding 5 million hectares[5]. Over a 30 year period, FMNR spread organically from farmer to farmer, largely without external intervention, to cover approximately 50% of the nation's farmland. At an average density of 40 tress per hectare, around 200 million trees have been regenerated, through small-scale farmers recognizing the tangible benefits being experienced by their neighbors.
Accordingly, we are confident that adoption of Evergreen Agriculture and land restoration practices will experience similar success in the project's participating countries, and will continue to organically scale-up and out well beyond the end of the project implementation and attract the accelerated investment of communities, local and national governments, and development agencies in general.

2. Ensuring cost effectiveness of the intervention and strengthened capacities of farmer groups

The project is designed to build the financial, and practical capacity of participating small-scale farmers to enable them to continue investing in the continued practice of project activities. Significant components of the project will focus on building the capacity of farmers to be able to assess, plan, adopt and use the most appropriate practices for their individual circumstances. Further, the project concentrates on practices and technologies that are easily taught and applied, and require little or, in the case of FMNR, no financial or other physical inputs. They are practices that are gender responsive and can be easily contextually adapted and refined through farmer experimentation to provide optimal results under enormously different agro-ecological and climatic conditions, and can be passed on from farmer to farmer and generation to generation. The project also seeks to develop appropriate value chains and improve market access for participating farmers, to ensure improved and more reliable livelihoods, and an opportunity to progress from subsistence to market-oriented farming.

3. **Establishing the necessary infrastructure and durable support mechanisms**

The project will establish improved business models, services and support mechanisms through investments in strengthening the capacity and function of relevant institutions, community-based organisations, farmer groups and farmer marketing associations. This will ensure participating small-scale farmers receive ongoing extension support, bulking on inputs and produce, and develop durable linkages with market actors, institutions and policy-makers.

4. Knowledge transfer

The majority of activities are aimed towards enhancing knowledge transfer and access to appropriate tools. These include: 1) the transfer of practical, technical, market and scientific knowledge and tools from executing entities to community-based organisations and individual farmers; 2) the bi-directional transfer of knowledge between local government policy and decision-makers and community stakeholders; 3) the transfer of technical and scientific knowledge, project results and tools from executing entities to national government policy and decision-makers; and 4) the transfer of scientific knowledge and tools from ICRAF to executing entities to improve the effectiveness and impact of their ongoing programming. In each case, the recipient's awareness of the benefits of project activities will be enhanced and capacity will be built to support and/or continue their application.

5. Enhanced exit

Importantly, the design of the project takes into account the potential for future carbon market mechanisms to provide additional revenue streams to vulnerable small-scale farming communities, to further ensure the sustainability of project outcomes and a legacy of ongoing socio-economic development. The project will sequester an estimated additional 61 million tCO2eq over a 25 year period, and has built in provisions for participating communities to own any benefits which may be able to be realized under future markets and mechanisms, providing a significant notional asset and potential revenue stream. A carbon feasibility study will determine the cost implications and potential benefits to

[5] Ref

communities.

F. Risk Analysis

Please describe the financial and operational risks and discuss mitigating measures.

Favourable national policies and legislation for agroforestry are not in place or are not implemented

- Create awareness on the economic costs of negative impacts climate change and on-going land degradation. Make the business case of investment for climate change resilience understood.
- Successful pilots in the target countries influence policy and legislative reforms to create an enabling environment for evergreen agriculture.
- Support for countries to strengthen policy, baselines and targets for adoption (e.g. related to INDCs and climate change adaptation/mitigation).

Local farmers are not sufficiently involved in adopting agroforestry practices

- Focus the scaling-up efforts on areas that are pre-disposed to the adoption of evergreen agriculture by their proximity to areas where scaling-up has already been successful.
- Ensure capacity building, learning exchange, and practical training at the local level for evergreen agriculture.
- Scale up rural advisory services in the areas with demonstrated success and the best local benefit/cost ratios favouring the adoption of evergreen agriculture practices.
- Work with the partner organisations (e.g. NGOs) that have had demonstrated success at scale in farmer adoption of participatory natural resources management.
- Support community-based organisations to enhance farmer-managed natural management, improve tree management, and manage livestock grazing to protect young trees.
- Boost existing tree product value chains, and support the creation of promising new ones.

Secure access to land is a barrier to agroforestry in some countries

- Focus on those countries and areas within countries where population pressure has resulted in secure land and tree rights recognition.
- Enhance land and tree tenure recognition to further incentivise farmers to establish tree-based systems.
- Adopt legislation and local regulations to further encourage and enhance evergreen agriculture and regreening.

Lack of economic incentives to invest in agroforestry and climate change adaptation

- Stimulate the involvement of the private sector in the scaling-up of specific tree crops e.g. shea, moringa; baobab, gum Arabica, etc. where business is already actively engaged in supporting evergreen agriculture.
- Stimulate conducive governance and self-organisation along the value chains

Low project sustainability

- Build policymaker awareness of the successes already achieved by local expansion at the ground level
- Build awareness of the cost-effective, climate change resilience agroforestry can provide
- Nurture appropriate communication campaigns to spread awareness of the successful up-scaling that has occurred, and to further mobilise many new farmers to adopt evergreen agriculture practices
- Support and strengthen ongoing farmer-to-farmer outreach to obtain greater scale until the process reaches a tipping point toward viral adoption at a massive scale.

National economic circumstances or natural disaster beyond the project's control have a significantly detrimental impact on participants

- Include crisis modifier in programme

Please briefly specify the substantial environmental and social risks that the project/programme may face and the proposed risk mitigating measures.

The project design has explicitly included consideration of potential environmental and social impacts of the project's activities, as well as mitigating measures to reduce the likelihood and severity of any unforeseen negative impacts. The project's activities were evaluated against UNEP's Environmental, Social and Economic Safeguards (ESES) Framework using the Environmental, Social and Economic Review Note (ESERN) as a screening tool to identify potential negative impacts. This process indicated that the potential social and environmental risks of the project are

low enough to be considered negligible. Furthermore the ESERN tool provides explanatory notes to describe the elements of the project's design which will mitigate against any potential negative environmental or social impacts. This tool will be used throughout the project to guide discussions amongst project stakeholders and to ensure that environmental and social safeguards are adhered to throughout the project. For example, to mitigate the risk that the project could unintentionally affect biodiversity or resilience trends in a negative manner, the project's approach is to make use of the most advanced scientific information to ensure that the crop and tree varieties selected are the most compatible with the local ecosystem and expected climate change impacts. The project will make use of existing social and environmental safeguards that are applied in terms of national policies on decentralized NRM and forest management to ensure that no negative unintended consequences occur as a result of the project's activities. The results of the ESERN tool are included as Annex 3.

G. Multi-Stakeholder Engagement

Please specify the plan for multi-stakeholder engagement, and what has been done so far in this regard.

From the outset of proposal development NDAs have been engaged. NDAs were invited to attend a 'proposal workshop' held in Nairobi Kenya in Jan 2017, all 8 NDAs or their representatives attended and were introduced to the project idea by World Agroforestry Center and World Vision proponents who described previous successes and the opportunities available. NDAs were then able to make comment as to whether the idea aligned with their national sectoral plans, climate change strategies, NAPAs/NAMAs/NDCs. Noting favorable alignment, NDAs were then invited to provide input into the basic design including activities, and pre-selection of project sites. Prior to the workshop some NDAs were met by project proponents in country, however following the workshop all project Proponents mad regular visits to the NDA offices and were guided in their engagement with line ministries by the NDA office. UN Environment also maintained a direct line to countries.

Pre-proposal engagement of communities and small-scale farmers:
Partner organisations of the project have and continue to engage and work closely with the relevant small-scale farming communities in participating countries during the design and implementation of their respective programmes. Partners of the Evergreen Agriculture Partnership were members of the partnership precisely because they are embedded with communities and work closely with CSOs. Participatory consultations are undertaken to assess community climate change and social and economic vulnerabilities (Climate Vulnerability and Capacity Assessment, CARE) as well as mutually plan for development (Area Development Plans, World Vision). The project has been designed based on decades of working with communities in a participatory manner, as well as years of community input on similar initiatives. This project as defined in the "Implementation Plan" and throughout the project activities will make use of a participatory community planning approach to planning the activities and selecting the participants based on a 'client profile'.

Engagement and consultation during project implementation:
As indicated, the will make use of a participatory community planning approach to planning the activities and selecting the participants based on a 'client profile'. During the inception phase of this project, the implementation plan will be further elaborated and contextualised at the community-level. ICRAF will use scientific tools, including Earth Observation approaches linked to biophysical, livelihood and farm systems data and climate modelling, to identify the most appropriate interventions for targeted agro-ecological zones, soil health conditions, farming systems, and wealth, gender and age groups. Community-based working groups (comprised of community representatives including tribal leaders, lead farmers, CBOs, women's groups and other marginalised or disadvantaged groups) will use this information, together with local and traditional farmer knowledge, challenges and aspirations, to inform and support community-driven determination and prioritization of contextually-appropriate Evergreen Agriculture approaches, practices and implementation design.

H. Status of Project/Programme

1) A pre-feasibility study is expected to be completed at this stage. Please provide the report in section J.

2) Please indicate whether a feasibility study and/or environmental and social impact assessment has been conducted for the proposed project/programme: Yes ☒ No ☒ – UN Environment ESERN screening tool was utilized
(*If 'Yes', please provide them in section J.*)

3) Will the proposed project/programme be developed as an extension of a previous project (e.g. subsequent phase), or based on a previous project/programme (e.g. scale up or replication)? Yes ☐ No ☐
(*If yes, please provide an evaluation report of the previous project in section J, if available.*)

I. Remarks

J. Supporting Documents for Concept Note

- ☒ Map indicating the location of the project/programme
- ☐ Financial Model
- ☒ Pre-feasibility Study
- ☐ Feasibility Study (if applicable)
- ☒ Environmental and Social Impact Assessment (if applicable)
- ☐ Evaluation Report (if applicable)

ANNEX 1 – NDAs

1. BURUNDI

Ministry of Finances and Economic Development Planning (OR "Ministry to the presidency in charge of planning and the good governance" as indicated by Mr. Ntahorwamiye)
Mr. Amié Claude Ntahorwamiye
B.P 1830, Bujumbura, Burundi
Tel.: +257 2222 0661 Mobile: +257 79 488 436; +257 75 488 436 E-mail: ntahorwamiyea@yahoo.fr

2. LESOTHO

Ministry of Energy, Meterology and Water Affairs
Mrs. Mabafokeng Felesiah Mahahabisa
Acting Director, Lesotho Meteorological Services Tel.: +266 2231 7250; +226 2232 4376
Fax: +266 2232 5057 E-mail: mahahabisa@gmail.com

3. MALAWI

Environmental Affairs Department
Mrs. Tawonga Mbale-Luka
Acting Director Private Bag 394, Lilongwe 3, Malawi Tel.: +265 1 771 111 Fax: +265 1 773 379
Mobile: +265 999 957 550 E-mail: tawongam@yahoo.com

4. SWAZILAND

Ministry of Tourism and Environmental Affairs
Mr. Emmanuel D. Dlamini
Principal Secretary P.O. Box 2652, Mbabane, Swaziland
Tel.: +268 2404 6162; +268 7606 2805 E-mail: fasidlamini@gmail.com E-mail: ps_tourism@gov.sz

5. TANZANIA

Permanent Secretary
Mr. Mbarak M. Abdulwakil
Luthuli Street, P.O. Box 5380, Dar Es Salaam, Tanzania Tel.: +255 22 211 3857; +255 22 211 6995 Fax: +255 22 211 3856 E-mail: ps@vpo.go.tz E-mail: km@vpo.go.tz

6. UGANDA

Ministry of Finance, Planning and Economic Development
Mr. Keith Muhakanizi
Kampala, Uganda
Tel.: +256 414 707 161, +256 782 177 125 E-mail: andrew.masaba@finance.go.ug

7. ZAMBIA

National Planning Department, Ministry of Finance
Mr. Chola Chabala

Director of Planning
P.O. Box 50062, Chimanga Road, Lusaka, Zambia 10101 Tel.: +260 211 251 207 E-mail: cjchabala@yahoo.co.uk

8. ZIMBABWE

Climate Change Management Department, Ministry of Environment, Water & Climate
Mr. Washington Zhakata (National Focal Point) Director
11th Floor, Kaguvi Building, Corner 4th Street/Central Avenue, Harare, Zimbabwe
Tel.: +263 4 701 681; +263 4 701 683; +263 773 069 438 Mobile: +263 773 069 438
E-mail: climatechange@environment.gov.zw
E-mail: washingtonzhakata@gmail.com

Mr. Elisha N. Moyo (Alternate Focal Point)
Principal Climate Change Research Officer
11th Floor Kaguvi Building, Corner 4th Street/Central Avenue, Harare, Zimbabwe
Tel.: +263 4 701 681; +263 4 701 683; +263 775 219 592 Mobile: +263 775 219 592
E-mail: enmoyo@gmail.com
E-mail: moyo_elisha_n@yahoo.co.uk

Annex 2 – Programme Sponsor

UN Environment

United Nations Environment Programme, an accredited entity of the Green Climate Fund, and longtime implementing entity for the Global Environment Facility, was established in 1972 and has been a lead organization in setting the global environmental agenda ever since. UN Environment has extensive experience in the design and implementation of initiatives that promote Ecosystem-based Adaptation, delivering both adaptation and mitigation benefits, and has championed tools and methodologies this project relies on at a national and global-level, including Vulnerability Impact Assessments, Natural Capital Accounting, and others. Its core business focuses on designing and implementing initiatives that address the negative impacts of climate change through the sustainable use and conservation of ecosystems. Particularly, UN Environment offers expertise on large-scale ecosystem-based adaptation to enable countries to build climate resilience over large productive landscapes. These initiatives consequently build the climate-resilience of rural communities and facilitate the development of sustainable natural resource-based (green) economies. UN Environment possess a demonstrated and strong convening power, uniting governments and policy makers at regional and global levels towards common environmental objectives and has a long history of supporting sustainable policy change. UN Environment will act as the accredited entity, global coordinator and support policy change capacity building efforts for this project.

The World Agroforestry Center

The World Agroforestry Center (ICRAF) has, over the past four decades, established itself as the world authority on appropriate agroforestry interventions for specific ecosystems and agro-ecological zones under varying climatic conditions. ICRAF, through its Evergreen Agriculture Partnership (EVAP), is a world leader in methodologies for incorporating trees into farming systems to maximize adaptation and social co-benefits, and demonstrating positive impact with scientific evidence.

Further, it has proven successful experience in managing the implementation of similar regional projects, that include multiple executing entities in each country. It has significant experience in coordinating successful collaborative projects of a similar scope, scale and level of complexity, and is currently managing DRYDEV, the USD50 million Dutch-funded Drylands Development Project, spanning 5 countries, which has substantially the same management structure several of the same partner organizations as are intended be involved in executing this GCF project.
ICRAF is proposed as co-chair of the Project Co-ordination Unit and technical advisor to the project on areas including species selection, intercropping, carbon sequestration maximization, applied research, and M&E.

The member organizations of the EVAP have worked closely for several years on a variety of large projects and initiatives, and have a demonstrated ability to collaborate effectively on project design and joint-implementation. Each of the collaborating organizations bring unique skills, capacity and experience, each is a demonstrated global leader in its field of specialization, and each plays a necessary role in contributing to the objectives of the project. ICRAF hosts the EVAP, which has recently assisted the European Commission to develop and approve a project to scale-up evergreen agriculture practices in the Sahelian countries, which will draw upon the same key land restoration practices and a similar project structure to this proposal.

World Vision

World Vision (WV) is a humanitarian organization dedicated to working with children, families, and their communities in 100 countries, supporting millions of children to reach their full potential by tackling the root causes of poverty and injustice. WV's size, experience and approach positions it uniquely for implementing complex, community-driven programs at scale. Scaling-up programs build on existing presence and resources in the region, utilizing networks of Area Development Programs, each covering 10,000-50,000 households, and each supporting multiple overlapping development programs over a period of 15-20 years. WV has demonstrated expertise in climate change adaptation and mitigation, with a particular focus on FMNR, and in working with the most vulnerable within communities, including women, children, people with a disability, and people living with HIV and AIDS.

WV has, for almost a decade, actively promoted FMNR as an effective, low cost, scalable approach to land restoration and sustainable agricultural intensification. It has successfully pioneered FMNR approaches in climate change mitigation projects, including Africa's first large-scale a/reforestation CDM project (Humbo - also 2nd in the world), the world's first Gold Standard a/reforestation voluntary carbon project (Soddo), and the world's first regional FMNR scaling-up project (FMNR for East Africa).

In recent years, all of WV's National Offices in both the East and Southern Africa regions have committed to the progressive mainstreaming of FMNR into development programming across all Area Development Programs, which is resulting in the provision of technical support to hundreds of thousands of vulnerable households.

Both WV East and Southern Africa regions (EARO and SARO respectively) have appointed dedicated FMNR Program Officers who provide technical support, training and follow up for staff and communities across those regions. WV is already promoting FMNR in all of the eight listed countries, but each country is at a different stage of uptake. Uganda and Tanzania are the most advanced, due to their inclusion in the FMNR for East Africa regional project which commenced in 2012, and which included grant funding to hire dedicated staff. Further, WV periodically trains technical staff within Government Ministries and other NGOs across both regions.

Details regarding WV's experience and capacity in each of the eight participating countries in included Annexure X

Catholic Relief Services

Catholic Relief Services (CRS) is a humanitarian relief organisation which helps millions of smallholder farmers worldwide recover from natural disasters and civil strife, build resilient farming systems, and grow them into agro-enterprises that engage successfully with markets. CRS's *Pathway to Prosperity* approach helps farmers build sustainable livelihoods through a phase-by-phase process. CRS currently has 116 agriculture projects in 38 countries, and is the largest implementing partner of USAID Food for Peace programs world-wide.

CRS has a strong history in restoration of degraded lands (especially watershed management) over many decades across Asia, Africa and Latin America, and since 2012, a particular focus on climate-smart agriculture in southern Africa, including agro-forestry and restoring the productivity of degraded lands at both farm and landscape levels.

CRS works closely with national governments, technical partners and the private sector as part of our standard program planning and implementation approach, and has a long history of working in 7 of the 8 countries included in this proposal, with on-going programs and partners in all but Swaziland.

CARE International

CARE International (CARE) is a global humanitarian organization with focus on addressing the root causes of poverty. CARE has a large country footprint and extensive programme management capacities, working in 90 countries around the world and supporting 880 poverty-alleviation and humanitarian aid projects to reach more than 72 million people. CARE Climate (leading engagement on this project for CARE) is CARE's global centre for climate advocacy, climate change adaptation for resilience, sustainable small-scale agriculture in a changing climate, and climate finance strategy and partnerships. In 2014, CARE implemented over 200 projects across 53 countries with a climate change adaptation or climate-resilience focus. About 80% of these projects addressed sub-national needs, and work primarily with farming, pastoralist and other natural resource dependent communities. Other projects are large scale and/or multi-country climate change/ climate resilience initiatives with partners, intended to innovate, develop learning, and inform policy action. Key examples include: the Adaptation Learning Programme (ALP) and Partners for Resilience and Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED). CARE has developed, tested and scaled tools for climate-change adaptation - most notably the widely used Climate Vulnerability and Capacity Analysis (CVCA) tool.

Through these projects and programmes, CARE works closely with communities, Local Authorities, National Government agencies, and a range of technical, scientific and academic stakeholders in developing approaches to promote climate change adaptation and resilience in poor and vulnerable communities and natural resource dependent populations. For example: developing the Social and Environmental Standards for REDD+ with the Climate, Community & Biodiversity Alliance; developing the integration of community-based and ecosystems-based adaptation to climate change as part of the Ecosystem and Livelihoods Adaptation Network (ELAN); and partnering with the CGIAR's Climate Change Agriculture and Food Security (CCAFS) research programme, CARE undertook research to understand the opportunities and limitations in carbon finance for small-scale farmers.

CARE Climate leads CARE's commitment to sustainable small-scale agriculture in a changing climate. This is guided by CARE's SuPER (sustainable, productive/profitable, equitable and resilient) principles and approaches to sustainable agriculture systems and food and nutrition security. In 2015, CARE worked with over 25 million participants directly, and 79 million indirectly, and had over 525 projects in 46 countries that focused on food and nutrition security and climate change. Included in this work is CARE's Pathways to Empowerment platform which works with farmers in Mali, Malawi, Tanzania, Ghana, India and Bangladesh. In the 4 years of this programme, women's access to extension services has tripled, and as a result income has increased by more than $7.3 million across 50,000 women farmers.

CARE's approach to Gender Equality and Women's Voice (GEWV) has well-established tools, learning and evidence which have been integral to CARE's climate advocacy and adaptation for resilience work, and to CARE's approach to sustainable small-holder agriculture in a changing climate. This work includes the 'Gender and Inclusion Tool-Box: Participatory Research in Climate Change and Agriculture', which was developed with CCAFS; the 'Cultivating Equality: Developing Just and Sustainable Food Systems in a Changing Climate' report developed with FoodTank and CCAFS; the 'Gender and Climate-Smart Agriculture' training developed with FAO; and the current gender assessment of IFAD's Adaptation in Small-holder Agriculture Programme (ASAP).

CARE's global programme strategy includes a commitment to Women's Economic Empowerment, including financial inclusion and promoting inclusive value chains. These are important commitments to efforts to bring climate, agriculture and FMNR programming and finance into a more cohesive platform of work. In 1991, CARE developed the Village Savings and Loan Association (VSLA) model, and, to date, more than 3.7million people in 30 African countries have joined these groups (approximately 50% of the 7 million VSLA members worldwide). Many of CARE's sustainable agriculture in a changing climate initiatives are grounded in working with farmers who are already in or forming VSLAs; many of these go on to become Farmer Field and Business Schools (FFBS). CARE Climate is working to support and scale an integrated model that brings structured approaches to participatory and community-based adaptation (CBA) together with VSLAs and FFBS, and to explore ways in which formal financial services and products can help small-scale producers to access climate and agriculture finance.

Annex 3 - ESERN

UNEP Environmental, Social and Economic Review Note (ESERN)

I. Project Overview

Identification	*Insert Project ID# from Programme Framework Table*
Project Title	Ecosystem-based Adaptation through Agroforestry
Managing Division	Ecosystems Division: *Climate Change Adaptation Unit*
Type/Location	Regional
Region	Eastern and Southern Africa
List Countries	Burundi, Lesotho, Malawi, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe,
Project Description	*Provide the project summary and description in 2-3 paragraphs* Land is the foundation for food security, economic growth and development, but it is a finite resource subject to growing pressures. In Southern and East Africa, land productivity and terrestrial ecosystem services are threatened by the impacts of climate change as well as unsustainable agricultural methods, pastoral practices, and deforestation, which in turn further exacerbate climate change vulnerability. Reversing land degradation and achieving sustainable land management is essential to meet growing demands for food, feed and fuel, sustain livelihoods, ensure social cohesion and creating resilience to the impacts of climate change on food systems and ecosystems; in other words it is essential for inclusive green growth. Evergreen agriculture is an Ecosystem Based Adaptation approach which provides harvestable tree products, including fruits, fuelwood, timber and fodder; contribute substantively to the resilience of farming systems and the reduction of gender-based inequity; sequester carbon, preserve biodiversity and ecosystem services, and create sustainable landscapes that enhance the resilience of communities. It focuses heavily on low-cost, rapid and proven effective technologies, such as Farmer Managed Natural Regeneration and the integration of leguminous 'fertilizer' trees, to maintain vegetative soil cover, bolster nutrient supply through nitrogen fixation and nutrient cycling, generate greater quantities of organic matter in soil surface residues, improve soil structure and water infiltration, increase greater direct production of food, fuel, fiber and income from products produced by the intercropped trees, enhance carbon storage both above-ground and below-ground, and induce more effective conservation of above- and below-ground biodiversity. The project aims to enhance resilience to climate change, improve food security, diversify livelihoods, and restore ecosystem services.

Estimated duration of project:	60 months
Estimated cost of the project :	50,000,000 USD

II. Environmental Social and Economic Screening Determination

A. Summary of the Safeguard Risks Triggered

Safeguard Standard Triggered by the Project	Impact of Risk[6] (1-5)	Probability of Risk (1-5)	Significance of Risk (L, M,
SS 1: Biodiversity, natural habitat and Sustainable Management of Living Resources	2	1	
SS 2: Resource Efficiency, Pollution Prevention and Management of Chemicals and Wastes	1	1	
SS 3: Safety of Dams	-	-	
SS 4: Involuntary resettlement	-	-	
SS 5: Indigenous peoples	2	1	
SS 6: Labor and working conditions	1	1	
SS 7: Cultural Heritage	2	1	
SS 8: Gender equity	2	1	
SS 9: Economic Sustainability	2	3	
Additional Safeguard questions for projects seeking GCF-funding (Section IV)	2	2	

B. ESE Screening Decision[7] (Refer to the UNEP ESES Framework (Chapter 2) and the UNEP's ESES Guidelines.)

Low risk ■ Moderate risk☐ High risk☐ Additional information requir☐

C. Development of ESE Review Note and Screening Decision:

Prepared by: Name: Jesica Andrews Date: 02 Feb 2017

Safeguard Advisor: Name: Yunae Yi Date: 27 Feb 2017

[6] Refer to UNEP Environment, Social and Economic Sustainability (ESES): Implementation Guidance Note to assign values to the Impact of Risk and the Probability of Risk to determine the overall significance of Risk (Low, Moderate or High).

[7] **Low risk**: Negative impacts negligible: no further study or impact management required.
Moderate risk: Potential negative impacts, but less significant; few if any impacts irreversible; impact amenable to management using standard mitigation measures; limited environmental or social analysis may be required to develop a ESEMP. Straightforward application of good practice may be sufficient without additional study.
High risk: Potential for significant negative impacts, possibly irreversible, ESEA including a full impact assessment may be required, followed by an effective safeguard management plan.

Project Manager: Name: Jesica Andrews Date: 24 Mar 2017
D. Recommended further action from the Safeguard Advisor: ESS advisor consulted 27 Feb 2017, will finalize at full proposal.

III. ESES Principle and Safeguard checklist

(Section III and IV should be retained in UNEP)

Precautionary Approach
The project will take precautionary measures even if some cause and effect relationships are not fully established scientifically and there is risk of causing harm to the people or to the environment.
Human Rights Principle
The project will make an effort to include any potentially affected stakeholders, in particular vulnerable and marginalized groups; from the decision making process that may affect them.
The project will respond to any significant concerns or disputes raised during the stakeholder engagement process.
The project will make an effort to avoid inequitable or discriminatory negative impacts on the quality of and access to resources or basic services, on affected populations, particularly people living in poverty or marginalized or excluded individuals or groups.[8]

Screening checklist	Y/N/ Maybe	Comment
Safeguard Standard 1: Biodiversity, natural habitat and Sustainable Management of Living Resources		
Will the proposed project support directly or indirectly any activities that significantly convert or degrade biodiversity and habitat including modified habitat, natural habitat and critical natural habitat?	N	
Will the proposed project likely convert or degrade habitats that are legally protected?	N	
Will the proposed project likely convert or degrade habitats that are officially proposed for protection? (e.g.; National Park, Nature Conservancy, Indigenous Community Conserved Area, (ICCA); etc.)	N	
Will the proposed project likely convert or degrade habitats that are identified by authoritative sources for their high conservation and biodiversity value?	N	

[8] Prohibited grounds of discrimination include race, ethnicity, gender, age, language, disability, sexual orientation, religion, political or other opinion, national or social or geographical origin, property, birth or other status including as an indigenous person or as a member of a minority. References to "women and men" or similar is understood to include women and men, boys and girls, and other groups discriminated against based on their gender identities, such as transgender people and transsexuals.

Will the proposed project likely convert or degrade habitats that are recognized- including by authoritative sources and /or the national and local government entity, as protected and conserved by traditional local communities?	N	
Will the proposed project approach possibly not be legally permitted or inconsistent with any officially recognized management plans for the area?	M	An initial activity of the project is to review and support the establishment of any necessary by-laws
Will the proposed project activities result in soils deterioration and land degradation?	N	
Will the proposed project interventions cause any changes to the quality or quantity of water in rivers, ponds, lakes or other wetlands?	N	
Will the proposed project possibly introduce or utilize any invasive alien species of flora and fauna, whether accidental or intentional?	N	Project many introduce species but they will not be invasive, and will be in line with appropriate research as provided by ICRAF
Safeguard Standard 2: Resource Efficiency, Pollution Prevention and Management of Chemicals and Wastes		
Will the proposed project likely result in the significant release of pollutants to air, water or soil?	N	
Will the proposed project likely consume or cause significant consumption of water, energy or other resources through its own footprint or through the boundary of influence of the activity?	N	
Will the proposed project likely cause significant generation of Green House Gas (GHG) emissions during and/or after the project?	N	
Will the proposed project likely generate wastes, including hazardous waste that cannot be reused, recycled or disposed in an environmentally sound and safe manner?	N	
Will the proposed project use, cause the use of, or manage the use of, storage and disposal of hazardous chemicals, including pesticides?	N	
Will the proposed project involve the manufacturing, trade, release and/or use of hazardous materials subject to international action bans or phase-outs, such as DDT, PCBs and other chemicals listed in international conventions such as the Stockholm Convention on Persistent Organic Pollutants or the Montreal Protocol?	N	
Will the proposed project require the procurement of chemical pesticides that is not a component of integrated pest management (IPM)[9] or integrated vector management (IVM)[10] approaches?	N	

[9] "Integrated Pest Management (IPM) means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to

Will the proposed project require inclusion of chemical pesticides that are included in IPM or IVM but high in human toxicity?	N	
Will the proposed project have difficulty in abiding to FAO's International Code of Conduct[11] in terms of handling, storage, application and disposal of pesticides?	N	
Will the proposed project potentially expose the public to hazardous materials and substances and pose potentially serious risk to human health and the environment?	N	
Safeguard Standard 3: Safety of Dams		
Will the proposed project involve constructing a new dam(s)?	N	
Will the proposed project involve rehabilitating an existing dam(s)?	N	
Will the proposed project activities involve dam safety operations?	N	
Safeguard Standard 4: Involuntary resettlement		
Will the proposed project likely involve full or partial physical displacement or relocation of people?	N	
Will the proposed project involve involuntary restrictions on land use that deny a community the use of resources to which they have traditional or recognizable use rights?	N	
Will the proposed project likely cause restrictions on access to land or use of resources that are sources of livelihood?	N	
Will the proposed project likely cause or involve temporary/permanent loss of land?	N	
Will the proposed project likely cause or involve economic displacements affecting their crops, businesses, income generation sources and assets?	N	
Will the proposed project likely cause or involve forced eviction?	N	
Will the proposed project likely affect land tenure arrangements, including communal and/or customary/traditional land tenure patterns negatively?	N	
Safeguard Standard 5: Indigenous peoples[12]		
Will indigenous peoples be present in the proposed project area or area of influence?	M	

human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms http://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/ipm/en/

[10] "IVM is a rational decision-making process for the optimal use of resources for vector control. The approach seeks to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control. The ultimate goal is to prevent the transmission of vector-borne diseases such as malaria, dengue, Japanese encephalitis, leishmaniasis, schistosomiasis and Chagas disease." (http://www.who.int/neglected_diseases/vector_ecology/ivm_concept/en/)

[11] Find more information from http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/CODE_2014Sep_ENG.pdf

[12] Refer to the Toolkit for the application of the UNEP Indigenous Peoples Policy Guidance for further information.

