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POLICY BRIEF No. 54

Soil Carbon Policies in Ethiopia and Kenya: Evolution, Challenges, and Opportunities

Introduction

This brief traces the historical evolution of policies on soil carbon in Ethiopia and Kenya and their options for its increased sequestration. The soil carbon ecosystem generates services such as the provision of food, feed, fiber, and clean water, as well as control of greenhouse gases and crop pests. Land degradation has historically attracted attention from governments and development partners, often focusing on soils but not specifically the depletion of soil organic carbon. The historical evolution of soil carbon policies tracks the land tenure system and human settlement in both countries as these factors often influence how land is sustainably managed. The absence of land tenure is often implicated as a primary driver of land degradation. Land tenure security and land restoration policies are both needed to address soil carbon stock sequestration (Amede, Belachew, and Geta 2001). In Ethiopian and Kenyan smallholder farming systems, investments in soil management are more likely to occur in conjunction with land tenure security or ownership. Both Kenya (Swynnerton 1955) and Ethiopia (Rhode et al. 2006) have seen rises in land registration.

KEY MESSAGES

- The soil carbon ecosystem is a public good and is prone to deterioration from various forms of land degradation and human settlement. Public policies could promote sustainable use for current and future generations to generate such essential ecosystem goods and services as food, feed, textile fiber, clean water, and control of greenhouse gases and crop pests.
- Soil carbon and climate change are intrinsically linked. When contained in greenhouse gases, carbon is the major cause of climate change, but when stored in the soil, it represents an important solution to the problem of climate change. Hence, policies and investments to store soil carbon are key.
- Factors such as the disruption and instability of land tenure, land degradation, devastating famines, and droughts have accentuated the critical need for public policies and large-scale national initiatives to address long-term challenges in food security and land management in both Ethiopia and Kenya.
- The global community, including the United Nations General Assembly, has taken keen interest and included soil carbon stocks under Target 15.3 of the Sustainable Development Goals.
- Active promotion and participation by local farmers and buyers from the international community would support the establishment of enabling policies and regulations to incentivize and monetize various soil carbon ecosystem service and goods value chains.
- With public funds allocated to soil carbon research and development, Ethiopia and Kenya could undertake research on innovative and emerging technology platforms to promote sustainable land management in order to increase soil carbon sequestration.

For those who have tenure rights, policies that raise the farm-gate prices of soil carbon ecosystem commodities are critical means for encouraging good land management strategies, since they provide farmers with both resources and incentives (Tiffen, Mortimore, and Gichuki 1994).

The study methodology involved a systematic literature review of peer-reviewed publications on land degradation and soil carbon policies in Ethiopia and Kenya. The review drew on fourteen databases, including Web of Science and Scopus, as well as websites, and references from bibliographies; it combined key search query terms related to soil and organic carbon, policy, sustainable land management (SLM), climate change, global warming, Ethiopia, and Kenya.

Policy and Development Context of Soil Carbon

Hunger and the urban/rural poor

The five largest global carbon pools in order of volume are:

I. the oceanic pool.

II. the geological pool including for instance coal, oil, and gas.

III. the pedologic or soil pool, involving humus and inert carbon.

IV. the atmospheric pool, for example carbon dioxide (CO2).

V. the biotic pool, including live biomass.

All these pools are involved in the carbon cycle and are intrinsically linked to climate change. When in a gaseous state, carbon is the major cause of climate change and a significant contributor to global warming. However, organic soil carbon represents a major solution to climate change and global warming, and there are abundant policy opportunities for soil carbon sequestration. Private benefits that drive land-use decisions often fall short of incorporating social costs, so carbon sequestration may not reach an optimal level from a social point of view. Because soil carbon sequestration is a public good, there is a case for public policy and investment interventions to encourage farmers to adopt appropriate long-term perspectives. The global community, including the United Nations General Assembly, has included soil carbon stocks under Target 15.3 of the Sustainable Development Goals, which specifies that each country should annually assess and report its soil carbon stock levels to the United Nations.

