Maize Sector Development Strategy (Working Document 2013-2017)

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A NOTE FROM THE MINISTER'S DESK

Agriculture is one of the pillars of the Ethiopian economy and the overall economic growth of the country is highly dependent on the success of the agriculture sector. The Government of Ethiopia has demonstrated strong commitment to agriculture and rural development through the consistent allocation of over 10% of the national budget to deliver enhanced production technologies and support services.

This working strategy document outlines a forward-looking approach to improving the maize value chain and aims to align maize value chain stakeholders on short- and long-term objectives, identify tasks and milestones to achieve these objectives, and outline an action plan to accomplish specific tasks within an established schedule.

This working strategy document aims to outline the vision, bottlenecks and interventions needed to transform Ethiopia's maize value chain. The development of this strategy has included the collective efforts of many stakeholders from the public and private sectors. Various syndication workshops organized by the MoA, ATA and EIAR have been held to ensure this document reflects the input of all relevant parties. A wide range of public and development partners have provided valuable input that has been incorporated to form this version of the strategy.

The strategy is released as a working document to kick start implementation and guide all stakeholders involved in the maize value chain. In the remaining period of the GTP, the strategy will be tested and refined as feedback and lessons learned will be collected from implementing stakeholders. Once completed, this strategy will be launched formally with the next 5-year National Development Plan.

On behalf of the Government of Ethiopia, I would like to thank all stakeholders who were involved in the development of this working strategy document and encourage these and other stakeholders to build upon this commitment as we move into implementation of the interventions contained in the strategy.

I strongly believe that together we will continue to create a highly effective maize sector that fulfills the promise of sustainably improving the livelihoods of smallholder farmers while contributing to Ethiopia's overall vision of achieving a middle income status by 2025.

Tefera Deribew
Minister, Ministry of Agriculture

List of Acronyms and Abbreviations

ACDI/VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance
AGP	Agricultural Growth Program
AISC	Agricultural Input Supply Corporation
AMDe	Agribusiness and Market Development
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ATA	Agricultural Transformation Agency
CBE	Commercial Bank of Ethiopia
CGIAR	Consultative Group on International Agricultural Research
CSA	Central Statistical Agency
CUs	Cooperative Unions
DA	Development Agent
ECPA	Ethiopian Consumer Protection Agency
ECX	Ethiopian Commodity Exchange
EGTE	Ethiopian Grain Trade Enterprise
EIAR	Ethiopian Institute of Agricultural Research
ENHI	Ethiopian Nutrition and Health Institute
Ethiosis	Ethiopian Soil Information System
ESA	Ethiopian Standards Agency
ESE	Ethiopian Seed Enterprise
FAO	Food and Agriculture Organization of the United Nations
FCA	Federal Cooperative Agency
FDC	Forward Delivery Contract
FTC	Farmers Training Center
GDP	Gross Domestic Product
GMO	Genetically Modified Organism
GTP	Growth and Transformation Plan
IBC	Institute of Biodiversity Conservation
IFPRI	International Food Policy Research Institute
MFI	Micro Finance Institution
MoA	Ministry of Agriculture
MoFA	Ministry of Foreign Affairs
MoFED	Ministry of Finance and Economic Development
MoI	Ministry of Industry
MoT	Ministry of Trade
NGO	Non-Governmental Organization
OPV	Open Pollinated Varieties
PPP	Public Private Partnership
PSE	Parastatal Seed Enterprises
P4P	Purchase for Progress
QPM	Quality Protein Maize
RARIs	Regional Agricultural Research Institutes
RBOA	Regional Bureau of Agriculture
RSE	Regional Seed Enterprise
SACCOs	Saving and Credit Cooperatives
SMEs	Small and Micro Enterprises
SG 2000	Sasakawa Global 2000
SNNPR	Southern Nations, Nationalities, and People's Region
USAID	United States Agency for International Development
WFP	World Food Program

Definition of terminologies

Belg season: The short rainy season, running from February to May

Forward Delivery Contract: An agricultural produce delivery contract reached between producers and buyers, e.g. between WFP and cooperative unions, for delivery at a pre-agreed future date

Meher season: The main cropping season, which runs from mid-June to mid-September

Parastatal seed enterprises: Government owned, semi-autonomous enterprises that are engaged in production, multiplication and distribution of seeds

Private Seed Companies: Privately owned enterprises including the multi-nationals that are engaged with production, multiplication and distribution of seeds

Quality Protein Maize (QPM): Improved varieties of maize which contain essential amino-acids that provide enhanced nutrition

Systemic challenges: Major biological, environmental or socio-economic hurdles that the maize sector is facing along the value chain

Value chain: The full range components and chain of activities involved in the lifecycle of an agricultural product (e.g. maize), from technology inception through input access to production and all the way to consumption

Warehouse receipt system: A system of financing and trading agricultural outputs based on a warehouse receipt, a document guaranteeing the existence and availability of a given quality and quantity of commodity in storage for safekeeping. Such a system finances agricultural commodity owners by using their commodity as collateral

Executive Summary

Maize is Ethiopia's leading cereal in terms of production, with 6 million tons produced in 2012 by 9 million farmers across 2 million hectares of land. Over half of all Ethiopian farmers grow maize, primarily for subsistence. Maize is thus an important crop for overall food security and for economic development in the country.

While significant gains have been made in maize production over the past decade, there remains great potential to increase productivity. Between 2001 and 2011, maize production increased by 50%, due to increases in both per hectare yields and area under cultivation. However, estimates indicate that the current maize yield could be doubled if farmers adopt higher quality inputs and proven agronomy best practices. At present, only 17% of maize farmers representing 30% of maize planted area make use of improved varieties of seed (CSA 2010/11), and only 30% of farmers use the recommended rates for fertilizer application.

The Maize Sector Development Strategy was formulated to ensure all components of the maize sector are addressed in a comprehensive and coordinated manner through a value chain approach. The core components of the maize value chain are: research and technology development; access to inputs; on-farm production; post-harvest processing and storage; and trade, marketing and demand sinks.

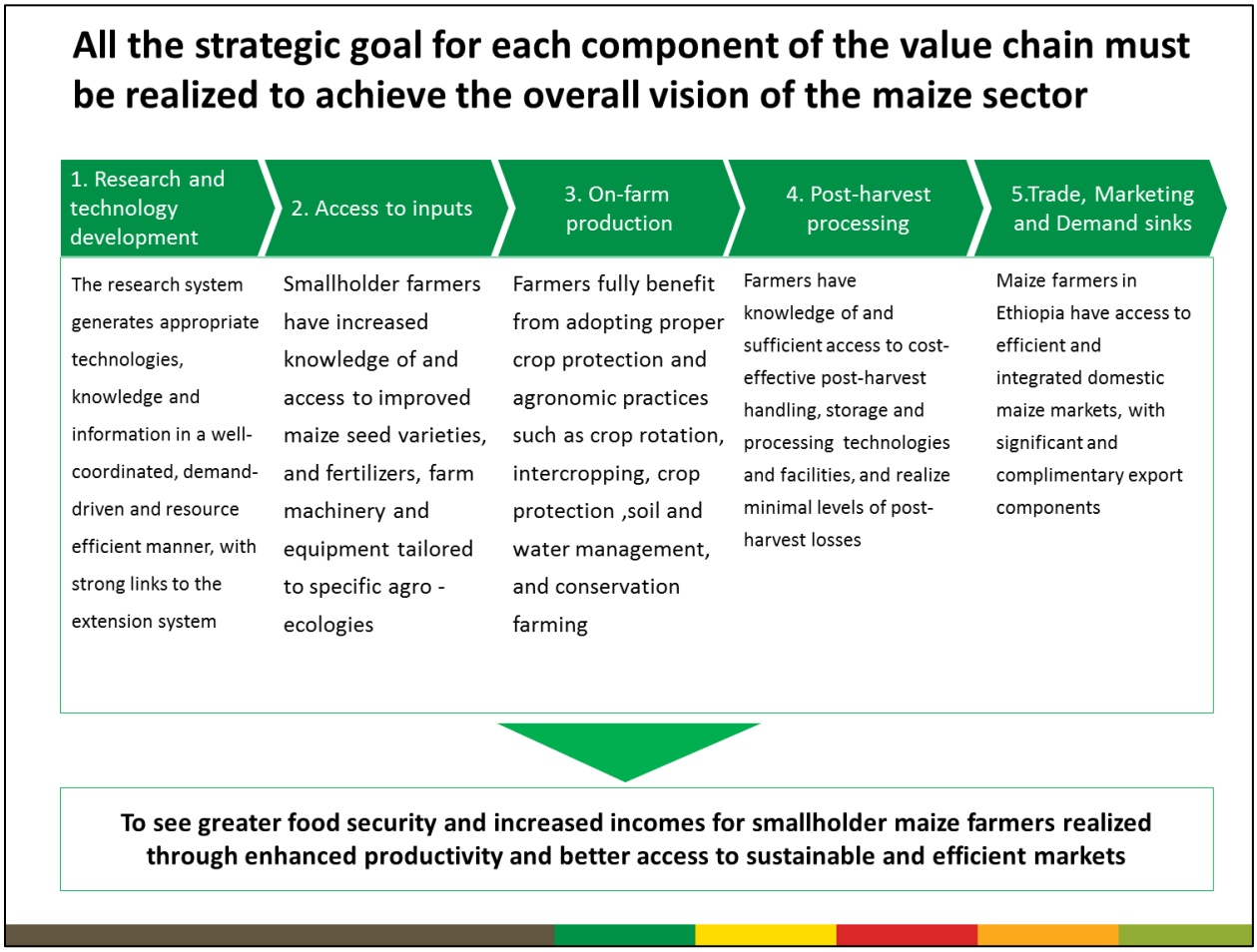
The strategy was developed through a participatory and consultative process. Over 90 stakeholders and many more smallholder farmers were consulted, with the Ministry of Agriculture and ATA coordinating the strategy development process. Furthermore, extensive review of relevant literature was conducted, and workshops were held to review and update the document in the presence of key stakeholders.

Overall vision for Ethiopia's maize sector
The vision for the maize sector is to see **greater food security** and **increased incomes** for smallholder maize farmers realized through **enhanced productivity** and better **access to markets** that are sustainable and efficient

Overall mission of Ethiopia's maize sector strategy
Build capacity among, provide comprehensive advisory support to and technically backstop key stakeholders along the value chain in order to significantly improve the productivity and competitiveness of the maize industry

The ultimate aim is to benefit all maize smallholder farmers by achieving improved yields and incomes through the proposed interventions.

Exhibit A: Strategic goal of each component of the maize value chain



The strategy identified a total of 20 strategic challenges and 21 comprehensive interventions required to address the major constraints along the maize value chain.

Strategic challenges	
20	**Total *(of which 9 are Central Challenges)***
5	Research & development *(1)*
5	Access to inputs *(3)*
3	On-farm production *(2)*
3	Post-harvest handling *(1)*
4	Markets *(2)*

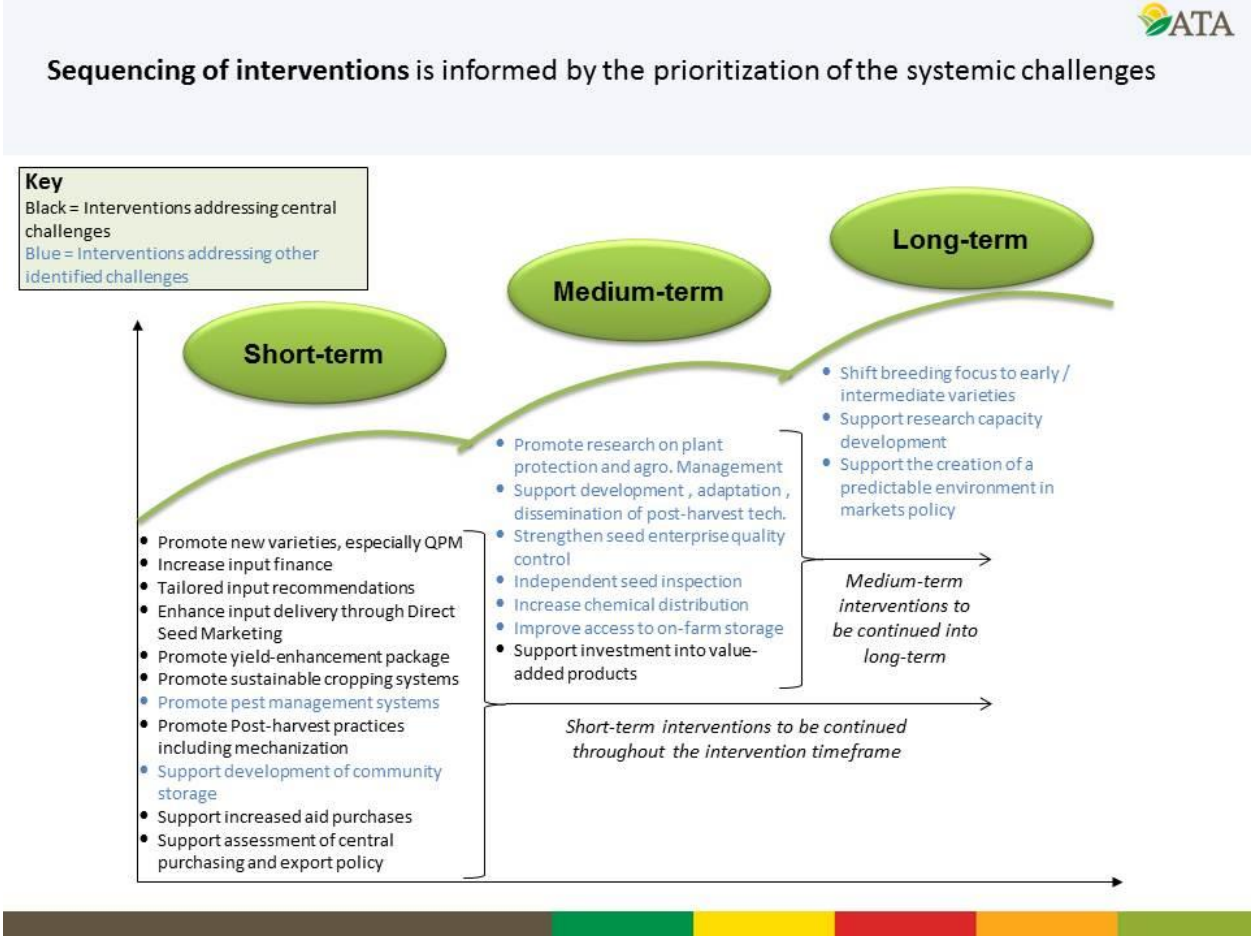
Geographic interventions	
21	**Total**
5	Research and development
5	Access to inputs
4	On-farm production
3	Post-harvest handling
4	Markets

The challenges have been prioritized and the interventions sequenced according to their feasibility, level of potential impact, and the time needed for their successful implementation. Often interventions are complementary, and can have an impact across multiple components of the value chain.

Value Chain Component	**Core Interventions /** Further Necessary Interventions
Research & Extension	• **Increase farmers' awareness of new varieties, especial Quality Protein Maize** • Update research on optimal agronomic management • Increase research focus on medium and short-cycle maize varieties • Generate/adapt and fast-track the dissemination of improved post-harvest technologies • Improve human and physical capacity of research centers
Access to Inputs	• **Engage in alternative options of input financing at the farmer level** • **Develop agro-ecology and socio-economically specific input recommendations** • **Conduct seed delivery through alternate channels** • Strengthen quality control at seed enterprises • Strengthen federal & regional inspection and certification capacity
On-Farm Production	• **Increase awareness of recommended input and agronomic management methods** • **Promote sustainable cropping systems to reduce the prevalence of mono-cropping** • Increase focus on integrated crop and pest management methods • Make appropriate chemical inputs available for weed and pest management
Post-Harvest Handling	• **Increase access to post-harvest processing equipment and technologies** • Increase farmer awareness of and access to effective on-farm storage • Increase farmer access to community-level storage facilities with skilled personnel
Marketing, Trade, & Demand Sinks	• **Tap into large-scale maize demand of food aid agencies** • **Explore exports to neighboring countries with high demand for maize** • **Explore and encourage investment into maize value-addition and promotion** • Create and reinforce a predictable and responsive policy environment

The implementation process to achieve this goal will be primarily led by the Ministry of Agriculture, with active involvement of key stakeholders along the value chain. An effective monitoring, learning and evaluation system should be in place to track progress and challenges during implementation based on agreed up on performance and impact indicators, and to take corrective measures proactively when the need arises.

Exhibit B: Sequencing of interventions proposed within the maize sector strategy



The release of this Working Strategy Document does not mark the conclusion of the maize sector strategy planning process. It is expected that the findings and proposals contained within this document will be refined and expanded in preparation for the release of a final sector strategy document in line with the next Growth and Transformation Plan due to start in 2015.

CHAPTER 1. INTRODUCTION

1.1 Purpose and scope of the strategy

The Ethiopian Agricultural Transformation Agency (ATA) has been tasked by the Agricultural Transformation Council to work closely with the Ministry of Agricultural and other stakeholders to develop an integrated national strategy for the maize sector. This strategy aims to sustainably increase the productivity of women, men and youth smallholder maize farmers in order to improve their food security and incomes, as part of meeting overall goals of the Ethiopian Growth Transformation Plan (GTP). The GTP envisions agriculture as the main source of economic growth, and an increase in smallholder farmer productivity as the key driver for agricultural output expansion.

This strategy has been developed in close collaboration with stakeholders, and will act as the anchor document to guide activities within the sector over the next 5 years. It provides an inclusive framework for prioritizing and coordinating activities towards the achievement of a common vision for the maize sector.

The release of this Working Strategy Document does not mark the conclusion of the Maize Sector Strategy planning process. It is expected that the findings and proposals contained within this document will be refined and expanded in preparation for the release of a final sector strategy document in line with the next Growth and Transformation Plan due to start in 2015. Additionally, it is envisioned that this strategy will remain a living document, to be updated regularly to reflect progress made, lessons learnt and changing realities.

