

## Opportunities and Constraints of Community Based Seed Production in Northern Ethiopia: The Case of Seed Producing Cooperatives in South Tigray.

### ABSTRACT

*Community-based seed production has a potential for improving farmers' access to quality seed of locally adapted and preferred varieties. Besides, Seed Producing Cooperatives (SPCs) are fully engaged in formal seed production as contract out-growers to public enterprises that benefits members economically. Hence, this research was aimed to assess the major opportunities and constraints of community based seed production the case of SPCs in southern zone of Tigray, Ethiopia. Three stage sampling technique was employed in this study. First, purposive sampling was employed to select the sample districts. Secondly, simple random sampling was employed to select the seven from fourteen seed producing cooperatives in the zone. Finally, focused group discussion at each kebelles which consists 7-10 group members (district seed multiplication experts, development agents and SPCs committee members were included) to gather data. The collected data was analyzed using ranking index. The result of the study shows that availability of suitable agro ecology, timely availability of technology, suitable and fertile land for seed production for the candidate crops respectively, were the main opportunities whereas lack of working capital, violating the bylaw of the cooperatives by members and diversified interest of farmers within a cluster respectively, were the main constraints of SPCs to respond the local demand for quality seed and seed security in the area. Therefore, improving the facilities of SPCs, creating common awareness of members on their guiding stated bylaws and creating common interest among members is very important for future development of community based seed production in the form of SPCs in the study area and beyond.*

*Keywords: Seed system; seed production; seed security.*

### 1. INTRODUCTION

Agriculture is the dominant sector in Ethiopia. It accounts about 43% of the Domestic Product (GDP), 90% of the exports and 80% of the employment (1). The sector is dominated by smallholder farmers which are responsible for about 90% the total agricultural production of the Nation (2). Seed security is closely linked with food security in Africa including Ethiopia but many Africa farmers lack access to modern high-yield seed varieties (3; 4). Improving the quality of seed of any preferred variety is the basis for agricultural productivity improvement (5). Use of quality seeds in field crops alone can enhance the crop productivity by 15-25% (6). Increasing quality and usage of improved seed has the potential to increase Ethiopia's annual crop production (7).

17 The national seed system of Ethiopia was considered as one of the key interventions in the  
18 transformation of the agricultural sector to ensure the target of doubling agricultural production by the  
19 end of 2015 (8). Nationally, the seed demand is increasing due to the agricultural development  
20 interventions. The seed demand of country is estimated to be over 700,000 tonnes each year. But,  
21 the formal or commercial sector supplies 20,000–30,000 tons of seed per year across all crops (9).  
22 Using improved high yielding crop seed by smallholder farmers can be means of difference between  
23 improved livelihoods and staying trapped in rural poverty (5; 10, 11). However, the use of these  
24 improved seeds still remains very low and has not been widely practiced by smallholder farmers (12).  
25 Seed shortage in quantity and quality which result farmers plant grains rather than seeds, sustaining  
26 yield reductions of at least 30% is common in Ethiopia. Yet, many farmers still fail to access these  
27 improved seeds from the formal seed supplies as many of the released varieties have never been  
28 widely distributed and made available in time and affordable price (13). The problem is more or less  
29 the same in Tigray region and the study area.

30 Nowadays, the community based seed production approach is widely used to deliver seeds to  
31 smallholder farmers in Africa including Ethiopia (14). Their contribution to improving seed supply and  
32 seed security has received a great recognition by policymakers and development practitioners (15).  
33 Besides, seed producing cooperatives (SPCs) are one of the community based cooperatives  
34 organized by farmers at local level for seed production and distribution in Ethiopia (16; 17). Moreover,  
35 seed producing cooperatives were considered as institutional options to narrow the gap between the  
36 demands for and supply of improved seeds in the region and the study area. Southern zone of Tigray  
37 especially the selected districts are identified by the regional government of Tigray as potential  
38 clusters of seed production mainly for the major crops like wheat, barley and faba beans. As a result,  
39 up to December 2016, there were 14 SPCs with 1520 members in the study area as to the annual  
40 report of southern zone of Tigray development corridor cooperative promotion agency (18).

