Recent Development in Seed Systems of Ethiopia

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Abstract

On average, 12 million hectares of land is cultivated by major food crops over the last five years in Ethiopia, of which 10,979,645 hectares was covered by non-improved local seeds. Of the total annual arable land coverage by major food crops, 96.5% is covered by local seed and 3.5% is by improved seeds. The annual average seed requirement for cereals, pulses and oil crops is estimated to be over 400,000 tons. Demand for improved seed is still increasing rapidly from time to time over the last seven years. The establishment of several private and public seed enterprises in the regional governments has increased the number of actors involved in the seed sector. Besides, due to some special initiatives of the government such as crush seed production programs, scaling up/out of best crop technologies and shift from rain fed to use of irrigation, there have been tremendous contributions to the formal sector and the huge gap between demand and supply has been narrowed down. To this effect, basic seed supply of hybrid maize increased from 44% in the 2006/07 cropping season to 115% in 2009/10, showing seed supply exceeded the demand in the history of the country's seed system. Certified seed supply for both hybrid and non-hybrid crops also increased from 28% and 33% to 58% and 60%, respectively in the same period. Demands of farmers often change over the changing condition that calls for demand re-vision during planning phase based on the dynamic condition of farmers' situation.

1.Introduction

Seed is a key input for improving crop production and productivity. Increasing the quality of seeds can increase the yield potential of the crop by significant folds and thus, is one of the most economical and efficient inputs to agricultural development (FAO, 2006).

Generation and transfer of improved technologies are critical prerequisites for agricultural development particularly for an agrarian based economy such as of Ethiopian. Despite the release of several

technologies, particularly of improved crop varieties, there has been limited use of improved seeds by the majority of farmers (CSA, 2010). Among others, unavailability of quality seeds at the right place and time coupled with poor promotion system, is one of the key factors accounting for limited use of improved seeds, which further contributing for low agricultural productivity. Poor availability and promotion of improved seeds is due to inefficiency of the seed systems of the country.

This paper, is therefore, aimed at providing an overview and assessing the current seed systems operating in the country and reviewing initiatives in the area and documenting best approaches.

2. Seed Systems in Ethiopia

Seed system in Ethiopia represents the entire complex organizational, institutional, and individual operations associated with the development, multiplication, processing, storage, distribution, and marketing of seed in the country. Farmers, particularly smallholder ones, are involved in multiple kinds of seed systems, which can guarantee them in obtaining the quantity and quality of seeds they need and to market their produce.

Seed systems in Ethiopia can be divided into two broad types: the formal system and the informal system (sometimes called local or farmers seed system). Both systems are operating simultaneously in the country and difficult to demarcate between the two. There is however, a fact that the formal system is the original source of improved seeds in the informal system. There is also a system referred to as integrated seed system. Other forms of seed systems operating in both systems also exist such as Community-Based Seed System (CBSS). Though not well developed, few commercial seed systems, as part of the formal system, are also operating in the country.

2.1. Formal Seed System

The formal seed system is called formal because it is mainly government supported system and several public institutions are also involved on it. The major actors of the formal system are: National Agricultural Research Systems (NARS), Ministry of Agriculture (MoA), Ethiopian Seed Enterprise (ESE) and private seed companies specializing on specific crops like Pioneer. Recently, regional seed enterprises (RSE) were also established as public seed enterprises (such

as Oromiya Seed Enterprise (OSE), Amhara Seed Enterprise (ASE), and Southern Nations nationalities and Peoples Region Seed Enterprise (SRSE) and entered into the formal system. All actors have inter-dependent roles in the system and inefficiency of one actor will automatically affect negatively the performances of the rest of the actors. NARS (EIAR & RARIs) is responsible for variety development and supply of initial seed, and ESE and RSEs are playing key roles in mass production of improved seeds. MoA is also involved in variety release, multiplication, certification, and distribution of seeds in the country. Private seed growers and other farmer institutions such as unions and cooperatives are also playing key roles in multiplication and distribution of different classes of seeds. Legal institutions such as variety release procedures, intellectual property rights, certification programs, seed standards, contract laws, and law enforcement are also an important component of the formal seed system of any country. They help determine the quantity, quality, and cost of seeds passing through the seed system (Maredia, *et al.,* 1999).

