

Maize Value Chain Potential in Ethiopia

Constraints and opportunities for enhancing the system



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I Executive Summary

MAIZE IN ETHIOPIAN AGRICULTURE

This report reaffirms that maize continues to be a significant contributor to the economic and social development of Ethiopia. As the crop with the largest smallholder coverage at 8 million holders (compared to 5.8 million for teff and 4.2 million for wheat), maize is critical to smallholder livelihoods in Ethiopia. In addition, maize is the staple crop with the greatest production at 4.2 million tons in 2007/08, compared to teff at 3.0 million tons and sorghum at 2.7 million tonsⁱ.

Moreover, maize plays a central role in Ethiopia's food security. It is the lowest cost source of cereal calories, providing 1½ times and two times the calories per dollar compared to wheat and teff respectively. An effective maize sector could propel Ethiopia's food production to quickly reduce the national food deficit and keep pace with a growing population.

THE POTENTIAL OF A VIBRANT MAIZE SECTOR

While maize already plays a critical role in smallholder livelihood and food security, this role can be expanded. Maize is the staple cereal crop with the highest current and potential yield from available inputs, at 2.2 tons per hectare in 2008/09 with a potential for 4.7 tons per hectare according to on-farm field trials, when cultivated with fertilizer, hybrid seed, and farm management practicesⁱⁱ.

It is estimated that, by bridging this yield gap and tapping into latent demand sinks, smallholders could increase their income from approximately USD 60 per hectare today to USD 350 to USD 450¹.

If yield potentials are realized, maize can also contribute towards improving food security and reducing land degradation through producing an incremental 1 million tons on 30 percent less land, and increasing the aggregate revenue generated from maize. For example, the poultry industry could generate USD 360 to 580 million in value in 2020 and source maize for feed from 50,000 to 100,000 smallholders.

CHALLENGES IN THE VALUE CHAIN

However, a series of constraints span the maize value chain in production, aggregation and trading, and demand sinks, or the end markets. High-level findings are presented below:

- **Production.** Productivity remains below potential due to low input usage and limited crop rotation; there is significant post-harvest loss of 15 to 30 percent of production,

¹ The expected income growth to USD350 is based on the assumption that smallholder farmers become high input users and increase their yield to four tons/ha

primarily on-farm; national maize commercialization rates are low at approximately 20 to 30 percent; most marketable surplus is sold within three to four months of harvest when prices are lowest due to farmers' cash needs and risks associated with pest infestation and other storage losses, and; smallholders are vulnerable as producers and consumers to food safety concerns from aflatoxins.

- **Aggregation and trading.** There is a lack of a fully functioning maize market, reflecting a weak industry structure. Four inter-linked issues have been observed as primary contributors to this situation: (i) price volatility, with intra-annual price swings up to 40 to 50 percent; (ii) lack of a year-round market, with most trading activity three to four months after harvest; and (iii) lack of depth, or sufficient supply, especially for quality maize.
- **Demand sinks.** On-farm consumption is the largest source of demand today, with few large, downstream buyers and limited processing activity. The most attractive demand sinks for maize are in food and livestock feed, with potential demand of 800,000 tons of cereal demand for food and upwards of 450,000 tons of maize demand for feed.

THE RECOMMENDATIONS

Core interventions and enabling activities can holistically strengthen the Ethiopian maize value chain – growing both supply and demand by increasing productivity from potentially lower acreage, and realizing key latent sources of demand, supported by a stable, liquid and year-round market. These recommendations are complementary to and intended to accelerate the impact of the current strategies of the Government of Ethiopia (GOE) and development partners:

- **Create clear role for cooperatives in the maize value chain and provide the necessary tools for them to be effective.** Simplifying the management and decision-making functions of cooperatives will reduce the capability and governance burden required to run them effectively. For instance, cooperatives could sell standardized input packages and buy maize at published and transparent prices.
- **Catalyze the growth of latent demand sinks, starting with feed for poultry.** Creating incremental demand sinks for maize will catalyze greater productivity and efficiency in the value chain, e.g., GOE should facilitate the growth of the poultry sector, where there is significant latent demand.
- **Foster emergence of strong, licensed traders to stabilize market.** Greater participation by the private sector in grain trading is of critical importance to create a year-round, liquid market that will benefit smallholders, by providing a consistent outlet for their produce, and downstream actors, by providing a consistent supply of quality grain. Supported by appropriate regulatory structures, expansion of various initiatives planned or already under development by the Ethiopia Commodity Exchange (ECX) could facilitate the orderly growth of such partners.

- **Define a clear and transparent role for government in maize markets, gradually shifting away from *ad hoc* stabilization efforts.** A clear mandate should outline when GOE intervenes in the maize market to prevent extreme price fluctuations, shortages, or excesses. Developing a transparent mandate of when and how market failures are addressed will provide all stakeholders with transparency and certainty of government intervention and reducing the perception of *ad hoc* interventions that reduce confidence of partner organizations.

There is also a set of critically important enabling actions that will further strengthen the maize market:

- **Improve storage management practices and equipment on- and off-farm.** Reducing on-farm and off-farm post-harvest losses will directly increase smallholder income and improve food security.
- **Continue efforts to increase market information.** Existing best practice mechanisms (e.g., ECX, regional marketing information systems) should be identified and used as channels to disseminate price and other market data to improve linkages in the maize market (e.g., crop forecasts for demand and supply).
- **Improve farm management practices of other crops.** Maximizing the productivity of maize should go hand-in-hand with improving productivity of other crops, for instance the sustainability of maize production is linked to effective crop rotation with pulses.

Realizing the potential of the maize value chain cannot be done in isolation; it will only occur if other components of the agriculture system are functioning effectively: extension, improved seed, integrated soil fertility management, pest management and irrigation. This report outlines a process by which Ethiopia may adopt a series of closely related activities to realize the potential in the maize value chain, while increasing incomes of its smallholder farmers and delivering on national food security objectives. Recommendations for improvements in other areas of the agriculture system are addressed in separate diagnostic reports.

THE WAY FORWARD

With a clear, credible plan of action, and an effective performance management process, Ethiopia will be in a strong position to deliver on this future vision of the maize value chain. Ethiopia can convert this latent potential into critical improvements in food security and livelihood for the country. The recommendations of this report offer a first view on how Ethiopia can chart a practical path of initiatives to achieve these goals.

The recommendations outlined in this report and in the other sub-sector diagnostic reports are not an explicit roadmap of the activities the Bill & Melinda Gates Foundation is best positioned to solely resource; they reflect a set of findings to support MoARD and all donors in the planning and implementing strategies to accelerate growth and food

security in the context of Ethiopia's nationally stated objective to achieve middle-income status by 2025.

Implementing the recommendations outlined in this report will undoubtedly require significant human and financial resources. It will also require a level of sequencing and coordination that has in the past been challenging to implement at a national level, not only in Ethiopia but in most countries in similar situations. To achieve these objectives, GOE will need to work closely with all its partners (donors and development community, NGOs, cooperatives and unions, national and international research organizations, private sector and the various organizations working directly with farmers at the local level).

This report provides a preliminary view on the sequencing of activities to strengthen the maize value chain. However, the recommendations and sequencing of activities outlined in this report must also be seen within the context of the overall recommendation provided in the holistic and integrated report, which seeks to find common themes from the various diagnostics requested by the Prime Minister. The integrated report also provides a clear vision on a possible implementation strategy, which would be a critical aspect of realizing the recommendations outlined in this report.

Detailed actions, owners, and prioritization of the recommendations are presented in the main report. A preliminary view of the sequencing of high-priority activities that could strengthen the maize value chain is as follows (Figure 1):

Figure 1: The recommendations are grouped into four themes

| | Near term (1-2 years) | Mid term (3-5 years) |
|---------------------------------------|--|---|
| Market Stabilization | <ul style="list-style-type: none"> ▪ 1.1 - Identify team to develop stabilization mechanism ▪ 1.2 - Develop rules of engagement /manual ▪ 1.4 - Secure funds needed to operationalize ▪ 1.5 - Identify operator and give them a clear mandate ▪ 1.6 - Establish consortium of actors in the value chain and setup periodic check-ins to assess the market | <ul style="list-style-type: none"> ▪ 1.3 - Refine policies as necessary to take advantage of opportunities to expand maize market |
| Create strong traders | <ul style="list-style-type: none"> ▪ 2.1 - Develop selection criteria and operational contract for regional private sector traders ▪ 2.2 – Modify current exchange rules and systems as needed to accommodate traders ▪ 2.3 - Develop regulation and checks and balances ▪ 2.4 - Select regional traders to register with ECX ▪ 2.7 – Track and monitor year-round market | <ul style="list-style-type: none"> ▪ 2.5 – Provide contractual support ▪ 2.6 - Simultaneously realize and pilot the inventory financing system ▪ 2.8 - Establish forward contracting system, |
| Catalyze poultry feed industry | <ul style="list-style-type: none"> ▪ 3.1 /2- Develop template contract for potential poultry investors , feed mills, and abattoirs ▪ 3.3 - Regionally identify locations for poultry farming and tailor contracts per region ▪ 3.4 - Issue tender offers / auctions to attract investors, select investors and sign contracts | <ul style="list-style-type: none"> ▪ 3.5 - Provide support per contract arrangement ▪ 3.6 - Scale-up after monitoring challenges faced by initial investors, level of feed production |
| Enable cooperatives | <ul style="list-style-type: none"> ▪ 4.1 – Select high potential coops ▪ 4.2 – Appoint/establish input assemblers ▪ 4.3 – Establish links between input suppliers and assemblers ▪ 4.4 – Develop menu of input packages and prices | <ul style="list-style-type: none"> ▪ 4.5 - Establish links between coops and large buyers ; facilitate off-take ▪ 4.6 – Provide coops necessary support to operationalize |

II Acknowledgments

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III Acronyms

| | |
|---------|---|
| ADLI | Agricultural Development-Led Industrialization |
| AMC | Agricultural Marketing Corporation |
| BoARD | Bureau of Agriculture and Rural Development |
| CIA | Central Intelligence Agency |
| CSA | Central Statistical Agency |
| CV | Coefficient of Variation |
| DA | Development Agent |
| ECX | Ethiopian Commodity Exchange |
| EIAR | Ethiopian Institute of Agricultural Research |
| EGTE | Ethiopian Grain Trading Enterprise |
| ESE | Ethiopian Seed Enterprise |
| ETB | Ethiopian Birr |
| FAO | Food and Agriculture Organization of the United Nations |
| FCI | Food Corporation of India |
| GDP | Gross Domestic Product |
| GOE | Government of Ethiopia |
| MoARD | Ministry of Agriculture and Rural Development |
| MoFED | Ministry of Finance and Economic Development |
| NGO | Non-governmental organization |
| PADETES | Participatory Demonstration and Training Extension System |
| PASDEP | Plan for Accelerated and Sustained Development to End Poverty |
| PSNP | Productive Safety Net Program |
| SD | Standard Deviation |
| SDPRP | Sustainable Development and Poverty Reduction Plan |
| USAID | United States of America Agency for International Development |
| VAT | Value-Added Tax |
| WFP | World Food Program |
| WRS | Warehouse Receipt System |

IV Background

Agriculture is the core driver for Ethiopia's growth and long-term food security. The stakes are high: 15 to 17 percent of GOE's expenditures are committed to the sectorⁱⁱⁱ, agriculture directly supports 85 percent of the population's livelihoods^{iv}, 43 percent of gross domestic product (GDP)^v, and over 80 percent of export value^{vi}.

Ethiopia's agricultural sector has witnessed consistent growth since 2003: maize production has expanded at 6 percent *per annum*, and the aggregate export value across all commodities has grown at 9 percent *per annum*^{vii}, underpinning an 8 percent annual growth rate in GDP^{viii}. Public investment has expanded access to productive inputs, such as hybrid maize seed and fertilizer². Concerted government spending in extension has also established over 8,500 Farmer Training Centers (FTCs) and trained 63,000 Development Agents (DAs) from 2002 to 2008³. However, the sector continues to face a set of constraints that restrict further and accelerated growth. Markets are underdeveloped, federal- and regional-level public and private sector partners lack capacities to implement, some gender imbalances continue to be unaddressed, safety nets account for a large proportion of agricultural spending, irrigation potential remains underdeveloped, shortages of improved inputs hinder growth, and key areas of the enabling environment require improvement. Most importantly 5 to 7 million Ethiopians remain chronically food insecure^{ix}.

At the request of GOE, in 2009, the Bill & Melinda Gates Foundation (BMGF) agreed to undertake diagnostic reviews of Ethiopia's seed system, irrigation, extension, agricultural finance, soil fertility/fertilizer and markets value chains for maize, livestock, and pulses⁴. Jointly, these sub-sector diagnostics inform a separate holistic report with systems-level recommendations across agriculture. This systems-level work captures common themes from the more siloed diagnostics and identifies priority areas to drive food security and growth. The integrated, summary report also provides an implementation strategy for a program to accelerate agricultural development in Ethiopia.

The development of these reports has been led by senior fellows with the International Food Policy Research Institute (IFPRI), the Ethiopian Institute for Agricultural Research (EIAR), the International Livestock Research Institute (ILRI), the International Water Management Institute (IWMI), and the Association of Ethiopian Microfinance Institutions (AEMFI). Throughout their work, these sector experts worked closely with

² Refer to the seeds and soil fertility diagnostic reports for more details

³ Refer to the extension diagnostic report for more details

⁴ Final reports from the individual sub-sector diagnostics are completed and available for review. Contingent on the approval of GOE, the foundation anticipates working with MoARD and IFPRI to facilitate the publication of the reports.

technical experts at the Ministry of Agriculture and Rural Development (MoARD) as well as other local stakeholders and local and international content experts.

The findings of the sub-sector diagnostics and the system-wide report are a complement to national GOE strategies, namely PASDEP II, along with corollary projects financed by GOE and its development partners. The purpose of the work is to support GOE to help accelerate the achievement of PASDEP II's goals for sustainable growth, food security, and a pathway to middle-income status by 2025.

V Methodology of Diagnostic Work

In close consultation with the Ministry of Agriculture and Rural Development (MoARD), a team of local and global experts, led by International Food Policy Research Institute (IFPRI), undertook the maize value-chain diagnostic in Ethiopia from November 2009 to April 2010. Over 100 stakeholders, including many small-scale farmers, were consulted as part of the process at the *kebele*, *woreda*, regional, and federal level. An independent Ethiopian expert panel, an international content group, development partners, local institutions, NGOs, and other actors also provided input into this work. These discussions culminated in a wide ranging stakeholder convening held in the beginning of March 2010, where the team's preliminary finding and recommendations were presented. This final report reflects the input of all local partners and stakeholders currently operating in the maize value chain in Ethiopia.