Already, the loss of soil carbon results in impacts that are evident in both countries through processes of land degradation. The consequences of famines in both countries have brought the devastating effects of land degradation and extensive human settlement to the forefront of development policy. Embedding public policies in the discourse of environmental sustainability, economic prosperity, and national development could help realize the multiple benefits of soil carbon, namely the provision of ecosystem services, and reduce the threat of land degradation.

Impacts of Soil Carbon Deterioration through Land Degradation

Land Degradation and Agricultural Production Systems

Ethiopia and Kenya have experienced serious and extensive land degradation, leading to the diminishment of agricultural production and other multifunctional roles of land. There is abundant evidence of the consequences of various forms of land degradation around the world, including in both countries. The Dust Bowl years on the Great Plains of the United States in the 1930s were the result of rapid erosion caused by decades of continuous mono-cropping of shallow-rooted annual crops. In northwestern China, similar unsustainable practices led to widespread dust and sandstorms from the 1970s through the 1990s (Riebsame, Changnon, Jr., and Carl 1991).

Land degradation has induced droughts that have been a major problem in Kenya and Ethiopia, resulting in the loss of human life and of livestock, large and economic setbacks at unprecedented levels, and heavy public expenditures (Table 1). In Ethiopia, the drought-induced famines of 1972-75 and 1982-85 led to the deaths of more than one million people, leaving many more on the brink of starvation. These tragedies contributed to the overthrow of Emperor Haile Selassie in 1974 and to the civil war that ended with the overthrow of the military regime of Mengistu Haile Mariam in 1991. Kenya also experienced similar famine crises at about the same time. The head of state at the time, President Daniel Arap Moi, engaged in nation-wide soil conservation programs in an attempt to address land degradation challenges.

Table 1. Socioeconomic Characteristics of Ethiopia and Kenya

COUNTRY AND VARIABLE	ETHIOPIA	KENYA
Size of country (sq km, thousands)	1,104.3	586.2
Population (millions), current estimate (2019)	100.0	50.1
Population density (people per sq km)	100	79
Gross domestic product (US$, millions, 2018)	30,200	34,637
Gross domestic product per capita (US$, billions)	1,040	1,680
Agricultural sector gross domestic product (US$, billions)	13,590	8,313
Contribution of agriculture to the gross domestic product (%)	44	27
Forest land cover for REDDS+ (%)	9.7	6.2
System of land tenure (1970- 1974)	Feudal	Communal or individual freehold
System of land tenure (1974-1990)	Marxist	Communal or individual freehold
Method for acquiring land tenure (1974-1990)	Distribution by Derg regime	Purchase through Settlement Trust Fund
People affected by famine in 1984 (millions)	6.6	3.8
Number of people who died in 1984 (millions)	1.2	N/A
Public policy reactions to the famine of 1984	Famine Early Warning Systems	Famine Early Warning Systems
	Strategic Grain Reserves	Strategic Grain Reserves
	Sustainable Land Management Programme	National Soil and Water Conservation Programme

The famine-prone character of the two countries does not seem to have improved with time. For instance, out of a population of 78 million in Ethiopia, more than 13 million people were affected by drought in 2003 (Disaster Prevention and Preparedness Commission 2005). In Kenya, meanwhile, about 4.5 million people are now permanently on famine relief, with droughts or famines occurring almost every year: 1974/75, 1977, 1979, 1980, 1982, 1983/84, 1991/92, 1995/96, 1999/2000, 2004, 2006, 2008/2009 and 2010/2011.

Experiences and Lessons from Soil Conservation Interventions

Land degradation has attracted high-level attention from the government and development partners. Several research and implementation projects have focused on visible problems like soil and water conservation. However, less attention went to the depletion of the soil organic carbon pool, so the literature on soil carbon ecosystems in Ethiopia and Kenya is limited. Hence in this policy review, SLM is used as a proxy for soil carbon.

