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The Economic and Social Cost of Land and Soil Degradation in Malawi

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Key Messages

- About 40% of Malawian soils are in poor health, and they continue to degrade annually through loss of topsoil, soil organic matter, and acidification.
- We estimate that Malawi is losing a minimum of 2.3 million MT of maize per year due to soil degradation.
- Efforts to reverse land degradation and restoring soil health have high returns with each dollar invested generating USD 4 to USD 7 in returns.
- To restore Malawi's soil health and improve agricultural productivity, the country's Action Plan on Fertilizer and Soil Health should comprehensively be financed and implemented by all stakeholders

Introduction

Healthy topsoil is a key factor in agriculture productivity and the livelihoods of millions of people in agrarian economies such as Malawi. In Malawi, 85% of the rural population depends on primary agriculture for their livelihood and food security. The agricultural sector contributes close to a quarter of the country's Gross Domestic Product (GDP) and accounts for more than 90% of total export earnings[1,2].

Healthy soils are therefore a critical driver of both food security and the livelihood of millions of Malawians. Soils are of good health is they have biological, physical, and chemical properties found in their top layer, or topsoil, that sustain plant and animal productivity, soil biodiversity, and environmental quality. Unfortunately, about 40% of Malawian soils are said to be generally in poor health because of the loss and degradation of the topsoil. This has compromised the effectiveness of Malawi's efforts to implement the Abuja 2006 declaration of improving access to inorganic fertilizer because of the reduced effectiveness that is caused by poor soil health. In this policy brief, we present Malawi's soil health situation and its consequences including the recommendations for the improvement of soil health in Malawi.

The state of soil health

Soil health in Malawi is declining[3]. The decline can mainly be attributed to the loss of topsoil, soil organic matter, and acidification. The combination of these drivers leads to an overall decline in soil nutrients and loss of the ability to retain water,

reducing soil capacity to sustain plant and animal productivity.

Over the years, farmland in Malawi has seen an accelerated loss of fertile topsoil. Some of the contributors to land degradation include climatic conditions and extreme weather events such as droughts and floods, fires, unsuitable land uses and management practices[4]. Soil loss carries away plant nutrients, and in addition causes off-site effects such as pollution, siltation of water storage, and more[5]. In 2010, the mean yearly soil loss rate was estimated at 26 ton/ha/year, rising to 30 ton/ha/year in 2017[5]. The rate of yearly topsoil loss in Malawi is in fact up to 10 times higher than the reported global average loss of 2.4 ton/ha/year, which points to the magnitude of rapid, fertile topsoil loss in Malawi[6].

Nutrient depletion of Malawi's soils threatens agricultural production and livelihoods. Key nutrients such as nitrogen, phosphorous, calcium, and zinc are deficient across Malawi, at varying levels according to locality. A 2018 study showed the average annual loss rate of nutrients is comparable to over 2,000 metric tons of Chitowe fertilizers per year[5]. At current average fertilizer prices, this equates to approximately US$1,880,000 per year.

Fertilizers may seem to be the answer to this concerning decline in soil nutrients. However, fertilizer applications have limited effectiveness without corresponding erosion control and restoration of soil organic matter. Consistent inorganic fertilizer application has been shown to accelerate soil acidification which has been on the rise across the country[4]. High soil acidity reduces the capacity of soils to avail essential nutrients to plants and thus hampers plant growth.

Soil organic matter is another key component of a healthy soil. It regulates and holds water and is essential to ensure nutrients in the soil are available to plants. Soils with a high organic matter content are generally less susceptible to acidification and have a higher probability for crops to withstand short drought spells. Evidence shows that soil organic matter in Malawi's farmland has decreased over the years and is often falling below a critical minimum threshold to support crop productivity and water retention[7].

Soil erosion and the loss of fertile topsoil are often caused by rainfall run-off and accelerated by unsustainable land management practices. Run-off also has a negative impact on rural water supplies for both domestic and productive uses. As less and less water infiltrates into the soil there is less water available for plant growth, and to recharge streams, rivers, and groundwater resources. Water shortages are expected to become a severe problem in the next 20 years[8].

The evidence on the state of topsoil in Malawi highlights the alarming speed at which fertile topsoil is lost nationwide. If left unaddressed this will inevitably lead to a further decline in agriculture productivity, threatening the already precarious livelihoods of millions of Malawians and

the economy as a whole, and the attainment of Malawi's long-term vision, Malawi 2063.

