

# **Agriculture as an Engine of Growth and Poverty Reduction: What We Know and What We Need to Know**

A Framework Paper for the African Economic Research Consortium  
Project on “Understanding Links between Growth and Poverty Reduction in Africa”

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## **I. Introduction:**

In most poor countries, especially in sub-Saharan Africa, large majorities of the population live in rural areas and earn their livelihoods primarily from agriculture. Table 1 shows figures for the continent as a whole and for different regions. Apart from Northern Africa (somewhat richer than the remainder of the continent) and Southern Africa (where mining and other industries play a major role), the remainder of the continent's population and workforce are heavily agricultural, with approximately 60 percent of the economically active population in agriculture.

As a result, any serious discussion of growth and poverty reduction in Africa must begin with a look at the role played by agricultural development. Understanding agriculture's role has important implications for policies. One extreme view, commonplace in the development literature of the 1950s, is that the agricultural sector is simply a reservoir of unemployed or underemployed labor, with low incomes and living standards, from which people must eventually be moved by economic growth in the non-agricultural economy. The alternative extreme view is that the agricultural sector itself must generate the growth that will eventually release labor and other resources. Either of these extreme views would lead to a corresponding set of policy implications, affecting the choices of governments and donors alike.

This paper will consider both of these viewpoints, along with various shadings in between. It will also address a series of "big picture" questions involving agriculture's role in development. Is agricultural growth necessary for economic growth and poverty reduction? Will investments in the agricultural sector have high social returns? If so, what kinds of investments are likely to have the highest payoffs? Are there important tradeoffs within the agricultural sector between growth and poverty reduction? This paper does not claim to be comprehensive; the literature on agricultural development is vast (and of varied quality), and on some points there is little professional consensus. Nevertheless, the paper will offer a survey of relevant literature, including both theory and empirical studies. It will also touch briefly on the policy literature, which has focused on a somewhat different set of issues than the academic literature.<sup>1</sup>

As a framework paper, it will also lay out a number of the country-specific characteristics that will affect agriculture's role in development and poverty reduction

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<sup>1</sup> It is also worth noting that the literature includes a number of recent surveys that are similar to this in scope and intent, including (for example) Diao et al. (2004), Irz et al. (2001), Mellor (1999), Staatz and Demebele (2007), Thirtle et al. (2001), and Timmer (2003), in addition to the comprehensive effort undertaken in the World Bank's *World Development Report 2008*. Many of the issues addressed in this paper have been covered previously in these excellent surveys, among others.

in individual countries – and it will also suggest aspects of agriculture’s role that should be documented and explored at the country level.

The outline of this paper is as follows. Section II will review some interesting features of the data on Africa’s , addressing the general question of why agriculture might play an important role in poverty reduction – and also why skeptics might reasonably question this role. consider some measurement issues and discuss methodological problems that complicate our ability to answer the questions of interest. Section III will review some of the arguments from “agricultural fundamentalists” and “agro-pessimists” alike; Section IV will offer a shorter review of the policy debates. Finally, Section V will offer a (somewhat idiosyncratic) weighing of the evidence, along with a dose of authorial opinion. Section VI will sketch out some of the specific questions that should frame country studies on agriculture and that can illuminate policy debates.

## **II. Why Focus on Agriculture?**

As noted above, most of Africa’s labor force works in agriculture. For many countries, two-thirds or more of the economically active population is allocated primarily to agriculture (Table 2), although many of these people also supply labor for other market and non-market activities. Slightly larger fractions of the population inhabit rural areas, where they presumably are connected at least indirectly to the agricultural economy. (See Table 3.)

Agriculture also accounts for large fractions of economic activity, measured in value terms. In many countries of the region, 30 percent or more of GDP comes from agriculture, and in a few countries, agriculture’s share of output reaches 50 percent. (See Table 4.) For Sub-Saharan Africa as a region, between 15 and 20 percent of GDP has originated in agriculture. This fraction has changed relatively little over the past 40 years, as the region’s economy in general has exhibited little growth or structural change (Figure 1). Measured in purchasing power parity terms (PPP), as reported in World Bank data, Sub-Saharan Africa has experienced little net growth in per capita income since the early 1980s.

The two paragraphs above point to the fact that agriculture’s share of employment is substantially higher than its share of GDP in most African countries. This fact is somewhat underappreciated, but it has important implications. As an arithmetic matter, if agriculture accounts for a higher share of employment than of value added, then output per worker in agriculture must be lower than in non-agriculture. In fact, the implied differences in output per worker are large. Table 6 reports calculations of output per worker in agriculture and non-agriculture. The differences are striking. Although these aggregate data cannot be viewed as a truly reliable measure of relative

incomes, they point to a sharp difference in incomes between sectors. Rural areas are poor, and agricultural labor offers low returns.

Table 6 offers additional information on rural poverty. If we take these numbers literally, fully 13 countries in Africa have *average* agricultural output per worker that is less than \$1/day. For another 17 countries, agricultural output per worker is less than \$2/day. By contrast, there are only 3 countries with non-agricultural output less than \$2/day – and these three are Congo DRC, Liberia, and Sierra Leone, all of which are observed in the data at a moment (2005) when they were emerging from severe episodes of civil conflict.

For Sub-Saharan Africa overall, output per worker in agriculture was \$486 in 2005, barely over the \$1/day poverty line used by the World Bank and others. By contrast, the output per worker in non-agriculture, calculated in the same fashion as the numbers given above, was \$3,770, which is higher by almost eightfold. Although we cannot rely too much on these aggregate data for measures of poverty, the data point strongly towards the conclusion that the problem of poverty in Africa is, at least in a proximate sense, related to a problem of low productivity in agriculture.

There are many possible reasons for the productivity differences across sectors. One possibility is that the sectoral disparity is simply an illusion – an artifact of measurement problems with both labor and output. The labor figures used here do not measure hours worked in agriculture; they instead represent the fraction of the economically active population who report that agriculture is their primary source of income. To the extent that rural people are counted, by default, as working in agriculture, we may overestimate the labor used in agriculture.<sup>2</sup> Similarly, the data may do a poor job of accounting for the value of agricultural output. National income and product accounts in principle include home consumed agricultural goods, so the problem is not one of theory. Implementation, however, can be tricky. Sectoral output is usually estimated from area and yield data, rather than from market sales, but it is not always straightforward to quantify the volume of output, nor is it obvious what prices should be used for valuing agricultural production.

Ultimately, however, it seems difficult to make the case that the sectoral differences are primarily due to mismeasurement. Living standards in rural areas are visibly lower in much of Africa; this is borne out in household survey data, anthropometric studies, and other empirical research. While measurement problems may be real, it is simply implausible to argue that the sectoral gap does not have a real origin.

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<sup>2</sup> This is not, however, a problem unique to poor countries. In many rich countries, farmers may work in off-farm activities (e.g., holding a steady job “in town”), and it is not clear whether we are likely to overestimate agricultural labor more severely in rich countries or in poor ones.

Among other possible explanations, it might be the case that agricultural labor is disproportionately low-skill, or that agricultural firms are poorly managed. Perhaps African countries are simply and irremediably very poor at agriculture – a result, possibly, of adverse climate and geography. Technologies (such as crop varieties and agronomic practices) may be less well developed in Africa than in other regions. Any or all of these explanations might help to account for the low measured productivity levels in African agriculture.

Beyond productivity and agriculture's role as a productive sector, there are other reasons to focus on African agriculture as a sector that affects growth and poverty. One particularly important issue is the sector's central role in feeding Africa's population – and its impacts on poverty via this channel.

The relationship between food consumption and poverty is too obvious to require much elaboration. But Table 7 points out that undernourishment continues to be a serious problem in many African countries, with 30 percent or more of the population classified as undernourished, based on data from the UN Food and Agriculture Organization (FAO). Malnutrition is both a consequence and a potential cause of poverty, as underfed people cannot supply much labor, are more susceptible to disease, and may in extreme cases suffer cognitive deficits.

For many in Africa, especially those in rural areas, malnutrition is a direct result of low agricultural productivity. Farmers who are largely reliant on home produced food may struggle in some seasons to provide adequate food for their families. More generally, the poor in both urban and rural areas spend large fractions of their incomes on food; low agricultural productivity affects the price of food in both urban and rural areas.

Note that although export-oriented agriculture is important in Sub-Saharan Africa, most of the region's agricultural production consists of food for domestic consumption. The converse is also true: most of Sub-Saharan Africa's food is produced within the continent. For the continent as a whole, approximately 90 percent of all calories consumed as food are produced within the region; most food is in fact produced within the countries where it is consumed. Table 8 shows a food balance sheet for the region, and it is apparent that imports are negligible for most food commodities. While a few coastal cities import significant quantities of grain and meat, much of the continent consumes virtually no imported food. Many interior countries are almost entirely self sufficient, except for a few luxury goods consumed by urban elites. Uganda, for example, imports less than 2 percent of its total calorie consumption.

With low productivity in agriculture, relatively few imports, and low incomes, Africans face high food costs relative to incomes. An equivalent statement is that the

real wage is low. Table 9 shows the fraction of household expenditure that is devoted to food in a number of African countries, over a period dating back to 1990 and before. The data show that across the region, it is common for households to spend half of their incomes on food. In a number of surveys, food accounts for two-thirds, three-quarters, or even eighty percent of household expenditure, with higher numbers in rural areas than in urban areas. Numbers like this almost necessarily imply deep poverty, closely related to low agricultural income and output.

Poor incomes in African agriculture may also be related to the gendered division of labor and the increasing feminization of agriculture. Figure 2 shows the fraction of women in the agricultural labor force, which has been rising for fifty years and will soon reach fifty percent. Perhaps more striking is that two-thirds of the economically active women in sub-Saharan Africa work in agriculture – compared with just over half of men. Agriculture in Africa is significantly and increasingly women's work. Since women are disproportionately involved in providing food for households, and since women tend to be disproportionately represented among the poor, agricultural development may have particular relevance from a gender perspective.

Taken together, the facts presented here suggest that if our goal is to understand economic growth and poverty reduction in Africa, we should begin with a careful examination of the agricultural sector. In a proximate sense, it is clear that a major cause of poverty and slow growth in Africa is the low level and the slow growth of agricultural productivity. This does not necessarily imply that agriculture should be targeted for remedial investments; after all, perhaps a better strategy is to import larger quantities of food, or even to provide food aid on a more systematic basis. But it appears essential to look at African economies in ways that disaggregate by sector.

Africa's agricultural situation raises a number of questions. Why are so many people in Africa "stuck" in the subsistence agricultural sector, using little improved technology, and essentially unable to benefit from the division of labor? Given the income and productivity differences across sectors, why do we not observe more people migrating out of subsistence agriculture and moving to cities? To address these questions, it is useful to look at previous theories and empirical studies.

### **III. The Structural Transformation: Theory and Evidence**

As early as Adam Smith, economists recognized that economic growth is accompanied by a sectoral transformation that leads to the movement of labor and other resources out of agriculture and into other activities.<sup>3</sup> The nature of this

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<sup>3</sup> Smith even seemed to recognize the fact that productivity differences across countries were greater in agriculture than in non-agriculture. He wrote (1986, p. 111), "The most opulent nations, indeed, generally excel all their neighbours in agriculture as well as in manufactures; but they are commonly more

transition – and the direction of causation – have attracted much discussion and generated a surprising degree of controversy. For example, economic historians have debated whether or not agricultural productivity improvements preceded the industrial revolution, and development economists have argued over whether foreign assistance should give priority to agricultural development or industrial development. The stylized facts, however, are not in dispute. Kuznets (1966) initially documented the nature of the structural transformation in both time series and cross-section data; other early empirical work includes Chenery and Syrquin (1975), Syrquin (1988), and similar studies that documented patterns of sectoral change within and across countries.

