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Agriculture and the Economic Transformation of Ethiopia

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ABSTRACT

Economic development transforms an economy from one that is largely agricultural to one that is largely manufacturing and services. Since agriculture currently dominates Ethiopia's economy and employment, however, there is an issue as to what its role should be in getting from here to there.

In the normal process of economic growth, non-agricultural sectors grow more rapidly than the agricultural sector. The slower growth of agriculture, its relative decline, concern about the difficulty of modernizing agriculture and pessimism about the potentials for technological change in agriculture suggest to some that agriculture should not be given priority for scarce resources in the interests of rapid overall growth. There is substantial evidence, however, that raising agricultural productivity is possible and that agricultural growth plays a key role in economic growth, particularly in low-income countries. Moreover, the Government of Ethiopia is committed to rapid growth of agriculture as a means of accelerating the economic transformation and reducing poverty.

This paper examines the implications of this commitment to both growth and reduction in poverty, analyzes the progress underway, and diagnoses the critical elements of change in policy required to reach the objectives. Combining a review of experiences of other developing countries with an analysis of growth multipliers for Ethiopia, the paper argues that a high rate of agricultural growth has far-reaching positive implications for increasing employment and accelerating poverty reduction. High agricultural growth also helps avoid the creation of mega-cities with large slum populations. In order to achieve this rapid agricultural growth with positive economy-wide linkages, however, it is necessary to engage "middle farmers", large enough to adopt new technologies and produce significant marketed surpluses, but small and numerous enough to have spending patterns that drive a vibrant rural non-farm sector. Finally, public and private investments in road, electricity and telecommunications are also needed to reduce marketing costs and enable growth in rural market towns and secondary cities, and provide social services to rural people.

Maintaining a growth rate in agricultural GDP of six percent would provide enough employment growth to contribute to rapid economic transformation of the economy and rapid decline in poverty. Given the low level of crop yields relative to those of other countries with comparable resources, and relative to best farmers and experiment stations, a high rate of growth in agricultural productivity appears to be feasible. Current government policies are generally consistent with attaining continued high agricultural growth rates. However, reforms are needed to accelerate growth in seed production and distribution, and to improve fertilizer distribution and to accelerate growth in fertilizer use.

1. INTRODUCTION

Economic development transforms an economy from one that is largely agricultural to one that is largely manufacturing and services (Johnston and Mellor, 1961). Ideally, that transformation brings with it increased per capita income, more equitable income distribution, urbanization of the population and from the latter, immense cultural advantages (Jacobs, 1969). If Ethiopia follows a normal pattern of high growth (agricultural growth at 6 percent per year), in 20 years the real size of the agricultural sector will have increased more than three-fold, but its share of GDP will have declined from 43 to 26 percent, as the urban sector expands more than six-fold. Along with that, all rural people would have access to secondary school education and well staffed health clinics and 90 percent of them would be on an all weather road and an electric distribution line.

Since agriculture initially dominates the economy and employment, there is an issue as to what its role should be in getting from here to there. In the normal process of economic growth, non-agricultural sectors grow more rapidly than agriculture, particularly in rapid growth contexts. Thus, it is inevitable that with rapid growth the relative importance of agriculture declines. It should do so rapidly. The slower growth of agriculture, its relative decline, concern about the difficulty of modernizing agriculture, pessimism about the potentials for technological change in agriculture, and even urban ignorance about the intelligence of illiterate farmers, have in many cases led to speculation that agriculture would most usefully be ignored or at least not given priority for scarce resources in the interests of rapid overall growth. There is a wide body of empirical evidence (presented in this paper), however, that raising agricultural productivity is possible and that agricultural growth plays a key role in economic growth, particularly in low-income countries.

Moreover, the Government of Ethiopia has taken a position on this matter. It is committed to rapid growth of agriculture as a means of accelerating the economic transformation – an agriculture led transformation of the economy (see for example, Mellor and Lele 1972, Mellor 1976, Mellor 1992.) At present the economy is dominated by low-productivity agriculture on potentially highly productive resources; the bulk of the people live in rural areas and many are isolated from not only the requisites for a high level of agricultural productivity but from the resources for education and health. In its efforts to promote economic development, the government is making large investments in roads, education, health and agricultural productivity. This paper examines the implications of this commitment to both growth and reduction in poverty, analyzes the progress underway, and diagnoses the critical elements of change in policy required to reach the objectives.

The paper also argues that there is ample reason for optimism with respect to Ethiopia's agriculture for two major reasons. First, Ethiopia does have a high potential for rapid agricultural

growth (particularly in the rainfall sufficient highlands agro-ecological zone), as evidenced by the gap between current yields and those obtained in research stations, as well as in similar ecologies in other countries, (especially for maize) (Diao and Nin-Pratt 2007, Spielman et. al. 2007, Seyoum Taffesse et. al. 2007.). Second, while the agricultural growth rate has been rapid in recent years, it is clear that a small number of removable constraints discussed below are constraining that growth. Thus, a few changes are at hand that can provide a high agricultural growth rate.

The remainder of this paper is organized as follows. Section two presents an overview of agricultural growth as a driver of development. Section three provides an exposition of agriculture's employment and growth linkages. Section four discusses key constraints to be removed to achieve a high growth rate in agriculture. The summary and conclusions are found in Section five.

2. AGRICULTURAL GROWTH AS A DRIVER OF DEVELOPMENT

A high rate of agricultural growth has far-reaching positive implications for economic development of low-income countries in terms of increasing employment and accelerating poverty reduction. High agricultural growth also helps avoid the creation of mega-cities with large slum populations. In order to achieve this rapid agricultural growth with positive economy-wide linkages, however, it is necessary to engage “middle farmers”, large enough to adopt new technologies and produce significant marketed surpluses, but small and numerous enough to have spending patterns that drive a vibrant rural non-farm sector. Finally, public and private investments in road, electricity and telecommunications are also needed to reduce marketing costs and enable growth in rural market towns and secondary cities. These four points are expanded below.

First and most important, **rapid agricultural growth dominates employment growth and poverty reduction** (Mellor and Desai, 1985; Bezemer and Heady, 2008; Christiansen, 2006; Diao et al. 2007, 2008; Thirtle, 2003). In a low income country rapid agricultural growth also provides a large share of GDP growth. However, agricultures dominance in employment growth continues into middle income status even as its share of GDP growth declines substantially (Mellor and Gavian 1999). Thus, achieving rapid agricultural growth in a low income country sets the stage for a broadly participatory growth structure when it reaches middle income status. Elevating employment growth to a higher status alongside GDP growth is a first and easy step to the broader concern with measures of growth that permeate the recent Stiglitz Commission report (Stiglitz 2009).

Second, **agricultural growth fosters a diffused pattern of urbanization** (Hardoy and Satterthwaite, 1986; Tacoli and Satterthwaite, 2003). Population is less concentrated in a single mega city. In contrast, scale economies of urban centers for export led industrialization lead to a concentration of urban growth, usually in one mega city. This is because large rural-urban income disparities, particularly with stagnant rural incomes, increase urban concentration and urban poverty as poverty drives rural people to queue for high paying urban jobs, swelling the ranks of the urban unemployed as they wait for those jobs (Harris and Todaro, 1970).

Because agricultural growth has its employment effect through multiplier effects to the rural non-farm sector (which includes small market towns), it provides a diffused spatial pattern of non-agricultural growth (Renkow, 2007). That diffused urban growth is rapid because of the high marginal propensity of rural and small town people to consume rural and non-farm goods and services produced in these same small towns (though some of the marginal consumption is for imported goods and goods produced in large cities, as well). As incomes grow, the expansion of non-farm activities in the small towns lead to their own scale economies, but for products and services serving the rural and small town market. Eventually these small town activities gain a

life of their own serving metropolitan centers and eventually exports. The diffused pattern of urbanization gets its start from the agricultural stimulus to the rural non-farm sector.[1]

Third, **the objectives of poverty reduction are best met by focusing growth on the "middle farmer" and on areas with high potential** to respond to improved agricultural technology (Jayne and Mather, 2010). Focus on the "poorest of the poor" can actually slow poverty reduction, if it comes at the cost of investments to promote rapid agricultural growth. Raising farm incomes is essential to drive employment increases, poverty reduction, and diffused urbanization. Thus the focus of agricultural growth must be on maximizing the growth in income from development expenditure. That impact will be greatest by concentrating on geographic areas that respond best to improved technology and more intensive cropping patterns, and on farmers who produce the bulk of output.

