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Voluntary Carbon Markets for Agriculture in sub-Saharan Africa

How-to Guide

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1. Introduction to voluntary carbon markets for agriculture in SSA

This document provides a foundational resource for understanding, assessing, and supporting carbon project development within the context of agriculture in sub-Saharan Africa (SSA). Areas covered include:

- Introduction to carbon markets
- Why are carbon credits relevant in agriculture?
- What are the key policies and considerations for successful development of carbon projects?
- Case studies and additional resources

1.1 What are carbon markets and carbon credits?

Carbon markets	<ul style="list-style-type: none"> • Definition: Carbon markets refer to a marketplace where credits for reducing greenhouse gas (GHG) emissions and allowances for emitting GHG are traded.¹ • Types: <ul style="list-style-type: none"> ○ Regulated Carbon Markets: These are established by international, national, or regional policies or regulations that set a limit (cap) on total allowable emissions. ○ Voluntary Carbon Markets: These markets operate without legal mandates and rely on the voluntary exchange of carbon credits, driven by market demand and supply. <p><i>Read more about carbon markets here and here</i></p>
Carbon credits	<ul style="list-style-type: none"> • Definition: Carbon credits are a way of reducing GHG emissions by allowing entities to trade their rights to emit carbon dioxide or other gases. One carbon credit is equivalent to one metric ton of CO₂ equivalent (1 T CO₂e).² • Types of carbon credits: (depending on the method of emission reduction or removal)³ <ul style="list-style-type: none"> ○ Reduced emissions credits: originate from initiatives, such as energy efficiency measures, renewable energy generation, or fuel switching, which are aimed at reducing emissions from certain sources. ○ Removed emissions credits: arise from initiatives focused on capturing and storing carbon from the atmosphere. ○ Avoided emissions credits: generated by initiatives designed to prevent emissions that would otherwise occur, such as preventing deforestation, reducing methane leakage, or improving waste management. <p><i>Read more about carbon credits here</i></p>

1.2 Why are carbon credits relevant in agriculture in sub-Saharan Africa?

In agriculture, carbon markets offer an innovative approach to overcome conventional financing obstacles and promote low-emission practices by transforming environmental benefits, such as reduced GHG emissions, into tradable commodities while also improving biodiversity conservation. The following sectors present opportunities for leveraging carbon credits through carbon sequestration and methane reduction.

<p>Agroforestry</p> <p>Planting trees within agricultural landscapes can sequester carbon and enhance biodiversity.</p>	<p>Livestock management</p> <p>Improved livestock management practices, such as rotational grazing and dietary adjustments, can reduce methane emissions.</p>
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¹ UNFCCC, Carbon Markets, [link](#)

² World Economic Forum, *what are carbon credits and how can they help fight climate change?* [link](#)

³ World Economic Forum, [link](#)

