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# IMPROVED TECHNOLOGY DISSEMINATION AND ADOPTION IN SSA: GLOBAL AND REGIONAL FOOD SECURITY, ECONOMIC AND ENVIRONMENTAL IMPLICATIONS

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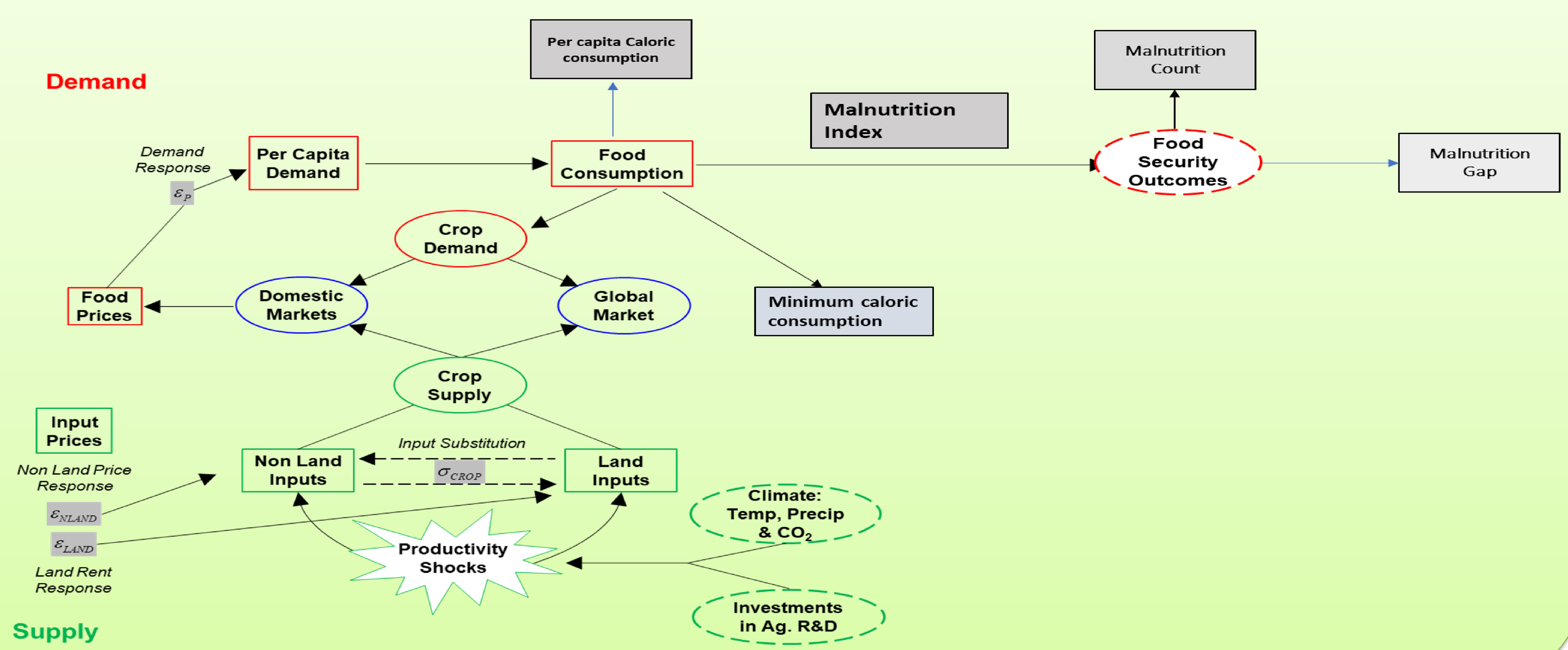
## Background