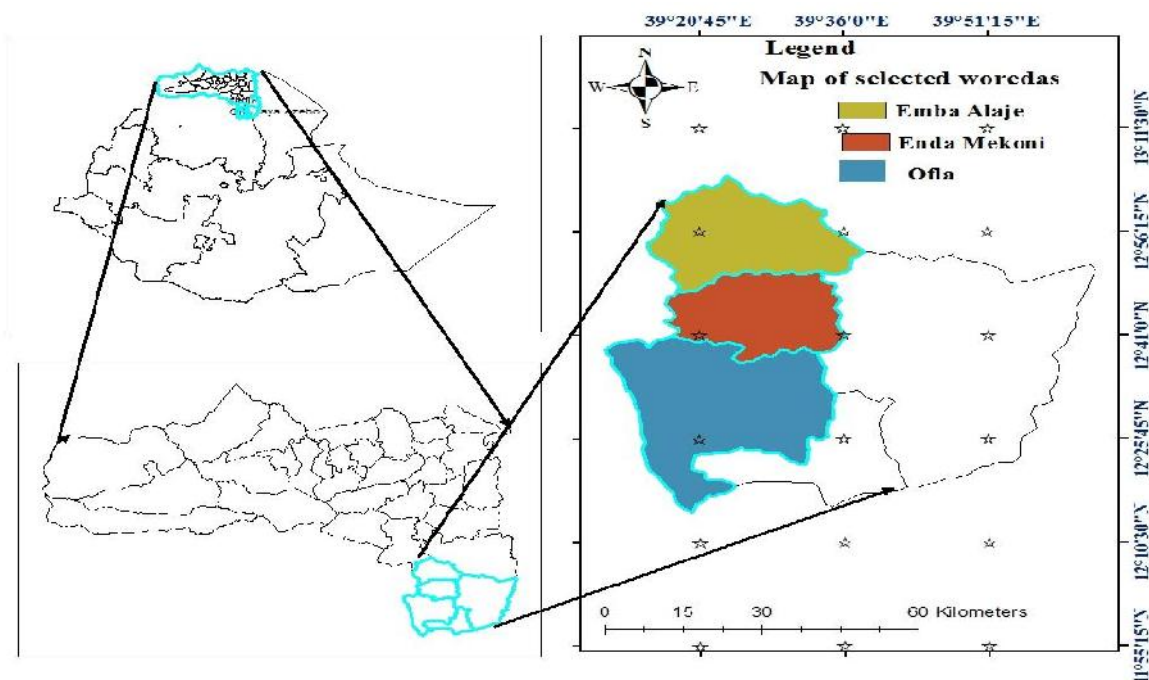
41 However, despite of the aggressively promotion of seed producing cooperatives by governmental and  
42 non-governmental organizations, still there is a huge gap between demand for and supply of  
43 improved seeds in the region including the study area. However, there is inadequate availability of  
44 research specifically which explore the opportunities and constraints of seed producing cooperatives  
45 in a scientific way. Therefore, this study was initiated to assess the existing opportunities and  
46 constraints faced by seed producing cooperatives in southern zone of Tigray, Ethiopia in which it can  
47 use as springboard for further research in seed producing cooperatives and may contribute to  
48 strengthening sustainable seed production as well as seed security in the study area and beyond.

## 49 **2. RESEARCH METHODOLOGY**

### 50 **2.1. Description of the Study Area**

51 The study was conducted in three districts of Southern Zone of Tigray, Northern Ethiopia in 2016.  
52 Namely, the districts are Emba Alaje, Enda Mehoni and Ofla which are found in the highland agro  
53 ecology of the zone. Geographically, the zone is located between 12<sup>o</sup> 15' and 13<sup>o</sup> 41' N latitude and

54 38° 59' and 39° 54' E longitude and with altitudinal range of 1350 –3925 Meter above sea level (Fig 1).  
 55 The zone covers a total area of 498,572 hectare and 143,326 hectare cultivable land. The average  
 56 land holding size of households in the zone ranges from 0.25-1.25 hectare. However, the average  
 57 landholding of the selected districts is ranges from 0.25-0.75 hectare of land per household. Southern  
 58 zone has experienced two rainfall seasons; the short rainy season locally known as “*Belgi*” that occurs  
 59 usually from February to April and the main rain season locally described as “*kiremti*” that comes  
 60 during June to September. On average, the area receives annually about 600 mm rainfall with mean  
 61 annual temperature of 25°C. Wheat, barley, faba bean, and field pea are major crops grown on the  
 62 highland agro-ecology while teff, sorghum, maize and fruit crops are dominantly grown on the lowland  
 63 agro-ecology of the area. Seed production is considered as an important component of crop  
 64 production in the three highland districts of the zone. Accordingly, fourteen seed SPCs have been  
 65 involving in seed production dominantly in wheat and sometimes in barley and faba bean crops (18).



66  
 67 **Figure 1:** Map of the study area

## 68 2.2. Sampling Technique and Size

69 Three-stage sampling procedure was employed to select the sample seed producing cooperatives. At  
 70 the first stage, three districts (Emba-Alaje, Ofla and Enda-Mehoni) were selected purposively from the  
 71 five districts of southern zone of Tigray on the basis of the fact that these districts have wider  
 72 experience/ exposure on seed production organizing in seed producing cooperatives. At second  
 73 stage, seven seed producing cooperatives (3 cooperatives from Enda-Mehoni, 2 cooperatives from  
 74 each Ofla and Emba-Alaje districts) were selected randomly based on proportion to their size from  
 75 fourteen kebelles which have seed producing cooperatives. After selecting sample cooperatives, one  
 76 focused group discussion was formulated within the composition of cooperative members, district

77 experts and development agents of the respective kebelles. Finally, the study was conducted in  
78 selected cooperatives with 84 individuals (12 individuals \*7 kebelles).