This sectoral analysis, similar to the diagnostic work in other sub-sectors of Ethiopia's agricultural system facilitated by the BMGF at the request of the Prime Minister, consisted of a rigorous multistep process, described below:

- **Extensive review of the relevant literature.** The maize value chain in Ethiopia has been the subject of substantial investigation. The team conducted an exhaustive review of over 40 reports, which provided a baseline understanding and starting point for the team's work. A listing of the various reports consulted is contained in Appendix 1. Further, a rich analysis of international cases provided a context to understand the enabling factors in other economies for successful interventions.
- **In-depth key informant interviews.** Over 100 stakeholders, including MoARD, BoARD, *woreda*- and *kebele*-level government staff, development partners, research institutes, traders, cooperatives, unions, farmers, investors, and others participated in interviews. The interviews brought context to and surfaced constraints identified in the literature review; they also provided a soundboard to validate findings and recommendations.
- **Collection of primary qualitative and quantitative data** – primary data were collected through participatory rapid assessment methods to fill key gaps in the available data set. This involved interviewing farmers' groups, community leaders, and local traders on various aspects of their operations. The fact-driven analysis allowed teams of consultants to make sectoral projections and modeling around constraints and opportunities in the maize value-chain. These analyses, in conjunction with informant interviews and literature reviews, provided the basis for a broad set of systemic recommendations designed to strengthen the current Ethiopian maize value-chain.
- **Multi-stakeholder convenings.** Convenings were held toward the end of the study to present, test and further refine the team's initial findings and recommendations. Convenings were attended by regional and federal government officials, private sector representatives, as well as national and international research organizations.

- **Synthesis and validation with expert panels.** As a final review of the recommendations and findings, three separate expert panels were consulted during the review process: an independent Ethiopian content expert panel; an international content expert group; and a high-level advisory group for cross-sectoral and broad development issues. Input was provided by these panels in an iterative process, consisting of meetings and direct comments into documents, held over a multi-month period. During this period, the team also continued to receive feedback from MoARD leadership.

The methods sought to combine academic rigor with a participatory, forward-looking, and actionable process with the stakeholders in Ethiopia who, at the end of the day, are the protagonists who will be affected by and take leadership in the implementation of the findings and recommendations of this work. It also sought to interact directly with the farmers, particularly women, who are not only the primary beneficiaries of the work, but the final link in the chain in implementing recommended interventions. The incorporation of a farmer perspective ensures that recommendations are demand driven, catering to the needs of the clients of this work.

1. Current Status and Future Potential for Maize

1.1 IMPORTANCE OF MAIZE IN ETHIOPIA

Agriculture continues to be the dominant sector in Ethiopia's economy, with cereals playing a central role. Grain production and marketing are particularly important: studies show that cereals account for 65 percent of the agricultural value added^x, equivalent to about 30 percent of the national GDP⁵. Maize is Ethiopia's largest cereal commodity in terms of total production, acreage, and the number of farm holdings. The following subsections elaborate on the importance of maize in terms of its coverage and contribution to food security.

1.1.1 Importance of maize in production value

Maize is the largest and most productive crop in Ethiopia (Table 1). In 2007/08, maize production was 4.2 million tons, 40 percent higher than teff, 56 percent higher than sorghum, and 75 percent higher than wheat production. With an average yield of 1.74 tons per hectare (equal to 3.2 million tons grown over 1.8 million hectares) from 1995 to 2008, maize has been the leading cereal crop in Ethiopia since the mid-1990s in terms of both crop yield and production. Wheat and sorghum yields have averaged 1.39 and 1.36 tons per hectare, respectively.

⁵ Grain production and marketing is 65 percent of agricultural value added, and agriculture is 47 percent of GDP, grain production and marketing as share of GDP is equal to $0.65 \times 47 = 30.6$ percent

Table 1: Cereal production and area by crop type, 1994/95 to 2007/08 (production in '000 of tons and area in '000 of hectares)

| Year | Teff | | Maize | | Sorghum | | Wheat | | Barlev | |
|----------------|-------|-------|-------|-------|---------|-------|-------|-------|--------|-------|
| | Prod | Area | Prod | Area | Prod | Area | Prod | Area | Prod | Area |
| Mean 1995-2000 | 1,706 | 2,094 | 2,730 | 1,624 | 1,488 | 1,164 | 1,134 | 939 | 940 | 947 |
| 2000/01 | 1,750 | 2,094 | 3,306 | 1,651 | 1,549 | 1,170 | 1,605 | 939 | 1,107 | 945 |
| 2001/02 | 1,645 | 2,107 | 3,050 | 1,647 | 1,572 | 1,117 | 1,461 | 991 | 979 | 957 |
| 2002/03 | 1,950 | 2,033 | 3,154 | 1,718 | 1,774 | 1,181 | 1,646 | 1,041 | 1,132 | 988 |
| 2003/04 | 1,687 | 2,110 | 2,744 | 1,766 | 1,784 | 1,237 | 1,618 | 1,110 | 1,087 | 1,019 |
| 2004/05 | 2,048 | 2,098 | 2,906 | 1,810 | 1,718 | 1,297 | 2,213 | 1,139 | 1,376 | 1,077 |
| 2005/06 | 2,247 | 2,117 | 3,912 | 1,804 | 2,200 | 1,328 | 2,307 | 1,213 | 1,398 | 1,109 |
| 2006/07 | 2,463 | 2,143 | 4,124 | 1,883 | 2,340 | 1,393 | 2,500 | 1,288 | 1,470 | 1,157 |
| 2007/08 | 3,025 | 2,263 | 4,162 | 1,978 | 2,685 | 1,452 | 2,382 | 1,382 | 1,467 | 1,172 |
| Mean | 1,949 | 2,194 | 3,154 | 1,805 | 1,774 | 1,301 | 1,646 | 1,181 | 1,132 | 1,050 |

SOURCE: Authors' compilation based on CSA Agricultural Sample Survey Reports for various years.

In addition to the highest total production *per annum* and the highest per-hectare yield, maize is also the single most important crop in terms of number of farmers engaged in cultivation. The vast majority of Ethiopian farmers are small-scale producers – estimates show about 94 percent of Ethiopian farmers rely on less than 5 hectares of land, of which 55 percent cultivate less than 2 hectares^{xi}. Eight million smallholders were involved in maize production during 2008/09 production season, compared to 5.8 million for teff and 4.5 million for sorghum, the second and third most cultivated crops in Ethiopia^{xii}.

1.1.2 Importance of maize in households' food security

Maize is instrumental for the food security of Ethiopian households, and is the lowest cost caloric source among all major cereals, which is significant given that cereals dominate household diets in Ethiopia, as highlighted by Table 2. The unit cost of calories per US dollar for maize is one-and-a-half and two times lower than wheat and teff respectively. Maize is also a low-cost source of protein in comparison to other cereals: maize provides 0.2 kg of protein per USD, compared to 0.1 kg of protein per USD from teff and 0.2 kg of protein from wheat and sorghum^{xiii}. Figures in Table 2 suggest that an average Ethiopian consumes a total of 1,858 kilocalories daily of which four major cereals (maize, teff, wheat, and sorghum) account for more than 60 percent, with maize and wheat representing 20 percent each.

Table 2: Importance of staple foods in diet of Ethiopia (2003)

| Commodities | Daily caloric intake | Percentage of daily caloric intake |
|-------------|----------------------|------------------------------------|
| Maize | 383 | 20.6 |
| Wheat | 364 | 19.6 |
| Teff | 254 | 13.7 |
| Sorghum | 191 | 10.3 |
| Other | 666 | 35.8 |
| Total | 1,858 | 100.0 |

SOURCE: As reported in Rashid (2010), the estimates for Teff are from the CSA and the rest from FAOSTAT

Table 3 disaggregates the link between income and cereal consumption. Except for teff, caloric intake from cereals declines with the increase in income – that is, moving from quintile 1 to 5. Rural households also appear to derive more calories from cereals than urban households. Finally, the contribution of processed cereals is still very low in Ethiopian diets, representing only 3 percent at national level, 13 percent among urban households, and only 2 percent among rural households. Across different income groups, the share of processed cereals ranges from 1.4 percent among the poor and 5.5 percent among the rich. This implies that processing is still at rudimentary level.

Given current upward trends in income growth combined with the variance in consumption habits by income level, there will be changes in the aggregate cereal consumption patterns of Ethiopians. These trends suggest that there will be more demand for processed maize in the future, as well as for livestock and feed, as animal protein consumption is also a function of income. They also show that maize will continue be a critical dimension of household food security.

Table 3: Calorie intake from cereals by income group and location (percent)

| | Teff | Wheat | Barley | Sorghum | Maize | Other Cereals | Processed Cereals | Total Cereals |
|--------------------------------|------|-------|--------|---------|-------|---------------|-------------------|---------------|
| National | 8.9 | 8.9 | 4.4 | 8.2 | 8.6 | 1.6 | 3.2 | 43.8 |
| <i>Income groups</i> | | | | | | | | |
| Quintile 1 (lowest income) | 8.9 | 9.6 | 6.9 | 9.5 | 10.5 | 1.5 | 1.4 | 48.3 |
| Quintile 2 | 9.2 | 9.6 | 5.5 | 7.9 | 10 | 2 | 2.1 | 46.3 |
| Quintile 3 | 8.3 | 8.9 | 5.3 | 7.9 | 10.2 | 1.9 | 2.4 | 44.9 |
| Quintile 4 | 8.7 | 9.2 | 2.4 | 10 | 7.7 | 1.4 | 3.6 | 43.0 |
| Quintile 5 (highest income) | 9.4 | 7.5 | 3.1 | 6.1 | 5.9 | 1.4 | 5.5 | 38.9 |
| Urban / Rural | | | | | | | | |
| Urban | 16.7 | 4.9 | 1.1 | 1.8 | 1.9 | 0.9 | 12.6 | 39.9 |
| Rural | 7.5 | 9.6 | 5 | 9.3 | 9.9 | 1.7 | 1.5 | 44.5 |

SOURCE: IFPRI calculations based Household Income, Consumption, and Expenditure Survey of CSA

1.2 POLICY ENVIRONMENT

The policy environment has had multiple effects on the maize value chain, particularly price policies.

In Ethiopia, strong control over food markets began when the socialist government came to power in 1974. During this time, the government was in control of almost all aspects of grain markets, leaving very little or no incentives for the farmers to increase productivity and traders to engage in trade.

The tight regulation over grain trade started loosening in the early 1990s after the change in power. The new government understood the importance of the cereal sub-sector and placed heavy emphasis on cereal production and marketing in each of its successive agricultural development strategies. Recent government policies and strategies, including the Agricultural Development Led Industrialization (ADLI), the Sustainable Development and Poverty Reduction Plan (SDPRP), and the Plan for Accelerated and Sustainable Development to End Poverty (PASDEP), all highlight the importance of cereals in overall economic development. As part of these strategies, GOE has undertaken substantial market reforms to stimulate the development of the cereals sector, including accelerated investments in road and communication networks and adaptation of

major programs to increase cereal production through large scale demonstrations of the benefits of modern seeds and greater fertilizer use⁶.

To date, the above policies have led to boosts in production, encouraging development of private sector, and reducing transactions costs. Total production of four major cereals has jumped from 8.2 million tons in 2000/01 to roughly 12.3 million tons in 2007/08 (Table 1); hundreds of thousands of small traders make their living by dealing in cereals; and the cost of trading a ton of cereal has declined from ETB 156 in 1996^{xiv} to ETB 54.0 in 2008^{xv}. In real terms, this represents a decline of 302 percent^{xvi}.

However, the road to liberalized cereal markets has not been easy. Although the government withdrew from markets through a series of proclamations and regulations during 1999 to 2002, the country encountered problems in 2002, when cereal markets collapsed following two consecutive years of bumper harvests. Absence of the Ethiopian Grain Trade Enterprise (EGTE) in its price stabilizing role not only adversely affected small cereal growers but also contributed to production declines in the following years due to reduced use of modern inputs (see boxed text below).

Challenges of grain market liberalization

With favorable weather and increasing adoption of the new technology, Ethiopia enjoyed two consecutive years of bumper crops in 2000/01 and 2001/02. But the blessings of the technology and good weather did not translate into improvements in farm households' well-being. The farm gate price of maize declined by an unprecedented 80 percent in early 2002, making maize farming highly unprofitable – so much so that some farmers allegedly did not find it worthwhile harvesting their maize crops. The ratio of input prices to producers' prices increased from 1.7 in 2000 to about 9.0 in 2002 and the fertilizer application declined by 22 percent in the next cropping year. Although price stabilization was no longer in its mandate, EGTE was directed to buy maize in order to boost farmers' confidence. The EGTE procured 18,000 tons of maize, of which 11,000 metric tons were exported. The situation took a turn for the worse in mid-2002, however. The rains did not come on time for the main cropping (*meher*) season, farmers reduced modern input applications, and it became evident that cereal production would be significantly lower than the previous year. Production forecasts for maize were revised downward by as much as 52 percent, making both government and its development partners nervous about a looming food security crisis, with the potentials of about 15 million people facing starvation. The crisis was eventually averted with generous donor support that included more than 1 million tons of food aid.

SOURCE: Adapted from Rashid and Negassa (2010)

The EGTE faced the opposite challenge in 2005 to 2008. Despite consecutive years of reported good harvests, prices of major cereals started rising sharply since late 2005, as did overall macro-inflation. Local grain procurement by the World Food Program (WFP) and EGTE fell to almost zero, and strategic grain reserves declined sharply to only 17 percent of the targeted level of 407,000 tons, posing significant risks of increased

⁶ The recent assessment of the infrastructural development and public spending in Ethiopia is documented in Mogues et al. (2008)

vulnerability to poor food insecure households. Furthermore, although many poor households in rural Ethiopia had access to the large-scale Productive Safety Net Program (PSNP), launched in January of 2005, urban households lacked access to similar programs. Therefore, the sharp increase in prices of all major cereals in the main urban centers became a major policy concern, which led to re-instituting of the urban food rationing program in April 2007. Actual distribution of wheat under this program began in Addis Ababa in June 2007 and 11 other urban centers were added by August 2008. Between June 2007 and June 2008, the program distributed about 249,000 tons of wheat at a subsidized rate of ETB 1,800 (or about USD 180) per metric ton, which was 89 to 306 percent lower than the wholesale price in the Addis Ababa market⁷. Other measures included imposition of 10 percent surtax to partly offset the costs of urban rationing and suspension of the value-added tax (VAT) on food items.

These examples underscore three important takeaways indicative of Ethiopia's cereals market. First, markets are still unable to absorb periodic shocks, as represented by the 2002 collapse. Second, although the shock was eventually managed through EGTE intervention, damage was already done as many farmers sold their crops (and possibly livestock later) before EGTE's intervention in 2001/02 and many farmers reduced input use in the following year. If a clearly defined price floor was in place, farmers would not have suffered these losses. Finally, instead of being transparent, the policy interventions in both 2001/02 and 2008 have been *ad hoc*, which has potentially shaken market actors' confidence and diminished the effectiveness of policy interventions.

1.3 MARKET ATTRIBUTES OF MAIZE

Market fundamentals determine both tradability and fluctuations of prices in maize. When a commodity plays a critical role in households' diets, such as maize in Ethiopia, variations in tradability and price can have serious implications for food security. The next two sub-sections examine the tradability and price volatility of maize.

