

3 Sustainable Use of Natural Resources in Tanzania

A Systematic Review of the Role of Agricultural Co-operatives Along Agro-supply Chains

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3.1 Introduction

Worldwide agrarian systems have undergone significant changes and transformations in recent decades, including the rise of dominant corporate-led agriculture industrial food regimes (Bernstein, 2015). Likewise, there is an increase in agricultural activity in rural areas among smallholder farmers and peasants through associations such as co-operative societies. The observed developments significantly increase pressure on natural resources, as resources, particularly arable land for cultivation, are becoming scarce. In some parts of the world, natural forests are cleared to meet the increased demand for agricultural activities, driven by the influx of rural migrants seeking land for agriculture, which often comes at the expense of the forest (Groth *et al.*, 2023). The Food and Agriculture Organisation (2020) observed that nearly 13 million hectares of forests are lost worldwide, with the highest loss rates in tropical regions, primarily due to subsistence agriculture (Babigumira *et al.*, 2014; Hosonuma *et al.*, 2012). Kissinger *et al.* (2012) note that the conversion of forestland to agricultural land has been one of the primary proximate causes of tropical deforestation, resulting in the depletion of natural resources. Unsustainable agricultural practices such as drastic land use change, extensively used pastures and pesticide usage lead to environmental degradation (Walsh-Dilley, 2013; Winkel *et al.*, 2016). Guided by their principle of “concern for community”, co-operatives can play a crucial role in addressing the observed challenges, as they influence production decisions among members (Cook *et al.*, 2004).

Globally, nearly one billion people are involved in co-operatives in some capacity, whether as members, customers or employees, which in turn has enabled co-operatives to employ almost 100 million people (International Labour Organisation [ILO], 2016). Based on their nature, co-operatives are autonomous associations of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise (Kurimoto *et al.*, 2015). Thus, cooperative enterprises are by nature a sustainable and participatory form of business

but also value-based and principle-driven organisations (ILO, 2016). Guided by the values of democracy, self-help, equality, self-responsibility, equity and solidarity, members of co-operative societies believe in the ethical values of openness, honesty, social responsibility and caring for others (Rwekaza and Mhihi, 2016). Due to their nature, co-operatives have attracted several stakeholders to form associations that aim to achieve common goals in their social and economic activities in different sectors. As observed by Wanyama, Develtere and Pollet (2009), co-operatives are unique member-owned institutions that unite the poor for poverty reduction and community development.

Co-operatives are increasingly being viewed as associations that foster collective actions in the area of natural resources management, which is gaining importance due to scarcity of resources and increasing resource degradation (Hagedorn, 2013). Cooperatives represent a model of economic enterprise that places a high regard for human values, environmental protection and conservation of natural resources. Co-operatives are well-placed to contribute to sustainable development because they endeavour to meet the economic progress of members while satisfying their sociocultural interests and protecting the environment (ILO, 2016). Throughout their value and supply chain operations, co-operatives stay in the communities where they are established as the profits generated are either reinvested in the enterprise or returned to the members (Moxom *et al.*, 2019).

Based on their nature of operations, co-operatives through their supply chain undertakings are vehicles for disseminating sustainable practices and technologies, which can foster the management of natural resources. Thus, they can promote sustainable use and conservation of natural resources without compromising the needs of the members who are largely smallholder farmers. Among the types of co-operatives, agricultural co-operatives play a crucial role in promoting sustainable agriculture and food security by facilitating resource sharing, collective bargaining and access to information and technology (Kalogiannidis *et al.*, 2024). They can effectively manage natural capital to achieve UN Sustainable Development Goals 12–15 by educating members on risk mitigation strategies and farm management techniques (Ghauri *et al.*, 2022). They (co-operatives) offer an alternative to traditional supply chains, which often involve multiple intermediaries that reduce farmers' profits (Dardak, 2015). In China, agricultural co-operatives participate in agro-food supply chain integration, helping to unite small-scale farmers and achieve both economic and social/environmental benefits (Zhang *et al.*, 2021).

In Tanzania, there is a rise in the population of smallholder farmers, which has led to a notable surge in the formation of Agricultural Marketing Co-operatives (AMCOS). Among others, the associations serve as collective platforms for producers to market their goods and carry out tasks collectively that would otherwise be unattainable individually. An AMCOS is a small local co-operative society which provides for the local purchase of agricultural input supplies and helps the smallholder farmers market their crops,

mostly cash crops such as cotton, coffee, cashew nuts, tobacco and tea (Anania and Rwekaza, 2018). Mostly, AMCOS are locally owned and operated to provide a variety of services such as farm input acquisition and supply, storage and processing, and marketing of produce to smallholder farmers along the agricultural supply chain (Anania, Rwekaza and Bamanyisa, 2020). The services are lacking in most areas, particularly in rural areas. AMCOS unite smallholder farmers along the agro-based supply chain to improve their livelihoods and increase household income.