Contemporary data show strong patterns of structural transformation, and these data also suggest that the historical forces that led to structural transformation in today's rich countries continue to drive patterns of development today. Figures 3-6 show that both in the cross-section of countries (Figures 3 and 5) and the time series data for countries that are currently rich (Figures 4 and 6), there are strong negative relationships between income per capita, measured in PPP terms, and agriculture's share of employment and output. Indeed, it is striking how similar the cross-section data are to the time series data, which reflect historical observations from fifteen currently industrialized countries, using Maddison's estimates of real per capita income along with historical data from Mitchell on agriculture's share of employment and output.

#### Theories of the Structural Transformation and Agriculture's Role:

The early development literature offered two different views of the structural transformation – and more generally of the role of agriculture in development. One influential early view was that of Lewis, who along with influential scholars such as Rosenstein-Rodan (1943) and Rostow (1960), viewed modern economic growth as essentially identifiable with industrialization. These authors, like most of the early growth and development economists, tended to view subsistence agriculture as a default source of employment and as a pool of reserve labor. The challenge of development, in their view, was to create and expand employment in the modern industrial sector. This sector was seen as having high potential for growth, and it was assumed that industry (and to a lesser extent services) would gradually absorb workers from agriculture. Lewis (1955) and Fei and Ranis (1964) viewed the agricultural sector essentially as a pool of surplus labor, with a very low shadow wage.

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distinguished by their superiority in the latter than in the former.” He also seemed to argue (p. 483) that agricultural productivity growth would normally precede industrial growth: “According to the natural course of things, therefore, the greater part of the capital of every growing society is, first, directed to agriculture, afterwards to manufactures, and last of all to foreign commerce. This order of things is so very natural that in every society that had any territory it has always, I believe, been in some degree observed.

In many dual economy models, such as those of Lewis, the labor market dynamics were somewhat ill defined. It was assumed that wage differences could and would arise between the modern sector and the traditional sector, with some kind of efficiency wage story (or alternatively, a price distorting minimum wage) accounting for the high wages paid in the modern sector. Harris and Todaro (1970), among others, recognized that incentives would arise for rural to urban migration in this model, but they maintained the assumption that the modern sector would provide a limited number of jobs, with wages above the market-clearing level.

An alternative view, also present in the early development literature, was that many poor economies suffered from what T.W. Schultz (1953) characterized as the “food problem.” Simply put, Schultz argued that many poor countries are in a situation of “high food drain,” in which they have “a level of income so low that a critically large proportion of the income is required for food.” Schultz took it as given that countries in this situation must produce the bulk of their own food to satisfy subsistence needs, presumably because imports are prohibitively costly and because these countries have few goods or resources to exchange for food. Until they can meet their subsistence needs, Schultz said, they are unable to begin the process of modern economic growth.

Schultz’s view was later echoed in a large literature on development, which held that an agricultural surplus is a necessary condition for a country to begin the development process. The hypothesis was a central argument of Johnston and Mellor (1961), Johnston (1970), Johnston and Kilby (1975) and Timmer (1988), and Johnson (1997), and it continues to figure prominently in the analyses of many other scholars (e.g., Eswaran and Kotwal 1993, Mundlak 2000).

The modern growth literature, however, ignored for many years issues of structural transformation. Following a brief flurry of interest in multi-sector models in the early 1960s (e.g., Uzawa 1961, 1963), little was written until the past ten years. Recently, however, a number of researchers have sought to examine the importance of structural change in the growth process. Several papers have attempted to offer formal models of structural change, industrialization, and growth.<sup>4</sup> Some have focused on long-run growth processes, and others have sought to explain cross-section differences among countries.

Some recent growth papers revisit the dualism of Harris and Todaro. In recent works, Temple (2005), Vollrath (2004) and Vollrath (2008), among others, have explored multi-sector models in which unemployment or underemployment is possible in the modern sector. In these papers, there may be fixed urban wages or other rigidities that

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<sup>4</sup> See, for example, Caselli and Coleman (2001); Echevarria (1995, 1997); Glomm (1992); Hansen and Prescott (2002); Irz and Roe (2001); King and Rebelo (1993); Kogel and Prskawetz (2001); Kongsamut, Rebelo and Xie (2001); Laitner (2002); Matsuyama (1992); Ngai 2004; Ngai and Pissarides 2007; Restuccia, Yang, and Zhu (2004); and Ripoll and Cordoba (2004).

prevent the urban labor market from clearing; other papers (e.g., Caselli and Coleman 2001) rely on transaction cost wedges that prevent the labor market from equalizing marginal products across sectors. These papers have the feature that the allocation of resources across sectors is inefficient; the social planner would allocate labor and capital differently.

A stylized policy implication of this class of models is that policies should focus on removing or reducing the rigidities that lead to inefficient outcomes and overallocation of resources to agriculture.

Another set of growth papers, including Gollin et al. (2002, 2007) follow Schultz in assuming that many poor countries are hindered in their growth processes by the need to tie down large amounts of labor and other resources in food production. A stylized policy implication of this line of argument is that efforts to boost agricultural productivity will have a large payoff in terms of growth.

Perhaps the central issue in the growth literature is the extent to which poor countries must rely on producing their own food. If food is essential for consumption, and if there is no effective alternative to countries producing this food domestically, then development must begin with a focus on agriculture and agricultural productivity – and specifically with food production.

A model in which countries must attain a high degree of food self-sufficiency seems appropriate at present for those parts of Africa that are landlocked, predominantly rural, and have large fractions of their population living at a considerable distance from coastal cities where they might have access to inexpensive food imports. This might include, for example, Uganda, Congo, Mali, Niger, Ethiopia, and Burkina Faso.

Some other countries, however, may be able to rely much more on imported food. Small island economies (e.g., Mauritius or Cape Verde), along with coastal economies with well developed port infrastructure and good access to international markets (e.g., South Africa; much of North Africa, and some countries in West Africa), may be able to feed themselves more efficiently from imports than through domestic production.

The papers referenced above typically rely on stylized models with some application to the data. However, they have not generally been based on purely empirical approaches. A separate literature has pursued econometric approaches.

#### Empirical Studies of the Structural Transformation and Agriculture's Role:

A voluminous literature, dating back to the work of Chinery, Syrquin, and others referenced above, has attempted to uncover causation in the (undisputed) correlations

between agricultural growth and economic growth. Some of this literature is focused on estimating the growth of total factor productivity (TFP) in agriculture and comparing it to TFP growth in non-agriculture. Some studies have sought direct links between agricultural growth and poverty reduction.

A difficulty with this literature is that the data afforded by historical experience do not offer much clean “identification” of causal relationships. To understand why, it is useful to contemplate a thought experiment. Specifically, consider what would be the *ideal* experiment needed to provide clear and unambiguous evidence of the effects of agriculture on overall growth and poverty reduction. For obvious reasons, this can only be a thought experiment, rather than a real experiment. The thought experiment is useful, however: it provides a benchmark against which to measure the other empirical and theoretical evidence that are actually available.

There are many possible variants on the experimental design, but essentially they would all have the following elements. First, take a large number of otherwise identical versions of the world as it currently exists. In each version of the world, identify a single developing country at random to take part in a “treatment”. Other countries will be left unchanged. With enough replicates of the world, we will have a large number of treatment countries, and indeed for each country we will have a large number of “treatment” experiences and “control” experiences. For the most effective control, we should also include a number of replicates of the existing world in which no country receives a “treatment”.

The “treatment” will consist of a fully funded program that will spur agricultural development, perhaps by achieving a given rate of growth in agricultural productivity. Control countries will receive no development programs, or possibly they will receive comparably sized development programs that target some other sector or sectors. The correct “control” is unclear.

As part of the experiment, we will observe these economies growing over time. Because the impacts of their development programs may take a long time to come online, we will follow these worlds over a period of several decades at least.

At the conclusion of this time period, we will compare “treatment” countries with non-treatment versions of themselves, and also with non-treatment versions of other developing countries. If we collect our data carefully, this comparison will allow us to identify (in a causal sense) the effects of agricultural development programs on growth and poverty reduction. We will be able to infer (with sufficient replications) that differences between the treatment and control versions of the same country are in fact due to the agricultural development “treatment”.

Obviously this thought experiment is an unattainable ideal. But it serves as a useful benchmark in evaluating the actual comparisons that economists have made in looking at the data. Both supporters and opponents of agricultural development have tended to focus on the limited cross-country data, either in regression analyses or in more anecdotal accounts and case studies. The usual idea is to look at countries that have implemented a set of policies (e.g., agricultural development policies) and to compare them with those that have not. But these cross-country comparisons are almost certainly flawed because there is no randomness in the “assignment” of countries to “treatment” or control. Moreover, countries may differ in ways that are correlated with the “assignment” and that directly affect their outcomes. For example, many of the poorest countries may have weak institutions, low productivity, poor geography, and little access to international markets. These countries are almost certainly agricultural, and many may have pursued agricultural development strategies – which in turn are likely to have proven ineffective.

Supporters of agricultural development generally look at successful countries and argue that they have almost all experienced significant agricultural development. This is a specious argument. Almost by definition, any country that has developed has undergone a structural transformation that involves some growth in the agricultural sector. As a result, these countries appear to show a positive relationship between agricultural development and growth; but this relationship may be spurious.

Opponents of a focus on agriculture, especially in sub-Saharan Africa, tend to argue that previous efforts have achieved little; they infer from this that it would be futile to pursue agricultural development efforts – or at least that it might be more productive to invest in other sectors. But this argument suffers from the opposite fallacy. If African development has been hampered by other barriers (e.g., civil conflict, poor institutions), then any development efforts will have failed – not just agricultural programs. It would be erroneous on this basis to arrive at the conclusion that agricultural development is futile.

We might seek evidence from “before” and “after” comparisons of individual countries that institute pro-agriculture reforms. But these reforms are seldom random in their timing; they typically accompany other policy changes that may have a greater direct effect on outcomes. Any inference about the impact of the agricultural policy changes on outcomes will be “contaminated,” in a statistical sense, by the impact of the other reforms.

Essentially the same problem holds with any of the real-world experiences on which we might be tempted to base our analysis. None of these really approximates the benchmark experiment. As a result, we will have great difficulty in interpreting the cross-country or time series data as offering any conclusive or clear evidence on the impact of agriculture on growth and poverty.

Nevertheless, a number of recent studies have taken aim at the relationship between agricultural growth and economic growth, making use of the best available econometric tools.

Many of these papers look for circumstantial evidence that agriculture has a causal effect on economic growth, rather than finding any unimpeachable support for a particular theory or model. For example, several papers seek to show that productivity growth is higher in agriculture than in manufacturing, as Jorgenson, Gollop and Fraumeni showed for the US time series (1987). If agricultural productivity growth is more rapid than non-agricultural TFP growth, then it can be argued that agriculture is a leading sector rather than a trailing sector. Thus, Martin and Mitra (1999) find that TFP growth in agriculture exceeds that in manufacturing, in a set of countries at varying levels of income. Similarly, Bernard and Jones (1996) find that agricultural TFP growth is higher than non-agricultural TFP growth in a sample of 14 OECD countries for a period from 1970-87.

