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Seed Demand Assessment

Practices, Challenges, and Options

Edited by

Adefris Teklewold

Dawit Alemu

Shiratori Kiyoshi

Abebe Kirub

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Ethiopian Institute of Agricultural Research

Seed Demand Assessment

Practices, Challenges, and Options

Website: http://www.eiar.gov.et
Tel: +251-11-6462633
Fax: +251-11-6461294
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Addis Ababa, Ethiopia

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Preface

One of the key elements of a seed system is how actual demand is estimated considering factors like weather, market, farmers' skill to maintain seed, and sources of seed. Fair demand assessment is crucial for actors engaged in the system including government, producers, importers, and distributors.

This publication contain papers that were presented during a seminar entitled ***"Experiment and Challenges in Seed Demand Assessment: in the view of Farmers' Perspective"*** jointly organised by Ethiopian Institute of Agricultural Research (EIAR)/Farmer Research Group II Project (FRG II) and Ministry of Agriculture (MoA)/JICA Quality Seed Promotion Project. The purpose of the seminar was to discuss the status of seed demand assessment in the country and to facilitate sharing of experiences among different partners from within the country and abroad.

The first paper discusses about the approaches and procedures followed nationally in seed demand assessment in the formal seed sector in the country. The second paper presents experience in Japan seed demand assessment and government basic replacement plan to reconcile the gap between demand and supply based on farmers' perspectives and strategies than government strategies alone. The third paper presents seed demand assessment procedure in along with the challenges in reconciling seed supply and demand in Oromia Region. The fourth paper deals with a preliminary observation on direct seed marketing by the producers themselves, an alternative approach being tested to improve the demand assessment by incorporating seed demand in local seed market system and seed quality issue. The last paper documents farmers' strategies to insure seed security linked with maintenance of local landraces adapted to specific agro-ecologies and its importance in seed demand assessment.

The information will help stakeholders including policy makers, researchers, farmers, and the private and public seed growers to understand the status, challenges, and opportunities in seed demand assessment in Ethiopia and beyond paving the way for the development of more efficient intervention options for the future.

Editors

Approaches and Procedures of Seed Demand Assessment in the Formal Seed Sector

Teshome Lakew
Agricultural Inputs Marketing Directorate, Ministry of Agriculture
Dawit Alemu
Ethiopian Institute of Agricultural Research

Introduction

Since the 1990s, smallholder frames in Ethiopia has demonstrated crop productivity growth through the adoption of improved technological package. For the sustainable long run maintenance of crop productivity growth, developing a responsive seed system that facilitates the adoption and flow of new crop technology is believed to be vital. In the current five year plan of Ethiopia, popularly known as the Growth and Transformation Plan, overhauling the national seed system is considered as one of the key interventions in the transformation of the agricultural sector to ensure the target of doubling agricultural production by 2015 (MoFED, 2010). It is well recognized that current performance of the system in terms of availing the required type of seed in the required quantity and quality at the required place and affordable price is below satisfaction.

The proportion of revealed seed demand over supply shows considerable shortage of supply, paradoxically with leftovers each year. However, the seed supply has been increasing recently where it reached to 79% of the demand revealed in 2010/11 cropping season. The level of use of available improved varieties is also very low, where for most crops not more than three varieties are multiplied by the formal sector. As the result, still there are very huge productivity gaps between the national average and yields that are achieved by farmers adopting the technologies. If we consider maize yield, the national average yield is about 25 q/ha (CSA, 2011) but maize farmers using improved varieties are getting on average above 50 q/ha (Dawit, 2011).

The governance aspect of the system is identified to be an important systemic bottleneck in improving the performance of the formal seed system. Specifically the weak and malfunctioning national regulatory system and the mismatch between supply and demand resulting in excess inventory and shortage are key areas of weakness of the system (Dawit et al., 2010). This paper documents the

existing approaches and procedures of seed demand assessment in the formal seed sector in Ethiopia along with the opportunities and constraints.

The Need for Seed Demand Estimation

Demand is the quantity that buyers are willing and able to purchase at a particular price. This is called effective demand and is not the same as the seed requirement. It is important to distinguish between the amount of seed farmers will actually buy and how much they would like to buy, or indeed how much the government would like them to buy. The total amount of certified or labeled seed sold may be quite a small proportion of the total requirement (FAO, 1994). The demand for seed exhibits strong intra-annual and inter-annual fluctuations as a function of weather, prices, and the amount of seed saved from the previous year (Minot et. al, 2007). Seed demand forecasting is the process of making projections of demand for products by examining past and present performance levels, combined with an assessment of available products and markets. This may be carried out within the government service or by individual companies in a purely commercial context (FAO, 1994):

Seed demand estimation plays a very important role in management decision making both by the government and seed growers. Some idea about the future is a prerequisite for making decisions in various aspects of seed supply management. From the government side, the need for seed demand forecasting is obvious. In a country like Ethiopia where greatest importance is attached to the use of productivity enhancing agricultural inputs such as improved seed, where most of the seed is locally produced, demand forecasting is essential for:

- Determining the amount of seed required by each crop and variety and plan seed production accordingly;
- Estimating and availing production and distribution credit;
- Strengthening seed quality control mechanisms;
- Knowing the potential demand and hence design appropriate extension method that convert the potential demand to an effective demands and;
- Formulation of policies regarding seed use and food production.

From the seed producers point of view demand forecasting is necessary for:

- determining the amount of seed by each crop and variety and plan production and distribution accordingly;
- Design popularization program for their varieties and;
- Design mechanisms that expand their market share for specific crops/varieties.

Approaches and Procedures in National Seed Demand Assessment

The approaches and procedures of seed demand assessment in Ethiopia are guided by the overall seed system prevailing in the country along with the key factors involved in the system. The demand for the seeds of the different crop varieties is currently assessed following bottom up approach starting from kebele to national level. It is done usually one season before so that seed of those varieties for which the farmers showed preference is produced during that season and made available the coming season. Demand identified at kebele, woreda, zone, region and national levels are adjusted based on trends of improved seed consumption in the previous year's and government development plans. Nevertheless, the demand assessment is not linked with promotion of new potential varieties and new demand creation. This has created a situation where farmers express demand only to those varieties that they now before, than those released recently with superior performance. While demand is assessed, at grassroots level farmers need is expressed in terms of the type, quantity, quality, and time of delivery of the seeds of different crop varieties in relationship to their respective prices. Practically the key factors that determine the demand are related with farmers acquaintance to the varieties, the expected performance of the varieties under the prevailing production conditions (agro-ecology, whether condition, soil fertility, the expected market conditions for the crop, the level of awareness of the farmers about the varieties, and farmers' ability to access the seed.

In general, this demand assessment approach can serve as an indication, however, it ignores the possible demand shift that may occur due to changes in the production and market conditions (weather shift, diseases and pest incidence, price change, shift in product demand, emergence of better opportunities etc), and the need for provision of choice for different type of seed (inter and intra-crop varieties).

Actors involved in seed demand assessment

Practically the whole task of seed demand assessment is done by the Ministry of Agriculture. Experts of the Ministry starting from kebele (development agents) to federal (Agricultural Inputs Marketing Directorate) levels are involved in one or another way to assess and compile the demand. The various levels of seed demand assessment and tasks performed at each stage are shown in Table 1.

Under the current system, the whole seed marketing task is the responsibility of the different public institutions at regional and federal levels. The participation of seed growers in seed demand assessment and promotion task is generally limited, if limited incentives to both public and private seed producers to worry

about seed demand assessment. Similarly, the consequences of poor demand assessment are hold by the public sector. This implies the need to reconsider the role of the public sector in the demand assessment and to shift more to the regulatory aspect and ensuring the demand assessment to be the responsibility of the seed producers themselves along with the risk of marketing.

Seed demand assessment is more complicated in estimating the demand of early generation seeds (breeder, pre-basic,). Although the demand of certified seed is assessed before one years as described above, it has been very difficult to get demands of early generation seed from seed producers which will be ready to user after three, or four or five years. The ESE more often submits its next season requirement to NARS. Hence, to reduce the risk of shortage of early generation seed supply in the coming four and five years, components of NARS relay more in demand forecasting than assessment. The average certified seed demand and cropped area growth rate of previous years, usually the recent five years, superimposed on the national crop production plan set by the government is used to forecast the certified seed demand for the coming five year. Once the certified seed for the next five years is determined, depending on the multiplication factor of the respective crop species, the forecasted five year certified seed demand is then used to calculate backward in forecast the early generation seed demand. This figure is given to the respective national commodity coordinator and regional research center to use it in planning their next season early generation seed multiplication. The plan is updated every year to have always the coming five years early generation seed multiplication plan.

Time of demand assessment

The time when the demand is assessed is critical as information required to reveal demand is normally dynamic and exhibit intra year/ season variation. While the weather condition of the season during which the intended seed is going to be grown is a factor that limits demand, due to capacity limitation, seed demand assessed before a season is exposed to the vagarious of weather condition that increase the amplitude of demand variation or total shift in variety or even crop type. More reliable information on weather condition can be obtained, when it is made closer to season, so do the seed demand assessment. Even though, the weather forecasting capacity in the country is improving from time to time, it application in crop production in general and seed demand assessment in particular is still at its infant stage. Similarly, information on market conditions for the produce is known after harvest. These factors require the time of demand assessment to be as close as possible to the production season, which again are linked back to the seed demand to consider the production of different type of seeds to ensure choice in terms of type and a system that holds excess stocks. Applying better demand estimation technique, such as Multiple Regression Technique that considers different factors influencing seed demand is required.

Table 1. Actors involved and share of responsibility in seed demand assessment

Level	Institutions	Individuals /experts	responsibility	Remarks
Kebele		Development Agents	• Assessing seed demand by crop and variety from individual farmers in the kebele • check whether the demand corresponds with land holding; • approve the demand by Kebele council,	• assessment is made one season before • normal production season is assumed • market conditions are assumed not to change
Woreda	Woreda office of agriculture, agronomy desk	Woreda crop experts	• compile kebele level assessed demand • adjust submitted demands based on previous years seed consumption and the Woreda development plan approve the demand by Woreda council,	• assessment is made one season before • normal production season is assumed • market conditions are assumed not to change
Zone	Zone office of agriculture, agronomy desk	Zone crop experts	• compile woreda based l demand • adjust submitted demands based on previous years seed consumption and the Zone development plan • approve demand by Zone council	
Region	Regional bureau of agriculture, extension directorate	Regional crop experts	• compile zone demand • adjustment • adjust submitted demands based on previous years seed consumption and the Regional development plan • Approve the demand by region council	
Federal	Ministry of Agriculture, Inputs Directorate	input experts	• compilation of regional level assessed demand at federal level • adjust submitted demands based on previous years seed consumption and national agricultural development plan • GTP plan and adjustment (Adjustments is made by discussing with respective regions)	

Trends in Matches and Mismatches of Seed Demand and Supply

As indicated in Table 2, since 2006/07 the trend in both demand and supply of seed is increasing. Similarly the proportion of supply to revealed demand is consistently increasing for both hybrid and non-hybrid seeds. Big increase on the supply sides is observed in the 2010/2011 production season. This is highly associated with the crash seed multiplication program that has been implemented by the GoE since 2009. The program has increased the supply considerably to reach to more than one million quintal of seed, which is about 80% of the revealed demand for the 2011 production season from the different regions.

