Onion seeds assessment for strengthening onion seed value chain

Fogera and Mecha districts

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Acronyms and abbreviations

Agro-BIG	Agri-Business Induced Growht in the Amhara Region
ANRS	Amhara National Regional State
ARARI	Amhara Region Agricultural Research Institute
ASE	Amhara Seed Enterprise
BoFED	Bureay of Finance and Economic Development
CSA	Central Statistics Agency of Ethiopia
DAP	Diammonium Phosphate
EC	Ethiopian Calender
EIAR	Ethiopian Institute of Agricultural Research
EUHS	Ethiopian Urban Household Survey
FAO	Food and Agricultural Organisation of the United Nations
GTP	Growth and Transformation Plan
Ha	Hectare
MARC	Melkassa Agricultural Research Center
Masl	meters above sea level
SPSS	Statistical Package for Social Sciences
SWOT	Strengths, Weaknesses, Opportunities and Threats

1. EXECUTIVE SUMMARY

The annual demand for fresh onion, both for Ethiopia and the region is growing. However, at present the supply is still erratic and in some instances imports (e.g. from Sudan) have been necessary to satisfy the national demand for fresh onion.
On the other hand, the onion prices are not always attractive / cost-covering for farmers. In particular during the harvest-season when substantial quantities of fresh onions are offered for sale this is the case.
Recognizing the potential for onion production in the region, the Agri-Business-Induced Economic Growth (Agro-BIG) Programme, has selected onion as one of the crops / Valua Chains. Pilot woredas are Mecha and Fogera in Amhara Region.

Recently the Agro-BIG team has carried out a Value Chain Analysis for onion. One of the main findings was that the lack of seeds (in quanlity and quantity) was a major constraint for improved and increased production. Unlike some other crops, the seed system for vegetables is not yet well developed. Therefor the programme commanded a specific study focusing on the onion **seed** Value Chain. By collecting detailed information on the seed VC, the programme will be in a better position to advice on adequate activities and measures for the reduction of the specific bottle-necks. The present study concentrates on the two pilot woredas, Mecha and Fogera. However, as the VC actors get beyond these boundaries, e.g. when selling to middlemen / traders who sell it in Addis, the study is not limited to these two woredas. The present report presents the results of the onion seed Value Chain. As this report is a complementary study to the one on the onion Value Chain in general, information available in the latter one is not repeated.

The onion seed Value Chain seems to be relatively short and not so complicated. Despite this it is not necessarily very transparent. When it comes to the direct actors, it is as yet not very clear who exactly plays which role and who benefits how much. Farmers mention the lack of quality seed but at the same time they do not yet seem prepared to pay a (substantial) higher price for quality seed.
Most seed growers appear to be quite informal, and are neither well organised, nor very well linked to the market. There seems to be ample room for the enhancement of application of good agricultural practices. Also cost-calculation as part of the business planning can be strengthened.

So far the Ethiopian Institute of Agricultural Research (EIAR) has released six improved onion varieties. However these are not yet widely available and ANRS is one of the regions where farmers face difficulties in obtaining them.

The certification of the produced seeds remains a concern. As most of the seed is produced from seeds from unknown sources, the options for certification are limited not to say zero.

Taking these findings into account as well as the focus and objectives of the programme, some key recommendations have been formulated.

2. INTRODUCTION

2.1 Background and context

The Agro-BIG programme employs a value chain approach to address constraints of the production of agricultural crops. As a first phase, the programme has started to work in two districts, Fogera and Mecha (Agro-BIG, 2013). The crops that have been selected are onion and potato. In the future the number of districts covered by the programme as well as the number of crops will be increased.

One of the reasons that the Agro-BIG programme selected onions is that it is considered as an important crop in Ethiopia. According to FAO (2010) onion is among the most important vegetable crops in the country. In Africa, Ethiopia is the third biggest onion producing country, after Egypt and South Africa.
However, the average onion yields in Ethiopia, which varies from 13.8 to 10 tons per hectare, is relatively low (FAO, 2012). At research level average yields of 30 tons per ha have been achieved in Ethiopia. In comparison, South Africa has yields that vary from about 15 to over 40 tons per hectare at farm level. Although the South African and Ethiopian contexts are not the same and different onion varieties are being cultivated these figures may indicate that there is still potential in Ethiopia for a substantial increase of the average yield per ha of onion production.

On the demand side, the demand for onion both for Ethiopia and the region are growing; expectations are that the overall demand for onion will continu to rise. However, the Ethiopian production has not always been able to meet the demand in terms of quantity and quality. Nor did it always satisfy the quality-price expectations of consumers, i.e. they want value for their money and may consider that imported onions respond better to their expectations.
The supply is erratic and in some instances onions were imported from neighbouring countries, like Sudan. The specific reasons for these imports, e.g. non-availability in Ethiopia, more value for money (better quality for the same or lower price), still need to be further investigated.
Neither for the locality nor for the region as a whole studies/ predictions regarding the total annual demand for onion seem to be available.

2.2 Need / justification of this present study

Recognizing the existence of great potential for agriculture in general and for onion in particular, the Agro-Business-Induced Economic Growth (Agro-BIG) Programme in Amhara Region, commanded the assessment of the onion seeds value chain in Mecha and Fogera districts.
Unlike other field crops, the seed systems of vegetables are not yet very well developed (IFPRI, 2010; ASE, 2013) in Ethiopia. This together with the fact that farmers identified the lack of onion seed (quality and quantity) as a major constraint indicated the need for a detailed study on the onion seed value chain. In this way the exact nature of the constraint would be analysed as well as possible actions to mitigate the bottlenecks.
This onion seed study is meant to contribute to a better understanding of the exact nature of the lack of onion seed. It is also meant to provide practical recommendations regarding what can realistically be done by the Agro-BIG

programme to contribute to an improved onion seed supply, paying attention to the possible contributions as well as interests of all the onion seed value chain actors.
The key objective of the study is to analyse the onion seed supply and demand providing more information on the constraints as encountered by the various actors in the onion seed value chain as well as in the onion value chain. Practical and realistic recommendations on potential support from the programme to the onion value chain actors, in particular those involved in the seed supply, should be provided.

2.3 Scope of the study

The study focuses on the onion **seed** value chain. The Agro-BIG team has already conducted a Value Chain Analysis on onion. Where relevant information from this study has been integrated in this present study on onion **seeds**. It has been avoided to repeat certain information and data in this present report on the onion seed value chain or, in other words, this present study has focused on onion seeds. Those who need more information on onion production and the onion value chain in general are advised to read the VCA report (Agro-BIG 2013).
Also, the study focuses on the 2 pilot woredas of the Agro-BIG programme, Mecha and Fogera, where onion cultivation is important. Obviously as it looks into a value chain whereby flows of products/ goods/ information are important, it is going beyond these two woredas where relevant.