A different approach is to ask whether changes in agricultural output (rather than TFP) are causally related to changes in GDP. For example, Tiffin and Irz (2006) use Granger causality tests to argue that the correlation between these two variables takes a form that implies a causal direction from agriculture to the aggregate economy, rather than the converse. Some authors (for example, Thirtle et al. 2001) have sought to test directly the links between agricultural productivity and poverty levels.

But recent literature reviews by Timmer (2002), Gardner (2003), and Tsakok and Gardner (2007) find little well-identified empirical evidence that would untangle the causality in the links between agricultural growth and general economic growth. Gardner and Tsakok conclude in fact that “this approach is fraught with difficulties that have so far precluded definitive findings” (p. 1145). They add the somewhat damning conclusion that “our view is that economists will simply have to face the fact that econometric studies of country data will not be able to establish causality.”

#### A Simple Model:

Given the differing views in the literature, it is useful to write down a simple model as a heuristic device for considering the ways in which agricultural development could generate differing impacts under different circumstances.

Consider a simple static model economy, drawn from Gollin and Rogerson (2009) and similar in spirit to Gollin, Parente, and Rogerson (2007).

In this model economy, each individual has preferences over two goods, which we label as agriculture ( $a$ ) and manufacturing ( $m$ ), given by:

$$u(a - \bar{a}) + v(m + \bar{m}) \quad (1)$$

where  $u$  and  $v$  are defined for non-negative values. We assume that both functions are increasing and strictly concave. The parameters  $\bar{a}$  and  $\bar{m}$  are both strictly positive.<sup>5</sup> The key feature of these preferences is the presence of the  $\bar{a}$  and  $\bar{m}$  terms, which serve to make the income elasticity of the agricultural good less than one and that of the manufactured good greater than one.<sup>6</sup> An extreme version of these preferences is the special case where:

$$u(a - \bar{a}) = \begin{cases} -\infty & \text{if } (a - \bar{a}) < 0 \\ \omega & \text{if } (a - \bar{a}) \geq 0 \end{cases} .$$

This utility function gives rise to an extreme Engel curve in which utility is flat once the economy has satisfied its food needs. A slight relaxation of this assumption gives the utility function in Gollin, Parente, and Rogerson (2007); i.e.,

$$u(a - \bar{a}) = \begin{cases} a & \text{if } (a - \bar{a}) < 0 \\ \bar{a} & \text{if } (a - \bar{a}) \geq 0 \end{cases}$$

The economy is endowed with one unit of land and each individual is endowed with one unit of time.

The technology for producing the manufactured good is given by:

$$m = A_m n_m \quad (2)$$

where  $n_m$  is the number of workers that work in the manufacturing sector, and the technology for producing the agricultural good is given by:

$$a = A_a L^\theta n_a^{1-\theta} \quad (3)$$

where  $n_a$  is the number of workers that work in the agricultural sector and  $L$  is land.

Given the extreme version of the preferences used here, we will simply assume that the economy is able to produce sufficient amounts of  $a$  so as to provide all individuals with at least  $\bar{a}$  units of the agricultural good. A sufficient condition for this is that  $A_a > \bar{a}$ . We assume that land ownership is equally distributed across the population.

The social planner's problem in this model economy is to maximize the utility of a representative household subject to the feasibility constraints. This turns out to be somewhat trivial given the extreme form of preferences that we have assumed. In particular, given that everyone needs to consume exactly  $\bar{a}$  units of the agricultural

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<sup>5</sup>While we refer to the nonagricultural good as the manufacturing good, it should be interpreted as representing both the manufacturing and the service sectors.

<sup>6</sup>It is sufficient that at least one of  $\bar{a}$  or  $\bar{m}$  be greater than zero for this property to hold. Having both positive allows for the possibility of a corner solution in which  $m = 0$ .

good, but receives no benefit from consuming any additional amount, the optimal allocation is to allocate enough workers to the agricultural sector so as to produce  $\bar{a}$  for each individual in the economy, and then to allocate all remaining workers to the manufacturing sector. It follows that the optimal value for  $n_a$  is given by:

$$n_a = \left[ \frac{\bar{a}}{A_a} \right]^{1/(1-\theta)}. \quad (4)$$

The key implication of this model is that in a closed economy in which food is a necessity, there is a powerful negative relationship between agricultural TFP and employment in agriculture. In particular, a one percent decrease in agricultural TFP  $A_a$  will lead to an even larger percentage increase in employment in agriculture, equal to  $1/(1-\theta)$ .

This basic result holds robustly so long as the economy is closed. The model sharply underscores the somewhat obvious point that in a relatively closed economy in which food is an essential consumption good (and in which food must be produced domestically), agricultural productivity is linked directly to the fraction of the population working in the agricultural sector. If we observe a large number of people in this sector, with low productivity levels, we should not view the result as a paradox; instead, it is a natural implication of a simple model with subsistence food production.

Gollin and Rogerson (2009) show that the same result holds for more general specification of preferences and also for situations in which the non-agricultural good is used as an input into agriculture. They also show that high transportation costs can exacerbate the effects of low agricultural productivity. In an economy where it is costly both to produce and to transport food, we should expect to find lots of people living in rural areas and producing their own food.

Although this simple sketch of a model is not intended to be taken as a literal representation of an African economy, the point is that a rudimentary model of this type makes it unsurprising that large fractions of the African population are engaged in agriculture, even while they have relatively low productivity and live in isolated rural areas. This is a predictable equilibrium outcome, so long as productivity is low and there are few alternative sources of food.

The closed economy assumption is restrictive but also revealing. Countries have a growth advantage if they are in a position to import significant quantities of food in exchange for exports of non-food goods or services. Trade can be a substitute for the long, slow business of increasing agricultural productivity. But for many countries with large populations in remote areas, it is difficult to see how food imports will plausibly replace domestic production. Although people will continue to move to the coastal cities of Africa, these migrations may entail significant transaction costs in the

short and medium term. As a result, there seems to be no real likelihood that a trade-based food strategy will meet Africa's needs in the next several decades.

#### **IV. The Persistence of Semi-Subsistence Agriculture and the Agricultural Transformation in Africa: Some Possible Causes**

Leaving aside theory and cross-country studies, the question remains of why agricultural incomes remain so low in much of African agriculture, and why semi-subsistence rural economies remain the norm in rural areas. Three possible explanations in particular seem compelling.

##### *Low Agricultural Productivity*

The World Bank's recent *World Development Report 2008: Agriculture for Development* notes that sub-Saharan Africa has lagged behind other regions of the developing world in agricultural productivity levels and growth rates. Grain yields, a measure of land productivity, grew at 2.8 percent annually in East Asia between 1961 and 2004; in sub-Saharan Africa, they grew hardly at all. Africa has far lower levels of modern variety adoption than other regions of the developing world. (See Table 3 for illustrative data on four of Africa's major crops.) In addition, little land is irrigated, and many farmers use almost no fertilizer.

These facts do not, however, necessarily imply low intrinsic productivity in agriculture. Input use (and therefore yields) may be low because of poor technology that does not respond well to inputs. But low input use could also result from policy distortions or lack of effective demand. In other words, causation could flow from a poor overall economy to low agricultural productivity, as well as the other way around.

There are reasons, however, to believe that sub-Saharan Africa may in fact lag behind other regions of the world in agricultural technology. The staple foods of sub-Saharan Africa – tropical maize, cassava, cooking bananas and plantain, sweet potatoes, yams – are not crops that have been widely researched in the rich countries of temperate zones. Modern agricultural researchers found fewer useful raw materials to work with in Africa than in Asia or Latin America, and their efforts also began later – in the 1980s, rather than the 1960s, for a variety of political and economic reasons. As a result, few useful crop varieties have been developed to this day for sub-Saharan Africa, and research successes have been rare.

Compounding this problem, the production environments of the sub-Saharan region are so enormously heterogeneous that technologies developed for one locale do not

necessarily have a very wide domain of usefulness. Where successful rice varieties in South Asia could be planted on many millions of hectares, a successful crop variety in Africa is unlikely to be planted on more than a few hundred thousand hectares.

Note that these explanations do not invoke pure geographic differences. There may in fact be soil or climate problems that make agriculture less productive in Africa than in other regions, but this is not obvious. Across the world and throughout history, farmers have overcome problems of poor land and rainfall by improving soils, managing water, and selecting new crops and farming systems. While there may in fact be important geographic differences in agricultural productivity across countries, these are not essential.

For a country study of agriculture, it would be helpful to document levels of agricultural productivity. This might include careful recording of yields based on representative surveys (and going beyond the available aggregate estimates, which often have little foundation in field-based surveys). It would also be valuable to document the diffusion of modern varieties and production systems, the use of inputs, and other measures of output per unit of input.

#### *Input Price Distortions:*

Agricultural inputs appear to have high farmgate prices in sub-Saharan Africa, even compared with other regions of the developing world. Partly in response, farmers use few chemical fertilizers or pesticides, even where these would appear to have high technical responses. Restuccia et al. (2008) suggest that high input prices are a significant explanation of the low agricultural productivity – and hence the low income levels – of many African countries.

What is less clear is why input prices are so high. To some extent this fact might reflect tariff barriers or price distortions in the non-agricultural sector, of the kind identified for many years by Valdés, Anderson, Krueger, and others. However, tariffs have come down sharply in many countries, with little evident effect on the affordability of non-agricultural inputs.

High prices might also derive from high costs of producing intermediate inputs or transporting them to rural areas (an issue addressed below). They might also reflect inefficiencies or imperfect competition in the wholesale and retailing sectors.

Policies to address high input prices would depend on the underlying source of the problem. Many African countries continue to experiment with subsidies for agricultural inputs (e.g., tractors, fertilizer). In many countries, input subsidies were put in place in the 1960s and 1970s to provide a partial offset to policies discriminating against the

agricultural sector; for the most part, subsidies were cut back sharply (or eliminated, in some cases) in the 1980s and 1990s under pressure from the IMF and World Bank, which saw them as expensive and inefficient.

It would be helpful if country studies could provide evidence of any continuing subsidies or taxes that affect the prices of inputs at the farm gate.

#### *Transportation and Market Access:*

A United Nations report in 2007 noted that “Africa is lagging significantly behind in the development of regional trade, particularly because of the lack of reliable and adequate transport” (ECA 2007). By almost any measure, Africa’s transportation infrastructure is poor by comparison to all other regions of the world. Transport prices are high along main corridors, and transportation along feeder and market roads into rural areas is particularly dreadful.

Overall, Africa has approximately half the road density (6.8 km of road length per 100 km<sup>2</sup> of land area) of Latin America (12 km/100 km<sup>2</sup>) and about one-third the density of Asia (18 km/100 km<sup>2</sup>). The quality of these roads is also poor by comparison to other regions. Few of the roads are paved, and fewer still are well maintained.

As a result, few people in sub-Saharan Africa have good market access. GIS data compiled by IFPRI suggest that only 20 percent of the rural population of sub-Saharan Africa lives within one hour of a market center (defined as a community of 5,000 people or more). Fully one-third of the rural population lives five hours or more from a market center. In a number of countries (e.g., Congo, Tanzania, Rwanda, Ethiopia), more than half the population lives five hours or more from a market center.

