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Seed System Potential in Ethiopia

CONSTRAINTS AND OPPORTUNITIES FOR ENHANCING PRODUCTION

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WITH SIGNIFICANT CONTRIBUTIONS FROM DAWIT ALEMU AND ROB TRIPP

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EXECUTIVE SUMMARY

Agriculture is a core driver of Ethiopia's economy, supporting 85 percent of the population's livelihoods and accounting for 46 percent of gross domestic product and 80 percent of export value. Given the significant current and future role of the agricultural sector, a vibrant seed system that provides quality seed to meet the demands of farmers is an essential enabler to continued economic and social development of Ethiopia.

This report presents an analysis of Ethiopia's formal seed system and identifies possible interventions to improve the efficiency of seed provision. The report only deals with seed for major staples, separating issues for "hybrids" (such as hybrid maize), which farmers purchase each year, and non-hybrid seed (accounting for the majority of Ethiopia's staples), which farmers can save for several seasons.

THE POTENTIAL OF A VIBRANT SEED SYSTEM

Progress in developing the seed system has already been made and can be built upon, including further development of improved varieties, increased farmer knowledge about input potential, and a clear policy direction that involves all stakeholders.

Increasing quality and usage of improved seed (along with other best practices such as irrigation, fertilizer adoption, and mechanization) has the potential to dramatically increase Ethiopia's annual crop production. For example, by adopting commercial seeds in combination with best practices on a quarter of the current crop area, research indicates that farmers could increase maize production by over 60 percent and self-pollinated crop production (such as wheat) by over 30 percent. This corresponds to a production increase of over 7 million tons per year (Dercon 2009).

CHALLENGES IN THE SEED SYSTEM

While access to and availability of seed has the potential to greatly improve smallholder productivity, there is currently a substantial gap between the country's production of commercial seeds and farmers' demand for, knowledge of, access to, and usage of these seeds. A series of constraints span both the hybrid maize and Self Pollinating seed systems. High-level findings are presented below:

- **Hybrid maize:** The shortage of hybrid maize seed in Ethiopia is a national concern, and farmers are unable to access seed in the quantities that they demand. Supply shortages are a result of constraints faced by both public sector operations, which account for 60 percent of hybrid maize seed production, and private sector operations, which account for the remaining 40 percent of production.
 - The public sector faces inconsistent and inaccurate planning for demand, productivity gaps and financial constraints in contract grower schemes, misalignment of processing and delivery with major seed producing areas, unknown and poorly managed capacity, and non-flexibility of distribution model in terms of providing farmers with choices and information.

- The private sector faces a shortage of basic seed for private seed growers, public intervention in all commercial aspects of the seed delivery chain that prevents private companies from charging competitive prices or distributing through channels other than the government, a business and regulatory environment that does not prioritize seed businesses in terms of resource allocation (such as access to foreign exchange to procure equipment), and insufficient support and start-up funding for young seed companies.
- **Self-pollinated crops:** Seed for self-pollinated crops face both demand-side and supply-side constraints. On the demand side, there is insignificant perceived advantages of mass-produced seeds over farmer-saved/traded seeds, creating insufficient incentive to purchase seeds as well as insufficient extension devoted to increasing farmer knowledge regarding seed varieties that deliver major improvements (such as yield increase or disease resistance). On the supply side, production of self-pollinated seed faces productivity gaps similar to hybrid maize and is currently a loss-making enterprise for the public system, which prevents ESE/RSEs from significantly expanding supply, and for the private sector companies that see little potential profit in such seeds.

RECOMMENDATIONS

Core interventions and enabling actions can holistically strengthen the Ethiopian seed system to improve farmers' productivity and livelihoods through an increasingly open and competitive seed production system that provides an affordable and diversified choice of seeds from both the public and the private sector. These recommendations are complementary to and intended to accelerate the impact of current GOE and development partner strategies:

- **Build capacity for public production:** Given that the public sector is and will continue to be the dominant player in Ethiopia's seed sector, it is important to improve the operational effectiveness of public seed enterprises through improved assessments of farmer demand and revised seed production strategies for each crop type.
- **Accelerate self-pollinating seed variety availability and adoption:** In order to increase yields and farmer productivity, the GOE should seek to increase the availability of good seed varieties, as well as farmer demand for these commercial varieties. Efforts to increase seed availability and adoption will include building an inventory of available varieties and using extension to popularize self-pollinating crops.
- **Enable private sector seed companies to reach their potential:** While the Government of Ethiopia has an explicit policy of increasing private sector involvement in the seed sector, there are several key enabling steps that the GOE can take to allow local private seed companies to thrive, such as expanding private seed companies' access to breeder seeds and promoting private sector involvement through enabling differentiated pricing and flexibility of distribution models outside of the government.
- **Create a joint vision and regular discussion forum for the seed sector:** In order to clarify roles and responsibilities among existing actors in the sector and to resolve any issues that arise, a joint vision and development program should be developed among the government, public sector producers, and private seed companies, along with a regular discussion forum to highlight and mitigate any issues blocking effective operations.
- **Introduce a robust certification system with appropriate enforcement adapted to Ethiopia's evolving seed sector:** In order to improve seed quality and increase the country's seed certification capabilities, the government should investigate options for feasible and affordable seed certification systems. Such a system should provide different levels of oversight for different types of seed, promote internal quality control procedures by seed producers, and include adequate attention to consumer education and protection.

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

THE WAY FORWARD

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

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

This report provides a preliminary view of the sequencing of various activities needed to strengthen the seed system. However, the recommendations and sequencing of activities outlined in this report must also be seen within the context of the overall recommendation provided in the holistic and integrated report which seeks to find common themes throughout the various individual diagnostics. The integrated report also provides a clear vision of a possible implementation strategy, which would be a critical component of realizing the recommendations outlined in this report.

Detailed actions, owners, and the prioritization of the recommendations are presented in the following sections. A preliminary view of the sequencing of high-priority activities that could strengthen the seed system follows:

	Short –medium term (1-2 years)	Long-term (3-5 years)
Public Production Capacity	<ul style="list-style-type: none"> ▪ 1.1 - Public sector strategy development and role differentiation ▪ 1.2 - Development of seed production strategy 	<ul style="list-style-type: none"> ▪ 1.3 - Optimization of the use of seed processing facilities ▪ 1.4 - Improvement of the supply chain management
Prioritize self-pollinating seed	<ul style="list-style-type: none"> ▪ 2.1 - Inventory of the current varieties ▪ 2.2 - Redirect the breeding program to prioritize filling the variety gaps ▪ 2.3 - Enhancing adoption process for " on the shelf" varieties ▪ 2.4 - Variety registration and release 	<ul style="list-style-type: none"> ▪ 2.3 - Enhancing adoption process for " on the shelf" varieties ▪ 2.5 - Disaster recovery plan
Enable private sector seed	<ul style="list-style-type: none"> ▪ 3.1 - Expand access to breeder seed ▪ 3.2 - Reduce public intervention in private production ▪ 3.3 - Strengthen the business enabling environment 	<ul style="list-style-type: none"> ▪ 3.2 - Reduce public intervention in private production ▪ 3.3 - Strengthen the business enabling environment ▪ 3.4 – Capacity building for private seed companies
Joint vision of seed sector	<ul style="list-style-type: none"> ▪ 4.1 – Create a 3-party agreement between the government, public sector producers and private seed companies 	
Seed certification system	<ul style="list-style-type: none"> ▪ 5.1 - Selection of feasible and affordable certification system ▪ 5.2 - Consumer education and consumer protection for seed consumers 	<ul style="list-style-type: none"> ▪ 5.2 - Consumer education and consumer protection for seed consumers ▪ 5.3 – Capacity building for regulatory organs

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ACRONYMS

AGRA	Alliance for a Green Revolution in Africa
AHLI	Agricultural Higher Learning Institutes
APARI	Afar Pastoral and Agro-pastoral Research Institute
ARARI	Amhara Regional Agricultural Research Institute
ARDPLAC	Agricultural and Rural Development Partnership Linkage Advisory Councils
ASE	Amhara Seed Enterprise
BoARDs	Bureaus of Agriculture and Rural Development
CSA	Central Statistical Agency
DA	Development Agent
EDRI	Ethiopian Development Research Institute
EIAR	Ethiopian Institute for Agricultural Research
ESE	Ethiopian Seed Enterprise
ESGA	Ethiopian Seed Growers Association
FBSM	Farmer Based Seed Multiplication
FRG	Farmer Research Groups
FTC	Farmer Training Center
GARI	Gambella Agricultural Research Institute
GOE	Government of Ethiopia
IFAD	International Fund for Agricultural Development
IV	Improved Variety
MASL	Meters Above Sea Level
MOARD	Ministry of Agriculture and Rural Development
NAIA	National Agricultural Input Authority
NARS	National Agricultural Research System
NGO	Non-Governmental Organization
NSIA	National Seed Industry Agency
OARI	Oromiya Agricultural Research Institute
OPV	Open-Pollinated Variety
OSE	Oromiya Seed Enterprise
PADETES	Participatory Demonstration and Training Extension System
PASS	Programme for Africa's Seeds Systems (AGRA)
PVP	Plant Variety Protection
RARIs	Regional Agricultural Research Institutes
REFLAC	Research Extension Farmer Linkage Councils
RSE	Regional Seed Enterprise
SARI	South Agricultural Research Institute
SNNPR	Southern Nations, Nationalities and Peoples Region
SORARI	Somali Pastoral and Agro-pastoral Research Institute
TARI	Tigray Agricultural Research Institute
WTO	World Trade Organization

BACKGROUND

Agriculture is the core driver of Ethiopia's growth and long-term food security. The stakes are high: nearly 15-17 percent of the Government of Ethiopia's (GOE) expenditures are committed to this sector,^{1,2} and agriculture directly supports 85 percent of the population's livelihoods,³ 45 percent of Gross Domestic Product (GDP),⁴ and over 80 percent of export value.⁵ Thirteen million smallholder farming households account for 90 percent of the country's total agricultural production,⁶ and five to seven million people in Ethiopia are chronically food insecure.

Ethiopia's agricultural sector has witnessed consistent growth since 2003. Maize production has expanded at 6 percent per annum and the aggregate export value across all commodities has grown at 9 percent⁷, underpinning an 8 percent annual growth rate in GDP.⁸ Public investment has expanded access to productive inputs such as hybrid maize seed and fertilizer. Concerted government spending in extension has also established nearly 10,000 Farmer Training Centers (FTCs) and trained 63,000 Development Agents (DAs) from 2002–2008.^{9,10} GOE has made marked progress in agriculture over the past decade. However, the sector continues to face a set of constraints: markets are underdeveloped, federal and regional governments lack implementation capacities, safety nets account for a large proportion of agricultural spending, irrigation is not utilized to its full potential, shortages of improved inputs hinder growth, and key areas of the enabling environment require improvement.

At the request of the Government of Ethiopia (GOE), in 2009 the Bill & Melinda Gates Foundation agreed to facilitate diagnostic reviews of Ethiopia's seed system, soil fertility, irrigation, extension, finance, and markets value-chains for maize, livestock, and pulses. The seed report contained here is one of eight diagnostics covering key agricultural sub-sectors and was led by senior fellows with the International Food Policy Research Institute (IFPRI), the Ethiopian Institute for Agricultural Research (EIAR), the International Livestock Research Institute (ILRI), the International Water Management Institute (IWMI), and the Ministry of Agriculture and Rural Development (MoARD). Jointly, these sub-sector diagnostics inform a separate holistic report with systems-level recommendations across the agricultural sector. This systems-level work captures common themes in the more siloed diagnostics and identifies priority areas to drive food security and growth.

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

METHODOLOGY OF DIAGNOSTIC WORK

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

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

¹ World Bank PER, 2008

² Please note that approximately one third of this is for food security, and a quarter for federal road construction

³ CIA Factbook (2009 est)

⁴ World Bank (2008)

⁵ MoARD (2010)

⁶ Negatu, W. (2005) Land Tenure and Technology Improvement in Smallholder Agriculture of Ethiopia. Addis Ababa University

⁷ FAOStat (1998 – 2007)

⁸ World Bank Economic Indicators (1997/98 – 2007/08)

⁹ Refer to the extension diagnostic report for more details

¹⁰ MoARD (2009 est)

- **Extensive review of the relevant literature** – The team conducted an exhaustive review of the existing reports, which provided a baseline understanding and starting point for the team’s work. A listing of the various reports consulted is contained in Appendix 1.1. Further, an analysis of international cases provided a context to understand the enabling factors for successful interventions in other economies.
- **In-depth key informant interviews** – Over 100 stakeholders, including MoARD, BoARD, woreda- and kebele-level government staff, development partners, research institutes, public and private seed enterprises, cooperatives, unions, farmers, investors, and others, participated in interviews. Appendix 1.4 contains the complete list of participating stakeholders and experts. The interviews provided context for constraints identified in the literature review; they also provided a sounding board to validate findings and recommendations.
- **Analysis of primary qualitative and quantitative data** – Primary data was collected to fill key gaps in the existing data set. This fact-driven analysis allowed teams of consultants to perform sectoral projections and modelling around constraints, opportunities, and trade-offs in the seed system. These analyses, in conjunction with the informant interviews and literature reviews, provided the basis for a broad set of systemic recommendations designed to strengthen the current Ethiopian seed system.
- **Multi-stakeholder conventions** – Conventions were held toward the end of the study to present, test, and further refine the team’s initial findings and recommendations. Conventions were attended by regional and federal government officials and private sector representatives, as well as national and international research organizations.
- **Synthesis and validation with expert panels** – As a final review of the recommendations and findings, three separate expert panels were consulted during the review process: an independent Ethiopian panel, an international content expert group, and a high-level advisory group for cross-sectoral and broad development issues. Input was provided by these panels in an iterative process, consisting of meetings and direct comments regarding project documents, held over a multi-month period. During this period, the team also continued to receive feedback from MoARD leadership.

