



CASA

Commercial Agriculture for Smallholders and Agribusiness

**Recommendations for Carbon Finance
and Climate Resilience initiatives in Mozambique**

February 2024



Foreign, Commonwealth
& Development Office

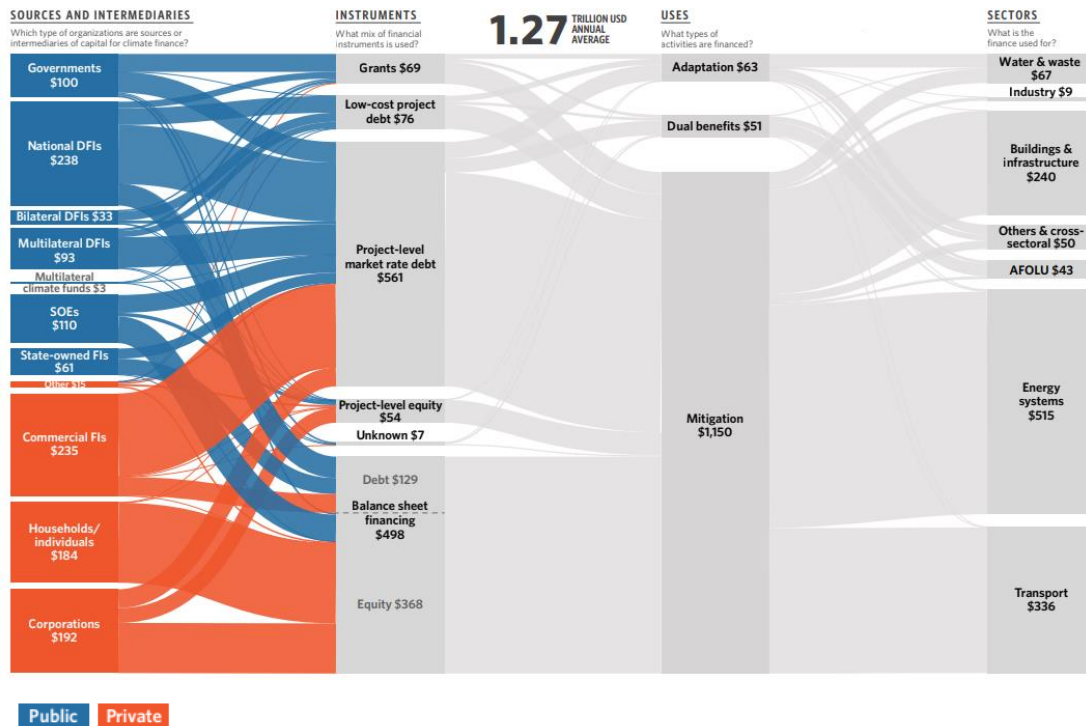


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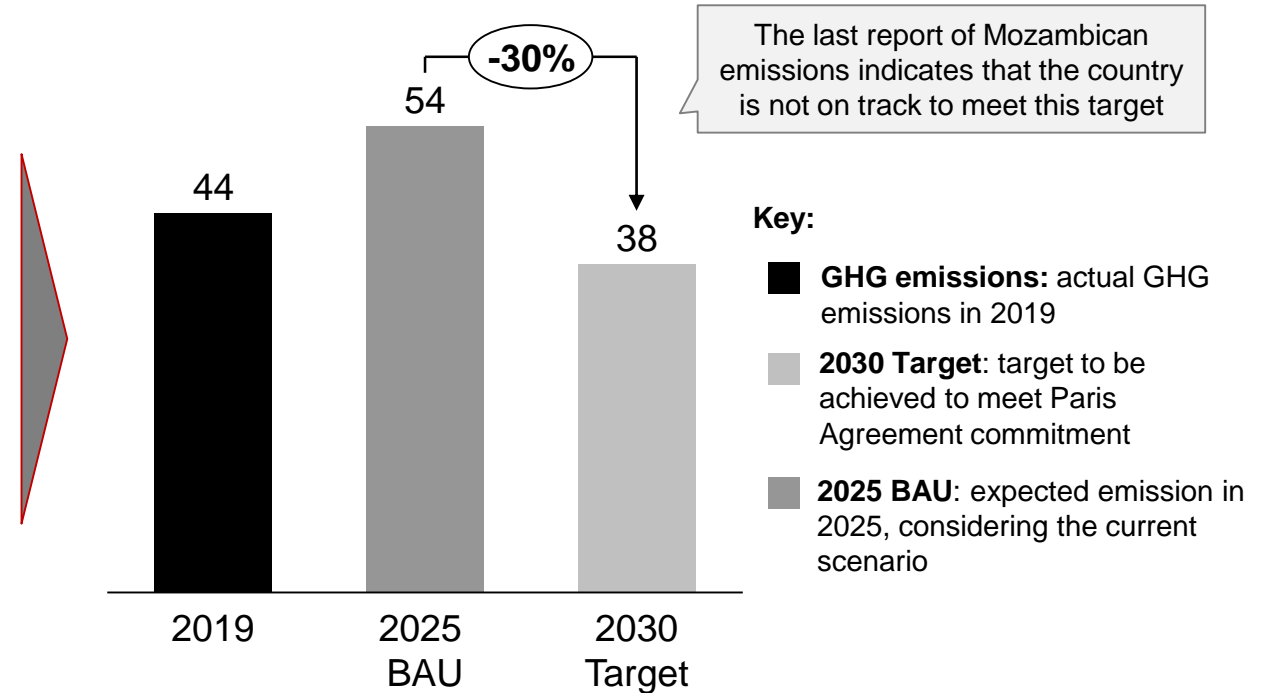
Globally, climate finance is doubling in size yearly and reached \$1.27T in 2022. Locally, Mozambique has ambitious goals set in the Paris Agreement, and it is not on track to meet them

