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Options for African Agriculture in an Era of High Food and Energy Prices

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INTRODUCTION

Sub-Saharan Africa (hereinafter called Africa), is a diverse place in terms of its climate, geography and socio-economics, but overall it is an agrarian place. Agriculture accounts for 70% of full-time employment in Africa, 33% of GDP, 40% of total export earnings, and its importance is even greater in the poorest countries. It is also a continent of enormous agricultural potential, one that should easily be able to double or triple its agricultural output and re-establish itself as a major agricultural exporter rather than the net importer it has become.

Yet the past 25 years saw serious neglect of agriculture by national policy makers, aided and abetted by leading donor agencies. Today, Africa is reaping the harvest of that neglect. Food production has barely kept pace with population growth while the continent has failed to industrialize. Per capita incomes remain low, and poverty, food insecurity, malnutrition and under-employment are high and persistent. The continent now imports about 10 million tons of cereals each year and many African countries found themselves vulnerable to the recent spikes in world food prices. It is sobering to recall that in the early 1960s Africa was the continent of hope while Asia was the continent of despair.

But things are changing. The recent increases in world food and energy prices have made agricultural growth an imperative for food security, and African governments and donors have signed up to a new food security agenda. At the same time, higher agricultural commodity and energy prices in combination with Africa's abundant resources have turned African agriculture into a 'business' opportunity for food, raw materials and biofuels. Private investors, sovereign wealth funds and others are piling in, and many African governments want part of the business action. The rate of agricultural growth has even picked up a little in recent years, though seemingly driven more by a commodity price boom than any acceleration in the underlying fundamentals¹.

Can Africa finally succeed in using agriculture as a growth sector, one that can help drive the economic transformation of the continent? Will it be able to do this in ways that also slash poverty and malnutrition? Can the food security and business agendas be compatible? Much will depend on the type of policies and public investments that African governments pursue.

The big strategic questions today are not about whether agricultural growth should be a priority, but:

- What type of agricultural development does Africa need?
- What policies are needed to develop Africa's agricultural potential?

¹ Nin-Pratt, Johnson and Yu (2012) show that agriculture grew by 3.6 % per year in constant prices during 2001-2010, but by 7.7% per year if the deflated increase in agricultural prices is included. This higher estimate is closer to the 6% growth in real agricultural GDP claimed by Ousmane (2008) over a similar period.

- What will it take to make it happen?
This paper discusses these questions.

WHAT TYPE OF AGRICULTURAL DEVELOPMENT DOES AFRICA NEED?

The need for technology driven agricultural growth

In early economic growth models, agriculture was characterized as a stagnant, labour surplus sector full of non-enterprising peasants who could be plundered of their labour, savings and output. In this model, industry is the prime driver of growth, while investments in agriculture face diminishing returns. Agriculture is only important when food becomes a national constraint which cannot be released through trade. The new insight of the growth linkages argument pioneered by Johnston and Mellor (1961) and Mellor (1976) was based on a dramatic shift in agricultural technology, not just greater use of factors. Observing the Asian Green Revolution (GR), they saw that agriculture could be a dynamic, technologically driven sector full of enterprising smallholders, one that significantly raised both land and labour productivity in farming and had powerful growth linkage impacts on the rest of the economy.

The growth linkages were most visible in the market towns and rural nonfarm economy within adopting regions, but they also impacted more broadly. Early attempts to estimate growth linkages used simple linear, fixed price multiplier models because that is all that was possible with the available computing technology. More recent econometric estimates and simulations with CGE models show that the earlier multiplier estimates were naturally a little high, but not that far wrong². The key point is that when the agricultural production function shifts upwards with technological change, not only can farm labour productivity increase but it can also pull lots of nonfarm workers into more productive and higher paying jobs too. It also lowers the unit cost of producing food, helping to lower the domestic price of food, hence real wages, thus benefitting the entire economy. Importantly, this can all happen even in a full employment economy, and the impact is even bigger when there is initially annual or seasonal underemployment in agriculture.

As Dercon (2009) reminds us, other sectors have growth linkages too, and the growth linkages themselves will be more muted if an economy is open to international trade. But in the real rather than neoclassical world of most African countries, their landlocked geography, poor infrastructure, limited minerals endowment, and small manufacturing base, mean that agriculture is often the only engine of growth available that has the scale needed to grow the national economy. Moreover, given poor access to trade routes and high transport costs, domestic prices are endogenously determined within wide border price bands, so the growth linkages impacts can still be strong even where trade has been liberalized. The price effects are strongest in rural areas where many foods and non-foods are virtual nontradables (Delgado, 1998).

Opportunities for mineral rich or coastal countries with competitive manufacturing bases are more diverse, but even here agriculture may be the only sector that can generate enough productive employment for the majority of the work force in the

² Haggblade, Hazell and Dorosh (2007, Table 7.3) compare multiplier estimates from a variety of empirical studies using different methods. On average, the multipliers from semi-input output model are within 20% of those estimated with econometric and CGE models.

foreseeable future. Smallholder led agricultural growth generates considerable additional employment in farming and the rural nonfarm economy, so can be a very effective way of spreading the benefits from minerals exports.

Unlike Asia, Africa has not yet achieved a technology driven transformation of agriculture at the needed scale. Average yields have barely increased in 30 years and TFP growth has been flat³. Area expansion has been the biggest source of production increase, but many of the more populous countries are running out of suitable crop land. Land and labour productivity are much lower than in Asia and Latin America, and the gap is widening (World Bank, 2007). Decades of under-investment in agricultural R&D and rural infrastructure have left Africa with lower densities of rural infrastructure than India had even in the 1950s (Spencer 1994)⁴, and with a seriously underfunded agricultural R&D system compared to other developing regions (Pardey et. al., 2006). By undervaluing agriculture's potential, governments and donors have helped create a self-fulfilling situation where agriculture remains a stagnant, peasant dominated sector that struggles to compete against imports, let alone in export markets.