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

INTRODUCTION: THE ANALYSIS OF THE ETHIOPIAN SEED SYSTEM

In mid-2009, the Bill & Melinda Gates Foundation agreed, at the request of the Government of Ethiopia (GOE), to support a diagnostic review of the country’s seed system. From November 2009 to March 2010, teams of local and international consultants worked in close consultation with a full range of stakeholders, including small-scale farmers, the Ministry of Agriculture and Rural Development (MoARD), Bureaus of Agriculture and Rural Development (BoARD), the Ethiopian Seed Enterprise (ESE) and its regional counterparts, private sector seed companies, Development Agents (DAs) in local kebeles, development partners, and research institutes.

Section One of this report provides an overview of Ethiopia’s commercial seed sector. In particular, it highlights the gaps between supply and demand in both self-pollinating and open-pollinating varieties and the respective contributions of public seed enterprises and private companies. The section provides the descriptive context for plant breeding and the availability of source seed, an analysis of the supply chain for seed multiplication, and seed marketing and farmer adoption.

Section Two provides an analysis of the enabling environment for seed production. Many factors shape the operational environment for seed production, from government targets and policies regarding seed production to quality control, certification, and information access for small-scale producers, both men and women.

In view of the preceding contextual analyses, Section Three outlines key issues and constraints identified by the research teams in the diagnostic. The section distinguishes between the production of hybrid maize¹¹ and the production of open-pollinating varieties. The issues faced in each area are significantly different for each type of seed. Section Four provides the recommendations emergent from the findings of the study, followed by a brief discussion in Section Five of the sequencing and process for implementation.

ETHIOPIAN SEED SYSTEM: PRODUCTION OF COMMERCIAL SEEDS

Overview of Ethiopia's Commercial Seed Sector

Ethiopian agriculture requires over 700,000 tons of seed each year to grow cereals (such as teff, maize, wheat, sorghum, barley, and finger millet) and pulses (such as faba beans, field peas, haricot beans, and chick peas).¹² Farmers in Ethiopia acquire seeds for their crops from two different sources:

- **The “formal” or commercial seed sector** – “Improved seeds” (seeds with better characteristics such as yield higher than normal seeds) are sold to farmers through farmer cooperatives, input suppliers, and other venues.
- **The “traditional” or “informal” seed sector** – These are seeds that farmers either save from their crops and use in subsequent planting seasons or trade/buy informally

This report presents an analysis of Ethiopia's formal seed system and identifies possible interventions to improve the efficiency of seed provision. The report only discusses seeds for the major staples mentioned above. We focus on the following two key types of improved seed, which are significantly different with regards to production system, marketing constraints, and policy directions:

- **Hybrid seeds** – Seeds are produced by artificially crossing selected parent lines. Farmers must buy this seed every year; they should not save seed from season to season. The only hybrid seed in use in Ethiopia is maize.
- **Open-pollinated varieties (OPVs) or self-pollinated seeds** – These can be saved by farmers for several seasons and account for the majority of Ethiopia's staples. The primary crop that improved OPVs are used for is wheat; other important open-pollinated varieties include teff, barley, sorghum, open-pollinated maize, and pulses.

The commercial sector supplies 20,000–30,000 tons of seed per year across all crops, representing only 3–6 percent of farmers' actual seed need.¹³ The use of commercial seeds as a percentage of stated demand (actual demand is likely to be significantly higher) varies among crops, as shown in Table 1, with the highest use at approximately 50 percent for maize and the lowest use at less than 10 percent for barley. Use of commercial maize seeds is lower in Ethiopia than in peer countries such as Zimbabwe, Zambia, and Kenya, where commercial maize seed use exceeds 70 percent of total maize seeds.¹⁴ However, there is significant variation within the country, with much higher usage in high-producing areas such as Bako and Adet, particularly as the most popular maize varieties (BH540 and BH660) are well adapted to these areas.

¹¹ The focus on hybrid maize is due to the fact that the research system in Ethiopia currently only produces hybrid seeds for maize. In future, hybrid seeds for sorghum and rice are likely to raise similar issues. There are already two released hybrid sorghum varieties, but they are not yet under production.

¹² Thijssen, M., Bishaw, Z., Beshir, A. and de Boef, W. (eds) (2008) *Farmers, Seeds and Varieties. Supporting informal seed supply in Ethiopia*. Wageningen International

¹³ Thijssen, M., Bishaw, Z., Beshir, A. and de Boef, W. (eds) (2008) *Farmers, Seeds and Varieties. Supporting informal seed supply in Ethiopia*. Wageningen International; World Bank (2009) *Assessment of the Formal Seed System in Ethiopia*. Addis Ababa: World Bank.

¹⁴ Thijssen, M., Bishaw, Z., Beshir, A. and de Boef, W. (eds) (2008) *Farmers, Seeds and Varieties. Supporting informal seed supply in Ethiopia*. Wageningen International

Table 1: Commercial Seed Use among Different Crops in Ethiopia, 2005–08

Percent of official seed demand supplied by commercial channels

Crop	2005	2006	2007	2008
Wheat	20	38	23	24
Maize ¹⁵	53	28	60	48
Teff	5	12	22	19
Barley	16	18	10	7
Sorghum	Na	7	16	48

Source: Spielman et al., 2009.

The stakes for increasing the quality and usage of commercial seed are high since widespread adoption could bring significant benefits for smallholder productivity. As shown in Table 2, current national average yields for cereals and pulses are much lower than yields achieved both in research fields and in farmer test fields using recently released varieties. These figures demonstrate the considerable yield gaps between current yields and the potential yields with improved seed varieties.

¹⁵ Includes hybrid maize and OPVs, however, more than 90% of the demand and supply for maize seed is for hybrid maize

Table 2: National Average Yield Levels and Yields for Recently Released Varieties

Crops	National average yield (q/ha)	Research field yield (q/ha)	Farmers' field yield (q/ha)	Variety considered
Teff	11.67	15 - 27	13 - 23	Kena
Food Barley	13.76	24 - 49	20 - 43	Guta
Bread wheat	16.25	44 - 50	35 - 47	Gasay
Durum wheat	16.25	23 - 68	24 - 40	Flakit, Obsa
Maize ¹⁶	21.22	80 - 110	50 - 60	Morka
Faba bean	13.23	24 - 52	20 - 42	Walki
Field pea	10.95	28 - 40	15 - 20	Ambericho
Haricot beans	10.43	20 - 30	18 - 22	SUG – 131

Source: CSA (2009); MoARD (2008, 2007, 2006); variety registry

Supply chain – from “breeder seed” to marketed seed

Source seed:

- *Breeder seed* - the stock seed produced by the breeder or institution that developed and maintains the cultivar, used to develop pre-basic and basic seed
- *Pre-basic seed* - the progeny of breeder seed, commonly used for crops that have low multiplication rates, and where large quantities of certified seed are required
- *Basic seed* – produced from breeder or pre-basic seed under the supervision of a seed control agency

Certified seed – seed must be certified for quality assurance, before being ready for distribution and marketing

On a national scale, estimates show that by adopting commercial seeds and improved agricultural practices on a quarter of the crop land in Ethiopia, farmers could increase maize production by over 60 percent from approximately 22 quintals/ha to 40–80 quintals/ha and increase self-pollinated crop production, such as wheat, by over 30 percent. Taken together, this corresponds to a potential crop increase of over 7 million tons of maize and wheat per year.¹⁷

In view of this potential, GOE has responded with a set of interventions to boost both access to and use of improved seed. These approaches include (i) decentralization of the seed system through establishment of regional seed enterprises, (ii) initial support for the participation of the private sector in seed production, (iii) capacity-building for the National Agricultural Research System, and (iv) expedited production of seeds through accelerated programs. GOE's involvement in commercial seed production is described in the next sub-section.

Seed Production in Ethiopia

The report provides an overview of the five key stages of the seed production value chain:

¹⁶ Note that the Morka maize variety is OPV, while the national yield includes both hybrid maize and OPV

¹⁷ Dercon, S. and Vargas Hill, R. (2009) 'Growth from Agriculture in Ethiopia. Identifying Key Constraints'. Paper prepared for Dfid

- **Demand planning** – Annual demand statistics are needed to drive sufficient production in subsequent years.
- **Plant breeding and source seed** – Breeding of crops to produce, multiply, and maintain source seed, the initial source of seed for multiplication.
- **Certified seed production** – Multiplication of source seed (mainly basic seed) to produce sufficient quantities for marketing and to meet projected demand. Several cycles of multiplication are needed.
- **Seed marketing** – Seeds are distributed and sold to the farmer, mainly through farmer unions and cooperatives.
- **Farmer adoption** – Farmer adoption depends on the timely availability of the required quality and quantity of seed, the farmer's ability to pay, and the farmer's awareness of a perceived advantage of commercial seeds over farmer-saved/traded seeds. The timely availability of seed is driven by the efficiency of the seed system.

This is followed by an analysis of the constraints, both for hybrid maize production and OPVs.

Demand planning

MoARD employs a bottom-up demand assessment, whereby the regional BoARDS develop annual seed demand statistics with input from woredas, development agents (DAs), and individual farmers about their seed needs. This information is aggregated into woreda, regional, and national demand statistics. The result is a rough estimate of the types and quantities of seed farmers want to purchase the following year in each region. This target is loosely apportioned to the various producers (such as ESE and the RSEs). At the end of the cycle, the government allocates supply proportionally through the cooperatives based on the original demand, without considering shifts in demand due to changes in rainfall pattern and market situation.

However, in many years, seed supply is well below demand, because of either variation in the original estimates or supply bottlenecks. For example, recalling Table 1, seed supply in 2008 covered 48 percent of stated demand for maize, 24 percent for wheat, 48 percent for sorghum, 19 percent for teff, and 7 percent for barley.¹⁸ Interviews suggest that, last season, the known shortage of supply created incentives for actors to inflate their demand and for black market sales and corruption to increase. In addition to these shortcomings, demand estimations are also highly dependent on the season (in other words, the onset of rains), which requires a much greater flexibility than is possible in the current system. GOE should aspire to targets that can take into account both stated demand and flexibility needed to accommodate shifts in farmer planting choices.

Plant Breeding and Source Seed

Plant breeding is the responsibility of the National Agricultural Research System (NARS), comprised of three main groups of public institutions, namely the Ethiopian Institute of Agricultural Research (EIAR), seven Regional Agricultural Research Institutes (RARIs), and four Agricultural Higher Learning Institutes (AHLI). These agencies and institutes target plant breeding for three different agro-ecologies (highlands, intermediate areas, and lowlands) with four key priorities: (i) yield improvement, (ii) pest tolerance, (iii) drought/moisture tolerance, and (iv) quality improvement.

Because the vast majority of field crop seed varieties currently in use in Ethiopia are the products of public research, either EIAR or the RARIs are responsible for producing breeder seeds for most varieties.

There are multiple challenges facing these government plant breeding and source seed production efforts, most notably linkage with demand planning, insufficient capacity to respond rapidly to farmer needs, and constraints to physical resources.

In the past, basic seed supply has been a bottleneck for many crops and has sometimes been insufficient for seed producers to multiply enough seed to meet farmers' demands for commercial seeds. However, for this production season (2010), all seed producers have received enough basic seed as per their demand, highlighting that in the past, the issue lay with the planning process.

¹⁸ Spielman, D., Kelemework, D. and Alemu, D. (2009a) 'Policies to promote smallholder intensification in Ethiopia: The search for appropriate public and private roles'. Paper presented at the Seventh International Conference on the Ethiopian Economy, Addis Ababa, June 25 – 27

Several crops require a continual stream of new varieties to keep pace with evolving pests and diseases (such as wheat stem rust, a problem that is exacerbated by climate change), but the public system lacks the capacities to respond to demand and develop new varieties with sufficient speed.

Further, the availability of irrigated land in the research centers, which are responsible for the maintenance and multiplication of source seed, is limited. Similarly, the public seed enterprises and private seed companies licensed for maintenance and multiplication of pre-basic seed face a shortage of irrigated land, limiting their ability to supply the required amount of basic seed.

Certified Seed Production

Traditionally, the Ethiopian Seed Enterprise (ESE) has dominated most commercial seed production in Ethiopia since the late 1950s. In 2008, approximately 80 percent of all commercial seed was produced by the government,¹⁹ despite the substantial gaps in availability or supply described in Figure 1. As shown in Table 4, the public share of seed production varies by crop, with the public sector producing about 90 percent of OPVs (such as wheat, teff, and barley) and about 60 percent of hybrid maize.