For households in these locations, the lack of transportation to market is a major impediment to buying and selling goods. For example, in Uganda, 30 percent of communities surveyed in the national household survey of 2005/06 did not have roads that were passable even in the dry season. Two-thirds of communities lacked any bus or taxi connections. As a result, markets (not to mention health clinics and other public services) are far and difficult to reach (Uganda National Household Survey 2006/06, p. 142).

A longstanding literature argues that high transport costs can pose a major impediment to development in Africa and other regions of the developing world. This includes theoretical papers along with a number of recent policy and empirical papers, such as Platteau (1996), Fan and Hazell (2001), Fan and Chan-Kang (2004), Torero and Chowdhury (2004), Renkow et al. (2004), Zhang and Fan (2004), and Minten and Stifel (2008). A recurring view in this literature is that African transport costs are so high that

they alter incentives for agricultural investment and impede development. Numerous studies also suggest that transport costs are higher in sub-Saharan Africa than in other parts of the developing world, such as Asia and Latin America.

To give a striking illustration of the continent's shortcomings in terms of transportation infrastructure, consider the case of Uganda. The country's paved road density in 2003 was approximately 16,300 km in a land area of 200,000 km<sup>2</sup> (CIA Factbook 2009). For comparative purposes, Britain at the end of Roman rule in AD 350 had almost an equivalent length of paved roads: 12-15,000 km in a land area of 242,000 km<sup>2</sup> (Lay 1992, p. 55 and CIA Factbook 2009). In this specific sense, Uganda lags Britain by almost two thousand years in the development of its road infrastructure.

While road construction is extremely expensive and subject to many institutional and governance problems, not to mention environmental concerns, it is difficult to imagine a development strategy for sub-Saharan Africa that will not involve major expansions in the road network – especially in farm-to-market roads.

In a recent paper, Gollin and Rogerson (2009) offer a numerical analysis of the relative payoffs to increasing agricultural productivity, non-agricultural productivity, and reducing transportation costs within a closed economy. Not surprisingly, since it presumes a closed economy, this study finds big effects from improvements in agricultural TFP and also finds strong interactions between agricultural TFP and transportation costs. The paper finds that doubling TFP in both agriculture and non-agriculture would reduce the agricultural share of the labor force by more than half and would lead to a dramatic increase in welfare. Combining the TFP changes with a halving of transportation costs would have an even greater effect, reducing agricultural employment to just over one-fourth of the total.

In recent years, a number of studies have attempted to document in detail the extent of “remoteness” and isolation in Africa, and some have also studied the economic impact of remoteness. At the country level, it should be a priority to document the extent of remoteness and at least to consider the spatial mapping of poverty onto various measures of transportation access.

## **V. Agricultural Development Strategies: Some Specific Questions**

The previous sections suggest that there is no single or unambiguous channel from agricultural development to growth and poverty reduction. There are reasons to believe that agriculture may play a key development role in certain economies. There are also reasons to believe that agricultural development matters for poverty alleviation. But the relationship between agricultural development, growth, and poverty reduction may vary considerably across countries. The following are some

questions that country studies should address in documenting the conditions of agriculture in Africa and in exploring the importance of agriculture for growth and poverty reduction in specific cases.

- a. *Are the poor, in fact, located in rural areas? Or have recent patterns of urbanization altered the spatial distribution of poverty?*

This is a central question for any discussions of agriculture's role in poverty reduction, because different prescriptions will be appropriate depending on whether the poor are urban or rural, landholders or landless, net purchasers or net sellers of food. A basic descriptive understanding of the situation of poverty in African countries is essential. All too frequently, agricultural policy has been made based on careless or internally inconsistent understandings of the locus of poverty.

Fortunately, a large amount of recent empirical work has addressed this question. Ravallion et al. (2007) use household survey data from 87 developing countries to argue that poverty remains largely a rural phenomenon, with about three-quarters of the world's poor living in rural areas. For sub-Saharan Africa, the authors estimate that in 2002, 70 percent of the poor were in rural areas. They further estimate that 51 percent of people living in rural areas were poor, compared with 40 percent of urban dwellers. The authors find that the fraction of the poor in rural areas fell slightly in the decade from 1993-2002, from about 76 percent to 70 percent, driven largely by a modest movement of people from rural areas to urban areas. The results are fairly robust to the choice of a poverty line at \$1.08 or \$2.15 per day, and also to the use of a headcount measure of poverty versus a poverty gap measure.

If current trends continue, it seems likely that poverty in sub-Saharan Africa will remain a largely rural phenomenon for many decades to come. Although much recent evidence suggests that urbanization can occur fairly quickly with economic growth (see the World Bank's *World Development Report 2009*), most of sub-Saharan Africa shows few signs of rapid change.

In some countries, however, there are large and growing numbers of the poor in urban areas where food imports may be cheaper than domestic production – and where imports provide a large fraction of food consumption. In these countries, agricultural development may have less impact on poverty than alternative development strategies that would emphasize employment and income support for the poor.

- b. *Why is labor productivity so low in African agriculture? Almost equivalently, why are incomes so low in rural areas in Africa?*

There are many possible explanations for the low productivity levels. One plausible explanation is that technologies for African agriculture are poor, perhaps reflecting a historical pattern of underinvestment in relevant research. This explanation has been discussed briefly in Evenson and Gollin (2003) and the continuing patterns of underinvestment are documented in some detail by Beintema and Stads (2006).

A second possibility is that there are simple geographic and climatological factors that make agriculture in this region inherently less productive than in other parts of the world, including other regions of the tropics. This point of view has been most notably argued by Gallup and Sachs (2000), Sachs (2001) and Masters and McMillan (2000, 2001). A related point is made by Johnson and Evenson (2000), who argue not that Africa is inherently less productive than other regions, but instead that it receives few spillovers from research carried out in other parts of the world.

A third possibility is that technology and geography are not the binding constraints; instead, the low productivity of African agriculture is due to factors of production. Low labor productivity could result from characteristics of the labor force (such as the low skill level of workers) or from low levels of capital and/or intermediate goods. In turn, the underlying causes could include market failures, transaction costs, or a number of other possibilities. By most measures, agricultural capital per worker and agricultural capital per unit of land are lower in Africa than in other regions of the developing world. Although measures are poor, Table 12 shows estimates, derived from FAO data, of agricultural capital per worker and per unit of land. The former has actually been falling in recent decades. Use of fertilizer, chemicals, irrigation, and machinery are also very low in sub-Saharan Africa, compared to other regions of the developing world.

Finally, a fourth possibility is that institutional arrangements – perhaps operating through the mechanism of very bad policy – have led to low productivity in agriculture, by destroying incentives of various kinds. Anderson and Masters (2007) review the current levels of policy distortions that penalize agriculture. They conclude on the basis of their analysis that while policies that discriminate against agriculture are less burdensome than in previous decades, they remain a significant challenge for Africa's farmers. The authors find that for the 21 countries in their study, the cost to farmers of government policy distortions was approximately \$6 billion annually, or about \$41 per person working in agriculture. They contend that the effects of policy discrimination against agriculture are large and that bad policies “could help explain ... the continent's slow pace of poverty alleviation and economic growth” (p. 1).

These various possibilities are not mutually exclusive, but to date there is little or no work that allows us to quantify the relative importance of these different explanations

for low productivity in African agriculture. Understanding this point seems central to making sense of Africa's stalled structural transformation.

For country studies, it seems critical to address the underlying causes and dimensions of low agricultural productivity. Which of the above explanations seems to be most compelling in each country? Are poor policies and institutions continuing to hold back agricultural development? Are technologies simply unavailable? Is investment low? What are the driving forces that are holding down productivity levels? The answers will differ across countries. In some countries, such as Zimbabwe, we might suspect that the technological frontier is not a major constraint, whilst poor policies and institutions play a central role in holding back agriculture. In some other countries, such as Liberia or Sierra Leone, we might suspect that recent conflict has physically destroyed much agricultural capital (including buildings, livestock, seed stocks, marketing infrastructure, etc.) and has also harmed the investment climate. Figuring out the country-specific sources of low agricultural productivity will be an important area for country studies to investigate.

- c. *Why is there such a large gap between labor productivity in agriculture and non-agriculture? Why don't migration and other forces tend to erode this gap? Why has there been so little improvement in productivity levels in agriculture over the past several decades?*

Most countries, in the course of economic development, have faced gaps in productivity between agriculture and other sectors. The structural transformation out of agriculture is a widely recognized element of economic growth. Africa's pattern of transformation is puzzling, however. First, the gap between productivity in agriculture and other sectors appears to be far bigger than that found in other regions of the developing world – or than that found historically in today's rich countries. Second, with the exception of a few countries (Nigeria, South Africa), the rate of migration to urban areas is surprisingly low, given the vast differences in productivity that appear to exist between agriculture and other sectors.

Does the gap in sectoral productivity and income simply reflect a measurement problem? Are we undercounting home production or other activities carried out in rural areas? If so, perhaps the differences in income or living standards are less pronounced than they appear in the data? Or is the gap real? If so, why do these differences persist? We would expect people to move from low productivity agriculture to high(er) productivity sectors. What are the forces that are leaving people "trapped" in agriculture? Gollin, Parente, and Rogerson (2004) suggested that one candidate explanation might be complementarities between home production and agricultural work that could make it relatively advantageous for people at low levels of income to live in rural areas and work in agriculture. In a more recent but related

paper, Gollin and Rogerson (2009) argue that subsistence constraints combined with high transportation costs might make it attractive for people to remain in rural areas, in low productivity agriculture. Are mechanisms of this kind contributing to African poverty? If so, what are the levers or mechanisms that would alter the equilibrium?

Why has there been so little convergence in productivity levels between sectors? If the underlying problem were one of technology and invention, a period of forty years (and expenditures of many millions of dollars) should surely have served to increase productivity in African agriculture. Alternatively, many stories of market failure suggest mechanisms that should be self-correcting over long periods of time. If returns to capital are, indeed, very high in developing country agriculture (as suggested, for example, by Banerjee and Duflo 2005), then it is hard to understand why investors would fail to figure this out over a period of half a century. The same would hold for other stories of slow technology diffusion (e.g., via imperfect social networks) or behavioral explanations for slow uptake of new technologies or techniques.

Country studies could usefully explore the reasons for persisting gaps between rural and urban living standards. What do we know about the reasons why rural people do not migrate on a larger scale to the cities of Africa? Do living standards differ as much as the data suggest? If so, why do people remain in rural areas? Even qualitative information on this point would be extremely useful for understanding agriculture's role in development.

*d. How much improvement in poverty and economic growth can be achieved through agricultural development? Is agricultural development necessary for growth in Africa? Is it sufficient?*

Although the problems of poverty in Africa may be closely linked to agriculture, as suggested above, that does not necessarily imply that agricultural development offers the best prospects for solving the problems. The best prospects for reducing rural poverty and increasing agricultural productivity might come from non-agriculture, creating additional opportunities for people to exit farming. A strategy of exporting non-agricultural goods or cash crops, and importing food, might prove better than a development strategy based on agriculture.

