

Africa's Turnaround: From Crisis to Opportunity in African Agriculture

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Forthcoming in D.R. Lee and M.B. Ndulo, eds.
*Food and Financial Crises in Sub-Saharan Africa:
Origins, Impacts and Policy Implications*
CABI Press, November 2011

Updated December 2010

Acknowledgements

A previous version of this paper was presented at the Institute for African Development, Cornell University May 1, 2009 under the title “The Political Economy of Agricultural Policy: Historical Trends, Recent Crises, and Prospects for Achieving the MDGs in Africa.” Many thanks are due to David Lee and several conference participants for their comments and suggestions.

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Introduction and summary

The world food and financial crises of 2007-09 brought sharp cuts in real income for many people, threatening to reverse recent achievements in health and nutrition, political empowerment and economic security around the world. The impact of higher food prices and lower economic growth rates could be particularly severe for the world's poorest, who spend a larger fraction of their incomes on food and have less savings with which to smooth their consumption over time. But for those who gained the least from historical growth in the world economy – including most of Sub-Saharan Africa -- the present crisis could mark a turning point towards new opportunities.

Sudden shocks, however harmful, can also be useful. It is widely said that the Chinese character for “crisis” is actually formed of two components, one for “danger” and one for “opportunity”. A more recent aphorism, attributed to Paul Romer in 2004 and then Rahm Emanuel in 2008, posits that “a crisis is a terrible thing to waste.” In Africa today, a central opportunity not to be wasted is public investment to raise agricultural productivity. This essay describes three major trends whose confluence raises the payoff from such investments, laying a foundation for rapid crisis recovery and sustained future growth. These three trends could be motive forces for the upturn in African economies that is described and debated by keen observers of the continent such as Ted Miguel (2009), and monitored on an on-going basis in sources such as the OECD African Economic Outlook (2010).

Each trend described in this essay involves a turning point in economic development, whereby African societies experienced phenomena similar to those seen elsewhere but with different timing and magnitude. The trends are not deterministic, in the sense that many other factors intervene to determine local outcomes. Measurement errors also

contribute to observed variation. The variance may be large for any given country and time period, but adding up these observations to compare continents over decades reveals unmistakable trends and new opportunities for African agriculture in the 21st century.

The first turning point discussed here is political. Africa's economic turnaround has many political dimensions; here we focus on just one aspect of policy, documented by new data from a World Bank study comparing farm policies around the world. This study's results show how far today's African governments have gone to reduce the cost to farmers of the export taxes, marketing boards and other interventions imposed by previous regimes. Africa's policy-induced price distortions peaked in the late 1970s and reforms since then have removed about two-thirds of that burden, greatly facilitating productivity growth and poverty alleviation. Further reforms could yield additional benefits, but most of the handicap imposed on African farmers by post-colonial governments has now been removed.

The second transition described here is demographic. Demography is a rich and complex field; in this chapter we focus on broad trends, as census data compiled in recent revisions of UN population projections reveal the slowly-unfolding implications of African history. Generally speaking, it appears that most African households obtained access to modern medicine much later and more suddenly than people in other regions. The resulting improvement in child survival and population growth rates during the 1970s and 1980s were faster than those seen earlier in Asia or Latin America, and although Africa's towns and cities were also growing at historically unprecedented rates, their absolute size was so small that they could absorb only a fraction of all new workers. Consequently, Africa's rural population also grew faster and for longer than any other in human history, with a correspondingly rapid and prolonged decline in per-capita endowments of land and other natural resources. The post-independence improvements in child survival also triggered a rise in child dependency rates, which also reached historically unprecedented levels in the 1970s and 1980s. Both trends began to reverse in the 1990s, thanks to gradual fertility reduction and continued urbanization. As seen earlier in Asia, the slowdown in rural population growth and the reduced burden of child

care creates a window of opportunity for new investment to bring larger increases in output per capita.

The third turning point is technological. Again, many new technologies influence African economies, and this chapter focuses on just one narrow aspect of the turnaround: national estimates of cereal crop productivity show how, after decades of stagnation during the Asian green revolution, African yields have grown steadily over the past decade, so that estimated cereal grain output per capita now equals that of South Asia. The start of this turnaround could be associated with the other two trends, as the cumulative result of increased labor per hectare and more favorable policies, but could also reflect the gradual spread of improved crop varieties that resulted from earlier investment in agricultural technology. The inflow of foreign aid to boost agricultural production did not rise until the late 1970s and peaked in the late 1980s, yielding payoffs some years later.

Taken together, these three trends imply a gradual lifting of previously-severe constraints on African agricultural productivity and economic growth, and hence new opportunities for public investment to yield increasing payoffs over time. The last two decades of global agricultural abundance, however, saw foreign donors' support for African agriculture decline steadily from its peak in the late 1980s to a historical low in 2006 of around one U.S. dollar per year, per person in Africa. Looking forward, the political, demographic and technological trends described in this essay put African farmers in a better position now than ever before to take advantage of the increased investment needed to overcome the global food and financial crises. This opportunity would be a terrible thing to waste.

The food and financial crises of 2007-2008

Figure 1 provides a visual snapshot of the food and financial crises, in the context of data from January 2006 through December 2010, in terms of world-market prices in US dollars for major food commodities (as measured by the DB Agriculture index), major foreign currencies (as measured by the DB US Dollar index) and major corporate equities

(as measured by the S&P 500 index). The crises began slowly around May through October of 2007, when food prices rose by about 20% in dollar terms. That was associated with an increase in the value of major foreign currencies against the dollar, so food prices in other currencies rose by much less than that. Equity values were also rising, but then from October 2007 through February 2008 the S&P 500 dropped by about 20% while food prices and foreign currencies kept rising. These trends paused in mid-2008, but a few months later all three measures plunged, as food prices and foreign currencies moved in tandem with equity valuation as the whole world lost real income. Economic recovery since then has involved upward trends in all three indexes, to levels in December 2010 that are roughly similar to those of December 2007.