### 79 **2.3. Methods of Data Collection**

80 The primary data for the study was mainly collected from focused group discussions (FGD) of all  
81 sampled kebelles. Each FGD was asked to mention the major opportunities and constraints of SPCs  
82 observed in doing in cooperatives. After having the lists of opportunities and constraints, the groups  
83 themselves were comparing each opportunities and constraints of seed producing cooperatives  
84 through pair wise ranking method. Besides to this discussion with district experts of the agricultural  
85 office, cooperatives promotion office, input supply office and key informants were employed.

### 86 **2.4. Methods of Data Analysis**

87 Ranking analysis was used to analyze the opportunities and constraints of seed producing  
88 cooperatives in the study area using ranking index method (19). Recently, this method was adopted  
89 by many authors, to quantify qualitative data in to the quantitative (for instance; analyze community  
90 perception on rangeland degradation in northern Ethiopia (20), and analysis of Honey Bee Production  
91 Opportunities and Challenges in Central Zone of Tigray, Northern Ethiopia (21), and livestock herders'  
92 perception on the causes and effects Senna obtusifolia L. invasion in rangelands of Norther Ethiopia  
93 (22). Hence, the index for this study was computed as:

**Rank index**= *Sum (number of FGD rank first\*8+ number of FGD rank second\*7+ number of FGD rank third\*6+...number of FGD ranked last \*1) for individual statements opportunity or constraint divided by Sum (number of rank first\*8+ number of rank second\*7+no rank 3\*6+...number of ranked last\*1) for all statements opportunity or constraints.*

*Value are assigned according the ranking order, highest value was given for the first rank and lowest value of one for the least rank.*

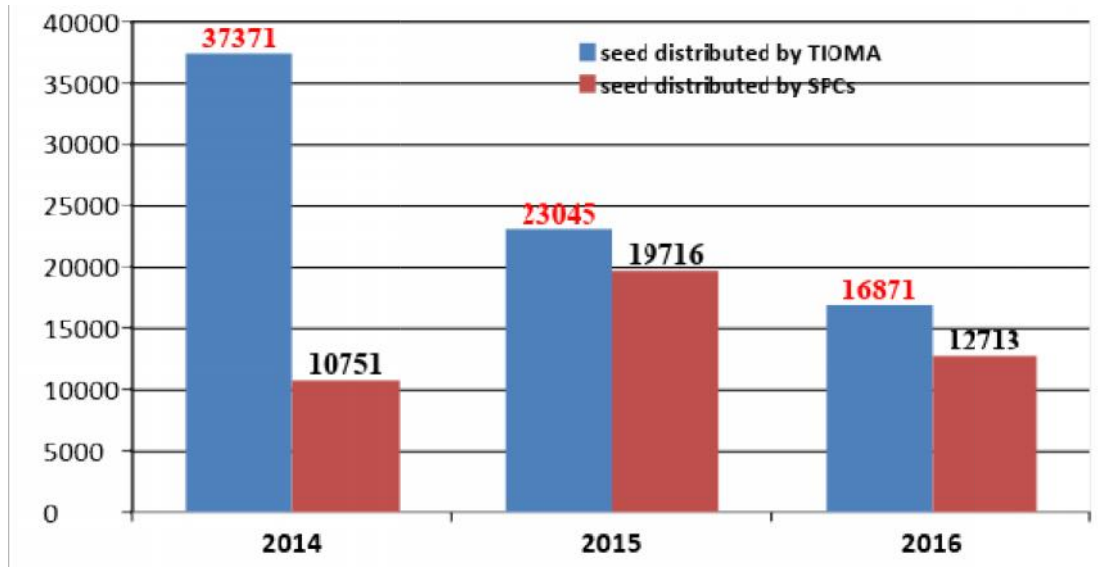
94 **Note: FGD= Focused Group discussion**

## 95 **3. RESULTS AND DISCUSSION**

### 96 **3.1. Trends of Improved Seed Distribution in Tigray**

97 As indicated in Figure 2, the amount of improved seed distributed by the regional input output  
98 marketing agency (TIOMA) shows decreasing trend over the three consecutive years. Besides the  
99 amount of improved seed distributed by seed producing cooperatives does not show significant  
100 improvement over the same years (Fig 2). But it is an evidence for the increasing demand for seed  
101 producing cooperatives in the region including the study area which can address the local demand for  
102 improved seed. In line with this, 14 improved crop varieties (seven wheat, four barley, two faba bean  
103 and one field pea varieties) of basic seed were distributed to seed producing cooperatives to be  
104 multiplied as seeds on a total of 1036.5 hectares of land. During the survey year a total of 4820

105 quintals of certified seed were multiplied and collected by the cooperatives (18). The improved seed  
 106 consumption of the southern zone of Tigray was about 4764 quintals in 2014 production season as to  
 107 the report of Central Statistics Agency (12). This implies that the seed consumption in the study area  
 108 is more or less covered by the seed producing cooperatives.