Table 2. Trends in the revealed demand and actual supply of certified seed in quintals)

Year	Certified hybrid maize			Certified non-hybrid crops			Total		
	Demand	Supply	%*	Demand	Supply	%	Demand	Supply	%
2006/07	123,777	35,244	28	629,422	205,680	33	753,199	240,924	32
2007/08	143,847	86,787	60	841,458	246,051	29	985,305	332,838	34
2008/09	193,079	95,735	50	737,992	278,353	38	931,071	374,088	40
2009/10	333,249	168,123	50	723,588	433,049	60	1,056,837	601,172	57
2010/11	432,648	365,335	84	930,980	716,512	77	1,363,628	1,081,847	79

**= Proportion of supply to demand*

Source: The national Seed Production and distribution committee, 2011

The problem related with poor effective demand assessment described above is reflected by a considerable amount of seed leftovers each year. In 2011 production seasons, Ethiopian Seed Enterprise alone fails to sell over 74 thousand quintals of seed and has been a left over. Of which, surprisingly, the 53 thousand quintals was hybrid maize, mainly seed of the most popular hybrid, BH660, high yielder but relatively late in maturity. Due to the critical shortage of seed for hybrid maize, each year the distribution and appropriation of hybrid maize seed used to be made by higher officials at federal level. The main reason for the leftover of hybrid maize seed is associated with the late arrival of the rains, which forced farmers to shift to early maturing crops and varieties.

Key Lessons and Recommendations

The current bottom-up approach of demand assessment by the public sector has been useful in ensuring the availability of seeds of improved crop varieties and reach farmers in different parts of the country. Significant increase in seed demand and supply is recorded. By 2010/11 cropping season the supply exceed a million quintal by showing almost a fivefold growth. However, there are key issues that need to be considered:

- The current demand assessment procedure does not consider the possibility of shift of demand due to weather and market conditions creating considerable mismatch between demand and supply;
- The association of the risks of poor demand assessment to the public sectors reduces the possibility of the investment by seed producers to reduce associated risks;
- The offer of just one option in terms of the type of crop variety at the time of planting limiting the possibility to manage production and marketing challenges farmers face;
- The limited link of demand assessment with demand creation causing production and marketing of seeds of older crop varieties.

Thus, it will be important to redesign the current approach followed in demand assessment in such a way that it consider the shift/change in demand, reduces the risk burden on the public sector, gives options to farmers, and allows creation of demand for newly released crop varieties.

To this end:

- Developing a national network and procedure to demonstrate and popularize newly released varieties to create demand and tapping recently released varieties potential;
- The time of demand estimation shall be closer to the season, which again is linked back to the need to consider the production of different type of seeds to ensure choice in terms of type and a system that holds excess/reserve stocks;
- Better demand estimation technique that considers factors influencing seed demands, such a Multiple Regression Technique shall be applied;
- MOA staff at all level and seed growers shall be trained in better seed demand assessment and forecasting techniques; and
- Transport facilities and materials like computers need to be fulfilled for Woreda experts and Development agents.

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Overview of Seed Demand Assessment in Japan: Comparison and Implication to sub-Saharan African Countries

Yoshiaki Nishikawa
Rural & Regional Development Management Program / Nagoya University

Introduction

The benefits of good crop varieties cannot be realized without availability of good quality seeds to farmers. Most farmers in developing Sub-Saharan African (SSA) countries, secure source seeds mainly from own production, exchange with other farmers and from local markets. However, quality of seeds, especially genetic integrity gets degraded after some generations of farmer seed production. Therefore, establishing a sustainable system for supplying genetically pure seeds by the formal seed system such as government research institutions is regarded to be essential. Public system in SSA countries usually tries to promote the use of certified seeds based on demand assessment following different approaches, which is generally a costly process whose efficacy very much limited on the quality of the demand assessment (Thijssen et al 2008; Nishikawa et al., 2011).

While talking about farmers' seed demand assessment, variety of questions such as: what are the different aspects of seed demand? what are the characters of good seeds from farmers' perspectives?, and what is the economic feasibility of seed demand assessment ? Need to be answered.

In this paper, the author introduces a case of rice, staple food of people in Japan, seed demand assessment, together with brief overview of farmers' perception on seeds in Madagascar for comparison. The issue might lead to assess the feasibility of Japanese system for possible adoption in developing countries, including Ethiopia.

Demand Assessment Process of Rice Seeds in Japan

According to the Seed Act[1)] of Japan, government is responsible to provide certified seeds of staple food, including rice. This responsibility has been devolved to sub-national jurisdictions called prefectures[2)]. The size of prefecture varies from 1.9 thousand km^2 for the smallest to 83 thousand km^2 for the the

largest. Farmers in some prefectures grow small number of varieties while farmer in other prefecture grow more than 10 varieties (MAFF Japan: website). Where many varieties are grown, it is difficult to predict the demand for each variety. In each prefecture, local government sets up Associations such as: Rice and Wheat Promotion Association, Rice and Wheat Quality Improvement Association, or Rice, Wheat and Soybean Promotion Association, that varies in naming and domain with prefectures to coordinate seed supply and distribution (APRWPA, 2003). Those associations work closely with Department of Agriculture of prefectural governments, unions, cooperatives and research stations (Figure 1).

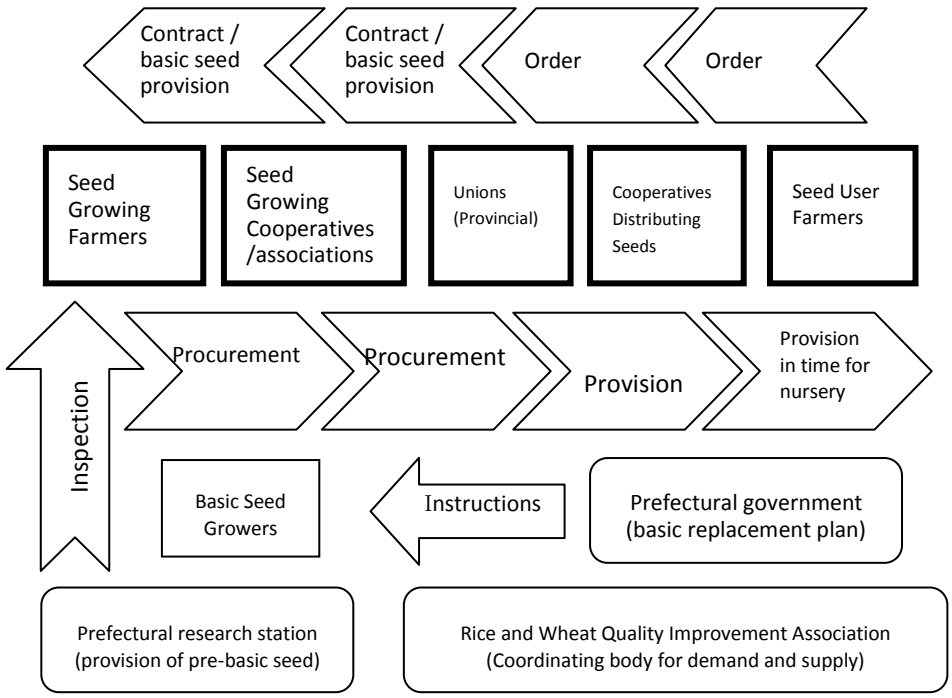

Figure 1. Rice Seed Demand / Supply system in Japan (Stakeholders Functions and Relations)

Demand assessment of rice seeds usually start two years before the time of planting seeds. Every year, prefectural governments develop the basic replacement plan, in which they decide how much portion of seeds sown by farmers has to be replaced with certified seeds of prefectures' recommended varieties in that particular year (Figure 2)[3].This implies that there is no seed demand assessment from users.

Blank boxes drawn with broken lines in Figures 2, 3 and 4 indicate there are no activities in the relevant year related to demand and supply management

explained in figure 1. While looking at figures 2, 3 and 4, it is important to compare with figure 1

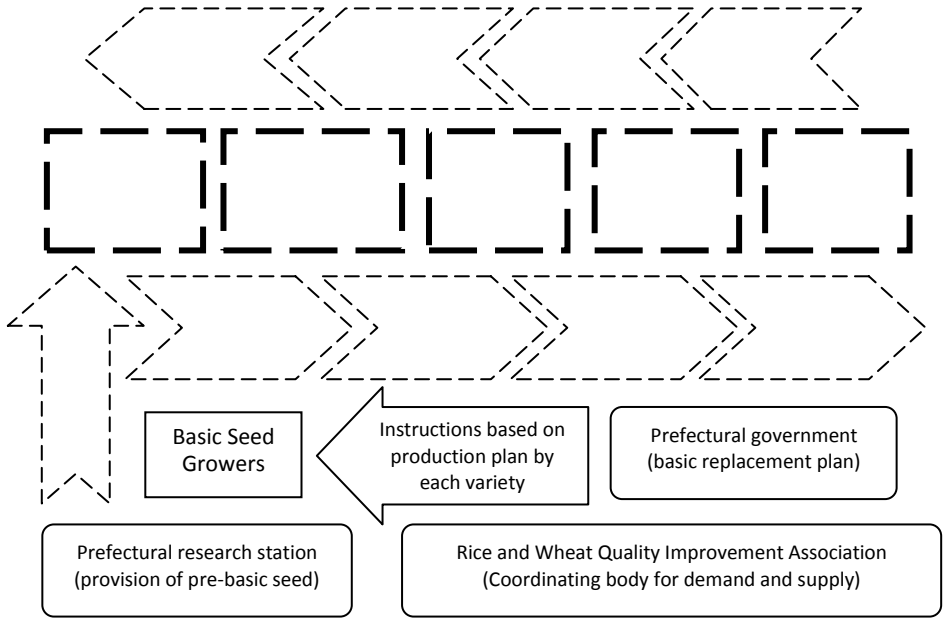

Figure 2: Rice Seed Demand Transmission /Distribution Mechanism in Japan (Two years before crop season)

Based on the replacement plan of the prefectural government, prefectural research stations provide pre-basic seeds for production of basic seeds. Basic seeds are produced by specialized farmers and farmers' groups registered by the respective local governments. The next year, basic seeds produced are provided to the seed growers, which are in many cases farmers' groups within multi-purpose agricultural cooperatives or agricultural production incorporated groups. Certification starts by inspecting fields intended for seed production. Regular inspections are carried out at the recommended/ prescribed stages of the crop growth. The products, namely seeds, are checked at laboratory for purity and other standard as requirement for certification.

