

# **In Search of a Strategy: Rethinking Agriculture-led Growth in Ethiopia**

*Synthesis Paper prepared as part of a study on  
Agriculture and Growth in Ethiopia<sup>1</sup>*

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**May 2009**

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<sup>1</sup> This work has been funded by the Department for International Development (DFID), United Kingdom. The views expressed are not necessarily those of the DFID. Only the authors are responsible for any errors.  
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# In Search of a Strategy: Revisiting Agriculture-led Growth in Ethiopia

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University of Oxford, March 2009

## Summary and action points

The background to this study was a request to explore the scope and constraints on further growth and commercialization of Ethiopian agriculture, with an emphasis on the main food staples in the country, teff, wheat, maize, barley and sorghum. The context is unprecedented growth in agricultural GDP, large increases in reported areas cultivated and yields in recent times but also, most recently, rapid food price increases.

Agriculture is the key sector in the government's development strategy. Furthermore, cereals are the main food staple, crucial for real wages in the rest of the economy and, in a landlocked economy, they are best understood as a commodity that is not internationally tradable. The implication is that the study of production growth has to be understood within the context of the overall economy, leading us to consider also the underlying question of the role of agriculture in growth in general, and its implications for the process of fostering growth in agriculture.

The government strategy, as reflected in ADLI, and its recent articulation in PASDEP, conceptualizes the overall growth process to start essentially in agriculture and cereal production, with production growth leading to more marketed surplus, more demand for non-agricultural commodities and a release of labour for urban and non-agricultural development. In our work, we have questioned some of the premises of this strategy, both on conceptual/theoretical grounds as based on the recent experience from Ethiopia and elsewhere in the world. However, we found a key premise in ADLI, the need to boost cereal production, to be correct. We qualify this premise nevertheless that in order to feed into overall growth, it requires a commensurate effort focusing on the growth process outside agriculture. Furthermore, a narrow focus on production is counterproductive in the medium run, requiring more focus on the value of production and on returns to agriculture across the value chain.

Our work has led to the identification of a number of action points, which should assist in prioritizing further government effort in agriculture.

**Action point 1: We urgently need a process of validation of the data on cereal production, area cultivated and yields.**

The figures on recent agricultural performance are impressive: doubling of cereal output in the last ten years, 44% more land cultivated with cereals and 40% higher yield in the same period. In the last five years, 12% more cereal production *per year*, yield growth of 6 percent per year and area growth of 5% per year. The same data sources show no evidence of intensification of agriculture: no increase in fertilizer use per farmer or per hectare, no significantly more irrigation, and expanding but still relatively small areas under the extension programme. Ethiopian yields have grown faster than recorded elsewhere, even compared to the green revolution in India, China or Vietnam. If the data are correct, this is the fastest green revolution in history, and its mechanisms should be analyzed. If any of the data, such as the area expansion data, are not correct, then this has huge implications for policy, as it would suggest that food production is considerably lower than reported. If the yield growth is due to the extension efforts, then careful evaluations could pin down lessons learned, as they would be immensely important for other parts of the country and beyond.

**Action point 2: The science to promote productivity growth via improved seeds requires more support.**

It has commonly been assumed that there are huge gains in yields to be obtained using existing packages of inputs such fertilizer and seeds. For example, it has been commonplace to quote evidence from the Sasakawa Global 2000 work suggesting that yields could increase threefold from using packages of improved seed, fertilizer and extension. The PASDEP projected a 120% gain in average cereal yields in Ethiopia in five years. It is well known that only for wheat and maize can significant gains be obtained via improved or hybrid seeds; the improvements available for other crops, not least teff, remain limited. Focusing on the most promising crop, maize, the systematic review by Anchala et al. (2001) showed that on farmer demonstration plots, the yield gains from improved or hybrid seeds under traditional practices were about 20% compared to traditional seeds; under improved practices (such as in terms of fertilizer use and cultivation practices) the gains from improved seeds were 50% compared to traditional seeds. These percentage gains on offer are substantially lower than what was on offer during the Green Revolution in South or East Asia.

Progress on seeds is not only hindered by science; the agro-ecological diversity of Ethiopia makes development of suitably adapted varieties costly and difficult for the small but competent crop science community in Ethiopia. But in terms of international scientific attention, Ethiopia is seriously marginalised. It would be timely to encourage high-profile international investments in relevant crop research, including in the field of biotechnology. Partnerships with international private sector partners should not be ignored, and taking a lead from recent progress in vaccine development and other medical research, it is possible

to design research arrangements that create incentives for research and development, without any subsequent dependence on multinational firms.

**Action point 3: The input packages available need to be rebalanced away from too much attention to fertilizer.**

Using properly combined input packages (including improved seeds, improved practices and fertilizer), substantial yield gains are available for Ethiopia, provided they can be made suitable for particular localities. For example, near crop research stations, a doubling of maize yields on farmer demonstration plots has been proven feasible from using such packages relative to traditional seed and practices. In practice, fertilizer has been strongly promoted without sufficient available improved seeds. For example, fertilizer use has moved near 40% of land area cultivated with cereals, but improved seeds only cover less than 5%. Further fertilizer expansion is bound to be constrained: while yield gains are relatively substantial especially for wheat and maize (typically at best about 50%), for other crops such as teff they are far more limited. Furthermore, these gains only materialize when combined with the adoption of optimal farm management practices in weeding, timing of planting and seed rates; otherwise, gains are typically far less. Most importantly, as fertilizer is expensive, economic returns are very low and likely to be negative for a large share of farmers not using it at present. Fertilizer expansion should not be expected or promoted unless as part of a complete package with seeds and general improved practices.

**Action point 4: The seed multiplication system is failing Ethiopian farmers and urgently needs to be reformed and expanded.**

Even if seeds alone do not offer the massive scope for yield gains, they are central to the input packages currently promoted. The inability to scale up the multiplication system is striking. Given the difficulties for quality control, on-farm multiplication systems are unlikely to substitute for the larger scale systems required. Incentives for commercial farms to expand seed production are essential.

**Action point 5: The extension system needs a systematic evaluation of its contribution to increased yields.**

In recent year, the extension system has been developed into a large-scale demand-driven system of advice to farmers. It may well have contributed to the recent increased yields. However, it has not been subject of systematic data collection for evaluation, compared to other key elements of policy making in Ethiopia, such as the PSNP. A careful quantitative evaluation focusing on yield effects may provide essential evidence on how yields can be improved further.

