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Rapid Cereals Production Growth in Ethiopia:

 How Rapid, How Achieved, Can it Continue, What Impact?

John W. Mellor

Cornell University

**(Please note –the tables and figures are at the end of the paper)**

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Abstract

The almost universally poor record for agricultural growth in African countries has led to pessimism about the potential of the sector and argument for emphasizing large scale farms if investment is to be made in agriculture (e.g. Stevan Dercon, Paul Collier 2014.)

Prime Minister Meles set a vision in 2000 for Ethiopia to reach middle income status in 25 years. The strategy was Agricultural Development Led Industrialization (ADLI.) That strategy focused initially on cereals production, a set of commodities that occupy 90 percent of the farmed area and dominate the consumption patterns of those below the poverty line. For the 16 years from 1995-96 to 2012-13 the cereals growth rate was 6.3 percent. With growth policies coming fully into play in the more recent 12 year period the growth rate was 7.0 percent. Eighty four percent of the production increase came from the small commercial farmer, ranging in size from 0.75 to 5.0 hectares. Less than three percent, as is typical of Asia and Africa, came from large commercial farms. From the agricultural growth has come radical decline in rural poverty and increase in food security of the poor. Those improvements have been driven by expenditures of the small commercial farmers on the employment intensive, non-tradable rural non-farm sector. The paper details the five major elements of the Ethiopian success and how they shifted over time.

 Key Words: agricultural growth; agricultural strategy; poverty reduction; Ethiopia; Africa; fertilizer, infrastructure

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Introduction

This paper commences with analysis of the growth rate in cereals production over the past 16 years, first for the collectivity of cereals and then for each individual cereal, documenting the relative roles of area expansion and yield. The diversity among the individual cereals illustrates not only the diverse conditions and results, but through consistency checks supports the reliability of the underlying data and analytical techniques. The dominant role of the small commercial farmer, in the case of Ethiopia with 0.75 to 5.00 hectare holdings, in growth is described. It is noted that these farmers are above the poverty line, are commercial, not subsistence, and not poor by the standards of their communities. Later analysis shows that nevertheless rural poverty declined precipitously and the relation between agricultural growth and poverty reduction is illuminated. The sources of growth are analyzed by time period showing how they changed over time with a further set of changes offering the potential for prolonged continuation of the high growth rate and a virtual end to rural poverty.

The Data and Analytical Methods

The basic data for the growth rates discussed in this paper are from the Ethiopian Central Statistical Agency (CSA). The Central Statistical Agency website (www.csa.gov.et) provides detailed information on their methodology. In brief, the data are from regular sample surveys. Plots are selected randomly and yields are determined by crop cutting. These are internationally standard procedures. CSA has been doing this for close to two decades with continuity in professional leadership and management and well trained and supervised staff. Continuous improvement derives in part from a professional head who has been consistently in charge throughout. In brief it is a highly professional organization. There are technical problems with the data, dealt with in the next paragraph. There is however no basis for a consistent set of biases that inflate the growth rate.

The trends in this paper are drawn from a paper commissioned from Richard Stuff (2013.) [[1]](#footnote-1) There are gaps in the data and definitions changed in 1997. Agriculture is strongly influenced by large fluctuations in weather. We are interested in the impact of trends in investment, technology and management, not trends in weather. To deal with those real problems, the analysis starts with 1997, since changes in definitions call for difficult adjustments to prior years. The data for 2002 were collected somewhat differently to that of the other years and so were dropped. That gives us 14 data years. There are gaps in the data for some zones, so those zones were dropped.

Thus the analysis is for zones with complete sets of data for the period 1996/7-201/12, excluding 2002. That set of zones encompasses about 87 percent of the cereals production of all the zones. The data were analyzed by standard linear regressions and also by the Sen Method which is better for taking out the impact of weather fluctuations. In fact the two approaches provide very similar results.[[2]](#footnote-2) The zonal level data and trends provide an enormous data set for future analysis. The ranges and the inter-quartile ranges among the zones are large, although not out of keeping with what is normally encountered in such analyses for other countries. Some of the variance among zones is due to natural conditions – weather and soil - but some define differences in human injections that will be valuable for diagnosing improvements. The zonal level date, with tests of significance are available at the source, footnote 2.

There is a concern that adjustments introduce an upward bias in the data. However using all the data, without the deletions stated above, provides a significantly higher growth rate of 7.38 percent for all cereals for the 16 years and 7.57 percent for the more recent 12 years – 9 and 17 percent higher than for the adjusted data. Thus the adjusted data provide a more conservative estimate – which we prefer as more accurate.

As will be noted in later sections of this paper there are numerous checks of consistency, further sustaining the reliability of the basic data from CSA. Most important, the data on decline in rural poverty are broadly consistent with the growth rate data and come from quite different data sets. This is a reliable data set for understanding how the growth was achieved, the unique features of the Ethiopian approach, its sustainability, and requirements for maintaining that growth rate in the future.