Figure 1. The food and financial crises of 2007-08



Source: Google Finance, downloaded December 29, 2010.

Note: In Figure 1, major food commodities are shown by the DB Agriculture Index Fund (NYSE:DBA), which tracks U.S. dollar prices for trade in maize, wheat, soy and sugar, weighted at 25% each and rebased annually as the Deutsche Bank Liquid Commodities Index. Major non-US currencies are shown by the DB US Dollar Short Index Fund (NYSE:UDN), which tracks the price of selling US dollars to buy a basket of Euros, Canadian dollars, Japanese yen, UK pounds, Swiss francs, Australian dollars, and Swedish kroner, trade-weighted as the US Federal Reserve Bank's Major Currencies index. The S&P 500 index is a value-weighted sum of major publicly-traded corporations on U.S. stock markets. The S&P 500 is shown from January 2006, while the DBA and UDN indexes started trading in early 2007; all data shown are through December 28, 2010.

Looking forward, the crisis of high food prices in 2007-08 and of falling equity values in 2008-09 may have been temporary, but could have huge long-term impacts by influencing investment patterns. If the period of food scarcity leads to more investment in agriculture, farm prices could fall again – on the other hand, the period of low equity values and low real incomes could lead to less investment in farm production, which if outstripped by food demand would lead to a sustained rise in real food prices. The trends described in each of the next three sections set the stage for how African farmers might respond to increased agricultural investments, through background trends in agricultural price policies, rural demography and farm productivity.

Trends and turning points in agricultural policy

The magnitude of government interventions in agricultural prices around the world can now be described more precisely than ever before, thanks to a three-year World Bank project led by Kym Anderson. Results have been published in a global overview (Anderson 2009) and four regional volumes including one on Africa (Anderson and Masters 2009), with all data freely available online (World Bank 2009).

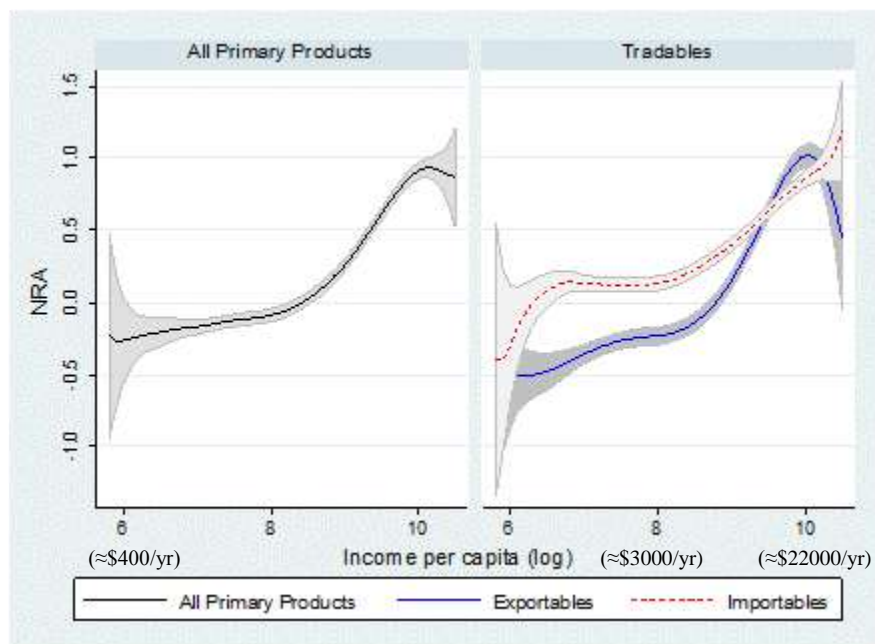
The project's approach was to employ a common methodology in case studies of 68 countries covering more than 90 percent of the world's population and GDP, drawing on local expertise to measure taxes, subsidies, quantitative restrictions and regulations for that country's major farm products, in every possible year from 1955 through 2005. The studies covered a total of 77 commodities (an average of 12 per country), thereby tracking policy interventions affecting about 70 percent of global agricultural output. The simplest summary measure of these interventions is a Nominal Rate of Assistance (NRA), defined as the tariff-equivalent magnitude of policy-induced distortions, relative to what prices would be in competitive markets. An NRA above zero represents a subsidy to farmers, at the expense of others in that country, while a value below zero represents taxation of farmers to help others.

The two main tendencies we see in agricultural policy across countries and over time are a powerful development paradox, whereby governments in richer countries tend to subsidize farmers while governments in poorer countries tend to tax them, and a strong anti-trade bias, whereby government tax international trade more than domestic transactions thus raising local prices for importable products while lowering prices for exportables. Both patterns had been previously most fully documented by Krueger, Schiff and Valdes (1991), and are illustrated here in Figure 2 using a much larger number of observations.

Figure 2 shows smoothed regression lines through all of the new dataset's 2,520 observations of a particular country and year, with total taxes or subsidies on all farm

products in the left panel, and the sub-total for each country's exportable and importable products separately on the right. Governments in the poorest countries – including Sub-Saharan Africa -- have imposed heavy taxes on all kinds of farmers, mainly by taxing farm exports. Total tax rates move rapidly towards zero as incomes rise, thanks to reduced export taxes and increased protection of importables. This tendency is paradoxical insofar as it runs against policymakers' stated goals, transferring income within each country from the poorer majority to a wealthier minority.