Landscape of Climate Finance in 2021/2022 Globally, trillions USD



Mozambique GHG emission overview* MTCO2e/year

*Excluding LULUCF¹. Includes agriculture




From 2019 GHG emissions, agriculture represented 43% of Mozambique emissions – an essential sector to achieve Mozambique NDCs

Note: 1 - LULUCF is Land use, land-use change, and forestry, 2 – Direct planting consists of planting using seeds instead of seedlings
 Source: Carbon Finance Playbook – Mozambique, <https://1p5ndc-pathways.climateanalytics.org/countries/mozambique/current-situation/>

Limited presence of international companies and low country emissions points to local opportunities in VCM

Carbon markets	Description and main investor	Market size (2021, USD)	Relevance for SHFs in Mozambique
1 Voluntary carbon markets (VCM)	Companies and countries purchasing carbon credits	~2 bn	High – Relatively larger potential to create projects for both conservation and regeneration
2 SBTI-led value chain decarbonisation	Companies reducing their own emissions via suppliers	~some bn	Low – Absence of large companies in Mozambique
3 Compliance carbon markets (CCM)	Companies and countries generating carbon credits, under a strict standard , to match a mandatory carbon cap	~850 bn	Low – Absence of large companies in Mozambique
4 Paris Agreement led ITMOs and ERs	National climate action plans to cut emissions and adapt to climate impacts	~ 2 trillion	Medium – Expected small investments from government, given lack of resources

 Proposed focus for Mozambique

Within the most relevant VCM categories for SHFs in Mozambique, agro-forestry and regenerative agriculture were prioritized, given potential scale and impact

Category	Key project types
Forest & land use	REDD+/ avoided forest conversion
	Afforestation, Reforestation and Revegetation (ARR)
	Wetland conservation
Agriculture & Livestock	Regenerative Agriculture
	Agroforestry
	Biochar
	Grassland/ rangeland management
	Nitrogen Management
	Methane emission management



Agroforestry (e.g. Acorn Agroforestry for SHFs model)

Description:

- Consists of integrating trees into the farm, alongside crops, **increasing soil fertility** and yields
- One of the **most common** carbon credit projects in Africa, given its simplicity and long-term benefits
- Can create **additional and diverse income sources for farmers**, depending on the tree choice

Challenges and risks

- Agroforestry needs a **sizable scale** to become financially sustainable
- Cash flow model requires **substantial upfront investment**, given that the tree needs some years to grow and start generating carbon credits and other income

Regenerative Agriculture (e.g. VM42 VERRA Protocol)

Description:

- Through regenerative practices, atmospheric **carbon dioxide is reintroduced into the soil**, increasing SOC level
- **Strong impact on soil fertility**, reduction in pests and diseases, and increase in climate resilience
- **Reduces food insecurity** and poverty, by providing diverse crops and income sources for farmers
- Usually, regen ag is not expensive

Challenges and risks

- Protocol is new, leading to **low practical knowledge** and increased implementation risks
- Protocol requires high levels of **behavior changes from farmers**, which can lead to attrition and delays

Key:

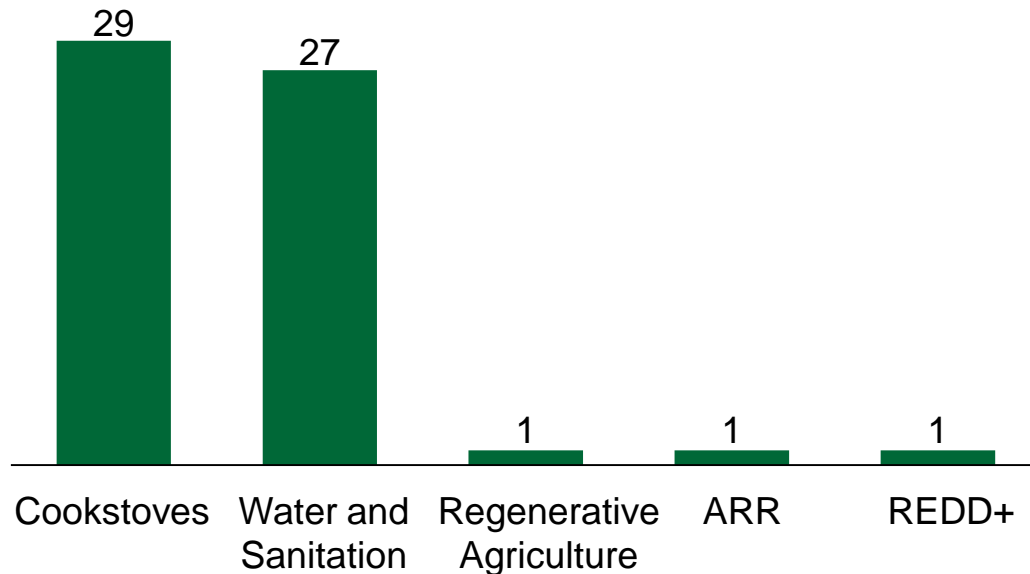
- Prioritized project type for SHFs, given potential scale and impact
- Relevant project type for SHFs, but with limited scale or impact

Note: SOC = Soil Organic Carbon
Source: VERRA protocols and projects, Acorn financial mechanism for Agroforestry

Although still incipient, VCM carbon ecosystem in Mozambique is growing quickly, especially given expectations of new, broader regulation

Carbon finance market is very nascent in Mozambique, mainly dominated by cookstoves projects

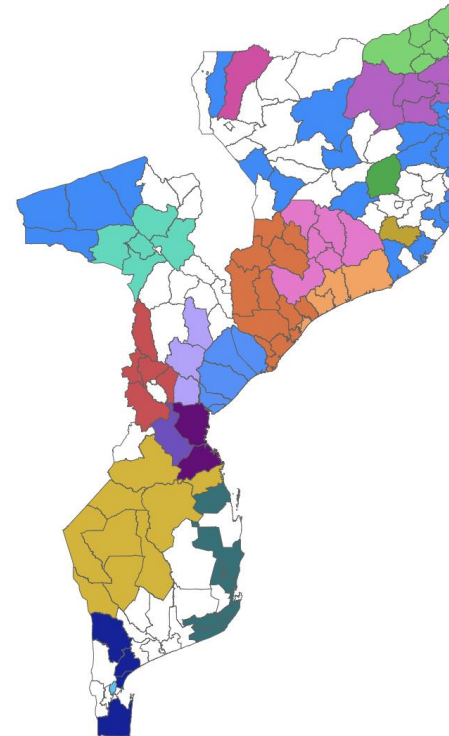
Mozambique active carbon projects
Number of projects, Oct 2023



Note: (1) Each colour represents one different developer
Source: Expert interviews, Carbon Finance Playbook, USAID, <https://shorturl.at/bgZAS>

Although incomplete and complex, REDD+ regulation is already attracting investors and developers

Map of registered REDD+ projects, by developer¹



- Currently, REDD+ decree (avoided forest conversion) is the **only official carbon policy**
- **Intense interest from investors and developers**, with 32 REDD+ projects (1 active, 31 in viability study)
- **Complex and unclear certification process**, including 8 steps, up to 40 months and \$100k-\$500k upfront cost
- **New policy is expected for Q1 2024.** Expectation that it will expand regulation to other carbon markets besides REDD+ (such as energy and agriculture), organize ecosystem, define stricter rules regarding social benefits and avoid double counting

We prioritized sectors with highest potential for carbon credit projects that can benefit SHFs, based on existence of medium-large organizations with structured relationships with SHFs

Crop	Big or medium organizations	SHF outgrower or ingrower model ¹	High value crop	High # SHFs	Potential for climate mitigation	Prioritized?
Cassava	No	No	No	Yes	Yes	No
Sugarcane	Yes	Yes	Yes	Medium	Yes	Yes
Maize	Yes	Yes	Medium	Yes	Yes	Yes
Fruits	Yes	Limited	Medium	Yes	Yes	No
Vegetables	Yes	Limited	Medium	Yes	Yes	No
Potatoes	No	No	Medium	Medium	Yes	No
Common bean	No	No	Medium	Yes	Yes	No
Pigeon pea	Yes	No	Medium	Yes	Yes	No
Coconut	Yes	Limited	Medium	Medium	Yes	No
Rice	Yes	Limited	Yes	Medium	Yes	Yes
Poultry	Yes	Limited	Yes	Yes	Yes	No
Cashew	Yes	No	Yes	Yes	Yes	Yes
Groundnut	Yes	Limited	Medium	Yes	Yes	No
Sesame	Yes	Limited	Yes	Yes	Yes	No
Soy	Yes	Limited	Medium	No	Yes	No
Cotton	Yes	Yes	Yes	Yes	Yes	Yes
Honey	No	Yes	Yes	No	Yes	No

Note: 1. Outgrower/Ingrower model needed to be bigger than 5,000 SHFs in one region to be considered as a Yes. Source: Expert interviews. Companies interviews and databases.