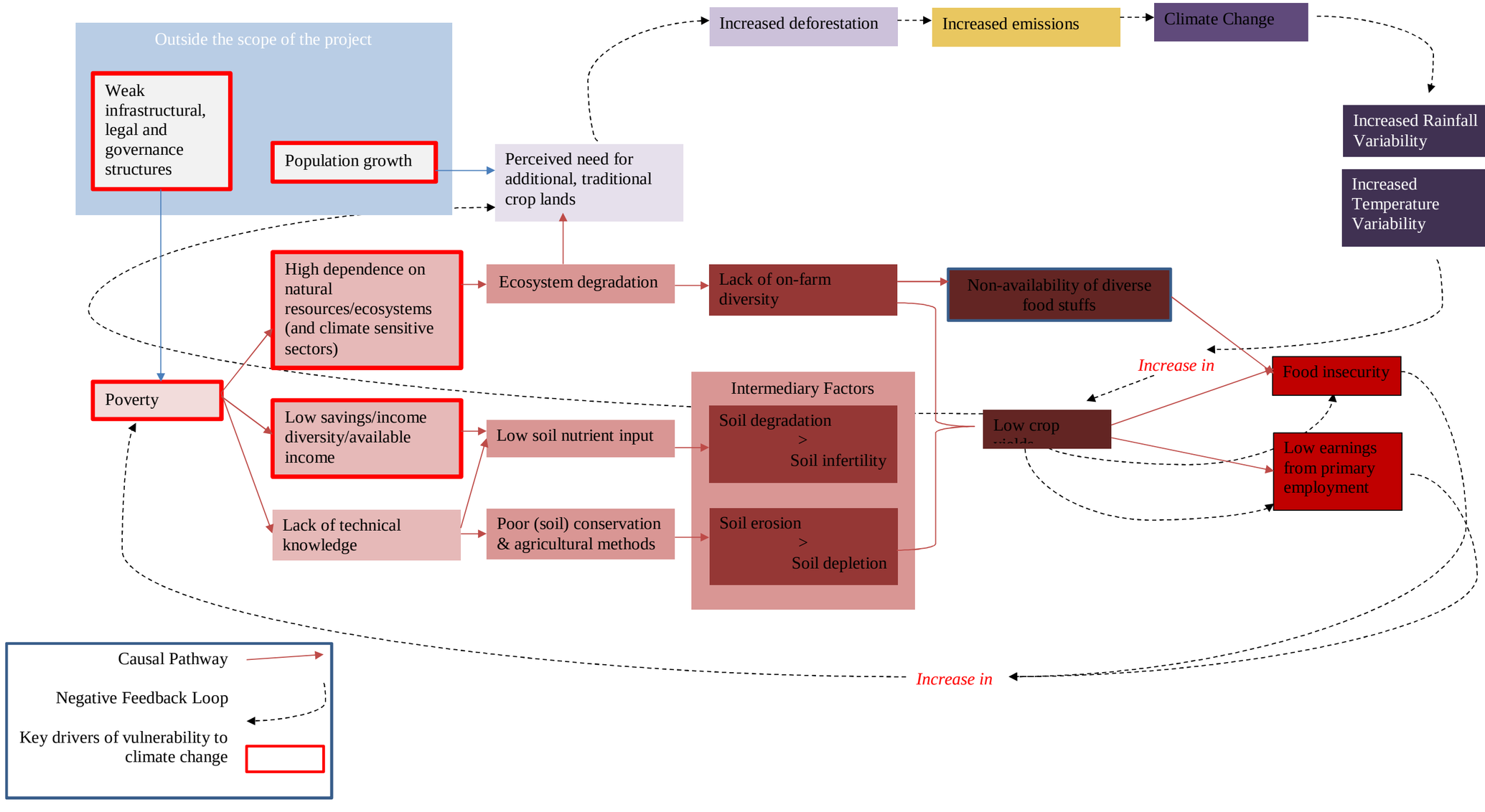
Will the proposed project be located on lands and territories claimed by indigenous peoples?	M	
Will the proposed project likely affect livelihoods of indigenous peoples negatively through affecting the rights, lands and territories claimed by them?	M	
Will the proposed project involve the utilization and/or commercial development of natural resources on lands and territories claimed by indigenous peoples?	N	
Will the project negatively affect the development priorities of indigenous peoples defined by them?	N	
Will the project potentially affect the traditional livelihoods, physical and cultural survival of indigenous peoples?	N	
Will the project potentially affect the Cultural Heritage of indigenous peoples, including through the commercialization or use of their traditional knowledge and practices?	N	
Safeguard Standard 6: Labor and working conditions		
Will the proposed project involve the use of forced labor and child labor?	N	
Will the proposed project cause the increase of local or regional un-employment?	N	
Safeguard Standard 7: Cultural Heritage		
Will the proposed project potentially have negative impact on objects with historical, cultural, artistic, traditional or religious values and archeological sites that are internationally recognized or legally protected?	N	
Will the proposed project rely on or profit from tangible cultural heritage (e.g., tourism)?	N	
Will the proposed project involve land clearing or excavation with the possibility of encountering previously undetected tangible cultural heritage?	N	
Will the proposed project involve in land clearing or excavation?	N	
Safeguard Standard 8: Gender equity		
Will the proposed project likely have inequitable negative impacts on gender equality and/or the situation of women and girls?	N	
Will the proposed project potentially discriminate against women or other groups based on gender, especially regarding participation in the design and implementation or access to opportunities and benefits?	N	
Will the proposed project have impacts that could negatively affect women's and men's ability to use, develop and protect natural resources, taking into account different roles and positions of women and men in accessing environmental goods and services?	N	
Safeguard Standard 9: Economic Sustainability		
Will the proposed project likely bring immediate or short-term net gain to the local communities or countries at the risk of generating long-term economic burden (e.g., agriculture for food vs. biofuel; mangrove vs. commercial shrimp farm in terms of fishing, forest products and protection, etc.)?	N	

Will the proposed project likely bring unequal economic benefits to a limited subset of the target group?	N		

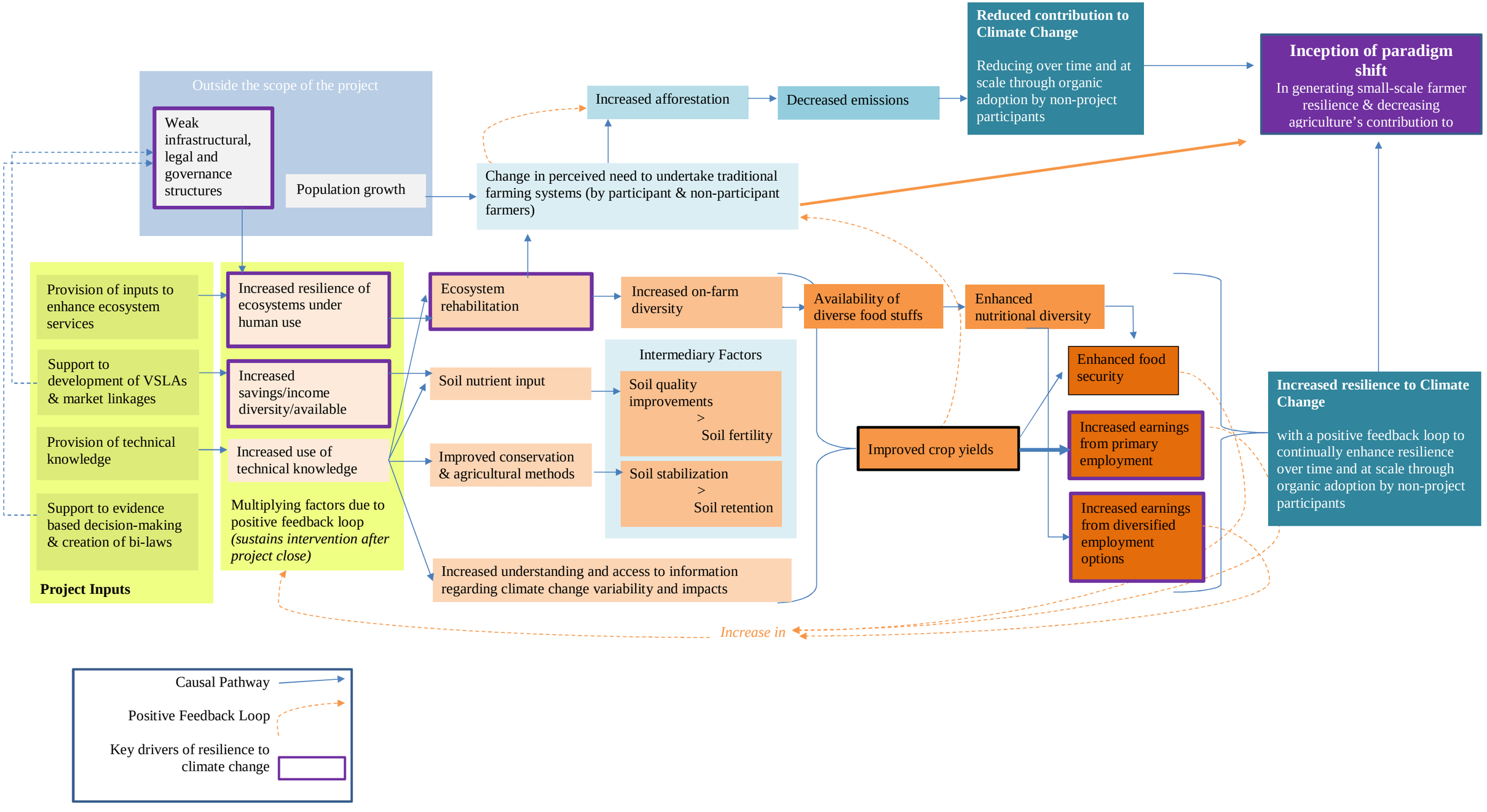
IV. Additional Safeguard Questions for Projects seeking GCF-funding

Community Health, Safety, and Security			
Will there be potential risks and negative impacts to the health and safety of the Affected Communities during the project life-cycle?	N		
Will the proposed project involve design, construction, operation and decommissioning of the structural elements such as new buildings or structures?	N		
Will the proposed project involve constructing new buildings or structures that will be accessed by public?	N		
Will the proposed project possibly cause direct or indirect health-related risks and impacts to the Affected Communities due to the diminution or degradation of natural resources, and ecosystem services?	N		
Will the proposed project activities potentially cause community exposure to health issues such as water-born, water-based, water-related, vector-borne diseases, and communicable diseases?	N		
In case of an emergency event, will the project team, including partners, have the capacity to respond together with relevant local and national authorities?	N		
Will the proposed project need to retain workers to provide security to safeguard its personnel and property?	N		
Labor and Supply Chain			
Will UNEP or the implementing/executing partner(s) involve suppliers of goods and services who may have high risk of significant safety issues related to their own workers?	N		

Annex 4 – Problem Tree Diagram



Annex 5 - Theory of Change



Pre-Feasibility Study

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INTRODUCTION

BACKGROUND AND RATIONALE

PROBLEM DESCRIPTION

Climate Change in Sub-Saharan Africa

In the low-emission scenario RCP2.6 (representing a 2 °C world), African summer temperatures increase until 2050 at about 1.5 °C above the 1951–1980 baseline and remain at this level until the end of the century. In the high-emission scenario RCP8.5 (representing a 4 °C world), warming continues until the end of the century, with monthly summer temperatures over Sub-Saharan Africa reaching 5 °C above the 1951–1980 baseline by 2100.

In southwestern Africa, the shift toward more arid conditions due to a decline in rainfall (Fig. 2) is exacerbated by temperature-driven increases in evapotranspiration (see Figure SOM 3). By contrast, the higher aridity index in East Africa is correlated with higher rainfall projected by global climate models, which, however, is uncertain and not reproduced by higher-resolution regional climate models. While High rainfall savannas can be replaced by forests in less than 20–30 years (Bond and Parr 2010).

In many parts of rural Sub-Saharan Africa, groundwater is the sole source of safe drinking water (MacDonald et al. 2009). Most of Sub-Saharan Africa has generally low permeability and minor aquifers, with some larger aquifer systems located only in the Congo, parts of Angola and southern Nigeria (MacDonald et al. 2012). Groundwater recharge rates have been projected to decline by 30–70 % in the western parts of southern Africa and to increase by around 30 % in some parts of East and southeastern Africa for both 2 and 3 °C warming above pre-industrial levels (Do ̈ll 2009).

Vulnerability to Climate Change

Vulnerability to climate change has been defined as:

> The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.[3]

The IPCC (2014) defines **Vulnerability as Exposure X Sensitivity – Adaptive Capacity.**

Exposure to climate variation is primarily a function of geography. For example, coastal communities will have higher exposure to sea level rise and cyclones, while communities in semi-arid areas may be most exposed to drought.

Sensitivity is the degree to which a given community or ecosystem is affected by climatic stresses. For example, a community dependent on rain-fed agriculture is much more sensitive to changing rainfall patterns than one where mining is the dominant livelihood. Likewise, a fragile, arid or semi-arid ecosystem will be more sensitive than a tropical one to a decrease in rainfall, due to the subsequent impact on water flows.

Adaptive Capacity is the ability of a system [human or natural] to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

One of the most important factors shaping the adaptive capacity of individuals, households and communities is their access to and control over natural, human, social, physical and financial resources. Since communities are not homogeneous, particular households or individuals within communities may have differing degrees of vulnerability.

Key Drivers of vulnerability to Climate Change include the following:

1. Population (relative to current productivity, income and natural resources)
2. Ecosystem Goods and Services: Fragmented and degraded ecological base will make the system more susceptible to the impacts of climate change
3. Dependence: Over-dependence on climate-sensitive sectors, such as agriculture, forestry, fisheries, and so on
4. Level of economic wealth (Poverty) - adds to climate change vulnerability because lack of access to health services increases the risks of climatic changes, and lack of access to capital makes it harder to implement adaptation measures.
5. Inequities in access to resources and wealth among groups
6. Weak socio-cultural (rigidity in land-use practices, social conflicts), infrastructural, financial/market (uncertain pricing, non-availability of credit, lack of sufficient credit), legal and governance structures
7. Technological, skill-related and human resource bottlenecks
8. Poor pre-existing health conditions

The importance of biophysical vulnerability is acknowledged as well. Many poor people are directly dependent on ecosystems for their livelihoods. Indeed, biodiversity is the foundation and mainstay of agriculture, forests and fisheries. Natural forests, freshwater and marine ecosystems maintain a wide range of ecosystem goods and services, including the provisioning and regulation of water flows and quality, timber and fisheries. The “poorest of the poor” are, often, especially dependent on these goods and services. For these groups, biophysical vulnerability means human and/or livelihood vulnerability.

Most Vulnerable African Populations to Climate Change

As described, Sub-Saharan Africa (SSA) is one of the most vulnerable regions in the world to climate change (IPCC, 2014). Sub-Saharan Africa faces massive impacts from climate change particularly with regards to agricultural production. Approximately 62% of the population of SSA is employed in agriculture (IFAD, 2011), and in 2014 it was estimated that 75% of those in rural areas were living in extreme poverty (less than 1.90$/day) (OPHI, 2014).

Rain-fed agricultural systems, which account for over 95% of farmed land in SSA[13], are particularly vulnerable (Serdeczny, 2015). The resilience of the small-scale subsistence farmers is directly tied to the health and resilience of the land they cultivate. Small-scale farmers

[13] http://www.iwmi.cgiar.org/issues/rainfed-agriculture/summary/

manage over 80% of the land in SSA, and they provide 80% of the food supply (FAO, 2012). Their ability to produce food will contribute to broad resilience (or not) among the overall sub-saharan population.

Climate change projections for this region point to a warming trend, particularly in the inland subtropics; frequent occurrence of extreme heat events; increasing aridity; and changes in rainfall—with a particularly pronounced decline in southern Africa and an increase in East Africa. Sub-Saharan Africa's already high rates of undernutrition and infectious disease can be expected to increase compared to a scenario without climate change. Particularly vulnerable to these climatic changes are the rainfed agricultural systems on which the livelihoods of a large proportion of the region's population currently depend (Schaeffer, 2016). As agricultural livelihoods become more precarious, the rate of rural–urban migration may be expected to grow, adding to the already significant urbanization trend in the region.

CLIMATE CHANGE IMPACTS ON AFRICA'S AGRICULTURAL ECONOMIES

Agricultural Impacts

Over the past 30 years, climate change has reduced food production between 1-5% per decade across the globe. Tropical cereal crops such as maize and rice, usually grown in already vulnerable regions in South and Central America, Sub-Saharan Africa and Asia, in particular, will be negatively affected.

The IPCC states with high levels of confidence that the overall effect of climate change on yields of major cereal crops in the African region is very likely to be negative, with strong regional variation (Niang et al. 2014). ''Worst-case'' projections (5th percentile) indicate losses of 27–32 % for maize, sorghum, millet and groundnut for a warming of about 2 °C above pre-industrial levels by mid-century (Schlenker and Lobell 2010). Using output from 14 CMIP3 GCMs and applying the crop model DSSAT, Thornton et al. (2011) estimate mean yield losses of 24% for maize and 71% for beans under warming exceeding 4 °C.

Maize, which is one of the most common crops in Sub-Saharan Africa, has been found to have a particularly high sensitivity to temperatures above 30 °C within the growing season. Geographically, the majority (~90 %) of currently cropped maize area is projected to experience negative impacts. Crop yield losses in these areas are mostly mediated through shortened cropping seasons and heat stress during the crop's reproductive period (Thornton et al., 2009; Cairns et al., 2012). These projections are robust, thus suggesting that adaptation of maize production should be a priority for many African countries.

Rosenzweig et al. (2014) find maize yield decreases of additional 10–20 % in other Sub-Saharan regions if nitrogen stress is considered. Not considering nitrogen stress results in higher model disagreement but still an overall negative trend of 5 to 50 %. Cassava appears to be more resistant to high temperatures and unstable precipitation than cereal crops (Niang et al. 2014). Similarly, multiple-cropping systems appear to reduce the risk of crop failure compared to single-cropping systems (Waha et al. 2012).

Each day in a growing season spent at temperature above 30 °C reduces maize yields by 1% compared to optimal, drought-free rainfed conditions (Lobell et al. 2011). The annual average temperature across Sub-Saharan Africa is already above the optimal temperature for wheat during the growing season (Liu et al. 2008), and it is expected to increase further. The sharp declines in crop yields that have been observed beyond certain thresholds are mostly not included in present process-based agricultural models (Rotter et al. 2011).

Moreover, climate extremes can alter the ecology of plant pathogens, and higher soil temperatures can promote fungal growth that kills seedlings (Patz et al. 2008). Such effects are as yet not represented in modeling studies. Similarly, the effect of CO fertilization remains uncertain but important: Depending on crop type and region, assuming positive CO fertilization may even reverse the direction of impacts.

Livestock production in Sub-Saharan Africa is also vulnerable to climate change. Livestock is an important source of food (such as meat and milk and other dairy products), animal products (such as leather), income, or insurance against crop failure (Seo and Mendelsohn 2007). Livestock is vulnerable to drought, particularly where it depends on local biomass production (Masike and Ulrich 2008), with a strong correlation between drought and animal death (Thornton et al. 2009). Available range- land may be reduced by human influences, including moves toward increased biofuel cultivation, veterinary fencing, increasing competition for land and land degradation (Morton 2012; Sallu et al. 2010).

The challenges facing small-scale farmers are exacerbated by land degradation, which affects more than 65% of land in many African countries. Land degradation erodes the land's resilience to climate change, accelerates change, and decreases the productivity of farming systems, thereby reducing incomes and food security, as it reduces the resilience of ecosystems and populations. In SAA, land degradation accounts on average for an estimated 7% annual loss of the agricultural GDP or close to USD 4 billion.

The scale and intensity of the problem will continue to escalate in the coming decades, with the population of SSA expected to reach 1.8 billion people, many millions of whom will have joined the middle class and adopted meat and dairy-rich diets. Current projections show that at least twice as much food will have to be produced per year by 2050 to meet that demand. A shift in the current agricultural model employed by millions of small-scale farmers across sub-saharan Africa is urgently needed.

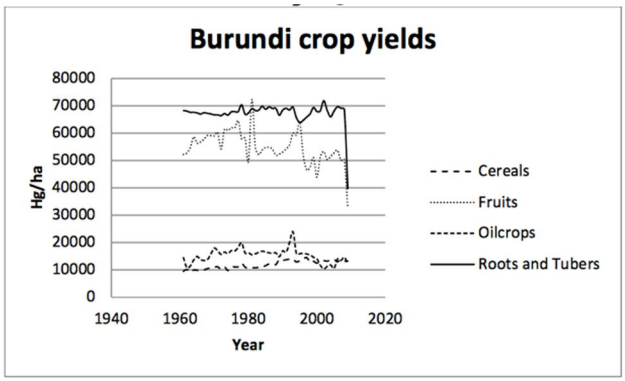
Agricultural Sector

Africa is a major producer of several cereals like sorghum, pearl millet, finger millet, teff and African rice. Another major cereal, maize, has overtaken these traditional cereals. Agriculture has been and continues to be wildly regarded as the 'engine for growth' in Africa. With subsistence agriculture practiced by majority small holder farmers, yield gaps are high and poor soils, amongst other constraints add to the difficulties for sustainable farming and incomes. Cereals like Sorghum, Millets, Wheat, Maize and Rice are major staple foods of the most population. These cereals are grown over an area of 98.6 m ha producing 162 m tons.

National Supply Markets

Burundi

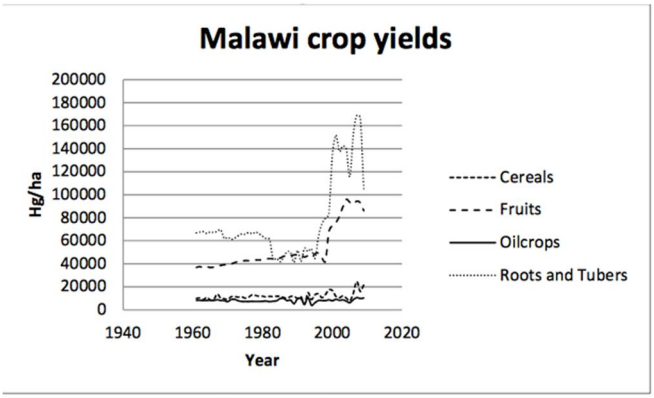
Crop yields in Burundi have poorly performed over the past years. Cereal yields have been increasing by an average rate of 1%, fruit yields have been decreasing by -1%, oil crop yields remained constant at an average growth rate of 0.0%, and tuber/root crops decreased by 1%. Fruit yields experience a sharp increase in early 1980's early 2000's. But, it experienced a sharp decline in 2009. Finally, cereal yields started to improve in the late 1990's. The civil unrests currently plagues country production.



Source: FAOSTAT

Malawi

Cereal yields, fruit yields, oil crop yields, and tuber/roots yields have been growing at 2%, 2%, 0%, and 1%, respectively. Tuber/roots and fruit yields experienced a sharp increase in the late 1990's. Cereal yields had drop in the mid-2000 but quickly recover from it while oil crop yields remained constant with multiple transitory fluctuations. Much of Malawi's success has been attributed to a fertilizer subsidy programme, a recent study by the World Bank and ICRAF has identified the potential for the subsidy programme to be replaced with fertilizer-trees generating additional benefits for local producers, environment and the national budget.

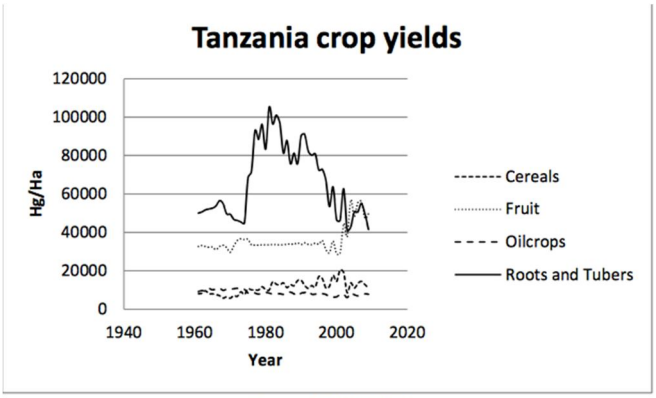


Source: FAOSTAT

Tanzania

In Tanzania, cereal and fruit yields have been growing at a marginal annual growth rate of 0.67% and 0.88% respectively. However, oil crops and tuber yields have grown by a negative growth

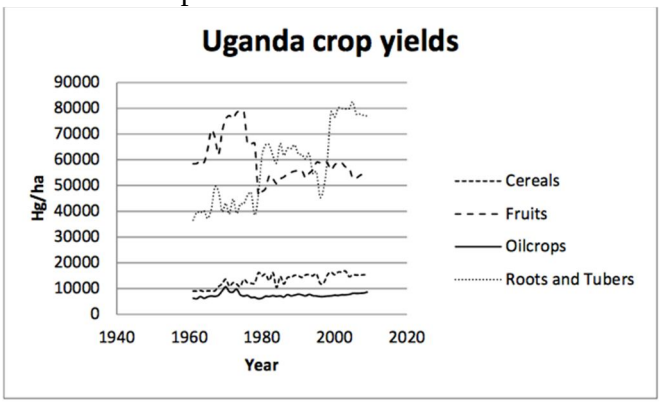
rate of 0.35% and 0.39%, respectively. Cereal yields had been experiencing an uninterrupted upward until a major drop came in the early 2000's. Fruit yields sharply increased in the early 2000's as the Tanzanian horticulture industry expanded. Unlike most SSA countries, tuber/roots yields have been declining since the mid-1980.



Source: FAOSTAT

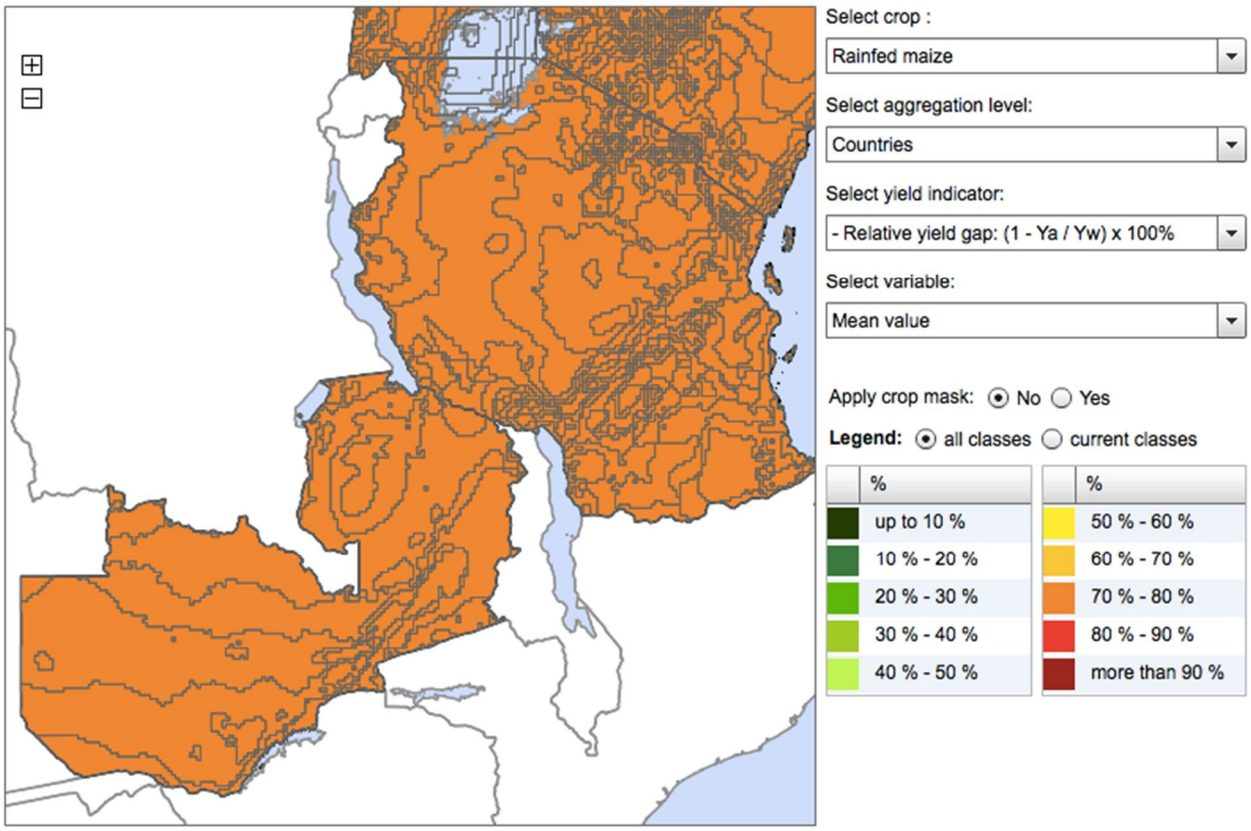
Uganda

Cereal yields, fruit yields, oil crop yields, and tuber/root yields have been growing by an average annual growth rate of 1%, 0%, 1%, and 2%. Tuber/root yields experience two sharp increases in early 1980 and early 2000. Fruit yields on the other hand experienced a sharp decline in early 1980, but were not able to recover from it. Oil crop yield had a sharp increase in 1970, but this positive event never reoccurred again. Cereal yields have kept a steady upward trend with minimal disruptions.



Source: FAOSTAT

Crop yields in sub-Saharan Africa are notoriously low, largely owning to soil quality and lack of fertilizer and not to the lack of irrigation. For example, Tanzania and Zambia are producing just 30% of what they could produce under current rain-fed conditions.



Source: Global Yield Gap Atlas

Across the board for the countries participating in this proposal their national strategies for food security and economic development, as well as climate strategies depend upon exploiting the yield gaps the continent experiences.

SUMMARY OF APPROPRIATENESS OF PROPOSED INTERVENTION

The capacity of agroforestry to both produce livelihood benefits and resilience as well as raise carbon stocks has been well demonstrated (Mbow, 2014, 2015, 2016). Some studies suggest that smallholder farmers in developing countries may combat climate change by reverting to more natural productive systems, which provide improved ecological and social functions [10], while meeting adaptation needs and building resilient agro-ecological systems that actively sequester carbon [11–14]. Currently, there is a growing interest in investing in agroforestry systems for these multiple benefits [15 ,16], and also as a set of innovative practices that strengthen the system's ability to cope with adverse impacts of a changing climate [17]. Although the feasibility and benefits of agroforestry-based mitigation to smallholder farmers are currently under debate, common ground is found when evidence emerges that high production levels and economic values of agroforestry products may generate financial capital beyond subsistence levels alone, thereby aiding capital accumulation and re- investment at the farm level [18,19].

A defining factor of African agriculture is the dominance of smallholder farmers with a strong priority on food security. Under such conditions, climate mitigation measures will need to

demonstrate support for improved food production as well as climate adaptation benefits [14,20 ,21]. Therefore, there is a strong role for agroforestry in addressing both climate adaptation and mitigation in primarily food-focused production systems of Africa.

In most parts of Africa, where historical emissions have been low and renewable energy options for future energy production having been piloted by the west are now available, climate change mitigation focusses on reforestation and forest protection. But such efforts to reduce tropical deforestation (often under the umbrella of REDD+) [6] conflict with the need to expand agricultural production in Africa to feed the continent's growing population [7]. Agroforestry could be a win-win solution to the seemingly difficult choice between reforestation and agricultural land use, because it increases the storage of carbon and may also enhance agricultural productivity [8,9].

ADAPTATION POTENTIAL UNDER AGROFORESTRY SYSTEMS

Agroforestry can play a crucial role in improving resilience to uncertain climates through microclimate buffering and regulation of water flow [15]. Growing attention is paid to the impact of agroforestry on microclimate control, and other favorable ecosystem functions.

