Effective governance structures for integrated carbon farming projects: evidence from Kenya

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Abstract:

In this paper, we explore the governance structures of carbon farming projects and assess how existing structures reduce transaction costs to facilitate the engagement of smallholder farmers. Building on qualitative data from eleven carbon farming projects in Kenya, we developed a generalized project-level governance structure. Our analysis of project-level governance structures revealed the need for multi-stakeholder partnerships, the importance of local implementation partners with strong connections to potential project participants and the need to develop multi-layer farmer-based structures for effective project implementation. The operational and geographic overlap of existing carbon farming projects, paired with recent growth in new projects entering the market, calls for the development of cross-project governance structures. Our findings provide important insights on the operationalization of smallholder carbon farming projects, relevant for project developers and policymakers in Kenya and beyond.

Keywords: carbon farming, carbon markets, institutional economics, governance structures

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1. Introduction

Smallholder farmers in Africa play a crucial role in ensuring food security and feeding the world's growing population. However, they face significant challenges, including soil degradation and the multifaceted impacts of climate change. To counteract ongoing soil degradation, sustainable agricultural land management (SALM) practices, together with training programs, and supporting policy measures are needed (Lal, 2004). Switching to more sustainable practices involves costs. While smallholders need to bear these costs, the benefits of climate change adaptation and mitigation accrue to society at large (Engel & Muller, 2016).

To encourage investment and reduce financial barriers to adoption, schemes that pay farmers for carbon sequestration and reductions and avoidance of greenhouse gas emissions provide an important opportunity for scaling climate action (Jackson Hammond et al., 2021; Lal, 2013; Lal et al., 2018; von Braun et al., 2021). Traditionally, payment for ecosystem services (PES) schemes were primarily government-funded (Engel, 2016; Lipper & Neves, 2011). Public funding alone, however, cannot achieve the scale for the required structural changes in the agricultural sector (Lee et al., 2016; PwC, 2011). With limited public funding, emerging agricultural carbon markets could be a possible tool to leverage private capital to transform food systems (Benessaiah, 2012; PwC, 2011).

The voluntary carbon market attracts private investment by providing a platform for trading emission reductions, so-called carbon credits. Carbon credits from the agricultural sector can be generated through the adoption of sustainable agricultural land management (SALM) practices that reduce greenhouse gas emissions and/ or remove carbon from the atmosphere and store it in soils and biomass. Investors can purchase carbon credits to offset their carbon footprint. The voluntary carbon market thus channels private finance toward nature-based climate solutions, enabling claims of carbon neutrality and supporting sustainability commitments (Tennigkeit et al., 2023).

Individual farmers, especially smallholders in Africa, are unlikely to interact directly with agricultural carbon markets. The reasons are manifold and include a lack of information and awareness about carbon markets, market complexity paired with a lack of technical expertise, high cost of participation in carbon markets and too small scale of operation for economic viability. A project developer or so-called intermediary institution that facilitates effective collaboration is needed to form and manage carbon projects (Lee et al., 2016; Tennigkeit et al., 2023; Wollenberg et al., 2021).

These project developers do not operate in an institutional vacuum. Existing research on institutions in carbon credit or PES projects places significant emphasis on the role of intermediaries (see for example Lee et al. (2016), Benessaiah (2012), Cacho et al. (2013)). This tends to present a simplistic structure where buyers and sellers of environmental services are seemingly connected through a single intermediary. The actual institutional setup is considerably more complex, and the current literature often falls short in exploring governance structures that include more than a single intermediary. Though other authors acknowledge the importance of multi-level institutions (Dietz et al., 2003; Roncoli et al., 2007; Tschakert, 2007), the work often lacks depth in explaining the characteristics and interlinkages of these institutions. Based on an in-depth study of six projects Shames et al. (2012) explore project-level organizational structures of agricultural carbon initiatives in Africa. While the work provides in-depth insights into the organizational structure of the projects, it falls short in exploring the broader governance structures beyond individual projects.

Broad consensus exists that for PES to be effective, an enabling policy and institutional environment is required (Börner et al., 2017; Lipper & Neves, 2011; Roncoli et al., 2007; Streck et al., 2012). Limited research, however, exists on the type of actors involved and the institutional structures facilitating the interactions between actors that need to be in place to reap the potential benefits of carbon farming projects (Roncoli et al., 2007). We contribute to filling this research gap by exploring two research objectives. Firstly, we aim to examine the governance structures, i.e., the actors and their interlinkages, of agricultural carbon projects. Secondly, we aim to assess how existing governance structures reduce transaction costs, thereby enabling the participation of smallholder farmers.

We borrow from institutional economics theory to shed light on the governance structures set up to operationalize smallholder carbon farming projects. We utilized a multiple-case study design and included eleven carbon farming projects from Kenya in our analysis. Data was collected through in-depth documentation analysis and semi-structured interviews with project stakeholders. A comparative assessment of the case study projects allowed us i) to develop a generalized governance structure for carbon farming projects, ii) to identify factors that lead to variations across projects in governance structures and iii) to explore how governance structures help reduce transaction costs. Hence, our work centers on implementation research, deepening the understanding of how smallholder carbon farming projects can be implemented successfully.

The paper is structured as follows. First, we describe the theoretical background of our study and define the concept of carbon farming, followed by an overview of governance structures and transaction costs. Thereafter, we describe our research design, methods and data. We proceed by presenting the findings from our multiple-case study analysis. We conclude with a conclusion and discussion of the policy implications of our findings.