Population in poor resource areas where it is not feasible to significantly raise farm incomes will benefit because the rapid employment growth in the more agronomically-favored areas will open employment opportunities in the small towns in these areas, Less migration from these agronomically favored areas will then leave more big city urban jobs for migrants from poor resource areas.

Likewise, the substantial proportion of households with small landholdings who cannot survive without rural non-farm sources of income are unlikely to be drivers of growth, though they can benefit from the growth linkages. Such households tend to respond poorly to opportunities for increasing agricultural production because they lack sufficient land and capital. For these households non-farm employment is a major source of income.

Very large, often absentee landowners, e.g. on Latin American haciendas, are also generally less efficient drivers of economic growth because they have consumption patterns that are import and capital intensive. As a result, their spending generates few growth multipliers and does little to reduce poverty (Timmer 1997.)

Fourth, rapid rural non-farm (including small market town) growth **requires sufficient infrastructure** (Ahmed et al., 2007; Haggblade, Hazell and Dorosh, 2007). Rural road networks linking these areas to surplus agricultural producers and inter-regional roads linking small market towns to major urban centers are crucial to enable efficient marketing of products. Likewise, electrification enhances production efficiency for producers of non-farm goods and services (as in the case of hand-looms in Ethiopia, Zhang et al., 2009), as well as improving quality of life (thereby reducing incentives for migration to large cities). Communications networks, (either mobile phone access or land-lines), also improves market efficiency by

[1] See the analysis of Taiwan's rapid economic growth by T. H. Lee (1976).

facilitating contacts between buyers and sellers and increased communications within vertically integrated marketing chains.

Characteristics of the Rural Non-Farm Sector

The rural non-tradable goods and services are generally pictured as low productivity, low income occupations and therefore undesirable. Four general points on the rural non-farm sector in developing countries need to be made.[2]

First, increased labor productivity is substantially due to increased capital input. Thus, the returns are divided between capital and labor. Second, labor markets generally work; when higher returns to labor in another sector are available labor will move (though female labor in Ethiopia is more constrained than is male labor). Third, lower return employment off farms is a first step to developing the skills for movement to higher return occupations. Fourth, a substantial portion of rural non-farm jobs require education, albeit at lower levels, for example bus conductors, tutors for primary schooling, clerks in retail shops. Thus jobs are made for the increasingly educated rural youth. Indeed the elasticity of employment of educated people is elastic with respect to the growth rate of employment.

Production in the rural non-farm sector is highly elastic. That is because there is normally a large supply of underemployed labor, or because labor productivity at very low levels of productivity can be increased with little or no investment. That contrasts with agriculture, which because of the land constraint is inelastic in its supply. In agriculture, production is increased by technological change which shifts the production function. The demand for agricultural output is highly elastic because agricultural goods are tradable including on international markets. Of course, other sources of rural income increase may have a similar multiplier effect on the rural non-farm sector. They are however all very small compared to agriculture.

Remittances are rarely more than five percent of rural income (Mellor and Gavian, 1991; Barrios and Mellor, 2006; Reardon, 2007) Tourism has very limited geographic scope and even in high tourism places, like Luxor, Egypt the impact on rural incomes is negligible (Mellor and Gavian 1991). Peri-urban areas that make up a small proportion of agricultural areas in low income countries do have a major pull effect on agricultural growth, as T.W. Schultz pointed out several decades ago. Rising urban incomes generate demand for high value agricultural commodities, such as livestock and horticulture products, that raise farm incomes. The peri-urban influence may include development of tradable production in nearby small towns. However outside peri-urban areas, small towns produce largely non-tradables for which demand must come from increased income from tradables, i.e. agricultural production (Hardoy and Satterthwaite, 1986).

[2] See Haggblade, Hazell and Reardon (2007) for a detailed discussion of the characteristics of the rural non-farm sector.

The association between booming small towns and prosperous agriculture is visually obvious. The argument here is the causality is from rising farm incomes to demand for non-tradables. Gavian et al. (2002) show from sample survey data in Egypt that that is the case. Mead and Liedholm (1998) reach a similar conclusion from their studies of small enterprises.

3. AGRICULTURAL GROWTH LINKAGES

To understand the role of agriculture in GDP and employment generation it is necessary to divide the economy into three sectors: tradable agriculture, non-tradable rural non-farm, and urban. Below, we describe a simplified growth multiplier model to illustrate the linkages across these sectors and the importance of agricultural growth.[3]

In this model, agriculture and the urban sector are assumed to grow at exogenous growth rates λag and λurb (equations 1 and 2):

$$(1)\quad GDPag,t+1 = GDPag,t * (1 + \lambda ag)$$

$$(2)\quad GDPurb,t+1 = GDPurb,t * (1 + \lambda urb)$$

The heart of the model is the multiplier effect of agricultural growth on the rural non-farm sector. We assume that output of the rural non-farm sector is demand-driven and that this demand comes from households.[4] Assuming that agricultural income is the sole source of income for farmers, the percentage increase in farmers' per capita demand for rural non-farm goods and services is equal to the percentage increase in *per capita* agricultural output times γ_{rnf}, the income elasticity of demand of farmers for rural non-farm goods and services.

$$(3)\quad \%\Delta\,(GDP_{rnf} / L_{ag}) = \%\Delta[GDP_{ag} / L_{ag}] * \gamma_{rnf}$$

Adding one to both sides and then multiplying by (one plus) the population growth rate gives (one plus) the percentage change in demand for rural non-farm goods and services.[5]

$$(3a)\quad (1 + \%\Delta\, GDP_{rnf}) = \{1 + \%\Delta[GDP_{ag} / L_{ag}] * \gamma_{rnf}\} * (1 + \lambda_{L\text{-}ag})$$

Substituting $\%\Delta[GDP_{ag} / L_{ag}] = [(1 + \lambda_{ag}) / (1 + \lambda_{L\text{-}ag})] - 1$

$$= (\lambda_{ag} - \lambda_{L\text{-}ag}) / (1 + \lambda_{L\text{-}ag})$$

[3] More complex formulations of multipliers can also be constructed, including a semi-input-output multiplier using a full social accounting matrix that specifies intermediate inputs, factors of production, institutions, savings and investment and the rest of the world (Haggblade, Hammer and Hazell, 1988; Thorbecke, 1994), endogenous price multi-market models with some multiplier features (Diao et al., 2007), and CGE models with underemployed labor to permit demand-led growth in some sectors (Dorosh and Haggblade, 2003). The simple model presented here captures the essential features of the agricultural growth multiplier.

[4] As discussed below, this specification implicitly assumes that the rural non-farm sector is perfectly elastic in supply, i.e. that the sector involves underemployed factors of production (labor and capital) and can thus easily expand (with no increase in prices). Mellor and Ranade (2006) constructed a neo-classical model in which labor is fully employed and therefore wage rates rise as demand for labor increases – that is the means by which the poor benefit. The model shows the conditions for a major income impact on the poor.

[5] Technically, this calculation gives the growth rate in demand by farmers. For simplicity, we assume that demand for rural non-farm goods and services by households deriving their incomes from the rural non-farm sector grows by the same rate as the demand by farmers.

Equation (3a) becomes

$$(1 + \%\Delta\ GDP_{rnf}) = \{1 + [(\lambda_{ag} - \lambda_{L\text{-}ag})/(1 + \lambda_{L\text{-}ag})] * \gamma_{rnf}\} * (1 + \lambda_{L\text{-}ag})$$
$$= (1 + \lambda_{ag}) + (\lambda_{ag} - \lambda_{L\text{-}ag}) * \gamma_{rnf}\ .$$

Thus, (3b) $\%\Delta\ GDP_{rnf} = (\lambda_{ag} - \lambda_{L\text{-}ag}) * \gamma_{rnf} + \lambda_{L\text{-}ag}$.[6]

Labor employment by sector is then calculated as the growth rate of GDP in each sector multiplied by an exogenous output elasticity of employment.

(4) $L_{ag,t+1} = L_{ag,t} * (1 + \%\Delta\ GDP_{ag} * \beta_{ag})$

(5) $L_{rnf,t+1} = L_{rnf,t} * (1 + \%\Delta\ GDP_{rnf} * \beta_{rnf})$

(6) $L_{urb,t+1} = L_{urb,t} * (1 + \%\Delta\ GDP_{urb} * \beta_{urb})$

Note that in this simplified model, the urban sector is not divided into the inelastic, tradable/formal sector and the elastic, non-formal sector. Instead, urban sector contains both sub-sectors and is modeled as inelastic.