After the famine in both Ethiopia and Kenya, a number of development partners, non-governmental organizations, and community-based organizations initiated 79 soil and water conservation projects in Ethiopia and 52 in Kenya. The estimated national investment budget totaled about US$ 150 million per year. Five major donors account for 75% of the investments in soil conservation: in decreasing order, the United States Agency for International Development; the World Bank Group; various United Nations programs and funds including the World Food Programme, the United Nations Development Programme, the United Nations Environment Programme, and the United Nations Children's Emergency Fund; the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH; the Swedish International Development Cooperation Agency, and the New Partnership for Africa's Development.

Only 4% of the projects contribute to a carbon offset that agrees with the standard definition. A variety of factors may have played a part in this outcome. Firstly, none of the projects have used pioneering, innovative policies on soil carbon sequestration. Secondly, the existence of different coordinators for various projects and partnerships created problems with institutional linkages, networking, and coordination at the national level. Thirdly, the programs and projects were small-scale and scattered, often had multiple objectives, and hardly mentioned carbon sequestration. Fourthly, except for projects and programs with one or two phases, their lifespan was usually less than 5 years. However, soil conservation only pays off after a gestation period of about 30 years, long beyond the planning perspective of many farmers (FAO 2001; Stillhardt, Herweg, and Hurni 2002). Therefore, projects with such a short duration often cannot realize benefits for communities, a factor that has probably compromised the success of conservation efforts in Kenya and Ethiopia. The project period is a key consideration because carbon sequestration demands a minimum of 5 years.

Policy and Investment Responses to Promote Sustainable Land Management

Policy to Monetize and Incentive Soil Carbon as a Public Good

Globally, innovative and voluntary carbon markets have been established; they generate financial incentives to shrink GHG emissions, especially CO2, and reduce the loss of soil carbon by trading emissions allowances in the form of carbon credits. Agricultural emissions comprise 14% of global GHG emissions, and these markets have created a win-win opportunity and incentives for SLM. Plants absorb CO2 from the atmosphere and thus contribute to mitigating climate change.

Voluntary strategies have created property rights for carbon, and a carbon market value chain has transformed the common carbon pool into a private good. Now public policy could be developed to effectively manage the soil carbon pool as a non-trivial input, where it takes on elements of a public good, and the carbon market becomes an oligopolist structure. With the facilitation of this market by government policy, the soil carbon industry could evolve as a mixed oligopoly if farmer and producer organizations and other land users are allowed to play a significant role in it.

Carbon value chain policies and ensuing regulations could specify carbon products, methods of assessing the amounts sequestered by farmers, pricing, payment systems, and registration of dealers in the regulated market. They may reduce the risks involved in carbon trading from agricultural land and build the confidence of global large emitters, who will in turn become increasingly likely to purchase carbon credits as the possibility of policy reversals reduces through

progressive legal paradigm establishment and self-regulation.

These policies could remove obstacles and challenges to farmer participation in the soil carbon market and provide for the organization of farmers to tap into this market. They could provide guarantees to ameliorate the high levels of uncertainty around agriculture's mitigation potential, which can arise as a result of a variety of factors: difficulties in measuring mitigation; concerns about permanence, since sequestered soil carbon can be lost when mitigation practices are abandoned; large monitoring, reporting, and verification hurdles that drive up transaction costs; and a need for coordination in order to generate a market-viable quantity of emissions reductions. Ethiopia and Kenya could pursue a fuller inclusion of agriculture in the carbon market.

National Investment and Research in Soil Carbon and Sustainable Land Management

In the Maputo Declaration (African Union New Partnership for Africa's Development 2010), African heads of government pledged to allocate at least 10% of their national budgets to the agricultural sector within 5 years. Of this, a minimum of 5% was meant to earmarked for agricultural research in order to sustain its growth rate of over 6% per annum.