**Action point 6: Policies related to food markets should focus on reducing transactions costs between urban and rural areas to reduce the gap between urban cereal prices and farmgate prices.**

While cereal markets are reasonably well integrated, transactions costs remain high, contributing to farmers receiving a relatively low share of cereal prices (often estimated between 30 and 60%). Sufficiently high farmgate prices remain essential to offer the economic returns necessary for farmers to adopt new technologies and improved varieties, but as growth would be affected by high consumer prices, reducing transactions costs is key to retain these incentives. As road infrastructure has improved considerably, key areas of attention include transport and the (vertical) integration of the marketing chain.

**Action point 7: Urban income growth is important to sustain a process of commercialization of cereal production and the overall transformation of agriculture.**

World cereal prices are only important for cereal production at the margin, as transactions costs to the border result in a huge gap between import and export parity prices, i.e. the gap between the wholesale price above which imports would be profitable and the wholesale price below which exports would be profitable. As export parity prices are very low, a sufficient growth in urban demand for food remains essential to avoid that any further yield expansion results in low output prices that would in turn make innovation and investment in agriculture unprofitable. The experience of the effects of the bumper maize harvest in 2001/02 when prices collapsed to very low, (and for farmers) unprofitable levels, remains a relevant warning for the future development of cereal production. The key lesson is that without expansion of agricultural demand, progress in the transformation of agriculture is bound to be constrained. At the same time, reducing transactions costs for importing and exporting cereals, via improvements in transport and marketing would improve export parity prices and reduce import parity prices, therefore improving farmers' incentives while reducing urban food price pressure.

**Action point 8: As part of a roadmap to better functioning private sector market institutions, the contestability of fertilizer markets, seed markets and transport markets needs to be mapped and improved.**

During our review of the state of different factor markets, we noted that all key markets in principle allowed entry by private sector firms. The presence of several agents owned or linked to the state should then not necessarily be a problem. Overall, only few firms were found to be active in the fertilizer and seed markets, and in markets such as long haul transport. Again, none of this ought to be a problem as long as these markets are contestable: i.e. where a private entrepreneur could enter these markets to capture any excess profits or efficiency gains if they were present. In practice, many of the incumbent firms, either from the public or private sector, are offered substantial benefits that would not be on offer to any new entrants to these markets. Also, specific rules offer further

advantages to assist these incumbent firms. Examples are credit arrangements for fertilizer imports, the organisation of fertilizer supply or the conditions for entry into the seed market. These rules and benefits are often reasonable solutions to specific current problems in the provision of these inputs, but may well undermine the medium term development of private market institutions, as they leave these markets non-contestable. In the short run, it would be essential to map the various regulations and benefits existing in these and other markets to understand the incentives they give for the development of mature, contestable markets.

**Action point 9: Land certification is likely to offer considerable improvements in terms of tenure security, but it now requires steps to ensure the consolidation of the system.**

Emerging evidence suggest that land certification has positive impacts. For cereal and other annual crop areas it is likely to offer a considerable improvement over earlier arrangements. However, to ensure that the system offers longer term security, measures need to be taken to ensure the consolidation of the system everywhere and the development of land registry systems.

**Action point 10: With the demise of the previous input credit system, innovative initiatives are required to ensure the development of functioning rural credit markets, focusing on the reinsurance of the exposure of MFIs or other plausible entrants.**

The input credit in operation previously, in which the regional state budget provided collateral for input loans, has proved to be untenable and is being dismantled. However, a new system still has to emerge. For farmers, input credit is crucial as their working capital is typically limited. There are, however, good reasons why private rural credit markets do not easily develop, not least in areas dependent on high risk, rainfed agriculture. The key reason is that as poor weather events tend to affect a large number of policy holders, banking in such conditions is highly risky as default rates are highly covariate. As input credit is crucial, pilot programmes on different options for insurance of farmers' credit and reinsurance of loan portfolios in rural settings are then urgently required.

## Introduction

**The questions.** This paper revisits two key questions for Ethiopian economic development: what should be the role of agriculture in the overall growth strategy in Ethiopia, and how can we achieve faster growth in agriculture? It is the outcome of a systematic review of the existing evidence from Ethiopia, put in the context of theories of economic transformation in initially rural economies as well as the experience across a range of settings. This summary paper builds essentially on two papers by the same team. In Dercon and Zeitlin (2009), variations of the standard workhorse for thinking through growth and transformation in agricultural economies, the dual economy model, was critically discussed and applied to the evidence from Ethiopia and other contexts. In Dercon and Hill (2009), the focus shifted more specifically to agriculture in Ethiopia, and the key constraints on growth and transformation.<sup>2</sup>

**The policy framework.** Why is it relevant to ask these large and seemingly abstract questions in this context? More than any other African country in recent history, Ethiopia has a well-articulated policy framework, the “Agricultural Development led-Industrialization”, nested in theory and evidence, and that has guided policy-making since the current government came to power (MOPED, 1993). Even if it has evolved over the years, it remains a strategy true to some basic principles: (i) development will have to start with the agricultural sector, and (ii) growth in agriculture will allow an increased demand for non-agricultural products, release of labour and a surplus for investment in other sectors. More than 15 years later, with better evidence, it is relevant to assess its intellectual and empirical foundations.

**Evolving policy thinking.** It would be wrong to suggest that ADLI has been static. Over the years, it has been added to, and it has developed in a more nuanced set of policy views, for example, as reflected in the Plan for Accelerated and Sustained Development to End Poverty (PASDEP), Ethiopia’s strategic framework for the five-year period 2005/06-2009/10. Containing a long list of sensible policies across a wide range of sectors and issues, most of what is discussed in this paper somehow is touched upon one way or another. Our focus is on some of the underlying fundamental constraints on growth and transformation, and what this implies for the strategy towards agriculture.

**The policy context.** Contrary to many other countries, the Ethiopian government has shown a strong commitment to agricultural development. In its policy actions, the Ethiopian government has consistently and increasingly looked for ways in which this strategy can be made to work, such as a large expansion of extension services and farmers’ training, and

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<sup>2</sup> Both papers as well as this synthesis paper, build on a review of recent performance of the Ethiopian agriculture by Adenaw (2009), as well as 11 specifically commissioned papers on the historical experience, including in Europe and more recently in Asia, as well as specific issues related to the Ethiopian economy. The commissioned authors are not responsible for any errors in interpretation in the synthesis paper.

other initiatives to boost land productivity, and large scale road infrastructure projects to improve linkages between different areas and towns. In parallel, for marginal areas in terms of agricultural output, a large scale productive safety net has been developed, inter alia to allow farmers to strengthen their asset base to allow them to graduate into more profitable agricultural activities. The scale of these actions, the commitment by policy makers to these objectives and the extent of government initiative to achieve these objectives is more reminiscent of the commitment of East-Asian policy makers to policy initiatives than other African examples.