Three structural features of the economy largely determine the importance of agriculture in employment generation: i) the (large) size of the non-tradable rural non-farm sector in GDP and employment; ii) the high elasticity of demand of farmers for rural non-farm sector goods and services (γRNF),7 and iii) the high employment content of the rural non-farm sector both in the base and at the margin. Values of these parameters are discussed in the following section and the notes to Table 1.

Ethiopia: Basic Multiplier Model Simulations

Table 1 presents the base data and parameters of the model, along with the simulated sectoral growth rates. Note that the figures on GDP and employment shares are similar to those for

[6] Note that this expression differs slightly from the typical multiplier formula based on total, rather than per capita, agricultural incomes, (i.e. $\%\Delta\ GDP_{rnf} = (\lambda_{ag} - \lambda_{L\text{-}ag})*\gamma_{rnf}$) by the term $(1- \gamma_{rnf})*\lambda_{L\text{-}ag}$. In the simulations below, with $\gamma_{rnf} = 1.5$ and $\lambda_{L\text{-}ag} = 2.5$, the difference between a multiplier based on total agricultural incomes rather than per capita incomes is (1-1.5)*2.5 = -1.25%. Given the population growth rate and the exogenous absolute level of agricultural GDP growth used, an income elasticity of demand of 1.29 would give approximately the same results as the 1.50 income elasticity of demand with the per capita income growth formula used in this paper.

[7] In most developing countries, farmers typically spend half of increments to their income on locally produced, non-tradable, non-farm goods and services (Bell, Hazell and Slade 1982, Delgado et. al. 1998, Hazell and Ramaswamy 1991, Hazell and Roell 1983). These include improvement of their houses, local furniture, to some extent local clothing, and of course a wide range of services ranging from clerks in stores, to tutors, to bus conductors, to bus repair facilities, increasingly shifting from rural areas to small towns. These goods and services are highly competitive with tradable goods and services because of the large, low priced labor input. The other half of incremental income expenditure goes about half to food (mostly livestock and horticulture) and urban based goods, including manufactured imports from China and used clothing (Bouis 1999).

other countries, e.g. Guatemala, (Barrios and Mellor, 2006), Afghanistan, (Akbarzad and Mellor, 2005), Rwanda, (Mellor, 2002), and Egypt, (Mellor and Gavian, 1999).

Two features should be noted about the base weights of GDP and employment (columns 1 and 2), and the implied average productivity of labor in these sectors. First is the substantial proportion of employment in the rural non-farm sector, which is slightly lower than the sector's share in GDP. This gives a relative productivity ratio (share of GDP divided by the share of employment) of 35:32 or 1.1:1.0.) Second, the proportion of employment in the urban sector is only about four-fifths as high as the proportion of GDP (18 percent compared to 22 percent), which implies a relative productivity ratio of 22:18 or 1.2:1.0.)

These two features follow from the greater share of value added paid to capital in the urban compared to the rural non-farm sector (i.e. the greater capital intensity of production in the urban sector).[8] This lower capital intensity entails lower labor productivity and wages in the rural non-farm sector. Nonetheless, employment and output growth in the rural non-farm sector is an important step in the transformation of the economy and of course, a basis for higher incomes due to greater employment – and eventually rising wage rates.

Columns 3 and 4 show the growth rates of the output of the three sectors under high and low agricultural growth scenarios. As discussed above, the growth rates of agriculture and the urban sector are exogenous. Under the rapid (6 percent per year) agricultural growth scenario (column 3), the rural non-farm sector grows by 7.7 percent per year, even faster than the agricultural sector. This is because of the income-elastic (income elasticity of demand greater than 1.0) demand of farmers for goods and services from the sector. In the lower agricultural growth scenario (column 4), the rural non-farm sector again grows by more than the agricultural sector, but both sectors grow at much slower rates (3.0 and 3.3 percent for the agricultural and rural non-farm sectors, respectively).

[8] In middle-income countries, the average capital intensity and average labor productivity of the urban sector are much greater than in Ethiopia.

Table 1: Ethiopia: Base Data and Simulation Results

	Base Data		High	Low		High	Low
	Employ.	GDP	GDP	GDP	Employ.	Employ.	Employ.
Sector	Share	Share	Growth	Growth	Elasticity	Growth	Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exogenous Sectors							
Agriculture	50%	43%	6.0%	3.0%	0.30	1.8%	0.9%
Urban	18%	22%	10.0%	10.0%	0.50	5.0%	5.0%
Endogenous Sectors							
Rural Non-Farm	32%	35%	7.7%	3.3%	0.90	7.0%	2.9%
Total	100%	100%	7.5%	4.6%	0.55	4.0%	2.3%

Notes:

a) Percentage employed by sector: Urban employment is assumed to equal the urbanization rate from the 2007 population census. Agriculture employment share is assumed to greater than its share in GDP (so that average labor productivity in agriculture is less than non-agriculture).

b) GDP shares are derived from the 2004-05 SAM. The share of rural non-farm GDP is taken to be approximately equal to rural household factor income less agricultural GDP (76-43=37 percent). Urban GDP is the residual.[9]

c) The high agricultural (farm) growth rate of 6.0 percent is the CAADP target. The low growth rate is the average medium-term real agricultural GDP growth rate. The high (10 percent) growth rate for the urban sector is an aggregate of the large scale industry growth rate and the urban informal sector. It is purposively put high. More normal at this stage of development would be an 8 percent rate of growth.

d) Employment growth is determined using the exogenous employment elasticities.[10]

e) The simulations assume an income elasticity of demand for rural non-farm goods and services of 1.5. Using data from the national 2004/05 HICES, Tafere et al. (2010) estimated rural household expenditure elasticities of demand of 1.82 for clothing and shoes, and 0.57 for other non-food.

Because production in the rural non-farm sector tends to use little capital and expands by increasing labor inputs in response to increased demand for its output, the sector tends not to increase labor productivity rapidly as it grows. Thus, its elasticity of employment with respect to

[9] Note that this figure is significantly higher than the share of rural income stated as off-farm in the World Bank 2005 study of rural poverty: 19% (calculated here from the simple average of six rural communities, using the percent of rural incomes from off-farm sources, i.e. wages and business incomes). The SAM calculations, however, count implicit incomes from marketing and transport of own produce, as rural household income. Moreover, the SAM (and the national accounts) likely capture a far greater value of rural income and consumption from the service sector than do household surveys.

[10] 0.3 for agriculture is consistent with agricultural growth from yield increasing technology (Rao 1975); it would be higher for growth in land area. 0.5 is a high assumption for the urban sector. It is common for there to be very low elasticities for garments and other globally traded goods for which competition drives down labor cost through increased labor productivity. The urban informal sector is much smaller than the rural relative to the size of the tradable component.

Note that the urban sector sums the tradable, generally large scale sector, with the urban non-formal sector (analogous to the rural non-farm sector) with their quite different coefficients. The urban non formal sector will be much smaller relative to the urban tradable/formal sector because the labor share of the urban formal sector is quite small, compared to agriculture, and also has a much smaller propensity to consume non-tradable goods and services from the non-formal sector.

growth is relatively high (0.9, column 5).[11] As a result, in a fast growth scenario, the growth rate of employment in the sector is more rapid than in agriculture – 7.0 percent for the rural non-farm sector, compared to 1.8 percent for agriculture, but 5.0 percent for the urban sector (column 6). Of course, when agricultural growth is slow the opposite occurs – only a 2.9 percent growth rate of employment in the rural non-farm sector and 0.9 percent in farming (column 7).

Table 2 shows the share of incremental employment and GDP growth in the fast and slow agricultural growth scenarios. In the fast agricultural growth scenario (6 percent growth rate) about three-quarters of the employment growth is from agriculture and its multiplier to the rural non farm sector. More than twice as much is from the rural non-farm sector as from agriculture. However, only about 70 percent of the GDP growth is attributable to agriculture and its multiplier to the rural non-farm sector, with the direct contributions from agriculture being only modestly smaller than from its multipliers to the rural non-farm sector.