¹⁹ Based on data from Agricultural Marketing Directorate, MoARD

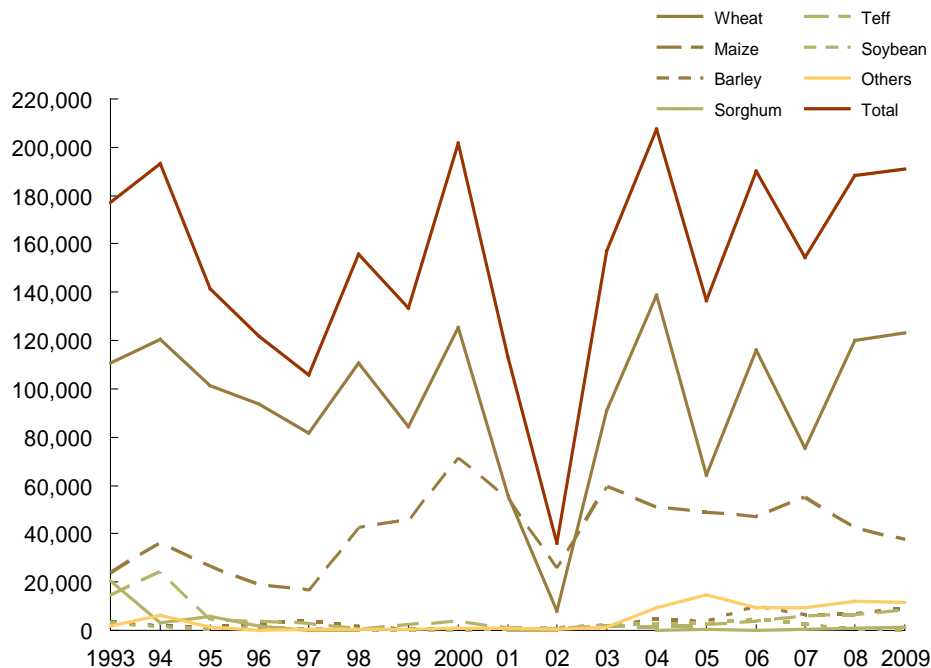
Table 3: Public vs. Private Sector Production of Commercial seed (2006 – 2008)

Crop category	Commercial seed suppliers	% of production		
		2006	2007	2008
Hybrid maize	Public seed Enterprises	71	62	50
	Private seed companies	28	30	40
	Other (state farms, unions, research centers etc)	1	8	10
Open-pollinated crops	Public seed Enterprises	90	85	90
	Private seed companies	0	1	0
	Other (state farms, unions, research centers etc)	10	15	10
Total	Public seed Enterprises	84	75	77
	Private seed companies	8	13	14
	Other (state farms, unions, research centers etc)	7	12	10

Source: Based on data from Agricultural Marketing Directorate, MoARD

As demonstrated in Figure 2, ESE production has been very variable since 1993, with its two major seed products being wheat and maize. Because the planting rate (number of seeds per unit area) for wheat is about six times that of maize, in most years ESE's production accounts for a larger area of maize than wheat.

Figure 1: Seed distribution by ESE, by crop and year (in quintals)



Source: ESE

Of all seed commercially produced in 2008, 83 percent was produced by ESE (8 percent on ESE farms, 35 percent through contracts with large farms, and 39 percent through contracts with small farmers), while the remaining 17 percent was produced by private producers.²⁰

In the past, ESE produced most of the seed on its own farms and on large private and state farms, but there have been several important developments in recent years toward the decentralization of the government's commercial seed production. Cognizant of the shortage of source seeds, the GOE has begun licensing production of source seeds to regional research institutes and private seed companies. A good example of this change is the recent licensing of basic seed production for publicly produced hybrid maize varieties to two regional research institutes and three private seed companies Agri-Ceft, ANO, and Avallo. Agri-ceft has already produced basic seed, which will be used for the coming production season; the other two will start multiplication this season. Other recent developments include:

- **Emergence of regional seed enterprises (RSEs)** – The increase in seed production by RSEs is consistent with the government's strategy of regionalizing many government responsibilities. The RSEs—currently operating in Oromiya and Amhara, with production in other regions anticipated—provide an opportunity to address location-specific needs by concentrating on regional priorities. The early portfolios of these two RSEs show a concentration on the same crops as ESE, with a somewhat different selection of varieties. The research team believes that this regionalization effort is a positive move for seed production in the country, as long as the RSEs continue to coordinate and communicate clearly with the federal government.
- **Increasing reliance on farmer-based seed multiplication (FBSM)** – In this model, groups of farmers at the local level produce seed that is cleaned, bagged and offered for sale locally the following season. FBSM production may be organized by a local cooperative and/or the regional BOARD or by contract growers and usually focuses on crops which are less mechanized than those produced on state farms. Although the strategy has great potential for localized seed production, it currently requires considerable supervision from extension personnel, suffers from low retrieval rates (due to black market sales and poor farming techniques, for example), and faces unproven financial sustainability.

To improve the commercial potential of FBSMs, the Royal Netherlands Embassy (through its Local Seed Business Program) is identifying where commercial opportunities may arise and how these can be captured²¹. ESE are also relying increasingly on out-growers for seed production due to (i) national policies that favor small-scale seed production through cooperatives,²² (ii) the growing tendency of state farms to look for the most lucrative crops (other than seed) to grow, and (iii) the fact that the price offered to contract seed growers is too low compared to the more attractive option of producing grain, storing it for several months, and then selling it into a market when prices are higher.²³ ESE signs a seed multiplication contract with individual farmers and then provides technical advice and supplies.

- **Increase in private seed production** (almost exclusively for hybrid maize) – The expansion of both small-scale and larger private seed companies—mostly in maize seed production—has been fairly steady, with over a dozen private sector companies that currently account for about 40 percent of maize seed offered to farmers.²⁴ A large seed company, Pioneer Hi-Bred, has been producing hybrid maize seeds in Ethiopia (based on source seed imported from South Africa) for nearly two decades. Pioneer contracts with large farms for its seed production but has had increasing difficulty acquiring access to land. Its production has grown fairly steadily in the past five years and currently stands at about 2,700 mt of maize seeds. The demand for Pioneer hybrids suggests that there is room for other international seed companies to enter the Ethiopian market, although problems such as access to land for contract seed production, the lack of private input dealers, and restrictions on repatriating funds to an international companies' home market have dampened interest.

²⁰ Thijssen, M., Bishaw, Z., Beshir, A. and de Boef, W. (eds) (2008) *Farmers, Seeds and Varieties. Supporting informal seed supply in Ethiopia*. Wageningen International; World Bank (2009) *Assessment of the Formal Seed System in Ethiopia*. Addis Ababa: World Bank.

²¹ See <http://portals.wi.wur.nl/agrobiodiversity/?page=5301>.

²² This is due to the need to have location specific seed multiplication considering the agro-ecological diversity and also variable rainfall patterns

²³ Recent years have also seen significant, non-seasonal grain price increases, but there is still an underlying seasonal component, although improvements in market efficiency may have made such cycles less severe. See Rashid (n.d.) for further details.

²⁴ Spielman, D., Kelemework, D. and Alemu, D. (2009a) 'Policies to promote smallholder intensification in Ethiopia: The search for appropriate public and private roles'. Paper presented at the Seventh International Conference on the Ethiopian Economy, Addis Ababa, June 25 – 27

Despite these challenges, Seed Co (based in Zimbabwe) will begin marketing seed in Ethiopia in 2010. There are also more than a dozen smaller private seed producers that have emerged in the past few years to produce hybrid maize seed, some of which are supported by AGRA.²⁵ Originally much of their production was contracted to ESE; however, now regional BoARDS tend to be the principal customers. Although these private growers do not yet have independent marketing capacity, they represent a basis for the future development of the Ethiopian seed industry.

Seed Marketing

Although significant public resources are invested in public plant breeding and multiplication, the products are not reaching farmers. OPV seed that is available is often stockpiled in farmer unions and cooperatives, and ineffective distribution mechanisms hinder the reach of existing seed.

Distribution of seed currently happens only through existing institutions, such as cooperatives and farmer unions, and is a constraint to the meaningful development of the private seed sector. Based on the demand planning process, MoARD instructs ESE on the type and quantity of seed to be delivered to cooperative unions, which in turn provide the seed to the primary cooperatives and farmers operating under these unions. This centralized system leaves cooperatives—and farmers—with relatively little flexibility in determining the type of seed they receive, when they receive seeds, or who supplies the seed. Due to central government seed allocation and “wholesale” seed prices set by GOE, cooperatives often are burdened by seeds they cannot sell, are unable to act as independent businesses serving the needs and interests of their farmer members, and cannot take advantage of high demand for certain seeds in the formal market that do not fit with centralized seed planning. Although cooperatives are supposed to approve the original seed demand figures provided by the BoARD, this is a long way from the independent assessment of farmer members’ seed demand that characterizes most cooperatives elsewhere in the world.

Despite a national shortage in hybrid maize, ESE had leftover seed from many crops for the last few years, and additional reserves are believed to be held in cooperative warehouses.²⁶ There are also concerns about the timeliness of the process of centralized seed allocation and the fact that some seeds may arrive too late for planting or may be distributed to the wrong location.

The current inability of companies to market seeds outside of government channels is a major stumbling block to the development of the private seed sector in Ethiopia. For example, the majority of Pioneer’s production is marketed through ESE and/or BoARD channels, although it also has a small network of seed dealers that sell Pioneer seed independently. As long as private producers do not have the opportunity to market their own products through dealers (cooperatives or private merchants), then the advantages from a competitive private sector will not be realized, since selling to a single customer (the government) does not allow for a dynamic private seed sector.

Farmer adoption

While there is limited data available about the national level of adoption of different seed varieties, there are some location-specific studies on adoption of improved varieties for specific crops. As shown in Table 3, uptake of new varieties seems to vary considerably by crop and location. Findings show that improved varieties can substantially improve the productivity of small-scale farmers. However, this table indicates that although farmers welcome new varieties of some crops, for others, rates of adoption are less than 50 percent. Adoption rates are also highly variable by region.

²⁵ Alemu, D., Mwangi, W., Nigussie, M. and Spielman, D. (2008) ‘The maize seed system in Ethiopia: Challenges and opportunities in drought-prone areas’. *African Journal of Agricultural Research* 3(4): 305-314

²⁶ Interviews with ESE and Oromia Seed Enterprise; Bako Hybrid Maize documentation

Table 4: Use of improved varieties - results of location-specific adoption studies		
Crop	Location	Rate of adoption of improved varieties*
Bread wheat	Amhara (W. Gojam and S. Gondar)	80%
Wheat	Oromiya, Bale	42%
Bread wheat	Oromiya	70%
Maize	Sidama and North Omo	22-30%
Maize	NW Amhara	43%
Maize	SNNP, Amhara and Oromiya	40%
Maize	SNNP	47%
Maize	SW Oromiya	39%
Chickpea	Oromiya	18%
Haricot bean	Oromiya	70%
Lentil	Oromiya	30%
Sorghum	Tigray	8%

*The definition of “improved variety” varies across studies; in some cases it does not include older varieties released by the research system.
Source: T. Lemma et al (2006)

From an extension perspective, there is inadequate production of small packs of new seed varieties that can be used in testing and promotion activities with farmers. Findings contained in the analysis suggest the following important principles for extension interventions to enhance adoption rates for new varieties:

- **Participatory varietal selection** – Farmers play an active role in defining the characteristics of seeds/plants that are important to them. This is an important way for researchers to learn directly from farmers. For example, in one maize trial, farmers expressed preference for several OPVs rather than the available hybrids, despite the latter’s higher average yields.²⁷ Gender is a factor in participatory selection, and so women should be included in these activities.
- **Avoidance of nationally defined packages** – Ensuring the distribution of locally relevant packages with demonstrated field testing and linkages to markets is critical to overcoming the shortcomings of package interventions experienced in the past, particularly in food insecure or low productivity areas.
- **Leverage Development Agent’s (DA’s) knowledge of local needs and practices** – DAs with knowledge of local needs and practices should help to formulate relevant, location-specific recommendations. Local needs also require adaptation and responsiveness to gender issues and to the proportion of women producers in both female- and male-headed households.

In summary, commercial seed production in Ethiopia is a growing economic sector that can help farmers improve their livelihoods through higher yields and increased production. Seed production in Ethiopia is currently dominated by the public sector, but an increasing number of private sector companies are active. Simultaneously, improvements in frontline delivery of these seeds for adoption by small-scale farmers and the initial participation by these farmers in participatory varietal selection will facilitate longer-term gains in productivity. Both public and private seed production face challenges and operate under an enabling environment that is described in the next section of this report.

²⁷ Mulaku, E. and Zelleke, H. (2002) ‘Farmers’ highland maize (*Zea mays* L.) selection criteria: Implications for maize breeding for the Hararghe highlands of eastern Ethiopia’ *Euphytica* 127: 11-30.

ENABLING ENVIRONMENT FOR SEED PRODUCTION

Many factors contribute to a successful – or challenging—operating environment for seed production in Ethiopia, from government targets and policies regarding seed production to seed quality control, seed prices, and farmers’ access to information. This section examines that operating environment with a discussion of current systems and constraints.

Seed policy

Locally responsive policies are required for the development and growth of a productive seed sector in any country. MoARD sets Ethiopia’s current policies, with responsibility divided between two Ministry directorates: the Agricultural Marketing directorate (with responsibility for input allocation) and the Animal and Plant Health Regulatory Directorate (APHRD) (with responsibility for quality control inspection). The country’s seed policies are broadly consistent with other policies in the agricultural sector, including a strong emphasis on serving all of Ethiopia’s farmers, improving rural welfare, and directing considerable state support to ensure that targets are met. There is considerable reliance on central planning, in which various state actors receive instructions from the top rather than being encouraged to develop their own decision-making capacities to serve national goals. Even though there is also a clear policy directive encouraging the participation of private sector actors, informal price controls are set by GOE in specific areas such as the production and marketing of hybrid maize.