While other developing regions of the world like Asia and Latin America, took advantage of this transition known at the time as the Green Revolution, the SSA region was inauspiciously left behind. The result of this was that while agricultural productivity in other regions of the world have been able to keep pace -and in some cases- outstrip population growth, SSA's total factor productivity (TFP) lagged its productivity (Frankema, 2014). Consequently, SSA countries have been challenged with high levels of food insecurity, and poverty. The agricultural TFP of SSA has shown signs of improvement in recent decades, even though it is still less than half the rate of other regions (Fuglie and Rada, 2013). Most of this progress has been due to research done by the Consultative Group on International Agricultural Research (CGIAR), and their collaborations with SSA's national agricultural research systems (NARS). Very few studies have attempted to quantify the effect of the adoption of these technologies on food security, as well as the economic and environmental implications. Previous studies have either not explored the multiple dimensions of food security or have made conclusions on food security based on subjective information about general household welfare (e.g. Rusike, 2010; Shiferaw et al., 2014). Hertel and colleagues have tried to show how improved agricultural TFP through technology adoption could impart food security, as well as other economic and environmental outcomes in SSA (see Hertel et al., 2014; Hertel and Baldos, 2016). However their study was based on the premise that SSA's TFP grew at the same rate as Asia and Latin America during the Green Revolution. This study caters to the peculiarities of SSA by assuming that agricultural TFP in SSA will grow at rates commensurate with the dissemination and adoption of CGIAR improved technologies as estimated by Fuglie and Rada (2013)

## SIMPLE Framework




## Study Implementation

This study was implemented using the partial equilibrium model of trade provided by the Simplified International Model of crop Prices, Land use and the Environment commonly known by the acronym SIMPLE (Baldos and Hertel 2013). The advantage of the SIMPLE model is that it allows for the use of counterfactuals to study the incremental impact of the proposed interventions on the outcomes of interest within the simulation period which will be 2006 to 2050. In other words, the results reported in this study show the improvements (or reductions) in the variables of interest compared to if there was no intervention between 2006 and 2050. This experiment is conceived in three phases corresponding to three different levels of cropland coverage by CGIAR technologies. The three levels are 42% (doubling of the 2005 coverage of 21%), 75% (increasing 2005 coverage levels by 54% points), and 100% (complete dissemination relative to 2005). I extrapolate from findings by Fuglie and Rada (2013) who reported using an econometric model that there was a 65% increase in TFP per hectare in the 21% of SSA's cropland to which CGIAR technology was disseminated from 1977 to 2005. Based on my estimation (see appendix) , this will mean that ceteris paribus increasing the coverage of SSA cropland to 42% will result in a 50.72% increase in TFP by 2050; a 75% coverage will result in an 86.98% increase in TFP; and a 100% coverage will result in a 120% increase in coverage.

## Results

Figure 1a: Regional Impact of Improved Technology Dissemination on Key Environmental and Environmental Variables in SSA

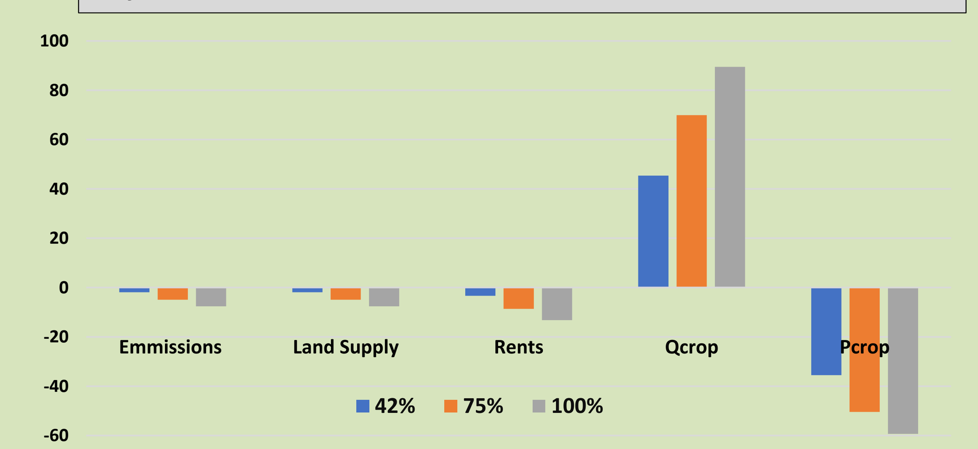



Figure 1b: Global Impact of Improved Technology Dissemination on Key Environmental and Environmental Variables in SSA