**Our approach.** In this paper, we will offer a balanced critique of ADLI, focusing on its conceptual and practical strengths and failings, specifically referencing the experiences in those countries that successfully achieved the agricultural transformation characteristic of economic development. We will argue for offering a more balanced place of agricultural development in the overall growth process. Agricultural transformation is possible, but will require concerted and much broader action via private and public investment to achieve its growth potential than the relatively narrow current focus and actions focusing on boosting cereal production from smallholders.

**Overview.** In the next section, we first briefly review the evidence on the recent experience of the agricultural sector. In section 2, we offer a summary of our conceptual theoretical framework, and discuss what it means for the strengths and weaknesses of ADLI as a growth strategy led by agriculture. In section 3, we give key lessons from history in relevant examples for Ethiopia. In section 4, we offer a discussion of some of the key constraints for growth in Ethiopian agriculture. In section 5, some concluding comments are offered in the form of a number of cross-cutting issues.

## 1. Agriculture in Ethiopia: recent experience and lessons<sup>3</sup>

**The data look impressive.** The overall economic context is one of growth in real GDP hitting double digits in recent years (about 11.5% per year on average between 2005/6 and 2007/8), with agricultural GDP growing on average at about 9.2% per year in the same period). Based on the data from the Central Statistical Authority, cereal production in the period 2004/05 to 2007/08 increased by more than 12 percent *per year*, with a close to 5 percent growth rate per year in area cultivated and more than 6 percent growth in yields. Since 1996/97, roughly the start of the current drive to increase output and productivity, cereal yields have grown by 40%, and land area cultivated with cereals by 44%.

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<sup>3</sup> This section draws on Dercon and Hill (2009), Adenaw (2009) and Taffesse Seyoum (2009).



***Large cereal output growth has taken places in the last decade, but its sources remain unproven.*** A large part of output growth has been via area expansion, but the figures suggest unprecedented yield growth, not driven by weather alone, in recent years. Rapid growth in cereal output appears not to have been achieved by rapid growth in modern input use, such as improved seeds, or increased fertilizer use. Extension services have increased delivery but it is not clear whether this can be squared with scale of yield increases. Water access via irrigation has not increased substantially either.

***The data suggest either one of the fastest green revolutions in history preceded by vast expansion of areas cultivated with cereals, or questionable evidence.*** FAO data suggest that cereal yields in Ethiopia were below most countries in the region, such as Uganda, Malawi and Kenya in 1993-2003, but in the last four years it has opened a considerable gap in its favour. Even more striking is the growth in wheat yield relative to Asian green revolution countries: it narrowed the yield gaps with India in four years to about 20%, while in 1993-2003, yields were on average only about half the Indian yields. The increase in yield levels between 2003 and 2007 took India 15 years to achieve from 1975, it took China a decade. China, India and Vietnam have never seen the growth rates in overall cereal yields shown in the data in Ethiopia in any four year period.

***Getting the data checked is a priority.*** It is crucial to conduct extensive survey work to pin down the sources of the growth in land areas cultivated and the sources of the reported yield increases. It is clear that further exploitation of the current primary and secondary data sources is not going to offer much more insight, as there is no means of cross-checking or linking data. The data will need to be supplemented with in-depth but targeted new data collection. The starting point should be carefully sampled sites, possibly included in the samples for the compilation of the official CSA data, that should be revisited by independent teams of enumerators to cross-validate the evidence generated. Both the issue of the sources of area expansion in the last 15 years as well as the recent yield growth require attention. Furthermore, the aggregation procedures to yield national figures require also attention, as they suggest that farm size has been able to keep up with rural population growth since 1980, as if land pressure has not increased at all.

***Confidence in data needs to be restored, by introducing auditing procedures.*** In general, it would appear to be time to consider the establishment of a data auditing unit within the structures of CSA/MOFED, but with considerable independence, whose aim should be to monitor and audit the quality of data generated on key issues of economic policy making in Ethiopia by the CSA and by other institutions. They should both offer advice and scrutiny to ensure that circumstances, such as the recent vast divergence in evidence on output between CSA and MOARD can be settled by a standard procedure, and not by discretionary action. The current initiatives on deriving consensus figures and strengthening procedures in data collection are positive steps but this is unlikely to remove the need for auditing procedures.

## 2. Agriculture and Growth in Ethiopia: The Framework<sup>4</sup>

***An agricultural, landlocked and poor economy.*** The Ethiopian economy is still predominantly agricultural, in terms of share of GDP, exports and employment. Crucially for our analysis, it covers a vast territory but is landlocked, and it is mainly dependent on its links with Djibouti for its imports and exports, putting a limit on the extent it can engage with the international economy as freight costs are substantial. It is also still one of the poorer countries in the world, affecting the economic size of its domestic market in value terms. More than 80% of the population is dependent on agricultural activities with low land and labour productivity. The basic staples are cereals.

***A delicate balance has to be found for sufficiently high food prices for farmers, but not too high to stifle growth and transformation.*** Food prices need to be high enough to ensure incentives for transformation of agriculture via input adoption, but not so high that they limit long-run growth. More specifically, the transformation of agriculture via input adoption will only come about if the *economic* incentives for this transformation are high for farmers. These incentives are strongly affected by prices, suggesting there is an important role to be played by policies that grow urban incomes, which will play an increasingly important role as a source of demand for agricultural goods. At the same time, sustained growth will require that economic transformation begins to take place, with more of the labour force gainfully involved in the non-agricultural sector. To ensure this does not occur at the cost of declining food production, and urban food prices that rise too high—such that any growth induced from increased incentives to input adoption is ultimately retarded by subsequent pressure on urban wages—a continued focus on increasing cereal output is required.

***Being landlocked, the international economy cannot overcome this requirement, offering some opportunities but mainly constraints on growth and agriculture.*** Exports and imports are possible but high freight and other transactions costs mean, for bulky cereals, high import parity prices (international prices plus costs of moving grain onto domestic markets, so the domestic prices at which imports can be profitably imported) and low export parity prices, especially as expressed at the farmgate. Export parity prices offer a floor to prices, and import parity prices limit the price consumers will have to pay. The result is that for a wide range of prices, the economy is closed with cereals behaving as a non-tradable good. Even if imports and exports are possible, domestic food production will be an essential

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<sup>4</sup> This section draws most heavily on Dercon and Zeitlin (2009).

determinant of food prices and wages, and therefore a central constraint on economic transformation and growth.

***Growth in urban demand is required for agricultural growth.*** To keep food prices below the high import parity prices, land productivity growth is crucial. But with low export parity prices, stimulating land productivity growth without growth in urban demand risks depressed food prices when harvests are successful, undermining rural earnings and agricultural transformation. A focus on agricultural output growth without growth in urban demand for agricultural produce would be self-defeating. Stimulating urban growth is likely to have to come from other sources than growth in agricultural incomes: currently, the evidence suggests that additional earnings in rural areas are still barely spent on non-agricultural commodities.