Seed strategy and planning

In addition to MoARD, a National Seed Committee includes senior officials of MoARD and representatives of seed producing organizations and research institutes. A professional sub-committee (with representatives from MoARD, EIAR, and ESE) has recently been charged with developing a five-year seed plan for Ethiopia. The recently published “Seed Multiplication Plan” (MoARD 2009) sets targets for seed production by crop through the 2013 season. The targets in this plan are exceptionally ambitious. They contemplate a six- or seven-fold increase in seed supply from 2009–10 for maize, with a targeted supply (73,240 mt for 2010) that would be enough to plant nearly twice Ethiopia’s current maize area. For other crops, there is little or no projected increase in seed supply for 2010, but many are scheduled for very significant increases in 2011. For example, rice, now a primary target for development, would experience a two-fold increase in seed supply, while field pea seed supply would increase six-fold, sorghum 20-fold and groundnut 70-fold (from current low base levels).

While it is critical for Ethiopia to have a five-year plan for seed production targets, as outlined above, this must be based on revealed demand and must be flexible enough to accommodate shifts in farmer demand due to changing crop markets and rainfall.

Seed price

Another controversial element of Ethiopian seed policy is the way in which the government provides parameters for the price of seed. The federal and regional governments set the purchase price and profit margins for each actor in the seed value chain, with some flexibility for private companies,²⁸ from ESE sale price to the seed price paid by farmers. The government sets wholesale prices using a weighted average price from different producers and sets retail prices with the addition of transport and handling costs and a fixed profit margin for cooperative unions and their respective members.

For many seeds, the government sets an artificially low sale price since many resource-poor farmers cannot afford the full cost of purchased inputs. This means that by most measures, seeds in Ethiopia are very inexpensive. In fact, “black market prices” for hybrid maize in Ethiopia (prices above those set by the government) are similar to the prices that farmers in other sub-Saharan African countries are willing to pay for this valuable input. Experts suggest that a price ratio between seed and grain of 5:1 is sufficient for a viable hybrid maize business; 2:1 can be profitable for basic grains such as wheat and barley. However, most calculations show that Ethiopian prices fall well below this ratio.

Although it is politically difficult to raise seed prices when farmers are accustomed to low cost seeds, when taken in tandem with grave food security concerns, artificially low seed prices are problematic and could potentially be counter-effective for several reasons:

- **Low adoption** – Studies suggest that farmers do not value products that are cheaply priced and therefore make less efficient use of them. Moreover, the low price means that distribution is not directed to the most efficient users, as it would be for a high-priced product

²⁸ The federal and regional governments negotiate with private companies giving some room for price-setting

- **High public cost** – As demonstrated by examples in southeast Asia (namely Vietnam) and sub-Saharan Africa (including Malawi), in the long term, price support schemes incur high long-term costs to the public system with limited returns and few incentives to encourage private companies to fill the gaps.
- **Crowding out the private sector** – Low prices fundamentally discourage investment in the sector.
- **Weak business case, low supply** – Current seed prices do not provide sufficient remuneration for actors in the supply chain to perform efficiently or enough income to sustain the production system (including replacing equipment and acquiring the additional infrastructure needed to maintain and expand production). For example, low source seed prices reduce the funding available for public institutions to invest in the critical R&D needed for varieties to keep pace with the shifting pest and disease environment.

If and when Ethiopia moves to develop more market-based prices for seeds, it will be worth considering support for targeted populations or regions, instead of nation-wide price support. This effort could include support for resource-poor farmers whose production could be improved by commercial seeds but who are unlikely to buy inputs, as well as “introductory” support to encourage farmers to try new seed varieties. Ethiopia could learn from a growing range of experiences in Africa with targeted input support programs.²⁹

Seed Certification and Quality Control

Since farmers have difficulty assessing the physical or genetic qualities of seeds before they are planted and grown, certification of seed quality is essential to provide consumers with quality assurance and a means of redress if expectations are not met. In Ethiopia, several national and regional institutions provide seed certification and quality control. In most cases this includes documentation regarding the source seed being used, inspections of seed production plots during the growing season, and physical tests of seed after harvest. Until recently, virtually all seed production in Ethiopia was conducted by ESE on large state properties with fairly straightforward inspection logistics. As the seed system diversifies and as seed production and conditioning increasingly take place at smaller and more dispersed locations, the management of seed certification will become more complex.

Unfortunately, Ethiopia’s current seed certification system is not functioning as expected, with an immense gap between the “rules on paper” and “practice in the field.” For example, although most seed sold to farmers (including seed from FBSM) is “certified,” most seed production plots are visited less often than the current regulations stipulate and certification tags are rarely attached to seeds bags in the presence of certifying agents. Regional certification labs do their best—field inspectors visit seed production fields as frequently as they can (and some of these fields are rejected each year), and seed samples are tested for germination and purity, but the physical and human resources available for these tasks is simply inadequate.

Ethiopia needs to reform its current seed certification system, which will take time, careful planning, and significant discussion among key stakeholders. There are no standard blueprints for improving the system, but experiences from other countries such as South Korea and Vietnam can be used to craft a system that (i) ensures seed quality, (ii) is cost-effective, (iii) is understood by farmers, and (iv) is sufficiently flexible to support and accommodate a growing and diversifying seed sector.

Several factors will be important to consider:

- **Participatory engagement** – For a certification system to be effective, its design, management, and modification require the active participation of seed producers and farmers, as well as regulatory authorities. Without the understanding of farmers and the input of seed producers, seed regulation is unlikely to be effective. A potential solution is a seed certification authority that actively solicits input from seed producers and farmers, and helps build their capacity.
- **Appropriate cost structures** – Seed certification is a type of quality control, and quality control costs money. Seed certification should not add more than 2–3 percent to the final price of seed. To help pay for this service, the GOE should develop mechanisms and price structures in which the price of seed includes fees that help to cover these certification costs.

²⁹ Dorward, A. (2009) Rethinking Agricultural Input Subsidy Programmes in a Changing World, London: SOAS/FAO. http://www.fao.org/es/esc/common/ecg/586/en/Dorward_FAO_Subsidy_Paper_FINAL.pdf

- **Sufficient safeguards for the integrity of seed** – An exceptionally important part of effective seed quality regulation takes place at the point of seed sale. For the most part, sale of sub-standard seed to farmers in sub-Saharan Africa is due to bad management or fraud that occurs after the seed has left the seed company’s fields and processing plant. Improper transport or storage and the temptation to adulterate seed (in other words, fraudulent sale of grain in seed bags) are major causes of concern for farmers and require a regulatory structure that focuses on point-of-sale inspection as well as consumer education and protection.
- **Alignment between policies and implementation** – Very few developing countries have comprehensive seed certification systems whose operation on the ground bears much relation to written regulations and procedures. But a number of countries have made significant steps toward improving their certification systems, allowing for voluntary certification in some cases, and placing more responsibility with seed producers. The options include accrediting seed producers to take responsibility for certification (as is done in South Africa) or implementing a Quality Declared Seed system. In many countries, a private company’s commercial reputation is based on its ability to provide internal quality control mechanisms and thus maintain market share.

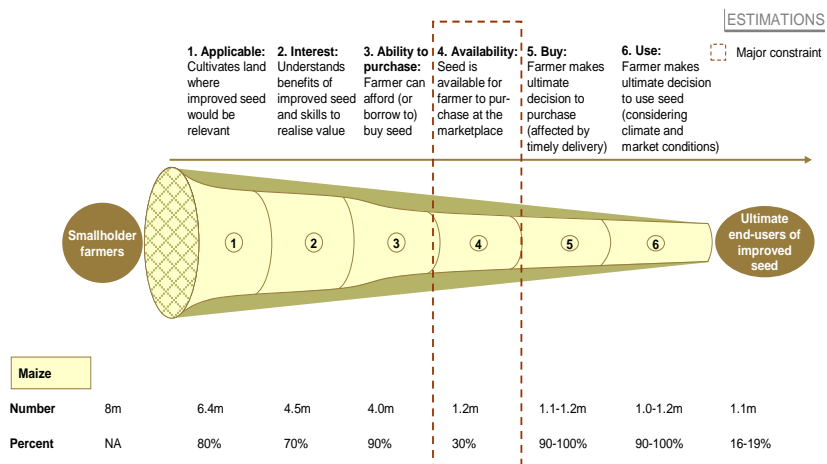
ISSUES AND CONSTRAINTS IN THE SEED SECTOR

This section outlines the key issues and constraints identified by the research team within both hybrid maize production, and production of open-pollinated varieties as the issues are significantly different for these two types of seed.

Hybrid maize – constraints to access

Figure 2 presents estimates of the availability of certified hybrid maize seed to farmers. As shown, over 6 million farmers (80 percent) cultivate land where commercial maize seeds could be used and to productivity, but seeds are available for purchase by only 1.2 million farmers (30 percent). Less than 20 percent of current farmers actually use improved/commercial maize seeds. Demand for hybrid maize seed is clearly not met.

Figure 2: Estimates of availability of Hybrid Maize Seed to Farmers



Source: Alemu et al., 2008; Thijssen et al., 2008; expert interviews

Currently, the public sector dominates maize seed production, with the Ethiopian Seed Enterprise (ESE) and two nascent Regional Seed Enterprises (RSEs) responsible for 60 percent of hybrid maize seed production.³⁰ These institutions rely predominantly on contract growers for hybrid maize seed production but retain responsibility for cleaning, processing, testing, and distribution to cooperatives. In the last five years the private sector has grown in terms of the number of participants as well as the overall quantity of production, with Pioneer Hi-bred and other private seed companies currently providing the remaining 40 percent of hybrid maize seed.³¹

³⁰ Spielman, D., Kelemework, D. and Alemu, D. (2009a) 'Policies to promote smallholder intensification in Ethiopia: The search for appropriate public and private roles'. Paper presented at the Seventh International Conference on the Ethiopian Economy, Addis Ababa, June 25 – 27

³¹ Spielman, D., Kelemework, D. and Alemu, D. (2009a) 'Policies to promote smallholder intensification in Ethiopia: The search for appropriate public and private roles'. Paper presented at the Seventh International Conference on the Ethiopian Economy, Addis Ababa, June 25 – 27

Despite this growth, the seed production system is not able to meet hybrid maize demand due to the constraints facing both public and private seed producers. These constraints are detailed below.

Public sector constraints include (i) inconsistent demand planning and target setting, (ii) productivity gaps and financial constraints in contract grower schemes, (iii) lack of coordination between production, processing, and delivery, and (iv) lack of choice or information provided to farmers by the distribution model.

- **Public sector constraint - inconsistent demand planning and target setting**

The government's methods for estimating seed demand from farmers, and subsequent seed production targets are inconsistent and inaccurate, leading to both over- and under-estimation of demand. The allocation process is also slow, contributing to delivery delays.

A number of problems with this centralized system of seed planning have been identified: (i) it does not account for farmers' ability to save seed from many self-pollinated crops for several seasons and thereby use local sources if they need to acquire fresh seed, (ii) agricultural development should be particularly concerned with ensuring widespread and equitable access to inputs such as seed, rather than simply seeking a summary statistic at the national or regional level, and (iii) assessing the actual benefits of commercial seed depends on access to location-specific information regarding the conditions and management practices under which seeds are used.

There is a need for more reliable information about farmers' seed demand to calibrate projections, including a better database of local and regional needs. Inclusion of data from and consultation with private sector sources on the demand-side calibration could also be beneficial in setting prospective targets. Furthermore, planning is currently favorable to high-potential areas, yet the low-potential areas are also seeing demand for improved seed. Given the lack of strong market incentives in low-potential regions, there is a case for GOE to play a stronger role in these areas.

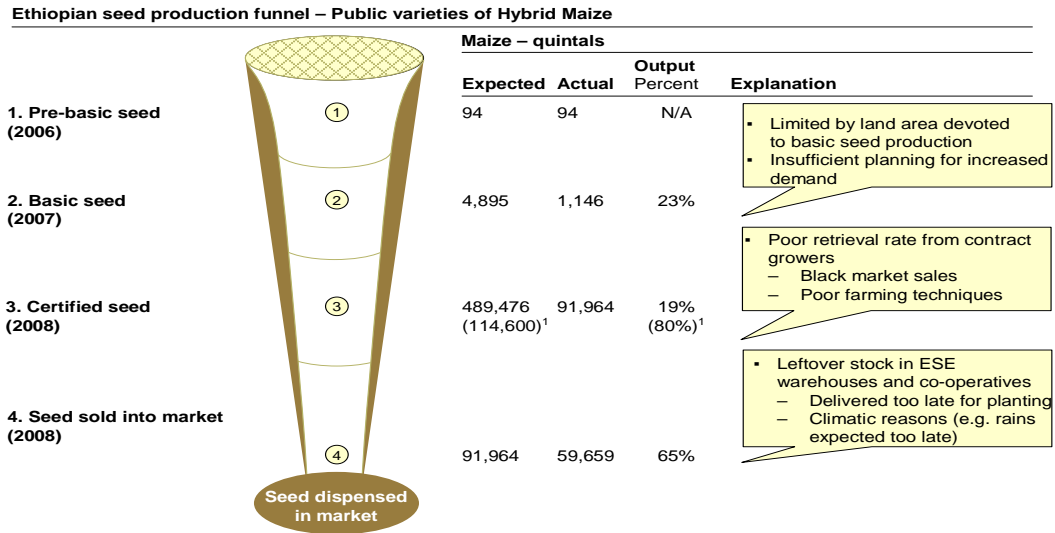
A shift in this planning process would require new roles for seed planners, who currently have the mandate of only setting and monitoring quantitative targets at the federal level. Achieving this shift is likely to require decentralization of the planning process and the inclusion of more individual players in seed provision, including research institutes, private seed companies, cooperatives and unions, traders, input merchants, and Development Agents, through the envisaged improvement of the extension system in coming years.

- **Public sector constraint – productivity gaps and financial constraints in contract grower schemes**

ESE and RSEs experience productivity gaps and financial constraints in their contract grower schemes, resulting in reduced quantity and quality of seed production. The retrieval rate from contract growers is often very low, with some growers returning less than 50 percent of the expected seed result.