The International Food Policy Research Institute compiles data on government spending on agriculture in African countries; it is regarded as the foremost source of information for monitoring the Maputo Declaration. In recent years, only 10 of 45 of the African countries covered by the dataset, including Ethiopia, attained the 10% target agreed upon in the Maputo Declaration (Benin et al. 2010). Among those that have not reached that goal, eight countries, including Kenya, show a decrease in the share of government spending on agriculture over the last 3 years, implying that carbon research may not attract any significant public funding. Public policy could reverse this trend; agricultural research is a public good funded by government.

Domesticating the Global Conventions on Soil Carbon

Considering their history of famines and the resulting impacts, Ethiopia and Kenya could visibly and actively join the strong global alliance to stabilize atmospheric levels of carbon and other GHGs to mitigate the risks of global warming. They could domesticate relevant international conventions by formulating policies, laws, and regulations to cover governance, technical issues, financial provisions, citizen participation and engagement, trade, marketing innovations, and digitalization. They could also establish offences and sanctions or penalties for those who flout the regulations.

Given the tremendous significance of agriculture for the global climate, progress in incorporating it into the United Nations Framework Convention on Climate Change has been slower than expected (UNFCCC 2009). Although the convention covered negative impacts of agricultural production in terms of land-use change and GHG emissions, it largely omitted the real and potential contributions of the agricultural sector through sequestering carbon in agricultural biomass and soils. The introduction of policies to redress this omission promises to foster a more balanced perspective in which food security is not necessarily at odds with climate change adaptation.

The Introduction of Innovative Information and Communication Technology Platforms in Sustainable Land Management

Public policies could help realize the multiple benefits of soil carbon in the provision of various goods, including food, services, and environmental services. The threat of land degradation could be internalized by all the key stakeholders in the entire agri-food system. Soil carbon-based strategies to remove carbon from the atmosphere through carbon capture and storage technologies, reforestation efforts, and soil erosion prevention have attracted high-level attention at global governance forums, earning recognition for their value as carbon sinks and as a key component of international food security.

Information and communication technology platforms that are successful in expanding SLM will be driven by:

- **Inventiveness:** Creativity and sustainability that fosters opportunities for growing SLM beyond a project cycle.
- **Higher quality at lower cost:** Synergistic partnerships for collective action and economies of scale to better share resources and to perform more efficiently.
- **Coalitions:** The engagement of many SLM stakeholders to command a comparative advantage in mobilizing communities to adopt SLM for landscape-level impacts at scale.

Conclusions and Suggestions

The evolution of carbon policies in both Ethiopia and Kenya has been a dynamic process. Their various policies and investment programs have been influenced by frequent structural changes in land tenure, political orientation, international environmental agreements, emerging technologies and priorities, global climate change, and carbon cycle-related discourses. Both countries ratified the United Nations Framework Convention on Climate Change (1994) and United Nations Convention to Combat Desertification (1996) climate negotiations without delay and have remained active participants since then. Both countries also possess the knowledge that soil carbon storage is a public good, although policies to incentivize and monetize soil carbon for the benefit of small-scale farmers have not been developed and promoted on a national scale. If and when these changes happen, farmers will likely be able to pool their efforts through public policy interventions to manage soil carbon sequestration on a sustainable scale.

Policies for innovative information and communication technology platforms could support the provision of carbon policy extension services to small-scale farmers. These policies would be geared toward technologies that generate significant private returns, in situations wherein grant funding may be more suitable to overcoming adoption barriers. For technologies such as conservation agriculture that entail specific machinery inputs and significant up-front costs, payment for ecosystem services schemes could be used to support farmers and break the adoption barrier. There is also the potential for carbon finance to support farmers who may wish to participate in forest carbon projects though Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) foster conservation, the sustainable management of forests, and the enhancement of forest carbon stocks.

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BMZ Federal Ministry for Economic Cooperation and Development

KALRO Kenya Agricultural & Livestock Research Organization

KIT Karlsruher Institut für Technologie

SLU Swedish University of Agricultural Sciences

EIAR Ethiopian Institute of Agricultural Research

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