2. Theoretical background

2.1 Payment for ecosystem services and carbon farming

The term *carbon farming* has emerged as a new buzzword in the debate on the role of the agricultural sector in combatting climate change. It refers to sustainable agricultural practices that aim to increase the storage of carbon in biomass/ trees and soils while reducing greenhouse gas emissions. Examples include agroforestry, intercropping, the cultivation of cover crops, reduced tillage or the application and improved management of organic fertilizers such as manure, compost or mulch. Another important feature of carbon farming is the underlying business model, whereby revenues are generated from trading carbon credits (Mcdonald et al., 2021; Schilling et al., 2023). The implementation of sustainable agricultural practices is understood to benefit farmers via increased productivity, profits, and reduced vulnerability to climate change. These benefits to farmers, however, often occur only in the medium to long term (Engel & Muller, 2016).

Payment for environmental services (PES) is an instrument addressing externalities by translating societal benefits from a change in land-use practices into profits for land users (Engel et al., 2008; Wunder, 2013). Engel (2016, p. 133) defines PES *"as a positive economic incentive where environmental service (ES) providers can voluntarily apply for a payment that is conditional either on ES provision or on an activity clearly linked to ES provision."* As the adoption of sustainable agricultural practices provides external benefits to people worldwide, PES can be an appropriate tool to translate these external societal benefits into increased benefits for farmers (Engel & Muller, 2016). The importance of carbon farming therefore stems from the synergy between ecological and economic objectives. Hence, carbon farming may be classified as one type of PES, with the service being climate change mitigation through carbon sequestration. There is, however, an important distinguishing factor between PES and carbon farming. PES are project- and program-based, and primarily government-funded (Engel, 2016; Lipper & Neves, 2011). Conversely, the idea of carbon farming evolves around land use and soil management as part of a strategy for farming to actively enter and engage in the emerging carbon market.

2.2 Governance structures

We draw from the New Institutional Economics (NIE) theory, recognizing the importance of institutional arrangements and collective action in influencing decision-making and resource allocation. Ostrom (1990, 2009) has significantly influenced the discourse on governance common pool resources, highlighting the importance of nested institutional arrangements, where local institutions (micro) are embedded within larger institutional structures (meso and macro). Vatn (2010) classifies governance structures into a) hierarchies, b) markets, and c) community management. Hierarchical governance involves a clear top-down decision-making chain seen in entities like governments and firms. Market-based governance relies on economic mechanisms, while community-based governance centers on collective action for resource allocation. In practice, hybrid structures are mostly observed, with PES involving a reconfiguration of institutional structures that leverage both communities and hierarchies. (Vatn, 2010). A challenge lies in finding the optimal combination of market, hierarchical, and community structures (Landell-Mills & Porras, 2002).

Vatn elaborates on his earlier work and defines governance structures as (i) *"the type of actors involved, characterized by their goals/motivations, capacities, rights and liabilities; [and (ii)] the institutional structures facilitating the interaction between the actors"* (Vatn, 2015, p. 225). The interaction between the actors can be linked back to his earlier work on them being hierarchies, markets or community structures. We build largely on Vatn's work to explore the governance structures of carbon farming projects and to assess the extent to which these projects build on communities and hierarchies.

The involvement of communities and hierarchies is significantly influenced by the presence of transaction costs. The concept of transaction costs revolves around the costs associated with coordinating interrelated actions (Vatn, 2010). Transaction cost theory suggests that organizational structures are influenced by the need to minimize transaction costs (Williamson, 1979). The costs associated with identifying, negotiating, contracting, and enforcing carbon sequestration projects are significantly higher when dealing with smallholder farmers, which are geographically scattered (Benessaiah, 2012; Cavatassi & Lipper, 2002; Lipper et al., 2010). As a result, project developers have favoured the participation of larger farms (Benessaiah, 2012). To avoid the exclusion of smallholder farmers from carbon farming projects, a thorough project design and effective governance structures that provide effective coordination, monitoring, and enforcement are required (Lipper et al., 2010; Tschakert, 2004).

The literature emphasizes the role of project developers or intermediaries, community-based organizations and the government. Project developers or intermediary organizations link carbon credit buyers and carbon credit producers, i.e., smallholder farmers (Lee et al., 2016). They design projects, provide technical support to farmers, set prices, and essentially define the *"rules of the game"* (Benessaiah, 2012; Lee et al., 2016; Wollenberg et al., 2021). For smallholder farmers to participate effectively in carbon markets, coordination and consolidation of sequestration supply will be necessary (Cavatassi & Lipper, 2002). This aggregation of supply may be provided by community-based organizations. By providing access to potential project participants, they play an important role as an entry point for carbon credit project developers. Responsibilities of community-based organizations may involve the contracting of farmers, by identifying farmers and ensuring that all participants are aware of the obligations and benefits of the carbon farming project (Tamba et al., 2021). Further, they can be the anchor for implementing peer-monitoring schemes that can significantly reduce the costs associated with the monitoring, reporting, and verification of activity- or result-based carbon credit schemes (Cacho et al., 2013). Additionally, farmer groups can serve as both receivers and distributors of carbon payments (Shames et al., 2012; Tamba et al., 2021). They can provide the platform to facilitate extension services and promote participatory learning techniques (PwC, 2011). To allow farmer organizations to take on these roles and responsibilities, it is key to improve their institutional capacity (Lipper et al., 2010) and to provide an enabling policy environment (Lipper & Neves, 2011; Roncoli et al., 2007). Important enabling factors include land tenure security, agricultural extension services, data availability and national strategy formulation (Streck et al., 2012). Governments further have an important role in legislation, enforcement, and protecting the interests of disadvantaged groups (Roncoli et al., 2007).

