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Background Paper

Transforming Rural Africa: Growing a Productive Agriculture Sector

Kevin Cleaver

JICA

Emerging Markets Forum
A nonprofit initiative of the Centennial Group

Transforming Rural Africa: Growing a Productive Agriculture Sector

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Preface

Dear participants,

This paper is one of ten papers which are expected to form a book focused on imagining Africa four decades from now. Of these ten papers, five will serve as background papers for sessions at the Fifth Africa Emerging Markets Forum:

- *Imagining Africa 40 Years from Now*
- *Demographics and Urbanization: Planning Cities That Work*
- *Building Human Capital: Improving Education Quality*
- *Transforming Rural Africa: Growing a Productive Agriculture Sector*
- *Africa's Infrastructure Deficit: Closing the Gap*

Another paper, *New Threats to Africa's Stability and Growth*, will also be distributed at the Forum. The remaining four papers are available on the EMF website:

- *The Impact of Commodity Terms of Trade in Africa: Curse, Blessing or Manageable Reality?*
- *Africa's Inclusive Growth Challenge*
- *Economic Diversification of African Economies*
- *Regional Economic Integration in Africa*

Following this Forum, the papers will be revised and published as chapters in a book which will be widely distributed to African leaders and policymakers, among other stakeholders. As such, we will welcome your comments and feedback during and after the sessions.

Harinder Kohli
Founding Director & Chief Executive
Emerging Markets Forum

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This paper was prepared by Kevin Cleaver with research assistance from Alden LeClair.

Executive summary

Agriculture remains vitally important to most African economies, providing 25% of African gross domestic product, with another 20% of African GDP produced by agribusiness. 60% of African employment is in agriculture. Though these high shares of GDP will decline over time, they will remain important for the next several decades. Stimulating agricultural growth is therefore one way to stimulate faster economic growth and more rapid poverty reduction.

African agriculture has not performed well for the past 35 years. Per capita agriculture growth, though positive, has declined in the most recent period. Crop yields in Africa are far below those in other developing countries. The productivity of labor, land, capital, and material used in agriculture has grown more slowly than that of most other developing countries. Much of the growth in agriculture that has occurred has been the result of expansion of cultivated area, and increases in labor use, rather than productivity improvements. The expansion of cultivated area has been at the expense of forest and grazing land. The environmental costs of this expansion are increasingly apparent. There is however considerable variation between African countries, with some countries performing well. The ingredients of better performance provide directions for future action.

The problems confronting African agriculture point to widespread government policy deficiencies often reflected in the net taxation of agriculture through policies affecting prices, marketing and processing, and trade. The anti-agriculture policy bias of most African governments is greater than that of other developing countries. Secondly, most African countries rate poorly on measures of the ease of establishing and doing private business. Farming, marketing, and processing of agriculture products are private businesses, and when it is difficult for business to operate, agriculture suffers. Thirdly, government expenditure in rural areas for infrastructure education, health, water supply, and local administration is frequently very weak. This inhibits agriculture development, as poorly educated farmers, who are also in poor health, do not make good farmers. Where potable water or irrigation water is not available and rural road networks are poor, agriculture is less likely to develop. The problems may be exacerbated in the future as the result of climate change. Nearly all projections of the impact of future climate change show large negative impacts on African agriculture.

Aid donors have not helped as much as they think, often providing contradictory policy advice and unsustainable agricultural projects. In addition, rich country governments, which provide aid on the one hand, subsidize their own agriculture, which curtails markets and prices for African agriculture.

Action is urgently required to reform agricultural price, taxation, and trade policy, with the objective of reducing the effective taxation of agriculture in Africa. As a corollary, a further shift away from government control and ownership of agricultural marketing, processing, and input supply companies is needed. An expansion of private investment in these activities, and in farming itself, is required. Moving up on the World Bank's Ease of Doing Business Index would help. Government investment is vital but it should be focused on improving rural roads, rural energy supply, rural water supply and irrigation, rural education, and health. Agricultural education needs improvement in every African country. Governments will need to play an important role in adapting African agriculture to a changed climate. Some African governments have shifted in these directions, reducing the effective taxation of agriculture, improving the ease of doing private business, and/or expanding domestic investment in rural development. Agriculture has responded positively. These reformers show the way.

Aid donors need to rethink their interventions. Greater coordination between donors is needed to avoid contradictory policy advice and to increase the frequency of successful projects. There are good practices that can be scaled up but also many bad practices that need to be abandoned. Reduction of OECD agricultural subsidies would help. This would tend to increase world agriculture

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prices and open OECD agriculture markets and import substituting African markets to African producers.

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Transforming Rural Africa: Growing a Productive Agriculture Sector

Why is African agriculture important?

A special look at African agriculture, as opposed to many other sectors of economic activity, is justified due to the large number of Africans dependent on agriculture and living in rural areas (about 59% of Africa's population). About 25% of African gross domestic product is currently derived from agriculture (with a range of 3-50%),[1] and much of its industry is agro-based (about 20% of African GDP is produced by agribusiness input supply, processing, marketing, and retailing).[2] 60% of African employment is in agriculture.[3] In order for African economies to grow rapidly and to provide employment for increasing numbers of people, African agriculture needs to grow rapidly and absorb increasing numbers of people entering the labor force.

Over the longer term, agriculture's share in African economies and in employment will decrease, as it has done in middle income countries in Asia and Latin America, as well as in industrialized economies. This process, however, is not instantaneous, and for the next several decades, rapid agricultural and agro-industrial growth are needed to stimulate more rapid economic growth and employment creation. The UN's International Fund for Agricultural Development (IFAD) estimates that most young Africans will be living in rural areas until about 2035, after which urbanization and natural growth will shift the balance towards towns and cities.[4] Population growth will add an estimated 350 million entrants to the labor force between 2015 and 2030. About 65% of young people now work in agriculture and another 25% in informal household enterprises.[5] So many of these new entrants must find employment in agriculture and rural enterprise.

A second reason for concentrating on agriculture is that so many of Africa's poor live in rural areas (about 70%) and are directly or indirectly dependent on agriculture and agro-industry. (This is greater than the number of people employed in agriculture.) Because they are directly or indirectly dependent on agriculture, stimulating agricultural development would provide them additional income, which in turn would help them exit from poverty. There are, of course, other avenues for some of them to exit from poverty including migration to cities or abroad or development of non-agricultural activities in rural areas. These other avenues have in fact been favored, as agriculture has stagnated in most of Africa, as will be shown below. The problem is that migration to the cities often has not provided an exit from poverty, as urban development and non-agricultural growth have not been sufficient to provide jobs and incomes for many. Instead, many migrants simply go from being rural poor to urban poor. Migration abroad, particularly to Europe, has been an outlet for some, but for many migrants this has also been disappointing, and for some it has resulted in death as migratory routes are dangerous and migrants are often not welcome.[6]

A third reason relates to food availability and nutrition. It is well established that food security and nutrition status are largely related to income levels, information availability, and education, rather than agricultural production per se. People who understand nutrition and have the incomes necessary to buy food tend to have better nutritional status, regardless of a country's level of agricultural production. This is because they ordinarily can buy food, including imported food, if there are national food production deficits. International agricultural markets are now sufficiently globalized that importing foodstuffs is relatively easy if the importers, and their customers, have income. There is a

1. African Development Bank. (2016). *Strategy for Agricultural Transformation in Africa, 2016-2025*, Abidjan: AfDB, p. 3; IFAD. (September 2016). *Rural Development Report 2016: Fostering Inclusive Rural Transformation*, Rome: IFAD, p. 133 cites similar figures.
2. IFAD. (2016).
3. Ibid.
4. Ibid, p. 143.
5. Ibid.
6. The World Bank's 2008 World Development Report, *Agriculture for Development* (World Bank 2008), provided evidence from China and India showing that growth originating in agriculture was three times more effective in reducing poverty than growth originating in other sectors (p. 26, p.30, p. 46). A comparable careful analysis has not been done for Africa, but the World Development Report came to a similar conclusion for Sub-Saharan Africa (Box 1.2, p. 30).

Despite the importance of African agriculture for economic growth, job creation, food security, and nutrition, it has performed poorly in nearly all countries of the continent for the past 35 years.

problem, however, in some countries in Africa with access to imports, particularly among the poor in rural areas. The poor do not have the income to pay for imported food, and transport constraints often prevent food arriving in poor rural areas where the purchasing power is low. In these cases, expanded local agricultural production is often the best option for addressing nutrition problems because it both raises incomes and increases availability. It is in these places, often suffering from war or drought, that food aid donors concentrate because incomes are low and increasing local food production difficult. It is, therefore, useful to think of ways to expand agricultural production in these difficult areas to help address food security and nutrition issues, as well as to generate jobs and income.[7]

Performance of African agriculture

Despite the importance of African agriculture for economic growth, job creation, food security, and nutrition, it has performed poorly in nearly all countries of the continent for the past 35 years. There have been African countries in which agriculture has performed well for several years, but in most cases these gains have disappeared over time. The traditional way to measure agriculture performance involves several indicators, including quantities produced per hectare of land, value of agriculture produced per hectare of land and per unit of labor, and total factor productivity (value of production compared to the combination of the of land, labor, capital, and material used in its production). These measures establish agricultural productivity, which can be compared across countries and compared with other developing countries and with industrial countries. Data permitting such measurements are notoriously poor in Africa. For this chapter, an extensive effort was undertaken to mobilize such data as exist. Data comes largely from the Food and Agriculture Organization, the World Bank, the International Food Policy Research Institute (IFPRI), and UNCTAD.[8] The limited number of relatively reliable productivity measures are shown below. They continue to point to low average productivity of African agriculture and low growth of productivity over time in most countries (see Annex Table A1).