Table 2: Simulation Results: Shares of Employment and GDP Growth

	Share of Employment Growth		Share of GDP Growth	
Sector	**(6% Agric Growth)**	**(3% Agric Growth)**	**(6% Agric Growth)**	**(3% Agric Growth)**
Farm	22.3%	19.7%	34.4%	27.9%
Non-Farm	55.4%	40.9%	36.2%	24.6%
Sub-total	77.7%	60.6%	70.6%	52.5%
Urban	22.3%	39.4%	29.4%	47.5%
Total	100.0%	100.0%	100.0%	100.0%

Source: Model simulations.

In a country as poor as Ethiopia, with agriculture so large initially, the contribution of fast agricultural growth to GDP growth is, of course, very important. It is as important as for the urban sector. One does not want to lose that. Returning to Table 1, column 3, the fast agricultural growth rate gives a one third faster rate of growth of GDP than the slow agricultural growth rate – 7.5 percent compared to 4.6 percent. On a per capita basis it is two thirds larger.

Turning to the slow agriculture growth rate (three percent rate), holding the urban growth rate constant, and the growth rate of employment slows from 4.0 percent (substantially faster than labor force growth) to 2.3 percent (somewhat slower than the labor force growth (Table 1, columns 6 and 7.). That is the difference between moderately rapid decline in poverty and rapid

[11] An employment elasticity of 0.9 implies a rather low marginal productivity of labor in the rural non-farm sector.

increase in poverty. That is why the cross section studies (next section) show agriculture having a large impact on poverty reduction and manufacturing growth having little or no effect. In a slow agricultural growth scenario the urban sector accounts for nearly half of GDP growth and 39 percent of employment growth (Table 2). That is of course accompanied by rapidly widening income disparities between rural and urban areas. The consequence is the rapid growth of urban unemployed and urban slums for the reasons described above.[12]

International Comparisons

Table 3 compares Egypt and Ethiopia and shows that the huge employment impact of the multipliers from agricultural growth holds up in middle income countries. This is important to Ethiopia since it means that building a solid base for agricultural growth is important even when Ethiopia reaches middle income status.

A somewhat slower agricultural growth rate is assumed on the Egyptian example than for Ethiopia. The urban growth rate is about the same. With those growth rates the impact of agriculture and its multipliers on GDP growth is close to negligible at 16 percent. But the impact on employment is huge – over half (56 percent) of employment growth is due to agriculture and its multipliers.

Nothing could make the point more clearly that GDP growth alone is not an adequate measure of economic progress. One does not have to go to the complexities of the Stiglitz exercise. One need only recognize that in a view of justice in any way approximating that of John Rawls, that the employment growth rate is critical and that that is driven by agricultural growth.

International Evidence on Agricultural Growth and Poverty Reduction

The fact that national income statistics do not differentiate tradable from non-tradable sectors requires piecing together information and searching for consistency. It is notable that international cross sector studies consistently report that poverty decline (consistent with employment increase) is large when agriculture grows and is either small or non existent when the urban sector or manufacturing grows. See for example Ravallion and his colleagues (2002, 2007), Timmer et al., (1997), Thirtle (2001, 2003), Christiansen (2006) and Diao et al., (2007).

[12] Note that these simple multiplier calculations give broadly similar results to the more complex general equilibrium analysis using a detailed Social Accounting Matrix including poor and non-poor farm households (Dorosh and Thurlow, 2009).

Table 3: Contribution to GDP and Employment Growth: Egypt and Ethiopia

Item	Egypt	Ethiopia
Base Share Employment		
Agriculture	26	50
Rural Non-farm	34	32
Urban	40	18
Base Share GDP		
Agriculture	16	43
Rural Non-Farm	16	35
Urban	68	22
GDP Growth Rate		
Agriculture	4.9	6.0
Rural Non-Farm	6.4	7.7
Urban	9.0	10.0
Share of Incremental Growth, Employment		
Agriculture	18	22
Rural Non-Farm	38	55
Urban	44	22
Share of Incremental Growth, GDP		
Agriculture	7	34
Rural Non-Farm	9	36
Urban	84	29

Source: Egypt: Mellor and Gavian (1999); Ethiopia: Tables 1 and 2.

These studies also show a significant lag between the agricultural growth and poverty reduction. That is consistent with the process being indirect with time for the multipliers to work through. If the impact was largely from increased supply of food and decline in food prices the impact would not be substantially lagged. In any case the price effect assumes a closed economy, whereas economies are generally thought now to be quite open.

It is notable that Timmer shows that when asset ownership is highly skewed the impact of agricultural growth on poverty reduction is negligible. That again is consistent with the impact working through employment in the rural non farm sector based on resident small farmers with a high marginal propensity to consume local non-tradables. Rich landowners tend to be absentee and to have more capital intensive and import intensive consumption patterns

4. IS HIGH (6 PERCENT) AGRICULTURAL GROWTH FEASIBLE?

The successful fast agricultural growth countries, which tend to be middle income countries, grow agriculture at a four to six percent growth rate (Mellor 1992). That is a reasonable target for Ethiopia, despite its lower income status because it has substantial productive agricultural resources and has a good start in the required institutional development.

The employment calculations above used six percent as a rapid agricultural growth rate. That is certainly at the upper limit of reasonable expectations for sustained agricultural growth. How that might be achieved? There are two issues: what is the commodity composition of growth and what is the input composition of growth?

The Commodity Composition of Growth

Ethiopia's agriculture is dominated by the cereals (32 percent of agricultural GDP) and livestock (33 percent). Export crops (17 percent of agricultural GDP) and other agriculture (18 percent) account for the remainder (Table 4). Table 4 states a hypothetical commodity composition of growth. Cereals growing at five percent per year are a rate consistent with demand growth. If per capita income growth is 5 percent, and the income elasticity of demand of 0.6, then demand would grow at 5.6 percent per year (2.6 percent population growth rate plus 0.6 times 5 percent per capita income growth rate) and real prices would actually rise slightly. A somewhat lower income elasticity would still equate with no change in real prices or a small price decline, since own-price elasticities for staples are also elastic.

High own-price elasticities of demand are typical of low income countries with low caloric intakes. Thus, the food staples growth rate is feasible from the demand side.[13] Because of the low base that rate could be exceeded from the production side. The doubling of yields that is seen as currently feasible would occur over a 14 year period, and over 10 allowing for a moderately rapid rate of transfer of area to other commodities. The seven percent for livestock is also feasible from the growth point of view and presumes substantial growth in exports. Growth of eight percent of export crops, dominated by coffee, could be achieved significantly from area expansion given the modest current area in that set of commodities and the rapid

[13] CGE model simulations by Dorosh and Thurlow (2009) show that accelerated agricultural growth across all agricultural sub-sectors results in only modest price declines (relative to the base run) through 2015. Wheat and maize prices decline by seven to eight percent; sorghum and teff prices are essentially unchanged; and vegetable and pulses prices rise by five to eight percent. Milk and cattle product prices decline more sharply (by more than 15 percent), highlighting the crucial importance of improved marketing in these sub-sectors. Moreover, the combination of rising real agricultural incomes and lower real staple food prices results in 4.3 percentage point reduction in national poverty by 2015, from 22.7 percent in the baseline scenario to only 18.4 percent with accelerated agricultural growth.

growth in demand for the high quality coffee produced by Ethiopia. Other commodities have been arbitrarily set at a modest rate. For a discussion of various aspects of agricultural productivity growth, see Chamberlin et al., 2007, Diao 2007, Spielman et al., 2007; Alemu et al., 2008; and Seyoum Taffesse et al., 2007.

Two points are noteworthy in this exposition. First, achieving a six percent growth rate requires that all major sub-sectors participate. Second, the growth rates are sufficiently high that a focus on priorities within these sub-sectors will be required and explicit attention given to achieving these targets.

The growth rates of 8 percent for export commodities, primarily coffee, and for livestock of 7 percent seem feasible. As that happens the base for those sectors will rise compensating for a gradual decline in the income elasticity of demand for basic food staples. That does confirm that it is important to achieve those very high growth rates for export commodities and for livestock.