Despite such potential, AMCOS faces numerous challenges in promoting natural resource conservation, including a lack of technical knowledge, limited access to finance and infrastructure and weak governance and management systems (Anania, Rwekaza and Bamanyisa, 2020). Therefore, it is essential to explore how agricultural marketing co-operatives can play a role in promoting sustainable agricultural practices and natural resource conservation. Towards achieving this, this chapter explores the role of AMCOS in promoting sustainable and natural resource conservation through its supply chain activities.

3.2 Theoretical Reflections

This chapter was underpinned by the Stakeholder Theory, Diffusion of Innovations and Value Chain Analysis, which enhanced the analysis and informed the findings. The theories provided complementary perspectives that helped to understand the drivers, dynamics and challenges associated with the conservation and sustainable use of natural resources within co-operative supply chains. Stakeholder Theory (Freeman, 1984; Freeman *et al.*, 2010) examines the relationships and interactions between organisation and their various stakeholders. Applying stakeholder theory helped to identify the different stakeholders involved in the supply chain operations of agricultural co-operatives, their interests, power dynamics and their influence on the sustainable use of natural resources. As the theory postulates, agriculture co-operatives, like any other firms, should create value for all stakeholders in the community, not just shareholders.

The Value Chain Analysis (Kaplinsky and Morris, 2001), based on the *filière* analysis, provided a framework for examining the actors, activities and linkages within the agriculture co-operatives supply chains. Unlike other approaches, the *filière* approach is oriented towards agricultural production and mainly focuses on issues of vertical integration relationships, power distributions, physical flow of commodities, transformation (Raikes *et al.*, 2000) and mapping of transformation relationships across the local agricultural value chains (Daryanto, 2014). The Framework guided the identification of the stages involved in the production, processing and distribution of agricultural products, as well as the actors and relationships that exist within each stage. This facilitated an understanding of how conservation practices and strategies can be integrated at different points in the value chain based on the

co-operatives' roles, responsibilities and interactions with suppliers, farmers, processors, distributors and consumers. In turn, it highlighted the potential leverage points and interventions to improve resource efficiency and promote sustainable practices.

Likewise, the Diffusion of Innovations Theory (Rogers, 2003) examines the process by which new practices, ideas or technologies spread and are adopted within a social system in the context of natural resource conservation and sustainable usage. The theory provided an understanding of strategies for the adoption and diffusion of sustainable practices within agricultural co-operatives' supply chains. Furthermore, it assisted in identifying factors that influence the acceptance and adoption of innovations while highlighting the key role of social networks and communication among cooperators towards facilitating the diffusion of best natural resource conservation practices.

3.3 Materials and Methods

The chapter was guided by a systematic literature review (SLR) approach in which the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Framework (Page et al., 2021) provided the methodological foundation for analysing the literature. A critical analysis of existing literature was done to determine the role of agricultural marketing co-operatives in promoting the sustainable use of natural resources within agricultural supply chains. Literature was sourced from reputable sources, including Scopus, Science Direct, Taylor and Francis, Wiley Online, International Co-operative Alliance (ICA), Food and Agriculture Organisation (FAO) and Research Repositories of Universities. The aim was to identify sustainability practices implemented by agricultural marketing co-operatives to manage natural resources and examine the role of cooperatives in influencing environmentally responsible behaviours across agricultural supply chains. Eligibility criteria based on the population, focus, study types and language are detailed in Table 3.1, which summarises the inclusion and exclusion criteria. The search terms were developed using

Table 3.1 Eligibility Criteria

<i>Criteria</i>	<i>Inclusion</i>	<i>Exclusion</i>
Population	Agricultural co-operatives, farmer groups, producer associations	Non-agricultural co-operatives or unrelated entities
Focus	Sustainable natural resource management within agricultural supply/value chains	Studies not addressing sustainability or supply chains, or value chains
Study Types	Peer-reviewed articles, case studies, grey literature, and organisational reports	Commentary, editorial opinions, non-empirical articles
Language	English	Non-English publications

Boolean logic and combinations of controlled vocabulary and free-text terms such as “agricultural co-operatives” OR “farmer co-operatives” AND “sustainable use” OR “natural resource management” OR “biodiversity” AND “supply chain” OR “value chain”.