Figure 3 highlights some of the shortfalls in hybrid maize production, which show that certified seed output was only 19 percent of the quantity projected. This is due to inferior planting and farming techniques, as well low financial incentives that encourage growers to sell seeds for a higher price on the black market. In 2009, black market seeds sold for over five times what producers could get from ESE or RSEs. Working with dispersed growers also increases the burden of quality control.

Figure 3: Seed Production and Shortfalls for Public Varieties of Hybrid Maize



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¹ The number in parentheses is based on what could have been produced with the actual from the stage before
 Source: Interviews with ESE and Oromiya Seed Enterprise; Bako hybrid maize documentation

• **Public sector constraint – lack of coordination between production, processing, and delivery**

The current processing, cleaning, testing, and storage facilities are not aligned to major seed producing areas. Key resources remain concentrated in specific areas, increasing logistics costs and slowing delivery to remote areas. Five additional state-run seed producing entities have been established, but no additional processing capacity has been added. Furthermore, current capacity is unknown, making it difficult for ESE/RSEs to take advantage of available resources or to understand what excess capacity could potentially be made available for private producers.

• **Public sector constraint – distribution model not providing choice or information to farmers**

The current centralized distribution model does not provide choice or information to farmers, who receive seed from the cooperatives that may or may not be what they requested from the system. Since the government is the only distribution channel, this eliminates the incentives for cooperatives to play a commercial role on behalf of farmers, such as sourcing competitively priced seeds and varieties that farmers need.

Figure 3 also highlights that only 65 percent of the certified seed that was produced was sold into the market, due to (i) leftover stock in union and cooperative warehouses due to late delivery (too late for planting) and (ii) poor management and high incentives for distributors to sell through the black market.

Private Sector Constraints: In principle, the policies to foster private sector engagement are on the books. In practice, the conditions to enable substantial participation have not come to fruition. In order to build a robust private sector capable of increasing its production, taking over the current volume contribution of the public system, and meeting farmer demand, several constraints must be understood and addressed: (i) the shortage of basic seed for private seed growers, (ii) government intervention in all commercial aspects of the value chain, (iii) poor business and regulatory support, and (iv) insufficient support and start-up funding for young seed companies.

- **Private sector constraint – shortage of basic seed for private seed growers**

The public sector is the primary producer of basic maize seed of public varieties (although Pioneer produces its own), but it produces insufficient quantities to satisfy demand, so private seed growers face a shortage of basic seed. Figure 3 identifies the key constraint in the 2008 season as the limited production of basic seed in 2007 (only 23 percent of what was expected). This was caused by insufficient planning or market mechanisms that did not account for increased seed demand, along with limited land allocated for basic seed production.

Recent improvements, including the licensing of research institutes and three private seed companies to produce basic seed for the popular hybrid maize varieties, are a step in the right direction; however, more must be done. Without a consistent supply, seed growers cannot plan their production or build a reliable customer base.

- **Private sector constraint – government intervention in all commercial aspects of the seed delivery chain**

The current public intervention in all commercial aspects of the seed delivery chain, from marketing to distribution and sales, can be a disincentive for private seed growers in Ethiopia (although they benefit from not sharing in the risk of the farmer's change in demand). Most private companies use public varieties and so cannot differentiate significantly based on variety choice. Seed is delivered in low quantities from ESE, often delaying production and making planning difficult. There have also been restrictions on private companies for charging a competitive price or distributing through channels other than the government (via cooperatives). One company (Pioneer Hi-bred) is the notable exception to these regulations due to its long-standing relationship with the government. In neighbouring countries, local seed companies are able to brand, market, and sell seed to smallholder farmers at competitive prices using innovative packaging and promotion methods.

“You get one shot for production. If the basic seed is bad or the growing directions are not right for your area, you can miss a whole season. Control is critical.”

- private seed grower

Case study – Crash Program

Faced with a severe shortage of hybrid maize foundation and breeder seed during 2009, MoARD launched the highly ambitious Crash Program with the objective of producing 700,000 quintals of hybrid maize seed.

The basis of this intervention was understandable and the efforts to execute it were extraordinary, with the program yielding some success. Land available for hybrid maize basic and pre-basic seed production was increased and, through use of irrigation, allowed for multiplication twice per year. However, from the perspective of certified seed production, the ambitious targets were not met – of the 4,000 hectares at Tendaho, only 2,400 were planted, while ESE raised less than 10 percent of the ETB 450 million needed to repurchase seed from out growers, leading to production of only 37,000 quintals (5 percent of the target). In addition, since all basic seed available was allocated to this program, local private sector seed companies, which are a key aspect of the government's long-term seed strategy, were crowded out of a key aspect of their business.

A public sector program such as this may indeed be the only effective way to meet the demand needs of farmers in a short term, emergency situation. However, design considerations to address such challenges require more planning. Furthermore, more sustainable and cost effective alternatives that leverage the strengths of other partners should be considered. These include the public sector development of a mechanism with a series of appropriate incentives, a transparent and supportive enabling environment, and most vitally, the regulatory and governance framework that would mobilize other partners, particularly local private sector seed companies, to undertake some of these multiplication activities under the supervision of the public sector. This would focus the public sector's limited resources on areas of upstream research and regulatory activities, in which it could make the most significant impact, while simultaneously bringing other partners into the equation to meet the needs of farmers throughout the country.

Reference: field visits, expert interviews

- **Private sector constraint – poor business and regulatory support**

The business and regulatory environment in Ethiopia discourages private seed businesses from starting and scaling up operations in the country. Private seed companies are unable to access foreign exchanges to procure international equipment and supplies (due to the shortage of foreign currency), they do not get priority access to irrigated land, and in the case of international companies, they are unable to repatriate their earnings abroad. This environment strongly discourages private seed companies from doing business in Ethiopia.

- **Private sector constraint – insufficient support and start-up funding for young seed companies**

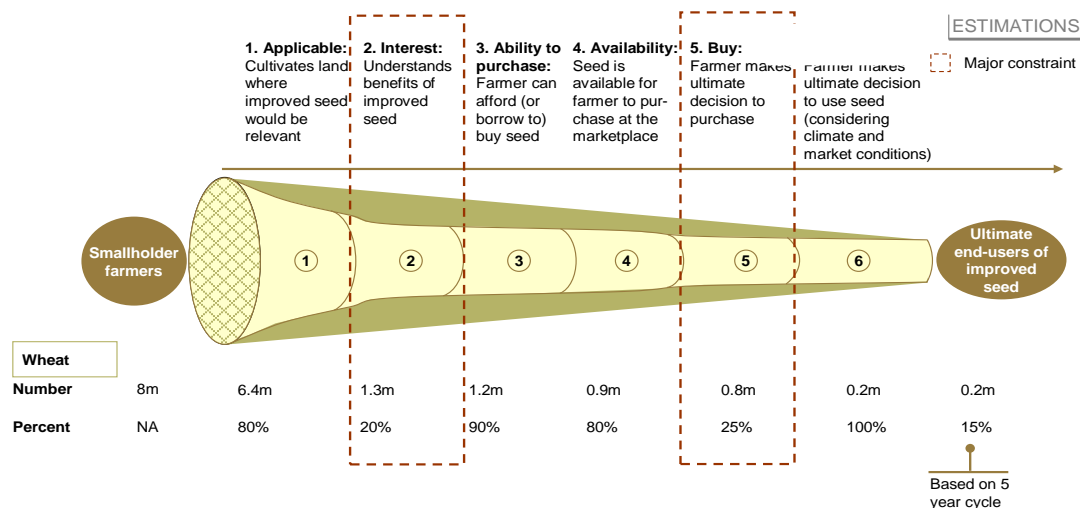
While Ethiopia is generally a credit-constrained country, the situation is especially problematic for companies that are small or active in the agricultural sector or that require start-up funding. This is due to a lack of competition in the financial sector, insufficient credit processes, and a lack of understanding of the agricultural sector within local financial institutions. Hence, starting up a seed company in Ethiopia based on credit is extremely difficult. It is difficult for seed-producing cooperatives or FBSMs to get official status (although there are some seed production cooperatives that do have it), so these institutions have to apply for credit as individuals, which further complicates the credit process and access to loans. Even if these companies manage to get a loan, they are likely to face further problems with regard to financing or protecting their business with working capital loans or business risk insurance, which further discourages the start-up of private seed businesses.³²

See Section 4 for recommendations to overcome these constraints and improve maize seed production and distribution in Ethiopia.

Self-Pollinated Crops – low farmer demand

Self-pollinated crops (such as wheat, teff, and other crops) face a different situation. While farmers readily demand hybrid maize seed, demand for commercial seed for self-pollinated crops is limited and erratic. As shown in Figure 4, since farmers can save seeds from these crops without compromising quality, demand for commercial seed is quite low, but there is significant potential for production of improved seed varieties that offer advantages over traditional seeds (higher yield, drought tolerance, etc.). Increasing farmers’ knowledge of higher yielding seeds is particularly important because higher yielding wheat varieties are already available in Ethiopia, with research field wheat varieties yielding 23-68 quintals compared with the national average of 16 (see Figure 2).

Figure 4: Use of Seed for Self-Pollinated Crops



Source: Thijssen et al., 2008; expert interviews

³² Refer to the agricultural finance diagnostic report for more details

Increasing the demand for and use of commercial self-pollinated varieties will require dealing with several constraints: (i) insignificant perceived advantage from varieties in mass production over farmer-saved/traded options, (ii) insufficient extension devoted to open pollinated crop needs, (iii) production of self-pollinated seed faces similar productivity gaps faced by hybrid maize, and (iv) the fact that production of self-pollinated seeds is currently a loss-making enterprise

Insignificant perceived advantage of mass-produced varieties over farmer-saved/traded options

There is a lack of transparency regarding the true performance of widely available crop varieties. There are tremendous gaps between actual yields and potential yields from varieties already available in Ethiopia. Breeders record wheat varieties with yields between 20–50 quintals, when the national average is 17 (see Table 2). There are also significant gaps between Ethiopia's yield and that of neighboring countries—Kenya has yields well over 20 quintals per hectare.

Without a major yield advantage or other advantages that farmers value (such as disease resistance), there is insufficient incentive for farmers to purchase commercial seeds rather than using seeds they can access through the informal market. Some success stories—like Kuncho teff variety seeds—indicate that once farmers understand the advantage of a commercially purchased variety (such as increased yield, potential for premium price earning, or improved resistance to stress), they quickly see the advantage of investing in these seeds.³³ This shows that farmer education is critical to the success of these seeds.

Insignificant extension devoted to open pollinated crop needs

Inadequate farmer knowledge about the varieties that do deliver major improvements (such as yield increase and disease resistance) is the result of constraints in both research and extension services, which do not prioritize farmer education or promotion of improved seeds as a core activity. Many research institutions fail to produce adequate quantities of newly released varieties for farmer demonstration purposes, and extension agents are not reaching farmers with higher-yielding varieties or improved practices to augment those varieties. MoARDS's 2009–10 Crop Technology initiative has documented that farmers who adopted OPV varieties with the recommended agronomic practices had higher yields than farmers who adopted improved varieties but followed traditional agronomic practices. Thus, it is important that the farmer outreach includes both improved varieties and recommended agronomic practices.

Production of self-pollinated seed faces similar productivity challenges as hybrid maize

Public producers (ESE/RSEs) utilize out-growers for multiplication of OPVs but retain all processing, testing, storage, and distribution. Out growers are paid a 15 percent premium on the grain price,³⁴ which in some years is not an adequate incentive. Low retrieval rates, compounded by expensive processing and distribution, makes this a much less profitable business.

Production of self-pollinated seed is currently a loss making enterprise

Given that demand is low and costs are high, production of OPVs is not currently profitable for the public system. This means that production of self-pollinated seeds will likely remain the purview of the public sector, since it is currently not financially attractive for private companies. As such, the public sector's hybrid maize sales currently help to subsidize the production of self-pollinated seeds. Private sector producers will only move into self-pollinating crops if it becomes a financially viable enterprise.

RECOMMENDATIONS

The ultimate goal and vision of this report is to help improve smallholder farmer productivity and livelihoods in Ethiopia through an increasingly open and competitive seed production system that provides an expanded, affordable, and diversified choice of seeds to farmers, provided from both the public and private sector. Plant-breeding should include high-yielding varieties based on the best germplasm for Ethiopia's diverse agro-ecologies and the supply chain should be able to meet the demand for commercial seed, while a strong extension system is critical in creating farmer demand for commercial seed through on-farm demonstrations and in ensuring that farmers have adequate information, choice, and ability to purchase the very best seed variety for the situation. We also acknowledge the need for market demand to help drive supply. Separate crop value-chain diagnostics in maize and pulses provide an analysis of these.

³³ Expert interviews; field visits

Although many of the interventions discussed in this section concern public sector responsibilities, consistent with multiple government strategy and policy documents, an important objective of this report is private sector participation in the seed system. The public and private sector will have different roles in seed production. Over time, the research team recommends that the private sector produce the majority of the hybrid maize seed and other hybridized seeds (since these seeds are most conducive to a sustainable business model), while the public sector should continue to invest in the research and development of new varieties specific to the diverse agro-ecological needs of Ethiopia. Since self-pollinating seed varieties are less commercially viable than hybrid maize, public sector seed enterprises should also assist with commercializing these seeds and educating farmers on the benefits of improved OPVs. Overall, the report envisions the eventual development of a balanced seed sector, with the private sector focused on commercially attractive hybrids and the public sector driving the increased availability and adoption of OPVs, as well as hybrids in food insecure regions.