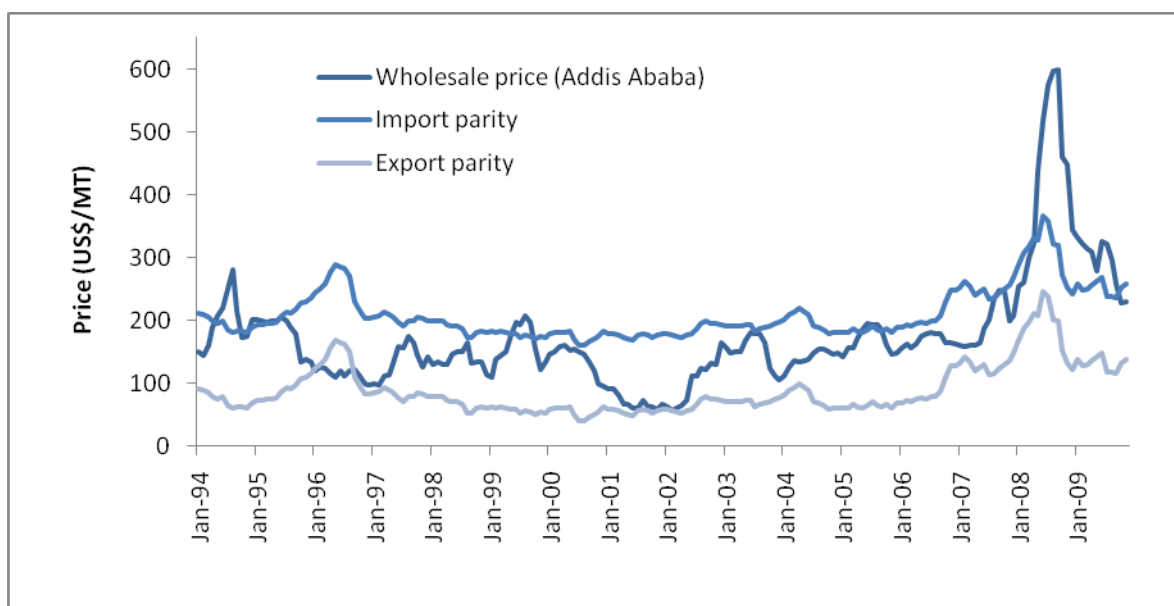
1.3.1 Non-tradability of maize

In Ethiopia, most cereals are non-tradable – meaning they are neither exportable nor importable. As a result, with the exception of food aid import, all major cereals are domestically grown and consumed. In Ethiopia, cereals are non-tradable due to high costs of transporting cereals both from the main port in Djibouti to primary consumption areas and from the main production areas to the port. Thus, the cost of transport is so high that it is not profitable to import or export cereals.

⁷ Because of the high price differentials, urban food rationing served as an income transfer program. According to data from an urban household survey administered by the WFP in June and July 2008, about 93 percent of recipient households immediately sold their ration on the open market, either to buy other cereals or to meet other consumption expenditure

One way to examine further the tradability of a commodity is through export and import parity prices, which represent prices at which a commodity will be exportable or importable. Figure 2 presents monthly parity prices and wholesale price of maize in Addis for January 2004 to November 2009, which shows that, with few exceptions, domestic prices have historically been within export and import parity prices. This implies that maize is not profitable to import or export. The exceptions are observed only in 2001/02, when the market collapsed, and in 2008 when the government had to ration foreign exchange due to a balance of payments problem.

Figure 2: Import and export parity price of maize (Jan 1994 - Nov 2009)



SOURCE: Rashid (2010)

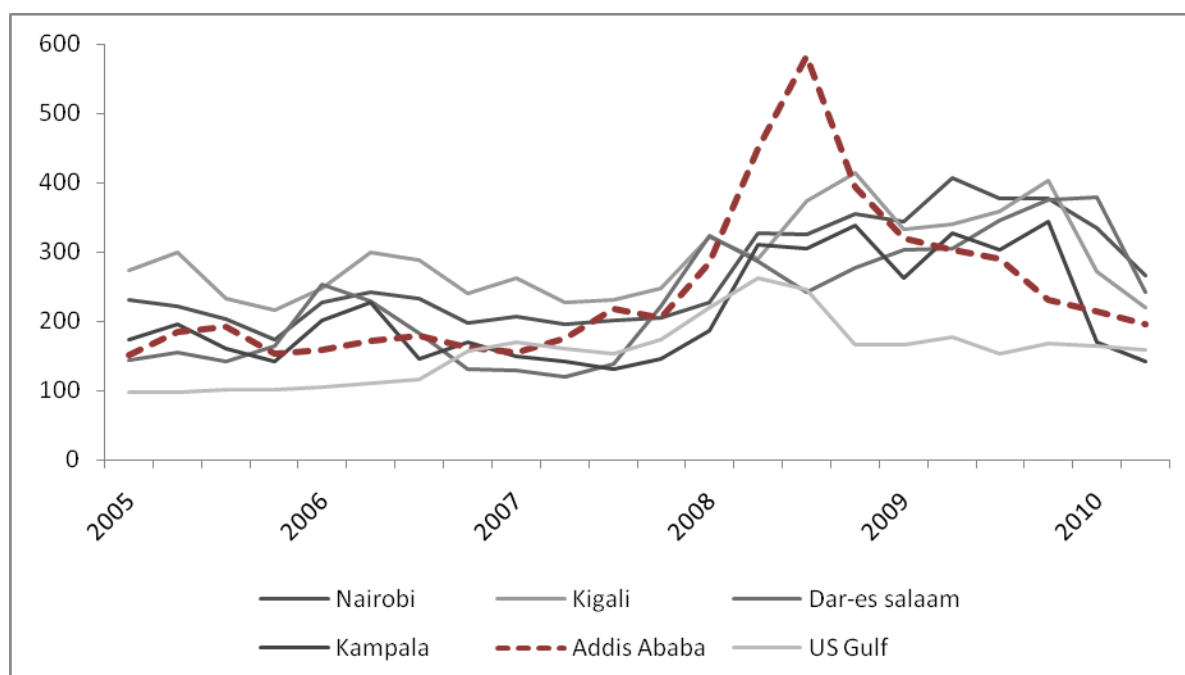
Figure 2 is constructed based on the US gulf prices for maize. Rashid and Assefa (2007) undertook a similar analysis using regional market prices and found that maize is not tradable regionally either. However, their study noted that the price difference between Nairobi and Sashamene (an Ethiopian market location on the main road to Kenya) averaged as much as USD 100 per ton, but that trade could still not occur due to prohibitively high transportation costs. Moreover, while macro policy reforms in the 1990s brought exchange rates to near equilibrium, leading to significant reduction in the distortions to agricultural incentives, the Ethiopian Birr became overvalued again in 2007 to 2008. The overvaluation of exchange rates along with rationing of foreign exchange led to the increase in the domestic prices to way above import parity in 2008. Once these issues were addressed domestic prices fell within the export and import parity again in 2009.

1.3.2 Price volatility

While price volatility is endemic to all markets, there has been excessive volatility in the Ethiopian maize market as demonstrated by the high standard deviation and Coefficient

of Variation (CV) in maize prices in Addis relative to other geographies in Figure 3. Variation of commodity prices between locations and over time is a natural market phenomenon. In fact, price variation is necessary for the existence of a market, as it creates the incentives that attract market actors to engage in trade when prices increase. Thus, it is not the variation in prices (across space and over time) *per se* that should be of concern to the policymakers, but rather excessive variability or, in some cases, little or no variability of staple food prices. Excessive variability of prices, to a large extent, is a reflection of a lack of market integration across space. On the other hand, little or no variability in prices has often been the outcome of policy interventions, such as pan-territorial pricing, which is what Ethiopia practiced in the 1970s and 1980s.

Figure 3: Ethiopian maize prices (USD/ton) and variability, 2005 - 10



| | Nairobi | Kigali | Dar-es Salaam | Kampala | Addis | US Gulf |
|-------|---------|--------|---------------|---------|-------|---------|
| Mean* | 235.8 | 262.5 | 206.5 | 182.2 | 198.8 | 135.8 |
| SD* | 76.0 | 75.9 | 82.8 | 75.6 | 109.2 | 44.5 |
| CV* | 0.32 | 0.29 | 0.40 | 0.42 | 0.55 | 0.33 |

* Mean, Standard Deviation (SD) and Coefficient of Variation (CV) are calculated based on monthly data from January 2000 to June 2010

SOURCE: Authors Compilation based on RATS, EGTE, and FAO database

Following market liberalization policies, cereal price variability has increased in Ethiopia, as would be expected. However, the higher variability of maize prices in Addis compared to neighboring countries demonstrates that there are structural bottlenecks in the Ethiopian maize market. For instance, as demonstrated in Figure 3, the Ethiopian maize market appears to be more volatile than world markets (represented by US gulf prices) and neighboring countries, with an estimated Coefficient of Variation (CV) of

0.55 relative to 0.33 and 0.42, on the world market and the next most volatile neighboring country, Uganda, respectively. Of the other three neighbors, Kenya appear to have lower volatility than Tanzania and Uganda, perhaps because Kenya is well integrated to the world market and continues to maintain a large food price stabilization program. In terms of price levels, maize prices in Ethiopia averaged about USD 299, which is much lower than all of its neighbors, except Uganda.

1.4 FUTURE POTENTIAL

Improving and strengthening the maize value chain in Ethiopia has the potential to generate significant benefits for small-scale producers. The benefits can be derived largely through productivity increases and improvements in marketing. Given that a very large number of smallholders are involved in maize production, increased productivity (e.g. achieving the potential productivity level demonstrated in on-farm trails) will directly benefit poor farmers only if marketing is simultaneously improved. This can trigger multiplier effects, including increased off-farm income and increased income from diversification to other crops. Furthermore, increased productivity can lead to better soil health management, as more can be produced from smaller land, providing farmers with opportunities to rotate crops and diversify their crop portfolios.

There are various estimates of Ethiopia's potential for maize productivity. On-farm trials suggest a yield potential of 4.7 tons per hectare compared to the 2008/09 national yield estimate of 2.2 tons per hectare^{xvii}. This implies that yield can be more than doubled. Yield growth potential for maize is much higher compared to other cereals, such as wheat, sorghum, and barley. Achieving the yield potential of maize would be possible through interventions such as improved technology adoption among smallholder farmers (e.g., chemical fertilizers, improved seeds, integrated pest management) as well as measures to reduce soil degradation (e.g., crop rotation), irrigation practices, and improved technical efficiency. Recommended interventions in other components of the agricultural system – soil health, irrigation, improved seed, finance, extension – are addressed in separate diagnostic reports.

Improvements in smallholder income from maize interventions can also be drawn from improvements in handling, storage and marketing:

- **Storage and handling.** Recent estimates on post-harvest losses for cereals range from 20 to 40 percent of gross production^{xviii}. Taking the lower bound estimate of 20 percent, and given maize production is 4.2 million tons, cutting post-harvest loss in half will result in an additional marketable surplus of 420,000 tons. This translates into increased food security, with a larger food supply, and improvements in smallholder income if surplus grain is marketed.
- **Marketing.** Benefits to smallholders can be increased by (i) improving the marketing and (ii) increasing their shares in the retailing:
 - **Improving marketing.** Currently, share of the farmers in the retail market is only about 4 percent^{xix}. Given the very long marketing chain, the smallholders do not

currently capture much value. This can be changed through improved aggregation, market linkages, quality control and better handling of post harvest practices.

- **Increasing shares in retailing.** Raising farmers' share of end prices is possible by improving the negotiation capability of farmers, such as through cooperatives and other institutional mechanisms and aggregation models. Exploiting opportunities from sources of demand such as ready markets (corn flour, corn starch, local food aid procurement) and large scale expansion of maize industry for latent demand sinks (poultry feed, ethanol, and safety net programs)⁸ are estimated to generate incremental revenue of more than USD 550 million.

At an aggregate level, the analyses in the diagnostic report suggest that there is a potential to increase smallholder income from approximately USD 60 per hectare today to USD 350 to USD 450 per hectare. This analysis is based on underlying assumptions about yield, waste reduction through post-harvest management, and availability of year-round market. For instance, the expected income growth to USD 350 is based on the assumption that smallholder farmers become high input users and increase their yield to four tons/ha. Under such an assumption, a farmer is likely to incur a cash cost of about USD 240 and generate an output value of USD 590, securing a cash margin of USD 350. If the potentials are realized, maize can also contribute toward improving food security and reducing land degradation (producing an incremental 1 million tons on 30 percent less land), as well as increase production value. For example, poultry industry can generate USD 360 to 580 million in value in 2020 and source maize for feed from 50,000 to 100,000 smallholders.

⁸ Capturing optional demand markets through expansion of large-scale maize industry is estimated to induce demand for maize more than double the current production size

2. Maize value chain diagnostic findings

2.1 VALUE CHAIN OVERVIEW

The maize value chain in Ethiopia involves multiple actors, including: input suppliers, producers, traders (local assemblers and wholesalers), retailers and processors, and consumers. Major actors, their activities, and the scale of operation of each actor are presented in Table 4. Note that there are many actors between the producers and the consumers, all performing various activities at different scales of operation, a model that can indicate inefficiencies in the value chain. For instance, a recent study found that a typical trader in Ethiopia operates within a radius of only 64 kilometers, suggesting that grains change many hands before reaching consumers, as grain often travels much further than 64 kilometers to consumers^{xx}. The large number of players along the value chain, and the fact that traders operate within a small radius, has important implications for marketing efficiency. It implies that spatial arbitrage takes place depending on personal relationships (or social capital), limiting long distance trade and increasing the price that consumers pay.

Table 4: Major actors, key activities, and average scale in Ethiopia's maize value chain

| Major actors | Key activities | Average scale |
|---|--|--|
| Farmer (smallholder farmers) | Production | Produce at a small scale. Sell only around 20% of produce, most immediately at harvest. Limited input use. |
| Local trader/ assembler/cooperative (Individuals in towns close to producing farms) | Assemble from farmers and sells to larger buyers typically transport grain on donkeys to nearest town | Transaction size about 1 ton and typically trade 4 market days a month |
| Wholesaler/unions (primary private individuals. Other actors include EGTE and commercial farmers) | Own or rent storage but usually do not store for more than one month. Use a broker to find buyers in Addis Ababa (main market) or other deficit areas | Typically have limited scale. Transaction of one truckload (about 5 tons). Typically trade 4 market days a month |
| Wholesaler (primary traders in major markets (for example, mercato in Addis Ababa). Other actors include EGTE and commercial farmers) | Use brokers to source grain from surplus areas. Own or rent storage and store grain for 1 - 2 months. Sell to retailers and processors | Transaction size around 10 tons. Sources from multiple traders/wholesalers |
| Retailer / processor (retail shops or processors in major markets (for example, Addis Ababa) | Directly (or through brokers), source grain from wholesalers. Clean grains and sell to end consumers. Little or no grain storage. Limited large-scale value addition | Transaction size of about two tons (retailers) |

SOURCE: Regional Agricultural Trade Supports (RATS) project study on maize value chain (2003), participatory rapid assessment, and expert interviews

Explaining the complexities of Ethiopian marketing chain, with full treatment of each of the actors, is beyond the scope of this paper. Therefore, the focus of the analysis has been on three broad stages: production, aggregation and trade, and consumption (demand sinks). The underlying objective is to understand the opportunities and constraints observed in each of the three stages in order to systematically identify appropriate intervention strategies for each stage of the value chain. The following three sections will examine production, aggregation and trade, and consumption (demand sinks) separately.

2.2 FINDINGS ON THE PRODUCTION SYSTEM

Cereal producers in Ethiopia are primarily smallholder farmers. They face a range of constraints across the value chain from production to aggregation and trading to commercialization that limit their productivity and incomes. For instance, smallholders often make limited use of commercial inputs, have low bargaining power, and sell only about 20 percent of their produce on average. Producers sell the majority of their produce immediately after harvest when the price is lowest, because of urgent cash needs (including loan repayment) and fear of risk due to storage loss⁹. The results of the value chain analysis on production are presented in the following two subsections, namely an overview of the domestic production systems and major challenges in the production system.