Integrating with and leveraging existing institutional frameworks is not only cost-effective but also essential for the long-term sustainability of carbon farming initiatives. Projects can effectively manage costs by leveraging pre-existing institutional capacity (Shames et al., 2012). Linking carbon projects to existing institutions offers possibilities for cost-sharing and can reduce transaction costs as well as costs for the project's monitoring, reporting and verification (MRV) system (Cacho et al., 2013; Costa et al., 2021; Lipper et al., 2010; Wunder et al., 2008). By using local offices, IT infrastructure, databases, and payment administration of existing public or private entities, transaction costs can be greatly reduced. Aside from the existing infrastructure, local institutions also have management capacity and networks in place, which newly established institutions would have to develop (Cacho et al., 2013). Further, to ensure the long-term sustainability of projects, they should not rely on single-purpose structures set up for a specific intervention as this poses the risk that they cannot be sustained beyond the project duration (Roncoli et al., 2007).

The importance of the enabling political environment and existing institutions calls for a context-specific analysis of governance structures for carbon farming projects. We build on the aforementioned theoretical background to explore how the structures set up by carbon farming projects contribute to reducing transaction costs, hence allowing the inclusion of smallholder farmers.

3. Research design and methods

In pursuit of our research objective of exploring the governance structures of smallholder carbon farming projects, and aligning with Ostrom (1990, 2009) who highlights the importance of context-specific analyses, we chose a multiple-case study research design. It involves the in-depth investigation of multiple cases, in this case, carbon farming projects, within the same context. Based on an initial screening of carbon farming projects across different carbon credit registries, we selected Kenya as our research country. This decision was driven by the country's high prevalence of projects that closely align with our project selection criteria (outlined below).

An integral component of multiple-case studies is the incorporation of replication logic (Eisenhardt, 1989). We implemented a literal replication strategy (Yin, 2009). Instead of replicating an earlier study, we draw inspiration from the work of Ellonen et al. (2009) who replicated the same research design and data collection approach across multiple companies within the same industry to analyze the process of generating innovations. The strategy involves selecting cases with similar settings and anticipated analogous outcomes, based on pre-defined selection criteria. This research design holds several key advantages. Firstly, it facilitates a cross-case comparison, allowing us to discern patterns that persist or differ across the diverse spectrum of carbon farming projects under scrutiny. Secondly, the adoption of a literal replication strategy contributes to the external validity, enhancing the credibility and generalizability of our findings. Finally, by employing this design, we aim to make a meaningful contribution to shaping the theoretical foundation underlying governance structures of smallholder carbon farming projects (Ellonen et al., 2009; Ridder, 2017; Yin, 2009).

Our approach consisted of four key steps: (1) project selection, (2) an in-depth examination of project governance structures through documentation analysis, (3) semi-structured interviews with project stakeholders, and (4) thematic analysis of the collected qualitative data.

The first step in the research process was to identify carbon farming projects in Kenya through a screening of the major voluntary carbon credit registries, namely Verra, Gold Standard, and Plan Vivo. Due to limited publicly available information, we excluded Acorn projects from our analysis. We initially filtered for Agriculture Forestry and Other Land Use (AFOLU) projects, ultimately identifying a sum of 21 projects.[1] We established a set of project selection criteria for the inclusion of projects into our analysis. To be included, projects need to work or intend to work with farmers on their own land and promote carbon farming practices that contribute to carbon sequestration in soils and/ or above- and below-ground biomass and/or emission reductions related to improved agricultural practices. These criteria led to the exclusion of REDD+ projects, projects focusing on mangrove protection, as well as projects promoting improved grassland management (especially rotational grazing) on communal lands. The intended purpose is to select comparable project types (literal replication), enabling the generalization of our findings. The underlying hypothesis is that the management of projects on communal land or that involve common resources (such as forests) will most likely require different governance structures than projects working with farmers on privately owned or administered land. We conducted a review of available project documentation, mostly extensive project descriptions uploaded to the carbon credit registries, to assess each project's alignment with the selection criteria. As a result of this scoping process, 11 projects were chosen for our multiple-case study assessment, and their key characteristics are summarized in **Table 1**. By following a rigorous project selection process, we aim to reduce the likelihood that the results are driven by selection bias.

[1] The last screening was conducted on 8.11.2023.

Table 1: Key characteristics of carbon farming projects included in our assessment.

#	Name	Main activities for carbon credit generation	Carbon pool[2]	Project scale[3]	Start of crediting period [PDD date][4]	Carbon Registry	Interview
1	Kenya Agricultural Carbon Project	Promotion of SALM practices including agroforestry	A/BGB, SOC, ER	45,000 ha	07/2009 [-]	Verra VCS	Yes
2a	Livelihoods Mount Elgon Project	Promotion of SALM practices including agroforestry	A/BGB, SOC, ER	35,100 ha	03/2016 [06/2019]	Verra VCS	Yes
2b	Sustainable Agroforestry Based Dairy Value Chain in Mount Elgon, Kenya	Improved smallholder dairy production systems	A/BGB, SOC, ER	35,100 ha	03/2016 [-]	Gold Standard	Yes
3	Western Kenya Soil Carbon Project	Promotion of SALM practices including agroforestry	A/BGB, SOC, ER	32,000 ha	10/2019 [08/2022]	Verra VCS	Yes
4	Boomitra Carbon Farming in East Africa through Soil Enrichment	Promotion of SALM practices including agroforestry	SOC	226,125 ha	10/2019 [07/2023]	Verra VCS	Yes
5	Komaza Smallholder Farmer Forestry Kenya	Agroforestry: Commercial tree planting	A/BGB, ER	45,088 ha	05/2017 [-]	Verra VCS	Yes
6	TIST Program in Kenya [5]	Agroforestry: reforestation on individual land	A/BGB	-	01/2004 [02/2011]	Verra VCS	No
7	Makueni Agroforestry Carbon Project	Promotion of SALM practices including agroforestry	A/BGB, SOC, ER	40,000 ha	10/2023 [05/2023]	Verra VCS	No
8	Restore Africa: Restoring trees and livelihoods in Kenya	Afforestation/ reforestation in community conservancies; agroforestry on individual land	A/BGB, ER	32,500 ha	10/2022 [07/2023]	Verra VCS	No
9	Hongera Reforestation Project (Mt Kenya and Aberdares)	Afforestation/ reforestation on public land; agroforestry on individual land	A/BGB	-	06/2022 [06/2022]	Verra VCS	No
10	Lake Naivasha Basin Reforestation Project	Agroforestry: Tree planting for watershed protection	A/BGB	1,150 ha	01/2017 [04/2018]	Gold Standard	No
11	Upper Tana	Agroforestry: Tree planting for watershed protection	A/BGB	153,078 ha	01/2017 [-]	Plan Vivo	No