***Land productivity growth via adoption of new technologies and practices requires strong economic incentives.*** Both in the green revolution in Asia and in the historical examples from Europe, adoption of new technologies and practices only took off strongly when it substantially paid farmers to do so. Any adoption involves uncertainty and learning costs for farmers, and it tends to be worthwhile for individual farmers to wait for adoption until success has been shown by others. New technologies and innovative practices require substantially higher mean yields and/or high prices for adoption to take off.

***To ensure sufficient incentives for agricultural growth, transactions costs reductions are essential to raise export parity prices.*** Low export parity prices imply that international market prices cannot offer the price incentives necessary for adoption of new technologies, modern practices or higher value crops. For many crops, bumper harvests in the short run would not need to depress prices substantially, as there would be scope for replacing imports, including for food aid from domestic production. Nevertheless, observed demand patterns in Ethiopia would also suggest that output gains may depress prices rapidly, as the collapse in grain and especially maize prices in 2001-02 showed. At the same time, sustained high domestic food prices would hinder overall economic transformation, limiting this route to stimulating adoption and innovation. One route to agricultural transformation would require considerable potential yield gains, but such strategy risks depressing prices quickly. To lift export parity prices, productivity gains leading to lower marketing, freight and other trading and transactions costs are essential to offer sustained incentives to agricultural growth by boosting farmgate prices.

***Rural-urban migration is constrained by the pressure it appears to put on food prices.*** Rural-urban migration is an essential ingredient of overall growth and transformation; its sustained acceleration within a context of stable food prices would be sign of a successful growth and poverty reduction strategy. Despite evidence of low labour productivity, the evidence suggests that recent rapid rural-urban migration has put pressure on food prices.

This reflects a further constraint on agricultural and overall growth, as any shift out of staple production without increased labour productivity, for example into other high-value crops or out of agriculture, may put further pressure on food prices.

***Lower trading and transactions costs would also allow agriculture to start shifting away from traditional staples to higher value crop, as well as allowing migration.*** As downward pressure on transactions costs could bring down import parity prices, it would open the possibility of an agricultural transformation into more high-value non-cereal crops. The reason is that lower transactions costs would reduce the upward pressures on urban prices that would follow if cereal production were to go down and imports were to be required to satisfy domestic demand for cereals. Limiting this constraint on moving out of cereals would allow farmers higher benefits from alternative crops for domestic and export markets, and indeed allow more migration as well without pressures on overall living standards via real wages.

***Agricultural-led Industrialization (ADLI) had important strengths but also weaknesses.***

Even if not exactly motivated as in the discussion above, ADLI's key strength was the recognition that agricultural output growth in the main cereals was crucial for growth. In its original form, ADLI implied a phased development, first focusing on output growth in agriculture, through technologies such as fertilizer, seeds and infrastructure, leading to industrialization as agricultural growth will then offer labour, inputs and demand for non-agricultural products. Even if the ideas surrounding phased development are played out less in its more nuanced current incarnation in PASDEP, in practice there is still much focus on increasing land productivity in cereal production via modern inputs (mainly seeds and fertiliser) and extension. The continuing relative focus on fostering output growth in cereals is not necessarily wrong, but it implies a relative neglect of other necessary conditions to allow this to start a transformation of the economy. One way of looking at it is to suggest that the implementation of ADLI may have focused too much on output rather than value, and looked at agriculture in isolation of the rest of the economy.

***PASDEP is not inconsistent with this analysis, but our framework suggests a number of priorities among all the different PASDEP focal areas.*** Agricultural growth and transformation are fundamentally constrained by the economic returns offered to farmers for productivity increases. High return technologies or crops, but also high prices, are essential to offer high overall returns to farmers. A floor to these prices is offered by export parity prices. Overall growth is nevertheless constrained by cereal output growth, as output growth is required to keep urban food prices sufficiently low. Sufficiently low import parity prices can limit the upward pressure on food prices during growth via imports. Urban income growth and the international dimension, in the form of the levels import and export parity prices, are then relevant for overall growth, not least *via* their impact on the scope for agricultural growth. PASDEP offered many ideas for priority policy areas. For agricultural

transformation and overall growth, those measures that encourage technology adoption, urban income growth and reduced transaction costs in agricultural markets stand out as most crucial. The evidence on progress on these, as well as further measures that could be taken, are discussed in section 4. In the next section, we briefly discuss some relevant international and historical experience on these processes.

### 3. Agriculture and Growth: Some Comparative Evidence<sup>5</sup>

***The ambition for productivity growth entailed in PASDEP was probably unprecedented in history.*** This ambition is well summarized by focusing on wheat, a crop widely spread in areas with historical and recent agricultural transformation. In the period 1993/2003, yield was approximately 1350 kg per hectare, in fact similar to some of the more fertile areas of England or the Low Countries in Europe around the 14<sup>th</sup> century, and a yield by the 18<sup>th</sup> century found across several Western European countries. A yield of 1350 kg/ha is about half the yield reached in India in the 1990s, and a third of yields in China. The current yield data suggest growth by more than 50% in 5 years, faster than ever recorded in a 5 year period in for example India or China. But this is still less than half the yield growth ‘planned for’ in the PASDEP, which projected (for all cereals) a 120% yield growth in this period (and only a 1% growth in area cultivated).

***The perceived wisdom is that growth in a predominantly agricultural economy has to start first in agriculture.*** With the larger share of GDP from agriculture, and the vast majority employed in agriculture, it is tempting to argue that such an agricultural economy is bound to have to start any successful development via growth in agriculture, before other sectors and activities are developed, not least industry. It has dominated thinking on how growth comes about. For example, it can be found in the textbook interpretation on the experience in England in the 18<sup>th</sup> and 19<sup>th</sup> century, with first an agricultural revolution to be followed by an industrial revolution. It can be found in the interpretation of the East-Asian miracle, when high growth in the economy is often suggested to have started with agricultural growth, started by a green revolution and institutional factors. It is reflected in the 2007 World Development Report on agriculture, where agriculturally dominated economies are said to have to start from agriculture.

***The evidence suggests a far more nuanced picture, with an important role for high urban demand, or other ways of ensuring high returns to farmers to encourage land productivity growth.*** Historically, agricultural transformations did not occur in isolation. Agricultural productivity increases only took place when there were clear economic incentives to do so.

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<sup>5</sup> This section draws most heavily on Dercon and Zeitlin (2009), as well as background notes by Allen (2008), Park (2008) and Otsuka (2008).