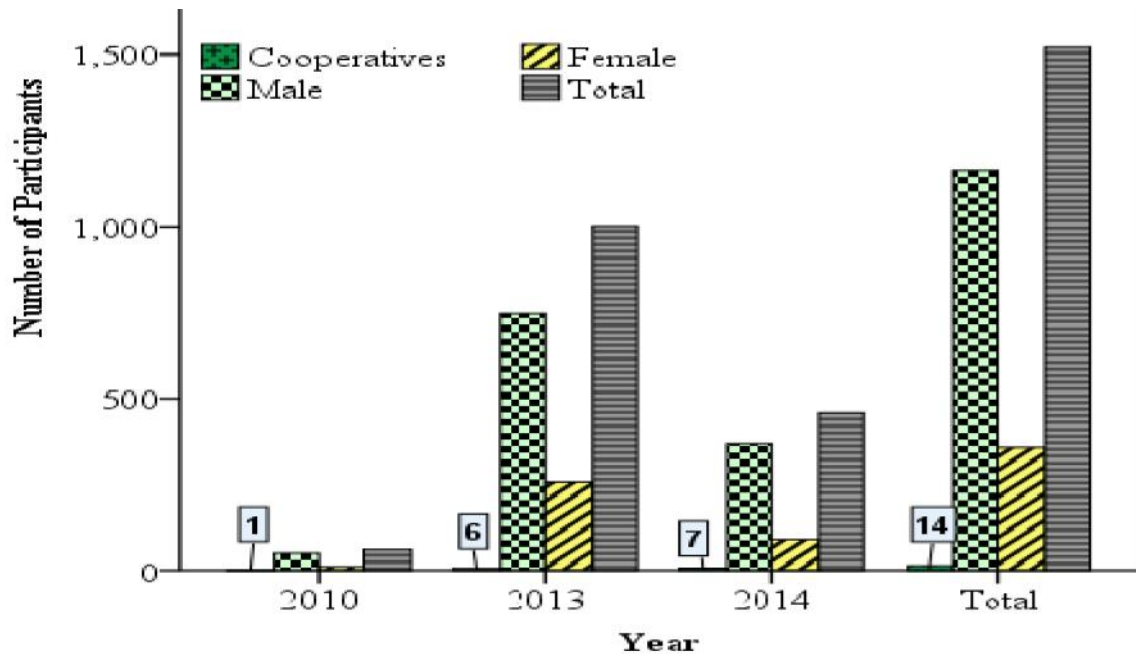
109  
 110 Figure 2: Amount of seed distributed in Tigray (in quintals) in consecutive three years (2014-2016).

### 111 3.2. Farmers Participation in Seed Producing Cooperatives in Southern Tigray, 112 Ethiopia

113 The history of seed producing cooperatives in Tigray region is a recent phenomenon. Similarly in the  
 114 study area, legally recognized seed producing cooperatives have a history of less than one decade.  
 115 According to the southern zone cooperative promotion office report seed producing cooperatives were  
 116 started with the establishment of Hiritymekan primary seed producing cooperative in Mekan kebele,  
 117 Enda-mekoni district. The cooperative was established by the financial support of Mekelle University  
 118 LSB (Local Seed Business) Project with total memberships of 60 interested smallholder farmers.  
 119 Starting from the establishment of this cooperative, promotion and mobilization of farmers to  
 120 participate in seed production and seed producing cooperatives was given a great emphasis by the  
 121 governmental and non-governmental organizations to organize farmers in cooperatives to multiply  
 122 seed. However, the establishment of other cooperatives has been flourished in 2013 in the study area  
 123 (Fig 3).

124 Nowadays, a number of projects have been supporting smallholder seed production in general and  
 125 SPCs in specific in the study area. As to southern zone Cooperative Promotion Office (18) report and  
 126 key informant interview of the respective districts; ISSD (Integrated Seed Sector Development), AGP  
 127 (Agricultural Growth Program and ATA (Agricultural Transformation Agency) are the main supporters  
 128 of seed production in the area. These projects mainly focused on capacity development of the  
 129 cooperatives to produce certified seed in quantity and quality.

130 Up to February 2016, the total number of primary seed producing cooperatives has reached 14 with a  
 131 total membership of 1520 smallholder farmers. The number of seed producing cooperatives has  
 132 increased between 2010 and 2015 (January) from 1 to 14. Similarly, the membership size has  
 133 increased from 60 smallholder farmers to 1520 over the same period. Moreover, female headed  
 134 household participation in SPCs in the study area has been reached about 23.48% in 2015 as  
 135 compare to in the beginning about 18 % in the 2010 (Fig 3).