[2] A/GBG = above- and below-ground biomass; SOC = soil organic carbon; ER = emission reductions

[3] Planned project scale as stipulated in the project description uploaded to the carbon credit registry.

[4] Depending on the carbon standard, projects might include earlier activities into the carbon accounting. The release date of the first project description document (PDD) is therefore a better proxy on when the carbon credit component started.

[5] Listed as eight separate project entries in the Verra Registry. The main difference are the underlying farmers. For our analysis consolidated into a single project.

The second step involved the online search for available documentation for the eleven selected projects. The main source are project descriptions uploaded to the carbon registries. Complementary sources include reports from stakeholder consultation meetings uploaded to the carbon registries, fact sheets, information on project websites as well as information from peer-reviewed publications or technical reports. From all sources, we retrieved information on the actors involved, their respective roles and responsibilities as well as linkages and interactions, e.g., provided in the form of organizational charts, stakeholder maps, tabular overviews, or written descriptions.

In the third step, we conducted semi-structured interviews with key staff members from 5 out of the 11 identified projects.[6] The interviews were conducted between April and June 2023. The interviews lasted between 30 minutes and 1.5 hours. The interviews were conducted based on interview guides that were adjusted for each project based on the initial documentation analysis. Where possible, we conducted interviews with multiple staff members from the same carbon farming project.

In the last step, we synthesized the information from our documentation analysis and the semi-structured interviews. We utilized triangulation to compare, complement, and validate information from the different sources. We conducted a thematic analysis to identify patterns and recurring themes across our case study projects. This involved a two-step process. Initially, we conducted a review to identify themes, and subsequently, during a second data review, we refined and adjusted these themes for greater coherence. The following section presents the findings from our analysis.

4. Results

4.1 Project-level governance structures

We start by highlighting key findings on the carbon farming project-level governance structures. We identified two levels: project development and management, and project implementation.

4.1.1 Project development and management

In the most simplistic setup, one might assume a single project developer can initiate a carbon farming project. Yet, the complexities involved in carbon credit project setup and the subsequent management lead in general to the formation of multi-stakeholder partnerships. We illustrate these partnerships in **Table *2***, by presenting the different actors involved in on our case study projects.

Table 2: Actors involved in carbon farming project development.

#	Name	Proponent	Technical advisor	Investor	Implementing partner
1	Kenya Agricultural Carbon Project	Vi Agroforestry Programme	Unique land use GmbH, Joanneum Research	World Bank BioCarbon Fund	

[6] The following projects were identified after the fieldwork and were hence not contacted: *Makueni Agroforestry Carbon Project*, *Restore Africa: Restoring trees and livelihoods in Kenya*, and *Hongera Reforestation Project*.

2	Livelihoods Mount Elgon Project	Livelihoods Fund SICAV SIF	Unique land use GmbH (for Verra component)	Livelihoods Carbon Fund	Vi Agroforestry Programme (main), Brookside Dairy Limited
3	Western Kenya Soil Carbon Project	Soil-Carbon Certification Services (SCCS)	Unique land use GmbH	GIZ/BMZ	Welthungerhilfe
4	Boomitra Carbon Farming in East Africa through Soil Enrichment	Boomitra Inc		Applied for external funding	Yara East Africa, Farm to Market Alliance, Kenya Organic Agriculture Network
5	Komaza Smallholder Farmer Forestry Kenya	Komaza Group Inc.	Unique land use GmbH, Conservation International	Applied for external funding	
6	TIST Program in Kenya	Clean Air Action Corporation		USAID	
7	Makueni Agroforestry Carbon Project	Eni S.p.A./ Kenya b.v.	Unique land use GmbH		Anglican Development Services Eastern (ADSE)
8	Restore Africa: Restoring trees and livelihoods in Kenya	Global Evergreening Alliance		GenZero	ICRAF (main), Self Help Africa (SHA), Adventist Development and Relief Agency (ADRA)
9	Hongera Reforestation Project (Mt Kenya and Aberdares)	DutchGreen Project Management BV	Climate Investment Partners LLC		Applied Institute of Agriculture and Technology (AIAT)
10	Lake Naivasha Basin Reforestation Project	South Pole Carbon Asset Management Ltd			WWF Kenya
11	Upper Tana	Water Fund Upper-Tana Nairobi (UTNWF)		Additional donor contributions	Sustainable Agriculture Community Development Program (SACDEP), Catholic Diocese of Murang'a (CARITAS)

