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Resources, Policies, and Agricultural Productivity in Sub-Saharan Africa

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What Is the Issue?

A key factor behind pervasive poverty and food insecurity in Sub-Saharan Africa (SSA) has been a lack of robust agricultural growth. While in recent decades many developing countries outside Africa have successfully raised their agricultural productivity, SSA continues to lag behind. To address the region's food problems and meet the needs of its growing population, much higher levels of agricultural production will be required of its land and labor resources. This report examines the long-term performance of agriculture in SSA countries and the roles of agricultural research, economic policy reform, labor force education, the presence of armed conflict, and the spread of HIV/AIDS in enabling or constraining agricultural productivity growth.

What Did the Study Find?

Agricultural total factor productivity (TFP) was stagnant in the SSA region between 1961 and 1985 and then grew at about 1 percent per year through 2008. Although an improvement, the TFP growth rate for SSA is still only about half the average for all developing countries during the same period. However, some SSA countries achieved productivity growth rates averaging 2 percent per year or higher. Agricultural research investments, economic reform, and other factors account for the fact that some countries improved their agricultural TFP more than others.

Factors Promoting Productivity

- *Investments in international agricultural research.* For example, by 2005, new technologies from the Consultative Group for International Agricultural Research (CGIAR) had been disseminated to over 34 million hectares, or about 21 percent of SSA cropland; output from these acres was increased by 65 percent, on average. Each \$1 invested in technical improvements by CGIAR yields an estimated \$6 in benefits.
- *Investments in national agricultural research systems.* Agricultural research by SSA countries returned about \$3 in benefits for every \$1 spent, on average.
- *Economic and trade policy reforms.* Policy measures in SSA countries that raised prices and improved agricultural terms of trade increased incentives for farmers in those countries to adopt new technology and raise productivity.
- *Farmer education.* Countries with higher rates of labor force schooling witnessed more rapid adoption of new agricultural technologies.
- *Irrigation.* Average farm yields on irrigated fields were about 90 percent higher than in nearby rainfed areas.

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Inhibiting Factors

- *Low investments in land improvement and fertilizer use.* In much of the region, long-term deterioration in soil fertility could be suppressing productivity growth.
- *Armed conflict and civil unrest.* Where these conditions exist in SSA, they are a deterrent to agricultural productivity growth.
- *HIV/AIDS.* High rates of untreated HIV/AIDS infection pose significant constraints to raising agricultural productivity in many SSA countries.

While comprehensive development of Africa's agricultural sector requires investments across multiple areas, the following simulations reflect the *marginal* impact of specific policy actions (assuming other policies remain unchanged).

Simulated impacts of policies to raise agricultural productivity in Sub-Saharan Africa

Drivers of agricultural productivity	Simulated policy change	Increase in agricultural productivity or output
International agricultural research	Double annual spending in SSA from 2005 levels *	4.1%
National agricultural research	Double annual spending from 2005 levels *	3.4%
Economic policy reform	Eliminate agricultural, trade, and macroeconomic policies that reduce earnings of farmers	4.7%
Labor force schooling	Increase average schooling level of farm laborers from 4 to 6 years	1.3%
HIV/AIDS therapies	Provide antiretroviral therapies to all of the adult population currently infected with HIV/AIDS virus	2.1%
Expansion of irrigation	Double irrigated area (from 5.6 million hectares to 11.2 million hectares)	2.9%
Reduction of armed conflict	Stop significant armed conflict in region	0.5%

* Simulations are based on increasing real research and development spending by 7% per year until annual spending is doubled and then maintaining spending at the higher level. Due to lag times for research to affect farmers' productivity, about half the impact is realized after one decade and the full impact after about two decades.

How Was the Study Conducted?

Using econometric estimates of a production function for a panel of SSA countries, the authors estimated the share of agricultural growth due to resource expansion and productivity improvements, while accounting for differences in natural resource quality across countries. The growth in total factor productivity (TFP) was derived from the production function estimates for each SSA country between 1961 and 2008. Then, using a subset of 32 countries in the region over 1977-2005, a simultaneous equations model was estimated to empirically test whether various factors—investments in national and international agricultural research, diffusion of new agricultural technologies, economic and trade policy reforms, farmer schooling, road infrastructure, armed conflicts, and the spread of HIV/AIDS—affected agricultural TFP growth in these countries. Results from the model were used to determine the economic returns to agricultural research investments in SSA, whether international and national agricultural research are complementary or can be substitutes, and whether there may be economies of size in national agricultural research systems.