This view is articulated by a number of influential figures at the moment, including Paul Collier (2008), who dismisses visions of smallholder agricultural development as a form of “romantic populism,” part of the “middle- and upper-class love affair with peasant agriculture” (Collier 2008, p. 71). Collier suggests that “urban

dynamism” is the key to solving agriculture’s problems.<sup>7</sup> Similarly, Ellis and Harris (2004) write that policies facilitating rural-to-urban migration may be more sensible than policies to support agriculture.

A diametrically opposite view is presented in Diao et al. (2006). In a paper that draws on detailed case studies of Ethiopia, Ghana, Rwanda, Uganda, and Zambia, in addition to cross-country data, the authors challenge the “agro-pessimism” of Collier and others. They conclude that “despite recent skepticism, agricultural growth is still important for most low-income African countries.” The authors specifically note that “agriculture is especially important for poverty reduction.” In fact, the authors argue that “most African countries cannot significantly reduce poverty, increase per capita incomes, and transform into modern economies without focusing on agricultural development.”

The paper by Diao et al. (2006) offers a rich and detailed review of literature from many sources on African agriculture. The authors conclude that increasing agricultural productivity in Africa will require significant and sustained investments in agricultural research and science, combined with infrastructure spending and other public investments. They argue that such investments have in the past yielded successes, as documented by Gabre-Madhin and Haggblade (2003).

Overall, the recent literature points to some signs of hope for productivity gains in African agriculture. In the past five to ten years, money has begun to flow again to research, and agriculture has been restored to the development agenda. It seems plausible that productivity growth will follow.

Is this productivity growth necessary for economic growth and poverty reduction? Is it sufficient for these outcomes? One useful task for country studies would be to think through the country-specific dimensions of poverty and economic activity to ask how the features of individual countries might affect agriculture’s role in growth and poverty reduction. As Thorbecke (2009) has proposed in his typology of countries – and as Collier and Dercon have proposed in their recent papers – there may be reasons to distinguish between different country typologies. In some countries that are landlocked and have little access to imported foods, agricultural productivity growth may be the only feasible means of achieving growth and poverty alleviation. In other countries – especially those with good coastal access to imported food, or those with

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<sup>7</sup> Collier has pressed this argument vociferously in non-academic forums, including the opinion pages of various newspapers; in a speech before the British All Party Parliamentary Group on Overseas Development, among other places, he has explicitly argued that the agricultural sector is unlikely to play a key role in generating growth or reducing poverty in Africa. He has called instead for more resource-based activities and low-tech manufacturing. (A podcast of his APPGOD speech is available at: [http://www.odi.org.uk/events/apgood/Agric\\_in\\_Africa\\_05/apgood\\_oct17/audio/PCollier.wma](http://www.odi.org.uk/events/apgood/Agric_in_Africa_05/apgood_oct17/audio/PCollier.wma).)

abundant export resources that might allow them to purchase food, there may be ways to achieve growth and poverty reduction without achieving food self sufficiency.

*e. What is the role of commercial and export-oriented agriculture, as opposed to smallholder systems, in achieving growth and poverty reduction?*

Collier (2008) argues that large-scale commercial farming, rather than smallholder agriculture, will be best able to meet the food supply needs of African consumers. At present, in most countries in Africa, large-scale farms primarily produce export commodities: rubber, tea, sugar, and -- increasingly -- horticultural crops. In these crops, though intriguingly not in coffee, large-scale farms seem to have competitive advantages relative to smallholder production. Can large farms achieve similar productivity gains in the production of food staples? There are few countries where large commercial farms have been engaged in the production of staple foods; South Africa and Zimbabwe are perhaps the most obvious exceptions. Why has this been the case? Collier has argued that government policies and restrictions, including limits on land ownership, have stymied the development of commercial food production. An alternative view is that large-scale farms do not have any particular competitive advantages in food production.

If large commercial farms can produce food more efficiently, this will benefit poor consumers by driving down the price of their principle consumption good. However, to the extent that the poor may also be food producers, we need to consider the possibility that expansion of large commercial farms may come at the expense of poor farmers. The net impact on poverty is not obvious; this is a subject for careful study.

Moreover, many analysts explicitly reject the idea that large farms have scale economies or other advantages that make them more productive than smallholder farms. For example, Diao et al. (2004) hold that: "Agriculture's pro-growth and pro-poor performance depends on small farms being in the vanguard. Small farms dominate agriculture in many developing countries, and the transformation from traditional to modern agriculture is based on the efficiency of small farms and their transformation from subsistence to market activities." Similarly, Hazell et al. (2007) argue that small farms play a key role in development because of their advantages in terms of both efficiency and equity.

Leaving aside the question of whether food production should come from large or small farms, there are important questions to be asked about the role of large-scale commercial agriculture in the sectors where it currently dominates. Horticultural production for export has taken off in a number of countries in sub-Saharan Africa,

including Kenya, Uganda, and Ghana. In these countries (among others), private sector firms (and occasionally NGOs) have played a key role in setting up the marketing and transportation networks that connect individual producers with supermarket chains and other buyers in Europe. Production may be centralized, but in many places it is contracted out, formally or informally, to networks of “outgrowers”. Volumes of shipments have risen dramatically in the region, and there appears to be a large market niche for African producers to meet off-season demands in the EU.

From a research standpoint, however, there are many unanswered questions about the commercial horticulture sector and its potential impact on growth and poverty in sub-Saharan Africa. Does the current industry structure have a significant impact on poverty? In locations where horticulture producers have entered, how do poverty reduction and income gains compare to similar locations that have not experienced the new commercial opportunities? What physical, social, and institutional infrastructure are required to help these market niches expand? Some of the obvious needs are transportation infrastructure, cold chain facilities, processing and storage facilities, and similar physical infrastructure needs. But some legal and institutional mechanisms may also be important: at least rudimentary contract enforcement, for example. And there has been little research on the social and environmental impacts of horticultural farms. Are they exposing workers to high levels of chemicals, especially given the outgrower system in which worker safety is difficult to monitor and enforce? All these questions would be interesting to address in country studies.

*f. How will changes in agricultural marketing – such as the increasing importance of supermarkets in both domestic and international supply chains – affect patterns of agricultural development?*

The past decade has witnessed dramatic changes in food marketing systems in much of the developing world, though these changes have been slower in sub-Saharan Africa than elsewhere. In particular, supermarket chains have begun to play a greater and greater role in the marketing and distribution of food and other goods, centralizing the traditional wholesale and retail marketing structures, which are characterized by tremendously diffuse supply networks.

At the moment, these changes have been slow to come to sub-Saharan Africa. There is relatively little spread of supermarkets outside of South Africa, Kenya, and perhaps a few coastal cities in West Africa. However, experience in other parts of the world suggests that this could change rapidly over the next decade or two, as supermarket chains expand aggressively.

Are these changes beneficial to the poor? Will they help spur growth in agriculture or in the overall economy? The answer to the first question depends to a large extent on whether the poor are net sellers or purchasers of food. Where the poor are primarily

consumers of food, with little involvement in production, any increase in marketing efficiency is likely to be beneficial if it drives down prices. Where the poor are smallholder farmers, however, as is the case in many parts of Africa, supermarkets are likely to have another effect, as they tend to purchase from larger farms. Because of transaction costs, supermarkets are likely to ignore producers who operate on a small scale; not only are transaction costs per unit of output higher on these small farms, but in addition many smallholders struggle to meet the quality standards and uniformity required by supermarkets.

If smallholders are heavily represented among the poor, then the arrival of supermarkets may have a mixed – and possibly harmful – impact on the poor. Country studies can usefully take up this issue and assess its relevance in specific cases.

- g. What are the government policies most directly affecting agricultural investment and growth? Are governments continuing to discriminate against agriculture? Are there prospects for altering the political calculations faced by African governments with respect to agriculture?*

Most governments in Africa (and indeed governments in every region of the world) have long histories of intervening in agricultural markets. Governments have frequently intervened to subsidize consumers through cheap food policies, while occasionally also intervening to subsidize producers (e.g., through cheap credit or subsidies on inputs). Although many governments were forced to liberalize such interventions, under the pressure of structural adjustment reforms in the 1990s and early 2000s, many interventions inevitably remain, and political pressure for further interventions is never far away. For example, in recent months, high food prices have elicited a number of strong policy responses in particular countries, including the institution of price caps and the re-emergence of fertilizer subsidies as highly politicized issues.

Country studies could usefully document the political forces aligned around agricultural policies. What are the country experiences of producer subsidies, consumer subsidies, price controls, marketing restrictions, and other government interventions in agricultural markets? While it is not important to include a detailed history of agricultural policy in each country, it is important to understand the policies currently in place and to have some description of their historical antecedents. Measures of the size and impact of government interventions are also likely to be useful, in the spirit of Anderson and Masters (2007).

Understanding the political background for agricultural policy will also be valuable. Many African governments have a long history of ignoring the concerns of the

agricultural sector. Since the colonial era, policies that effectively tax agriculture have been widespread. Export crops have been taxed for the purposes of revenue generation; at the same time, many governments have pursued cheap food policies to secure political stability. Farmers are relatively voiceless; this is especially true of smallholders, who are not well organized politically and whose concerns are typically subordinated to those of larger farmers and urban dwellers.

Without changes in the political environment, it is difficult to see how significant public investments in agriculture will be made or how the policies in place will change in ways that support agricultural production. It is worthwhile to ask what potential there is for political change in Africa with respect to the representation of agricultural interests. Without some changes, it seems unlikely that agriculture can play a constructive role in growth and poverty alleviation.

Country studies can play an important role in sketching out the political factors that impact agriculture in specific countries. What are the representation and political power of agricultural interests? Are smallholder interests effectively represented in public debates, or do large commercial interests in estate crops seem to exert disproportionate influence? How powerful are urban consumers, and how strong is the pressure for low food prices?

Although country studies need not delve too deeply into the pure politics of agriculture, they can offer a helpful context for understanding the political economy of agricultural development. Without some of this context, it will be difficult to understand the problems and challenges that agriculture faces in contributing to economic growth and poverty reduction.

*h. African agriculture has heavily gendered divisions of labor and responsibility for production, processing, and other activities that take place within households and rural communities. What roles do women currently play in agriculture, and how much control do they currently have over land and productive resources? How will women be impacted by changes in agricultural technologies and institutions?*

In most of Africa (though notably not in North Africa), women play an important role in providing labor in agriculture. As noted above, women are nearly half of the agricultural labor force for the region as a whole, and in some countries they provide much more than half of the economically active population. Female-headed households also account for a significant fraction of total households; in many countries, female-headed households may make up one quarter to one third of all households. In eastern and southern Africa, where outmigration of men and the

HIV/AIDS epidemic have both contributed to the loss of men from rural areas, estimates run as high as 25-60% of all households headed by women.<sup>8</sup>

Households headed by women may face different problems and constraints than households headed by men. More generally, women working in agriculture face different problems and constraints than do men. Women also are overwhelmingly responsible for the processing and preparation of food in Africa; as a result, they face additional challenges as consumers.

Surprisingly little is known in most countries about the specific problems faced by women as producers, consumers, and as heads of households. Country studies of agriculture in Africa should pay special attention to documenting the roles of women in agriculture. Do women face legal restrictions that prevent them from owning land? Are there other obstacles that limit their tenure security with respect to land? Are women as producers able to gain access to technology, credit, inputs, or hired labor? Do they face disadvantages in marketing their output, for example because of social conventions that restrict their mobility or access to transportation? Does this affect the mix of crops that women grow or the livestock that they are able to keep? Do the constraints faced by women affect poverty levels, and do they affect the prospects for agriculture to be a leading sector in terms of economic growth?