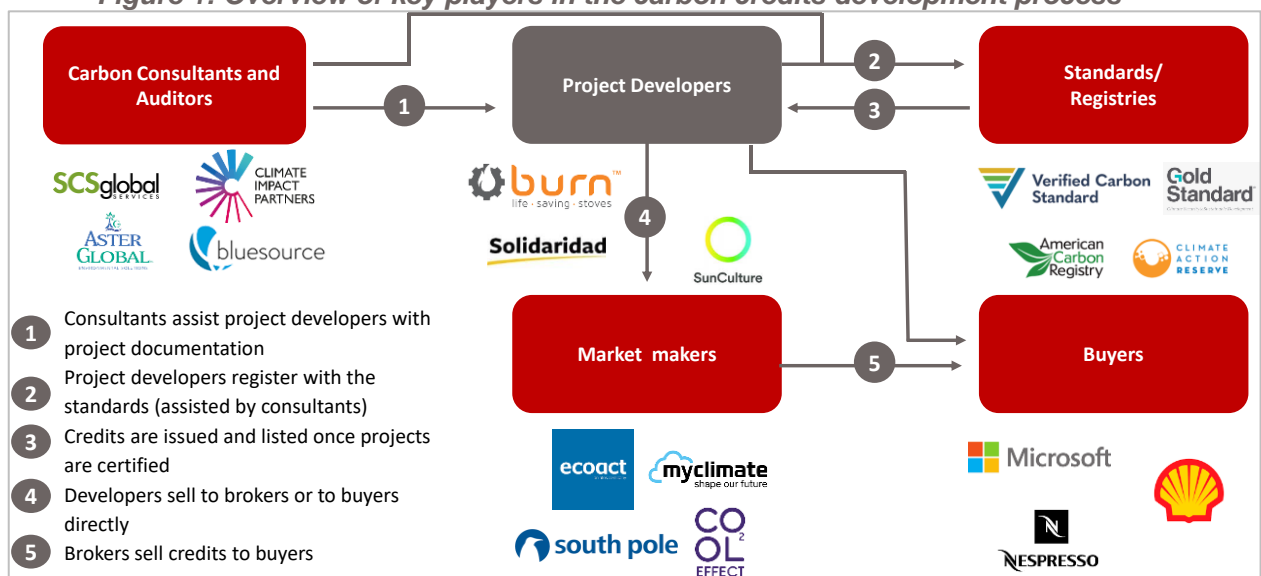
<p>Agroforestry offers significant opportunities for carbon credits by contributing to carbon sequestration and enhancement of biodiversity through preventions of soil erosion, while also providing additional income sources for farmers.</p>	<p>Anaerobic digestion or composting of manure also reduces methane emissions.</p> <p>Equally, livestock management offers significant opportunities for carbon credits due to the limited focus despite the high emissions.</p>
<p>Soil management</p> <p>Conservation tillage, cover cropping, and agroecological practices enhances soil carbon sequestration.</p>	<p>Water management</p> <p>Sustainable water management practices, such as efficient irrigation, can reduce energy use and associated emissions and generate credits for emission reductions related to improved water management. In addition, practices like intermittent flooding and alternate wetting and drying can reduce methane emissions from rice paddies.</p>

In determining the attractiveness of opportunities for carbon projects in the above sub-sectors, it is important for actors and project developers to:

- **Gather baseline data** on current land use, agricultural practices, and environmental conditions and consult with local communities, farmers, and relevant stakeholders to understand their needs, priorities, and challenges.
- **Assess the potential environmental impacts of the proposed project**, considering factors like biodiversity, soil health, and water quality and evaluate the social implications of the project, including its effects on local communities, livelihoods, and equity.
- **Evaluate the financial feasibility of the project** by conducting a cost-benefit analysis, considering both short-term and long-term returns as well as identifying potential funding sources, including grants, loans, or partnerships with private entities.
- **Ensure proposed carbon sequestration practices are integrated** with existing agricultural activities for long-term sustainability and incorporate adaptive management strategies to adjust the project based on evolving conditions and lessons learned.

1.3 What is the process for registering projects for carbon credits?

Figure 1: Overview of key players in the carbon credits development process



Despite presenting an innovative solution to address traditional financing hurdles, carbon market actors encounter various challenges in developing projects. Actors such as USAID can play a key role in catalyzing the development of carbon markets by leveraging expertise and resources to

overcoming barriers and challenges hindering the growth of carbon markets, through potential initiatives as summarized below.