2.2.1 Overview of domestic production

Production – involving input acquisition, planting, growing, and harvesting – is the key activity in the maize value chain. Maize production activity is performed by three types of actors: subsistence farmers, market-oriented smallholders, and commercial farmers.

Subsistence farmers are by far the major actors as maize producers both in terms of numbers and in terms of total product volume. These actors are characterized by small land ownership (usually less than 2 hectares) and low utilization of yield enhancing technologies such as hybrid seeds and chemical fertilizers. At an aggregate level, less than 5 percent of the farmers use high yielding seed and 5 percent of the farmers apply chemical fertilizers^{xxi}. Women are involved in maize production at different stages, including 60 percent of the maize processing in Ethiopia, and family labor is the major source of farm labor. Most farmers use traditional methods of shelling, such as hand shelling and beating sacks for shelling. They also use traditional facilities for maize storage, such as *dibignit* and *gotera* mud structures, which are likely to increase post-harvest losses.

⁹ Most of the marketed volume of maize (60 percent) is marketed during January, February, and March (immediate periods following the harvesting and threshing time of November and December). The remaining 25 percent is sold during April, May, and June, 14 percent during July, September, and October, and 2 percent during October, November, and December

There are several estimates on marketed surplus of maize, a measure of commercialization, ranging from 15 to 30 percent of total production^{xxii}. This is mostly sold by the second group of actors in maize production – market-oriented smallholder farmers – which account for roughly 40 percent of total holdings. These producers own relatively more land (2 to 5 hectares), hire temporary labor, use manually operated machines for some operations (for example, for maize shelling) and make more use of improved technologies such as seeds and chemical fertilizers. Market-oriented smallholder farmers sell a considerable proportion of their maize produce (around 40 to 60 percent).

The value chain network functioning around smallholder farmers comprises linkage among input suppliers (private), farmers, cooperatives, extension service providers, credit service providers, and traders. Where cooperatives are well developed and organized, they tend to provide input supply and product marketing services to smallholders.

The third type of maize producers is commercial farmers, including some that also produce hybrid maize seeds. While such commercial farmers are few in number, they operate at a relatively large scale (more than 50 hectares of land per farm), and are mechanized in their plowing, harvesting, and shelling activities. They also have better storage facilities, use improved seeds, chemical fertilizers, and hire laborers. This group of farmers operates mainly in Amhara and Oromiya regions and many of them specialize in seed production. They sell their products to wholesalers in surplus areas and to EGTE, and in the case of seed producers, to cooperatives and Bureaus of Agriculture and Rural development (BoARDs).

2.2.2 Production stage challenges and opportunities

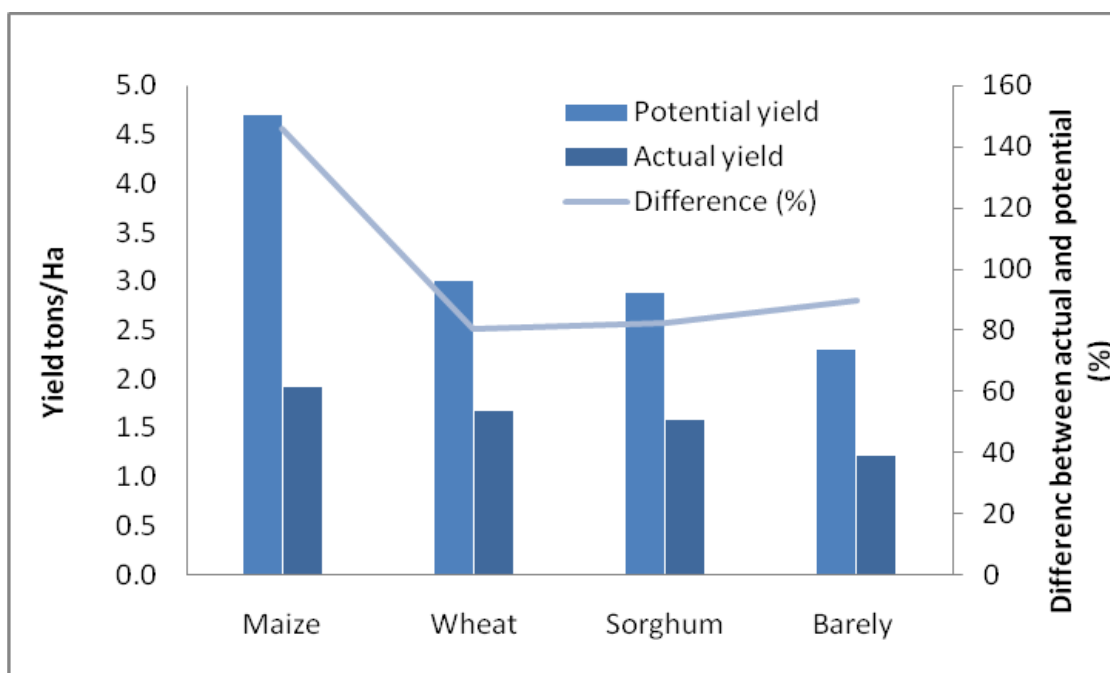
Maize farmers in Ethiopia face a series of challenges that limit their overall production and income. The key challenges can be broadly categorized into three groups: (i) lower yields due to limited use of modern inputs; (ii) majority of sales immediately after harvest; and (iii) high post-harvest losses (both on- and off-farm).

Lower yields due to limited use of modern inputs

To address the first challenge, GOE has placed heavy emphasis on increasing cereal productivity in all of its policy strategies, especially in PADETES. As a result, compared to other cereals, maize yield has grown faster in recent years. For instance, during 2003 to 2007, average maize yield was 1.9 tons per hectare compared to 1.7 tons/ha for wheat, 1.6 tons/ha for sorghum, and 1.2 tons/ha for barley^{xxiii}.

However, among all major cereals, maize still has the highest potential for additional yield gains (Figure 4). During 2003 to 2007, maize yield has averaged 1.9 tons compared to a conservative estimate of yield in farm-level trials of 4.7 tons, giving a difference between potential and actual as 146 percent of current average yield. For all other major crops, the gap between potential and actual yields, as percentage of actual yield, is within 80 to 90 percent.

Figure 4: Actual and potential yields of major cereals, 2003 - 08



SOURCE: Authors' calculation from CSA data and World Bank Memorandum (2006), potential yields based on on-farm trials

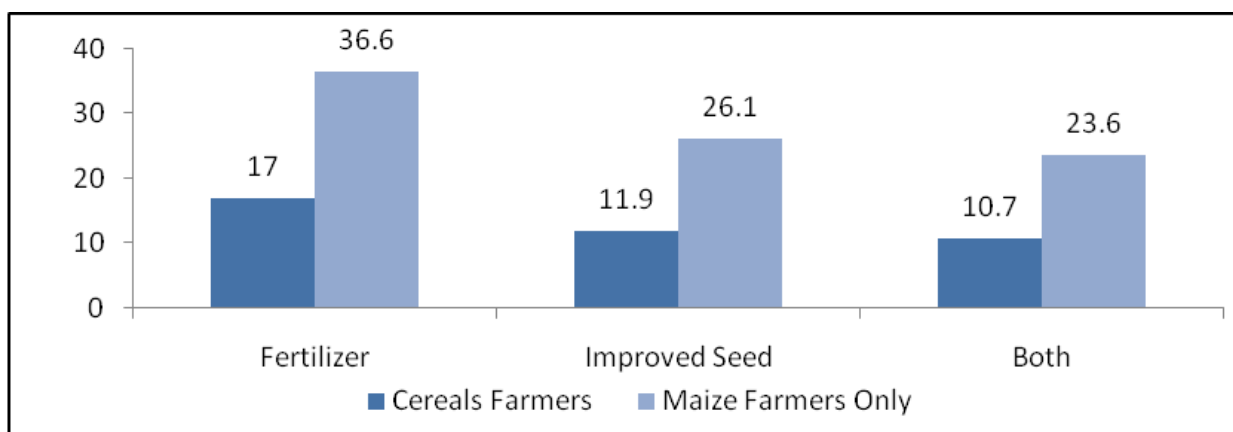
Available statistics suggest that potential maize yields have not been realized due to limited use of modern inputs, such as hybrid seeds and chemical fertilizer. Estimates from a recent household survey, jointly conducted by IFPRI and EDRI in 2008, provide the most up to date evidence on the status of modern input use in the country¹⁰, as presented in Figure 5. This indicates that only about 17 percent of all cereal growers in the country used fertilizer and 12 percent used improved seeds. The numbers vary widely across regions, ranging from about 36 percent in Amhara to only 2 percent in Tigray.

Estimates of chemical fertilizer use for maize cultivation are significantly higher than the national average for the cereal growers. Roughly 37 percent of the maize farmers used fertilizer, more than twice the national average of 17 percent for all cereal farmers. Similarly, an estimated 26 percent of the maize growers used improved seed, which is again more than twice the national average for all cereals farmers.

Note that to achieve the yield potential, a farmer has to use both modern seeds and chemical fertilizer along with good farm management. Again, estimates in Figure 5 indicate that, only about 11 percent of all cereal growers used both improved seeds and fertilizers, which is less than half the proportion of maize farmers.

¹⁰ The IFPRI-EDRI survey included about 2,000 households and was representative of all cereals growing regions

Figure 5: Percent of Ethiopian farmers using modern inputs, 2008



NOTE: The averages are sample weighted average, not simple average of the regions

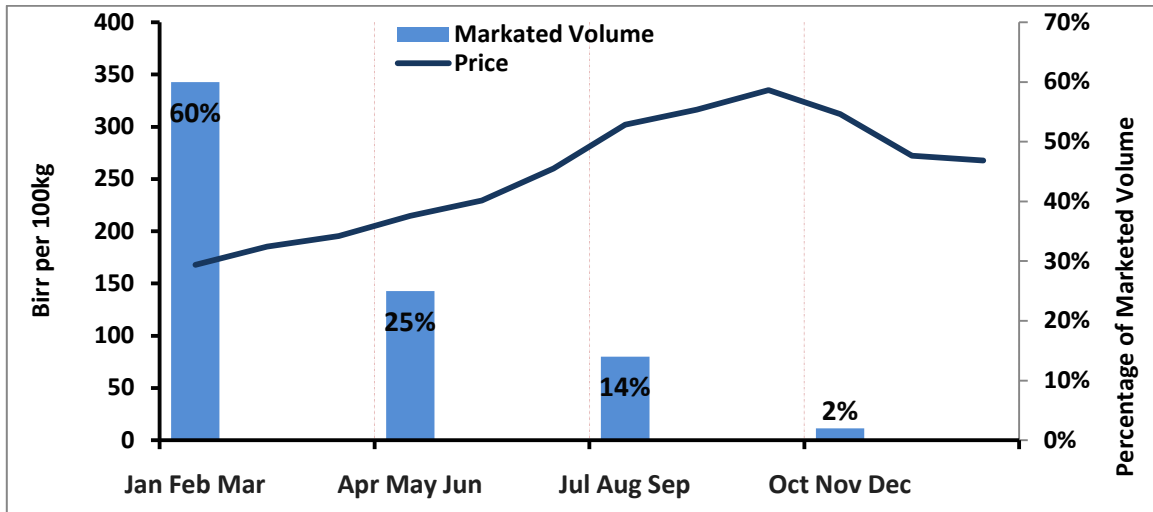
SOURCE: Authors' calculations IFPRI-EDRI household survey, 2008

Majority of sales immediately after harvest

The second challenge that Ethiopian maize farmers typically face is distress sales immediately after harvest – Figure 6 illustrates the challenge. This demonstrates that 60 percent of the total marketed volume is sold during the first three months after the harvest and another 25 percent in the next three months. By the time prices peak, farmers are left with only 16 percent of the market volume. The maize that is marketed during the lean period is supplied by a few large traders, implying that the benefit from higher prices does not accrue to smallholders.

The uneven distribution of maize marketing inter-annually is not unique to Ethiopia. Farmers in most developing countries exhibit similar marketing patterns, selling during the period immediately following harvest, due to liquidity constraints, lack of adequate storage, and uncertainty in price variability. However, in Ethiopia, this appears to be particularly severe. The methods and timing of harvest, as well as traditional storage facilities (mud pits, *gotera*), pose higher risks of pest infestations, disease and quality deterioration than many other developing countries. Moreover, farmers also have to repay loans, pay for children's school fees, and meet other financial obligations during the first three months after the harvest. As a result, farmers often find it profitable to sell immediately after harvest despite low prices.

Figure 6: Price movement and timing of maize sales



SOURCE: Price Source: EGTE, marketed volume data are based on Abebe and Hundie (2002) and participatory rapid assessment in January 2010.

High post-harvest losses

The final major challenge that maize farmers face is the high post-harvest losses, with estimates varying from 20 to 40 percent of the gross production^{xxiv}. The rapid assessment conducted for this study suggests a slightly lower level of 15 to 30 percent; with losses concentrated at the farm level. Losses were found to be driven primarily by the timing of harvesting, shelling methods, and the type of storage devices. On-farm storage structures, such as *dibignit* and *gotera*, can also make maize susceptible to different types of damages, including weevil and rodent attacks, which cause substantial loss of stored grain. Moreover, harvesting and crop management practices are sub-optimal in the sense that there are losses resulting from improper handling, threshing, and transporting.

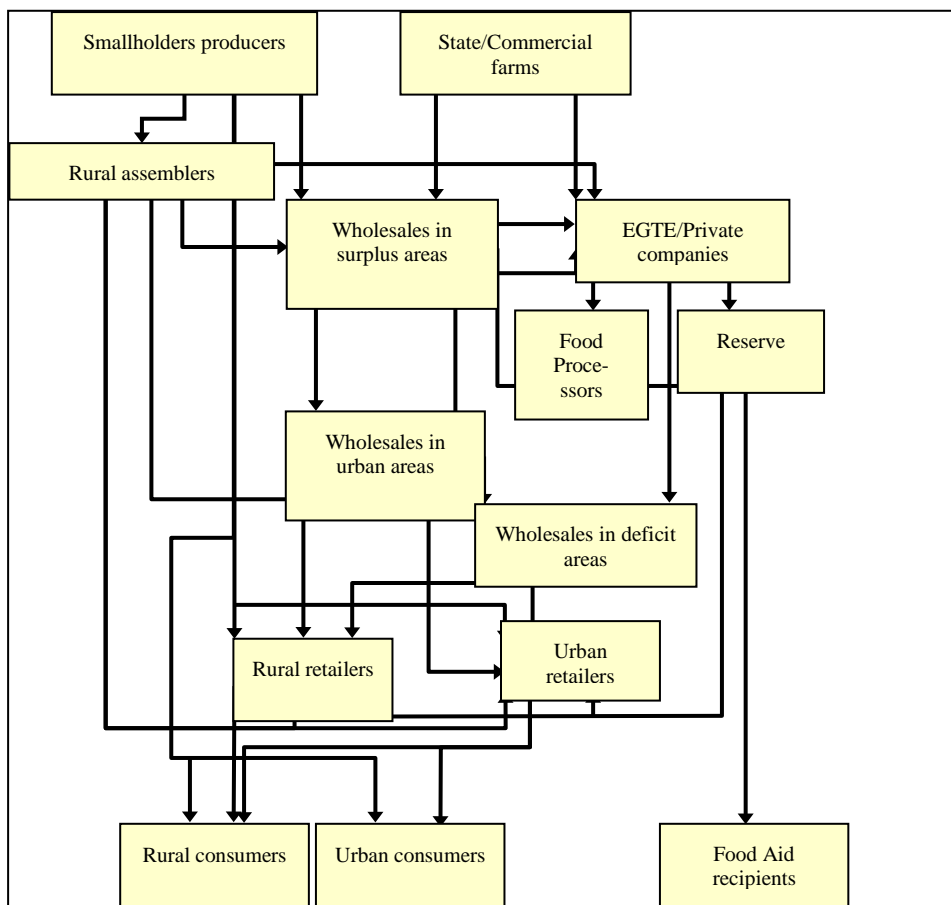
The benefit of crop rotation is worth noting. Current crop rotation practices in Ethiopia, which leave about one-third of the maize cultivated area without rotation, lead to soil nutrient loss and to pest infestation. Loss of nutrients such as nitrogen, potassium, and phosphorous is estimated to be about 122, 82, and 13 kg/ha^{xxv} due to lack of appropriate rotation practices. If smallholders are able to employ crop rotation with the proper amount of input usage, this could result in a possible yield increment by nearly 150 percent as outlined above. Methods to improve soil health are further explored in the separate soil health diagnostic report.

