

## Summary of the Dissertation

# **Between Three Fires: Population Pressure, Soil Degradation, and Land Conflicts in Sub-Saharan Africa – Evidence from Kenya and Uganda**

by

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The agricultural sector is widely recognized as one of the key sectors of economic development in Sub-Saharan Africa (SSA). It employs the majority of the region's population and contributes significantly to countries' GDP. In spite of its importance, the sector's performance remains unimpressive. As a result, food insecurity and poverty, especially among rural households, continue to be threats in much of SSA. Studies have identified soil degradation as one of the fundamental reasons of the sector's poor performance. At the same time, population pressure on farmland is believed to be the major underlying cause of soil degradation in the region. Soil degradation would seriously affect majority of people since a large proportion of the region's population live in rural areas and to a great extent depend on agriculture for their livelihoods. Indeed, if population pressure reduces soil quality, the situation is likely to grow worse in the near future, given the region's high population growth rate. Theoretically, however, population pressure can affect soil quality in two ways: it can negatively affect soil quality due to more frequent and intensive use of farmlands, but it can also induce transition of the farming system towards

more intensive farming using more fertilizer and improved seeds in order to make small farmlands more productive. In SSA, the net effect is likely to be negative, given the region's current low fertilizer use. Moreover, land tenure insecurity may also inhibit investment in land improvement and contributes to soil quality deterioration.

It is unfortunate that the two problems—population pressure and soil degradation emerge at a time when land-related conflicts are also increasing in much of SSA. Land conflicts can also seriously reduce farm productivity and exacerbate food insecurity and poverty. Although land conflicts are prevalent in many parts of SSA, their root causes may vary from one country to another. At present in Northern Uganda, most incidences of land conflicts are attributed to the massive displacement of people caused by armed conflicts that affected the region during the period 1986-2006.

To shed light on the aforementioned issues, this dissertation seeks to answer five main questions: i) whether population pressure on farmlands affects soil quality, and if so how; ii) whether population pressure induces agricultural intensification; iii) whether land ownership rights affect soil quality; iv) whether displacement caused by armed conflicts has increased land conflicts in post-war Northern Uganda; and v) whether land-related conflicts affect agricultural productivity. I use Kenya and Uganda as case studies to answer the first two questions. Both constitute ideal cases in that they used to be among the countries with the best soil in Africa, but now are seriously affected by soil degradation. To answer the third question, I take Uganda as a case for study. The nature of land rights in Uganda makes it ideal for examination of this issue; in Uganda land is owned either privately or communally under customary tenure system. My hypothesis is that in an environment characterized by a low rate of fertilizer usage, population pressure on farmland reduces soil

quality. I also hypothesize that parcels that are individually-owned in general have better soil than communally-owned parcels. Moreover, I expect to find a positive correlation between population pressure and agricultural intensification. With regard to displacement and land conflicts, I hypothesize that households that were more affected by displacement are more likely to be affected by land conflicts in the post-war period. Lastly, I hypothesize that land conflicts reduce agricultural productivity.

This study offers the following contributions to the literature. First, this is the first study using panel data for real soil samples to analyze the impact of population pressure on soil quality. This unique panel data allows the use of the fixed effects model, which affords control of unobservable time-invariant characteristics that could cause bias of parameter estimates. Second, to the best of my knowledge this is the first explicit examination of the impact of land tenure security on soil quality. Third, the study contributes to the scarce empirical literature on land conflicts and agricultural productivity nexus. Lastly, it appears to be the first study to provide empirical evidence that one of the pathways through which land conflicts can affect agricultural productivity is disincentivizing farmers to use improved seeds.

This study uses three sources of data. The main source is Research on Poverty, Environment, Agriculture and Technologies (RePEAT). RePEAT data provides detailed community-, household-, parcel-, and plot-level information. The data is collected by the National Graduate Institute for Policy Studies and its collaborators in Kenya and Uganda. I use panel data from two waves, 2004 and 2012, and 2003 and 2012, in Chapter 2 and 3, respectively. In addition to RePEAT data, I use agroclimatology data sourced from National Aeronautics and Space Administration-Prediction of Worldwide Energy Resource

(NASA-POWER). This source provides information on rainfall, temperature and wind speed. In Chapter 2, the population density data for Kenya is obtained from Kenya National Bureau of Statistics. Chapter 4 uses RePEAT data collected in Northern Uganda in 2015. Like data from earlier RePEAT surveys, this provides rich community-, household-, parcel- and plot-level information. Furthermore, the 2015 survey has detailed information on issues related to displacement following armed conflict in Northern Uganda.

Several noteworthy findings emerge from Chapters 2 and 3. First, I find that that population pressure reduced soil quality in both of the countries studied, and that it induced considerable agricultural intensification in Kenya but not in Uganda. The findings suggest that although Kenyan farmers are trying to mitigate the negative effect of population pressure on soil quality, the rate of soil degradation is probably outpacing that of agricultural intensification. Furthermore, the results indicate that unlike the case of Kenya, farmers in densely populated areas of Uganda are yet to respond to the adverse effect of population pressure on farmland. The study also finds that the type of land ownership rights can affect farmers' incentives to invest in soil improvement in Uganda since parcels that are individually owned are found to have better soil than communally-owned parcels.

In Chapter 4 the study finds that displacement has increased the incidence of land conflicts in post-war Northern Uganda. Specifically, households that were displaced to locations far away from their homes are more likely to be involved in new land conflicts and are more likely to be concerned about land conflicts. The number of years a household spent without doing farming in its home village, and weakening of informal institutions of land governance are found to be the main transmission mechanisms of these results. Lastly,

land conflicts are found to have a negative effect on agricultural productivity since they reduce farmers' incentive to invest in the plots due to insecure property rights.

The findings have a number of policy implications. First, family planning, especially among rural households, should help to control population growth, and in turn reduce population pressure. Second, there is a need to promote agricultural intensification, especially in densely populated areas such that the effect of population pressure on agricultural intensification outweighs that of population pressure on soil degradation. One way to achieve this is through policy that stimulates investment in soil conservation and land improvement. Implementation of such policy may include provision of subsidies on external inputs such as fertilizers; encouragement of farmers to use locally available inputs such as manure and compost; and provision of technical services supporting appropriate use of those inputs. Also important are policies that can eventually lead to improved markets for agricultural products, policies that are likely to induce farmers to invest in soil improvement. Without such policies, poor farmers are unlikely to invest in soil improvement as long as what they produce from such degraded lands can meet their immediate needs. Lastly, land rights security and individual ownership of land should be promoted because they tend to induce farmers to invest in land improvement.

With regards to land conflicts and their detrimental effects, the key policy implication is the urgent need for efficient land conflict containment and resolution mechanisms. This could include the establishment of formal land governance institutions to complement the existing but slowly weakening informal institutions, so as to prevent or in a timely way resolve land conflicts whenever they occur. Moreover, surveying and

registering land if done carefully may also play a significant role in reducing land-related conflicts.