136  
 137 **Figure 3.** Number of cooperatives and farmers' participation in seed producing cooperatives south  
 138 Tigray

### 139 3.3. Opportunities and Constraints of Seed Producing Cooperatives

140 Based on the rank index result, there are 15 opportunities and 17 constraints of seed producing  
 141 cooperatives to respond the demand for quality seed in Southern Tigray (Table 1 and 2). Availability  
 142 of suitable agro ecology is one of the first ranked opportunities in all seed producing cooperatives in  
 143 the study area. This implies that the agro ecology of the selected districts was mainly *Dega* which is  
 144 suitable for seed production. A similar finding was reported by Gebremedhin (23), in eastern zone of  
 145 Tigray. Timely availability of technologies like basic seed and related inputs is ranked second  
 146 opportunity of SPCs in southern Tigray. Seed producer farmers have got the opportunity of getting  
 147 basic seed year after a year some times for free. Previous study by Zewdie and Abdoul (24), indicated  
 148 that community seed production have many tangible advantaged for farmers which can serves as  
 149 demonstration site, improve adoption of new varieties and increases timeliness of seed delivery.

150 Availability of suitable and fertile land for seed production for the candidate crops (wheat, barley and  
 151 beans) is the third ranked opportunity of seed producing cooperatives to produce and market seed.

152 The highland districts of the zone are potential area for seed production which received optimum  
 153 rainfall with good distribution. In addition, farmers perceived that their land is fertile and suitable to  
 154 produce the major high land crops. Availability of non-governmental organizations supports is also the  
 155 fourth ranked opportunity of seed producing cooperatives to produce and market seed. Group  
 156 participants reported that a number of projects have been supporting community based seed  
 157 production in general and seed producing cooperatives in specific. Integrated Seed System  
 158 Development (ISSD), Agricultural Growth Program (AGP) and Agricultural Transformation Agency  
 159 (ATA) are some of the projects contribute to support seed producing cooperatives in the study area  
 160 (Table 1). Previous studies in Ethiopia, confirms that availability of conducive ecology for various seed  
 161 production, suitable land and water resources, conducive policy environment, available domestic  
 162 markets, available seed proclamation and strong donor support for seed sector were some of good  
 163 opportunities for seed production in Ethiopia (25).

164 **Table 1: Opportunities of SPCs to respond the local demand for quality seed production**

Opportunities of SPCs to produce seed	Rank index			
	NGD	N	Index	Rank
Availability suitable agro-ecology	7	45	0.141	1 <sup>st</sup>
Timely availability of inputs (like basic seed...)	7	44	0.138	2 <sup>nd</sup>
Suitable and fertile land for seed production for the candidate crops (wheat, barley and faba beans)	7	43	0.134	3 <sup>rd</sup>
Availability of NGO supports	7	34	0.106	4 <sup>th</sup>
Gradually improved community awareness on seed production	5	29	0.091	5 <sup>th</sup>
Availability of supports from agricultural research institutes	5	22	0.069	6 <sup>th</sup>
Technical supports from agricultural experts	4	19	0.059	7 <sup>th</sup>
Accessibility of the Kebeles to main road	5	17	0.053	8 <sup>th</sup>
Attractive market price for seed	5	16	0.050	9 <sup>th</sup>
Availabilities of facilities (store, cleaning machine, packing.....)	4	16	0.050	9 <sup>th</sup>
Availabilities supports from University	3	12	0.038	11 <sup>th</sup>

Certification of seed supply and distribution	1	7	0.022	12 <sup>th</sup>
Access to supplementary irrigation	2	6	0.019	13 <sup>th</sup>
Electric city accessibility	3	6	0.019	13 <sup>th</sup>
On farm quality seed inspection based on morphological observation)	3	4	0.013	15 <sup>th</sup>
<b>Total</b>		<b>320</b>	<b>1.00</b>	

---

165 *NGD= number of focused group discussion in which the opportunities was mentioned*

166 Source data: organized from seven focused group discussions, 2016

167 Seed producing cooperatives also faced many constraints while involving in seed production. The  
 168 rank index value indicated that lack of working capital is one of the first ranked constraints of seed  
 169 producing cooperatives in the study area. This implies that seed cooperatives need initial capital to  
 170 buy the basic seed from seed enterprises and also needs more capital to collect the seeds from  
 171 producer farmers during harvesting. Previous study was confirmed that limited financial self-  
 172 sustainability of cooperatives is the main constraint for seed production in Ethiopia (25). Similarly, a  
 173 recent study in Ethiopia also revealed that cooperatives face over-dependence on the government,  
 174 weak internal governance, problems of leadership and low economic viability (15).