Crop yields for major cereals were significantly lower in Africa than the world average in 1990 and remain significantly lower in 2014, which is the latest year for which data are available (Tables 1 and 2). Average African crop yields are lower than in the comparator non-African developing countries selected. The comparator countries were chosen because they are regarded as having maintained a relatively favorable (though far from perfect) policy posture toward agriculture during the past 15 years.

Have African farmers been catching up in yields per hectare over time? Growth rates in crop yields for wheat and sorghum have been slightly higher in Africa than the world average, and about equal to or less than the world average for millet, rice, and maize (Table 3). Comparison with the good developing country agriculture performers shows a mixed picture with Vietnam and India doing relatively well and China performing poorly in terms of the speed of growth of cereal yields.[9]

Growth in crop yields should have been faster in Africa over this 24-year period because initial yields were low and the productivity enhancing techniques needed for faster growth are known (including more fertilizer, irrigation water, and farm mechanization).[10] Scrutiny of the table suggests,

7. The World Bank's 2008 World Development Report also argued that agricultural development is important for nutrition beyond its importance for income growth by increasing access to food in places with low access to imports (op. cit., pp. 94-95).

8. FAO data is drawn from FAOSTAT: http://www.fao.org/faostat/. UNCTAD data is drawn from UNCTADSTAT: http://unctadstat.unctad.org. World Bank data is drawn from the World Development Indicators (2016): http://databank.worldbank.org.

9. It is worth noting that though Table 3 shows crop yield declining for most major staple crops in China, those five crops diminished significantly in importance to Chinese agricultural production (from 32.8% of total value of agricultural production in 1995 to 23.5% in 2013) as production shifted towards higher value meats and vegetables. The result was a rapid growth in agricultural GDP despite declining crop yields for major staples.

10. This idea forms a major part of the argument by the three Rome based agricultural agencies of the UN regarding the possibility of achieving zero hunger: FAO, IFAD, WFP. (2015). *Achieving Zero Hunger.* Rome: FAO, IFAD, WFP. This article pointed out, for example, that wheat yields in Europe are 7 tons per hectare (2015) (p.3), while wheat yields are only 2.6 tons per hectare in Africa. See also Fischer, R.A., Byerlee, D., & Edmeades, E.O. (June 2009). Can Technology Deliver on the Yield Challenge to 2050, *Expert Meeting on How to Feed the World in 2050*, Rome: FAO, 24-26.

Crop yields for major cereals were significantly lower in Africa than the world average in 1990, and remain significantly lower in 2014.

Table 1: Crop yields (tons/hectare) of major cereal crops, compared to high performing agricultural producers (1990)

	Maize	Millet	Rice	Sorghum	Wheat
Africa	1.5	0.7	2.1	0.7	1.6
World, Average	3.7	0.8	3.5	1.4	2.6
China	9.4	3.7	12.8	7.6	5.9
Mexico	2.0	0.5	3.7	3.3	4.2
Peru	2.0	-	5.2	2.7	1.1
Vietnam	1.6	-	3.2	-	-
India	1.5	0.7	2.6	0.8	2.1

Source: FAO (2016)

Table 2: Crop yields (tons/hectare) of major cereal crops, compared to high performing agriculrural producers (2014)

	Maize	Millet	Rice	Sorghum	Wheat
Africa	2.1	0.6	2.7	1.0	2.6
World, Average	5.6	0.9	4.6	1.5	3.3
China	6.0	2.4	6.7	5.0	5.0
Mexico	3.3	1.0	5.7	4.2	5.2
Peru	3.2	-	7.6	4.4	1.5
Vietnam	4.4	1.3	5.8	-	-
India	2.8	1.3	3.6	0.9	3.0

Source: FAO (2016)

Table 3: Annual growth in African and comparator crop yelds, 1990-2014, (%)

	Maize	Millet	Rice	Sorghum	Wheat
Africa	2.0	-0.7	1.1	1.5	2.8
World, Average	1.9	1.1	1.1	0.8	1.1
China	-0.8	-0.7	-1.8	-1.1	-0.8
Mexico	2.2	6.1	2.1	1.5	1.1
Peru	2.1	-	1.7	6.9	2.2
Vietnam	4.8	-	2.5	-	-
India	3.1	5.7	1.6	1.7	1.6

Source: FAO (2016)

Mirroring the situation with crop yields, the growth in total factor productivity (land, labor, capital, and materials) in agriculture has been slow, hovering at 1.4 % growth per annum in the period 2000 to the most recent year in which data are available.

however, that except for wheat and sorghum the growth rate of crop yields in Africa has not been more rapid than in the rest of the world. The advantage of being able to apply known technology for maize, rice, and millet is not stimulating a much more rapid increase in the yields of these crops in most of Africa. The crop with the fastest growth in yields in Africa is wheat, which is a relatively minor crop in Africa. (It is a temperate zone crop and thus confined in Africa to highland areas that have temperate climates.)

Mirroring the situation with crop yields, the growth in total factor productivity (land, labor, capital, and materials) in agriculture has been slow, hovering at 1.4 % growth per annum in the period 2000 to the most recent year in which data are available (Figure 1).[11] This is not much different from total productivity growth in the earlier period and is consistent with Africa's poor performance with respect to crop yields per hectare.

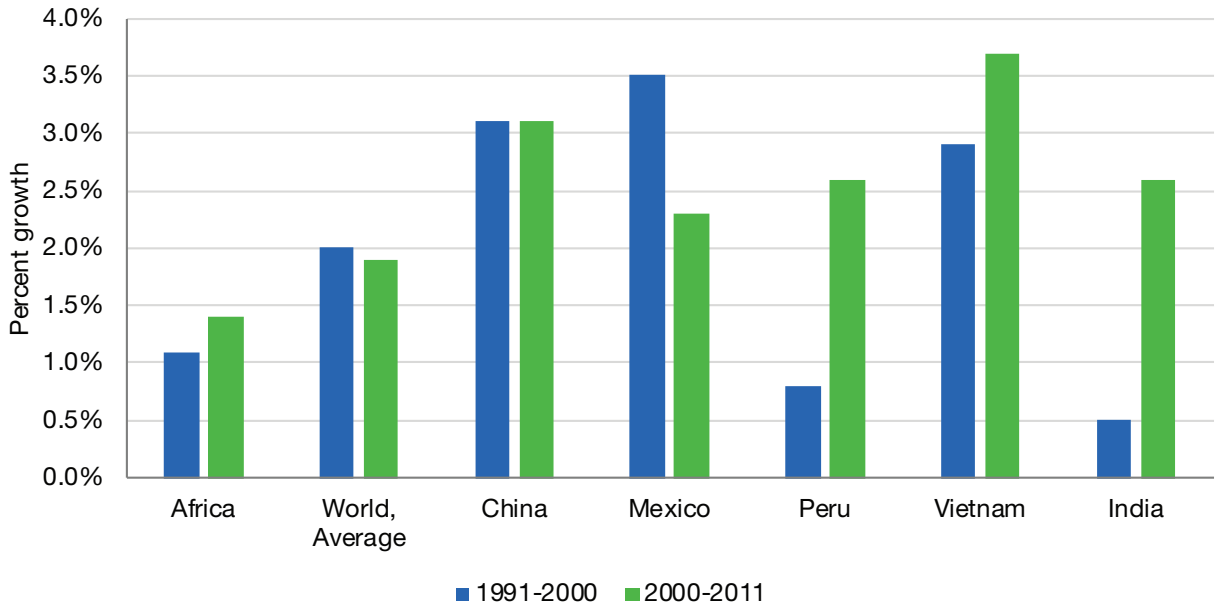
However, there is considerable variation within Africa on this measure. Total factor productivity growth in the 2000-2011 period was higher in several African countries (e.g. Niger, Angola, Congo, Sierra Leone, South Africa, Botswana, Morocco, and Cameroon).

IFAD reported similar results in its recent Rural Poverty Report. Although the IFAD analysis covers a somewhat different period, its results are nearly identical to the analysis done by IFPRI. It showed the following results based on its data (Table 4).[12]

11. IFPRI defines its total factor productivity measure as follows: "Total factor productivity (TFP) is the ratio of total output (crop and livestock products) to total production inputs (land, labor, capital and materials). The output values are the FAO-constructed gross agricultural outputs, measured in constant 2004-2006 US dollars and smoothed using the Hodrick-Prescott filter. Each output value is a composite of 190 crop and livestock commodities aggregated using a constant set of global average prices from 2004-2006. Inputs include agricultural land, measured by the sum, in hectares, of cropland and permanent pasture; labor, measured by the number of animals in cattle equivalents; machinery, measured by the total amount of horsepower available from four-wheel tractors, pedestrian-operated tractors, and combine-threshers in use; and fertilizer, measured by tons of fertilizer nutrients used." (IFPRI 2014). See also Annex Table 1.

