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# STRENGTHENING ORGANIC AGRICULTURE THROUGH CARBON MARKETS IN NIGERIA: A REVIEW OF THE ROLE OF ASSOCIATION OF ORGANIC AGRICULTURE PRACTITIONERS OF NIGERIA (NOAN) IN EMPOWERING SMALLHOLDER FARMERS

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## ABSTRACT

The integration of organic agriculture and carbon finance presents a transformative opportunity for the sustainable development of agriculture in Nigeria. This review examines the role of the Association of Organic Agriculture Practitioners of Nigeria in carbon markets as a mechanism to enhance organic farming systems while economically empowering smallholder farmers. Organic practices such as conservation tillage, composting, forestation, and cover cropping not only promote ecological health but also offer measurable contributions to carbon sequestration. However, the adoption of carbon farming schemes by smallholder organic farmers remains limited due to high certification costs, complex monitoring, reporting, and verification systems, as well as a lack of institutional support. Drawing insights from successful models globally, the paper explores how NOAN can bridge these gaps by leveraging approaches such as group certification, participatory guarantee systems (PGS), targeted capacity building, and digital tools. Furthermore, the review proposes policy and structural reforms necessary to integrate carbon farming into Nigeria's organic agriculture standards, policies, and national climate strategies. The study concludes that, with strong institutional leadership, inclusive design, and multi-stakeholder collaboration, carbon markets can deliver dual benefits: enhancing environmental sustainability and improving the livelihoods of smallholder farmers.

**Keywords:** *Carbon market, Carbon credits, Carbon offsets, organic agriculture, smallholder farmers.*

## INTRODUCTION

Greenhouse gases (GHG) such as nitrous oxide ($N_2O$), carbon dioxide ($CO_2$), methane ($CH_4$), and chlorofluorocarbons (CFCs) naturally occur in the atmosphere and play a vital role in maintaining a temperature balance that supports life. However, human-induced activities in different sectors of the economy have led to an excessive accumulation of GHGs in the atmosphere (USEPA, 2025). In the agricultural sector, activities such as the combustion of fossil fuels (coal, oil, and gas) through increased use of heavy machinery, deforestation, the production and use of synthetic chemicals, and low soil conservation techniques contribute to GHG emissions in the atmosphere (Xing and Wang, 2024). Excessive GHGs disrupt atmospheric energy balance by altering solar radiation, temperature patterns, humidity levels, and precipitation, a phenomenon commonly referred to as climate change (IPCC, 2014). Climate change, driven by global warming, contributes to the partial melting of glaciers and polar ice caps, resulting in rising sea levels and an increase in extreme weather events, including floods, droughts, intense heat waves, and heavy rainfall. These changes also lead to irregular rainfall patterns and shifts in relative humidity, which have profound implications for agriculture, food security, human safety, and the overall health of ecosystems (WHO, 2023).

Mitigating the climate crisis requires the adoption of Negative Emissions Technologies (NETs), which are designed to actively remove greenhouse gases (GHGs) from the atmosphere. These technologies have broad applications across key economic sectors, including energy, environmental management, waste processing, and agriculture. In agriculture, NETs are particularly relevant in organic farming, where its principles underscore climate-smart and ecologically sustainable practices as opposed to inorganic practices that heighten methane and carbon emissions (Bocean, 2025). Technologies such as forestation, soil conservation techniques,

improved farm inputs management, and efficient irrigation systems are pivotal to carbon sequestration in plant biomass and soils (Newell *et al*., 2022). These techniques are not only environmentally adaptable but also improve the health of the soil and ecosystem, providing farmers with a dual opportunity to enhance food security while contributing to climate mitigation. Among various climate policies aimed at addressing global warming, carbon marketing systems stand out as a promising tool for incentivizing and scaling up these sustainable agricultural practices (Siedenburg, 2012; Newell *et al*., 2022).