1.2 Overview of the maize sector in Ethiopia

1.2.1 Importance of maize

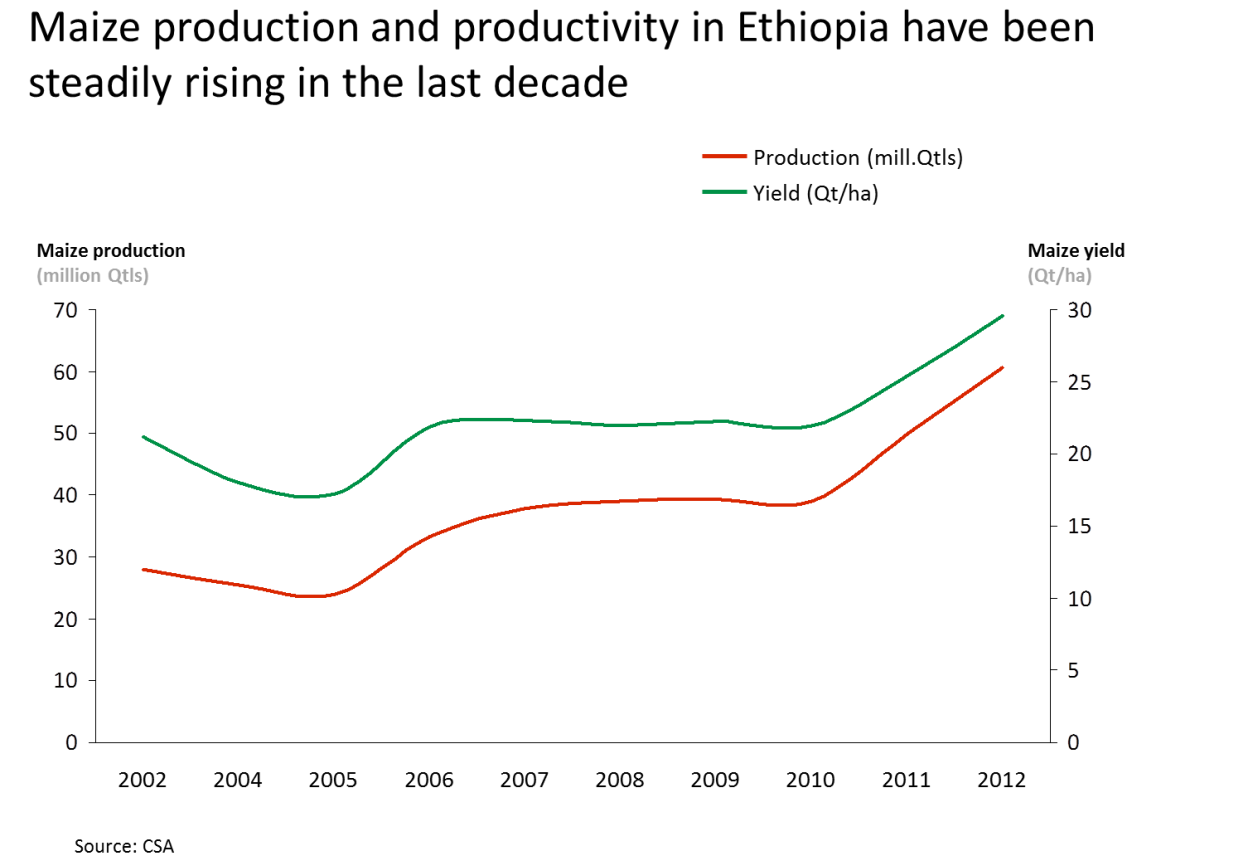
Maize, a member of the grass family, is believed to have originated in Mexico, and to have been introduced to Ethiopia in the 1600s to 1700s. In Ethiopia, maize grows under a wide range of environmental conditions between 500 to 2400 meters above sea level. Maize is Ethiopia's leading cereal in terms of production, with 6 million tons produced in 2012 by 9 million farmers across 2 million hectares of land (CSA 2011/12, Meher season). Over half of all Ethiopian farmers grow maize, mostly for subsistence, with 75 % of all maize produced being consumed by the farming household. Currently, maize is the cheapest source of calorie intake in Ethiopia, providing 20.6 % of per capita calorie intake nationally (IFPRI, 2010). Maize is thus an important crop for overall food security. Maize is also used for making local beverages. Additionally, the leaves and stovers are used to feed animals and the stalks are used for construction and fuel. A small quantity of the grain produced is currently used in livestock and poultry feed, and this is expected to increase with the development of the livestock and poultry enterprises in the country. The green fodder from thinning and topping is an important source of animal feed and the dry fodder is used during the dry season. Moreover, the crop has potential uses for industrial purposes, serving as a starch, a sweetener for soft drinks, an input for ethanol fuel production and oil extraction, etc.

As compared to other cereals, maize can attain the highest potential yield per unit area. World average yield for maize is about 4.5 t/ha and that of developed countries is 6.2 t/ha, with a harvest of 10 t /ha being common. The average yield in developing countries is 2.5 t/ha. In Ethiopia the national average yield is about 3.0 t/ha (CSA, 2011/12).

While significant gains have been made in maize production over the past decade, there remains large potential to increase productivity. From 2001 to 2011, maize production increased by 50%, due to increases in both per hectare yields (+25%) and area under cultivation (+20%). However, estimates indicate that the current maize yield could be doubled if farmers adopt higher quality inputs and proven agronomy best practices. At present, only 17% of maize farmers representing 30% of maize planted area make use of improved varieties of seed (CSA 2010/11), and only 30% of farmers use the recommended rates for fertilizer application.

Ethiopia is already a significant maize producer in Africa, and this role could be further enhanced. Currently, Ethiopia is the fourth largest maize producing country in Africa, and first in the East African region (FAO, 2012). It is also significant that Ethiopia produces non-genetically modified (GMO) white maize, the preferred type of maize in neighboring markets. This strategy envisions exports markets being a significant part of the demand sink for Ethiopian maize.

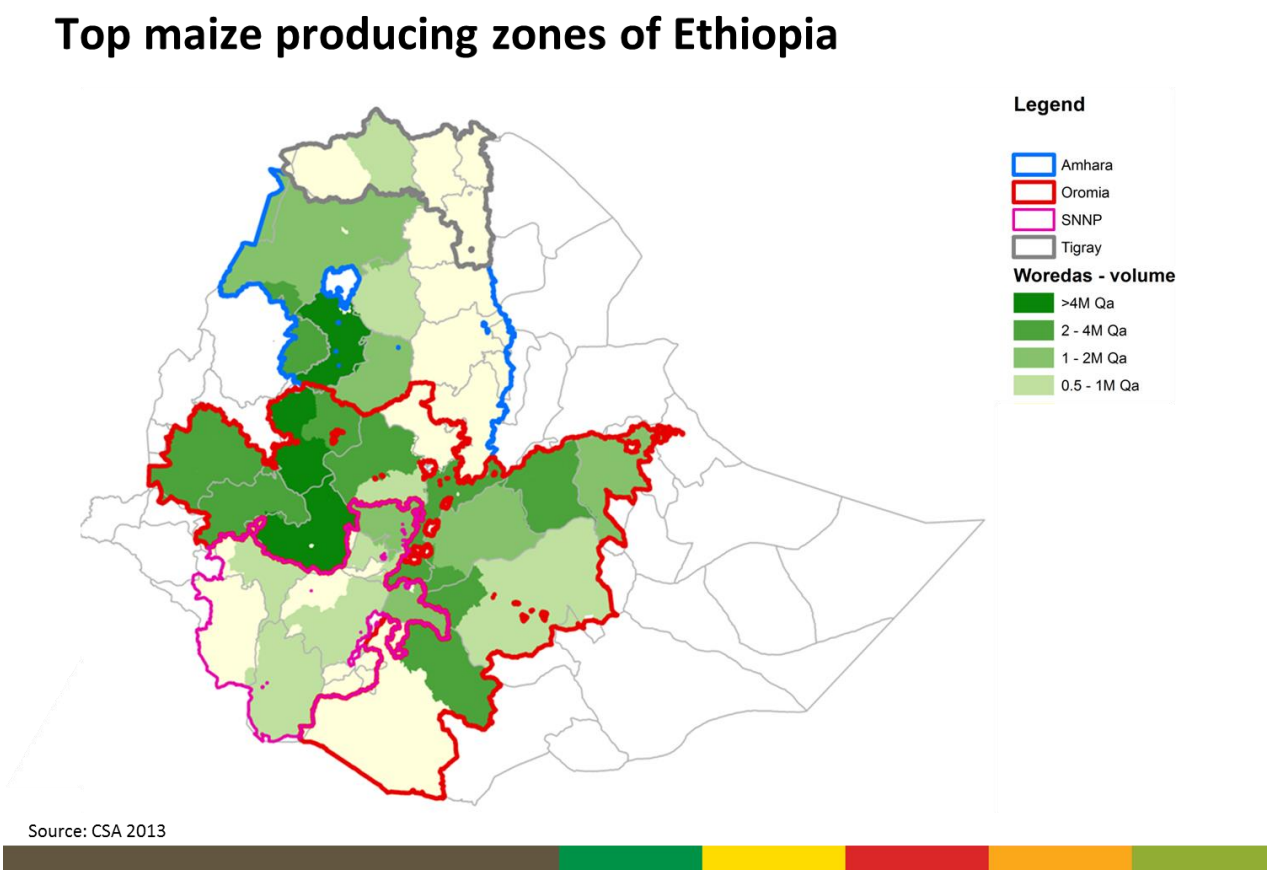
Exhibit 1: Ethiopian maize production and productivity, 2001-2011



1.2.2 Major maize producing areas

Maize is mainly grown in the four big regions of the country: Oromia, Amhara, SNNP, and Tigray. Oromia and Amhara contribute to almost eighty percent of the maize produced in 2012 (CSA, 2011/2012). Ten zones found in the two regions contributed to more than half of the national maize production in 2012. Among the top maize producing zones are: West Gojjam (5.6 million q), East Wellega (4.3 million q), Kaffa (3.8 million q), East Shewa (3.1 million q), West shewa (2.9 million q), West Arsi (2.7 million q), Illubabor (2.7 million q), East Gojjam (2.2 million q), West Wellega (2.1 million q), and West Harerghe (2.1 million q). Other regions such as Benishangul Gumuz and Gambela also grow maize and have the potential to increase their current production level in the future.

Exhibit 2: A map of top maize producing zones of Ethiopia based on 2013 CSA private peasant holdings Agricultural survey



1.2.3 Potential for intensification of maize production

The western part of the country is generally well suited for the current maize varieties with the largest adoption (BH660, BH540, BH543, BH670, AMH800, and AMH850). Specifically, the agro ecology spanning Amhara, Benishangul Gumuz, Eastern Gambela, Western Oromia, and Western SNNP are well suited for production intensification, by using current varieties of improved seed, applying proper agronomy practices and increasing accessibility to improved farm implements and equipment. In Benishangul Gumuz, and Eastern Gambela regions, there is scope to increase both the land area under maize cultivation and the productivity per hectare.

1.2.4 Women farmers in the maize sector

Addressing gender inequality is one aspect of improving smallholder welfare in the maize value chain, and the broader agricultural sector.

In 2010, women accounted for 48% of agricultural labor in Ethiopia, and were responsible for 60-80% of household food production. However, despite the significant involvement of women farmers (including female heads of households, married women and female youth) in agricultural production and

marketing, the extension system historically has not identified and integrated the specific needs of women farmers and has instead taken a “one-size-fits-all” approach.

At least one study indicates that this inattention has been reflected in lower yields for farmers from female-headed-households, implying that accounting for gender in the design of interventions may serve not only to increase the equity of outcomes but also to increase their overall impact on production.

1.3 Components of the maize value chain

To ensure all components of the maize sector in Ethiopia are addressed in a comprehensive and coordinated manner, a value chain approach is being followed. The core components identified within the Ethiopian context include: research and technology development; access to inputs; on-farm production; post-harvest processing & storage; trade, marketing and demand sinks. These value chain components are shown in **Figure 2**

Exhibit 3: The maize value chain

Gender Considerations in Value Chain Analysis

Using a gender lens in analyzing the situation of small-holder farmers contributes to the development of demand-driven solutions that consider and address the needs, constraints, opportunities and capacities of both men and women farmers. Undertaking gender analysis to understand the level of participation of women farmers (female heads of households, married women and female youth) in the different components of the value chain, is an integral part of any value chain development process.

1.4 Major stakeholders

Ministry of Agriculture

The Ministry of Agriculture (MoA) is responsible for developing and coordinating the implementation of the overall national agricultural development strategies and policies for Ethiopia, with input and support from the regions and other stakeholders. The ministry is also responsible for packaging newly developed technologies and disseminating them through its extensive federal and regional extension networks. Furthermore, the ministry compiles the annual input (mainly fertilizer) demand, makes the purchase, and distributes to all regions through the regional bureaus of agriculture.

Other Relevant Ministries

The Ministry of Trade has a mandate to strengthen Ethiopia's agricultural export sector and improve the country's competitiveness in foreign markets by formulating and implementing export promotion policies and strategies, as well as collecting, analyzing, and disseminating export trade-related information to relevant members of the business community.

The Ministry of Industry has a mandate to develop agro-processing industries, in line with the country's overall industrial development strategy, by creating conducive conditions to encourage investment, generating and linking relevant stakeholders for industrial project ideas, attracting joint ventures from abroad, and providing support to agro-processors.

The Ministry of Foreign Affairs and foreign missions can contribute to linking exporters with foreign buyers by facilitating contacts and assisting in business deals; organizing trade missions; creating opportunities for exporters to participate in international trade fairs, exhibitions, conferences and workshops; and creating awareness of market opportunities.

The Ministry of Women, Children and Youth has a mission to ensure equal participation and benefits of Ethiopian women in the social, economic and political spheres and to protect the rights and wellbeing of children, follow up the implementation of international conventions, conduct research and study, prepare policies and guideline and follow up their implementations, collaborate with organizations working on women's and children's issues and perform capacity building activities.

Agricultural Transformation Agency (ATA)

The ATA is currently working with its partners in problems solving to facilitate identification of solutions to systemic bottlenecks; implementation support to provide project management, technical assistance, and knowledge sharing; capacity building to strengthen key public, private, and civil society partners to ensure sustainability of interventions; and coordination to enhance linkages and coordination among stakeholders in high priority areas to reach agreed-upon milestones and objectives. ATA's overall mandate is to address systemic bottlenecks in the agricultural sector by supporting and enhancing the capability of the MOA and other public, private, and non-governmental implementing partners, with the ultimate objective of improving the livelihoods of smallholder farmers.

Regional Bureaus of Agriculture (RBoA)

The Regional Bureaus of Agriculture (RBoAs) are responsible for coordinating and leading agricultural development in their respective regions. RBoAs oversees the implementation of the extension packages and provide support to woreda offices of agriculture in delivering extension services. They also facilitate coordination and alignment across development partners to ensure coordinated agricultural development services are delivered at the woreda level. In some regions, zonal offices of agriculture play coordination and technical support role for woreda offices of agriculture. There are 9 regional administrations and 69 zones including the Harari regional government.

Research Institutions

The Ethiopian Institute of Agricultural Research (EIAR) and the Regional Agricultural Research Institutes (RARIs) have the mandate to generate, adapt and promote agricultural technologies that are required to enhance agricultural productivity. These institutes play a key role in developing solutions and technologies, as well as providing and disseminating recommended agronomic practices and improved inputs (for instance improved seed varieties and adapted farm implements). EIAR is responsible for the coordination of nationwide research, while the RARIs are expected to conduct targeted research and develop region-specific recommendations.

EIAR manages a number of federal research centers, with each mandated to work on a specialized set of agricultural research topics. Three federal research centers/projects are particularly relevant for the maize sector: Bako National Maize Research Project (BARP), which focuses exclusively on maize research; and Melkasa Agricultural Research Center (MARC), which focuses on drought tolerant maize varieties (DTM). Ambo ARC works on maize research for highland sub-humid maize producing agro-ecologies

In addition to the crop research centers, there are agricultural mechanization research centers such as Bako Rural Technology Center, Agricultural Mechanization Research at Melkasa Agricultural Research Center, and Bahirdar Rural Technology Center. These centers focus on production of agricultural machinery prototypes and testing of imported machinery.

Higher Learning Institutions (HLIs)

There are over 30 universities and colleges currently in operation in the country. Many of the older ones such as Haramaya University, Mekele University, Hawassa University have agricultural colleges, which engage in agricultural research and extension, mainly addressing priority constraints in the regions where they are located.

Seed Enterprises

The Parastatal Seed Enterprises (PSEs) include the Ethiopian Seed Enterprise (ESE) and Regional Seed Enterprises (RSEs) in Amhara, Oromia, SNNP, and most recently, Somali. In general, PSEs exercise the double mandate of 1) implementing the government targets to produce sufficient quantities of improved seed for all key crops including cereals like maize, while 2) functioning as independently profitable businesses.

ESE is the oldest and largest seed producer in the country; its board of directors is led by the head of EIAR, with other members from EIAR and MoA. RSEs are governed by respective RBoAs and receive operational support including deployment of Bureau staff. RSEs are relatively new seed producers – the oldest, Oromia Seed Enterprise (OSE), is only 3 years old – established to cater for the needs of their respective regions.

Next to PSEs, privately owned seed companies are significant contributors to national seed output. There are two types: multinational and domestic. Multinational seed companies import varieties developed by their own privately funded research, broadening Ethiopian farmers' access to technology. Because they do not rely on publically developed varieties, they are able to price and market their seed independently. They rely on internationally recognized seed brands and internal quality control facilities. Currently, one multinational, Pioneer Hi-bred, is active in Ethiopia. A few others – Seed Co, Morrell, Nirmal and Vibha - have completed registration and are expected to start production within two years.[1]

The informal sector also produces a substantially quantity of seed that is sold within the country.

Extension services

Research institutions depend on extension services to disseminate new technologies and agronomic best practices. At the ground level, extension is provided through multiple channels. One channel is Farmer Training Centers (FTCs), which serve as training and demonstration sites. Another is Development Agents (DAs), which provide advisory services mostly to groups of farmers.

Farmers

Farmers, particularly smallholder farmers, are the ultimate owners of and beneficiaries from this sector strategy. They are also key stakeholders during the implementation process. To aid in the expedited dissemination of technologies and knowledge, and provide community support, farmers are organized in a 1-to-5 farmer network led by model farmers.