In each prioritized value chain, several companies were analyzed and visited, leading to the definition of four main opportunities for deeper analysis

Prioritized crop	Reasoning to analyze these organizations	Companies	Priorization process	Prioritized?
Maize	Strong relationship (out-grower scheme or exclusivity) with SHFs or nearby community. Capacity to deliver technical assistance.	ECA	Effective out-grower scheme, experience with Regenerative Agriculture and need for financial support to expand TA.	Yes
		Luteari	Effective out-grower scheme and need for financial support to expand model. Smaller size and less organized than ECA.	No
		PNG	Already submitted application to REDD+ program. Successful cases working with SHFs in the region. Need support to reduce deforestation caused by inadequate agricultural practices.	Yes
Cashew	Major institutions driving national production and engaging in industry growth	Condor	Interested in participate and benefit from pilot, but unavailable to lead it.	No
		ETG	Interested in participate and benefit from pilot, but unavailable to lead it.	No
		TechnoServe	Structured and sizable NGOs were better positioned to develop the pilot in this industry.	Yes
Cotton	Major processors, driving national production and engaging in industry growth. Out-grower model.	JFS	Well-structured out-grower model, including inputs financing and TA. Interested and studying carbon finance programs	Yes
		SAM	No interest in participate in programs.	No
Sugarcane	Major processors, driving national production and engaging in industry growth. Out-grower model.	Xinavane	Main support needed was repairing SHFs' water infrastructure, destroyed by a cyclone and flood. Difficult to monetize through CC.	No
		Maragra	No interest in participate in programs.	No
Rice	Prioritized flooded rice, since major carbon credit opportunity in rice is improve water management.	Wanbao / Regadio Baixo Limpopo	No interest in participate in programs.	No
		Acuçareira da Mafambisse	Few SHFs are using flooded methodology	No

Main 4 opportunities identified in Mozambique contemplate different methodologies, regions and organizations

Organization (Type)	Crops involved	Proposed regions	Proposed concept	Potential full scale (# SHFs, 20 years)	Impact (add farmer profit)
TechnoServe (NGO)	Cashew	Nampula, Zambézia, Cabo Delgado	Intensification of cashew trees, through seedling distribution and financial incentive for new trees. Multi-stakeholder initiative with private sector engaged in distributing inputs.	200,000	\$282 pa
JFS (Agribusiness)	Cotton	Cuamba, Niassa	Financing mango trees agroforestry, in the border of cotton farms, therefore enabling new income sources for SHFs and indirectly increasing cotton yield.	150,000	\$99 pa
ECA (Agribusiness)	Maize	Catandica, Manica	Support Regenerative Agriculture practices to increase yield in maize, through technical assistance and distribution of cover crop seeds	40,000	\$201 pa
Parque Nacional da Gorongosa (NGO and Carbon credit Developer)	Commodity crops (Maize, beans, etc)	PNG Buffer Zone, Sofala	Promote Regenerative Agriculture practices to increase yield in maize and beans, through technical assistance and distribution of tools and seeds	60,000	\$191 pa

Of the 4 opportunities, cashew and JFS have highest reach, while the regen ag projects have better ROI and expect faster results

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A) Potential reach Number of SHFs (k)
B) Total CRU Revenue per SHF \$/y/SHF
C) Potential SHF profit \$/SHF (year)
D) Potential SHF profit per ha \$/ha (year)
E) Initial investment per SHF (\$/SHF)
F) ROI = C/E SHF yearly return per dollar invested
G) Time needed to receive carbon credits (years)

■ 5 years
 ■ 20 years
 ■ Farming improvement
 ■ Carbon credit

Category	Project	Potential reach (k SHFs)	Total CRU Revenue per SHF (\$/y/SHF)	Potential SHF profit (\$/SHF (year))	Potential SHF profit per ha (\$/ha (year))	Initial investment per SHF (\$/SHF)	ROI = C/E (SHF yearly return per dollar invested)	Time needed to receive carbon credits (years)
Agroforestry	1: TechnoServe	80 (5 years), 200 (20 years)	175	152 (Farming improvement), 130 (Carbon credit) = 282	188	660	0,43	4-5
	2: JFS	40 (5 years), 150 (20 years)	56	29 (Carbon credit), 70 (Farming improvement) = 99	132	200	0,50	4-5
Regenerative Agriculture	3: ECA	16 (5 years), 40 (20 years)	100	186 (Farming improvement), 15 (Carbon credit) = 201	201	200	1,00	1
	4: Gorongosa	20 (5 years), 60 (20 years)	100	189 (Farming improvement), 1 (Carbon credit) = 191	191	130	1,47	1

Agroforestry projects have lower recurring costs, once the trees are already planted and satellite (monitoring system) is set up, which leads to high share of CC going to SHF. For Regen Ag Projects, training and soil samples analysis increase recurring costs, reducing share of CC for SHF