The Ethiopian government has enabling policy framework for agricultural research and technology generation and is fully supporting the research system by allocating appropriate resources. Therefore, the country's agricultural research system (NARS) has developed and released more than 664 varieties of 50 different crop types (MoA, 2010). ESE has only been able to produce 111 different seeds of just 26 different crop varieties in 2009 cropping season. Seed multiplication by ESE focused mainly on two cereal crops (wheat and maize) and annual supply of certified seed by the enterprise doesn't exceed 20,000 tons (Marja H. *et al.*, 2008). Wheat and hybrid maize constitute about 85% of the total output of the enterprise.

2.2. Informal Seed System

The informal seed system, also known as local system or sometimes as "farmers" system, is called informal because it operates under non-law regulated and characterized by farmer-to-farmer seed exchange. According to Cromwell, Friis-Hansen, and Turner (1992), five key features distinguish the informal from the formal system. These are, the informal system is traditional, semi-structured, operate at the individual community level, uses a wide range of exchange mechanisms, and usually deal with small quantities of seeds often demanded by farmers.

In the context of some countries like Ethiopia, the informal system is extremely important for seed security. The bulk of seed supply is provided through the informal system, implying its importance in national seed security. About 60-70% of seed used by Ethiopian smallholder farmers is saved on-farm and exchanged among farmers, and the remaining 20-30% is borrowed or purchased locally. The informal seed system (either self-saved seed or farmer-to-farmer seed exchange) accounts for 90% of the seed used by smallholder farmers (Belay, 2004), while the share of improved seed is less than 10% (Tables 2 and 3). The majority of Ethiopian farmers show a tendency of depending on the informal system due to the following key reasons

- It is relatively cheaper and readily available in the farmer's villages just at the time of seed is needed.
- It allows use of seeds after testing on primary adopter farmers.
- It is more reliable and its sustainability is more guaranteed than the formal system.

As depicted in Table 1, on average more than 12 million hectare of land are cultivated by the major food crops over the last five years (2005-2010). These are: cereals, legumes, oilseeds, root crops and horticultural crops. In 2009/10 cropping season, out of 10,979,645 hectares (84.75%) were covered by local seeds (Table 2). Moreover, about 71.3% of the total cultivated area is covered by major cereals: tef, maize, barley, wheat and sorghum, followed by legumes (11.5%) and oil seeds (6%). In the same cropping season, the annual area coverage of tef, maize, sorghum, wheat, and barley are 2.59, 1.77, 1.62, 1.68, 1.13 million hectares, respectively. Major pulses (faba bean, field peas, beans, chickpeas, grass pea, and lentil) occupy 14.9 million hectares, and oilseed crops: noug, linseed, rapeseed, peanut, sunflower, sesame, and castor bean is about 0.78 million hectares (Table 1).

Table 1. Area cultivated (ha) by major crops over the last five years (2005/06-2009/10) Cropping season

Crop category	2005/06	2006/07	2007/08	2008/09	2009/10
Cereals	8,072,561	8,463,080	8,730,001	8,770,118	9,233,025
Pulses	1,292,063	1,378,939	1,517,662	1,585,236	1,489,308
Oil crops	796,397	740,847	707,059	855,147	780,916
Vegetables	117,578	95,194	119,091	162,125	138,393
Root crops	168,836	188,917	184,329	145,742	212,208
Other temporary	77,554	97,677	84,977	69,103	63,418
Permanent crops	767,582	823,121	1,039,313	906,518	53,086
Total	11,292,571	11,787,775	12,382,432	12,493,989	11,970,354

Source: CSA, 2006-2010

Table 2. Area covered (ha) by informal seeds over the last five years (2005/06-2009/10)

Crop	Cropping season				
	2005/06	2006/07	2007/08	2008/09	2009/10
Cereals	7,636,935	8,127,710	8,309,899	8,333,097	7,660,560
Pulses	1,283,564	1,373,914	1,509,394	1,568,457	1,358,379
Oil crops	790,471	736,791	702,518	851,626	706,361
Vegetables	116,298	94,636	118,026	159,626	122,832
Root crops	167,189	186,804	180,624	143,761	183,254
Other annuals	77,000	97,575	83,041	68,048	56,431
Permanent	750,353	810,364	1,023,591	885,427	48,927
Total	10,821,810	11,427,794	11,927,093	12,010,042	10,136,744