Figure 2. National-average NRAs and real income per capita, by trade status

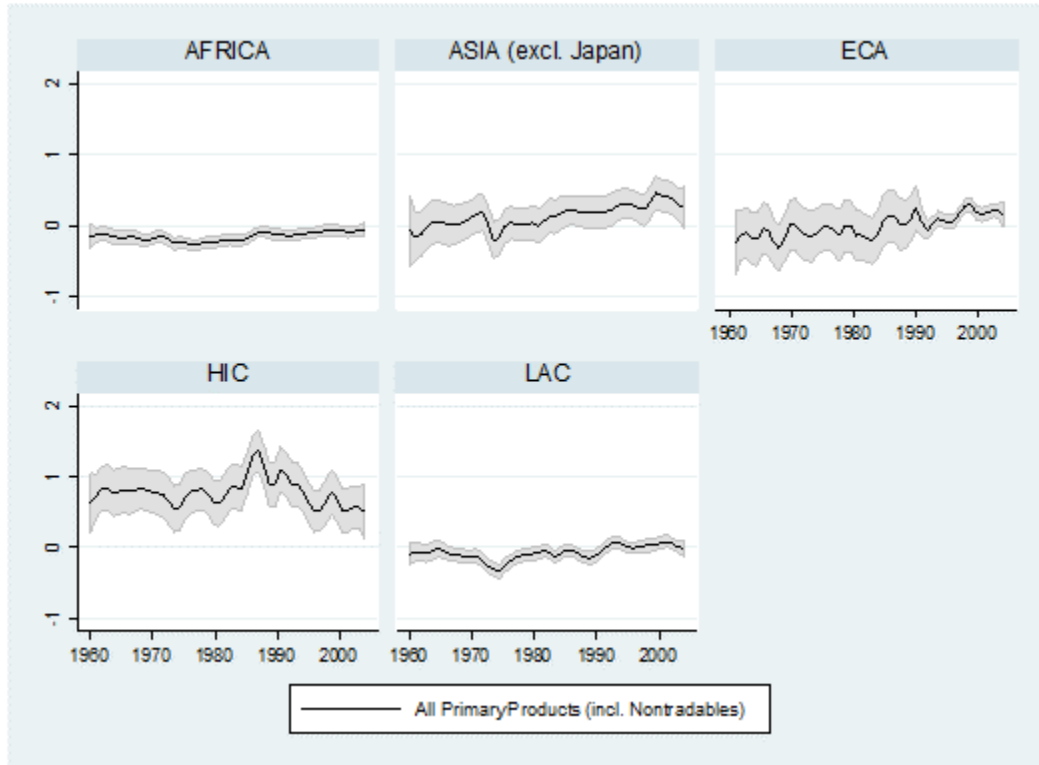


Note: Author's calculations, from data available at www.worldbank.org/agdistortions. Each line summarizes annual data for 66 countries from 1961 to 2005 (n=2520), smoothed with 95% confidence intervals using Stata's `lpolyci` at bandwidth 1 and degree 4. Income per capita is expressed in US\$ at 2000 PPP prices.

Figure 2 combines cross-sectional and time-series variance for the world as a whole. To focus on Africa's opportunities over time, Figure 3 shows trends in assistance to agriculture for each continent separately. In Africa, we see a decade-long slide from the early 1960s to the early 1970s towards greater taxation of farmers, but this was gradually reversed in the 1980s and 1990s. The data for other regions show that generally, as their incomes rose they provided increased subsidies to agriculture in the past, and have now cut those market price supports in favor of other channels for farm support. Africa thus

remains the only region whose agricultural policies became *more* favorable to farmers in the 2000-2004 period.