Growth Rates for Cereals

Table 1 summarizes the growth rate data . The growth rate accelerated in the most recent 12 years of the 16 year period. That is consistent with the increasing attention to investment and institutional development called for in the Policy and Investment Framework (PIF) (2010) for the current ten year plan.

Insert table 1

The growth rates calculated for the zones with consistent data for the full set of four cereals and the most recent 12 year period seem most representative for depicting the aggregate situation and for projections. That is a most impressive 7.0 percent growth rate. That is 17 percent higher than the CAADP target of 6.0 percent.[[3]](#footnote-3)

In both the recent 12 years and the longer 16 years area increase accounted for 40 percent of the growth and yield for 60 percent. Both show 11 percent faster growth rates in the more recent period. At forty percent it is surprising that yield increase held its percentage since one would assume, as the PIF suggested, that potential for area increase must be declining over time.[[4]](#footnote-4) However, as shown below there is strong positive correlation between yield increase and area increase. That is not surprising because higher yields infer greater profitability thereby increasing the incentive to bring previously marginal land into production. Since cereals comprise such a high proportion of total area the bulk of that area increase must have come from overall increase in area, not a substitution from other crops.

It is excessively conservative to discount the acceleration and take the 16 years figure of 6.3 percent. But even that is 5 percent higher than the CAADP target. No other country has maintained that high a cereals production growth rate for a 16 year period. Later sections of this paper examine in detail the sources of growth to reinforce the plausibility of these growth rates.

In summary, these growth rates are plausible given: (a.) the very low base of yields, (b) the large investments, especially in physical infrastructure[[5]](#footnote-5), (c) attention to rapid institution building and reform, and (d) the highly publicized centrality of agricultural growth to the government’s growth targets and national vision.

The government’s growth target for agriculture is 8.0 percent – one-third faster than the very high CAADP rate. If the average for cereals for all zones (not the subset chosen for comparability in this analysis) of 7.6 percent is taken for the most recent 12 years, then the achievement has been not much off the target. It drops to 7.4 percent for the full 16 years.

Growth Rate of Individual Cereals

There has been considerable difference in the growth rates among individual cereals. Those divergences provide a further test of internal consistency in the growth rate data. They also allow a more detailed analysis of sources of growth and hence recommendations for the future.

Teff

Teff is now the most important cereal by value. It is specific to Ethiopia with the consequence that it receives very little foreign aid. For example, the World Bank’s large regional agricultural research project does not include teff. It is considered difficult to breed and is particularly susceptible to lodging. It has traditionally had relatively low yields and high labor intensity with a consequent relatively high cost of production. Teff is the favored cereal for consumption by Ethiopians. As a result it has an income elasticity of demand of 1.13 (Kibron et. al 2010.) Because of its higher cost of production and strong demand it commands a substantial premium in price over the other cereals. As a result it is consumed largely in urban areas and by the higher income rural families. Low income families consume some teff, normally mixed with other cereals, but the bulk of consumption is in the upper half of the income distribution. Because of the elastic demand and growth in per capita income the price of teff has risen relative to other cereals. Thus teff has faced the most favorable price relatives among the cereals (Figure 1.) Of course Ethiopia does not differ from other counties in having an income elastic cereal –e.g. Basmati rice in South Asia, and premium rice variety’s in Southeast Asia.

Insert figure 1

Teff’s growth rate accelerated by over one-quarter between the two periods. That is more than any other cereal. Teff had the highest growth rate, except for the minor cereal, sorghum, in the more recent period of any of the four cereals. There is a logical explanation of the substantial acceleration. Six years ago a new variety, Kuncho, was released and spread rapidly with a major impact on fertilizer use (Minton et.al.2013.) Here we have an internal consistency check on the data. The difference in acceleration among crops is consistent with independent information on causes of that differential. See also the finding on wheat, below.

Relevant to the later exposition of sources of growth and to the internal consistency of the data, the rapid spread of Kuncho, an improved teff variety, – 30 percent area coverage after three years - shows that the seed multiplication system for open pollinated varieties now has capacity for rapid expansion.[[6]](#footnote-6) This effect of technology was reinforced by the more favorable price relationships for teff relative to other cereals.

For teff, area increase accounted for about one-quarter of the production increase for the full 16 years, but increased to nearly 40 percent for the most recent 12 years. That is presumably because of the impact on profitability of the combination of technology and price.

Wheat

Among the four cereals, wheat had the slowest growth rate for the 16 year period and is the only one decelerating in the more recent period. Again this is a test of internal consistency of the data. The area growth rate slowed by nearly one-third between the two periods while yield and total production growth rate declined by about 10 percent between the periods. Wheat rust has been a particularly serious problem in the recent years, explaining the deceleration. That problem plus the poorest price performance among the four cereals would explain both the lower growth rate and the deceleration.