Adding to the tragedy is the fact that with very few exceptions this neglect has not led to industrial success. While some remain optimistic about Africa's ability to become an exporter of manufactured goods even in the face of today's competitive onslaught from Asia, there is little evidence of success so far. Even if industry were to grow more quickly, its small employment share (10-15%) and relatively low employment elasticity imply that it would still take years before it could make a serious dent in the agricultural work force. Africa's GDP growth over the past decade seems to have been driven primarily by a commodity price boom and the expansion of services, and low productivity services at that, while imports of manufactures from China alone soared from virtually zero in 2000 to over \$50 billion in 2009 (Cissé, 2012)⁵.

Even the oft stated urbanization of Africa and the new hopes of growth built on urban agglomeration seem to be something of a mirage. Drawing on recent calculations by Africapolis that combine remote sensing data with previously unreleased census data, Potts (2012) estimates that Nigeria's urban population is actually only 60% as large as UN estimates. She also argues that population growth rates in most Nigerian cities have been well below the national population growth rate and have slowed in recent years. Important sources of error have arisen from the reclassification of many rural areas as urban based on achieving certain population sizes regardless of occupations, and because there of gross errors in the reported census data for many cities. Poverty rates and unskilled wage rates in urban areas are not that different from rural areas, and manufacturing employment remains small. There is little evidence here to support the idea that Nigeria is increasingly been driven by manufacturing and urban led growth. Rather, it suggests a story of urban stagnation and an increasing reliance on agriculture by most of the population. Potts also marshals evidence to show that similar patterns of slowing urbanization are common across Africa.

³ TFP growth averaged a mere 0.02% per year over 1961-2006, though increased to 1.37% per year over 1984-2006 (Yu and Nin-Pratt, 2011).

⁴ Sebastian (2008) shows that 34% of rural Africans live more than 5 hours from a market town of 5,000 people, compared to 5% in South Asia and 17% in East Asia.

⁵ Includes North Africa, though only Algeria appears among the top six countries for China-Africa trade.

No doubt academic debate about the role of agriculture will continue, but the bottom line seems to be that except for mineral rich countries or coastal countries with successful manufacturing enclaves, technology driven agricultural growth is one of the few viable options available today in Africa for growing national GDP. When one adds in other goals like creating sufficient jobs to employ a fast growing work force, reducing poverty⁶, containing environmental degradation, or mitigating climate change, the importance of technology driven agricultural growth led by smallholder farms becomes even more compelling, regardless of mineral endowments or geographic location.

This is not to say that agricultural growth on its own is sufficient. Given already large urban populations, focusing on agricultural growth alone will clearly not do. Countries need a multi-sector approach – driven in part by trade possibilities but also with sufficient balance in the early stages to help create demand for each other's less tradable outputs, and with strongly linked rural and urban growth. Simulations with CGE models confirm the need for a multi-sector approach if African countries are to achieve their growth and poverty reduction targets (Diao et al., 2012).

Agricultural growth must also be affordable and give good returns to public investment compared to investments in other sectors. In a series of studies, Fan and his colleagues at IFPRI have shown that public investments in most of the public goods needed for agricultural growth in Africa give favourable benefit/cost ratios, and are very beneficial for the poor, much as they found in similar studies of Asia's Green Revolution (Fan, 2008). But public investments are also needed across the board to enable broader patterns of growth. Fortunately, investments in many of the needed public goods like roads, transport corridors and power can be win-win for rural and urban areas.

Balancing new agricultural agendas

Regardless of the academic debate, African policy makers, donors, sovereign wealth funds and private sector investors are finally awakening to the importance of African agriculture. Two really important drivers have captured their attention. First, the recent increases in world food and energy prices have made agricultural growth an imperative for food security. Increases in domestic food prices have often been much greater than in world markets with severe implications for the poor (Dorward, 2012), and the political instability associated with sudden food price increases has exposed the folly of becoming too dependent on world markets. Since most of the food insecure households in Africa live in rural areas and mostly on farms, improving the productivity of subsistence oriented farms has become a high priority. As part of the 2009 G-8 Summit, leaders of 43 countries and multilateral organizations endorsed the L'Aquila commitment to “act with the scale and urgency needed to achieve sustainable global food security,” creating the New Alliance for Food Security and Nutrition.

⁶ Christiaensen and Demery (2007) provide a recent review of the links between agricultural growth and poverty reduction in Africa.

Second, higher agricultural and energy prices in combination with Africa's abundant resources have turned agricultural growth into a 'business' opportunity for producing food, raw materials and biofuels. Average yield gaps are large compared to other developing regions and best African farmer practices; there is still remaining uncultivated land that could be brought into production⁷; and Africa has only tapped a small share of its irrigation potential⁸. Regional markets are growing with rapid population growth and urbanisation, and prospects for South-South trade look particularly strong. Given also that world prices seem likely to remain high, sovereign wealth funds and foreign and African private sector investors are piling in.

Unfortunately these two drivers of change are not necessarily complementary. Many donors and NGOs are pushing for a broad social, environmental and climate change agenda based on subsistence oriented farmers for food security and poverty alleviation reasons, but with little thought about increasing agricultural growth (Badiane, 2008). On the other hand, the private sector is pushing a new business agenda, often with an emphasis on large commercial farms, integrated value chains and exports. Many governments seem uncertain which way to go, should it be a 'social' or a 'business' oriented strategy?

The business oriented strategy does not have to be inconsistent with a pro-poor approach, as long as it engages with large numbers of smallholders who are, or can, become commercially viable. Already, private sector investments along value chains are opening up new market opportunities for some smallholder farms, particularly for high value products. However, it is also becoming apparent that many more smallholders are being left behind while larger farms are gaining market shares. Many smallholders are not only missing out on new high value chains, but have lost access to modern inputs, credit and market outlets even for their traditional food staples (Djurfeldt, Aryeetey and Isinika, 2011). There has also been growth in land grabbing and the development of corporate sized farms which threaten to displace smallholders from their land as well as their markets (Deininger and Byerlee, 2010).