12. IFAD. (2016), p. 139.

Figure 1: Growth in total factor productivity (aggregate of land, labor, capital, and material)



Source: IFPRI (2014)

The rate of per capita agricultural growth has fallen in the most recent period, and is lower than that of other developing countries.

Table 4: Agricutlural factor productivity, annual change (%)

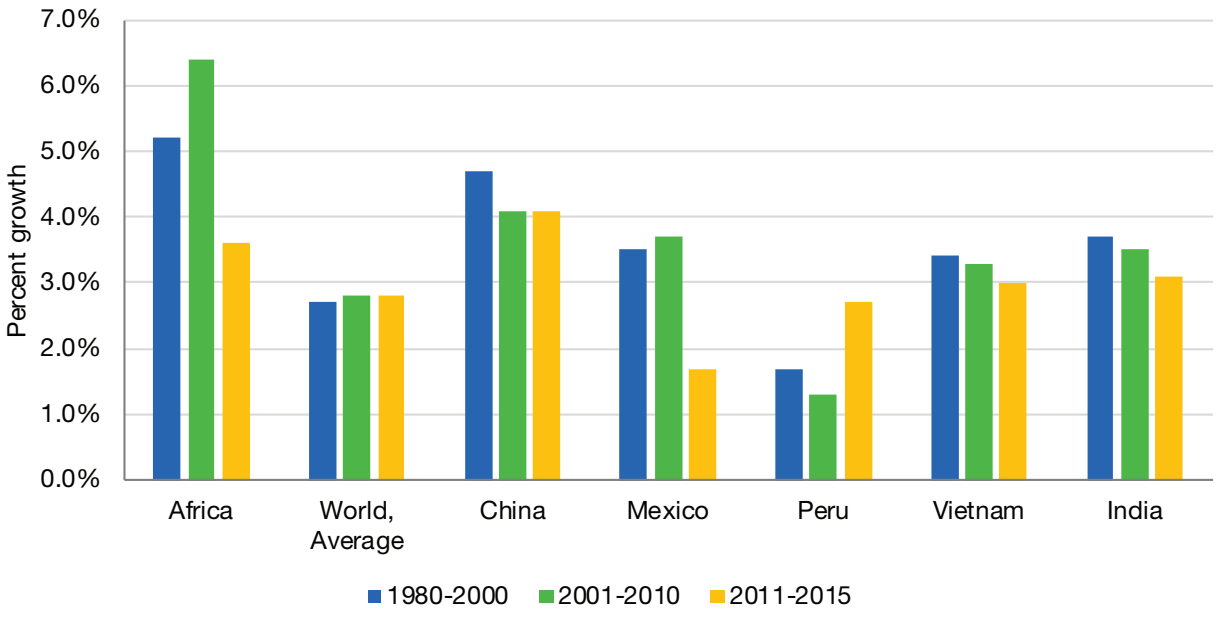
	Total factor productivity	Labor productivity	Land productivity
	1992-2012	1990-2014	1990-2012
Sub-Saharan Africa	1.07	1.09	1.06
Rest of World	1.75	2.04	1.76

Source: IFPRI (2014)

Low growth in productivity should translate into low growth of agricultural GDP unless there are large infusions of capital investment, increases in labor use, expanded use of land (for example, by cutting down forests to plant crops), or increased use of inputs such as fertilizer.

The data show African agricultural growth to have been greater than the world average, and at least as good as (and in some cases better than) that in other developing countries over the long term (Figure 2). The average agricultural growth rate in Africa covers considerable variation between African countries with several countries growing faster than the average of the last five years (Mali, 11.7%; Algeria, 7.4%; Congo, 7.0%; Ethiopia, 6.6%; and Togo, 6.4%). Average African population growth has been relatively rapid, however, at about 2.7% p.a. in the 1980-2000 period, falling to about 2.5% p.a. in the period 2000 to the present. Per capita agricultural growth has, therefore, been lower (3.8% p.a. in the 2000-2010 period and 1.1% p.a. in the 2011-2015 period). Additionally, the rate of per capita agricultural growth has fallen in the most recent period, and is lower than that of other developing countries. This is important for comparison with other countries. China's

Figure 2: Growth rate of agriculture value added (constant prices)



Source: Derived from World Bank (2016)

Future agricultural growth will need to come increasingly from the combination of faster productivity growth, continued expansion of labor use, and investment.

recent population growth has been close to zero, so that their remarkable agricultural growth rate is relatively close to their per capita agricultural growth rate.[13]

The most recent African agricultural growth rate computed in per capita terms (1% p.a.) is nearly identical to the growth in total factor productivity for the most recent period. However, in the earlier period (2001-2010) agricultural growth was considerably higher than productivity growth. Where was this growth coming from? Africa was, in earlier years, getting some agricultural growth from the application of more labor due to rapid rural population growth. Some additional growth came from expanding area under crops. When these two sources of growth are added to the limited productivity growth, the result was a higher rate of agricultural growth. The IFAD analysis cited above came to the same conclusion: Most agricultural growth in Sub-Saharan Africa has been attributable to expansion of land under cultivation, followed by expansion in agricultural labor, with some increase in agricultural value added due to improved terms of trade effects.[14]

The availability of new crop land appears to be drying up in the more recent period. Thus, although agricultural labor has continued to expand, it is applied to a constrained land base (Table 5). The result is that Africa's rate of agricultural growth has reflected its productivity growth, which has been slow; therefore, the rate of agricultural growth has declined. Future agricultural growth will need to come increasingly from the combination of faster productivity growth, continued expansion of labor use, and investment.

Nutrition and food security

Has the relatively poor agricultural performance in Africa contributed to food insecurity and nutrition problems? The prevalence of undernourishment in Africa is higher than elsewhere in the world, and though it has declined in the past 25 years, the decline has been only from 29% of the African population undernourished to nearly 19% currently (Figure 3).

The impact of this high prevalence of undernourishment in Africa is telling. Some 36% of African children under 5 years of age are stunted due to nutrient deficiencies, and 18% are underweight.[15]

The average incidence of undernourishment in Africa is higher than in the comparator countries, particularly the two Latin American comparators. However, there is considerable variation among African countries. Several Africa countries have a current incidence of malnutrition equal to Mexico's, including Tunisia, South Africa, Algeria, Egypt, Gabon, Ghana, Mali, Morocco, and Mauritius. Several of these countries, but not all, are also relatively good agricultural performers. This supports the finding that good agricultural growth helps to resolve issues of malnourishment but does not alone solve the problem. Other, more important factors are at play including population growth, education levels, income growth, the composition of food

13. As described in footnote 9 above, China's remarkable agricultural growth has been primarily due to a shift to higher value crop and livestock production and not to an increase in yields for staple crops.
14. IFAD. (2016) (op. cit.), p. 139.
15. Black, RE et al. (2013). Maternal and child undernutrition and overweight in low income and middle income countries. *Lancet* 382: 427-51.

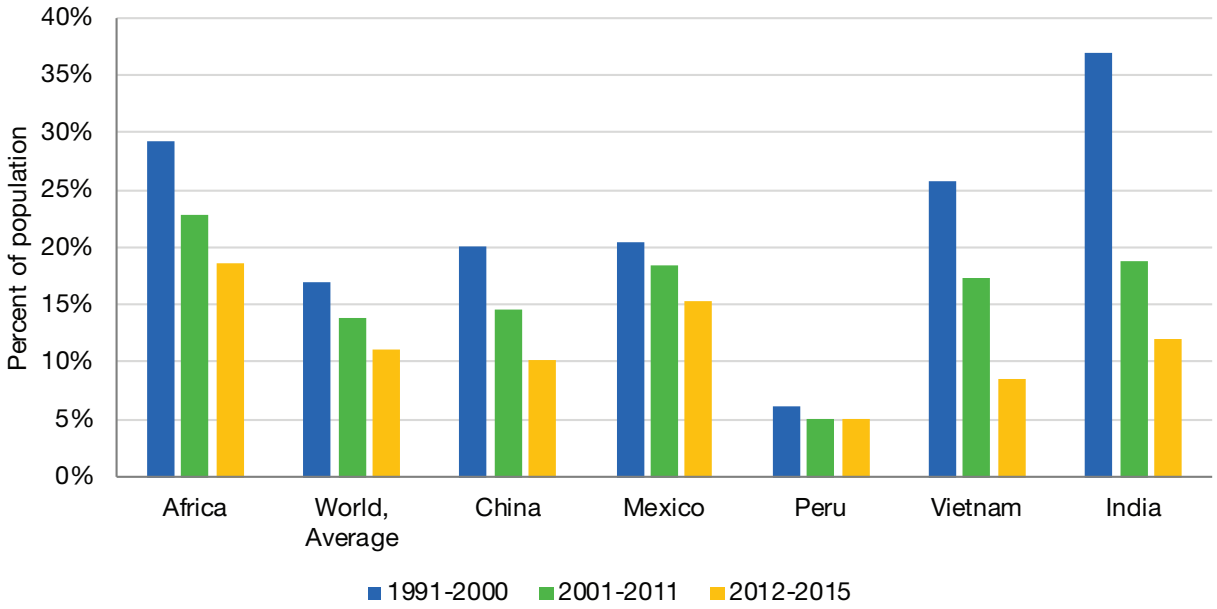
Table 5: Labor and land use in African agriculture

	1995	2000	2005	2011	2015
Labor use (millions)	127.4	179.0	198.1	224.2	243.8
Agricultural land (millions of ha)	1102.8	1123.2	1150.2	1168.7	1172.2*
Agricultural land per laborer (ha/person)	8.7	6.3	5.8	5.2	5.0*

Source: FAO (2016)
**2013*

Africa was found by FAO to be the only region in the world where the number of hungry grew, from 175 million in the 1980s to 235 million by 2009.