Challenge	Description	Potential initiatives
High costs of registration	<ul style="list-style-type: none"> The upfront registration investments, averaging between \$100,000-\$200,000, pose a significant financial barrier, particularly in developing markets. 	<ul style="list-style-type: none"> Provide incentives to offset upfront registration costs, making it more feasible for agribusinesses to participate in carbon markets, for instance Acorn Rabobank is helping smallholder farmers participate in carbon markets by financing the initial setup cost. Develop cost-sharing programs where USAID shares the financial burden of project registration with the participating entities.
Developing supportive environment	<ul style="list-style-type: none"> Ongoing efforts are directed toward developing regulations for clean cooking, productive use of energy (PUE), solar home systems (SHS), with limited focus on agriculture. 	<ul style="list-style-type: none"> Assist in the development of robust regulations and frameworks for carbon projects in the agriculture sector, creating a conducive environment for investment, e.g., the Africa Carbon Markets Initiative (ACMI) focuses on helping stakeholders develop conducive policies and create an enabling environment.
Limited technological adoption	<ul style="list-style-type: none"> Foundational technologies for Monitoring, Reporting, and Verification (MRV) face low adoption in SSA, primarily due to their associated high costs. 	<ul style="list-style-type: none"> Facilitate the transfer of MRV technologies by providing training and resources to increase their adoption in SSA. Support/implement pilot programs to showcase the effectiveness of MRV technologies in agriculture, encouraging broader adoption by agribusinesses.
Limited pipeline of bankable projects	<ul style="list-style-type: none"> The limited pipeline of bankable pipeline hinders the development of carbon markets, as the scarcity of financially viable initiatives hampers the expansion and effectiveness of carbon credit mechanisms. 	<ul style="list-style-type: none"> Offer technical assistance to agribusinesses in project development, helping them navigate the complexities of carbon project implementation. E.g., AfDB's African Carbon Support Program provides TA, capacity building, and project preparation support for carbon projects. Encourage the aggregation of smaller agricultural projects to enhance their viability and attractiveness.
Lack of adequate knowledge and collaboration among stakeholders	<ul style="list-style-type: none"> Insufficient knowledge and expertise on carbon project development within agricultural settings. Lack of collaboration among stakeholders impedes the sector's development by limiting dissemination of crucial information and best practices. 	<ul style="list-style-type: none"> Organize workshops and knowledge-sharing events to educate local actors, including agribusinesses, on the benefits and processes of engaging in carbon markets. Foster partnerships between USAID, local governments, private sector entities, and other stakeholders to collectively address challenges and promote sustainable carbon projects.

1.4 What are key considerations for successful development of carbon projects?⁴⁵

⁴ Technica, [link](#)

⁵ Renewable Energy Magazine, [link](#)

Considerations	Description
Carbon taxation	<ul style="list-style-type: none"> When designing carbon taxation, it is crucial to consider adopting stable and consistent carbon taxation practices across sectors and the SSA region to create a level playing field for businesses, prevent carbon leakage, and maintain competitiveness. Read South Africa carbon tax act here. The policy is among the first in the world to apply a carbon tax to all sectors of the economy, except for agriculture and food production, which are exempt for now.* Consistent taxation fosters predictability and simplifies compliance and is helpful in providing predictability to businesses and project developers, a role that USAID is well positioned to perform compared to individual developers.
Benefits sharing	<ul style="list-style-type: none"> Carbon policies should align with the concept of just transition,[^] establishing a transparent and fair mechanism for distributing the revenue from trading of carbon credits and revenue generated from carbon taxation back to the communities directly affected by emission reduction efforts and address potential disparities in how the costs and benefits of emission reduction efforts are distributed across different socioeconomic groups. Ensuring vulnerable communities are not disproportionately burdened, i.e., they face more negative impacts or risks from climate change or carbon policies than others without receiving adequate compensation or benefits, is crucial. South Africa's carbon tax policy is one of the few in the world to use a revenue-neutral approach, which means that the government does not use the collected tax revenue to fund any specific programs or projects, but rather distributes it among all taxpayers according to their income levels.^δ
Baseline and additionality criteria	<ul style="list-style-type: none"> Policies should define robust baseline and additionality criteria that determine whether a project's emissions reductions are additional to what would have happened without the project. This ensures only projects that lead to genuine emissions reductions are eligible for carbon credits. Additionality is important to ensure the environmental integrity and credibility of carbon projects and credits. However, proving additionality can be difficult and subjective, as it requires establishing a baseline scenario and comparing it with the project scenario.
Flexibility and innovation	<ul style="list-style-type: none"> Carbon policies should allow for flexibility in compliance mechanisms to accommodate different industries and technologies and encourage innovation by providing incentives for the adoption of new and cleaner technologies.
International commitments	<ul style="list-style-type: none"> The policies should also be aligned with international climate commitments, and National Determined Contributions (NDC), to contribute to global emission reduction efforts.
Market stability	<ul style="list-style-type: none"> Policies should allow for mechanisms to prevent excessive volatility in carbon prices, which can impact the long-term effectiveness of carbon markets.
Leakage	<ul style="list-style-type: none"> Carbon projects should ensure the emission reductions or removals achieved by the project are not partially or fully offset by an increase in emissions elsewhere (leakage). For instance, a forest conservation project that prevents deforestation in one area may cause displacement of logging activities to another area, resulting in net zero or negative emission reductions. Leakage can undermine the effectiveness and impact of carbon projects and credits. Therefore, leakage should be identified, monitored, and accounted for in the project design and implementation, although the process to identify and quantify leakage is often difficult.
Permanence	<ul style="list-style-type: none"> Carbon projects should ensure emission reductions or removals achieved by the project are permanent and irreversible, i.e., the carbon stored or