In some ways, this neglect of small farms is surprising because the predominant evidence from farm surveys still shows the classic negative relationship between farm size and efficiency (Eastwood, Lipton and Newell, 2009; Binswanger and McCalla, 2009). Nor, except for a few specialist crops, are there any obvious sources of economies of scale within the normal range of family farm sizes in Africa, particularly if machinery rental markets are allowed to work. However, smallholder farmers face two major challenges today. One is that they are at a major disadvantage in linking to modern value chains because of their low volumes of sales, poor market information and contacts, and limited ability to meet the high credence requirements of many high value outlets. They are also high cost, high risk farmers to serve for private agrodealers and financial institutions.

⁷ Estimates vary widely. FAO (2009) estimates that Africa still has a further 800 million ha of uncultivated land with potential for rainfed crop production, whereas Fischer et al. (2002) estimate 240 million ha. Much of this land is fallow land within extensive farming systems, so bringing more such land into more regular use would require intensification practices. FAO and the World Bank (2009) explore such options for the Guinea Savannah zone.

⁸ You et al (2011) estimate that Sub-Saharan Africa could profitably increase its irrigated crop area from surface and groundwater supplies from 7 to 21 million ha by 2050.

The other problem is competition from corporate sized farms that can exploit entirely new types of farming technologies, such as GPS-controlled precision farming, minimum tillage, GM seed and agrochemical packages, and back this with investments and political connections that give them privileged access to markets, modern inputs, insurance and credit, resulting in yields and cost structures that small farms simply cannot beat (Byerlee, 2011). This is different from the failed large state-run farms tried in Africa in the past, or even the privileged white settler farms of Southern Africa. It is the development model of the Brazil's Cerrado being brought to Africa (FAO and World Bank, 2009). In some land surplus countries this transition may be welcome and unstoppable, but unless carefully managed it is a growing threat to the welfare of small farmers in more populous countries.

If more smallholder farms are to become commercially successful, governments will need to do more to support them by investing in the kinds of R&D and rural infrastructure that small farmers need, helping to organize small farmers for the market, and incentivizing the private sector to link with more small farmers. It also helps that large farms (greater 500 ha) still only control about 5-10% of the cropland in Africa's most populous countries (Lipton, 2012), and without the aid of a substantial number of smaller farms these countries will not be able to generate the market surpluses they need to feed their growing urban populations, drive exports, and generate productive rural employment.

What of the smallholders who cannot become commercially viable? Some are successfully diversifying their livelihoods out of farming (Reardon et al., 2007), but there are many instances where this is not yet possible on the scale required or where the returns to nonfarm activities remain too low for them to escape poverty. Many others are sinking into deeper poverty and subsistence modes of production because of higher food prices and reduced access to land, markets and modern inputs. If neglected, small scale subsistence farming can become a poverty trap for many and a cause of considerable environmental damage (Cleaver and Schreiber, 1994). Yet investing in this type of farming is often little more than a productive safety net approach, particularly in remote and more marginal agricultural regions. It may be more cost effective to invest in improving subsistence farming rather than to spend on income transfer programmes or facilitating farm exits, but that is something that needs to be determined on a case by case basis. There seems to have been very little work comparing the two approaches; Owens, Hoddinott and Kinsey (2003) are an exception.

Judgments about who are viable farmers based on existing patterns of farming can be very misleading because they are circumscribed by existing opportunities. There are countless examples of subsistence oriented small farms seizing new commercial opportunities when given the chance. Even though it is hard to draw a line in practice between smallholders with viable business prospects and those who do not, it seems clear that a differentiated strategy is needed. Small farmers with viable market prospects need to be supported as a business proposition, while small farmers that for whatever reason are likely to remain poor and subsistence oriented need to be supported in more humanitarian ways that help them become food secure and diversified out of farming. While some kinds of interventions are beneficial to both groups of small farms (e.g. rural roads and some kinds of R&D), many others need to be tailored differently to the two situations (e.g. market mediated approaches to

financial and insurance services, fertilizer subsidies). The need for more sharply differentiated small farm strategies has not been so necessary in the past, and its emergence has important implications for how policies and investments to improve food security, reduce poverty, develop agribusiness opportunities and promote agricultural growth more generally need to be structured and integrated.

These considerations suggest the need for a three part strategy for Africa's agricultural agenda. One is to promote the growth of commercial agriculture and its value chains, using public policy to enable the private sector (farmers and agribusiness) to take the lead. Two is to shape that engagement in ways that enable as many small farms as possible to link to markets and successfully commercialize. Three is to put in place support programmes targeted to those small farms that cannot succeed as viable businesses. In Table 1, the right strategy is 4, combining 1 and 3, leading to a balanced portfolio of farm size outcomes, but one that does not neglect smallholders. The right balance will vary by country context, particularly the relative abundance of land and labour.

Table 1:

Strategy		Subsistence oriented small farms	Business oriented small and medium sized family farms	Corporate farms and estates
1	State led social agenda	XX	X	
2	Private led business agenda		X	XX
3	Business agenda with public-private partnerships (PPPs) and other policy support for smallholders as businesses		XX	X
4	1 + 3	XX	XX	X

Note: Higher number of Xs indicates greater number of farms reached

WHAT POLICIES ARE NEEDED TO DEVELOP AFRICA'S AGRICULTURAL POTENTIAL?

Many agricultural development strategies have been developed in recent years at national and regional levels for Africa, and mostly under the guidance of NEPAD's Comprehensive African Agricultural Development Plan (CAADP). Country CAADP plans lay out full menus of activities and investments needed to achieve 6% agricultural growth. Additionally, many countries have developed strategies for reducing poverty and achieving food security, which also include plans for agriculture.

These plans are typically much better prepared today than those of earlier decades. The better ones have been country rather than donor led, have been developed with the participation of key stakeholders, and have had serious input from evidence-based policy analysis from national and regional sources. They provide broad visions of what needs to be done. The downside is that they are burdened with far too many

economic, social, health, environmental and climate change goals, and they want to move the entire front of activity in the agriculture, fisheries and forestry sectors at the same time. This is not a recipe for success. Asia's GR happened because policy makers first focused on growth in the production of rice and wheat in irrigated areas. Once the pile of food began to get larger they expanded the scope of their interventions.