Not only should there be worthwhile technological advances, crops or new techniques to adopt, it should pay the farmers to do so. The role of urban demand was central to stimulating fast growth in England in the 18<sup>th</sup> and 19<sup>th</sup> century, where the growth in incomes in London (linked to income from international commerce) made agricultural productivity increasing investments, such as enclosures and conversion from pastures to crop land profitable, stimulating agricultural growth. Upward pressure on food prices and increasing demand for high-value crops also drove agricultural transformation in France in the 19<sup>th</sup> century: the growth of Paris as a dynamic urban centre has been shown to have been key for the agricultural transformation in its surrounding areas. Turning to modern cases, China's agricultural growth since 1985 was precipitated by measures that offered a strong increase in returns on offer to farmers via the liberalization of agricultural prices, resulting in a significant increase at the outset of the economic reform process, and the freeing of households to specialize in crops with high returns. In Vietnam, the highly fertile and widely irrigated land created *agronomic* conditions conducive to large returns at the outset of that country's green revolution, offering quick gains in output and yields when price incentives were put in place. In the Philippines, the green revolution from the 1960s, linked to the high yield rice varieties, gradually resulted in rice price declines, slowing the agricultural growth and economic transformation as it resulted in only slow agricultural income increases, even if it started at a relatively high level of prices.

***The availability of agricultural innovations offering very high productivity increases also plays an important role.*** Economic incentives have to be high for adoption, but as adoption tends to be costly and prices tend to face downward pressure when yields increase, the size of yield gains matter considerably. The Green Revolution in India and Southeast Asia appears to deserve its name not least because of the massive yield gains that were on offer by using new varieties. Wheat technologies developed at CIMMYT, with suitable complementary inputs, offered a more than fivefold increase in yields on small farmer demonstration plots in India. Rice yields on offer via IR8 rice were early on estimated to be 5 times the traditional variety using traditional methods and 10 times using optimal input packages. These yield gains on offer are well above those currently on offer from modern varieties and input packages in Africa.

***Three key lessons emerge from contrasting evidence from elsewhere with theory.*** First, fast agricultural transformation requires the availability of high return technologies. Secondly, farmers will tend to adapt when economic incentives to do so are high, so that while the availability of appropriate technology, input and extension packages may matter, these are not sufficient if economic returns cannot be sustained. With input prices given by world markets, this requires sufficiently high food prices. Thirdly, in a landlocked economy, this will require sufficiently high urban demand and therefore growth from other sources. Except when some substantial technological innovations are available, agricultural growth cannot start and will not be sustained in isolation from growth in the rest of the economy.

## 4. Constraints on Agricultural Transformation<sup>6</sup>

**Three key issues are fundamental to understand the role and scope of growth of agriculture in overall economic transformation.** These are: the opportunities for boosting land productivity, the constraining role of food prices and the limits and opportunities offered by the functioning and performance of product and factor markets. On each of these issues, although there are limits to the data available, the available data can offer substantial insights, if they are carefully collated and interpreted.

### 4.1 The scope for boosting productivity

**It is hard to understand the sources of recent reported yield growth.** The current evidence of rapid land productivity growth is not easily explained. There is no evidence on rapid increases in the combined use of improved seeds, fertilizer and extension that could account for the reported changes in output. Satellite data suggest that the most recent (2008/09) Meher harvest was not experiencing better climatic conditions than the average of the preceding four years. If the effort on farmer training and extension are behind the increases in yields, then this needs to be documented much better: the *evidence* base to assess this is not there.

**There is currently not as much scope for land productivity gains as suggested.** The evidence on the scope for rapid yield growth is not as encouraging as it tends to be reported. The combination of improved seeds, fertilizer and improved practices could offer considerable yield increases in some crops, but what is on offer is not comparable in terms of trial field gains to what was available during the green revolution in other parts of the world. Some of the widely reported evidence, such as the SG2000 trials, is, on closer inspection, not as compelling as it may seem. The Ethiopian agricultural research system has produced and documented solid research using proper controlled trials, offering encouraging but not dramatic yield gains from combining seed, fertilizer and extension. It is well known that only for wheat and maize one can obtain significant gains via improved or hybrid seeds; the improvements available for other crops, not least teff, remain limited. Focusing on the most promising crop, maize, the systematic review by Anchala et al. (2001) showed that on farmer demonstration plots, the yield gains from improved or hybrid seeds *under traditional practices* were about 20% compared to traditional seeds; *under improved practices* (such as in terms of fertilizer use and cultivation practices) the gains from improved seeds were 56% compared to traditional seeds. For the most optimistic scenario,

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<sup>6</sup> This section draws mainly on Dercon and Hill (2009).

in which one compares improved or hybrid seeds with a full package of improved practices, including fertilizer, compared to using traditional seeds and traditional practices, a doubling of yields could be obtained in farm demonstration plots near the agricultural research centres. These percentage gains on offer are substantially lower than what was on offer during the Green Revolution in South or East Asia.

***Greater investment in new technologies is needed as current technologies will not bring about rapid yield growth.*** Yield gains on trial plots for rice or wheat on the eve of the green revolution offered yields five times or more of the yields for traditional plots, using comparable production practices but the newly available seeds. Even then it took India and China at least a decade to double yields, as yield gains from trial or demonstration plots are rarely fully achieved when the technology is transferred to farmers' plots. If what is on offer in terms of improved maize seeds were adopted by all Ethiopian maize farmers, using current technologies, the gains in overall cereal output would only be 3%, which will be spread over many years. Larger yield gains are only possible by combining improved production practices with fertilizer and improved seeds. Still, the gains in cereal output would only be 20%. A key weakness is that the science is missing: there are no 'golden eggs' for an Ethiopian green revolution. The evidence suggests that there are not enough high yielding seed varieties available, adapted to local circumstances. A concerted effort to achieve technological advances is needed. To achieve this, the current research structure needs a determined overhaul and expansion, with stronger interactions of the international science world, and stronger links with the private sector, both domestically and internationally.

***To ensure maximum productivity growth from existing technologies it is essential that a combined package of seed, fertilizer and extension is delivered to farmers. For this fast progress on seed multiplication is needed.*** Evidence points to reasonably high returns of a combined package of seed, fertilizer and extension, at least in key crops such as maize and wheat. Much effort has been made on extension, and fertilizer is typically in ample supply and relatively widely adopted. However, improved seeds are only covering less than 5% of land area under cereals cultivation. While some efforts have been made to increase seed supply, without a massive effort to expand seed multiplication, including via stronger private sector involvement, and to reform the entire regulatory and support system surrounding it, this will remain a remarkable missed opportunity.

