POLICY BRIEF

Anthropogenic Land Use Change and Adoption of Climate Smart Agriculture in Sub-Saharan Africa

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Context to the study

- Human-related land use changes for crop and livestock production at the cost of vegetation and forest cover are the main reasons for climate change.
- The changes in climate are also affecting the sustainability of agriculture in SSA
- Recent policies promote climate-smart agriculture (CSA) to respond to the challenge.

Summary of findings

- Agricultural land has been increasing at the expense of forestland in Kenya and Malawi and Uganda.
- Irrigation has been widely adopted but at a larger extent in Kenya and Malawi than in Uganda.
- Owned land and accessing land through rental markets favours allocating land to CSA technologies, particularly where land pressure is high.
- Climate shocks such as droughts or floods increases the use of CSA practices but not the extent of increasing land allocated to CSA if already using CSA.

Introduction

- Agricultural production and productivity (crop and livestock) is increasing in Sub-Saharan Africa (SSA) at the cost high carbon footprint. Emissions of greenhouse gases is mainly from land use changes, food and feed production and manure management. This double burden is slowing down development efforts, particularly in SSA. Agricultural policy has been promoting Climate-Smart Agriculture (CSA) technologies and practices especially among smallholder farmers. Although there is compelling evidence on the impact of CSA technologies on agricultural productivity, their uptake in low-income is still low and considered unsatisfactory (Makate, 2019). Hence, empirical gap exists in context-specific studies, particularly, on intertemporal and spatial anthropogenic changes of land use related to CSA household decisions to inform policy. We considered a basket of CSA practices, including soil erosion control variables like terraces, control bunds (stones, earth or sandbags/gibbons), tree belt, water harvesting bunds and drainage ditches; Use of organic manure; Irrigation farming by diverting streams, hand and treadle pumps, motor or gravity-fed; land preparation techniques that include box ridges, zero tillage, pit planting, ripping and minimum tillage. Data is from LSMS and FAOSTAT.

Summary of research

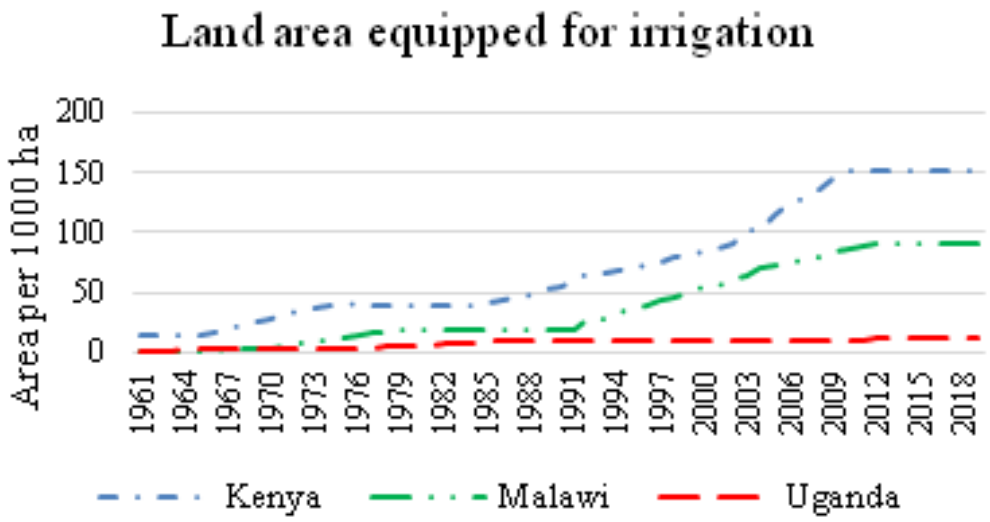
The study used the state-contingent production function (Quiggin and Chamber, 2006). The theory assumes that a farm household is produced **distinct outputs** from allocating **different inputs** with a varying probability of a given states of nature occurring. Under different states of nature, the farmer input choice does not determine the output, but different **allocations lead to different amounts for costs**

and outputs. With climate risk and subjective assessment of soil fertility, farmers input choice should minimize production cost under different states on nature. With CSA technologies, farmers would be interested to choose one or more technologies that are risk substituting or complementing at a minimal cost. Farmers can adopt combination of these technologies on one parcel of land or different parcels of land.

Research findings

Land allocation to irrigation among farm households in the selected countries

The area under irrigation has been increasing in Malawi and Kenya since 1961, while in Uganda the data shows little change in the trend over time. Overall, households allocating land to a basket of CSA practices and the amount of land under CSA is fluctuating across space and over time, but with a negative trend. Such a negative trend can be counter-productive in SSA (Bank and CIAT 2015b; CIAT and BFS/USAID 2017).



Effect of farm household land source on the extent of land allocated to CSA

The context of Malawi

Increasing owned land by 1 ha led to additional 0.11 ha land allocated to CSA technologies, representing 21% increase. An increase in one-year lagged rainfall amount reduced the portion of land allocated to CSA in the subsequent year. However, the observed magnitude effect is too small for economic impact as evidenced by

the insignificant effect. Renting-in land increased the amount of land allocated to CSA at household level. This could be associated with land pressure in Malawi and households considering renting land as an alternative source to agricultural land. Hence, the focus of the country CSA policies more on food security (57%) than mitigation (43%) and adaptation (30%) could put further pressure on land resources.

The context of Uganda

Renting-in land for agriculture decreased land allocated to CSA technologies. Following the argument from the results for Malawi, this could be counter-productive if agricultural land becomes scarce in Uganda. However, it is explained by the low uptake of irrigation in Uganda, which could increase exploitation of land. This in line with the CSA policies in the country that more on adaptation (65%) to the changing climate than mitigation (57%) and food security (50%).

The context of Kenya

Kenya has experienced a lower increase in land use change from forest to agriculture which together with the sharp increase in irrigation over the last 20 years (<20,000 ha to >140,000 ha) suggests a positive influence of the adoption of CSA practices on the pressure on land. Hence, the CSA policies tend to mitigate climate change effects in an attempt to improve productivity of available land dedicated to agriculture.

Policy Recommendations

1) **Smallholder farmer access to land is critical to adopt CSA in Malawi and Kenya but not in Uganda where land holding size is higher.**

   - The more land farmers have, the more they implement CSA practices in Malawi and likely in Kenya where policies focus on technologies to mitigate climate change.
   - CSA Practices like irrigation reduce the effects of climate hazards such as drought and floods.
   - In Uganda there is need to increase adoption of CSA practices to see an increase in land use efficiency.

2) **Country level policy focus may influence adoption of CSA practices.**

   - Adoption of CSA practices such as irrigation and control bunds in Malawi and Kenya goes in line with the countries strong focus of policies on food security and mitigation, while Uganda focused more on adaptation policies for lower adoption of the same CSA practices.

References

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