2.3 AGGREGATION AND TRADING

Increasing maize productivity will benefit smallholders only if the marketing activity (aggregation and trading) is well developed. By serving as a channel to transfer products to intermediate and final consumers, a well developed marketing system creates the economic incentive for producers to invest in production and productivity enhancing activities. Although most maize produced in Ethiopia is used for on-farm consumption, the maize that is marketed faces a market characterized by poor coordination, low scale

and volume of operation, high cost and high risk. Such bottlenecks in maize marketing reflect inadequate market fundamentals, leading to weak industry structure with adverse consequences for all actors in the value chain from smallholders, to traders and consumers. The long and complex maize marketing chain in the country (Figure 7) exemplifies the inadequate maize market fundamentals.

Figure 7: A typical maize marketing chain in Ethiopia



SOURCE: RATES 2003; Expert Interviews; Field Visits

The maize marketing chain is not only long and complex; the scale of operation at various stages is also very small (Table 5). A typical local trader / assembler transacts about one ton of maize (worth about USD 300) four times a month during the peak periods, which goes up to three to five tons in the case of traders in the surplus areas, and to 10 tons a week for the wholesalers in Addis Ababa. Most local traders do not have their own trading premise or storage facilities. In terms of storage capacity and financial ability to store, only traders in the large terminal markets can store maize for one to three months.

Table 5: Typical trading volumes along the value chain

| Agent | Trading volume |
|-----------------------------------|---|
| Local trader/assembler | <ul style="list-style-type: none">• Transaction size approximate to 1 ton• Typically trade 4 market days in a month |
| Trader (surplus area) | <ul style="list-style-type: none">• Transaction size approximate to 3 to 5 tons (one ISUZU truck)• Typically trade 4 market days a month• Turnaround time of 3 to 5 weeks |
| Trader (Addis Ababa/deficit area) | <ul style="list-style-type: none">• Transaction size approximate to 10 tons a week• Own or rent storage and usually store grain for 1 to 3 months |
| Retailer | <ul style="list-style-type: none">• Transaction size approximate to 2 tons (retailers) |

SOURCE: RATES Maize Value Chain Study [2003]; expert interviews; field visits

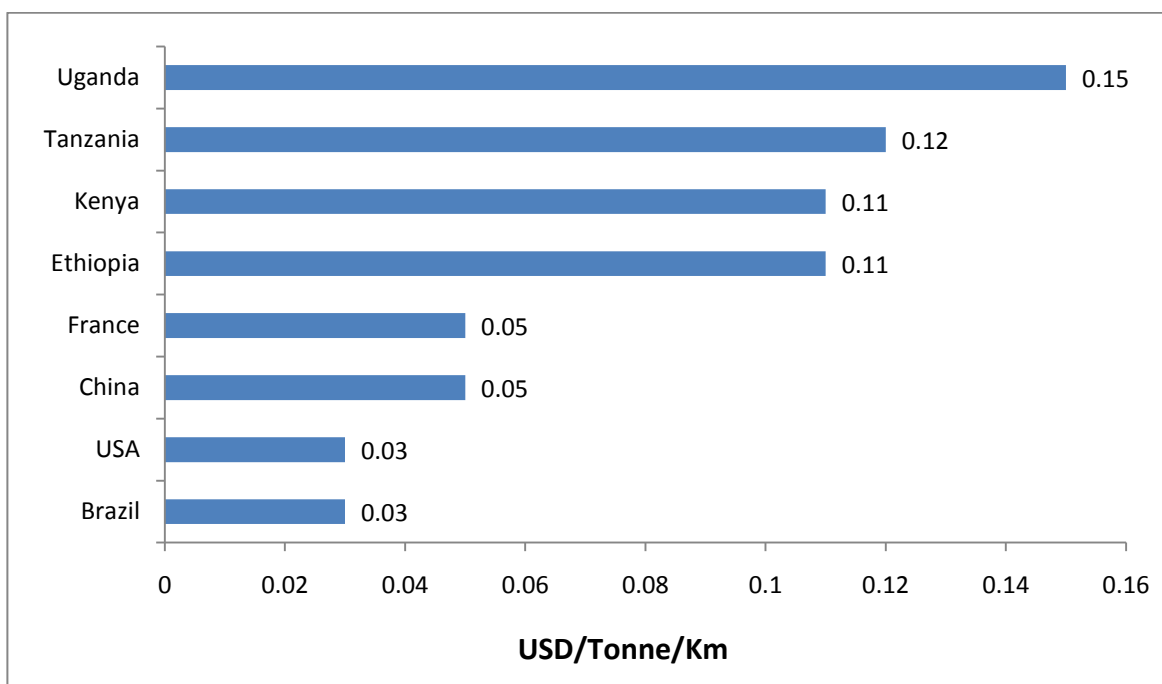
2.3.1 Market fundamentals

Building infrastructure, addressing information asymmetry, and supporting institution building are widely recognized as the government's responsibility. Simultaneously, these are also commonly cited as the sources of market failures. Following is a discussion on the status of each of these market fundamentals.

Infrastructure building

While Ethiopia has made remarkable progress in reducing transaction costs and improving overall infrastructure during the past decade, the country's maize market is still characterized by inefficient movement from surplus to deficit areas. Ethiopia is a geographically diverse country and maize from surplus areas needs to move long distances to eventually reach the consumers in the deficit areas. In the current market structure, maize primarily moves through the Addis Ababa market, which is considered as a source of market information and center of price discovery. Transporting most maize through Addis often adds to transactions costs and thus the final prices that a consumer in the deficit area pays. Furthermore, while there has been reduction in average transportation costs per kilometer in recent years, there is room for further improvements (Figure 8). In particular, although Ethiopia's average transport costs of USD 0.11/t/km fares well compared to its neighbors, it is still more than two times higher than in China and three times higher than in Brazil:

Figure 8: Long-distance transportation cost in selected countries (USD/ton/km)



SOURCE: World Bank (2009)

Institution building

Despite the Government of Ethiopia's efforts in institution building, the functionalities of the key institutions such as credit, insurance, and risk management are still limited. The following four examples demonstrate the need for continuing development of key institutions. Table 6 presents a summary of these examples.

Table 6: Summary characteristics of enabling institutions in Ethiopia

| Institutions/ organizations | Expected role | Current reach/coverage |
|-----------------------------|---|---|
| EGTE | Historically, EGTE was responsible for price stabilization; but its mandate has changed over the years. By a 2002 proclamation, price stabilization role was eliminated, but was re-instated following 2008 food crisis | Very limited role in terms of its market share and reach to the smallholders. It's primarily purchases at the local market level; responsible for imports; gathers price information; and have intervened in markets occasionally |
| Credit (Banking) | Providing financial access to various actors in the value chain. | Bank branch to population has improved from 1:250,699 in 1998 to 1:156,128; but still limited access |
| Insurance | Risk management in case of shocks, accidents, and other losses | Insurance branch to population ratio has improved from 1:780,658 in 1998 to 1: 539,350; but it is very low access |
| ECX | Price discovery, risk management, alleviation of liquidity constraints through Warehouse Receipt System | 100% coverage for coffee and oilseeds and pulses by law; limited coverage for cereals |
| Cooperatives | Risk pooling, technology diffusion, product aggregation, price negotiations, and better marketing | Limited coverage; limited management skills; and weak overall human capacity |

SOURCE: Authors' characterization

- EGTE.** EGTE was initially mandated to stabilize domestic prices of main staple cereals, thereby reducing the risk of volatile prices for consumers and suppliers. However, it has been given conflicting mandates over the years. One proclamation indicates that EGTE is required to stabilize prices, perform on a commercial basis, and earn foreign exchange. The conflict occurs where the mandate of price stabilization, which is a social function requiring subsidies, competes with the mandate to earn foreign exchange which requires making profits, which is not a social function. Furthermore, EGTE intervenes as and when necessary, making such interventions *ad hoc* while sending inconsistent signals to the actors in the value chain. Moreover, EGTE purchases on an *ad hoc* basis, without set rules such as price floors to protect farmers from further price decline, and usually intervenes immediately after harvest while it sells the stocks around the year. EGTE's market sales would be more strategic in terms of achieving price stabilization if instead they were concentrated in lean seasons when maize supply to makers is limited. In recent

years, EGTE has also been mandated to export coffee and pulses, which may limit its role in cereal markets due to capacity constraints.

- **Credit and insurance.** Ethiopia has made significant progress over the last ten years with regard to the provision of credit and insurance. Specifically, the ratio of bank branches per capita has increased from one branch to 250,000 people in 1998 to one branch to 156,000 people in 2008. This is almost a 60 percent improvement, but still extremely low density of bank branches relative to total population. In 2008, the country had 562 bank branches of which almost 35 percent were in the urban areas, implying that access to banking in rural areas was very limited. Similar characterization can be done for insurance sector. Insurance is also limited in rural areas, especially as, there is no agricultural or crop insurance¹¹.
- **ECX.** The Ethiopian Commodity Exchange (ECX), a national commodity exchange, has received wide range of media coverage for its design, use of modern technology, management and other institutional attributes. However, its role in cereal trade has so far been limited. In fact, since a government proclamation mandated that coffee be traded through the exchange, ECX has primarily been focused in that area at the expense of trading in cereals. A recent proclamation, which requires all oilseeds and pulses exports to go through ECX, may further delay the development of trading in cereals as ECX has been wise to carefully and deliberately roll out new initiatives to guard against overextending its capabilities.
- **Cooperatives.** Since early 2000, GOE has provided strong support to the development of agricultural cooperatives with an objective to improve smallholders' links to the markets. The policy environment for cooperative development has improved tremendously, and there is an ongoing manpower capacity building effort. In 2009, the number of multipurpose agricultural cooperatives operating in different parts of the country was approximately 6,725. These cooperatives are mainly engaged in providing commercial inputs to farmers and in marketing agricultural products of farmers. Nevertheless, according to a recent study, the size of cooperative membership is small, the commercialization impact of cooperatives is limited, and incentives for cooperative participation are poor^{xxvi}. The same study reports that only 40 percent of farm households in 2006 had access to a cooperative in their peasant association; and that in peasant associations where a cooperative exists, only 17 percent of the households had membership in the cooperative. Among other things, as summarized in the box below, the internal environment of cooperatives (poor management and low participation of members) contributes to the slow development and impact of the sector.

¹¹ Refer to the agricultural finance diagnostic report for more details

Lack of Professional Management within Cooperatives

- Management issues

Only one salaried management employee (accountant), with limited professional and educational experience.

Less savvy than traders and other intermediaries (for example, limited knowledge of demand and price information).

Need for training in the areas of purchasing, bookkeeping, business development, market information gathering and storage management

- Weak relationships with the unions

Coop union is responsible for a large number of cooperatives and unable to support them (for example, not providing loans).

Limited trust between cooperatives and unions (for example, cooperatives unsure if dividends will be paid in cash or shares).

Some cooperatives prefer not to go market through unions, thereby limiting access to large demand centers.

- Limited/no access to finance

Limited financing available from unions due to capacity constraints; cooperatives have limited direct access to commercial banks due to lack of sufficient collateral.

Financing limits day-to-day operations of cooperatives (for example, unable to buy volume from farmers, forced to turnover quickly).

SOURCE: Authors' observations from field interviews conducted in Bako in 2009

2.3.2 Consequences of inadequate market fundamentals

Inadequate market fundamentals result in a weak industry structure, manifested by:

(i) fragmented demand and supply, (ii) absence of year-round markets, and (iii) a lack of depth in the market. A discussion of these three factors follows.

Fragmented demand and supply

First, the fragmentation of trade is evident in the small transactions sizes (1 to 5 tons) and the small volume that is traded through cooperatives. One primary cause of fragmentation is that traders are not strategically linked to each other. Fragmented trading, and hence small business volume, precludes traders from reducing the unit cost of operation through necessary scale and from investing in storage required to take advantage of temporal arbitrage. Fragmented trade applies on both the supply and demand side:

- **Fragmented supply.** Given the small size of supply from individual farmers, operating a warehouse of 5,000 tons capacity will require aggregation of grain from about 15,000 smallholders. Aggregation through cooperative marketing provides a scale advantage both to the producers and traders. However, the amount of grain

aggregated and traded through cooperatives is limited, largely due to underdeveloped cooperative structures swamped by management and financial constraints. The cooperatives are unable to carry out a year-round, liquid trading function, primarily due to management and governance related challenges such as weak management capacity, lack of role clarity between board and managers and insufficient access to working capital.

- **Fragmented demand.** Small number of large buyers against many small retailers leads to fragmented demand.

Second, fragmented demand and supply results in a lack of large scale aggregation and storage, which in turn leads to an absence of year-round market. Underdeveloped aggregation and storage practices are results of various factors, including limited scale and storage capacity of private trade, little volume traded through cooperatives, and lack of quality control. Risk and fear of *ad hoc* government intervention of different forms and lack of adequate working capital limits the storage and aggregation capacity of the private sector. The box below presents the reflection of some key value chain actors with regard to the various risks they face. Problems related to poor management at cooperatives and lack of finance, together with mistrust of members in cooperatives as a result of bad legacy, affect the performance of cooperatives in terms of aggregating grains.

Market actors' opinions

"Government has the right to protect the consumer but the interventions make it risky for me to buy and hold large quantity of grain" ~ *Trader in Bako*

"It is very difficult to get financing, much harder [for maize] than for some other crops" ~ *Trader in Shashemene, Awasa*

"Almost every decision [relating to cooperative purchase] needs board approval, so buyers do not wait and find another trader" ~ *Union manager in Awasa*

SOURCE: Authors' research

Finally, the lack of depth in the maize market, particularly of quality maize, creates supply shortages, especially for large buyers. Large buyers face challenges in procuring consistent supply of quality maize. As such, processors prefer procuring maize from commercial farms over smallholders, typically seeking to secure their own maize production before investing in processing activities. Currently, there is not a formal quality control infrastructure, such as instruments to check for consistency in size, color, and level of moisture content. Instead, traders and cooperatives lack the appropriate storage structures like ventilation and handling facilities; chemical treatment practices are inefficient because of lack of appropriate facilities, and; quality control is usually made visually and based on mutual trust with producers. The lack of quality control is of particular concern regarding the presence of aflatoxins, a carcinogen, in maize (see box below). Developing appropriate standards around acceptable levels of aflatoxins, as well

as encouraging pre- and post-harvest treatments, such as through better storage facilities, is an essential component of future interventions in the maize market.