Figure 3: Prevalence of undernourishment



Source: World Bank (2016)

intake, and diet (some food is more nutritious). Where civil war or civil strife exists, food insecurity and malnutrition are almost always severe. Many African countries continue to have an extraordinarily high prevalence of malnutrition. Those with over double India's rate include Central African Republic, Chad, Congo, Liberia, Namibia, Rwanda, Tanzania, Zambia, Sudan, and Zimbabwe. Most of these have suffered long bouts of civil strife.

Africa was found by FAO to be the only region in the world where the number of hungry grew, from 175 million in the 1980s to 235 million by 2009. According to the FAO, about 23% of Africa's population remained hungry in 2012.[16]

Where indicators of food security and nutrition are better than agricultural performance, it is usually because other sources of income permit food imports. Indeed, the growth in food imports, at 5.6% p.a. in the 1996-2005 period and 10.7% p.a. in the most recent (2006-2015) period, has been extraordinarily rapid in Africa.[17] In 2009, 74% of African wheat consumption and 41% of its rice consumption was imported.

The more rapid rate of increase in food imports in the most recent period mirrors the slower per capita agricultural growth rate in that period. The food import growth rates along with the high rates of undernourishment suggest that there is ample room for expanded agricultural production, both to assist in supplying food and eventually to substitute for imports.

16. Hunger and malnutrition, though closely related concepts, are measured differently, which explains the somewhat different results.

17. UNCTAD data is drawn from UNCTADSTAT: http://unctadstat.unctad.org.

The first widespread proximate cause is extremely limited fertilizer use. Africa's fertilizer use is much lower than the average in the world, and lower than that in comparator developing countries.

Conclusions regarding agricultural performance in Africa

Low agricultural productivity in Africa has contributed to low growth in agricultural GDP and, therefore, low growth of incomes derived from agriculture. It has also contributed to widespread gaps in food availability. Although food imports have grown rapidly, there is still a widespread nutrition problem. The nutrition/food security problem cannot be solved by faster agricultural growth alone. Reduction in civil strife, faster overall income growth, and nutrition education, among other factors, are more important. But faster agricultural growth would translate into faster growth in rural and farm incomes, which would contribute to improved nutrition, and in some cases, could make the difference in physical food availability as well.

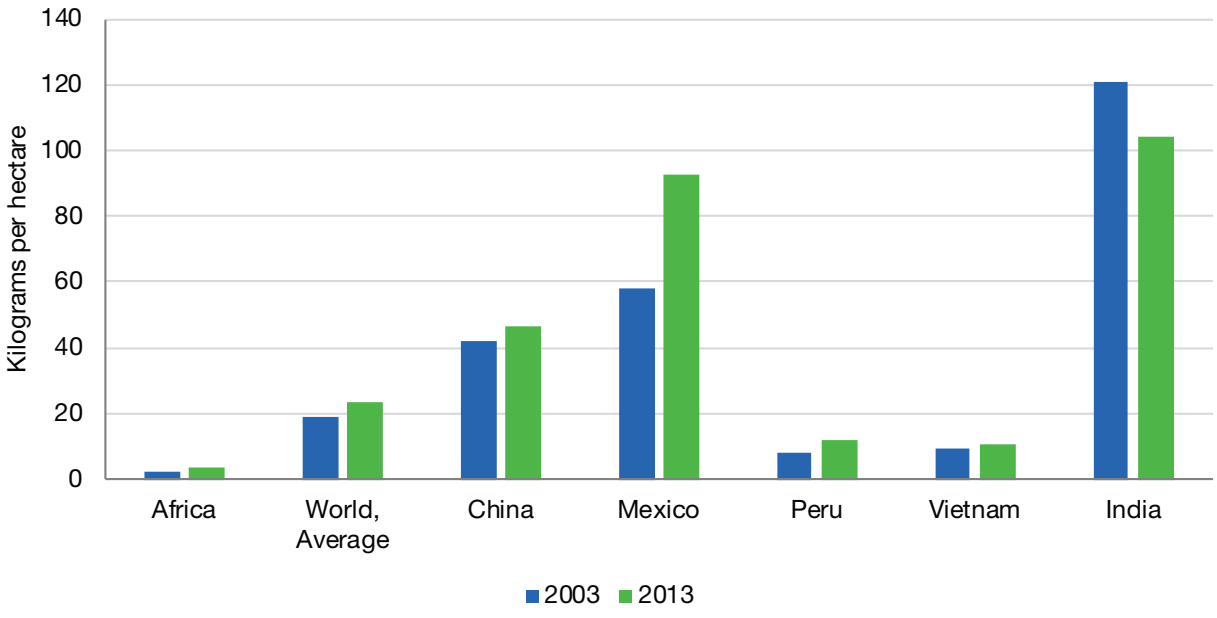
Proximate causes for low growth of African agriculture

There is an extensive literature identifying the immediate, or proximate, causes for low productivity and slower than desirable growth of African agriculture. The first widespread proximate cause is extremely limited fertilizer use. Africa's fertilizer use is much lower than the average in the world, and lower than that in comparator developing countries.

This situation is not changing. Growth of fertilizer use in Africa has been negligible (in absolute terms), as shown in Figure 4: 2013 fertilizer use is about the same as in 2003. For the world as a whole, and for most of the comparator countries, fertilizer use has increased by much larger absolute amounts.

The causes for low fertilizer use in Africa are several. First has been the frequently limited farmer knowledge about fertilizers. The second relates to negative incentives for the use of fertilizers created by governments in

Figure 4: Fertilizer consumption per hectare of agricultural land



Source: FAO (2016); World Bank (2016)

A related cause of low African agricultural growth has been the high cost of transporting agricultural products and inputs due to poor roads, high fuel costs, and weak competition that limits the marketing of agricultural products.

the form of wide-spread price controls. Suppression of prices received by farmers for their crops, which has been common in Africa, reduces the profitability of applying fertilizers. Most governments also suppressed the private marketing of fertilizer, instead maintaining government control of distribution citing the "strategic" nature of fertilizers. The track record of government agencies in distributing fertilizer in Africa is poor. In addition, many governments created barriers to inter-regional trade in fertilizers, usually to protect their own parastatal fertilizer companies. As a result, fertilizer could not move from African countries where fertilizer was available to those where fertilizer was unavailable.[18] Expanded fertilizer use has been instrumental in the expansion of crop production elsewhere in the world, and its absence in Africa has been perhaps the most important proximate cause of low crop yields and low growth in production.

A related cause of low African agricultural growth has been the high cost of transporting agricultural products and inputs due to poor roads, high fuel costs, and weak competition that limits the marketing of agricultural products.[19] High transport cost is also influenced by the poor condition of ports and rail. Poor infrastructure is, in turn, due to poor maintenance and in part to lack of investment. Data show flat infrastructure financing in Africa in current prices, declines in real terms, and large unmet needs (Table 6). Low road density leads to isolation of farmers, which is associated with lower agricultural productivity and more poverty.[20]

Agriculture requires water. Limited or sporadic rainfall in much of Africa is a constraint, as it is in South Asia and much of East Asia. In South Asia and East Asia, this constraint has been addressed by massive investment in irrigation. Currently, 42% of South Asia's arable land is irrigated compared with only 1.3% of Africa's arable land (Table 7). This percentage has not changed in decades, indicating continued low investment in irrigation. The major reason for low investment is the low priority allocated to agriculture by most African governments; another is the high cost of irrigation investment in Africa. The World Bank estimated in its 2008 World Development Report on Agriculture that the cost of investment in Sub-Saharan Africa was $8347 during the years 1995-1999 (the last period for which such an analysis was conducted).[21] The investment cost outside of Africa for the same period was $3506.

Much of the land in Africa is public forest land, parks, and public range land. Governments have historically

18. Good analysis of the African fertilizer situation is provided in World Bank. (2016b). *Enabling the Business of Agriculture*. Washington: World Bank. See also AfDB. (2016), p. 17.
19. AfDB (2016), Technical Annexes, Abidjan, Cote D'Ivoire emphasizes the transport hurdles (pp. 18-19).