We distinguish between four types of actors: project proponents, technical advisors, investors and implementing partners. None of the projects has been set up by a single actor or proponent. We identified three distinct requirements during the project initiation phase as key drivers. First, the need for an entity with an interest and the capacity to supervise and coordinate the setup of the project. In most cases (eight projects), the main project proponent is an international entity that has the capacity or ability to mobilize the resources required to set up an agricultural carbon credit project. Second, the technical expertise on carbon standards needed to prepare the project documentation and conduct the calculations for estimating the carbon sequestration potential. The technical requirements are especially high for projects that generate carbon credits for soil carbon sequestration. In this case, Unique land use GmbH, one of the co-developers of the Verra VM0017 soil carbon methodology, is oftentimes (in four out of five soil carbon projects) involved in the project development as a technical advisor on the monitoring, reporting and verification (MRV). Third, the necessity for project pre-financing, including costs related to registration and certification with a carbon credit registry. The pre-financing of carbon farming projects does not need to be disclosed for registration with a carbon standard. At least three of the projects have received significant donor support (Kenya Agricultural Carbon Project, Western Kenya Soil Carbon Project and TIST). Further, private investors are a potential source of pre-financing, as exemplified by the Livelihoods Carbon Fund providing funding for the Mt Elgon Livelihoods Project. Other proponents, such as Boomitra and Komaza have sought external funding through various funding sources, such as the WFP Innovation Accelerator Innovation Challenge (Boomitra) or investors such as Novastar and AXA Investment Managers, FMO and Mirova's Land Degradation Neutrality Fund (Komaza).

4.1.2 Project implementation

Regarding the partnership setup for project implementation, we observed two possible options. The first involves the project proponent directly overseeing and collaborating with smallholder farmers. Alternatively, the project proponent can opt to engage with designated implementation partners. The decision of whether project developers form partnerships with local entities hinges on their existing relationships with smallholder farmers. If the project developer is already actively working alongside farmers on the ground, the engagement of an additional implementing partner to connect the proponent with the farmers may not be necessary. Examples of this approach include the Kenya Agricultural Carbon Project, Komaza, and TIST (see blank spaces for 'implementing partner' in **Table *2***). In the remaining projects, constituting the more widely adopted approach (eight out of eleven projects), the project proponent is an international entity. Although, occasionally, they establish local subsidiaries for project operations. These international entities collaborate with local implementation partners, adding an additional institutional layer to facilitate the mobilization of participating farmers. The implementation partner or the project proponent operates through field officers who are employed or engaged through a service contract.

In theory, project proponents or implementing partners could engage directly with smallholder farmers. Yet, the operational scale of these projects, typically spanning 32,000 to 45,000 hectares (see **Table 1)** and involving a similar number of smallholder farmers, practically requires the adoption of multi-layer pyramid structures to effectively implement the projects.

Farmer-based structures serve as an important means of aggregation. At the base of the structure are the individual smallholders or farming households. All case study projects work with groups rather than individual farmers. For farmers to participate in carbon farming projects, they either need to be already organized in farmer groups (see for example Kenya Agricultural Carbon Project) or the project supports or encourages the organization into groups (see for example TIST). In the more agroforestry-focused projects Hongera, Naivasha and Upper Tana, the anchor points are Community Forest Associations (CFAs) or Water Resources Users Associations (WRUAs). Some but not all projects require the groups to be officially registered with the government. Assuming a commonly reported group size of around 15-30 farmers per group and project scales ranging between 32,000 and 45,000 farmers, this still translates to 1,000 to 3,000 groups. Some of the projects, such as the Western Kenya Soil Carbon

Project, the Kenya Agricultural Carbon Project, the Mount Elgon Livelihoods Project and TIST, therefore organize the farmer groups into clusters. The clusters are usually formed based on geographic proximity.

For these farmer-based structures to work, different positions are usually filled. The groups and clusters have formalized leadership structures. Registered groups have in line with Kenya's *Community Groups Registration Act*, usually a chairperson, vice chairperson, secretary, and treasurer. Projects refer to the leader as a community resource person, community facilitator, community quantifier or group leader. These people oftentimes receive additional training and play key roles, especially in the monitoring and reporting of group-level activities. They are the primary liaison within the farmer groups. Clusters usually appoint a cluster leader as well as sub-committees. Other roles may include a co-leader and an accountability officer. The farmer groups and clusters, together with the appointees, are therefore the farmer's link to the implementing partner or project proponent.

We identified three key factors that may explain cross-project variations in the farmer-based structures. First, the extent and frequency of agricultural extension service provision. Projects that regularly provide extension services usually require more formalized group structures for efficient service provision (as seen in the Western Kenya Soil Carbon Project, the Kenya Agricultural Carbon Project, and the Mount Elgon Livelihoods Project). Second, the devolution of specific responsibilities, particularly related to the monitoring of project activities, to the participating farmers via peer monitoring schemes (all of the aforementioned projects and TST). Third, the pre-existing structures of the implementation partners. Boomitra builds strongly on pre-existing initiatives and in their cooperation with Farm to Market Alliance, they build on Farmer Service Centers (FSCs), also referred to as one-stop shops, which provide some form of cluster under each FSC.

Three of the projects, the Western Kenya Soil Carbon Project, Restore Africa and Upper Tana, further mentioned in their project documentation that they have set up a steering committee or an advisory board. These include representatives from the project proponent, implementation partners, farmer representatives and potentially representatives from the county government or other key local stakeholders.

Table *3* provides an overview of the common actors involved in carbon farming projects, including their roles and responsibilities.

Table 3: Roles and responsibilities of the actors involved in carbon farming projects.