Primary Cooperatives and Unions

Agricultural cooperatives play an important role in organizing smallholder farmers, providing inputs and output marketing services. There are 3 federations in Ethiopia, comprising 160 unions and about 10,000 primary agricultural cooperatives. The GTP envisions an increase in the number of cooperatives in Ethiopia to over 56,000 by 2015.[2]

Private sector

The maize value chain can benefit from private sector investment and participation in seed and input production and distribution; import, export, production, and distribution of post-harvest machinery; agro-processing and other demand sinks. Such participation can be achieved through a variety of business models, including Public-Private Partnerships (PPP) involving commercial farmers, manufacturers, processors, traders etc.

Non-government, multilateral, and bilateral organizations

Non-government, multilateral, and bilateral organizations are major players in agricultural and rural development. Many of these organizations implement programs in food security and natural resource

[1] 5-year Strategy for the Transformation of the Ethiopian Seed System, ATA

[2] Ministry of Finance and Economic Development (MoFED); Growth and Transformation Plan (GTP), 2010/11-2014/15, September 2010 -Addis Ababa

management. In particular, USAID has scaled up its agriculture development investments in Ethiopia, focusing around the AGP. In support of AGP's Market and Agribusiness Development sub-component, USAID launched the US$50 million Agribusiness and Market Development (AMDe) project, led by implementation partner ACDI/VOCA, focusing on six agricultural value chains including maize. The Food and Agricultural Organization of the United Nations (FAO) is involved in multi-faceted interventions in the area of food security and natural resource management.

The World Food Programme (WFP)

WFP is the world's largest humanitarian agency fighting hunger worldwide. In Ethiopia, WFP's Purchase for Progress (P4P) strategy focuses on enhancing smallholder farmers' marketing opportunities. Through its food procurement and partnerships, P4P aims at strengthening the management and marketing capacities of the cooperative unions (CUs) and small-scale traders associations through which many smallholder farmers access markets.

Sasakawa Global 2000 (SG 2000)

SG 2000 Ethiopia is an agricultural initiative of two non-governmental organizations: the Sasakawa African Association and the Carter Centre Global 2000. SG 2000 Ethiopia, established in 1993, works in close collaboration with the Ministry of Agriculture, with its main objective being to promote transfer of appropriate and improved agricultural technologies to smallholder farmers. The goal is to increase production and productivity to assure greater family food security and more profitable participation in commercial activities along the value chain, while respecting natural resources as well.

Ethiopian Grain Trading Enterprise (EGTE)

The Ethiopian Grain Trading Enterprise plays a major role in cereal marketing in Ethiopia. More specifically, EGTE is the primary public enterprise that purchases grain from farmers to sell in local and export markets, contributing towards stabilization of cereal markets in Ethiopia.

Commercial Bank of Ethiopia (CBE)

The Commercial Bank of Ethiopia (CBE) is the largest commercial bank in Ethiopia with an estimated Birr 86.5 billion in assets (at the end of June 2011). The bank holds over 60% of deposits and about 38% of all bank loans in the country. The bank has about 8,000 employees and over 550 branches in major cities and regional towns.

Other Financial Institutions

Other financial institutions including banks, credit and savings institutions, other MFI's and Rural Savings and Credit Organizations , etc. all have a significant role to play in enabling financial access to sector players for inputs, output financing and equipment purchases.

Ethiopian Commodity Exchange (ECX)

The Ethiopian Commodity Exchange is an organized marketplace, where buyers and sellers come together to trade, assured of quality, quantity, payment, and delivery. ECX currently trades mostly coffee, sesame and pulses; however its founding objectives include the trade of cereals including Maize.

1.5 Strategy development approach

In close consultation with the Ministry of Agriculture and other relevant institutions, the Maize team at the Agricultural Transformation Agency undertook a maize value chain diagnostic in Ethiopia starting in July 2011. Over 90 stakeholders and even more women, men and youth smallholder farmers were consulted as part of the process at the kebele, woreda, regional, and federal level. Government institutions, Development partners, NGOs, and other actors also provided input and feedback. These discussions culminated in a wide-ranging stakeholder meeting held in December 2012, where the team's preliminary findings and recommendations were presented and validated. Development of the strategy document expands on and further refines the initial findings and recommendations by incorporating additional supporting data and analyses, as well as key learning from immediate interventions. Drafts of the strategy document were reviewed and syndicated with institutional owners during the June 2013 national maize sector strategy review workshop.

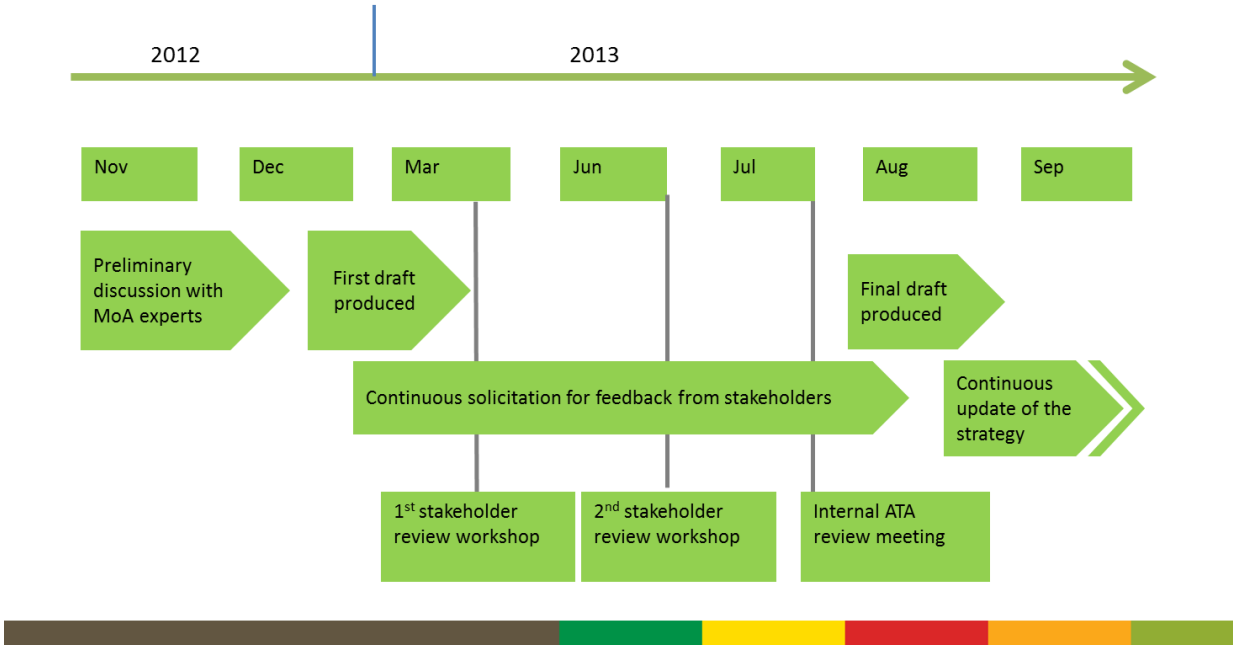
It is expected that the maize sector strategy development process will continue through the development of the next Growth and Transformation Plan due in 2015, with which a formal version of the strategy will be launched.

The ATA Wheat, Maize and Barley team has continued to work closely with stakeholders during implementation of immediate interventions, which have provided rich learning for the development of this strategy. For instance, the team has partnered with MoA, RBoAs, WFP, USAID, ACDI / VOCA, TechnoServe, SG 2000, 16 unions and CBE on an integrated project to deliver 30,000 MT of maize of WFP's Purchase for Progress (P4P) initiative. This initiative will be scaled up to 100,000 tons and eventually to 300,000 tons in the coming few years through a combination of the three grain procurement facilities: Forward Delivery Contract (FDC), direct purchase, and soft tender. The program aims to provide an integrated set of services to maize farmers across the country. Lessons from this on-going initiative and others should be used to improve the sector strategy going forward.

This sectoral analysis results from a rigorous multi-step process, as described below:

- **Extensive review of the relevant literature:** The team conducted an exhaustive review of existing reports published by local and international experts, which provided a baseline understanding and starting point for the team's work. The team also undertook visits to all relevant research institutes to review the most recent research findings.
- **In-depth key discussions with key stakeholders:** Over 90 stakeholders in various institutions, including MoA, RBoA, woreda and kebele-level government staff, development partners, research institutes, traders, cooperatives, unions, smallholder farmers, and others have been consulted in the strategy development process. The consultations helped identify and validate the challenges and interventions proposed in this strategy.
- **Multi-stakeholder convening:** Stakeholders were initially convened in December 2011, with numerous follow-up discussions since then. ATA has continued through 2011, 2012, and 2013 to engage key stakeholders throughout the season in refining aspects of the strategy, through both discussions and practical engagements in implementing on-going programs.

Exhibit 4:Timeline of the Maize Sector Strategy development



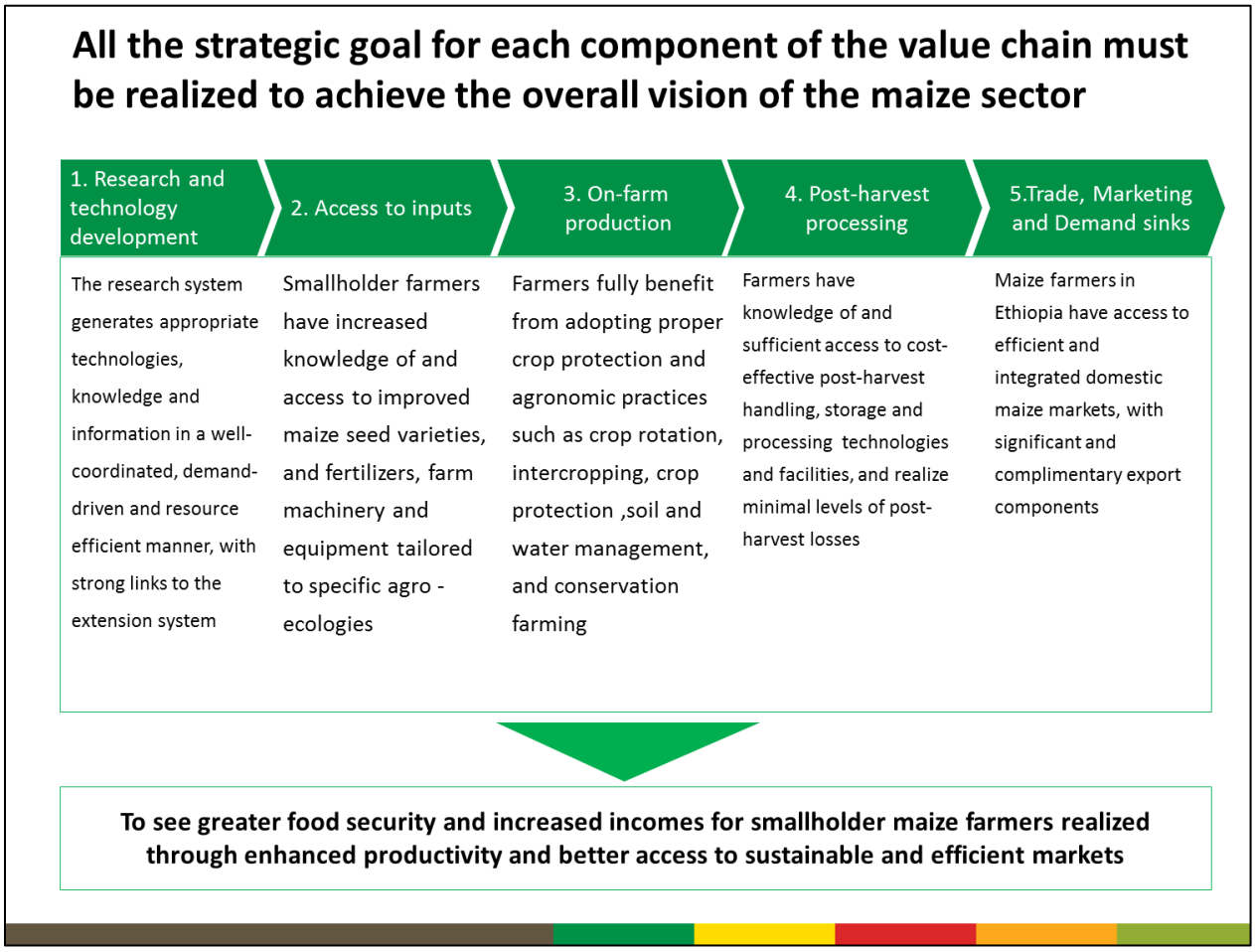
CHAPTER 2. VISION, SYSTEMIC CHALLENGES, AND INTERVENTIONS

2.1 Overall vision

The vision for the maize sector is to see greater food security and increased incomes for smallholder maize farmers realized through enhanced productivity and better access to markets that are sustainable and efficient

Strategic goals reflecting the components of this vision are shown in the figure below

Exhibit 5: Strategic goal of each component of the maize value chain



To achieve the stated strategic goal for each component of the value chain, a detailed diagnostic has been conducted to identify systemic challenges and design the interventions required to address them. Sub-section 2.4 provides a summary of the analysis conducted on each component of the value chain. Each sub-section includes:

- **Strategic goal** informed by international and Ethiopian best practices
- **Systemic challenges** constraining the development of the sector

- **Long-term strategic interventions** to address systemic challenges

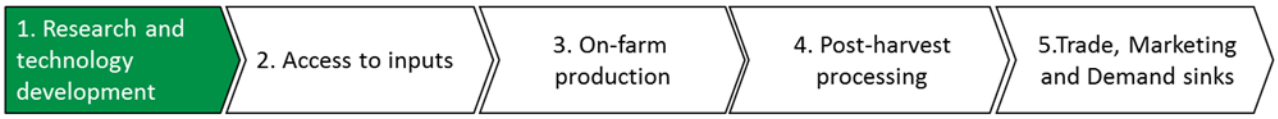
Often interventions and supporting environmental factors have an impact across multiple components of the value chain. For instance, effectiveness of the extension system, availability of credit, and favorability of the policy environment each influence the value chain at multiple stages and can have a multiplicative effect. Nonetheless, the value chain approach—focused on the ultimate end goal of improving farmer productivity and income—remains the most suitable diagnostic approach.

2.2 Mission

Build capacity among, provide comprehensive advisory support to and technically backstop key stakeholders along the value chain in order to significantly the productivity and competitiveness of the maize industry.

2.3 General objective

Across Ethiopia, boost maize productivity, improve smallholder farmers' incomes, and increase the commercialization of the crop. For designated intervention woredas, increase yield by 100%, smallholder farmers' incomes by 50% and commercialization of the crop to 50% of production.



2.4 Strategic goals and interventions

2.4.1 Research and technology development

Strategic goal

Strategic goal for research and technology development
Farmers benefit from a maize research program which generates appropriate technologies, knowledge and information in a well-coordinated, demand-driven and resource efficient manner, with strong links to the extension system

Systemic challenges

A significant proportion of farmers do not know about new varieties, especially Quality Protein Maize varieties

While some maize hybrid varieties such as BH660, BH540, and Melkasa 2 are relatively well known by farmers; there are several newer varieties that could have significant benefits that remain unknown to farmers. In particular, varieties of Quality Protein Maize (QPM), which has substantial demonstrated nutritional benefits and is widely adopted in other African countries, are not widely known or adopted in Ethiopia despite the fact that more recently introduced QPM varieties in the country can produce yields on par with more popular varieties.

The lack of awareness is partly because there is limited incentive amongst seed producers to popularize these new varieties, if the benefits of additional awareness and demand are not exclusive to any one producer, even if for a defined time frame. This has indirectly forced most seed producers to focus on producing already popular varieties. As a result; the new varieties remain poorly multiplied and marketed, and thus not accessible to farmers.

Exhibit 6: Yield and adoption range of released maize varieties in Ethiopia

Variety name	Year of release	Released by	Altitude range	Rainfall	Maturity days	Average yield (qt/ha)
PHB-30G19 (shone)	2006	PHBSE	1000-2000			80.0
Tabor(30-H83)	2001	PHBSE	1600-2000	800-1600	137	76.0
BH-543	2005	BNMRC	1600-2200	1000-1200	148	75.0
BH-670	2002	BNMRC	1700-2400	1000-1500	165	70.5
AMH850(Wenchi)	2008	Ambo	1800-2600	1000-1200	183	70.0
AMH851(Jibat)	2009	Ambo	1800-2600	1000-1200	178	70.0
BH-660	1993	BNMRC	1600-2400	1000-1500	160	70.0
Shindi(phb-30g-97)	2001	PHBSE	1500-1900	800-1600	137	69.0
BH-541	2002	BNMRC	1000-1800	1000-1200	150	65.5
AMH800 (Arganne)	2005	Ambo	1800-2500	1000-1200	175	60.0
BH-661	2011	BNMRC	1000-2000	1000-1500	160	60.0
BH-540	1995	BNMRC	1000-2000	1000-1200	145	57.5
BHQp-542	2002	BNMRC	1000-1800	1000-1200	145	55.0
BH-530	1996	BNMRC	1000-1300	1000-1500	140	55.0
BH-140	1988	BNMRC	1000-1800	1000-1200	145	53.5
Gambela Comp-1	2002	BNMRC	500-1000	1000-1200	110	45.0
Rare-1	1997	HRU	1600-2200	900-1200	163	42.5
Gibe Comp.-1	2001	BNMRC	1000-1800	1000-1700	145	42.5
Kuleni	1995	BNMRC	1700-1400	1000-1200	150	42.5
A1-ComP	1975	HRU	1600-2200	1000-1200	163	40.0
UCB	1975	BNMRC	1700-2000	1000-2000	163	40.0
Abo-Bako	1985	BNMRC	500-1000	1000-1200	150	40.0
A-511[a]	1974	HWU	500-1800	800-1200	150	35.0
Melkasa-3 [c]	2003	MARC	1200-1700	600-800	125	35.0
Melkasa-2	2003	MARC	1000-1700	600-800	130	35.0
Gutto	1988	BNMRC	1000-1700	800-1200	126	27.5
Fetene(ACV-3)	1996	HWU	1000-1700	450-550	105	25.0
Tesfa(ACV-6)	1996	HWU	1000-1700	450-550	105	25.0
Melkasa-1	1999	MARC	500-1600	400-500	105	25.0
Katumani	1974	HWU	1000-1700	450-550	105	22.5

Source: EIAR/ Directory of Released crop varieties and their recommended cultural practices, 2004 E.C

There is limited research on plant protection and optimal agronomic management

Historically, the predominant focus of research into maize has been on the production and optimization of new varieties. On the other hand, research recommendations on agronomic management and plant protection are often not site-specific, resulting in lower than optimal yields when applied. Additionally, current recommendations on plant protection (e.g. stalk borer and striga) and agronomic management – e.g. optimal plant populations and nutrient levels by variety are not frequently updated, and there is

limited research effort to refresh these recommendations. The extension system relies on research outputs to update recommendations, and without such output, farmers and extension agents do not receive refreshed, agro-ecology specific recommendations to optimize yields.