The selection process followed the four PRISMA stages and is summarised in Figure 3.1 (PRISMA Flow Diagram), which includes identification, screening, eligibility and inclusion. In the identification, a total of 600 records were identified through database searching, while 80 were retrieved through grey literature and references (Total Records = 680). Titles and abstracts were screened for relevance, leading to the exclusion of 250 duplicates after screening. A total of 430 full-text articles were assessed for eligibility, and 368 were excluded due to reasons such as inadequate relevance to sustainability of natural resources or agricultural co-operative focus. At the end, a total of 62 studies and reports were included in the qualitative synthesis through a

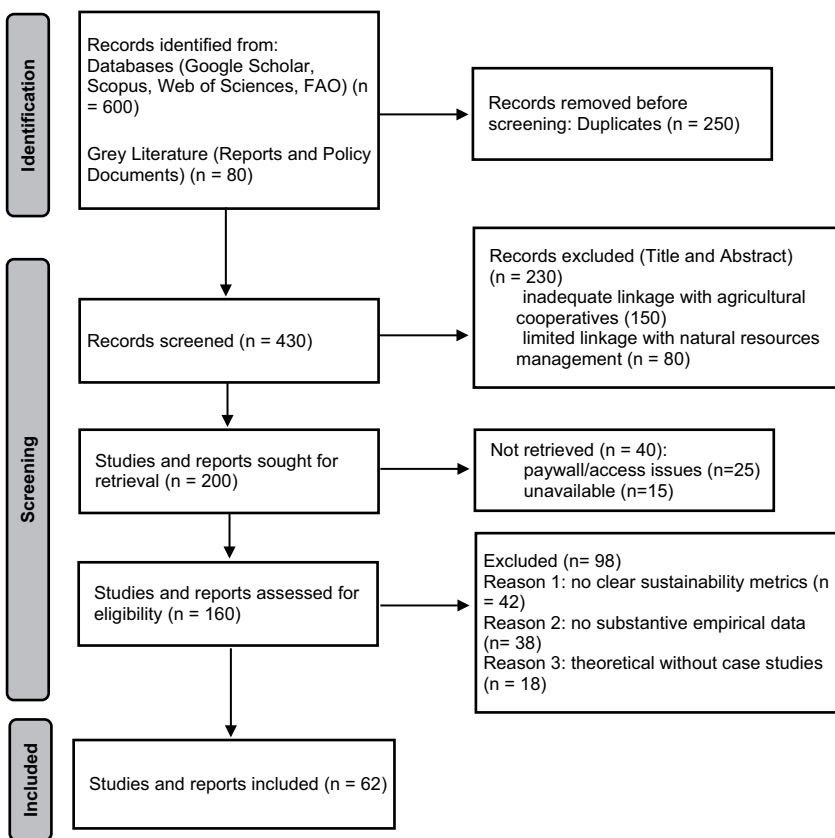


Figure 3.1 PRISMA Flow Chart.

narrative synthesis approach due to the diversity of methodologies across the included studies. Extracted data was analysed thematically across the key dimensions that included ecological practices and supply chain practices. This study did not involve human subjects or personal data, and ethical integrity was upheld through proper citation and acknowledgement of all included sources.

3.4 Results

Co-operatives make a substantial contribution to a reformed approach to production and consumption by ensuring equitable management and efficient use of natural resources through their governance and democratised structures. At the local level, co-operatives support the localisation of the economy and reinvestment of surplus within communities where they operate. Additionally, at higher levels, larger cooperative enterprises or cooperative apexes implement and replicate cooperative values and principles across value chains globally (Moxom *et al.*, 2019). A significant role has been played by AMCOS as a primary member-based cooperative in the following parameters, as highlighted later.

3.4.1 Training and Capacity Building

Cooperatives, as guided by their 5th Co-operative Principle on “Education, Training and Information”, have been the engine for promoting conservation and sustainable use of natural resources (Komba, 2024; Dale *et al.*, 2013; Kumar, Wankhede and Gena, 2015; Birchall, 2004). As member-based associations, co-operatives have provided forums for members and surrounding local communities to find solutions that embrace green economic ventures by defining their property and user rights, diversifying economic activities and managing natural resources. In Tanzania, a reforestation programme has been implemented in Urambo District, where individual smallholder farmers (AMCOS members) have been trained to grow back trees as part of conserving natural resources (Katundu and Mwaseba, 2009). Through co-operatives, the programme aimed to restore depleted natural forests caused by the increased demand for firewood to dry Tobacco. The fuelwood grown under these programmes replaced wood that was otherwise being harvested unsustainably from natural woodlands. Additionally, in the long run, it would reduce pressure on woodlands through co-operatives (Bamanyisa, 2019).