Actor	Roles and responsibilities
Advisory/ Steering committee	- Supervise the project operations and progress - Provide strategic guidance - Establish and oversee a grievance mechanism
Proponent	- Identification of carbon farming project opportunity - Identification of partners and setup of the project - Management and oversight of project implementation - Coordination and supervision of implementing partners - Monitoring and reporting required for carbon standards - Sales and marketing of carbon credits - Creating linkages with other projects, national government and internationally
Technical expert	- Project development support

	- Technical support for (soil) carbon sequestration measurement - Support in the setting up of the project's MRV system
Investor	- Provision of funding for project initiation
Implementing partners through field/ extension officers	- Implementation of project activities - Sensitization and awareness raising to farmers - Identifying and enrolling farmers - Training on SALM practices - Regular farm visits - Conduct surveys/ support data collection for project MRV - Contact point for project communication and grievances
Cluster of farmer groups	- Access point to farmer groups
Farmer groups (including group leaders and resource persons)	- Provide access points to farmers - Ensure implementation of SALM practices, e.g., through a group action plan - Participate in MRV process - Consolidation of individual activity data into group activity reports - Benefit-sharing (if at group level)
Smallholder farmers	- Implementation of SALM practices

Based on the above-mentioned findings, **Figure *1*** presents a visual depiction of a generalized project-level governance structure of carbon farming projects. We include the institutions and interactions evident in most projects, though some projects have a simplified version and others a slightly more sophisticated one, affecting the overall number of institutional layers and the type of actors and aggregation mechanisms.

Despite the challenges generally associated with engaging smallholder farmers, carbon farming projects in Kenya seem to have implemented effective strategies to reduce transaction costs. Although specific reporting on costs for project development and implementation is generally lacking, we conclude from the growing market that the projects managed to achieve long-term financial sustainability. Three key strategies are observed across the case study projects. Firstly, smallholder carbon farming projects effectively minimize transaction costs by building on existing projects or structures. This involves collaboration with locally operating NGOs, cooperatives or other community-based organizations that already have established connections to smallholder farmers. Further, some initiatives like the Western Kenya Soil Carbon Project build upon the groundwork of previous non-carbon projects. Secondly, the projects are operating at a large scale with all projects except for the Lake Naivasha project targeting a project area of at least 32,000 hectares. To reach scale, the projects leverage networks of local partners. Third, the delegation of responsibilities to participating farmers emerges as a key strategy. Beyond engaging farmers in the project's MRV system, they actively contribute to tasks related to the registration and mapping of new participants and provide platforms for peer learning. Despite these strategies, projects still seek donor support, participate in innovation contests, or rely on private investors due to significant upfront costs.

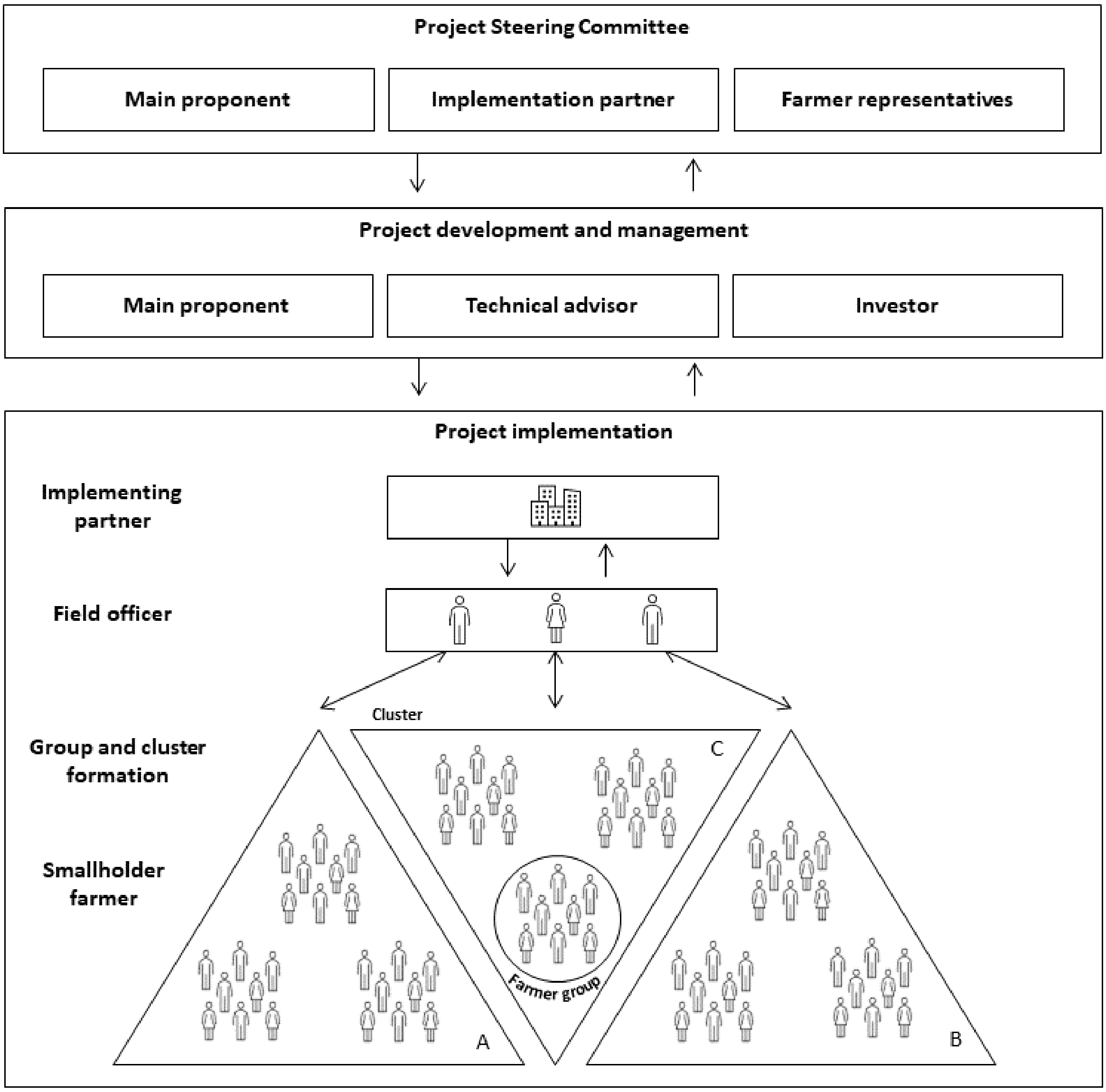

Figure 1: Generalized project-level governance structure of carbon farming projects.