Minimizing risk of aflatoxin, improving food safety

The lack of quality control standards for maize in Ethiopia is of particular health and economic concern with regard to aflatoxin, a carcinogen and mutagen that occurs in variety of crops including cereals, oilseeds, spices, and tree nuts. Chronic exposure to aflatoxin has serious health effects for humans and other animals, resulting most noticeably in liver tumors, liver cancer, and death. Aflatoxin is often referred to as a "silent killer" as it can take long periods of continual exposure for negative health effects to occur, though immediate death, while rare, may occur.

Aflatoxin is prevalent throughout East and West Africa. One study shows that 90 percent of Africans tested show evidence of aflatoxin exposure, and in parts of West Africa exposure is as high as 99 percent. Similar to East Africa and most of West Africa, Ethiopia has a serious problem with aflatoxin, though the exact levels of exposure are uncertain due to a lack of data or testing.

While aflatoxin is prevalent throughout the continent, few countries in Africa routinely test for aflatoxin in maize that is not exported or bought by a major buyer (e.g. food processor, WFP). For instance, within Ethiopia, a national standard has yet to be set for "acceptable levels" of aflatoxin. However, some large buyers, like WFP, have already set such standards for food purchases and donations. It is likely that ECX will have similar standards in the future.

Aflatoxins not only pose a serious health risk, but also a significant economic risk to farmers should their crop be rejected from buyers. For instance, in Kenya two WFP purchases were recently confiscated and destroyed because of unacceptable levels of aflatoxin. This is of particular concern to smallholders as aflatoxin occurs primarily where there is high moisture content and high temperatures, which is often driven by inadequate storage structures.

Any recommendation that seeks to increase the productivity of maize must consider the health and economic risks that aflatoxins pose. Smallholders who depend on maize for livelihood improvements yet do not take preventative measures for aflatoxin risk either (i) severe health repercussions from consuming high levels of the toxin, or (ii) significant economic risks from having supply rejected from the commodity exchange, exporters, processors, or other buyers.

So what is the solution for aflatoxin? Although there are some promising avenues for pre- and post-harvest treatment of infected maize, treatments will be expensive. In developed countries, it is estimated that pre- and post-harvest interventions to combat aflatoxins add approximately 20 percent to the cost of the product to consumers. To date, no pre- or post-harvest treatment has been implemented at any scale in Ethiopia (nor elsewhere in Africa). Moreover, the cost of aflatoxin treatment must be considered alongside the other investments asked of smallholders to improve productivity such as improved seeds, fertilizer, and irrigation. In sum, combating aflatoxin will require a combination of quality standards and testing, proper pre- and post-harvest interventions, and extension interventions to increase awareness around the health and economic repercussions of not preventing the toxin in maize.

SOURCE: Authors

Quality control services are limited because there is not a market for differentiated qualities of maize, except basic differentiations such as white versus yellow maize and insect infested versus clean maize. Moreover, there is limited market incentive to award product quality, and the private sector lacks capacity and scale to invest in quality control facilities. Such constraints lead to loss of farm income because farmers are unable to satisfy demand for higher quality grain that can command higher price, including trading maize on the Ethiopian Commodity Exchange (ECX), supplying to food-aid organizations that have quality standards, and entering into contracts with agro-

processors. Similarly, traders and cooperatives are not able to fully exploit benefits from temporal arbitrage.

The lack of year-round market, price instability, and lack of depth have adverse consequences for all actors in the value chain as described below:

- **Smallholders** receive a low price at sale for their grain and have a constant fear of losses due to infestation and price crashes, particularly during a bumper harvest. In addition, smallholders have a very thin market outlet in the pre-harvest season.
- **Aggregators** (cooperatives and traders) also receive low price at sale and have limited maize trading activity during the pre-harvest season.
- **Processors and downstream actors** (both current and potential actors) are challenged by an inconsistent supply of quality grain and significant price volatility, particularly if they are sourcing from smallholders. Further investment in downstream activity is also being discouraged by perceived difficulty to get supply.
- **Consumers** are faced with a situation in which their cheapest calorie source is seasonal with significantly higher prices in the pre-harvest season.

2.4 SOURCES OF DEMAND

The degree to which maize can enhance smallholder livelihood and contribute to overall economic growth depends on the extent to which latent demand can be accessed at the end of the value chain. End market opportunities are major drivers of value chain dynamics. Developing strong downstream demand for maize is critical to strengthening the value chain as it provides farmers with reliable incentives to boost productivity. Export markets, processing industries (poultry and animal feed and bio-fuel production), domestic household consumption and procurement for food aid could provide ample end-market opportunities for maize. It is estimated that such "demand sinks" could absorb as much as double the current production of maize. Nevertheless, this is in contrast with the current situation where by on-farm consumption is the largest demand sink, especially as there are few large downstream buyers and insignificant processing activity. This presents challenges for any increase in maize production over current levels.

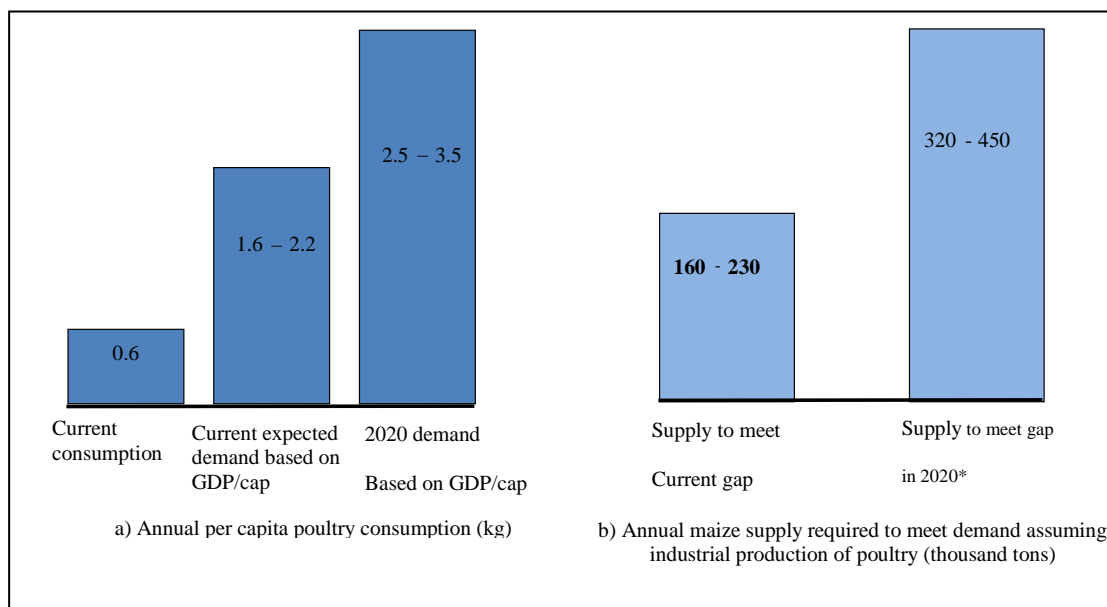
Below is an examination of possible demand sinks for maize within Ethiopia. Of the options below, capturing latent food and feed demand appear to be the most attractive demand sinks in the long term based on economics and Ethiopia-specific constraints.

Food demand

A preliminary analysis of potential demand indicates that there is a large food demand from unmet local consumption for food aid (cereal demand of approximately 500,000 tons for relief and additional 300,000 tons for safety net programs) with ready buyers. Maize is the most suitable crop for unmet consumption, as wheat is 30 percent more expensive per ton, and teff is over 100 percent more expensive^{xxvii}. Moreover, The World

Food Program (WFP) was already procuring 40 percent of food aid import locally before a procurement ban¹², suggesting that they are a ready buyer.

Figure 9: Expected poultry demand in Ethiopia and derived maize demand of the poultry industry



* Estimated based on historical population and GDP per capita growth and correlation between GDP per capita and poultry consumption

SOURCE: FAO; Global Insights; interview with poultry farmers

Feed demand

There is also latent feed demand from shifting to grain-fed poultry and other livestock and capturing latent livestock demand. Analyzing the poultry industry as an example of broader feed opportunities, it can be concluded that poultry production in Ethiopia today is substantially below expected levels given GDP per capita. Moreover, the poultry industry is relatively unproductive due to limited use of quality feed. Closing these gaps could create a poultry industry worth USD 360 to 580 million by 2020, requiring annual supply of 320,000 to 450,000 tons of maize. Figure 9 illustrates current poultry demand, in contrast with the expected demand given current levels of GDP, as well as the expected demand in 2020 based on an increase of GDP. In addition, the maize supply required to meet this demand is shown.

Conversely, exports and bio-fuels are less attractive demand sinks.

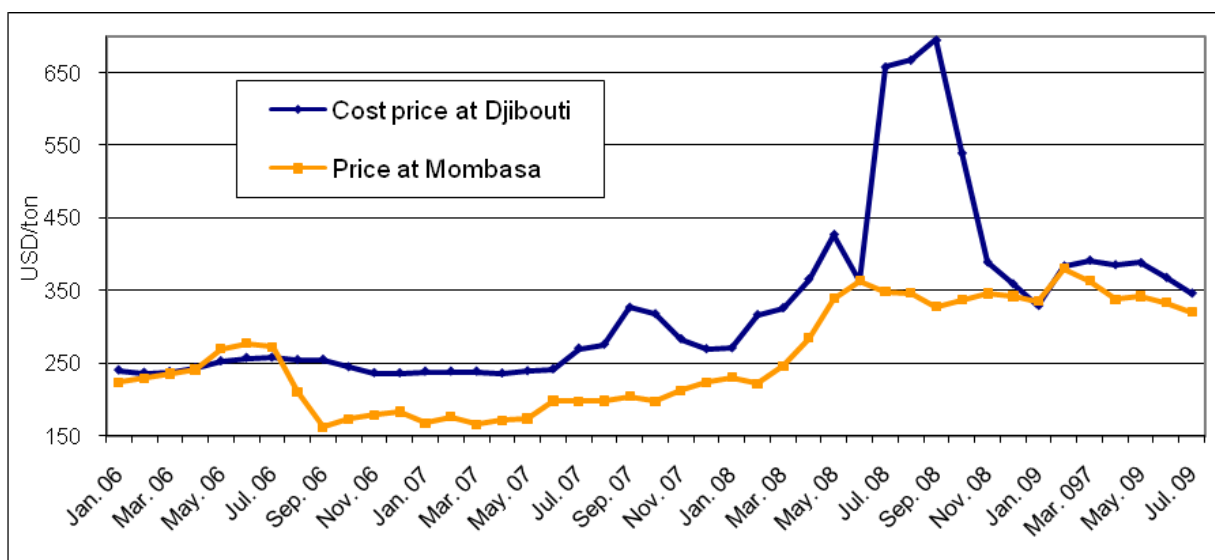
¹² The local procurement ban has been lifted for the P4P program (WFP), which is allowed to purchase 40,000 tons locally

Exports

As examined in section 2.3.1, maize is not an attractive crop for export. The domestic price for maize is often above the export parity, implying that traders will make less money when selling maize internationally. This is compounded by high transport cost, making export less attractive.

Although Ethiopia has geographical proximity to the Middle East and East African regional markets, as a land-locked country, domestic land transport is expensive and makes exporters uncompetitive. For instance, direct linkage to Kenya through road transport is not well developed and cost of transport via Djibouti is not likely to be competitive – transporting a ton of grain from Addis Ababa to Djibouti costs USD 80 per ton. Figure 10 illustrates that the border price (excluding shipping cost) at Djibouti is more than the price at Mombasa (Kenya), making it unattractive for Ethiopia to export to the Kenyan market.

Figure 10: Export price of maize at Djibouti and price at Mombasa



SOURCE: EGTE; FAOSTAT; RATIN; WFP; year for each case

Bio-fuels

Bio-fuels have high potential from a production perspective, but current economics suggest that price per gallon would be higher than historical imported price of fuel. The economics are further hindered by transportation costs of fuel exports – local demand for gasoline is limited, so reaching scale in bio-fuels production would require the ability to export, which is likely unviable at current prices given transportation costs.

In sum, the end-market opportunities identified (local unmet consumption, local processing for import substitution, and exports to neighboring countries) are estimated to demand around 315,000 tons, or USD 42 million, of maize. Provided that the market is

competitive and some of the market hurdles are removed, the demand side is quite encouraging to absorb and allow more supply.

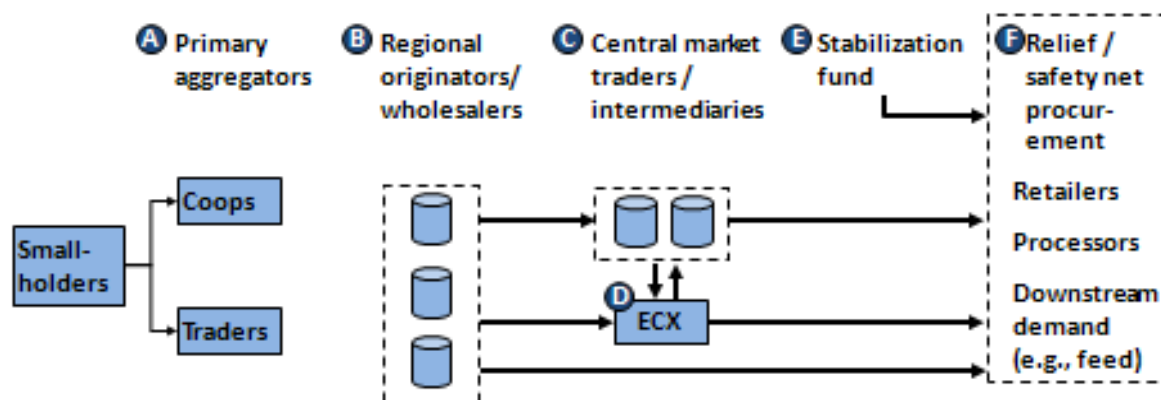
3. Recommendations

In the context of developing the maize sub-sector of Ethiopia toward improving the income of smallholders and supporting the overall economic development process of the country, it is important to envision a comprehensive intervention approach that embraces the entire value chain. Improving the productivity of only one aspect of the maize value chain has the potential to yield disastrous results, such as during the bumper crops of 2002, where production was improved, but unmatched by improvements in aggregation and marketing, resulting in crops that were left to rot in the field.

The future Ethiopian maize value chain should demonstrate increased productivity from potentially lower acreage and a gradual realization of key latent demand sinks with both ends of the value chain enabled by a stable, coordinated, liquid and year-round market. More production is needed for food security, however, it can have an adverse income effect without additional demand, and acreage increase is not sustainable without rotation (mono-culture). It is therefore critical to grow productivity, commercial demand and increase rotation over time. From the supply side, greater productivity from input use, reduced losses and effective crop rotation to sustain productivity, while on the demand side, realization of latent demand sinks such as domestic sourcing of food for relief and safety net programs, development of a feed/poultry industry, and increased processing from a more developed food processing sector could be envisaged. Creating such an effective chain will be a gradual process and requires holistic improvements in supply, demand and market mechanisms in parallel.