2.4 Methodology

Sample frame, design and size

Two stages of random sampling were used in the study. The first stage involved the selection of onion growing kebeles at district level and the second stage involved the selection of onion seed producing farmers in those selected kebeles. Thus, the first stage sampling frame constitutes onion seeds growing kebeles and the second stage the farmers.
In the two districts, a total of 4 onion growing kebeles were randomly selected: 3 kebeles in Fogera district (Awa Kokit, Kuhar Michael and Bebeks) and 1 kebele in Mecha district (Kudmi). In each of these kebeles, 10 onion growing farmers were randomly selected. Thus, the total number of farmers covered in the study was 40.

Data collection methods

Relevant literature was reviewed. Primary and secondary data were collected using the following methods:

- a questionnaire for farmers' interviews;
- collection of information on production, marketing, opportunities and constraints in the onion seed value chain from key informants across the onion value chain;
- focus group discussions with farmers at kebele level to complement and cross check the findings from the interviews as well as to evaluate the system employed in onion value chain;
- collection of secondary data.

Data organisation and analysis

The Statistical Package for Social Sciences (SPSS) was used for statistical analyses of the data.

3. BACKGROUND AND CONTEXT OF ONION PRODUCTION IN ETHIOPIA

3.1 Onion in Ethiopian agriculture in general and in ANRS in particular

Onion is among the major root crops grown both at the country as well as regional level. In 2011/2012 and 2012/2013 Meher season, the national onion production reached about 3,281,574 quintals and 2,191,886 quintals, respectively (Table 1). Slightly over half of this was produced in the ANRS (2011/12 season).

The average yield (2011/12 season) in ANRS (about 138 qt/ha) was about 28% higher than the average national level. During the next agricultural season (2012/13), the total area planted with onion in Ethiopia went down considerably. The same could be noticed at ANRS level. Because of the smaller area planted, the total onion production went down as well. Another reason for this lower production was the decrease of the average yield per hectare, both at national level as well as at ANRS level (down to about 126 qt/ha). The causes for this decreased yield still have to be further investigated.

According to the data obtained from the respective district agricultural offices, yields of onion seeds lie between 5 to 8 quintals per hectare, whereas the highest productivity of onion seeds was recorded in Mecha district, namely 8 qt/ha. On the other hand the highest (274.8 qt/ha) and the lowest (165 qt/ha) productivity of onion bulbs were recorded in Fogera and Mecha districts, respectively.

At the regional level, for the above two Meher seasons, the volume of onion **production** reached about 1,676,007 quintals and 999,725 quintals, respectively. For the 2011/2012 and 2012/2013 Meher season production levels, onion stood second (after potatoes) and third among the root crops at the regional level (Table 1). In terms of yield (productivity: quintals per hectare), onion was the first respectively the third major root crop at the regional level for the above mentioned seasons (Table 1).

Regarding onion production, the Amhara region production contributed about 51% and 46% of the national onion production in 2011/2012 (2004 E.C) and 2012/2013 (2005 E.C), respectively (Table 1).

Table 1. Main root crops in Ethiopia: area covered and production

	2011/2012 (2004 Eth. calender)			2012/2013 (2005 Eth. calender)		
Crop	Area (Ha)	Production (qt)	Yield (qt / Ha)	Area (Ha)	Production (qt)	Yield (qt / Ha)
Onion	30,478	3,281,574	107.67	21,865	2,191,886	100.24
Potato	59,509	4,754,405	79.89	74,935	8,633,478	115.21
Garlic	13,279	1,239,615	93.35	21,258	2,225,479	104.69
Taro	39,696	3,152,421	79.41	41,338	11,177,734	270.40
Sweet potato	51,313	3,901,352	76.03	41,634	11,850,508	284.64

Sources:
Adapted from CSA Volume I (May 2012) Report on area and production of major crops in 2011/2012 (2004 Eth. Cal).
Adapted from CSA Volume I (May 2013) Report on area and production of major crops in 2012/2013 (2005 Eth. Cal).

Table 2. Amhara: land used for growing onions and average yields; 2011/12, 2012/13

2011/2012 (2004 Eth. Cal)			2012/2013 (2004 Eth. Cal)		
Area (Ha)	Production Qt	Yield Qt /Ha	Area (Ha)	Production Qt	Yield Qt /Ha
12,175	1,676,007	138	7,918	999,725	127

Sources:
Adapted from CSA Volume I (May 2012) Report on area and production of major crops in 2011/2012 (2004 Eth. Cal).
Adapted from CSA Volume I (May 2013) Report on area and production of major crops in 2012/2013 (2005 Eth. Cal).

3.2 Common onion varieties in Ethiopia

Up to date six onion varieties: Bombay red, Adama red, Red creole, Mermiru brown, Mermiru white and Nasik red varieties of onion were released by the Ethiopian Institute of Agricultural Research (EIAR). However, none of the varieties were available for Amhara region. There was also no onion seed supply by the regional research institute, ARARI. The main reasons and causes behind this still have to be further investigated.

In Ethiopia in general and in Fogera and Mecha districts in particular, Bombay Red is the most grown variety under irrigation. Farmers have a preference for Bombay Red, mainly because it produces well i.e. a high yield compared to other varieties. Under the same circumstances and given the conditions in the area, Bombay Red has a relatively high yield compared to other varieties. Another reason is that the variety has a relatively short growing season. This allows farmers in irrigated areas to have 3 growth-cycles instead of 2. Yields of up to 400 qt/ha were observed in farmers fields (Olani, 2010. p.2). This is mainly due to the fact that this variety yields well under higher plant density. It can produce good bulb size at a spacing as low as 4 cm between plants. However, Bombay Red is not very suitable for production under rainfed conditions as it easily rots in the field if it rains during maturity stage.

Adama Red can only produce a good bulb size at a plant spacing greater than 6 cm between plants. However, Adama Red can be produced under rainfed conditions as it is not as sensitive as Bombay Red to rotting at maturity stage as a result of rainfall (ibid).

Table 3. Released onion varieties in Ethiopia

Variety	**Maturity (days)**	**Seed produ-cing ability**	**Seed yield (qt/ha)**	**Bulb colour**	**Yield in research field (qt/ha)**	**Yield in farmers field (qt/ha)**
Bombay Red	90 - 110	High	13 – 20	Light red	250 - 300	
Adama Red	110 – 130	High	10 – 13	Dark red	300 - 350	90 - 150
Red Creole	130 - 140	proble-matic	2 – 6	Red	270 - 300	90 - 150
Mermiru brown	120 – 130	High	12	Brown	NA	NA
Mermiru white	NA	NA	NA	White	NA	NA
Nasik Red	NA	NA	14	Slightly reddish	265	187

NA: not available
Sources:
Ministry of Agriculture, 2013;
Fikre Mulugeta and Olani Niku, 2010 in Tadesse Adgo Mihiretu;
Lemma, D. and A. Shimeles, 2002.