175 Seed producer cooperatives were made binding bylaw how much seed to produce and amount of  
 176 seed returned after harvest to their cooperatives with members. Mostly the agreement is to return  
 177 90% of their produced seed by leaving 10% for seed purpose for the individual producers. However,  
 178 the study revealed that violating of the bylaws made by members with their cooperatives is second  
 179 ranked constraint of seed production in the study area. Consequently, the cooperatives collect and  
 180 sell below their estimated/planned (Table 2). Returning less than 50 percent of the expected seed  
 181 result by some growers was reported as the main constraints of Ethiopian seed systems (7; 26). In  
 182 addition, previous findings on cooperatives in developing countries, reported that low member  
 183 participation, weak leadership, dependence on supporting organizations and a lack of working capital  
 184 are the common problems (27).

185 Diversified interest of farmers within a cluster is ranked as third constraint of SPCs to produce quantity  
 186 and quality seed in the study area. This implies that if seed is not produced in a clustered based it  
 187 may lead to rejection of the produced seed by seed quality assurance agency and it may also serves  
 188 as a means of variety mixing. A study on community based seed multiplication in Benishangul  
 189 Gumuz, Metekel zone, were faced challenges like selling of produced seed immediately after harvest  
 190 as a grain, managing of seed multiplication plots not differently from normal grain production and  
 191 difficulty to monitors each and every plot seed multiplication (28).

192 Low capacity building activities related to seed production and seed producing cooperatives and lack  
 193 of facilities (store, weighting balance, cleaning machine, packing machine, offices...) were the main  
 194 constraints faced by SPCs (Table 2). low quality seed due to lack of access to formal quality control  
 195 structures, poor seed recovery from participating farmers, over dependence on technical and  
 196 infrastructural support from public institutions and development partners, and limited financial self-  
 197 sustainability (24). lack of sound seed demand study outputs, lack of integrated seed production  
 198 planning both by public and private seed growers, lack of integrated seed supply system (marketing)  
 199 both by public and private seed growers, lack of early generation seeds of some crops, lack of  
 200 certified seeds of some crops and lack of efficient extension and seed regulatory services are the  
 201 main challenges of community based seed production (25).

202 Having clustered farmers with similar soil characteristics, the isolated nature of farmer based seed  
 203 multiplication sites that create difficulty in supervision and quality control; the unwillingness of farmers  
 204 to sell seed to the public seed enterprises once the seed is produced; the limited ability of farmers to  
 205 sell the seed to the enterprises as per the set schedule; the limited financial capacity of the  
 206 enterprises to undertake timely planned purchases from farmers; the limited facilities of the regional  
 207 seed enterprises, especially seed cleaning facilities and storage warehouses, thereby increasing their  
 208 overall cost of production are the challenges faced to farmer-based seed multiplication schemes in  
 209 Ethiopia (29). In addition, difficulty in accessing quality source seed; limited capacity in ensuring  
 210 quality seed production and purchase from participating farmers; difficulty of clustering farmers and  
 211 unclear links with the formal seed system under the current central distribution system were the major  
 212 challenges of seed production and marketing by farmers' cooperative union in East Shewa and Arsi  
 213 Zone of Oromiya region (29). Diseases and insect pests, limited understanding amongst stakeholders  
 214 on the importance of adhering to standards in seed production and seed multiplication business, lack  
 215 of market for seed, very low preparation for market linkage of cooperatives, expectation of farmers for  
 216 free inputs and Scattered fields are major challenges faced by farmers based seed multiplication in  
 217 the Eastern Zone of Tigray (23),

218 **Table 2: Constraints of SPCs to respond the local demand for quality seed in southern zone of**  
 219 **Tigray**

constraints	Rank Index			
	NG	N	Index	Rank
Lack of working capital	7	57	0.141	1 <sup>st</sup>
Violating the bylaw of the cooperatives	7	55	0.136	2 <sup>nd</sup>
Diversified interest of farmers within a cluster	7	47	0.116	3 <sup>rd</sup>

Low capacity building activities to SPCs and seed production	7	45	0.111	4 <sup>th</sup>
Lack of facilities (store, machines, office etc...)	6	30	0.074	5 <sup>th</sup>
Low market price for seed	6	19	0.067	6 <sup>th</sup>
Occurrence of different diseases	4	27	0.067	6 <sup>th</sup>
Low sense of cooperative ownership	3	27	0.064	8 <sup>th</sup>
Low awareness on community based seed production	4	26	0.047	9 <sup>th</sup>
Low participation of farmers in SPCs	3	15	0.037	10 <sup>th</sup>
High price of basic seed	3	14	0.035	11 <sup>th</sup>
Lack of electric city to operate machines	2	8	0.025	12 <sup>th</sup>
Low agronomic management practices by farmers	1	8	0.020	13 <sup>th</sup>
Low marketing promotion for seed	1	7	0.020	13 <sup>th</sup>
Supply of mixed seeds by some cooperative members	1	7	0.017	15 <sup>th</sup>
Dependency on project supports	1	10	0.017	15 <sup>th</sup>
Lack of certificate of seed distribution	1	2	0.005	17 <sup>th</sup>
		<b>404</b>	<b>1.00</b>	

220 **Note:** *NGD= number of focused group discussion in which the constraints was mentioned*

