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Africa's Food Crisis: Conditioning Trends and Global Development Policy*

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Abstract

African countries continue to face deepening food crises which have been accentuated by the global food, energy and financial crises. This situation is part of a long term structural problem: decades of under-investments in agricultural sector and poor policies of support for smallholder farmers who form the bulk of the farming population. The inability of these farmers to achieve a supply response when commodity prices were high and market access was less of a problem suggests that there are multiple sets of binding constraints that continue to limit the potential of agricultural growth to reduce food security and poverty on the continent. What the continent needs is a smallholder-based green revolution that can help raise agricultural productivity and lift millions out of poverty. Many challenges face the achievement of the green revolution in Africa.

This paper reviews some of the historical trends that have hampered the performance of the agriculture sector. In addition, it reviews the impacts of more recent trends including the global financial crisis, public sector investments, inequities in global agricultural development policies, rush for agricultural lands by foreign investors, domestic commercial financing markets, climate change and emerging carbon markets. The paper argues that while opportunities for accelerated growth exists for African agriculture, new sets of policy instruments will be needed to support smallholder farmers to access new agricultural technologies, finance, reduce impacts of climate change and adopt sustainable land use practices that can allow them to benefit from emerging global carbon markets.

1. Introduction: Africa's Deepening Food Crisis

Long before the current world food crisis, Africa was already in food crisis: one in three people and a third of all children were undernourished and more than one half of all Africans – about 300 million people -- lived on less than one dollar per day. Africa was also the only continent that was increasingly dependent on relief aid from abroad and had the highest projected gap in meeting the MDG goal of halving hunger and poverty by 2015 (Figure 1.1)

The world food problem has turned an already serious long term problem into a catastrophe. Recent assessments show that the aggregate food price index has risen by an average of 60% (Binswanger and McCalla (2008)). The increase in commodity prices is not restricted to food grains and the prices of vegetable oils, sugar, dairy and meat products have also risen. The World Bank now estimates that as a result of these price increases an additional 100 million Africans are being driven further into poverty. Children are especially affected and there is evidence of rising malnutrition as poor households cut back on food consumption.

Undoubtedly, Africa is suffering more than other developing regions from the world food crisis because of its initial high poverty level and its dependence on food imports which are now a major burden on its balance of payments (Figure 1.2). The high cost of food imports and rising domestic food price inflation pose significant fiscal, economic and budgetary challenges for countries, as well as social and political challenges which could wipe out democratic gains in recent times.

Africa did not suddenly unravel into this state. The food crisis on the continent reflects a long term structural problem: poor performance of the agricultural sector, especially the low agricultural productivity for the staple food crops. Africa has some of the lowest levels of cereal yields and labor productivities and these have barely changed in 30 years (Figures 1.3 and 1.4).

Figure 1.1: Projected gaps in achieving the MDG poverty target

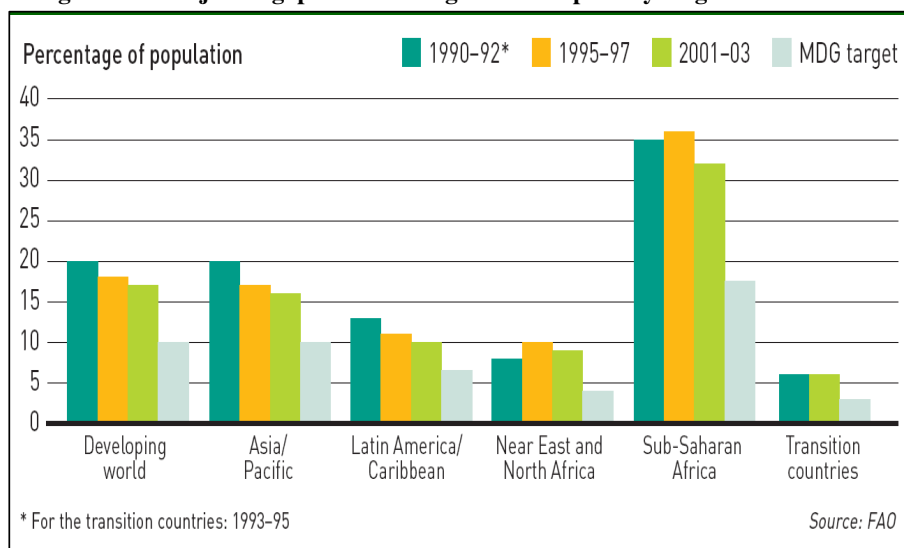
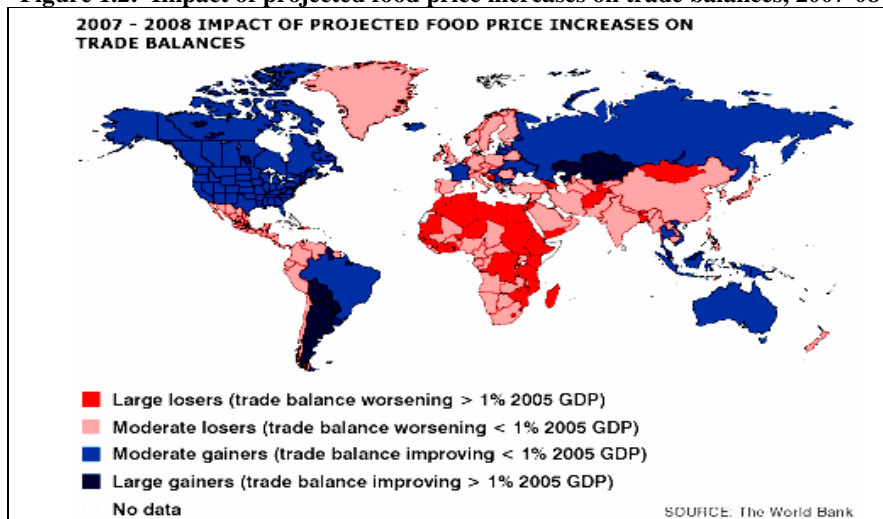
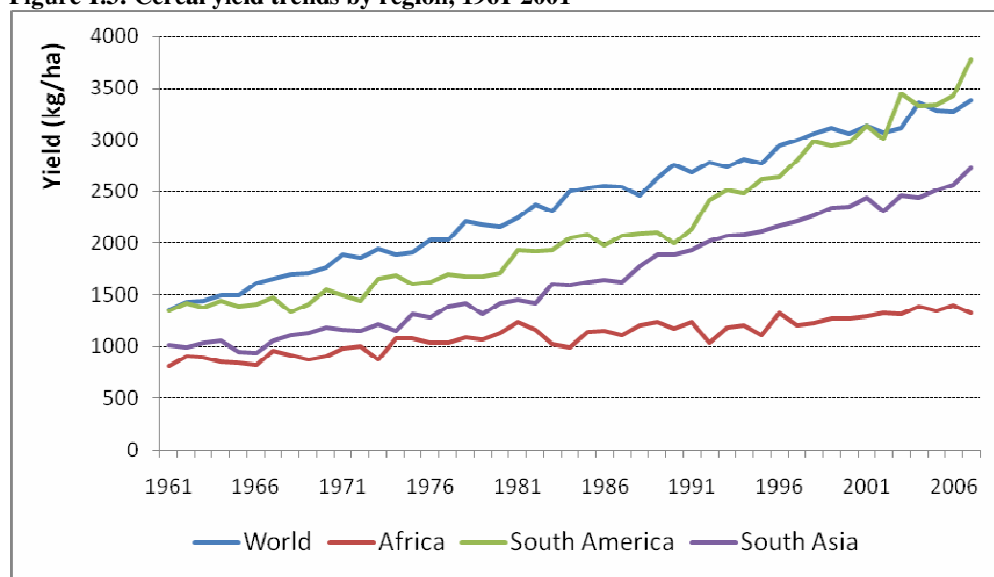