It is not my intent to review these plans here, or to provide a comprehensive discussion of all the types of investments and policies that might be needed to ensure their success. Rather, I want to focus on a few core issues that will have a major impact on the possibilities of success. The first two are markets and productivity. Past successes in African agriculture have arisen where two key conditions converge: a) favourable market incentives for farmers and agribusinesses, and b) a steady stream of productivity-enhancing agricultural technology (Haggblade and Hazell, 2010). My third key issue is volatility. African agriculture has always been risky, but changes in climate and global food markets have brought a whole new level of volatility to the continent that needs to be managed. Finally, I want to focus on how to make it all happen, including the key role of government, needed levels of investment, and the slimming down of initial development objectives to get things moving.

CREATING MARKET INCENTIVES

In an era of globalization and market liberalization, agricultural development needs to be market driven, but this can only succeed if agricultural value chains actually work and grow. Additionally, pro-poor growth requires that large numbers of smallholders can successfully link to these value chains. These issues are less important for many subsistence oriented farmers, but are of primary importance for smallholders that are capable of transitioning to successful commercial enterprises.

Making markets work

There is plenty of evidence to show that the private sector can be very effective in driving high value chains in Africa, especially those supplying urban markets and for export (e.g. Minot and Ngigi, 2010). These value chains are more conducive to contract farming and other forms of inter-linked contracts, and enable private sector players to achieve good returns by providing farmers with access to all their required inputs and credit and a market (Dorward, Kydd and Poulton, 1998). For these markets to work, it is often enough that the government limit itself to creating an enabling business environment. Markets for high value traditional and non-traditional exports already account for some 25% of the marketed share of Africa's agricultural output, and domestic markets for products like fresh milk, meats, fruits and vegetables are flourishing in several countries.

There is less evidence to show that the private sector can successfully drive value chains for staple foods in their present relatively undeveloped state in Africa. These value chains are characterized by large numbers of spatially dispersed smallholders trading in small quantities, spatially thin input markets, bulky and relatively low value products, and high risks, leading to significant market coordination failures that the private sector has little incentive to fix through contract farming or other interlinked contract arrangements (Poulton and Lyne, 2009). To intensify production, farmers

need access to a package of purchased inputs (improved seeds, fertilizer, labour), extension, fixed and working capital, and market outlets. If one element of the set is missing, then investments in all the others will be lost or significantly reduced. Similarly, potential service suppliers face uncertain demand for their services unless farmers are assured of access to other complementary services. In well-developed value chains, the ‘invisible hand’ of the market serves to coordinate all these services, or large agribusiness players step in and ‘integrate’ the value chain. But in poorly developed value chains for food staples, neither of these options may happen, and private investors will not invest significant capital in developing agricultural service businesses. Markets can then become trapped in low output equilibria.

Analysts differ in the extent to which they believe these complementarities pose a problem for the development of private service suppliers. Conventional liberalisation policy does not recognize this as a problem, whereas others (e.g. Dorward et al., 2005, 2009; Djurfeldt et al., 2005) argue persuasively that it is an important factor underlying the slow growth of food staples production in many African countries. Asian governments overcame their market coordination problems by stepping in with large-scale public interventions that went far beyond a facilitating role and provided most key services itself, including research and development, extension, improved seeds, fertilizer, credit, storage, and marketing. They also intervened to stabilize prices for producers and consumers alike, and provided subsidies for many key inputs to encourage their uptake.

Similar attempts to replicate this approach in Africa during the 1960s and 1970s were much less successful and collapsed in the late 1980s under the weight of their high fiscal costs (Djurfeldt et al., 2005). The structural adjustment programmes that followed removed or downsized many of the state monopolies that dominated agricultural markets and input distribution systems, along with associated input subsidies and price controls. Left largely to the private sector alone, the value chains for food staples have tended to focus on larger farms in breadbasket areas with good market access⁹, while many smallholders and especially those in more remote areas remain underserved (Djurfeldt, Aryeetey and Isinika, 2011; Kherallah et al., 2002).

The difficulties of coordinating markets for food staples may be one reason that some governments are willing to provide land to multinational investors and sovereign wealth funds for corporate farming. These entities are virtually turn-key operations that create their own integrated value chain from production to export, bringing in technology and management and marketing expertise, and also building the infrastructure, processing and handling facilities they need, potentially saving the government from having to make those investments itself.

A key challenge is how to fix these problems without introducing new types of government failure that may be worse than the market failure problems they are trying to fix. One approach is to set up a high level committee or trade association comprising public and private sector representatives to coordinate activities along a value chain. The Presidential Initiatives for selected commodities in Ghana and Nigeria played this role, though the results were mixed (Sanogo and Adetunji, 2008).

⁹ The spontaneous development of rice milling and markets observed in lowland rice areas by Otsuka and Larson (2012) is indicative of the private sector’s capacity to respond to agricultural growth in high potential areas.

Using value chain analysis, such committees or trade associations could in principle identify bottlenecks, propose solutions and then oversee their implementation. Preferred solutions would be implemented by the private sector or through public-private partnerships. Governments can also offer incentives to private sector players, helping to offset some of the initial costs of kick starting activities along value chains for targeted commodities or regions. Tax breaks, ‘smart’ subsidies, loan guarantees, and preferential tariff arrangements can all play useful roles.

Linking small farmers to value chains

For most smallholders in Africa, the best market opportunities still lie with local markets for food staples and some perishable high value products like livestock and horticultural products. As discussed above, ensuring that smallholders can retain access to these markets and the modern inputs and credit they need can no longer be taken for granted. Another challenge is to link more small farmers to high value chains serving urban and export markets, which are increasingly controlled by large agribusiness firms.

As Vorley, Lundy and MacGregor (2009) have observed, the successful engagement of small farmers in value chains takes a triangular relationship between three parties: *trained and organised* small farmers; a *receptive* business sector; and a *facilitating* public sector.