All of the varieties presented in the table above are hold in the Melkassa Agricultural Research Centre (MARC).

3.3 Brief description of Fogera and Mecha districts

In the surveyed areas, about 83% and 90% of farmers in Fogera and Mecha districts grow onion every year with a very limited rotation of the land.

Fogera district

The district has a total area of 117,405 hectare of land and the climate is predominately lowland. The altitude ranges from 1,774 to 2,415 meters above sea level (masl). A land survey in Fogera showed that about 44% is arable or cultivable and another 20% is irrigated (IPMS, 2010). Teff, maize, rice, sesame and onion are the most important cash crops. The land covered by onion crop reached 6,671 hectares in 2013 (Agro-BIG, 2013).

Mecha district

Mecha has a total area of 156,027 hectare of land of which about 53% is arable or cultivable and another approximately 5% is irrigated. Wheat, maize, barley, potatoes and onion are the most important cash crops. The climate is predominately lowland.

4. MAIN ACTORS IN THE ONION SEED VALUE CHAIN

The existing opportunities and constraints in onion **seed** value chain were assessed whereby **direct and indirect actors** were contacted.
The main direct and indirect actors in the onion seed VC in the 2 woredas are as presented in table 5 below.

Table 4. summary of onion **seed** value chain actors and functions

Function	**Actors performing the function**
Input supply (like fertilizer, pesticides, …)	Cooperatives, unions, federations Government institutions, agriculture office (extension advice), etc. Private companies, NGOs
Release of (new) seed varieties	research institute
Basic seed production	Farmers ……
Market information	Brokers (to be confirmed, more research needed)
Transport	Broker / wholesaler
Processors	None as seed is not processed
Grading	No grading as such?? But cleaning and selection of seed (have to get rid of the 'empty' seeds)
Buyers	Farmers Cooperatives (further research needed) 1 seed seller: sold to broker who sold to/bought on behalf of a w/saler
Service providers	• Bank – financial services • Certification Agency – certification • Research institutes – research on varieties; release of new varieties

The **direct** actors include producers, traders and retailers. Those actors who provide services for the functioning of the value chain such as the financial institutions, business service providers, government, researchers and extension agents are under the indirect actors of the value chain. The indirect actors are e.g. the Certification Agency, the Research Institutes (ADET, ARARI); they provide services (direcly or indirectly) but do nowhere in the chain own the product (is onion seed).
Below, a brief decription of each category of main actors in the onion **seed** value chain.

Farmers

Depending on the timely availability of the required quality and quantity of seed, the farmer's ability to pay, and his or her awareness of a perceived advantage over farmer-saved/traded options will determine whether a farmer adopts a certain variety, practice etc. Timely availability of seed is driven by the efficiency of the seed system.

Up to date very little attention has been paid to the fact that female farmers may have other criteria for selecting a variety than male farmers. As many farmers are female, this aspect should not be neglected.
Onion production in Fogera and Mecha districts was seriously hampered by various constraints. 57% of the farmers' respondents in Fogera mentioned the lack of onion seeds as a main bottleneck. This made it the third most important constraint, after shortage of water (27%) lack of market (63%).
In Mecha district the most important constraints that were mentioned were plant diseases (60%), high cost of fertilizer (30%) and lack of market (23%). So, although lack of seeds was mentioned it was not amongst the three main constraints.
With the exception of one farmer at Fogera district, the other respondents mentioned the absence of a well regulated market for the sale of their onion seeds and onion bulbs. The farmers' cooperative of onion producers at Fogera district is very weak and unable to solve the problems encountered by its members. This issue needs to be investigated further because it may appear that the farmers expect a guaranteed sale at a guaranteed price. Even with contract farming this is rarely offered and one should make sure that the farmers have realistic ideas on their perspectives.

Research institutes
In the regional seed system, the research institute is responsible for providing the early generation seed classes like breeder seeds and pre-basic seeds. The next responsible organizations are the public/private seed growers who advance to basic and certified seed classes.

Certification Agency
Neither public nor private seed growers in the two woredas under study produced certified onion seeds. However, individual farmers and private growers did produce onion seeds. As they used seeds from an unknown seed source they eventually failed to get a certification from the Seed Quality Regulatory office (Bureau of Agriculture, ANRS).

Seed suppliers / growers
The seed supply system for the main crops is whereby seeds are distributed and sold to the farmer, mainly through farmer unions and cooperatives. Unlike improved seeds like hybrid maize, wheat, teff, etc., onion seeds are not part of this seed system in Amhara region. In the region, neither the research institutes nor the public seed enterprises do produce onion seeds and thus are unable to supply onion seeds to farmers.
The only available seed supply is from private traders, mostly from unidentified seed sources. As a consequence, the seeds and bulbs produced by farmers can not be accepted by the government seed distribution system of the region. Thus the seed distribution is left exclusively in the hands of private traders.

Table 5. Area coverage and production status of onion seeds

	Fogera district			Mecha district		
Crop year	Area (Ha)	Product. Qt.	Yield Qt/Ha	Area (Ha)	Product. Qt.	Yield Qt/Ha
2013 (2004/2005)	23.00	115.20	5.01	11.00	88.00	8.00
2012 (2003/2004)	18.43	92.13	5.00	2.00	16.00	8.00
2011 (2002/2003)	24.00	168.00	7.00	1.25	10.00	8.00
Total	65.43	375.33		14.25	114	

Source: Fogera and Mecha district agricultural development office (2013)

Observation: the data on Mecha have to be verified as, statistically, it is highly unlikely that the average yield is the same (up to two decimals) for 3 years in a row.

As onion is an increasingly important crop, attention should be given to include onion seeds in the existing seed supply system.

Supply of agricultural inputs

With the exception of fertilizer, which was exclusively provided by farmers' cooperatives, all the remaining critical inputs such as seeds, pesticides and others were provided by private traders.

5. AGRONOMY OF ONION / ONION SEED PRODUCTION

5.1 Seed production

The two main ways of producing onion seed are either through bulb-to-seed production, or through seed-to-seed production.

a. 'bulb to seed' seed production

Onion seeds production from bulbs is the most common in Ethiopia. Onion bulbs grown in the warmer season (February to June) are collected and stored for one to two months at a temperature of around 12^0C. They are planted during the cool season, August to December. The production of seeds with the 'bulb to seed' method takes about 15 months.