Source: CSA, 2006-2010

The total area covered by improved seeds in 2009/10 (2002 E.C) cropping season was about 361,231 hectares. In the same season, the largest volume of improved seeds used was that of maize and wheat, which amounted to about 5,720 and 4,690 tons, which has covered the largest area under improved seeds cultivation estimated to be about 210,000 and 38,000 hectares, respectively (Table 3).

Table 3. Area covered (ha) by improved seeds (formal) during 2005/06 to 2009/10

Crop	Cropping season				
	2005/06	2006/07	2007/08	2008/09	2009/10
Cereals	429,536	335,369	412,629	430,937	322,819
Pulses	5,224	5,025	6,309	14,918	12,912
Oil crops	1,833	4,056	2,273	2,328	9,139
Vegetables	779	559	501	1,899	2,788
Root crops	813	2,114	2,251	799	3,721
Other annuals	70	102	-	-	-
Permanent	9,681	11,742	5,828	13,120	9,852
Total	447,936	358,967	429,791	464,001	361,231

Source: CSA, 2006-2010

Table 4. Comparison of area coverage (ha) by the informal and formal seed system during 2005/06 to 2009/10

Total	2005/06	2006/07	2007/08	2008/09	2009/10
Informal	10,821,810	11,427,794	11,927,093	12,010,042	10,136,744
Formal	447,936	358,967	429,791	464,001	361,231
% informal	96.03	96.95	96.52	96.28	96.56
% formal	3.97	3.05	3.48	3.72	3.44

2.3. Integrated Seed System

The line between the formal and informal seed sectors can become somewhat blurred, as seeds of improved varieties can be saved by farmers and eventually considered as "local variety" or "local seed" after some years of usage. In addition, in Ethiopia there have been attempts made by the government and NGOs to promote quality seed production and distribution through market channels for landrace varieties, although until now the volume they represent is quite small (Lipper *et al.*,2005). Thus, the formal and local seed systems are not always as distinct or separated as the two labels may imply something to integrate and synergize both systems.

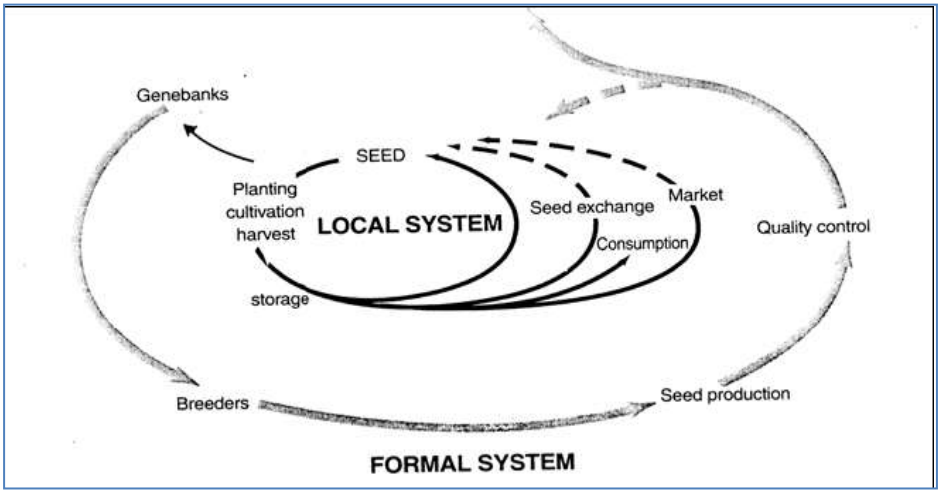

Figure 1. The formal seed system and the local system of farmers' seed supply *(Adapted from Almekinders and Louwaars, 1999)*

As one can see from figure 1, the formal and local seed systems are the two major systems serving as sources of farmers' seed supply, having interactions to each other. Three aspects of the integration between the systems are of notes:

- Materials themselves flow between the two systems, creating integration.
- Farmers themselves often draw seed from both systems for different kinds of seeds.