2 agroforestry opportunities were developed in cashew and cotton, which have potential to enable industry growth and reach 100,000s of SHFs at scale

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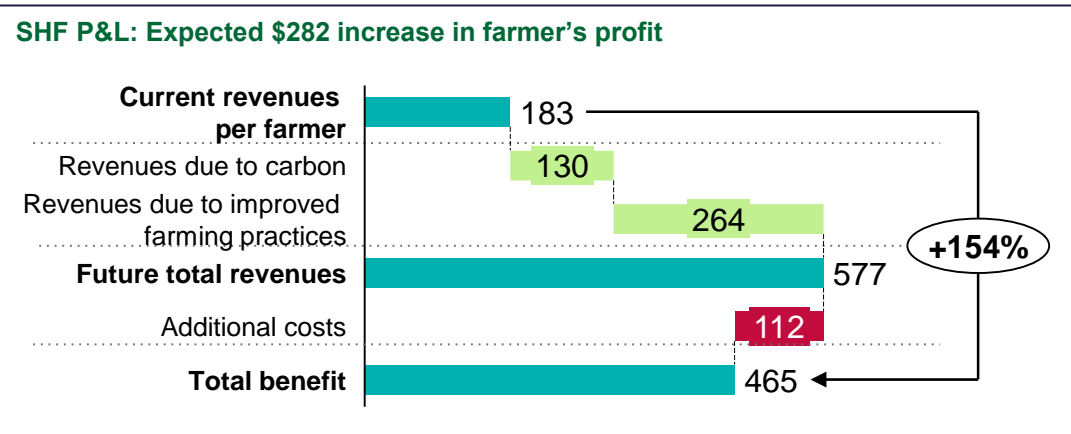
Cashew – TechnoServe



Model: Intensify cashew trees from 60 to 100 per ha, through providing high-quality seedling and incentive to care for new trees in the early years

Region: Nampula

Potential scale: 80k smallholder farmers (200k in 20Y)



Risks: Low

- Proven carbon credit model
- Need to test financial incentives for care for new trees to ensure their efficacy, given challenges of current replanting program

Feasibility: Medium

- High complexity and lack of a strong private-sector implementation partner with established buying relationships with SHFs

Potential support: Support registration and development of PDD; Support pilot to test farmer incentives; Develop satellite monitoring system

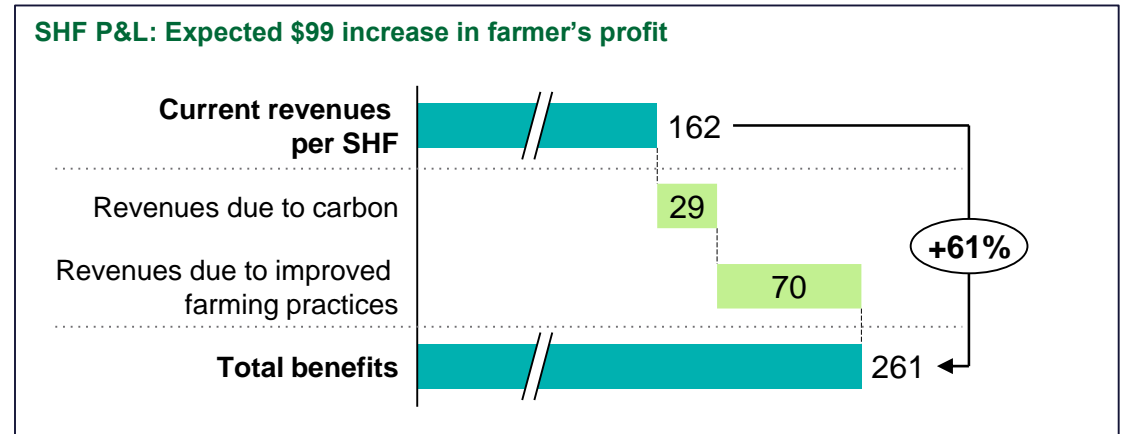
Cotton – JFS



Model: Finance agroforestry, through offering 50 mango seedlings, to be planted in the border of each cotton small farm

Region: Cuamba, Niassa

Potential scale: 40k smallholder farmers (150k in 20Y)



Risks: Low

- Already proven carbon credit model
- Impact of agroforestry in cotton yield and defense against diseases is relatively unknown

Feasibility: High

- JFS is a strong implementation partner, with structured relationship with SHFs and relevant field presence for many years

Potential support: Develop SOC baseline and monitoring methodology; Research best trees; Develop PDD

2 Regen Ag opportunities were developed in maize/beans, which have the potential to increase incomes and resilience for 10,000s of SHFs within ECA/PNG networks