Likewise, as natural resources conservation education becomes increasingly essential for promoting sustainable natural resource management, AMCOS has been playing the role of educating its members and the broader community. Thus, agricultural co-operatives inform their members and communities about the importance of conserving and using natural resources sustainably (Komba, 2024). They have promoted awareness campaigns, conducted training programs and provided technical assistance on sustainable

resource management practices. This has been instrumental as it enabled members and stakeholders in the supply chain to adopt sustainable practices and increase their understanding of conservation strategies and approaches through sustainable farming and marketing.

3.4.2 Adoption of Sustainable Practices

Cooperatives position their members to better meet the socioeconomic and environmental sustainability agenda due to their ethos and structure, which aim to fulfil the requirements for sociocultural and environmental protection (ILO, 2016). Among others, primary co-operatives have contributed to enhancing carbon stocks through their involvement in land use and land-use changes, which have helped conserve existing forests and restore forests and biodiversity in degraded forest ecosystems (Bamanyisa, 2019). For example, smallholder farmers in Moshi District have, for many decades, adopted an agroforestry cropping system in which coffee is interplanted with bananas, and horticultural crops are grown alongside trees such as *Grevillea Robusta* and *Persea Americana* (Winter, 2009). Such agroforestry practices have a significant mitigation potential and conserve natural resources due to their ability to sequester carbon through multiple plant species and maintain soil organic carbon (Bamanyisa, 2019).

AMCOS has disseminated sustainable practices and innovations in the agricultural sector through the provision of extension services to smallholder farmers (both members and non-members). Komba (2024) found that members of AMCOS purchase and use environmentally friendly agricultural inputs, adhering to the sustainable principles of input cans and containers by properly disposing of hazardous wastes on farm sites, rather than dumping them in rivers or along road sides. This has enabled co-operatives to contribute to the conservation of natural resources and climate change mitigation by supporting crop diversification, the use of climate-smart technologies and machinery, improved watershed management and the utilisation of renewable energy in their supply chain activities.

3.4.3 Community Engagement in the Conservation of Natural Resources

Co-operatives are the most effective at the local level among community-based associations. They are formed to bring together local communities through daily interactions with members and non-members (Moxom *et al.*, 2019). Agricultural co-operatives guided by the 7th Principle of “Concern for Community” have engaged communities in various socioeconomic activities aiming at improving the welfare of the community, including the sustainable use of natural resources. Chambo *et al.* (2021) and Mchopa *et al.* (2020) found that AMCOS serves both members and non-members in the community by providing services such as collective bulking, processing, and marketing. This enables smallholder farmers to earn a higher profit from their coffee, thereby

increasing their ability to invest in climate-smart and sustainable practices that preserve the environment and natural resources.

Through their supply chain activities, collective savings have enabled co-operatives to invest in climate-smart technologies and machinery that their members use to improve their resilience to climate change (Oryema, 2022). Likewise, co-operatives offer increased access to quality agricultural inputs such as drought-tolerant and disease-resistant seedlings, fertilisers and pesticides. These initiatives enable smallholder farmers to adopt sustainable farming practices, which in turn improve their knowledge and skills in the conservation of natural resources. Thus, co-operative societies facilitate a “trickle-down” effect in mainstreaming sustainable practices throughout the co-operative movement due to the specific features of the co-operative model, including the values of democracy and solidarity (Wanyama, 2014).

Agricultural co-operatives have the potential to reduce greenhouse gas emissions resulting from forest degradation and deforestation (Birchall, 2003). As member-based associations, they engage communities in afforestation programs and intensification of agricultural practices that reduce the need for clearing new land for agricultural expansion. Given their ability to harness strengths and build capacities for enhancing communities’ economic and social conditions (Ferguson, 2012), it is increasingly compelling that co-operatives offer avenues for improved farming practices such as agroforestry. The aforementioned practice allows trees to be incorporated into a cropping system rather than being cut down. In turn, this improves nutrient availability, stores carbon, reduces soil erosion and increases land-use efficiency (Wang *et al.*, 2015). As a result, this has fostered communities of smallholder farmers to participate in natural resource conservation activities in an effort to reduce pressure on forests, thereby enhancing the forest’s potential to sequester carbon and reduce greenhouse gas emissions (Bamanyisa, 2019).