***A narrow focus on fertilizer is definitely misplaced.*** Fertilizer alone is unlikely going to offer much scope for expansion of yields. In practice, fertilizer has been strongly promoted without sufficient available improved seeds. For example, fertilizer use has moved near 40% of land area cultivated with cereals, compared to the 5% covered by improved or hybrid seeds. Further fertilizer expansion is bound to be constrained: while yield gains are relatively substantial (when combined with the adoption of optimal farm management practices in weeding, timing of planting and seed rates) especially for wheat and maize (typically at best



about 50%), for other crops such as teff they are far more limited. Furthermore, these gains only materialize when combined with the adoption of optimal farm management practices in weeding, timing of planting and seed rates; otherwise, gains are typically far less. Most importantly, as fertilizer is expensive, economic returns are very low and likely to be negative for a large share of farmers not using it at present. Fertilizer expansion should not be expected or promoted unless as part of a complete package with seeds and general improved practices.

***The evidence is not consistent with a view that Ethiopian farms have become too small to be efficient.*** Average labour productivity is no doubt extremely low, as is marginal labour productivity (relevant for earnings, and for growth and the transformation of the economy via migration). However, the evidence on land productivity, related to plot and farm size is more contentious. A standard narrative on Ethiopian agriculture is one of decreasing farm sizes and commensurate impacts on productivity. Although surprising, the evidence from the official CSA agricultural statistics would suggest that farms are not smaller now than they were in the mid-1990s or even the early 1980s, due to large land expansion. Furthermore, the evidence on whether these farms are too small to be efficient is surprisingly conflicting. Some studies have found that there are increasing returns to scale in smallholder agriculture, suggesting efficiency gains from land consolidation. We could not confirm such a relationship, and the standard negative yield-plot size relationship, found across the world, appears to be confirmed in Ethiopia as well. Even if the former evidence is right, simulations on the growth impact from migration (allowing land consolidation) based on the higher estimates available in other studies, showed that the impact was extremely small, undermining the economic significance of this concern. We recognize that this result is puzzling and further work on understanding the costs and potential benefits from land consolidation would be in order.

***There may be scope for encouraging large scale commercial agriculture, not just as a niche source of export earnings, but to stimulate commercialization and transformation of smallholder agriculture.*** The available evidence on returns to scale in smallholder agriculture is not offering insights on whether large scale commercial agriculture could be a profitable source of investment with payoffs also for productivity increases and commercialization of smallholder agriculture. Currently, large scale commercial agriculture is largely kept separate and does not focus on cereal crops. There is considerable scope for exploring different modalities for stimulating large scale commercial agriculture investments, not just to boost output, including of cereals, but more importantly for their positive externalities on the transformation and commercialization of smallholder agriculture. For example, 'islands' of larger commercial farms for cereals or high value crops could be offered incentives to have substantial interactions with smallholder agriculture such as via out-grower (contract farming) schemes, and marketing arrangements. However, the available evidence also shows that state interventions in these areas typically lead to

failure; at best governments can offer a clear and transparent framework to enable investment.

#### **4.2 Food prices and international markets**

**High cereal prices offer a strong encouragement for farmers to boost yields and commercialize agriculture, but the floor offered by export prices is low.** For farmers, yield increases are only worthwhile if they translate in higher economic returns. In fact, evidence from across the world suggests that productivity growth via innovation and adoption requires substantial economic returns to take off and spread. As an open economy with considerable transactions costs to reach international markets, cereals are effectively a non-tradable good for a broad range of prices. Domestic market prices will fluctuate between high import parity prices, when harvests are poor, and low export parity prices, when harvests are highly successful. Should cereal prices fall to these low export parity prices, incentives required for the adoption of agricultural technologies and inputs are unlikely to be sufficiently strong. Figure 1 and 2 show this clearly for wheat and maize, with cereal prices fluctuating between import and export parity prices except for in periods of foreign exchange scarcity or import restrictions (in recent months, or in 1999). The floor offered by export parity prices is low, and was hit for maize in 2001/02. High fuel and transport costs widen this band, such as in the last year, pushing export parity prices even further down.

**Growth in urban demand is then crucial to stimulate agricultural transformation.** It is therefore essential for agriculture to be faced with growing urban demand, which in turn implies a dependence on growth in the non-agricultural sector. Bumper harvests, such as for maize in 2001/02 depressed prices considerably, and evidence suggest considerable hardship faced by farmers in that period, discouraging attempts to boost yields. The process of boosting urban growth is beyond the scope of this study, but cannot be looked at independently from growth in agriculture.

**High cereal prices may help agricultural growth but would hinder urban growth, so a balance has to be found.** Given the structure of the Ethiopian economy, high urban food prices hinder growth and transformation. A balance has to be found between the upward pressure required for agricultural transformation and the downward pressure needed for non-agricultural growth. One key mechanism is to bring down transactions costs in food markets. Effort should be made to encourage a narrowing of the band between export and import parity prices, thereby benefiting both farmers and urban consumers. In fact, productivity growth and the reduction of transactions costs, via productivity gains in marketing and transport, *have* to go hand in hand to be sustainable. To maximize these incentives, cereal imports and exports should be freely allowed, and actively encouraged when prices hit the parity bound, as they offer a floor and roof to prices. In the last 12 months, high cereal prices cannot just be blamed on international prices, as they have moved well above import parity prices.

Figure 1: Import and export parity, and wholesale prices for wheat (Addis Ababa), January 1998 to November 2008