One year before planting, unions and cooperatives estimate farmers' seed demands for the season. In this process, seed demand from individual farmers is not assessed, with the understanding that farmers never decide which varieties to plant well ahead. Rather what unions and cooperatives submit to the coordinating Association is only demand estimates, which are not based on actual farmers declared demands. Based on this demand estimates and also considering available amount of basic seeds, the Association provide basic seeds to seed producing cooperatives and seed growers (Figure 3).

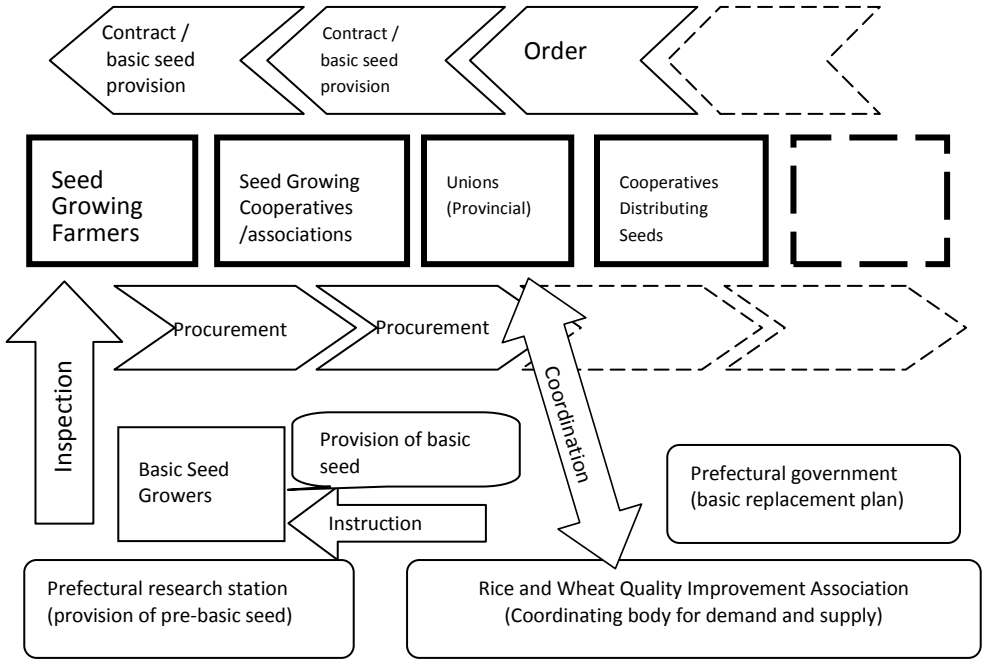

Figure 3. Rice Seed Demand Transmission /Distribution Mechanism in Japan (One year before crop season)

Several months before the planting time, cooperatives collect orders from member farmers and these orders are summarized by unions. At this final stage, associations are able to know the gap between supply and demands. When supply is higher than demand, association either stores the leftover for the following season or sells them as grain. Especially when replacement rate is not so high, which happens often and governments need to bear cost for storage or the economic loss due to lower price of commodity compared to seeds.

Semi certified seeds are produced by seed producing farmers but are not initially intended for certification. However, semi certified seed is produced in a well-managed condition to maintain acceptable varietal purity and other seed standards. Seed quality is checked according to prescribed seed standard. When certain varieties attract higher market demands in relatively short period, which happens often, the Associations face difficulty of balancing distribution of originally certified and additionally required seeds among unions and cooperatives.

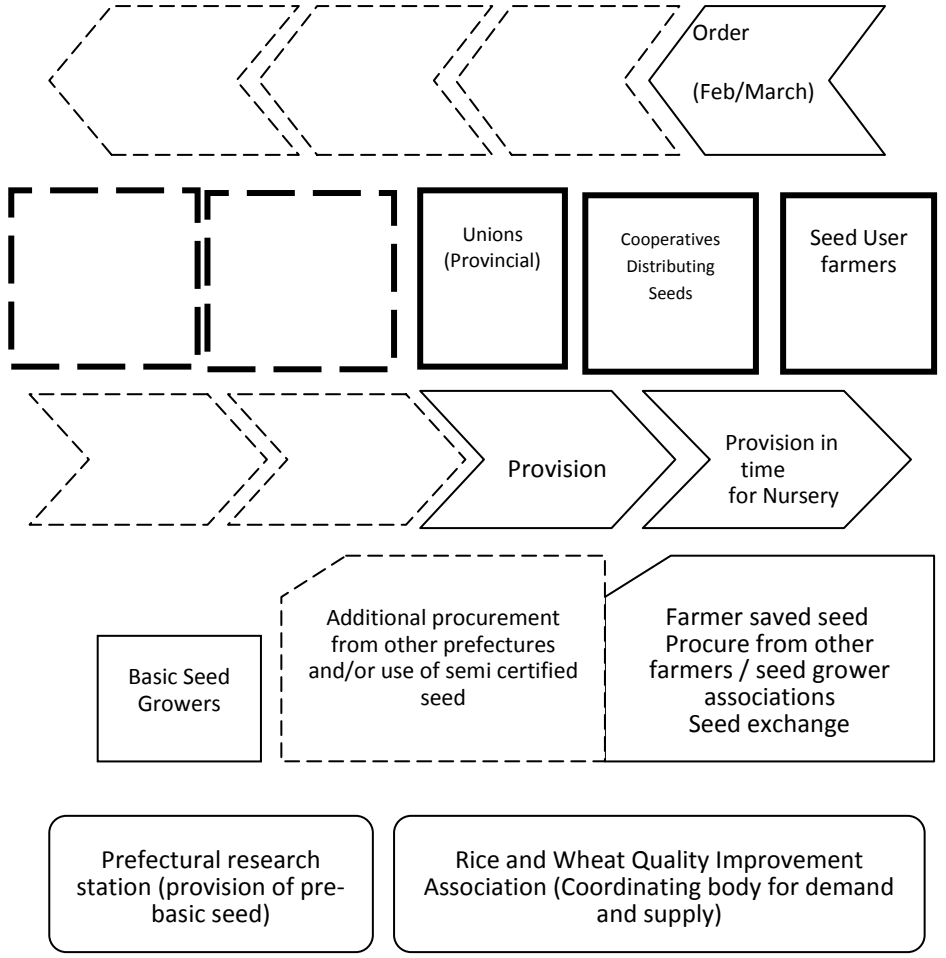

Figure 4. Rice Seed Demand Transmission /Distribution Mechanism in Japan (Year of crop season)

Governments take certain level of initiatives to promote recommended varieties within each prefecture and unions and farmers make their own choice to some extent. Due to the limited capacity of pre-basic seed production and certification, each prefecture restricts the number of varieties produced each year. When farmers want to use varieties other than produced within their prefecture, they procure the seeds from other prefectures that produced seeds of those varieties or buy from private producers, or produce that particular variety by themselves.

In Japan, replacement rate is getting high in recent years, especially in the so-called branded rice varieties, which have higher acceptance in the market. However, until recently, in most prefectures, replacement rate was only 50 to 70 % due to the use of farmer harvested seeds for a few years after introduction of

certified seeds. This happens, as rice is a self-pollinated crop where drastic genetic degeneration does not happen within few generations under good production practice. Furthermore, some locally grown varieties are not controlled by the association and seeds of those varieties are managed by farmers themselves for a long time.

In Japan, when branded rice is sold in market, consumers recognize the name of varieties for which they pay premium price that stimulate the use of certified seeds. On the contrary, in areas where branded rice is not produced, harvested products are used for processing and variety is not recognized. In the later case, farmers do have less incentive to replace seeds every year so long as the quality of seeds they plant is acceptably high. This creates difficulty to local governments to estimate seed demands.

A Case of Rice Seed Procurement by Farmers in Madagascar

In Madagascar, where rice consumption per person is the highest among African countries, rice seed is mainly procured from farmers own production and local market, although the government policy promote the use of certified seeds produced by formal sector. Farmers' perception on quality of seeds from different seed sources show interesting tendency. In terms of quality, seeds from public seed enterprise are recognized as best but seeds produced by farmers' groups and farmers themselves are also regarded good enough by many of farmers (Andriamiandrisoa and Nishikawa, 2011). Farmers think seeds from public seed enterprises are more expensive and less available compared with seeds produced by farmers' groups and ordinary farmers (Table 1). Under this situation, farmers procure seeds from different sources and this behavior make difficult for the government to estimate effective demand.

Farmers usually have different sources (government is just one of them) and criteria for choosing seed for their own use. Farmers' criteria are not necessarily limited only to agronomic characters of seeds /varieties. Belief of poor quality of farmer saved and locally available seed is not shared by farmers. Rather, most farmers perceive that the quality of farmers' produced seeds is acceptably good together with other aspects such as seed availability and price. At the same time, without demand assessment and information dissemination about seeds, seed growers have difficulty in selling their seeds regardless of their quality (Nishikawa, 2011; Nishikawa et al., 2011).

The important thing that one can learn from this is to change the starting point not from government strategies but from farmers' perspectives and strategies.

Table 1. Perception of seed characters by farmers in Madagascar

		Quality (%)**		Price (%)**		Availability (%)**	
Formal	Public Seed Production	Very Good	5	Very cheap	0	Aboundant	11
		Good	19	Cheap	6	Reasonably available	5
		Fair	8	Fair	12	Fair	4
		Bad	2	Expensive	17	Poor	13
				Very Expensive	0	Very poor	17
	Farmer Seed Enterprises (FSE)	Very Good	12	Very cheap	1	Aboundant	5
		Good	12	Cheap	3	Reasonably available	8
		Fair	0	Fair	4	Fair	6
		Bad	0	Expensive	8	Poor	5
				Very Expensive	6	Very poor	0
Informal	Farmer to Farmer	Very Good	4	Very cheap	3	Aboundant	30
		Good	39	Cheap	38	Reasonably available	36
		Fair	15	Fair	17	Fair	25
		Bad	17	Expensive	2	Poor	0
				Very Expensive	0	Very poor	1

Source: Andriamiandrisoa and Nishikawa, 2011

Implications and Conclusions

Without question, access to 'good seeds' is vital for improving farmers' productivity. However, different stakeholders differ on their understanding to the value of good seed. These differences should be emphasized by researchers, extension agents, and policy makers. A good variety means different things for different stakeholders; and is location, time, and market specific. Distinction between the provision of good (improved) variety and good seed is vital although the two aspects are closely related and mutually indispensable.