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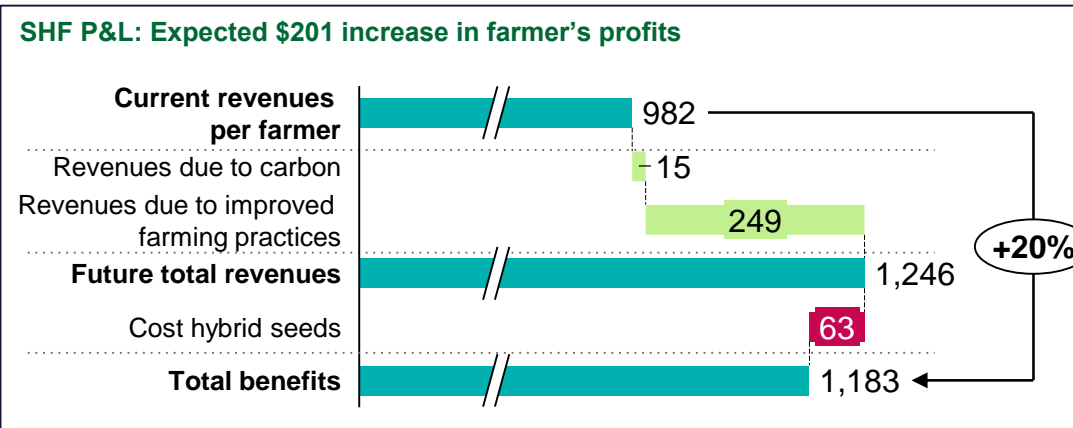


Maize – ECA

Model: Promote Regenerative Agriculture to increase yield in maize, through technical assistance and purchase of cover crop seeds.

Region: Catandica

Potential scale: 16k smallholder farmers (40k in 20Y)



Risks: Medium-High

- Regen Ag is a recent and not yet proven protocol
- Potentially need to partner with carbon credit developer to deliver program

Feasibility: Medium

- Although ECA has strong relationship with SHFs, it had not yet started exploring carbon credits and has not yet taken any initial steps

Potential support: Identify developer partner or support development of PDD; Develop SOC baseline and monitoring methodology; Develop pilot

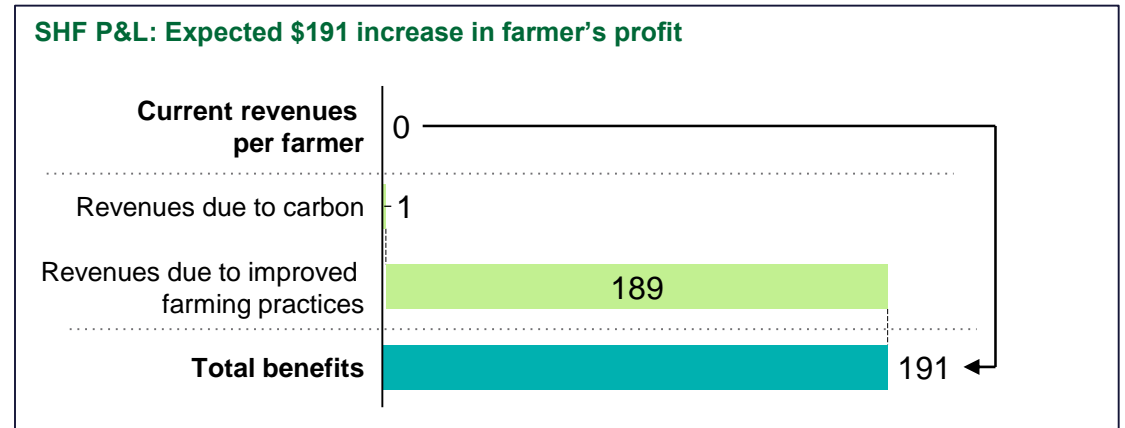


Maize and other commodities – Gorongosa National Park

Model: Promote regen ag to increase yield in maize and beans, through technical assistance and purchase of tools and cover crop seeds

Region: Gorongosa National Park's Buffer Zone

Potential scale: 20k smallholder farmers (60k in 20Y)



Risks: Medium

- Regen Ag is a recent and not yet proven protocol
- PNG is already a developer in REDD+ program, investing resources in carbon finance

Feasibility: Medium

- Although PNG has access to external support (financial or operational), it lacks strong relationship with SHFs in the buffer zone (except coffee and honey)

Potential support: Develop SOC baseline and monitoring methodology; Develop PDD; Develop pilot

The proposed pilots have significant risks related to VCM inherent instability: potential inability to receive credits, future taxes and future carbon credit prices

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Expected Impact in each pilot

**Opportunity 1:
Cashew-TechnoServe**

**Opportunity 2:
Cotton-JFS**

**Opportunity 3:
Maize-ECA**

**Opportunity 4:
Maize-PNG**

Risk 1: Inability to receive carbon credits

Reasons: Challenges in the certification process, change in the protocols, political or economical reasons, etc.

