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Value chain analysis of community-based common bean seed at selected Districts of Gurage Zone, Southern Ethiopia

Solomon Adimasu Godebo*[1], Tewodros Tefera[2]

[1]*College of Agricultural Sciences, Wachemo University, Hossana, Ethiopia*

[2]*College of Agriculture, Hawassa University, Hawassa, Ethiopia*

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Abstract

The study was conducted to analyse community-based common bean seed value chain in selected districts of Gurage Zone, Southern Ethiopia. The objectives of the study were identifying community-based common bean seed value chain actors and defining their roles; analyzing market margin of actors; analysing determinant factors of seed supply; and identifying constraints in the seed value chain. A multi-stage sampling technique was implemented for this study. The data were collected from both primary and secondary sources. Descriptive statistics, Value chain and econometric analysis were employed to analyse the data. Primary actors in the study are input suppliers, seed producers, collectors, South Seed Enterprise, Cooperatives and seed clients. Accordingly, the value chain activities are, input supply, production, value addition, marketing and final-use. The producer's share is highest in channel-III, which is 62.3% when producers sell their seed to South Seed Enterprise. The market supply of common bean seed is significantly affected by seed farming experience, quantity of seed produced, frequency of extension contact and District. Late delivering of seed, shortage of improved seed, weak extension contact are main constraints in production. The major seed marketing constraints include weak market linkage, low price at harvesting time, insufficient handling, poor quality seed and lack of storage centers in the production area. Hence, relevant seed value chain actors should join hands to upgrade the seed value chain to improve its performance and governance structure so as to overcome the prevailing constraints and seizing the opportunities.

***Corresponding Author:** Solomon Adimasu Godebo ✉ solomonadmasu2014@gmail.com

Introduction

Following cereal crops, pulses are important crops grown in most part of Ethiopia and in 2016 they covered 12.3% ha of cultivated land (CSA, 2017). From pulses, common bean provides an economic advantage to smallholders as source of protein, food security, and cash income; plays great role in soil fertility management; generate foreign currency; and create employment opportunity (Ferris and Kaganzi, 2008). Despite its importance, the national average yield is 1694 Qt/ha for red bean which is low compared to its genetic potential (CSA, 2017). Seed is one of the most important yield-enhancing inputs in crop production; without seed farmers cannot be in production (FAO, 2006). The prevailing seed system in Ethiopia classified in to formal, community-based (semi-formal) and informal system. The formal seed sector covers only 15% of the national demand in Ethiopia (Dawit, 2010). The participation of the private sector in the pulse seed business is negligible; serving less than 7% of seed demand (Asnake *et al.*, 2014).

On the other hand, the informal seed system is incapable of producing improved seed with the required quality and quantity (Dawit, 2010). Seed supply system and marketing in Ethiopia in general and the study areas in particular are weak and inefficient. For example, the supplies of certified grain legume crops seeds are less than 5% in Ethiopia (Zewdie *et al.*, 2008).

Improved varieties of common bean in Ethiopia were not adopted by many farmers (Bekele *et al.*, 2007). The main reasons are insufficient seed production (multiplication) and marketing systems that limit the availability of quality improved seeds, lack of credit, late delivery, low performance of extension services, poor linkage between different actors involved in seed supply system, and farmers' socio-economic situation (Zewdie *et al.*, 2009).

Community-based seed supply is an intermediate between the formal and informal seed system and not well developed in Ethiopia (Abebe and Lijalem, 2011). The community based seed multiplication is owned and managed by farmers and supported by Non-Governmental Organizations (NGOs) and research centres. NGOs provide the financial assistance and capacity building (Thijssen *et al.*, 2008) whereas the research system supplies early generation seeds. This system improves the access to high quality seeds and makes it available to farmers at affordable price. Thus, seed value chain study on community based seed system provides insightful feedback for possibility of value chain governance and upgrading. Successful value chains depend on, linkage between actors and their interactions. There is insufficient seed production and lack of appropriate marketing systems of quality improved common bean seed. In addition, there are also poor linkages among actors.

Improving input supply system, production, value addition, and marketing and strengthening farmers' participation in seed supply are key elements for proper functioning of community-based seed value chain. In response of this fact, this study has been undertaken to narrow there search gap.