221 *Source data: organized from seven focused group discussions, 2016*

## 222 **4. CONCLUSION AND RECOMMENDATIONS**

223 Seed producing cooperatives are one of government focus which acknowledged in the national  
 224 strategy for improving food security of the country. Access to quality seed is one of the key inputs for  
 225 improving food security of smallholder farmers. Smallholder farmers participated in seed producing  
 226 cooperatives have got dual chance for self-seed security and common benefits coming from their own  
 227 organization by selling to other farmers, organization seed enterprises and NGOs working with seed  
 228 related activities. According to the result of the study, the author realizes that almost all of the seed

229 producing cooperatives in the study area had common opportunities and constraints. However, the  
230 weight of the opportunities and constraints was not equal across the cooperatives. Availability of  
231 suitable agro ecology, timely availability of inputs (like basic seed), suitable and fertile land for seed  
232 production of the candidate crops (wheat, barley and faba beans) and availability of NGO supports  
233 were reported as their main opportunities of community based seed production in the form of seed  
234 producing cooperatives to respond the quality seed for the local demand in the study area. In addition,  
235 there were also cooperative specific opportunities; for instance, availability of certification of seed  
236 distribution, stores and different machine and electric city were some of the cooperative specific  
237 opportunities of seed producing cooperatives.

238 On the other hand, lack of working capital for variety of operations, violating the bylaw of the  
239 cooperatives approved by their general assembly related to the seed multiplication and amount of  
240 seed return to their cooperatives, diversity of farmers interest within a cluster; which this leads  
241 disagreement on the crop type multiplied and causes variety mixing as well as purity of the seed and  
242 low capacity activities were indicated as their main constraints of seed producing cooperatives while  
243 involving in seed production. Occurrence of diseases, lack of store and low sense of ownership of  
244 members, lack of access to electric city to operate machine were also some of the important  
245 constraints reported by specific cooperatives.

246 This study conclude that suitable agro-ecology, fertile land and timely availability of inputs are the top  
247 three opportunities to exploit for further development of community-based seed production, whereas  
248 limited working capital, difference in commitment and interest of smallholder farmers are top three  
249 challenges yet to be solved for sustainable community seed production. Hence, the study forwarded  
250 the following recommendations;

- 251 ❖ It could be recommended that the concerned governmental and non-governmental body should  
252 be able to work on awareness of the farmers about the importance of village based clusters of  
253 seed production for the development of seed producing cooperatives and to have better quality  
254 and quantity seed at community level.  
255
- 256 ❖ It should better if concerned governmental and nongovernmental organizations provide trainings  
257 on seed production for seed producing cooperative members and non-members which can serve  
258 as out-growers for sustainable seed production in quality and quantity and can be protected from  
259 mixing of different crops at time.
- 260 ❖ There is a need to search revolving fund approaches to address the lack of working capital of  
261 seed producing cooperatives especially during seed collection and seed distribution.
- 262 ❖ An actionable and integrated support by concerned government and stakeholders is needed to  
263 exploit the existing opportunities and to solve the constraints of SPCs in a systematic manner so  
264 as to develop a successful cooperative based seed production, marketing scheme and  
265 responding the local demand for quality seed.

266

267

**5. REFERENCES**

268

1. USAID. United States of America and International Development. Agricultural Growth Program-Agribusiness and Market Development (AGP-AMDE) Project, Business Enabling Environment Assessment.2012

271

2. CSA. Central Statistical Agency agricultural sample surveys 2016/2017 (2009) report on Area and production of major crops (private peasant holding, Meher season) Addis Ababa, Ethiopia. Volume 1: 584 Statistical bulletin, 2017.

274

3. Dawit A. The political economy of Ethiopian cereal seed systems: State control, market liberalisation and decentralisation. Working Paper Futures Agriculture. 2010

276

4. ICARDA. International Center for Agricultural Research in the Dry Areas ICARDA Annual Report Beirut, Lebanon, 2015.

278

5. Louwaars NP, De Boef WS. Seed sector development in Africa: A conceptual framework for creating coherence between practices, programs, and policies. *J. Crop Improve.* 2012; 26(1):39–59.

281

6. Roy B. Farmers' participatory quality seed production of field crops-A case study. *J. Crop and Weed.* 2014; 10(2):89-93.

283

7. Alemu D, Rashid S, Tripp R. Seed system potential in Ethiopia. Constraints and opportunities for enhancing the seed sector. IFPRI, Addis Ababa, Washington. 2010

285

8. MoFED. Ministry of Finance and Economic Development). Growth and Transformation: Five Years (2011-2015) Strategic Plan of Ethiopia. Accessed March 2, 2016 at [http://www.ethiopians.com/Ethiopia\\_GTP\\_2015.pdf](http://www.ethiopians.com/Ethiopia_GTP_2015.pdf)

288

9. Thijssen M, Bishaw Z, Beshir A. De Boef W. Farmers, Seeds and Varieties, Wageningen International, the Netherlands. 2008

290

10. McGuire, S. and Sperling, L. The links between food security and seed security: facts and fiction that guide response. *Development in Practice.* 2011; (4-5):493-508.