20. *Africa 2050: Realizing the continent's full potential* (Ahlers et al. 2014) p. 289, contains the following statement: "Thurlow and Wobst (2004) found rural poverty in Zambia to be higher in remote areas. Stifel and Minten (2003) showed rural poverty to be higher and rice productivity to be lower in more remote places of Madagascar. Binswanger, Khandker and Rosenzweig (1993) make this conclusion very broadly across Indian agriculture." See Thurlow, J. & Wobst, P. (2004). The Road to Pro-poor growth in Zambia: Past Lessons and Future Challenges, *Development Strategy and Governance Division Discussion Paper* (16), Washington; IFPRI. See Stifel, D. & Minten, B. (2003). Transactions costs and agricultural productivity: Implications of Isolation for rural poverty in Madagascar. Background paper for the Northeast Universities Development Consortium Conference, Yale University, New Haven, Connecticut, October 17-19. See Binswanger, H., Khandker, S., and Rosenzweig, M. (1993). How Infrastructure and financial institutions affect agricultural output and investment in India. *Journal of Development Economics 41*(2); 337-366.
21. World Bank (2008), op. cit., p. 65.

Table 6: Infrastructure financing in Africa

	2012	2013	2014	2015
Total infrastructure financing (billions of current dollars)	89.3	99.6	74.5	83.4
Infrastructure investment required (5.5% of African GDP benchmark) (billions of dollars)	127.2	132.3	136.4	125
Percent unmet	29.8%	24.7%	45.4%	33.3%

Source: ICA (2015); World Bank (2016)

Climate change may already have begun to contribute to increased water scarcity, increased frequency of severe weather shocks (including droughts), and increased coastal flooding.

Table 7: Land equipped for irrigation in Africa

	1995	2000	2005	2010	2013
Total land equipped for irrigation (millions of ha of land)	12.4	13.2	14.1	14.7	15.0
Total agricultural land (millions of ha of land)	1,102	1,123	1,150	1,163	1,172
Percent of total agricultural land equipped for irrigation	1.1%	1.2%	1.2%	1.3%	1.3%

Source: FAO (2016)

managed this land poorly. The result has been high rates of deforestation (an annual loss of approximate 0.5% of forest area from 2005-2015), land degradation (about 67% of Africa's land area has become or is becoming highly degraded due to nutrient depleting crop cultivation, fragile soils, overgrazing, and firewood collection),[22] loss of biodiversity, and land conflicts between people. Figure 5 shows the loss in total forest area in Africa during the past 10 years. Forest production is included in agricultural production, so this contributes to the poor performance of agriculture. But, equally importantly, the loss of forests affects basic nutrients and water, further affecting agriculture.

Finally, the Intergovernmental Panel on Climate Change (IPCC) predicts that the adverse effects of climate change on agriculture will be especially marked in Africa. Climate change may already have begun to contribute to increased water scarcity, increased frequency of severe weather shocks (including droughts), and increased coastal flooding.[23] These changes are likely to be already dampening agricultural yields and hence agricultural growth.[24] An analysis undertaken in 2010 projected that African staple crops will have 8-22% lower yields by 2050 due to climate change, all other things equal.[25]

More fundamental causes of poor agricultural performance

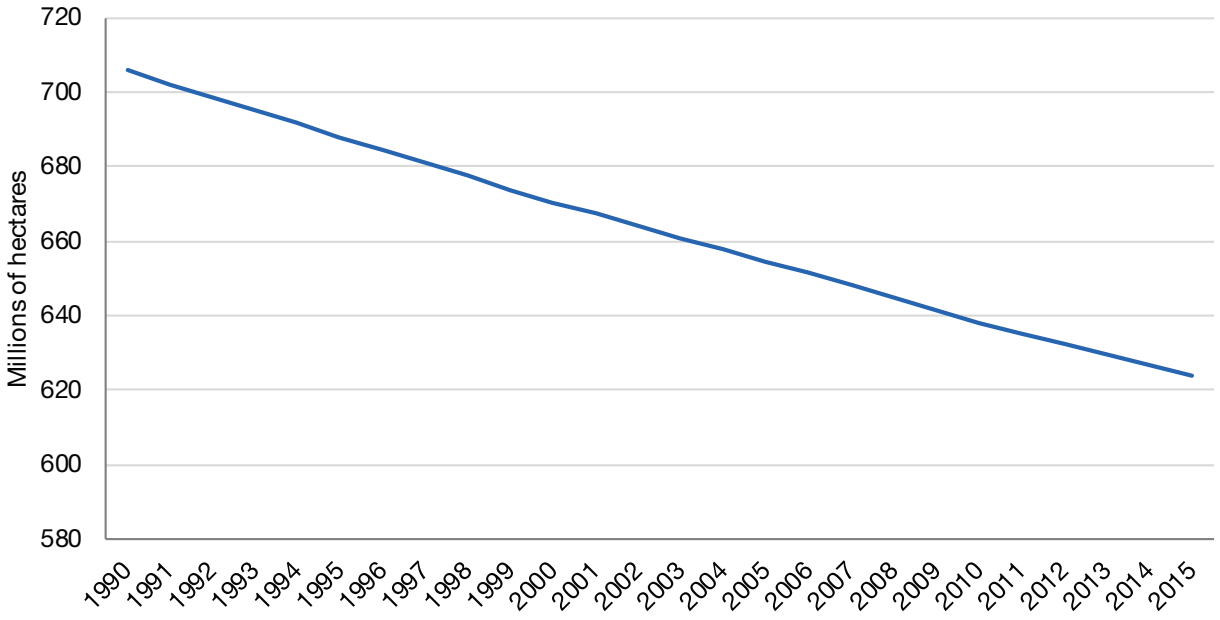
It is increasingly clear that public policy is often a more fundamental cause of poor agricultural performance in Africa than the proximate causes discussed above. Public policy in most African countries has hindered private investment in agriculture, agriculture marketing, marketing of farm inputs, and processing of outputs. In addition to the problems with fertilizer and infrastructure described above, poor policy has inhibited the use of improved seed, livestock services, chemical inputs, and farm mechanization as well. Further, government policy that hinders private investment, both local and foreign, reduces investment in marketing and processing of agricultural products.

The World Bank's Ease of Doing Business index, summarized in Annex Table A2 for Africa, shows that nearly all African countries make it difficult for private investors (which includes farmers) to do business.[26] The combination of poor economic policy, an excessively complex and often rent-seeking regulatory environment, inadequate courts and contract enforcement, inadequate protection of land rights, border controls on trade,[27] and frequent capital controls makes private investment in African agriculture and agro-industry risky and in many cases unprofitable.[28] Thus, private investment, both foreign and domestic, is curtailed. The lack of investment in fertilizer companies, agricultural processing enterprises, private irrigation schemes, and

22. Glatzel, K. et al. (2014) No ordinary matter: Conserving, restoring, and enhancing Africa's soils, *Agriculture for Impact*.
23. Intergovernmental Panel on Climate Change. (2015). *Climate Change 2014, Synthesis Report, Contributions of Working Groups I II, and II to the Fifth Assessment Report of the IPCC*. Geneva: IPCC.
24. FAO's *The State of Food and Agriculture: Climate Change, Agriculture and Food Security* (FAO 2016a) found that the impacts of climate change on African agriculture are already alarming.
25. Schlendker, W and Lobell, D.B. (2010). Robust negative impacts of climate change on African agriculture. *Environmental Resources 5*(1).
26. World Bank Group; Doing Business; Economy Rankings. See website: www.doingbusiness.org/rankings.
27. The share of intra-African trade remains low at 12% of total African trade, compared to interregional trade in other parts of the world (UNECA 2010).
28. These factors are all reflected in the ease of doing business indicators.

A second and closely related issue has been a tendency by most African governments over the past 50 years to control some farm output and farm input prices, and to tax or otherwise inhibit agricultural trade.

Figure 5: Total forest area in Africa



Source: FAO (2016)

transport companies, among others, is not surprising in this situation.

A second and closely related issue has been a tendency by most African governments over the past 50 years to control some farm output and farm input prices, and to tax or otherwise inhibit agricultural trade.[29] Controls similar to those discussed for fertilizer, with similar motivation, have been imposed on the price of food and export crops. Price controls on farm products at farmgate are often intended to reduce food prices for consumers, but they also reduce the incentive for farmers to produce the crops controlled. Price controls often require that governments operate crop marketing enterprises to purchase the crop from farmers to assure that the artificially low price at farmgate can be maintained. In some cases, crop movement controls were also imposed to suppress parallel or black markets that would pay more. Similarly, export crops were often marketed through parastatal enterprises, permitting governments to set low prices for export crops to farmers and to retain much of the revenue paid by foreign importers. This arrangement was common throughout much of Africa for cotton, cocoa, coffee, rubber, and tea. Again, these policies have been found to discourage production of these crops and technical innovation by farmers. Restrictions on trade in food crops between African countries has had the same effect as trade restrictions on fertilizer: African countries with surpluses of some food crops often found it difficult to sell into neighboring deficit countries in part due to trade restrictions. Of course, transport constraints and "dumping" by industrial countries also affected this trade.