Table 4: Ethiopia: Hypothetical Commodity Composition of Growth

Commodity group	Base, percent	Growth rate	Share of growth
Cereals	32	5	26.7
Livestock	33	7	38.6
Exportable	17	8	22.7
Other	18	4	12.0
Total	100	6	100

Future Agricultural Growth: Input Requirements

Expansion of area cultivated has been a major source of cereal production growth since the 1980s. In the 1990s, area growth averaged 5.8 percent per year while average yields actually declined (Table 5).[14] During the 2000/01 to 2008/09 period, however, increases in area cultivated have slowed to 3.1 percent per year, with yield growth accounting for more than half of the total 7.0 percent per year growth in cereal production. For the three years 2004/5 – 2007/8 the growth rate of cereal production was nearly 12 percent (Figures 1 and 2). In part, the

[14] There has been some controversy about the reported rate of increase in agricultural production in Ethiopia for the past several years. In part, this controversy was due to differences between figures produced by the Ministry of Agriculture and those of the Central Statistical Agency (CSA.) In general, the Ministry of Agriculture figures, which are based on estimates provided by their local officials, showed higher growth rates than CSA, which are derived by actual crop cuttings. The following analysis of cereal production, which accounted for 32 percent of value added in agriculture in 2005/06 (livestock accounted for 33 percent) is based on the official CSA data.

rapid growth in the latter period can be explained by excellent weather for cereal production. Future growth rates in area cultivated are unlikely to be so high.

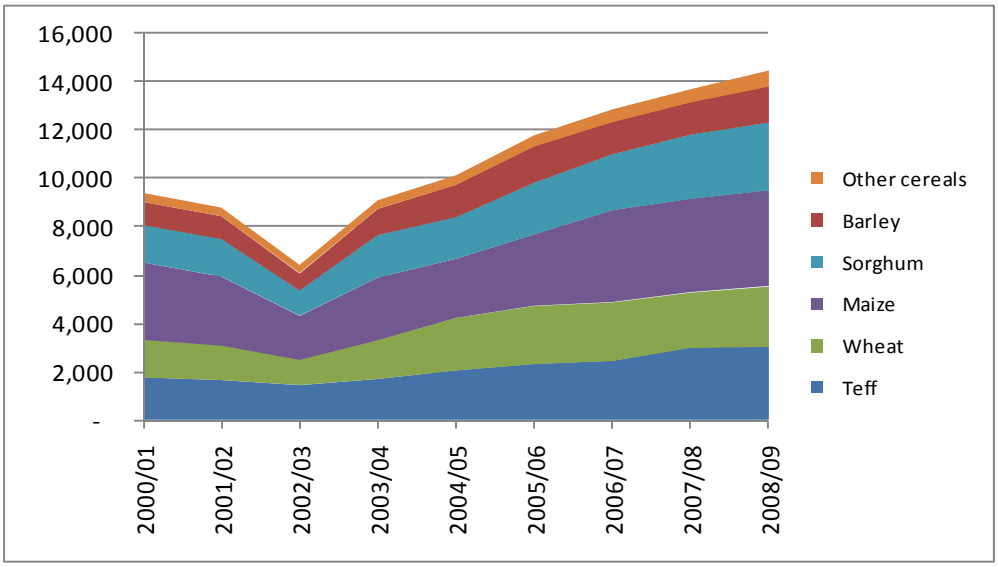
Table 5: Ethiopia: Cereal Area, Yield and Production, 1961/62 – 2008/09

	FAO Area (mn has)	FAO Yield (tons/ha)	FAO Production (mn tons)	CSA Area (mn has)	CSA Yield (tons/ha)	CSA Production (mn tons)
1961/62-1969/70	6.23	0.73	4.53	n.a.	n.a.	n.a.
1970/71-1979/80	5.25	0.90	4.63	n.a.	n.a.	n.a.
1980/81-1989/90	4.89	1.15	5.63	4.30	1.14	4.89
1990/91-1999/00	5.87	1.18	6.88	5.60	1.20	6.67
2000/01-2008/09	8.24	1.30	10.68	7.72	1.41	10.94
Average Growth Rates (from logarithmic regressions)						
1961/62-1969/70	1.1%	0.8%	1.9%	n.a.	n.a.	n.a.
1970/71-1979/80	-4.9%	3.7%	-1.4%	n.a.	n.a.	n.a.
1980/81-1989/90	0.5%	-0.8%	-0.3%	2.4%	-1.7%	0.6%
1990/91-1999/00	5.9%	-0.7%	5.1%	5.8%	-0.5%	5.2%
2000/01-2008/09	2.7%	3.6%	6.5%	3.1%	3.5%	7.0%

Source: Calculated from data from the FAO website and CSA agricultural surveys.

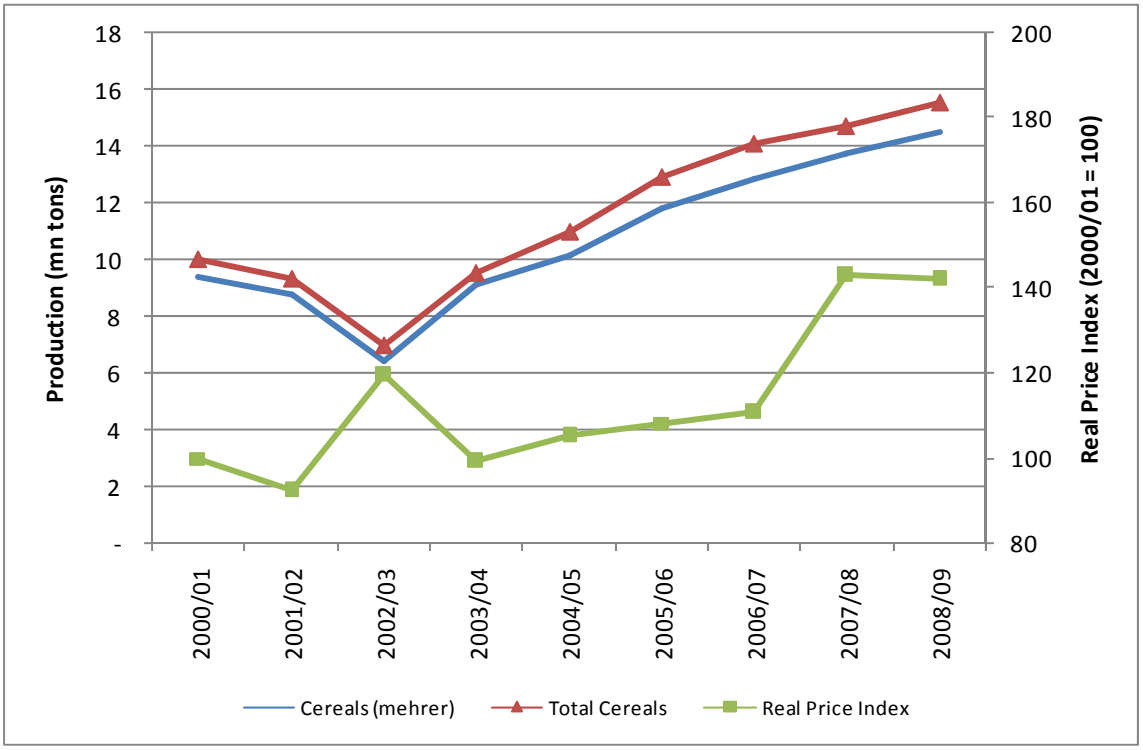
Given increasing population pressure on land, there is limited scope for mobilizing land at the margin. Nonetheless, additions to farm population can provide the labor for bringing pasture land, more steeply sloping land and other underutilized land into production. Thus, it is not unreasonable to assume that area growth can continue for a few years at a slightly lower rate of 2.5 percent rate, somewhat lower than population growth. (Note that in the 1950s and 1960s India, seen as very overcrowded relative to the land base, had a similar growth in cultivated area Mellor et. al. 1968.)

Figure 1: Ethiopia: Cereal Production, 2000/01 – 2008/09



Source: Calculated from CSA data.

Figure 2: Ethiopia: Cereal Production and Real Prices, 2000/01 – 2008/09



Note: The real price index shows the production-weighted average of the wholesale prices of the four major cereals (teff, wheat, maize and sorghum).
Source: Dorosh and Ahmed (2009), calculated from CSA and EGTE data.

Future increases in yields will require greater intensification, including substantial increases in fertilizer use. By 2008, fertilizer use had increased to over 400 thousand tons, most of which was applied to cereals. The growth rate for fertilizer for that period was somewhat less than five percent. With major effort and some policy modification that rate can be accelerated to 15 percent. That is the sustained rate achieved by countries such as India in a similar stage of fertilizer growth (Mellor 1968.) That would add 60,000 tons per year – and of course growing as the base expanded. Assuming an average nutrient content of 35 percent, the 60,000 tons of fertilizer would add 21,000 tons of nutrients per year. Again assume a response coefficient of 10 kg of grain output for each kg of nutrients would add 210,000 tons of cereal equivalents of output. That would add 1.6 percentage points to the cereals growth rate. That added to the area expansion would provide a 4.1 percent growth rate in output.