Agroforestry helps to conserve and protect natural resources by, for example, mitigating non-point source pollution (e.g. dust), controlling soil erosion and creating wildlife habitat generating greater on-farm biodiversity [33]. It facilitates flexible responses to rapid shifts in ecological conditions, while at the same time maintaining or restoring soil and water resources [13,33,59].

Microclimatic improvement through agroforestry has a major impact on crop performance as trees can buffer climatic extremes that affect crop growth. In particular, the shading effects of agroforestry trees can buffer temperature and atmospheric saturation deficit — reducing exposure to supra-optimal temperatures, under which physiological and developmental processes and yield become increasingly vulnerable [10]. Scattered trees in agroforestry farms can enhance the understory growth by reducing incident solar radiation, air and soil temperature, while improving water status, gas exchange and water use efficiency [31].

Agroforestry contributes to ecosystem functions in water recycling by increased rainfall utilization compared to annual cropping systems. Lott et al. [60] reported that about 25% of the water transpired by trees is used during the dry season, indicating that they are able to utilize off-season rainfall (comprising 15–20% of the total annual rainfall) and residual soil water after the cropping period, with the rest being lost by evaporation (40%) or deep drainage (33–40%). This complementarity between trees and annual crops extends possibilities of soil moisture uptake, hence making soil resource utilization more efficient than in pure monoculture [30,58].

Trials have been conducted to demonstrate that reduction of vegetation cover amplifies the decline of rainfall through positive feedbacks between precipitation and vegetation via reduced evapotranspiration and increased albedo [61]. Additionally, analysis of the water cycle addresses the importance of managing tree cover as part of the direct influences trees have on local and regional patterns of rainfall [62,63]. This highlights the potential of agroforestry to alleviate drought in Africa.

MITIGATION POTENTIAL UNDER AGROFORESTRY SYSTEMS

Performance of mitigation options in agroforestry will depend on the relative influence of tree species selection and management, soil characteristics, topography, rainfall, agricultural practices, priorities for food security, economic development options, among others. In order to improve carbon sequestration, or to reduce carbon emissions, several options are available, but all are related to development needs of local communities.

These agroforestry practices are based on a variety of management approaches and have potential positive implications for climate change mitigation [42]. It has been shown that agroforestry systems have 3–4 times more biomass than traditional treeless cropping systems [20 ,43], and in Africa they constitute the third largest carbon sink after primary forests and long term fallows [35]. In addition, Zomer et al. [36] show that the area suitable for agroforestry worldwide is much larger with substantially greater potential than existing systems. In Africa, Unruh et al. [8] reported that a total of 1550 million ha are suitable for some type of agroforestry.

There are many methods to estimate carbon sequestration in agroforestry systems; some of them are based on in situ measurements, but the application of different assumptions introduces large inconsistencies into available data [9]. Reported C stocks and C sequestration vary widely across agroforestry systems in Africa. Integrated land use practices, such as agro-silvo-pastoral systems, combine high C stocks with high C sequestration potentials. Table 2 shows the potential of various agroforestry systems for climate change mitigation.

In addition, agroforestry systems can meaningfully reduce the pressure on natural forests for energy needs. Some authors assume that higher consumption of tree products would motivate farmers to adopt agroforestry [54], in particular where fuel wood is diminishing. Development of agroforestry for sustainable fuel wood can contribute to energy substitution and becomes an important carbon offset option [8].

AGRICULTURAL PERFORMANCE UNDER AGROFORESTRY SYSTEMS

The steady decrease in soil fertility due to many drivers is a serious constraint for sustainable agriculture in Africa [22– 27]. Topsoil erosion is the most detrimental form of soil degradation and is likely to be aggravated by long-term removal of surface litter and crop residues. The shortage of mineral fertilizers and poor performance of current agricultural policies have directed discussions on food security towards sustainable agroforestry practices [27–29].

Agroforestry has potential to improve soil fertility. This is mainly based on the increase of soil organic matter and biological nitrogen fixation by leguminous trees. Trees on farms also facilitate tighter nutrient cycling than monoculture systems, and enrich the soil with nutrients and organic matter [30], while improving soil structural properties. Hence, through water tapping and prevention of nutrient leaching [10,31], trees help recover nutrients, conserve soil moisture and improve soil organic matter [32].

The potential of agroforestry to reduce the yield gap varies depending on the biophysical and

human context. There are a number of successful agroforestry technologies, such as trees that improve soil, fast-growing trees for fuel wood, indigenous fruit trees to provide added nutrition and income, and trees that can provide medicinal plant products [33]. In practice, there is a need to differentiate between simple agroforestry systems (such as alley cropping, intercropping and hedgerow systems) and complex agroforestry systems that function like natural forest ecosystems but are integrated into agricultural management systems [34,35]. The interest of investigating agroforestry in a changing climate comes from the potential of agroforestry practices to produce assets for farmers, combined with opportunities for climate change mitigation and potential to promote sustainable production that enhances agroecosystem diversity and resilience.

The global estimated potential of all greenhouse gas (GHG) sequestration in agriculture ranges from 1500 to 4300 Mt CO2e yr ^{1}, with about 70% from developing countries; 90% of this potential lies in soil carbon restoration and avoided net soil carbon emission [20]. Tree densities in farming landscapes range from low cover of about 5% in the Sahel to more than 45% in humid tropical zones where cocoa, coffee and palm oil agroforestry systems prevail [36]. In sub-Saharan Africa, 15% of farms have tree cover of at least 30%. This points to a high potential in Africa for sequestering carbon and reducing other agriculture related GHG emissions — particularly in farm land that currently has low tree cover — while maintaining the basic production systems.

ADAPTATION-MITIGATION IN AGROFORESTRY

Combining adaptation with mitigation has been recognized as a necessity in developing countries, particularly in the AFOLU (agriculture, forestry and other land use) sector. In reality, there is no dissociation between crop production and other ecosystem services from land use. Agroforestry in general may increase farm profitability through improvement and diversification of output per unit area of tree/crop/livestock, through protection against damaging effects of wind or water flow, and through new products added to the financial diversity and flexibility of the farming enterprise [33]. It can also substantially contribute to climate change mitigation [17,20 ,21].

The use of multipurpose trees and integrated approaches can enhance the profitability of agroforestry [15], for example, trees can be sources of fodder, which in turn is converted into valuable plant nutrients [14]. Trees on farms can provide wild edible fruits [39] and non-timber products that serve as alternative food during periods of deficit and primary sources of income for many rural communities [64]. Hence, a growing scientific challenge relates to the methods and tools to assess useful trees in various human-ecological contexts [15]. In most cases, benefits of agroforestry add up to a substantial improvement of the economic and resource sustainability of agriculture, while contributing to GHG sequestration.

Agroforestry may nevertheless involve practices that raise GHG emissions, such as shifting cultivation, pasture maintenance by burning, nitrogen fertilization and animal production. In order to optimize agroforestry for adaptation and mitigation to climate change, there is a need for more integrated management to increase benefits and reduce negative impacts on climate.

PARADIGM SHIFT AND NEED FOR GREEN CLIMATE FUND INVESTMENT

Agroforestry systems readily bundle both mitigation and adaptation strategies and provide several pathways to securing food security for poor farmers, while contributing to climate change mitigation. Agroforestry should attract more attention in global agendas on mitigation because of its positive social and environmental impacts. However, adding trees to cropping systems and/or animal production requires learning of advanced cultivation methods and some support to ensure swift adoption [65]. The failure of extension services in poor African countries limits the possibility to scale up innovations in agroforestry for improved land use systems. Another structural limitation to bringing agroforestry adoption to scale can be seen in the limited investment in the sector compared to intensified farming systems, which has seen strong support during the post-colonial era, mostly for export cash crop (monocultures of groundnut, cocoa, cotton, among others).

GREEN CLIMATE FUND PRIORITIES

The Green Climate Fund has provided guidance on the types of interventions, expected results, results areas and indicators for success. The document "Analysis of the Expected Role and Impact of the Green Climate Fund" gives the following with regards to the climate sectors being examined by this feasibility study:

- Adaptation is highly context-specific and dynamic, and must respond to the particular and evolving risks and opportunities that manifest themselves in a certain country, or region within it. Adaptation is often highly localized, and can be difficult to distinguish from larger efforts to pursue sustainable development.
- Africa, with one seventh of the world's population, is poised to bear nearly 50 per cent of estimated global adaptation costs in health, water supply, and agriculture and forestry.
- 58. The adoption of more resilient crops and farming techniques in this context is of interest. While the exact impacts of future climate change on agriculture and food production systems are difficult to predict, there is a strong case for strengthening the capacity of systems that deal with current climate and weather impacts, in order to be prepared to manage future potential disruptions.
- About 65 percent of the global total increase in climate-related hunger is projected to occur in Africa
- It is clear that there are multiple "no regrets" entry points into supporting better outcomes. These include support for environmentally and socially sustainable climate-smart agriculture, which can reduce food security risks as well as pressures on water supply.
- The Millennium Ecosystem Assessment noted that climate change was the driver of ecosystem degradation the impact of which was increasing most rapidly, although there is uncertainty about scope and the specific economic implications of this change. Ecosystem-based adaptation (EbA) offers flexible and cost-effective measures to address risks at multiple scales that can also deliver co-benefits for mitigation, livelihood protection and poverty alleviation. Ecosystem services have been shown to reduce exposure to natural hazards and build adaptive capacity, which also contributes to resilient outcomes. While the contribution of ecosystem services to human resilience is only beginning to be understood, there is a strong economic case for investing in EbA and ecosystem-based approaches. Understanding of how ecosystem-based adaptation

works is still evolving. However, there are obvious linkages with other results areas of the Fund, including water, agriculture and forests.

- The IPCC Working Group II Contribution to the Fifth Assessment Report includes analysis of natural and managed resources, their systems and their uses. It focuses on freshwater resources, terrestrial and inland water system, coastal systems and low-lying areas, the ocean system, and food security and food production systems. These resource areas capture key ecosystems and ecosystem services that will be affected by a changing climate and that should be considered for adaptation investments. It is reasonable to assume that the impact of interventions in these areas would be felt in countries that contain key ecosystems, and where economic activity and human wellbeing depend most significantly on natural resources.
- Regional focus - Asia and sub-Saharan Africa may be particular priorities for investment in more resilient climate-smart agriculture. Many of the poorest people in these two regions depend on agriculture for their livelihoods. They are therefore highly impacted by disruptions to agricultural systems, and the risk of such disruption is high. At the same time, population, wealth, demand for meat, and therefore emissions from agriculture are all growing rapidly. The IPCC suggests losses of 18 to 22 per cent in some parts of Africa under a business as usual scenario by mid-century if remedial action is not taken.
- Net losses of forest cover exceed 7 million hectares per year, agriculture and forestry account for a quarter of global emissions. Although the division of these emissions between agriculture and forestry is approximately half, they are highly interlinked which complicates estimation. The greatest mitigation potential from forestry is through avoided deforestation. Avoided deforestation and sustainable forest management can also support adaptation, although a thorough understanding of how to maximize the resilience of both ecosystems and livelihoods through forests is still emerging. While impacts can be difficult to estimate and aggregate, resilience can be built by the contribution of standing forests to on- going provision of ecosystem services (such as the protection of soil, or flood defence or provision of non-timber forest products as safety nets) thereby contributing to the resilience of ecosystems and ecosystem services results area. It can also support employment and income generation. As an example, there are an estimated 14 million people employed in the formal forest sector.
- With high carbon stocks and forest area, 65 per cent of mitigation potential in the forest sector is estimated to be in the tropics. 50 per cent of this potential is achievable through avoided deforestation, as a result of the high rates of primary forest loss in many tropical forest nations. The Global Forest Resources Assessment of the FAO suggests that the decline in forest extent has been particularly high in Latin America and Africa over the last 15 years.

PARADIGM SHIFT POTENTIAL

Green Climate Fund defines "**Paradigm Shift Potential**" as the following:

1. "*degree to which the Fund can achieve sustainable development impact beyond a one-off project or programme investment through replicability and scalability*", as well as
2. "*systemic change towards low-carbon and climate-resilience development pathways*".

This project strongly contributes to both. The project is designed as a massive effort to scale-up and replicate successes which have been experienced across Africa already. Africa is well positioned to be a leader in shifting the agricultural production paradigm. The project also pairs the scientific, policy, and practitioner communities to generate huge learning potential for all parties involved. All too often good ideas are thwarted by lack of access to scientific data or sound understanding of local contexts, this project will connect UN Environment – a leader in global environmental policy, World Agroforestry Center – a world leader with over 40 years of research in agroforestry systems, and grassroots practitioners with national governments across the 8 countries.

EverGreen Agriculture with FMNR and fertilizer trees and shrubs is spawning a continental movement of simple farming practices to regenerate trees on farmlands. In areas where the practices are introduced to farmers and supported with appropriate extension and follow up, the practices are now going viral and they are being disseminated rapidly between farmers. Recent evidence from Malawi underscores this process. A mapping study of trees on farmlands in Malawi that was published in January, 2017, showed that tree cover on farms is increasing rapidly. Farmers have now established at least some trees on more than 97% of the farmlands of the country (PROFOR, WRI, ICRAF 2017). And the tree cover now exceeds 10% of the crop area on 28% of the farmlands in the country.

On some levels, FMNR is perceived as counterintuitive, and highly unusual, compared to more conventional, complex, and expensive approaches to achieving a climate smart agriculture, and combatting deforestation and desertification. A common perspective is that such complex, longstanding and extensive problems surely require complex, expensive, long-term solutions.

The FMNR regreening successes in Niger and Malawi, and many other countries, represent a paradigm shift with catalytic impact potential. FMNR was not conceived in a think tank and is not driven by industry experts. It is a successful and high impact movement of the poor and illiterate. In fact, the paradigm has already shifted.

The bottom line is that presumably illiterate, poor, risk-averse farmers with everything to lose if they implement a technology that does not work, are adopting FMNR and other evergreen agriculture practices by the millions. The time is ripe to bring the inspiration and knowledge of these farmers to scores of millions more farmers across Africa and the tropical world. FMNR is being freely adopted in dozens of countries in Africa and Asia because it is a very low cost, rapid, flexible and accessible tool. FMNR enables farmers to respond quickly to their ever-changing economic, environmental and social reality. They adapt this flexible tool, happily sacrificing ‘optimum output’ for the much more desirable outcome of yield and income stability.

Resource-poor, risk-averse farmers have to survive and want to thrive in a highly risky social-environmental-economic situation. Failure can literally mean disaster, even death, so they opt for the stability of yield/income over time rather than maximum yield in some years. Dr. Richard Stirzaker of the CSIRO wrote the following:

> *“I have followed the development of Farmer Managed Natural Regeneration (FMNR) since its very beginning in Niger during the early 1980’s. Thirty years later, independent scientists have hailed FMNR as contributing to the greatest positive transformation of the Sahel. I agree.*

FMNR is a counter-intuitive idea. Traditional agroforestry has always tried to specify the ultimate tree-crop combination and arrangement that maximises complementarily. FMNR is based on a naturally regenerating suite of tree species, each growing where they are because they have demonstrated an ability to best exploit a specific niche and overcome prevailing constraints. The farmer then thins and selects from this 'template' that nature has produced. Farmers derive their livelihoods from cropping around the trees, cutting browse for animals, producing construction poles and firewood. The contribution each of these options make towards food security depends on current trees density, rainfall, availability of labour and the prevailing prices for the different products, providing food and income stability in a very variable environment.

I do not think that any research program, no matter how well funded, would have come up with the idea, because it expertly combines the subtleties of location specific tree selection with farmer specific opportunities and constraints."

In many ways, FMNR can be considered a 'no regrets' technology. In 30 years of promotion, the social, economic and environmental benefits of FMNR are well documented, and very few negative impacts have come to light, despite in-depth evaluations in several West Africa nations and Ethiopia. It has been said that "if you have nothing to lose and everything to gain, then by all means go for it". In the 1980's FMNR was promoted at village level and it took root and spread. In the early 2000s, organizations such as World Vision and the Africa Regreening Initiative promoted FMNR at district and national levels, and from that initiative, FMNR has taken root and is spreading. This step-wise progression showed that with an incremental increase in effort, an exponential increase in adoption could be achieved.

In April 2012, this realization led to World Vision in partnership with the World Agroforestry Center– hosting an international conference in Nairobi called Beating Famine to analyse and plan how we could improve food security for the world's poor through the use of FMNR and Evergreen Agriculture. This and a subsequent Beating Famine conference held in Lilongwe, Malawi in 2015 have resulted in a growing groundswell of interest and uptake in FMNR by governments, NGOs and communities. The conferences acted as a catalyst for regular media coverage in some of the world's leading outlets and a noticeable increase in momentum for an FMNR global movement.

The Beating Famine conference and subsequent global recognition and support of FMNR set the scene for a new approach to spreading FMNR: that of engaging all stakeholders simultaneously. If FMNR could spread in Niger as a largely bottom up movement across five million hectares in just twenty years, what would be possible if all stakeholders – government policy makers and extension services, civil society, NGOs, faith based organizations, UN agencies, donors, and communities and individuals worked together towards achieving the same goals? Technically, there is no reason why numerous countries could not achieve regreening rates of five million hectares in five years simultaneously.

The rapid uptake of FMNR cannot fully be explained by its simplicity, low cost or quick rewards. Individuals and communities which had lost hope and who felt like helpless victims of poverty and climate change are being empowered to address their situation. FMNR practicioners realize that they can do something very tangible that is within their means. The deep sense of pride and satisfaction that FMNR has triggered in this Senegalese lead farmer is being replicated wherever FMNR has been introduced.

FMNR does not create dependency and it is bottom up, putting individuals and communities firmly in the decision-making seat. In a very real sense, FMNR is giving people back their dignity and sense of belonging.

FMNR generally has an extremely high success rate and once adopted by a population can spread very rapidly from one farmer to the next because of its ease of adoption, low cost and lack of dependence on external resources or expertise. In one study, the cost of FMNR implementation per hectare was $4.00 compared to $150+ per hectare for tree planting.

Potential for scaling up and replication

This project has the potential to be a signature example of paradigm-shift. One in which Africa is already primed to lead the way. This project will create a movement of change in agricultural practices and sustainable land management that delivers on global ambitions such as the Sustainable Development Goals (see section C.1) and the Paris Agreement by combining food security with climate change adaptation and mitigation benefits. In particular, the project will demonstrate how countries can specifically deliver on their Nationally Determined Contributions in practical ways, at minimal to no cost to their GDP, while at the same time improving food security, resilience, and well-being for the most vulnerable citizens in their countries; the small-scale farmer. Practical benefits to farmers such as increased crop yields, increased on-farm biodiversity and products, increased fodder, increased nutritional diversity, increased incomes and increased resilience will encourage sustainability and uptake by neighboring farmers. Given the extremely high cost-benefit ratio of the intervention lends itself to mass replicability.

For example, what began as an experiment with a few willing farmers in 1983 in Niger Republic, was adopted by several million farmers, largely without external funding, and spread to 5 million hectares or approximately 50% of the nation’s farmlands over a twenty year period. At an average density of 40 trees per hectare, some 200 million trees were regenerated and land was restored at an average rate of 250,000 hectares per year for twenty years with minimal and often no government or other external assistance. This Niger phenomena has inspired new movements in other West, East and Southern African countries and in many instances the uptake and spread of FMNR beyond the time and geographic limits of the projects which introduced FMNR.

While several of the partner organizations to this proposal have first-hand experience from their involvement in scaling-up FMNR, building small-scale farmer resilience to climate change and supporting the development of related value chains, Reij and Winterbottom 2015 distilled lessons learnt from successful re-greening 'movements' to propose six steps to effective scaling-up of re-greening. These steps provide a critical foundation for this proposal, but are not intended to be prescriptive. Rather, they represent a pragmatic approach to accelerating the spread of re-greening in line with this project (Annex X).

1. **Identify and analyze existing re-greening successes.**
   This will provide a solid foundation for scaling up re-greening, based on an improved understanding of the scale and impacts of farmer-led innovations that are already taking place. This step will help project implementers to understand what indigenous knowledge already exists and what motivates farmers. Using what farmers already know and what they or their peers are already doing as a starting point instead of introducing entirely new concepts, gives a greater likelihood of acceptance.

2. Build a grassroots movement for re-greening and mobilize partner organizations.
This project will build the capacity of and empower women and men farmers to practice and spread FMNR and EVA. Community ownership of FMNR will be built. Peer-to peer learning will be facilitated and training and development of community-based institutions will be supported. Farmers learn best from their peers and are more likely to adopt what they see their peers doing. Where suitable groups such as farmers clubs, savings groups and traditional governing structures exist, capacity will be built in FMNR and EVA, planning, advocacy, marketing and financial management. Where necessary, new groups will be formed and trained. All pertinent stake holders will be engaged – including women, men, youth, farmers, herders, merchants, faith and traditional leaders and local government. Groups will be assisted to form a vision for the future and on how to make a plan. Partner organizations will be invited to participate in FMNR workshops, field visits and to select key staff to do an online training course.

3. Address policy and legal issues and improve enabling conditions for re-greening.
This will be accomplished by analyzing barriers and adapting more conducive national and county-level policies, legislation, and development interventions. Field visits for policymakers and elected officials will be arranged. Communities themselves which have benefited from FMNR implementation and which have become passionate campaigners for FMNR and EVA will be capacitated to advocate for the mainstreaming of re-greening in development programs at county and national levels using the Citizens Voice and Action approach.

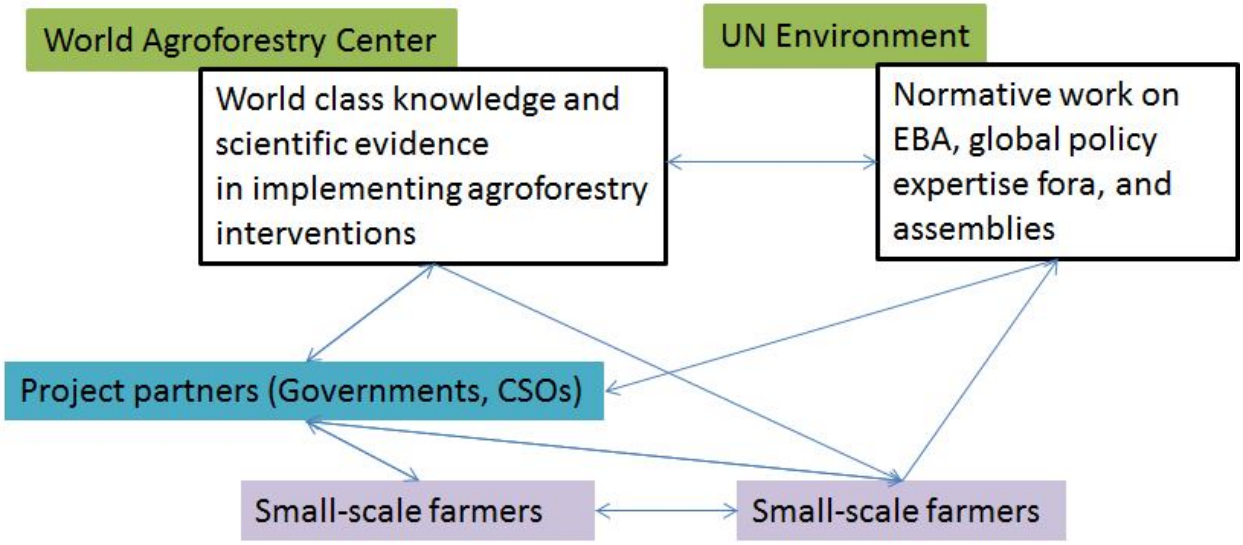
4. Develop and implement a communication strategy.
The project will systematically expand the use of all types of media to inform stakeholders at all levels and disseminate information about re-greening benefits and experiences. Special emphasis will be given to radio programming in the local vernacular to reach as wide an audience of potential practitioners as possible.

5. Develop or strengthen agroforestry value chains.
FMNR and evergreen agriculture are both foundational and complementary to small-scale farming economic development. Thus, focus will be given to value chain development, which in turn will enable farmers to capitalize on markets in stimulating the scale-up of re-greening. Product selection will be determined through a value chain assessment and will be region and country specific, but typically, marketing opportunities for FMNR and EVA related products may include – honey, fodder, livestock, grains, fruit and vegetables.

6. Expand research activities.
Additional research will fill gaps in knowledge which will be fed back into scaling-up efforts.As an integrated approach, these activities will ensure that Governments, communities, local organizations and institutions, and value chain stakeholders have the information, knowledge, capacity, and incentives to continue scaling-up project activities beyond the life of the project, and to receiving significant ongoing benefits from their efforts.

Knowledge and learning potential

The project aims to contribute to the knowledge base that supports effective climate change adaptation and resilience through dissemination of documented findings, lessons learned and case studies to a wide range of stakeholders (through a detailed communication strategy validated at project inception). The project facilitates iterative and improved knowledge generation, creation and sharing for collective learning among small-scale farmers, extension officers, government counter parts at the national level, and project partners. A central tenant of the project design is making the **scientific expertise housed at the World Agroforestry Center readily available, and rapidly accessible to small-scale farmers and project partners**. **Moreover, peer-to-peer learning among small-scale farmers is a foundational element of the project design**. Finally, UN Environment will integrate and disseminate lessons learned into various international and regional policy for a (e.g. EBAFOSA). At times knowledge and learning will be communicated directly to SSF (e.g. through text message groups) and at other times knowledge will be packaged and realized through partners. Learning will also take place in the reverse flow, channelling ground realities back up to the scientific and policy experts for review and study.



Monitoring and Evaluation resources will be positioned such that M&E can scale up during periods of increased shocks or stresses (e.g. an El Nino event) to generate more precise knowledge on how communities cope with such shocks and stresses, how well the various agroforestry interventions perform, and ultimately feed back into project design and to contribute to the international knowledge base on how localized adaptation efforts respond to global events.

Action Research will underpin project learning, providing continuous feedback, decision-support and quality assurance to the project. **M&E will take place each year, and lessons learned and compared across the countries will be fed back into programme design at the start of each year**. Action research will focus on -

e) formative evaluation: monitoring of project design in the initial phases;

f) planned comparisons: testing efficacy of alternative interventions or controls against predetermined indicators of outcome success;
g) process evaluation: monitoring for analysis and performance management; and
h) summative evaluation: evaluating results of project activities against targets ensuring that information is analysed, disseminated and used by project stakeholders in a timely manner.

Baselines will be established and tools, derived from (2) above, will be adapted to effectively monitor and evaluate programme impacts temporally and spatially on household food security, adaptive capacity and mitigation at varying scales across agro-ecological zones. This data will be analysed and used at a number of levels to improve implementation and allow continual refinement of community and household interventions.

A variety of approaches will be used to ensure effective learning, including:

d) **Intra consortium learning** (between participating communities, governments, and project partners)

- The Project Coordination Unit will capture key learnings to ensure that evidence and effective innovations are shared between implementing organisations and other key stakeholders in each of the countries. Face-to-face meetings will be used to share and discuss results at the project and national level.
- Inception workshops will be held in each country with implementing partners and other national stakeholders to capture existing local knowledge and ensure that contextually-appropriate best practices are incorporated into project planning and design.
- Technical partner organisations, including ICRAF and WRI, will continually refine and adapt the assessment, prioritisation and monitoring tools employed by the project, and will ensure appropriate scientific evidence and research findings inform and guide the iterative redesign and refinement of project activities.
- An end-of-project workshop in each country will contribute to the synthesis of project outcomes and findings, which will be documented and disseminated broadly in a variety of formats.

e) **Stakeholder learning** (learning with the GCF)

- Stakeholder communications, including milestone reporting and progress against the indicators will be communicated in line with programme partners' expectations.
- Develop a long-term, shared vision for landscapes in question at national levels through an inclusive and participatory process aimed at generating knowledge that is salient, credible, and reliable to all stakeholders. Share data and communicate plans widely, via ICTs where feasible, and taking into consideration the information channels and literacy levels of men and women. Pursue strategies that empower women and others to share their viewpoints and innovations.

f) **External and Global linkages** (with wider research/ development practice)

- Case studies from the project will be identified and documented to demonstrate the impact of the GCF's investment in restoring landscapes, building resilience and adapting to climate change.
- Regular media releases provided and posted on the websites of partner organisations, and on the Evergreen Agriculture Partnership site, CGIAR, the FMNR Hub, Global Alliance on CSA and Africa CSA Alliance websites.

Contribution to the creation of an enabling environment (i.e. achieving system change) and to sustainable development, including economic social and environmental co-benefits for a paradigm shift

The project will promote the 2030 Agenda for Sustainable Development, in particular SDG 1, SDG 2, SDG 5, SDG 13 and SDG 15, by supporting **8 African countries** to massively scale-up evergreen agriculture and the regreening of farm landscapes for the enhancement of climate change adaptation, food security, and livelihoods. **Six of the eight participating countries are LDCs**.

Many of the goals of the **2030 Agenda for Sustainable Development** are linked and cannot be addressed in isolation of each other. For the vast majority of vulnerable small-scale farmers across Sub-Saharan Africa, food security, rural poverty, gender inequality, land degradation and climate change are inextricably linked, and each can only be effectively tackled through programmes or approaches which recognise and address the connections between these issues.
This project will contribute substantively to the achievement of SDG1: End poverty in all its forms everywhere (specifically including targets 1.1, 1.2, 1.4, 1.5, 1a and 1b); SDG2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture (specifically including targets 2.1, 2.2, 2.3, 2.4, 2a and 2c); SDG5: Achieve gender equality and empower all women and girls (specifically including targets 5.1, 5.5, 5a and 5c); and SDG13: Take urgent action to combat climate change and its impacts (specifically including targets 13.1, 13.3, 13a and 13b). Further, the 2030 Agenda for Sustainable Development recognises the importance of the conservation and sustainable use of terrestrial ecosystems (Goal 15) and of reversing land degradation and achieving Land Degradation Neutrality (LDN) by the year 2030 (target 15.3). The objective of LDN is to ensure that the productive land resources we depend on for ecosystem services remain at least stable or are being regenerated. Two joint actions need to be taken to make land degradation neutrality happen: avoid further land degradation and recover already degraded land. These two actions are at the heart of this project.

The Sustainable Development Target 15.3 is also at the heart of the United Nations Convention to Combat Desertification (UNCCD), and is central to many African countries' Nationally Determined Contributions (NDC) to the UN Framework Convention on Climate Change.

The project also fully aligns with Aichi biodiversity targets 14 and 15 of the Strategic Plan for Biodiversity, 2011-2020, which seek to enhance the benefits to all from biodiversity and ecosystem services.

The role of healthy soils in addressing climate change and ensuring food security was a major focus of the 21st Conference of the Parties on climate change in Paris. Over 100 countries

ratifying the UN Framework Convention on Climate Change (UNFCCC) highlighted the importance of the land sector, that covers agriculture and forestry, in their Intended Nationally Determined Contributions (INDC). This project will contribute to the implementation of the **Nationally Determined Contributions** of participating countries.

This project will contribute to the implementation of the three **Rio Conventions**: the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC), and the United Nations Convention to Combat Desertification (UNCCD) adopted in 1992 at the "Earth Summit" in Rio de Janeiro. In particular, it will contribute to the UNCCD and its 10-Year Strategy (2008-2018) and the CBD and its Strategic Plan for Biodiversity 2011-2020 by addressing the links between climate change and ecosystems, forests, combating desertification, biodiversity conservation, and sustainable land use and land management for food production.