Considerations	Description
	<p>avoided by the project should not be released back into the atmosphere in the future.</p> <ul style="list-style-type: none"> • Permanence is important to ensure long-term benefits and sustainability of carbon projects and credits. However, ensuring permanence can be challenging and uncertain, as there may be natural or human-induced risks that can compromise the carbon stock or performance of the project. • USAID can promote permanence in agricultural carbon sequestration projects by: <ul style="list-style-type: none"> ○ Introducing financial instruments that link incentives to the long-term permanence of carbon sequestration. ○ Designing programs that empower local communities to actively participate in safeguarding the permanence of carbon sequestration schemes. • Allocating resources for research and development in advanced technologies that enhance the permanence of carbon stocks.
<p>* SAIIA, link; World Economic Forum, link ^ UNDP, what is just transition? And why is it important?, link ^o National Treasury, link and link</p>	

2. Case studies from USAID and non-USAID stakeholders

Project developer	Goal	Carbon mitigation and sequestration activities	Impact
Sub-Saharan Africa			
Northern Rangelands Trust- Kenya (NRT), link	NRT's soil carbon project focuses on community-based conservation and sustainable natural resource management in the northern rangelands of Kenya.	Soil carbon project that advances carbon sequestration and mitigation through innovative strategies encompassing sustainable rangeland management, agroforestry, and community conservancies via collaboration with pastoralist communities, and extensive stakeholder engagement.	Set to generate \$300M in the next 10 years and remove 50M tons of CO ₂ over 30 years 1.9M ha under conservation
Boomitra- East Africa, Asia link	Boomitra offers a tech-driven platform that focuses on soil monitoring, carbon sequestration, and climate finance to support farmers and ranchers in Kenya, Uganda, Tanzania, and India adopt sustainable agricultural practices.	The technology enables precise monitoring, reporting, and verification of carbon content, nutrients, and moisture levels in the soil. Through strategic global partnerships, Boomitra facilitates the adoption of carbon-sequestering agricultural practices, quantifies the resultant additional carbon captured, and collaborates with international standards bodies to generate carbon credits.	56,000 acres currently under management Average carbon credits price \$10-20
Acorn Rabobank - SSA, link	Focused on helping smallholder farmers in Kenya, Tanzania, Zambia, Rwanda, Uganda, India, Mexico access voluntary carbon	The project uses cutting-edge technology to measure and certify carbon sequestered by trees planted by the farmers, and issues carbon removal units (CRUs) that can be sold to corporates to reduce their carbon footprint.	235,000 farmers supported 255,000 CRU issued 245,000 ha covered