The growth rate in production for the 16 years was 5.8 percent – a still impressive number. It slowed to 5.1 percent in the more recent period. Area increase was the slowest for the four cereals, at a 1.5 percent growth rate in the more recent period. This is a good case of improved technology over-balancing a moderately unfavorable trend in prices. That is of course very good for poor people as will be discussed later.

Maize

Maize, not surprisingly, has shown substantial acceleration in the growth rate for yield. That has driven acceleration in the rate of growth in area and in the overall rate of growth. This is also an internal consistency check on the data. The improvement in the hybrid seed multiplication system has been substantial in recent years, greatly accelerating the spread of hybrid varieties and the intensity of fertilizer use on maize.

The maize production growth rate, an impressive 7.2 percent in the more recent period, accelerated by 26 percent from the full period. The area growth rate accelerated by 29 percent and the yield growth rate by 23 percent - consistent with each other and with what we know about the improvement in seed production.

Sorghum

 The sorghum growth rate has accelerated from 7.8 percent to 8.0 percent with area increase accounting for nearly half of the production growth rate. Those were the highest growth rates of the set of four cereals with much faster area growth accounting for the higher rate of growth. The yield performance was slightly lower than that for maize. Sorghum is the least important of the four cereals.

Summary of Differences Among Cereals

The salient point about the differences among the cereals is that the differences are significant and are easily explained. That increases confidence in the underlying data and analytical methods. It is striking that teff had the highest growth rate after the minor crop, sorghum, and was faster than maize which had all the advantages of drawing on private sector international resources and large scale international support –all lacking for teff. This suggests that the Government made allocations according to its judgment of the importance of the commodity and compensated for the lack of foreign aid to teff. Perhaps the teff researchers were also lucky! The government of Ethiopia does seem to be guided by its own analyses of rates of return in achieving its explicit growth targets. That is undoubtedly an important explanation of its success.

Relative price behavior is associated with differences in performance. The worst performing crop is wheat which had the poorest relative price behavior and the best is teff with the best price behavior. Of course all the crops did well irrespective of price behavior and hence the technological factors are clearly more important than price.

Sources of Growth

Two features distinguish the sources of rapid growth in Ethiopian cereal production. First is a constant. The output growth comes largely from the small commercial farmers –holdings of say 0.75 to 5 hectares. Large scale commercial farms had a negligible impact on the growth rate, as did those with less than 0.75 hectares. Second is a variable, the sources of growth have changed over time with the government displaying a pragmatic approach.

Small Commercial Farmer:

The small commercial farmers are defined here as those with enough land to produce under traditional practices enough income to meet the poverty line level of basic staples consumption plus the minimum non- food items that complement that level of food consumption – the standard definition of the World Bank old $1.00 per day poverty line. Those would be the farmers with enough land to be fulltime farmers. That would be on average one hectare of land. If currently modern practices are introduced 0.75 hectares of land are required. The more expansionary definition is used in this paper. Because of past land reforms very little agricultural land is in holdings of greater than five hectares. There are large commercial farms that manage about ten percent of the cropland and less than five percent of cereals production. They tend in place of residence and culture not to be part of the rural community, and not to have significant effect in reducing rural poverty - points discussed below in the context of poverty reduction.

By this definition the small commercial farmer is not poor, is not a subsistence farmer, is commercial, buying and selling, and is sufficiently employed on the farm to see increasing farm income as the way to overall increase in income. Most of these farmers have sufficient income and capital to invest in what they see as profitable innovations and to take risks to innovate. On risk taking, it is important not to see unwillingness to make unprofitable innovations as risk aversion. They of course face a severe credit constraint in the face of large investment opportunities.

Table 2 shows the division of land and farms by size class. The definition used requires splitting the size class 0.50 to 1.0 hectare. The table follows the CSA definition of excluding large scale farms (over 20 hectares) in the upper part and adds them in the lower part.

Insert table 2

The table shows 84 percent of production is by small commercial farmers, or if the product of large commercial farmers is added, 86% of production is commercial. Fifty four percent of the households are small commercial farmers. A more restrictive definition of 1.0 to 5 hectares catches 77 and 72 percent respectively of production and 40 percent of the households are small commercial farmers. The bulk of those farmers are highly commercial. It is notable that the average size of holding of the multi-purpose cooperative members is just under two hectares. The members of cooperatives are small commercial farmers.

Focus groups carried out by the USAID AMDe project show small commercial farmers want credit in much larger amounts than micro credit provides, are interested in the cooperatives from a business point of view, desire extension services to improve their farming, and from surveys and focus groups think well of the extension agents. They use fertilizer at significantly lower than optimal levels because of the credit constraint. There are in Ethiopia, as throughout Sub-Saharan Africa, no finance institutions serving the small commercial farmer.