This project also closely links with the **Global Soil Partnership** (GSP) that the EU has strongly supported since its establishment by the FAO in 2012. This partnership aims to improve global soil governance for healthy and productive soils for a food secure world, as well as sustain other essential ecosystem services. It complements similar initiatives for water (the Global Water Partnership) and land (Voluntary Guidelines on the Responsible Governance of Tenure of Land and Other Natural Resources). The GSP is currently overseeing the development of Voluntary Guidelines for Sustainable Soil Management, to which this project will contribute through its results on the ground.

Environmental Co-Benefits

- Restoration of approximately 1 million hectares of degraded and climate vulnerable ecosystems (at no additional cost but equating to approximately $ 45/ha)
- Enhanced soil quality, reduced soil erosion, enhanced soil fertility, enhanced soil moisture retention
- Enhanced on-farm biodiversity primarily in the form of additional tree products (fodder, fruit, nuts, edible leaves and traditional medicines) and increased ecosystem services from bees, birds, insects and wildlife,
- Enhance water infiltration, and soil moisture
- Increased sustainability in fuelwood practices
- reduce erosion from water runoff and wind, and progressively accumulate organic matter through leaf-litter to replenish top soil and improve its structure.

Social Co-Benefits

- Nutritional diversity enhanced through on-farm crop diversity
- Nutritional diversity enhanced through increased income for purchase of additional food stuffs
- Market linkages developed and fortified
- Reduces marginalization of SSF by placing them at the center of related national policy debates
- Project also substantially improves SSF decision making capacity and strengthens farmer associations for greater impact at district and regional levels

- Contributes to safeguarding farmer investment from extreme weather events (see feasibility study) and safeguards farmers on –farm investments on a seasonal basis by providing reliable climate-information for planting, etc.
- In places where national policies or local bi-laws are established or reinforced, the project will contribute to the reduction of land tenure insecurity and possibly even displacement. It may also reduce migration flows of the most impoverished into urban slum areas
- inclusive/participatory approaches and shared management plans for sustaining natural resources will ensure greater availability of fodder and improved crop yields, while increasing community cohesion and reduce conflict between pastoralists and small-scale farmers

Economic Co-Benefits

- Establish and/or strengthen community-based farmer marketing groups or associations, ensuring vulnerable small-scale farmers have access to bulk purchasing of inputs and marketing of farm produce access to markets, information and extension support. It will also build the capacity of farmer groups to assess market opportunities
- Engage with other value chain actors and develop appropriate equitable value chains, resulting in strengthened regional markets and increased livelihood opportunities for participating small-scale farmers
- Fertilizer subsidy costs to government reduced
- Framework established for potential future linkages with carbon markets which could bring significant additional revenue communities should carbon markets rebound
- Fodder made available for livestock which reduces loss of livestock and increases health of livestock

Gender Co-Benefits

- Project will target 50% female headed household rate among beneficiaries – for a total of approximately 5,625,000 direct female beneficiaries
- Project will make a significant effort to identify female lead champion farmers where cultural context and farmer capacity allows
- Under Output 5 female-led entrepreneurship and Village Savings and Loan Associations will be promoted
- Travel time for girls for fuelwood is likely to be reduced (it is not possible to give a figure for this at this time given the various national and landscape differences of the project sites)

Ensuring gender-sensitive development impact: Women provide almost 50% of farm labour across Sub-Saharan Africa, and are key players in both agricultural and pastoral production processes, but own only a tiny fraction of farms. They are the primary natural resource managers, providers of food security, and repositories of knowledge and expertise on indigenous plants, medicines, food and water, but they are often denied proprietorial rights and regularly face discriminatory practice *vis a vis* access to information, resources and extension services.

However, approaches responsive to climate change or environmental degradation often focus on natural resources and not on the vulnerable communities and men and women who depend on those resources. This project consortium has extensive experience and skills in the application of community-based livelihood approaches that will ensure that protecting and enhancing natural

resources provides benefits to individuals, households, and communities. Despite knowledge gaps, it is increasingly clear that gender issues are inherent in land management approaches, including but not limited to participation and power in decision making. Few landscape approaches have been undertaken with an explicit gender focus; this project aims to do that. It will address the role and rights of women at individual and collective levels in relation to land use, and will address practical and strategic gender needs through greater access to information, skills and services, and purposive inclusion within community-based planning, decision-making and reporting procedures and structures. A gender responsive project is thus envisioned through

a) Ensuring gender analysis is part of overall context analysis for each country project and that project level activities will be adjusted to address findings (involve women and young and marginalized people in defining landscape boundaries; their needs and opportunities can easily be overlooked)
b) Ensuring interventions include those that are gender responsive through addressing labour burden challenges and reduced access to and control of key resources such as land
c) Ensuring that training and extension services are delivered for women and youths as well as for men in the (with appropriate content and delivery timing)
d) Ensuring that key project staff and community group members are trained and can effectively identify gender-related issues in project activities, and take appropriate steps to address them
e) Ensuring the active engagement of women's organisations in the scaling-up of agroforestry and regreening, as well as in relevant policy dialogues and stakeholder platforms.

COUNTRY BASELINE SCENARIOS

ANALYSIS OF THE NATIONAL CLIMATE CHANGE CONTEXT

The following section give the key environmental context, climate change observations, extremes, rainfall, and temperature, as well as key projected impacts and vulnerabilities. All data was obtained from the World Bank Climate Change Knowledge Portal unless otherwise noted.

BURUNDI

The Republic of Burundi is a landlocked country located in Central Africa just south of the equator (29°-30°25’ E and 2°20’-4°25’ S), covering a small area of 27,834 km2. Rwanda borders its northern boundary, Tanzania along its eastern edge, and the Democratic Republic of Congo lies to its west. It’s characterized by five geomorphological zones: Imbo floodplain (western Burundi), Congo-Nile watershed (western highlands), the central plateaus (largest region), and the Bugesera and Kumoso depressions (northeast/east Burundi), and has typical relief of countries in the East African great rift region. Two hydrological basins run through the country: the Nile Basin (13,800 km2) and the Congo Basin (14,034 km2), which provides Burundi with ample water resources. Yet, water is a vulnerable resource due to multiple factors, namely climatic conditions and unequal space-time distribution of rainfall. Main environmental challenges include soil degradation, deforestation, and sanitation that are in part due to high population density, placing pressure on natural resources as well as extreme events. Agriculture is the mainstay of the economy with 90% of the 9.85 million inhabitants depending on it for their livelihood. This sector combined with animal husbandry contributes about 40-60% of the GDP,

with exports mainly from coffee, tea, and cotton constituting 70-85% of export revenues. Burundi has the second highest population density in sub-Saharan Africa and years of civil war have severely damaged its economic structure and contributed to widespread poverty. In 2013 it was ranked 178 out of 187 countries on the Human Development Report with poor levels of education, access to modern health services, access to potable water, and access to electricity (less than 5% of population). Burundi is currently transitioning away from a post-conflict state to a stable and growing economy with its primary focus on modernizing public finance, strengthening basic social services, and upgrading economic infrastructures and institutions (e.g. within the energy, mining, agriculture, and private sectors). Main development goals include diversifying the economy, improving its standards of living, and becoming an increasingly stable and competitive economy. Burundi has identified numerous adaptation projects to climate change such as improving early warning climate forecasts, rehabilitation of degraded areas, conserving natural environments, rainwater harvesting, and creation and preservation of buffer zones around the floodplain of Lake Tanganyika and the lakes of Bugesera.

The rainy season in Burundi seems to be decreasing in the northeastern regions of Burundi, they have experienced torrential rains, lightening, and thunder during the rainy season, increasing their vulnerability to loss of livestock, food insufficiency, decreased agricultural output, bush fires, and loss of human life. Improved early warning climate forecasts, erosion control mechanisms, among others will help reduce the risks associated with storms.

KEY CLIMATE PERIODS

- Burundi's climate is controlled by the Inter-tropical Convergence Zone (ITCZ), which brings rain to Burundi as it moves southward. Additionally, the altitude of the country influences and modifies the climate on the local scale.
- The rainy season occurs during the months of October-May, which is interrupted by a short dry period in January, which lasts only 15 days.
- The dry season lasts from June-September and experiences the highest average annual temperatures, occurring from August to September (around 21°C).
- Altitude affects the precipitation and temperature regime based on varying relief. The relief of the country ranges from 773 m to 2,670 m and mean annual rainfall ranges from less than 900 mm (e.g. Imbo floodplain) to 1,600 mm (e.g. altitudes above 2,000 m)

OBSERVATIONS

EXTREMES

- Observations from 1999-2006 show a shortening of the rainy season coupled with an extension of the dry season in the northeastern regions of Burundi. The rainy season experiences heavy rains, thunder, and lightening.
- Since 1999, the region of Bugesera has experienced a delayed onset of rainfall and the water levels in all of the lakes have decreased.
- The Imbo region has experienced excessive dryness that has caused a decrease in water resources and in the water level of Lake Tanganyika. Additionally, there is a tendency towards desertification in this region.

RAINFALL

- A cyclic character of rainfall has been observed. It alternates between periods of rainfall surplus and periods of deficits. Inter-decadal variability operates on periods of around 10 years.
- Since 1999, the central plateaus region has seen an increase in seasonal variability with a tendency towards a longer dry season from, 5-6 months instead of the normal 4 (June-September).

TEMPERATURE

- Mean temperature has increased by 0.7-0.9°C since the 1930s.
- Since the 1980s, mean annual temperature in the southern and equatorial regions of East Africa has experienced a significant increase.

KEY PROJECTIONS

- Mean annual temperatures are projected to increase by 1.9°C by 2050.
- A reduction in precipitation is expected for May (end of rainy season) and October (beginning of rainy season).
- Mean annual rainfall is projected to increase over Burundi by mid and late 21st century.
- Projections indicate increases in mean annual precipitation over eastern tropical Africa.
- Most models project there will be a slight increase in days with 'heavy' rain by 2100.
- An increase of drought is expected in the northern part of the country that will cause a decrease in water levels in the northern lakes.
- Floods are expected to increase in frequency and magnitude in the low-lying areas (e.g. Imbo floodplain).
- Maximum and minimum temperatures are projected to increase considerably over equatorial Eastern Africa, with the number of days warmer than 2° C significantly increasing over the 1981-2000 baseline by the middle and late 21st century under A1B and A2 emissions scenarios.
- 'Cool' days are projected to decrease with the highest changes seen in November-January for the middle to late 21st century under A2 (high) and B1 (low) emissions scenarios. 'Cold' nights are projected to decrease throughout the 21st century under B1 and A2 emissions scenarios. Highest changes are seen during the winter months.
- Models project an increase in the number of 'hot' days per year for 2046-2065 and 2081-2100 under the low and high emissions scenarios.
- Droughts are expected to become more intense and more frequent, occurring between 40 and 60% of the time.

KEY IMPACTS AND VULNERABILITIES

- The rainy season in Burundi seems to be decreasing in the northeastern regions of Burundi, they have experienced torrential rains, lightening, and thunder during the rainy season, increasing their vulnerability to loss of livestock, food insufficiency, decreased agricultural output, bush fires, and loss of human life. Improved early warning climate forecasts, erosion control mechanisms, among others will help reduce the risks associated with storms.

LESOTHO

Lesotho is a landlocked country in Southern Africa situated at latitudes 28-31° S and longitudes 27-30° E, and spanning 30,255 square kilometers. It is wholly surrounded by the Republic of South Africa and has a population of over 2 million people. 4 distinct agroecological zones characterize the country, with lowlands comprising 17% of the land, foothills 15%, Mountains 59%, and the Senqu River Valley 9%. Only 10% of the country is suitable for cultivation and the most favorable socioeconomic conditions lie within the lowlands, foothills, and Senqu River valley regions. The country has a temperate climate with subalpine characteristics, distinguishing it from other south African countries; Lesotho experiences droughts, floods, frosts, snow, hailstorms, and tornadoes. Water is one of Lesotho's few natural resources as well as its most valuable. Almost half of the Basotho people engage in small-scale crop cultivation or animal husbandry as a means of income, but agriculture only comprises about 10% of GDP. Water exports to South Africa, manufacturing, customs duties, and remittances from Basotho in South Africa account for the large majority of GDP. In FY2012-2013, GDP grew by 6.8% largely as a result of increased agricultural output and construction activities. Areas of economic growth include the development of water projects (Metolong Dam and the Lesotho Highlands Water Project Phase II) and continued development in the mining of diamonds. Principle external shocks to the economy remain the uncertain global economic recovery and climate change impacts. The majority of agriculture is dependent on favorable climatic conditions and thus highly vulnerable to extreme weather events and is a contributor to instability in people's living standards and food security. Food security and self-sufficiency is a perennial problem in Lesotho, where the country has been unable to meet its domestic food demand since the 1960s. Poverty is widespread, with a national poverty head count rate of 57.1%, and it's concentrated in rural areas where about three-quarters of the population lives. Because of Lesotho's dependence on rainfed agriculture, susceptibility to extreme weather events, and fragile ecosystems, the country is highly vulnerable to climate change. Priority adaptation strategies for the country include adjustments to tillage practices; adjustments of livestock breeds, improving water management and development of irrigation systems; policies supporting growth and diversification of the economy; strengthening institutions; protection of natural resources; investing in research and development; improving disaster management; and weather insurance.

KEY CLIMATE PERIODS

- Lesotho is characterized as a temperate climate with alpine characteristics, and having four distinct seasons. There are large variations in temperature and rainfall from season to season, with Lesotho experiencing hot summers and relatively cold winters. Autumn and spring seasons serve as a transition from summer and winter.
- Winter occurs during the months of June-August and mean temperatures vary between 0.1° C to 17.3° C. Significant amounts of snowfall occur during this season in the high-lying areas of Lesotho, and on an average of every 3 years in the low-lying regions.
- Summer lasts between the months of December-February and has mean temperatures around 25° C. Around 85% of rainfall occurs during the summer months.
- The main rainy season begins in October and lasts through April, bringing between 400-1,200 mm of rainfall per year. The northern region of Lesotho experiences the most rainfall (800-1,200 mm) and the Senqu River valley and southern lowland districts experience the least amount of rainfall (400-600 mm).

OBSERVATIONS

EXTREMES

- Droughts are becoming more frequent in recent years. And recurrent droughts have resulted in a steep reduction in the production of cereals and other staple crops.
- Lesotho is experiencing desertification in the Southern lowlands and across the Senqu River Valley.
- Increase in the frequency and intensity of extreme events and natural disasters has been observed in recent years.
- An increase in hot days and nights and the hottest days and a decrease in cold days and nights have been observed over southern Africa in recent decades.

RAINFALL

- High variability in inter-seasonal (between seasons) and intra-seasonal (within a season) precipitation.

TEMPERATURE

- Mean annual temperature in Lesotho has increased by 0.76° C between 1970-2001.

KEY PROJECTIONS

- Northern Lesotho is projected to see a larger increase in annual temperature than southern Lesotho (demarcated into two regions at 30° S). The northern areas are projected to see annual temperatures increase between 0.4-4.7° C while the southern regions will experience temperature increases between 0.2-3.8° C by 2100
- Projections suggest a late onset of summer rains and a change in rainfall patterns that will become more erratic.
- Mean annual precipitation is projected to increase slightly by middle (2046-2065) and late 21st century (2081-2100), under low, medium, and high emissions scenarios. General Circulation Model (GCMs) projections have large error bars associated with them, encompassing both negative and positive changes in mean precipitation.
- The northern region of Lesotho (North of 30° S) is projected to see no change to a slight increase in precipitation by 2100 during the summer months (December-February), while Southern Lesotho (South of 30° S) is projected to see average to below average precipitation in summer.
- Most projections indicate an increase in precipitation for autumn (September-November) in northern and southern Lesotho by 2100.
- Projections for winter precipitation (June-August) show a reduction in precipitation for both northern and southern Lesotho by 2100.
- Most projections indicate an increase in precipitation for northern and southern Lesotho by 2100 for spring (March-May).
- Projections indicate an increase in the intensity and frequency of floods and droughts.
- Droughts are projected to intensify in certain seasons during the 21st century in southern Africa as a result of increased evapotranspiration and/or decreased precipitation.
- The annual number of ‘consecutive dry days’ is projected to increase by 2100, with northern Lesotho projected to see the largest change.

- The number of 'frost' days is projected to decrease by mid century (2046-2065) and late century (2081-2100) under low, medium, and high emissions scenarios. The largest projected change in the number 'frost' days is over northeastern Lesotho in the Mountain livelihood zone.
- The number of 'warm' days and nights is projected to increase by mid and late 21st century under low, medium, and high emissions scenarios. Northwestern Lesotho is projected to see the largest increase.
- The number of 'cold' days and nights is projected to decrease by mid and late 21st century.
- 'Heat wave duration' is projected to increase by 2046-2065 and 2081-2100 under each low, medium, and high emissions scenarios. Northwestern Lesotho is projected to see the largest change in the length of heat waves.

KEY IMPACTS AND VULNERABILITIES

- Compounding factors such as soil erosion, loss of arable land from human migration to the lowlands, high poverty levels, and competition of crops and livestock for land will exacerbate socioeconomic issues affected by droughts in Lesotho. Adaptation strategies such as the adjustment of tillage practices and halting land degradation through the use of appropriate soil and water management and conservation measures will be a necessity for disaster risk reduction.
- Early warning systems, flood-tolerant crop varieties, better land use practices, and disaster management are adaptation strategies that will increase the country's resiliency.
- Integrated water management, public awareness campaigns concerning water resources conservation, preservation of wetlands, water harvesting, and early warning systems can further reduce the risks associated with water scarcity in the future.

MALAWI

Located in southern Africa and bordered by Mozambique, Tanzania, and Zambia, Malawi is a small, densely populated, and landlocked country with one of the lowest levels of per capita income in the world (USD$164 in 2006). Over the past ten years, Malawi's poverty levels have remained largely unchanged as economic growth and development have stagnated due to widespread emigration, HIV/AIDS, a deteriorating infrastructure, macroeconomic instability, limited competitiveness of Malawian products in international markets, and a rapid population growth rate. Malawi's topography is varied; the Great Rift Valley that contains Lake Malawi stretches from north to south with elevations ranging from 800-1200 meters. Highland peaks can reach as high as 3000 meters above sea level. While the country's climate is tropical overall, temperatures in higher elevations can be relatively cool. The flood plains, wetlands, and forests of the Lower Shire Valley are particularly vulnerable to climate change, with drought and flood disasters currently directly affecting over half a million people. These areas also serve as vital habitats for wildlife and for crop production (rice, cotton, beans, sorghum, millets, and sugar cane).1 Over the past two decades, drought and flood events have increased in frequency, intensity, and magnitude with negative consequences for food and water security, water quality, energy, and the sustainable livelihoods of rural communities.

KEY CLIMATE PERIODS

- Cool season (May to mid-August)
- Hot season (mid-August to November)
- Rainy season (November to April)

OBSERVATIONS

EXTREMES

RAINFALL

- The increase in temperature has been most rapid in the rainy summer (December-February) and lowest in the hottest season (September-November).
- As year-to-year variability in rainfall is very high in Malawi, long-term trends are difficult to identify. In 2006, wet-season (December-February) rainfall over Malawi was markedly low, possibly causing a decreasing trend in December-February rainfall; however, evidence does not reveal consistent decreases.

TEMPERATURE

- Mean annual temperature has increased by 0.9°C between 1960 and 2006, an average rate of 0.21°C per decade.
- The average number of 'hot' days per year in Malawi has increased by 30.5 between 1960 and 2003.
- The average number of 'hot' nights per year increased by 41 nights (an additional 11.1% of nights) between 1960 and 2003.
- The frequency of cold days and nights has decreased significantly since 1960 in all seasons except September-November.

KEY PROJECTIONS

- All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in the current climate. Annually, projections indicate that 'hot' days will occur more often.
- Nights that are considered 'hot' for the annual climate of 1970-99 are projected to increase more quickly than hot days. Decreases in the frequency of days and nights that are considered 'cold' in current climate are projected, with these events becoming exceedingly rare by the 2090s.
- Substantial changes in annual rainfall are not projected between June and October and monthly rainfall changes for November through May are inconsistent, with some models projecting increases and others projecting decreases, particularly in the periods from September-May.
- All models consistently project increases in the proportion of rainfall that falls in heavy events in the annual average of up to 19% by the 2090s.

KEY IMPACTS AND VULNERABILITIES

- Model results estimate that droughts, on average, cause GDP losses of almost 1 percent every year. Economic losses are much higher during extreme droughts.
- One study suggests a possibility that rainy seasons will grow shorter, potentially leading to more frequent failures in maize cultivation, which in turn has significant implications for future food security

SWAZILAND

TANZANIA

The United Republic of Tanzania is situated in East Africa between the latitudes of 1° and 12° S and longitudes 30°-40° E. It is the largest country in East Africa spanning 945,087 square kilometers and boasts the highest point in Africa, with Mount Kilimanjaro standing 5,950 meters high. Eight countries border Tanzania: to its north are Kenya and Uganda; to its west lie Rwanda, Burundi, and the Democratic Republic of Congo; Zambia and Malawi to its southwest; and Mozambique to the south, while the Indian Ocean is off its eastern border. Highland areas dominate the country except for the coastal strip along the Indian Ocean. The central plateau sits 900-1,800 meters above sea level and is dotted with mountain ranges. The country is endowed with rich natural resources including forests, wetlands, and coastal fisheries as well as great biodiversity and diverse scenery that attract many tourists. Over 80% of the population (49.25 million) derives their livelihood, income, and employment from the land as most Tanzanians partake in agricultural and pastoral activities. Tanzania's economic breakdown has changed in recent years as the agriculture sector has diminished in its share while services and industry have grown. These three sectors make up the bulk of the economy with agriculture comprising 25% of GDP, industry and construction 21%, and services contributing the largest share to GDP at 45%. Economic growth has been steady at an annual rate of 7% since 2005 and has stemmed from communications, financial services, construction, manufacturing, and retail trade sectors. Growth outlooks for the medium term look steady and will continue from these sectors, however in order to become a successful emerging economy, policies on human development will need to be improved, less constraints on businesses, increasing competitive labor-intensive sectors, and modernizing agricultural production. Tanzania remains a poor country with small average capita income (US$ 570) and 28.2% of Tanzanians living below the poverty line. It has made progress on its Millennium Development Goals (MDGs) but will likely only achieve 3 of 7 by 2015. They are on track to meet the goals relating to combating HIV/AIDS, reducing infant and under-five mortality, but are struggling in achieving the targets of primary school completion, maternal health, poverty eradication, malnutrition, and environmental sustainability. Climate change has impacted Tanzania and threatens the majority of working Tanzanian's livelihoods as they rely on natural resources. Adaptation priorities for the country focus on agriculture and water resource management, such as irrigation, water saving, rainwater harvesting; coastal protection; alternative clean energy sources; sustainable tourism activities; and community awareness programs in public health.

KEY CLIMATE PERIODS

- Tanzania experiences a tropical climate that has regional distinctions due to different topographic characteristics such as relief and altitude. Mean annual rainfall ranges from 500 mm to more than 2,500 mm with an average dry season of 5 to 6 months.
- Coastal Tanzania experiences hot and humid weather with one rainy season between March to May and average temperatures around 27°-29° C.
- The mountainous/highland areas experience more of a semi-temperate climate with a short rainy season ("Vuli") between November and December and a longer rainy season ("Masika") during February through March. Average temperatures vary between 20°-23° C throughout the year.
- The central plateau region experiences a drier climate with considerable variations in temperature throughout the year.
- The Inter-Tropical Convergence Zone (ITCZ) is the primary influence on seasonal rainfall, causing different regions of Tanzania to experience either one or two rainy seasons.
- The northern and eastern parts of the country experience two wet seasons as the ITCZ migrates between the equator and tropics bringing a short rainy season between October and December as it moves southward across the country, and one from March to May or the 'long' rains, as it travels northward back to the equator.
- Southern western, and central Tanzania experience one rainy season from October through April or May, when the ITCZ is closest to the Tropic of Capricorn.

OBSERVATIONS

EXTREMES

- Over the past 30-60 years, Eastern Africa has experienced more frequent precipitation extremes such as droughts and heavy rainfall.
- Monthly minimum and maximum temperatures increased between 1974 and 2004 at the meteorological stations located in the regions of Arusha, Bukoba, Dodoma, Iringa, Kilimanjaro, Mbeya, Morogoro, Mwanza, Songea, Tanga, Zanzibar, and Shinyanga in Tanzania.
- The number of 'hot' days and nights per year have increased, with statistically significant increases in 'hot' nights. The average number of 'hot' nights per year increased by 50 nights between 1960 and 2003. 'Hot' days increased significantly during the season of December-February, increasing at a rate of 2.5 days per month during this period.
- The average number of 'cold' nights per year decreased significantly between 1960 and 2003, with the average nights per year declining by 34.
- '5-day maximum rainfall' events in March-May have increased significantly between 1960 and 2006, increasing at a rate of 11.03 mm per decade.

RAINFALL

- Mean annual precipitation has significantly decreased over Tanzania by 2.8 mm per month per decade between 1960-2006.
- Seasonal rainfall has significantly decreased in Tanzania between 1960-2006 for the seasons of June-September and March-May.
- Rainfall over Tanzania has become more variable.

TEMPERATURE

- Average annual temperature has increased by 1° C between 1960 and 2006, with the largest increase seen during January and February.
- Since the 1980s, mean temperature in the southern and equatorial regions of East Africa has experienced a significant increase.

KEY PROJECTIONS

- Projections from CMIP3 GCMs indicate Eastern Africa will become wetter by the end of the 21st century with more intense wet seasons, and October-December and March-May will experience fewer severe droughts. However, Regional Climate Models project that boreal spring rains (March-May) by the middle of the 21st century in Tanzania may be shortened, while the boreal fall (October-December) rainy season will lengthen in Tanzania.
- Heavy precipitation is projected to increase over East Africa, with high confidence from GCM Maximum 1- and 5-day rainfall totals are projected to increase by the 2090s with up to 24 mm in 1-day events and 4-37 mm in 5-day events.
- Maximum and minimum temperatures are projected to increase considerably over equatorial Eastern Africa, with the number of days warmer than 2° C significantly increasing over the 1981-2000 baseline by the middle and late 21st century under A1B and A2 emissions scenarios.
- Droughts are projected to intensify (medium confidence) in the 21st century in some seasons over Eastern Africa.
- 'Heat wave duration' is projected to increase over Tanzania by the end of the 21st century under A2, A1B, and B1 emissions scenarios. Western Tanzania is projected to experience the largest change.
- Sea level is projected to rise throughout the 21st century and increase between 0.4 m (low emissions scenario) and 0.8 m (high emissions scenario) by 2100.
- The annual number of 'hot' days and nights is projected to increase and 'hot' nights increasing mostly rapidly in December-February. 'Hot' days per year are projected to occur on 19-40% of days by 2060s and 19-65% of days by 2090s, while 'hot' nights per year are projected to occur on 30-68% of nights by 2060s and 35-91% of nights by 2090s.
- The annual number of 'cold' days and nights are projected to decrease throughout the 21st century. 'Cold' days and are projected to occur on 0-4% of days by 2090s and 'cold' nights are projected to occur on 1% of nights by 2090s.

KEY IMPACTS AND VULNERABILITIES

- Reducing Tanzanians' vulnerability to such extreme climate events will depend on adaptation activities that develop early warning systems, adopt drought tolerant seed varieties, scale up renewable energy generation, and incorporate emergency planning and response efforts.
- Reducing the risk posed by these disasters are aimed at establishing a disaster planning framework, establishing rural areas development plans, relocation of vulnerable

communities, improving building codes, encouraging terracing and contour farming, and developing an early warning system for flood events.

UGANDA

ZAMBIA

Zambia is a land-locked country and lies between latitudes 8° and 18° south and longitude 22° and 34° east with a land area of 752,614km. It is situated in the tropics and has a warm climate. It is drained by five major rivers, the Zambezi, Kafue, Laungwa, Laupula and Chambeshi; several large lakes lie within its boundaries, including Lakes Tangayika, Mweru, Kariba and Bangweulu. Zambia is also a home to a variety of wetlands, the most prominent of which are the Bangweulu and Barotse flood plains. Zambia's population has been on the rise, from 8 million in 1994 to 12.6 million in 2008-10 and projections point to 22 million by 2030. Two thirds of the country's inhabitants live in rural areas, of which about 80% live under UN defined levels of poverty. In 2000, infant mortality was 1,100-1,600 in approximately half of the country but the number of children under 5 who were underweight was less than 30 in large part of the country. The Zambian economy is predominantly dependent on exploitation of its natural resources particularly mining and increasingly forestry. Agriculture is predominantly rainfed and over half of the areas in south-east are cultivated. Zambia's climate is highly variable and over the last few decades has experienced series of climatic extremes, e.g. droughts, seasonal floods and flash floods, extreme temperatures and dry spells, many of these with increased frequency, intensity and magnitude. Their impacts on the country are evident in climate-induced changes to physical and biological systems which increasingly exert considerable stress on the country's vulnerable sectors, especially agriculture. The adverse impact climate change on food and water security, water quality, energy and the sustainable livelihoods of rural communities coupled with poverty also limit economic development.

KEY CLIMATE PERIODS

- Hot months are very dry, and there is almost no rainfall between May and August.
- The rainy season is from September to April, during the cooler months, and is driven by the migration of the ITCZ.

OBSERVATIONS

EXTREMES

RAINFALL

- Rainfall in Zambia is strongly influenced by the El Niño Southern Oscillation (ENSO), which causes large inter-annual variability.

- El Niño brings drier than average conditions in the wet summer months (DJF) in the southern half of the country, whilst the north of the country simultaneously experiences significantly wetter-than average conditions.
- The reverse pattern occurs with La Niña episodes, with dry conditions in the north and wet conditions in the south.

KEY PROJECTIONS

- The country's vegetation is mainly made up of savannah woodlands dominated by Miombo woodlands, which cover about 50 percent of the country. Future vegetation patterns are likely to change under projected climatic variables- for example, the Kalahari and evergreen forest may disappear.
- Proportion of rain from heavy events is expected to increase
- Temperature is expected to increase by 1.2-3.4 C

ZIMBABWE

Zimbabwe is a landlocked country located in southern Africa, between the Zambezi and Limpopo Rivers. It is bordered by South Africa to the south, Botswana the west and southwest, Zambia to the northwest, and Mozambique to the east and northeast. Although it does not board Namibia, less than 200 metres of the Zambezi River separates it from the at country. Zimbabwe's total population is 12.97 million. Mineral exports, gold, agriculture, and tourism are the main foreign currency earners of Zimbabwe. Zimbabwe has a tropical climate with many local variations. The southern areas are known for their heat and aridity, parts of the central plateau receive frost in winter, the Zambezi valley is also known for its extreme heat and the Eastern Highlands usually experience cool temperatures and the highest rainfall in the country. The country's rainy season generally runs from late October to March and the hot climate is moderated by increasing altitude. Zimbabwe is faced with recurring droughts, the latest one commencing early in 2015 and ongoing into 2016. Severe storms are rare.

KEY CLIMATE PERIODS

- Rainfall in Zimbabwe is influenced by the El Niño Southern Oscillation (ENSO), which causes large inter-annual variability.
- El Niño brings drier than average conditions in the wet summer months (DJF)
- The reverse pattern occurs with La Niña episodes

OBSERVATIONS

EXTREMES

- Zimbabwe has experienced a warming trend towards the end of the twentieth century

RAINFALL

- There has been an overall decline of nearly 5 per cent in rainfall across Zimbabwe during the 20th century with the early 1990s witnessing probably the driest period in the past century

TEMPERATURE

- There has been an increase in both the minimum and maximum temperatures over Zimbabwe represented by a decrease in the number of days with a minimum temperature of 12 C and a maximum of 30 C.