These types of price and trade policies were nearly universal in Africa from the 1970s to the 1990s and are still more prevalent in Africa (and in the Middle East and Central Asia) than in other developing countries,[30] although

29. An important summary of this issue was published by the World Bank in World Bank (2008); pp. 10-13, p. 39, pp. 98-102.

30. The Brookings Institution produced a report entitled *Ending Rural Hunger* (Brookings Institution 2015) that found that "the countries with the

Analysis shows huge gaps in agricultural technical and vocational training and, indeed, in rural education overall.

there has been a slow process of reversal of these types of policies over time.[31]

A third fundamental constraint involves the serious weakness of many local administrations and public institutions in rural areas. Local governments in rural areas are nearly always hindered by the lack of human capacities needed for planning and execution as well as by limited transparency and accountability. Agricultural development requires broad rural development including investment in and maintenance of rural roads, potable water, irrigation water, schools, health systems, land management,[32] contract dispute resolution, and more generally the rule of law. These key components of development are often done more poorly in rural areas than in urban areas. One reason is the lack of financial resources in rural compared with urban areas. Per capita GDP in Sub-Saharan Africa's urban areas was 5.5 times that of rural areas in 2010 (the last year for which data are available). In comparison, in India, urban areas had per capita incomes 2.7 times that in rural areas; the ratio was 2.1 in Mexico and 2.7 in Vietnam.[33] Thus, the fiscal base for local revenue in Sub-Saharan Africa rural areas is comparatively very weak, and it is not surprising that local services are badly managed and, in many cases, unavailable.

Analysis shows huge gaps in agricultural technical and vocational training and, indeed, in rural education overall.[34] Depending on the country, either weak local administrations or poor central government management and investment in rural areas are to blame.

The large number of donors working on African agriculture has contributed to weak policy and poor outcomes. Ahlers et al. (2014) found that in 2009, there were 225 bilateral donors operating in Africa, 242 multilateral donors, and 40 UN agencies.[35] Most had agricultural programs. These programs often come with advice and sometimes with conditions that must be met by governments to unlock the aid. Advice and conditions are often contradictory, differing from one donor to the next. For example, many donors support agriculture subsidies, but some are against. Many operate with public institutions only, others advocate limiting or eliminating public involvement in favor of the private sector. Others support agricultural services (research, extension, livestock) managed by their own nationals rather than locals. Many donors set up agricultural extension services following models developed elsewhere. It is common that in the same African country there will be European-style agricultural extension systems (several styles to choose from) uneasily co-existing in the same country with American- and NGO-style agricultural extension services. It should not, therefore, be surprising that there is often no national agricultural extension system in these countries but rather a hodge-podge of donor-supported services. The same situation holds for agro-processing, livestock services, and farm input distribution. Donors have thus been enablers of the confusion and lack of direction in government agricultural policy and investment.[36]

Trade and subsidy policy in OECD countries and much of the industrial world has been found by OECD and IFPRI to inhibit African agriculture. The OECD/DAC estimates

weakest [agricultural] policy environment are primarily, but not exclusively in Sub-Saharan Africa, the Middle East, and Central Asia," p. 25. It highlights the types of policy described here as "bad policy."

31. Ibid. This was also the conclusion of World Bnak (2008), op. cit. p. 21, p. 30, p. 98. The World Bank's report stated that average effective taxation of agriculture in Sub-Saharan Africa declined from 28% in 1980-1984 to 10% in 2000-2004 (p. 98). This was still significantly higher than the effective taxation in other developing countries (pp. 98-101).

32. Only 10% of Africa's rural land is registered, the remaining 90% is undocumented and managed informally. Woman have serious constraints in many African countries as inheritance rights are not provided to widows or daughters, despite about 60% of African farmers being women See AfDB (2016).

33. Data from IFPRI (2012), cited in McIntrye, J. Transforming African Agriculture, McIntyre, in Ahlers et al. (2014), eds., op. cit., p. 273.

34. The Omidyar Network found that 70-80% of African youth lack an education beyond the primary level (Omidyar Network 2013). IFAD shows that on average about 60% of those under 35 in rural areas have incomplete primary school, and many struggle with basic literacy and numeracy (op. cit., p. 189).

35. Ahlers et al (2014), op cit. Binswanger and McCalla also documented this problem in *The Changing Context and Prospects for Agriculture and Rural Development in Africa* (Binswanger-Mkhize, H. & McCalla, A. 2008).

36. The Brookings Institution's report, *Ending Rural Hunger* (2015) ranks the quality and quantity of bilateral aid donors (p.37). The rankings are generally low, reflecting poor quality agricultural aid. Denmark, Luxembourg, Iceland, Ireland, and Norway received the top scores. Slovak Republic, Czech Republic, Korea, Greece, Italy, Portugal, Slovenia, Poland, the United States and the European Commission received the worst rankings.

African governments must create the enabling environment for private investment in agriculture, agricultural input supply, agricultural marketing, and agricultural processing.

that OECD member countries provide about $250 billion p.a. (though varying from year to year) on domestic farm subsidies.[37] Subsidized products are imported by Africa often in competition with its own production. African exports of farm products that compete with North American and European farm products are constrained. Tariffs on agriculture in the European Union and the US are currently 13.2% and 5.3% respectively, as compared with 4.2% and 3.1% for non-agricultural goods. Fewer OECD trade barriers and lower OECD agricultural production subsidies would be good for African agriculture.

Action agenda

The most important action to be taken to stimulate African agriculture involves a change in the role of the state. African governments must create the enabling environment for private investment in agriculture, agricultural input supply, agricultural marketing, and agricultural processing.

The actions suggested in the World Bank's Ease of Doing Business are a good place to start in improving the enabling environment for private investment in agriculture. These include better economic policy (removing agricultural price controls and product movement controls), eliminating government monopolies on agricultural marketing and processing, reducing barriers to private investment in these areas (both domestic and foreign), strengthening the court system and enforcement of contracts, improving land tenure laws to provide protection for land owners, and facilitating a land market, among others.[38]

No African country does particularly well on the World Bank Ease of Doing Business index, but there is considerable range in the severity of the problem. The least bad, listed from the best downwards are Mauritius, Rwanda, Botswana, South Africa, Tunisia, Morocco, Zambia, Namibia, Swaziland, Kenya, Ghana, Lesotho, Uganda, Cape Verde, and Egypt. Of these, all except Swaziland, Kenya, Lesotho, Cape Verde, Mauritius, and Egypt had significantly higher rates of increase in crop yields than the average for Africa (see Annex Table A2).

Government and donor resources for agriculture will not be sufficient to cover investment needs. The Rome-based UN agricultural agencies have estimated that agricultural investment requirements are about $53 billion p.a.;[39] the African Development Bank estimated the requirement at $120 billion p.a.[40] These estimates provide a range of investment requirements. Private investment, including foreign private investment, will be needed to respond to this need, whether the high or the low figure is taken. This magnitude of investment resources will not be forthcoming in the current poor investment climates in most countries in Africa. In the past, governments have responded to the lack of private investment in processing and farm input supply by creating public enterprises for processing, marketing, and supplying inputs. The number of failures of such enterprises over the past 50 years is staggering, representing billions of dollars of wasted investment. Governments should create the policies necessary to attract private investment into these activities, which will require a dramatic change in government policy in every African country, though more in some than in others.

The large financing gap that exists for private sector agriculture and agro-business needs to be filled. The World Bank's International Finance Corporation estimates that 84% of small and medium enterprises in Africa (which includes non-agricultural sectors) have limited or no access to finance. Smallholder farmers also have limited access to finance.[41] Given public sector financing restraints, making more financing available will require the development of private financial intermediation, including banking services in rural areas. The most important action

37. This figure is quoted in Brookings Institution (2015).
38. A good summary of the changes needed in this regard is provided in IFAD (2016). The African Development Bank has also promoted this argument, AfDB (2016), Technical annexes, pp. 15-17. See also Thorpe, J. & Maestre, M. (2015). *Brokering Development: Enabling Factors for Public-Private Partnerships in Agricultural Value Chains*. Rome: IFAD and the Institute of Development Studies.
39. FAO, IFAD, WFP (2015). p. 11 (Table 4).
40. AfDB (2016), Technical Annexes, p. iii.
41. Ibid, p. 14.

African governments should focus their direct investment interventions on infrastructure development, mediating land use, providing a social safety net and education in rural areas, improving tax policy affecting agriculture, promoting regional integration, and improving access to world markets by reducing trade barriers.

that governments can take to make this happen is not to create the banking services themselves but, again, to create the enabling policy environment for investment by private and cooperative banks.

There is, however, an important role for governments beyond creating a good policy environment and institutional environment for private investments. Government efforts are required to strengthen public institutions in rural areas, including their human capacity, their fiscal base, and their transparency. Where the local resource base is weak, the central government may also need to provide resources. Most certainly it will require creating rural technical and vocational training related to agriculture, improving rural education and health facilities more broadly, and improving rural infrastructure (rural roads, potable water, rural energy, and rural information and communications technology).