Thus, 54 percent of rural families are small commercial farmers and 46 percent are dependent substantially on off farm sources of income for survival. The latter 46 percent of families produce only 14 percent of agricultural output. They are less devoted to agriculture as compared to finding off farm employment, are poorer and with less capital and less risk bearing abilities than the small commercial farmers. It is convenient to define them as Rural Non-Farm (RNF) population even though 10 to 20 percent of them earn a significant share of their income from farming.

Farms above 20 hectares are taken by CSA as large scale farms. They produce at most 10 percent of output and only three percent of cereals production. Their growth rate has been comparable to that of the small commercial farmers, not faster, and therefore they account for only a small part of the 7.0 percent growth rate. Small Commercial farmers, far more than Large Commercial farmers require public sector services, institutions, and investment if they are to achieve high output growth rates. Thus, when Governments do not provide those services, the large commercial farms grow more rapidly.[[7]](#footnote-7)

Changing Sources of Growth

Dividing sources of growth into three distinct periods is a useful simplification. The first period would be from 1995 to roughly 2008 – intensification of traditional processes. The second would be from 2008 to the present – improved seed fertilizer intensification. The third is forward looking, from the present to another 10 or more years of seven percent growth, based on a few new priorities. As each period developed it was easy to see it as a system that was working well, giving the required growth and not needing change. In that context, without predicting the need for change it is unlikely to occur and the growth rate will slow, perhaps without understanding why. Two essential background elements are critical to understanding the evolving efforts over the 16 year period.

An Essential Background of Government Expenditure on Agriculture

CAADP (African Union 2010), after considerable analysis set a target, with a rough definition of components, of ten percent of government expenditure allocated to agriculture. Ethiopia has, from long before CAADP, exceeded that target. No other African country has done so, except briefly for Ghana and the very recent exception of Rwanda. It is important because Governments must build a wide variety of services to agriculture. They are often of a type that represent more detail than a growth strategy should have and yet are critically important. The targets for the priorities will not be met if the overall allocation to agriculture is grossly inadequate. With this target met attention can be directed to the optimal allocation of that money including full funding for a few priorities.

An Essential Background of Road Investment

We now have in the recent IFPRI study (Minton et.al. 2014) a definitive statement of the impact of a set of changes of which rural roads were central. Transport costs and marketing margins declined precipitously from 2000. That had a large impact on relative prices farmers face which increased incentives to invest and intensify. The focus is on declining costs (dropping in half) between major markets and central cities. That is where the initial investments have been. It is implicit that there is a long way to go in connecting farmers and villages with central markets. Further, much of the road system is still gravel roads while IFPRI data show that it is all weather roads that bring development (Ahmed 1975.)

The focus here is on the economic impact. In viewing infrastructure investment it is important to realize that with all of the economic transformation envisaged for Ethiopia the rapid growth rates in agriculture have built the market towns, much of which are defined in CSA data as rural. There has also been migration to the central city. Nevertheless the rural population will continue to grow for a considerable time into the future. Thus a concern for social welfare must give emphasis to rural education and rural health. Those require improved roads. Why would the educated health worker or teacher bring a family to a place without all- weather road access? That is why investment in rural roads must be massive and justified only in small part by the impact on agricultural growth even though that latter effect is very large. Just as the teacher and medical staff require a road, so do the trained supporters of growth by the small commercial farmer. Roads are more than just price relationships. Note that CAADP, in defining government agricultural investment, does not count rural road investment even though it says it is important to agricultural growth.

Phase I- Intensification of Traditional Practices

The growth rate in the first decade of the period analyzed must be seen first in terms of the remaining potential for recovery from the Dergue period disruptions and then in terms of potentials to increase intensification in a traditional context. Prior to the present government in 1992, Ethiopia went through a horrendous period of deeply misguided policies, decline of the agricultural sector in both cropped area and intensity, and disruptions from civil war. In the first few years after accession of the present government growth from recovery could be expected. It is likely that the recovery of area and quality of husbandry continued beyond 1995 helping explain the early high growth rate.

The Policy and Investment Framework (PIF) for the current plan analyzed the growth rate for several years from the early 1990’s,[[8]](#footnote-8) and concluded that the growth rate had been on the order of seven percent at that time. Further analysis made it clear that that growth could not be explained by modern technology. The base and the growth rates for improved seed and inorganic fertilizer were simply too small to explain even a small percentage of that growth rate. (Ethiopia, Government of 2010.)

The conclusion in the PIF was that the growth was from area expansion, some of which was recovery from the decline in the Dergue period, intensification of traditional labor intensive practices, and large increase in the road network as explained above. In the earlier part of the period the cultivated area expansion was rapid and then slowed somewhat. By that time the expansion of the road network was underway and would be expected to bring additional intensification with markedly improved price relationships (Minton et.al. 2012.) However another factor entered.