A 10 kg of grain output for each kg of fertilizer nutrient ratio is high by current estimates of the marginal productivity of fertilizer for small farmers of about 4 for wheat (Seyoum Taffesse et al., forthcoming).[15] However, a major reason for this low marginal productivity of fertilizer is likely the poor provision of critical complements to fertilizer (e.g. improved seed, appropriate agronomic practices, water, etc.). Large commercial farms in Ethiopia have similar fertilizer application rates for maize and wheat as do smallholders who use fertilizer, but have significantly higher yields (Table 6). Comparing large commercial wheat farmers with smallholders who do not use fertilizer, the marginal yield (0.58 tons/ha) divided by the marginal fertilizer (0.158 tons/ha) is 4.0 (a ratio of approximately 8.0 in terms of tons of marginal yield per ton of nutrient). Similar calculations for maize result in a marginal output per fertilizer input of 7.0 (1.57 / 0.225). Thus, if all complementary inputs are available and appropriate agronomic practices are used, a relatively high marginal productivity of fertilizer for small farmers appears to be possible.

[15] In addition to problems such as poor quality seed, insufficient rainfall, etc. that lower yields on plots with chemical fertilizer, the estimates of productivity of chemical fertilizer may also be biased downward because effects of organic fertilizer are difficult to take fully into account in the analysis. Fields near the village often receive substantial applications of organic manures and thus have high yields, even though they receive little or no chemical fertilizer. More distant fields receive the inorganic fertilizer, but do not usually benefit from organic fertilizer. Nonetheless, the substantial areas with no chemical fertilizer and slow growth in fertilizer use overall are consistent with low response ratios.

Table 6: Ethiopia: Fertilizer Use and Yields of Maize and Wheat by Farm Size (2007/08)

	(1) Smallholders (w/o Fert)	(2) Smallholders (With Fert)	(3) Large Farms	(2)-(1) Small Farms (w/ Fert) - (w/o Fert)	(3)-(1) Large Farms - Smallholders (w/o Fert)
Total Fertilizer (tons/hectare)					
Wheat	0	0.155	0.147	0.155	0.147
Maize	0	0.181	0.225	0.181	0.225
Yield (tons/hectare)					
Wheat	1.39	1.67	1.97	0.28	0.58
Maize	1.98	2.28	3.55	0.30	1.57
Marginal Yield / Marginal Fertilizer					
Wheat	---	---	---	1.77	3.99
Maize	---	---	---	1.65	7.00

Source: Calculated from CSA Agricultural Sample Survey data.

An increased marginal productivity of fertilizer would likely be sufficient to provide the additional percentage point to growth to meet the cereals portion of the six percent target. Note that there is broad agreement that cereal yields can be doubled with current technology. A five percent growth rate of cereals production would double yields after a 14 year period. That is a reasonable time span for putting in place the requisites of that growth.

As fertilizer use grows the base expands and so the growth rate can be maintained in the face of decline in increments to cultivated area and eventually to the transfer of area in cereals to high value crops.

The preceding discussion assumes that all the growth in fertilizer use of 15 percent per year would be applied to cereals. That is roughly consistent with current practice. The growth of other commodities would require intensification of land use, including rapid increase in fertilizer use off a low base, and some transfer from cereals to high value commodities. The growth in fertilizer use on other crops would be in addition to the 15 percent growth rate. Since the base is low the addition would be modest. Of course major change in fertilizer and seed marketing would be needed, as is discussed below.

The high growth in fertilizer use will raise the base level of agricultural output. That has two implications. First, as the base increases, a given percentage growth rate will have an increasing impact on the crop output growth rate. That will allow for a gradual decline in the growth of area cultivated. The past growth is not surprising – being typical of high population density agricultures in early stages of accelerated growth. But inevitably that growth declines as little land remains to be developed. The proportion of output growth from yield will have to increase relative to that from expanded land area.Having said all that, it would be prudent **to assume a substantial reduction in the agricultural area growth rate** and for increased importance to the effort to maintain the fertilizer response

Policies and Actions to Meet the 6 Percent Target Growth Rate

The current government agricultural development strategy covers a wide range of activities essential to rapid agricultural growth. These include support for agricultural research; massive expansion of the training of extension workers, in the number of extension personnel and integrating of the research and extension systems; credit extended on a commodity and input specific basis; and a large program to expand the road system (Spielman et al., 2007). All these programs require improvement and expansion. In this context two areas require major institutional change at present and are critical to reaching the six percent long term growth rate. They are to more than double the growth rate in fertilizer use and to shift from current close to zero growth in certified seed production to a large scale program.

Fertilizer

The most encouraging sign for the future is fertilizer use having reached a base of a size sufficient to have aggregate impact (Seyoum Taffesse et al., 2007). That provides the potential for a large and increasing share of increments to production coming from increased fertilizer use. The objective should be more than doublling the growth rate of fertilizer use. That in turn means very large absolute increments per year. India, at a similar stage in fertilizer use was increasing use at a 15 percent rate. It will be a challenge to maintain and preferably to increase the response to fertilizer even as the use increases. That puts pressure on the research system as well as extension.

It is reasonable to want the cooperatives to be the major force in fertilizer delivery.[16] That requires a focus on continued rapid expansion of coverage by the cooperatives. The area covered needs to expand rapidly as does the intensity of use where there is coverage. Public expenditure on the administrative costs of rapidly adding branches and providing cooperative access to national and even international credit markets at government rates are both common

[16] There is a considerable literature on the cooperative system in Ethiopia (Seyoum Taffesse and Bernard 2006, Seyoum Taffesse et al. 2007).

means of encouraging the cooperative movement without providing insurmountable problems for private competitors. However, competition always has a valuable impact.

Thus, it would greatly increase the probabilities of meeting the very high fertilizer growth target if the private sector were encouraged to purchase fertilizer at the major wholesale points and then play a major role in fertilizer distribution. This calls for a major public policy decision.

Since the grain traders generally have good access to credit perhaps they can finance farmers as well. In the short run the banks should be encouraged to extend loans for this purpose. In the long run a national rural credit system is needed.

Achieving Normal Rates of Fertilizer Productivity

The assumption of a ten to one response coefficient for nutrient input is well justified from historical data and cross section data in contemporary countries. Of course as fertilizer intensity expands the productivity at the margin declines. However, technological innovation has fully compensated for that keeping marginal response rates roughly constant over time.

Unfortunately data on actual farmer cereal yields for Ethiopia show very low response ratios – output to fertilizer input of only about two for wheat (Seyoum Tafesse et al., 2009.)[17] That low response ratio is due to lack of critical complements including certified seed. Thus, meeting the high rate of growth target requires radically increasing the response to fertilizer to international norms and maintaining it at that level. Two critical needs must be addressed: radical change in seed supply and seed supply policy; and improving the quality of the applied agricultural research/extension complex to provide dynamic improvement in farming practices. In addition the infrastructure network must be expanded rapidly (Alemu et al., 2008).

Seed

The most serious problem in meeting the accelerated growth target is the lack of growth in the production of high quality seed (Alemu et al., 2007). There has been little growth in use of certified seed. All three stages of the seed process need rapid expansion.

Fertilizer use cannot be expected to grow rapidly without large scale use of improved seed. As fertilizer application rtes increase rapidly it is natural for the response coefficient to decline. The norm however is for the response to be maintained. That is only possible if improved varieties and practices are constantly provided as fertilizer use rises. That in turn depends on huge quantities of certified seed.

[17] That figure for productivity of chemical fertilizer is biased downward because fields near the village often receive substantial applications of organic manures and thus have high yields, even though they receive little or no chemical fertilizer. More distant fields receive the inorganic fertilizer, but do not usually benefit from organic fertilizer. Nonetheless, the substantial areas with no chemical fertilizer and slow growth in fertilizer use overall are consistent with low response ratios.

Production of breeder seed by the research system needs to accelerate markedly. This is now a major bottleneck (Alemu and Spielman, 2006). Foundation seed is also a bottleneck and needs to be expanded. It would be logical to mobilize the large scale private and state farms for this purpose. For that to succeed the margins for producing foundation seed need to be increased.