A useful starting point for country studies would be some simple documentation of data describing women's participation in agriculture. How many women work in agriculture? How many hours do they typically devote to market agricultural production, and how much to transportation, processing, and marketing of food? How many female-headed farm households are there, and how do they compare to male-headed farm households in terms of land area and quality, input use, output levels, and other measures of productivity? How many women have secure tenure over the land that they farm, and what fraction of agricultural land is held by women? How do asset holdings differ between men and women, and how do various measures of poverty differ?

Understanding the situation of women in agriculture will help shed light on the role that agriculture can play in growth and poverty reduction.

- i. *Agriculture has already experienced significant climate change in many parts of the African continent – particularly on the edges of the Sahel and in the grasslands of Eastern Africa. How will continued (and more extreme) changes*

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<sup>8</sup> This particular claim comes from a study by the International Fund for Agricultural Development (IFAD), at <http://www.ifad.org/gender/learning/challenges/women/60.htm>. (Last accessed August 1, 2009.)

*in climate affect producers and consumers over the decades ahead? And what responses can governments take to minimize the harm?*

Most climate models offer very little detail in their predictions of climate change and its impacts at the country level. Region-wide, there is little consensus on the likely extent of warming or the associated changes in precipitation and in the timing of rainfall. There seems little doubt, however, that Africa will experience significant additional changes in climate, perhaps exacerbating processes that have been underway for several decades.

At the country level, it is critical to begin discussions of the impact of climate change on agriculture, so as to address possible adaptation and responses. In some countries, possibly including parts of East Africa, increased rainfall may make agriculture more productive, increasing the sector's potential for generating income growth and poverty reduction. In many other parts of the continent, particularly those bordering the Sahara on the north and west, rainfall declines may be acute and may have devastating impacts on poverty (Stockholm Environment Institute 2008, p. 18).

Different countries will face different challenges and opportunities as a result of climate change, and they also have different potential for adaptation. Country studies can usefully survey the extent of knowledge about climate change impacts within specific countries. While it would be beyond the scope of the country studies to conduct (or even to critique) climatological studies, they can reasonably seek to review existing studies and to describe the range of estimates with respect to temperature, precipitation, and other key climate variables.

## **VI. Conclusion and Recommendations**

Recent debates between “agro-pessimists” and agricultural fundamentalists seem to paint a stark choice between development strategies that focus exclusively on agriculture and those that largely ignore the sector in much of Africa. This is unfortunate. Given that almost all countries on the continent have at least one third of their workforce in agriculture, and given the importance of agricultural output in the consumption baskets of the poor, it is hard to imagine that significant growth or poverty reduction will arrive in the absence of agricultural productivity growth.

A few countries may be able to substitute agricultural imports for productivity growth; these countries will be at a considerable advantage relative to their neighbors. But many countries, including some of the continent's largest, will be unable to feed their populations with imports. A country like Congo, for example, will continue to depend heavily on domestic production for its food needs.

In the long run, non-agricultural productivity growth will be crucial for Africa, as it has been in every other region of the world. The non-agricultural sector will eventually become the primary source of employment, and a smaller number of people (presumably operating larger farms) will produce food for urban markets. This general story – told convincingly in the early agricultural development literature – seems in large measure to be right.

What is the role of government and the international community? The structural transformation will take place in Africa – as it did in the rest of the world – because of the low income elasticities of agricultural goods combined with improvements in agricultural technologies. Governments have little direct role to play in managing this transformation or hindering it. However, government certainly has a role in supplying public goods that may affect the speed of the transformation.

For example, agricultural research is almost always a public sector activity, because the replicability of seeds makes it difficult for private firms to recoup the benefits of genetic improvement research.<sup>9</sup> Transportation infrastructure also has a public good aspect, since private actors are likely to under-provide and under-maintain roads.<sup>10</sup> Governments (or perhaps farmer organizations) also have a role to play in managing quality and setting standards (for domestic as well as export markets). Governments also have a role to play in providing goods for the non-agricultural sector, including a variety of legal and regulatory functions.

Perhaps it is useful in closing to recall Adam Smith's admonition to remember the interdependence of the agricultural sector and the non-agricultural sector:

The great commerce of every civilised society is that carried on between the inhabitants of the town and those of the country. It consists in the exchange of rude for manufactured produce, either immediately, or by the intervention of money, or of some sort of paper which represents money. The country supplies the town with the means of subsistence and the materials of manufacture. The town repays this supply by sending back a part of the manufactured produce to the inhabitants of the country. The town, in which there neither is nor can be any reproduction of substances, may very properly be said to gain its whole

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<sup>9</sup> The few exceptions to this pattern involve hybrid seeds, where heterosis effects make it worthwhile for farmers to purchase fresh seed each season, and a few other crops in countries where intellectual property rights allow breeders to collect rents from their research.

<sup>10</sup> The need for public involvement here is somewhat less clear; history provides many examples of privately funded road construction and maintenance, with toll collection offering a mechanism for cost recovery. However, it is telling that most countries have opted for a strong public role in road construction. One concern is that privatized roads are often natural monopolies, so that a public role may be needed from a regulatory standpoint even if it is not required for construction or maintenance.

wealth and subsistence from the country. We must not, however, upon this account, imagine that the gain of the town is the loss of the country. The gains of both are mutual and reciprocal, and the division of labour is in this, as in all other cases, advantageous to all the different persons employed in the various occupations into which it is subdivided.

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**Table 1: African Population in Agriculture**  
**Agriculture Shares in Total and Economically Active Population (Estimates for 2010)**

<b>Region</b>	<b>Agricultural population (1000)</b>	<b>Total Population (1000)</b>	<b>Agricultural Population as Fraction of Total</b>	<b>Total economically active population in Agriculture (1000)</b>	<b>Total economically active population (1000)</b>	<b>Economically Active Population in Agriculture as Fraction of Total</b>
<b>Eastern Africa</b>	236442	323484	0.731	116304	156470	0.743
<b>Middle Africa</b>	71331	125471	0.569	30896	53276	0.580
<b>Northern Africa</b>	64913	208146	0.312	26090	86970	0.300
<b>Southern Africa</b>	7414	54458	0.136	2371	22871	0.104
<b>Western Africa</b>	132840	295347	0.450	59496	127852	0.465
<b>Africa, Total</b>	512940	1006906	0.509	235157	447439	0.526

Source: FAOSTAT, © FAO Statistics Division 2009, 31 March 2009

**Table 2: Agriculture's share of labor force, projections for 2010.**

<b>Country</b>	<b>Total Economically Active Population in Agriculture (1000)</b>	<b>Total Economically Active Population (1000)</b>	<b>Agricultural Workforce as Fraction of Total</b>
Burkina Faso	6,606	7,178	0.920
Rwanda	4,983	5,602	0.890
Burundi	4,362	4,916	0.887
Niger	6,495	7,616	0.853
Guinea-Bissau	615	769	0.800
Guinea	4,080	5,121	0.797
Mozambique	8,867	11,273	0.787
Malawi	5,209	6,634	0.785
Ethiopia	30,337	38,991	0.778
Gambia	663	876	0.757
Tanzania	16,866	22,293	0.757
Mali	5,468	7,314	0.748
Uganda	12,041	16,112	0.747
Eritrea	1,867	2,511	0.744
Kenya	13,899	19,695	0.706
Senegal	4,177	5,937	0.704
Madagascar	7,162	10,292	0.696
Angola	5,890	8,532	0.690
Somalia	2,867	4,320	0.664
Chad	3,219	4,956	0.650
Cent. African Rep.	1,265	1,998	0.633
Zambia	3,438	5,438	0.632
Liberia	860	1,385	0.621
Congo, DRC	15,919	27,283	0.583
Sierra Leone	1,323	2,333	0.567
Zimbabwe	3,679	6,519	0.564
Ghana	6,921	12,692	0.545
Togo	1,618	3,021	0.536
Sudan	8,618	16,678	0.517
Mauritania	783	1,559	0.502
Cameroon	3,635	7,674	0.474
Benin	2,029	4,591	0.442
Botswana	338	803	0.421

**Table 2: Agriculture's share of labor force, projections for 2010.**

<b>Country</b>	<b>Total Economically Active Population in Agriculture (1000)</b>	<b>Total Economically Active Population (1000)</b>	<b>Agricultural Workforce as Fraction of Total</b>
Côte d'Ivoire	3,134	8,181	0.383
Lesotho	270	733	0.368
Namibia	301	893	0.337
Congo	594	1,833	0.324
Morocco	4,251	14,562	0.292
Egypt	8,769	32,780	0.268
Gabon	178	692	0.257
Nigeria	14,682	59,031	0.249
Algeria	3,289	15,407	0.213
Tunisia	1,030	4,922	0.209
Mauritius	48	582	0.082
South Africa	1,355	20,063	0.068
Libya	78	2,436	0.032

Source: FAOSTAT, © FAO Statistics Division 2009, 31 March 2009.

Data included are for all countries with economically active population greater than 500,000.

**Table 3: African Rural Population, 2010 projections**

<b>Region</b>	<b>Rural Population (1000)</b>	<b>Urban Population (1000)</b>	<b>Total Population (1000)</b>	<b>Rural as Fraction of Total</b>
<b>Eastern Africa</b>	227,403	96,082	323,485	0.703
<b>Middle Africa</b>	74,176	51,297	125,473	0.591
<b>Northern Africa</b>	98,666	109,483	208,149	0.474
<b>Southern Africa</b>	23,305	31,154	54,459	0.428
<b>Western Africa</b>	157,233	138,107	295,340	0.532
<b>Africa, Total</b>	580,783	426,123	1,006,906	0.577

Source: FAOSTAT | © FAO Statistics Division 2009 | 31 March 2009

**Table 4: Real GDP per Capita, 2005 and Agriculture's Share of GDP**

<b>Country</b>	<b>Agriculture, value added (% of GDP)</b>	<b>Real GDP / Capita (PPP)</b>	<b>Country</b>	<b>Agriculture, value added (% of GDP)</b>	<b>Real GDP / Capita (PPP)</b>
Liberia	0.658	313	Eritrea	0.226	526
Guinea-Bissau	0.603	458	Zambia	0.221	1,183
Central African Rep.	0.556	644	Chad	0.214	1,468
Comoros	0.510	1,127	Guinea	0.202	1,081
Ethiopia	0.467	628	Cameroon	0.195	1,959
Tanzania	0.461	1,049	Zimbabwe	0.191	..
Sierra Leone	0.458	585	Lesotho	0.170	1,311
Congo, Dem. Rep.	0.455	267	S. Tome/Principe	0.168	1,416
Togo	0.427	758	Senegal	0.167	1,547
Rwanda	0.389	772	Egypt	0.149	4,574
Ghana	0.375	1,160	Morocco	0.133	3,554
Mali	0.366	1,004	Namibia	0.121	4,599
Burundi	0.348	319	Tunisia	0.115	6,445
Burkina Faso	0.341	1,026	Cape Verde	0.092	2,538
Sudan	0.336	1,679	Swaziland	0.089	4,462
Malawi	0.329	648	Algeria	0.085	7,176
Uganda	0.328	846	Angola	0.077	3,729
Nigeria	0.328	1,731	Mauritius	0.061	9,975
Gambia, The	0.326	1,078	Gabon	0.049	13,821
Benin	0.322	1,213	Congo, Rep.	0.046	3,309
Madagascar	0.282	834	Djibouti	0.035	1,850
Kenya	0.270	1,346	Seychelles	0.030	14,187
Mozambique	0.269	677	Equatorial Guinea	0.029	28,536
Mauritania	0.237	1,684	South Africa	0.027	8,478
Cote d'Ivoire	0.228	1,614	Botswana	0.020	12,088

Source: World Bank, World Development Indicators online. Accessed 31 March 2009.