The extension service was expending at a phenomenal rate, on the way to the present 63,000 extension officers. Because these agents were based at the Kebela level they met the bulk of the farmers in their area. Farmers have a good impression of the extension agents.[[9]](#footnote-9) They are poorly trained, of course, but they are dealing with farmers at a very low level of productivity as well. And they worked in a context of national exhortation with respect to the Prime Ministers vision for the country and the strategy for implementing it. Agriculture was publicly very front and center in the strategy.

Thus, in that early period, the infrastructure investment, the national drive, and the extension agents made a difference, and the small impact of modern technology must have had an attitudinal impact as well. As a reference point, in India, in the early years after independence the agricultural growth rate accelerated sharply, the area expanded and yields increased (Mellor et. al 1968.) During that period the same conditions as in Ethiopia held about modern technology. It was being pushed and must have affected attitudes, but the base was too low to allow much impact. India expanded its extension service but it was far smaller than the huge effort in Ethiopia. The expansion of the road network was not nearly as massive. The Ethiopian commitment to an agricultural strategy and greater current knowledge of agricultural development (as later represented in CAADP) also favored more rapid growth for Ethiopia. Thus, it is logical that Ethiopia would have grown much faster than India at a similar stage of development even though the mechanism was similar.

Phase II – Seed/Fertilizer Based Growth

The PIF made a powerful argument that while the growth rate up to 2010 had been exemplary it was based on processes that would soon run out (Ethiopia 2010.) It was essential that the strategy change. The central element of that change would be very rapid (15 percent growth rate recommend) rate of increase in fertilizer us. It was clear that would also require major change in the seed supply system – with encouragement of private sector as well public sector hybrid seed production and growth of community based relatively small scale efforts for open pollinated seed. This growth must be seen in the context of exceeding the CAADP target of 10 percent of government expenditure on agriculture, and continued large scale expansion of the road network.

There was considerable controversy about this change in strategy. The past growth had been cheap in resources and successful. Why change? The many, locally and in the donor community, opposed to emphasis on agriculture found this low cost strategy acceptable as well. In the event the Government did swing towards the PIF recommended very high fertilizer target and radical change in the size and institutional structure of the seed industry. These changes were imperfect but worked.

Fertilizer use expanded from the modest base of 232,270 tons in 2002 to 729,245 tons by 2013 (Figure 2). The growth rate for the whole period was eleven percent. It accelerated from nine percent from, 2002-2009 to 14 percent from 2009 to 2013. The increment to use from2012 to2013 was 93,902 tons. That would be about 56,000 tons of nutrients. Assuming that increment was associated with improved seeds and a consequent 10 to 1 production rate would explain 75 percent of the yield increment. That is a high proportion. The remainder would be explained by the broader price effects from the massive road investment (see Minton et. al. 2014,) and spread of new varieties and other improved practices to the base use of fertilizer.

Insert figure 2

The Governments control of imports and its commitment to meet the fertilizer target resulted in a supply push (see Desai 1982 for its importance)-pushing fertilizer out to the primary cooperatives, pressuring them (under complaints!) to move fertilizer on to the farmers. That with the extensions system brought the rapid growth.[[10]](#footnote-10) The rapid spread of the new teff variety, stated above, showed that the system for improved open pollinated seed had greatly increased its capacty.

Phase III – Keys Priorities for the Next Phase

The seven percent growth rate is catch-up growth. In the long run, when Ethiopia has caught up to the more advanced countries, land as a source of growth will lose its position and yield growth will be similar to the rate generated in research stations of currently advanced countries, e.g. around two percent. The questions should be: 1.For how long can the current rate be maintained? 2. What are the requirements for doing so?

Simplistically, from FAO data for recent years, average cereal yields in France are over three times those of Ethiopia. Assuming France’s yields increase at two percent per year from continued research would allow the 7.0 percent rate to be maintained for another 20 years of catch-up growth.

A simple seed/fertilizer strategy, as at present, cannot maintain the seven percent growth rate. That becomes clear as the needs for the future are stated. One way to suggest those needs is to note conditions in which all high productivity agricultures have a large complex structure and in which Ethiopia is now markedly deficient. Six such areas stand out. Briefly stating these makes the point first that simple seed fertilizer without other institutional support is ready to run down; second that the requirements for continuing the seven percent growth rate are currently known; third that efforts are underway to meet them; and fourth that the requirements although feasible are not trivial.