Seed demand assessment is not a theoretical postulation but a practical exercise and distribution of certified seeds based on demand assessment is only part of the solution. Government sector needs to recognize farmers' options to acquire necessary seeds with more or less acceptable quality by their own conscience from various sources including their own harvest.
Understanding the above mentioned comparative analysis leads to set forth the following recommendations for further research and development deliberation in the area:

- Many researchers and farmers themselves recognize problems of seed harvest and saving by their own. One of the proposed directions for researchers may be to improve existing farmers' practice but not replacing them with externally developed system. For example, improvement of seed storage methods, improvement of treatment before sowing, sharing precise information for necessary replacement periods and field management for cross-pollinated crops

will be of importance as research topics (Figure 5); and

- Simultaneously, research and extension agents (public sector) need to provide necessary varieties and a certain amount of good quality seed. Most important activities to be performed by the research and extension structure include development of new varieties based on farmers' needs, simplification of standard control organizations like decentralization of certification, differentiation of certification methods for different crop and varieties depending on degree of market orientation, and economic analyses of seed demand assessment itself. Economic feasibility of demand assessment is very important aspect to be considered by policy makers.

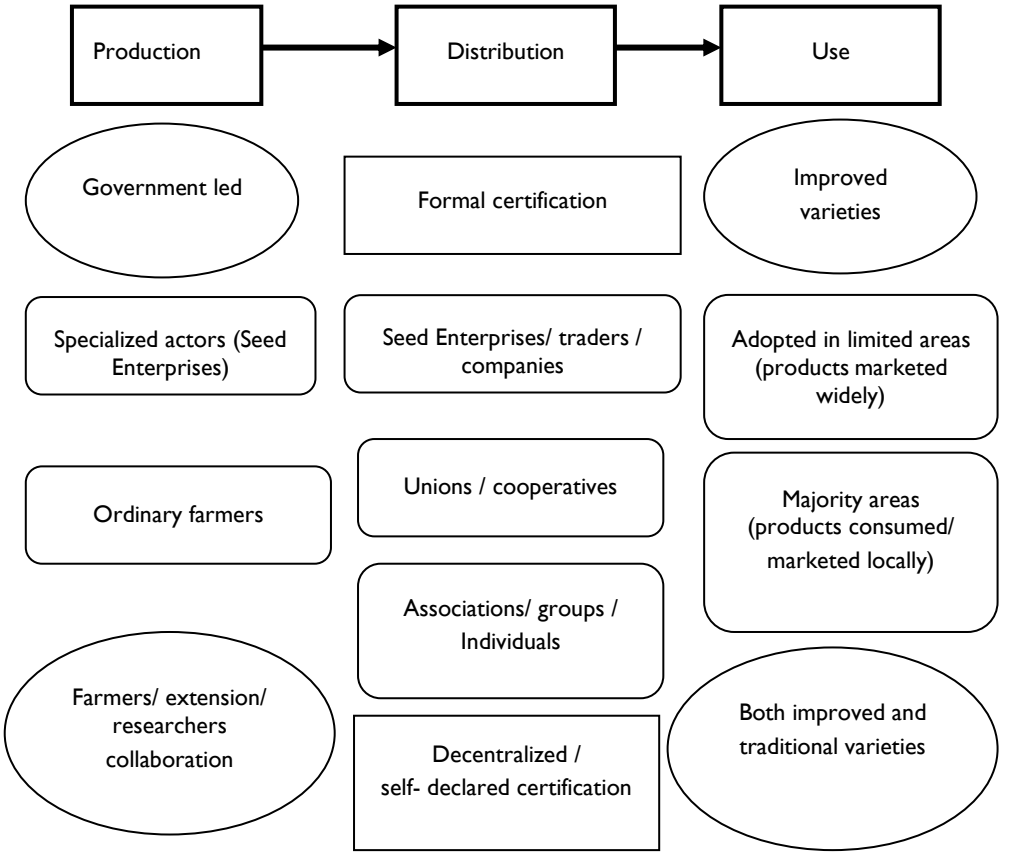

Figure 5. Parallel seed demand assessment and distribution system

Acknowledgements

The author is heavily indebted to Mr. Minoru Yoshino, JICA expert to Project for Sustainable Development of Rain-fed Lowland Rice Production in the Republic of Ghana and formerly a researcher at Fukuoka Agricultural Research Center, Japan, for his advice and providing information.

Notes:

1) *Formal name is 'Seed Act for Staple Crops'. This act covers only rice, wheat, barley, and soybeans. Government does not have direct responsibility for certification of seeds for other crops.*
2) *Japan's administration system has three layers: national, prefectural and municipal.*
3) *Blank boxes in Figures 2, 3 and 4 indicate there are no activities in the relevant year related to demand and supply management explained in figure 1. While looking at figures 2, 3 and 4,please always compare with figure 1 .*

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Seed Demand Forecasting, Supply and Distribution System in Oromia

Mekonnen Gelaw
Oromia Bureau of Agriculture

1 Introduction

Seed is a key input for improving crop production and productivity. Increasing the availability and quality of seeds can increase yield of crops 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 superior crop varieties, there has been limited use of improved seeds by the majority of farmers (CSA, 2010). Unavailability of quality seeds at the right place and time coupled with poor promotion system, is one of the key factors accounting for the failure to exploit the potential of improved varieties, which further contributing for low agricultural productivity. Seed demand forecasting system is an important function to produce and avail seed for the farmers at the right time and required quantity.

This paper presents the overview of seed supply and distribution and seed demand assessment/forecasting method in Oromia Region. The supply and distribution system is described in terms of actors engaged in the system and the contribution of the formal and informal seed sectors along with the performance related to the relationship between demanded and supplied seed in the region.

2 Seed Supply and Distribution

Both the informal and formal seed system play important role in the supply and distribution of seeds in the region. The informal seed sector in Oromia seed system context is defined as seed production and distribution along with the different actors where there is no legal certification in the process, which includes retained seed by farmers, farmer-to-farmer seed exchange, community based seed multiplication and distribution, NGO based seed multiplication and distribution, on-farm seed multiplication made by research centers, agricultural universities and colleges as part of their technology demonstration and pre-scaling out activities. The formal seed sector is considered as the production of

seed using known sources of planting materials and under goes certification process for its production. The major actors in the formal seed system in the region are Ethiopian Seed Enterprise (ESE), Oromia Seed Enterprise (OSE), Cooperative Unions and private seed companies.

It is recognized that the seed system in the region is constrained by: insufficient supply of seed, poor quality seed delivery mechanism, lack of clarity of institutional mandates, loose integration between the informal and formal seed system and lack of sustainable project based community seed production scheme. Estimates indicate that majority of the cultivated land in the region (about 94% during the 2010/11 cropping season) is planted with seed supplied from the informal seed system (Table 1). While the contribution of the formal sector is too small in terms of areas coverage, the yearly seed demand assessment/forecasting procedure fail to precisely estimate seeds demand under the formal seed sector.

Within the context of the national seed system, the regional seed supply and distribution system follows procedure that includes (i) appropriation of produced seed by zone and district level, (ii) engagement of cooperative unions and primary cooperatives in the distribution, and (iii) price setting and sales to farmers. Oromia Bureau of agriculture (BoA) proportionally allocates the produced seeds for Zone Office of Agriculture based on their demand. Then each Zone agricultural office appropriates the allocated improved seeds for their respective districts and authorizes Cooperative Unions to purchase the seeds. The cooperative union supply improved seeds to primary cooperatives by adding cost of transportation and administration costs.

Table 1: Area planted with improved seeds in Oromia Region (2010/11)

Crops	Total area (ha)	Area covered with improved seeds	
		Area (ha)	%
Cereals	4,576,387	337,635	7.38
Pulses	552,162	3,858	0.70
Oil crops	307,313	NA	0.00
Vegetables	50,614	48	0.09
Root crops	83,278	36	0.04
Total	5,569,754	341,577	6.13

Source: Central Statistics Agency, 2011, NA. Not available

Moreover, research centers, universities, NGO, private, seed dealers (special for vegetable seeds) participate in seed distribution in the region. They mainly deal in filling agro-ecologies, crops and varieties gap unaddressed by the public seed enterprises.

Majority of the farmers purchase seeds on cash basis, while around 10% of the farmers purchase seed on credit basis with or without down payment. The cooperative union collects the money from sales of seeds and deposit to Bank to settle the credit of BoA.

Analysing the demand, supply and distribution of seed during 2005/06 - 2010/11 in Region one can easily note the mismatch between the planned and what actually supplied. The trend in seed supply fall behind the demand (Figure 1) andwhat is supplied every year is in short almost by half to what is demanded. A study conducted by a team from Oromia BoA and OSE in collaboration with Local Seed Business point up that the avearge actual seed supply in the region during the 2003/04 to 2010/11 production year was only 3% of the potential demand.

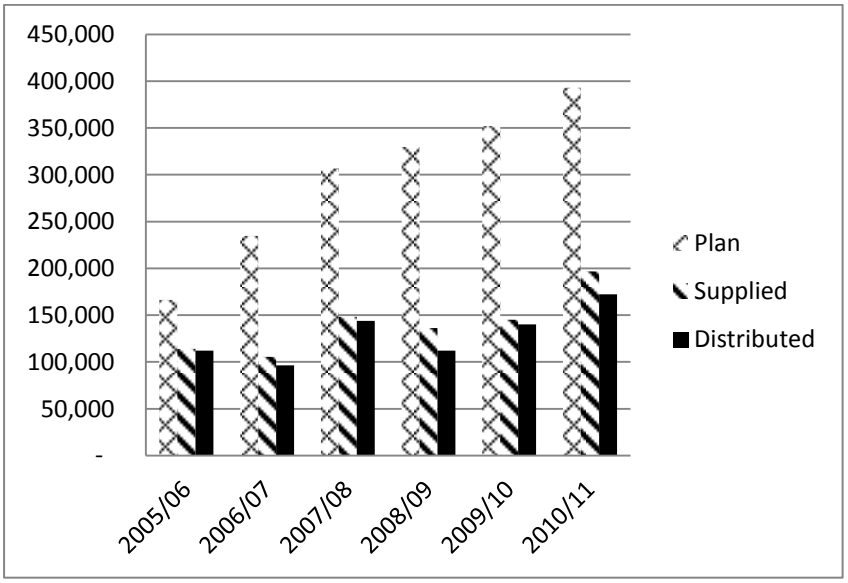

Figure 1: Comparison of demand, supply and distribution of seed in Oromia Region during 2005/06 - 2010/11 production year.
Source: Oromia Bureau of Agriculture, unpublished

Lack of competitive seed distribution system among seed producers, low accountability and traceability for seed quality deterioration, long distribution chain and lack of credit facilities are some of the weaknesses of seed supply and distribution process in the region.

