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Soybean (*Glycine max* (L.) Merril) Value Chain Analysis in case of Jimma Zone, Southwestern Ethiopia

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This study was conducted at Tiro Afeta district of Jimma zone with the objectives of analyzing and mapping the value chain and identifying the determinants of soybean supply to the market in the study area. Tiro-Afeta district was selected purposively due to its potential in soybean production and marketing. There are 17 rural kebeles administrations in the Tiro-Afeta district. From these rural kebele eight kebeles were selected purposively based on current production level of soybean and finally, four kebeles were selected randomly. Semi-structured questioner was developed and used to collect data from input suppliers, collectors, local retailers, local wholesalers, national wholesalers, national retailers, processors, exporters and enablers or supporters who were purposively selected. Both primary and secondary source data were considered for the analysis, value chain map and econometric methods were used to analyze the data. The result of the study showed that the main value chain actors were input suppliers, soybean producers, wholesalers, retailers, collectors, processors, exporters and consumers. The average amount of soybean supplied to the market by producers was 4.47 quintals with a minimum amount of 2.48 quintals and maximum amount of 5.73 quintals. Compared to farmers, traders took above 65.8% of the total profit margin. The result of Ordinary Least Squares model showed that quantity of soybean produced, sex of the household head, and distance to the nearest market, frequency of agricultural extension visits and cooperative membership positively and significantly affected soybean market supply. Based on the findings, the study recommends introduction of soybean improved varieties and sustainable supply of bio-fertilizer and increase of credit, rural roads and agricultural extension services. Increase the access of cooperatives and intensify cooperative to collect soybean from the farmers could affect the farmers' profit margin positively by eliminating unwanted chain actors from the chain. Thus, huge emphasis should be given to cooperative development on the study area.

Key words*:* Benefit share, Market supply, Value Chain, Ordinary Least Squares, Farmers marketing organization (FMOS)

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INTRODUCTION

Global soybean production and trade has changed dramatically in the past three decades. Soybean is one of the world's most important pulse crops with an annual worldwide production of 223,184,884 tons in 2009 (FAOSTAT, 2011). The Soybean is one of the most important food plants of the world, and seems to be growing in importance. It is an annual crop, fairly easy to grow, that produces more protein and oil per unit of land than almost any other crop. It is a versatile food plant that used in its various forms, capable of supplying most nutrients. In terms of its nutritional value, can serve as a substitute for meat and to some extent for milk. Soybean is an alternative protein source to the rural families and can be utilized at home in various forms and the surplus can be sold to other consumers and manufacturers for income. Soybean is among the major industrial and food crops grown in every continent (FAOSTAT, 2011)

World leading soybean producing countries Uruguay 3.2**,** Bolivia 3.3, Ukraine 3.9, Canada 6.00, Paraguay 10.0, India 10.5, China 12.2, Argentina 53.4, Brazil 86.8, USA 108.0 million metric tons (FAOSTAT 2016). Domestic market demand for soybean increased and reached 68,900 tons (CSA 2000-2011). Soybean has an average protein content of 40% and is more protein-rich than any of the common vegetable or animal food sources. Soybean seeds also contain about 20% oil on a dry weight of the grain basis, and of which 85% *unsaturated* and cholesterol free. Soybeans have been variously referred to as the miracle golden bean, the golden nugget, nuggets of nutrition, pearls of the Orient, the meat of the fields, the meat that grows on vines, the Cinderella crop of the century, the Cinderella crop of the West, the protein hope of the future, and the amazing soybean. Regardless of what it is called, soybeans are a promising and proven source of plant protein and edible oil.

Soybean is one of the world's major crops has been cultivated by men since nearly 5000 years because of its agronomic and nutritional value. Soybean is a source of edible oil second most consumed oil in the world after palm oil and is used to produce livestock feed. Many other products with a soya basis are also directly used for human consumption soymilk soy yogurt snacks soya sauce protein extract and concentrates (FAOSTAT, 2011). In addition to being a potentially profitable cash crop, the high protein content (~40%) in soya means it could also contribute to improved nutritional status of rural households (Dixit *et al.,* 2011).

In the major producing countries and particularly in Brazil, Argentina Paraguay and the USA soybean contributes significantly to the total value added by the agricultural sector. In these countries, soybeans and its sub-products also occupy an important position in total export earnings.

Ethiopia produced an estimated volume of 150,000 tons in 2014/15, the result of combined production by smallholders and commercial farmers. The growth in production is attributed mainly to the increase in area cultivated and productivity. The total area of land under soybean production during the last 10 years has increased tenfold, while the total volume of production during the same period increased 21 times. Productivity level of soybean is 2.1 tons per hectare and this level is very low compared to its potential, which could go up to 4 tons per hectare if improved varieties are used (Sopov, M. *et al*., 2015,)

In Ethiopia Owing to the late rains and uneven rainfall distribution in some of the main soybean-producing areas, production for MY 2015/16 is forecast downward to 66,000 metric tons, a drop of 6,000 metric tons from previous year. Going forward, production is expected to rebound and continue its upward climb in order to meet some of the increasing local demand for edible oil and soybean meal for livestock feed, most particularly soybean meal for poultry production. The government plans to incline up poultry production as part of its Livestock Master Plan. These anticipated increases in production will come with improved yields and expanded acreage planted in soybeans, some of which will be done on commercial farms. Over the last several years, soybean production has doubled from 35,000 metric tons in MY11/12 to 72,000 metric tons in MY14/15. Most of this growth in production was due to an increase in the area planted and to a lesser extent improved yield. The expansion in are planted was largely attributed to the increasing, but still small number of large-scale commercial farms producing soybeans, which account for about half of total production. For example, in one of the leading-production areas, the Metekel zone in Benshangul Gumuz region, there are more than 150 commercial farms, with an average size of 50 hectares that are producing soybeans. In addition, there are several large-scale soybean farming operations like Ethio Agri-CEFT Plc and Ruchi Agro-Industry. Soybeans are also being used as a rotational crop on some of the government-owned sugarcane plantations.