Limited research has been conducted on developing widely adapted early and intermediate maturing varieties, as well as varieties for special end uses and challenging environments

In the past decades, there has been a bias towards the release and dissemination of late-maturing maize varieties compared to early-maturing varieties. This focus on late maturing varieties has been driven by the agro-climatic conditions of the major maize-producing belt. Due to climate change, however, the growing cycle has become increasingly variable, with shorter and irregular seasons. The research system has yet to respond adequately to this emerging phenomenon.

While research over the years has led to a number of new maize varieties, which are widely used across the country, there is scarcity of specialized varieties suitable for less traditional growing areas and the emerging set of diversified end uses. Going forward, the expansion of irrigated agriculture will drive demand for heat-tolerant and highly productive OPVs and hybrids, while the observed rapid rate of urbanization and industrialization in the country is bound to create a niche market for processed foods. Additionally, there will be greater demand for maize that can grow in challenging environments (e.g. acid soils and dry lands). Therefore, it is time to refocus research to address the diversified emerging demand for these more specialized varieties.

Research should also account for the fact that adoption of maize varieties that are grown for household consumption may be partially determined by women's household consumption preferences, such as cooking time, taste, and responsibility for child nutrition.

Inadequate research on post-harvest considerations, including storage and value addition

At present farm-level post-harvest losses among smallholder maize farmers are excessively high. The losses are largely caused by the improper time and method of harvesting/threshing and storage, which expose the produce to physical, pest and pathogen damage very often leading to serious quality deterioration. On average all those factors result in a combined loss estimated at 16% (Rembold et. al.).

Adding to the problem is the fact that there are very few if any post-harvest processing and storage technologies that are within reach and that fit to the socio-economic conditions of small scale farmers. Therefore, greater strives are needed in this area to come up with appropriate technologies. Furthermore, a more intensive research in food science and utilization research is needed to turn stored maize produce in to diversified end product through value addition. Given the popularity of maize in Africa and throughout the world, attention should be paid to the wide range of available technologies developed and applied in other countries and which of these could be feasibly and beneficially adapted in an Ethiopian context.

Aside from the quantity of post-harvest loss, the growing health risks associated with mycotoxin (aflatoxin) contamination is source of major concern. There remains limited research on the prevalence

and concentration of aflatoxins in Ethiopian maize: one study of the 2004/2005 harvest found aflatoxins in a high proportion of samples collected from multiple regions, though the concentration of toxins was below an internationally accepted threshold in almost all cases (Ayelew). While there is little present evidence in Ethiopia of the instances of acute aflatoxicosis frequently seen in Kenya, a more comprehensive empirical study of the scope of the issue should be conducted, and awareness should be raised at all levels of the toxicity risk posed by improper storage procedures.

Research centers have human and infrastructure capacity gaps

Human and infrastructure capacity gaps persist at maize research centers, both at the national and regional levels. There is significant attrition of staff at the research centers, and new recruits have limited technical capability. The centers also lack sufficient physical infrastructure – such as greenhouses, well equipped laboratories, farm machinery, and transport facility – that could allow them to more efficiently generate and multiply new technologies.

Strategic interventions

Increase farmer awareness and develop a system to facilitate access to and wider adoption of new varieties, especially Quality Protein Maize varieties

A multi-stakeholder approach to increase farmer awareness of new varieties, especially QPM varieties, should be implemented. Such an approach should bring together public and private partners to shortlist the most beneficial new varieties by agro-ecology and to develop an awareness campaign through regular and wide-scale demonstrations and field days, and should be backed by sufficient multiplication of seed of these new varieties. Any campaign should account for potential differential preferences of female smallholders.

Update research on plant protection and optimal agronomic management

Research on plant protection and optimal agronomic management should be updated, including on problematic soil management, water management, cropping systems, plant population and nutrient levels (including micro nutrients). A process should be implemented to make such updates a regular output of the research system. Newly developed integrated, sustainable, multi-purpose and ecology based pest management methods such as the push and pull methods should be widely demonstrated and promoted at the required scale to bring about significant impact in terms of minimizing the two major biotic constraints of maize – stalk borer and striga.

Concerted efforts should be made to ensure that outputs of research are promptly fed into the extension system, including updating recommendations and trainings for extension workers and for farmers.

Support research on the development of widely adapted medium-short cycle varieties, and varieties for special uses

Maize research centers should reposition their strategies to focus in a balanced manner on both long cycle and medium-to-short cycle varieties. Such an approach should aim at producing a balanced set of new varieties in the coming years, in order to enable farmers to select appropriate varieties, and mitigate the effects of climate change.

Selected collaborative research projects on generating/adaptation and promotion of maize varieties for special uses should be developed and fast-tracked. Such projects should involve federal and regional research institutes, universities and relevant CGIAR centers.

Generate/adapt and fast track the dissemination of appropriate post-harvest processing and handling technologies, including storage and value addition techniques

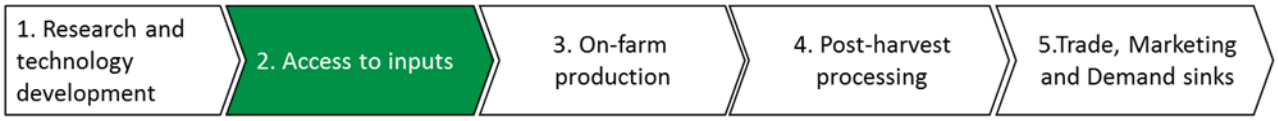
Currently available technologies should be inventoried with appropriate technologies to be packaged and promoted aggressively through public-private partnerships. Available control methods vis. use of resistant cultivars, harvesting at maturity, rapid drying on platforms to avoid contact with soil, appropriate shelling methods to reduce grain damage, sorting, use of clean and aerated storage structures, controlling insect damage, and avoiding long storage periods should be promoted to minimize the increased aflatoxin threat. Renewed efforts should be made with the assistance of CGIAR centers to come up with joint projects on generation and/or adaptation of novel post-harvest processing and handling techniques and technologies for the production of value added products.

Gender Considerations in Research and Technology Development

- In order for maize technology benefits to be fully realized, research has shown that women's preferences and constraints need to be considered
- Research agenda-setting should incorporate the concerns of both men and women
- Technology development should consider accessibility and applicability for both men and women
- Focus should be given to developing and disseminating need based-technology which considers the gender divide in agricultural labor

Improve human and physical capacity of research centers

Human resource management at research centers need to be focused on staff retention and motivation, as well as on quality training for new technical hires and capacity building for the current staffs. Strategic maize research centers should be better equipped with the physical infrastructure such as green houses, bio-tech labs, crop protection labs, irrigation facilities, tractors and other equipment and transport facility necessary for efficient execution of their role.



2.4.2 Access to inputs

Strategic goal

Strategic goal for input production and distribution
Smallholder farmers have increased knowledge of and access to improved maize seed varieties, fertilizers, farm machinery and equipment, each tailored to specific agro ecologies

Systemic challenges

Lack of affordability of the full inputs package

Smallholder maize farmers, including male and female-headed households, face finance shortages that can prevent full adoption of the recommended inputs package. Finance shortage force farmers to use sub-optimal input packages, or in some cases not to use inputs at all. Even when using the full package would be financially beneficial over the course of a longer time horizon, this short-term shortage of finance at the critical time of input purchase period prevents farmers from realizing the optimum yield they could otherwise achieve.

Application of the full inputs package of 25 kg seeds, 100 kg DAP, and 100 kg Urea per hectare costs a farmer around 3200 ETB. This amounts to approximately one third of the national average annual per-capita non-food expenditure. Therefore, it is a huge decision for a smallholder farmer to take risk and shift expenditures from children's school fee, social responsibilities expenditures, and tax payments in order to purchase a full package of inputs.

To increase the rate of purchase of a full inputs package, farmers need access to financial services, either savings, credit or other financial instruments. In the case of maize, given comparatively low seed requirements, fertilizer represents the highest input cost. Even farmers who use hybrid seeds often sow their seed without supplementing it with the recommended fertilizer for cost reasons.

For farmers seeking to purchase a full inputs package, liquidity is another major barrier. At the start of a given planting season, many farmers do not have sufficient cash on hand; they will have the cash only after the actual harvesting and marketing the maize. However, seed producers and AISC need to collect revenue at the time of sale, since the cash will be used to cover costs toward supplying inputs in future seasons. Thus, there is a vast timing mismatch between input suppliers and end-users, farmers.

Inputs are not sufficiently targeted to specific agro-ecologies

Current application rates of seeds and fertilizer are not sufficiently targeted to specific soil and agro-ecological variations. The blanket application of inputs does not provide the full potential for yield

increases, and can at times reduce yields and deplete soil nutrients. Most maize farmers apply a blanket rate of 100kg DAP and 100kg Urea despite differences in soil type, rainfall pattern, and variety of maize seeds used, which impact the optimal application rate.

Limited access to improved inputs, especially seed, due to inaccurate demand assessment

The quantity of seed supplied to cooperatives and farmers is often insufficient and not aligned with farmer demand. On the other hand, in some areas and cases there are reports of oversupply leading to seed carry over. For instance, according to IFPRI research, in 2010/11 the supply of BH-660 exceeded previously identified farmer demand by nearly 30,000 quintals, while available BH-540 was more than 20,000 quintals short of demand.

An inaccurate seed demand prediction system is one root cause of such supply issues. At times, insufficient incentives and attitude problems on the part of key actors in the seed sector also contribute to the problem.

Access to improved farm implements and equipment in maize producing areas is so far insignificant.

Poor and inconsistent seed quality

In different maize growing zones, there are persistent issues related to sub-standard quality of the improved seeds available to farmers. The common seed impurity issues raised by farmers are: 1) mixture of seed with sand, other grains and other maize varieties, and 2) damage to seed kernels by weevils. These quality problems adversely affect germination rates for improved seeds, leading to low adoption of improved seeds, especially hybrids, by farmers.

Seed quality can be compromised at two different levels. The first is when seeds originally come from seed enterprises. At this stage, seed quality can be compromised through exposure to insect attacks, as well as the combination of various seed varieties in the same batches, particularly mixing of early-maturing and late-maturing varieties. According to a 2011 assessment of hybrid maize production facilities, which included 8 research centers and 10 seed producers, shortcomings in both qualified staff and appropriate facilities led to inadequate internal quality control.

The second level of seed quality compromise happens at the cooperative level, when quality can be compromised during loading, unloading, and storage.

It should be noted that the informal sector—for which quality control may be an even greater challenge—comprises a substantial proportion of seed production in the country.

Late delivery of inputs, particularly seeds

Farmers need improved seeds to be available at their nearest primary cooperative or retail outlet before the planting season commences. Timely availability of improved seeds at primary cooperatives has been a major challenge in recent years, especially during early on-set of rainfall. By

comparison, fertilizer delivery has been improved over the past two years and farmers in many areas have no problem of accessing Urea and DAP from the primary cooperatives early before the planting period.

Strategic interventions

Engage in alternative options of input financing at the farmer level, potentially including:

- **Farmer savings groups:** Supporting and providing incentives for farmers to form savings groups, such as Savings and Credit Cooperatives (SACCOs), can assist them in saving post-harvest income for use in purchasing inputs the following season. The scope of currently existing MFIs and SACCOs should be extended to involve more farmers in the system. Such schemes can fill gaps in especially poor areas where there is limited access to financial institutions.
- **Extending the reach of sustainable lending through financial institutions:** Savings and credit are important financial tools that help maximize household-level investments in optimal production, and in building assets that can be used for future production expansion. Due to previous challenges with input credit delivery to farmers through public channels, alternative, more sustainable options for financing farmers through MFI's and banks should be extended to reach farmers in a more cost-effective way. Two key approaches could be leveraged in this regard: 1) Reducing overall production risk through complimentary financial instruments such as crop insurance, and 2) Deploying technology such as electronic payments systems to reduce cost and risk of enrollment, repayment and access to account services, and to encourage savings.
- **Contract farming and forward delivery contracts:** Linking farmers with large scale buyers both through contract farming and forward delivery contracts could help farmers access input finance in a much more structured manner. Structuring the relationship between the producers, that is the smallholder framer, and the final commercial buyer brings in an element of predictability and lowers the risk of participation for all other players within the value chain. To reach women farmers, input finance approaches should be sensitive to women's demands for seed and fertilizer.

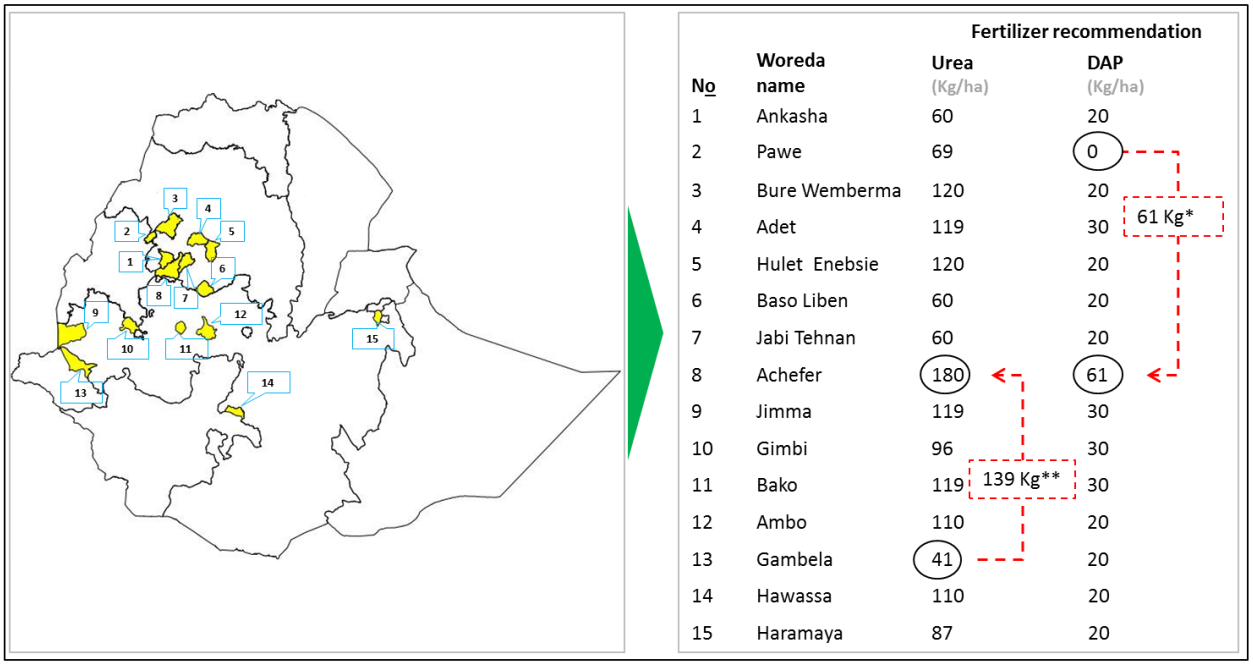
Input recommendations should take specific agro-ecologies and socio-economic conditions into consideration

Seed characteristics and nutrient contents should be studied and analyzed thoroughly before recommending inputs to specific areas. Projects such as the Ethiopian Soil Information System (Ethiosis) can provide appropriate data for agricultural research institutes to study soil patterns and recommend the right mix of inputs required for each woreda. This will facilitate development of input packages and agronomic practices tailored to specific agro-ecologies. In addition to this, EIAR and RARIs should work together in developing granular input recommendations. Together, these actions will help farmers apply the right type of inputs with the right quantity.

Exhibit 7: Woreda-level fertilizer recommendation for 15 sites

Input recommendation should be tailored for specific agro-ecologies for maximum impact

Key: Input requirement difference



There is a huge disparity in the amount of Urea and DAP that is recommended for various woredas of the country

Source: Wakene Negassa et.al; Soil Fertility Management Technologies for Sustainable Maize Production in Ethiopia

Conduct seed delivery through alternate channel(s)

On-time delivery of seeds to farmers requires more than physical transport; additional safeguards for quality, traceability, documentation and monitoring are necessary. This necessitates the need for a more robust logistical solution than the status quo, which primarily relies on the delivery capacity of regional seed enterprises. Two potential solutions may be pursued, individually or in combination:

- A full-fledged logistics provider (LP) should be tasked with the delivery of seeds and fertilizers directly from seed enterprises and AISE to primary cooperatives who supply inputs to farmers. Such a logistics provider would be managed via the Regional Inputs Directorate and tasked to ensure that seeds are delivered within a contracted timeframe to all designated primary cooperatives with the required seed quantity and quality maintained.
- Infrastructure should be established for direct seed marketing (DSM), in which different actors including regional seed enterprises, the Ethiopian Seed Enterprise, private sector seed producers, and entrepreneurs are permitted and encouraged to establish separate end

distribution points for the sale of improved seed (both publicly and privately produced) directly to farmers. Such a distribution method would incentivize timely distribution of seed in the quantity demanded by farmers, and would bring to bear the collective resources of different actors to address it.

To monitor seed distribution through the above channels, a tracking system must be created and updated in a timely manner to identify and communicate any delays or emerging issues so that appropriate actions can be taken in response.

Strengthen quality control at seed enterprises

There is still much to be desired when it comes to the internal quality control system of seed enterprises: quality is compromised across seed value chains due to insufficient internal quality control systems, inappropriate storage and transport challenges. Seed enterprises must be supported to improve their operational standards, and seeds produced at public and private seed companies should be subjected to inspection for quality.[3] To accomplish this, the following steps should be pursued:

Gender Considerations in Access to Inputs

- At present, women farmers' access to various inputs is hindered by lack of awareness and access to credit
- Agricultural inputs should be made accessible to both female and male farmers
- Doing so involves Identifying and addressing the kind of input needed, as well as current capacities, constraints and existing and potential opportunities for access

- **Provide guidelines for and enforce internal quality control for all seed producers**

  The establishment of clear and comprehensive quality guidelines for all components of the seed system is among the most important steps in internal quality control. The federal seed regulatory system should lead this process by developing guidelines and minimum standards covering internal quality labs for seed producers, storage and transport facilities, including for the number and qualifications of quality control staff. Regional authorities should enforce these standards through inspection, certification and capacity-building for compliance. This can ensure high quality along all the major dimensions.