3 Seed Demand Forecasting/Assessment

Demand forecasting is a key management function. It is of vital importance especially for governments, producers, importers and distributors in terms of supplying seed and related inputs timely. Indicative idea about the future is a prerequisite for making decisions in various aspects of management. From the government side the need for demand forecasting is obvious. In a country like Ethiopia where greatest importance is attached to the use of productivity enhancing agricultural inputs, especially fertilizers that are imported by investing huge amount of foreign currency, demand forecasting is useful for:

- Estimating foreign exchange need and make financing arrangements;
- Estimating production and availing credit;
- Arranging supplies of inputs to the consuming centres in due time and in desired quantity; and
- Formulation of policies regarding input use and food production.

A fair amount of accuracy in demand projections is critical. Inaccurate assessment would lead to heavy left-over or shortage. Between 2008/9 and 2010/11 left over seed of major crops amounted 58,257 q; and the cost incurred due to this left over is estimated to be about 60,018,070 Birr (Table 2). Generally excessive surpluses lead to inventory accumulation and heavy losses in terms of:

- interest and storage charges;
- quantity and quality losses;
- re-bagging costs, and above all,
- wastage of the badly needed foreign exchange.

On the other hand, underestimation of demand would lead to supply shortage, with adverse effects on:

- promotional efforts;
- agricultural production and land productivity;
- food security; and
- full exploitation of the potential of the farm inputs, particularly improved seeds.

Table 2: Estimates of incurred cost due to seed left over *(major crops)*

Seed	*2008/09*		*2009/10*		*2010/11*	
	Amount left over (q)	Estimated cost (Birr)	Amount left over (q)	Estimated cost (Birr)	Amount left over (q)	Estimated cost (Birr)
Wheat	19,839	14,244,402	9,171	5,181,615	1,812	1,389,804
Maize	705	1,128,000	4,938	7,397,124	18,736	28,104,000
Barley	1,011	587,391	316	151,680	550	419,650
Tef	255	336,600	711	824,760	213	253,044
Total Cost	21,810	16,296,393	15,136	13,555,179	21,311	30,166,498

3.1 Factors Influencing Seed Demand

Factors that influence seed demand include:

- Total cultivated area;
- Seed rate;
- Extension efforts on the introduction of improved techniques;
- Input-output price relationship;
- Seed sold in the previous year;
- Extension of cultivated area (including new land brought in to cultivation, increasing irrigated area which allows two crop harvests per year);
- Adoption of complementary inputs;
- Accessibility to inputs;
- Weather conditions;
- Distribution efficiency; and
- Availability of credit.

Among these factors, total cultivated area, seed rate, seed sold in the previous year, accessibility to inputs, extension of cultivated area and to some extent weather conditions are considered to estimate seed demand in the region.

3.2 Seed Demand Assessment Procedure

Seed system development can be viewed as a dynamic process of matching the supply to the changing demand for seeds. According to Minot et al. (2007), farmers generally demand seed from formal seed source for only three reasons: seed replacement, variety change and emergence response. Seed replacement refers to the purchase of new seed of the same variety in response to the deterioration of the variety over cropping seasons (100% for hybrid every year, 3-4 years for self- and open-pollinated as well as clonally propagated varieties). Variety change refers to the "adoption" of a new variety (hybrid or non hybrid) with the expectation of improved performance. Seed emergence refers to the seed needs of farmers that normally save seed but were unable to do so because of a poor harvest due to environmental constraints.

For proper marketing, accurate assessment of seed demand is very important. The first step in demand forecasting is to calculate the existing seed requirement; then seed demand is determined using the available market data following some principles. Seed requirement (crop area x seed rate) is the amount of seed consumed in establishing the total crop area. Seed demand (seed requirement x per cent bought seed) is the amount of commercial seed that is purchased by farmers.

In conducting seed demand assessment of the region, the below mentioned forcasting/assessment methods are jointly employed.

- Collect farmers seed demand directly from farmers by Das,
- Trend analysis of previous years actual seed deamnd, and
- Area of land to be coverd by fertilizer and improved seed and the amount of fertilizer and seed required.

Every year, farmers seed demand assessment is carried out in the region following bottom-up approach. In the process DAs in collaboration with development team and rural kebele Administration collect seed need in terms of crop variety and quantity from individual farmers. Such data is compiled by the Input Coordination Unit's of BoA at districts, Zone and regional levels to come up with the total seed demand of the region. At each level the seed demand is validated on the basis of previous years actual seed demand and targets put in the development plan. The estimated regional seed requirement is apportioned to the various producers (i.e. ESE, OSE, BoA and private companies), though the latter could produce more or less than what they were supposed to produce on the basis of their capacity as well as resources. Based on the total regional seed demand and estimated seed price, the Oromia Bureau of Agriculture allot budget for seed purchase. For instance the budget allocated for seed purchase in the year 2010/11 and 2011/12 was Birr 398,068,928 and Birr 557,803,331 respectively)

Demand assessment and forecasting has a long lead time, at least one season, and is carried out within the government structure. Various government services at different capacity are engaged with flow of activity and schedule shown below.

- The DA in collaboration with the Kebele administration and societal development teams identify and verify the type and amount of input needed by the farmers and submit it to the district agricultural office every year before September 25;
- The District agricultural offices verify and compile the demand submitted from the Kebele administration and submits to Zone Agricultural Office before October 10 each year;

- The Zone Agricultural Offices verify and compile the demand submitted by District Agricultural Offices and submit to BoA before October 25 each year; and
- The Regional BoA compile the demand submitted by Zone Agricultural Offices and approve with or without adjustment. The regional demand then is submitted to Ministry of Agriculture, Agricultural Input Directorate for national seed appropriation.

4 Challenges in Seed Demand Assessment

- Poor Extension Service. Farmers are often not well informed about the potentially available varieties suitable to their target agro-ecologies. More frankly, certain DAs compile seed demand simply from past records. Slow adoption of newly released varieties is another concern, which often gives way for compiling demand of only known old varieties;
- Inconsistent and Incorrect Seed Demand Assessment**.** The prevailing procedure for estimating farmers' seed demand and the subsequent seed production targets are sometimes, inconsistent and inaccurate, leading to both over and under-estimation of demand. It is to be noted that farmers' seed demand can change as planting time approaches based on seed prices, availability and prices of other inputs, cash constraints, or/and anticipated weather conditions; and
- Lack of standardized seed replacement period. The seed demand assessment system does not take into account standard cycle of seed replacement based on the breeding system of a particular crop (every year for hybrid, 3-4 years for self and open-pollinated as well as clonally propagated varieties).

5 Recommendations

- Strengthen Extension Service**s** Improve farmers' awareness on the potentially available varieties suitable to their target agro-ecologies. Widely advocate the advantage of using improved seed, teaching on the benefit of improved varieties and their specific characteristics by strengthening the extension education and service. Besides, the public and private seed enterprises should be fully involved in seed extension and promotion activities;
- Place better demand forecasting system**.** There is a need to develop seed demand forecasting technique that considers factors such as seed prices, availability and prices of other inputs, cash constraints, weather forecast, and cycle of seed replacement period; and
- Strengthen the capacity of agricultural staff. The capacity of agricultural staffs at all level (especially DAs), seed producers and seed suppliers need to be strengthened with regard to their knowledge and skill of seed demand assessment.

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Observation on Direct Seed Marketing in Amhara Region

Mesfin Astatike[1], Ahmed Yimam[1], Dawit Tsegaye[1], Minilek Kefale[1], Demeke Mewa[1],

Tadesse Desalegn[1], and Mohammed Hassena[2]

[1] Integrated Seed System Development Project (ISSD), Bahir Dar University

[2] ISSD National Partnership Coordinator

Introduction

The most important input in agriculture is seeds of improved crop varieties. The availability of the preferred type and amount at the required time is normally associated with the efficiency of the national seed system: from demand assessment to seed marketing. Because of the limited participation of the private sector in the seed system, the government alone is burdened with all activities along the seed chain by means of developing different structure. The government follows a centralized marketing system mainly because of the fact that seed is demanded in all part of the country including those areas where there is no road network to supply the seed to the farmers. Unions and cooperatives are the responsible performer in seed distribution.

The inefficiencies of seed distribution in the Amhara Region is manifested with considerable amount of seed leftover in some parts; while shortage stands out in other parts. For instance, in 2009/2010 the leftover of hybrid maize seed was more than 1,000 quintals and the figure increased by over 100% in 2011. While this is partly due to defective demand forecasting, it is also very much related to the efficiency of seed distribution mechanisms. In the first place, there is long planning and distribution process as planning and distribution is done at all levels including region, zone, woredas, unions, and primary cooperatives. These processes are liable for erroneous inference of demand and delaying time of seed reaching final distribution. After the seed reach the distribution centre, cooperatives will not be effective as most of them are not fulltime employees. As a result, accessibility of the seed to the farmers, early before the planting season, is limited contributing to the leftover of seed at the end of the season. There are also other reasons such as variability in rainfall pattern, sticking mainly to previously known variety, lack of credit and high price of fertilizer that contributed to high leftover in 2011 (ABoA report, unpublished).

High leftover of seed is also contributed by lacks accountability in the system. The estimation of seed demand is done through government structure that has no direct responsibility for the unsold seed as the seed is distributed finally by cooperatives. Similarly, quality deterioration is a critical problem in seed sector

of Ethiopia attributed to the lack of traceability and accountability (Dawit, 2010). The seed production is decentralized and there are different producers mainly cooperatives, private seed companies and public seed enterprises. The government pool the seed produced by all these producers and distributed through unions and primary cooperatives. When the Government collects the seed, there is no procedure in place that traces back the producer and makes responsible for any quality loss. Ultimately, the blame goes to the government as a whole. If the government continues to distribute seed, producers can't develop experience and capacity to play roles in the market economy pursued to be order of the future. In addition to lack of capacity, at the moment, most of the companies, including the public are reluctant to enter to marketing as the challenge of marketing is already taken care by the government. Within the large public, there is almost a consensus that it is only the government that has to involve in the seed marketing particularly at district/local level. As the result, it is necessary to point out alternative route and method of seed distribution to the wider public and investigate their importance in improving availability of seed to farmers while ensuring accountability.