Figure 1.2: Impact of projected food price increases on trade balances, 2007-08



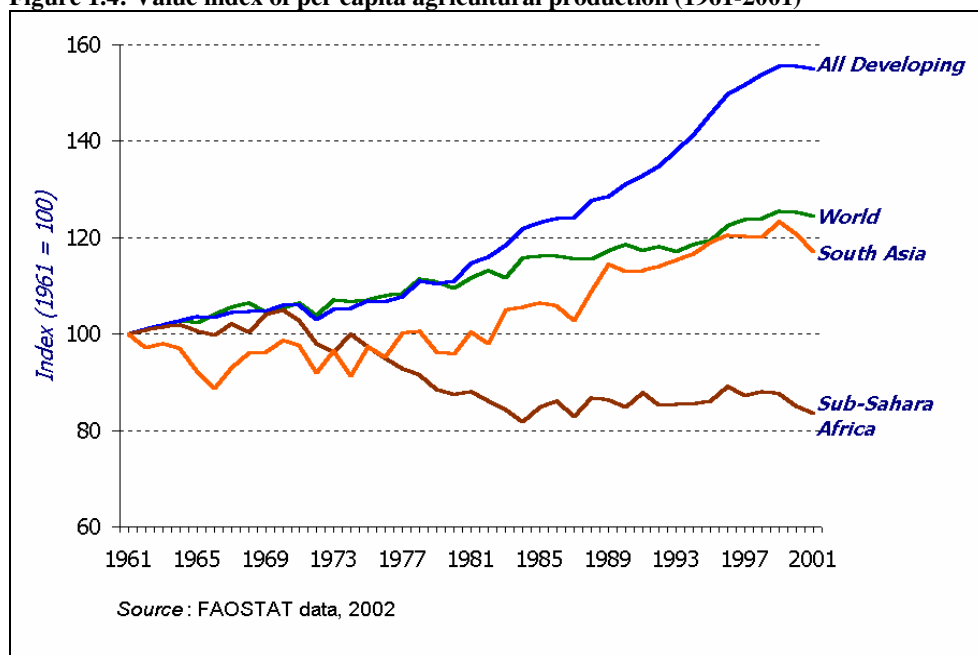
The continent has declining per capita agricultural output levels, especially of staple foods; it has some of the lowest chemical fertilizer use rates, with serious nutrient mining and declining soil fertility; and is losing world market shares for all its traditional export crops (World Bank 2007). While yield gains have been made in more recent times they still fall way below what is needed to feed the rapidly growing population.

Figure 1.3: Cereal yield trends by region, 1961-2001



Source: FAOSTAT

Figure 1.4: Value index of per capita agricultural production (1961-2001)

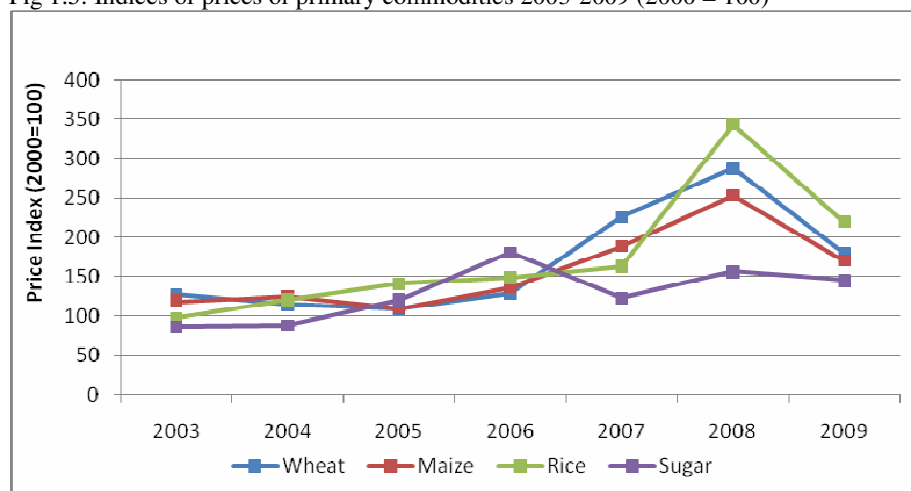


Source: FAOSTAT

Paradoxically, there is enormous potential for agricultural growth in Africa. The continent has abundant arable land (e.g., it has twelve times the land area of India and only half as many people to feed). With few exceptions, the distribution of land is still equitable by international standards and small farms dominate the continent. A rapidly growing labor force (despite HIV/AIDS) suggests a growing scope for adopting higher yielding crops, as well as more labor-intensive technologies and farming systems. Rapid growth in population means that domestic and regional markets for staple food crops offer huge opportunities to help stimulate agricultural growth. Estimates from the International Food Policy Research Institute (IFPRI) show that the size of the staple food crops sector is much larger (estimated at around \$150 billion) compared to traditional and non-traditional export crops (estimated at around \$ 16 billion).

The current food crisis and the associated growth in global demand for biofuels offer Africa an important growth opportunity (ECA/AU 2009). World food prices are already falling from their 2008 peak but are not expected to return to their low and declining pre-crisis levels (Fig 1.5). The OECD and FAO expect world food prices to stabilize at about 30-40 percent higher than before, which, while providing some welcome relief to the poor, will also make agricultural investments more attractive than before. The challenge is whether African farmers will be able to achieve significant supply response to take advantage of the new opportunities offered by the changing global landscape for food.

Fig 1.5: Indices of prices of primary commodities 2003-2009 (2000 = 100)



Source: UNCTAD (2008)

In this context, increasing the productivity of smallholder farmers in Sub-Saharan Africa is both an imperative and an opportunity for enhancing food security, accelerating pro-poor growth, and responding to new pressures such as high energy and food prices. IFPRI research shows that doubling the productivity of food staples across Africa by 2015 would raise average GDP growth to 5.5 percent per annum, lift over 70 million people out of poverty, and turn Africa from a food deficit to a surplus region with 20-40 percent lower food prices (Diao et al. 2008).

The main objective of this paper is to review the situation of food production in Africa and some of the conditioning factors which have implications for global development policies. Before delving into the development trends that are contributing to the deepening food crisis in Africa, the next section looks at some lessons from the Asia green revolution and earlier attempts to achieve a green revolution in Africa and some of the factors that constrained success. This is followed by a discussion of the changing domestic and global landscapes of agriculture that are currently impacting on African agriculture, including global development finance, domestic support to agriculture, inequity in global policies of support for agriculture, foreign direct investments, 'land grabs', climate change the evolving carbon markets. The paper ends with concluding remarks on how to better shape global development policies to enable African agriculture to play its role in helping to feed itself and the rest of the world.

2. Lessons from Asia Green Revolution and Earlier Attempts in Africa

Asia faced a crippling food crisis situation in the 1960s and early 1970s. The rapid population growth and low productivity of agriculture posed a nexus of challenges for national governments that included the threat of widespread famine. Asian countries embarked on a massive program to raise agricultural productivity for their food crops. Rapid investments were made in agricultural research to develop short-statured high yielding varieties of wheat and rice. Governments supported the adoption of fertilizers and invested heavily in irrigation. Price supports were used to raise price incentives for farmers. The result was dramatic: millions of farmers rapidly adopted

the high yielding new varieties of wheat and rice. As yields doubled and tripled, Asia experienced the green revolution which turned around the looming food crisis. Governments also supported farmers with subsidies to promote adoption of the green revolution technologies. For example in India, the government invested in a series of complementary investments, including irrigation, roads, education and subsidies for irrigation, fertilizers, energy and credit . The rates of return to these investments were very high in the early stages of the green revolution, although some have declined since the 1980s (Table 2.1).

Table 2.1: Returns to agricultural growth and poverty reduction from investments in public goods and subsidies in different phases of the Asian green revolution

	1960s	1970s	1980s	1990s
<u>Returns in Agric GDP (Rupees per Rupees spent)</u>				
Road investment	8.79	3.8	3.03	3.17
Educational investment	5.97	7.8	3.88	1.53
Irrigation investment	2.65	2.1	3.61	1.41
Irrigation subsidies	2.24	1.22	2.38	NS
Fertilizer subsidies	2.41	3.03	0.88	0.53
Power subsidies	1.18	0.95	1.66	0.58
Credit subsidies	3.86	1.68	5.2	0.89
Agricultural R&D	3.12	5.9	6.95	6.93
<u>Decrease in the number of poor people per million Rupees spent</u>				
Road investment	1272	1346	295	335
Educational investment	411	469	447	109
Irrigation investment	182	125	197	67
Irrigation subsidies	149	68	113	ns
Fertilizer subsidies	166	181	48	24
Power subsidies	79	52	83	27
Credit subsidies	257	93	259	42
Agricultural R&D	207	326	345	323

Source: Fan, S., Gulati, A., and Thorat, S (2007). Investments, subsidies and pro-poor growth in rural India. International Food Policy Research Institute. IFPRI Discussion Paper 00716.