It is recommended to plant in two rows on a raised bed of 50 centimetres (cm) width. Depending on the conditions in the field, the variety etc. spacing between rows and plants may be 30 cm and 20 cm, respectively. To enhance germination, it is advisable to cut the edge of the bulb tip up to half or a quarter of its length.

The number of flower stalks produced by a single onion bulb varies from 3-12, depending on the cultivar. At the breeding station of Melkassa, with controlled conditions and from where most of the varieties are released, yields of 250 to 1,000 flowers1 per umbel were registered (2002; L. Desalegne, S. Aklilu p.40).

b. 'seed to seed production

With the seed-to-seed method, seeds are planted rather than bulbs. The plants grow and mature, are allowed to go to seed, and the new seeds are collected. This method takes around 7 to 8 months to produce seed. The production of seeds of perishable varieties that cannot be stored for a long time is possible with the seed-to-seed method whereas this is not the case with the bulb-to-seed method. A disadvantage of this method is the impossibility to select the best or healthiest bulbs for planting.

As an example for Mecha and Fogera woreda, starting with 4 kg breeder[2] seed for one hectare by the end of the year 1.65 qt of prebasic onion seeds will have been produced (expected yield). This is sufficient to cover about 40 hectares of land. By sowing this prebasic onion seeds by early the next year (2015 if starting in 2014, is year I) it is possible to harvest a minimum of about 206 qt of basic onion seeds by the end of 2015 (year II) (refer to annex 8.4 for details on the seed nomenclatura).

In order to assure the best possible yields with the seed to seed method in Amhara region, the seedlings raised on a seedbed should preferably be transplanted during the cool season, i.e. from October to November (Lemma 2002, p. 47).

1 This depends on the conditions, variety etc. In the literature figures of 200 – 600 flowers per umbel can also be found.

2 For details on the seed nomenclature please refer to Annex 8.2

c. comparison of the two ways of seed production

The table below presents some of the main advantages and disadvantages of the 2 methods for onion seed production.

Table 6. Comparison of advantages and disadvantages of types of seed production

Method	Advantage	disadvantage
bulb-to-seed	• Selection of the best / healthiest bulbs to grow seed	• Takes relatively long, 15 months, to produce seeds • costlier method compared to seed-to-seed
seed-to-seed	• takes a short(er) period to produce seeds compared to bulb-to-seed • lower costs compared to to bulb-to-seed • possible to produce seeds for perishable varieties that cannot be stored for a long time	• Selection of the best / healthiest bulbs to grow seed not possible

The bulb-to-seed method has the advantage that it allows the selection of particular bulbs that offer the desired characteristics and high-quality genetics. However, seed-to-seed production is much cheaper, because there's no need to store bulbs from one season to the next; nor do any bulbs have to be replanted.

Both methods are used by farmers in the study areas, Mecha and Fogera. According to the survey, the majority of farmers in Fogera district used onion bulbs to produce onion seeds but most of the farmers in Mecha district use the seed-to-seed method to produce onion seeds. A few farmers in Fogera district used both techniques to produce onion seeds by directly planting seeds as well as planting bulbs.
In both districts, farmers used Bombay Red for seeds as well as bulbs for production for consumption. Farmers used up to 8 kg of seeds and up to 40 qt of bulbs for planting one hectare. They were unable to get true-to-type Bombay Red variety. Traders were the only available source to them and these did not have a certification for the planting material.

5.2 Growing conditions for onion and onion seed

The quality and quantity of onion seeds produced is influence not only by the genotype but also by environmental factors such as temperature, rainfall and soil conditions. Also, agricultural practices play an important role in ensuring a good and productive seed production. A summary of the main factors and practices has been given below.

Temperature

Onion is a cool season crop and most of the onion varieties are adapted to low and mid altitude areas (700 – 1800 masl) even though they can grow at up to 2000 masl. Onion **seed** production is mainly dependent on temperature levels. The ideal temperature for **mother bulb** production is 18 - 24 degrees (Celsius) daytime and 10 – 12 degrees (Celsius) nighttime temperature. For bulb production the temperature can go beyond these ranges. However, the temperature is a major factor for flower stalk development and seed set. Higher temperatures can prevent or reduce flowering. Flower stalks will emerge when the temperature is 9-17^{0}C. The maximum yield of up to 14 quintal per hectare was obtained at Melkasa area where the day temperature was 26-29 ^{0}C and night temperature 11-16 ^{0}C. On the other hand, the lowest yield, 3-8 quintal per hectare was recorded in Melka where the day temperature rose to 31-37 ^{0}C and night temperature at 14-23 ^{0}C.

After the bulbs develop, cool weather with ample moisture is required for flower stalk initiation. After that, drier conditions with good sunshine are required for seed maturity, harvesting and processing (Olani, 2010, p. 3).

High temperatures during flowering can result in flower abortions and hence lower seed yields. Therefore, selection of the appropriate period (month) in a given locality is crucial for the production of seed. Studies and experiences in Ethiopia have demonstrated that the onion seed production is best if the mother bulbs are planted in September – October; then the flowering is likely to take place in January / February, i.e. the cooler season.

The different crop varieties have specific requirements. For instance, Bombay Red and Adama Red can flower and produce higher seed yields under relatively lower temperatures. A variety like Red Creole needs low temperatures and will, unlike the previous mentioned varieties, not produce sufficient seeds in the lowland and relatively hot areas like, for example the Central Rift Valley.

Seedbed preparation

Three kinds of seedbeds are commonly used for onion. This could be raised, sunken or flat ones. Raised seedbeds are more appropriate for the rainy season to drain excess water or when water logged soil conditions are expected. Sunken seedbeds are better in areas with prolonged dry conditions as they better conserve moisture. Flat seedbeds are used where the land is level and has adequate drainage (2002; Lemma, D. Shimeles, A. p.21).

Soil types

Onion can be grown under diverse soil types. However, for high productivity well drained soil with a PH range of 6.0 to 6.8 are needed. In accordance with the soil types and weed intensity, the land should be ploughed repeatedly; some literature recommends ploughing the field 3 times (Olani, 2010, p. 12). Loam or clay loam soils are best suited for seed production.

Seeding rate

The onion seeding rate depends on the type of planting method used. When seedlings will be transplanted, about 3-4 kilogrammes of 90 – 95% germinating **seeds** are

required for one hectare of land. When direct seeding (i.e. no transplantation will take place) is used, approximately 12 kg of seed with the same range of germination is needed. About 60 – 70 seedbeds with an area of 450 square metres are required to produce sufficient number of seedlings for planting one hectare. The seeds are to be sown at 10 cms between rows, lightly covered with soil and mulched with grasses or straws until seedling emerged (2 – 5 cm) from the soil (ibid.).