The cost of land degradation

Land degradation, through the impact on agricultural yields, reduces Malawi's GDP by as much as 2.7% per annum[4]. This amounts to economic losses measured in hundreds of millions of dollars every year. With the conservative estimation of soil loss of 22 tons/ha per year, maize productivity is projected to decline by up to 61% per year[4]. Combining this data with the 2023/24 Agricultural Production Estimates[a], it shows that Malawi is losing a minimum of 2.3 million MT in maize production due to soil degradation. Smallholder farmers are hit hardest as they are estimated to experience a general decrease of 0.3% in maize production for every 1% loss of topsoil, compared to 0.1% for large producers[4]. If nothing happens and soil loss increases by 10%, Malawi's GDP will decrease by 0.26%, total agricultural production will decrease by 0.42% per year[4]. Further, the risk of continued topsoil loss in Malawi could lead to an additional half a million people living in poverty in the next decade[9].

When assessing the impact of topsoil and nutrient loss against welfare indicators, we see that the most fragile households in Malawi are impacted more severely in the areas of food security and caloric intake. Female-headed households are expected to experience double the negative impact on productivity and per capita real consumption than male-headed households[4], because of gender-influenced differences in access to land. Although much of Malawi practices matrilineal inheritance and matrilocal marriage, data shows that female-headed households are disproportionately likely to access land with lower-quality soils[9].

The Good News

The good news is that concerted efforts can restore the health of Malawi's soils with benefits accruing to farmers in the form of improved yields, increased fertilizer efficiency and greater water availability. This will lead to higher income, food, and water security for rural farming households as well as increased resilience shocks and natural disasters.

Encouraging results from several studies show that the cost of taking action is far lower than the cost of business as usual. One study revealed that for short (6 years) as well as longer-term (30 years) scenarios, a 4.3 USD return would be generated on every 1 USD invested in halting land degradation and the loss of topsoil[10]. Reversing land degradation and restoring soil and ecological health is a very good investment, showing a return of up to 5 USD for every 1 USD invested[11] or 7-30 USD return per every 1 USD according to some

[a] The 2023/24 APES data estimates that 1,841,932 ha are allocated to maize production and the average yield is 1.958 MT per hectare.

analyses[12]. However, government investments in land restoration in Africa remain very low.

Crop yields will cease to decline when grown in healthy soils. Yields will generally improve through increased nutrient and water availability, and reduced acidification, leading in turn to higher inorganic fertilizer efficiency. In a test case in Southern Malawi in 2016, farmers in protected and restored watersheds with reduced topsoil loss rates and improved soil health had an average increase in maize yields of 62% compared to farmers in unprotected watersheds[13].

Malawi has also developed a 10-Year Fertilizer and Soil Health Action Plan whose goal is to improve soil health that will result in increased agricultural productivity. The action plan includes a set of activities that aims to reduce soil erosion and degradation, increase the adoption and use of smart fertilizer and soil management technologies, increase domestic production of fertilizers, enhance capacity on soil health research and development and extension, and increase knowledge on good soil health management practices. The action plan provides an opportunity for state and non-state actors to join hands in implementing policies and programs that would improve soil productivity in Malawi.

Conclusions and Policy Recommendations

The relationship between soil health and Malawi's economic performance and food security is clear and highlights the potential to accelerate poverty alleviation. The increase in access to inorganic fertilizer in Malawi has not resulted in a substantial increase in crop productivity because of low fertilizer use efficiency that has been caused by poor soils. The matter of improving soil health in Malawi has become urgent because, while on-time soil improvement can have large near-term effects, failure to preserve and rejuvenate topsoil now could delay agricultural growth for generations. Malawi has already started responding to this by pioneering the development of a country action plan on fertilizer and soil health. As such, we make the following policy recommendations:

- Implement Malawi's own national Fertilizer and Soil Health Framework and Action Plan that bridges policy, research, and programmatic action and incentivizes farmers and communities to adopt improved soil management practices and collectively restore natural resources at both farm and landscape levels.
- Recognize farmers, the true stewards of Malawi's soil, as central to change efforts, building their capacity, access to information, technologies, and inputs, and especially ensuring that benefits of improved soil management accrue to farmers and communities. Achieving change at the farmer level will require:
    - Investing in building the capacity of extension services to teach and demonstrate the value of more sustainable soil management.

- Ensuring that subsidies provided to farmers are linked to soil health information systems and directly address the soil nutrient deficiencies in agricultural production problems farmers face
- Investing in policy innovations that recognize the central importance of incentivizing farmers extends beyond subsidies, and may include alternatives like payment for ecological services, cash transfers, or other social safety nets that protect farmers from downside risks farmers face when considering any behavioral change.

- Launch a public awareness campaign on the importance of soil health to agriculture, water, and climate resilience, and work across multiple stakeholders to promote good practice.

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