The green revolution in Asia bypassed Africa for a number of reasons. First, wheat and rice (the crops of the green revolution) are not the major food crops in Africa, where farming systems are dominated by root and tuber crops and sorghum, millet, maize and pulses. These crops are more difficult to improve than wheat and rice. Second, Africa has more diverse agro-ecologies than Asia, so one-size-fits all technical change is impossible to achieve. Third, while the Asian green revolution largely occurred within homogenous irrigated-farming systems, African agriculture is dominated by diverse rain-fed systems, with less than 5% of the arable land irrigated (Table 2.2) compared to over 45% of irrigated arable land in Asia. Market infrastructure was also much better developed in Asia, where close to 55% of rural population were within less than one hour of a market, compared to 20% in Africa. These weak fundamentals together with lack of appropriate institutional policies partly contributed to the limited successes of three past attempts to bring about a green revolution in Africa.

Table 2.2: Irrigated land in farming systems in Africa in 2000

Farming Systems	Land Use('000 ha)	Irrigation('000 ha)	Percent Irrigated
Cereal/root crop mixed	62,874	163	0.26
Highland Perennial	3,890	79	2.03
Maize mixed	108,629	360	0.33
Root crop	11,525	37	0.32
Forest based	38,594	27	0.07
Tree crop	49,289	182	0.37
Agro-pastoral	8,050	71	0.88
Sparse (arid)	111,395	1,145	1.03
Large commercial	99,640	1,498	1.50
Irrigated	3,291	3,291	100.00
Africa total	1,101,166	12,680	1.15

Source: Compiled from FAO (2003)

The successful experience with hybrid maize in Eastern and Southern Africa in the 1980s was the first experience. From Malawi to Zambia, Zimbabwe and Kenya, smallholder farmers rapidly adopted improved varieties of maize and fertilizers. As yields increased, smallholder farmers became efficient producers of maize and were more efficient than the historically well supported large scale commercial farmers under the dualist agricultural systems in those countries. The transformation occurred because of strong state support for smallholder agriculture, especially in terms of agricultural research, extension, improved access to credit, guaranteed minimum prices and subsidies for improved seeds and fertilizers. As technical change process drove rural income growth and employment, development experts dubbed it the “emerging maize revolution” in Africa. Unfortunately this was scuttled by the imposition of structural adjustment programs (discussed in Section 3.1).

The second attempt was the Sasakawa Global 2000 (SG2000) program, which worked with governments in a number of countries to provide high-input technological packages, including free seeds and fertilizers to farmers in pilot areas to demonstrate the benefits of technologies. The program was highly successful in spreading the adoption of new crop varieties and fertilizers and significantly raised cereal yields. From Mali to Ethiopia and Malawi the program recorded exceptionally high yields. But it soon faced challenges because it did not consider marketing and policy support systems, the increased production quickly led to price collapse. In Ethiopia, maize prices collapsed by over 80% in 2002 and farmers who had earlier adopted improved high-input packages stopped using these technologies due to low profitability.

Thirdly, the Millennium Village Project (MVP) also tried to raise agricultural productivity in a number of African countries. This integrated rural development model provided free seeds and fertilizers for farmers; demonstration of new technologies; focused on village level interventions; and expansion of efforts into integrated rural development, including focusing on health, nutrition and education. Farmers rapidly adopted the improved crop varieties across the Millennium villages, crop yields rose significantly, sometimes by as much as 400%. Policy, market and institutional support systems would be needed to take such benefits to scale and ensure sustainability.

Currently, the Alliance for a Green Revolution (AGRA), created by the Rockefeller Foundation and the Bill and Melinda Gates Foundation is spearheading an integrated value chain effort for a smallholder driven green revolution, with initial investment of \$400 million in programs covering development of improved seeds, soil fertility, and market access, backed by a strong focus on

improving the policy environment. Although AGRA's strategy is designed to take into account previous experiences and a deeper understanding of historical policy and institutional conditions that have limited or scuttled gains in agricultural growth, success will be largely influenced by the current continental and global agricultural policy and development changes conditioning agricultural development in Africa. The evolution and impacts of these changing landscapes are discussed in the next two Sections.

3. Factors that Contributed to the Decline in Agricultural Growth in Africa

Discussed below are four factors which have had major impacts on smallholder farmers in Africa. Acting together, they have left the vast majority of Africa's small farmers saddled with low-productivity technologies, poor transport and market access, limited and costly access to modern inputs, and considerable exposure to the vagaries of weather and market shocks. The outcome of all these factors is that large numbers of Africa's small farmers are now trapped in poverty. Breaking out of these poverty traps will require a major rethink on package of public investments and policy changes that can help unlock the potential of African agriculture.

3.1 Structural adjustment in Africa

Initiated in the 1980s by the World Bank and the IMF, structural adjustment was designed to reduce the role of government, cut back on public sector expenditures, improve balance of payments, reduce government deficits, enhance macroeconomic performance and help African countries to achieve higher economic growth rates. The key elements of the policy reform included macroeconomic reforms, privatization of government agencies, liberalizations of markets, removal of the government from the agricultural markets, and elimination of subsidies. Because the policy reforms devalued currencies, reduced taxation on agriculture and raised producer prices (Kherallah et al, 2002), they generated significant positive benefits for farmers in the tradable sectors, especially cash crops. But for smallholder farmers producing staple foods for domestic markets, the net effect of the structural adjustment has been largely negative - as exemplified by the collapse of the hybrid maize green revolution in eastern and southern Africa mentioned above. Competition from low cost and often subsidized food imports, reduced access to credit at affordable rates, and the removal of input subsidies have led to a dramatic reduction in the adoption of modern crop varieties and fertilizers. As noted by Nobel Prize laureate Norman Borlaug; "*The high cost of fertilizers has been especially pernicious*" (Hesser, 2006). In several cases, farmers, who had earlier adopted modern varieties, discontinued the uses of modern varieties and chemical fertilizers (Kosura and Karugia, 2005). While recent growth in the use of fertilizers in Kenya is often touted as the success story of market liberalization (Ariga, et al, 2006), the evidence is vastly different for other African countries where the use of improved seeds and fertilizers have declined. Even in Kenya, the use of fertilizers has declined with the recent rapid increases in fertilizer prices leaving the country with looming huge food deficits. Taking out the public sector out of supporting farmers has turned out to be a costly mistake for African countries as prices of farm inputs have skyrocketed leaving many farmers poorer than before and more vulnerable.

3.2 Decline in global support for investments in African agriculture

Donor support for agriculture also declined precipitously. As domestic budgets tightened, investments declined in agricultural research and other public goods such as irrigation, rural roads and rural electrification. Low investment has also eroded civil service salaries, immobilized extension and research staff, diminished staff incentives, and fueled an exodus of senior scientists from public research institutions (Pardey et al., 2006).

The low level of investment in agriculture in Africa was strongly correlated with the decline in Official Development Assistance (ODA) for agriculture. As bilateral and multilateral donors shifted emphasis in the 1990s towards the social sectors, especially health and education, the share of agriculture in overall ODA declined across African countries (Table 3.1). Yet, evidence has shown that the rates of return to public expenditures are high in agriculture due to its growth and poverty reduction effects. Fan et al (2009) show that the rates of return to public investment in agriculture exceed those from health, education and roads (Table 3.2).

Table 3.1: Agricultural aid as a percentage of total aid, selected sub-Saharan African countries, 2002-2006

Country	2002	2003	2004	2005	2006
Botswana	1.64	1.00	0.87	0.97	0.74
Burkina Faso	5.50	8.35	7.23	7.63	7.87
Cameroon	2.87	1.00	1.36	2.94	1.45
Cote d'Ivoire	0.85	1.29	1.29	0.94	4.24
Ethiopia	4.82	3.30	1.97	2.08	2.83
Ghana	3.56	4.32	1.79	4.10	5.80
Kenya	5.17	4.42	3.59	2.86	4.33
Malawi	3.88	6.37	3.93	8.72	5.28
Mali	6.46	4.62	6.71	6.78	5.29
Nigeria	1.24	1.91	0.83	0.12	0.05
Togo	3.30	4.63	3.53	2.49	1.40
Uganda	2.99	3.16	5.08	4.96	5.18
Zambia	3.96	2.29	1.33	1.80	2.51

Source: Statistical portal of the Organization for Economic Cooperation and Development (OECD). Adapted from Fan et al. 2009.