4.2 Cross-project governance and coordination

The projects selected for our assessment work with smallholder farmers on similar activities, particularly the implementation of sustainable agricultural management practices. To evaluate potential operational overlaps among projects, we utilized geographic data files uploaded to the Verra Registry or location information from project documentation to map the project areas. ***Figure 2*** presents the outcome of this mapping process. Geographic overlaps are evident, particularly among the Kenya Agricultural Carbon Project, the Mt Elgon Livelihoods Project, and the Western Kenya Soil Carbon Project. TIST has operations in Makueni, as will the Makueni Agroforestry Carbon Project. Some further overlaps are evident between the Komaza project areas in Nyandarua in Central Kenya and the TIST operations. Moreover, the Boomitra project targets for nationwide operations, introducing the potential for overlaps with all existing projects.

The primary concern associated with multiple projects operating in the same geographic area is the risk of double enrolling farmers, leading to potential double accounting of the same carbon sequestration or emission reduction activities across different carbon farming projects. This can undermine the integrity of carbon farming projects. This risk has been substantiated through multiple interviews, where stakeholders reported instances of newly launched projects reaching out to smallholder farmers already enrolled in their respective projects. The necessity for cross-project governance structures is underscored by the recent surge in carbon farming projects, with five of the eleven projects initiating carbon credit operations since June 2022 (see **Table 1**.).

We addressed this concern during interviews with stakeholders from two recently initiated projects: the Western Kenya Soil Carbon Project and the Boomitra Carbon Farming Project. These projects were identified as having a heightened risk of double enrolling farmers due to geographic overlaps with pre-existing initiatives. Our discussions centered on current approaches or structures for cross-scale project coordination, along with proposals for prospective governance structures. Currently, formal coordination procedures are lacking. Project stakeholders confirm that in light of the emerging challenge posed by double registration, a robust framework for cross-project governance is needed to uphold the overall integrity of agricultural carbon markets.

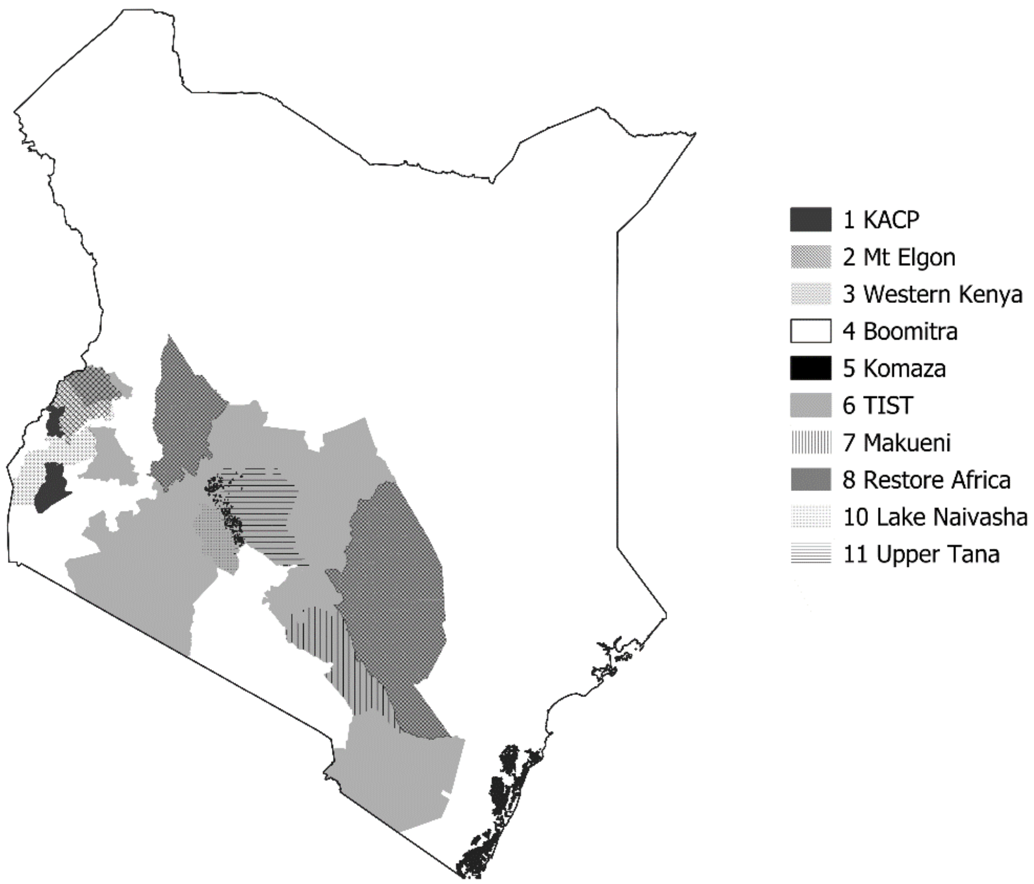

Figure 2: Map of carbon farming projects in Kenya.[7]

[7] The Hongera Reforestation Project did not provide information about the project location.

The interviewees mentioned two potential coordination mechanisms. First, projects taking autonomous initiative to harmonize operations, for example through meetings between projects active in the same locations. Second, coordination through government intervention, notably through existing platforms like county agricultural sector steering committees (CASCOs). The interviewees justified government intervention by the mandate of county governments for agricultural extension services. They, hence, called for county governments to assume coordination responsibilities. Some mentioned that budgetary limitations currently necessitate calling entities to bear the costs for stakeholder meetings.