Methodology

In order to make a quick comparative assessment of the performance of direct seed marketing versus conventional public driven cooperative marketing, Participatory Rapid Appraisal (PRA) was conducted in four Woredas. Direct marketing of maize seed was piloted in two woredas (Dangla and South Achefer) and the conventional public driven cooperative marketing was exercised in two other woredas (Mecha and north Achefer). The assessment was made mainly based on farmers' satisfaction in seed delivery. The four woredas are among the major maize producing woredas in the region laying adjacent to each other.

Two peasant associations in each of the four study woredas were selected for the PRA expercies. Feedback was also collected from woreda experts. Checklist focusing mainly on farmers' satisfaction on the delivery system of maize seed was prepared. An attempt was made to compare with previous year experience to avoid year effect as previous year seed distribution system was the same in the region. Moreover, group discussion involving implementers was organized in the two pilot Woredas. Information collected from farmers, woreda experts, implementing partners and researchers observations were summarized as a learning process and conclusions were drawn.

Results and Discussions

Designing and implementation of pilot testing

The discussion with different stakeholders pinpointed identifying and valuation of alternative ways of marketing seed to be one of the priority issues in seed sector development in the country. In view of the current inefficiency of seed delivery to the farmers, discussant at different forums including the regional seed sector core group[1] and regional platform opted for an alternative but effective seed delivering mechanism. While consensus was built on the importance of the problem, direct marketing of seed by producers was identified as superior approach to overcome not only the delivery obstruction but also accountability linked in tracing back seed quality deterioration along the seed chain. Based on this outcome full project proposal was prepared.

Indeed, getting approval to carry out the experiment had been very demanding and took long time. Although they fully agreed with initiative, the approval has to come from the decision makers, bureau management group. There has been a dichotomy of view in the approval process: some said that it is against the direction of the government and should not be tried in the region while others were optimistic and want to test it as a search of alternative mechanism that can better deliver input to the farmers. The contention enabled our team to detect perspective variations that exist at different levels. The first and most important is the one that existed between the expert and decision makers. The experts concern is mostly technicality while the decision makers care on how things are aligned with government policies and approaches. It is also worthy to note that some didn't want to carry out the experiment without denying the inefficiency of the existing system just only for siding the government current seed distribution approach.

One source of arguments at BoA was that many of the seed companies do not have the capacity to market seed on their own. Discussion was then organized with companies identified to have potential in seed marketing, BoA management, and regional seed core group to evaluate the capacity of seed growers. It was then agreed to start experimentation with the involvement of four companies namely: Ethiopian Seed Enterprise, Amhara Seed Enterprise, Avallo International, and Ethio AgriCeft in four different pilot woredas. In order to develop accountability and to make sure that every farmer in each woreda gets seed, each woreda was assigned to one company. Accordingly, Dangla Wereda was assigned to Ethiopian Seed Enterprise; Mecha woreda to Amhara

[1] *Regional seed core group is a team organized from major stakeholders that design and steer regional seed partnership projects*

Seed Enterprise; South Achefer to Avallo International PLC, and Jabi Tehinan to Ethio AgriCeft. MoU was prepared and signed among Bahir Dar University, regional BoA and seed growers except Ethio AgriCeft to implement the direct seed marketing. Ethio AgriCeft misunderstood the rationale of the experiment as if it is an approach that limit their selling capacity, and excluded from the experimentation. Thereafter, the concept of direct seed marketing and related procedural issues were explained to the selected woredas and modality of implementation was discussed. Bahir Dar University and BoA facilitated the discussion between the companies and respective woreda.

The seed growers then started to familiarize themselves to the woreda and start doing preparatory work like store preparation, assessing the demand by taking data from the Woreda office of Agriculture (WOA) and tried to crosscheck the data at each market centre with development agents, kebele administration and cooperative leaders. This has helped the companies to refine previously assessed demand and limit the amount seed to be transported to each market center. As soon as they observed the difficulties in managing the direct marketing, Amhara Seed Enterprise (ASE) pull out from the project and opted for distributing the seed through union and inspect them instead of selling directly. But BoA didn't accept ASE's proposal and ultimately resigned from seed marketing experiment. For that reason, the experiment was carried out only by the involvement of Avalo International and ESE in Dangla and South Achefer woredas, respectively.

Initially, seed marketing was planned to be accomplished through agro-dealers. However, the seed growers were not willing to assign agro-dealers due to lack of experienced agro-dealers in the project woredas and also fear of adulteration during seed marketing which can raise issue of accountability. Therefore the seed growers decided to execute seed marketing by their own.

Given the fact that both companies do not have experience of marketing seed, they needed the support of the woreda and the project team for facilitation. Accordingly, negotiation was made with cooperatives to avail storage facility. The WOA also want to put an eye on the seed companies and closely follow the whole process including seed pricing. A case in point was that the Ethiopian Seed Enterprise planned to sell at lower price[2] than the regional price and Avallo international fixed higher price in which the WOA intervene in both instances and negotiated to set price.

[2] *Note that ESE planned to sell at a lower price not from market point of view but it was difficult for them to violate the price, which was decided by the board.*

Demand Estimation and supply

Conventional demand estimation

The traditional approach of estimating seed demand is almost uniform across the country. Extension/ development agents (DA) who live by the farmers are the first government entities who start the seed estimation process in that particular Kebele. This has to go up through the ladder, where it is first approved at Kebele level followed by woreda level. This has to then be compiled at zonal level and finally consolidated at regional level. At all levels, there are different assumptions that are involved to fix amount. Recent trends show the major challenge of seed leftover, although the supplied amount is far below the demanded. Though a number of reasons could be listed, the level of accuracy of the demand estimation is the major cause of this challenge. Reports suggest that to some extent DAs purposefully add up on the assessed demand for fear of getting only part of what they have requested. In the two non-pilot woredas, only 29.92% of what was demanded is sold. Similarly, in the two pilot woredas the amount of seed sold was only 55.91% of what was demanded.

Demand estimation in pilot woredas

The two companies that participated in the pilot testing came late to the process of demand estimation. However, they have done their part to get some indication on the amount of seed they have to supply to the respective Woreda. To begin with, they took the previously assessed demand from WOA following the conventional procedure. Looking into the figures and further discussion with development agents, cooperatives and Kebele administration, both companies contemplate possibility of over estimation and decided to supply part of what is required (Table 1).

The amount of seed supply in the pilot woredas was less than 80% of what was initially planned. In the other two woredas too, the supply was very much lower than what was planned. In North Achefer, what was supplied was only 30% of the plan and even the reduced quantity was not completely sold. The proportion of sell to demand was only 38% in Mecha and 21% in North Achefer. These clearly show that the planned demand has little to do with the actual demand. In this regard, the system should prove better responsibility and accountability in estimating seed demand.

Table 2. Demand and supply of maize seed in 2011

Woreda	Demand/supply	Varieties (q)		
		BH660	BH540	PHB3253
Dangla (ESE)	Demand	4330		
	Supply	3322.5		
	Sold (%)	64		
South Achefer (Avallo)	Demand	2400	1985	
	Supply	1904	1588.88	
	Sold (%)	60	100	
Mecha	Demand	8340*		
	Supply	2999.875	1984.75	281.875
	Sold (%)	49.21	73.30	96.59
North Achefer	Demand	7825*		
	Supply	60	2159.875	132
	Sold (%)	56.45	69.24	78.50

**this demand is for all varieties*

Supply and leftover

Although there is variability in availability of seed among the four woredas, in 2010 majority of the farmers indicate that there was no enough hybrid maize seed in their locality. The shortage was aggravated by late arrival of seed to the distribution centers. As the result, majority of the farmers used own saved seed and some bought from other farmers. The saved seed and those bought from other farmers could be hybrid maize seed produced through contractual arrangement with public seed sector.

In 2011, the availability of hybrid maize seed is very much improved and majority of the farmers reported that there is no problem of availability. However the extent of availability varied among woredas. In Dangla and south Achefer woredas farmers indicated that there were enough amounts of hybrid maize seed supply and the required type. On the other hand, farmers in Mecha and North Achefer indicated that the there was limitation of supply particularly in terms of the type of varieties farmers looking for. For instance, in Mecha Woreda the demand was for BH 540 but what supplied was only BH 660. Due to this there was big left over of BH 660 seed.

Indeed, in both Dangla and South Achefer, less than half of what has been requested initially for BH660 was sold. By supplying part of the initial request, the companies saved transport cost to and from the sites for about 100 tones at Dangla and 50 tones for South Achefer. In case of Mecha and North Achefer, the gap between demanded and supplied was as high as 1,108 tones. The demand was 1,616 and what was sold is only 508 tons. A number of reasons were mentioned to explain the mismatch between the submitted seed demand and what actually was sold out. The reasons include:

- failing to identify and submit actual demand. Although effective demand is different from need, more than 50% difference and in some case as high as 80% can't lead to a good seed production and supply planning;
- late delivery of seed in non-pilot woredas also increased the discrepancy between demand and actual sale out;
- fertilizer price has increased in 2011 affecting farmers' interest to use hybrid seed;
- farmers used their own hybrid maize seed from what they produced on contractual arrangement with ASE and even sold some quantity to their neighbors. When don't not get new variety, farmers prefer to use the seed in their hand as they know that it is all the same. The neighboring farmers also buy from them, particularly if there is problem in timely distribution;
- availability of credit. In this instance it was decided to sell seed on cash but lately the government allows credit to farmers to by seed. Unfortunately, it was late and some of the poor farmers were excluded from getting fertilizer;
- farmers saw problem on the physical quality in the first few batches of sold seed and changed their mind to use other sources of seed including saved seed; and
- both companies did not assign enough experts to sell seed. As the result, the experts have to shuttle between selling points and thus all stores were not opened throughout the week as expected.

Regardless of many reasons in the list that can justify why the seed supplied was not sold out, the team pin point the weakness in estimating demand to be fundamental issue. From the grass root level getting demand that is close to the reality is very important otherwise put the whole seed chain at risk. Here it is critical to examine by whom seed demand is estimated and assessed and who sell the seed. Under the current condition two different actors are involved in these processes. The cooperative are the ones that sell seed to farmers while estimation is made by government employees who didn't own the seed and loss nothing for what is supplied but not sold.

Price of hybrid maize seed

Farmers were asked if the price of hybrid seed in 2010 was high or not and there was divergence in the response. About half of the farmers indicate that the price is fair while the remaining half indicate that the price was unfair. Base on the survey, the most important reason behind high price is the monopoly of seed market, where cooperatives are the only organizations that sell seed and fix high price to widen their profit margin. This is partly to compensate for their inefficiency. In Ethiopia, cooperatives are less business oriented, and are less efficient in providing the required service (Dawit, 2010). Some other minor issues identified by farmers in affecting seed price are shortage of seed supply and high transportation cost. In non pilot woredas, price of seed is decided by government procedures and was 14.30 Birr/kg for BH660 and 15.30 Birr/kg for

BH540. In the pilot woreda, the price is different as the companies have to set their own price in consultation with the respective WOA.