Transplanting

Onion seedlings are ready for transplantation to the field at 45-55 days after sowing or when 3-4 true leaves emerge; the seedlings have then attained a height of about 12-15 cm. This stage is just before the bulb formation starts. If seedlings stay longer on the beds (over 60 days after sowing) bulb formation will have started and the potential for bulb size development will be reduced with negative effects on the yield. Consequently the age of the seedlings is very important for the transplantation.

In the double row planting, mother bulbs are put at 30 cm space between rows on a ridge and 20 cm between plants on a row. It has been demonstrated that this has a positive effect on the yield. However, producers often use a single row per ridge with a spacing of 50 cm between rows and 20 cm between plants. The main reasons are the ease of weeding and pesticide application. In practice this has had a negative effect on the yield. The optimal spacing depends, amongst others, on the variety; for seed production the recommended spacing is different from the one for bulb production (for consumption).

Similar to other transplanted vegetables, withholding irrigation water for two to three days before uprooting the seedlings from the seedbed facilitates uprooting and thus reduces damage of the seedlings.

Pruning or trimming of plant parts if often practised to facilitate the transplanting operation. Field experiments in Ethiopia have shown that trimming either leaves/shoots or root parts did not show a significant effect on the growth and yield. However when both parts, i.e. shoots and roots were pruned, this had a more detrimental effect than pruning either shoots or roots. The heighest yield was realised when seedlings were not pruned at all (2002; Lemma, D. Shimeles, A. p.23, 24).

Water application

Uniform application of water is essential for obtaining healthy seedlings. Watering cans could be used to avoid misplacement of seeds and improper application of water at early stages. The application should be changed to flooding when seedlings reach about 5 – 8 cms height. The soil should be kept moist but not wet. As to reduce high evapo-transpiration (2002; Lemma, D. Shimeles, A. p.22) watering is by preference done in the morning or late afternoon and should be avoided when there is a strong sun.

During flowering, seed development and maturity stage, excessive rainfall and low temperatures are undesirable as they can propagate disease development and poor seed setting. Sunshine at the time of full blooming stage will facilitate the activity of beneficial insects and thus promote cross-polllination and seed set. The relative humidity should be lower at the time of seed set (Olani, 2010, p. 3).

Onion plants have shallow root system and thus need frequent water application. Although watering demand depends on the actual growing area, generally onion

plants should be irrigated every 5-7 days. Watering should be ceased 15-25 days before collecting the matured bulbs as to allow for a proper and adequate curing of the bulbs.
In Fogera and Mecha districts, all onion seeds production (by planting seeds) as well as onion bulbs planting (for getting seeds or bulbs used for consumption) were done under irrigation outside the main rainy season (Meher). Regarding sources of irrigation water, 57% in Fogera and 100% of the respondents in Mecha district used water from the river and dam for irrigation.

Fertilization
Seedbeds for onion seedlings should be rich in compost. Otherwise compost should be prepared with the following components and composition: 3 folds of soils, 2 folds of animal manure or compost and 1 fold of sand. In addition to this, before panting 200 kilograms of DAP (Diammonium Phosphate)3 and after 15-20 days after planting, 100 kilograms of Urea fertilizer per hectare should be applied. To maintain soil fertility and reduce incidence of pests, crop rotation is of paramount importance, therefore onion cultivation in same field should be rotated every three to four years.

Pests and diseases
The preharvest and post harvest losses reach about 25% and 8%, respectively (Seid et al., 2013; Biswas, 2010). The major diseases affecting the onion crop include various fungi like: downy mildew (*Peronospora destructor)*, fusarium basal rot (*Fusarium oxysporum* f.sp. Cepae), rust (*Puccinia allii)*, onion smut (*Urocystis cepulae)*, purple blotch (*Alternaria porri)*. The crop is also affected by bacterial soft rot (*Erwinia carotovora* subsp. Carotovora).
Among onion insect pests, the most common are: thrips (*Thrips tabaci)*, onion fly (*Delia antique)*, wireworms (Agriotes spp.), onion leaf miner (*Liriomyza cepea*) and weevil (*Ceutorhynchus suturalis*).

Pollination
Onion is a cross pollinated crop. The seed field needs to be isolated from other flowering types of onions by 500 – 1000 meters to avoid cross pollination with other varieties / qualities (e.g. non-certified) by insects.
Efficient pollination depends largely on the presence of insects in the area and their activity at flowering time. Sufficient population of pollinating insects including honeybees are needed to achieve the full potential of onion seed and consequent higher seed yield. In this light, one also has to analyse the potential effects of use of chemicals, etc. (this issue was part of the environment study commended by Agro-BIG).

Seed collection and storage
Not all umbels of the same plant mature at the same time, therefore the harvesting may take 3 to 4 times. The seed collection can start when about 10% of the seeds in

3 The often applied Diammonium phosphate; while it has been shown that this leads to increased soil acidity. In S.R.M. Janssens, S.G. Wiersema, H. Goos and W. Wiersma; The value chain for seed and ware potatoes in Kenya; opportunities for development

each umbel are exposed. However, others recommend that harvesting should start only when about 50% of black seed is exposed on an umbel. If the onions / umbels are left to stay longer, seed heads shatter and the seeds will fall in the field (and thus be lost).
When cutting the heads (umbels) they should be supported in the palm of the hand to avoid seed shattering. The harvested umbels should be dried in the shade for a few days. Following this drying, the seeds must be separated from the umbels. The way of extraction should be such that it does not damage the seeds. Seeds can be treshed by rubbing of dried umbels and then cleaning the seeds (winnowing followed by seed separation by flotation). Subsequently the pure seed should be dried for 3 to 4 days, under morning and late afternoon sun or in the shade. The moisture degree should be maximum 7 – 9%. If the moisture content is higher, this results normally in a reduced quality of the seed (shorter shelf life, lower germination rate, …).
In the area under study, the seeds are often stored in the farmers' house. Because of the relatively high temperature, the shelf life will very likely be less than one year. Ideally, the dried seed should be stored in porous materials such as cloth or paper ags in dry and ventilated conditions.

Yield
Productivity of onion **seeds** varies across varieties and ecologies, for instance, Adama Red onion seed growers around the rift valley area produce 15-20 quintal of onion seeds per hectare. In the Amhara region it seems to vary from around 5 (Fogera woreda) to 8 (Mecha Woreda; both WoA information). A seed producer that obtained good quality mother bulbs in Mecha woreda is expecting a yield of 12 kg per ha.