- Furthermore, farmers sometimes use different channels for the same crop.

It is obvious that the two systems are interacting in many ways and this interaction is found to be beneficial. Integrating the formal and local systems is, therefore, important to exploit benefits of the synergetic impacts as a result of integration on addressing seed security and sustainability in the country.

3. Current Situation in Ethiopian Seed Systems

Ethiopian seed system has been confronted with several challenges. During intervention activities made so far, the following were identified as major challenges of the general seed system of the country:

- Lack of proper linkage between different actors involved in seed systems;
- Inadequate supply of good quality seed at affordable prices;
- Focus on few crops (maize & wheat) in the formal system and other beneficial crops (such as pulses & oilseeds) remain orphans;
- Low level of private sector involvement in the formal system;
- Inefficient seed promotion, distribution and marketing mechanisms;
- Weak variety release and seed quality assurance system.

A core goal of the government of Ethiopia within the framework of ADLI strategy is to raise crop yields through a centralized and aggressive extension-based push focusing on technology packages combining improved seeds, fertilizers, credit and better management practices. The main objective of scaling-up/out of best practices is to increase agricultural production and productivity thereby improves household income and livelihoods. In the recent years, agricultural GDP grew at levels close to double figure, a pattern confirmed by just looking at cereal production growth rate. The success was registered through scaling-up/out of best practices through the use of improved seed, fertilizer and agronomic practices and by producing two to three times a year using irrigation.

Based on reports from Central Statistics Authority (CSA, 2005-2009), cereal production over the period increased by more than 4% per year (Table 1). At the same time, area under cultivation and production had also increased at a rate of 2.5% and 2% per year, respectively. Among cereals, the largest increases in all dimensions were registered in tef,

wheat and sorghum in that order.

According to reports from Central Statistics Authority (CSA, 2010), fertilizer was applied on 4,734,474 ha of land which is 39.38% of the total area cultivated in 2010 cropping season. The demand and use of inputs by smallholder farmers have been increased tremendously. As a result, the amount of fertilizers (DAP and urea) supplied to regional states had increased from 375,717 tons in 2006 to 595,261 tons in 2010. Including the leftover amount of 231,303 tons in the previous season, an additional 595,261 tons of fertilizers were imported during 2010 cropping season, and a total of 826,564 tons was distributed in 2010 season. This figure is 40% more than the volume imported in the previous season (Table 5).

Table 5. Fertilizer distribution (in tons) to farmers during (2005/06-2009/10)

Year	DAP	Urea	Total
2006	251,156	124,561	375,717
2007	259,020	129,121	388,141
2008	265,768	138,988	404,756
2009	289,446	158,075	447,521
2010	394,029	201,232	595,261
Total	1,459,419	751,977	2,211,396

Source: MoARD, 2010

Table 6. Comparison of total amount of fertilizer imported, supplied to regions and used by farmers in 2010/11 (tones)

Description	DAP	Urea	Total	% used *vs* purchased & supplied
Leftover from 2009 season	204,412	96,874	301,286	
Imported in 2010 season	324,792	200,485	525,278	
Total supply by 2010/11 season	529,204	297,359	826,564	
Transported to regional states	394,027	201,232	595,261	72.00
Amounts used by farmers	337,950	177,224	515,175	62.33

Source: MoARD, 2010

There is, however, discrepancy between total amount of fertilizer supplied to regions and used by farmers. Of the total amount of fertilizers collected by regions, 62% was used by the farmers for 2010 '*Meher'* (major rainy) season (Table 6). The reason why farmers couldn't use the amount of fertilizers provided may be associated with little

working capital, uncertain access to credit and often cannot afford the cost of improved seed and the fertilizer. Thus, one can understand that most farmers use less amount of fertilizer per hectare than the recommended rate. This in turn has negative effect on yield potential of different crops; thereby reducing productivity and total annual production. Farmers opt to apply the majority of fertilizers they have to cereal crops and this can be witnessed by ever increasing productivity and production of cereal crops in the last five years period (Table 7).