**Table 5: Sub-Saharan Africa: Real GDP per Capita and Agriculture's Share of GDP, 1965-2005**

<b>Year</b>	<b>GDP per capita, PPP (constant 2005 international \$)</b>	<b>Agriculture, value added (% of GDP)</b>	<b>Year</b>	<b>GDP per capita, PPP (constant 2005 international \$)</b>	<b>Agriculture, value added (% of GDP)</b>
1965	--	0.219	1987	1,595	0.184
1966	--	0.218	1988	1,619	0.181
1967	--	0.218	1989	1,626	0.180
1968	--	0.204	1990	1,602	0.180
1969	--	0.201	1991	1,572	0.183
1970	--	0.196	1992	1,518	0.177
1971	--	0.197	1993	1,484	0.178
1972	--	0.200	1994	1,466	0.175
1973	--	0.198	1995	1,484	0.172
1974	--	0.203	1996	1,517	0.181
1975	--	0.200	1997	1,531	0.181
1976	--	0.195	1998	1,527	0.181
1977	--	0.203	1999	1,524	0.175
1978	--	0.197	2000	1,541	0.167
1979	--	0.188	2001	1,558	0.169
1980	1,794	0.185	2002	1,571	0.200
1981	1,758	0.193	2003	1,606	0.192
1982	1,718	0.188	2004	1,671	0.175
1983	1,653	0.179	2005	1,729	0.172
1984	1,636	0.174	2006	1,792	0.165
1985	1,615	0.180	2007	1,865	0.151
1986	1,604	0.182			

Source: World Bank, World Development Indicators online. Accessed 31 March 2009.

Table 6: Labor productivity in agriculture and non-agriculture, African countries (2005).

Country	Output per Worker, Agriculture	Output per Worker, Non-Agriculture	Implied Relative Labor Productivity, Non-Agriculture / Agriculture	Country	Output per Worker, Agriculture	Output per Worker, Non-Agriculture	Implied Relative Labor Productivity, Non-Agriculture / Agriculture
Eritrea	110	1,792	16.31	Tanzania	514	1,951	3.79
Mozambique	147	1,829	12.42	Botswana	560	16,486	29.44
Burundi	154	1,787	11.62	Chad	572	1,445	2.53
Angola	216	8,023	37.13	Lesotho	582	1,554	2.67
Congo, DRC	218	306	1.40	Kenya	599	2,902	4.84
Niger	252	2,398	9.52	CAR	616	937	1.52
Guinea	257	3,968	15.43	Ghana	656	1,445	2.20
Rwanda	268	3,638	13.60	Cameroon	856	2,710	3.17
Burkina Faso	282	7,987	28.29	Mauritania	879	2,321	2.64
Ethiopia	337	1,187	3.52	Benin	974	1,340	1.38
Malawi	356	1,988	5.59	Côte d'Ivoire	1,113	2,162	1.94
Madagascar	360	1,997	5.55	Sudan	1,120	1,673	1.49
Zambia	363	2,175	5.99	Namibia	1,274	5,260	4.13
Uganda	377	1,871	4.96	Morocco	1,515	3,560	2.35
Senegal	382	3,827	10.03	Algeria	2,532	7,052	2.79
Guinea-Bissau	385	1,185	3.08	Egypt	2,615	4,749	1.82
Sierra Leone	392	367	0.93	Tunisia	3,210	6,036	1.88
Mali	476	1,984	4.16	Gabon	3,344	17,482	5.23
Gambia	493	2,753	5.58	S. Africa	3,620	7,745	2.14
Congo	494	4,232	8.56	Mauritius	6,152	8,744	1.42
Togo	502	1,112	2.22	Zimbabwe	..	..	5.71
Liberia	513	327	0.64				
				<b>Sub-Saharan Africa, Total</b>	486	3,770	7.76

**Table 7: Prevalence of undernourishment in total population (%)**

<b>Country name</b>	<b>1990-92</b>	<b>1995-97</b>	<b>2003-05</b>	<b>Country name</b>	<b>1990-92</b>	<b>1995-97</b>	<b>2003-05</b>
Congo, DRC	29	57	76	Cameroon	34	35	23
Eritrea	67	64	68	Congo	40	43	22
Burundi	44	57	63	Sudan	31	24	21
Sierra Leone	45	43	47	Benin	28	26	19
Angola	66	58	46	Namibia	29	29	19
Ethiopia	71	63	46	Swaziland	12	20	18
Zambia	40	41	45	Guinea	19	18	17
Cent. African Rep.	47	50	43	Cape Verde	12	14	15
Liberia	30	39	40	Lesotho	15	13	15
Rwanda	45	56	40	Uganda	19	23	15
Zimbabwe	40	46	40	Côte d'Ivoire	15	16	14
Chad	59	51	39	Mali	14	15	11
Mozambique	59	52	38	Burkina Faso	14	12	10
Madagascar	32	37	37	Ghana	34	16	9
Togo	45	39	37	Nigeria	15	10	9
Tanzania	28	41	35	Mauritania	10	8	8
Djibouti	60	50	32	Mauritius	7	6	6
Guinea-Bissau	20	26	32	Algeria	<5	5	<5
Kenya	33	30	32	Egypt	<5	<5	<5
Gambia	20	31	30	Gabon	5	<5	<5
Malawi	45	36	29	Libya	<5	<5	<5
Niger	38	40	29	Morocco	5	5	<5
Botswana	20	24	26	South Africa	<5	<5	<5
Senegal	28	32	26	Tunisia	<5	<5	<5

Source: FAOSTAT, 31 March 2009.

**Table 8: Sub-Saharan Africa, Food Balance Sheet, 2000**

<b>Commodity</b>	<b>Production quantity (1000 tonnes)</b>	<b>Import quantity (1000 tonnes)</b>	<b>Stock variation (1000 tonnes)</b>	<b>Export quantity (1000 tonnes)</b>	<b>Domestic supply (1000 tonnes)</b>	<b>Feed quantity (1000 tonnes)</b>	<b>Seed quantity (1000 tonnes)</b>	<b>Food Manufacture (1000 tonnes)</b>	<b>Waste quantity (1000 tonnes)</b>	<b>Other Uses quantity (1000 tonnes)</b>	<b>Food quantity (1000 tonnes)</b>	<b>Food/capita/year (Kg)</b>	<b>Calories/capita/day</b>	<b>Proteins/capita/day (g)</b>	<b>Fat/capita/day (g)</b>	<b>Net Imports as Share of Total Production</b>	<b>Net Imports Weighted by Calorie Shares</b>
Cereals	69297	16790	4304	686	89704	3965	1952	2303	8863	320	72301	119	1019	26	7	0.18	0.08
Starchy Roots	161443	378	-230	61	161530	16715	2072	1	31415	12850	98478	162	433	4	1	0.00	0.00
Sugarcrops	42724	0	6	0	42730	152	192	38918	494	1413	1562	3	2	0	0	0.00	0.00
Pulses	7715	269	402	85	8302	436	659	0	948	127	6132	10	94	6	0	0.02	0.00
Oilcrops	13395	122	85	1168	12434	23	739	7137	774	476	3286	5	65	3	5	-0.08	0.00
Vegetable Oils	4229	1535	-16	452	5295	0	0	3	35	859	4399	7	174	0	20	0.20	0.02
Vegetables	21741	750	-2	202	22288	0	0	0	2222	0	20066	33	25	1	0	0.02	0.00
Fruits - Excluding Wine	42665	449	35	1201	41948	2402	0	4823	4437	15	30272	50	87	1	0	-0.02	0.00
Stimulants	3923	115	259	3395	902	0	0	7	90	340	464	1	2	0	0	-3.63	0.00
Spices	480	17	5	47	455	0	0	0	15	5	435	1	6	0	0	-0.07	0.00
Alcoholic Beverages	22115	306	97	79	22439	0	0	0	1122	125	21193	35	42	0	0	0.01	0.00
Meat	6507	375	3	98	6787	0	0	0	0	5	6781	11	55	4	4	0.04	0.00
Animal Fats	251	317	17	10	575	5	0	0	0	232	338	1	12	0	1	0.53	0.00
Milk - Excluding Butter	16847	2099	-33	169	18743	284	0	0	904	192	17363	29	52	3	3	0.10	0.00
Eggs	943	22	0	3	962	0	87	0	75	2	800	1	5	0	0	0.02	0.00
Fish, Seafood	4497	1669	2	1338	1698	391	0	-16	0	31	4425	7	14	2	1	0.20	0.00
Miscellaneous	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.00	0.00
Vegetal Products													2051	43	35		
Animal Products													140	10	9		
<b>Grand Total</b>													<b>2192</b>	<b>54</b>	<b>44</b>		<b>0.10</b>

**Table 9: Food consumption budget shares by country, from household survey data.**

Country Name	Population	Share (%) of food consumption expenditure in total household consumption expenditure				
		Before 1990	1990-94	1995-99	2000-04	2005-08
Algeria	National	52.5		53.0		
	Rural					
	Urban					
Botswana	National	40.0	71.0			
	Rural		71.0			
	Urban					
Burkina Faso <sup>3</sup>	National		45.8	52.2		
	Rural					
	Urban					
Cape Verde	National				41.0	
	Rural				53.0	
	Urban				38.0	
Central African Rep. <sup>2</sup>	National		57.7			
	Rural					
	Urban					
Chad	National			57.8		
	Rural			65.3		
	Urban			49.9		
Côte d'Ivoire	National	49.0				
	Rural					
	Urban					
Egypt	National	60.0				
	Rural					
	Urban					
Equatorial Guinea	National	62.0				
	Rural					
	Urban					
Ethiopia	National			52.8	50.8	
	Rural			57.6	54.3	
	Urban			36.2	38.4	
Ghana	National	60.5	58.0			
	Rural	65.8				
	Urban	52.9				
Kenya	National					45.8

**Table 9: Food consumption budget shares by country, from household survey data.**

Country Name	Population	Share (%) of food consumption expenditure in total household consumption expenditure				
		Before 1990	1990-94	1995-99	2000-04	2005-08
	Rural					58.2
	Urban					35.8
Lesotho	National	40.0			44.3	
	Rural					
	Urban					
Libyan Arab Jamahiriya <sup>2</sup>	National	37.2				
	Rural					
	Urban					
Madagascar <sup>3</sup>	National		71.8			
	Rural					
	Urban					
Malawi <sup>2</sup>	National		28.3	62.9	65.5	
	Rural			77.7	55.2	
	Urban			41.1	65.5	
Mali	National	53.2				
	Rural	57.0				
	Urban	47.1				
Mauritius	National	41.0	44.0	43.0	38.1	
	Rural					
	Urban					
Morocco	National	63.0				
	Rural					
	Urban					
Mozambique <sup>3</sup>	National			72.3	54.5	
	Rural			73.4	71.8	
	Urban			70.3	38.8	
Namibia <sup>3</sup>	National				24.3	
	Rural				38.7	
	Urban				15.7	
Nigeria	National	61.0				
	Rural	67.8				
	Urban	61.5				
Niger	National					29.7
	Rural					33.5
	Urban					25.6
Rwanda	National	52.1			71.7	