Production of certified seed should be largely a private sector activity. Ready availability of rapidly growing supply is far more important to growth than the price of seed – which is after all a small portion of total production costs and in any case serves to greatly increase the profitability of fertilizer. Prices need to be determined so as to provide high levels of profit to seed producers to give them the incentive not only to provide high quality seed but to expand rapidly.

The Applied Research/Extension Complex

The Government of Ethiopia has put a major emphasis on hugely expanding and training the extension service, with a correct emphasis on technical capacity (Spielman et al., 2006). It also supports the research system well. But, maintaining the response ratio will require increased technical competence of the extension service and substantial expansion of the research system.

Roads and Other Physical Infrastructure

The large investment in road infrastructure has so far been allocated primarily to the trunk system. The next phase must provide the feeder systems (Dercon et. al., 2008.) A ten year plan should add ten percent each year to the areas served by adequate infrastructure and thereby add ten percent per year to the areas that can be intensively developed to meet the high six percent growth target.

Likewise, expansion of the cell phone network and improved cell phone service can also spur growth of commercial agriculture. Improved cell phone communications has the potential to lower price margins, raise farm gate prices, and enable farmers to target and time market sales more effectively.

Focus on Medium Size Farmers

Finally, in order to substantially increase agricultural productivity, marketed surpluses and achieve the substantial multiplier effects discussed above, it will be necessary to focus much of the productivity enhancing investments and extension on medium size farmers. Many crop farmers in Ethiopia lack sufficient land (and water) to provide full time employment and a level of living from operating that farm that places them above the World Bank $1 a day poverty line.

That definition is built up from the minimum calories required for an active life plus other goods and services of similar necessity. It is in essence a survival level of income.

Under current farming practices in Ethiopia it requires about one hectare of land to achieve that level (although livestock and other incomes bolster household incomes significantly). Using a cutoff of 0.90 hectares, 40 percent of rural families are medium size farmers and they farm 75 percent of the land and presumably a somewhat higher proportion of output (Table 7). It is this set of farm families who will most readily adopt innovation, increase production, and drive increased rural incomes.

Table 7: Ethiopia: Total area cultivated by farm size and agro-ecology[a]

Farm Size (hectares)	Moisture Reliable Cereal	Moisture Reliable Enset	Humid Lowland	Drought Prone	Pastoralist	Total
		(thousand hectares)				
0.0 - 0.25	111.7	133.2	6.5	76.9	6.8	335.0
0.25 - 0.52	364.3	298.7	17.1	271.2	22.1	973.4
0.52 - 0.90	884.0	355.7	31.0	474.3	39.4	1,784.4
0.90 - 1.52	1,739.5	330.0	47.0	824.8	70.5	3,012.0
1.52 - 25.20	4,153.2	272.4	94.4	1,617.8	140.3	6,278.0
Total	7,252.7	1,390.0	196.0	3,265.0	279.1	12,382.8
		(percentage of national total)				
0.0 - 0.25	0.9%	1.1%	0.1%	0.6%	0.1%	2.7%
0.25 - 0.52	2.9%	2.4%	0.1%	2.2%	0.2%	7.9%
0.52 - 0.90	7.1%	2.9%	0.3%	3.8%	0.3%	14.4%
0.90 - 1.52	14.0%	2.7%	0.4%	6.7%	0.6%	24.3%
1.52 - 25.20	33.5%	2.2%	0.8%	13.1%	1.1%	50.7%
Total	58.6%	11.2%	1.6%	26.4%	2.3%	100.0%

[a] Each farm size interval (quintile) contains 20 percent of Ethiopia's small farms, approximately 2.57 million farms.

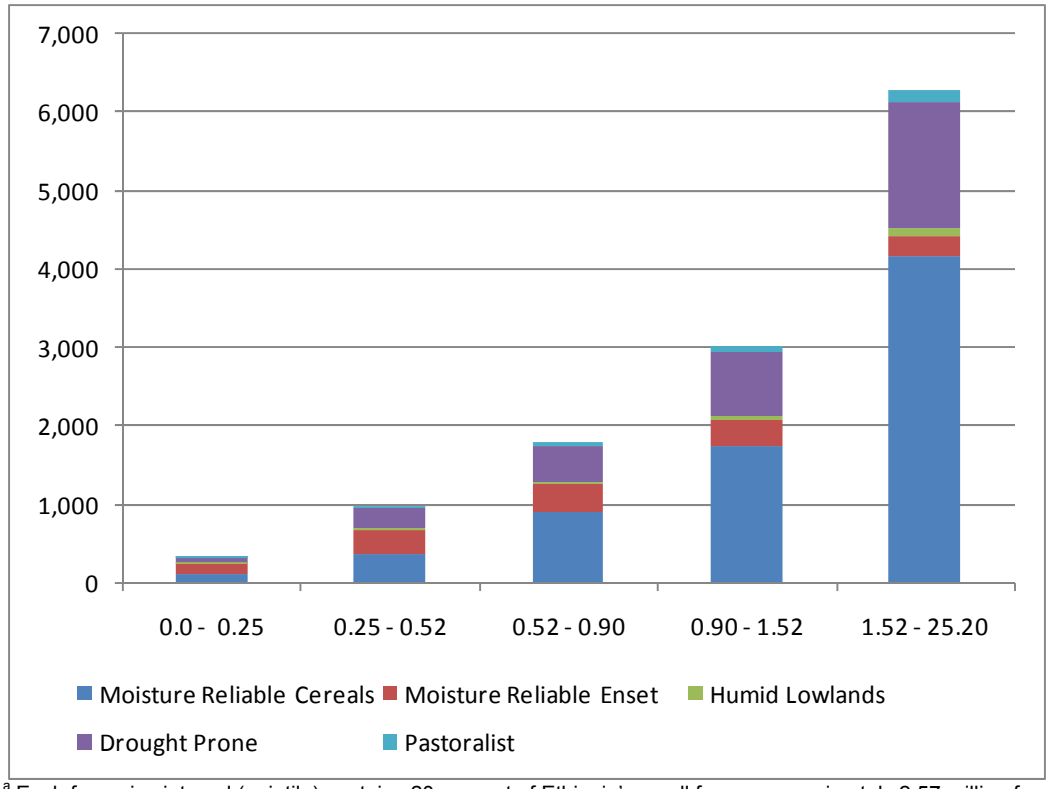
Source: Calculations from the Agriculture Sample Survey of 2007/08, Central Statistical Agency (CSA)

Most of these farmers (accounting for 48 percent of all farmers) reside in the moisture reliable cereal-based highlands, though medium size farmers in the drought-prone highlands are also numerous (20 percent of all farmers), (Figures 3 and 4). However, in the absence of expanded irrigation or improved land and water management systems, it is only the former group (in the moisture reliable highlands), that in general are likely to have large numbers of farmers of both sufficient farm size and reliable enough water, to achieve large increases in productivity and marketed production.[18] In the moisture-reliable enset-based highlands, population pressure has

[18] The proportion of production that takes place in the reliable rainfall areas is of course much larger than the proportion of land. If we assume value of production per hectare is 50 percent higher in the reliable rainfall areas compared to the unreliable; then 63 percent of production takes place in those areas. If the production growth rate is a modest three percent in the unreliable areas, it

already diminished farm size to such an extent that out-migration has become a major pathway out of poverty.

Figure 3: Total area cultivated by farm size and agro-ecology, 2007/08[a]



[a] Each farm size interval (quintile) contains 20 percent of Ethiopia's small farms, approximately 2.57 million farms.

In contrast with the medium size farmers, the smallest 40 percent of farms account for only 10.6 percent of total area cultivated nationally. They are unlikely to make a major contribution to increasing aggregate farm incomes. Of course some with this size holding will farm intensively and produce substantial marketed surplus. Most of these households, however, will farm less intensively and for these households, their way out of poverty is to increase their income from non-farm employment. Of course, increasing their agricultural productivity will add to their income and is desirable, but their low income, attention to their non-farm income sources, and lack of capital requires quite different farm income raising measures than for the medium size farm population.