ESE decided to sale BH660 at 14 Birr/kg and BH540 at 15 Birr/kg. This price was lower than the price fixed by the region and is advantageous to farmers (Table 2). However, ESE was asked to increase the price at least to the level decided by the region. The reason given was that the expected complains from other woredas on price of hybrid maize seed by ESE and ASE in which are both parastatal companies. It was also difficult for ESE to increase the price because the price is normally foxed by board of ESE. These two ideas reflect the reality of seed marketing and the level of flexibility although at last ESE was allowed to sell the seed at lower price.

Table 2: Price of hybrid seed (Birr/kg) in different Woredas

Woreda	Variety	
	BH 660	BH540
Mecha	14.30	15.30
South Achefer[$]	14.57	15.57
North Achefer	14.30	15.30
Dangla	14.00	

[$]. *Price in South Achefer is an average of all selling points*

Avalo International Plc proposed different price with respect to accessibility of market centers. Accordingly, the price ranged from 14.50 Birr/kg to 14.65 Birr/kg for BH660 and between 15.50 Birr/kg to 15.65 Birr/kg for BH540. Avalo was able to convince the WOA and get the permission to sell accordingly. The price increment by the private company for BH660 was between 1.4% and 2.4%, which is actually very small. In 2011, complaint on hybrid maize seed price was similar to the previous year. No complaint on price difference of hybrid maize between pilot and non pilot woredas was filed mainly because the difference was not significant. In fact in Dangla the price was even lower.

Quality of service delivery in seed marketing

With the current piloting activity, it is not a realistic idea to expect actual marketing of seed, as there are a number reasons that will not let to fully exercise the experiment. The practical issue was to assess whether the companies gave better service to farmers or not. It was just an attempt to assess farmers' satisfaction in pilot activities in comparison with what they used to be and by discussing with farmers in non-piloted woredas. Time of seed delivery is

the major component where service improvement is expected. Experience in 2010 shows that distribution was delayed in all woredas surveyed. In particular, farmers in Mecha unanimously indicated that there was a delay in seed supply in 2010. The major reasons for late supply are delay in supply from main source and problem created by cooperatives in distribution after getting the seed. Delayed supply and distribution is an important seed marketing problems that need due consideration.

In 2011, seed delivery to the distribution centre was started nearly at the same time across the four woredas. But there was a clear difference between the two groups of woredas in terms of the time when the seed was put up for sale to farmers. All farmers in the pilot seed marketing woredas get seed in time while majority of the farmers in the other woredas didn't get in time. This was partly because the seed supplied to the cooperatives was not distributed in time and thus the woreda office of agriculture was not allowed to start distribution until they have received the requested amount from the region. The cooperative leaders were also busy by their own farming activities and bureaucracies.

Moreover, farmers in the pilot woreda indicated that the distribution system save their time; as the farmer come to the shop, s/he can buy the seed immediately without any other pre-requisite. It also built trust with the intended accountability and responsibility to the quality of the seed that the farmers bought. Unfair distribution system arisen due to shortage in supply of BH 540 and Pioneer 3253, when the cooperatives selectively give to some farmers.

Nearly all farmers in the two pilot woredas are satisfied with the direct sale of seed by companies due to on time seed sell as well as ease in the purchasing procedure. There was also fair distribution as there was no serious shortage of the varieties farmers looking for. However, all this points of satisfaction are better only in a relative term. Otherwise, the two companies did not always open their selling shops because of staffing problem. The sells persons were forced to shuttle among the selling points that created a discomfort on the farmers' side. On the other hand, in other woredas where marketing was done by cooperatives, the distribution was late; cooperative do not open all the days and farmers has to queue for some times to get the seed; and there was also unfair seed distribution that arose dissatisfaction among farmers with regard to distribution.

View of Woreda experts in direct seed marketing

Although experts at woreda level are not direct beneficiary of the seed marketing, it was important to look into their views as they players a major role in the seed system. Moreover, agricultural experts in the woreda consider themselves as a guardian of farmers and do not tolerate any thing that put farmers in disadvantage. In fact, the woreda experts and decision makers

initially saw the pilot experiment as something strange since it was not in their mind that private companies can directly sell seed. Since it is a decision from the region, they bear it and agree to support the initiative. During the implementation, they found their involvement, although still high, was low. That gave them a big relief and showed that there is also other ways to implement an activity.

Experts identified the timely availability of seed as the advantage of the direct seed marketing exercise. Despite the fact that some experts still are unclear on to how seed could be handled by private companies, they appreciate the outcome. This may give an indication on the effort required in orienting experts if system change is to be implemented. Moreover, seed marketing implementers indicated that to undertake seed as a viable business enhancing the current poor capacity of seed producers to market seed on their own requires due attention.

Conclusion

Despite the overwhelming claim for shortage of seed supply, the amount of seed left unsold in store in the country is increasing over years particularly for hybrid maize that illustrate inefficiency in the chain starting from planning to distribution. The involvement of the seed producers is mainly limited to seed production while other activities including assessing demand as well as distributing the seed is left to the government structure, although finally cooperative distribute seed to farmers. For this reason there is lack of accountability along the chain affecting effective planning and distribution. This pilot activity is designed to examine whether direct seed marketing by producers will improve accountability as well as efficiency in seed delivering.

Direct marketing of seed by producers is uncommon and the process of convincing stakeholders and partners required long process. While the divergence in idea as to whether it benefits farmers or not is yet to be decide, there was substantial resistance to accept the idea initially. Nevertheless, with unreserved effort, it was possible to pilot direct marketing in Amhara region. Among the two private and two public seed companies selected to include in the piloting study, one private and one public seed companies dropped out through the process which can be an indication that even the companies are not ready to be involved in seed marketing. It is with the support of the local authority that the other two remained engaged in the piloting. At the same time, throughout the process, WOA keep on controlling every details which can be an indication for mistrust developed on companies and private sectors that may remain as challenge in decentralizing seed marketing system. The initial plan was to market seed through agro-dealer. However, companies that participated in the piloting did it by their own mainly because of the lack of licensed agro-dealers and to some extent due to the limited trust these companies have on agro-dealers

with regard to seed management and ethics. This may be of a concern and emphasis has to be given in cultivating agro-dealers as the concept is new and its progression requires time.

The gap between estimated demand and actual sale is mainly because of accountability and lack of direct financial consequence on those who estimate demand. In short period of time, with a thoughtful observation and information gathering, the companies have reduced the mismatch between demand and supply and saved some financial loss that could have occurred in transporting the excessive supply. Even the whole of what they supplied after adjustment was not sold. The indication is that it is the owner of the seed and or those that are engaged in seed marketing, including the cooperatives, who can estimate the demand better since the mismatch in supply with demand do cost themselves.

Price of seed is fixed by the government and companies have less room to determine their price. Indeed, in South Achefer, where the private company sold the seed price was higher. On the other hand, in Dangla, where public seed enterprise participated, price was lower even below from what the regional government set. This price variation is not regulated by the market but ESE can only sale at a price fixed by its board. These may indicate that, with further piloting, the process of setting price based on demand and supply of seed will require better understanding of the pros and cons.

Providing quality services to farmers was the major focus of the pilot study. Despite that, direct seed marketing is a new paradigm in the seed system. According to this study, seed companies tried to provide relatively better service to farmers mainly in terms of on time seed delivery: they start to sell seed ahead of planting time, opening their shops relatively for longer hours and selling seed with no bureaucracy. Although, the improvement in service provision was not to the expectation, farmers expressed their satisfaction. Direct seed marketing enlightened farmers to whom they make account in case of seed quality failures, which was not the case before. The procedure gives a relief to the woreda experts from heavy workload that arises from organizing seed distribution and has help seed producer to realize the possibility of direct marketing.

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Farmers' Strategies to Ensure Seed Security: A Key Component in Seed Demand Assessment

Regassa Feyissa

Ethio-Organic Seed Action (EOSA)

Introduction

Self-retained seed from own harvest and farmer-to-farmer exchange are the major sources of planting materials that dominate the seed supply under most small-scale farming systems. This local seed system provides farmers with access to seed of both traditional and modern varieties, in diversity they require, in time for planting and at a cost, they can afford. In most cases, the quality of seed reaching farmers in this way is comparable with that of formal seed sector (Regassa Feyissa, 2007). The public sector although has the responsibility of seed production and distribution, is limited in capacity to meet seed requirements of small-scale farmers. It also focuses on few crops that bring profit to the enterprises. In some cases, the private seed sector operates but with the objective that is at odds with the needs of small-scale farmers, who require seed of multiple varieties of all crops they grow, and in small amounts, at the right time, from the nearby and at a reasonable cost. In general, the formal seed sector (public & private) in many developing countries has little contribution to the overall seed system.

In Ethiopia, the potential use of formal seed, characterized by a vertically organized production and distribution scheme, is limited to a few favorable conditions. The share of seeds of formal varieties in the entire seed supply system of the country can hardly reaches 10% (Zewde *et al, 2008*). One of the major reasons is the focus on developing limited uniform formal varieties. In such a country of diverse agro-ecology with unique requirements that at times are marginal to those uniform formal varieties, especially to those that have narrow adaptation plasticity. In general, with the exceptions of hybrid maize and bread wheat varieties for which the adoption rate is significant, particularly in the relatively uniform high potential areas, and a few legume crops, nearly all planting materials for both formal and informal varieties are farmers own seed.

However, regardless of the enormous contributions of farmers' seed system to the entire agriculture of the country, there is little support to strengthen the system. This farmers' system necessarily requires systemic enhancement to

boost its potential to develop into a sustainable local seed systems that operate in networks, and in a more concerted and organized way. It is also essential to work towards integrating the formal and the informal seed systems, which as of now are functioning in parallel.

This paper presents strategies farmers follow to be seed secure, challenges to their strategies, and support required to enhance and strengthen the local seed system as a whole.

Strategy of Farmers Seed System

Small-scale farmers' seed systems are usually characterized by agro-ecological conditions, the extent of crop diversity; the cultural practices used to t manage it, and the farmers' socio-economic objectives and needs. The common denominator for small-scale farmers' seed system, however, is the genetic diversity that the system harbors in order to stabilize production. Diversity supports livelihoods and minimizes environmental and socio-economic risks, and provides the opportunity to intensify production with limited resources. It is also a security against crop failure where smallholder farmers grow several genetically distinct varieties of crops within the same field. This is how they always reduce the risk of crop failure due to pest and diseases or adverse environmental conditions (Melaku et al., 2000).