Several key principles underlie this vision:

- **Seed system driven by demand** – Rather than emphasizing the quantity of seed available to farmers, this report is concerned with the seed type and seed quality and with ensuring that seed production meets farmers' demand. Essentially, a well-managed seed system ensures that the right seed is reaching the right farmers at the right time.
- **Flexible and decentralized system** – Investing each actor in the seed value chain with more responsibility for decision-making and managerial freedom is the key to more responsive and robust seed provision and is one common thread among all the proposed interventions.
- **Scaling up local successes and adapting to local reality** – It is not possible to import a single blueprint solution to fit Ethiopian circumstances. The solution will include various options (including learning from others' experience) and approaches that are most appropriate for Ethiopia's conditions and resources. This includes tailoring possible solutions to the resources at hand rather than designing an ideal system that is resource-intensive with no realistic hope for full funding.
- **Careful sequencing of interventions** – It is important to consider the sequencing of interventions. Strengthening the Ethiopian seed system will be a gradual process that begins by identifying and testing selected interventions, learning from experience, and progressing to further changes and innovation.

To achieve this vision, the research team recommends the following interventions:

CREATE A JOINT VISION AND DEVELOPMENT PROGRAM FOR THE SEED SECTOR

Key problems highlighted in this diagnostic work were the lack of trust between the government and private sector; ongoing misunderstanding about who will do what, and missed production targets. In order to coordinate the future direction of the seed sector, GOE needs to play a leading role in setting the standard, ensuring an effective industry structure, and holding the private sector accountable for delivery. Implementation should be undertaken strategically, with the aim of driving programs that build self-sustaining momentum in the seed sector. Meanwhile, active support could be given to facilitate and accelerate private sector activity and effectiveness within a well-regulated structure, in order to reduce the burden of execution on the government. In development of this program, consideration could also be given to bringing together the various functions of the seed system within GOE, e.g. marketing, regulatory and other related functions currently sit in different parts of the government, making coordination and communication more difficult.

Establishing a joint vision and development program between the government, public sector producers and private seed companies, would be extremely beneficial in terms of aligning all players around a common goal and to assure all parties of each others' commitment. This development program would formalize the expectations and commitments each side will make towards increased seed production, and could consist of several key components:

- Sector vision and objectives (i.e. a blueprint for the next 5 years)
- Clearly defined roadmap, roles, responsibilities and realistic production targets for all key public and private actors and how they will be reached (e.g. public seed enterprises to focus primarily on commercial seed for orphan crops, in line with current policy, and private sector entry to be encouraged in hybrid maize seed)
- Code of conduct on business and grower ethics (potentially contractually binding in some way, e.g. a private company might lose rights to breeder seed the following year if they fail to meet their targets)

- Joint governance and coordination, potentially through annual reviews by a third party to help to ensure adherence to the plan.
- Discuss forum for all stakeholders (this can also help to jointly highlight and address issues in the sector).
- Establishment of online information exchange platform on the overall seed production, marketing, storage etc
- Government intervention on specific enablers for the sector (as outlined above), including support mechanisms and incentives for private sector growth (e.g. risk sharing, land leasing, planning permission, tax incentives, financing with favourable terms, technical assistance).

Key benefits of such an agreement would be stimulation of a stronger cadre of private sector actors, through reduction in the perceived risk to private sector players and appropriate proactive interventions by the government. This should bring increased efficiency, as the private sector has a financial interest to deliver, while maximizing the benefit from the use of private sector skill and execution and delivery expertise. It would also establish accountability for the private sector in terms of working towards agreed development goals.

Both the government (i.e. ESE and RSEs) and private sector companies that the research team interacted with were strongly supportive of this concept, and there was significant appetite to ramp up public/private meetings into this sort of compact so that each side could bargain. It is important to consider what pre-existing structures could be leveraged to coordinate this body. In this regard, strengthening the recently established Ethiopian Seed Growers Association (ESGA) will be important to align different stakeholders. There is also an open question as to what entity or office could be a trusted third party to assist in progress reviews and enforcement of responsibilities.

The activities necessary to initiate this process would include a joint task force chaired by the leadership of ESE or the State Minister, along with broad-based representation across the stakeholders. The task force would generate the expectations for each side, both public and private sectors, and agree to issues around tax incentives, access to parental lines, and land agreements, inter alia. Other activities would be likely to include draft codes of conduct as well as monitoring and evaluation against progress and objectives.

Table 5: Create a Joint Vision and Development Program for the Seed Sector

Action	Steps	Owners
Create a 3-party agreement between the government, public sector producers and private seed companies	Establish agreement on responsibilities and code of conduct	MoARD and BoARD, ESE and RSEs
	Strengthening the recently established Ethiopian Seed Growers Association (ESGA)	MoARD
	Regular reviews to track progresses	MoARD
	Establishment of seed information exchange platform	MoARD

Source: Team analysis

Case study – Etosa Cooperative Union

The experience of the Etosa Cooperative Union with dissemination of improved haricot bean varieties and the experience of the Erer Cooperative Union with Kuncho teff varieties show how cooperatives can effectively manage seed production and multiplication with adequate training and source seed. The haricot beans program was supported by Melkassa Research Center and the teff program was supported by Debre Zeit Research Center of EIAR.

Reference: TBD

Build Capacity for Public Production

Since the public sector is and will continue to be the dominant player in Ethiopia's seed sector, the research team recommends improving the operational effectiveness of public seed enterprises in the following areas:

- **Public sector strategy development and role differentiation** – A critical first step is for the Ethiopian government to continue its strategy development and differentiate roles between RSEs and ESE. This process, while already underway, should be significantly escalated so that ESE and RSE can rationalize their own responsibilities and changes to the system can be pushed through. This process should include business process planning and the separation of target-setting for ESE and RSEs. RSEs should be responsible for developing their own business plans and specializations. Given GOE's policy of shifting hybrid maize to the private sector, we would recommend that RSEs start the process of shifting to self-pollinating varieties. RSEs should also take the lead in the business planning process, including improved demand assessment, marketing, and production of these seed varieties, with ESE eventually moving out of downstream production. It will be important to identify any additional skills or resources that will be needed by the RSEs and ESE given these clarified responsibilities and to fill any gaps through capacity-building or additional resources. These plans will likely need to be supported in the short term by seed experts and those with experience in ESE until appropriate levels of expertise are met. This will help to improve public sector assessments of farmers' seed demand.
- **Locally appropriate and relevant production strategies** – Develop seed production strategies for each crop type, taking into consideration the specificity of the different crops, agro-ecology, and different actors at all levels. This should include production strategies for both hybrid seeds and OPV seeds. Given the lower margin for OPV seeds (and the proposed shift for RSEs to self-pollinating varieties), a strategy will need to be in place to allow for RSEs to establish their budget and be self-sustaining businesses. Financial support (credit) will need to be available for RSEs so they have the ability to engage in seed buy-back, and support will likely be needed so that more financially viable models can be developed.
- **Effective deployment of existing resources** – Regardless of specialization, the current situation with seed processing facilities needs to be remedied, as there are major discrepancies between where supply is produced and where it is processed. An assessment is needed to inventory where facilities are currently located and their capacity, as well as where there are additional needs required to meet demand. These resources should then be appropriated according to where the need is greatest. At time of writing, no one in the system could say exactly where or how these processing facilities were being run. A strategy should be put into place to deal with moving these facilities as needed, taking into consideration other strategic goals. There may be potential to leverage the state ownership of some capital equipment (for example, seed processing facilities or seed cleaners) by renting it out at a fee to private sector companies. This would act to pass some of the hybrid maize seed margin back to the RSEs as operating margin, while allowing for the RSEs to make their evolution to OPV/ orphan crops.
- **Improved supply chain management** – This must take into consideration all actors involved, including cooperatives and private seed companies. This should include empowering primary cooperatives and cooperative unions with adequate capability (such as training and information regarding demand collection and seed choice), greater decision-making authority (to select the seed suppliers that meet their needs and to directly assess the demand of their farmer customers) and financial independence (to ensure that they are viable entities). Given the public OPV focus, cooperatives and other agencies can play a critical role in the production and distribution of these seeds (see case study above). Experiments with a wide range of such cooperative seed production initiatives supported by multi-disciplinary innovation teams were started in 2009. The extension system could also factor in as a link to farmers and their potential participation in OPV production. In most countries studied, OPVs are produced at a farmer level in a much less capital-intensive way than Ethiopian production.

Table 6: Building Capacity for Public Production		
Action	Steps	Owners
Public sector strategy development and role differentiation	Improvement in demand assessment mechanism for both commercial and source seeds	MoARD, BoARD, EIAR, RARIs, ESE, RSEs
	Coordination and target sharing among Seed Enterprises	ESE and RSEs
	Support Seed Enterprises to develop clear business plans	ESE and RSEs and NARS
	Design of mechanism for increased production of self-pollinated seeds by ESE/RSEs	MoARD, BoARD, EIAR, RARIs, ESE, RSEs
Development of seed production strategy	Hybrid seed production strategy	MoARD, BoARD, EIAR, RARIs, ESE, RSEs
	OPV seed production strategy	MoARD, BoARD, EIAR, RARIs, ESE, RSEs
Optimization of the use of seed processing facilities	Assessment of the existing facilities and critical needs for investment	ESE and RSEs and NARS
	Development of strategy for efficient utilization of available facilities	ESE and RSEs and NARS
Improvement of the supply chain management	Empowering primary cooperatives and their unions with greater decision-making powers (to select the seed suppliers that meet their needs and to directly assess the demand of their farmer customers) and with financial independence to ensure that they are viable entities	MoARD and BoARD

Source: Team analysis

Accelerate Self-Pollinating Seed Variety Availability and Adoption

In order to increase yields and farmer productivity, the GOE should seek to increase farmer demand for and use of commercial seed in self-pollinated crops. This is also dependent on the availability of good varieties. To increase seed availability and adoption, the research team suggests the following steps:

- Inventory of currently available varieties to identify gaps** – While many varieties have been developed to date, a true understanding of their potential does not currently exist. This inventory should consider NARS varieties, as well as varieties developed by international research organizations and other country-based research organizations. Information collected should include crop types, yields across agro-ecological zones, growers’ data under existing conditions, and disease resistance, inter alia. NARS should be the overall owner of this effort, but an outside consultant or expert will likely be needed to collect the data. There is an opportunity to extract much greater value from agro-ecology based breeding, as opposed to the “broadly-adapted” (but not really well adapted) varieties currently available. In other African countries, fine-tuning of varieties to local farmer needs and interests has meant that formerly “non-commercial” seed products have become of high commercial interest to local companies.
- Prioritization of varieties to fill gaps** – Based on this inventory, the government breeding program should focus on developing varieties that fill the identified gaps, and resources should be allocated accordingly. Prioritization of seed development should be aligned with local, regional, and international research centers and should focus on the more profitable varieties for both the seed producers and the smallholder farmers. In addition, as a means to stimulate the development of the private sector, particular focus could be placed on varieties that are most commercially viable.

- Effective commercialization campaign leading to enhanced adoption of available varieties** – There is the need to have a good supply of small quantities of new varieties of seed, which are then distributed further by farmers and groups. A campaign should be launched either at the research level or further down the chain to reward the actual use and/or testing of varieties at farmer level. In keeping with their agenda, RSEs should act as primary catalysts for bringing new varieties demanded by farmers into production and pushing for uptake and trials (potentially setting land aside to do this). These RSEs will be able to specialize enough to get new varieties to farmers and to work with them to ensure uptake. RSEs can also work with other actors in the system (such as cooperatives) to ensure that the right seeds are being replicated and that they are able to be received at the right time, etc. Specific variety promotion activities could include (i) widespread on-farm trials of pre-released and new varieties to demonstrate to farmers and to feed information back to researchers, (ii) use of media (print, radio, etc) to provide information to farmers about the varieties that are available, and (iii) strengthening the system of research-extension interactions including forums such as Agricultural Rural Development Partners Linkage Advisory Councils (ARDPLACs) at the woreda level that will facilitate knowledge exchange and the widespread testing and demonstration of new varieties. NARS and the extension system should also work together to support extension agents with skills and supplies (such as small “tester” packs of diverse types) to spread usage. Other countries have seen significant success in using seed packages that sell at roughly ETB 50–100, with enough seed for a farmer to try and observe the results. These quantities would be easily replicated at the RSE level for farmers to try, representing a significant departure from the current situation in which new varieties are not tested for commercial viability or farmer use and none get beyond the government test plots to see if performance and farmer adoption is an option. The question of what would be required for a private company to consider multiplication of these crops should also be considered. Demonstrations of new and pre-release varieties could be a way to actively seek out options for private sector production of public varieties.
- Streamlined variety registration and release** through the revised seed proclamation to ensure faster availability of new varieties. Work on this is already underway by MoARD, IDLO, and Wageningen University in a revised seed proclamation, which is due to be finalized in 2010. This includes a variety registration and release. There are three options for registration and release: (i) normal, (ii) expedited in one year, and (iii) substituted (if the application can scientifically prove that the variety has undergone the appropriate tests then the minister can waive the need for local adaptability trials).
- Disaster recovery plan** - There is also a need for a well-developed plan for fast, large-scale production in the case of disease (emergency seed). Options include large seed stocks (which is expensive) or a list of customers from whom grain of known provenance can be purchased in case of a disaster. The latter option has been included in the revised seed proclamation.