African governments should, therefore, focus their direct investment interventions on infrastructure development, mediating land use, providing a social safety net and education in rural areas, improving tax policy affecting agriculture, promoting regional integration, and improving access to world markets by reducing trade barriers. Reducing trade barriers between African countries would also help African agriculture.

There are other areas of intervention that will best be achieved through private-government-farmer-donor partnerships. These are quite difficult to manage. Most important in this regard is agricultural technical change, which needs to be more aggressively pursued than it is currently, because it is directly related to expanding agricultural productivity. In the past, technical change was thought to be best stimulated by governments and donors through public agricultural research, extension (farmer training), livestock services, and public irrigation projects. Much of the literature on African agricultural development focuses on the kinds of technologies that need to be introduced; these include introduction of quality seed, better weed management, reducing post-harvest losses, introduction of disease-resistant varieties of all crops, better soil nutrition management and irrigation water management, introduction of pest-resistant varieties, adoption of productivity-increasing methods such as zero tillage, sustainable feeding practices for livestock, and investment in bio-technology. Many of these improved practices have been introduced through donor-financed projects and by governments and have not taken hold at sufficient scale, if at all. Another approach to technological change is required, outside of the traditional donor-managed or government-managed service.

An alternative to government-managed technical services is privately managed services. The private sector often provides such services for crop and livestock production that serves a private sector interest. Is this the way to stimulate technical change? The problem with private sector-managed agricultural services and technology is that they are invariably targeted to export crops or profitable cash crops, typically produced by larger and more sophisticated farmers. Small farmers, who are the bulk of Africa's farm population, are frequently ignored. A newer and probably better approach is to avoid leaving technology services and irrigation exclusively to either government or the private sector. Rather, the best approach is through programs involving public-private partnerships with farmer participation and with donor participation, where there are willing donors. Projects at large scale involving the public sector, private sector, and farmer groups are difficult to organize, which is why they have been so infrequently done. But these now appear to have great promise, and one donor, IFAD, has had some surprising success with this approach.[42] This does not mean that private sector technical intervention should be discouraged, as it has been in much of Africa. The improvement of the investment climate should encourage such investment. But this is unlikely to be enough, hence the premium on expanding public-private-farmer-donor partnerships.

42. See Thorpe & Maestre (2015).

Donors will need to be more willing to be led and coordinated by governments, perhaps with the help of a few donor coordinators.

Public sector-managed irrigation projects are found to be high cost in Africa, and thus there is very little new investment in irrigation. Donors now avoid irrigation investment in Africa due to high costs and poor public sector management. But private investors undertake small scale irrigation when it is profitable to do so. Government partnerships with the private and cooperative sectors to invest in and manage irrigation is the way to go. The combination of government, donor, private sector, and farmer financing and management can lead to expanded and better managed irrigation schemes.

A corollary to encouraging private investment and public-private partnerships is for governments in Africa to be more supportive of the development of independent farmers' organizations, cooperatives, and other types of farmer institutions. It is through these types of institutions that farmers can form true partnerships with governments, the private sector, and donors. Without such institutions, most farmers in Africa are too small to participate effectively in broad actions in agricultural development affecting their livelihood.

Donors will need to be more willing to be led and coordinated by governments, perhaps with the help of a few donor coordinators, as the African Development Bank has recently observed.[43] The Center for Global Development and the Brookings Institution have also published material pointing out this problem.[44] Having fewer donors would also make sense. This could perhaps be achieved by consolidating some of the many separate bilateral agencies handling agriculture in each donor country and by consolidating some of the multilateral agencies and UN agencies into fewer larger and more efficient agencies providing agricultural aid. Donors should also avoid the type of projects they have supported in the past to help governments create public enterprises to market, process, and supply inputs for agriculture. Rather, they should promote privately and cooperatively owned enterprises to provide these services, or public-private partnerships. Private and cooperative enterprises have a much better track record than do government enterprises not only in Africa but also everywhere in the world.

Climate change impacts need to be dealt with more aggressively than previously thought, beginning now.[45] Preparation for such action to date has not been sufficient. Changes in water availability, temperature, and severe weather need now to be factored into agricultural research, extension, and project planning.[46] The principal needed actions will involve measures in each African country to help farmers adapt to climate change, most often by adapting agricultural practices to temperature changes and changes in water availability. Where these changes are substantial, it may mean abandoning crops that require, for example, lower temperatures and more water in favor of crops that tolerate higher temperatures and less water. It will require agricultural research and extension to find and promote technologies that help farmers adapt their cropping practices to cope with these changes and, where possible, to profit from them. Again, this is likely to be most effectively accomplished through public-private-farmer (and donor) partnerships given the poor government track record and the narrow interest of the private sector.

OECD countries should agree, through the OECD Secretariat, to estimate the costs to African agriculture of OECD country trade and subsidy policy, and either make policy adjustments to mitigate impacts or provide compensation to African countries for negative impacts.

The above constitutes an expanded action agenda for African governments, donors, and OECD countries, which, if undertaken, could achieve the objectives of obtaining faster growth in agriculture, greatly reducing rural poverty, and contributing more to improved nutrition. What is the prognosis for such dramatic change?

43. AfDB (2015).
44. See the Brookings Institution (2015).
45. Schlenker and Lobell predict that in the absence of adaptation measures, climate change will lead to decreases in yields of 8 to 22% for Africa's top rain-fed staple crops. See Schlenker & Lobell (2010).
46. FAO's 2016 report *The State of Food and Agriculture: Climate Change, Agriculture and Food Security* is an excellent summary of the issues of climate change and agriculture, with a comprehensive action agenda.

Combining the good practice of agricultural leaders into country policy and strategy in lagging African countries would be an excellent beginning for accelerated agricultural development in Africa.

There has been little change in the posture of African governments, donors, or OECD countries with respect to agriculture for years. The prognosis at this point for aid is not good, as economic and fiscal constraints are bedeviling most industrial countries and political resistance to aid by industrial country populations is increasing. The one exception to this trend is with respect to climate change where several climate funds have been created (for example, by the World Bank and IFAD) to help developing countries adapt to the effects of climate change.

A few African countries are doing better on some of these action points, though none at the level required. Rwanda has greatly eased constraints on doing business, and private investment has entered its export sector (especially tea). Rwanda has also dramatically improved its nutrition situation. Uganda has improved its ease of doing business, as has Ghana, and private investors have responded. Particularly notable is the vegetable oil sector in Uganda, which is an excellent example of the public-private-farmer-donor partnership extolled in this chapter. Côte d'Ivoire has begun to improve its economic policy and regulatory environment with respect to agriculture, and looks to be rejuvenating its cocoa sector. Nigeria, Zambia, and Ethiopia have taken some small steps with respect to ease of doing business, and Ethiopia's agricultural sector has responded surprisingly well. Ethiopia's floriculture sector is flourishing. Kenya has developed its financial sector in a public-private-donor partnership, which has facilitated capital flows to Kenya's commercial agriculture and to agro-business. Part of Kenya's success with its horticulture sector is in response to its improved climate for private investment in export agriculture and its improved rural finance situation. Burkina Faso has reformed its cotton sector, which appears to be healthy. Tanzania has become more inviting of private domestic and foreign investment.

Each of these countries has achieved higher growth of agriculture in recent years. Each has shown that foreign and domestic investors are willing to invest in agriculture and agro-industry where government policy creates an enabling environment. Each has shown that the private sector is willing to work with reliable governments and donors. These countries provide partial models for what might be done by the many lagging countries that have done nothing in these domains. Combining the good practice of these agricultural leaders into country policy and strategy in lagging African countries would be an excellent beginning for accelerated agricultural development in Africa.

Annex

Table A1: Land productivity, labor productivity, output growth (%), and TFP growth*