Carbon markets are mechanisms where carbon units are traded within defined frameworks, either as credits or offsets for the avoidance or removal of greenhouse gas emissions. These units are measured in tonnes of carbon dioxide or its equivalent. Farmers can generate these carbon units by implementing NETs that are sold in the carbon market to reduce or offset emissions. In Africa, agricultural credits (forestry and land use) account for approximately 50% of the carbon credits issued in the market. These markets offer significant opportunities through carbon credits to farmers who adopt climate-smart agricultural practices and operate within defined policies and governance frameworks (Bourdonnay, 2024). According to Akakija (2024), Nigeria is advancing its efforts in climate action by upholding its obligations under Article 6 of the Paris Agreement White and Case, 2022) . To reinforce her commitment to cutting greenhouse gas emissions, the National Council on Climate Change released a regulatory guidance outlining Nigeria's carbon market strategy. (Akakija and Ugwu, 2024) The proposed framework aims to foster collaboration among government institutions, the private sector, investors, and stakeholders, thereby boosting private engagement and enhancing the issuance and transfer of certified credits across various industries.

The carbon market has the potential to generate jobs, empower communities, bridge the climate mitigation financing gap and attract green investments by increasing global demand for carbon offsets. However, in African countries, the carbon market is plagued by challenges such as the lack of transparency and credibility in carbon offset activities, weak policy frameworks, inequitable benefit distribution, limited infrastructure, and a lack of technical expertise for high-quality project development (Huang, 2020). Further challenges include unappealing carbon credit prices that don't match project costs, heavy reliance on relatively low international demand in Africa, the risk of carbon colonialism, and excessive layers of intermediaries . All of these discourage entities from actively participating in the carbon market.

Carbon marketing presents significant opportunities in agriculture, particularly for smallholder farmers who dominate Nigeria's agricultural sector, yet remain an underutilized asset in the transition to organic and sustainable agriculture. Smallholder farmers often operate with limited inputs, capacity building, and markets. Developing agricultural carbon markets in Nigeria offers numerous benefits, including enhanced training for farmers, promotion of ecologically sustainable practices, improved financial security for farmers, and increased investment in quality farm inputs and equipment (BoP and EERC, 2022). However, in India and the United States of America, low payment, substantial burdens of paperwork, credibility of credit calculations, markets skewed to benefit larger-scale agriculture, greenwashing and accurate estimation of carbon sequestered underscore the hesitant attitude of smallholder farmers towards participating in the agricultural carbon market (Barbato and Strong, 2023).

Private sector institutions can develop agricultural carbon projects and create regulatory frameworks that bridge existing gaps in the carbon market, ensuring transparent and efficient management of agricultural credits between smallholder farmers and buyers (Ghosh and Sharma, 2024). In Nigeria, these institutions can collaborate with other stakeholders (government agencies and international project proponents) to enhance the involvement of organic smallholder farmers in the carbon market. One such organisation is the Association of Organic Agriculture Practitioners of Nigeria (NOAN), a non-governmental organisation established to serve as an umbrella body representing all stakeholders in the country's organic agriculture sector. The range of stakeholders (farmers, researchers, processors, exporters, individuals, institutions, NGOs, and public sectors) plays a critical role in Nigeria's organic agriculture landscape. NOAN is strategically positioned to establish effective systems that can facilitate the seamless integration of organic farmers into Nigeria's carbon market. Therefore, this study assessed the potential of NOAN in promoting the participation of organic farmers in carbon markets.

**Aim of the study**

This study assessed the role of the Association of Organic Agriculture Practitioners of Nigeria in promoting the participation of organic farmers in Nigeria's carbon market.

## CARBON MARKETS

As sustainable development has gained prominence, Carbon markets are essential tools in reducing greenhouse gas emissions. The carbon market is not only a mechanism for enforcing compliance among businesses, but also an avenue for companies to demonstrate their social responsibility. The carbon trading system creates financial incentives for lowering environmental footprint, integrates environmental costs into business decisions, and facilitates a smoother transition to a low-carbon economy. Carbon markets are trading mechanisms/avenues designed to mitigate climate change through the exchange of carbon credits or offsets. A carbon market refers to an economic framework that supports the buying and selling of "carbon credits"- environmental commodities that signify GHG emission reductions, avoidance, or sequestration (USDA, 2023).

Carbon credits are marketable permits, each representing the right to emit one metric ton of carbon dioxide ($CO_2$) emissions or an equivalent amount of other greenhouse gases that a business is allowed to emit. These credits are primarily used in emissions trading systems, where companies receive a predetermined allocation based on their emission levels and can buy additional credits if needed or sell surplus ones. These permits enable companies to emit a specified quantity of GHGs within a given timeframe, and governments typically issue them under cap-and-trade regulations. Also referred to as "carbon allowances" (Bourdonnay, 2024).