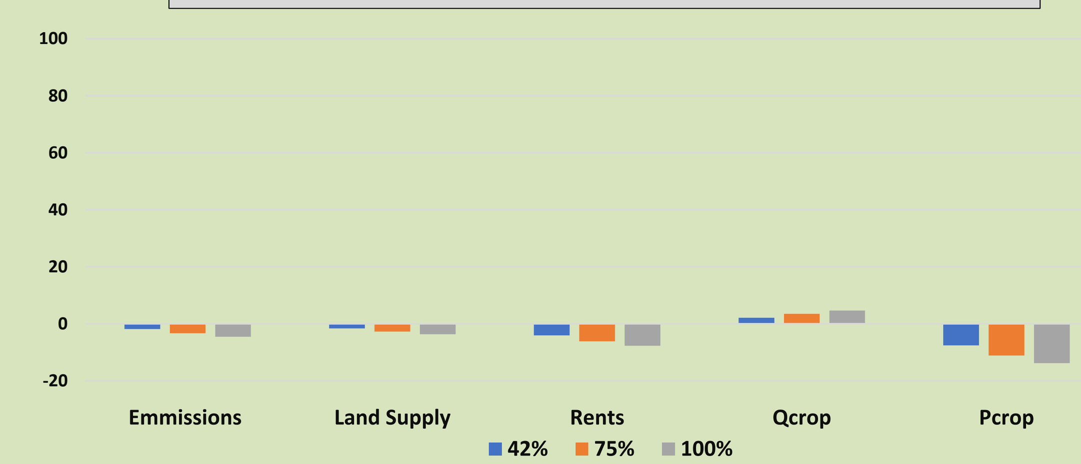



Figure 2a: Regional Impact of Improved Technology on Key Food Security Variables in SSA Dissemination

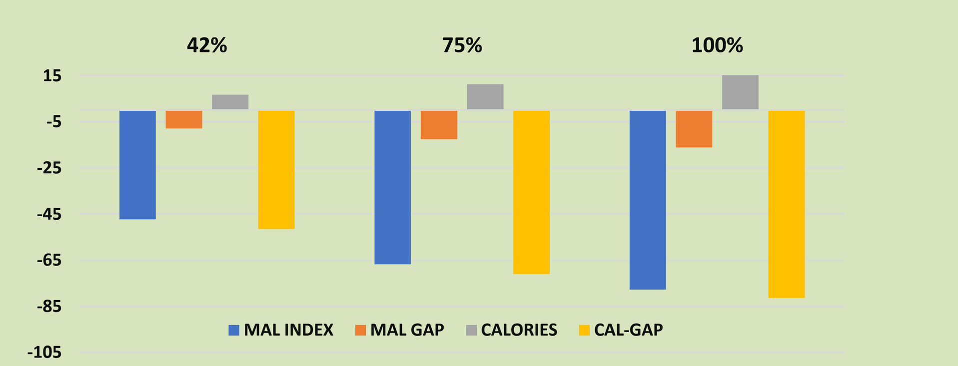
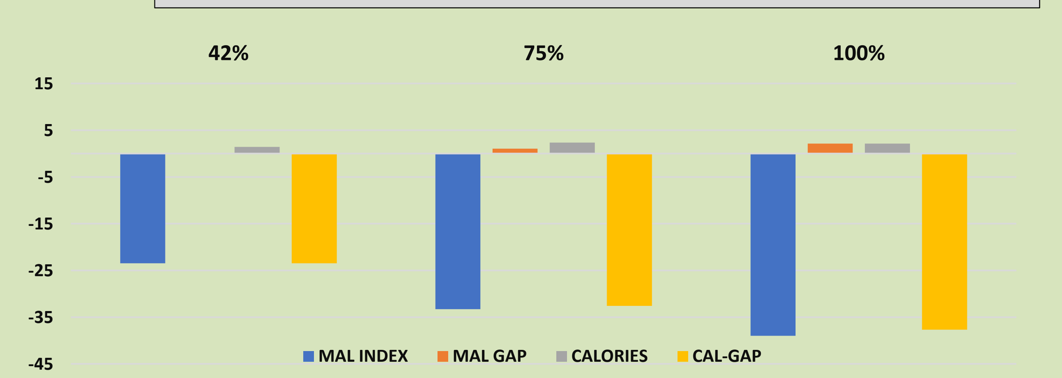



Figure 2b: Global Food Security Impact of Improved Technology Dissemination in SSA

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