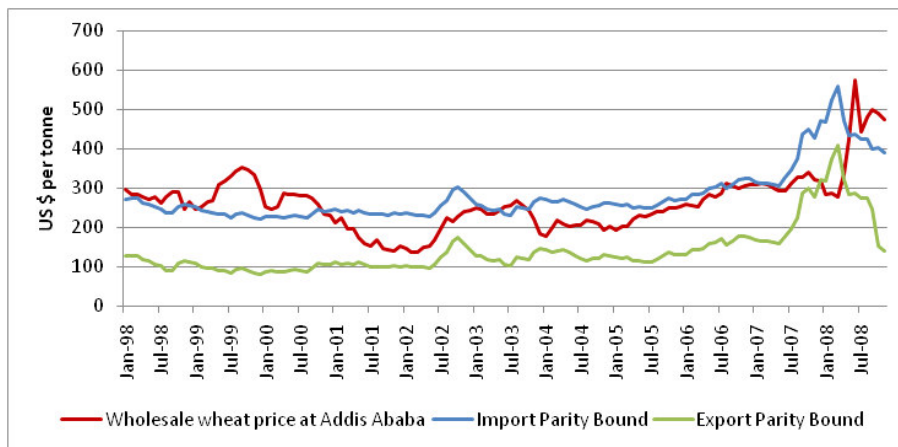
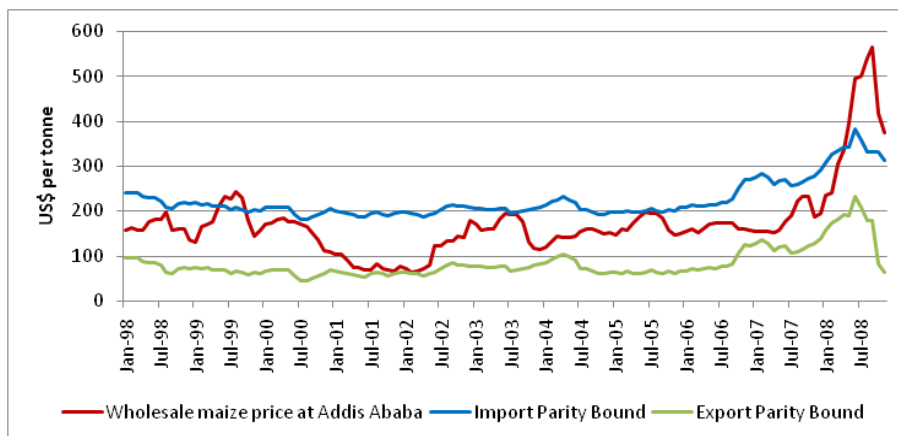


Figure 2: Import and export parity, and wholesale prices for maize (Addis Ababa), January 1998 to November 2008



### 4.3 The functioning and performance of product and factor markets

**Output markets function reasonably well in terms of market integration, but margins between farmgate and consumer prices remain high.** Estimates of farmgate prices relative to urban consumer prices suggest that farmers receive not more than half of the consumer price, even though little value addition takes places between leaving the farm and selling the product. To reduce these transactions costs, productivity increases at higher levels of the value chain are essential; in fact, we could detect room for cost reductions via scale economies in particular trading activities.

**Apparent high costs and non-competitiveness of transport and marketing require attention.** While building and maintaining road infrastructure remains important to bring down costs, our analysis shows that both high fuel costs and perhaps non-competitive

markets for transport activities imply that these infrastructure improvements have not been sufficient to bring about productivity gains in transport. Increasing competitiveness will require addressing entry costs, including via credit and simpler procedures, but the apparent presence of non-competitive practices by incumbents also requires closer scrutiny. Reducing the cost of mobile phone use, including via encouraging competition could have large benefits to improve information flows and therefore competitiveness. Trade credit, not least towards smaller traders, and exploiting scale economies at the lower levels of the marketing chain should provide other means of exploiting scale economies.

***Innovative models of wholesale and retail markets, and of agricultural production can help commercialization and growth of agriculture.*** Encouraging investments to streamline the marketing chain could have large benefits, given the experience in other countries. Opening up the marketing chain at the wholesale and retail level to supermarkets has been shown to create large productivity increases in marketing and better farmgate prices in many developing countries. This occurs in part because the provision of direct outlets for high-value crops rewards improvements in quality and in levels of commercialization by farmers. Nevertheless, the development of supermarkets tends to require urban income growth and a growing middle class. Contract farming arrangements are another example by which commercialization can be fostered.

***Markets for modern inputs are still functioning relatively poorly.*** Even though entry is legal, both fertilizer and seed markets are characterized by limited contestability: incumbents (private and public) appear to have considerable advantages including on credit, making entry or expansion by other players difficult, both at the wholesale and retail levels. As fertilizer prices remain a serious constraint on profitable adoption of modern inputs, productivity increases in the handling and marketing of fertilizer remain an important factor to increase incentives to farmers. Increasing contestability, by, for example, measures that allow new entrants to use fertilizer as collateral for trade credit may help.

***A rethinking of rural credit provision is essential, and should not be ignored.*** Rural credit provision has become dysfunctional as formal or microfinance rural credit markets are dwarfed by the input loan system. The latter is increasingly failing, not least given its links to the regional state public finances, and its disappearance appears now likely. Nevertheless, across the world, working capital credit, such credit for inputs, has always been a key part of rural transformation, and the vacuum left by the likely disappearance of the current input loan scheme is both a danger, but also an opportunity to foster better models of rural credit delivery, in any case unconnected to public finances.

***There is scope for innovative schemes offering insurance to farmers, offering incentives to engage in more risky, high return agricultural techniques and crops.*** Insurance markets are underdeveloped, while agriculture in Ethiopia is among the most risky in the world. Furthermore, adoption of new techniques and inputs carry considerable risks for farmers. While crop insurance for smallholder agriculture is unlikely to be a sustainable option, it is

imperative to develop schemes that offer protection and insurance when harvests fail, beyond safety nets. Pilots that creatively take forward ideas on index-based insurance and other models that involve limited transactions costs should be actively encouraged, and become part of an improved overall infrastructure for rural credit provision.

***Developing innovative risk management schemes are specifically relevant to foster the development of rural credit markets.*** Risk and the lack of insurance and other risk management mechanisms are a key reason why private rural credit markets do not easily develop, not least in areas dependent on high risk, rainfed agriculture. The key reason is that as poor weather events tend to affect a large number of policy holders, banking in such conditions is highly risky as default rates are highly covariate. Encouraging MFIs or other institutions to engage in banking operations for rural input credit provision is then not without risks for the sustainability of these institutions. As input credit is crucial, pilot programmes on different options for insurance of farmers' credit and reinsurance of loan portfolios in rural settings are then urgently required.

***Progress on land tenure security is encouraging but requires rapid consolidation.*** Much progress has been made on improving security of tenure in Ethiopia, even though the schemes still fall well short of fully transferable and collateralisable land rights. Nevertheless, land certification appears to have brought benefits, and it will benefit farmers if it is consolidated everywhere. It will be imperative to develop and to continuously update land registry systems and the opportunities of modern technology for area measurement and recording could offer further security. At the same time, commercialization efforts in agriculture will require mechanisms to get access to rural land for investment; these mechanisms should be clear and transparent, with reasonably fast, legally enforceable and contestable procedures.