Table 3.2. Returns to public spending in Africa and Asia

Returns to agriculture or rural income (local currency/local currency spending)							
Sector	Ghana	Uganda	Tanzania	Ethiopia	China	India	Thailand
Agriculture	16.8	12.4	12.5	0.14	6.8	13.5	12.6
Education	-0.2	7.2	9.0	0.56	2.2	1.4	2.1
Health	1.3	0.9	n.e.	-0.03	n.e.	0.8	n.e.
Roads	8.8	2.7	9.1	4.22	1.7	5.3	0.9
Ranking in returns to poverty reduction							
Agriculture	n.e.	1	2	n.e.	2	2	1
Education	n.e.	3	1	n.e.	1	3	3
Health	n.e.	4	n.e.	n.e.	n.e.	4	n.e.
Roads	n.e.	2	3	n.e.	3	1	2

Source: Fan et al. 2009.

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3.3 Poorly developed markets and low prices for agricultural products

Investment in agricultural technologies is driven by the nature of incentives. Output prices play a significant role, as well as the ratio between output and input prices. Unfortunately, because of poorly developed markets and high transport costs, output prices have remained low and variable, with a more rapid increase in prices for agricultural inputs. Poorly developed rural input markets raise transaction costs for farmers and make it difficult to access improved seeds, fertilizers and other agricultural inputs. High tariff and non-tariff barriers reduced intraregional trade flows leading to greater price volatility. More open intra-regional trade between African countries offers important opportunities to exploit differences in comparative advantages, achieve greater scale economies in marketing and to help stabilize food supplies in the face of adverse weather events at country levels. Expanding regional markets can serve as a vent for surpluses which can help reduce the thinness of domestic markets and likelihood of price collapse from raising agricultural productivity in the absence of wider markets. A recent IFPRI study shows that if Africa were to double its cereals production over the next 5 years, then average farm gate prices would fall by 40% if current intra-regional trade barriers and transport costs prevail, but by only 10% if regional trade were fully liberalized and investments in infrastructure were made to bring transport costs down (Diao et al., 2008). This translates into very different outcomes for farmers; farm incomes increase when prices fall 10% because their unit production costs fall by more than 10%, but they are net losers if prices fall 40%.

As shown in Table 3.3 the size of the intra-regional trade in East and Central Africa is still small, estimated at \$300 million or 1.5% of total value of trade. Several factors are limiting intra-regional trade in food staples. One is poor infrastructure and high transport costs, and this requires long term investments. Another factor is the bulky nature and perishability of many of Africa's staple food crops. Processing and value addition will be needed to transform several of these crops into a wider range of products for which there is relatively high demand (e.g., processed cereals, processed foods targeted to growing ethnic food markets, livestock feed, etc.) in local, regional and international markets. However, the greatest scope lies with regional markets.

Table 3.3: Value, destination and composition of agricultural trade, 1996-2000, East and Central Africa (ECA)

Traded items and destination	Value (\$billions)	Share (%)
<i>Domestic market for food staples</i>	15.9	78.7
Traditional exports to non-ECA countries	2.4	11.9
Non-traditional exports to non-ECA countries	1.3	6.4
Other exports to non-ECA countries	0.3	1.5
<i>Cross-border trade with the ECA</i>	0.3	1.5
TOTAL	20.2	100

Source: Omamo, W., Diao, X., et al. (2006). Strategic priorities for agricultural development in eastern and central Africa. IFPRI Research Report 150.

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3.4 Weak political will to support agriculture

Underlying these negative factors was a lack of political will amongst Africa's senior policy makers and donors towards agricultural development. This is now changing with the adoption of the Comprehensive African Agricultural Development Program (CAADP) by African governments under which countries committed themselves to invest at least 10% of their national

budgets into agriculture. While many of these pledges have yet to be realized, nevertheless some individual countries have made substantial increases in their spending on agriculture (e.g. Ethiopia, Malawi, Uganda and Nigeria). The world food crisis, which created social and political upheavals in many African countries, appears to have become a tipping point to a renewal of attention towards greater focus and investments in agriculture.

4. New Trends that Impact on African Agriculture

But new developments are emerging which will further influence the ability of Africa to transform its agricultural sector. The rest of this paper will review some of these trends and discuss their expected effects on agricultural development in Africa, with implications for global development policy agenda.

4.1 Renewed support for African agriculture

The worsening current account deficits arising from the combined effects of food, energy and financial crises have made it more difficult for many governments to meet their expected investment targets.

While African governments are expanding support to agriculture, there is still much need for significant increase in ODA support to African agriculture. Estimates from IFPRI show that 33-39 billion dollars of agricultural investments will be needed to achieve the MGD targets by 2015. The recent decision by the G8 to expand support to agriculture in Africa, with promised support of \$15 billion, is a positive development. The World Bank has doubled its investments in agriculture in Africa from \$400 million to \$800 million. IFAD and the African Development Bank have also expanded lending to the agricultural sector in African countries. The challenge is where to focus these new investments. Given years of underinvestment in critical public goods, a significant share of these investments should go into the provision of support for agricultural research and extension, rural roads, energy, infrastructure and irrigation, all of which are critical for stimulating growth. Concentrating ODA funds on public goods will free up domestic resources to focus on providing support to smallholder farmers to take advantage of new agricultural technologies to raise agricultural productivity. It is also equally important that these new investments focus on the breadbasket areas of African countries – regions with good agro-climatic conditions, relatively good infrastructure and high population densities, where returns to agricultural investments would be much higher. Expanding food production in these areas will lead to more rapid successes for the agricultural sector, galvanize greater political and financial support, reduce food price inflation and benefit consumers and producers.

4.2 Global inequality on agricultural policies: support for the rich, abandonment for the poor

The inability of African farmers to achieve a supply response to take advantage of the high commodity prices from the food crisis reflects a mix of underlying challenges: binding capital constraints, deep poverty, lack of access to new technologies and poor infrastructure which continue to limit the production response capacity of farmers. At the heart of this is the lack of provision of support to smallholder farmers. While farmers in the rich countries continue to receive subsidies poor farmers in Africa continue to languish with lack of comprehensive support packages that would help unlock them from productivity and poverty traps.

The global landscape on agricultural policy perpetuates income inequality. Farmers in developed nations (where agriculture is a miniscule share of their GDP) receive the highest levels of support,

but poor African countries (where agriculture accounts for high shares of GDP) receive no support. For example, the share of agriculture in the GDP is extremely low in many of the OECD countries, ranging from 1% for USA, UK and Germany, to 2% in Japan, Italy and France. However, farmers in these countries receive the highest level of subsidies, in some cases as high as 62% of gross farm receipts. Estimates of agricultural subsidies as shares of agricultural GDP are high: USA (25%); UK (22%); Italy (20%); Germany (30%) and France (29%) (Figure 4.1).

The inequalities become even starker when one examines the extent of agricultural subsidies per hectare of cultivated land (Figure 4.2). Developed economies have the highest levels of subsidies per hectare: Japan (\$905); UK (\$360); Italy (\$567); Germany (\$583); and France (\$501). The picture is different in sub-Saharan Africa: Ghana (\$ 4); Kenya (\$6); Tanzania (\$4). Malawi, where most of the recent debate on subsidies in Africa focuses, provides only \$43 per hectare. The continued high support for rich farmers in the developed economies, while denying poor farmers in Africa much needed support, perpetuates poverty in Africa.

The issue now is no longer about whether farmers in Africa need subsidies. A recent study by Sanchez (2009) shows it is much cheaper to support poor farmers to produce food than either importing the food or delivering it through food aid. The study indicates that it costs \$135 per ton to produce maize when farmers are supported to produce the food locally; \$320 per ton is the food is to be purchased locally from another African country and distributed where needed; and \$812 to buy, ship and distribute a ton of US maize in Africa.