Table 7: Prioritize Self-Pollinating Seed Availability and Adoption

Action	Steps	Owners
Inventory of the current varieties	Assess the suitability gaps in terms of agro-ecology, disease resistance, and crop type	EIAR and RARIs
Redirect the breeding program to prioritize filling the variety gaps	Initiate and/or strengthen breeding activities for the identified gaps	EIAR and RARIs
Enhancing adoption process for “ on the shelf” varieties	Strengthening the research-extension linkage	NARS, MoARD and BoARD
	Wider promotion of the varieties along with recommended agronomic practices through enhanced demonstration and popularization	EIAR, RARIs, MoARD, and BoARD
	Enhancing end-users education through media and other mechanisms	MoARD and BoARD
	Strengthening the system of research-extension interactions along with ARDPLACs	ARDPLAC
Variety registration and release	Pass the revised seed proclamation	MoARD / regulatory body
Disaster recovery plan	Definition of a disaster recovery plan	ESE

Source: Team analysis

Enable Private Sector Seed Companies to Reach Their Potential

While the Government of Ethiopia has an explicit policy of increasing private sector involvement in the seed sector, there are several key enabling steps that are critical to allow local private seed companies to thrive. Specifically, the government should consider:

- **Expand access to breeder seed** – Expanding private seed companies’ access to breeder seeds through publishing and enforcing an open and transparent application process with the clear goal of distributing breeder seed to all entities that meet a set standard. Private companies should be allowed to access breeder seed by working directly with EIAR breeders under a license agreement. The new seed proclamation, being developed by MoARD, IDLO, and Wageningen University, will address this. It also reduces the requirements for seed producers, who formerly had to have a PhD in order to get a certificate of competence—now only “experience” is required.
- **Reduce public intervention in private production** – This will ensure a level playing field between the public and private sector producers, attract more private companies to the seed sector, and expand farmer choice. This could include allowing differentiated pricing (such as seed prices set by private companies) and freedom to select distribution models outside of government distribution channels (such as farmers’ own distribution through private “agro-dealers” or existing public channels, including cooperatives). Seed companies should be encouraged to develop their own branding, marketing, and customer base, driving competition and trust within the system that will help minimize price increases and provide farmers with access to the best quality seeds and the desired variety. It is also important to consider, in times of shortage, what mechanism should be created to ensure proportional distribution without disrupting private sector development.
- **Strengthen business environment** – Expand and ensure access to incentives that promote private enterprises, such as access to tax incentives and foreign exchange for equipment and supplies from abroad or training for private sector seed growers in leadership and management skills. This could be driven by MoARD and/or the Seed Growers Association.
- **Capacities of private entrepreneurs** – The nascent private sector companies that do exist rarely have the experience or skills necessary to be able to ramp up and take over production. GOE should identify which pre-existing private sector incubator programs can be leveraged for capital and technical capacity building, namely the Alliance for Green Revolution in Africa (AGRA) program and others like it, to help local entrepreneurs develop seed businesses and start working in the market. Critical aspects that programs like this help to address include business planning, seed brand development, leadership and management skills, and technical and operational capacity (such as estab-

lishing grower plots and creating marketing plans), etc. NARS breeders could work with nascent private seed companies to develop the most appropriate breed seed varieties for their agro-ecological needs and build on-farm knowledge regarding the care and maintenance of that particular breeder seed.

Development of this should be carefully monitored by the government, with the explicit goal of meeting private seed company needs as per the government policy of uptake by private sector companies. EIAR could define a training program for the maintenance of parental lines and second breeders from public and international breeding programs to assist private companies. This would help to ensure that the system works as hoped and continues to produce a high standard of product. AGRA and other donors have already signalled their willingness to be involved in these types of schemes; this effort could dramatically improve capacity within the nascent (but high-potential) private sector.

One of the potential concerns of the government related to liberalizing the local seed industry is that, once given increased freedom to operate, seed companies will price gouge to the detriment of the smallholder farmers. However, other African countries have (through the approach advocated by AGRA and their Programme for Africa's Seeds Systems (PASS)), tried to foster a “vibrant, competitive” local seed market by facilitating the entry of several companies and using grant funding to direct their attention to the needs of poor farmers, as opposed to large-scale, well-off farmers. In fact, it has been demonstrated that once the companies recognize that the vast bulk of opportunity is represented by poor farmers (the majority), they are often willing to forego pursuing the higher-priced (but far smaller) market represented by large-scale farmers.

Table 8: Enable private sector seed companies

Action	Steps	Owners
Expand access to breeder seed	Strengthen transparent application process and distribution of breeder seed	MoARD, BoARD
	Strengthen the licensing of basic seed production and support capacity building	MoARD, EIAR
Reduce public intervention in private production	Permit differentiated pricing	MoARD, BoARD
	Allow to select a distribution channels	MoARD, BoARD
Strengthen the business enabling environment	Ensure access to tax incentives	MoARD
	Ensure access to foreign exchange for equipment and supplies from abroad	MoARD
Capacity building	Leverage private sector incubator programs like AGRA	MoARD, BoARD
	NARS breeders to work with nascent private seed companies	NARS

Source: Team analysis

Create a Joint Vision and Development Program for the Seed Sector

Key problems highlighted in this diagnostic work are the lack of trust between the government and private sector, ongoing misunderstanding about who will do what, and missed production targets. In order to coordinate the future direction of the seed sector, GOE needs to play a leading role in setting the standard, ensuring an effective industry structure, and holding the private sector accountable for delivery. Implementation should be undertaken strategically, with the aim of driving programs that build self-sustaining momentum in the seed sector. Meanwhile, active support could be given to facilitate and accelerate private sector activity and effectiveness within a well-regulated structure in order to reduce the burden of execution on the government. In development of this program, consideration could also be given to bringing together the various functions of the seed system within GOE, such as marketing, regulatory, and other related functions, currently are handled by different parts of the government, making coordination and communication more difficult.

Establishing a joint vision and development program among the government, public sector producers, and private seed companies would be extremely beneficial in terms of aligning all players around a common goal and assuring all parties of each others' commitment. This development program would formalize the expectations and commitments each side will make toward increased seed production and could consist of several key components:

- Sector vision and objectives (a blueprint for the next five years).
- Clearly defined roadmap, roles, responsibilities, and realistic production targets for all key public and private actors and how they will be reached (for example, public seed enterprises to focus primarily on commercial seed for orphan crops, in line with current policy, and private sector entry to be encouraged in hybrid maize seed).
- Code of conduct for business and grower ethics (potentially contractually binding in some way, such as a private company losing rights to breeder seed the following year if it fails to meet its targets).
- Joint governance and coordination, potentially through annual reviews by a third party to help to ensure adherence to the plan.
- Discussion forum for all stakeholders (this can also help to jointly highlight and address issues in the sector).
- Government intervention on specific enablers for the sector (as outlined above), including support mechanisms and incentives for private sector growth (such as risk sharing, land leasing, planning permission, tax incentives, financing with favorable terms, and technical assistance).

Key benefits of such an agreement would be the stimulation of a stronger cadre of private sector actors through reduction in the perceived risk to private sector players and appropriate proactive interventions by the government. This should bring increased efficiency, as the private sector has a financial interest to deliver, while maximizing the benefit from the use of private sector skill, execution, and delivery expertise. It would also establish accountability for the private sector in terms of working toward agreed development goals.

Both the government (ESE and RSEs) and private sector companies that the research team interacted with were strongly supportive of this concept, and there was significant appetite to ramp up public/private meetings into this sort of compact so that each side could begin. It is important to consider which pre-existing structures could be leveraged to coordinate this body. In this regard, strengthening the recently established Ethiopian Seed Growers Association (ESGA) will be important to align different stakeholders. There is also an open question as to which entity or office could be a trusted third party to assist in progress reviews and enforcement of responsibilities.

The activities necessary to initiate this process would include a joint task force chaired by the leadership of ESE or the State Minister, along with broad-based representation across the stakeholders. The task force would generate the expectations for each side, both public and private sectors, and facilitate agreement to issues regarding tax incentives, access to parental lines, and land agreements, inter alia. Other activities would be likely to include draft codes of conduct as well as monitoring and evaluation of progress and objectives.

Table 9: Create a Joint Vision and Development Program for the Seed Sector

Actions	Steps	Owners
Create a 3-party agreement between the government, public sector producers and private seed companies	Establish agreement on responsibilities and code of conduct	MoARD and BoARD, ESE and RSEs
	Strengthening the recently established Ethiopian Seed Growers Association (ESGA)	MoARD
	Regular reviews to track progresses	MoARD

Introduce Robust Certification System with Appropriate Enforcement Adapted to Ethiopia’s Evolving Seed Sector

In order to improve seed quality and increase the country’s seed certification capabilities, the research team recommends implementing a practical system of seed quality control and certification. The system should provide different levels of oversight for different types of seed or actors, promote internal quality control procedures by seed producers, and include adequate attention to consumer education and protection. Given the low levels of literacy and consumer knowledge among farmers, the system should maintain formal certification but leverage “quality declared” seed (as well as emergency seed) to decrease resource requirements when feasible. This will require:

- Select a feasible and affordable certification system, including analysis of the costs of various seed certification and quality control options. This will allow GOE to concentrate resources on relevant crops and producers. Given the low levels of literacy and consumer knowledge among farmers, the system could include both formal certification and informal certification to decrease resource requirements when necessary. Work has already been done by MoARD, ID-LO, and Wageningen University to outline a revised seed proclamation which describes a multi-tiered certification system, managed by a new Quality Control Office:
 - **Certified Seed** – for crops requiring most stringent regulation, requires highest volume of field and lab tests, important for any seed for the export market
 - **Quality Declared Seed** – still a government enforced regulation, but less frequent testing required
 - **Emergency Seed** – allowed to meet slightly less demanding standards in terms of provenance, purity, and germination
- Pass the revised seed proclamation through parliament.
- Inventory current certification resources (such as laboratory and field testing equipment and trained human resources) and determine gaps in certification capacity. Procure the necessary infrastructure and source and train additional certification staff.
- Design and launch a communication strategy to disseminate information of new certification standards and system (for government, producers, and farmers) through extension activities.
- Ensure consumer protection (point-of-sale monitoring) for seed consumers.
- Support regulatory organs to have adequate enforcement capacities with provision of training, resources, and facilities.

Table 10: Introduce a Robust Certification System

Actions	Steps	Owners
Selection of feasible and affordable certification system	Analyze the costs of various seed certification and quality control options under likely scenarios of seed system growth and diversification in order to help identify feasible and affordable options	MoARD, BoARD
Customer education	Consumer education (through extension activities) and consumer protection (point-of-sale monitoring) for seed consumers	MoARD, BoARD
Capacity building	Support regulatory organs to have adequate enforcement capacities along with provision of training, resources and facilities required	MoARD, BoARD

Source: Team analysis

To successfully implement these recommendations, a range of actors including the GOE, the Ministry of Agriculture, the donor and NGO community, and the private sector will need to work together to implement the various components and programs. See Appendix B for details of actors and suggested timelines, and section 5 for implementation priorities over the next five years. Timing will depend on detailed implementation planning

In conclusion, the seed sector in Ethiopia is in a state of flux—much work has been done by the government of Ethiopia, the private sector, and other stakeholders to produce and distribute seeds to smallholder farmers and other users. However, many changes are needed to create an open and competitive seed production system that provides an expanded, affordable, and diversified choice of seeds to farmers, ultimately helping smallholders and other farmers to increase their productivity. The actions recommended above should help the country to establish an enabling framework that ensures growth and allows the national seed system to flourish.

IMPLEMENTATION

The above recommendations require a specific sequencing and prioritization over a five year period. The activities will involve a wide range of actors, beginning with small-scale farmers and working up to the regional and federal levels, along with research institutes, private sector seed companies, development partners, and a host of other stakeholders. Driving these changes will require a combination of sponsorship at the highest level from GOE, as well as the input and concerted engaged of the regions. Over the next five years, the sequencing of the recommendations and activities outlined above could occur during two phases.

During phase one, activities could focus on the creation of a joint vision and on critical activities to support private sector seed companies and initiate the process of developing the production capacity in both the public and private system. In the first year, the process will also involve disseminating the findings and recommendations among partners at all levels and building consensus on their implementation.

- **Pass the prospective seed proclamation** – This is due to be finalized in 2010 and will include improved certification and variety registration and release. Without these basic alterations in the local seed supply system, it will be extremely difficult to drive significant improvements in the seed system to bring benefit to the smallholder farmers. Therefore it is important that the proclamation is passed and communicated as soon as possible.
- **Creation of a multi-stakeholder seed forum** that will drive toward a mutual understanding, common vision, and code of conduct across public and private actors in the Ethiopian seed system.
- **Clear strategies and business plans for public producers** – Both ESE and RSEs will develop business plans in the first year that will provide assessments of revenue opportunities and an ability to manage activities with improved capacities and strategies to reach production targets.
- **Determine breeding priorities** – Public sector breeding priorities will need to be determined through a multi-stakeholder process, driven by a combination of expressed demand from local farmers, and opportunities in specific commodities for growth and food security.
- **Expand access to source seed for private companies** for increased basic seed production in hybrid maize. Cognizant of this, as mentioned above, GOE has already started licensing private seed companies to own parental lines (pre-basic seeds) of the popular hybrid maize varieties.
- **Permit independent pricing and distribution strategies** – More transparency and less intervention will be needed in pricing schemes to develop the incentives for the private sector to invest in sustainable enterprises. Distribution strategies will also need to be addressed through a multi-stakeholder dialogue to determine the right balance of channels.
- **Enabling actions** – Core enablers include a revisiting of the tax incentives and foreign exchange rules that encourage (or discourage) private sector investment.

The focus during phase two would on be activities that will increase the system's effectiveness and sustainability. These will go in tandem with deepening the impact of the intervention, and monitoring and evaluating the progress achieved during the first four years of implementation.