Synthesizing the results from the interviews revealed the need for a shared responsibility model for cross-project coordination that involves the carbon farming projects, the government as well as the carbon credit standards and registries.

It is the projects' responsibility to clearly communicate participation rules to smallholder farmers. Mitigating the risk of double enrollment entails collaborating with well-established implementing partners who possess comprehensive insights into farmers' participation in various initiatives. Additionally, it involves proactive awareness-raising among farmers about the exclusivity of participation in a single project, accompanied by transparent communication of potential consequences. Further, projects should engage with other carbon credit projects operating in the same area to harmonize operations. As an alternative to autonomous coordination across carbon farming projects, the government could offer formal forums and coordination structures. Jurisdictional delineation has been proposed as a strategy to prevent overlaps. However, as most projects operate in multiple counties, one might think about the need for anchoring the coordination structure at the national level. Carbon credit registries, exemplified by Verra, could contribute to transparency as location files of participating farmers are mandatory for project validation. This might be a potential source for verifying farmer participation. However, challenges such as time lags in identifying double registrations and limited possibilities when projects are registered under different standards are acknowledged. To date, there are no lists available with the carbon registries or government that would allow carbon farming projects an eligibility screening of participating farmers.

5. Discussion and conclusions

The objective of this paper was to examine the governance structures, i.e., the actors and their interlinkages, of carbon farming projects and to assess how existing governance structures reduce transaction costs, thereby enabling the participation of smallholder farmers. We conducted a multiple-case study design and built our analysis on qualitative data from eleven carbon farming projects in Kenya.

Most of the literature on institutions in carbon farming schemes simplifies the institutional structure by focusing on the role of a single project developer or intermediary linking the providers and buyers of environmental services. However, this representation falls short in capturing the actual complexity of institutional setups. While some studies acknowledge the importance of multi-level institutions, they do not provide an overview of who these actors are and how they are interlinked. Our work has similarities with Shames et al. (2012) who were the first to assess in detail the project-level governance structures of carbon farming projects. Despite the broad consensus on the necessity of institutions and an enabling policy and institutional environment for effective PES, limited research exists on the actors involved and the institutional structures facilitating interactions between these actors in the context of carbon farming. Our work contributes to filling this research gap in a time of high interest in developing carbon farming projects.

Our analysis of project-level governance structures provided key insights into how projects are operationalized. Firstly, the establishment of carbon farming projects necessitates multi-stakeholder partnerships, driven by the need for oversight, pre-financing, and technical expertise essential for navigating carbon markets. Secondly, the choice of separate project implementation partners is influenced by existing relationships between project proponents and participating farmers. International entities usually collaborate with local implementation partners as they lack the required local networks. Thirdly, the operational scale of carbon farming projects, typically between 32,000 and 45,000 hectares, requires the adoption of multi-layer pyramid structures for farmer engagement. The number and formalization of these layers depend on factors such as the extent and frequency of extension service provision, the devolution of (monitoring) responsibilities, and the pre-existing structures of implementation partners. We synthesized the findings and developed a generalized governance structure for smallholder carbon projects.

Our analysis further revealed significant operational and geographic overlaps among the eleven case study projects. This raises the potential challenge of double enrolling farmers into multiple projects, a concern that may become more pronounced as five of the eleven projects commenced carbon credit operations since June 2022. Given the growing number of carbon farming projects, there is a clear need to establish a robust governance structure for cross-project governance, which is currently lacking. This structure could either involve autonomous coordination between carbon farming projects or rely on additional coordination support from the government. Carbon credit standards and registries could support the market by supporting cross-validation of registered farms to mitigate the risk of double enrollment of farmers in numerous projects. Establishing shared governance structures for cross-project coordination is crucial to maintaining the overall integrity of agricultural carbon markets. Kenya has made recent progress in this area by providing a regulatory framework for carbon markets. The *Climate Change (Amendment) Act, 2023* mandates the National Climate Change Council (NCCC) to provide guidance and policy directions to stakeholders active in the carbon market. Further, a National Carbon Registry shall be implemented, which will provide an inventory of all carbon credit projects in Kenya. Little is known about whether and how the government will set up governance structures and ensure the involvement of carbon credit projects for cross-project coordination.

Our findings are closely aligned with the theoretical foundation and findings presented in the theoretical background. Prior studies have shown that governance structures usually build on a combination of market, hierarchical and community structures (Vatn, 2010). Despite being a market-based approach, market-based schemes do not primarily involve a shift from public policies to market allocations. It can be seen as a reconfiguration of institutional structures, leveraging on communities and hierarchies, rather than abandoning them (Vatn, 2010). Our findings fully support this, emphasizing especially the importance of leveraging on community- or farmer-based structures. Landell-Mills & Porras (2002) see a key task in finding the optimal combination of market, hierarchical and community structures. Our work demonstrates that for achieving effective participation of smallholder farmers in carbon farming projects, multi-stakeholder partnerships are needed, and projects need to build on multiple layers of actors. A potential challenge arises, as the involvement of multiple partners might increase the likelihood of elite capture of carbon along the chain of actors. A potential question that arises is whether the "optical combination" mentioned by Landell-Mills & Porras (2002) is the same for all involved stakeholders and in light of potentially conflicting objectives and interests.

Agricultural carbon markets are still in their infancy. To support their establishment and ensure the active participation and benefits for smallholder farmers, further research with a focus on implementation strategies will be needed. The findings will be important in guiding policy makers among others on the implementation of appropriate and context-specific governance structures for carbon farming projects.

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