Table 7. Area covered (ha), crop production (q) and average productivity (q/ha) over the last five years

Crop category	Parameter	2005/06	2006/07	2007/08	2008/9	2009/10
Cereals	Area	8,463,615	8,730,001	9,019,054	8,770,117	9,233,024
	Production	128,660,941	137,169,908	146,800,700	144,964,059	155,342,280
	Productivity	15.2	15.71	16.28	16.61	17.00
Pulses	Area	1,228,564	1,344,091	1,446,730	1,391,731	1,328,618
	Production	13,661,202	15,806,944	17,445,197	17,452,634	16,451,467
	Productivity	11.12	11.76	12.06	13.04	10.72
Oil crops	Area	740922	707059	875855	855147.41	780915.89
	Production	4968294	5406849	7454594	6557044	6436144
	Productivity	6.71	7.65	8.51	8.96	9.81

Source: CSA, 2006-2010

3.1. Seed Demand *vs* Supply

Since the establishment of Ethiopian Seed Enterprise as the first public and formal seed sector, the enterprise has remained the sole producer and supplier of improved seeds for over three decades. The enterprise is also playing the leading role for the advent of organized seed production and supply system in the country. Despite the better capacity ESE has, seed supply remained far behind the demand in those years. The huge gap between the demand and supply has existed in the history of the enterprise. Stimulated by the fast agricultural development growth over the last seven years, demand for improved seed is still increasing rapidly from time to time in the country. The overall annual average seed requirement for cereals, pulses and oil crops is estimated to be over 400,000 tons (Marja H. *et al.*, 2008). However; the average yearly supply of improved seed doesn't exceed 20,000 tons since the establishment of ESE.

In the recent years, following the establishment of several private and public seed enterprises by the regional governments increased the

number of actors involved in the seed sector. The Ethiopian government took the initiatives of organizing and bringing together those actors and combining their efforts to increase improved seed supply in the country. As a result of shift in seed multiplication strategy, production and supply of improved seeds particularly that of hybrid maize and wheat was considerably improved since the last three years. Determination of farmers' seed demand followed by demand-oriented seed multiplication and supply is one of the strategies undertaken. Besides, increasing the number of actors involved in the seed businesses is another key initiative of the government in support of the seed system. Among others, establishment of regional public seed enterprises and offering special supports to the private seed sector can be mentioned as typical examples. The majority of actors, however, often involved in seeds of crops that can offer them profit margins and some of useful crop varieties demanded by farmers were remain neglected. In order to avoid this limitation and fill seed supply gaps the government has also launched a program called "crush seed multiplication" since the last three years. The program has been executed by the coordination of Ethiopian Institute of Agricultural Research (EIAR), ESE & MoARD on three strategic crops, namely: maize, wheat, and rice. As a result of this initiative, there have been tremendous contributions to the formal sector and the huge gap between demand and supply of initial seed has been narrowed down. To this effect, basic seed supply of hybrid maize exceeded the demand by 2010/11 production year in the history of seed supply in the country (Table 8). The program, however, has limitations in terms of long-term ownership and sustainability as it is undertaken by a 'Technical Committee" (TC) containing experts from the three organizations. Thus, in order to sustain the program and undertake other similar initiatives, the input supply system, which has currently been operated by the TC, should be institutionalized and strengthened in such a way that it could take the entire ownership.

Table 8. Demand and supply of hybrid maize basic seed over the last five years (2005/06-2009/10)

Production year	Demand (t)	Supply (t)	% Supply
2006/07	1,179	515	43.68
2007/08	2,427	1,023	42.15
2008/09	2,224	1,145	51.48
2009/10	2,755	1,509	54.77
2010/11	5,606	6,450	115.05

Source: MoARD, 2010

Despite the aforementioned several efforts undertaken by the government, there is often shortage of source seed, which limits commercial seed production in the country, mainly due to mismatches between seed demand and supply (Table 9). One of the reasons for the mismatch is that there is limited capacity to supply as much source seed as demanded and multiplication of initial seed, which subsequently delivered to mass producers, is not supported by irrigation and almost totally depend on main season rainfall. The other main reason is that demands of farmers often become volatile, indicating problems related with demand assessment and forecast during planning process, suggesting demand re-vision based on the dynamic condition of farmers' situation has paramount importance. Moreover, seed production supply system in the country has focused only on hybrid maize and wheat varieties that limited farmers' option to other beneficial crops. This makes farmers merely depend on farm-saved varieties which are genetically low productive. As depicted in Table 8, the overall seed supply of all crops is 28%, and the maximum supply of 31% was for cereals out of all crops grown in Ethiopia