The set of core interventions identified and other enabling actions that can be taken to holistically strengthen the maize value chain are discussed in the next section. An end state vision of what the maize value chain could resemble is shown in Figure 11:

Figure 11: Vision for Ethiopia's of future maize market



SOURCE: Authors

The vision for the activities of these actors, as well as how this differs from today, is as follows:

- **Small local coops and traders** would aggregate grain from farmers at the village level, ensuring adequate and efficient shipment of surplus to the nearest market. This is different from the current situation in that there would be more significant volume going through coops, and primary actors would have stronger market linkages to large traders.
- **Regional originators** would source grain from production zones and be able to hold stock until sufficient demand arises. Relative to the current situation, trading would be larger-scale and maize supplies could be stored year-round.
- **Central market traders/intermediaries** would provide liquidity to the central market in Addis, enabling cross-regional flows and available supply year-round for buyers. This would require a greater degree of depth to supply large amounts of grain year-round than is currently available.
- **ECX** would create a year-round liquid market for maize (and other cereals), providing smallholders a consistent outlet for their produce and downstream actors a consistent supply of quality grain. Unlike today, financing and storage support would be available to enable a year-round market.
- **A stabilization fund** would buy and sell strategically to prevent market failures. Different from today, the stabilization fund would address market failures in a systematic and predictable way that is transparent to all actors in the value chain.
- **Relief procurement.** Local procurement volume, timing and price would be determined according to local stabilization needs, and any shortage would be imported. Unlike today, there would be no ad hoc decision making on the ability to procure locally, and decisions would be made in relation to stabilizing the maize market.

3.1 CORE RECOMMENDATIONS

3.1.1 Strengthen stabilizing role government currently plays in maize market with clear and transparent system with capable partners

GOE currently operates in a stabilizing role in maize and other cereals markets to ensure that: (i) there are no extreme price fluctuations and supply shortages or excesses and (ii) actors in the value chain have a clear and transparent understanding of when and how market failures will be addressed, alleviating their perceived risk. However, today's system lacks the clarity and mandate needed to do this role effectively. Working with the current stabilizing partner, EGTE, the government role should be clarified to ensure appropriate market intervention. It is necessary to ensure that there is no ad hoc distortion, and that there are clear, transparent ways to address market failures to alleviate perceived risks and market distortions.

Specifically, the actions to implement this recommendation are to:

- **Develop transparent and predictable parameters that direct when and how interventions are conducted** in the maize market. Interventions should be linked to local food aid procurement (e.g., sell to them in times of surplus), the domestic market (e.g., sell when price nears import parity, buy during bumper harvests or when price is near the cost of production) and the global market (e.g., release or import in times of shortage). Potential rules of intervention to address market failures could include buying prices based on cost of production and selling prices based on import costs. In such a model, storage of excess maize could be through EGTE warehouses or in strategic grain reserve storage.
- **Set up a decision-making panel to approve such interventions** on the ministerial level. Such a panel should be supported by a technical, advisory group, and will enable EGTE's core functions.
- **Conduct a targeted project to develop this revised and systematic mechanism** and its appropriate governance structure. If EGTE will be the executing body, the dual mandate (profitability and stability) of EGTE has to be revised, and organizational capabilities should be strengthened to improve execution on this clarified mandate. Alternatively, incentives can be designed for licensed private sector actors to execute this mechanism on behalf of the government.

Table 7 below provides concrete actions and potential owners and stakeholders for each step to develop a market stabilization mechanism:

Table 7: Implementation actions to create a market stabilization mechanism

| | Actions | Potential owners |
|-----|---|--|
| 1.1 | Identify working team and multi-stakeholder advisory panel that will develop a clear stabilization mechanism | MoARD/BoARD |
| 1.2 | Develop algorithm with rules of engagement and operational manual to execute this, e.g. identifying buy and sell triggers and enabling data like crop forecasts | MoARD/BoARD, multi-stakeholder advisory panel, local and international technical experts |
| 1.3 | Refine policies as necessary to take advantage of opportunities to expand maize market | MoARD/BoARD |
| 1.4 | Secure funds needed to operationalize | MoARD/BoARD, donors |
| 1.5 | Identify operator for the rules of engagement established and give them a clear mandate to execute | MoARD/BoARD, multi-stakeholder advisory panel |
| 1.6 | Establish consortium of main public, private and social sector actors in the value chain and setup periodic check-ins to collectively and transparently assess the market | MoARD/BoARD, multi-stakeholder advisory panel |

Establishing this clear and transparent mechanism should simultaneously reduce the maize price instability and the perceived risk amongst all actors in the value chain. In particular, smallholder farmers should have greater security leading to increased production and increased food security. Over time, there could also be the emergence of strong private sector trading (see recommendation 3) that will create a more stable, liquid, year-round market leading to minimal role for the public sector in the grain market.

One key lesson from international case studies (see boxed text “International case studies”) is that such market stabilization strategies need to be very carefully designed and over time, the public sector should progressively withdraw and create the environment for effective private sector operation to play the role while the public sector acts as a regulator and provide intervention as a last resort.

International case studies of stability mechanisms

Several international cases highlight potential approaches and key lessons to addressing market failures with market stabilizers. China’s experience may be particularly relevant to Ethiopia.

India. The Food Corporation of India (FCI) purchase, stores, and distributes wheat and rice to the poor after procuring from farmers to support price. The approach has a marginal impact on stability of the market due to the small share of total volume traded. Consumers gained most, with mixed benefits for producers and high cost to FCI.

Egypt. The government began with state-controlled procurement, marketing, and processing systems and have reduced government intervention with more private traders over time, and now provide subsidized wheat to consumers. The approach provides for a steady supply of wheat, but with misaligned incentives for farmers and at a high costs to government. The partial privatization has improved price stability and market integration.

China. The state system provides fixed procurement contracts for farmers into government warehouses and provides rationing to consumers. Early in the development stages of this, the public sector played a key role in both mitigating market failures and building confidence in the market, but this required scale and skillful execution to be effective. However, there are pitfalls to avoid: distorting incentives over time, e.g. low prices that discourage producers or subsidies that are impossible to sustain; original intentions to privatize but fear of market liberalization that leads to continued and originally unplanned state interventions, and; negative fiscal impact if stabilization measures become de facto subsidies.

3.1.2 Foster emergence of strong licensed traders to create a more liquid, year-round market, by creating an appropriate regulatory framework and incentive mechanisms

Strong traders will be required to create a year-round liquid market for maize (and other cereals) that will benefit smallholders (consistent outlet for their produce) and downstream actors (consistent supply of quality grain). These traders will initially require support (financing and/or storage) and a structured market outlet, which can initially be provided through by engaging them in local procurement of maize by the government and donors agencies.

The Ethiopian Commodity Exchange (ECX) can be used as a platform to enable this recommendation. Large regional traders can be identified (based on an ECX membership criteria), registered on ECX and given support required (financing and/or storage) to create a year-round liquid market. Over time, these traders can also be the agents through which forward contracting is introduced on ECX. Simultaneously, the inventory financing system can be launched, as planned by ECX, to build the capacity of smaller aggregators to trade year-round.

The specific types of interventions needed to stimulate this include:

- **Providing financing support.** This ensures that these traders have the working capital to both create a liquid market (have access to buy and sell large quantities of grain as and when the market demands) and to have a year-round market (have the ability to buy and sell year-round).
- **Providing storage support.** This can initially be through leasing space in government owned warehouses (e.g., EGTE warehouses) or working with donor organizations to provide the quality and quantity of storage that will be required.
- **Providing assistance in establishing a structured market outlet.** This can initially be provided by the local procurement of maize for relief and safety net programs. Later this can be expanded to other demand sinks (e.g., feed for commercial livestock production, food processing).

Smallholder farmers will have a secure market outlet through these traders, and there can be a gradual transition to forward contracting with these traders, enabling small-holders to attain better prices for their produce. Similarly, downstream actors (e.g., future food processors / feed mill operators) will have more security of supply from these regional traders. Once trading is being conducted at scale, these private market makers will stimulate a year-round market with more depth than the current structure.

However, it must be noted that this transition to strong private traders is likely to be a gradual process and not all types of procurement can feasibly be carried out by the private sector through the exchange. Similarly, it does not appear feasible for ECX to perform all procurement operations of the Ethiopian Grain Trade Enterprise in the short run. Furthermore, regulations should be in place to prevent rent-seeking behavior among traders. Nonetheless, gradual capacity building of the traders will create confidence in a market that should evolve into a thriving private year-round market accommodating actors of all sizes and functions, stabilizing prices, and yielding the greatest returns to smallholder farmers through improved, transparent market access.

Given the strong presence of brokerage institution in the Ethiopian grain market, though dominantly informal, handling a considerable volume of business with strong social capital and market influence, working with such actors in the market would be useful. One of the possibilities could be to gradually bring such actors into the formal market system through negotiations and providing appropriate incentives and support. Otherwise, their continuous and strong presence in the market will make it difficult for

the licensed and formal actors to be effective and competitive runners of the intended coordinated and year-round cereal market.

Table 8 below contains more details on the specific implementation steps and the potential owners and stakeholders required for each step.

Table 8: Implementation actions to create strong, licensed traders

| | Actions | Potential owners |
|-----|---|-------------------------|
| 2.1 | Develop selection criteria and operational contract for regional private sector traders, e.g. support that will be provided on financing and/or storage, trade volume that they need to be conducting | MoARD, ECX, ECEA, BoARD |
| 2.2 | Modify current exchange rules and systems as needed to accommodate traders | ECX, ECEA |
| 2.3 | Develop regulation and checks and balances | ECEA, MoARD |
| 2.4 | Select regional traders with presence in key maize belts initially and register with ECX | MoARD, ECX, ECEA, BoARD |
| 2.5 | Provide contractual support guaranteed, e.g. financing and storage, to accelerate operations | ECX, ECEA, MoARD, BoARD |
| 2.6 | Simultaneously realize and pilot the inventory financing system as planned by ECX and MoARD | ECX, ECEA, MoARD |
| 2.7 | Track and monitor year-round market, e.g. price trends, sale volume year around | MoARD, ECX, ECEA |
| 2.8 | Over time, establish forward contracting system, piloted with regional and central market drivers | ECX, ECEA |

3.1.3 Catalyze the growth of latent demand sinks, starting with poultry feed

Creating incremental demand sinks for maize will be required to catalyze greater productivity and efficiency in the value chain. There is significant latent feed demand for poultry and growing this sector will increase production value of maize. Actions, such as developing and issuing tender offers to potential poultry investors, should be taken to catalyze the growth of this industry. Security of supply could be provided through contracted maize supply for potential feed mills and poultry farmers (by market maker or large trader/union). Additional incentives such as long-term land leases or tax breaks can be used to promote inclusive models like this.

Furthermore, a smallholder out-grower model has had success in other countries and can be encouraged in high potential areas of Ethiopia. Brazil's poultry industry is based on small out-growers with each smallholder looking after a poultry shed that can produce 10,000 or more broilers every two months. These smallholders have strong contracts with chicken producers that provide other upstream (e.g., feed mills, technical

support/extension) and downstream (e.g., abattoirs, packaging) services. Examples of such a smallholder friendly model of increasing commercial production of poultry also exists in sub-Saharan Africa and details of a model being used in Mozambique are provided in the box below.

Case study – Smallholder out-grower model in Mozambique

An aggregator signs a contract with smallholder out-growers and provides the inputs needed. For example, the aggregator has contracts to supply day-old chicks and feed to smallholders and provides extension services.

Smallholders grow the chicks in houses that have low investment cost. For example, sheds being used in parts of Mozambique are made of local mud and local recycled materials (10 to 20 percent the cost of a normal mud shed).

Even with the low capital investment from the smallholders, they achieve high productivity in poultry production, comparable to large-scale commercial operations. For example, there has been evidence of mortality rates of only 2 to 3 percent.

The aggregator buys back the poultry and sells live animals or conducts other downstream activities before sale (e.g., has an abattoir for processing and/or packaging facility).

In addition to creating demand and increasing the production value of maize (main feed used in poultry production), this provides significant increase in income to the smallholder poultry out-grower. For example, the profit to family over 72 weeks is five times the capital cost of the shed and smallholder families have made USD 1,000+ profit per year. In addition, this has lower cash flow risk (potential for cash to be received every 42 days) and weather risk.

SOURCE: Authors

Table 9 provides more details on the specific implementation steps and the potential owners and stakeholders required for each step.

Table 9: Implementation actions to catalyze poultry feed industry

| | Actions | Potential owners |
|-----|--|------------------------------------|
| 3.1 | Develop template contract for potential poultry investors with terms of support for smallholder poultry production | MoARD, BoARD |
| 3.2 | Simultaneously develop contracts for feed mills and abattoirs | MoARD |
| 3.3 | Regionally identify locations for poultry farming and tailor contracts per region | BoARD |
| 3.4 | Issue tender offers / auctions to attract investors, select investors and sign contracts | MoARD, BoARD, investors, suppliers |
| 3.5 | Provide support per contract arrangement (e.g. financing guarantees, technical assistance, supply contract for maize from new, licensed regional traders, extension support to develop the maize varieties needed) | MoARD, BoARD |

3.1.4 Create clear role for cooperatives in maize value chain and give necessary support to make them effective

Today support for farmers is fragmented – coops provide inputs but limited marketing, traders are the main grain buyers, credit coops provide farming and extension training on agronomic practices.

An alternative vision includes revitalized aggregators with simplified and standardized transactions with farmers: standard input packages and credit facilities, simple off-take arrangements based on transparent pricing linked to the market and close links to extension.

The functions performed by the cooperative system need to be streamlined in order to simplify the management and decision making required. Making the role of the cooperatives simple and transactional will reduce the capability and governance burden required to run them effectively. It is important for cooperatives to supply producers with standardized input packages at widely publicized prices and to buy maize (and other cereals) at competitive and transparent prices to be passed along to a larger buyer (for example, regional trader), with clear incentives for product quality. Several steps need to occur in order for this to happen:

- Input assemblers, working closely with Ethiopian Seed Enterprise (ESE) and the Ethiopian Institute for Agriculture Research (EIAR) and their regional office, will be needed to package inputs and distribute to cooperatives.
- High potential cooperatives in main maize areas should be selected and linked to large buyers who can take advantage of the primary aggregation offered by cooperatives.
- Selected cooperatives should adopt a new management structure (improved managerial skill, simplified approach, limited decision making required) and be supported in early stages for finance to purchase maize at publicized prices, sell maize packages.
- Extension can be linked to the cooperative system by seconding Development Agents (DAs) to cooperatives to assist in farmer implementation of input packages (for example, optimal agro-economic practices) and off-take (for example, building knowledge of quality requirements needed by buyers).