As strategy, smallholder farmers always maintain seeds of a range of crop varieties in gardens, back yards, and fields and in their traditional storage facilities unless situations dictate otherwise. The farm household small storage containers (clay pots, gourds, underground pits, etc) got example, represent a "*de facto*" *ex situ* seed reserve, which in evolutionary sense is more dynamic than that of the conventional seed bank. These facilities together with farm fields form a complex of communal seed system. In general, reproduction of seeds by farmers themselves is a basis for local seed strategy where they consistently retain seed as a security measure by providing a backup in case of crop failures. They always store seeds for three main purposes consumption, sale and as seed stock (Melaku Worede, 2011).

Small-scale farmers, have a flexible and dynamic seed strategy in order to meet agro-ecological and socio-economic challenges over space and time. In the process, they develop, manage and use new forms of their varieties, which basically are heterogeneous but at times could also be monotypes, based on the objectives and needs they develop it for. Farmers may also discard the diversity that does not match the new challenges, which is a reality in evolutionary processes. As to the small-scale farmers' production strategy, the inherent heterogeneity of their varieties ensures a degree of adaptability and resilience under changing conditions such as shifts in climatic conditions and emergence

of new races of diseases and pests. For this reason, farmers usually prefer heterogeneous but stable forms than monotype varieties, where unlike monotypes; stable polygenic forms serve the purposes of both conservation and production with maximum opportunity in maintaining the co-evolutionary process, and without excessive loss of genotypes. This is a basic strategy for farmers' decentralized breeding or development of stable forms of their varieties over locations and at different times and for different purposes.

Most farmers in Ethiopia practice seed selection, production, saving and informal distribution by their own, although this is usually unnoticed or insufficiently recognized. The seed production under this strategy in most cases is non-specialized and is rather an integrated production of field crops, roots, and tubers for consumption and marketing as the case may be (Regassa Feyissa 2000). Maintenance of diversity in this way provides farmers with wide option and self-reliance in terms of plating materials, and enables them to ensure household level food security. Unfortunately, this farmers' strategy is at times judged from distance, the effect of which is wrong perception of small-scale farmers' practices and strategies. The context in which farmers' varieties, the landrace, is still conceived of but distantly, particularly by those who admire the superiority of single-gene over polygenic forms, is one such example for remote judgment.

It is very important to recognize that small scale farmers variety use and development as well as seed production and exchange mechanisms still remain central component of the dynamic system that play a major role in the agricultural system of the country (Regassa Feyissa 2000). . This traditional seed system is an important backup to the overall agricultural crop production, and functions outside legal regulation, in most cases, and serves as a source of seeds of both formal and farmers' varieties. Usually, farmers' dependency on external seed sources occurs due to climatic impacts that may cause poor stability of some varieties, and due to displacement of farmers' own varieties.

Challenges to Farmers Seed System

With the advent of frequently new affections for modernization and centralization of seed supply systems, the seed security strategy of small-scale farmers' based on species and varietal diversity is challenged with disruption, and is eroding beyond the pace of the process for its developmental change. Moreover, although this farmers' seed system remains a huge potential to draw up on, the economic valuations of agricultural crop productivity for the most part overlooks its important contributions. The risk is that the economic valuation may favor benefits, but may not be long lasting or sustainable. The steady depletion of traditional crop systems leads to shortage of seeds of locally

adapted crop varieties. This scenario would have a direct implication on local and national food security, especially under the situation where the climate change chaos is bringing more difficulties to rely on narrow options.

The farmers' seed system in many developing countries is already troubled with various challenges forced by different factors such as loss of crop types and varieties, and changes in socio-economic and agro-ecological conditions. Under such circumstances, small-scale farmers remain deprived of diversity and alternatives while the formal seed sector is not in a capacity to satisfy seed demand of diverse crops that such farmers are in need of. The private seed sector, in this case, is of a little help since its interest is on crops and varieties that generate more profit. On the other hand, there is limited public seed sector investment for strengthening farmers' seed system. The effect of all these ultimately played a role in exacerbating food insecurity in the country.

With increasing local farm population and land fragmentation that complicates agricultural productivity to feed all, there is a clear link between relatively declining investment on building and enhancing local farmers' capacity and a decline in performance of the seed sector and productivity as a whole. Few technologies and efforts aim at local farmers' varieties and their seed systems. In fact, farmers' varieties and seed systems are locked out of the scene of those concerned.

The result is that many farmers' varieties of different crop species, which beyond being sources of planting materials are reservoirs of genes for present and the future use, are deprived of attention that gradually disfavor their acceptance as compared to those formal varieties on which much has been invested. Myths that farmer varieties are not as high yielding, but without any investment to enhance their productivity, has pushed these varieties off the development line, being also one of the causes for local seed insecurity.

In Ethiopia, the formal plant breeding has had little success in enhancing local farmers' varieties, which had better meet farmers' needs, particularly in physically and economically marginal environments, even in those crop types for which Ethiopia is a center of diversity and origin. Crop improvement activities and investment mainly focus on potential production areas and on a few crop varieties such as hybrid maize. As a result, a few crop varieties are available for less favorable environments. Many of the wheat varieties become susceptible for major diseases in a very short period after their release. Shortage of new varieties and their limited stability over diverse locations therefore, is one of the big challenges that farmers' seed system faces. The situation discourages the adoption of new varieties by small-scale farmers and weakens the local seed system. It is at this point, where the tragedy of food self-insufficiency starts as the alternative sources of planting materials shrinks.

Under the above-mentioned circumstance, the alternative source of seed for unfortunate farming communities would only be the formal seed system, which includes commercial seed producers. However, the formal seed system, characterized by a vertically organized production and distribution of tested seed of approved varieties, in most cases is imperfect under the o small-holder farmers' condition. On another, the commercial seed system by its nature does not produce and distribute seeds of subsistence crops mainly produced by the smallholder farmers. Due to profitability, the commercial seed system has no focus in targeting farmers living in economically marginal and environmentally diverse areas, It is only farmers' own seed system, in where it is not disrupted, which supports the livelihoods of the poor in areas that cannot be covered by commercial seed system and the products of the formal plant breeding.

Being disrupted and devoid of support, this community-based seed diffusion mechanism cannot continue to supply seeds of all crop types forever in a larger quantity and for all micro-agro-ecologies. One of the reasons for this is sharp decline of growing different crops at household level due to shrinking of household farm size caused by land fragmentation. As a result, consistent access to seeds of those crop types of immediate household use is declining at local level, remaining a challenge to small-scale farmers. Moreover, the unpredictable seasonal rainfall variability induced by climate change is exacerbating the situation; in case of failure of first planted crop type, seed for replanting is required. In a situation where access to sequential crops lack, small-scale and diversity based farms would continue to face seed shortage. Hence, impact of climate change on the seed sector (formal & informal) should not be underestimated and will continue to be a formidable challenge.

Strengthening Farmers Seed System

Farmers' seed system is dynamic, co-evolving with environmental and socio-economic changes. To adapt to the changes, farmers develop new varieties that best fit to their specific environment and satisfy their needs and objectives. Following a long-standing tradition, they retain their own seed stock unless disruptive circumstances prevent them. The system however is at stake due to different factors requiring immediate attention. In order for the small– holder farmers to effectively exploit their productive potential, the age old traditional seed system (seed banking, seed multiplication and distribution, processing and marketing of products) requires some sort of backstopping. . This may include measures for supporting community initiatives for sustainable financial services, establishing savings and credit co-operative and other forms of assistance which could be incorporated into existing community activities.

This approach give farmers ready access to planting material with a complete control on the choice of crop types and cultivars adapted to local growing conditions, and . Farmers will also be in a position to critically evaluate the relative merits of a wide range of cultivars thereby limiting undue expansion of cultivars that are costly and poorly adapted. These local seed networks, which include local markets and traditional seed exchange system, give access to seed of displaced crops. Nevertheless, this is true only where displacement has occurred throughout the communities at large.

To address the complex environments under which the small-scale farmer is operating, the formal breeding system has to promote decentralized participatory variety development programs. The programs need to be built upon the indigenous knowledge of farmers to select planting materials suitable to their condition and requirements. This approach can create complementarities between the practices of formal breeders and those of farmers and increase the effectiveness of variety development activities.

The efficiency of the approach can be enhanced through increasing the level of seed reserves at community level and putting in place adequate capacity to enhance, multiply, and distribute landraces and their enhanced forms. Similarly, appropriate roles should be set for the public sector, private seed industry, where they exist, and for the informal sector that ensure complementarity to each other.

Implication of Farmers' Strategies in Seed Demand Assessment

For small-scale farmers, seed is an essential social good and household level capital upon which livelihood depends. . Almost all social, cultural and psychological values of food are embedded in seed. At farming community level, seed and the seed culture bind people together and in some cases remain points of reference and identity for households or individual farmers In general; seed at farming community level is not considered as a commodity, but as an asset with a range of socio-economic, bio-cultural, and agro-ecological values. It is the constitution of the values embedded in seed that brings complexity and dynamism in farmer seed systems. The level of the complexity and dynamism is usually reflected in the seed strategies farmers employ under different farming and production systems.

Nonetheless, farmers' seed strategies are flexible, open-ended and follow patterns of production systems, patterns of changes in agro-ecological requirements and conditions as well as patterns of socio-economic needs.

Farmers' demand for planting materials and their strategy of retaining seeds are based on these patterns and requirements as well as on many other factors. Assessment of farmers' seed demand should therefore, consider and understand first the values embedded in the local seed system and the nature of the seasonal cropping pattern of a particular area in a particular season.

Under mixed farming system of small-scale farming, which is unique to Ethiopia, for example seeds of sequential crops and varieties of same crop but of different planting time are maintained for strategic production reasons that include security against crop-failure. Secondly, unless situation dictates otherwise, small-scale farmers do not usually plant a farm to a single crop, season after season. They rather prefer plant a farm with diverse crops to time and space. Similarly, when we consider the traditional agronomic practices and household level nourishment, cereals and legumes are not mutually exclusive but essentially go together. Therefore, farmers always need to have seeds of these crop types.

What described above are some of the features that describe farmers' seed strategy for which diversity within and among crops should be a norm. These features of small-scale farmers' seed strategy and requirements are usually overlooked and wrongly measured by the standards of commercial seed production system. Reduction of the local seed system to a narrow context of simple business deal, often results in disruption and deterioration of local seed systems, the consequence of which would be seed insecurity. To this end, any effort for assessing local farmers' seed demand is advised to consider the above and many other governing factors specific to farming and production systems as well as to the existing and emerging socio-economic objectives and needs of the farming communities.

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