KEY PROJECTIONS

- Increases in temperatures, droughts and flooding is expected
- Future scenarios have predicted increases in global-mean temperature of between 1.30 and 4.60C by 2100, representing global warming rates of between 0.10 and 0.40C per decade. Zimbabwe's continental interior location means that it is predicted to warm more rapidly in the future than the global average.

ANALYSIS OF THE PROGRAMMATIC BASELINE

COUNTRY INSTITUTIONAL CAPACITY ANALYSIS / PROCESS FOR SELECTION OF PARTNERS

World Agroforestry Center is the secretariat of the Evergreen Agriculture Partnership. The Partnership is a collective of organizations and with a shared vision of agricultural systems that can sustain a productive green cover on the land throughout the year, for the benefit of the land and livelihoods of smallholder farmers around the world. The Partnership's mission is to increase food and nutritional security and resilience while enabling climate change adaptation and mitigation across Africa.

The partnership's objective is to support information needs, provide capacity building and knowledge generation to assist nations around the globe in scaling up Evergreen Agriculture to achieve this the partnership is:

- Providing technical support to policy, scientific and scaling-up institutions on the adoption of relevant innovations
- Building scientific research partnerships to address key knowledge gaps and issues to overcome the barriers for more rapid scaling-up
- Supporting the mainstreaming of EverGreen Agriculture into the programmes of the community of United Nations organizations and development banks
- Building support for greater scaling up and impact as well as into regional and sub-regional organizations
- Building partnerships with non-government organizations and strengthening their technical capacity to support the spread of EverGreen Agriculture

Members of the Partnership were invited to submit information on their existing capacities and programming in partner countries. This information included information on existing site location, information on existing programming activities, information on existing organizational and individual technical capacities, ability to scale out to new sites. The partnership then reviewed this information and selected a lead organization to chair and organization a national consortium which would implement the project. The factors considered in selecting the lead organization was the aforementioned as well as their cost-effectiveness and ability to reach climate vulnerable areas. The remainder of this section details the outcomes of the country institutional partners and selection review process.

BURUNDI

Background Situation on the Scaling-Up of Evergreen Agriculture

World Vision Burundi is currently focusing heavily on Food Security and Livelihoods (FSL) in all 18 of its long term area development programs (ADP), spanning 6 provinces of Burundi. Each of these programs include landscape restoration and natural resource management, with a specific focus on the protection and restoration of ecosystems. In the past three years, World Vision Burundi focused on fighting against erosion due to rain water by establishment of 701,989 meters of contour bunds and 13,000 meters of fire breaks were established; 5648 improved cooking stoves and plantation of 1,150,570 trees, mainly agroforestry and nitrogen-fixing species, planted along the contour bunds. These activities have enhanced the yield, resilience and sustainability of farming systems of 25,551 families and cover an estimated 29,182 hectares of land.

CRS has since 2014 been implementing the Amashiga project in Mujinga province, which focuses on health, nutrition, agriculture, NRM and governance. The project is intended to run for 5 years and to directly benefit 50,000 households.

Partnerships and consortia in Burundi

Both WV and CRS have well-established linkages with Government ministries, international and local NGOs, CBOs, technical and academic institutions, and both are involved in several ongoing complementary initiatives. CRS has a very strong relationship with Caritas Burundi. WV appears to have stronger technical capacity in EVA, with staff now trained in FMNR, greater geographic coverage, and linkages to regional FMNR networks.

The Vision for Scaling-Up

WV has proposed scaling-up EGA to more than 30,000 households within its existing Area Programs in 3 geographic areas: 1) Rutana province, which is located in the East of Burundi in the agroecological zone of Moso. It is a region which receives low annual rainfall, is extremely vulnerable to the impacts of climate change, and which WV cites as being most appropriate for scaling-up FMNR and NRM; 2) Cankuzo province, which is also located in the East of Burundi within the same agro-ecological zone of Moso and part of Buyogoma. It has a similar

agroecological context to Rutana, but has experienced significant pressure on its natural resources (including fuelwood) from hosting large numbers of Congolese refugees; and 3) the provinces of Muramvya, Gitega and Karusi, which are located in the central plateau of Burundi in the Kirimiro Agro-Ecological zone, with an average altitude of 1600m. These provinces are densely populated and highly affected by nutrient-depleted soils and erosion.

CRS proposes building on its Amashiga program, located in Mujinga province, as well as another project spanning 5 provinces in which CRS is Sub, integrating appropriate EVA practices and scaling-out to other provinces.

From the WebEx discussions and from the spreadsheet and survey documents received, it appeared that WV has a very clear and significant proposal for an inclusive and collaborative approach to scaling-up EGA in Burundi, building on the strengths and existing relevant programs of CRS and other partner organizations.

Burundi: A smaller country with limited short-term impact potential, and significant risks.

The discussions emphasized the significant interest and capacity of both organizations, and the emerging EVA programming and opportunities - but it also highlighted the limited existing adoption. Our tentative classification of Burundi is as a Tier 3 country, reflecting its relatively smaller size, limited scale of existing EVA programs and significant political risk levels.

The indicative annual budget for Tier 3 countries to scale-up evergreen agriculture practices is $625 thousand ($3.125 million over 5 years).

The tentative target for the number of farms/hectares on which adoption will have occurred in five years is 60,000.

LESOTHO

Background Situation on the Scaling-Up of Evergreen Agriculture

World Vision Lesotho has in recent years adopted Climate Smart Agriculture into its Area Programs, with a focus on conservation agriculture, and it is supporting 16,400 households to become more resilient to the impacts of climate change. It has also supported a major tree planting initiative, spearheaded by Her Majesty Queen Masenate Mohato Seeiso that is mobilising children across the country. The initiative has so far planted 68,205 trees, including 56,105 indigenous and 12,100 exotics, through sponsorship funding and support from the Ministry of Forestry and Land Reclamation, and with labour and ongoing maintenance from local communities.

Due to its cost effectiveness, World Vision Lesotho has adopted farmer managed regeneration (FMNR) to compliment the tree planting, in an effort to scale-up interventions to address land degradation. In 2015, WV Lesotho delegates from the Beating Famine conference introduced and supported the adoption of FMNR into WV Lesotho's programming. EverGreen Agriculture,

including and tree planting is now being scaled-out in 5 Area Programs, with budgets approved for an additional 5. There are currently 168 trained individuals and 93 of them have adopted and are implementing FMNR. These demonstration/learning plots have provided a strong and promising platform for potential scale up into all World Vision Lesotho 14 Area Programs in 7 districts within the country.

CRS has, since 2009, invested considerably in promoting sustainable land management (SLM) as a measure to reduce rural poverty and enhance community resilience to climate change among the most vulnerable strata of the Basotho population living in very degraded and vulnerable areas of Lesotho. CRS Lesotho's SLM activities are implemented in an integrated manner through a Centre of Excellence (CoE) approach, which is an Ecosystem-based Adaptation approach (EbA) in which communities develop and implement their Natural Resource Management (NRM) plans to help manage ecosystem health while receiving ecosystem services at the same time.

CRS has also developed E-learning centers, which are used by farmers to get information about prices, weather, training for FMNR, etc., and are working to digitize successes and best practices. CRS' SLM activities include soil and water conservation in rangelands, conservation agriculture (CA), plantation of fruit trees along CA plots, promotion of FMNR, wetland rehabilitation, Natural Resource Management (NRM) planning, and multiple use water services (MUS).

CRS has made significant progress promoting EverGreen agriculture practices in Lesotho, including:

- CA with trees. So far, about 500 smallholder farmers covering about 250 hectares of land have planted fruit trees on their CA plots;
- the production of 2000 tree seedlings through tree nurseries that are being managed by herders and youths. These seedlings are being purchased by the Ministry of Forestry – which, in turn, plants them on degraded rangelands in order to increase the green cover and restore soil health and biodiversity;
- planting of shrubs and grasses on 1,300 hectare of degraded rangeland – which has resulted in reduced surface runoff, increased soil cover, and increased water level in downstream wells and springs; and
- FMNR. CRS has so far trained 60 vulnerable farmers and community members on FMNR, and as a result 65 hectare of land has been rehabilitated.

CRS has also developed significant programs which compliment EverGreen agriculture, including:

- supporting the uptake and continued practice of CA by over 5000 farmers covering 2600 hectares of land. Approximately 500 of these farmers are producing fodder for their livestock from their CA plots;
- participating as a founding members of the CA Task Force in Lesotho;
- promoting SLM-related knowledge and skills in Lesotho. CRS Lesotho led a technical team in the development of SLM and CA training materials that are now being used by Government institutions, as well as a number of local and international NGOs;
- supporting the creation of functional community based organizations;

- supporting rangeland management. CRS has trained 15 herder associations on NRM planning and management of their rangelands across several districts in Lesotho. These herder associations have developed natural resource development plans that incorporate annual grazing plans to allow natural regeneration of indigenous vegetation.
-

Partnerships and consortia in Lesotho

Both WV and CRS have significant well-established partnerships with Government ministries, international and local NGOs, CBOs, technical and academic institutions, and both are involved in significant and complementary ongoing initiatives. WV appears to have stronger technical capacity in EVA and greater geographic coverage, while CRS appears to have slightly more experience in working with and through partner organizations. To capitalize on the strengths and experience of both organizations, and existing relationships and relevant programs, it is clear that WV and CRS will need to work collaboratively.

The Vision for Scaling-Up

WV has proposed scaling-up EVA practices within its existing Area Programs in the Northern and Southern Regions. In the Southern lowlands, the focus would be on Mafeteng district comprising Matelile AP, Malumeng AP (comprising of foothills and lowlands semi-arid dry plains) and Sekameng AP (lowlands semi-arid drylands). Mohale's Hoek district in the dry semi-arid lowlands hosts Mpharane AP (predominantly foothills). Maphutseng is in the south lowlands and the Senqu/Orange river valley zone. Mokotjomela AP has highlands and Senqu river valley and is in the Quthing south of the country. Koeneng AP, Pitseng AP and Makhunoane APs have started integrating EGA into their programming model and would provide an opportunity for rapid scaling-up. Further, it is proposed that a demonstration sit be developed in Maphutseng AP as the entry point for EGA promotion.

CRS has proposed building on its existing projects in the Districts of Mohale's Hoek, Thaba Tseka, Mokhotlong, Berea, Maseru, and scaling-up EVA practices within those locations to an additional 12,500 households.

Lesotho: A smaller country with limited short-term impact potential, and significant risks to target achievements

The discussions emphasized the significant interest of both organizations, and the support of Government and other national partners to scale-up EVA, but also the limited existing adoption. We are leaning toward CRS as the lead implementing NGO in strong partnership with World Vision.

Our tentative classification of Lesotho is as a Tier 3 country, reflecting its relatively smaller size, limited existing EGA programs and significant risk levels in achieving ambitious adoption targets.

The indicative annual budget for Tier 3 countries to scale-up evergreen agriculture practices is $625 thousand ($3.125 million over 5 years).

The tentative target for the number of farms/hectares on which adoption will have occurred in five years is 60,000.

MALAWI

Background Situation on the Scaling-Up of Evergreen Agriculture

Evergreen agriculture practices have been promoted for over 20 years in Malawi, particularly through the National Agroforestry Food Security Program, coordinated by ICRAF, and involving the national extension system, the National Small Farmers Association of Malawi (NASFAM), and the efforts of NGOs such as Total Landcare, World Vision and Concern International. Malawi is now experiencing a spontaneous and rapidly expanding evergreen agriculture movement. An ICRAF-WRI-World Bank study released in 2016 mapped the tree cover on farmlands in five districts and showed that tree cover has been increasing rapidly on farms throughout the country. Only 3% of agricultural lands in these districts now have no trees on them. The report diagnosed that the key drivers were the need for households to produce their own fuelwood and fruits in the face of declining natural forest cover.

It was estimated that there are now more than 155,000 hectares of crop fields under Faidherbia parklands in the five districts (which is 20 percent of the total arable land). Other estimates indicate that about 500,000 farmers have *Faidherbia* trees on their crop fields countrywide. A recent estimate by the US Geological Survey suggests that at least one million farmers across the country are now engaged in tree regeneration on their farms, which is more than one-third of the farms in the country. These results suggest that Malawian farmers are increasingly receptive to the integration of agroforestry into their farms, and that the conditions are ripe for building a vigorous national broad-based movement for rapidly accelerating tree cover in agricultural systems.

Malawi has a long history of agroforestry research conducted by ICRAF and national agencies. The work has pioneered a portfolio of fertilizer shrub and tree systems, including the intercropping of gliricidia, tephrosia and other nitrogen-fixing species with maize and other crops. In recent years ICRAF has been piloting approaches to combine the scaling-up of nitrogen-fixing shrubs and trees along with inorganic fertilizer subsidies in order to provide ways for government to assist farmers to transfer to a more sustainable integrated soil fertility system that will reduce the heavy burden of subsidies on government food security expenditures in the medium term. Estimates in the 2016 report indicate that government expenditures on fertilizer subsidies could be drastically increased if farmers were assisted to establish these evergreen agriculture systems on their farms

In Sept 2016, the government joined the African Restoration Initiative (AFR100) and adopted a national target to restore and increase the productivity and functionality of 4.5 million ha of deforested and degraded lands by 2030. Mapping and assessment of the high-priority areas for implementing restoration opportunities is being done with the assistance of WRI and IUCN. This exercise indicates that the potential opportunity for scaling up agroforestry, including FMNR, fertilizer tree and shrub systems, and CA with trees, is more than 3.7 million ha or 40%

of the country, based on current mapping estimates of the amount of cropland having less than 15% tree cover. The GCF EVA Project can assist the country's efforts develop a portfolio of investments that accelerate the realization of this potential. In that the Government of Malawi has committed to an extensive reforestation effort, the EVA Project will align very well with that strategy.

CRS has existing NRM activities in Malawi that the new EVA project will build on. The Ubale Project is a springboard for the scaling-up of EVA as it builds on the technical aspects of fertilizer trees and shrubs (gliricidia, etc), while also including green manure cover crops: 250,000 HHs are currently involved in agroforestry interventions, with 206 AEDOs, 1,854 Lead Farmers, 25,000 FFA workers; with Village Civil Protection Committees (VCPC) in all 264 GVHs for nurseries with 3,960 members. Agroforestry is covered through support to 800 demonstration plots by Government extension agents and Lead Farmers that showcase and promote gliricidia utilization as fuelwood and fertilizer. This will be expanded to 2000 demonstrations in 2016-17. The Food for Assets component is working with 71 watershed conservation works and 155 riverbank protections, each of which planted 10,000 trees of various species. The VCPCs and Natural Resource Management Committees will manage these assets. Further, all GVHs will be supported to establish nurseries capable of growing 10,000 seedlings at a time for continued planting after the project ends. The trainings are leveraging 330,000 HHs into the project. Most of the AF work is at community level.

CRS proposes to scale up evergreen agriculture practices in the UBALE, Tafika, and SORT projects covering districts in northern, central and southern Malawi. Chikwawa, Nsanje, Blantyre Rural, Kasungu, Mzimba, Karonga, and Chitipa Districts).

The CRS MODES project is using radio and mobile phones for extension messages. This can provides a foundation for the FMNR up-scaling as well as for other forms of EVA and AF. The SANE Project will leverage its collaboration with the Ministry of Agriculture's Extension Services to effectively spread messages about the practices to 400,000 farmers nationwide. CRS is working closely with the Ministry of Agriculture and has been able to influence the content of extension messages as well as their delivery.

CRS doesn't directly implement projects but rather works through its partners. It has a large number of grants which are subcontracted to partners, including local, national and international NGOs.

CARE is implementing a number of programs in Malawi and is involved with the Ubali program discussed above. It is also engaged in a number of programs in the Central and southern regions on soil and water conservation, CA and forestry management, capacity-building and the conservation of natural resources. A large CA program in Nsanje involving 10,000 HHs is winding up and CARE is looking to scale-up from there. A new Irish Aid program is getting under way to focus on CA and CSA in light of the government's current agricultural program.

World Vision is one of the largest NGOs in Malawi with a foot print in all of Malawi's districts. It works with more than half of Malawi's smallholder farmers. A number of interventions are being implemented to facilitate movement from dependency to self-reliance. World Vision

introduced FMNR into its area development programs in 2014. WV Malawi and ICRAF co-hosted the 2015 'Beating Famine' conference which generated a massive amount of interest from donors, government agencies, NGOs and communities across Malawi, and an excellent foundation for networking in the scaling-up of FMNR in Malawi and across the Southern Africa region. The Malawian Government shared the successes in evergreen agriculture and it committed to rolling out a national program to further accelerate the process. Consequently, World Vision has now embedded FMNR as an element of its food security work in nearly every district. It is also working with the churches and district committees to scale it up.

In the Central region the churches have taken the lead with FMNR promotion. The pastors fraternal, which includes pastors from all denominations, and 26 churches, have committed to working with their parishioners in implementing FMNR. WV works with the pastors, local forestry agents, traditional leaders and communities to promote FMNR. This activity is rolling out in the North, Central, Eastern and Southern Districts of Malawi. The intervention started in August 2015 after a meeting with 170 church leaders from across Malawi.

World Vision has now individual and group FMNR plots across the country. Malawi contains the best examples of maturing FMNR sites. This makes it an ideal destination for learning visits from the region. A key element in successful adoption has been the facilitation of learning visits to active FMNR sites where farmers can see for themselves and talk to other farmers actually practicing FMNR.

World Vision currently has two big grants – THRIVE and one on forest management dealing with the sustainable management of natural resources. The THRIVE grant is working in 4 districts on food security work and food resilience programming with environmental conservation as a big piece of that. As a response to the recent devastating droughts in the country they are building FMNR and agroforestry into their drought response work.

Total Landcare (TLC) is a strong national NGO that is a leader in agroforestry and conservation agriculture. They are noted for their technical capacity and they are implementing numerous projects throughout the country. Their Adaptation to Climate Change Project in central Malawi is one of their major ones, involving all components of NRM, including FMNR and assisted natural regeneration (ANR) in degraded forests. Along with Concern Universal and Christian Aid they are implementing CA extension under a DFID Consortium on Enhancing Community resilience to climate change.

TLC has three Conservation Agriculture and Agroforestry programs – one each in the south, central and north. It is also implementing a large government program on reforestation and sustainable agriculture that is starting across the country in 10 districts. They have recently had success with the direct seeding of Faidherbia, which could make the scaling-up of that tree much more convenient for farmers. A number of organizations, including TLC, are running programs on rural radio. TLC runs three programs each week on CA and sustainable energy and they are planning to use them to introduce the FMNR component.

Concern Worldwide is implementing CA in two southern districts and would like to integrate EVA practices into those programs. They currently facilitate the Malawian Climate Smart Agriculture Alliance (MCSAA), including the establishment and hosting of a national secretariat,

which advocates for government promotion of CSA through its policy frameworks, budgetary instruments and oversight mechanisms.

Malawi is in a particularly favorable situation for rapidly and extensively expanding evergreen agriculture throughout the country by outscaling from the numerous evergreen hubs where success has already been achieved. These conditions indicate that Malawi has a unique opportunity at the present moment to achieve ambitious evergreen agriculture adoption targets.

Partnership Networks

In addition to the **Malawian Climate Smart Agriculture Alliance (MCSAA)** mentioned above there are a number of additional networks that could be vehicles for the scaling-up of evergreen agriculture in the country:

- **The National Conservation Agriculture Task Force** coordinated by Concern Worldwide.
- **The National Agroforestry Task Force**
- **The Civil Society Network on Climate Change**. TLC has been influential and steering it. It's a network that encourages climate change adaptation and mitigation in the country.
- **CICERNET** is an umbrella network for all agricultural institutions coordinated by Lilongwe University.

ICRAF and the World Bank are convening a **National Agroforestry Scaling-up Workshop** in Malawi on 24-25 January. It will be working to develop a plan for accelerating the scaling-up process, securing support and mobilizing many actors to implement a national scaling up strategy.The outcomes of this meeting will be useful for the national planning for the EVA GCF project.

The Vision for Scaling-Up

CRS and World Vision are the two proponents that have bid on being selected as the national lead NGO. World Vision's proposed way forward for scaling-up draws from their strong technical capacity in FMNR on the ground, building out through their extensive network of long term ADPs. That capacity is a very important aspect that can be shared to build capacity in the other partner organizations. CRS's vision for scaling-up tends to focus on working from the national level to site-based activities implemented through other organizations in a number of major projects.

World Vision and CRS are both eminently suitable to be the lead in many respects. The two organizations appear to complement each others' capabilities in the context of this project. Our tentative conclusion is that we are leaning toward CRS as the most appropriate organization to lead the consortium at the national level. World Vision would then be a key partner to CRS to bring in their complementary strengths.

Malawi is tentatively classified as a Tier 1 country with the most favorable foundation among the eight countries to achieve rapid scaling-up of evergreen agriculture practices. **Tier 1**

countries have an indicative annual budget allocation of $1.750 million ($8.75 million over 5 years).

This is associated with an adoption target of 400,000 farms/hectares, by far the largest target compared to the other seven countries. This target is based on the fact that the country's dense rural population and strong drivers for EVA adoption have already resulted in viral impact already ongoing.

SWAZILAND

Background Situation on the Scaling-Up of Evergreen Agriculture

World Vision Swaziland operates in 20 out of 55 constituencies in Swaziland, and it promotes Climate Smart Agriculture technologies in all of these. In partnership with FAO, WVS has supported the uptake of CA, and CA with trees, by over 15,000 households.

WVS in partnership with the Swaziland Water and Agricultural Development Enterprise (SWADE) has engaged in a one-year project on land reclamation covering 50ha in the Lubombo region. Also WVS facilitated a community food-for-work project focussing on rangeland management which has supported 18,000 people.

WV has learnt from its existing programs and it seeks to increase demonstration plots, increase extension support and follow-up, include a focus on LVCD and market linkages, and to work with local schools to develop centers of learning.

Partnerships and consortia in Swaziland

It was noted by WV Swaziland that most partner organizations are not yet well-established in Swaziland. Accordingly, stakeholder and program mapping may need to be conducted to ensure that existing work is being effectively leveraged. Further, the project should engage relevant partner organizations to build their respective capacities as a foundation for future scaling-up efforts.

The Vision for Scaling-Up

The scaling-up activities proposed by WV Swaziland include mainly FMNR and CA with trees, and focus on 4 constituencies located in the eastern side of the country: Madlangempisi in the Hhohho region; Mkhiweni and EKukhanyeni in the Manzini region; and Mpolonjeni and Sthobelweni in the Lubombo Region.

Swaziland: A smaller country with limited short-term impact potential, and significant risks

WV Swaziland appears to be the only implementing organization with sufficient capacity and existing relevant programs to lead national implementation of the project. Our tentative

classification of Swaziland is as a Tier 3 country, reflecting its relatively smaller size, limited existing EVA programs and significant risk levels in achieving ambitious adoption targets.

The indicative annual budget for Tier 3 countries to scale-up evergreen agriculture practices is $625 thousand ($3.125 million over 5 years).

The tentative target for the number of farms/hectares on which adoption will have occurred in five years is 60,000.

TANZANIA

Background Situation on the Scaling-Up of Evergreen Agriculture

The most dramatic success of evergreen agriculture upscaling in Tanzania has occurred in the Shinyanga area in the northwestern part of the country. An estimated 370,000-500,000 hectares have been restored through the grassroots development of *ngitilis*, a local form of FMNR/ANR that has been implemented by farmers and herders in about 1000 villages. The Shinyanga HASHI Project was the springboard for this restoration process, which has occurred since the early 1990s. Healthier and more productive agropastoral woodland-savanna grazing areas have been restored through the rehabilitation of traditional *ngitilis*. The trigger for success in Shinyanga was the emphasis on building on the Sukuma peoples' local practices and experience. This model is ripe for further upscaling in other parts of the country, and there is considerable potential to adapt and out-scale the Shinyanga model. There have also been some additional projects that have attempted to deploy similar grassroots community-based NRM in various parts of the country, but it appears that these have had more modest success.

Norway has invested $80 million in national REDD-readiness, and in nine REDD+ pilot programs to create biocarbon opportunities. A carbon market in Tanzania has not yet been successfully established as a platform for conserving and regenerating forests. This is mainly due to the crash of global carbon markets, which has made biocarbon projects infeasible as a means to incentivize carbon offsetting in many countries. This may change in future years as carbon prices strengthen again.

The overall policy environment underpinning more effective approaches to accelerated on farm tree establishment in Tanzania is improving, with the impending enactment of the National Regreening Strategy by Parliament. The strategy includes a recognition of the major potential for ANR/FMNR to be an effective land restoration method.

The Ministry of Agriculture has also drafted a National EverGreen Agriculture Scaling-Up Strategy that aspires to reach 1 million farmers over the next five years with the adoption of evergreen agriculture practices.

A National Regreening Workshop was convened at Parliament in June, 2016, that reviewed the status and prospects for accelerating the adoption of ANR/FMNR and fertilizer/fodder shrubs and tree practices on farms and community forest/grazing areas. The meeting generated serious political momentum behind these developments. It also resulted in the launch of the National

Regreening Network, chaired by Bishop Simon Chiwanga, former Anglican Archbishop for East Africa, former Minister of Education, and chair of the LEAD Foundation. The National Regreening Network will be a vehicle for strategy implementation and can serve as an umbrella body for agroforestry related technology upscaling. There is now also a national FMNR 2020 Strategy with a target of reaching 5 million farmers by 2020.

The LEAD Foundation has been successfully promoting FMNR in a number of watersheds in the Dodoma Region and has been spearheading national political awareness of FMNR as an important practice for the restoration of Tanzania's farm, forest and grazing lands. The Network, which also involves World Vision, ICRAF, the Anglican Church, and other organizations, aspires to coordinate support to build the capacity of communities and farmers throughout Tanzania to adopt ANR/FMNR/evergreen agriculture. The Anglican Church of Tanzania has decided to promote FMNR/ANR throughout its entire network of parishes across the country. Many farmers already sustain *Faidherbia albida* trees on their farms in northern Tanzania and in Iringa in the south, where some further extension of the practice has been pursued in recent years.

World Vision launched a vigorous program of scaling-up FMNR in its Area Development Programs (ADPs) across the country in 2014. WV operates in 13 regions in Tanzania. Better natural resources management with FMNR is a pillar in its regional and country strategic framework. Currently, 25,000 HHs are developing FMNR on their farms in the Kilimanjaro, Singida, and Dodoma Region ADPs.

The BABATI Promoj project is a component of a large WV development program called 'Secure Africa's Future'. In Mbarati the project promotes land use planning and working with local government authorities to ensure that the communities in forested areas have management plans for forests. And it has a CA partnership with organizations in Kenya. It mobilizes farmers and pastoralists to set aside their land for FMNR, and the projects track progress by taking tree measurements. They note that there is an enabling environment in Tanzania, along with local and regional planning. In areas where they work they plan with district level planning teams – mainstreaming these activities in the districts. WV doesn't program across the whole country but focuses on the specific locations of their numerous ADPs.

ICRAF has conducted research on nitrogen-fixing fertilizer/fodder shrubs and trees for over 25 years in Tanzania, in collaboration with the National Agroforestry Centre and other agencies. Pilot scaling-up of these practices has been done in a number of locations, including the MICCA Project (CARE/ICRAF) in the foothills of the South Uluguru Mountains.

There are good examples of fertilizer tree systems featuring gliricidia-maize intercropping in Tabora and now in Dodoma under the Africa Rising Project, and the *Faidherbia albida* systems in Mbarali. ICRAF can provide guidance and technical support in scaling-up these technologies. In Dodoma, ICRAF has a network of farmer groups in 4 villages integrating gliricidia in their fields. In high potential areas, such as in the southern highlands, there is scope for upscaling small-scale timber production on farmlands. These systems have markets for timber and food crops produced on farm that can be expanded rapidly.

ICRAF has also been strengthening the institutionalization of evergreen agriculture, agroforestry and FMNR in the country by fast tracking the revision of the country's current agroforestry strategy, and it is preparing to promote the development of a national agroforestry strategy. ICRAF Tanzania works very closely with CARE, CRS and Ox-farm via the ACSAA Tanzania chapter.

CARE has been implementing a number of NRM and forest conservation projects in various parts of the country that may be a basis for scaling-up evergreen agriculture/FMNR/ANR. The Hillside Conservation Agriculture (HICAP)/MICCA has focused on conservation agriculture, VSLAs, soil carbon measurements, tree planting/agroforestry, and improved cookstoves.

CARE has a program called Sustainable Management that deals with land rights and agriculture. A major part of this program revolves around sustainable agriculture and conservation agricultural practices. The work is done by engaging the district authorities on extension and input supply. In their Pathways/WERISE project they are focusing on sustainable agriculture, agriculture extension, village savings and loan associations (VSLA), training paraprofessionals in agronomic practices, and women's empowerment. The CARE-WWF Alliance Conservation and Development Project has been working on climate smart agriculture, VSLA, agriculture extension, nutrition, community forest conservation, wildlife management areas conservation, water resources management, and value chain development (cassava, sesame, pigeon peas).

The Women's Empowerment and Natural Resource Governance (WENG) Project and The Forest Resources Transparency Programme (FOREST) have been engaged in civil society coordination, networking and multi-stakeholder collaboration. This is leading to inclusive management of forest resources; civil society effectively monitoring and advocating for appropriate forestry laws and regulations; civil society organizations empowering poor and vulnerable citizens to participate in the governance of forest resources in specific areas under threat; increasing the legitimacy, accountability and transparency of civil society organizations through capacity building; and ICT for technical and monitoring activities.

The Rain Falls Project was implemented in the Kilimanjaro Region from 2011-2014 in which improved soil and water conservation practices were promoted by 60 champion farmers (42 of whom were women) and this cascaded to 263 fellow farmers (144 of whom were women), and high adoption rates of soil and water conservation practices were observed.

CARE has strong in-house technical expertise, as well as regional CARE technical support for the up-scaling of evergreen agriculture in Tanzania. Its approach in Tanzania is based on the testing, adoption and scaling-up of technologies and practices through a network of Champion Farmers. These farmers are selected by local institutions under a Learning and Practice Alliance using a range of criteria including the capacity to adopt and innovate, willingness to engage in action research, and ability to reach out to and work with other early adopters in their communities.

Working with researchers and extension staff under the Learning and Practice Alliances they share the results of their experience with other farmers, and continue with further short cycles of action research across seasons to help determine costs, returns on investments, and ways of

scaling-up. On-farm soil and water conservation and management practices will become more important than ever for smallholder agriculture and CARE can bring this learning to a scaling-up effort for evergreen agriculture in Tanzania. The central focus of Champion Farmer engagement is to enrich and support empowerment of rural women, though it is recognized that farming communities cover a range of farmer types, so engaging both women and men is also key to wider success, particularly in triggering wider uptake and adoption.

Vi Agroforestry is a Swedish NGO that has been doing agroforestry extension in the Lake Zone of Tanznia for decades. It could be a partner with deep experience in working with farmers on the adoption process of key practices.

WWF is designing a program that could be included in the project. And that **CRS** has a model drawing on village level savings and loans programs that might also be a springboard for scaling-up EVA. These VLSAs may provide entry points through the associations, which are predominantly women farm-dependent. There's a structure there that often includes the incorporation of new farming practices, including the introduction of fertilizer trees. VLSAs have proven quite effective in the scaling-up of gliricidia fertilizer tree systems in Mali through the work of OxFam, and thus the opportunities here ought to be explored in further depth.

The Conservation Farming Unit has been promoting CA practices in Tanzania, which could also include the integration of fertilizer/fodder shrubs and trees.