Figure 3. National-average NRAs by region and year, 1960-2004

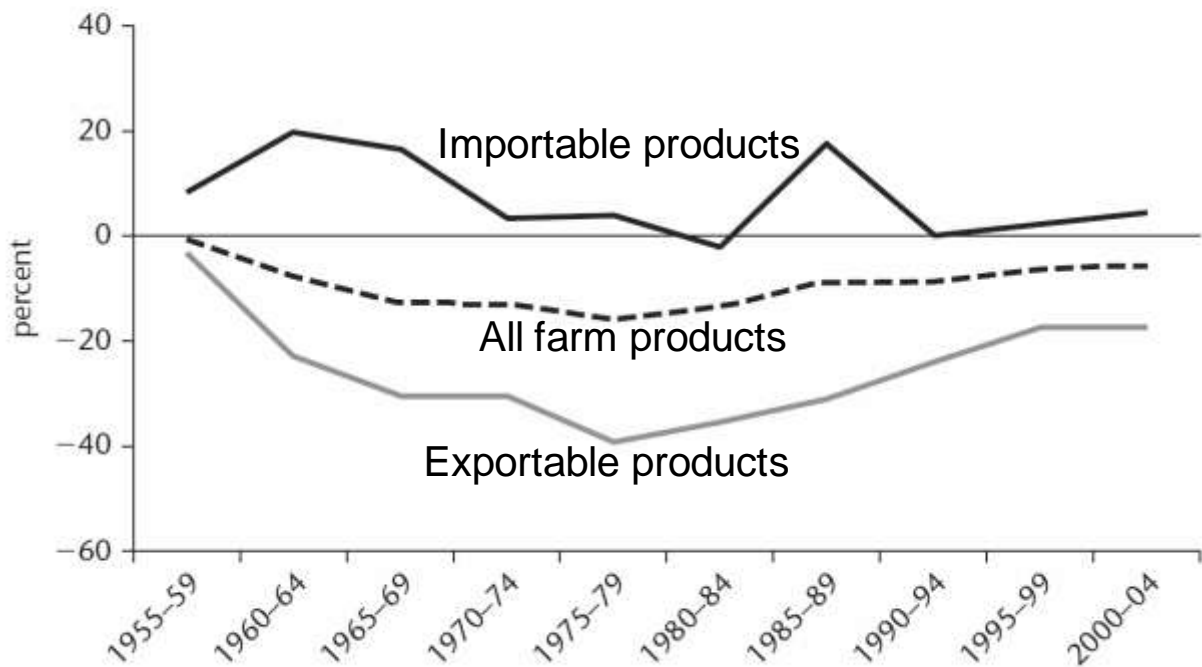


Source: Reproduced from W.A. Masters and A. Garcia (2009), "Agricultural Price Distortion and Stabilization: Stylized Facts and Hypothesis Tests," in K. Anderson, ed., *Political Economy of Distortions to Agricultural Incentives*. Washington, DC: World Bank. Region designations are LAC – Latin America, ECA – Europe and Central Asia, HIC – High income countries. Smoothed line and 95% confidence interval are computed with Stata's `lpolyci` using bandwidth 1 and degree 2.

Figure 4 combines the ideas in previous figures, focusing only on the Africa data. Here there are fewer observations, so we show simple averages across countries over a five-year period. For each country and year, the data are a value-weighted sum of all farm products (the dashed line), some subset of which are imported (the top line) or exported (bottom line). These show clearly how African governments imposed steadily increasing taxes on exports and offered reduced protection from imports through the late 1970s. Since then, about half of the tax burden on exportables has been removed. Multiplying these tax rates times the value of output, it turns out that the total tax burden amounted to

about US\$134 per agricultural worker in the late 1970s, which had been reduced to US\$41 in the 2000-2005 period.

Figure 4. Average NRA across 16 African countries, by 5-year period, 1955-2004



Source: Reprinted from Figure 1.3, in K. Anderson and W.A. Masters (eds), *Distortions to Agricultural Incentives in Africa*. Washington, DC: The World Bank, 2009.

Trends and turning points in rural demography

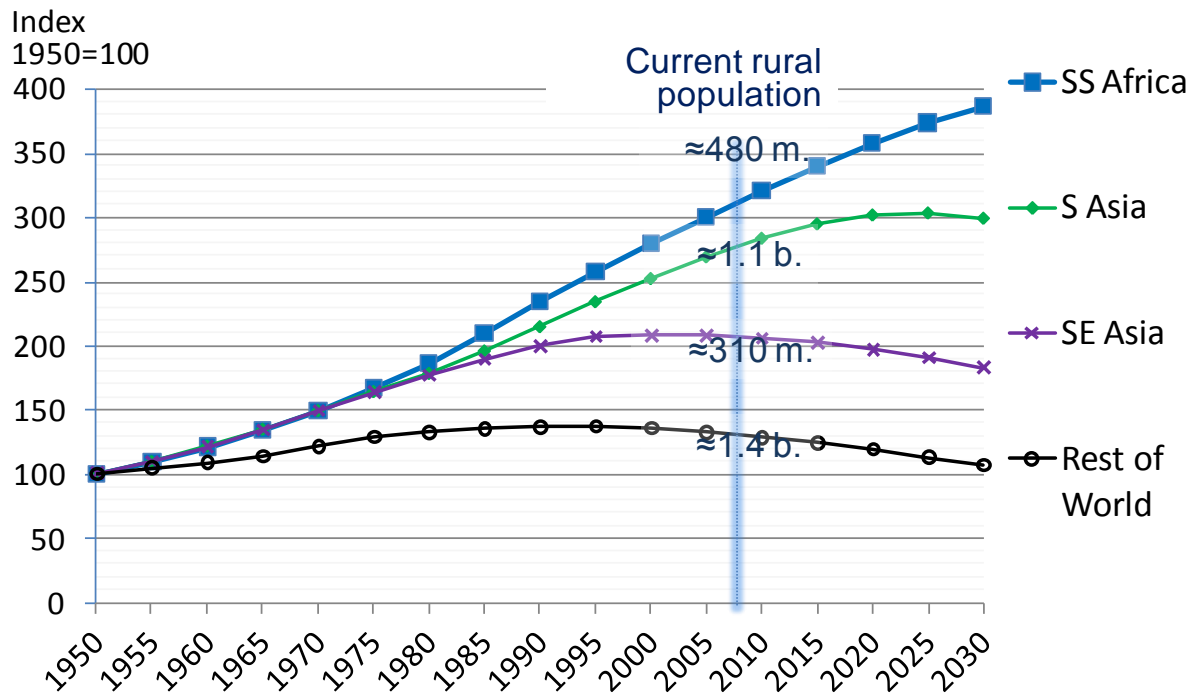
Government policies influence incentives, but farmers' ability to respond depends on the natural resources available to them and the technologies with which they can be used. A later section will focus on trends in farm technology and productivity. To address resource availability, this section focuses on two key aspects of population dynamics: the number of rural people, and share of all people who are of working age.