Fig 4.1. The Role of Agriculture in the Economy and Agricultural Subsidy in Selected OECD and SSA Countries

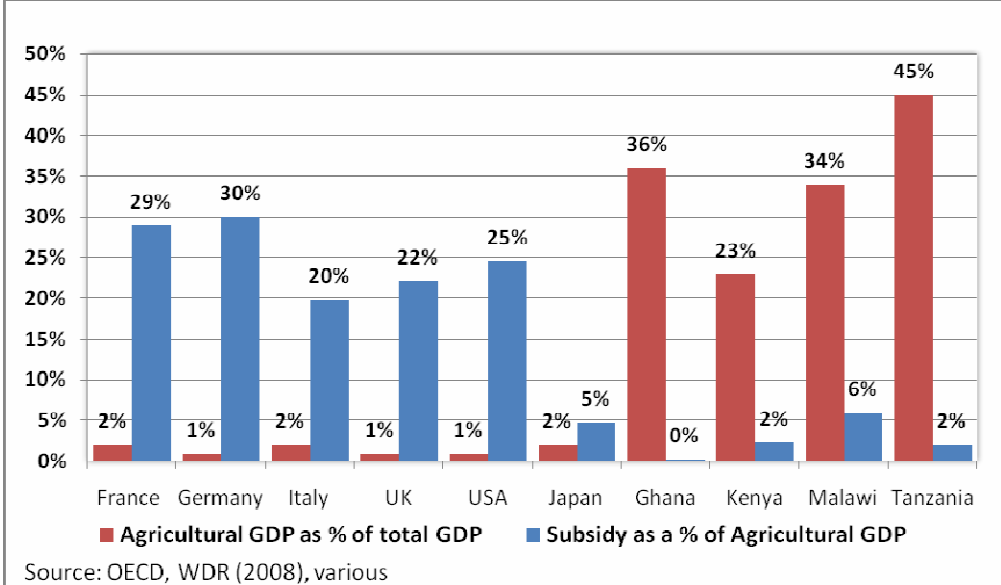
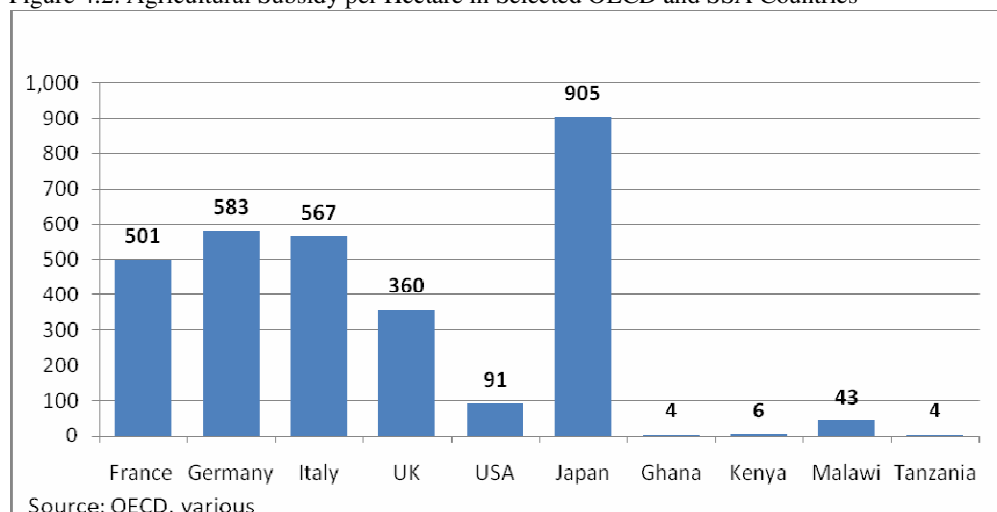


Figure 4.2: Agricultural Subsidy per Hectare in Selected OECD and SSA Countries



What is needed is a rethink of the role of the state and how to develop effective public –private partnerships in developing and expanding fertilizer markets, while reducing distortions and inefficiencies through better institutional arrangements for delivery of subsidies and monitoring and evaluation of impacts of subsidy programs. Many African governments are doing this now. The Nigerian government has initiated a phasing out of the traditional general price subsidies and moving towards the use of smart subsidies with use of vouchers for farmers, starting with pilots in few states. The Tanzanian government has moved away from its traditional approach of subsidizing transportation of fertilizers to regional warehouses to the use of smart subsidies and vouchers. The World Bank will be supporting a national roll out of the smart subsidy program with \$160 million. To strengthen this AGRA is supporting the development of an extensive network of agro-dealers across over 50 districts. Rwanda’s success with the use of smart subsidies has been credited for the rapid agricultural productivity experienced by its smallholder farmers. Malawi is experiencing a phenomenal revolution: transforming a once poor and food insecure nation to a breadbasket for Africa, for 4 years running (Denning et al, 2009). Assessments of the subsidy program show that it led to increased agricultural productivity; maize food security at household levels; increased nutrition and rural employment (Dorward et al., 2008). As food production grew, food price inflation declined, with Malawi experiencing a 7% economic growth rate – one of the highest in the world.

While many countries are now moving towards the use of smart subsidies, what is less clear is agreement of the objectives being pursued – whether subsidies are being used to meet social objectives such as food safety nets; to stimulate agricultural growth to meet national food security; or to promote pro-poor growth? Clearly, the types of policy instruments to be used depend on the objectives being pursued. While fertilizer subsidies may be useful for promoting agricultural growth objectives, they may not be the most efficient and effective way for promoting social safety net objectives, which may be better done via conditional income transfers. Other policy challenges include how to target support to farmers much better to enhance cost effectiveness and assure that the benefits reach poor smallholder farmers;

improvement of technical efficiencies in the use of inputs through better targeting of appropriate seeds and fertilizers and improvement of agronomic efficiencies; how to ensure that subsidies do not displace investment in critical public goods such as rural roads, research and extension and irrigation; and most importantly, how to ensure that there are clear exit strategies for subsidies once they have achieved their objectives.

Africa should learn from these experiences in Asia. Traditional general price subsidies have not worked in Africa due to problems of elite capture, distortion of private markets, promotion of inefficient use of fertilizers, especially in areas where rates of returns to fertilizer use are low and cross-border leakages of fertilizers between countries due to differential subsidy and exchange rates. Equally critical is the need to recognize that fertilizer subsidies alone will not solve the problems of low-productivity traps of farmers and there is need for significant complementary investments in rural infrastructure, irrigation and rural roads, all of which provide public goods and significant returns. What is needed is a sensible balance between support for farmers to access and use improved seeds and fertilizers and investments in public goods.

4.3 Global financial crisis, economic growth and agriculture

Africa has been experiencing rapid growth in foreign direct investments ahead of the global financial crisis due to sound macroeconomic and regulatory policies (Strauss-Kahn, 2009). For example, foreign direct investments rose from \$13 billion in 2004 to \$33 billion in 2007. Equity flows reached an all time high of \$15 billion in 2006. Private equity and debt flows rose to \$53 billion in 2007 (IMF, 2008; Marcia and Massa, 2009). While the first round effects of the global financial crisis have been minimal, the second round effects are already impacting on African economies, with implications for the agricultural sectors. These include (IMF, 2009): contraction in demand for commodities and consequent slump in commodity prices; increase in credit risks and tightening of lending to emerging markets; increased volatility in some local financial markets that are exposed to foreign equity investments (e.g., Nigeria, Kenya and Uganda); and decline in lending to domestic subsidiaries of foreign banks etc. The demand for agricultural commodities, which had peaked during the food crisis, is weakening due to contraction in economic growth in developed countries. The slowing demand is predicted to affect the growth rates of African economies which are estimated to drop from 6.9% in 2007 and 5.5% in 2008 to only 1.7% in 2009 (Marcia and Massa, 2009). Remittances have continued to play a significant role in expanding domestic resource availability. Remittances to sub-Saharan Africa grew from \$4.4 billion in 1999 to \$8 billion in 2004 and reached an all-time high of \$11 billion in 2007. The contraction of economies in the developed countries, rising unemployment and decline in wages and disposable incomes are leading to a decline in remittances.

Africa's debt situation improved significantly over the past decade as countries embraced good macroeconomic and fiscal policies and budget reforms. This was reinforced by the implementation of debt cancellation programs. As a result total debt in Africa declined from \$279 billion in 2000 to \$260 billion in 2007. Total debt service ratio (as a % of exports on goods and services) declined from 17.5% in 2000 to 5.6% in 2009 (ECA/AU, 2009). However, total debt levels have risen to \$300 billion in 2009 as a result of the combined effects of food and global financial crises. Growing budget and balance of payment deficits facing several African countries, especially oil-importing food deficit countries, and the decline in global commodity prices for major primary agricultural exports, may further reduce investments, domestic savings and available resources for investments in agriculture, infrastructure and social sectors. Analysis by Marcias and Massa (2009) showed that a contraction of FDI by 10% is expected to lead to a reduction in per capita income growth by 0.5% or an estimated loss of \$5 billion in output in sub-

Saharan Africa. Since agriculture accounts for a large share of GDP in many African countries, and relies heavily on remittances, it is likely that agricultural sector will be even further weakened as governments pull back on much needed public investments and support to farmers – and as remittances decline to support investments in productive assets and farm inputs.