Table 8. Comparison between improved seed demand and supply over the last three years (2008/09 to 2009/10)

Crop category	Demand (t)	Supply (t)	% supply
Cereal crops	2,056,469	638,856	31.07
Pulse crops	312,155	33,159	10.62
Oil crops	34,341	3,435	10.00
Total	2,402,965	675,450	28.11

Source: MoARD, 2010

Although the gap still exists in the case of certified seed supply for both hybrid and non-hybrid crops, there is also an increasing trend over the last four years in fulfilling the demand (Table 10).

Table 10. Demand vs supply of certified seeds of hybrid and non-hybrid (in qt) over four years

Production year	Hybrid seed			Non-hybrid seed		
	Demand	Supply	% Supply	Demand	Supply	% Supply
2007/08	123,777	35,244	28.47	62,9422	205,680	32.68
2008/09	143,847	86,787	60.33	841,458	246,051	29.24
2009/10	193,079	95,735	49.58	737,992	278,353	37.71
2010/11	333,249	193,123	57.65	723,588	433,049	59.85

Source: MoARD, 2010

Another intervention was scaling-up of proven technologies available in the research system, a strategy initiated and undertaken by EIAR. The main objective of technology scaling-up was stretching to potential technology application ecologies in Oromia, Amhara, South, and Tigray regions, and in four emerging regions mainly pastorals and agro-pastorals (such as Somali, Afar & Benishangul Gumuz regions) with appropriate technologies best fitting to their respective situation. This initiative has contributed significantly to productivity, production, and benefits. The strategy is focusing on creating integration among all actors mainly research, extension and farmers with the support of administrative organs and NGOs. This approach has played a significant role in putting huge amount of seeds in the hands of small scale farmers, which potentially enhance the informal system. In 2009/10 cropping season, about 67,393 quintals of seeds were produced in the above mentioned regions through scaling up program (Asnake F. *et al.* 2010: unpublished data.The 2009/10 cropping season seed multiplication and distribution data shows that from 360,272 quintals of seeds allotted to regions only 264,039 quintals (73.29%) had reached to farmers and finally planted. This indicates that ESE and RSEs have significant amount of carry-over seed stock every year, while several farmers are not getting access to improved seeds. This problem was attributed to poor seed marketing (promotion and sales outlets) for reaching end users and/or the inabilities of the enterprises to meet the farmers need in terms of varietal choice and product quality (Table 11).

Table 11. Amount of improved non hybrid seeds (in qt) collected and planted by regions during 2010/11 cropping season

Crops	Amount of Seed		
	Allocated	Collected	Planted
Wheat	307,012.12	224,412.85	206,577.03
Barely	18,872.33	16,370.00	13,209.30
Tef	18,210.50	20,358.84	17,868.50
Sorghum	197.00	928.87	874.92
Rice	0.00	54.35	26.80
Faba bean	2,748.00	2,489.60	2,101.80
Linseed	469.39	279.00	708.10
Lentil	1,121.00	2,448.90	2,133.60
Haricot bean	3,285.00	12,857.70	10,584.00
Chick pea	6,586.00	1,522.32	871.82
Field pea	195.00	2,512.04	2,497.04
Soya bean	823.09	0.00	0.00
Sesame	0.00	52.25	52.25
Ground nut	0.00	1,819.00	1,819.00
Rape seed	0.00	19.00	1.00
Forage	0.00	4,683.00	4,683.00
Pepper	20.00	30.41	30.41
Others	732.98	0.00	0.00
Total	360,272	290,838	264,039

Source: MoARD, 2010

3.2. Seeds Supply by ESE

The majority of commercial seed production in Ethiopia is in the hands of ESE for several years since its establishment. Currently, however, three regional seed enterprises: Oromiya seed enterprise (OSE), Amhara seed enterprise (ASE), and Southern seed enterprise (SSE) have emerged with the aim to supply improved seeds for their respective region. In addition, the number of private farms involved in seed production is increasing particularly in Amhara and SNNP regions that have an important role in national seed supply.