Clustering smallholders into groups is a useful way of aggregating output for the market and reducing the costs of supplying inputs and credit, making them more competitive with large farms. Suitably organized and managed, such clusters can also provide a useful channel and enforcement mechanism for entering into collective contract arrangements with corporate agribusinesses and financial institutions. State sponsored cooperatives do not have a good record in Africa, and a general lesson from experiences in many countries is that the best results materialize when small farm organizations remain voluntary and self-managed, but receive technical help and training on organizational, administrative and marketing skills from outside. Some NGOs have become quite skilled at playing such a catalytic role.

Corporate agribusiness links to smallholders are often placed on a contractual basis, and this affects the types of farmers they will want to link with. Contract farming has emerged as the most common form of contractual relationship for many high value crops, though it still remains quantitatively small in much of Africa (Oya, 2012). Based on a meta-narrative of five contract farming case studies, Barrett et al (2012) conclude that the private sector is more receptive to smallholders when they are located in the right places in terms of the crops and ecologies they want to work with, and the location of their processing facilities and markets. Farmers in remote areas are least likely to be of interest. Agribusiness partners also prefer to work with organized farmer groups that can enter into contractual arrangements, and the involvement of NGOs that catalyse and support such organization is attractive. Surprisingly, initial farm size and wealth turn out not to be that important, as also observed by Swinnen and Maertens (2007).

The public sector needs to support smallholders by investing in the kinds of R&D and infrastructure that can make them more competitive, and by promoting farmer

organizations. Given also the difficulties and costs of working with small farmers, agribusinesses may need to be encouraged through moral persuasion (e.g. by setting codes of practice) and financial incentives, at least during the initial stages of setting up their value chains. One approach is for the government to simply contract the private sector to provide services to smallholders. Another is to subsidize some of the initial incremental costs to corporate agribusinesses of setting up linkage arrangements with small farms. Governments can also help offset some of the high perceived risks of investing in agricultural value chains, and which can be aggravated by linking to lots of small farmers. Publicly provided credit guarantees, insurance or co-financing seem to be emerging as instruments of choice, and can also help leverage additional commercial bank lending along value chains.

Often neglected in these discussions is the key role that many small and medium sized agribusiness firms play in value chains, and who are often much more deeply linked to smallholder farms. The small scale agricultural traders, for example, who collect and bulk up produce from smallholders, the small scale millers and processors that serve local farmers, and small agro-shops that provide smallholders with fertilizer, improved seeds, veterinary supplies and the like. Support to these kinds of firms can play a key role in linking more small farms to value chains. AGRA's support of networks of small agrodealers and small seed companies is a good example. Farm Africa's franchised network of one-stop veterinary medicines and services is a good example of how a social enterprise approach can help (www.Sidai.com).

Since there are potentially many ways of setting up value chain arrangements with small farms, and what works for one commodity or in one location may not work elsewhere, it is important to encourage innovation rather than promote a standard model for all situations. One approach that is growing in favour is the use of competitive grant schemes that reward agro-processors who successfully set up viable and sustainable marketing links to small farms. The competition might also be open to other players like NGOs who can partner with an agro-processor and act as an intermediary in organizing small farmers and setting up the marketing arrangement. Full payment of grants should be tied to the proven sustainability of the marketing arrangement, so the grant contracts may need to extend over several years.

RAISING AGRICULTURAL PRODUCTIVITY

Although additional investments in irrigation and new land have important roles to play, the most important way to get agriculture growing quickly and at scale will be through improved technologies that raise yields and labour productivity. There are already many suitable technologies available but most require greater use of modern inputs, especially fertilizer. Even though this can often lead to dramatic increases in yields¹⁰, African farmers still use low levels of fertilizer (13 kg/ha of nutrients per hectare). Such low usage levels are causing widespread soil nutrient mining. Henao and Baanante (2006) estimate that during the 2002-04, over 80% of countries in Africa were losing more than 30 kg of nutrients per year, and 40% of countries were losing over 40 kg/ha/year. This cannot go on and better solutions are urgently required. The recent sharp increase in the price of fertilizer does not help. Key

¹⁰ For example, the hybrid maize revolution in Eastern and Southern Africa (Smale and Jayne, 2010), the activities of the Sasakawa SG2000 program, and the high yields obtained by many individual farmers (Jirström, Andersson and Djurfeldt, 2011).

questions are: a) does Africa have an alternative option for intensifying production using low external input (LEI) farming methods, and if not, b) are there ways of making the use of fertilizer more profitable at today's prices?

Is there a viable alternative to higher external input use?

Do improved low-external input (LEI) farming practices offer a viable alternative? Most African farmers already use LEI farming methods by default and get low yields, but considerable work has been done trying to improve and intensify these options. Available documented evidence suggests that yields can be doubled or tripled through improved LEI practices (Pretty et al., 2006; Tripp, 2006; Haggblade et al., 2010). Yet despite such promise, farmer uptake has been disappointing. A difficulty is that improved LEI practices are labour and land intensive, both seasonally and in total (Tripp, 2006). Improved LEI systems rely on the generation of organic matter (OM) and nutrients within the farming system, and these require land and labour to produce. When corrected for the total land area needed to support each hectare of crop, improved LEI yields are not nearly as high as claimed in the literature. Nor are LEI methods suitable for small farms if land is the binding constraint. LEI methods are also knowledge intensive and often require collective action amongst neighbouring farmers (Tripp, 2006). Many of the successful examples have resulted when grass roots organizations have taken the initiative and brought in well trained experts who train and organize communities. Unfortunately this approach is costly and not easily scaled up.

The challenge is to develop LEI technologies that boost both labor and land productivity, and that is much easier to achieve with the use of some inorganic fertilizer (Lipton, 2004). Since many LEI methods improve soil growing conditions, they also increase crop yield response to fertilizer, making the two approaches complementary.