6. CONCLUSIONS AND RECOMMENDATIONS

The conclusion that critical constraints in the onion seed production and lack of onion seed (quality as well as quantity) do exist has been confirmed by the present study. In order to assure that farmers will benefit from the identified opportunities, these constraints will have to be eliminated or at least reduced. This chapter provides some key practical recommendations for possible contributions by Agro-BIG. The recommendations have taken into account that Agro-BIG cannot solve all the issues because of limitated resources and also because it has to stay focused on the main interventions as formulated in programme documents.

Table 7. main conclusions and recommendations

Conclusion	**Recommendation**
In case better quality seeds (with higher germination rate etc.) are used, yields of onion production and efficiency of the use of resources (e.g. labour) and means of production (land, water, fertilizers, …) can be increased	Assist in mobilization of key actors in the onion seed VC, e.g. via the stakeholder platforms and participate in discussions on solutions of main identified bottlenecks.
Although it is quite clear that the supply of quality seed is in short, there are no reliable estimates of the quantities needed (per growing season, per locality). Availability of these estimates will allow (future) producers to develop their business plan.	Assist the relevant entities (e.g. Woreda bureaus of agriculture) to make adequate estimates of quantities of seed needed.
Most of the farmers seem to be aware of the advantages of quality seed. However, not all of them are prepared to pay the substantial higher price. This decourages (potential) seed producers.	Assist farmers in cost calculations and calculations of effectiveness in order to make them aware of the fact that it can be beneficial to invest in quality seed. Inform farmers on the credit facilities.
Various entities have a stake in the procurement / distribution / marketing of seed. Strengthening of their cooperation and joining forces may decrease certain bottlenecks regarding the availability of quality seed from reliable sources.	Promote increased cooperation and joint action by the Amhara Regional Agricultural Research Institute (ARARI), Amhara Seed Enterprise (ASE) and the Certification Authority in order to increase joint efforts to obtain quality seed from reliable sources
There is kind of a vicious circle: as seed producers cannot get seed from a certified / known source they will not get certification for the seeds they produce.	Lobby and work with the regional seed certification unit in order to solve the issue on lack of certified seed. Jointly analyse how this constraint can be reduced, e.g. by means of close monitoring of certification unit of fields of seed producers, thus allowing (partial) certification.
Most of the actors of the onion seed VC seem to have (at certain stages) lack of credit. Also their skills to properly plan	Assist (potential / future) onion seed growers with business planning (based on estimated demand, production costs,

their businesses may benefit from upgrading.	etc.). Communicate on financing possibilities for onion seed production
For individuals it may be difficult, too expensive and too risky to engage in seed production. Formation of groups could probably solve this issue.	Pilot with some seed producing groups. Advise them on practical issues, like division of tasks and responsibilities, business planning, marketing issues. Promote the organization of field days where farmers (and potential buyers of seed) visit the fields of onion seed producers. Furthermore this can improve the direct contact between suppliers of seed and demanders (farmers / onion growers).
Agricultural practices of onion seed producers may be improved / strengthened	Promote the training of onion seed producers, including advice on production of training materials.
(future) onion seed producers have limited experience with seed production, certification issues as well as marketing. The DA's have general experience but not necessarily very thorough information on (onion) seed production	Identify successful / promising initiatives regarding (onion) seed production in other regions in the country or in neighbouring countries. Obtain and disseminate information on this and analyse possibilities for exchange visits.
Detailed information on the functioning of the onion seed VC, in particular the specific role of the actors, the volume of their activity, specific bottlenecks of each type of actor, etc. is still incomplete. In order to assist in and advice on appropriate measures as well as to provide assistance to adequate and sustainable initiatives more details on the functioning of the VC are needed.	Gradually update the VC information, by making use of data collected at woreda and regional level, at the research institutes, etc. Also use the stakeholder meetings to update information on the onion seed value chain. Notwithstanding this lack of details some pilots, e.g. with the local production of onion seeds may be launched. They should be monitored closely so that the lessons learnt can contribute to improvement of interventions by Agro-BIG.

7. REFERENCES

AgroBIG (2013) *Value Chain Analysis of Onions, report on updated VC analysis of onions*.

Amhara Seed Enterprise (ASE) (2013) Progress report.

Asaduzzaman et.al. (2012) *Effect of bulb size and plant spacing on seed production of onion*. Journal of Agricultural Research; 405 – 414.

Biswas, S.K., Khair, A., Sarker, P.K. and Alom, M.S. (2010) *Yield and storability of onion* (*Allium cepa* L.). Bangladesh Journal of Agricultural Research 35(2): 247-255, June 2010.

Bureau of Finance and Economic Development for Amhara Region (BoFED) (2013) Progress report.

Central Statistical Agency of the Federal Democratic Republic of Ethiopia (CSA) (2012) *Agricultural Sample Survey 2011/2012* (2004 E.C.). Volume I: Report on Area and Production of Major Crops.

Central Statistical Agency of the Federal Democratic Republic of Ethiopia (CSA) (2013) *Agricultural Sample Survey 2012/2013 (2005 E.C.).* Volume I: Report on Area and Production of Major Crops.

Ethiopian Development Research Institute (2009) *Analysis of Changes in Food Consumption pattern in Urban Ethiopia.*

Federal Democratic Republic of Ethiopia (2013) *Seed Proclamation of the Federal Democratic Republic of Ethiopia No. 782/2013*.

Fogera District Agriculture Office (2013) Progress report.

Food and Agricultural Organizations of the United Nations (FAO-UN) (2010) *Onion seed production techniques, a manual for extension agents and seed producers*. Olani Niku & Fikre Mulugeta; Ethiopia.

Food and Agricultural Organizations of the United Nations (FAO-UN) (2012) Annual Report: Top Ten Onions (dry) Producers in the World.

IAR (1998) Seed production Guideline: Tomatoes, Onion and Pepper.

IFPRI (2010) *Seed system potential in Ethiopia: Constraints and opportunities for enhancing the seed sector*.

IPMS (2010) *Vegetables value chain development in Fogera district: Experiences from IPMS project interventions*.

Lemma D., Shimeles A. (2002) *Research experiences in onion production*. Research report no. 55.

Mecha District Agriculture Office (2013) Progress report.

Ministry of Finance and Economic Development (2010) *Growth and Transformation Plan of the Federal Democratic Republic of Ethiopia*

Olani N., Fikre M. (2010) *Onion seed production techniques; a manual for extension agents and seed producers*. Asella, Ethiopia.

Rowan F. Sage and Xin-Guang Zhu (2011) *Exploiting the engine of C4 Photosynthesis*. Journal of experimental botany.