Likelihood: **Medium**

High¹

SHF profit reduction:
50-70%

Low

SHF profit reduction:
10-30%

Medium²

SHF profit reduction:
30-50%

Medium²

SHF profit reduction:
30-50%

Risk 2: Future taxation of carbon credits

Reasons: Mozambique government is discussing an increase in income tax on the carbon credit projects. Current tax is 2%. Expect taxation is 15-20%

Likelihood: **High**

Low

SHF profit reduction:
10-30%

Very low

SHF profit reduction:
< 10%

**Low impact on SHF
SHF profit reduction**

< 10%

**High impact on program
sustainability**

Program profit < 0%

**Low impact on SHF
SHF profit reduction**

< 10%

**High impact on program
sustainability**

Program profit < 0%

Risk 3: Reduced carbon credits price (analysis based off price of \$25)

Reasons: Changes in the carbon market dynamic, insurgence of new players with better costs, etc.

Likelihood: **Medium**

Very low

Minimum viable carbon
credit price: \$4

Low

Minimum viable carbon
credit price: \$10

High

Minimum viable carbon
credit price: \$21

High

Minimum viable carbon
credit price: \$24

Increasing scale (ha/SHF) has the potential to reduce these risks

Assumption: (1) Impacts SHF ability to pay for spraying (2) Lack of training assumed to lead to a loss of 30% in expected yield for both maize and cover crop.

Overall, the VCM is risky, high cost and has relatively limited potential to positively impact Mozambican SHFs in the short-term

KEY CHALLENGES ACCESSING VCM FOR SHFS IN MOZAMBIQUE



HIGH RISK

NO GUARANTEE OF SUCCESS

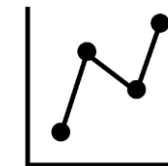
- Uncertain policy environment e.g., taxes, rules about partnering with developers
- Demanding criteria from carbon agencies – and risk of losing credits if the criteria aren't met (e.g., if trees are cut down)
- Protocols for regenerative agriculture not yet established / proven
- Global uncertainty on overall future of VCM



HIGH COST

SIGNIFICANT INVESTMENT REQUIRED

- High start up costs e.g., registration, baselining, community consultation, MRV set-up: requires scale to implement
- High operating costs e.g., MRV, reporting
- For donors: costs of learning reduce Value for Money of initial investments in this area



MODEST IMPACT

RELATIVELY LOW IMPACT POTENTIAL

- Few sectors/businesses have large numbers of SHFs in structured supply chain relationships required to access carbon credits
- Works best in higher value cash crops; difficult in informal commodity markets
- Value of carbon credits is relatively low – could go up in future, but also down

Engagement with the developing carbon market can have immediate impact while enabling learning and ability to influence the policy context to ensure SHFs are not excluded

Main support needs to enable SHFs to participate in carbon markets

Proposed focus for FCDO
Mozambique

Develop sound SHF business models

- While carbon credits require additionality, projects supported need to make economic sense for SHFs in all scenarios and limited revenues from carbon credits should be coupled with increased revenues from improved farm operations
- Need to develop sound business models that meet both carbon and farm profitability objectives

Develop high quality “best practice” projects

- Low quality projects and lack of transparency are devaluing carbon credits and trust in the VCM globally
- Opportunity to develop and showcase strong projects that are improving SHF lives while reducing carbon emissions – with solid MRV and transparent calculation and reporting of benefits

Influence policy and regulation (nationally and internationally)

- Regulatory and enabling environment will largely determine the size of the opportunity for Mozambican SHFs: key role for donors to make clear recommendations and advocate for government policy to enable SHF participation (e.g., clarity on developing agriculture projects in REDD+ areas and on level of taxation; investment in insurance scheme that provides reassurance on permanence of SHF practices)

Support development of appropriate technology solutions

- Technology solutions can bring down cost of MRV thus enabling smaller projects and higher share of carbon credit revenues to SHFs after covering monitoring costs
- Potential for donors to support development of relevant tools, ensuring appropriate privacy and data access controls are in place

Supporting high quality projects with leading agribusinesses and industries will have immediate impact while also enabling learning on technology and regulatory requirements, feeding into ability to influence broader development of the carbon market system. Investment in pilots should be supported by explicit investment in learning and sharing

Recommendations

OVERALL PROPOSED STRATEGY FOR FCDO



INVEST IN TA FOR PILOT OPPORTUNITIES over the next 1-2+ years to prove models and generate learnings which can be shared with stakeholders



INFLUENCE OTHER DONORS and engage them in co-investing in the selected opportunities where larger sums of funding are required to scale up the projects



INFLUENCE GOVERNMENT by attending relevant forums, sharing insights from on-the-ground work on carbon markets for Mozambique's SHFs

ILLUSTRATIVE POTENTIAL INVESTMENTS

- Support with project design and stakeholder alignment / defining roles and responsibilities (e.g., cashew stakeholders; PNG engagement of buyer partners; ECA engagement with project developers)
- Development of soil organic carbon baseline and MRV methodology (for JFS and ECA)
- Development of Project Design Document (PDD) (required to register with carbon standards) including baselining, community consultations and economic modelling
- Support pilot to test SHF incentives and adoption rates, in parallel with or after PDD is completed and approved