Most of ESE seed production has been taking place on its own farms, state farms and contractual farmers' fields. Over the past decades, annual seed sell of ESE was between 7,000 to 22,000 metric tones (ESE, 2010). Most recently, the enterprise has been taking shift in strategy and as a result of crush seed production programs undertaken in 2009/10 cropping season, ESE alone produced about 54,326 tons of certified seeds, of which 52,430 tons (96.51%) is for cereals (Table 12). This shows that there is a 61% increase in supply as compared to what was supplied in the preceding year (2008/09 cropping season). As

indicated in the table, from cereals, about 78% of the produce was the share of wheat seed.

Table 12. Annual certified seed supply by ESE over the last five years (in tons)

Crop category	2005/06	2006/07	2007/08	2008/09	2009/10
Cereals	18,153	19,573	22,695	30,288	52,430
Pulses	1,678	1,977	1,969	2,841	1,485
Oil seeds	882	621	579	596	298
Horticultural crops	0.2	3	4.5	1.8	2.9
Fiber crops	24	-	3.3	-	100
forage crops	8.9	10.3	-	1.8	9.3
Total	20,746	22,184	25,251	33,729	54,326

Source: ESE, 2006-2010

3.3. Seed Supply by the Research System (NARS)

Once a new variety is developed and released from the national agricultural research system (NARS), be it at the federal or regional level, it is mandatory that the variety should be put into the seed production system. This requires a sequence of seed multiplication over several seasons as several classes of seed: as nucleus, breeder, pre-basic, and basic in order to get adequate amount for commercial seed production (certified seed). Since the first three seed classes are mainly produced in the research stations, seed supply by the national agricultural research system (NARS) is focusing mainly on these seed classes which often provided to seed producers to further multiplication as basic seed followed by certified seed.

There has been chronic shortage of initial seeds and the research system couldn't satisfy the demand of commercial seed producers. On the other hand, since the seed system of the country is not well developed, the little amount of seed produced hasn't been channeled into the appropriate seed system. After the development of the five years strategic plan, however, there has been development in the NARS seed system mainly of EIAR, which has changed its direction towards client-driven quality seed production in required quantity using supplemental irrigation. As discussed in the earlier sessions, the strategic plan also makes use of special approaches such as crush seed multiplication in order to augment seed production under normal season (rain fed) conditions, thereby fill the initial seed shortage.

Table 13. Seeds of different classes produced by EIAR during 2009/10 cropping season

Crop category	Amount of seeds (tons)				
	Breeder	Pre-basic	Basic seed	Certified	Total
Cereals	113	323	398	13	847
Pulses	33	41	76	-	150
Oil seeds	5	41	3	-	49
Potato	27	-	-	-	27
Cotton	0.1	2	24	-	26.1
Total	178.1	407	501	13	1,099.1

Source: EIAR, 2010

Table 14. Performance of breeder, pre-basic and basic seed production by EIAR and ESE during 2009/10production year

Seed class	ESE		EIAR		Total		Supply (%)	
	Plan	Supply	Plan	Supply	Plan	Supply	EIAR	ESE
Basic	47,903	34,613	8,161	4,996	90,677	39,609	81.05	38.00
Pre-basic	4,779	3,137	4,000	3,356	11,916	6,496	84.00	54.50
Breeder	-	-	1,136.0	1,769	1,136	1,769	156.00	-
Total	52,682	37,750	13,297	10,117	103,729	47,867	-	-

Source: EIAR, 2009/10

4. Lessons Learnt and way Forward

The aforementioned two seed systems (the formal and informal) were operating for several decades in the country and playing the lions share in supplying seeds for the entire crop production. Smallholder farmers are involved in either of the systems that can guarantee them with the quantity and quality of seeds they need. The government is committing necessary resources and technical support to the formal system to tackle the problem associated with seed shortage. Despite the all-round support provided by the government, the formal seed system is not yet developed to the level it should attain. On the other hand, the informal (farmers') seed system is operating with limited resources from the farmers without significant support from the government. It is well known that almost the entire seed supply in the country is based on rain fed seed production system. These are the key factors contributing for quality seed supply shortage in the country.