1. Livestock Sector. Domestic demand for cereals for human consumption has largely kept up with the seven percent growth rate in cereals production. Real prices have trended neither up nor down. That has had a tremendous impact on food security. However, that large increase in human consumption of cereals is driven by relatively high income elasticities (0.72) of demand on the part of the poorer half of the rural income distribution. As poverty decreases those elasticities will become more inelastic and the population growth will also decline. As the demand for human consumption slows with decreasing poverty the scope for intensive livestock production built on high grain feeding rates will gradually increase. The present livestock growth rate is only about half the rate of demand growth. The PIF noted that this problem would arise and recommended creation of a new position of Minister of State for livestock - a recommendation that was implemented. The required changes are underway. Put simply the time is near when the size of the public support for the livestock sector will need to be as great for the crop sector.
2. Finance. Failure to understand the dominant role of the small commercial farmer and her financial needs has resulted in virtually complete lack of access of the small commercial farmer to credit to meet rapidly increasing investment requirements. Those requirements are already well beyond financing fertilizer and that dispersion will accelerate in the next round of growth. All countries with high productivity agriculture have a specialized agricultural finance system suitable to the bulk of their farmers (Desai and Mellor, 1998). It is only in Africa that the lack of such institutions is endemic. International experience is clear (Desai and Mellor 1998) that the two requirements of a finance system for the small commercial farmer are convenience of access, requiring thousands of branches, and a loan officer able to assist in making profitable loans for agricultural production and following up for on time repayment. In that context, the institutional structure depends very much on national culture and institutional history. There are currently discussions within the government on how best to meet this need.
3. Fertilizer. A huge advance is being made in tailoring plant nutrient provision to agro-ecological differences. That is essential and admirable. However, the lack of competition to the cooperatives is not only detrimental to cooperative development, as discussed below, but constrains the current level of fertilizer use and restricts growth to a much smaller base than is necessary. The private traders are now banned from fertilizer distribution, leaving a cooperative monopoly. The success on fertilizer was due to putting the more effective cooperatives in overall charge, pushing large inventories on the cooperatives with a consequent pressure to move fertilizer, and a massive extension effort. For the future, growth will have to move much closer to the optimal and hence lower margins. Maintaining the current rate of growth in fertilizer use will require greater efficiency as farmers move further out the response curve. There needs to be competition to ensure diagnosis of the cooperatives that are under performing and pressure to increase efficiency. Cooperatives define non overlapping geographic areas and hence do not compete with each other. In 1996 the government barred the private trade from fertilizer distribution, presumably to foster the cooperatives growth. The grain traders want to return to fertilizer distribution because it complements the grain trade – different season of use of warehouse space, working capital, and management. While IFPRI studies show the operating margins of the cooperatives to be too low, the private traders in focus group studies are happy with those margins – underlining the complementarity. Opening to the private trade will bring competition, clarity as to where the deficiencies of the cooperative lie, and service to now under serviced areas. It is now time for that to happen.
4. Primary Cooperatives. Ethiopia is committed to the multi-purpose cooperatives being the core of servicing the farmer. They occupy such a role in a large number of high and middle income countries. The advantage of cooperatives over private traders is a loyal membership. Farmers, in focus groups, are consistently clear that they prefer cooperatives to private traders. Unfortunately, the reality is that the primary cooperatives, to which farmers are members and see as the object of their loyalty, rarely have a paid manager and as a result offer poor services. The basic problem is that the primary cooperatives are, correctly from an ease of access point of view, targeted at the Kebela level. They are in fact not multi-purpose cooperatives but are solely distributors of fertilizer. The size of business is insufficient to cover a paid manager. The question then is how to increase the scale sufficiently. The principle argument against such expansion of scale is that the cooperatives cannot even manage what they have and should not be complicated by adding activities. The obvious solutions with the say ten percent of the cooperatives operating well (unpublished Agricultural Transformation Agency study) is to add some activities to get scale, hire a paid manager, build the loyal membership and then expand from there.
5. Irrigation. The PIF allocated over half of the investment in the Plan to irrigation. There is substantial rainfall that is seasonal, charging water tables and rivers. Irrigation ensures against poor rains and allows a second crop. But to be effective it requires a much larger irrigation institutional structure than now exists. The time is coming when the decline in area expansion of the past has to be compensated by increased irrigated area, with emphasis on a second crop. But the institutional structure in high productivity agriculture is far more complex and larger than now exists in Ethiopia. A major effort is required.
6. Coffee. Ethiopia stands out in lacking an institutional super structure to manage the coffee sector. Being in an international market requires that rapid advances be made in productivity including disproportionately large expenditure on a fully integrated research/extension system. A host of quality related measures need to be instituted from the farm through the export markets. A government committee looked at this without finding a solution. That effort is continuing. But there is urgency in reaching that decision.

Agricultural Growth and Poverty Reduction

The resources for agricultural growth are often justified by expected impact on poverty reduction. The international cross-section data are consistent with that. Where Agriculture grows rapidly poverty declines rapidly.[[11]](#footnote-11) Where it does not poverty declines little or not at all. Timmer (1997) shows that large scale, e.g. Latin American style, agriculture is not associated with such declines in poverty.

The CSA data show that the proportion of the rural population falling under the poverty line has from 1995 to the present dropped from somewhat above fifty percent to somewhat above 25 percent. A recent World Bank study, as yet unreleased, fully corroborates these numbers. They are consistent with the growth rate in cereals product shown in this paper.