Table 10 below provides more details on the specific implementation steps and the potential owners and stakeholders required for each step:

Table 10: Implementation actions to support cooperatives

| | Actions | Potential owners |
|-----|--|---|
| 4.1 | Select high potential cooperatives in the main maize areas, e.g., 50 - 60 <i>woredas</i> with high yield and commercialization, to initially support | MoARD, BoARD, cooperative promotion agency |
| 4.2 | Appoint / establish input assemblers who will assemble input packages for farmers in high yield potential maize belts | MoARD, BoARD, cooperative promotion agency |
| 4.3 | Establish links between input suppliers and assemblers | MoARD |
| 4.4 | Develop menu of input packages, e.g. tailored to agro-ecological conditions and affordability different segments of farmers; approve prices for different input packages | EIAR, regional research institutions, MoARD, BoARD |
| 4.5 | Establish links between high potential cooperatives and large buyers and facilitate off-take arrangements between coops and buyers | Cooperative promotion agency, MoARD, BoARD |
| 4.6 | Prove coops the necessary support need to operationalize; workshop to explain packages and off-take arrangements; place DAs in coops to test alternative models for extension delivery | MoARD, extension directorates, cooperative promotion agency |

3.2 ENABLING ACTIONS

Apart from the four core interventions outlined above, there are a set of enabling actions that will further strengthen the maize market. These include:

3.2.1 Improving on-farm storage management practices and equipment to reduce post-harvest losses

Reducing on-farm post-harvest losses will directly increase smallholder income and improve food security. This recommendation focuses on stimulating the testing, development and scale-up of on-farm storage structures that can prevent post-harvest losses, as detailed in Table 13. Both storage structure and practices need to be addressed:

- Tenders or contracts should be offered with set criteria for storage system development (for example, maximum loss levels, maximum cost of structure, minimum capacity) and contracts offered to the best provider for scale-up opportunities.
- Storage management practices (for example, optimal harvesting time, drying techniques, storage hygiene) need to be improved and should be disseminated through the extension system. This is particularly important in order to combat the presence of aflatoxin – smallholders should be educated on the health and economic repercussions of the toxin, as well as on the best storage and harvesting practices to prevent it. Improvement of storage management practices should be one step in a wider intervention to develop, commercialize, deploy, and scale up interventions that

prevent the consumption of toxins, including: teaching farmers about pre-harvest and harvest agronomic practices; disseminating technology for appropriate post-harvest drying, storing, and processing activities; developing alternative uses for contaminated foodstuffs; and ensuring proper bio control (e.g. identifying the affected strains). Interventions should be pursued in collaboration with the multiple international research and donor organizations that are already working to develop farm-level interventions to prevent its consumption (e.g. FAO, World Bank, USAID).

Finally, smallholders must also have greater access to credit in order to purchase storage structures. Methods to provide credit to smallholders are addressed in full in the Finance diagnostic report.

Table 11 represents the various stages in the production and post-harvest management of maize, with a description of the current status, and opportunities for improvement. While this is not an exhaustive and rigorous characterization (in the sense that this is not based on systematically conducted nationally representative surveys), the table demonstrates very clearly that the interventions needed to change the current situation from planting to marketing are not complicated; and much of the technology is readily available and are in use in many different countries, including some of the developing countries in Africa.

Table 11: Opportunities in production and post-harvest management of maize

| Value chain activity | Current situation | Improvement opportunities |
|--------------------------------|---|---|
| <i>Planting</i> | <ul style="list-style-type: none"> ▪ Oxen-plowing (3 - 5 times) ▪ Some use of fertilizer¹³ but very limited use of hybrid seed ▪ Sowing by broadcasting ▪ Mono-cropping and limited rotation | <ul style="list-style-type: none"> ▪ Supply of hybrid seed treatment before planting¹⁴ ▪ Row planting of seedling (requires labor and is time-intensive); regular crop rotation |
| <i>Growing</i> | <ul style="list-style-type: none"> ▪ Hand weeding (at least after 20 and 40 days of planting) ▪ Oxen plowing | <ul style="list-style-type: none"> ▪ Supply of optimum chemicals (herbicide and insecticide) |
| <i>Harvesting</i> | <ul style="list-style-type: none"> ▪ Manual removal of cob in field or cutting of entire plant and removal at home ▪ Manual shelling by hand or hitting of cob in a sack | <ul style="list-style-type: none"> ▪ Supply and adoption of low-cost shelling devices ▪ Provide extension advice on trade-offs between field and home removal of the cob |
| <i>Post-harvest management</i> | <ul style="list-style-type: none"> ▪ Traditional storage (underground pits, gotera) ▪ Treatment (often non-standard chemicals) to protect grain | <ul style="list-style-type: none"> ▪ Low-cost individual or community storage structures that prevent losses from pest attacks and spoilage due to high moisture contents |
| <i>Marketing/consumption</i> | <ul style="list-style-type: none"> ▪ More than 60% of produce is consumed ▪ Around 20% of the maize produced is sold ▪ Around 60% of sales occur immediately after harvest | <ul style="list-style-type: none"> ▪ Increase commercialization through increased yield and reduced losses ▪ Improve storage and alleviate liquidity constraints through WRS; so that farmers do not have to sell immediately after harvest |

SOURCE: Authors' characterization based participatory rapid assessment in 2009

¹³ Refer to soil fertility diagnostic report for an overview of fertilizer usage practices (and other soil fertility techniques)

¹⁴ Refer to seeds diagnostic report for recommendations on how to improve the availability of hybrid maize seed

Table 12 below provides more details on the specific implementation steps and the potential owners and stakeholders required for each step:

Table 12: Implementation actions to improve on-farm storage management practices and structures

| | Actions | Potential owners |
|-----|--|--|
| 5.1 | Develop template criteria for on-farm storage structure, including capacity, acceptable loss range, maximum cost structure | MoARD, EIAR, regional research institutes, BoARD |
| 5.2 | Tailor criteria to the different needs / drivers of losses in these main maize producing areas | EIAR, regional research institutes, BoARD |
| 5.3 | Issue a tender for private sector actors and existing research institutions to develop pilot storage structures | MoARD |
| 5.4 | Conduct rapid field assessment of these structures in the main maize producing areas and ask technical experts to improve as needed | MoARD, BoARD, regional research institutes |
| 5.5 | Issue contract for best provider to produce storage structures in bulk and provide extension support to ensure uptake from farmers | MoARD, BoARD |
| 5.6 | Simultaneously develop extension module and train DAs on delivering best practice storage management, including optimal harvesting time, drying, storage, hygiene, separation of grain | MoARD, federal and regional extension, BoARD |

3.2.2 Scaling-up efforts to increase market information and transparency

Much has been done to improve market information systems in Ethiopia, particularly through efforts of regional governments and the Ethiopian Commodity Exchange. Existing best practice mechanisms (for example, ECX, regional marketing information systems) should be identified and used as channels to disseminate not only price data, but also other market intelligence data needed to improve linkages in the maize value chain.

Below are more details on the specific implementation steps and the potential owners and stakeholders required for each step:

Table 13: Implementation actions to increase market information

| | Actions | Potential owners |
|-----|---|-------------------------|
| 6.1 | Collect and triangulate market information data (price, demand and supply signals by region) available from different sources, e.g. crop forecasts from donors, EGTE, CSA, and regions | MoARD, BoARD, CSA, EGTE |
| 6.2 | Develop simple, standard display of regional price, supply, and demand forecasts so farmers / aggregators can make informed buy and sell decisions | MoARD, BoARD |
| 6.3 | Identify current best practice information delivery channels, e.g. ECX, regional marketing information systems, and disseminate market information data | MoARD, BoARD |
| 6.4 | Simultaneously, use government network, e.g. post data in <i>kebele</i> offices and FTCs, to disseminate information periodically | MoARD, BoARD |
| 6.5 | Hold expos for buyers and sellers in deficit and surplus maize regions to create better market linkages, similar to initiatives with foreign buyers and local exporters in high value crops | MoARD, BoARD |

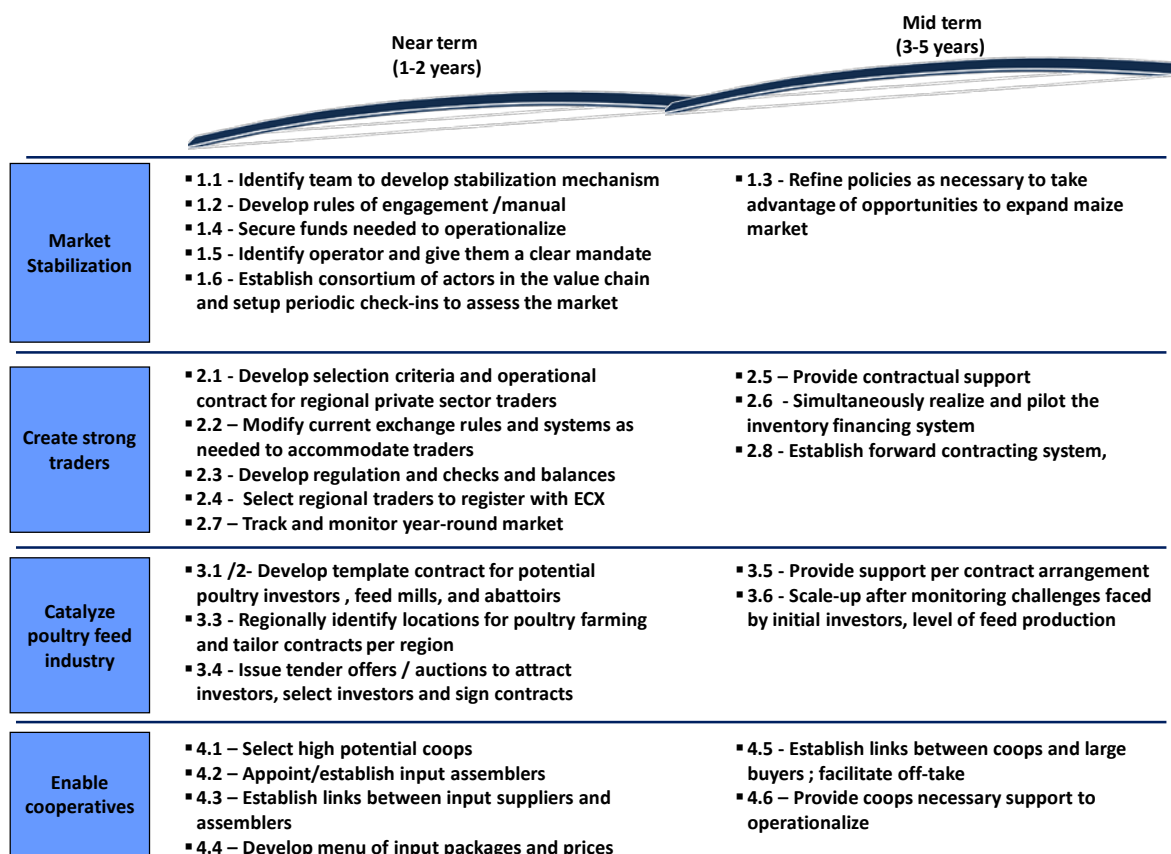
3.2.3 Improving farm management practices to enhance maize productivity

Maximizing the productivity of maize should go hand-in-hand with improving the productivity of other crops. There are adverse consequences to replanting maize on the same land year-on-year and the sustainability of maize production should be linked to effective crop rotation. Improving farm management practices should include the development of modules on crop rotation in cooperation with the extension system for maize production, as detailed in Table 13.

3.2.4 Implementation modality

Fully implementing the recommended strategies needs considerable financial and time resources and prioritizing and sequencing. Accordingly, it is recommended that a programmatic approach be adopted to implement the proposed strategies step-by-step. The implementation of the strategies could be envisaged within five years' time. Within this framework, the first two years would be used to strengthen the value chain to serve the immediate market and the last three to five years used for developing the industry structure to serve new markets and support boost in productivity. Interventions and sub-actions have to be rigorously prioritized to go after the high potential opportunities, with details and sequencing as listed in Figure 12.

Figure 12: Implementation modality



For implementation to be successful, a range of actors including GOE, the Ministry of Agriculture and Rural Development, the donor and NGO community, and the private sector will need to work together to implement the various components and programs. Ultimately, the transformational change required will need to come from within Ethiopia – from the actors in the value chain and existing institutions to the highest policymakers.

4. Conclusion

4.1 OVERVIEW

The findings in this report demonstrate the importance of maize as a significant contributor to the economic and social development of Ethiopia. Maize is grown by more small-scale farmers than any other single crop in Ethiopia, and remains a central building block for the country's long term food security. GOE along with its development partners have made great strides toward enhancing the productivity of maize with expanded access to hybrid varieties and improved extension. Realizing the full potential of the crop as a component of Ethiopia's long-term food security and growth relies on clear direction and execution capacity from GOE and a wide number of stakeholders.

4.2 FIVE-YEAR SECTORAL VISION

The next five years will be a critical window to accelerate the achievement of the long-term vision for the maize value chain. At the close of this period, the report envisions an effective and functioning mechanism in place for market stabilization, a strong network of traders, a vibrant demand pull in poultry feed and food aid, and strong and efficient cooperatives to drive growth and food security in the sector. The potential is sizable: projections show the ability to boost smallholder income from USD 60 per hectare to USD 350 to 450 in a five-year window in some high potential areas with the demand pull in place with food aid and poultry to drive these livelihood improvements.

With a strong and functioning value chain beginning with production, then aggregation and trading, and finally with unlocked demand sinks, GOE and its development partners, along with the private sector are in a remarkable position to place Ethiopia on the first five-year trajectory to fully develop the sector by 2025.

4.3 THE WAY FORWARD

The recommendations outlined in this report and in the other sub-sector diagnostic reports are not an explicit roadmap of the activities the BMGF is best positioned to solely resource; they reflect a set of findings to support MoARD and all donors in the planning and implementing strategies to accelerate growth and food security in the context of Ethiopia's nationally stated objective to achieve middle-income status by 2025.

Accelerating the five-year vision contained in this report will undoubtedly require the effective use of significant human and financial resources. It will require a level of sequencing and coordination that has in the past been challenging to implement at a national level, not only in Ethiopia, but in success cases globally, from Latin America to East Asia. To achieve these objectives, GOE will need to work closely with all its partners, ranging from the development community to the private sector. The recommendations contained in this report offer a preliminary view on the sequencing of various activities to strengthen the maize value chain.

The findings contained in this report are also complementary to a range of other findings across the diagnostic studies supported by the BMGF from April 2009 to March 2010. The five-year sectoral vision for maize relies on a set of factors contained in accompanying diagnostic reports, including a robust system of agricultural extension, a vibrant and efficient seed sector for hybrids, and access by small-scale producers to irrigation. Additionally, a set of enabling factors will deepen the impact of these recommendations, including financial services, rural infrastructure, and information and communication technologies. At every stage of the value-chain gender must be prioritized, as women are often primarily responsible for planting, harvest, value addition, and marketing.

Since each of these sectors is mutually dependent, the recommendations and sequencing of activities for the maize value chain must be seen within the context of the overall recommendations provided in the holistic and integrated report requested by the Prime Minister. With maize as a key crop to drive Ethiopia's growth and food security, these steps will be critical to accelerating the long-term vision of achieving middle-income status by 2025.

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End Notes

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- iii World Bank PER (2008)
- iv CIA (2009 est)
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- vii FAOStat (1998 to 2008)
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- xii Central Statistics Agency (Date TBD)
- xiii EGTE (dates TBC); Caloriecount
- xiv Gabre-Madhin (2001)
- xv Rashid and Hill (2009)
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- xxii IFPRI (2009)
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- xxiv FAO (2009)

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- xxv Expert interviews (2010); field visit to Bako (2010)
 - xxvi Bernard et al. (2008)
 - xxvii EGTE