The number of rural people determines the volume of natural resources available per rural worker. Not all rural people are farmers, and not all of farmers' income comes from agriculture. Rural residence itself is not fixed, as individuals migrate to and from urban areas. Nonetheless, the direction and magnitude of change over time in the rural

population indicates whether rural resources are become more or less abundant relative to the rural workforce.

Figure 5 presents the estimated total rural population of major regions, subtracting each country’s estimated urban population from their national totals. Census methods and data quality vary by country and year, but as with the policy measures in the previous section, aggregation to the continent and decade scale reveals enormous differences between Africa and other regions. To facilitate comparison, the data are shown as index numbers based in 1950. (Each region’s current estimated rural population is shown as well.) Clearly, while the rural populations of Africa and Asia expanded at roughly similar rates in the 1950s and 1960s, the rate of increase slowed quickly in Southeast Asia where the number of rural people peaked around 1995. Growth in South Asia became somewhat slower than Africa’s, and is not projected to peak until 2025, while Africa’s rural population is projected to keep rising past 2030.

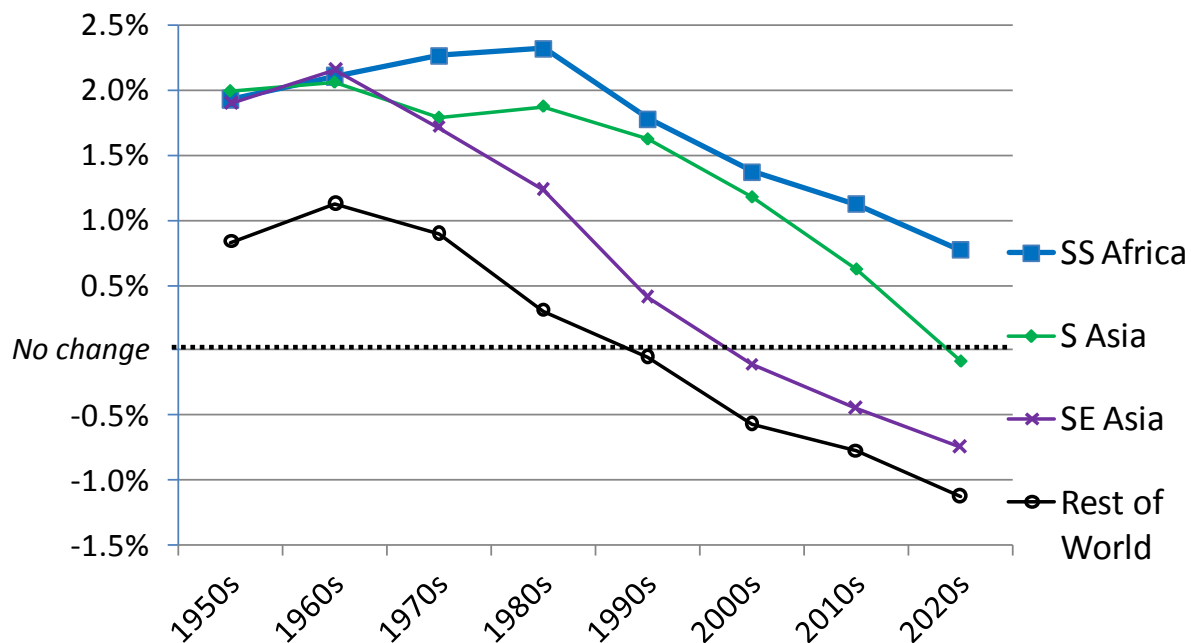
Figure 5. Rural population estimates and projections, 1950-2030



Source: Calculated from FAOStat (2009). Rural population estimates and projections are based on UN Population Projections (2006 revision) and UN Urbanization Prospects (2001 revision).

These data are shown in percentage-change terms in Figure 6. Each region's rural population growth rate reaches zero and crosses the dotted line in its peak year, when the absolute size of the rural population as shown in Figure 5 stops growing and begins to decline. The growth rates reveal how Asia's rural population expansion began to slow in the 1960s, even as Africa's kept increasing and remained above 2% per year for over three decades – a much higher level than was seen earlier in other regions.

Figure 6. Rural population growth estimates and projections by decade, 1950s-2020s