However we make the point above that Ethiopia’s agricultural growth, as for most low income countries, is driven by the small commercial farmer who is not poor. How is that connection between incomes accruing to non-poor small commercial farmers getting into the hands of the poor? It is not for this paper to spell this out in detail. However a recent paper by Dorosh and Mellor (2012,) based on Ethiopian data does document that connection.

Briefly, small commercial farmers spend half of increments to their income on the employment intensive, non-tradable rural non-farm sector. Obvious examples are increased size of house and improvements in house quality, locally made furniture, at least for women some increase in local tailoring, and most important increased services ranging from retail clerks, to transport services (bus conductors, drivers, and repair facilities), and personal services at the farm level. The demand for such goods and services is elastic –that is the sector grows faster than farm incomes (Gavian et.al.2002, Meade and Liedholm 1998, Liedholm and Meade 1987.) Over time those activities move increasingly to the market towns creating vibrant towns many of which move to becoming small cities, providing a dispersed pattern of urbanization.

Thus as long as there is a large stock of underemployment rural labor, concentrated mostly in the rural non-farm population the growth in incomes of the small commercial farmer will have major impact on poverty reduction.

Agricultural Growth and Food Aid

Ethiopia has been one of the largest recipients of food aid. Although food aid fluctuates considerably from year to year, it has dropped by about 200,000 tons in the four years 2008 to 2012, but still is at about 800,000 tons per year. That level of food aid is consistent with the remaining level of rural poverty.

Despite dropping nearly in half in the past 22 years the proportion of the rural population below the World Bank poverty line is still a little above one quarter. That is 18 million people under the poverty line. The 800,000 tons of food aid would provide 44 Kgs of cereals per person under the poverty line. That in turn would be 29 percent of the average consumption per capita of the rural population according to IFPRI household data. Since it is reasonable to assume some leakage to somewhat higher income groups the increased consumption by the most deprived would still not lift them up to the average for the bottom half. Thus the only modest decline in food aid is a reflection of its gross inadequacy to initially fully meet the food security needs of the poor. It would seem however that from now it will be only a few years before food aid justified as lifting the rural poor up to the poverty line will be able to decline substantially. Given that food aid is equal to about 20 percent of domestic wheat supply significant adjustments in the composition of production and consumption will need to occur.

Conclusion

Ethiopia demonstrates that growth rate in cereals production faster than the Africa wide target in CAADP is feasible and for decades. That growth is based on the not poor small commercial farmer who requires a wide range of public goods and service if she is to increase production rapidly. Ethiopia has succeeded because it has a clearly stated vision and a strategy that explicitly places rapid agricultural growth at the forefront of the growth and economic transformation process. The high growth rate started with recovery after a long period of stagnation and retrogression, intensification of traditional process enhanced by a massive extension service and large scale investment in roads. Next a seed fertilizer strategy was followed with a major push to ensure a high growth rate in fertilizer use. Now that approach is also running out and the government is tooling up to advance six major institutional structures for the next round. The changes needed for that next round are feasible but difficult.

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TABLE 1. CEREALS GROWTH RATES, YIELD, AREA, PRODUCTION, 1996/7 – 2011/12

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cereal | Growth rate -16 years % | Growth rate –recent 12 years - %  | Difference 16 and 12 years - % points | Percent difference between two sets of years |
|  Teff- yield | 4.17 | 4.59 | 0.42 | 10 |
| Area | 1.57 | 2.99 | 1.42 | 94 |
| Production | 5.89 | 7.50 | 1.61 | 27 |
| Wheat – Yield | 4.03 | 3.63 | -0.40 | -10 |
| Area | 2.18 | 1.52 | - 0.66 | -30 |
| Production | 5.81 | 5.15 | -0.66 | -11 |
| Maize- yield | 3.44 | 4.22 | 0.78 | 23 |
| Area | 2.33 | 3.01 | 0.68 | 29 |
| Production | 5.73 | 7.23 | 1.50 | 26 |
| Sorghum – Yield | 4.46 | 4.77 | 0.31 | 7 |
| Area | 3.97 | 3.77 | -0.20 | -5 |
| Production | 7.80 | 7.97 | 0.17 | 2 |
| Sum W-M-S- Yield | 3.63 | 4.03 | 0.40 | 11 |
| Area | 2.64 | 2.71 | 0.07 | 3 |
| Production |  6.25 | 6.57 | 0.32 | 5 |
|  |  |  |  |  |
| Average – simple all four | 6.31 | 6.96 | 0.65 | 10 |
| National average All zones | 7.38 | 7.57 | 0.19 | 3 |

Source: Consultants paper to JMA by Richard Stuff, analyzing Central Statistics Organization (CSA) data Paper and data available from JMA, see footnote 2.