- **Strengthen processing and distribution of public system** – This will provide for the implementation and deepened strategic analysis that was initiated in the first year. Specific revenue opportunities may be pursued by RSEs. Improved distribution systems for seed through unions and cooperatives will be re-examined and specific recommendations put in place.
- **Leverage research-extension linkages to promote uptake of OPVs** – On-farm adoption by small-scale producers, particularly women, for the uptake of OPVs will be initiated. This will involve a stronger collaboration between local research institutes and public extension directorates in BoARDs.
- **Strengthen cooperatives** to play a commercial role in input selection and sales, and potentially production.

- **Prepare disaster recovery plan as a preventative measure for disease risk** – The onset of disease risk, like wheat rust, could have devastating effects on both growth and food security. GOE should have a plan in place to scale-up rapid production of resistant varieties in collaboration with several other public sector ministries, BoARDS, and, potentially, private sector partnerships.
- **Enabling actions** – Leverage private seed sector donors to invest in the scale-up of best practices emerging from lessons in the first year with both the regulatory environment and also with start-up capital, capacity building, strategy development, and other business planning activities; continue to monitor the progress of the seed forum and provide the resources and training needed to implement the certification.
- **Launch mass communication around certification changes** – Farmer education will be vital for the certification system to have impact. This will need to be launched in the fifth year at the very latest, and potentially in earlier years to ensure the integrity of the private sector and the appropriate regulation during its initial period of regulated growth.

Figure 5 – Summary of potential sequencing and prioritization for implementation

	Short –medium term (1-2 years)	Long-term (3-5 years)
Public Production Capacity	<ul style="list-style-type: none"> ▪ 1.1 - Public sector strategy development and role differentiation ▪ 1.2 - Development of seed production strategy 	<ul style="list-style-type: none"> ▪ 1.3 - Optimization of the use of seed processing facilities ▪ 1.4 - Improvement of the supply chain management
Prioritize self-pollinating seed	<ul style="list-style-type: none"> ▪ 2.1 - Inventory of the current varieties ▪ 2.2 - Redirect the breeding program to prioritize filling the variety gaps ▪ 2.3 - Enhancing adoption process for “ on the shelf” varieties ▪ 2.4 - Variety registration and release 	<ul style="list-style-type: none"> ▪ 2.3 - Enhancing adoption process for “ on the shelf” varieties ▪ 2.5 - Disaster recovery plan
Enable private sector seed	<ul style="list-style-type: none"> ▪ 3.1 - Expand access to breeder seed ▪ 3.2 - Reduce public intervention in private production ▪ 3.3 - Strengthen the business enabling environment 	<ul style="list-style-type: none"> ▪ 3.2 - Reduce public intervention in private production ▪ 3.3 - Strengthen the business enabling environment ▪ 3.4 – Capacity building for private seed companies
Joint vision of seed sector	<ul style="list-style-type: none"> ▪ 4.1 – Create a 3-party agreement between the government, public sector producers and private seed companies 	
Seed certification system	<ul style="list-style-type: none"> ▪ 5.1 - Selection of feasible and affordable certification system ▪ 5.2 - Consumer education and consumer protection for seed consumers 	<ul style="list-style-type: none"> ▪ 5.2 - Consumer education and consumer protection for seed consumers ▪ 5.3 – Capacity building for regulatory organs

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Source: Team analysis

CONCLUSION Overview

The findings in this report demonstrate the pressing need for an improved seed system to drive the economic and social development of Ethiopia’s agricultural system. Access and availability of improved seed can greatly improve the productivity of smallholder farmers. However, constraints in production and in farmers’ demand, access to, and use of both hybrid maize and self-pollinating varieties remains a fundamental barrier. GOE, along with its development partners, have made great strides toward enhancing Ethiopia’s seed system, and examples of best practice do exist. Realizing the full potential of the seed system as a component of Ethiopia’s long-term food security and growth relies on clear direction and execution capacity from GOE and a wide range of stakeholders.

Five-year sectoral vision

The next five years will be a critical window to accelerate the achievement of the long-term vision for the seed system. At the close of this period, the report envisions an increasingly open and competitive seed production system that provides an expanded, affordable, and diversified choice of seeds to farmers, provided by both the public and private sector. Plant-breeding should include high-yielding varieties based on the best germplasm for Ethiopia's diverse agro-ecologies, the supply chain should meet the demand for commercial seed, and a strong extension system should ensure farmer demand through demonstrations and information to enable decisions to adopt the varieties best suited for agro-ecological, food security, and commercial potential.

The potential is sizable: increasing the usage of improved seed can dramatically increase Ethiopia's annual crop production. By adopting commercial seeds in combination with best practice techniques on only a quarter of current crop area, farmers could increase maize production by over 60 percent and self-pollinated crop production by over 30 percent. This corresponds to a production increase of over 7 million tons per year. The gains could place the sector on track to meet PASDEP II's 2015 production targets.

The way forward

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

The findings contained in this report are also complementary to a range of other findings across the diagnostic studies supported by the Bill & Melinda Gates Foundation from April 2009 to March 2010. The five-year sectoral vision for Ethiopia's seed system relies on a set of factors contained in accompanying diagnostic reports, including a robust system of agricultural extension, vibrant and efficient output markets for commercialized production, and access by small-scale producers to the productive inputs like irrigation and fertilizers to achieve the yield potential of improved seed. Additionally, a set of enabling factors will deepen the impact of these recommendations, including financial services, rural infrastructure, and information and communication technologies. At every stage of the seed system, gender must be prioritized in developing the appropriate seed technologies, engaging women in participatory variety and crop selection, ensuring equitable distribution in input markets, and extending the inclusive reach of extension services for appropriate adoption.

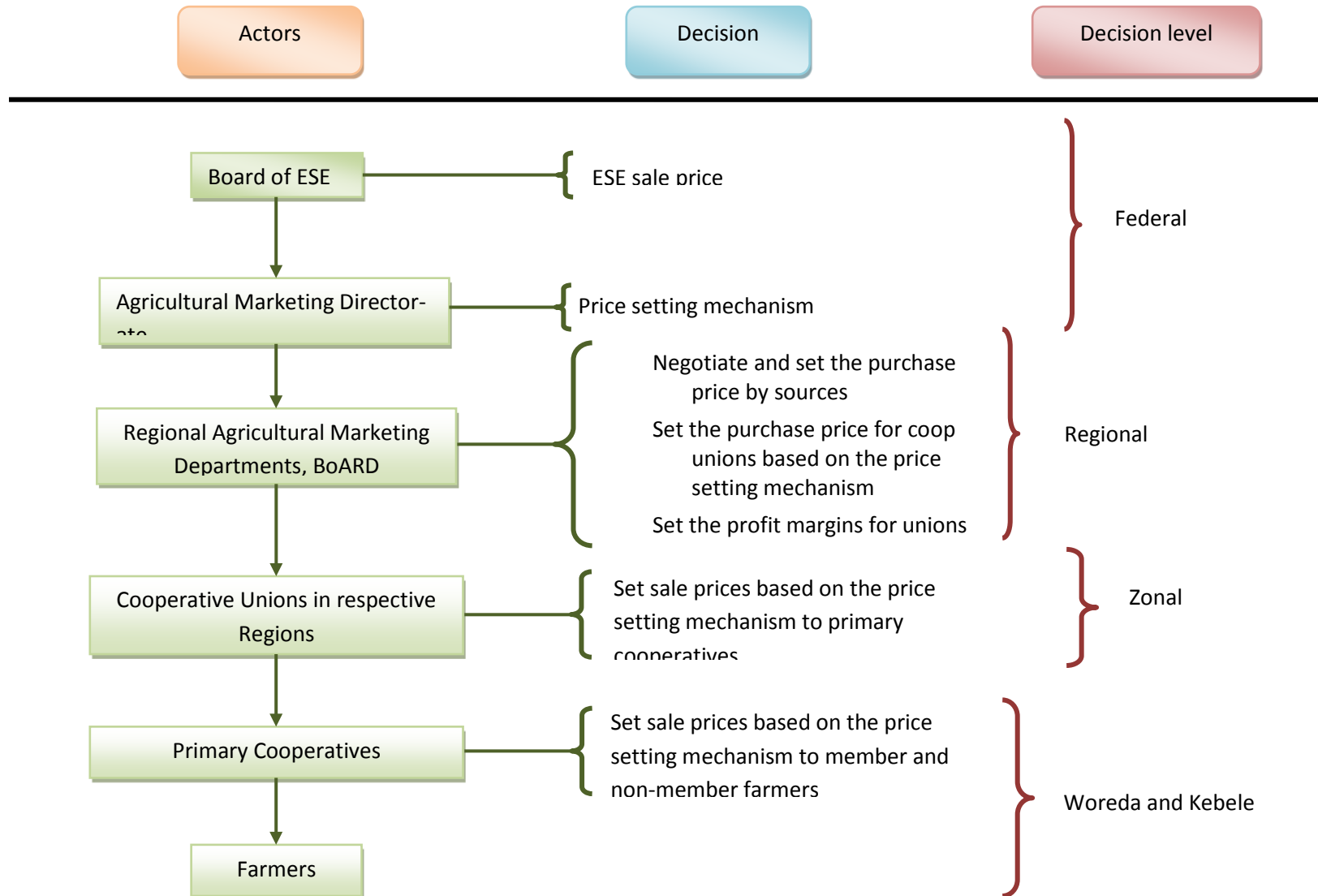
Since each of these sectors is mutually dependent, the recommendations and sequencing of activities in the seed system must be seen within the context of the overall recommendations provided in the holistic and integrated report presented to the Prime Minister. An efficient seed system is crucial to the development Ethiopia's growth and food security, and these steps will be critical to accelerating the long-term vision of achieving middle-income status by 2025.

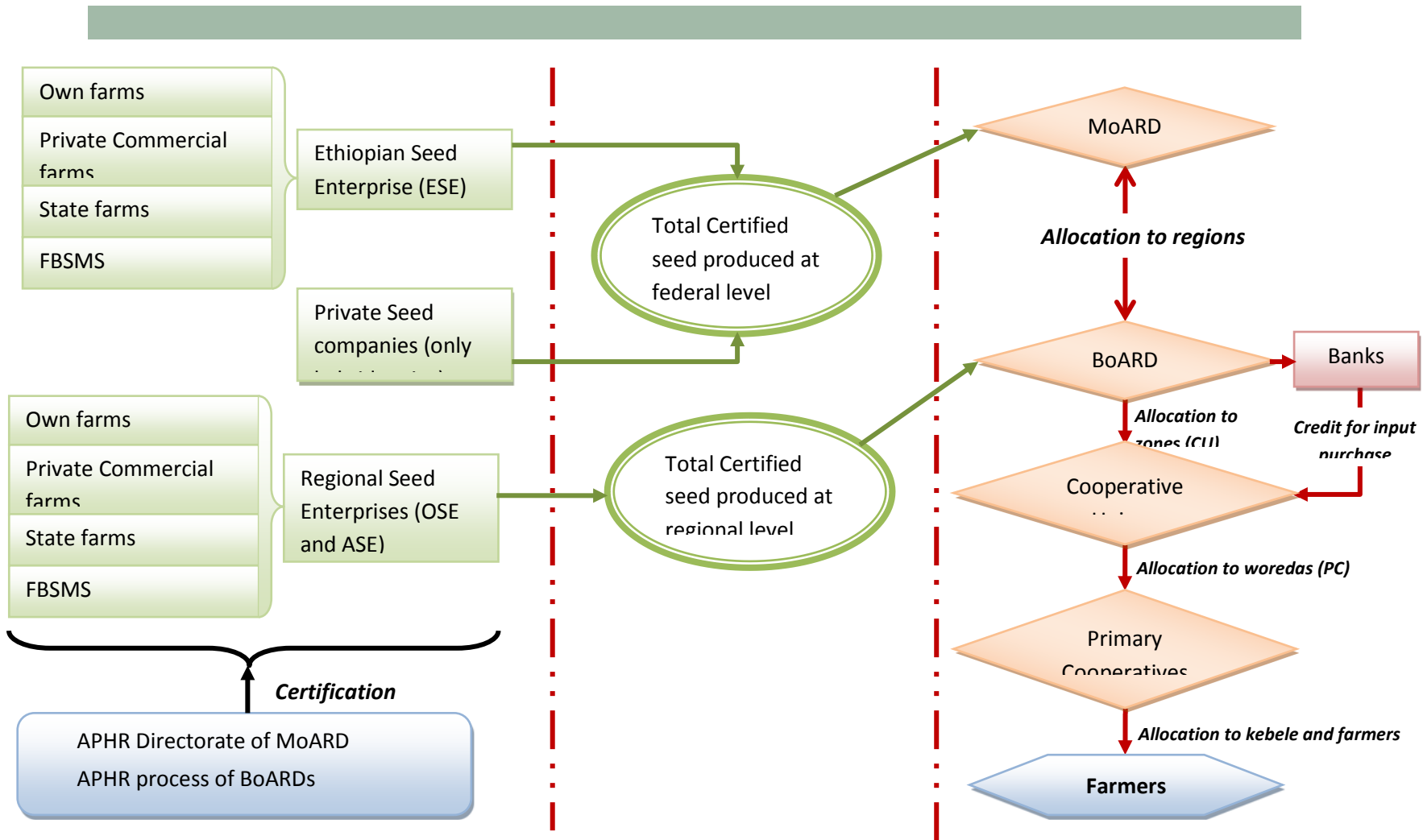
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APPENDIX 2: ACTORS AND THEIR ROLES IN SETTING SEED PRICES





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