Project developer	Goal	Carbon mitigation and sequestration activities	Impact
	market and transition to agroforestry.		
One Acre Fund - East & Southern Africa , link	One Acre aims to help smallholder farmers in Kenya, Uganda, Tanzania, Rwanda, Burundi, Malawi, Zambia, and Ethiopia access the voluntary carbon market and benefit from planting trees on their farms.	The project aims to plant 1 billion trees by 2030, which would sequester about 300 million tons of carbon dioxide equivalent, equivalent to taking 65 million cars off the road for a year and uses satellite imagery, machine learning, and blockchain to measure and certify the carbon stored by the trees, and to issue CRUs that are transparent and traceable.	Still in development stage
USAID's Zambia Community Forest Program (CFP) , link	To establish the largest REDD+ program to date in Zambia, by involving local communities in the management and conservation of forest resources.	Establish baseline forest carbon stocks in 12 sites across Zambia, covering approximately 1.2 million hectares of forest land; develop a certification system for community-managed forests, ensuring alignment with REDD+ principles and standards; and establish a market for certified forest products (timber and non-timber) and carbon credits. The program also supports farmers in soil fertility management and collaborates with agribusiness to improve market access for smallholders.	Increased forest carbon stocks by 1.2 million tons Reduced GHG emissions by ~0.8 MT per year Generated \$3.5M in annual income for local communities
Global			
Cargill , link	Cargill made a commitment to reduce supply chain emissions by 30% by 2030	In collaboration with Iowa Soybean Association and using USDA's COMET- Farm Tool to measure carbon sequestration, the Soil and Water Outcomes Fund will allow Cargill to pay farmers to adopt sustainable practices such as reduced tillage and cover crops to sequester carbon.	10,000 acres of farmland enrolled by Iowa farmers \$30-45/acre in carbon payments and 7,500 tons of CO ₂ e sequestered \$30,000-45,000 in revenues to Iowa farmers
Indigo Ag , link	Indigo Ag, an agricultural technology company, intends to remove one trillion tons of carbon dioxide from the atmosphere across 12 billion acres	The "Terraton Initiative" aims to reduce emissions by encouraging farmers to adopt regenerative farming practices. This includes planting cover crops, reducing the use of chemicals and fertilizers, rotating different crops, and integrating livestock to improve soil health.	20M acres submitted plans to apply \$15 per verified 1 MT of CO ₂ e 40-60 MT of CO ₂ e sequestered

Project developer	Goal	Carbon mitigation and sequestration activities	Impact
California Air Resources Board (CARB), link	CARB introduced the “Rice Cultivation Projects Compliance Offsets Protocol” in 2015, which is the first protocol that measures GHG reductions from crop-based agriculture	Rice farmers who have been cultivating for minimum of 2 years and have soil with 3 percent or less organic content in the top 10 cm on the soil volunteer to implement one of three methods included in the protocol to sequester carbon: dry seeding, early drainage, or alternative wetting or drying.	21 rice growers across 22,000 acres signed up Price set according to the market, e.g., in 2017, price per ton CO ₂ e was \$7

3. Relevant stakeholders

Stakeholder	Role
Africa Carbon Markets Initiative (ACMI)	ACMI is a partnership of governments, businesses, and organizations that aims to scale up the production and demand of high-quality carbon credits from Africa. ACMI also supports the distribution of revenue equitably and transparently with local communities.
The International Carbon Action Partnership (ICAP)	ICAP provides a platform for technical dialogue, capacity building, and information dissemination on ETS design and implementation. ICAP also supports the linking of carbon markets and the development of common standards and guidelines.
Carbon Market Watch	Carbon Market Watch exists to ensure carbon pricing and other climate policies cut pollution and drive a just transition toward zero-carbon societies. Carbon Market Watch provides evidence-based advocacy, turns complex issues into comprehensible messages, and helps people understand and influence climate policies that affect them.
South Pole	South Pole enables climate action for a low-carbon future and is a leading provider of global sustainability solutions and services. South Pole helps businesses, governments, and organizations to measure, reduce, and offset their environmental and social impacts and develops and manages projects that generate carbon credits and renewable energy certificates.
Ecosphere+	Ecosphere+ enables businesses and individuals to take climate action through nature-based solutions. Ecosphere+ sells carbon credits and other environmental assets from a portfolio of projects that protect and restore forests, peatlands, and mangroves in addition to providing advisory services and digital tools to help clients measure, reduce, and offset their carbon footprint and achieve their sustainability goals.
Africa Development Bank (AfDB)	AfDB is working to expand carbon markets in Africa and help its clients access carbon finance for their low-carbon investments. The AfDB has launched the African Carbon Support Program (ACSP), which provides technical assistance, capacity building, and project preparation support for carbon projects in Africa.
Global Environment Facility (GEF)	GEF is a financial mechanism that supports developing countries and regions to implement projects and programs that address global environmental challenges, including climate change. GEF’s work in carbon markets involves providing grants and co-financing for projects that reduce greenhouse gas emissions or enhance carbon sequestration in various sectors, such as energy, transport, industry, forestry, agriculture, and waste management.