Partnerships and consortia in Tanzania

In addition to the **National Regreening Network** (mentioned above), an important emerging network is the **National Alliance for a Climate Smart Agriculture**, that is connected to the African CSA Alliance, and is coordinated by CARE.

There is also a **Tanzania Natural Resources Forum**, involving four organizations working on land rights and land access to farmers, and a **Pastoralists Program** that works with local NGOs. WWF also has a consortium working in southern Tanzania.

A major question is how best can the EVA Project mobilize more partners and scaling-up successes through these networks and also influence more focused investment in EVA/FMNR/ANR by the partners and by the donors in CSA.

The Vision for Scaling-Up

World Vision's proposed way forward for scaling-up draws from their strong technical capacity in FMNR on the ground, building out through their extensive network of long term ADPs. That capacity is a very important aspect that can be shared to build capacity in the other partner organizations.

CARE's vision for scaling-up tends to focus on working from the national policy level to site-based activities implemented through other organizations. CARE emphasizes district support as critical, and they work very closely with district officials to strengthen the government extension

programs. They also develop paraprofessionals in each of the villages where they are working. Their operating principle is investing 70% of project funds through other organizations.

CARE and World Vision are the two proponents that have bid on being selected as the national lead NGO. They are both eminently suitable in many respects. Our tentative conclusion is that we are leaning toward CARE as the most appropriate organization to lead the consortium at the national level, given their experience and capabilities in coordinating and managing such consortia. World Vision would then be a key partner to CARE to bring in their strong technical capacity on the extension of the EVA practices, with which CARE has less experience and capacity.

Thus, the two organizations appear to complement each others' strengths and weaknesses quite well in the context of this project. Questions that still need to be addressed are ones that concern the depth of CARE's commitment to the specific value proposition of this project, given the lesser depth of its experience in the EVA domain; and the overall quality and scope of the country-specific proposal that they would be tasked to construct during the coming weeks.

Tanzania: A big country with a medium-high potential, but with significant risks.

The discussions emphasized that very fast impact on the ground in Tanzania be a challenge in Tanzania, although the basis for wide-scale adoption of EVA has now been established. It was noted that it may take time to gather momentum compared to the situation in some other countries. We have tentatively classified Tanzania is as a Tier 2 country, reflecting that there are major opportunities for scaling-up but these must be tempered with significant levels of risk that ambitious targets may be difficult to achieve.

The indicative annual budget for Tier 2 countries to scale up evergreen agriculture practices is $1.45 million ($ 7.25 million over 5 years).

The tentative target for the number of farms/hectares on which adoption has occurred in five years is 200,000. This target is somewhat more conservative than that indicated by CARE. Their preliminary target was that the number of HHs adopting EVA over the project duration, with additional project funding and building on existing programming, would be 285,000 across the consortium partnership. They noted that this doesn't include the possibility of an additional 250,000 HHs that might be anticipated if adoption could also be pursued through the large program of CRS on water use efficiency.

UGANDA

Background Situation on the Scaling-Up of Evergreen Agriculture

The Ugandan Government sponsored a national seminar on evergreen agriculture in 2013 and has supported the upscaling of evergreen practices for the past several years. Evergreen agriculture will be an important aspect to achieve the country's commitment to the African Restoration Initiative (AFR100) under which Uganda is now targeting to restore 2.5 million

hectares of degraded land by 2030. There are a number of locations where scaling-up is being promoted, and several projects under way providing support to the effort.

World Vision Uganda first implemented the Farmer Managed Natural Regeneration (FMNR) model in its Offaka Area Development Program (ADP) from 2011 to 2013. Given the success of the project, including increased tree cover and fodder for animals, among other benefits, from 2012, the project was expanded to the WV Area Development Programs in Kibaale (Nalweyo), Kotido (Nakapelimoru), Abim (Nyakwae), and Nakasongola district (Nakitoma sub county). Offaka served as the learning site for the farmers from the newly selected areas. At present, 38 Area Programmes are rolling out FMNR. They are operating in over 65 districts with longstanding relationships with the public and private sector and they are deploying models for community empowerment.

The model is being implemented through FMNR Training of Trainers with 280 FMNR Champions operating at the institutional and community levels. The FMNR Champions are training other community members. Community learning sites have been established so that the newly trained farmers can visit them, learn and replicate the practice on their farms. The children and teachers at 45 schools have been trained in FMNR and they have established environmental clubs through which messages of environmental conservation are delivered to other children and the wider community through songs, drama, and essay writing. This is done in partnership with Tree Talk Plus. The project has also introduced the Children's Handbook and Teacher's Guide on Environment with the goal of introducing the model into the school curriculum. Through this, children and teachers have been able to learn more about the model as part of their regular classroom lessons.

WV Uganda has also built a Uganda FMNR Network of livelihoods implementing organizations with the goal of scaling up FMNR, scaled up this work and implemented an innovation project in 2014 and 2015 on improving access and use of weather forecasting for agriculture planning and decision-making by rural farmers and increasing the adaptive capacity of rural farmers to climate change. In addition, WVU is collaborating with the World Agroforestry Centre (ICRAF) and District Local Governments to support the implementation of FMNR. This initiative strives for the restoration and improvement of degraded agricultural land and aims to increase resilience to climate extremes through natural reforestation and agroforestry.

WVU supports the FMNR network, which is an independent movement and continues to build the momentum towards land restoration in Uganda. It has a membership of 35 NGOs and CBOs that are mobilized to support the expansion of the best practices in FMNR and evergreen agriculture. The Uganda FMNR network came into being in 2014 during the FMNR national conference. It is a unique organization in that it is having a big impact in spreading FMNR.

The network planned to support 12 National and Local level institutions to integrate FMNR into their programs. As a result 26 organizations now report having integrated FMNR into their programs. These include MAP international, PADO-Uganda, JICODI, SEDEFO (semi desert foundation), KOPEIN, Warriors Squad Foundation, Restless Development and the Uganda Land

Allain from Kotido. In addition, 7 new organizations signed up to become members of the FMNR network at the national level.

In Kibaale, 18 organizations have also committed to setting up an FMNR network at the district level. These are Bujuni Catholic parish; Kihaimira Forest conservation; Pachwa Linda Obuhangwa; Development Alternatives program (DAP); Uganda rural development training; Bunyoro Tourism and environmental conservation; Albertine Environmental conservation initiative; World Voices Uganda; Kagadi-Kibaale community radio; Kagadi-Kakumiro-Kibaale tree growers' association; Bugarama private forest owners' association; Kibbuse foundation; Eco-Agric Uganda; Kibaale civil society network; Harness nature Kakumiro; EMESCO Foundation; Provate tree nursery operators and Nalweyo catholic parish. Each organization volunteers resources to host each network meeting.

CARE takes a three pronged approach to its programming in Uganda, demonstrating innovation to promote learning, building capacity of clients/beneficiaries and advocating government to uptake the innovations and other partners to scale-up the practices. Advocacy is mainstreamed in all actions of CARE Uganda and the country office a fully-fledged advocacy working group to champion key ideas, successes and amplify the voices of vulnerable communities. CARE promotes farmers' engagement with duty bearers and creates a platform for dialogues and civic engagement.

CARE is implementing the Partners for Resilience Program which is diversifying livelihood activities and developing village savings and loan activities to create alternative sources for livelihoods, and has model farmers working on CA and small-scale irrigation, and rainwater harvesting ponds for kitchen gardens. The project involves the national meteorological authority on early warning systems. It is implementing a community-based adaptation program for Uganda's wetlands, including a component developing wetlands management plans and bylaws used to manage conflicts, and policy dialogues, and advocating for the national climate change policy. CARE earlier implemented the Global Water Alliance which looked at resilience as well. And had a number of actions in capacity building through the ACCRA Consortium. In terms of extension for agroforestry CARE works through the district forest services in 17 AE zones and provides relevant technical services.

Another complementary project is using the governance approach to climate change, which includes tree planting with the national forest authority, supports communities maintaining woodlots on their land and setting aside land for communities to expand woodlots, and the better implementation of forest laws and policies. CARE has a team of foresters, two agricultural economists, an agronomist working on women's empowerment and senior staff working on DRR and climate change. CARE works with local partners on ground doing some of this work and with district government and the Ministry of Local Governments. CARE's grants and activities are largely implemented through partners with over 50% of expenditures subcontracted to them. These are managed through a subgrants coordinator that manages partnerships and consortia and collaborates with peoples organizations such as Advocates Coalition for Environment (ACCORD), and the Northern Uganda Womens Organizations and PELEM. CARE, together with its partners, has just revisited its country program strategy and has agreed to refocus more on sustainable agriculture based on findings of the analysis.

Landcare Uganda is a vibrant Landcare Association that is active in several parts of the country in supporting grassroots farmer groups to address sustainable land management and food security through agroforestry. This includes the Mt Elgon area and in the central and southern parts of the country.`Uganda Landcare is allied with the Uganda Master Tree Growers which hosts trainings on agroforestry management.

ICRAF Uganda runs a number of projects related to evergreen agriculture in collaboration with national and international partners, including the Trees for Food Security Project that is refining evergreen agriculture practices and extension methodologies. And it provides technical support for the Uganda FMNR Network hosted by World Vision.

ACDI/VOCA is implementing a large project in Karamoja that includes FMNR upscaling.
IUCN is active in supporting the Uganda Government's efforts to assess land restoration opportunities to address its restoration target.

Partnerships and consortia in Uganda

There are several important networks that already are active in the scaling-up of evergreen agriculture, or can engaged for this purpose. These include:

- **The Uganda FMNR Network,**
- **Uganda Landcare Network,**
- **Africa Climate Change Resilience Alliance (ACCRA), and the**
- **Uganda Climate Smart Agriculture Alliance** (which includes CARE, WV, Concern Worldwide, OxFam, Save the Children, and the Ministry of Agriculture, among others).

All of these networks have objectives that are well-aligned with the scaling-up of evergreen agriculture/FMNR, and they provide a unique opportunity for further engaging in joint programming, learning, scaling-up and joint advocacy for ever green agriculture.

The Vision for Scaling-Up

World Vision's proposed way forward for scaling-up draws from their strong technical capacity in supporting FMNR expansion on the ground, and building out through their extensive network of long term ADPs. That capacity is a very important aspect that can be shared to build capacity in the other partner organizations. CARE's vision for scaling-up tends to focus on working from the national policy level to site-based activities implemented through other organizations.

CARE and World Vision are the two proponents that have bid on being selected as the national lead NGO. They are both suitable in many respects. Our tentative conclusion is that we are leaning toward World Vision as the most appropriate organization to lead the consortium at the national level, given the strength and breadth of their experience and capabilities in successfully scaling-up FMNR, and in coordinating the national FMNR network.

Uganda is tentatively classified as a Tier 2 country with a very favorable foundation to achieve rapid scaling-up of evergreen agriculture practices. Tier 2 countries have an indicative annual budget allocation of $1.45 million ($7.25 million over 5 years).

The tentative target for scaling-up is 200,000 farms/hectares.

ZAMBIA

Background Situation on the Scaling-Up of Evergreen Agriculture
Evergreen agriculture has been promoted for many years by the country's agricultural extension system and the Zambian Conservation Farming Unit. The national recommendations are to establish *Faidherbia albida* trees in crop fields at a density of 100 trees per hectare (10m x 10m spacing). Hundreds of thousands of maize farmers have been trained in the technology and have received *Faidherbia* seed in this program. The CFU has recently received major new funding for their extension efforts on conservation farming practices and they plan to intensify their work with *Faidherbia* upscaling as a component of CA.

World Vision Zambia is implementing 28 Area Development Programs (ADPs) across the country. The scaling-up of FMNR has been made a core part of their current national NRM strategy, with strengthened programming surrounding agroforestry and conservation agriculture. More than half of the ADPs are now promoting FMNR and plans are under way to build that capacity into the other ADPs in the immediate future, and to have a specialized staff member dedicated to FMNR in each ADP with sustainable development programs. They are shifting from a strong emphasis on conservation agriculture extension toward much more emphasis on FMNR and agroforestry in all of the ADPs.

During 2015 a total of 40,000 households were reached with CSA and EVA practices. WV proposes that number of households that can be reached with additional funding is estimated to be 225,000 to 250,000. Working with CRS, OxFam, Concern and others in the CSA Alliance they believe that even more households than number this can be reached. The WVZ program has just obtained funding for a large new project on FMNR, which can be linked in to further support the GCF evergreen agriculture upscaling program.

World Vision, along with its partners, is also promoting the upscaling of *Faidherbia albida* as a fertilizer tree, particularly taking advantage of CFU expertise where they have a joint presence. In the southern province WV is emphasizing fodder shrubs for dairy cows and goats, linking agroforestry support to the development of dairy enterprises.

CRS has an agricultural livelihoods department that is promoting integrated soil fertility management systems with herbaceous and tree legumes. They are working with FAO, Concern, OxFam and others on this. They are also collaborating with COMACO and the Grasslands Trust in promoting pigeon peas and cowpeas.

In Eastern Province, the non-profit private enterprise COMACO has assisted thousands of farmers to establish alley cropping systems with nitrogen-fixing trees in their crop fields, which

have dramatically increased yields and sustained production during drought years. COMACO is currently gearing up to implement a World Bank biocarbon project covering the whole of Eastern Province that will further support the expansion of agroforestry. Pioneer Seeds Company and Cargill Seeds have also supported the upscaling of EVA practices, making Zambia an example of how the private sector can engage in the promotion of evergreen agriculture at scale. This work is building upon 25 years of research and extension by ICRAF and the Department of Agriculture on fertilizer tree and shrub systems.

ICRAF has been developing evergreen agriculture practices in collaboration with the national research program for over 25 years in Zambia, with a particular focus on fertilizer shrubs and tree systems suited to the conditions in Eastern Province. It has provided technical support to a number of scaling-up projects over the years. Recently, this included a project to scale-up fertilizer shrubs and trees through the network of Pioneer maize seed dealers. Currently, it is working with the Nutri Aid Trust to train agrodealers to carry tree seed in their shops in Eastern Province. Nationally there are about 3000 agrodealers that could be stocked with tree seeds and extension materials so that the dealers can effectively serve as sales and extension agents for agroforestry.

The Grassroots Trust is working at the chiefdom level in several parts of the country to promote a holistic approach to NRM in communities, in order to control burning and indiscriminant livestock grazing. The implementation of these practices at the local level will be an important foundation to enable FMNR and ANR to gain traction throughout the country. Total Landcare is also now active in Zambia, and it has established numerous natural regeneration demo plots of FMNR/ANR in Eastern Province.

Concern Worldwide, and its partner Self-Help Zambia, are implementing a number of projects throughout Zambia, including work on conservation agriculture, upon which the scaling-up of evergreen agriculture practices can be built.
The above summary of activities indicates that there is a strong foundation in Zambia for the rapid scaling-up of a range of evergreen agriculture practices. This provides the basis for a strong consortium that can leverage this into a coordinated and coherent national scaling-up effort. The Zambian Alliance for Climate Smart Agriculture already includes all of the key players, and can be a basis for strengthening policy support for the EVA scaling-up effort.

Zambia: A big country with high potential

Zambia is tentatively classified as a Tier 2 country with an indicative annual budget to scale up evergreen agriculture practices of $1.5 million ($7.5 million over 5 years).

The Vision for Scaling-Up

World Vision’s proposed way forward for EVA scaling-up draws from their strong technical capacity in FMNR on the ground, building out through their extensive network of long term ADPs. That technical capacity is a very important aspect that can be shared to build capacity in the other partner organizations. . They have indicated an ambitious target for the proposed number of households that can be reached with additional support: 225,000 to 250,000.

CRS' vision is to expand the scaling-up work through a number of partners, and to build on their current focus on integrated soil fertility management systems.

CRS and World Vision are the two proponents that have bid on being selected as the national lead NGO. They are both eminently suitable in many respects. Our tentative conclusion is that we are leaning toward World Vision as the most suitable organization to lead the consortium at the national level. This is due to their strong technical focus and demonstrated commitment to the scaling-up of EVA practices, particularly FMNR, and their strength on the ground across the country. CRS would then be a key partner to WV. The two organizations appear to complement each others' strengths quite well in the context of this project. There is great potential to build a truly national alliance that supports and expands the scaling-up work of many partners. Thus, effective consortium leadership and an optimal sharing of resources for maximum impact will be an important aspect to come to grips with in acheiving success.

Zambia is tentatively classified as a Tier 2 country with a favorable foundation to achieve rapid scaling-up of evergreen agriculture practices. Tier 2 countries have an indicative annual budget allocation of $1.45 million ($7.25 million over 5 years).

The tentative scaling-up target for Zambia is 200,000 farms/hectares.

This is based on the strong current upscaling efforts that are already going on. However, it is noted that Zambia has a relatively less dense farm population and higher forest cover than most other countries, and this has meant that the drivers for evergreen agriculture are not as favorable as in other countries such as Malawi, where farms are very dense and there is a much greater forest cover in local communities.

ZIMBABWE

Background Situation on the Scaling-Up of Evergreen Agriculture

World Vision Zimbabwe first promoted the FMNR and Evergreen Agriculture concept in Zimbabwe in 2013 through presentations and a workshop for interested NGOs. In 2015, WV Zimbabwe sent delegates to the Beating Famine conference in Lilongwe, a landmark event that highlighted the impacts of FMNR. Plans for FMNR scale up were made at the conference and were used by World Vision Zimbabwe in its subsequent planning processes.

World Vision Zimbabwe is now promoting FMNR through the USAID-funded Enhancing Nutrition, Stepping Up Resilience and Enterprise (ENSURE) Project in partnership with SAFIRE, SNV and CARE, through the Australian DFAT-funded Matabeleland South Integrated Health and Livelihoods Project, and through a number of its longer-term Area Development Projects. WVZ is working with CARE on the ENSURE project on a regreening strategy. CARE working in three districts and WV in another 3 districts. There are currently a total of five demonstration plots covering more than 40 hectares and targeting approximately 250 households for trialing and show-casing the FMNR concept. A total of 310 individuals have received

training on the FMNR concept in these targeted communities and they are assisting with cascading the FMNR concept to 1000+ surrounding smallholder farmers. These demonstration and learning plots have provided a strong and promising platform for potential scale-up into all of World Vision Zimbabwe's 29 Area Development Programs.

FMNR is a major priority for WVZ in addressing the development of foundational soil and water assets at the farm and community level, and in developing resilience and livelihoods. They are trying to merge FMNR with their economic development value chain model. In this they are working with all the government departments, including the Forestry Department and the Environmental Management Agency which started taking up evergreen agriculture practices before WV did, by selling Faidherbia and sesbania seedlings to communities.

The CARE Zimbabwe program is involved in several different sectors with a track record in food security and to a lesser extent small-scale agriculture as part of that. A new grant from UNDP has been obtained for the development of the small scale agriculture model using the CARE principles focused on sustainable productivity, equity and resilience. One value add is their gender analysis in agricultural livelihoods. The have a good team working on soil and water conservation and conservation agriculture for several years. CARE is doing rangeland management in the southern part of the country based on the Holistic Grazing Systems of Alan Savory.

CRS in Zimbabwe has been working on food security with an emphasis on conservation agriculture. They are doing a trial with CIMMYT on green manure cover crops to improve soil fertility in the country with a pilot to scale-out GM/cover crops in Mwewa District. They are collaborating with the University of Zimbabwe farmer learning centres - doing research and farmer extension on improving soil fertility and market linkages.

Prior to the ENSURE project that is now implemented by WV and CARE, there was a huge PRIZE project implemented by CRS with a lot of environmental works. CARE was involved in that consortium with a focus on environmental issues and trees planted. A large new OFDA program is now going to be implemented by CRS in four districts to improve food security and the environment, and may be linked to the evergreen agriculture scaling-up activities.

The CRS expert on low-cost ICT solutions may be able to contribute on digital beneficiary registration, and on monitoring activities involving beneficiaries. CRS is also starting up a new collaboration in 2017 with ILRI on livestock interventions with an emphasis on fodder shrubs.

ICRAF had a small team in Zimbabwe that recently finished up a couple of decades working on agroforestry research, training and upscaling. In recent years much of the focus was on the scaling-up of fodder shrubs with dairy farmers in collaboration with Land O'Lakes, an American dairy cooperative, with funding from USAID. ICRAF had also been scaling-up the practice of establishing faidherbia trees in croplands with cross-visits to a valley in north-central Zimbabwe where farmers have traditionally cultured these trees across the landscape.

CIMMYT is conducting major research on CA and has now been graduating to a CA with trees approach.

The Campfire Movement of Zimbabwe was very much akin to a landcare approach. It was run by the government. In some areas it is still running well, such as in the Matebeleland miombo forests with teak trees. Timber trees that are produced through the Campfire Program are replaced after harvest.

The Friends for the Environment NGO is working on the planting trees and has a target of establishing 500 million trees by 2026.

The Forestry Commission is currently planting 6.5 million trees annually with a 65% success rate. The Government has proposed to plant 50 million more trees in 10 years through the Ministry of Environment, which may provide a good entry point for linkages with evergreen agriculture/FMNR upscaling. There are also a number of projects of the Ministry of Agriculture and the Environmental Management Authority under the Ministry of Environment that are working on grazing systems management. That may also provide an entry point for assisted natural regeneration (ANR).

Other potential collaborating organizations are Concern, the Barefoot Trust, Permaculture, and the Ministry of Agriculture Dept of Research Services – and livestock people at the research stations.

The Ministry of Water and Environment has the focal point for the GCF: Mr Washington Zacakata.

The Vision for Scaling-Up

The joint review of the current work and capabilities of the international NGOs led to consensus that World Vision was best placed to lead the consortium in Zimbabwe, considering their experience and current coverage on scaling-up FMNR.

Zimbabwe is tentatively classified as a Tier 2 country with a very favorable foundation to achieve rapid scaling-up of evergreen agriculture practices. Tier 2 countries have an indicative annual budget allocation of $ 0.625 million ($ 3.125 million over 5 years).

This is associated with an adoption target of 60,000 farms/hectares, a relatively modest target that recognizes that the foundation for rapid scaling-up is still in the early stages of development.

SUMMARY OF ANALYSIS

The below is a summary of baseline projects and the potential to scale up given the institutional capacity present in country. Countries are placed into Tiers to provide initial targets and budgets as determined from the analysis.

Project Country targets and budgets

Tier 1 countries: Very good EVA infrastructure established, big impact potential, least risk
Annual budget: $1,750,000 per year average

Target 400,000

- Malawi – dense rural population; strong drivers for EVA adoption; 2-3 m farms; with viral impact already going

Tier 2 countries: Big or Medium countries, medium risk, medium potential impact
Annual budget: $1,450,000 per year average

Target 200,000

- Uganda – Good EVA infrastructure; strong FMNR network; dense farm population.
- Zambia – Strong current upscaling going on; less dense farm population
- Tanzania – Scaling-up infrastructure just being established.
-

Tier 3 countries: Smallest size, least short-term potential impact, significant risk
Annual budget: $625,000 per year average

Target 60,000

- Zimbabwe – Early days for scaling-up; significant political risk.
- Burundi – Early days for scaling-up; FMNR less potential; significant political risk
- Swaziland – Early days for scaling-up
- Lesotho – Early days for scaling-up

Annual budget across all eight countries: $8.8 million. 5 years x $8.8 million = $ 44 million.

Total target = 400k + 600k + 240k = 1.24 m farms (1.1m estimate used to account for variations)

Imputed cost per farm is $ 50 million / 1.1 million farms = $ 45 per farm/ha.

SPATIAL ANALYSIS OF THE PROPOSED SITES

The locations of the current successful experiences in the scaling-up of evergreen agriculture practices in each country were identified and the GPS coordinates were noted. Location data was also collected on the proposed sites for scaling-up of the technical interventions during the project. High-resolution Google Earth maps were accessed for each of these sites. These maps were then analysed to obtain the current land use, and precision estimates of tree density per hectares and tree cover percentage. The Collect Earth tool of FAO was used to obtain this data (www.openforis.org/tools/collect-earth.html).

Collect earth Tree Cover Methodology

The study was conducted on high resolution satellite imagery from google earth which can magnify to enable data collection and interpretation. A grid of 1 hectare was overlaid over the image of the area of interest. This is done over the entire region to narrow down to the area of

interest on QGIS. Once the grids were produced; a specially designed survey is then customizable to various study needs by clicking at any point within the sampling point or grid. A grid spacing of 1000m was used. The tree cover percentage was computed based on the tree count from the high-resolution imagery that was guided by the sampling dots within each sampling plot or grid. The trees counted are only those that intersect with the sampling dots.

Each sampling dot is 2m by 2m at spacing of 20m by 20m and there are 25 such dots within each sampling points. This is then expressed as a percentage of the total area of the sampling plots 1 hectare for this study. This information was then entered into the survey card and saved awaiting the analysis stage. In the survey, the tree cover classes are recorded based on the six IPCC classes on the land use categories that include: croplands, forest, settlements, wetlands, grasslands and other lands. The croplands tree cover further subdivided into 3 sub categories: the farmland, on boundary and within farmland tree covers.

Analysis of the data was done on a systemic platform called the Saiku. Once all the plots were sampled, they were directly exported to the saiku server where the analysis was done. The saiku analysis presents useful information that can be presented in pie charts, waterfall charts, bar graphs and dot charts based on the information that was initially entered in the plots using the specially designed surveys.

The points were later exported to the google earth engine to conduct a validation process through a supervised classification and also to map the tree cover classes. The tree cover map would be the exact representation of the data outputs of the saiku analysis. From the saiku analysis one is able to conduct a query and generate diverse data interpretations for a study area.

COMMON PHYSICAL FEATURES OF THE PROPOSED PROJECT SITE(S)

PROCESS FOR SITE SELECTION

Vulnerability to Climate Change

The target project sites are areas of smallholder agriculture with farming populations exhibiting high levels of poverty and vulnerability to climate change, along with a high potential for sustainable climate change mitigation (landscape carbon storage potential). These areas are characterized by a high potential for achieving enhanced climate resilience through the project interventions, including improving environmental conservation and increased socioeconomic benefits. They are areas that have been subject to land degradation in a series of human-induced drivers of land use change such as agriculture, settlements, biomass demand and population pressure, among others. These drivers have resulted in a hazardous cycle of degradation effects on both natural landscapes (such as degraded forests) and on poorly managed agricultural lands and on unmanaged rangelands.

Proximity

The identified project areas will be areas of out-scaling from locations where the recommended project interventions (evergreen agriculture practices) have already been successfully adopted at

scale. Thus, the potential exists to spread out the good land use practice impacts to neighboring landscapes in the vicinity.

Land Use and Land Cover

The general land use types for the proposed project sites in all eight target countries are predominantly croplands and rangelands. These two categories have the highest potential to adopt low-cost climate resilience activities such as evergreen agriculture with farmer-managed natural regeneration (FMNR). The diversity of agricultural conditions across the eight countries invites a deeper understanding and analysis of the farming systems to inform evidence-based policy and decision making, particularly with regard to the specific choices to be made among the three key evergreen agriculture project intervention practices.

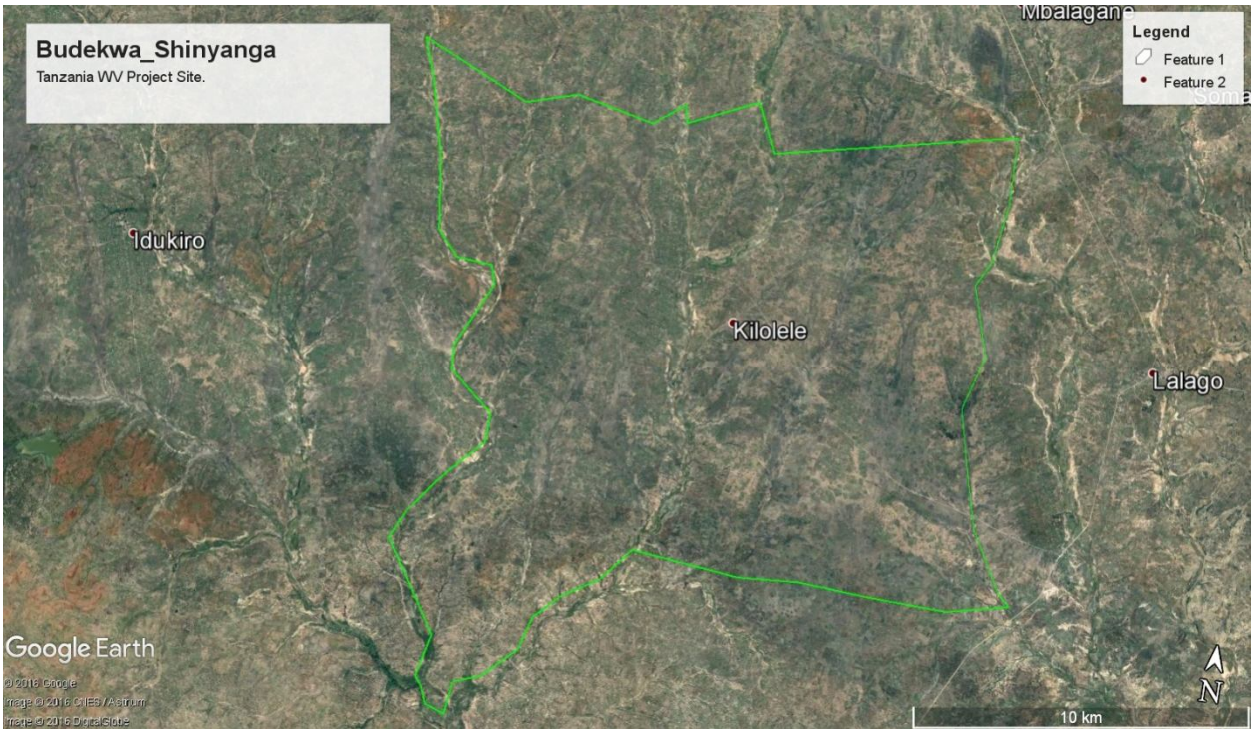
The land use classes of focus in the project are those that are characterized currently by low tree-cover densities. The current tree cover densities across the project sites do vary by country and by site, based on the agro ecological zones, climatic conditions and current farming and grazing practices. The standard definition of low tree cover that is adopted for the project is a percentage tree cover of less than 10%. The average tree covers for all the project sites as mapped is at 6.7%.

For the croplands, the project interventions of evergreen agriculture that will dramatically increase the density of tree cover, offer the opportunity to reverse the detrimental trends exacerbated by poor farming practices and climate variability and climate change, that have resulted in the massive loss of topsoil, and soil fertility, soil organic matter, and soil water holding capacity. The project interventions will restore these soil properties through very low cost practices that will also maximize longterm carbon storage and increase food productivity.

Soils

The soil types across the land uses for the project areas that support agricultural productivity are predominantly loams to sandy loams. But they have been subject to anthropogenic drivers of degradation. Reversing the trend of soil fertility depletion in all farming systems has become a major development policy issue. Technical options include the optimization of crop-livestock interactions, integrated use of organic and inorganic nutrient sources, and in particular the establishment of fertilizer shrubs and trees along with other conservation agriculture practices.

The project areas selection criteria was largely based on the features readily identified to be directly attributed to the imperative of increasing climate resilience, including the nature of the landscapes based on their biophysical indicators (land use, tree cover densities and agro ecological zones) and terrain characteristics. The factors such as the hydrology, sediment and the river morphology could not be directly attributed to climate resilience in the context of the project, hence they not given direct consideration in site selection.



TECHNICAL FEASIBILITY OF THE INTERVENTION - EXPECTED IMPACT

THE PROPOSED INTERVENTIONS

The proposed project will be scaling-up three best available technologies/practices that have already proven to be popular with millions of African farmers once they have been exposed to them. These practices are:

- **Farmer-managed natural regeneration (FMNR) of trees in crop fields** and community lands to increase crop yields, better protect crops from high temperatures and drought, provide enhanced supplies of fuelwood and fodder for livestock during the dry season.