Most experts agree that African farmers will need to use more fertilizer if they are to increase yields, but they also need to strike the right balance between managing soil organic matter, fertility and moisture content and the use of inorganic fertilizers. Given also the diversity of Africa's complex and risky rainfed farming systems, limited irrigation potential, and often degraded and fragile soils, finding the right balance will require a wide range of locally adapted practices, or a rainbow revolution as the Inter-Academy Council has coined it (IAC, 2004). Given also the very high cost of fertilizer for most African farmers (often several multiples of the world price), the transition to more intensive farming may initially be restricted to bread basket areas where the yield returns are highest.

Longer term solutions to the fertilizer problem include investing in regional trade corridors, nurturing private fertilizer distribution systems, regional collaboration between countries on bulk buying and transportation of fertilizers, and improving on-farm efficiency of fertilizer use through agricultural R&D, extension and provision of other complementary inputs, especially improved seeds (Morris et al., 2007). These actions would eventually bring down the cost of fertilizer and improve its accessibility. The problem for many African countries is that they cannot afford to wait for long term solutions. Fertilizer subsidies are one way of supporting higher use until such time as longer term solutions take effect.

Fertilizer subsidies

The main purpose of a fertilizer subsidy is to help kick start fertilizer use and the development of private fertilizer distribution systems when starting from an initial base in which demand is spatially thin and private distribution systems are weak. Farmers may also have limited knowledge and experience in using fertilizer. If the yield response to fertilizer is sufficiently high then a fertilizer subsidy might help kick start a sustainable pattern of higher usage, and provide economic incentive for dealers to expand their supply network. Response rates will typically be much higher if the fertilizer is combined with improved seeds and either irrigation or improved soil water management, so in effect the subsidy needs to be part of an integrated package that offers the farmer a game changing return to its use. Once fertilizer use and markets are established at sustainable levels, the subsidy can be phased out. An effective fertilizer subsidy scheme would also enable governments to buffer the impact of temporary price spikes in world fertilizer prices.

Asian countries successfully used fertilizer subsidies for this purpose to help launch their GR, and Fan, Gulati and Thorat (2008) estimate that in India the subsidy generated a favourable benefit/cost ratio during its early years, and helped reduce poverty. Problems came later when the cost of the subsidy escalated with the use of fertilizer, and the government was politically unable to phase it out; the benefit/cost ratio soon declined to below 1. The experience with similar subsidy schemes in Africa has been less favourable, and this is often blamed on the poor performance of the parastatals that administered the schemes. Unlike in India where the distribution was left largely to the private sector, in Africa parastatals were given virtual monopoly power over the procurement and distribution of fertilizer, with predictable results. The high cost of transporting and distributing fertilizer within Africa did not help, nor did pan-national distribution policies that diverted fertilizer from the areas where it yielded the highest response.

To keep the costs of a fertilizer subsidy down, the subsidy rate should be targeted to avoid displacing existing commercial sales. This may mean focusing on smallholder farms, and not all in the highest potential areas. Vouchers look promising as an effective delivery mechanism for a subsidy, and if they are redeemed through private agrodealers they can also help build up a fully privatized procurement and distribution system (Minot and Benson, 2009). Malawi introduced a voucher scheme in 2005 and has been very successful in increasing its food production. In a recent study of the Malawi programme, Dorward and Chirwa (2011) estimate that the benefit/cost ratio was 1.3 during 2005/06 to 2008/09, and 1.6 if growth linkage multipliers arising from the increased productivity are factored in.

Another use of fertilizer subsidies is to help poor subsistence oriented farmers become more food self sufficient. This typically involves allocating a small amount of subsidized fertilizer and seed (starter packs), as in Malawi during 1998-2004. This type of subsidy is essentially a productive safety net, and which may sometimes be more cost effective than distributing food or cash. Targeting starter packs or vouchers to the poor is a challenge, and leakages to non-poor people are a common problem. One of the mistakes in the past has been to try and combine both types of subsidy objectives in a single programme, leading to a system that does not achieve either goal very effectively.

The use of fertilizer subsidies remains a contentious issue within the donor and academic communities, but they are still popular with many government policy makers. Subsidies can be a powerful and speedy development catalyst in some situations, and at current world prices they may be a cost effective alternative to food imports. But they are easily abused and are difficult to remove once established, so need to be designed carefully and include an appropriate sunset clause.

MANAGING VOLATILITY

Market and production risks have always permeated African agriculture and its value chains, and held back agricultural development. Climate change and volatile world food and energy prices are making things much worse. Yet the institutions for managing risk in African agriculture are not well developed. Farmers and rural communities have to rely largely on their own devices. Past government interventions to stabilize food prices were costly and inefficient and worked more to the benefit of urban consumers than farmers. They were dismantled as part of the structural adjustment reforms. There are few working crop insurance programmes in Africa, and most countries do not carry significant food stocks. Intraregional trade in food staples is also insignificant, so there is limited ability for markets to pool production risks across countries. Developing more efficient ways of managing risk needs to be a core part of the agricultural development agenda, both for producers and consumers.

Producers

A return to costly and state run price stabilization or insurance programmes does not seem desirable, and market mediated approaches are offered as an alternative. Weather index insurance looks promising, but is still being tested through small-scale pilot programmes. The evidence from a recent review of 30 pilot programmes (Hazell et al., 2010) suggests that index insurance for insuring banks, microfinance organizations and relief agencies (perhaps also guarantee funds, agro-processors or corporate sized farms) is less costly and more likely to succeed than trying to directly insure lots of small farmers. Common problems in insuring small farmers are low farmer demand because of high basis risk and perceived low benefits, and the difficulty and cost of setting up an effective delivery network. These problems are more easily overcome if the insurance is linked to a credit and a technology package that offers the farmer a real value adding proposition that goes beyond simple risk management. There has also been limited spontaneous development of index insurance by the private sector, and governments, donors or NGOs have had to initiate nearly all the programmes that exist.

Apart from a few export crops, relevant futures markets do not exist for most African farmers. Farmers also need intermediaries to access the futures markets that do exist. The few opportunities that arise involve traditional export crops and contract farming, where farmers can be offered a forward price contract by a marketing association or private agribusiness firm.