- **Build capacity for internal quality control among all seed producers**

  In addition to external quality control, internal quality control systems are necessary for all seed producers. Internal quality control must be insured at two phases: production and post-production (in the lab). Appropriate quality control in the production process includes enforcement and appropriate facilities for isolation of breeder, pre-basic seed, and basic seed. Post-production quality control includes awareness and enforcement of ways in which certified seed must be treated differently from grain.

[3] 5-year Strategy for the Transformation of the Ethiopian Seed System, April 2012, ATA.

Strengthen federal and regional inspection and certification capacity

Ensuring sufficient inspection and certification capacity to regulate and manage the fast-growing industry is crucial. This is especially true with regard to hybrid maize seed, for which poor quality seed can translate into a failure to germinate or total crop failure for smallholder farmers. As outlined in the research and technology development section, the current regulatory capacity is stretched extremely thin and requires greater support in terms of human and equipment capacity.

2.4.3 On-farm production

Strategic goal

Strategic goal for on-farm production
Farmers fully benefit from adopting improved varieties, proper crop protection and agronomic practices such as crop rotation, intercropping, soil and water management, and conservation farming

Systemic challenges

The majority of farmers do not use the right input and agronomic management methods

In general, the great majority of smallholder farmers are aware of the benefits of adopting input technologies to enhance their maize productivity. However, this awareness is mainly about Urea and DAP, while knowledge about micro-nutrients is almost non-existent and amelioration of problematic soils is hardly practiced.[4] Furthermore, level of use of improved pre-harvest implements and machines is very low. Similarly, there is much room for improvement in getting farmers to adopt and implement the recommended package of agronomic management methods including proper tillage and land preparation, row planting, maintaining the right planting depth, plant population, time and frequency of weeding, and properly timed harvesting.

Maize mono-cropping decreases yield and increases exposure to pest outbreaks

In mono cropping, there is constant nutrient uptake each year, leading to the gradual loss of valuable nutrients such as nitrogen, phosphorous, and potassium from the soil. An estimate made by IFPRI from expert interviews shows that 122 kg of nitrogen, 82 kg of potassium, and 13 kg of phosphorous is lost per hectare due to lack of appropriate management practices. Such nutrient losses damage soil ecology, decrease yield, and expose maize to disease outbreaks.

Crop rotation, double cropping, and intercropping are effective agronomic practices that can help counter such fertility losses and help farmers maintain yield, increase labor utilization efficiency, stabilize soil nutrient levels and control disease outbreaks. Despite these benefits, not all farmers use these techniques. Farmers cite lack of awareness and high labor consumption as impediments against adoption. They emphasize the large amount of additional labor required as the main deterrent to adoption. This is contradictory to research made by EIAR which shows that both agronomic techniques

[4] Even fertilizer and improved seed, of which knowledge of the benefits is widespread, are under-utilized due to the issues in input supply, distribution, and affordability enumerated in earlier sections.

enhance labor utilization efficiency. This may indicate that the primary obstacle does amount to a lack of awareness of the full net benefits, coupled with a lack of practical knowledge on how to efficiently implement these practices at the farm level.

There are not adequate crop-protection techniques availed to smallholder maize farmers

Maize is vulnerable to attacks by weed, stem borer, blight and termites to name but few. Damage inflicted by these weeds and pests is enormous: the precise impact varies according to variety, intensity, and timeframe, but in general the most commonly-observed damage ranges from 30% to 100%.

- **Common weeds affecting maize yield**

  Four common weed types have been recorded in high maize producing areas of Ethiopia: perennials such as *Cynodon dactylon, Digitaria* spp., *Cyperus* spp.; annual weeds especially grass weeds, invasive (e.g. *Parthenium hysterophorus*) and parasitic weeds (Striga spp). These weeds reduce maize yield and quality by depleting nutrients, light, and water. In general the damage can reach 35 to 80 percent.
- **Common maize diseases**

  Four common maize diseases have been recorded in Ethiopia: maize streak virus, leaf blight, common leaf rust, and smut). Common leaf rust and leaf blight are very common in each of the three major agro-ecologies (lowland, mid-altitude, and highland), while maize streak virus is commonly found in mid-altitude and lowlands of the country.
- **Common maize insect pests**

  More than 40 species of insect pests affecting maize production have been identified in Ethiopia to date.[5] Stem borer, termites, and Aphids are the three most impactful. The average grain loss caused by stem borers is estimated between 20 to 50%,[6] while 100% crop loss has been recorded from termite attacks.

Mono-cropping and other inappropriate farming practices, climate change, drought, irregular rainfall patterns and overall environmental degradation are leading to increasingly heavy pest and weed incidence in maize producing areas of the country. Yet, despite the huge crop loss caused by weeds and pests, many farmers still do not apply appropriate crop protection techniques in a timely manner. This failure can be traced to the following major reasons: limited knowledge and information among farmers, overlap of farm operations leading to lack of labor, lack of availability of the appropriate chemicals, sub-standard quality of pesticides that can be found in retail shops, and excessive prices charged by pesticide retailers for those chemicals.

[5] Abraham *et al*., 1992 quoted in Girma Demissie et.al; Review of the Past Decade's (2001-2011) Research on Pre-Harvest Insect Pests of Maize in Ethiopia

[6] Girma Demissie et.al; Review of the Past Decade's (2001-2011) Research on Pre-Harvest Insect Pests of Maize in Ethiopia

Most farmers do employ traditional methods of crop protection techniques such as hand weeding and mulching. While some use agro-chemicals as an alternative to traditional practices, the most commonly used chemicals are 2-4-D and malathione. These two chemicals are not effective against many of the relevant weeds and insects, and are often not integrated with other necessary management practices as well. For this reason, their effectiveness in protecting maize plants is very minimal.

Exhibit 8: List of common maize diseases and pests in the major agro-ecological zones of Ethiopia

Common maize diseases and pests in Ethiopia

Production zone	Elevation	Maize disease	Insects	Weeds	Other threats
Mid-altitude sub humid	100-1800	Leaf blight, Rust, GLS, and Ear rot	Stalk borer, and Storage pests	• Grass weeds • Invasive weeds (eg. *Parthenium hysterophorus*) • Parasitic weeds (Striga)	Low soil fertility
Moisture stress	500-1800	Leaf blight, and Rust	Stalk borer, termites, and storage pests		
High altitude sub humid (transition and true highlands)	1800-2400	Leaf blight, Rust, Grey leaf spot, and Ear rot	Stalk borer, and storage insects		Poor stalk quality
Low altitude sub humid	<1000	Maize streak virus, Grey leaf spot, and Rust	Stalk borer, and storage insects		Lodging

Source: S. Twumasi-Afriyie et.al; Development And Improvement Of Highland Maize In Ethiopia, EIAR, 2001

Strategic interventions

Increase awareness of maize recommended agronomic practices through:

- **Training regional, zonal, and woreda-level experts, DAs and farmers:** To increase awareness of appropriate maize agronomy (integrated crop-soil-water management, management of problematic soils etc.), the most recent version of the maize extension package should be provided to regional, zonal, and woreda-level experts alongside training on its contents. This would serve to promote dissemination of agronomic best practices through Development Agents (DAs) to farmers. To reach women farmers, extension workers need to be sensitive to women's demands, which calls for additional gender awareness training.

- **Increasing coverage of demonstration plots at FTCs and with model farmers:** Demonstration plots serve the dual purpose of validating the effectiveness of agronomic practices for the specific locality, as well as proving to farmers the benefits of adopting the set of agronomic best practices. Thus, carrying out demonstrations at FTCs to show the agronomic effectiveness and economic benefits of optimal practices is recommended. A target should be set to ensure a minimum number of female-headed households are selected as model farmers.
- **Organizing field days and exchange visits for DAs and model farmers to showcase successfully carried out farm practices:** Organizing exposure field visits can further influence DAs and farmers to shift from traditional to recommended agronomic practices. Such visits can serve as a relay system, with previously trained farmers who have successfully implemented agronomic best practices conveying their practical knowledge on to future adopters in an informal setting. Women DAs and women farmers should be specifically targeted to participate in these events.

Promote sustainable cropping systems for maize agro-ecologies

Sound intercropping, relay cropping, double cropping or crop rotation can fit within a sustainable cropping system for maize farmers depending on agro ecology. Such cropping systems have the benefit of increasing yields, reducing nitrogen fertilizer needs (if cropping systems involve nitrogen fixing plants) and reducing the risk of income loss for farmers due to a diversity of crops and markets. Within the overall maize sector strategy, these agronomy practices provide an opportunity to increase overall efficiency of production while not flooding maize market outlets, since part of the land currently under maize could be replaced by legumes or alternative crops with alternative market outlets. In such a scenario, farmers could produce more maize from less land, and produce other crops on the land that is released from maize production. Therefore, greater efforts should be made to select the companion legume crops most compatible with maize, and to identify appropriate spatial and temporal arrangements to enhance productivity. In moisture stress areas these methods should be integrated with moisture conservation practices.

Increase focus on integrated crop and pest (insect pest, pathogens & weeds) management methods through a multi- disciplinary approach

Emphasis should be given to integrating chemicals with cultural, mechanical and biological control practices for major maize producing regions in the country. Newly developed integrated, sustainable, multi-purpose and ecology based pest management

Gender Considerations in On-Farm Production

- Assess and ensure appropriate utilization of input by both female and male farmers, as well as awareness and utilization of relevant agronomic practices
- Extension services should proactively target women farmers to ensure that they gain the knowhow to implement appropriate agronomic practices.
- Extension services should make specific efforts to Understand the level of participation of women farmers in various farm activities, identify appropriate times and places for training in order to reach female farmers, and provide them with ongoing extension support

methods such as the push and pull methods should be widely demonstrated and promoted at the required scale to bring about significant impact in terms of minimizing the two major biotic constraints of maize – stalk borer and striga.

Make available appropriate chemical inputs for weed and insect pest management

Crop protection chemicals should be made available at primary cooperatives on time. To accomplish this task, like any other input, adequate attention has to be given to pesticides. The national demand should clearly be worked out well ahead of time and pesticides should be made part of the input procurement plan of the country. The regulatory systems should be strengthened to alleviate observed shortcomings related to availability, quality, etc. during pesticide supply, distribution and use. Market-based approaches to improving pesticide distribution should be investigated as well.

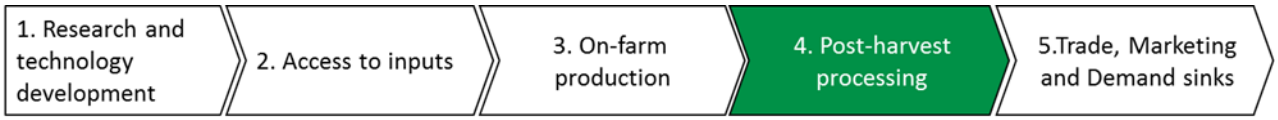
Exhibit 9: Yield impact and current adoption rates of agronomic best practices in maize production

Individual agronomic best practices contribute to the effectiveness of the full inputs package

Keys: Low Medium High

Agronomic Practice	Impact on Yield	Current Adoption rate	Description of benefits
Full inputs package	High	20-30%	- Full package of inputs can double the current average yield - Better land fertility
Crop protection	Medium-High	50-70%	- Protects maize from weeds and insects - Increases yield
Row planting	Medium-High	25-30%	- Better weed control (no need for chemical control) - Yield increase (Crop will be exposed to sun light) - Enhanced Urea fertilizer utilization by the crop
Seed & fertilizer Placement technique	Medium-High	15-20%	- Enhances effectiveness of inputs in increasing yield
Crop rotation	Medium-High	10-15%	- Yield increase - Breaks disease cycles - Nitrogen fixation (reduced need for Urea application)
Intercropping	Medium	5-8%	- Better land fertility - Protects maize from weed infestation - Fixes nitrogen in the soil and reduces the need for Urea application

Source: Discussion among maize breeders, MoA experts, and regional BoA extension experts during the March14,2013 Maize SS review workshop



2.4.4 Post-harvest processing storage and value addition

Strategic Goal

Strategic goal for post-harvest processing and storage
Farmers have knowledge of and sufficient access to cost-effective post-harvest processing and handling methods, including storage, and incur significantly reduced post-harvest losses

Systemic challenges

Insufficient access to mechanized post-harvest processing equipment

Currently, most of the shelling and cleaning of maize is done manually, usually by women. Shelling and cleaning equipment for maize are not widely available, and since such equipment is usually less cost-effective to own on an individual farmer level, there is need to develop shelling services at an aggregator level. The alternative manual shelling and cleaning takes much more time and results in variable quality, which is undesirable for large scale buyers.

Agricultural mechanization research and rural technology centers have been producing shelling and cleaning machine prototypes. However, there are very few well established factories which can mass produce the prototypes and disseminate to users at a large scale. On the other hand, farmers also lack awareness of existing technologies which are relatively less costly.

Inadequate awareness of and insufficient access to cost-effective on-farm storage technologies

According to the 2010-11 CSA Crop and Livestock Utilization report, only 11 % of maize production is marketed by farming households. This implies a vast majority of production is kept on-farm, to be used for domestic consumption, seeds, animal feed and in-kind wages.[7] In 2008, IFPRI conducted an Agricultural Household Marketing Survey (EAHMS) that indicated the most common ways of storing grain on-farm are: in a gotera / granary (39% of households), in a gudegade /pit in ground (15%), in house in a container (34%),in the house without container (24%), and other types of storages (19%).[8] These storage mechanisms result in high levels of post-harvest losses, particularly since chemical and other supplementary technologies are often not applied. There is a need to further understand the level

[7] IFPRI's 2012 Ethiopian Agricultural Transformation Agency baseline survey shows that maize farmers consume 61% of their produce, market 25%, save 2% for seed, and use the remaining 12% as gifts, barter, wage in kind and etcetera.

[8] Note that a farmer may use a combination of these storage types based on his/her preference and access.

of post-harvest losses at farm level, and to develop and disseminate appropriate technologies to reduce these losses.

Insufficient access to community-level storage facilities with skilled personnel

There is a lack of sufficient number of proper storage facilities with skilled personnel within easy reach of smallholder farmers. Cooperatives, which could provide this service, on the whole have sub-standard storage facilities and limited personnel with knowledge of proper storage techniques (see **Table 1**). The result of this is that farmers have to either store on farm or sell their produce immediately, with no option to take advantage of larger scale and lower cost common storage options.

Table 1: Common vs. recommended storage duration and practices

Storage methods	Level of adoption	Common storage duration and practices	Recommended storage duration and best practices	Risks
Sacks	Farmers	▪ Speculative storage for **up to 12 months**	▪ Store **up to 8 months** at controlled temperature and humidity levels ▪ Sacks should be kept in rodent-free room and placed on wooden planks, away from the walls to avoid excess humidity ▪ Sacks should be periodically fumigated with skilled personnel to avoid hazardousness to human health	▪ Loss due to storage pests ▪ Molding and grain deterioration due to unmanaged humidity ▪ Darkened grain and reduced cooking quality due to exposure to high temperature
Bins (*Gotera*)	Farmers	▪ Speculative storage for **up to 12 months**	▪ Store **up to 8 months** at controlled temperature and humidity levels ▪ Bins should be fumigated periodically for protection against storage pests	
Warehouses	Usually used at cooperative level	▪ Speculative storage for **up to 12 months** ▪ Grain and seed commonly stored together with chemicals (e.g., fertilizers and pesticides), farm implements, and other goods	▪ Store **up to 9 months** at controlled temperature and humidity levels ▪ Grain for export should be isolated from chemicals ▪ Improved seed should be stored separately from grain to avoid physical adulteration, maintain field uniformity, and attain productivity potential	▪ Loss of product purity due to multi-purpose storage

Strategic interventions

Increase access to post-harvest processing technologies

Mechanical threshing and cleaning services should be made available to most farmers in the surplus producing areas. The natural service point for threshing would be at the primary aggregator level, such as primary cooperatives or local entrepreneurs. For cleaning services, there is evidence that economies of scale can be achieved at the secondary aggregator level, be they unions or wholesalers. Provision of both technologies would require three elements: 1) production of high-quality machinery in sufficient quantity, 2) convenient servicing of such machinery and 3) training of operators on optimal use. Initially, to introduce and test equipment, a public / private partnership model should be explored, but eventually, a sustainable private sector provision of these services would be the preferred mechanism.

A number of technologies in post-harvest mechanization (e.g. threshers, millers, etc.) have been developed over the past two decades. Many of these have great potential to increase productivity, reduce losses and improve income of farmers. But the technologies are not scaled up and remain in the hands of technology originators and research centers. The government should incentivize and motivate entrepreneurs to produce, disseminate and popularize those technologies which can measurably improve the income of smallholder farmers.

Increase farmer awareness of and access to effective on-farm storage technologies

Farmer awareness of effective on-farm storage techniques can be increased via public media such as radio, and through more interactive channels such as training at FTCs or cooperatives by DAs. Such awareness should be matched by convenient access to appropriate storage materials such as the new metal silos, chemicals and pest-resistant bags. Additional research should be conducted on local on-farm storage technologies, as well as possible innovations that could significantly improve the cost-effectiveness of on-farm storage.

Increase access to community-level storage facilities with skilled personnel

Storage can have significant economies of scale. Therefore, it is unlikely that on-farm storage alone can fully meet farmer's storage needs in the most cost-optimal manner. Increased access to community-level (walking distance from farmers) professional storage facilities is proposed as an immediate way to shift the way farmers store produce, especially produce for marketing.

Gender Considerations in Post-Harvest Handling

- Currently, farmers' access to post-harvest technologies is low. Since, post-harvest activities are most frequently handled by women, an accommodative system should be created to ensure women's access to technologies like threshers, identify potential opportunities for value addition and facilitate support for implementation
- The introduction of mills and their adoption by women depends on cost, location, availability, and time savings (Evans School, 2009)

Fundamentally, such storage facilities would justify their existence by cutting farmers' storage losses to minimal levels. However, additional benefits would include: 1) allowing farmers to time their sales with favorable prices, especially if such storage are located at local marketplaces 2) providing aggregators with convenient locations to pick up a significant amount of output 3) providing the market and policymakers with information on stocks of grain available at the community level and 4) creating the possibility of linkage to financial institutions from whom farmers could borrow against their stocks of stored grain (especially if the stores are managed by a competent third party).