Carbon offsets are certificates or permits representing a unit of verifiable emission reduction projects, such as renewable energy, forestation, or carbon capture, which entities fund to offset their emissions. These instruments take the form of certified units issued when such initiatives successfully remove or prevent greenhouse gases from entering the atmosphere. Primarily traded in voluntary markets, offsets enable businesses to compensate for their carbon footprint beyond regulatory requirements. Unlike carbon credits, offset transactions are generally discretionary, allowing organizations to pursue sustainable environmental goals (USDA, 2023)..

According to Ghosh and Sharma.(2024), carbon credits and the offset function within two primary market frameworks:

a. **Compliance markets** are government-regulated systems that enforce emission reduction targets through cap-and-trade mechanisms, where businesses must either cut emissions or purchase allowances to meet legally binding quotas. These markets operate under strict regional, national, or international frameworks, with regulatory bodies setting declining emission caps for specific industries to incentivize decarbonisation. Companies that exceed their permitted emissions must purchase additional credits from those that have reduced their footprint below the allocated limits, creating a financial incentive for emission reductions. Rigorous monitoring and verification processes ensure the integrity of emissions reporting and trading, while the gradual tightening of caps drives innovation in green technologies.
b. **Voluntary markets** are carbon offset markets, where companies and individuals can willingly purchase credits from projects that reduce or remove $CO_2$ from the atmosphere. This market enables companies and individuals to purchase carbon offsets on a discretionary basis, align with specific sustainability goals without legal mandates. These markets offer a supple approach for entities looking to enhance their corporate image, meet consumer demand for greener products, or prepare for sustainable regulatory requirements. Governed by independent standards rather than strict governmental oversight, voluntary markets facilitate investments in a diverse range of emission-reduction projects.

Carbon credits are primarily functional in the compliance market, while offsets are operational in the voluntary market; however, surpluses of deficit credits can also be traded in voluntary markets. As described by Barbato, and Strong (2023) ; Ghosh and Sharma.(2024), regulatory and voluntary carbon markets typically involve a range of stakeholders and the common terminologies used include:

**Carbon market programs** sign up participants, such as farmers and landowners, providing

financial incentives for adopting practices that reduce greenhouse gas emissions in agriculture and forestry. Entities that implement these programs can also be identified as project proponents.

**Carbon registries** establish and maintain program standards, set rules for credit generation, and record project details, including carbon credit ownership.

**Measurement, Monitoring, Reporting, and Verification (MMRV)** involves assessing greenhouse gas emissions and carbon storage, tracking changes over time, validating data, and compiling reports.

**Protocols** define the rules for generating carbon credits, covering participant qualifications, emission sources, and procedures for measuring and verifying reductions or sequestration of greenhouse gases.

**Project Developers** act as intermediaries for offset projects, working with landowners to design initiatives, coordinating with verifiers and registries, and often selling credits. Purchasers of carbon credits include companies that meet regulatory obligations, as well as organizations/ individuals that voluntarily reduce their emissions.

**Technical assistance** providers help farmers and landowners adopt sustainable practices that cut emissions and qualify for carbon credits, offering expertise to navigate environmental markets.

**Third-party verifiers** are independent entities that confirm whether carbon offset projects comply with protocol requirements.

**Vintage** refers to the year in which a carbon credit's emission reduction or removal occurred, though credits may be issued later after verification.

**Carbon Market and Organic Agriculture**

Integrating carbon marketing into organic agricultural systems presents a dual advantage: advancing climate change mitigation and promoting the financial capacity of farmers. In agriculture, carbon marketing is implemented through sustainable projects, which are primarily traded in voluntary markets to offset emissions from companies (Cariappa, 2023).. These projects are grounded in the principles of organic agriculture, enabling practices that are ecologically adaptable and promote the sustainable health of the ecosystem. The choice of sustainable practices and implementation methods varies between project proponents and the carbon certification body. The main sustainable practices, among others, are:

i. Forestation: The process of growing forests or restoring damaged forests through agroforestry, afforestation, and reforestation boosts carbon sequestration by removing 0.9–1.5 gigatonnes of carbon dioxide equivalent (GtCO2eq) per year from the atmosphere (FAO, 2021). Carbon offset estimates are based on planting 675 trees per acre, which collectively sequester approximately 20 tons of $CO_2$ per year (Saving Nature, 2023).
ii. Soil Carbon Sequestration: Practices such as conservative tillage, crop rotation, and the use of organic amendments enhance soil carbon storage, generating carbon units for marketing purposes.
iii. Enhanced management of farm inputs and wastes: Converting farm wastes into renewable energy and minimizing the use of inorganic farm inputs lowers methane emissions, making these practices eligible for carbon marketing.
iv. Efficient Irrigation: The use of drip and sprinkler systems conserves water, reduces energy use, and cuts emissions.