	Land productivity (gross production per hectare of agricultural land, constant 2004-2006 US dollars)				Labor productivity (agricultural gross production per economic active person in agriculture, constant 2004-2006 US dollars)				Output growth (%)			TFP growth (%)		
Country/ region	1990	2000	2005	2011	1990	2000	2005	2011	1991-2000	2001-2005	2006-2011	1991-2000	2001-2005	2006-2011
SSA	81	109	128	140	620	680	742	767	3.1	2.9	2.9	1.8	1.3	1.4
Angola	15	24	39	68	258	315	367	473	4.8	6.3	7.9	3.0	4.1	4.7
Benin	395	511	532	630	820	1175	1239	1300	6.1	3.5	1.7	3.3	5.2	0.4
Botswana	8	8	9	12	1055	728	783	913	-0.6	2.3	4.8	-5.2	2.5	4.6
Burkina Faso	110	147	205	190	294	338	363	344	4.4	4.3	1.5	0.2	1.5	-1.6
Burundi	487	396	428	500	412	348	337	230	-0.9	2.8	-3.9	-0.5	-1.2	-6.4
Cameroon	238	325	423	577	700	847	939	1171	3.2	3.8	3.9	1.7	2.6	4.0
Central African Rep.	108	152	158	193	521	643	679	760	3.5	1.7	3.1	2.1	1.3	2.7
Chad	17	23	30	28	456	509	505	515	3.6	3.1	2.3	-0.1	0.7	-0.1
Congo, Dem. Rep.	172	150	147	163	474	320	286	268	-1.8	-0.5	1.8	-2.0	0.3	1.3
Congo, Rep.	20	26	32	40	462	546	615	734	2.9	3.4	3.5	0.9	4.2	4.2
Côte d'Ivoire	209	289	273	306	1422	1823	1935	2240	3.5	1.1	2.5	1.2	3.6	2.4
Ethiopia	82	144	190	244	248	230	247	288	2.6	5.0	5.1	-1.4	2.6	3.2
Gabon	39	48	48	57	991	1179	1235	1615	1.7	0.3	4.5	1.6	-2.8	2.8
Ghana	160	294	352	430	696	907	977	1065	5.7	4.3	4.0	2.5	0.7	2.8
Guinea	73	111	127	147	435	447	491	530	3.7	3.7	2.6	-0.4	2.1	-0.3
Guinea-Bissau	105	130	150	198	437	534	571	620	3.5	2.9	3.5	0.8	0.0	2.2
Kenya	148	165	217	258	505	426	455	485	1.5	4.0	2.3	-0.5	2.2	1.5
Liberia	103	153	160	154	501	530	532	471	3.3	1.3	1.4	2.4	0.2	-1.8
Madagascar	69	65	76	89	624	505	472	477	0.5	2.2	3.7	-0.1	1.3	1.9
Malawi	244	410	324	562	302	450	466	557	5.6	3.1	4.9	4.7	1.9	1.5
Mali	46	47	65	88	759	838	879	1037	3.0	3.7	4.9	1.2	3.5	1.4
Mauritania	9	10	11	12	762	689	675	670	1.7	2.3	2.6	1.0	-0.5	0.3
Mozambique	24	34	40	65	202	246	247	236	5.3	2.2	1.7	3.0	0.9	0.1
Namibia	10	10	12	10	1747	1531	1694	1557	0.1	2.8	-1.2	-1.9	-3.7	0.2
Niger	34	46	56	71	483	584	644	872	5.2	5.9	8.0	1.9	2.4	6.4
Nigeria	235	390	458	471	1368	2249	2642	2943	4.9	4.0	1.9	3.6	2.0	1.9
Rwanda	590	742	830	1223	403	367	397	436	0.7	4.6	4.9	0.1	0.0	1.2
Senegal	101	139	141	129	403	367	335	369	1.5	0.0	1.5	-1.2	-1.5	-1.8
Sierra Leone	153	118	170	234	395	364	443	525	-1.2	8.7	4.4	1.3	5.3	2.4
Somalia	33	33	37	42	738	720	702	708	0.7	1.3	2.0	1.9	-1.6	1.5
South Africa	96	111	118	135	5594	6928	8057	10614	1.3	1.9	2.8	4.3	4.1	3.4
Sudan	31	55	69	0	829	1115	1211	1141	5.0	3.0	0.6	3.9	-1.3	-0.8
Tanzania	116	129	175	222	361	337	397	445	1.8	5.8	4.8	-0.6	2.8	2.1
Togo	151	176	214	247	518	616	603	620	3.8	1.1	2.5	2.5	-1.3	0.6

Source: IFPRI (2016)

Table A1: Land Productivity, Labor Productivity, Output Growth (%), and TFP Growth (%)

Uganda	322	395	418	440	566	595	583	524	2.9	1.9	1.2	0.0	-0.1	0.0
Zambia	36	39	49	73	345	328	369	423	1.4	4.5	4.1	1.3	3.0	2.0
Zimbabwe	121	138	91	101	533	577	510	502	2.2	-3.4	1.0	1.0	3.4	1.4
Algeria	74	94	131	177	1599	1464	1681	1949	2.7	5.4	3.5	2.6	5.4	-1.1
Egypt	4178	5220	5623	6222	1565	2661	2932	3372	4.8	3.3	1.6	2.2	0.8	1.0
Libya	53	66	70	78	6253	10221	11947	15886	2.9	0.0	0.0	5.1	0.0	0.8
Morocco	167	170	224	315	1564	1697	2100	2777	1.2	4.2	3.1	-0.6	3.3	3.4
Tunisia	282	303	353	355	3617	3861	4266	4583	2.2	3.2	2.3	0.4	2.4	1.1
Comparators														
China	447	718	850	1067	717	1073	1249	1823	5.3	2.9	3.7	3.1	3.1	3.1
India	720	922	1034	1370	616	695	714	861	2.6	2.2	4.7	0.8	1.5	3.7
Vietnam	1588	2132	2387	2823	470	729	838	980	5.9	4.8	3.8	0.5	1.8	3.4
Peru	156	279	321	427	1274	1714	1898	2397	5.0	4.2	4.8	3.5	2.9	4.4
Mexico	219	279	319	351	2663	3444	3919	4546	2.9	2.5	1.0	3.2	3.5	1.2

Source: IFPRI (2016)

* Total factor productivity (TFP) is the ratio of total output (crop and livestock products) to total production inputs (land, labor, capital and materials). The output values are the FAO-constructed gross agricultural outputs, measured in constant 2004-2006 US dollars and smoothed using the Hodrick-Prescott filter. Each output value is a composite of 190 crop and livestock commodities aggregated using a constant set of global average prices from 2004-2006. Inputs include agricultural land, measured by the sum, in hectares, of cropland and permanent pasture; labor, measured by the number of animals in cattle equivalents; machinery, measured by the total amount of horsepower available from four-wheel tractors, pedestrian-operated tractors, and combine-threshers in use; and fertilizer, measured by tons of fertilizer nutrients used." (IFPRI 2014).

Table A2: Ease of Doing Business Ranking compared to growth in food production and change in prevalence of malutrition

Country	Ease of doing business rank, with low number best**	Average annual growth in cereal crop yields (tons per hectare) 2000-2011***	Percent change in prevalence of undernourishment, 2000-2014****
Top third in Ease of Doing Business rankings in Africa (2006-2011)			
Mauritius	26	-7.2	-2.1
South Africa	33	3.5	0.0 x
Botswana	46	10.4	-11.5
Namibia	49	2.6	11.9
Tunisia	71	5.2	0.0 x
Kenya	82	0.9	-11.1
Ghana	86	1.8	-12.5
Zambia	91	4.5	4.9
Seychelles	97	n/a	n/a
Uganda	103	2.8	-2.9
Ethiopia	104	4.6	-25.9
Swaziland	104	-2.4	5.1
Nigeria	114	1.2	-2.2
Lesotho	115	-0.7	-1.8
Rwanda	115	8.6	-29.0
Second third in Ease of Doing Business rankings in Africa (2006-2011)			
Tanzania	121	-0.4	-6.7
Morocco	121	14.4	-1.5
Egypt	123	0.0	0.0*
Malawi	125	2.0	-7.9
Algeria	126	4.6	-3.7
Guinea-Bissau	128	2.8	-7.7
Gambia	130	-3.6	-8.8
Mozambique	138	1.7	-16.7
Cape Verde	139	-12.7	-8.3
Madagascar	143	3.2	-1.8

Table A2: Ease of Doing Business Ranking compared to growth in food production and change in prevalence of malutrition

Sudan	143	1.0	n/a
Gabon	147	0.4	0.0*
Zimbabwe	147	-3.9	-10.3
Sierra Leone	152	4.1	-15.7
Togo	155	1.3	-17.8
Cote d'Ivoire	156	0.0	-1.6
Bottom third in Ease of Doing Business rankings in Africa (2006-2011)			
Burkina Faso	156	1.3	-5.9
Mali	157	-0.1	-8.9
Cameroon	158	-0.4	-22.4
Liberia	158	-0.6	-4.6
Senegal	158	0.9	-19.4
Benin	158	2.7	-16.4
Mauritania	159	4.4	-5.9
Guinea	164	-0.1	-10.8
Angola	164	1.8	-36.9
Equatorial Guinea	164	n/a	n/a
Eritrea	166	4.0	n/a
Niger	167	2.5	-13.3
Burundi	168	0.6	n/a
Chad	170	3.5	-5.7
Congo, Rep.	172	0.5	-5.6
Congo, Dem. Rep. of	175	-0.2	n/a
Comparators			
Peru	53	2.1	-14.1
China	88	1.7	-6.9
Vietnam	88	2.5	-17.1

Source: World Bank (2016)
**Adapted from the World Bank Doing Business, Measuring Regulatory Quality and Efficiency; for years 2006 to 2011. See World Bank Group: www.doing business.org/rankings
***FAO Statistical Yearbook, Africa Food and Agriculture, 2014, Accra, Ghana; FAO Statistical Yearbook, 2014 Asia and Pacific For China and Vietnam; and FAO Statistical Yearbook 2014 for Latin America and the Caribbean for Peru.
**** FAO Statistical pocketbook, op. cit. A large decline is positive. The countries with an x already had a low 5 prevalence of under-nourishment in the year 2000. Countries with a + show an increase in the prevalence of undernourishment.

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