Seid Hussen, Hassen Beshir and Yitbarek W/Hawariyat (2013) *Postharvest Loss Assessment of Commercial Horticultural Crops in South Wollo, Ethiopia, Challenges and Opportunities*. Wollo University.

Tadesse Adgo Mihiretu (2008) *Farmers' evaluation and adoption of improved onion production package in Fogera district, South Gondar, Ethiopia*; M.Sc thesis submitted to Haramaya University, Ethiopia.

USAID (2011) *Potato value chain analysis and development in Ethiopia: case of Tigray and SNNP Regions*.

8. ANNEXES

8.1 Questionnaire

Wereda _____

Q1. Code number _____

Q2. Name of the household head _____

Q3. Wereda where the household resides 1. Fogera 2. Mecha

Q4. Kebele where the household resides

1. _____ 2. _____

3. _____ 4. _____

Q5. Sex of the household head 1. Male 2. Female

Q6. Age of the household head (years) _____

Q7. Marital status of the household head

1. Married 2. Single 3. Divorced 4. Widow

Q8. Total family size of the household _____

Q9. Educational status of the household head

1. Illiterate 2.Grades 1-8 3.Grades 9-12 4.Diploma 5.Degree 6. Read & write

Q10. Total arable land owned by the household (hectare) _____

Q11. Average land used for onion production annually (hectare) _____

Q12. Do you use extra labour in the farm apart from the family labour?

1. Yes 2. No

Q13. In how many production seasons do you grow onion **seeds**?

1. Meher 2. Irrigation 3. Belg 4. Meher & Irrigation

Q14. In how many production seasons do you grow onion **bulbs**?

1. Meher 2. Irrigation 3. Belg 4. Meher & Irrigation

Q15. If irrigation is used, then what is the source of irrigation water?

1. River 2. Spring 3. Dam 4. Lake 5. River & Spring

Q16. Do you use onion seeds as planting material to produce onion seeds?

1. Yes 2. No

Q17. Do you use onion bulbs as planting material to produce onion seeds?

1. Yes 2. No

Q18. Do you use both onion seeds and bulbs as planting material to produce onion seeds? 1. Yes 2. No

Q19. Where do you get planting materials to produce onion seeds?

1. Cooperatives 2. Agriculture office 3. Private traders 4. NGOs

Q20. What is the variety used for onion seeds production? _____

Q21. What is the seeding rate of onion **seeds** per ha for seed production (kg)?

Q22. What is the seeding rate of onion **bulbs** per ha for seed production (Kg)?

Q23. What is the price of onion seeds used for seed production? _____

Q24. What is the price of onion bulbs used for seed production? _____

Q25. **Area** and production of **onion seeds** for the last three years:

Production year	Area (hectare)	Production (qt)
1. 2012/2013 (2005 Eth. Cal.)	_____	_____
2. 2011/2012 (2004 Eth. Cal.)	_____	_____
3. 2010/2011 (2003 Eth. Cal.)	_____	_____

Q26. **Area** and production of **onion bulbs** for the last three years:

Production year	Area (hectare)	Production (qt)
1. 2012/2013 (2005 Eth. Cal.)	_____	_____
2. 2011/2012 (2004 Eth. Cal.)	_____	_____
3. 2010/2011 (2003 Eth. Cal.)	_____	_____

Q27. **Income** from **onion seeds** sales for the last three years:

Production year	Income (birr)
1. 2012/2013 (2005 Eth. Cal.)	_____
2. 2011/2012 (2004 Eth. Cal.)	_____
3. 2010/2011 (2003 Eth. Cal.)	_____

Q28. **Income** from **onion bulbs** sales for the last three years:

Production year	Income (birr)
1. 2012/2013 (2005 Eth. Cal.)	_____
2. 2011/2012 (2004 Eth. Cal.)	_____
3. 2010/2011 (2003 Eth. Cal.)	_____

Q29. What is the productivity of **onion seeds** per hectare? _____

Q30. What is the productivity of **onion bulbs** per hectare? _____

Q31. How often do you grow onion seeds?

1. Every year 2. Every two years 3. Every three years 4. Depends on situation

Q32. What are the major constraints in **onion** production in priority order?

1. Lack of seeds 2. Shortage of water 3. Lack of labour 4. Lack of market
5. Lack of finance 6. High cost of fertilizer 7. Lack of extension service
8. Plant diseases 9. Insects pests 10. Weeds 11. Others

Q33. What did you observed in the past years about onion **seeds** production in the area? 1. Increased 2. Decreased 3. No change

Q34. What did you observed in the past years about onion **bulbs** production in the

area? 1. Increased 2. Decreased 3. No change

Q35. What is your expectation about **onion seeds** production in the future?

1. Will increase 2. Will decrease 3. No change

Q36. Do you use modern agricultural inputs (fertilizers)?

1. Yes 2. No

Q37. If yes to the above question, then where do you get the fertilizer?

1. Cooperatives/unions 2. Private traders 3. NGOs
4. Agriculture office 5. Agricultural Inputs Supply Corporation (AISCO)

Q38. Do you use pesticides? 1. Yes 2. No

Q39. If yes to the above question, then where do you get the pesticide?

1. Cooperatives/unions 2. Private traders 3. NGOs
4. Agriculture office 5. Agricultural Inputs Supply Corporation (AISCO)

Q40. Do you use onion seeds? 1. Yes 2. No

Q41. If yes to the above question, then where do you get the seeds?

1. Cooperatives/unions 2. Private traders 3. NGOs
4. Agriculture office 5. Agricultural Inputs Supply Corporation (AISCO)

Q42. What percent of the onion bulbs produced by the household is used for in-house consumption? _____

Q43. Have you got training on onion seeds production in the last three years?

1. Yes 2. No

Q44. If yes to the above question, who gave you the training?

1. Development Agent 2. NGOs 3. Private individuals 4. Trained farmers

Q45. Is there cooperative supporting onion seeds production? 1. Yes 2. No

Q46. If yes to the above question, then are you a member? 1. Yes 2. No

Q47. Is there a market for sale of onion seeds and bulbs in the area? 1. Yes 2. No

Q48. For whom do you sell most of your onion outputs?

1. Cooperatives 2. Wholesalers 3. Local traders 4.Cosumers 5. Government

Q49. How do you sell most of your onion products?

1. Cash 2. In kind 3. Credit

Q50. General recommendations for successful onion seed production in the area

_____

_____

_____

_____

Thank you!