- **Establishment of fertilizer trees (particularly Faidherbia albida)** at a density of 100 trees per hectare to dramatically increase crop yields, buffer crops from drought, and provide additional supplies of fuelwood and nutritious fodder for livestock.

- **Establshment of fertilizer shrubs at a high density in crop fields** (1000-5000 shrubs per hectare) managed through coppicing to provide large increases in crop yields, large annual increments in fuelwood production, and enhanced livestock fodder supplies.

These practices have been studied and refined through decades of scientific research by the World Agroforestry Centre, and by its partner research organizations in the project countries.

They have met the test of popularity with farmers in many other African countries as well (Garrity et al, 2010). The evidence shows that millions of farmers have already adopted these practices, but there is potential for tens of millions more farmers to adopt them during coming years. These practices are innately pro-poor. They are most suited to benefitting very poor farm households that lack the investment cash to purchase crop inputs or alternative source of cooking and heating energy – or find such investments too risky for their meager budgets.
The eight countries that will be included in this project were carefully selected to be ones where there has been evidence already compiled that these practices have been successfully scaled-up. This provides a solid foundation for our confidence that there is enormous potential for success in dramatically accelerating the scale of adoption during the coming years – if appropriate investments are made in addressing the key challenges in doing so.

The key challenges to the massive scaling-up of these practices are (a) Exposure by farm families to the technologies and their gaining an understanding of how to establish and manage them under their particular circumstances, (b) Access to quality seeds or seedlings of practices 2 and 3 (practice 1 does not require planting), (c) Community cooperation in areas where young trees need to be conserved and protected from ruminant livestock browsing during the dry season. These are the challenges which this project was specifically designed to overcome.

Each of these practices has been refined for application to take into account the variations in the socio-ecological environments and farming systems in each of the countries. The key refinements in the technologies involve alternative choices in the tree species/variety that is selected for regeneration or planting; the choice of the optimum density for the trees in crop fields depending on local circumstances; and the pruning regimes to be used to meet the range of priorities that farmers may have in terms of increasing their crop yields, or producing more fuelwood or fodder supplies. Farmers will be the ultimate arbiters as to the refinements in the management practices that they feel are most suitable to their family/s circumstances among the options available to them through the project.

The comparative advantage of UN Environment in the fields of climate change adaptation in general, and Ecosystem-based Adaptation in particular, will support the identification and adoption of emerging best practices throughout the project implementation period. The experience gathered by UN Environment in the field of EbA is growing constantly as a result of the findings and outcomes of multiple UNEP EbA projects funded by GEF, Adaptation Fund and other bilateral funds. UN Environment is a globally recognized leader in Ecosystem-based Adaptation methodologies and approaches to climate change adaptation.

MODIFICATIONS IN THE TECHNOLOGIES BASED ON INDUSTRY BEST PRACTICES

FARMER-MANAGED NATURAL REGENERATION (FMNR)

FMNR is the selection of naturally regenerating tree seedlings in crop fields. Tree seedlings establish themselves naturally in virtually all crop fields on small-scale farms in Africa. The seedlings may emanate from seeds that are present in the soil, or they may be the aerial regrowth

of tree root systems that have been present in the field ever since farming was practiced there. In order to regenerate trees from the seedlings or root systems, the farmer learns to select the most useful species and to prune them so that only one or two shoots are maintained. These seedlings are then protected from grazing livestock, from fire, and from being inadvertently weeded out during the crop-growing season. They will soon grow into full-canopy trees that are further pruned during their growth to harvest fuel wood and fodder supplies and to manage the tree canopy to provide the optimal density of shade for sheltering the crops from drought and over-radiation.

FMNR is and can be practiced successfully across a very wide range of climatic conditions and soil conditions in African countries. The practice is particularly well-suited to the subhumid and semi-arid conditions that are typical for the vast extent of rainfed crop production on the continent. These are conditions where the planting of tree seedlings is more problematic due to periodic drought spells. Higher success rates with tree planting are harder to attain in arid, semi-arid and subhumid conditions. Technically, FMNR is also possible and is practiced in higher rainfall climates. However, communities generally have more options in more favourable climates and farmers may choose to plant high value fruit and timber trees in addition to or *in lieu* of practicing FMNR in these agroecologies.

The density of tree populations on farmland is ultimately the prerogative of the individual farm family. The optimal numbers of trees depends on a number of factors, including the particular species of trees, the products desired from the trees, the canopy management practices, and the experience of the family in integrating trees with their crops. For instance, in areas where ***Faidherbia albida*** is the dominant naturally-regenerated tree species, a population of 100 to 400 trees is considered optimum during the early years, but would be thinned down to 50 trees as the stand matures, since this species has great longevity (70-100 years) and grows to a very substantial size with a widely-spreading canopy. In areas where other native fruit, fuelwood and fodder tree species are the dominant regenerants, the trees may be pruned heavily and a population of up to 200 trees per hectare may be sustained. Thus, the range of tree densities that are regenerated may be anywhere in the range of 10 to 200 trees per hectare, depending on the local situation.

The practice of FMNR is also a very effective way to protect and manage natural regeneration on abandoned cropland and degraded land off the farm - on community grazing lands and on degraded forest land. In these circumstances, community organizations mobilize to thin, prune and sustain an optimal population of trees on these lands to ensure healthy conditions for both healthy production of grass vegetation and tree growth.

FMNR implementation experience[14] shows that communities and individuals tend to be more open to adopting this practice when:

- There is a shortage of firewood and building timber
- Loss of tree cover has negatively impacted crop yields and livestock productivity
- Landscapes are deforested and degraded

[14] FMNR Integrated Project Model, January, 2012. World Vision Internal Document.

- The environment has lost critical levels of biodiversity
- Community members are forced to migrate for work due to decreasing crop yields and farm profits
- FMNR constitutes a considerable income generating opportunity
- Where tree loss has contributed to some or all of the following, making environments less habitable - stronger winds, more prolonged droughts, more severe floods, higher temperatures, dust storms, decreased seasonal water flow and well recharge, etc.

The success of FMNR will be increased in the presence of enabling policies providing user rights or ownership to natural resources are in place and understood by the local population. Also, FMNR tends to flourish where organizational structures are in place, such as cooperatives and farmers organizations with a set of by-laws devised by all stakeholders.

There is no set class of stakeholder most likely to adopt evergreen agriculture practices. The majority of adopters tend to be poor small holder farmers, but better off farmers who see an opportunity to increase and diversify their income streams are also numbered amongst adopters. Vulnerable households tend to also be the main adopters of FMNR, perhaps because of the low cost and low risk coupled with relatively quick benefits. Generally speaking, stakeholders who have experienced setbacks such as recurring drought and crop failure, or who no longer have access to previously freely available natural resources such as fuel wood and building materials, wild food harvest, traditional medicines and fodder, those who are experiencing reduced soil fertility and resulting declining crop yields and those who have few alternative livelihoods strategies to draw on, are more receptive to adopting FMNR.

The biggest determining factor to success - more important than climate, geography, or even presence of tree stumps - is the attitude of communities and individuals, their willingness to try and their commitment to succeeding.

FMNR is about decision-making, and community ownership is essential. The physical practices that are part of the FMNR movement are important, but they will not succeed unless the people who use the land are agreed on how to regenerate and manage their trees:

- FMNR succeeds best when everyone who uses, or has access to the land that is being managed is engaged in the process from start to finish, otherwise trees may be destroyed and conflict may arise.
- All stakeholder concerns need to be understood and addressed. All stakeholders should take part in creating and using the bylaws and other agreements that determine how the whole community will manage and benefit from trees.
- For FMNR Facilitators who are not part of the community themselves, building relationships is especially important, because they will not have credibility until they are known and trusted.

FERTILIZER TREES ESTABLISHMENT IN CROP FIELDS (WITH *FAIDHERBIA ALBIDA*)

Faidherbia is a nitrogen-fixing acacia species that is indigenous to Africa and is widespread throughout the continent. What makes it unique is its growth habit, known as 'reverse leaf phenology' (Barnes and Fagg 2003). *Faidherbia* goes dormant and sheds its foliage during the early rainy season, at the time when field crops are being established. Its leaves only regrow at the end of the wet season. This unusual phenology makes it highly compatible with food crops, since it does not compete with them significantly for light, nutrients or water during the growing season. On the contrary, annual crops in the vicinity of *Faidherbia* trees tend to exhibit improved performance and yield (Barnes and Fagg 2003).

Numerous published reports have recorded increases in maize grain yield when grown in association with *Faidherbia*. These reports range from increases of 6% to more than 200 % (Barnes and Fagg 2003), depending on the age and density of trees, agronomic practices used and the weather conditions. *Faidherbia*'s effects tend to be most remarkable in conditions of low soil fertility. In Zambia, results of 15 sets of observations conducted by the CFU in the 2008 growing season found that unfertilized maize yields in the vicinity of *Faidherbia* trees averaged 4.1 t/ha, compared to 1.3 t/ha nearby but beyond the tree canopy (Aagard 2009). Similar results were obtained in the 2009 and 2010 growing seasons. The work also drew on observations in Malawi, where maize yields were increased up to 280 % in the zone under the tree canopy compared with the zone outside the tree canopy (Saka et al. 1994).

The association between *Faidherbia albida* and increased crop yields is well documented. Barnes and Fagg (2003) noted in their comprehensive monograph on the species that "there has been a huge amount published on the beneficial effect of *Faidherbia albida* on the soil once it is established". Most of these studies have observed significant increases in yield beneath or near the trees. They observed that the tree is found over a wide range of soils and climates and with varied plant and animal associates, from desert to wet tropical climates. However, it does not tolerate competition from other plant species, and thus does not have invasive tendencies.

Mokgolodi, Setshogo et al[15] stress the fertiliser value of *Faidherbia albida* an agroforestry system, and show that:

> *"...it deposits great amount of organic fertilizer on food crops. Leaves entering soils are comparable to fertilization of almost 50 t·ha^{-1}·year^{-1} of manure in dense stands of 50 large trees per ha. These nutrients help maximize agricultural production and reduce the need for a fallow period on poorer soils"* .

In Zambia and Malawi the recommended density for *Faidherbia* seedlings is a grid pattern of 100 trees per ha. Fields with *Faidherbia*-maize systems managed with such a planting pattern (10 m x 10 m) can accommodate full mechanization. The result is a maize farming system under an agroforest of *Faidherbia* trees. The trees may live for 70-100 years, providing inter-

[15] Mokgolodi, N., M. Setshogo, et al. (2011). "Achieving food and nutritional security through agroforestry: a case of Faidherbia albida in sub-Saharan Africa." Forestry Studies in China 13(2): 123-131.

generational benefits for a farm family, with a very modest initial investment. As the trees mature, and develop a spreading canopy, they are gradually thinned down to about 50 trees per hectare.

There is increasing recognition of the opportunity to exploit the abilities of *Faidherbia,* and in recent years more concerted efforts have been made to improve and enhance this indigenous African agroforestry system.in many parts of the continent (Garrity, 2010). Currently, the Departments of agriculture in both Zambia and in Malawi are encouraging farmers to establish *Faidherbia* trees in their maize fields, the chief aim being to increase food production. The Zambian Conservation Farming Unit estimates that the tree is now cultivated by over 170,000 farmers. The efforts are backed by national policy and supported by the Zambia National Farmers Union (Smith 2009).

Faidherbia albida trees may also be established by direct-seeding in the crop fields at the beginning of the cropping season when maize or other crops are planted. Two pre-germinated seeds are placed in a small ball of manure and placed in a shallow hole dug at each planting station. The locations are then marked with a stake that can alert the weeders to avoid chopping out the young seedlings during weeding operations.

Planting *Faidherbia* requires some patience on the part of the farmer and development-support institutions. It is one of the fastest-growing acacia species, but its initial growth is slow as it develops a deep root system. It therefore takes a few years before the trees begin to provide substantial leaf biomass and fertility benefits. In a survey of 300 farmers with Faidherbia in their maize fields, one-third of the farmers indicated that the trees began to provide significant benefits to their crops in one to three years. Another forty-three percent related that it took four to six years before they observed the benefits of planting *Faidherbia* (Phombeya 2001). However, establishing *Faidherbia* does not preclude planting other nitrogen-fixing trees in the same fields that have a more immediate impact on soil fertility and crop yields (see next section).

Cultivation of crops under *Faidherbia albida* has been traditionally practiced in Malawi for generations within systems that evolved under smallholder farmers' environmental and socio-economic conditions. Traditionally, some Malawian farmers grew their crops under scattered trees of *Faidherbia albida* (Rhoades 1995).

Formal research on the tree began in Malawi in the 1980s where it was carried out as part of the activities of the Agroforestry Commodity Team under the Government's Department of Agricultural Research and Technical Services (DARTS). Saka *et al.* (1994) reported 100-400 % maize yield increases under *Faidherbia* trees in the Lakeshore plain of Malawi. Several agencies have been promoting its cultivation in Malawi for the last two decades (Akinnifesi et al. 2008). It is estimated that currently about 500,000 Malawian farmers have *Faidherbia* trees on their farms (Phombeya 2009). The majority of these stands were developed through assisted natural regeneration of seedlings that emerged in farmers' fields.

FERTILIZER SHRUBS ESTABLISHMENT IN CROP FIELDS (EG *GLIRICIDIA SEPIUM*)

The recommended practice for establishing fertilizer shrubs with *Gliricidia sepium* or other similar nitrogen-fixing species *(eg Senna Spectabilis, Acaica augustissima, Leucaena leucocephala, Caliandra calothryrsus)* is as follows: The *Gliricidia sepium* seeds are first germinated in nurseries and raised into seedlings prior to being intercropped in the maize fields. The targeted density is 2,667 established shrubs per hectare but may range from 1000-5000 shrubs per hectare depending on farmer preference.

The shrubs are cut back three times per year to a stump of 25-30 cm high. This ensures that the shrubs provide abundant foliage and wood but avoid competing with the adjacent maize plants. The leaf biomass resulting from each round of cutting is incorporated into the soil, first prior to maize seed sowing, and then two subsequent times during plant growth. Once established, the shrubs allowed to continue to grow for many years, but with periodic efforts to cut them back.

Since the early 1990s, the World Agroforestry Centre, and its partners in eastern and southern Africa have been developing a range of agroforestry systems that would improve soil quality and significantly boost crop yields, providing high returns on both land and labour. The most popular system in southern Malawi, where land holdings are very small (<0.5 ha), is intercropping maize with nitrogen-fixing tree species of *Gliricidia sepium*, *Sesbania sesban*, *Tephrosia candida* and pigeonpeas. *Sesbania sesban*, *Tephrosia (T. vogelii* and *T. candida*) and pigeonpeas are often relay-intercropped with maize (Snapp et al. 1998; Akinnifesi et al. 2008). In these systems, farmers plant the trees in rows between their crops. *Gliricidia* is pruned back two or three times a year, and the leaves and the biomass are incorporated into the soil. A long-term experiment spanning more than a decade, involving the continuous cultivation of maize with *Gliricidia* at Makoka Research Station, Malawi, yielded more than 5 t/ha in good years, and an average of 3.7 t/ha overall, in the absence of mineral fertilizers. That compared with an average of 0.5–1 t/ha in control plots without *Gliricidia* or mineral fertilizer (Akinnifesi *et al.* 2007; Makumba *et al.* 2006).

Rotational fallows that incorporate nitrogen-fixing trees are also suited to areas where land holdings are somewhat larger (>1 ha). In this case, during the fallow period farmers grow short-lived shrubs such as *Sesbania sesban* and *Tephrosia candida*, rather than the long-lived, intercropped trees like *Gliricidia*. Rotational fallows of *Sesbania sesban* and *Tephrosia candida* have been widely tested in farmer participatory research in Malawi. Results from 152 farms show that agroforestry increased the yield of maize by 54-76 % compared to unfertilized sole maize, which is the *de facto* farmer practice (Akinnifesi et al. 2009). When supplemented with inorganic fertilizer, the yield increase over the control was 73-76% across tree species (Akinnifesi et al. 2009).

In addition to increasing soil fertility and crop yields, these agroforestry systems were observed to suppress weeds (Sileshi et al. 2006), improve water filtration (Chirwa et al. 2007), and increase the amount of soil carbon (Makumba et al. 2007). There is clear evidence that production systems that incorporate *Gliricidia*, *Tephrosia*, *Faidherbia* and other leguminous cover crops assist rural populations to adapt their agriculture to the adverse effects of climate change. Research results and farmer interviews indicated that these systems increased the grain harvest during serious droughts **(**Akinnifesi et al 2010; Sileshi et al 2010). Farmers obtain at

least a modest yield during seasons when farmers that not using these practices may experience crop failure.

The Malawi economy is heavily dependent on agriculture, which contributes 35% to the GDP, and, employs 78% of the national labor force (Republic of Malawi 2008). Ninety-percent of national export earnings come from the sector. Almost all maize is grown under rainfed agriculture during the single rainy season from November to April. The crop is subject to rainfall variability that can be particularly damaging when dry spells occur. Decades of intensive cultivation by smallholders, in the absence of significant fertilizer use, have depleted the soils of nutrients, particularly nitrogen (Sanchez 2002; Carr 1997). National yields of maize have averaged 1.3 t/ha during the past two decades (Denning et al 2009; FAO 2008).

Over half of Malawi's farm households operate below subsistence. Only 20% of maize farmers produce a surplus and sell some of their product, due to low productivity and small farm size. As a result, most households must purchase maize at much higher prices when stocks are exhausted, typically during January to March (Republic of Malawi 2008). During the 2004–2005 maize-growing season drought had a devastating effect on yields: the national average that year was 0.76 t/ha, 40% below the long-term average. In November 2005, five million Malawians—38% of the population—needed food aid (Famine Early Warning Systems Network 2007). These circumstances underscore the urgent need to improve smallholder maize productivity and make it more resilient to drought stress.

In the face of this crisis, the Government launched a programme to subsidize agricultural inputs, using discretionary budget funds to import fertilizer and procure improved maize seed for distribution to farmers. The cost of the maize subsidy in 2005–2006 was estimated at approximately US$50 million (Denning et al. 2009). The result was a harvest estimated at 3.44 million tonnes, an all-time national record for Malawi, generating a surplus of about 1.34 million tonnes of maize grain above national requirements.

The key issue now is how to ensure sustained growth in maize production to prepare for the medium-term situation when fertilizer subsidies may have to be scaled back or withdrawn. Agroforestry systems, through the use of nitrogen-fixing trees, are providing options in Malawi that complement and reduce the need for inorganic nitrogen fertilizer. There is a long history of research on suitable fertilizer tree practices in Malawi and in the neighboring countries in Southern Africa (Sileshi *et al.* 2008).

Malawi launched an Agroforestry Food Security Programme in 2007 based on these results. The programme is managed by the World Agroforestry Centre, the Ministry of Agriculture, the Malawian Farmers' Association (NASFAM), and a number of NGOs. It provides tree seeds, nursery materials, and training for a range of agroforestry species, including fertilizer trees. By mid-2009, over 120,000 farmers had received training and tree materials from the programme. Support from the Government of Ireland has now enabled the programme to expand nationally to 40% of Malawi's districts, involving least 200,000 families or around 1.3 million of the poorest people.

Malawi's Agroforestry Food Security Programme is also incorporating a diverse range of fruit, timber, fuelwood, and tree cash crops into maize farming systems to enhance enterprise diversity and income generation. It relies on whole-village mobilization, particularly through farmer and women's groups, to accomplish the scale of action targeted. Women and the rural poor are the major beneficiaries. The poor are observed to often adopt agroforestry systems more rapidly than wealthier households (Ajayi *et* al, 2005; Place *et al, 2005;* Pye-Smith 2008).

The Malawi Agroforestry Food Security Programme is assisting the uptake of tree types of nitrogen-fixing tree legumes: Short-term species such as *Tephrosia candida, Sesbania sesban*, and pigeon peas, which are planted and incorporated within one year; medium-term solutions such as *Gliricidia,* which can be continuously pruned for organic fertilizer for one to two decased; and long-term full canopy trees of *Faidherbia albida,* which provide benefits for many decades. These species are often combined in the same fields. The optimum combinations are being tailored to the range of variation in agroecological conditions and farm circumstances across the country.

Research has shown that such forms of Evergreen Agriculture may generally increase yields from 1 t/ha to 2–3 t/ha, even if farmers cannot afford commercial nitrogen fertilizers. However, with an application of a quarter-dose of mineral fertilizer, maize yields may surpass 4 t/ha **(**Akinnifesi et al 2010; Sileshi et al 2010). A current opportunity is to directly link fertilizer subsidies to agroforestry investments on the farm in order to provide for long-term sustainability in nutrient supply, and to build up soil health as the basis for sustained yields and improved fertilizer response efficiency. This can be done in the short-term by combining the provision of limited amounts of subsidized fertilizer with the provision of seed and technical advice to establish fertilizer tree systems. Farmers can thus be further encrouaged to produce more of the nitrogen required by their crops on farm, increasing and sustaining their maize yields and improving their soils. This would foster a gradual shift of investments from fertilizer subsidies to sustainable on-farm fertility regeneration. Discussions are underway with the Government of Malawi to map out such a ***'subsidy to sustainability'*** pathway.

The Zambia Agroforestry Project of The World Agroforestry Centre has contributed significantly to the research and development of Evergreen Agriculture practices in Zambia and southern Africa. The maize agroforestry technologies developed include short-rotation leguminous tree improved fallows. Research on improved fallows began in the late 1980s, and received growing attention in the mid-1990s in Zambia (Mafongoya et al. 2006), following the articulation of biological approaches to soil fertility management (Sanchez 1994). Investigations on the performance of rotational fallows of *Sesbania sesban, Tephrosia vogelii, Tephrosia candida*, pigeonpeas (*Cajanus cajan*) and *Crotalaria* spp. have shown that after a 2–3 year fallow, these shrubs provide 100–250 kg of nitrogen per hectare, enhancing the yields of the maize crops that follow (Kwesiga and Coe 1994; Mafongoya et al. 2006). Trials across farmers' fields with maize grown after 2 years of *Sesbania showed* the yields of unfertilized maize were less than 1 t/ha, while the majority of farmers with improved fallows had yields of more than 4 t/ha (Kwesiga *et al.* 2003). In addition, improved fallows provide abundant fuel energy for rural households. Between 15 and 21 t/ha of fuelwood were harvested after 2- and 3-year fallows of *Sesbania*, respectively (Kwesiga and Coe 1994).

Research on the intercropping of maize with the coppicing legumes *Gliricidia sepium, Leucaena leucocephala, Calliandra calothyrsus, Senna siamea* and *Flemingia macrophylla* have also been on-going for over a decade in eastern Zambia. In contrast to the short-rotation fallows, intercropping with coppicing species increases grain yields continuously for many years after their establishment. The additional organic inputs are derived each year from the foliage re-growth that is cut and applied to the soil. Results of long-term experiments established in the early 1990s show very significant improvement in soil fertility and maize yields (Sileshi et al. 2006a).
The disadvantage of the short-term improved fallow systems is that land is taken out of production for 2 out of every 5 years. Nevertheless, they provide greater aggregate crop production and higher returns on investment than the continuous cropping of unfertilized maize, the farmers' *de facto* practice (Ajayi et al. 2009). Over a 5-year cycle, the net profit from unfertilized maize was US$130/ha compared to US$$269 and US$309/ha for maize grown as an intercrop with *Gliricidia* or in rotation with *Sesbania,* respectively. The agroforestry practices had a benefit to cost ratio (BCR) ranging between 2.77 to 3.13 in contrast to 2.65 with subsidized fertilizer applications, 1.77 in fields non-subsidised fertilizer, and 2.01 in non-fertilized fields (Ajayi et al. 2009).

One way to assess impact is in terms of food security, by determining the number of days of additional food that the practices provide to a household. Assuming an average fallow plot area of 0.20 ha, these systems generate is between 57 and 114 extra person days of maize consumption per year (Ajayi et al 2007). An initial investment in terms of higher labour is involved when farmers move from conventional to evergreen agriculture models, but once farmers gain experience with them they manage labour use more efficiently (Tripp 2005). Through learning-by-doing, farmers in eastern Zambia have adapted official recommendations and made innovations with improved fallow practices. Such innovations include the use of bare-rooted seedlings instead of bagged seedlings, combinations of more than one fertilizer tree species, and pruning *Gliricidia* concurrently with weeding. Details of these innovations have been documented by Katanga et al. 2007.

There is evidence that the integration of fertilizer trees into smallholder maize production in Zambia, alone or in combination with conservation farming practices, has resulted in greater productivity, food security, and family income. These practices are, however, knowledge-intensive as opposed to being cash-intensive. Thus, sustained rural advisory services, through the public sector and private sector, are important to ensuring sustained uptake and expansion over the longer term (Kwesiga et al 2005; Ajayi et al 2005; Place, 2005).

Mokgolodi, Setshogo et al[16] stress the fertiliser value of *Faidherbia albida* an agroforestry system, and show that:
"...it deposits great amount of organic fertilizer on food crops. Leaves entering soils are comparable to fertilization of almost 50 $t \cdot ha^{-1} \cdot year^{-1}$ of manure in dense stands of 50 large trees per ha. These nutrients help maximize agricultural production and reduce the need for a fallow period on poorer soils" .

[16] Mokgolodi, N., M. Setshogo, et al. (2011). "Achieving food and nutritional security through agroforestry: a case of Faidherbia albida in sub-Saharan Africa." Forestry Studies in China 13(2): 123-131.

In a study of maize production under an agroforestry system in Malawi, Quinion[17] recorded an improved crop yield of between 22-35%, which whilst insufficient to lift farmers out of extreme poverty, was important in reducing the pre-harvest hungry season by several weeks.

FMNR has been reported to have yielded significant improvements in household income and food security, both in Niger and other Sahelian countries. Reij, Tappan et al. (2009) attribute an increase in cereal harvest across Niger and Burkina Faso of 500,000 tonnes to the improved fertility and growing conditions produced under FMNR systems.

In 2004, the then Director of World Vision Senegal wrote that: "despite severe famine in Niger, farmers practicing FMNR in the Aguie Department did not need food assistance because they were able to meet their own needs through selling firewood and non-timber forest products" . A specific illustration of the monetary benefits a tree can yield is that of baobab (Adensonia digitata) in the Mirriah Department of Niger. A single mature baobab is reported to produce a value of between 14,000 and 35,000 CFA (AUD$26-66) per year. This is sufficient to allow the purchase of between 70-175kg of cereal.

Agroforestry encompasses a range of practices, including the intentional integration of trees into farming systems, farmer managed natural regeneration, and assisted regeneration of trees on grazing lands. A suite of agroforestry practices are included in "evergreen agriculture," including farmer-managed natural regeneration, along with the active intercropping of trees with other crops and the integration of trees into improved farming practices known as "conservation farming" or no-till and reduced tillage. Often, regreening practices will involve more than one agroforestry or sustainable land management practice.

CONSIDERATIONS FOR SUCCESS

SUITABLE CLIMATIC CONDITIONS

Agroforestry and forestry activities including tree planting, FMNR and ANR are successful across a wide range of climatic conditions. High success rates with tree planting are harder to attain in arid and semi-arid conditions, but utilizing best practice methods (e.g. land preparation, selection of seedlings for health, vigour and adaptation, timeliness of planting, weeding and protection from livestock and fire and where possible, supplementary watering) high survival rates are possible. Survival rates tend to increase in higher rainfall climates, however, greater attention to weeding may also be necessary. In semi-arid conditions, FMNR has been shown to be a much more successful method for tree establishment.

The greatest uptake of FMNR at scale to date has primarily been observed in the 400-1000 mm rainfall zone to date. There are very successful examples from Niger, Burkina Faso, Mali, Senegal, Ethiopia and Malawi. In the regions of Maradi and Zinder in southern Niger, over 5 million hectares have been regreened by 1.2 million farm households. On-farm tree densities

[17] Quinion, A. (2008). Contribution of soil fertility replenishment agroforestry technologies to the livelihoods and food security of smallholder farmers in central and southern Malawi, University of Stellenbosch.

have also been dramatically increased over the past decade on 500,000 hectares of Mali's Seno Plains, and over a million farmers in Malawi have been nurturing, protecting and managing the naturally-regenerated trees on their farms.

It is believed that this is primarily because FMNR is able to address perceived needs and issues, such as fuel wood and/or fodder shortages, declining soil fertility and strong winds, and that FMNR can do this at very low cost, quickly and at scale. At the same time, in such climates, tree planting can be expensive and have a low success rate, though with care, some of the constraints can be adequately addressed.

Technically, FMNR is also possible and is practiced in higher rainfall climates. However, communities generally have more options in more favourable climates and farmers may choose to plant high value fruit and timber trees, rather than adopt FMNR practice which might be perceived as having lower economic value. Success with tree planting tends to be much higher in higher rainfall zones than in drier zones.

FMNR works in arid and hyper arid zones as well. The key determinants are the presence of living tree stumps and seeds of tree species with ability to coppice, and the communities and individuals willingness to adopt new practices and eliminate or curb destructive ones. Relative economic or other values of the regenerating tree species will also affect willingness to adopt FMNR.

Never the less it is important to consider the uncertainties related to future climates, land use and land cover, soil fertility in drier environments and pests and diseases pose challenges to the scaling up of agroforestry practices. The effects of climate change on agroforestry systems are not fully understood despite many efforts in modeling climate analogs and future climate impacts. This raises questions on which trees and management options will be suitable in future climates and how to best minimize negative climate change impacts on farming systems. There is, therefore, a need to better predict the range of climate variability to assess the short and long term impacts of changing temperature and rainfall on ecosystem suitability for current agroforestry practices. (Mbow, 2014).

STAKEHOLDER UPTAKE: WHICH STAKEHOLDERS ARE MOST LIKELY TO ADOPT

Local investments in regreening have been driven by a combination of factors, including the emergence of effective sustainable land management practices aimed at improving food security and increasing fodder and fuelwood. Demographic and land use pressures have also induced farmers to invest in on-farm trees, and more outside assistance has become available to farmers to respond to land degradation and climate change. Almost always, however, innovative farmers have taken the lead in regreening efforts. Experience from Burkina Faso, Ethiopia, Mali, Niger, and elsewhere shows that farmers, especially when supported by local regreening champions, are motivated to protect and manage trees on their farms. National governments and other

stakeholders play key roles in establishing more favorable enabling conditions to trigger and accelerate the scale-up process[18].

Common denominators of adoption in a wide variety of situations where farmers have successfully developed agroforestry enterprises (Byron[19], 2001) are:

(1) ease of access to markets for the forestry products
(2) benefits (economic and other) from agroforestry are perceived by farmers to be higher than alternative uses of the land
(3) a viable forestry production technology is available and known to farmers
(4) farmer access to sufficient areas of land and with secure perceived tenure and:
(5) farmer confidence in being able to control risk, such as fire, pests, theft.

FMNR implementation experience[20] shows that communities and individuals tend to be more open to adopting this practice when:

- Loss of tree cover negatively impacts crop yields and livestock productivity
- Landscapes are deforested and degraded
- The environment has lost critical levels of biodiversity
- There is a shortage of firewood and building timber
- Community members are forced to migrate for work due to decreasing crop yields and farm profits
- FMNR constitutes a considerable income generating opportunity
- Where tree loss has contributed to some or all of the following, making environments less habitable - stronger winds, more prolonged droughts, more severe floods, higher temperatures, dust storms, decreased seasonal water flow and well recharge, etc.