Materials and methods

Description of the study areas

The research was conducted in to two district of Gurage zone namely Abeshge and Sodo districts. Abeshge is one of the Districts of Southern Nations, Nationalities and People's Region State (SNNPRS), in Gurage zone. It is located about 158 km southwest of Addis Ababa and 258.5 km northeast of Hawassa town, the capital of SNNPRS. The district is bordered on the south by the Wabe River which separates it from Cheha District, on the west and north by the Oromia Region and on the east by Kebena District. The District has 26 rural and 3 urban kebeles and has total population of 61,424 people, of which 32,450 (52.8%) are men and 28,974 (47.2%) women (CSA, 2007). The altitude of the District is varies between 1001 and 2000 m.a.s.l. The District has two agro climatic zones, Woina-dega (10%) and Kola (90%). Its annual rainfall varies between 801-1400 mm. The economy of the District is based on crop-livestock mixed farming system. The major crops produced in the District include maize, teff, sorghum, common bean.

Sodo is other District in Gurage zone and located at 100km to the southwest of Addis Ababa. The District bordered on the south by Meskan and on the west, north and east by the Oromia Region. Based on the 2007 Census conducted by CSA, the District has a total population of 134,683, of these 67,130(49.8%) were men and 67,553(50.2%) were women (CSA, 2007). The altitude of Sodo District is 1800-3400 m.a.s.l. The Agro-ecology classified into Woina-dega (65%) and Dega (35%) agro climatic zones and annual rainfall varies from801to1200 mm. The economy of the District is dominated by mixed farming. The major crops of include wheat, sorghum, barley, common bean, pea and chickpea.

Data type and sources of data

The study employed both qualitative and quantitative approaches and the sources of data were primary and secondary sources.

The qualitative approach used Focused Group Discussion, key informant interview and observation whereas the quantitative approach employed questionnaire survey. The primary data were collected from seed producers, collectors, South Sees Enterprise (SSE) and cooperative union. The survey was conducted through personal interview with randomly seed value chain actors by using questionnaire. The Key Informant Interviews and focused group discussion was carried-out after survey data collection completed. Secondary data were collected from Districts Agriculture and Natural Resources office, SNNPRS Agriculture Bureau and Natural Resources, Hawassa University Canadian International Food Security Research Fund (CIFSRF) project. Relevant literature and documents were reviewed to provide theoretical background. The different types dependent and independent variables used in the study (Table 1).

Table 1. Summary of dependent and independent variables used in the model

Variable	Explanation	Category	Code and unit of measurements	Expected sign
Dependent variable				
VSSM	Seed supply to the market	Continuous	Quintal	
Independent explanatory variables				
Age	Age of Household Head	Continuous	Year	-/+
Sex	Sex of the Household Head	Dummy	0=Female 1=Male	
DMkt	Distance to Market	Continuous	Kilometre	-
Credit	Credit Access	Dummy	1=HH take loan, 0=Otherwise	+
FoEC	Frequency of Extension Contact	Categorical	Number of contact	+
LEdu	Level of Education	Categorical	Number of year of schooling	+
Land	Land Size	Continuous	Total area of land in hectare	+
SFExp	Seed Farming Experience	Continuous	Year	+
QSPro	Quantity of Seed Produced	Continuous	Quintal	+
Family	Family Size	Continuous	Number	+/-
District	District of Household Head	Dummy	0=if Abeshge, 1= Sodo	

Sampling procedure and sample size

Multi-stage sampling technique was implemented to select sample households. In the first stage, two districts selected randomly out of total districts of Gurage zone. In the second stage, community-based common bean producer *kebeles* were purposively identified. In the third stage, from the identified community-based producing *kebeles,* four sample *kebeles* from each district were selected randomly. In the fourth stage, out of the sampled *kebeles* community-based common bean seed producers farmers were separated from none producers. In the fifth stage, out of the identified community-based common bean seed producers 136 community-based common bean seed producer farmers were selected randomly. Names of sample Kebeles were Hudad-7, Boketa, Tewul-gefersa and Fenta from Abeshge and Gogetie-2, Kela-zuria and Negassa from Sodo District. The numbers of respondents were determined by using a formula developed by Yamane (1967). To determine the required sample size at 5% level of precision the following formula was applied:

$$n = \frac{N}{1 + N(e^2)}$$

Where: n = is the sample size,

N = is total number of seed producers farmers (210) in the selected *Kebele* and

e = is the level of precision (0.05)

Methods of data collection

Development agents in each of study *kebeles* were trained for data collection. The questionnaire was pre-tested in two seed producer households in each *kebeles*. Data were collected under intensive supervision and follow up of the researcher. Key informant interview was employed to get the supplemental information that shows current community-based seed value chain in the study areas. Focus group discussion was conducted to collect important data on constraints in value chain. The discussions were conducted in each selected *kebeles* with 6-8 participants per discussion group.