**Table 9: Food consumption budget shares by country, from household survey data.**

Country Name	Population	Share (%) of food consumption expenditure in total household consumption expenditure				
		Before 1990	1990-94	1995-99	2000-04	2005-08
Senegal	Rural	32.1			80.2	
	Urban				50.9	
	National		53.0			
Sierra Leone	Rural					
	Urban					
	National	63.7 <sup>5</sup>			49.3	
South Africa <sup>3</sup>	Rural	70.1 <sup>5</sup>				
	Urban	56.9 <sup>5</sup>				
	National	25.0		23.0	25.0	
Swaziland <sup>3</sup>	Rural					
	Urban	24.5				
	National	31.6	28.0			
Tanzania, United Rep of	Rural	34.2	38.0			
	Urban	22.9	16.0			
	National	66.0	71.3		65.4	
Togo	Rural		72.3		67.0	
	Urban		66.9		60.2	
	National	71.0				63.7
Tunisia	Rural					73.1
	Urban					56.0
	National	44.0	42.0			
Uganda <sup>3</sup>	Rural					
	Urban					
	National	68.0	64.0	52.0	44.0	
Zambia	Rural			56.0	49.0	
	Urban			38.0	32.0	
	National	80.0		63.0	64.0	
Zimbabwe	Rural			77.0	75.0	
	Urban			55.0	52.0	
	National	35.0	37.3			
	Rural		47.1			
	Urban		31.1			

Source: FAOSTAT, accessed 31 March 2009.

**Table 10: Real per capita GDP Levels and Growth Rates, Penn World Tables**

<b>Country</b>	<b>Real Per Capita GDP, 2003</b>	<b>Growth Rate, 1960-2000 (except as noted)</b>	<b>Notes</b>
Algeria	5,993	1.33	
Benin	1,345	0.52	
Botswana	8,056	5.59	1970-2003
Burkina Faso	1,071	0.91	
Burundi	763	0.66	
Cameroon	2,713	0.84	
Cape Verde	5,117	2.84	
Central African Republic	887	-0.77	1970-2003
Chad	884	-0.78	
Congo, DRC	1,859	1.83	
Cote d'Ivoire	2,019	0.80	
Djibouti	4,326	-0.45	1979-2003
Egypt	4,759	2.91	
Equatorial Guinea	11,587	3.66	
Eritrea	611	0.04	1992-2003
Ethiopia	688	1.09	
Gabon	9,559	0.05	
Gambia	937	0.31	
Ghana	1,440	1.91	
Guinea	2,887	-0.42	
Guinea-Bissau	584	0.03	
Kenya	1,218	0.14	
Lesotho	2,008	2.83	
Liberia	342	-7.03	1970-2003
Madagascar	759	-1.40	
Malawi	771	1.36	
Mali	1,184	1.30	
Mauritania	1,430	0.31	1970-2003
Mauritius	16,464	3.52	
Morocco	4,061	2.13	
Mozambique	1,452	0.45	
Namibia	5,556	-0.03	1970-2003
Niger	834	-0.95	
Nigeria	1,223	0.07	

**Table 10: Real per capita GDP Levels and Growth Rates, Penn World Tables**

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<b>Country</b>	<b>Real Per Capita GDP, 2003</b>	<b>Growth Rate, 1960-2000 (except as noted)</b>	<b>Notes</b>
Rwanda	1,302	0.13	
Senegal	1,407	-0.38	
Sierra Leone	713	-2.28	1970-2003
Somalia	683	-2.57	1970-2003
South Africa	8,836	0.97	
Sudan	1,178	0.11	1970-2003
Swaziland	8,950	3.09	1970-2003
Tanzania	912	0.63	
Togo	789	-0.90	
Uganda	1,113	-0.18	
Zambia	946	-0.52	
Zimbabwe	2,439	0.66	

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Source: Alan Heston, Robert Summers and Bettina Aten. 2006. Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania. Online at:

[http://pwt.econ.upenn.edu/php\\_site/pwt62/pwt62\\_form.php](http://pwt.econ.upenn.edu/php_site/pwt62/pwt62_form.php)

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**Table 11: Poverty in Africa (World Bank PovCalc data), most recent years available.**

<b>Country</b>	<b>Headcount Poverty (% below \$1.25/day)</b>	<b>Poverty Gap</b>	<b>Squared Poverty Gap</b>
Algeria	6.79	1.36	0.45
Angola	54.31	29.94	20.52
Benin	47.33	15.73	6.97
Botswana	31.23	11.04	5.03
Burkina Faso	56.54	20.27	9.38
Burundi	81.32	36.39	19.10
Cameroon	32.81	10.17	4.15
Cape Verde	20.56	5.86	2.25
Central African Republic	62.43	28.30	16.14
Chad	61.94	25.64	13.50
Comoros	46.11	20.82	12.10
Congo, Dem. Rep.	59.22	25.31	13.61
Congo, Rep.	54.10	22.82	12.10
Côte d'Ivoire	23.34	6.82	2.87
Djibouti	18.84	5.29	2.19
Egypt, Arab Rep.	1.99	0.39	0.16
Ethiopia	39.04	9.60	3.26
Gabon	4.84	0.90	0.28
Gambia, The	34.34	12.05	5.53
Ghana	29.99	10.49	5.11
Guinea	70.13	32.24	18.32
Guinea-Bissau	48.83	16.52	7.55
Kenya	19.72	6.10	2.74
Lesotho	43.41	20.76	12.81
Liberia	83.65	40.78	24.04
Madagascar	67.83	26.52	13.23
Malawi	73.86	32.31	17.39
Mali	51.43	18.79	8.98
Mauritania	21.16	5.66	2.03
Morocco	2.50	0.54	0.22
Mozambique	74.69	35.40	20.48
Namibia	49.14	24.59	14.79
Niger	65.88	28.08	15.12
Nigeria	64.41	29.57	17.20
Rwanda	76.56	38.21	22.94
Senegal	33.50	10.80	4.67

**Table 11: Poverty in Africa (World Bank PovCalc data), most recent years available.**

<b>Country</b>	<b>Headcount Poverty (% below \$1.25/day)</b>	<b>Poverty Gap</b>	<b>Squared Poverty Gap</b>
Sierra Leone	53.37	20.30	9.82
South Africa	26.20	8.18	3.26
Swaziland	62.85	29.38	17.06
Tanzania	88.52	46.84	28.73
Togo	38.68	11.37	4.48
Tunisia	2.55	0.46	0.15
Uganda	51.53	19.11	9.13
Zambia	64.29	32.76	20.76

**Table 12: Agricultural capital, capital per worker, and capital per unit of land, sub-Saharan Africa, 1980-2000**

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	<b>Agricultural Capital Stock (\$ million constant 1995)</b>	<b>Economically Active Population in Agriculture (1000)</b>	<b>Capital Per Worker</b>	<b>Agricultural Area</b>	<b>Capital Per Unit Land</b>
1980	169,891	120,344	1,412	863,215	197
1990	199,587	148,249	1,346	877,651	227
2000	228,288	180,055	1,268	886,000	258

Source: FAOSTAT, © FAO Statistics Division, accessed 11 April 2009

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Figure 1: Real per Capita GDP and Agriculture's Share of GDP, Sub-Saharan Africa (1965-2007)

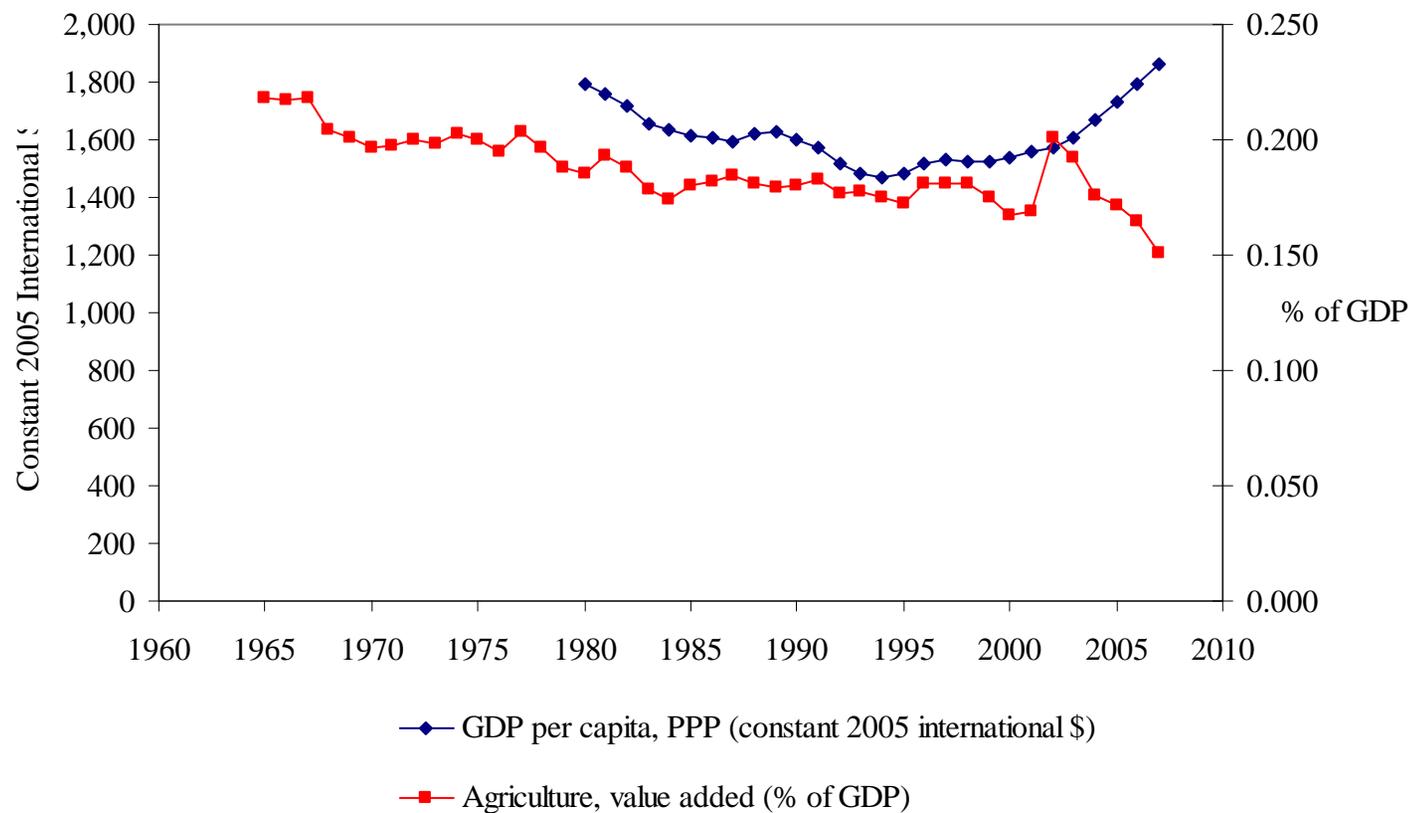


Figure 2: Women in African Agriculture