One promising approach to availing such storage is to provide support to existing cooperatives and unions in increasing their storage capacity and quality. To do so, Ethiopian government stakeholders could partner with external development partners such as the World Food Program, as described in Exhibit 10.

Exhibit 10: Post-harvest equipment and storage support for farmers and primary cooperatives

Rationale, Objectives, and partners of the coop warehouse

Rationale

1. Post harvest grain losses can go as high as a quarter of the total production
2. Farmers are pressured to sell immediately after harvest in fear of storage
3. Cooperative are not well equipped with proper PHH equipment to supply to large scale buyers

Objectives

1. To reduce post harvest loss
2. To alleviate farmers' pressure to sell immediately after harvest
3. To increase the competitiveness of cooperatives

Partners

World Food Programme (WFP) and Other Development Partners	FDRE-MoA and Regional Bureaus of Agriculture	Storage and Other Service Providers	Ethiopian Agricultural Transformation Agency
• Provide the necessary support (infrastructure and equipment and/or contracting construction companies) to physically erect the storage • Provide training in store management	• Identify potential areas for building storages • Provide enabling environments e.g. license needs • Create farmers' awareness regarding the benefits of community level storages	• Work with cooperatives at the startup stage of the project • Give on the job training to cooperative store keepers	• Select primary cooperatives located in maize producing woredas • Liaise with Federal and Regional bureaus of agriculture • Engage with other partners which can provide trainings to accountants, store keepers, and managers to be employed

Source: Consultation with development partners, interviews with farmers and unions, and team analysis

2.4.5 Trade, marketing, and demand sinks

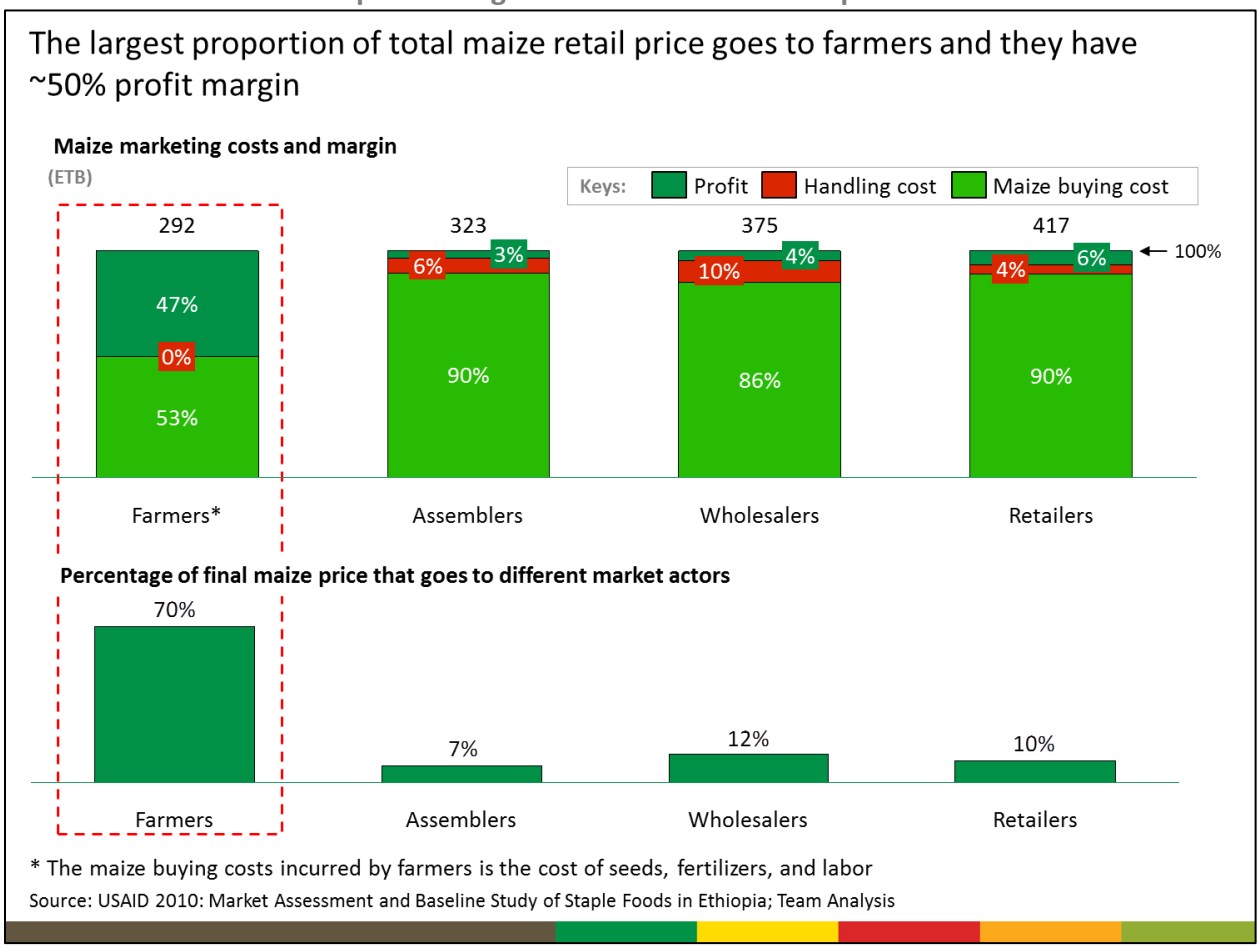
Strategic goal

Strategic goal for trade, marketing and demand sinks
Maize farmers in Ethiopia have access to efficient and integrated domestic maize markets, with significant and complimentary export components

Generally, the maize market in Ethiopia has significantly improved over the past years, with markets now fairly integrated and smallholder farmers retaining the majority of the value within the market chain. According to an IFPRI Report in 2011,[9] spatial price variations between markets in Ethiopia have steadily declined over the past decade, possibly due to better road networks, increased access to mobile phones and increased numbers of larger capacity transportation trucks. While margins have been declining in the retail and milling components of the value chain, farmers seem to retain significant portion of final prices, with nearly 70% of the final price being retained at farm level.[10] Additionally, even though there are a large number of players within the overall sector, more than 75% of all grain traded changes hands two times or fewer.

[9] Bart Minten et.al; Structural Transformation in Ethiopia, Evidence from Cereal Markets, June 2011, IFPRI
[10] 2010 value chain analysis by COMPETE | USAID , ATA analysis

Exhibit 11: Maize farmer's profit margin and share of the retail price



Despite these encouraging developments, there is still a lack of strong, structured demand sinks for maize in Ethiopia. While more and more of the population is eating maize, the preferred cereals for consumption remain tef and wheat. There are few large buyers of maize in the domestic market, maize is very little used in the food processing industries and the significant export potential remains largely untapped. In general there exist weak demand sinks for maize, and attention should be on increasing the number and size of these demand sinks, while structuring them in a manner that optimizes benefits to smallholder maize farmers.

Paying particular attention to the market for Ethiopian maize is especially important given historical market failures. In 2001, there was a bumper maize harvest in Ethiopia as a consequence of high adoption of new agro-technologies (especially hybrid maize) and favorable weather. The increased surplus translated into an 80% fall in the price of maize by early 2002. The fall in price was well below the cost of maize production, and in response many farmers left their maize on the farm to rot.

According to IFPRI's 2010 Maize Value Chain study, the ratio of input prices to farm gate prices rose to 9.0 from 1.7 in the two years beginning in 2000. Even as recently as 2005, maize production rose by 39%. Unfortunately, the increased supply was not matched with proportional demand. The following year prices again settled below the cost of production. Farmers sold their maize at a loss either because they needed cash immediately or to avoid further losses from problems associated with storage.

Another important consideration is the role of gender in how smallholder maize marketing decisions are made. Oftentimes, women are responsible for production of crops for consumption within the household while men take responsibility of production of crops for sale.

Systemic challenges

Current absence of large domestic demand sinks which can absorb maize production

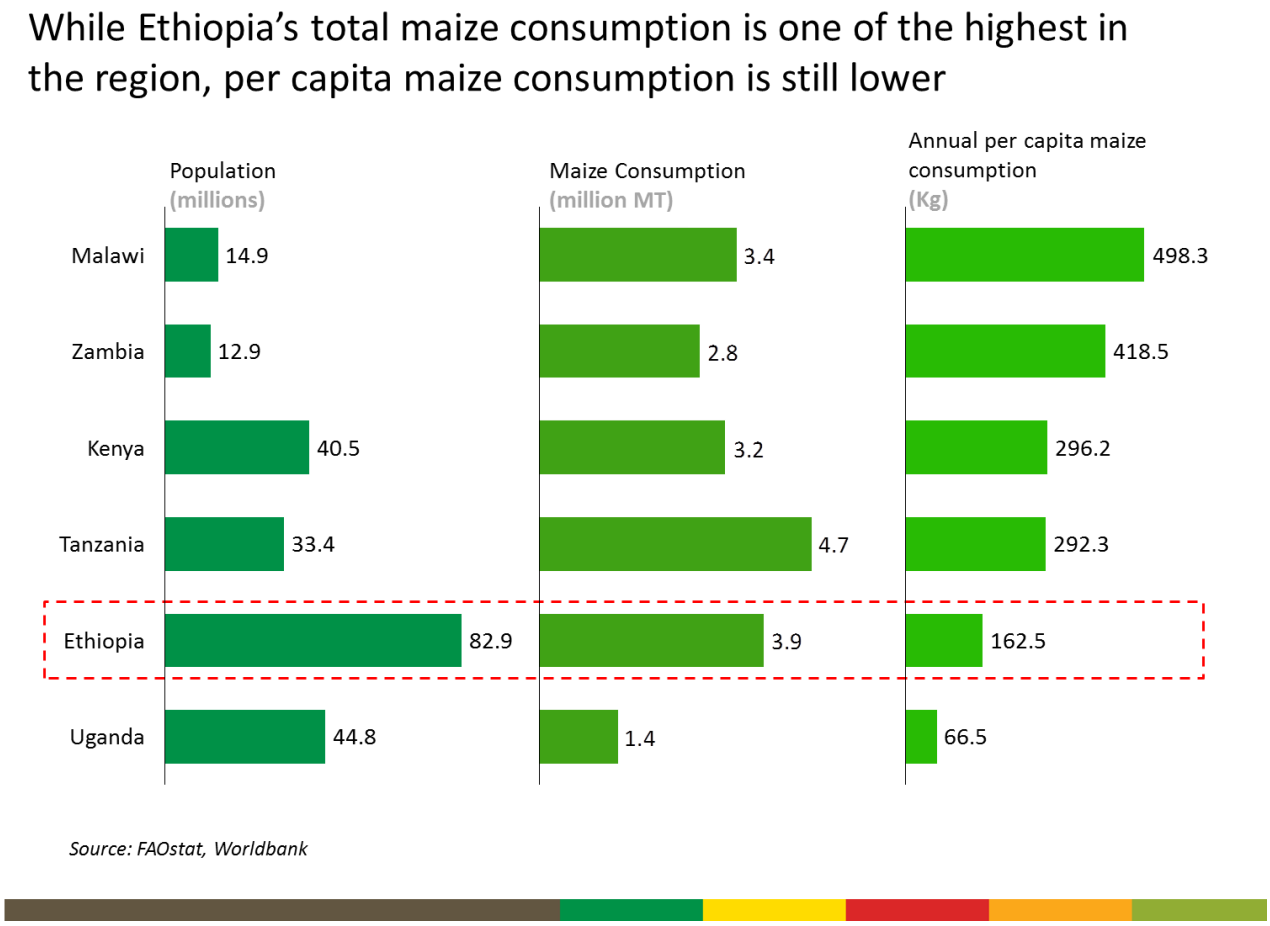
In urban and semi-urban areas of the country, consumers prefer tef and wheat, with maize considered less desirable for consumption. While maize is one of the major staples in rural areas, where farmers produce it for subsistence, in urban areas there is a long held attitude towards maize as an inferior cereal, reinforced by conservative food habits. However, this inflexible preference for tef may be relaxing, as the increasing cost of living leads a number of households to use mixed flour of maize and tef.

Still, per capita maize consumption in Ethiopia continues to lag behind regional neighbors. At 162.5 kg per person annually, Ethiopia's *per capita* consumption is one of the lowest in the region compared to a regional average of 289.05 kg per capita. (Given Ethiopia's large population relative to its neighbors, the *total* volume of maize consumed across Ethiopia is still second in the region only to Tanzania.)[11]

The only large buyers of processed maize remain NGOs engaged in the distribution of nutritional food aid, and their demand is intermittent. For instance, the UN World Food Program has increased its domestic maize purchasing in Ethiopia in recent years, procuring 85,000; 34,000 and 66,000 metric tons in 2010; 2011 and 2012 respectively. The program has also expressed an intent to continue to grow its purchasing in Ethiopia in coming years. However, the demand from such NGOs is not consistent over time and cannot catalyze maize demand at a large scale.

[11]Source: FAOStat and World Bank. It should be noted that these consumption figures may not include "green maize", consumed over the course of the growing season rather than after harvest.

Exhibit 12: Maize consumption in Ethiopia and neighboring countries



Low production capacity and insufficient market demand for value-added products

At present, grain sale for direct consumption is almost the only available option to maize farmers. Maize food processing is at its infancy stage in Ethiopia. There are eight major maize processing factories in the country, with limited production capacity that amounts to only an insignificant proportion of overall national production. This is partially explained by the insufficient demand for processed maize foods in the country. The share of maize foods such as cornflakes, famix, and corn soya blend is negligible in the consumption basket of an average Ethiopian household.

Even though there is a growing trend of maize-based food processing factories in Ethiopia, according to individuals in the sector the food processing enterprises established so far are heavily focused on processing food for the World Food Program (WFP). In addition, many have capacity only for

unsophisticated technologies, e.g. dry milling, while fast-growing agro-processing sectors may demand maize starch and starch derivatives which require wet milling techniques.

Maize processing for animal feed has shown positive growth over the past few years. The United States Department of Agriculture estimates that Ethiopia produced 500,000 MT of animal feed from maize in the 2012 crop cycle, more than doubling over the prior 3 years. Despite its rapid growth, however, elasticity for this sector to absorb surplus production in a given year may be limited, and any substantial increase in production would require further demand sinks.

As many farmers rush to quickly bring their entire harvest to market (in need of immediate cash and fearing quality-deterioration over time), the limited volume of large-scale buyers in this sphere contributes to reduced income and frustration among farmers. The lack of such a market also leads to limited awareness among farmers, primary cooperatives, and cooperative unions of the variety and quality requirements of maize value-addition industries.

Lack of a predictable and responsive policy environment for maize market actors

While Ethiopia's policymakers have demonstrated an overall strategic commitment to the transformation of the agricultural sector through the GTP, there is nonetheless room for improvement with regards to specific tactics of policy related to the marketing of cereals, including maize. Market actors lack a clear framework on which to form expectations for when government action or government-directed action (e.g. through EGTE) might be taken, for instance to support maize markets in the case of over-supply. There should be a clearly-defined mechanism to keep policies flexible enough to respond to changing dynamics and circumstances. Internal and external factors affecting the maize sector should be constantly assessed and policy recommendations proposed proactively.

The supply of maize grain from small scale producers is not of suitable quality for industrial uses

The supply of maize grain from producers and other actors is often not suitable for industrial uses for several different reasons including pest infestation caused by poor storage conditions, cultivation of varieties undesirable for industry, and a generally low grade of quality. Hence use of maize as raw materials for agro-processing is very low relative to overall production, particularly when compared to the industrial use of wheat in the country.

Although certain maize varieties have been released that are better suited for various uses in terms of color, yield and agro-ecological merits, these varieties are not fully utilized by the farmers and processors. Moreover, maize processors do not have adequate knowledge about quality difference among different maize varieties for processing. So far the only selection criterion for processors to purchase maize as raw material is color.

This challenge can be addressed through interventions mentioned above in prior sections. Specifically, it requires increasing farmer and aggregator awareness of maize varieties suited for industrial use and the particular quality and post-harvest requirements of industrial uses. It also requires farmers have access to required resources, including inputs and post-harvest equipment, to fulfill these requirements.

Strategic interventions

Explore export options to neighboring countries where non-genetically modified white maize is in high demand

There is significant demand for maize in the region. Ethiopia had been exporting a sizable quantity to regional neighbors (see exhibit 13 below): Sudan, Kenya, Somalia, Jordan, Saudi Arabia, and Yemen until the recent export ban (initiated in 2008 in response to the food price surge that year), although prices have somewhat stabilized since then.

Relaxing the export ban would benefit maize farmers by securing access to international markets. Since large, unplanned exports might have a negative impact on local food security and prices, it would remain crucial to carryout cereal availability studies annually to determine if there is an exportable surplus of maize production on sustainable basis.