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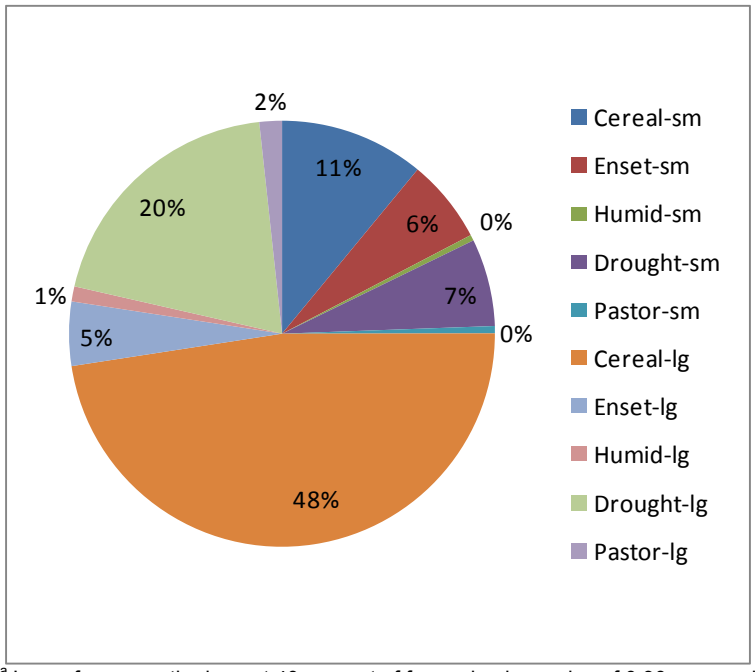
requires 7 3/4s percent growth rate in the reliable areas to meet the six percent overall growth targets. That seems a reasonable figure given the homogeneously excellent resource base. The comparisons with other countries are across the both the reliable and unreliable water regimes.

Figure 4: Shares of area cultivated by farm size and agro-ecology, 2007/08[a]



[a] Large farms are the largest 40 percent of farms, having a size of 0.90 or more hectares.

5. SUMMARY AND CONCLUSIONS

This paper has made a case for the importance of achieving high agricultural growth. It concludes by highlighting five major implications of the alternative: a development strategy that neglects or minimizes the importance of high agricultural growth.

First, in Ethiopia, as in all low income countries, the size of the urban population is so small, at 15 percent of the total according to official estimates (based on administrative boundaries and definitions) and by 20 percent (based on population density and travel time to urban centers of at least 50,000 people)[19], that at current growth rates of population and the urban sector it will be 20 years before the rural populations decline in absolute size.[20] Given that there is little scope for expansion of area cultivated on to relatively fertile land,[21] continued growth in the rural population suggests that average farm size may continue to decline for about two decades.

Given a 2.6 percent overall population (and labor force growth rate), and assuming that 43 percent of the population is initially employed in agriculture, even if non-agricultural (urban plus rural non-farm) employment grows at a very high rate of 4.3 percent per year (as in Table 1), the decline in the farm population and hence the growth in the average size of farm would be at a negligible 0.6 percent per year. Further that projection has the rural non-farm and small town population absorbing a substantial share of the non-farm growth. Thus, Ethiopia must, even with employment intensive agriculture led growth, deal with a situation for a long time into the future in which social welfare programs (health and education) and increased incomes must occur in very large part in the rural sectors. That is of course what drives current government policy.

Second, with neglect of agriculture, urban growth will be rapid but driven by the push of rural people with declining real incomes being driven to the cities. In other words, much of rural-urban migration would be driven by the "push" of rural poverty, rather that the "pull" of rising urban incomes. Moreover, the larger are the rural urban income disparities, the greater the incentive will be for rural people to migrate to the cities. Potential rural-urban migrants will note the large urban incomes, perhaps recognize that those jobs are not immediately available, but will be willing to "queue" in urban slums waiting for those jobs. The greater the disparity between rural and urban incomes, the longer the queue, and the greater the number of underemployed, poor, slum dwelling urban population (Harris/Todaro.) The scale economies and the concentration of

[19] See Schmidt and Kedir (2009) for details of these calculations and estimates of urbanization (the agglomeration index) for 1984, 1994 and 2007.

[20] See Hashim and Dorosh (2009) for various scenarios of the size of the agricultural labor force and poverty in Ethiopia.

[21] The continued expansion of area cultivated over the last 10 years, even in the highlands, remains a puzzle. Increased conversion of pasture lands for crop cultivation is one possibility. Scope for continued land area expansion by this means, however, is likely to be severely limited.

foreign aid, in the major city concentrate that urban poverty. That is the story of rapid growth in the major cities of agriculture neglecting Africa.

Third, neglect of agriculture includes neglect of rural infrastructure – easily the most expensive aspect of agricultural development. That too is a standard African story. The same expansion of infrastructure that is critical to agricultural growth is also critical to social improvement (health and education.) Schools and clinics are easily built far from all weather roads. But, the teachers and health technicians and their families will in general live where there is a town with an all weather road (and electricity). Traveling to the isolated village is a struggle and often does not happen. Thus, provision of rural social services cannot be put off for decades before urban growth is sufficient to productively absorb rural population increase. Providing these rural social services requires infrastructure expenditure that represents easily the largest element of investment for agricultural growth. The alternative is at least 20 years of ill health and under education for rural people.

Fourth, except for physical infrastructure, agricultural growth competes only marginally for resources with urban growth. Agriculture depends on public institutional infrastructure relatively more than other sectors; hence much of the investment required is not directly competitive with urban growth. Further there are strong political benefits to research stations and extension workers scattered throughout the countryside.

Fifth, is the large impact of structural growth in employment through multipliers to the rural non-farm sector. Rapid agricultural growth and its multipliers is responsible for a far higher percentage of employment growth than of GDP growth. Agriculture and its multipliers to the rural non-farm sector are less capital intensive than is urban industrial growth.

Thus, although labor productivity is by definition low in agriculture and the stimulated rural non-farm sector that does not mean that factor productivity is lower. There is simply much less factor payment to capital. The elasticity of employment with respect to GDP growth is quite inelastic in agriculture but highly elastic in the rural non-farm sector. In contrast, the employment elasticity is very low in the urban manufacturing sector. That is partly because international competition forces cost reductions that occur in relatively labor intensive industry by raising labor productivity. Because of the high income elasticity of demand of farmers for non-farm production, it is correct to say that the faster the agricultural sector grows the faster its relative importance declines. The growth in demand for educated people is elastic with respect to the rural employment growth rate – absorbing a growing social system generated expansion of educated young people.

A six percent growth rate in agricultural GDP provides a growth rate in employment that contributes to rapid economic transformation of the economy and rapid decline in poverty. The

low level of crop yields relative to those of other countries with comparable resources, and relative to best farmers and experiment stations suggest the potential for that growth rate. Growth in the past several years in level and changing sources of growth are consistent with achieving that goal.

The Government's policies towards agricultural growth are generally consistent with the objective. They range broadly over the usual prerequisites of such growth. However seed production has lagged far below the level necessary for rapid growth from the current base. Similarly fertilizer use although growing moderately rapidly needs to be greatly accelerated. To maintain those growth rates requires a steady stream of improved technology from the agricultural research system and its dissemination by the extension system.

Annex Figure 1: Total area cultivated by farm size deciles and agro-ecology, 2007/08[a]

Farm Size (hectares)	Moisture Reliable Cereal	Moisture Reliable Enset	Humid Lowland	Drought Prone	Pastoralist	Total
0 - 0.13	32.2	34.6	1.8	18.2	2.1	88.9
0.13 - 0.25	79.5	98.6	4.6	58.7	4.7	246.2
0.25 - 0.38	137.4	135.9	7.1	110.3	9.0	399.7
0.38 - 0.52	226.9	162.8	10.1	160.9	13.1	573.7
0.52 - 0.69	363.5	170.0	13.0	207.2	18.7	772.3
0.69 - 0.90	520.5	185.7	18.1	267.1	20.6	1,012.1
0.90 - 1.15	739.1	164.0	21.1	354.2	30.7	1,309.1
1.15 - 1.52	1,000.5	166.0	25.9	470.7	39.8	1,702.9
1.52 - 2.12	1,469.5	141.7	29.1	606.7	54.4	2,301.3
2.12 - 25.20	2,683.7	130.7	65.3	1,011.1	85.9	3,976.7
Total	7,252.7	1,390.0	196.0	3,265.0	279.1	12,382.8

[a] Each farm size interval (decile) contains 10 percent of Ethiopia's small farms, approximately 1.28 million farms.

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