## **Concluding remarks: some cross-cutting themes**

***Don't look at smallholder agriculture in isolation.*** Conceptually, but also empirically, our analysis has aimed to show that looking at agriculture in isolation is highly misleading. This is true in general for any sector: growth is about finding the appropriate allocation of all production factors in the economy, and the available technology to attain the fastest possible route to wealth creation, irrespective of the sector in which production factors are to start with. The current sectoral allocation should by no means be taken as optimal, and it is an undisputed fact that development across the world has involved the large movement of labour out of the rural sector. One troubling feature of the policy debate on ADLI, only partly addressed in PASDEP, is that smallholder rainfed agriculture appears to be treated in relative isolation, with a relatively narrow focus on boosting production per se. Our analysis

has emphasised the specific relevance of cereal production, via its impact on real wages and urban food prices in the economy but also the limits on the role played by international cereal markets. The implication is that any effort to boost cereal production has to take place in conjunction with urban demand and income growth, with its implications for food price formation. Similarly, low farmgate prices as a share of overall crop prices require that the constraints posed by high transactions and marketing costs are addressed simultaneously with attempts to boost yields, to ensure sufficient economic returns to farmers. Furthermore, other forms of agricultural organisation, such as large scale commercial farms are treated as a niche sector, without any explicit treatment of the interactions with smallholder agriculture, while there may be scope for substantial externalities.

***Invest in science and innovation, not only domestically, but with donor and private foundation's help, internationally.*** While not scientists themselves, the authors of this study found it striking how hard it was to find top international scientists working on crops and crop breeding problems with specific relevance to Ethiopia. Ethiopia has a strong body of domestic researchers, but their apparent relative isolation from frontier work, such as biotechnology, is striking. There is currently an increasing interest in applying technology to address agricultural problems in the developing world, but in practice, most top level research, such as on genetic modification but also other forms of biotechnology is focused on crops of relevance to richer economies. One key reason is that such research is increasingly taking place in private research facilities or that public or university research investment has to be proven to have commercial benefits to secure public funding. Research on crops and problems of relevance to Ethiopia does not offer these required economic returns.

Nevertheless, as medical research initiatives have shown, there is currently a massively increased goodwill to push research on topics to address developing country problems. Furthermore, creative funding solutions can be designed to overcome the absence of incentives for private research when the purchasing power is not present in the poor settings involved. These funding arrangements can at the same time overcome the standard concern that modern technologies such as GMO crops necessarily need to lead to monopoly power and exploitation by multinationals. One model would be a large 'prize' paid by donors for a large-scale successful adoption of an improved seed by at least 100,000 farmers, after which the innovation becomes a public good. Given its history and the nature of the problems it faces, Ethiopia would be extremely well placed to foster and benefit from such schemes.

***Ethiopia needs a more active competition policy to foster competition and contestability, as part of a roadmap for the development of sustainable market institutions.*** In our study, we found suggestive evidence of serious competition problems in a variety of markets. In most markets relevant for agriculture, such as for seeds, seed multiplication, fertilizer, trade in produce, or commodity transport, the private sector is allowed to enter. Nevertheless, we found many examples of specific advantages to incumbent firms or rules affecting competition. Overall, many of these benefits or regulations to incumbent firms were in response to real problems with the functioning of these factor markets, and in many cases they fixed particular problems. However, they risk undermining the progress towards the stated goal of developing well-functioning private market institutions in all markets. In each of these markets, more effort should be made to encourage entry, or at least to avoid hindering entry by offering specific advantages to incumbent (public or private) firms or by regulations that make entry too costly.

Examples include the entry costs in the fertilizer import market, where fertilizer could not be used as collateral for import loans and where regulations push up the amount of capital required to operate. Similarly, costs of entering seed production could be reduced again by improving access to finance and by a clear regulatory framework without excessive costs related to quality control. Discretionary advantages to vegetable and flower farms may be justified to offer incentives for entry of new firms with an export focus, but this focus effectively reduces incentives for private firms to enter into seed production or other high value crops with direct externalities for smallholder agriculture. The Ethiopian Commodity Exchange offers progress for the functioning of output markets, but it cannot be expected to address all inefficiencies in commodity trading. For example, despite massive road infrastructure investment, there is evidence of some productivity gains in transport, but transactions costs are still similar now compared to 2002. Long-haul transport requires considerable entry costs resulting in a small number of incumbents, but the resulting scale economies need to be translated in lower costs, not monopoly rents.

In general, licensing, regulations and discretionary benefits to particular companies may well have been introduced in view of solving specific problems, but these increase the cost of entry, and reduce the incentives for productivity gains for incumbents, and have long-term implications for the development of well-functioning markets. A comprehensive review of incentives for productivity gains at various parts of the value chain through an angle of contestability and competition policy would be the next step.

***The recent rise and fall of international fuel and food prices offer conflicting incentives for investment in agriculture, but strengthens our focus on reducing transactions cost and urban income growth.*** Recently, due to rising global fuel needs, the decline in fossil fuel stocks, and the scope for biofuel technologies, cereal and fuel prices have started to co-move. In the last few years, this resulted in rapid increases; currently, a downward spiral is

taking place. This suggests two likely scenarios for the future: either high fuel costs and high cereal prices which make Ethiopia a closed economy in practice, and dependent on domestic cereal production to keep food prices sufficiently low; or low fuel costs and low cereal prices which make Ethiopia more able to take advantage of international markets to keep urban prices low. In the first scenario trade volumes will be low, or even non-existent, and export potential will be restricted to high-value, low bulk crops, in well situated production areas. Cereal production for the domestic market will be profitable, with high cereal prices not inducing imports. As a result, in this scenario, domestic market access would be a strong driver of commercialization, causing areas closer to urban centers to experience more growth. Given high transport costs, more remote areas, even if of high potential, are unlikely to be profitable.

Under the second scenario cereals can be imported into Ethiopia quite cheaply, providing limited incentives for innovation in cereals. However, the production of high value-added crops in agriculture would provide possibilities for the rural sector, while urban growth can be fed by low-price cereal imports. As the costs of transporting to domestic market centers would also be low, commercialization would be driven to a greater extent by agricultural potential, and not simply by market access. Either scenario would suggest a rather different location and focus of investments. Both are possible, and, as at present, we may well experience rapid regime shifts (from high to low prices), making strategic investments more difficult to be profitable in a sustained way. Focusing on land productivity improvements makes most sense when international prices are likely to remain high, as in that case domestic production can offer an alternative to expensive imports, trying to push prices below import parity, while in bumper years and as long as urban demand is lacking, relatively high export parity prices will offer decent incentives to farmers via exports when domestic prices are low. But this strategy can quickly hit the rocks if international prices are low, so that imports are cheap, exercising downward pressure on prices, while bumper harvests could not be profitably exported at low export parity prices.

The result is a *necessity* to complement any policy focusing on land productivity increases with other measures, strengthening the key arguments made in this paper. Stronger urban demand would avoid food prices dropping to export parity prices. It is also essential to affect parity prices directly by reducing transactions costs, such as via better marketing infrastructure, port infrastructure, and a more competitive or at least contestable long-haul transport sector.



## Papers and Background Notes Prepared for the Study

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