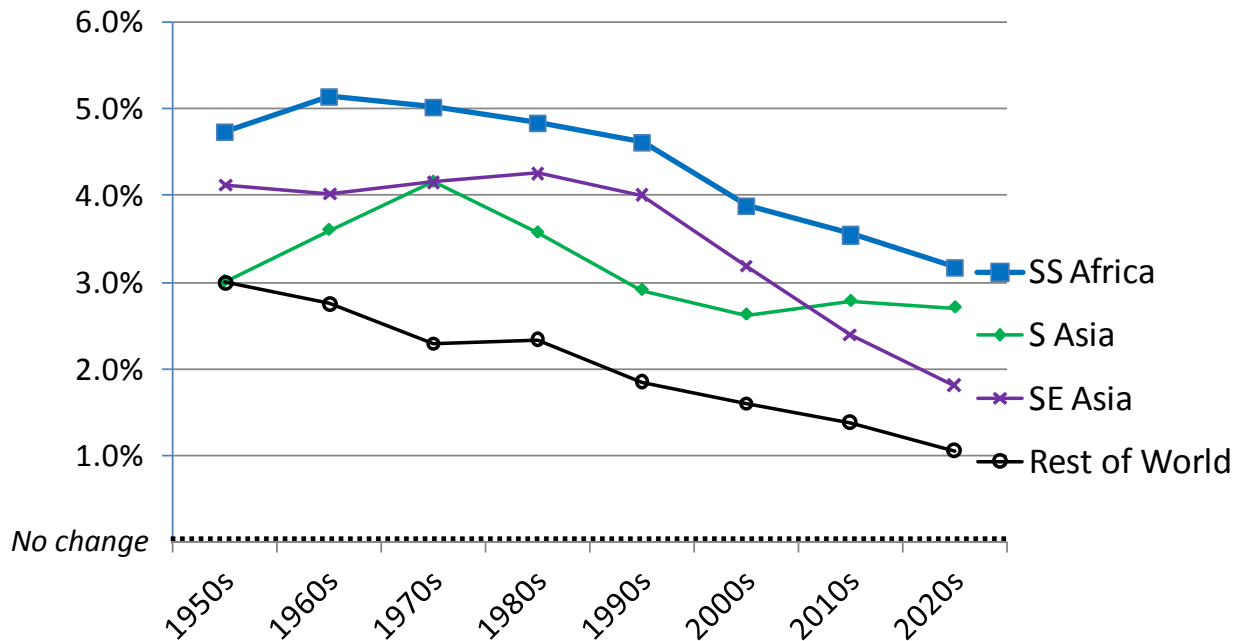


Source: Calculated from FAOStat (2009). Rural population estimates and projections are based on UN Population Projections (2006 revision) and UN Urbanization Prospects (2001 revision).

One might think that Africa's rural population grew so quickly because its urban areas grew slowly. To check this intuition, Figure 7 shows the corresponding data for urban populations. In fact Africa's towns and cities have grown much faster than those in other regions, at average rates around 5% per year during the 1950s-1980s. The explanation for rapid rural population growth is not slow urban growth, but a faster rate of total population growth and a smaller initial share of the population in towns and cities, so that

even the world's fastest rates of urban growth could not keep up with the demographic shock associated with rapid reduction in child mortality.

Figure 7. Urban population growth estimates and projections by decade, 1950s-2020s

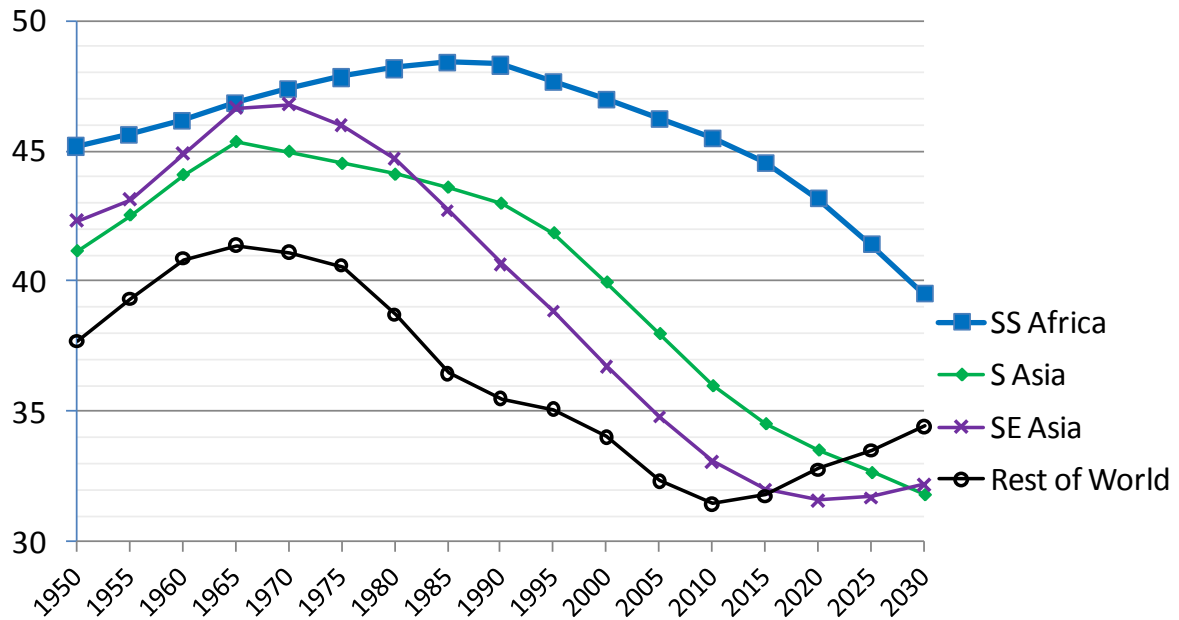


Source: Calculated from FAOStat (2009). Rural population estimates and projections are based on UN Population Projections (2006 revision) and UN Urbanization Prospects (2001 revision).

The magnitude and duration of rural population growth matters to the extent that the productivity of local cropland and livestock must rise even faster, if the rural areas are to feed themselves and also produce a growing surplus. Africa's exceptionally high rural population growth rates during the 1970s and 1980s imposed a uniquely high hurdle that is now rapidly easing, in much the same way that a similar but lower challenge gradually faded earlier in Asia.

A population's changing dependency ratio imposes a somewhat similar kind of demographic burden, whereby those of working age must care for children or the elderly before per-capita gains can be achieved. The relevant data are illustrated in Figure 8, based on the 2008 revision of the UN population prospects. Here we see sharp changes in the fraction of all people who are either children (0-14) or elderly (65+).

Figure 8. Estimated and projected total dependency rates (ages 0-14 and 65+), per 100 adults of working age, 1950-2030



Source: Calculated from UN Population Projections, 2008 revision (March 2009), at <http://esa.un.org/unpp>

In periods when the dependency rate is rising, education and health care costs grow even as the share of the population that is of working age declines. Conversely, when the dependency rate falls, the fraction of people who can work rises. If those new workers can be matched with high-productivity new investment, growth in output per capita can accelerate rapidly.