Stakeholder	Role
Rainforest Alliance	Rainforest Alliance provides evidence-based advocacy, turns complex issues into comprehensible messages, and helps people understand and influence climate policies that affect them.
Fairtrade International	Fairtrade International enables small-scale farmers and rural communities in developing countries access carbon finance for their climate adaptation and mitigation projects.
Carbon Trust	Carbon Trust helps businesses, governments, and organizations to measure, reduce, and offset their carbon emissions and achieve their sustainability goals.

4. Additional resources

Resource	Description
Report: Carbon farming: Opportunities for Agriculture and Farmers to Gain from Decarbonization	The report explores the opportunities and challenges for agriculture and farmers from decarbonization through carbon markets and provides examples of carbon farming projects and initiatives around the world, as well as recommendations for policymakers, investors, and consumers to support the development and scaling of carbon farming.
Report: Carbon markets and agriculture: Why offsetting is putting us on the wrong track	The report discusses the problems and risks of carbon markets and agriculture. The report argues that carbon markets and agriculture are not compatible because of the negative impacts on farmers, food security, and climate ambition. The report also provides policy recommendations to address these issues and to support a transition toward agroecology.
Report: Making climate finance work in Agriculture	The report explores challenges and opportunities for mobilizing and delivering climate finance for agriculture in developing countries and provides recommendations and best practices for enhancing the effectiveness and impact of climate finance for agriculture.
Report: 4 ways to unlock carbon finance in agriculture to drive climate action	The article discusses the urgent need for the agricultural sector to reduce GHG emissions to limit global warming while feeding three billion more people by 2050. It emphasizes the role of carbon markets in financing this transition but points out challenges, particularly in measuring soil organic carbon and provides a four-step framework for project developers and companies.
Report: Systemic Solutions for Climate Change Adaptation and Mitigation in Agriculture, Nutrition, & Food Systems	The report explores the concept and practice of systemic solutions, drawing on examples from different sectors and regions and provides recommendations and best practices for designing and implementing systemic solutions.
Report: Roadmap for achieving net-zero emissions in global food systems by 2050	The report discusses a roadmap for achieving net-zero emissions in global food systems by 2050 and evaluates more than 60 scenarios based on existing low-emission and carbon sequestration practices in agriculture, land use, and other food system activities.
Report: Catalyzing Climate Finance for Low-Carbon Agriculture Enterprises	The report examines the potential contribution of small and medium enterprises (SMEs) that use renewable energy to improve the productivity and resilience of rural communities in India and sub-Saharan Africa and identifies the challenges and recommendations for channeling climate finance to scale these enterprises and their impact on climate adaptation and mitigation.

Resource	Description
Report: Agriculture and climate change: Reducing emissions through improved farming practices	The report analyzes the potential of different practices to reduce GHG emissions from crop and livestock production, such as fertilizer optimization, irrigation efficiency, feed additives, and manure management. The report also estimates the costs and benefits of these practices for farmers and the society, and the barriers and enablers for their adoption.
Podcast: Carbon Markets: Should farmers participate?	This Levi Lyle Podcast episode discussed the emergence of start-ups offering farmers compensation for generating agricultural carbon credits. The podcast explores the unknowns and challenges surrounding the development of new ecosystem services markets for farmers.
Podcast: Carbon Farming Podcast	The Carbon Farming Podcast with Agoro Carbon Alliance covers the latest news and insights from the world of agricultural carbon. The podcast features discussions with industry experts, farmers, ranchers, and agronomists about the carbon market and farm-based carbon credits.