4.4 Domestic financial sectors and smallholder farmers

Lack of access to finance is a major constraint to unlocking the potential of agriculture in Africa. Despite the economic positive growth witnessed by many countries in the last decade, averaging over 5% annually, the agriculture sector continues to lag behind in many countries. While the commercial finance sector has been rapidly growing, the agricultural sector continues to receive less than this share of total lending. For example, less than 1% of the total commercial lending in Tanzania goes to agriculture and in Kenya, the share of total lending to agriculture has declined from 5% to 3% over the past few years. In West Africa Monetary and Economic Union less than 3% of total commercial bank lending goes into agriculture – yet in many of these countries and regions agriculture accounts for between 50-70% of the GDP. While increased official development assistance will continue to be needed to meet development financing gap to achieve the green revolution in Africa, huge opportunities exist to leverage a significant share of this amount from local financial markets. While there exists significant excess financial liquidity in local financial institutions, commercial banks do not lend to agriculture for several reasons. These include the high dispersion of farmers which increase lending and recollection costs; high level of covariate risks as farmers in a given location are often subject to the same sets of risks – both climatic and price; lack of acceptable collaterals by applicants; seasonality and low profitability of smallholder agriculture; lack of risk mitigating instruments to lower risk of lending to poor farmers; and high costs of borrowing money on capital markets which leads to higher interest rate charges for farmers.

One alternative for accessing finance for farmers is to rely on microfinance institutions. Despite the spread of microfinance institutions in Africa they do not lend much to agriculture. Interest rates charged by microfinance institutions are extremely high – in Uganda and Tanzania this can be as high as 35-48% annually, well beyond the reach of poor farmers. They lend small amounts often not appropriate for the needs of agriculture. Repayment schedules do not synchronize well with seasonal nature of agriculture. Loan durations are also too short (6-8 months) to be useful for farmers. While microfinance institutions experienced rapid growth rates in the 1990s in the rural space, many have become increasingly like commercial banks, emphasizing short term loans and deposits, but yet to develop appropriate lending products for farmers.

The severe commercial bank financing constraint is pushing some countries to consider reactivating national agricultural banks (e.g. Uganda, Nigeria and Tanzania). Such state-led development banks have a poor history in Africa. New institutional innovations and policies are needed to leverage commercial financing into smallholder agriculture. These should include (a) reducing the high perceived risks of lending to agriculture, especially through the use of loan guarantees; (b) encouraging banks to develop commercial lending operations in the rural space to mobilize savings and provide credit; (c) developing more appropriate loan products that can serve the needs of farmers and the entire agricultural value chain; (d) improving credit policies that synchronize credit needs with the seasonal nature of agriculture, especially disbursements and repayment schedules; and (e) providing financial literacy to farmers in managing farming as a business, as well as credit management. Recent use of loan guarantees being spearheaded by AGRA is beginning to show successes in leveraging commercial banks to lend to agriculture in East Africa. With the use of \$16 million in loan guarantees for commercial banks, AGRA has been able to leverage \$170 million in market-based and affordable loans for smallholder farmers

and agricultural value chains that support them in Tanzania, Uganda, Kenya, Mozambique and Ghana. What is needed now is to scale up commercial bank lending to the agriculture sector through the development of markets for risk sharing instruments. By reducing part of the risk of lending by banks, it will be possible to leverage substantial flows of funds in support of agriculture across the value chain and allow African farmers to secure the financing they need to participate more effectively in meeting national, regional and global food needs.

4.5 “Land Grab”: new challenges for smallholder farmers

One of the major trends affecting agriculture in Africa today with implications for global agriculture is the recent rush to secure lands for food production from Africa to feed rich but resource-poor emerging economies. IFPRI estimates that between 15 and 20 million ha of farmland has been involved in these transactions, worth about \$20-30 billion. While low wage emerging economies benefitted from the industrial outsourcing revolution, Africa could benefit from the new wave of global food outsourcing. Several factors influence this accelerating demand for farm lands. Rising land prices in the developed countries, due to the food crisis and the commodity price increases, have increased the cost of food production. Demand for land for use in biofuels production has risen and companies are looking elsewhere for low cost lands in developing countries to produce crops for use in biofuels production. Rising population and increased demand for food in places like China and India, where increases in per capita income is driving demand for high value foods such as dairy, meat, eggs and horticulture, is pushing such countries to look elsewhere to meet their food needs. The volatility of the global commodity markets, uncertainties arising from export bans on foods during the peak of the food crisis and fear of reliance on thin global food markets, drives countries to look for barter trade models to secure their food supplies. Increasingly water-constrained countries in oil-rich countries such as Saudi Arabia, United Arab Emirates, and Qatar etc are investing billions of dollars acquiring lands in Africa to secure their food supplies. The same applies to China and India which are experiencing yield plateaus due to declining water tables, high cost of irrigation and limited response to use of mineral fertilizers (Songwe and Deininger, 2009).

The land transactions vary across countries, depending on whether they are private sector to government (Table 4.1) or government to government (Table 4.2).

Table 4.1: Selected "Land Grabs" in African Countries: Private to Government

Country	Investor Country	Amount (ha)	Sectors	Amount (\$)
Angola	Lourho (UK)	25,000	Rice	NA
Malawi	Lourho (UK)	125,000	NA	NA
Democratic Republic of Congo	Agriculture South Africa (South Africa)	10,000,000	NA	NA
Ethiopia	N.A. (Saudi Arabia)	1,700,00*	NA	100,000,000
Madagascar	Daewoo (South Korea)	1,300,000	Maize	NA
Nigeria	Trans4mation Agric Tech Ltd. (UK)	10,000	NA	NA
Sudan	Jurch Capital (USA)	400,000	NA	NA

Source: Von Braun, J. and Meinzen-Dick, R (2009); *Daily Nation, Aug 14, 2009

Table 4.2 Table: Selected "Land Grabs" in African Countries: Government to Government

Country	Investor Country	Amount (ha)	Sectors	Amount (\$)
Ethiopia	India		Agriculture Flowers Sugar Estates	\$ 4 billion
Kenya	Qatar	40,000	Fruits Vegetables	\$ 4 billion (for port construction)
Sudan	Egypt	2,000,000	wheat	
Sudan	Jordan	25,000	livestock Crops	
Sudan	Saudi Arabia	9,200 - 19117	Wheat, Vegetables, Livestock,	
Sudan	South Korea	690,000	wheat	
Sudan	UAEL (Abu Dhabi Fund for Development)	30,000	Corn, Alfafa, Wheat, Potatoes, beans	
Tanzania	Saudi Arabia	500,000	Potatoes, beans	
Zambia	China	2,000,000	Jathropa, (Biofuel)	

Source: Von Braun, J. and Meinzen-Dick, R (2009)

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While it cannot be denied that Africa needs significant private investments in the agricultural sector, the rush for land in Africa has several potential challenges. It has raised the specter of reliance on large scale agriculture to feed Africa. Nigeria, for example, recently launched as the major pillar of its agricultural strategy a Commercial Agriculture Program, which is being supported with a \$ 2 billion financing facility from the Central Bank of Nigeria. This is to support large scale commercial agriculture, yet smallholder farmers form over 80% of farmers. This ignores the poor history of large scale agriculture. Evidence from the literature has shown that small farms are not inefficient: in many cases they are even more efficient, technically and economically, than large farms. The inverse relation between farm size and productivity is often due to inefficiency in the use of land and labor by large farms.

The land transactions ignore smallholder farmers (except when they use out-grower schemes). Government land transactions often encroach upon and give away communal lands without consultations. Because many of such lands are not under legal title deeds, the poor risk being expropriated of their lands. Forced evictions or compensation of lands taken from communities are not done in transparent ways, leaving room for political elite takeover of communal lands. Due to asymmetry of information and power, large farms and government officials take over lands without appropriate compensation. Lands are not properly valued nor are communities compensated with alternative livelihoods based on the opportunity costs of their lands. The reliance on large mechanized agriculture on large farms can lead to labor substitution instead of increased employment and rural wages. Environmental consequences of such large scale mechanized production systems have yet to be assessed. In some of the land transactions foreign companies and governments are given lands to produce food exclusively for export back to the investor countries. Yet, the African countries giving away the lands are starving. The food

produced benefits the investor countries in terms of reduced food price inflation, including fiscal and macroeconomic benefits.