The major actor in the formal system, the Ethiopian Seed Enterprise, was remained the sole seed producer for years. Seed production by the enterprise is focusing mainly on two cereal crops, wheat, and maize; seeds of other crops are entirely supplied by the informal system

(farmer-to-farmer seed exchange) and the research systems. The enterprise is trying to produce as much quantity of seeds as possible, but reports indicating that it was continuously facing inefficiencies particularly with respect to collecting seeds multiplied under farmers fields. One of the several reasons the enterprise has failed to collect contractual seed production is due to problems related to its pricing policy and capacity in terms of human and capital. The pricing policy of the enterprise is usually failed to respond to the ever changing local market situations. The price (particularly time of price adjustment) offered to farmers couldn't attract the interests of several farmers. As a result, most of the contractual farmers are insisting to give back what has been produced, and the seed is sold as grain in any local markets. The government understood that a single enterprise couldn't meet the huge demand of seeds in the whole country. As a result, took the initiatives to establish regional seed enterprises with the objective of supplying seeds demanded in the respective regions. Thus far, three high-level public seed enterprises are already established in the three major regions of the country (Oromiya, Amhara, and SNNP) and are playing significant roles in quality seed supply in their regions. Parallel to this initiatives, the government should also give due attention to the private seed sector in providing similar supports.

In countries like Ethiopia where the formal seed supply is inefficient, the informal system is extremely important for seed security of the nation. The majority of Ethiopian smallholder farmers are largely dependent on this system mainly through farm-saved seed exchange. The system is providing cheaper and readily available in the farmers' village at the right time of seed is needed. As a result, the majority of Ethiopian farmers show a tendency of depending on the informal system. The informal seed system is more reliable and sustainable, and thus need to be strengthened with special emphasis of formalizing the system through integration with the law-regulated formal system.

For one reason or another, the private seed sector is still undeveloped in the country. Special attention and support should be offered by the government particularly in making the working environment more encouraging to the private sector. Other farmer organizations involving in seed sector such as unions and cooperatives are also playing key roles in multiplication and distribution of different classes of seeds and other farm inputs. Such organizations, however, couldn't get capacity building supports so far from the government. Hence, necessary support,

particularly with respect to training and important facilities should be provided to these organizations.

Legal issues, such as variety release procedures, intellectual property rights, seed certification programs, seed standard authorization and contract laws enforcement are also important components of seed systems determining the quality and costs of seeds passing through the seed systems in the country. These legal issues need to be strengthened.

Studies indicated that ESE and RSEs maintain significant amount of carry-over seed stock every year due to the fact that seed enterprises fail to meet farmers need in terms of varietal choice and timing of seed supply. Immature marketing system of the enterprises can also be considered as one of the key factors. Thus, coordination and linkages among all actors and pertinent stockholders is paramount importance that needs strengthening. Technology promotion and seed marketing should also be enhanced.

The current developments and initiatives in the national seed system have revealed the following key issues that need special attention:

- effective seed demand assessment mechanisms and genuine involvement of farmers/users during planning phase is crucially important;
- as seed is an expensive product, every seeds produced must be channeled into the seed system. Thus, appropriate systems which can strictly control seed outlets should be in place;
- demand-driven seed multiplication strategy and supply with value addition in the seed chain (with respect to quality, time and place of supply and fair pricing) should be looked into;
- two-to-three times seed production per year is needed to fill the huge gap between seed demand and supply. Thus, development of irrigation capacity particularly in the NARS seed system should be given the utmost priority;
- provide opportunities for consolidation of investments on capacity building, basic facilities, infrastructure and training activities on variety maintenance and initial (breeder) seed production at national and regional levels;
- establish clear and simple institutional and functional linkages between research and seed producing institutions;

- formulation and implementation of clear seed policies in the country and establishment of executing institutions is highly important;
- capacitate experts and extension agents that can strengthen the entire integrated seed system; and
- as the involvement of the private seed sector is largely motivated by profit making, seed policies and ethics of seed production and marketing should be maintained so that seed quality shouldn't be compromised.

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