8.2 Stakeholders met

No.	Name	Organization	Job Title
1	Abebe Atlaw (Dr)	Ethiopian Agricultural Research Institute, AA	National Seed Coordinator
2	Tafesse Gebru (Dr)	Ethiopian Seed Enterprise, Addis Ababa	General Manager
3	Håkan Sjöholm	Programme for Agribusiness Induced Growth in the Amhara Region (AgroBIG)	Project Manager
4	Johanna Hoogervorst		Value Chain & CB Advisor
5	Habtamu Tsegaye		Value Chain Advisor
6	Aychew Kebede		Capacity Building Advisor
7	Birru Yitaferu (Dr)	Amhara Regional Agricultural Research Institute	Director General
8	Ermias Abate		Tissue Culture Researcher
9	Sissay Gebresillasie		Biotechnology Researcher
10	Tesfaye Weyessa (Dr)	Adet Agricultural Research Centre	Centre Manager
11	Tesfaye Abebe (Dr)		Senior Researcher
12	Teshome Walle (Dr)	Amhara Bureau of Agriculture	Deputy Bureau Head
13	Kassahun Tesega		Quarantine Process Head
14	Abera Teklemariam (Dr)	Amhara Seed Enterprise	General Manager
15	Emshaw Workneh		Seed Prododuction Head
16	Mengistu Gidey	Regional Cooperative Promotion Agency	Deputy Manager
17	Zelalem Addis	Regional Trade & Industry Bureau	Marketing Process Head
18	Ayelign Adane	Gondar Seed Quality Laboratory	Head
19	Asseme Ferede	Fogera District Administration	Chief Administrator
20	Chalachew Molla	Fogera District Agriculture Office	Head
21	Demes Mulualem		Horticulture Process Head
22	Merkew Asnakew		Agronomist
23	Fikre Asnakew	Fogera District Cooperatives Office	Head
24	Kebede Asfaw		Marketing Expert
25	Yechale Abebe	Mecha District Agriculture Office	Head
26	Tewachew Abebe	Koga Irrigation Project, Mecha	Acting Head
27	Nigussie Belay		Agronomist
28	Sibhat Alemu	Private Seed Grower, Mecha	Manager
29	Tigist	Tsion Seeds & Agricultural Inputs Shop, BD	Manager
30	Tilahun Michael	TM Seeds & Agricultural Inputs Shop, BD	Manager
31	Ethiopian Fruit and Vegetable Marketing S.C (ET Fruit), Addis Ababa		

8.3 List of farmers interviewed

District	Kebele	No.	Name of the Farmer
Fogera	Awa Kokit Kebele	1	Abebaw Wudu
	Awa Kokit Kebele	2	Eshete Tessema
	Awa Kokit Kebele	3	Asmamaw Birraw
	Awa Kokit Kebele	4	Dessie Bantie
	Awa Kokit Kebele	5	Wulo Tessema
	Awa Kokit Kebele	6	Nigussie Admasu
	Awa Kokit Kebele	7	Tarekegn Segedie
	Awa Kokit Kebele	8	Gebrat Shumye
	Awa Kokit Kebele	9	Senta Bezaye
	Awa Kokit Kebele	10	Birra Gobez
	Kuhar Michael Kebele	11	Nigussu Alle
	Kuhar Michael Kebele	12	Tesfa Bihon
	Kuhar Michael Kebele	13	Alle Engdayehu
	Kuhar Michael Kebele	14	Yismaw Aderaw
	Kuhar Michael Kebele	15	Tadellew Alle
	Kuhar Michael Kebele	16	Moges Amsalu
	Kuhar Michael Kebele	17	Wondalem Kassie
	Kuhar Michael Kebele	18	Saleamlak Kassie
	Kuhar Michael Kebele	19	Abebaw Mengist
	Kuhar Michael Kebele	20	Yehalem Fekadu
	Bebeks Kebele	21	Muche Sewagehn
	Bebeks Kebele	22	Gashaw Bayu
	Bebeks Kebele	23	Weretaw Kefyalew
	Bebeks Kebele	24	Endris Usman
	Bebeks Kebele	25	Yismaw Asres
	Bebeks Kebele	26	Bitew Dagne
	Bebeks Kebele	27	MelakeTsion Wassie
	Bebeks Kebele	28	Eshete Sewagehn
	Bebeks Kebele	29	Gashaw Gonie
	Bebeks Kebele	30	Derbew Enyew

District	Kebele	No.	Name of the Farmer
Mecha	Kudmi Kebele	31	Allene Dessie
	Kudmi Kebele	32	Reda Aynalem
	Kudmi Kebele	33	Tena kebede
	Kudmi Kebele	34	Gashu Getie
	Kudmi Kebele	35	Dessie Wondie
	Kudmi Kebele	36	Dagnie Mengie
	Kudmi Kebele	37	Gashaw Demeke
	Kudmi Kebele	38	Genetu Yehun
	Kudmi Kebele	39	Alelign Gessesse
	Kudmi Kebele	40	Minyichiel Lakie

8.4 Seed nomenclatura

Different stages of seed can be classified as follows:

- Breeder seed is the initial source of seed and is usually produced by the breeder. It is the source for the production of pre-basic or basic seed.
- Pre-basic seed is the progeny of the breeder seed and is usually produced under the supervision of a breeder or his designated agency. This generation is commonly used for crops that have low multiplication ratios and where large quantities of certified seed are required.
- Basic seed is the progeny of breeder or pre-basic seed and is usually produced under the supervision of a breeder or his designated agency and under the control of a seed quality control agency.
- Certified seed is the progeny of basic seed and is produced on contract with selected seed growers under the supervision of the seed enterprise, public or private. Certified seed can be used to produce further generations of certified seed or can be planted by farmers for grain production.

Table: Comparative seed nomenclature in selected countries of West Asia and North Africa

Definition	**OECD[a]**	**AOSCA[b]**	**Ethiopia**
1st generation supplied by plant breeders	Breeder	Breeder	Breeder
2nd generation	Pre-basic	Foundation	Pre-basic
3rd generation	Basic	Registered	Basic
4th generation	Certified 1	Certified	Certified 1
5th generation	Certified 2	-	Certified 2

[a] OECD = Organisation for Economic Cooperation and Development.
[b] AOSCA = Association of Official Seed Certifying Agencies.
Source: FAO, 1975; van Gastel and Hopkins, 1988.

Breeder seed production is not monitored by the seed certification agency, while basic seed and certified seed are covered in the seed certification scheme. The seed quality control agency verifies the quality both in the field and in the laboratory and certifies that the seed meets the national standards. Such classes of seed are known as certified. It is important to note that all certified seed classes relate to a breeder seed through one or more generations.

Source: http://www.fao.org/docrep/006/y4011e/y4011e0v.htm