The price of a carbon credit can vary depending on the project type, perceptions of credit quality, protocol type, vintage, and the co-benefits of the activity (World Bank, 2023). In California, United States of America (USA), agriculture accounted for about 85% of the total offset credit issuances between 2013 and 2023 (USDA, 2023). Additionally, in Africa, agricultural credits account for approximately 50% of the carbon credits issued in the market. These markets offer significant opportunities for farmers who adopt climate-smart agricultural practices, operating within defined policies and a governance framework (Bourdonnay, 2024).

In agricultural carbon markets, the project proponent oversees project design, including the selection of interventions, target areas, and scale, based on their capacity and that of the implementation partner. The proponent trains the partner (typically an NGO) on project activities and assigns them the responsibility of recruiting

farmers. The NGO collects essential farmer data, such as current agricultural practices and plot GPS coordinates, to establish a baseline and conducts remote monitoring. Its role extends to farmer enrollment, awareness and capacity building, supplying and installing necessary materials, ensuring accurate implementation, and supporting third-party validation and verification during audits. The project proponent manages all MMRV processes, including registration, validation, verification, and initial project costs. Upon carbon credit sales, the proponent deducts these costs from the gross revenue and distributes a predetermined share of the net proceeds to the NGO and participating farmers, as agreed upon prior to project commencement. It is reported that approximately 55-70% of the net revenue is allocated to the farmers (Cariappa, 2023).

The framework for the carbon market in Nigeria is still in its early implementation phase. Hence, there is a paucity of information on the constitutional structure, framework, and operations of the agricultural carbon market in Nigeria. However, in the USA and India, the agricultural carbon market is challenged by different factors, especially for smallholder farmersa. (Cariappa,2023; Barbato and Strong, 2023; Ghosh and Sharma, 2024), as highlighted:

a. Poor Capacity Building: The limited knowledge of contract details, expectations for the farmer, and the expected remuneration at the end of the project is poorly communicated. Discrepancies in information reduce farmers' interest in carbon farming, leading them to believe that the agricultural carbon market is a form of greenwashing.
b. Substantial burdens of paperwork: This was evaluated as a heavy bureaucratic process for farmers, and they are clearly reluctant to further indulge.
c. Credibility of carbon unit calculation: Farmers think that carbon units are not calculated in their favour. They feel cheated and are not enthusiastic about continuing.
d. Low payment: Farmers felt that the payment was low, likely due to their farm size or a lack of trust in the system's credibility. They even know that the market is skewed in favour of large-scale farmers. All of which can be addressed with a proper structure and plan.

**The Role of The Association of Organic Agriculture Practitioners of Nigeria in Enhancing Smallholder Participation in Nigerian Carbon Markets**

The Nigerian Organic Agriculture Network (NOAN) is a well-established non-governmental organization with over 15 years of experience in coordinating stakeholders across Nigeria's organic agriculture value chain. As the umbrella body for organic farming practitioners, NOAN collaborates with both local and international partners to advance organic agriculture through advocacy, capacity building, market development, standardization, certification, and policy formulation (NOAN, 2025). Key international partners include the International Federation of Organic Agriculture Movements, the Research Institute of Organic Agriculture, the African Organic Network, the West African Organic Network, the Knowledge Hub for Organic Agriculture and Agroecology in West Africa (KCOA), Ecological Organic Agriculture, the Biodivision Africa Trust, and the Deutsche Gesellschaft für Internationale Zusammenarbeit. With a robust technical team (comprising permanent and contract staff), NOAN implements projects and initiatives across 20 Nigerian states and remains committed to expanding its reach to all 36 states. Through its structured approach and strategic partnerships, the organization empowers Nigerian farmers to adopt sustainable, organic, and climate-smart practices and access carbon markets.The rapid expansion of organic agriculture (OA) in Nigeria underscores significant potential for carbon market integration within the sector. Nigeria currently ranks as the 10th largest organic producer in Africa, with 157,019 hectares under organic cultivation and an export volume of 17,119 metric tons (FiBL and IFOAM – Organics International, 2025). Given the emerging carbon market landscape, OA presents a viable pathway to enhance the livelihoods of farmers, particularly smallholders, who represent 70% of Nigeria's agricultural workforce. Strategic collaborations between NOAN, government agencies, financial institutions, and carbon-emitting enterprises can accelerate this transition. By prioritizing the empowerment of smallholder farmers through carbon market mechanisms, such partnerships can drive sectoral growth while advancing sustainable agricultural practices and enhancing climate resilience.