Public sector credit guarantees are showing some promise as a way of leveraging more bank credit into agricultural value chains, and this may help offset some of the constraints faced by farmers and small and medium sized agribusiness firms arising from risk.

There is need for further product and institutional innovation and also for a stronger public sector role in facilitating the development of new programs. In particular, governments need to ensure there is an enabling legal and regulatory environment for index insurance and forward contracts, set up more weather stations and commodity market exchanges, and in the case of index insurance, provide an initial line of reinsurance. But these are long term developments. In the meantime, market mediated approaches are failing to provide an adequate solution at the scale needed to manage risks in African agriculture. As a result there is a renewed interest amongst government policy makers in minimum price guarantees schemes and crop insurance.

Consumers.

Food prices have become much more volatile in recent years and seem likely to remain so. Although some attempt is being made to address this issue at a global level, Africa also needs to take appropriate actions of its own. Many African countries could achieve greater price stability simply by opening up their food markets to greater intraregional trade. This would effectively pool production shocks across neighbouring countries. Beyond that a key question for policy makers is whether they should intervene directly in domestic food markets to reduce price shocks or allow markets to work and address the problems of vulnerable groups through direct assistance in times of crisis. Given past experience with stabilization schemes, the latter approach seems best, though may require holding emergency food stocks at country and regional levels.

Developing sensible and coordinated approaches to risk management needs to become an integral part of a country's agricultural development strategy. Such strategies need to balance the different interests of producers and consumers, and be cognizant of potential tradeoffs as well as complementarities between resilience and growth. There is significant interest within the international aid community in programmes and policies for climate change adaptation, and these interventions also need to be integrated into the larger risk management agenda. Again, questions about potential tradeoffs between resilience and growth need to be addressed and balanced¹¹.

WHAT WILL IT TAKE TO MAKE IT HAPPEN?

Paying the bill

To meet their agricultural aspirations, African governments have set themselves a target of 6% agricultural growth, which seems broadly sufficient to meet growing regional demand for food and to allow for growth in exports. This corresponds to a 50% increase over the 4.1% annual rate of growth in real agricultural GDP achieved during 2003-2009¹².

Achieving a 6% growth rate across Africa will require significant additional public and private investment. There are three IFPRI studies that use simulation models to

¹¹ Concern about potential tradeoffs between climate change adaptation and food security and poverty alleviation are flagged as an issue in the draft report of the High Level Panel of Experts on Food Security and Nutrition of the United Nations' Committee on World Food Security.

¹² <http://www.resakss.org/index.php?pdf=50920>.

estimate the amounts of investment required to achieve specific agricultural growth targets in Africa. Diao et al., (2008) simulate a doubling of food staples production over 5 years, 2009-13. This leads to a sector wide growth rate of 10% per year in their model. To achieve this goal, they calculate that public spending on agriculture would need to increase to \$7.5 billion per year (2008 dollars). Using 2004 as a base year, Fan et al., (2012) estimate that Africa would have needed to spend \$14 billion/year on agriculture from 2004 until 2015 (2008 dollars) to achieve an average agricultural growth rate of 7.5% (the rate they calculate that was needed to achieve the MDG goal of halving poverty by 2015). Msangi and Rosegrant (2012) use 2000 as a base year, and estimate that Africa would have needed to spend an additional \$5.28 billion per year on agriculture over 2000-2050 (in 2000 dollars), or \$6.6 billion in 2008 dollars. They do not give the corresponding agricultural growth rate, but since it is a base line scenario then presumably it is based on recent trends, so probably close to 4%. They also estimate that this level of spending would need to double to offset the negative impacts of climate change. Averaging these estimates gives a spending need of about \$10 billion per year in 2008 prices, corresponding to an agricultural growth rate of between 6% and 7%.

Given that government spending on agriculture in Africa is currently about \$4 billion per year, the required spending gap is \$6 billion per year. The OECD reports that total ODA for African agriculture was \$2.83 billion in 2008/09¹³, though actual disbursements were 20% less. This leaves a funding gap of between \$3 and 4 billion per year. Other potential sources of investment funds include ODA from other developing countries (especially the BRICS), and foreign direct investment. It is difficult to get good data on these flows, especially the amounts going into agriculture rather than agroindustry, but while they are growing they are still small (Byerlee, 2011).

To fill the remaining gap, African countries will need to about double their agricultural budget shares to 10%, i.e. they will actually need to fulfil their promise in the Maputo Declaration. This is not an unreasonable target; Asian governments spent 15% of their total budgets on agriculture during the early years of the GR.

These calculations should be treated with caution. In addition to data and model assumptions, they assume equal spending instalments over time whereas in reality many investments with long lead times might need to be front loaded. Nor is it clear that they allow for additional spending on fertilizer subsidies. At least they suggest that the funding needs to achieve 6% agricultural growth are not beyond reach.

Where to begin: Achieving early successes

Too many agricultural strategies, including the CAADP country compacts, seek to move on many fronts at the same time and are cluttered with an array of economic, social, health and environmental targets. There is hardly any recognition of the limitations of public institutions to implement change or absorb large increases in spending, the political time frame for producing successful results, the financial resources available, or the long gestation periods needed for some types of investments. Nor, despite a prevailing optimism in the donor community, are all goals

¹³ <http://www.oecd.org/dataoecd/36/61/49154108.pdf>

win-win. Sacrificing growth at an early stage to achieve quick gains on other goals can be suboptimal for long term outcomes. For example, investing in smallholder led growth can be a much more powerful way of achieving long term prosperity and deep poverty reduction than direct short term spending on the poor, but it may take longer for poverty to start falling. Or achieving sustainable farming systems or carbon capture at low levels of productivity may look good from a short term environmental perspective, but may not last when confronted by rising population pressure and livelihood aspirations. Too many naïve assumptions in development plans can be a real hindrance to their successful implementation.