Evidence suggests that co-operatives create opportunities for members to gain not only economic benefits but also facilitate societal development, including improvements in environmental health, quality of life and community economic stability (Acharya, 2017). Thus, co-operatives are obliged to promote sustainable conservation of the natural environment for the wellbeing of their members and communities at large. As such, AMCOS members have been involved in environmentally friendly activities such as agricultural practices that support shade-grown farming and composting, which increase soil carbon stocks (Fitzgerald, 2013). Additionally, AMCOS contributes to reducing carbon emissions and enhancing carbon sinks by participating in land use and land use changes (Bamanyisa, 2019). The marketing of agricultural products, supply of agricultural inputs, provision of extension services, promotion of intensive farming and advocacy of agroforestry practices are linked to greenhouse gas emissions and carbon removals (Bamanyisa *et al.*, 2019).

3.5 Discussion

The mismanagement of natural resources as a result of agricultural activities is becoming more serious to the environment because agriculture is the primary source of household livelihood (income, food, assets). As poverty and population growth continue, households' engagement in unsustainable agricultural practices is intensifying, reaching a point where serious resource degradation is occurring. Until recently, natural resource management has been in disarray, with government agencies and departments struggling to provide effective management support. This creates a vacuum, and agricultural co-operatives, as grassroots organisations mainly formed in the local communities, have implemented several interventions and initiatives as countermeasures. The initiatives and interventions revolve around their supply chain undertakings, which include the acquisition of farm inputs, production (seeding, planting, weeding and harvesting), post-harvest management (storage and warehousing), processing and marketing.

As indicated in the findings, co-operatives have been considered among the most reliable member-based associations in ensuring sustainable use of natural resources. This has been the most instrumental aspect in natural resource conservation and management, as it has promoted and disseminated sustainable agricultural practices throughout their supply chain activities. Among others, include conservation agriculture, where smallholder farmers have been trained and supported to practise agronomic conservation approaches. The practices ensure that seeding, planting, weeding, irrigation and harvesting are done without disturbing the soil, guaranteeing minimum soil disturbance, maintaining soil cover and enhancing crop rotation in their production activities.

AMCOS has also spearheaded the formation of natural resources development groups in the community, which are supported through the funds set aside for "corporate social responsibility" (the principle of concern for the community). The practice has been observed in Urambo and Mufindi Districts, where cooperatives play a significant role in supply chain activities within natural forests or forest reserves. The contributions made are instrumental in the conservation of natural resources, primarily forests (both natural and man-made), as AMCOS has been able to promote and encourage agro-forestry, afforestation and reforestation practices. The community has been significantly involved as AMCOS attempts to engage beneficiaries in natural resource conservation through collective actions to develop sustainable, community-based solutions.

Likewise, throughout the agro-supply chains, cooperatives have adopted the concept of the 3Rs (reduce, reuse, recycle) in an attempt to reduce waste and protect natural resources. Such practices, including the use of reusable containers, crates and bins for transporting and storing produce, have enabled co-operatives not only to reduce packaging waste and the associated costs but also to promote environmental sustainability within their supply

chain operations. Additionally, organic waste, such as crop residues, animal waste and spoiled produce, has been recycled through composting or anaerobic digestion to produce a nutrient-rich organic fertiliser. This, in turn, has reduced spoilage and the need for synthetic fertiliser to AMCOS members (smallholder farmers) and minimised waste disposal costs.

3.6 Conclusion

AMCOS, as primary cooperatives (grassroots institutions), play a vital role in natural resource conservation by promoting sustainable agricultural practices among their members and stakeholders involved in their supply chains. By creating links between farmers and markets that prioritise sustainable and environmentally friendly products, AMCOS can encourage its members to adopt more sustainable agricultural practices for the conservation of natural resources. They promote natural resource conservation by providing their members with access to sustainable markets, which offer higher prices for farmers who adopt sustainable agricultural practices. Likewise, by pooling their resources, AMCOS provides its members with access to information, training and support, which helps them adopt practices that foster the sustainable use of natural resources. The study recommends that co-operatives should align their resources and integrate supply chain operations to conserve natural resources for current and future generations, as required by the 6th and 7th Principles of Co-operatives. Likewise, the policy and legal framework have to embrace the initiatives made by the co-operatives by mandating supply chain stakeholders to comply with the requirements.

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