Exhibit 13: Share of Ethiopian maize export in the regional market

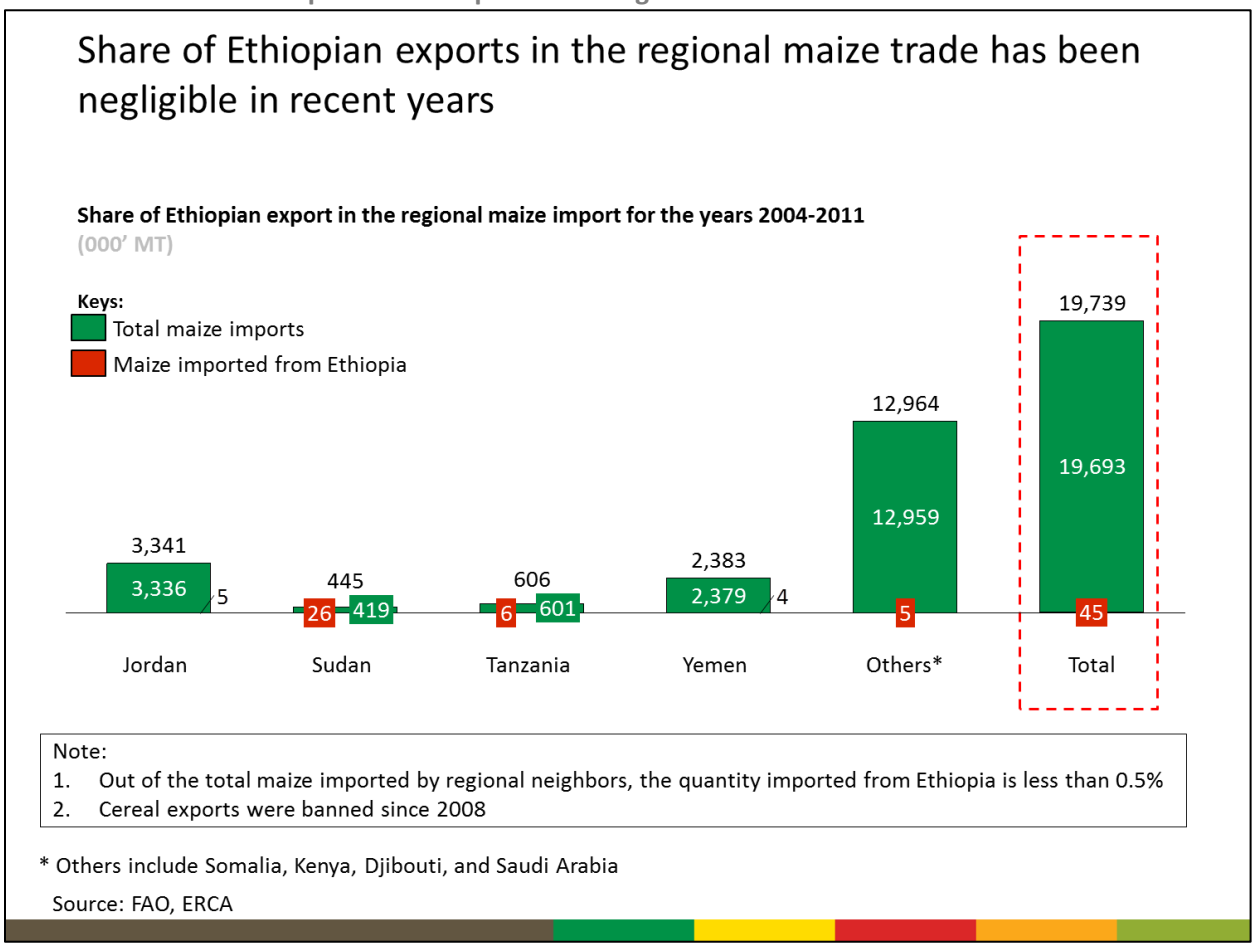
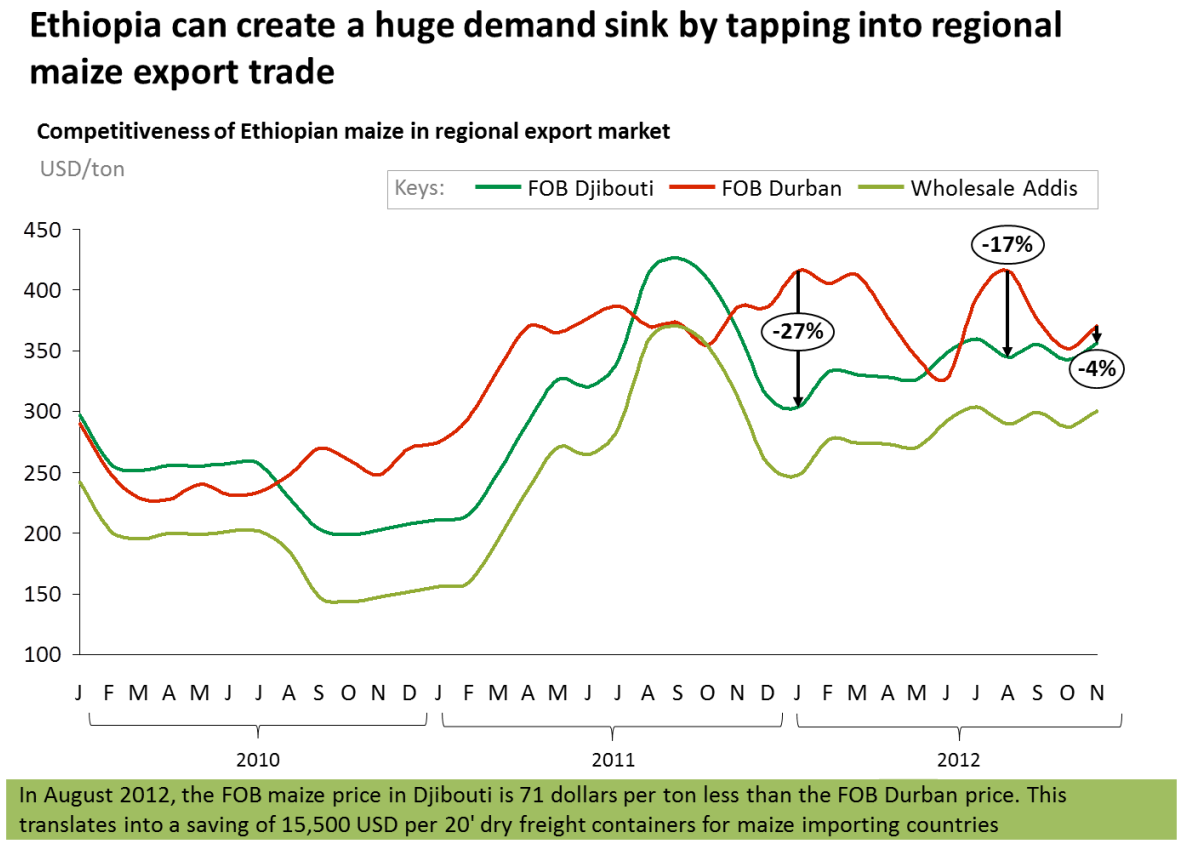


Exhibit 14: Maize export market opportunities for Ethiopia



Tap into the large-scale local maize demand of food aid agencies

Large scale local buyers such as WFP have been procuring maize through cooperatives and private traders. The procured maize has been mainly for food aid assistance to food insecure areas of the country and also for regional emergencies.

WFP has procured 2.7 million tons of maize from five East African countries in the past three years. Ethiopia has been the major source of maize for WFP's procurement and therefore WFP plans to make Ethiopia the regional hub of maize sourcing for its Djibouti corridor. This would create significant demand for maize and help guarantee farmers against price collapses caused by lack of effective demand.

Currently, in 2013, WFP is purchasing 30,000 MT maize from 16 cooperative unions located in the three major maize producing regions of Ethiopia, and could scale up the purchase to 300,000 tons annually.

Explore and encourage investment into processing and promotion options of value-added products such as animal feed, maize meal, blended food and fortified maize with pro-vitamin A

Increasing affluence generally leads to a rising demand in urban markets for value-added products. There is therefore great potential for part of the maize produced in Ethiopia to be diverted for food processing and value addition.

Concerted efforts must be made to foster public private partnerships to enhance the generation, adaptation and promotion of value-added products in order to create additional market sinks. Concurrently, wide-scale awareness and sensitization campaigns should be conducted to bring new maize value-added products (from within the country and abroad) with market prospects to the attention of prospective investors and other stakeholders. Focuses should include the processed food and animal feed industries, as well as wet milling facilities for the production of starch and other industrial inputs.

As these industries develop, key stakeholders in the private and public sector should promote farmer, primary cooperative and union awareness of the variety and quality requirements of maize value-addition industries. Traders and processors should be informed and sensitized to these specific characteristics as well.

Gender Considerations in Maize Marketing

- When maize is sold for cash, gender has a significant effect on how decisions are made and who sells the crops (Evans School Policy Analysis and Research, 2009)
- Constraints which hinder women's access to market information and infrastructure should be assessed and addressed in order to increase their returns
- Some of these constraints can be addressed by enabling women to participate in farmer institutions in order to have access to market information and facilitate linkage

Additionally, the government should create a more favorable environment for those who are interested in engaging in maize value addition and processing, including both domestic investors and those working in joint venture with international companies.

There is potential as well for cooperative unions and primary cooperatives to develop basic value-addition capabilities.

Thus, securing additional market demand for processed maize foods and increasing poultry production up to the level of mass exports is recommended as a catalyst to increase maize demand sinks.

Create and reinforce a predictable and responsive policy environment for maize marketing

Previous and ongoing government efforts to foster agricultural growth are commendable, and the policy environment is by and large conducive to production, transportation, and sales of cereals including maize. Nonetheless, there is need to maintain the policy interventions flexible and robust enough to respond to changing dynamics and changing circumstances related to domestic and export markets.

There should be considered reassessment every year of specific maize market policies, including the openness of export markets and the potential for coordinated buying and price support. Such assessment should be based on observed maize production and maize market conditions. Creating a consistent norm of this sort of considered assessment is important for maize market actors – including farmers, aggregators, and large buyers including aid agencies – to form reasonable expectations that market conditions, and particularly any supply gluts, would receive an appropriate and timely response.

Summary of challenges and interventions

Table 2: Summary of challenges and interventions summarizes the challenges and interventions outlined in the previous sections.

Component	Systemic challenge	Strategic intervention
Research and technology development	• A significant proportion of farmers do not know about new varieties • There is limited research on plant protection and optimal agronomic management • Limited research has been conducted on developing widely adapted early and intermediate maturing varieties, and varieties for special end uses and challenging environments • Inadequate research on post-harvest considerations, including storage and value addition • Research centers have human and infrastructure capacity gaps	• Generate/adapt and fast track the dissemination of appropriate post-harvest processing and handling technologies, including storage and value addition techniques • Update research on plant protection and optimal agronomic management • Support research on the development of widely adapted medium-short cycle varieties, and varieties for special uses • Increase farmer awareness and develop a system to facilitate access to and wider adoption of new varieties • Improve human and physical capacity of research centers
Input production and distribution	• Lack of affordability of the full inputs package • Inputs are not sufficiently targeted to specific agro-ecologies • Limited access to improved inputs due to inaccurate demand assessment • Poor and inconsistent seed quality • Late delivery of inputs, particularly seeds	• Engage in alternative options input financing at the farmer level, potentially including: – Farmer savings groups – Extending access to financial services to a majority of smallholder farmers – Contract farming and forward delivery contracts • Input recommendations should take specific agro-ecologies and socio-economic conditions into consideration • Conduct seed delivery through alternate

		channels (e.g. dedicated logistics provider and/or direct seed marketing) • Strengthen quality control at seed enterprises – Provide guidelines for and enforce internal quality control for all seed enterprises – Build capacity for internal quality control among all seed producers • Strengthen federal and regional inspection and certification capacity
On-farm production	▪ The majority of farmers do not use the right input and agronomic management methods ▪ Maize mono-cropping decreases yield and increases exposure to pest outbreaks ▪ There are not adequate crop-protection techniques availed to smallholder maize farmers	• Increase awareness of maize recommended agronomic practices through: – Training regional, zonal, and woreda-level experts, DAs and farmers: – Increasing coverage of demonstration plots at FTCs and with model farmers: – Organizing field days and exchange visits for DAs and model farmers to showcase successfully carried out farm practices: ▪ Promote sustainable cropping systems for maize agro-ecologies ▪ Increase focus on integrated crop and pest (insect pest, pathogens & weeds) management methods through a multi- disciplinary approach ▪ Make available appropriate chemical inputs for weed and insect pest management
Post-harvest processing and storage	• Insufficient access to mechanized post-harvest processing equipment • Inadequate awareness of and insufficient access to cost-effective on-farm storage technologies • Insufficient access to community level storage facilities with skilled personnel	• Increase access to post-harvest processing technologies • Increase farmer awareness of and access to effective on-farm storage technologies • Increase access to community-level storage facilities with skilled personnel
Trade, marketing, and demand sinks	• Current absence of large domestic demand sinks which can absorb maize production • Low production capacity and insufficient market demand for value-added products • Lack of a predictable and responsive policy environment for maize market actors • The supply of maize grain from small scale producers is not of suitable quality for industrial uses	• Explore export options to neighboring countries where non-genetically modified white maize is in high demand • Tap into the large-scale local maize demand of food aid agencies • Explore and encourage investment into processing and promotion options of value-added products such as animal feed, maize meal, blended food and fortified maize with pro-vitamin A • Create and reinforce a predictable and responsive policy environment for maize marketing

2.5 Cross-cutting themes

2.5.1 Gender considerations in the maize value chain

Women's empowerment through gender mainstreaming into agricultural and rural development will be central to achieving initiatives aimed at improving production and distribution of food and agricultural products, raising levels of nutrition and enhancing the living conditions of rural populations. Women are responsible for a large part of the labor that produces many of Ethiopia's main cereal crops, particularly maize. However, a majority of the work done by women tends to be economically "invisible." As a consequence, their important role is not translated into an equality of opportunities, especially when it comes to the technology development process, decision-making; gaining access to inputs, markets, and services and sharing of income and benefits. Some of the particularly significant challenges female farmers face, in comparison with their male counterparts, is reduced access to improved seed varieties, proper training and extension services, as well as reduced access to vital output markets in which to sell their goods.

Thus, gender mainstreaming should be employed as a key strategy in order to address the challenges of women farmers across the maize value chain and enhance the competitiveness of the value chain through increasing their efficiency and effectiveness.

The objective of gender mainstreaming in value chain programs is to ensure the participation and benefit of women, men and youth farmers.

The gender mainstreaming effort in the value chain ensures that women farmers are purposely targeted across all components of the value chain through identifying and addressing constraints which hamper their participation and benefit. Women farmers, particularly female-headed households, are targeted to access and utilize the full package of inputs and as well across all the components of the value chain programs. Women farmers in male-headed households should also be targeted in the value chain programs depending on the level of their involvement in the different components of the value chain.

Interventions to address this disparity include:

- Develop and promote labor saving technologies
- Maize inputs including seed and fertilizer should be equally accessible to both female and male farmers
- Female and male farmers should have equal of access to knowledge and maize production technologies for processing and storage of maize which reduces losses
- Gender-related constraints on access to markets should be assessed and addressed, including by linking women's groups maize markets
- Gender sensitivity should be supported among primary cooperatives

Cooperatives can be a way in which women (either married women or women heading households) can come together to pursue specialized, income-generating activities such as production and distribution of

maize seeds. Women can receive financial and technical support through the cooperative system, including production and marketing of their produce. Capacity building for women and women's groups is also important.

2.5.2 Climate and environment considerations in the maize value chain

Conservation Agriculture

Conservation agriculture (CA) aims to achieve sustainable and profitable agriculture and subsequently aims at improved livelihoods of farmers through the application of minimal soil disturbance, permanent soil cover and crop rotations. CA holds tremendous potential for all sizes of farms and agro-ecological systems, but its adoption is perhaps most urgently required by smallholder farmers, especially those facing acute labor shortages and seriously affected by soil erosion. It is a way to combine profitable agricultural production with environmental concerns and sustainability and it has been proven to work in a variety of agro-ecological zones and farming systems. It has been perceived by practitioners as a valid tool for Sustainable Land Management (SLM), reducing the cost of production without sacrificing yield.

Conservation agriculture farming can cope with the increasing needs of the ever expanding human populations by:

- Stopping and reversing land degradation
- Enhancing soil health and soil moisture content
- Boosting productivity
- Reduced labor demand, which is of interest to female headed households, elders and disable segments of the communities.

Principles of Conservation Agriculture

Conservation agriculture principles are widely applicable in most agricultural landscapes and land uses with locally adapted practices.

CA technology embraces the following linked principles:

- Minimum soil disturbance
- Permanent soil cover
- Crop rotation/association
- Weed control

Separate application of individual conservation agriculture principles cannot bring the expected cumulative results. For example, engaging in no tillage agriculture without ensuring permanent soil cover and the prevention of free animal grazing after harvest can lead to greater surface sealing, causing greater surface run off and soil erosion. On the other hand, maize cover crops such as desmodium, in combination with vetver and napier grass, support a "push and pull system" to control maize stalk borer and parasitic weeds (e.g. striga).

Climate information

Climate has profound effects on the biophysical resources of the planet. It is the major factor controlling the patterns of vegetation structure, productivity, and plant and animal species composition. Many plants can successfully reproduce and grow only within a specific range of temperature and respond to specific amounts and seasonal patterns of rainfall, and fail to survive if the climate changes. There are substantial concerns associated with the global problem related to the impacts of climate change. The impacts of a changing climate, such as rising global average temperatures, increases in frequency and severity of extreme events (droughts, floods, frosts, pre-longed dry spells) and the shifting in seasons are already affecting human well-being, biodiversity, economies and livelihoods worldwide. The most vulnerable populations are the economically disadvantaged parts of the world – including Ethiopia.

Numerical models (General Circulation Models or GCMs), are currently most credible tools available for simulating the response of the global climate system. However, because of their coarse spatial resolution, GCMs to date are unable to provide reliable climatic information at regional and local scales. As suggested in different guidelines and documentations developed by the IPCC (2007), the climate change information required for many impact studies is at a much finer spatial scale than that provided by GCMs. Accurate and timely user-tailored local climate information and predictions are required to help the agriculture sector to reduce the impacts posed by climate variations.

The availability of downscaled user-tailored local level weather and climate information mainstreamed to the agronomic practice of maize is important to assess and quantify the magnitude of future weather and seasonal climate variability impact maize producing areas. This reduces the risk of economic setbacks and ecological damage in maize belt areas. The procedures used in this strategy are: integrating the rainfall observations from plastic rain gauges, installed at Farmers Training Centers (FTCs), for selected model farmers' at the farm level, and delivering experimental user-tailored downscaled local weather and climate forecasts. This integrated weather information and user tailored seasonal climate outlook helps farmers proactively approach their maize's agronomic activities rather than reacting to the climatological cropping calendar.

CHAPTER 3. IMPLEMENTATION FRAMEWORK

3.1 Prioritization of bottlenecks and sequencing of interventions

While each of the above-mentioned bottlenecks must be addressed, ATA's principle of prioritizing and identifying those bottlenecks within the sector whose alleviation has the greatest potential to achieve our objective leads us to apply a further layer of selectivity.

Within the five value chain components discussed at length above, the three requiring the highest priority intervention – in order to directly impact farmer yields and incomes – are Access to Inputs; On-Farm Production; and Trade, Marketing & Demand Sinks.

Furthermore, within each of the components discussed, bottlenecks can be distinguished between those most central to impairing the optimal function of that component, and those which, while still substantial bottlenecks, do not bear the same degree of centrality.