Table 2. Distribution of Households and Area, by Size of Holding, 2012/13

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Farm Size, hectares | Number of Households | Percent Households | Hectares crop area | Percent crop area | Percent crop area, including large scale |
| Less than 0.10 | 1,023,948 |  6.8 |  39,443 |  0.3 |  0.3 |
| 0.10-0.50 | 4,045,371 | 27.0 |  978,161 |  7.0 |  6.3 |
| 0.50-1.00 | 3,623,186 | 24.2 | 2,192,139 | 15.7 | 14.2 |
| 1.00-2.00 | 3,769,567 | 25.1 | 4,414,360 | 31.7 | 28.3 |
| 2.00-5.00 | 2,291,342 | 15.3 | 5,224,614 | 37.5 | 33.7 |
| 5.00-10.00 |  222,239 |  1.5 |  963,328 |  6.9 |  6.2 |
| Over 10 |  16,176 |  0.1 |  127,431 |  0.1 |  0.8 |
| Total | 14,991,829 | 100 | 13,939,459 | 99.2 | 89.8 |
| Large Scale |  7,496  | 0 |  1,548,828 | - | 10.0 |
| Total | 14,999,324 | 100 | 15,488,281 | - | 99.8 |

Source. Central Statistical Agency, sample survey 2012/13 . Some totals less than 100 due to rounding errors. Large scale farms only account for3.2 percent of cereals production.

Source: Price data obtained from Ethiopia Grain Trade Enterprise (EGTE) and Consumer Price Index (CPI) from Central Statistical Agency (CSA)

Note: Addis Ababa wholesale price considered as representative price and deflated by CPI (general consumer price index).

Source: Federal Democratic Republic of Ethiopia, Ministry of Agriculture (2013). Fertilizer Import, Consumption and Carryover Stock. Unpublished, from Department of Agricultural Input/output & Finance.

Note: Consumption of this year is total fertilizer available (import + left overstock) for this year minus leftover stock of the year.

1. Stuff, Richard, (2013) An Analysis of Ethiopian Crop Productivity Trends, available from John Mellor Associates, Inc. 801 Pennsylvania Ave NW, PH 18, Washington D.C. – and a yet to be determined website of CSA in Addis Ababa, Ethiopia. [↑](#footnote-ref-1)
2. The Sen Slope is a nonparametric method that calculates the change in the variable’s value vs. time (slope) for each succeeding point in the series and uses the median slope as the net magnitude of the trend. Following is the source for the Wikipedia text on the Sen method http://en.wikipedia.org/wiki/Theil%E2%80%93Sen\_estimator [↑](#footnote-ref-2)
3. CAADP is the Africa wide strategy developed through a highly professional effort sponsored by the African Union and signed off on unanimously by the heads of state of all African countries (African Union 2010.) The concept, followed by Ethiopia, was that each country would use the CAADP as basis for a refined application to its own specific conditions. [↑](#footnote-ref-3)
4. The Policy and Investment Framework (PIF) (2010) stated the policies and quantified the investments for the upcoming 10 year plan for agriculture. [↑](#footnote-ref-4)
5. See the extent of the initial infrastructure problems in rural Ethiopia in Minton et .al 2012b, an application to teff, Minton et.al. 2012a. and the large impact of the road investment in agricultural modernization in Minton et.al. 2012c.) See also Dercon et.al. 2008 [↑](#footnote-ref-5)
6. For a full analysis of the teff situation, see Minton et. al. 2012 [↑](#footnote-ref-6)
7. Most African countries do not provide those essential services for rapid agricultural growth, leading to the conclusion e.g. Collier and Dercon (2014) that high growth rates require large scale farms. As pointed out later that emphasis results in very little impact of agricultural growth on poverty reduction and of course in most African countries large scale farms hardly exist and it is not made clear where they will come from –imported from the US?. Of course, all Asian countries got their agricultural growth largely from the small commercial farmers. Africa is seen by some as different because of the widespread failure to provide the essential public services to the small commercial farmer. Ethiopia is a striking exception to that. [↑](#footnote-ref-7)
8. That analysis of trends was an unsophisticated inspection of graphs and drawing trend lines from visual judgments, not the sophisticated approach reported here. Nevertheless the result was similar. [↑](#footnote-ref-8)
9. Focus Group studies for the AMDe USAID project corroborate this as do as yet unpublished IFPRI studies [↑](#footnote-ref-9)
10. The extension system expanded to 63,000 extension agents. They were obviously poorly trained but IFPRI unpublished studies and the Focus Groups of the USAID/AMDe project consistently show that farmers had a good impression of the extension agents. Because the large number allowed them to be based at the Kebela level (the lowest administrative unit) they could in general walk to visit farms. [↑](#footnote-ref-10)
11. See for example Timmer (1997) , Ravallion (2002), Thirtle (2001) [↑](#footnote-ref-11)