The rush for agricultural lands in Africa underscores the growing importance and role for Africa to help meet the growing food needs in a rapidly changing global agricultural and food demand landscape. This opportunity should be harnessed properly. What is needed is an equitable win-win situation: for African countries, smallholder farmers and the investor nations or firms. A number of critical policy issues deserving attention include: (a) the need to develop a clear code of conduct to provide better governance systems on land transactions; (b) how to ensure that the communities benefit adequately, perhaps through greater reliance on co-ownership by communities of such farms as investors; (c) assessment of the environmental impacts of large scale mechanization; (d) how to secure property rights of the poor, especially women and indigenous populations who become more vulnerable under customary land tenure systems; and (e) enforcement of the principle of prior consent to ensure that communities that are affected are included in the negotiations and kept fully informed of any changes in land use or ownership or contact arrangements.

4.6 Climate change, increased risks and vulnerabilities for smallholder farmers

While Africa contributes less than 3% of the global green house emissions, compared to 40% from the G-8 countries, it must now bear a disproportionate burden of economic losses, as well as the human, health and social consequences of its effects. Climate change is expected to dramatically change the face of agriculture and increase the vulnerability of hundreds of millions of poor farmers, rural and urban populations in Africa. It is expected that severe drought will occur more frequently, especially in the dry semi-arid regions of the Sahel, which already suffer from low rainfall and high inter-and intra-seasonal variability in rainfall and lengths of the growing season. In the coastal areas, it is expected that rising sea temperature levels will lead to greater levels of flooding. It is estimated that 75-250 million people in the Sahel will be at risk of droughts as the region is expected to be drier, which will be more severe than the severe droughts of the 1970s in the Sahel. Flooding in southern Africa is expected to increase, bringing to mind the severe floods of 2000 that wiped out one-third of the crops in Mozambique, killed many and led to massive displacement of populations (Fleshman, 2007). The net loss due to climate change in Africa could be as high as \$133 billion with agriculture bearing the most of the brunt – an estimated loss of \$132 billion (Morrison et al, 2007). In Mali, it is estimated that because of projected yield declines and loss of forages the country will suffer economic losses in the range of \$70-\$142 million (Butt et al., 2005). Studies have found that the elasticity of farm revenues to climate change is high in Africa and especially so in the dry areas. In one study it was reported that elasticity of revenue to climate change was as high as -1.3, suggesting that a 10% increase in temperature will lead to a 13% reduction in revenues. This elasticity was as high as -1.6 for dryland areas compared to 0.5 for irrigated areas (Kurukulasuriya and Mendelsohn, 2008).

Among some of the ways of adjusting to climate (Dinar et al, 2008) change includes (a) production practices: delayed planting; shifting into more drought tolerant crops; shifting the composition of livestock between large animals such as cattle and smaller ruminants that better tolerate heat; investment in water harvesting and better water management, and changing land uses (b) market approaches: the use of crop and flood insurance, catastrophic bonds, weather market derivatives, enterprise diversification; (c) technological innovations: the development of drought and flood tolerant crops, development of crops with better water use efficiency; increased reliance on biological nitrogen fixation, incorporation of organic matter and use of conservation

tillage; and (d) policy interventions: support of farmers to purchase crop insurance, price stabilization, strategic grain reserves, use of market hedging instruments.

There are several constraints to adaptation by farmers to climate change. These include lack of access to information on weather, lack of predictive information on climate change and expected impacts, lack of information on appropriate adaptation methods, cost of adjustments to adaptation etc. However, interestingly, majority of farmers in a multi-country study on climate change in Africa consider lack of access to credit and savings to be the most important barrier to adaptation (Dinar et al, 2008). Access to finance reduces adjustment costs, allows farmers to move to more efficient and optimal adaptation pathways, invest in crop insurance, improve investments in appropriate land, water and soil fertility management strategies and reduce the effects of shocks on their overall incomes and assets, and smooth consumption demands.

The development and piloting of weather-indexed crop insurance (Hess and Syroka, 2005; World Bank, 2005; Skees et al., 2002) in a few African countries (Mali, Ethiopia, Kenya) offer new opportunities for farmers, although the cost of the insurance premiums are high for farmers. Because farmers will invest sub-optimally in insurance products, policies will be needed to support initial subsidies for use of crop insurance. The cost of insurance is high when the basis risk cannot be correctly determined due to lack of weather stations. Public policies are needed to support the development of weather stations. Africa will need more drought and flood tolerant crops for its farmers. This will require greater support for national and international agricultural research centers of the Consultative Group on International Agricultural Research (CGIAR) to develop new strains of crops with tolerance to drought, floods, diseases and pests. Major investments will be needed in irrigation and water management across Africa. Climate change also needs to be fully integrated into national agricultural sector planning strategies in Africa. Greater support is needed in broadening the genetic base of crops; promote diversification of farmers into more drought tolerant crops; investment in irrigation and water management; development of local capacity in climate science to improve climate predictions, preparedness and disaster management. Greater efforts must also be put into developing effective programs for reducing vulnerability of at risk populations through social safety net programs.

4.7 Emerging carbon markets and incentives for sustainable land use by smallholders

Deforestation is one of the major causes of release of green house gases and major contributor to global climate change. FAO (2005) estimated that 13 million ha of forest land are cleared annually during 1990 - 2005. Africa has some 635 million ha of forest cover or 16% of total global forests cover, so it has potential to help sequester carbon and contribute significantly to the reduction of carbon emissions through carbon sinks¹. It is estimated that Africa accounts for only 3.8% of the green house gases – compared to 4.2 billion ton of CO₂ emissions by the EU-15 countries².

The size of the carbon trade market runs into several billions of dollars. It grew from \$19 billion in 2006 to \$30 billion in 2007 or 250% the total value of aid to Africa. According to the World Bank Africa accounts for a miniscule share of this market – a meager 3% of certified emission reduction, compared to 61% by China and 12% by India.

¹ Carbon trading could help Africa's poor: World Bank. Reported by Maurius Bosch, Reuters, May 29, 2009.

² Source: EU Environmental Agency

One of the ways in which smallholders can benefit from these emerging carbon markets is for them to be compensated for better land use practices – those which reduce deforestation, degradation, revamping of ecosystem services, biodiversity etc. Sustainable intensification of land uses, as opposed to extensive land use practices will allow farmers to meet their food needs on smaller pieces of land, reduce deforestation and degradation and contribute to reduction of carbon emissions. But that requires getting agriculture right in Africa. It has been estimated by FAO (2007) that avoided deforestation and sustainable agriculture can allow Africa to mitigate carbon losses of 167.8 million and 69.7 million tons of carbon (Table 4.3).

Table 4.3: Potential carbon mitigation from land-use change, 2003-12 (million tons of carbon)

Region	Avoided deforestation	Sustainable Agriculture	Forest Restoration	TOTAL
Africa	167.8	69.7	41.7	279.2
Asia	300.5	227.3	96.2	634
Latin America	1097.3	93.1	177.9	1368.3
TOTAL	1565.6	390.1	315.8	2271.5

Source: FAO (2007)

Policies are needed to encourage African farmers to adopt sustainable land use practices, expand carbon markets to allow for their wider participation, pay them well for carbon sequestered, support sustainable harvesting of forest- and non-timber forest products, diversity livelihoods of communities, and reduce the case of leakages where positive gains in carbon sinks in one community is offset by non-sustainable land use practices in other regions through adoption of sustainable watershed management practices. The development of a formal emissions trading market through the participation of commercial banks will help to speed up benefits of carbon trading for Africa's smallholder farmers. African countries will need to put in place legal, regulatory systems to foster the emergence of carbon trading markets.

It is critically important to document the carbon stocks saved from sustainable agricultural intensification in Africa (Ebeling, J. and Mai Yasué (2008) and use this to engage in the discussions on inclusion of this within the Kyoto protocols and influence early dialogues on this at the December 2009 Copenhagen UN Framework Convention on Climate Change. There is need to accelerate investments in developing countries to build data collection, monitoring and analytical capacities. A smallholder driven green revolution in Africa that helps to save millions of ha of forest land from traditional slash and burn practices will help reduce global warming and reduce climate change. But for farmers to benefit from the related benefits on carbon markets there is need for critical analysis and estimations of these benefits. This is an area for priority research in Africa by agricultural and applied economists.

5. Conclusions

This paper has reviewed the situation of food production in Africa and some of the conditioning factors which have implications for global development policies. Food production per capita has continued to decline for the past three decades. Improvements have been made of recent with increased spending on agriculture by a few countries, but generally spending is still much below what is needed for agricultural growth. Countries need to increase investments in agricultural

research, extension and infrastructure, especially irrigation, roads and energy to increase the rates of returns to investments in the sector. It is evident that majority of smallholder farmers on the continent are locked under poverty traps. Unlocking the potential of smallholder agriculture must start with policies to unlock poverty traps. Decades of policies of abandonment of African smallholder farmers have to be replaced, with a new sense of urgency, with policies of support. Global development policies have to embrace the provision of comprehensive packages of support for smallholder farmers for them to take advantage of new agricultural technologies – most of which sits on shelves across the continent.