Methods of data analysis

Descriptive statistics, inferential statistics and econometric analysis were employed to analyse the data. Thus; descriptive statistics, used percentages, means, so as to describing seed value chain actors, marketing function and household characteristics in the value chain. Whereas econometric analysis was used to analyse determinates of seed supply in the study areas.

Analysis of cost and marketing margins

As products move successively through the various stages, transactions take place between multiple chain actors, money and information are exchanged along product flow (Kaplinsky and Morris, 2001). The four steps of value chain analysis were applied in this study:

1. Mapping the value chain to understand the characteristics of the actors and their relationships.

2. Analyse the distribution of benefits in the chain or cost and market margin. This involves analysing the margins within the chain; who benefits from the chain and who would need support to improve performance and gains.

3. Defining upgrading needed within the chain. By assessing profitability within the chain and identifying chain constraints, upgrading solutions can be defined.

4. Emphasizing the governance role. Governance defines the structure of relationships and coordination mechanisms that exist among chain actors.

Estimates of the marketing margins are the best tools to analyse performance of market. Marketing margin was calculated by taking the difference between producers and consumer prices. Mathematically, produces' share can be expressed as:

$$PS = \frac{Pp}{Cp} = 1 - \frac{MM}{Cp} \quad (1)$$

Where: PS= Producer's share, Pp= Producer's price, Cp = Consumer price and MM = marketing margin

Computing the Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as a percentage (Mendoza, 1995)

$$TGMM = \frac{\text{Consumer Price} - \text{Producer Price}}{\text{Consumer Price}} \times 100 \quad (2)$$

Where, TGMM=Total gross marketing margin.

Net Marketing Margin (NMM) is the percentage over the final price earned by the intermediary as his net income; once his marketing costs are deducted. The higher marketing margin diminishes the producer's share.

$$NMM = \frac{\text{Gross marketing margin} - \text{Marketing costs}}{\text{Consumer Price}} \times 100 \quad (3)$$

Higher NMM or profit of the marketing intermediaries reflects reduced downward and unfair income distribution. An efficient marketing system is where the net margin is near to reasonable profit.

In analyzing margins, first the Gross Marketing Margin (GMM) was calculated. This is the difference between producer's price and consumer's price (price paid by final user).

Gross Market margin will be computed as:

$$GMM = \frac{\text{Consumer price} - \text{Marketing gross margin}}{\text{Consumer price}} \times 100 \quad (4)$$

Where, GMM = Gross market margin.

Econometric analysis of market supply model

Multiple linear regression was used to analyze factors affecting community-based common bean seed supply to the market in the study areas. This model is also selected for its simplicity and practical applicability (Green, 2003). The multiple linear regression model was specified as follows.

$$Y = X'\beta + U$$

Where Yi= Amount of seed supplied to the market, X'= a vector of explanatory variables, ß = a vector of parameters to be estimated and U = disturbance term.

Results and discussion

Demographic characteristics of sample households

The gender representation of the respondents indicates 88% male and 12% female. With regards to level of education; 14.6%, 51.4% and 34% were attend non formal education, primary and secondary school, respectively. The average age of the respondents was 40 years and average years of farming experience in seed production were 2 years. The average family and land size of household is 5.5 and 2.2 ha, respectively (Table 2).

Table 2. Demographic and socioeconomic characteristics of sample households

Variables	Items	Number	%
Sex	Male	120	87
	Female	18	13
	Illiterate	20	14.5
Education	Primary	72	52.2
	Secondary	46	33.3
		Mean	SD
Age		40	9.2
Experience		2	0.43
Family Size		5.5	2.1
Land size		2.2	0.9