Combining these two methods of prioritization – across the value chain, and among bottlenecks within each individual component – results in an effective method of prioritizing which bottlenecks require the most immediate attention and focus from government and other actors in the sector. These bottlenecks are indicated below in Exhibit 15.

Exhibit 15: Prioritization of Systemic Challenges Identified in the Sector Strategy

Prioritization within the Maize Sector Strategy

Of the issues identified within the strategy, interventions must be prioritized to address the central bottlenecks within the highest priority value chain components

Component	Central Bottlenecks	Other Identified Bottlenecks
Research & Technology	• Poor awareness of new varieties, especially QPM varieties	• Limited research on optimal agronomic management • Capacity gaps in research centers • Limited research on early and medium maturing varieties • Limited research on post-harvest
Access to Inputs	• Lack of affordability of inputs • Inputs not sufficiently targeted to agro-ecologies • Gap between seed demand and availability	• Poor seed quality • Late delivery of seeds
On-Farm Production	• Improper agronomic management methods • Mono-cropping	• Inadequate crop protection techniques
Post-Harvest Processing	• Lack of access to mechanized processing	• Inadequate on-farm storage • Insufficient communal storage facilities and personnel
Trade, Marketing, & Demand Sinks	• Absence of large demand sinks • Insufficient capacity for value addition	• Lack of predictable & responsive policy environment • Production unsuitable for industrial use

The prioritization across the systemic challenges informs the prioritization and sequencing of proposed interventions.

Table 3. Timeline of proposed interventions

No	Intervention	Prioritization	Timeline		
			Short-term	Medium-term	Long-term
Research					
1	Conduct a focused program to increase farmer awareness and access to under-utilized varieties, particularly QPM	Core			
2	Strengthen research in crop improvement (e.g. early maturing, varieties for special uses, drought resistant maize), crop protection (e.g. stalk borer, GLS, blight), and agronomic	Non-Core			

	management (multiple cropping, plant population, integrated soil-water-fertility management); and facilitate wide dissemination and promotion of those technologies				
3	Intervene to shift research/breeding focus more strongly in the direction of early and intermediate-maturing varieties	Non-Core			
4	Support the development/adaptation and dissemination of storage and post-harvest processing technologies and value added products	Non-Core			
5	Support institutional, financial, material and human resource development	Non-Core			
Inputs					
6	Develop and promote a financial mechanism (e.g. input credit) to support farmers in purchasing inputs (seed, fertilizer, implements and equipment). Provide policy, financial and organizational support to promote use of inputs	Core			
7	Ensure that input recommendations are tailored to prevailing agro-ecological and socio-economic conditions and regularly updated	Core			
8	Support systems to enhance input delivery, including through Direct Seed Marketing	Core			
9	Strengthen public and private enterprises' seed production efficiency and quality control, including through support of an independent inspection system	Non-Core			
10	Support the create of independent seed inspection agencies at the regional level	Non-Core			
Production					
11	Promote multi-stakeholder initiatives to scale up yield enhancing package of technologies, while particularly integrating appropriate varieties, crop protection and agronomic management	Core			
12	Promote improved cropping system approaches and water management methods	Core			

12.1	Provide access to problematic soils ameliorating methods	Non-Core			
13	Promote initiatives for training and promotion of integrated crop and pest management systems	Non-Core			
14	Engage with key stakeholders to increase distribution of chemical inputs for pest and weed management	Non-Core			
Post-harvest					
15	Create awareness of and access to best practices in post-harvest processing methods, including mechanized shellers	Core			
16	Create awareness of and access to improved on-farm storage technologies	Non-Core			
17	Support and facilitate provision and improvement of on-farm storage technologies and training of skilled personnel	Non-Core			
Marketing					
18	Promote and support increased purchases by international aid organizations	Core			
19	Support timely reassessment of markets policy, including evaluation of central purchasing and export policy	Core			
20	Provide ongoing support for stakeholders' exploration and investment into processing and promotion of value-added products	Core			
21	Provide support in creating and maintaining a predictable policy environment in the long-term	Non-Core			

3.2 Implementation arrangement (process and responsibility sharing)

Initially, all activities could be grouped in two major categories: a) priority activities for immediate interventions and b) complimentary activities for medium-term intervention. Greater focus should be given to priority activities, and secondary activities should be considered only if the former are on track.

Implementation could be coordinated through a Maize Value Chain Initiative, beginning with the 2014 crop cycle, to pursue the specific interventions aimed at realizing the strategy.

Each major activity such as research, input etc. should have a primary owner to coordinate activities of all relevant stakeholders, develop activity work plans and monitor implementation.

The implementation of this strategy requires active involvement and wide participation of a host of organizations, each one of them individually striving to accomplish shared tasks and contributing, in the process, to the success of the strategy.

The Strategy should primarily be implemented with the leadership of the federal Ministry of Agriculture (MoA) in close collaboration with the Ethiopian Institute of Agricultural Research (EIAR), Regional Agricultural Research Institutes (RARIs), the Regional Bureaus of Agriculture (RBoAs) and Higher Learning Institutions (HLIs).

Although primary responsibility rests on these few institutions, the strategy is expected to be implemented in close coordination and collaboration with all relevant stakeholders. Stakeholders range from farmers, transporters, traders, processors, extension staff, and research staff, to community development organizations, development partners, international and national research institutions, politicians, and policymakers. Government actors, both at the federal level (MoA, Ministry of Trade, Federal Cooperative Agency, EIAR, etc.) and the regional level (Bureaus of Agriculture, Cooperative offices, Regional Agricultural Research Institutes, etc.), are critical stakeholders and partners in implementation. Civil society organizations and donors are equally vital to ensuring successful implementation. Terms of reference should be signed with key actors depicting clear roles and responsibilities. Concerted efforts should be made to strengthen linkages and partnerships, ensure participatory execution and governance of the strategy, and enhance the sense of ownership among actors.

As far as possible, efforts should be made to commit adequate human and material resources as are required for the on-time implementation of the strategy.

An effective monitoring, learning and evaluation system should be put in place to track progress and challenges during implementation, and to take corrective measures proactively when need arises. Timely review of performance and fund utilization should be conducted based on agreed upon performance indicators and targets. At the federal and regional levels, multi-stakeholder platforms should be established to coordinate and provide direction on prioritizing and implementing interventions. Quarterly meetings chaired by representatives of the Ministry/Bureau, as well as field visits, should be conducted to allow individuals actively participating in the program to physically meet and to provide an opportunity for first hand inspection of operations.

3.3 Partner institutions

The stakeholders in this program range from farmers, transporters, traders, processors, extension staff, and research staff; to community development organizations, development partners, international and national research institutions, politicians, and policy makers. The government, both at the federal (MoA, Ministry of Trade, Federal Cooperative Agency, EIAR, etc.) and the regional level (Bureaus of Agriculture, Cooperative offices, Regional Agricultural Research Institutes, etc.), are critical stakeholders and partners during implementation. Civil society organizations and donors are equally vital to ensuring successful implementation.

Key governmental, civil society and private sector stakeholders crucial to the strategy's implementation are listed below.

Table 4. A roster of key stakeholders

Value Chain Step	Lead Institutions	Collaborating Institutions
Research & development	▪ EIAR ▪ Universities ▪ RARIs ▪ IBC ▪ MST	▪ MoA (including Extension Directorate) ▪ RBoAs (including Extension Directorate) ▪ Donors ▪ Private companies ▪ Universities ▪ CGIAR centers ▪ Regional research networks (e.g. ASARECA) ▪ MOFED ▪ RBOFED ▪ NGOs
Input production	▪ MoA ▪ RBoAs ▪ ESE ▪ RSEs ▪ Research and rural technology centers ▪ Universities-IOT ▪ ESA	▪ MST ▪ Private Companies ▪ FCA (Federal Cooperative Agency) ▪ SMEs, Cooperatives, Unions ▪ NGOs ▪ Donors ▪ CGIAR centers ▪ Regional research networks (e.g. ASARECA) ▪ MOFED ▪ RBOFED

Input supply and distribution	▪ ESE ▪ RSEs ▪ MoA ▪ RBoAs ▪ Private companies ▪ Research ▪ Cooperatives and Unions	▪ EIAR and RARIs ▪ RSEs ▪ FCA ▪ Private companies ▪ Cooperatives and Unions ▪ NGOs ▪ Donors ▪ Financial institutions ▪ Local administration ▪ Agro-dealers ▪ MOTMOFED ▪ RBOFED ▪ Transport association ▪ Ministry of Women, Children and Youth
On-farm production	▪ MoA (especially Extension Directorate) ▪ RBoAs (especially Extension Directorate) ▪ EIAR and RARIs ▪ Cooperatives & unions ▪ Local administration	▪ EIAR and RARIs ▪ NGOs ▪ Financial institutions ▪ Donors ▪ MOFED ▪ RBOFED ▪ Ministry of Women, Children and Youth ▪ National Meteorology Agency
Post-harvest processing and utilization	▪ MoA (especially Extension Directorate) ▪ RBoAs (especially Extension Directorate) ▪ EIAR and RARIs ▪ Unions and cooperatives ▪ Private enterprises ▪ MST	▪ NGOs ▪ ENHI ▪ Universities (Food Science Units) ▪ Donors ▪ Financial institutions ▪ MOFED ▪ RBOFED ▪ Internal revenue ▪ CGIAR centers ▪ Regional Research Networks ▪ Ministry of Women, Children and Youth
Market access and growth	▪ Ministry of Trade ▪ Ministry of Industry ▪ Ethiopian Standards Agency (ESA) ▪ MoA ▪ FCA/RCA ▪ ECX ▪ EGTE	▪ CSA ▪ ENHI ▪ MoFA ▪ Donors ▪ NGOs ▪ ECPA (Ethiopian Consumer Protection Ag ▪ Ministry of Women, Children and Youth

CHAPTER 4. MONITORING, LEARNING, AND EVALUATION (MLE)

4.1 Impact and outcome indicators

With the launch of the maize sector strategy under the 2015 Growth and Transformation Plan, an effective monitoring, learning and evaluation system should be in place to track progress and challenges during implementation and to take corrective measures proactively when the need arises. In particular, timely review of performance and fund utilization should be conducted based on agreed upon performance indicators and targets. Monitoring, learning and evaluation should rely on the results framework to track progress of planned activities towards meeting stated objectives. The results framework consists of indicators at the output, outcome, and impact levels. An indicative / suggested results framework is included below.

Table 6: Performance indicators

Impact	Impact indicators
▪ Increased smallholder productivity	▪ At least 100% increase in average maize yield (quintal/hectare) productivity by 2017 from the current baseline in target woredas ▪ Decrease of 50% in the gap in maize yields between farmers in male-headed and female-headed households (from a 30% baseline difference in yields) in target woredas by 2017
▪ Increased smallholder income	▪ At least 50% increase in smallholder maize farmers' income in target woredas by 2017
Outcomes	**Outcome indicators**
▪ Increased adoption of improved varieties, appropriate fertilizer and best agronomic practices by SHFs	▪ At least 70% of maize SHFs (including 70% of female-headed households) in target woredas using improved varieties and appropriate fertilizers by 2017 ▪ At least 50% of smallholder maize farmers (including 50% of FHHs) in target woredas using recommended agronomic practices (including appropriate planting date, plant population, fertilizer volume, and fertilizer application method) by 2017
▪ Increased adoption of improved post-harvest handling techniques and practices ▪ Decrease in post-harvest losses for maize	▪ At least 20% increase in smallholder maize farmers (including increase of 30% in FHHs) adopting improved post-harvest handling techniques and practices (including adopting maize shellers and appropriate storage) in target woredas by 2017 ▪ Reduce the rate of post-harvest loss by 50% for smallholder maize farmers in target woredas from the current baseline
▪ Increased in proportion of maize marketed	▪ Increase the marketed maize crop output from the current 25% to 50% in target woredas by 2017
▪ Increased share of wholesale price captured by maize farmers	▪ At least 80 % of the share of wholesale price captured by maize farmers by 2017 in target woredas ▪ At least 50% increase in the proportion of SHF's marketed maize that is marketed more than one month following the harvest in target woredas by 2017

Output	Output Indicators
Research and technology development: Performance of maize research centers enhanced as a result of alleviating capacity limitations at maize research centers	
▪ Maize research centers capacitated	▪ Technology output of maize research centers (number of released varieties, agro-ecology-specific recommendations, and mechanized technologies) improved by 25% by 2017
Inputs production and distribution: Smallholder farmers have increased knowledge of and access to affordable, reliable and sustainable sources of high quality improved maize seed varieties, appropriate fertilizers, chemicals, farm implements and equipment tailored to specific agro ecologies	
▪ Increase in amount of high-quality seeds and fertilizer packaged and distributed to farmers on time	▪ Over 95% of maize seed delivered meets established quality standards and is properly labeled (including volume) by 2017 in target woredas, based on independent inspection ▪ Over 95% of fertilizer delivered to maize SHF's meets established quality standards and is properly labeled (including volume) by 2017 in target woredas, based on independent inspection ▪ The proportion of maize seed arriving after ideal planting time is reduced by 75% by 2017 in target woredas ▪ The gap in quantity between farmer demand for and actual distribution of improved maize seed and fertilizer is reduced by 90% by 2017 in target woredas
▪ Increase in availability of input finance to smallholder farmers	▪ 70% of SHF's in target woredas have access to input finance equivalent to at least 75% of their required outlay by 2017
On-farm production: Smallholder farmers have increased knowledge on and access to agronomic best practices (including row planting, soil and fertility management, crop protection)	
▪ Increase in number of farmers exposed to agronomic best practices through on-farm demonstrations	▪ At least 80% of maize farmers in target woredas (including 80% of FHHs) receive training and demonstration on benefits of use of fundamental agronomic best practices including appropriate planting date, plant population, fertilizer volume, and fertilizer application method by 2017 ▪ At least 50% of maize farmers in target woredas (including 50% of FHHs) receive training and demonstration on benefits of use of the complete package of technologies including crop rotation, soil and fertility management, crop protection, crop-soil-water management (e.g. problematic soil management and micro-nutrient amendments) by 2017
Post-harvest processing: Increased knowledge of and access to post harvest processing facilities and practices by smallholder maize farmers	
▪ Number of off-farm communal storage locations built to properly store harvested maize ▪ Number of farmers with access to adequate storage facilities	▪ Enough storage facilities built for communal use in maize growing target woredas to store 60% of surplus produce by 2017 ▪ At least 35% of maize SHF farmers in target woredas (including 35% of FHHs) to have access to adequate on-farm and off-farm storage facilities by 2017

▪ Number of farmers with access to improved post-harvest processing and handling facilities and practices	▪ At least 50% of maize farmers in target woredas (including 50% of FHHs) to have access to improved post-harvest processing and handling facilities and practices, including shellers, by 2017
Trade, marketing, and demand sinks: Increased access to sufficient and reliable markets for maize SHF outputs	
▪ Cooperatives and other output aggregators have increased access to maize output financing	▪ Finance available to at least 50% of SHF maize output aggregators in target woredas by 2017
▪ Number of demand sinks created for Maize	▪ Volume of maize purchased by large buyers, including aid agencies, large private sector companies, and EGTE, increased by 100% in target woredas by 2017 ▪ At least 7 food processing enterprises to sign contracts with smallholder-sourced maize suppliers by 2017

CHAPTER 5. POTENIAL RISKS AND CHALLENGES

Achievement of stakeholder buy-in: The strategy and more specifically the long list of intervention activities within it are expected to be implemented by stakeholders individually and collectively, as the case may be, and therefore there will be task and responsibility sharing every step of the way. This presupposes that buy-in is secured from all key stakeholders from the outset, and that these stakeholders (federal and regional government organizations, farmers unions and primary cooperatives, NGOs and others) rise up to the task and participate in the implementation with heightened sense of ownership, commitment and accountability. The possible risk here is the prevailing low institutional capacity and the fact that this capacity is often already overstretched and thinly spread, leaving it unable to handle the pressure that the task of achieving transformation brings with it. This risk can be addressed by all stakeholders working together under MoA leadership and guidance.

Support and alignment of international partners: During the implementation of the strategy, particularly in research and technology generation, technology dissemination and scaling up, the all rounded support of international collaborators is going to be absolutely crucial. Such collaborators include CGIAR centers such as CIMMYT and IITA and regional research networks such as ASARECA and FARA. Although normally such agencies are willing to collaborate in agricultural research and development, they sometimes have their own targets and objectives to pursue and they may relegate any country-specific initiatives to lower priority. Without anticipating and mitigating such concerns, international participation in the strategy may not be sufficient to achieve the desired ends.

Timely availability of resources: The strategy is an ambitious plan to be implemented across widespread geographies and involving diverse partners and a multitude of farmers. Hence it will require a considerable financial resource outlay. The resource is expected to come from different sources, and especially the funds expected from the government may at times be inadequate or late, as competing priorities and emergencies which can force diverting resources for other uses. While the financial commitment required to achieve the strategy should not be underestimated, it will ultimately be more than repaid in the increased productivity and livelihood of smallholder maize farmers.

Favorability of upcoming cropping seasons: Ethiopian agriculture is predominantly rainfall dependent, and whenever there are irregularities, which seem to occur more often in recent years because of climate change, the consequences and impact on productivity is often very severe. Furthermore, natural hazards such as flooding and migratory pest invasions can also claim heavy losses. While such risks cannot be fully mitigated, careful tracking of climate and environmental data can help to anticipate and mitigate such challenges at their earliest appearance.

Continuity of personnel, particularly at lower levels: The implementation of the strategy and the interventions and activities thereof are going to be implemented mainly by the people on the ground – the woreda BOAs, DAs and experts. One of the widely recognized challenges with regard to staff in the management structures and field operations is the rapid turnover. This problem affects continuity of activities at this level and leads to disruptions of programs. Interventions encompassed within the national strategy for the extension sector will help address this challenge.

CHAPTER 6. MAIZE SECTOR STRATEGY REVIEW

The release of this Working Strategy Document does not mark the conclusion of the Maize Sector Strategy planning process. It is expected that the findings and proposals contained within this document will be refined and expanded in preparation for the release of a final sector strategy document in line with the next Growth and Transformation Plan due in 2015.

Additionally, it is envisioned that this strategy will remain a living document, to be updated regularly to reflect progress made, lessons learnt and changing realities. Annual stakeholders' workshops should be organized at federal and regional level to review progress and challenges faced during implementation, and possibly introduce changes and adjustments in the strategy.

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