Indicative budget: \$250 – 500,000 over 2 years could cover TA to 1-3 opportunities
Cashew and JFS opportunities may offer highest potential impact + additionality in short-term

Supported by:



Implementing partners:



Example of alternatives for FCDO support

/ NOT EXHAUSTIVE

Proposed Activities

Opportunity 1: Cashew-NGO

6-month mock-test to test SHF behavior change (active care take for trees), given financial incentive from “fake” carbon credit

Provide technical and financial support in the development of PDD¹ for REDD+

Provide support in the refinement of carbon model and potential co-benefits

Opportunity 2: Cotton-JFS

Support additional research and methodology definition for monitoring of SOC (Soil Organic Carbon) and establish baseline

Support in the definition of best approach in terms of developer (partner with the local REDD+ or be the developer in a ARR model)

Contribute for agronomical definition of best practices and species to be used in the program

Opportunity 3: Maize-ECA

Provide technical and financial support in the development of PDD¹ for Regen Ag Protocol

Support development of Demo Plots and Field Days, following the proposed practices in the pilot

Support development of mock-test to evaluate SHF adherence to Regen Ag farming practices

Opportunity 4: Maize-PNG

Note: PDD is the first essential document necessary to register as a Carbon credit developer in REDD+ process in Mozambique.

While the focus of this study was climate mitigation, climate resilience remains the key need and opportunity to support Mozambican SHFs, above climate mitigation efforts

1

Climate mitigation

Reduction of carbon emissions of agribusiness and supplier, with or without monetization

Avoided forest conversion / deforestation (REDD+): REDD+ conserves forests before they are degraded or deforested, resulting in the avoidance of a business-as-usual scenario that would have produced higher emissions

Agroforestry and reforestation: Agroforestry mixes trees with other agricultural land-use, such as field crops and livestock, thereby storing carbon in trees and improving biodiversity. Reforestation is growing trees on land recently covered with forest

Sustainable agriculture: Mix of practices which avoid (or remove) carbon and provide good stewardship of natural resources that farms rely on, e.g., crop rotation, tillage reduction, fertilizer optimization and green manure

Biochar: Biochar is a biological fertilizer produced through the pyrolysis of agricultural residues, sequestering carbon. Enhances fertility and soil microbial activity, improves water retention and promotes nutrient availability

Potential reach: Mainly viable through large agribusinesses contracting 10,000s of SHFs; total estimated reach \pm 10-20% SHFs in short term

2

Climate resilience

Agribusiness support to SHF suppliers to become more resilient to changing weather patterns

Increase SHF income and access to credit: Farmers can invest in improved seeds, inputs and techniques that increase incomes, increasing overall resilience for the family

Resilient agricultural practices / inputs: Better practices (such as agroforestry, crop rotation) and inputs (e.g., drought-tolerant seeds) help farmers adapt to climate change and shocks

Infrastructure improvements: With investment in infrastructure, such as irrigation systems and dykes, farmers can continue production and maintain productivity despite lack of rain or in case of a flood

Climate insurance: Farmers are able to partially recover financial losses after floods/cyclones, increasing ability to invest for next season

Potential reach: Approx. 60-70% of SHFs sell some crops, though can be most cost effective to influence through medium-large agri-businesses

Scope to support climate resilience projects in all business segments, alongside targeted focus on carbon credits through larger agri-businesses

	1 Climate mitigation pilots	2 Climate resilience pilots
	Reduction of carbon emissions of agribusiness and supplier, with or without monetization	Agribusiness support to SHF suppliers to become more resilient to changing weather patterns
Small (Rev. <\$500k)	<p>1a</p> <ul style="list-style-type: none"> • NGO-led initiative that involves SMEs e.g., as sales agents for biochar, potentially receiving share of carbon credits as incentive payment • Large-company led initiative that engages intermediary SMEs 	<p>1a</p> <ul style="list-style-type: none"> • Supporting small businesses with simple initiatives e.g., information provision to SHFs. Linking small businesses into larger eco-system can increase ability to drive SHF behaviour change. May need NGO support
Medium (Rev. \$500k - \$5mil)	<p>1b</p> <ul style="list-style-type: none"> • Partnership between developer/existing concession with business/es with ± 1000-5000 of contract grower SHFs <i>[TBC developer interest/incentives and timeframe; potential need for NGO involvement]</i> 	<p>2b</p> <ul style="list-style-type: none"> • Support mid-size businesses to support ± 1000-5000 outgrower farmers to adopt regenerative agricultural practices (helping expand mid-size business and its farmer base)
Large (Rev. >\$5mil)	<p>1c</p> <ul style="list-style-type: none"> • Carbon project with business that works with ± 5000-50,000 contract grower SHFs; may still need to partner with developer 	<p>2c</p> <ul style="list-style-type: none"> • Support large businesses to support ± 5000 – 50,000 contract farmers to adopt regenerative agricultural practices (helping to expand business and its farmer base)

Sources: TNS; CASA; Expert interviews