Scaling-up EverGreen agriculture practices or regreening[21] can occur through a range of processes, including the following:

- The development of new agroforestry systems by farmers who protect and manage the natural regeneration of shrubs and trees on their cultivated fields or plant multipurpose or economically valuable tree species.
- The rejuvenation of old agroforestry parklands through planting tree crops like cashew or through natural regeneration of preferred agroforestry species like shea nut (Vitellaria paradoxa).
- The protection and management of natural regeneration on abandoned cropland and

[18] Scaling Up Regreening: Six Steps to Success. A Practical Approach to Forest and Landscape Restoration. Reij, C., & Winterbottom, R. WRI.Org. 2015

[19] Byron, N. and Arnold, M. (1999) What futures for the people of the tropical forests? World Development 27: 789 – 805 quoted in Paul Woods doctoral thesis, 2000.

[20] FMNR Integrated Project Model, January, 2012. World Vision Internal Document.

[21] Scaling Up Regreening: Six Steps to Success. A Practical Approach to Forest and Landscape Restoration. Reij, C., & Winterbottom, R. WRI.Org. 2015

degraded land off the farm.

- Local protection, regeneration, and improved participatory management of natural forests by forest-user groups and rural communities.
- Reclamation and restoration of the productivity of degraded, abandoned cropland using rainwater harvesting and agroforestry practices.
- Improved management of livestock and grazing areas by pastoralists through the systematic protection and regeneration of trees and shrubs that are important sources of browse for livestock.
- Sustainable intensification of rain-fed crop production through a combination of improved land and water management practices (e.g., agroforestry, microdosing, and water harvesting). (Winterbottom, Reij, Garrity, et al. 2013)

The success of FMNR will be increased in the presence of enabling policies providing user rights or ownership to natural resources and which are understood by the population are in place. Also, FMNR tends to flourish where organizational structures such as cooperatives and farmers organizations with a set of by-laws devised by all stakeholders are in place.

There is no set class of stakeholder most likely to adopt evergreen agriculture practices. The majority of adopters tend to be poor small holder farmers, but better off farmers who see an opportunity to increase and diversify their income streams are also numbered amongst adopters. Vulnerable households tend to also be the main adopters of FMNR, perhaps because of the low cost and low risk coupled with relatively quick benefits. Generally speaking, stakeholders who have experienced setbacks such as recurring drought and crop failure or who no longer have access to previously freely available natural resources such as fuel wood and building materials, wild food harvest, traditional medicines and fodder, those who are experiencing reduced soil fertility and resulting declining crop yields and those who have few alternative livelihoods strategies to draw on are more receptive to adopting FMNR.

FMNR can be practiced on any land that has living tree stumps capable of re-sprouting, or has self-sown trees growing on it. Some conditions will favor FMNR uptake, and some will make it more difficult. These include:

- In volatile conflict situations, managed trees may be damaged frequently, or pruning may be too difficult to do safely. The authors have seen many situations, however where conflict was decreased or eliminated through FMNR. This may be because, as trees grow, more natural resources become available and there is less competition for scarce resources. Also, the decision for stakeholders to practice FMNR involves consultation and a coming to agreement on how to manage the natural resource base optimally and to everybody's benefit. The collaboration and transparency required to do this may also reduce incidence of conflict, in a very real sense, FMNR can be a connector between parties that may have differences.
- Urban settings may not have the necessary tree stumps or social cohesion required for practicing FMNR, though it may be possible on public or vacant land, in school and hospital yards, and along roadsides. And of course anyone can manage trees on their own urban land using FMNR principles.

- Peri-urban settings pose problems also where poor people rely on firewood for their fuel supplies. It can be difficult to enlist their collaboration.
- Areas where large numbers of livestock are regularly grazed will present greater challenges because livestock can damage young growth.
- Areas where land is burnt every year.
- Areas which are very dry may present extra challenges. However, living tree stumps have been found even in desert conditions with very low rainfall (50-100mm per year), so always experiment to see if FMNR can be useful.

Areas which do not have living trees stumps or self-sown seeds left in the soil will require more work to establish FMNR. One option may be to fill gaps through tree planting and direct sowing of seeds. Another is to prepare water harvesting structures such as zai holes and half-moons. Tree seeds can be introduced to these basins intentionally through sowing or incidentally through placement of animal dung (which often contains seeds), or natural dispersal agencies such as birds, wildlife and livestock.

The biggest determining factor to success - more important than climate, geography, or even presence of tree stumps - is the attitude of communities and individuals, their willingness to try and their commitment to succeeding!

FMNR is about decision making, and community ownership is essential. The physical practices that are part of the FMNR movement are important, but they will not succeed unless the people who use the land are agreed on how to regenerate and manage their trees.

- FMNR succeeds best when everyone who uses, or has access to the land that is being managed is engaged in the process from start to finish, otherwise trees may be destroyed and conflict may arise.
- All stakeholder concerns need to be understood and addressed. All stakeholders should take part in creating and using the bylaws and other agreements that determine how the whole community will manage and benefit from trees.
- For FMNR Facilitators who are not part of the community themselves, building relationships is especially important, because they will not have credibility until they are known and trusted.

LAND USE TYPES MOST SUITABLE FOR ADOPTION

There are no restrictions on land use type for implementing FMNR. FMNR is being applied on cultivated land, communal grazing land and degraded forest land. FMNR is typically implemented to restore degraded land. Occasionally land has been so degraded that there are few sprouting stumps, or naturally sown seedlings remaining. In situations like this practices such as digging Zai holes and half-moons, and direct sowing of tree seeds may be implemented to bring the land to a point where FMNR can subsequently be practiced. Particularly on ‘hard-pan’ or compacted sites, digging Zai holes and half-moons can be practiced at the same time as FMNR is being practiced. The zai and half-moons increase capture and infiltration of water and concentrate fertility for crops and trees growing in their depressions.

Most commonly on degraded land tree planting is used after FMNR and other methods have restored the soil and water to a point where planted trees have a better chance of surviving. However, tree planting can be conducted concurrently with FMNR if there are significant spaces between regenerating trees, or where specific valued species need to be introduced. Tree managers may also choose to plant trees that are not native to the area, or not naturally available on their land – such as fruit trees, high value timber trees, or fertilizer trees. Or, they may use tree planting to increase the number of trees beyond those that remain naturally on their land.

VIABILITY OF ECOSYSTEMS-BASED ADAPTATION THROUGH AGROFORESTRY

TO ENHANCE CLIMATE CHANGE RESILIENCE

In Niger, farmer managed natural regeneration (or FMNR) has produced dramatic results, increasing crop harvests in many areas, and sparking a regional, farmer-led re-greening movement. In some villages, the annual "hungry period" when food supplies are nearly exhausted has been significantly shortened. Many rural producers have doubled or tripled their incomes through the sale of wood, seed pods, and edible leaves. Large areas of countryside that a few years ago faced constant shortages of fuel wood and fodder now produce surpluses for sale in nearby markets[22].

Because of the practice of FMNR, small scale farmers in Niger are producing an estimated additional 500,000 tons of cereals a year which helps feed about 2.5 million people[23]. A World Bank study estimates the annual production value of the new trees is at least $US 260 million, which flows directly back to farm families, either as cash or as produce[24]. In the region of Maradi in Niger alone, in 2008, a very conservative estimate is that 62,000 farm families practicing a full version of FMNR have generated an additional gross income of US$17 - 23 million per year, contributing 900,000 to 1,000,000 new trees to the local environment[25].

Many assessments indicate that in regions where FMNR has been practiced, degraded land has been restored, crop yields have increased and resilience to shocks has been enhanced. Financial benefits through sale of tree products and increased grain and livestock production are estimated to be up to $250 per hectare. FMNR adoption was shown to increase household gross income by between 22,805 and 27,950 FCFA (or about 46 and 56 USD) per capita, or by between 18 and 24 percent. These results are consistent with the feedback provided by the farmers themselves, strong majorities of whom report improvements since FMNR adoption in the availability of wood, soil fertility, crop yields, numbers of livestock, household revenues and food security (see graphic below).

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22 Changing the Development Paradigm: Key to Managing Drought Risk in areas of Chronic Food Insecurity in Africa. Gubbels, P. Background Paper prepared for the Global Assessment Report on Disaster Risk Reduction 2013

23 Reij, C., Tappan, G., Smale, M. 2009. Agro-environmental transformation in the Sahel: another kind of "Green Revolution". IFPRI Discussion Paper 00914. International Food Policy Research Institute, Washington DC

24 World Bank (Oct 2010) Niger Strategic Program For Climate Resilience p11-12. See also Botoni, E. et Reij, C. (2009) Silent transformation of environment and production systems in the Sahel: impacts of public and private investments in natural resource management. (CILSS et Université libre d'Amsterdam)

25 Haglund E. Ndjeunga J., Snook, L., Pasternak, D. (2009) Assessing the Impacts of Farmer Managed Natural Regeneration in the Sahel: A Case Study of Maradi Region, Niger (draft) p.27

Trees better withstand climatic variability than annual crops and can be grown as an economically valuable species. Once established, trees produce valuable products year after year, require minimal maintenance and withstand drought. Having reliable income from sales of wood and other tree products enables farmers to buy food from other areas where rainfall is more reliable. The widespread adoption of FMNR is attributed to the fact that its benefits significant enough and are obtainable at minimal costs to the farmer while the risks are low. There are no expenditures beyond additional labour. For these reasons FMNR is considered as a very cost effective, easily adopted means of enhancing food security and increasing resilience.

There is mounting evidence that FMNR contributes significantly to resilience, in terms of community capacity to absorb shocks. When drought and accompanying food shortages hit the regions of Maradi, Tahoua, Tillabéri, and Zinder in 2004–05, villages with high levels of adoption of FMNR fared much better than those devoid of trees. For example, villages in Aguié District were able to harvest regenerated trees for food, fodder, and firewood to sell in exchange for grain. The inhabitants did not rely on famine relief and did not have a single death of a malnourished child.

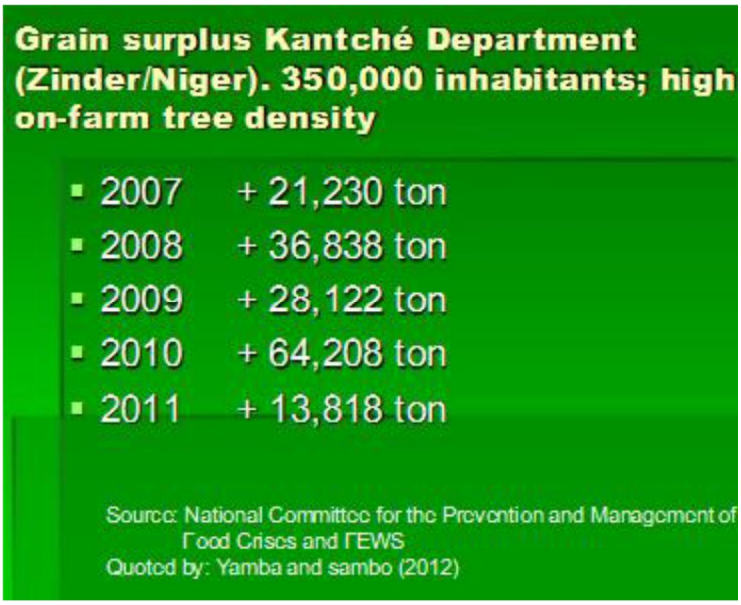
Farmers practicing FMNR and other agro-ecological techniques have been able to stockpile grains during good years, harvest trees for food and income in bad years, and sustain productivity by improving fertility and water holding capacity of soils, reducing erosion, and preventing ill effects of sun and wind on young crops. All this has strengthened farmer resilience in the face of cyclical droughts[26].

Such impact goes beyond the village level. Evidence from the Kantché department of Niger, where adoption of FMNR is widespread, shows overall grain surpluses both in the drought of 2009, and again in the drought of 2011.

In summary, the evidence in Niger suggests that agro-ecological techniques such as agro-forestry, integration of livestock, soil and water conservation constitute an alternative pathway for investing in agriculture that not only increases productivity, but also strengthens resilience, sustainability of the natural resource base and improves food security.

While not sufficient by itself to end food and nutrition insecurity, for the most vulnerable households in the face of recurrent drought, the evidence shows that agro-ecolgical farming is a far more appropriate and cost effective approach for reducing the “resilience deficit” in drought prone, ecologically fragile areas, compared to conventional “Green Revolution” agriculture. To achieve resilience, agro-ecology must be accompanied by complementary strategies to diversify incomes, reduce risk, protect livelihoods, and improve nutrition.

[26] Reij (2006:2); IPCC (2007:444, 447–48) Tougiani et al. (2008:16) in World Resources (2008) op. cit.



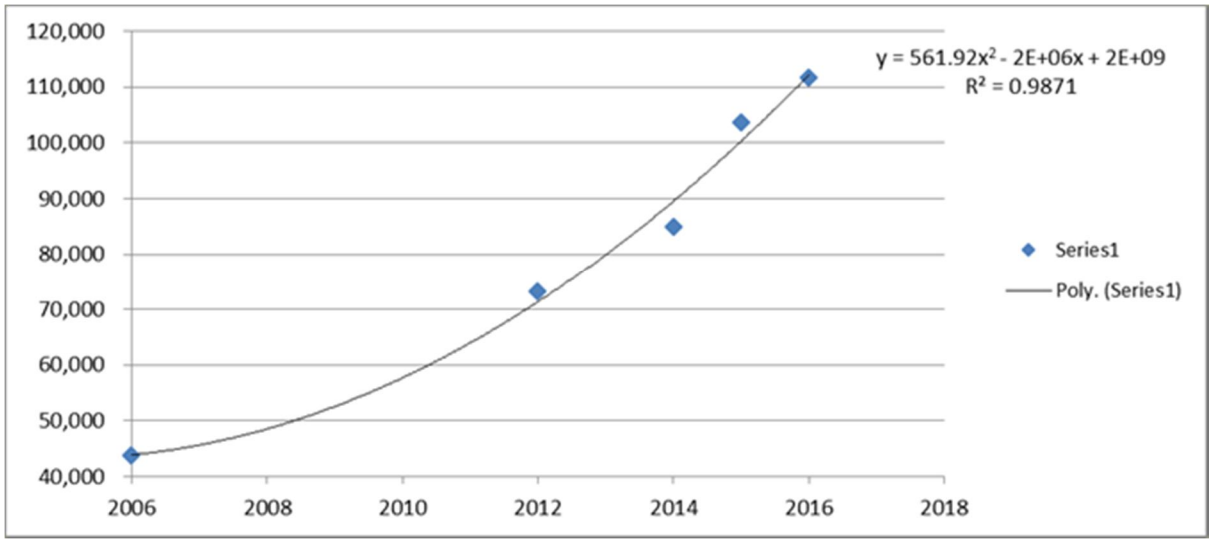
TO ENHANCE CLIMATE CHANGE MITIGATION

Tree planting and FMNR make a direct contribution to climate change mitigation through CO2 sequestration. In Niger, in a semi-arid context, strengthening the rights of farmers to manage trees on cropland has resulted in the restoration of tree cover on some 5 million hectares, sequestering at least 30 million tonnes of carbon over the past 30 years[27].

In a 700-1,000 mm rainfall zone, the World Vision/World Bank CDM, Humbo Community Managed Natural Regeneration Project has registered[28] an increase in sequestered CO2 from a 44,000 ton base line in 2006 to 111,657 tCO2 in 2016.

[27] Carbon storage per tree is extrapolated from Trees of Hope project allometric equations for Faidherbia albida, cited in J. Whalen, To what extent can new Farmer Managed Natural Regeneration initiatives in Niger benefit from carbon finance? Working paper by Face the Future (2012). Estimated average density of 40 trees/hectare across 5 million ha based on consultation with Tony Rinaudo, Natural Resources Advisor at World Vision, and surveys by G. Tappan, United States Geological Survey (USGS). Field surveys by USGS in 2005-2006 estimated 12.6 tons of above ground woody biomass / ha in regenerated agroforestry formations. With a conversion factor of 0.45 this amounts to 5.67 tons of Carbon per hectare. Pers. Comm. G Tappan, June 4, 2014.

[28] Humbo Carbon Stock Data, June, 2016.



TO IMPROVE LIVELIHOOD ALTERNATIVES AND INCOME

In Niger, a relatively modest investment in the 1980s and 1990s by development assistance agencies and NGOs to strengthen community land and forest rights through institutional reforms and local-level training has generated about US$900 million annually[29] in economic benefits nationally or between $200 - $1,000 additional value of products consumed and sold per household. It is important to put this in context.

Increased household income and assets[30]

For Sahelian countries, the gathering of agroforestry tree products is one of the few livelihood activities that hold great potential for income generation and poverty reduction among resource-poor households. When farmers perceive the potential market value of products such as fruits, fodder or shea butter, they are more likely to invest in the protection and regeneration of trees and shrubs. If FMNR increases tree cover, then it follows that opportunities for increased household income can arise.

A small empirical evidence base is emerging on the benefits of FMNR. Economically, small-scale farming families can experience income growth as a result of improved crop yields, the sale of tree products and improved livestock production as well as the growth of assets such as high value trees. For some World Vision projects, income for community has also been derived through the sale of carbon credits. In some contexts there might be a time delay before income benefits from FMNR are accrued (for example, if there is no market for fodder or firewood).

[29] Surveys by ICRAF and others (Pye-Smith, 2013) indicate that the value of wood, fodder, fruit, pods, leaves and other tree products amounts to approximately $1,000 per household per year. The estimated value of firewood alone amounts to about $250 per household, while benefitting women by reducing the distance travel and time required to harvest firewood. Approximately 4.5 million people live in the areas where FMNR has been scaled up, and with an average household size of 5 persons, this equals 900,000 households (Reij, 2006 cited in Sendzimir et al, 2011).

[30] FMNR Evidence Gap Analysis, World Vision Internal Document, 2016.

Brown et al. (2011)[31] demonstrated the income earning potential of FMNR from carbon sequestration. The Humbo Community-based Natural Regeneration project in Ethiopia regenerated 2,728 ha of degraded forests, which is expected to generate about 760,000 USD in the first ten years of the project through the Clean Development Mechanism. In the final evaluation, 68% of respondents reported 'less' or 'much less' poverty in the community compared with 5 years previous (midline evaluation 8%, endline non-project area 43%).

TO IMPROVE NUTRITION AND DIETARY DIVERSITY

Wild foods have been a very important element in the diet of most rural African families, and are crucial in diversifying food sources, particularly in the pre-harvest hungry season[32]. The poorer the household, the more important these resources are. A study in Niger in the 1990's reported that "Edible wild plants were prominent in local diets during both drought and during years of adequate rainfall; more than 80 species were commonly consumed". The Niger Government states that "210 vegetal species contribute directly to human nourishment, especially during famine periods; 235 species are eaten by domestic animals; 270 are used in traditional cures; 127 species in handicraft work and shelter etc' (Afifi 2011). Scoones et al[33]. comment that:

> *"Having a diverse resource base with a range of different trees, plants and insect species increases the options for maintaining food security. Different products complement each other with seasonally different patterns of availability...however the role of wild foods in agricultural systems under stress is ...[not] well documented and an acknowledgement of their importance for food security has yet to influence mainstream thinking"* (Scoones, Melnyk et al. 1992).

Agroforestry and forest restoration interventions are important for enhancing these traditional food sources. Smallholder farmers have traditionally maintained trees and bush areas as a source of energy, nutrition, medicine and construction materials, and to provide a buffer during crises, such as crop failures or income shortfalls. Tree products play an important role in assuring food security, especially in the 'hunger months' when grain stores are low and farmers are waiting for the next harvest34 (Faye et al. 2010[35]).

According to the FAO, food security has four components. Growing more trees on and around farms in agroforestry systems (including FMNR) can contribute to all four:

> ***Availability*** (production and/or presence in the marketplace): Through the foods produced by the trees; by spreading harvest period over a greater portion of the year and through improved crop yields and livestock production due to the beneficial impact of trees on agricultural land.

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[31] Brown, R.B., Dettmann, P., Rinaudo, T., Tefera, H. and Tofu, A. (2011) Poverty alleviation and environmental restoration using the Clean Development Mechanism: a case study from Humbo, Ethiopia. Environmental Management, 48, 322-333.
[32] The Low Hanging Fruit. Yates, P. Charles Darwin Univ. World Vision Australia. 2013. Unpublished.
[33] Scoones, I., M. Melnyk, et al. (1992). The Hidden Harvest: Wild Foods and Agricultural Systems. A Literature Review and Annotated Bibliography. London, IIED.
[34] FMNR Evidence Gap Analysis, October 2016. World Vision Australia internal document.
[35] Faye M.D., Weber J.C., Mounkoro B., and Dakouo J.M. (2010) Contribution of parkland trees to farmers' livelihoods: a case study from Mali. Development in Practice, 20, 428–434.

Access (entitlement): Through a families' direct access to food products, and through greater potential income as excesses of fuelwood, building materials, honey, fruits and seeds, oils, raw materials for handcrafts or non-food products are sold.
Utilisation: By diversifying the range of foods available, and thereby increasing the likelihood of complementarity and adequate micronutrient availability; by increasing household incomes due to product sales that can enable purchase of better foods; Through the virtuous cycle of better health and higher productivity.
Nutritional content: A tree such as *Moringa oleifera* can yield many crucial micronutrients; Shea (*Vitellaria paradoxa*) and desert date (*Balanites aegyptiaca*) can yield oil for consumption or trade; certain Australian acacia species (eg. Acacia colei) can yield wood and protein rich seed; marula (*Sclerocarya birrea ssp. caffra*) and baobab (*Adensonia digitata*) can yield vitamin C; leafy greens can be important sources of Vitamin A, B, iron and calcium and so on. No single species has to be complete in itself or provide more than a portion of the diet, yet the combined effect of a diverse diet is likely to be much more nutritionally complete, and much more stable in the face of production shocks, than a diet derived from fewer food sources[36]

CARBON CALCULATIONS

Expected tonnes of carbon dioxide equivalent (t CO_2 eq) to be reduced or avoided

This project will be scaling-up three key evergreen agriculture practices: farmer-managed natural regeneration of trees on farms, establishment of full-canopy fertilizer trees (particularly *Faidherbia albida*) in crop fields, and the establishment of fertilizer shrubs at high density in crop fields. The adoption of these three practices is estimated to be:

FMNR 75% of 1,250,000 households = 937,500 households
Fertilizer Trees 15% of 1,250,000 households = 187,500 households
Fertilizer Shrubs 10% of 1,250,000 households = 125,000 households

1. FMNR Carbon Stocks Increase

We estimate that the adoption of FMNR by 75% of the project households will add an average of 25 additional trees per hectare. This is a conservative estimate obtained from the results of the previous scaling-up projects upon which this project is based. Our calculations indicate that this number of trees (25 per hectare) will accumulate 20 tC/ha over the 25 lifetime of the project. This estimate is conservative because it does not account for any increases in soil organic carbon that will also accrue to the presence of the trees (which is substantial but is also variable across sites). Aggregated across the total number of adopting households, the accumulation of 20 tC/ha will result in an increase in landscape carbon storage of 18 million tC or 66 million tons of CO2.

2. Fertilizer Trees Carbon Stocks Increase

[36] The Low Hanging Fruit. Yates, P. Charles Darwin Univ. World Vision Australia. 2013. Unpublished.

The adoption of fertilizer trees (particularly Faidherbia albida) by 15% of the project households will result in an additional 50 Faidherbia trees per hectare. This results in a tree cover percentage of approximately 50% and a carbon stock of 50 tC/ha. Aggregated across the total number of adopting households this will result in an increase in landscape carbon of 9 million tC or 33 million tons of CO2.

3. Fertilizer shrubs carbon stocks increase

The adoption of fertilizer shrubs (particularly Gliricidia sepium and similar N-fixing species) will result in an average accumulation of carbon in wood and soil organic carbon of at least 2 tC per hectare per year, based on our direct published observations. This will result in an increase in carbon stocks per hectare of 50 tC by the end of the project time span of 25 years. We foresee adoption of this practice by 10% of the project households which would result in a total carbon accumulation of 6 million tC per year or 22 million tons of CO2.

Detailed Methodology Underpinning These Estimates:

The project target areas were identified according to an analysis that examined the geographical areas where rural population vulnerability was high and current tree cover in agricultural landscapes was low. Using Google Earth as the primary open source mapping tool, the GPS coordinates of the prospective project locations were determined and converted to the WGS 84 coordinate system used uniformly across all the 8 countries. The project areas thus identified and marked. Mapping of project areas involved delineation of project areas from GPS points provided by use of polygons. The mapping exercise was however twofold:
Phase 1: For the purposes of comparative analysis of the tree covers analysis in diverse landscapes; an average of 100 square kilometers radius per project site.
Phase 2: The mapping of the location of project sites phase two involved mapping of the project areas with regards to the spatial extents as guided by the country teams in the discussions at the UNEP-GCF workshop. Guidance was provided through individual consultations with the country teams and later requisite data provision in second phase.

- **Generation of Land Use statistics. (Data collection; analysis; interpretation; and results and discussions).**

One hectare plots were deployed in all the chosen project sites (3 per country) on the high resolution images at wall to wall coverage and data collected from each plot. Each project site had about 10,000 such plots with 25 sampling dots in each plot; Collect Earth Land Use and Land Use Change analysis. Land use data was collected as guided by the six IPCC Land Use classifications thus: Croplands, Grasslands, Forests, Settlements, Wetlands, and Other land. This data was then analyzed interpreted into percentage land use per project site by use of Saiku, statistical analysis software. The results and discussions of the exercise concluded that the dominant land uses were cropland and rangelands in most of the project sites and that the other four types of land uses were either not represented at all or missing in these project areas.

- **Determination of tree cover per Land Use.**

A sampling design was then developed for the allocation of tree covers in the various land use classes and this data gathered per project site based on the number of trees; Collect Earth Tree

Cover Methodology. The data was analyzed and interpreted into various forms; through spreadsheet and pie charts per country which is the mean tree covers percentages for the three project sites per country. As a general observation most of the project areas with the highest tree covers were in the rangelands as opposed to the other land uses. In the detailed crop land analysis it was noted that the tree cover in most of the project areas was from boundary plantings of trees, as opposed to the intercropping of trees within the farmland, which is the focus of this project.

- **Estimation of baseline carbon and future carbon from tree covers at end of project period.**

Carbon stock estimations in the different Land Use classes used a parsimonious approach guided by the IPCC tier 1 figures of the Good Practice Guidance (IPCC, 2006). The approach used a literature review of carbon stocks in an array of agroforestry systems and comparison of the trends in previous ICRAF tree cover and carbon stocks analyses and carbon stock conversion algorithms to determine the baseline carbon and end carbon based on tree cover. The methodology assumed a mid-point figure of 41tC/Ha from range of 29-53tC/Ha for mature agroforestry systems (Albrecht & Kandji, 2003).

The baseline carbon for both croplands and the rangelands was determined by summation of the current tree cover function (tree cover percentage by carbon fraction) plus the default carbon stock values (IPCC, 2006). The carbon sequestration trends forecasted per age of the agroforestry system were then fitted in to attain the end carbon at year six (Arora et al., 2014).

End carbon was calculated by cumulative values of previous carbon sequestration trends in agroforestry systems for the intended practices of evergreen agriculture namely: intercropping with multipurpose trees (Nair & Nair, 2014). Changes in carbon stock then determined by the difference between the baseline carbon and the end carbon. The latter was converted to carbon dioxide emissions reductions.

This methodology was guided by the following assumptions:

1. Biomass carbon is equal to the default Tier 1 value for agricultural land (5 tC/Ha) when there are no trees on that land (i.e. tree cover = 0%); (Zomer et al., 2016).
2. There is an incremental linear increase of tC/Ha proportionally as tree cover increases from the baseline (5 tC/Ha at 0% tree cover) up to the maximum value for Mixed Forest in that specific carbon zone (Zomer et al., 2016).
3. The ratio of cropland and rangelands carbon emissions reductions for assisted natural regeneration (ANR) respectively is 1:1; hence a similar allocation fashion (Roshetko, Lasco, & Delos Angeles, 2007).
4. The generic climatic zone for all the project areas was assumed to be semi-arid (IPCC, 2006).

Equations:

a) Change in Carbon Stocks = Carbon stock in new agroforestry systems (C_N) – Baseline carbon stock (C_B).

b) $CO_{2eq} = (C_B) + (TC*CF*44/12)$.

c) $CO2_{eq}$ = Baseline Carbon + (Tree Cover %*tC/Ha*44/12).

This methodology provided for carbon stock figures that are subject to higher levels of certainty in:

- **i.** Better area allocation per project site and country.
- **ii.** More accurate methodologies such as modelling and more country specific data at subsequent tiers 2 and 3.
- **iii.** Availability of current set of activity data.
- **iv.** Better allocation of biophysical characteristics; soil types and the agro-ecological zones.

Summary of Results

Expected tonnes of carbon dioxide equivalent (t CO2 eq) to be reduced or avoided[37]

Annually: 4.84 million tons CO2

Lifetime: 121 million tons CO2

In a comparable project undertaken in a 700-1,000 mm rainfall zone in Ethiopia, the World Vision/World Bank CDM, Humbo Community Managed Natural Regeneration Project deployed farmer-managed natural regeneration on an area of 6,000 hectares and registered[38] an increase in sequestered CO2 from a 44,000 ton base line in 2006 to 111,657 tCO2 in 2016. On a per hectare basis this was an increase of 1.12 tCO2/ ha annually.

Brown et al. (2011)[39] demonstrated the income earning potential of FMNR from carbon sequestration. The Humbo Community-based Natural Regeneration project in Ethiopia regenerated 2,728 ha of degraded forests, which is expected to generate about 760,000 USD in the first ten years of the project through the Clean Development Mechanism. In the final evaluation, 68% of respondents reported 'less' or 'much less' poverty in the community compared with 5 years previous (midline evaluation 8%, endline non-project area 43%).

FINANCIAL AND ECONOMIC ANALYSIS OF THE INTERVENTION

COMPARISON TO ALTERNATIVE OPTIONS

This analysis is being finalized, however initial comparisons of the most similar methods (e.g. mangrove restoration) recognize significant cost savings for agroforestry interventions as outlined in the concept note (FMNR, EverGreen Agriculture, etc.).

VALUE PROPOSITION

This analysis is being finalized, however initial calculations demonstrate that carbon can

[37] A conservative 90% of the above calculation is cited in the concept note.
[38] Humbo Carbon Stock Data, June, 2016.
[39] Brown, R.B., Dettmann, P., Rinaudo, T., Tefera, H. and Tofu, A. (2011) Poverty alleviation and environmental restoration using the Clean Development Mechanism: a case study from Humbo, Ethiopia. Environmental Management, 48, 322-333.

be sequestered for less than $1USD/tCO2eq, and at no additional cost (i.e. from the same investment) adaptation benefits are realized for 45USD/household.

CONCLUSIONS

Agroforestry systems readily bundle both mitigation and adaptation strategies and provide several pathways to securing food security for poor farmers, while contributing to climate change mitigation.

Like few other land use options, agroforestry has real potential to contribute to food security, climate change mitigation and adaptation, while preserving and strengthening the environmental resource base of Africa's rural landscapes. It has a key role to play in landscape-scale mitigation schemes under the REDD+ or AFOLU (Agriculture, Forestry and other land uses) concepts. For millions of African farmers whose livelihoods are threatened by climate change and land degradation agroforestry offers a pathway toward more resilient livelihoods. However, at farm level, combining mitigation and adaptation in agroforestry to enhance the resilience of social and land use systems should be scrutinized in a context where the primary goal is to increase social and economic benefits through agriculture.

The Agroforestry intervention is suitable for the projected climate change impacts and is highly cost effective as compared to nearly all other options.