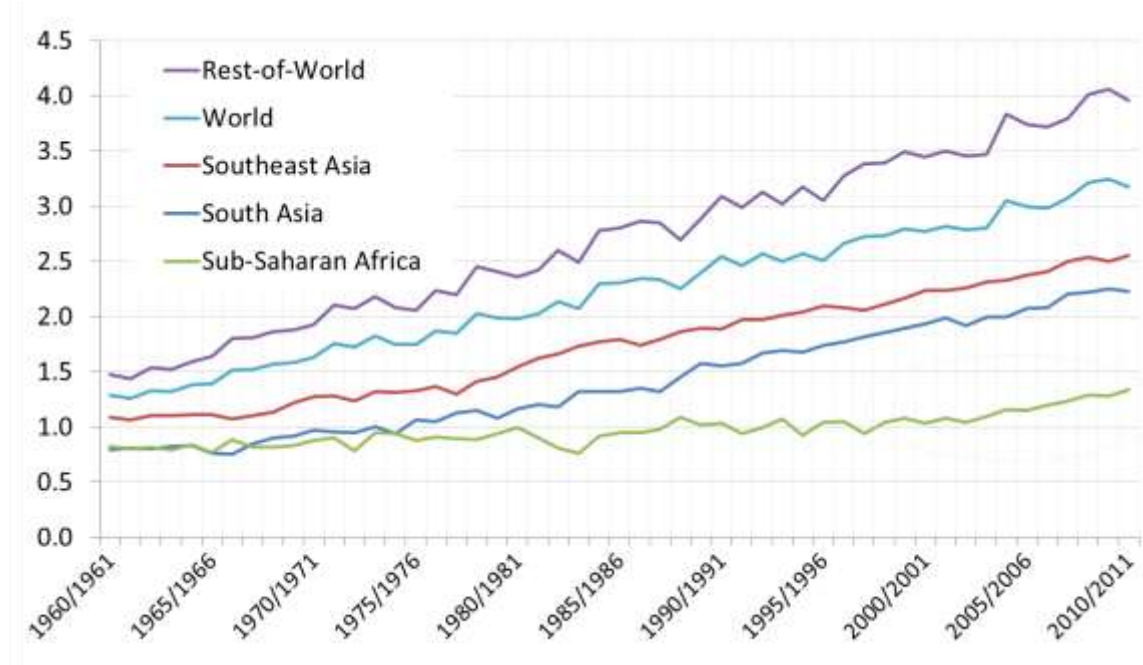
Trends and turning points in agricultural productivity

Farmers' response to political and demographic influences, interacting with the technologies available to them, creates the large differences in average cereal grain yields per hectare shown in Figure 9. This is a very partial measure of agricultural productivity, but more complete measures would require weights on the relative values of other crops and other inputs. The more transparent approach used here simply adds up the most comparable type of crop. Some cereals are more valuable than others but all have roughly the same nutritional value. Cereals are also very widely grown, and every country formulates its own independent estimate of their area and yields. As result, the inevitable

errors are smoothed out over a large number of observations, and the huge differences shown in Figure 9 are clearly of great practical importance.

As shown in Figure 9, South Asia and Africa had similar cereal yields in the early 1960s, well below Southeast Asia and the rest of the world. In the late 1960s, yields began to grow in Asia, and have continued to grow steadily since then at about the same rate as in the rest of the world. African yields fluctuated with little growth until the late 1990s, but have risen steadily over the past decade at about the same rate as they did earlier in Asia.

Figure 9. USDA estimates of cereal grain average yield by region, 1961-2010 (mt/ha)



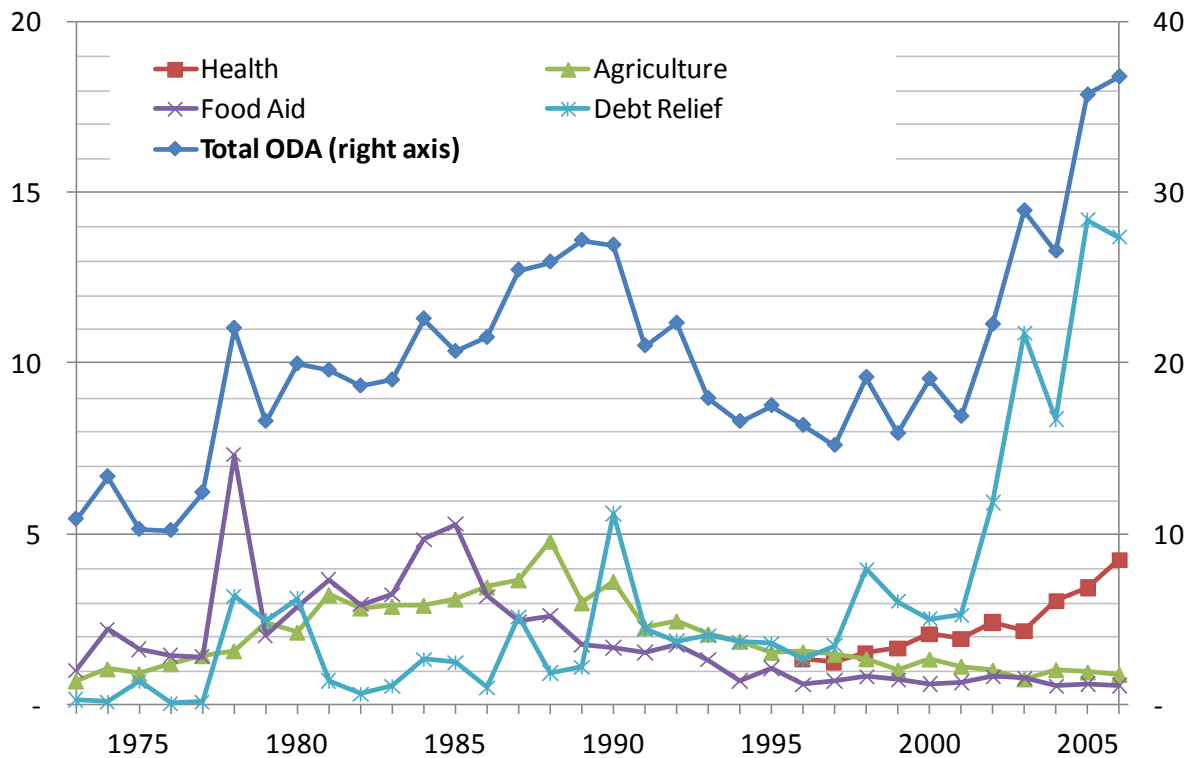
Source: Source: Calculated from USDA, PS&D data (www.fas.usda.gov/psdonline), downloaded 7 Nov 2010. Results shown are each region's total production per harvested area in barley, corn, millet, mixed grains, oats, rice, rye, sorghum and wheat.