292

11. Augustine L. Policy constraints in smallholder agri-food production and trade in Africa. *Paper presented at the Seventeenth AERC Senior Policy Seminar*, Maputo, Mozambique. 2015

294

12. CSA (Central Statistical Agency). Key findings of the 2014/2015 (2007 e.c.) agricultural sample surveys. Addis Ababa, Ethiopia. 2015.

296

13. ISSD (Integrated Seed System Development). Annual magazine Integrated Seed Sector Development Ethiopia Programme, Oromia East Unit Haramaya University. 2014.

298

14. Stephen, W., Tom, R., Samuel, K. and Chris, O.O. Review of Community Seed Production Practices in Africa: Implementation Strategies and Models. pp. 3-28. *In: Ojiewo, CO., Kugbei, S., Bishaw, Z. and Rubyogo, JC. (eds.), Workshop Proceedings Community Seed Production, Ethiopia, 9-11 December 2013. FAO, Rome and ICRISAT, Addis Ababa. 2013.*

302

15. Dawit TS, Franc J.H.M, Verhees and Hans C.M. Van Trjip. Seed producer cooperatives in the Ethiopian seed sector and their role in seed supply improvement: A review, *Journal of Crop Improvement.* 2017; 31(3):323-355.

304

- 305 16. Amsalu Ayana. 2015. Seed Producer Cooperative Development: Experiences of Integrated  
306 Seed System Development (ISSD) Ethiopia Programme. *Second Ethiopian Cooperatives*  
307 *Development Conference*, 7-8 May Hawassa, Ethiopia. 2015.
- 308 17. Amsalu A, Borman G, Subedi A, Abay F, Mohammed H, Nefo K, Dechassa N, and Dessalegn  
309 T. 2013. "Integrated Seed Sector Development in Ethiopia: Local seed business development as  
310 an entrepreneurial model for community-based seed production in Ethiopia." *Community Seed*  
311 *Producton*. 2013; 9-88.
- 312 18. SZDCO (Southern Zone Development Corridor Office). Five -Year Strategic Plan achievement  
313 of Southern Southern Zone Development Corridor Annual report. Maichew, Tigray, Ethiopia.  
314 Unpublished. 2015
- 315 19. Musa, LM-A; Peters, K J and Ahmed, M.K. A. On farm characterization of Butana and Kenana  
316 cattle breed production systems in Sudan. *Livestock Research for Rural development*. 2006;  
317 18(12).
- 318 20. Solomon G. Community perception on rangeland degradation: a case study in two differently  
319 settled areas of northern Ethiopia. *Journal of Agricultural Research and Development*, 2015;  
320 5(1):0101-0107.
- 321 21. Haftu K, Daniel D. , Gebru B.. Tsegay G., Guash A, Guesh G. Mulualem Z. Gebrekiros G.  
322 Analysis of Honey Bee Production Opportunities and Challenges in Central Zone of Tigray,  
323 Northern Ethiopia. *International Journal of Scientific and Research Publications*, 2015; 5(4).
- 324 22. Gebreyesus GB. Livestock herders' perception on the causes and effects *Senna obtusifolia* L.  
325 invasion in rangelands of Norther Ethiopia. 2017
- 326 23. Gebremedhin W. Challenges and Opportunities of Seed Multiplication in Eastern Tigray  
327 Ethiopia. *Journal of Biology, Agriculture and Healthcar*. 2015
- 328 24. Zewdie B and Abdoul, A.N. Are farmer-based seed enterprises profitable and sustainable?  
329 Experiences of VBSEs from Afghanistan. 2015
- 330 25. Melaku Admasu, Lemma Dessalegne, Brehanu G.Medhin. Ethiopian Seed Association (ESA)  
331 Proceedings of Annual Conference Summary, Addis Ababa, Ethiopia. 2014
- 332 26. Kumlachew Alemu.. Seed production and dissemination systems analyses: The case of  
333 Ethiopia. *Food Science and Quality Management*. 2015;35:25-37.
- 334 27. Borda-Rodriguez A, Johnson H, Shaw L, Vicari S. What makes rural co-operatives resilient in  
335 developing countries? *J. Inter. Devel.:* 2016: DOI:10.1002/jid.3125.
- 336 28. Abebaw Assaye, Adane Melak, Birhanu Ayalew, Dessalegn Teshale and Yalew Mazengia..  
337 Assessment of Seed Systems in North Western Ethiopia; with Special Emphasis on Community  
338 Based Seed Multiplication Scheme. *World Scientific News*, 2015; (6):100-110.
- 339 29. Dawit A. Farmer-Based Seed Multiplication in the Ethiopian Seed System: Approaches,  
340 Priorities and Performance. Working Paper 036. *Futures Agriculture*. 2011