An alternative to trying to drive the entire agricultural sector forward in this way is to focus on a few first movers, say priority foodstaples that are imported and traditional export crops, and drive their value chains hard for growth and employment creation, with the expectation that the rest of the sector will subsequently follow. This is very similar to the Asian Green Revolution (GR) strategy, where an initial thrust on import substitution for wheat and rice led the successful rural transformation that followed. A more focused approach can also lead to quick wins that are good for developing political momentum and support for agriculture. Once the first movers have been successfully launched and rural incomes and employment are rising, then attention can shift to other activities and goals.

Picking the first movers requires careful analysis. Static measures of comparative advantage may not be enough. Calculations based on past data are insufficient when the agenda calls for technological change, and marginal economic concepts may not hold when large increases in output are anticipated. Nor should growth linkage impacts be ignored. Simulations with economy wide models are a much better guide for selecting priority commodities, as illustrated by Omamo et al., (2007). Another criterion is to pick commodities that do not have bottlenecks that will take years to overcome.

There can also be a regional dimension to first movers. Given low initial levels of national infrastructure, it may be best to start in high potential areas that have the best infrastructure, market access and agricultural growth potential. These “bread basket” areas are often more densely populated, making the per capita costs of investment more plausible. This was also part of the Asian GR strategy, and is the strategy being pursued by the Alliance for a Green Revolution in Africa (AGRA) in its own support to African countries. Once growth has successfully been established in these areas, the priority can then shift to spreading it to other less optimal areas.

Some goals may not be easily postponed without incurring significant adjustment costs later, but others may be less critical. Historical analysis of development pathways suggests that societies are willing to trade off some environmental degradation during the early stages of development, but then reverse this later as they become wealthier, or as population pressure increases (e.g. Tiffen, Mortimer and Gichuki, 1994). Much the same happened with water and air quality in today’s industrialized countries (Lomborg, 1998). In India, there was more than a 10 year lag before public investments enabled the GR to spread to Eastern India where some of the poorest people lived. There may be less tolerance for postponing some environmental and social goals today (e.g. under the pressure of the MDGs), and not all the damage incurred by postponing goals is reversible. Nonetheless, there is need

for greater realism in setting and phasing objectives in agricultural development strategies.

Role of government

Agricultural revolutions do not just happen, not at the speed and scale that Africa needs. Government has to provide leadership through strategic planning, building partnerships with key stakeholders, monitoring progress, and backing this up with enabling public investments and policies.

Under the Washington consensus, this is pretty much all governments are expected to do. However, it is becoming clear that there are still many market failures in Africa and the private sector is not yet able to go it alone. I have already discussed several areas where governments may need to play more active roles, including:

- Coordinating value chains that do not work adequately.
- Supporting the procurement and distribution of fertilisers, including the use of subsidies.
- Managing volatility and risk in value chains, and for consumers
- Helping smallholders link to value chains
- Supporting subsistence oriented smallholders

This is not an argument for retreating back to the heavy handed forms of government intervention of pre-structural adjustment days. There are more opportunities today for contracting out, or using public-private partnerships to fulfil many of these needed public sector roles. What is needed are strong and effective public institutions, including ministries of agriculture, that can develop and oversee appropriate ways of fulfilling these functions, and that is something that is still badly lacking in many African countries. There is urgent need for additional capacity building, including the capacity to undertake evidence based policy analysis in government departments and universities.

CONCLUSIONS

In a world of high food and energy prices, Africa has both an opportunity and an imperative to accelerate its agricultural growth. Unlike the past, this growth needs to be driven predominantly by productivity enhancing technological change, particularly in the more populous countries where suitable new crop land is now scarce. This growth will require increased use of fertilizers, improved seeds and water as part of improved land management practices.

Agricultural development requires many things, but the fundamentals for Africa are developing markets, increasing agricultural productivity and managing volatility. This cannot happen at sufficient scale and speed without strong public sector leadership, enabling policies and investments, and well-focused implementation strategies.

Key areas where additional public support is needed include: coordinating value chains that do not work adequately; supporting the procurement and distribution of fertilisers, including the use of subsidies; managing volatility and risk in value chains and for consumers; and helping smallholders link to value chains. These are areas

where the structural adjustment reforms have led to too broad a retreat of the state, and there is now need for stronger public sector interventions. The best way to achieve these is for government to work through private sector and civil society partners, and by adjusting market incentives with price and tax policies. However, there are many situations where only public sector institutions have the capacity to intervene, and it behooves the donor community to give more attention to strengthening that capacity, especially within ministries of agriculture. There is also a role for fertilizer subsidies, and the challenge is to design more effective delivery mechanisms.

The public sector must also provide support to the many small, subsistence oriented farmers who for various reasons are unlikely to transition to commercial farming. This should include on-farm support for increasing the productivity of their food crops, training and assistance in diversifying or exiting out of farming, and safety net programmes. A lot of the difficulties incurred in designing effective credit, insurance, fertilizer subsidies and marketing strategies can be avoided if the support for subsistence oriented farms is handled separately. Mixing the two in the same programmes often leads to outcomes that satisfy neither need.

African countries have set themselves an ambitious target of 6% agricultural growth. The investment cost of this agenda is manageable, but will require that African governments actually fulfil their commitment in the Maputo Declaration and increase their agricultural budget shares to 10%. It will also require that donors abide by their own commitments.

Timing will be a challenge. Outside breadbasket areas, agricultural development can only move slowly until necessary levels of infrastructure and technology development have been achieved, and there are often long lead times before these kinds of investments have impact. Donors and governments need to bite the bullet and rapidly expand these kinds of investments. Until transport and marketing costs can be slashed, most African farmers will be locked into low productivity farming systems.

There are many challenges ahead, but if agriculture is to become a leading growth sector in the same way that it did in Asia some 50 years ago, it will take serious and sustained political commitment by governments and donors to an agricultural growth agenda. This has always seemed to me to be the missing ingredient in Africa compared to Asia and which explains much of why their fortunes became so inverted after the 1950s. CAADP and the New Alliance for Food Security and Nutrition are a promising start, but it remains to be seen how serious these commitments really are.

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