Africa's decade of normal yield growth is particularly important in the context of changes in area planted and the recent slowdown in population growth. These productivity gains can be attributed to a wide range of new technologies and production practices, many of which involve much higher labor use than was used in the past, when rural population densities were lower. Increased labor has been applied to a variety of soil and water conservation techniques, more intensive management of livestock and manure, more careful weeding and higher plant densities, as well as more use of inorganic fertilizer.

Higher yields also involve new seed varieties that have been developed and released by the region's agricultural research services, much of the funding for which comes from foreign aid.

Figure 11 tracks the flows of all donors' Official Development Assistance (ODA) per person in Africa, in constant 2005 US dollars. The dark upper-most line, whose units are shown on the right side vertical axis, indicates that total aid rose to about US\$27 per person per year in the late 1980s, then fell to about \$16 in the late 1990s before rising sharply after 2001 to over \$36 in 2005 and 2006. The surge after 2001 was largely composed of debt relief, whose units are shown on the left side vertical axis, which rose from about \$3 to \$14 per person during this period. There was also a substantial rise in aid for the health sector, from about \$1 to about \$4 per person. In contrast, aid for agricultural production, which had risen with total aid in the 1970s and 1980s, peaked in 1988 at about \$5 per person, and then fell steadily back to its 1973 level of \$1 per person.

Figure 11. ODA commitments to Africa in selected sectors and total, 1973-2006 (real 2005 US dollars per capita)



Source: Author's calculations, from OECD Development Assistance Committee (2008), Bilateral ODA Commitments by Purpose (www.oecd.org/dac), deflated by OECD deflator (2005=100) and divided by midyear population estimates for Sub-Saharan Africa from the U.S. Census Bureau, International Database.

Conclusions

The food and financial crises of 2007-2009 have caused great hardship for many people, raising the real cost of food and lowering real incomes. In an effort to limit its costs and avoid repeating the experience, governments and philanthropic donors around the world have committed themselves to increased investment in agricultural production in Africa. This essay identifies three large-scale trends whose recent turning points suggest that Africa is poised to take advantage of such investment and produce rapid agricultural growth in the coming years.

First, African governments have now removed most of the policy distortions that kept farmgate prices artificially low in the past. Doing so required wrenching reforms of

deeply-rooted marketing boards, parastatal agencies and trade regulations that were typically established by European colonial authorities, and then actively used by post-colonial regimes to tax farmers and support city-dwellers. While there is ample scope for further reforms in favor of farmers, there is likely to be broad political support for those shifts as indicated by similar transitions in other developing countries. Furthermore, Africa's shift away from heavy taxation of its farmers occurs at the same time as other regions have reduced their price supports and found other means of supporting their agricultural sectors. The net result is a much more favorable policy environment for African farmers.

Second, African households have now absorbed much of the post-colonial demographic shock that gave Africa the world's fastest rates of population growth in the past. The continent's demographic transition was especially severe due to the sudden arrival of modern medicine, bringing sharp improvements in child survival at a time when the vast majority of Africans were still farmers. Africa's towns and cities grew quickly but from a small base, so both urban and rural population growth rates were faster than those previously recorded in other regions. As these growth rates slow down and a larger fraction of Africa's population enters the workforce, it becomes much easier for investment and technical change to raise per-capita output. Furthermore, this more favorable phase of population history occurs at a time when other regions have already passed through it, so that Africa will gradually become the only major region of the world to be experiencing this demographic dividend.

Third, African farms have now completed a full decade of rising cereal-grain yields, ending a long period in which output growth came primarily from expanding cropped area. Yield growth in the past decade has occurred at a similar rate as was experienced elsewhere in other green revolution periods, and far outpaces population growth. To the extent that new technologies continue to become available for adoption by African farmers, their relative land abundance could allow for rapid increases in total output – but new technologies require public-sector agricultural investment, for which there was much more funding in the 1980s and early 1990s than there has been since then. Given the

inevitable time lag between those investments and the resulting productivity gains, Africans are only now reaping the benefits of past funding, and new programs will have to grow very quickly to limit the consequences of recent neglect.

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