The following are considerations for NOAN to

develop a robust system for organic farmers in Nigeria to build and implement carbon projects.

a. The involvement of NOAN in the carbon market would strengthen collaboration with national and international organizations, such as the World Bank, Carbon Vistas, and the African Development Bank. These alliances could provide essential resources, bridge technical, financial, and infrastructural gaps to scale carbon projects for smallholder farmers across Nigeria.
b. Capacity building is indispensable to creating stakeholders' awareness of the opportunities that exist in the carbon market for organic agriculture practitioners.
c. To encourage widespread participation, carbon farming can be incorporated into national organic agriculture policies and standards. Embedding carbon credit schemes within organic frameworks will attract investment and support the upscaling of sustainable agricultural practices. There should also be a defined penalty for defaulters.
d. Create a unit within the association that is solely dedicated to developing and implementing carbon projects. This unit must be able to:
    i. Identify and collaborate with project proponents (locally and internationally) to implement interventions through training, facilitating project registration, data collection, calculations, coordinating paperwork, and managing MMRV processes using technologies such as remote sensing (RS) and Geographic Information Systems (GIS).
    ii. Recruit and train personnel (staff) to execute the different aspects of carbon projects as professionals.
    iii. Identify and create farmers' groups; they may choose to adopt the principles of the Participatory Guarantee System (PGS) when forming these groups. Grouping farmers under such a system enables the generation of collective carbon credits, making projects more viable, scalable, and inclusive while enhancing the market influence of smallholder farmers. NOAN may also need the services of PGS coordinators to serve as technical assistants.
    iv. Use proven models to devise context-specific strategies for better extension services (engagement, information sharing, and training of farmers). This type of extension service is essential for delivering comprehensive training on policies, certification procedures, and the technical aspects of monitoring, reporting, and verification. Equipping farmers with this knowledge will enable them to participate effectively in carbon markets with total trust in the credibility of the system.
    v. Strategic carbon marketing is enhanced as a key stakeholder in the carbon ecosystem. NOAN can negotiate better terms for agricultural credits, ensuring fair compensation for farmers and protecting the interests of buyers. This would resolve concerns over low value for carbon credits and build market trust. Furthermore, the relationships between farmers and credit buyers can be fostered through digital platforms, farmer aggregation models, and early-adopter incentives, which ultimately strengthen the value chain for carbon farming.

The above considerations provide NOAN with the opportunity to participate in the entire carbon marketing process, from project design to implementation, MMRV, issuance of carbon unit certificates, trading of carbon units, and sharing of dividends, thereby enabling a fair trade for all stakeholders involved.

## CONCLUSION

Carbon marketing holds significant potential to transform organic agriculture in Nigeria, particularly by providing financial incentives and climate resilience for smallholder farmers. However, unlocking this potential requires more than just technical alignment; it calls for strong institutional coordination, policy integration, and capacity building.

The Association of Organic Agriculture Practitioners of Nigeria (NOAN), as the central body representing the organic sector, is uniquely positioned to champion this transition. By developing robust systems for farmer aggregation, promoting participatory certification models, facilitating data-driven project implementation, and negotiating fair credit terms, NOAN can bridge the gap between carbon finance and the realities of grassroots farming. To ensure sustainable and inclusive participation, it is essential to integrate carbon farming frameworks into national agricultural and climate policies, backed by stakeholder partnerships and digital innovation. With the proper institutional support and multi-level collaboration, Nigeria can establish a thriving organic carbon market that delivers environmental integrity, economic empowerment, and long-term transformation of its food system, anchored by smallholder farmers at its core.

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