Value chain analysis

Mapping actors and identifying their role in the common bean seed value chain

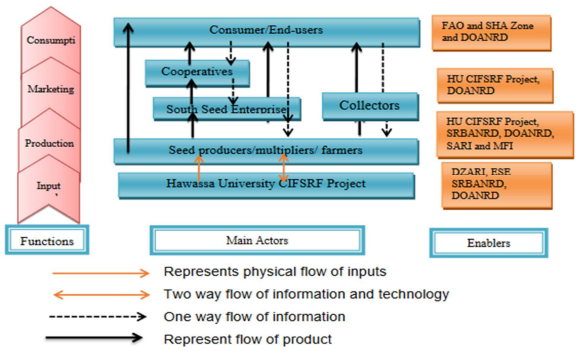

Fig. 1. Value chain maps of community-based common bean seed

According to UNIDO (2009), value chain mapping helps to identify the different actors involved in the value chain and understand the existing roles and responsibilities. Mapping seed value chain used qualitative and quantitative terms identified actors and map their roles and responsibilities. Hence, three major actor categories primary actors, chain supporter and chain influencer were identified. Four major roles and function was identified: input supply, production, and marketing and consumption. The value chain map of community-based common bean seed in Abeshge and Sodo districts is shown in Fig. 1.

Primary actors

Input suppliers

Hawassa University Canadian International Food Security Research Fund (CIFSRF) Project is the only input supplier and financial source for seed producers. The project cover input expenses of community-based common bean seed in the Abeshge and Sodo Districts. Farmers repay seed in kind during harvesting season without interest. The value chain map of community-based common bean seed is shown in Fig. 1.

Producers

All community-based common bean seed producers in Abeshge and Sodo Districts are small-scale seed farmers. Producers are the major actors who perform most of production functions from farm preparation to post-harvest handling and marketing of seed.

Local seed collectors

Seed collectors collect common bean seed from producers for the purpose of re-selling it to final-users. The activities of collectors include purchasing and collecting and selling seed to grain producers.

South seed enterprise

South Seed Enterprise (SSE) purchase seed from producer farmers who can supply quality seed. Farmers submit seed to SSE with in specified day and the Enterprise purchase seed by premium price, 15% above grain price. The SSE purchase unclean seed and then transport, clean, and package, store and sell of clean and package at amount 25 kg and finally sold to grain producers.

Cooperatives

The cooperatives and Unions mainly involved in purchasing seed from South Seed Enterprise and transport and store seed until marketing and distribution of seed for members and non-members farmers carried out.

Seed Users /Grain producer Farmers/

Consumers or final-users are those purchasing the certified seed for grain production. About three types of seed consumers were identified: grain producer farmers, investors and NGOs (FAO and Self Help Africa). Grain producer farmer's purchase certified seed directly from producers, collectors or from South Seed Enterprise and Cooperatives through District Agriculture and Natural Resources office. In general final-users have their quality criteria to purchase seed.

Chain supporters

Hawassa University CIFSRF Project provides training and capacity building for experts on production and marketing of seed. Districts Agriculture and Natural Resource office provides extension and market information. SNNPRS Bureau of Agriculture and Natural Resources and District office of Agriculture and Natural Resources are playing facilitation role during input distribution. ESE, South Research Institute and Melkasa Research Institute supplies early generation seeds to CIFSRF project.

Chain influencers

Field supervision, monitoring and quality controlling services were done by SNNPR Bureau of Agriculture and Natural Resources and in collaboration with Wolkite plant seed quality controlling centre. Decision on seed purchasing price by South Seed Enterprise was made by the committee established for buying price setting purpose. Federal and regional seed enterprises set price of certified seed selling prices. The smallholder farmers are not formally organized and due to low bargaining power they cannot governing the value chain, thus, farmers forced to sell their product at the price offered by collectors during harvesting time. There is weak linkage between producers and South Seed Enterprise. Most producers' seed were failed because of poor quality of seed; however, produce sold to the collectors were mostly sold in food grain market with low prices. SSE was key value chain governor and seed market performance dependent on SSE, thus, the community-based seed value chains influenced by the South Seed Enterprise.

Table 3. Amount of produced and marketed by sample respondents in 2016/17

Seed produced in ql			Seed marketed in ql		
Abeshge	Sodo	Total	Abeshge	Sodo	Total
196.55	31	227.55	140.85	21	161.85

Note: ql=quintal

Common bean seed marketing channel

Four main alternative channels were identified for community-based common bean seed marketing. In 2020 total amount of production of common bean seed by sample respondents were 227.55 quintals and 161.85 quintals (71.12%) were supplied to the market (Table 3).

1 Producers → Consumer
2 Producers → Collectors → Consumers
3 Producers → SSE → Consumers
4 Producers → SSE → Cooperative → Consumers

Costs and distribution of benefits among value chain actors

Farmers incur costs during the production and marketing their produce. The marketing cost of the common bean seed mainly involves the cost of post-harvest activities. Table 4 indicates production and marketing cost related to the transaction of common bean seed by producers, collectors, South Seed Enterprise and Cooperatives.