To achieve a smallholder-based agricultural green revolution, national governments need to invest in improving access and affordability of agricultural technologies through the use of smart subsidies. Agricultural policy analysts have to come to terms with this: the opportunity cost of not doing so is too high in Africa, where majority of the farmers are too poor. The state has to provide needed support and do so in ways that builds markets.

Lack of access to financing continues to undermine agricultural growth, especially for smallholder farmers, limiting their ability to afford improved seeds, fertilizers, small-scale irrigation and livestock feed etc. The global financial crisis has had limited impacts on Africa and domestic banks have huge amounts of financial liquidity. Innovative policy and institutional instruments are needed to leverage the commercial banks to expand lending to smallholder farmers and agricultural value chains that support them.

The recent trends of large land acquisitions or “land grabs”, while promising investments in infrastructure and offering market opportunities, deserve critical analysis. They pose significant challenges to pro-poor agricultural growth in Africa. Policies are needed to ensure that such land deals are fair, transparent, enforce principle of prior consent, do not undermine land rights of farmers and their communities etc.

Climate change is affecting weather patterns, exacerbating risks and deepening poverty traps for farmers. Policies are needed to enhance capacity of farmers on climate change adaptation. As the development community looks to the Copenhagen conference on climate change in December 2009, it is critical that global development policy focuses on including agriculture as part of the climate change agenda. Raising agricultural productivity and changing the land use patterns of smallholder farmers in Africa will contribute towards reducing deforestation and reduce carbon losses from reduced deforestation. Paying African smallholder farmers for such shifts in land use will expand their participation in the growing carbon markets, while promoting sustainable land use practices. This can be achieved through a smallholder green revolution which raises agricultural productivity, expands rural incomes and employment and reduces pressure on deforestation and land degradation.

References

Ariga, J., Jayne, T.S. and Nyoro, J. (2006). *Factors driving the growth in fertilizer consumption in Kenya, 1990-2005: Sustaining the momentum in Kenya and lessons for broader replicability in sub-Saharan Africa*. International Development Collaborative Working Papers. Michigan State University

Binswanger, H and McCalla, A. (2008). The changing context and prospects for agricultural and rural development in Africa. AFDB-IFAD Joint Evaluation of ARD in Africa

Butt, T.A., McCarl, B.A., Angerer, J. dyke, P.T. and Stuth, J.W. 2005. *The economic and food security implications of climate change in Mali*. Climate Change, Vol 68 No.3 February 2005.

De Shutter, O., (2009). Large scale land acquisitions and leases: a set of core principles and measures to address human rights challenge. Special Rapporteur on the right to food. FAO, Rome.

Denning G, Kabambe P, Sanchez P, Malik A, Flor R, et al. (2009) Input Subsidies to Improve Smallholder Maize Productivity in Malawi: Toward an African Green Revolution. PLoS Biol 7(1): e1000023. doi:10.1371/journal.pbio.1000023

Diao, X., S. Fan, D. Headey, M. Johnson, A. Nin Pratt, and B. Yu. 2008. Accelerating Africa's food production in response to rising food prices—Impacts and requisite action. Washington, DC: International Food Policy Research Institute. Draft.

Dinar, A., Hassan, R., Mendelsohn, R., Benhin, J. et al. (2008). Climate change and agriculture in Africa. Impact Assessment and Adaptation Strategies. Earthscan.

Dorward, A., E. Chirwa, R. Slater, T. Jayne, D. Boughton, and K. Valerie. 2008. *Evaluation of the 2006/7 agricultural input subsidy programme, Malawi. Final Report*. Project Report. UNSPECIFIED.

Ebeling, J. and Mai Yasué (2008). [Generating carbon finance through avoided deforestation and its potential to create climatic, conservation and human development benefits](#) [FREE OPEN ACCESS]. Phil. Trans. R. Soc. B, DOI: 10.1098/rstb.2007.0026

Economic Commission for Africa (ECA) and Africa Union (2009). Economic Report on Africa 2009. Developing Agriculture Through Regional Value Chains. 193 pages.

Fan, S., Mogues, T., and Benin, S. (2009). Setting priorities for public spending for agricultural and rural development in Africa. IFPRI Policy Brief 12, April 2009.

FAO (2009). FAOSTAT Database: <http://faostat.fao.org>

FAO (2007). The State of Food and Agriculture: Paying Farmers for Environmental Services. FAO, Rome.

FAO (2005). Global Forest Resources Assessment. Progress Towards Sustainable Forest Management. FAO Forestry Paper 147. FAO, Rome.

Formatted: German
(Germany)

Hess, U., and Syroka, H (2005). Weather-based insurance in Southern Africa. The case of Malawi, Agriculture and Rural Development (ARD) Discussion Paper 13, World Bank, Washington DC

Michael Fleshman, 2007. Climate change and Africa: stormy weather ahead.
<http://www.un.org/ecosocdev/geninfo/afrec/newrels/climate-change-1.html>

Hesser, L.2006. *The Man who fed the world. Nobel Prize Laureate Norman Borlaug and his battle to end world hunger.* Durban House Publishing Company, Texas

International Monetary Fund: IMF (2008). Regional Economic Outlook Sub-Saharan Africa (April). Washington DC: IMF

International Monetary Fund: IMF (2009). Impact of the global financial crisis on sub-Saharan Africa. Washington DC: IMF Africa Department

Kherallah, M., C. Delgado, E.Gabre-Madhin, N.Minot, and M.Johnson, (2002). *Reforming Agricultural Markets in Africa.* Baltimore: IFPRI and Johns Hopkins University Press.

Kosura, W. and J. Karugia, (2005). Why the early promise for rapid increases in maize productivity in Kenya was not sustained: Lessons for sustainable investment in agriculture. In: Djurfeldt, G., Holmen, H., Jirstrom, M., and Larsson, R. (eds). *The African Food Crisis. Lessons from the Asian Green Revolution.* CABI, UK and USA.

Kurukulasuriya, P. and Mendelsohn, R., (2008) A Ricardian Analysis of the impact of climate change on African crop land. *African Journal of Agricultural and Resource Economics*, Vol 2. No (1): 1-23).

Marcias, J.B. and Massa, I (2009). The global financial crisis and sub-Saharan Africa. The effects of slowing private capital inflows on growth. Working Paper 304. Overseas Development Institute, UK.

Michael Fleshman, 2007. Climate change and Africa: stormy weather ahead.
<http://www.un.org/ecosocdev/geninfo/afrec/newrels/climate-change-1.html>

Morrison, W., Schesinger, M., and Andronova N., 1997. Country-specific market impacts of climate change. http://www.Crga.atmos.uiuc.edu/publications/market_impact/text.html

Omamo, W., Diao, X., et al. (2006). Strategic priorities for agricultural development in eastern and central Africa. IFPRI Research Report 150.

Formatted: French (France)

Pardey, P. G., N. M. Beintema, S. Dehmer, and S. Wood. 2006. *Agricultural research: A growing global divide?* Food Policy Report. Washington, DC: IFPRI.

Skees, J.R., Gober, S., Varangis, P., Lester, R., and Kalavakonda, V. (2002). 'Developing rainfall-indexed insurance in Morocco'. Working Paper 2577, World Bank, Washington DC

Songwe, V. and Deininger, K (2009). Foreign investment in agricultural production: opportunities and challenges. The World Bank. Washington DC.

Strauss-Kahn, D., (2009). The global financial crisis; the challenge for Africa. Address delivered at the Celebration of Africa Week, 2009. International Monetary Fund, Washington Dc.

UNCTAD (2008). Addressing the global food crisis: key trade, investment and commodity policies in ensuring sustainable food security and alleviating poverty. Presented at the High-level conference on world food security: the challenges of climate change and bio-energy, 3-5 June, 2008

| von Braun, J. and Meinzen-Dick (2009). "Land grabbing" by foreign investors in developing countries" Risks and Opportunities. IFPRI Policy Brief 13, April 2009. International Food Policy Research Institute. Washington DC

Formatted: German
(Germany)

World Bank (2005). Managing agricultural production risk. Report 32727-GLB, ARD Department, World Bank, Washington DC

World Bank (2007). World Development Report 2008: Agriculture for Development. Washington DC. World Bank.