Table 4. Costs of common bean seed value chain in Birr per quintal

Items	Producers	Collectors	SSE	Cooperative
Purchase price	_	750	1190	1913
Production costs	650	_	_	_
Total Marketing costs	44.5	60	340	11
Total cost	694.5	810	1530	1924

Marketing margin can be used to measure the share (benefit) of the final selling price that is taken by a particular actor in the value chain. Gross Marketing Margin (GMM) is the percentage over the price earned by the producer/seller once his selling price is deducted. The TGMM was highest in channel-II which is 39.3%. Without considering channel-I (producers sell directly to final-users), the producers share was found to be the highest in channel-III which is 62.3%.

Table 5. Marketing margin of common bean seed in the value chain

Actors	Items Birr/quintal	Marketing channels			
		I	II	III	IV
Producers	Selling price	740	750	1190	1190
	Marketing costs	10	15	44.5	45.5
	Value added	80	85	495.5	495.5
	TGMM	0	39.3	37.8	38.3
	GMMp	100	61.2	62.3	61.7
Collectors	Purchasing price		750		
	Selling price		1220		
	Value added		405		
	GMMcl		38.5		
	NMMcl		33.2		
SSE	Purchasing price			1190	1190
	Selling price			1913	1913
	Value added			383	383
	GMMe			37.8	37.5
	NMMe			20	19.8
Coop	Purchasing price				1913
	Selling price				1930
	GMMcp				1.0
	NMMcp				0.88

This indicates that channel-III provides producers with better share of value created. In terms of profit made (value added), producer's profit was 80, 85, 495.5 and 495.5 birr per quintal for channel-I, II, III, IV, respectively. NMM was highest in channel-II, which 33.3% this is because collector directly purchases seed by low price from producers and sale to grain producers (Table 5).

Econometric model outputs

Determinants of volume of seed supply to seed market

Analysis of determinants of volume of market supply of seed was found to be important to identify seed supply to market by using multiple linear regression model. In this regard, eleven explanatory variables were hypothesized to determine the volume marketable supply of community-based common bean seed. The numbers of significant variables are four, which are Districts significant at 10%, seed farm experience at 5% significant level, amount of seed produced at 1% significance level and frequency of extension contact at 1% significance level (Table 6).

District

As the District is significantly at 10% significance level. Sodo District as compared to Abeshge District, the volume of common bean seed supply less than by 0.78 quintals, keeping other variables held constant. This is in line with Abraham (2013) who illustrated as Districts have effect on the volume of market supply of tomato in Habro and Kombolcha Districts in Oromiya Region.

Table 6. Determinants of amount of common seed supplied to the market

Variables	Coef.	Std. Err	p-value
District	-.784	.404	0.058*
Age	.019	.018	0.287
Sex	-.097	.439	0.825
Leduc	.161	.269	0.553
DMarket	-.048	.157	0.763
SFExp	.939	.365	0.013**
FSize	-.046	.067	0.491
LSize	.097	.229	0.675
ASProdu	.328	.116	0.006***
ACredit	.124	.393	0.754
FExt	.734	.146	0.000***
_cons	-1.99	1.15	0.087
N = 136 F/Ch²= 40.44*** R²=0.88 Adj. R² = 0.86			

Note: ***, ** and * are statistically significant at 1%, 5% and 10%, respectively.

Seed farming experience (SFExp)

Experience affects common bean seed market supply positively and significantly at less than 1% significance level. Thus, as farmer's experience increased by a year, seed supplied to market increased by 0.94 quintals. This is similarly Tadele and Ashalatha (2016) increase in volume of teff and wheat supplied to the market.

Amount seed produced (ASProdu)

Amount of seed produced significantly and positively affected volume of seed supplied to the market at 1%

significance level. Thus, a quintal increase in the amount seed production has caused an increase of 0.33 quintals of market supply of common bean seed. This is similar with Abraham (2013) an increase fruits and vegetables production has increased market supply of the commodities significantly in Habro and Kombolcha Districts.

Frequency of extension contact (FoEC)

It was positively and significantly associated with common bean seed volume of supply at 1% significant level. This indicates that as the number of contacts of farmer with Development Agent increases by a time, the quantity of supplied to the market increased by 0.73 quintals of seed. The funding is in line with the study by Rehima (2006).

Table 7. Major Constraints of community-based seed in production

Types of constraints	Response	Number	%
Late delivering of seed	No	-	-
	Yes	136	100
Shortage of seed	No	50	36.8
	Yes	86	63.2
Pest	No	94	69.1
	Yes	42	30.9
High rain-fall	No	112	82.4
	Yes	26	19.1

Constraints in the value chain

Production constraints

During Focus Group Discussion farmers indicated that; the seed does not arrive on time and arrives after the farmers made alternative decisions on planting, this is in line with Zewdie *et al.* (2009). Productivity is below potential due to late delivery of seed. Amount of seed supplied to producers is inadequate and producers are not expanding production and supply of seed in the study areas. Accordingly, about 63.2% of the respondents responded that, as there is shortage of improved seed; the result has similar find as Dawit (2010) (Table 7). Due to involvement Agricultural development agents non-extension activities, the development agents not properly provide extension service for seed producers and some of development agents have no enough technical capability to support the seed producers; is similar as Zewdie *et al.* (2009).

Table 8. Major marketing constraints of community-based common bean seed

Types of constraints	Response	Number	%
Low price at harvesting time	No	88	64.7
	Yes	48	35.3
Lack of storage	No	66	48.5
	Yes	70	51.5
Market Linkage Problem	No	22	16.2
	Yes	114	83.8
Seed quality	No	60	44.1
	Yes	76	55.9

Marketing constraints

Most of farmers need to sale early to cover their needs. However, purchase of seed by South seed enterprise is not conducted on time. Thus, marketing linkage between producers and South seed enterprise is weak. Due to this reason seed purchased by collectors at the price of grain during harvesting time. About 83.8% respondents mentioned the weak market linkage in the study area; the finding is in line with Zewdie *et al.* (2008; 2009). Poor farm management and post-harvest handling practice results poor quality seed, most of farmers produce poor quality seed and sold the product to by grain price. About 55.9% producers produced poor quality seed. The collection centers are vital for marketing and quality preservation; however, poor storage result in poor quality seed. About 51.5% of respondents have no proper storage place for the produced seed (Table 8).

Conclusion

The major seed value chain actors in the study areas were input suppliers, seed producing farmers, collectors, South Seed Enterprise, Cooperatives Union and final users. Hawassa University CIFSRF Project supply inputs while community based seed producers members involved in seed production. Farmers are small-scale and formally unorganized; Efforts should be made by government and CIFSRF Project to strengthen the yet infant seed producers to become organized seed producing and commercial seed producing Enterprise. Major actors such collectors, South Seed Enterprise (SSE), cooperative involved in seed and information flow from producers to final users. Hawassa University CIFSRF project, SNNPR Bureau of Agriculture and Natural Resources, Districts Offices are chain supporters.

Seed regulatory authority, seed laboratory (Wolkite plant seed controlling centre) and research centres are chain influencers as they influence the quality and quantity of seed marketed.

The producer's share is highest in channel-III (producers-SSE-consumers), when they sale to SSE which is 62.3% and they get highest profit from channel-III which is 495.5 birr per quintal. The collectors purchase seed from the farmers at a lower price and sell at higher price. The main reasons farmers sell seed to collectors were due to late purchasing of seed by SSE and when rejected due to low quality of seed. The strong market linkages between producers and South Seed Enterprise needs to be enhanced by designing contract farming arrangements for mutually benefit and sustainability of production and marketing quality seed.

Market supply of common bean seed is significantly affected by district attributed to agricultural potential, seed production experience, quantity of common bean seed produced, and frequency of extension contact. Constraints of production are late (untimely) delivering of seed, shortage of improved seed, weak extension service. The major seed marketing constraints are weak market linkage, low price during harvesting time, insufficient handling and poor quality seed that cannot meet standard set by SSE and lack of storage facilities in the production areas and this reduce market supply of seed and profit of farmers.

Seed should deliver at the right time to enhance productivity, and sustain of seed the supply. Production of seed should be according to Agro-ecology of Districts. Increasing the use of improved seed and farm management practices could increase productivity and amount of market supply. To maintain quality access to improved storage facilities should be enhanced at farm gate level and educating producers on post-harvest handling activities of seed is the right pathway. Strengthen of linkages among community-based seed value chain actors shall be done. Strengthening extension contact by providing continuous capacity building and separating extension providers from other administrative activities should be done by Districts Agricultural and Natural Resources office.

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