The main soybean-producing areas are in the regions with high potential for soybean are Benishangul-Gumuz, Oromia Amhara region and South nation nationality and people's regional states. In the southwestern par0ts of the country where there are high potential areas for upgrading of commercial soybean production are Buno Bedele zone, Chawaka district and Jimma zone (Oil Seeds Business Opportunities Ethiopia, 2009.) In these regions, the top-producing zones are Illubabor, Horogudru Wollega, East and West Wollega, Metekel, Assosa, Kemashi, Awi and West Gojam (CSA 2015/16).

OBJECTIVES

The general objective of the study is to analyze and map soybean value chain in the study area. The specific

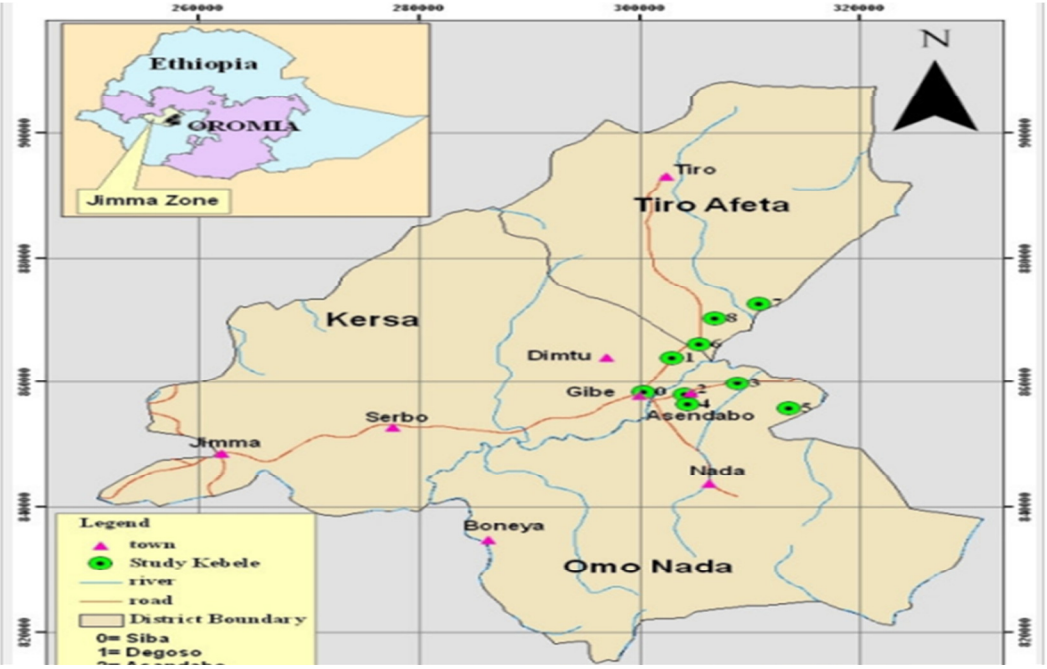

Figure 1. Map of the study area Tiro Afita Jimma zone CSA (2007)

objectives of the study are

- To analyze and map the soybean value chain and estimate the share of profit of actors along the chain in the market and,
- To identify the determinants of soybean supply to the market;

Study Area

Tiro Afeta is Part of the Jimma Zone (Figure 1), and bordered on the South by Omo Nada, on the west by Kersa, on the north by Limmu Kosa, and on the east by Sokoru. The administrative center of the district.is Dimtu. The altitude of this district ranges 1640-2800, mountains include Geshe, Haro, Gebera and Hako Albiti. Perennial rivers include Gilgel Gibe, Busa, Nedi and Aleltu.

Sampling Techniques and Procedures

Both probability and non-probability sampling techniques were used. Probability sampling techniques were used for selection of sample kebeles and producers whereas non-probability techniques were used for selection of study district, potential kebeles, and total producers from selected kebeles, interviewed respondents, traders' and consumers selection.

Sampling procedures

The sample for this study was drawn from all actors concerned along soybean value chain such as producers, soybean collectors, wholesalers, processors, retailers, exporters and consumers. Based on their distribution, soybean value chain actors have been selected by using their appropriate sampling techniques.

Kebeles and Producer's sampling

Tiro-Afeta district were selected purposively as the study area based on the amount of soybean production and participation of farmers in soybean marketing. There are 17 rural kebele administrations in the Tiro-Afeta district. From these, 8 kebele administrations were selected purposively. And also, from these selected rural kebele four of them were selected randomly. Accordingly, Dacha Nede, Riga Siba, Kajelo and Tiyo kebeles were selected randomly. There are about 76, 61, 68 and 43 soybean producers in Dacha Nede, Riga Siba, Kajelo and Tiyo kebele respectively. Sample frame was drawn for the study population by employing probability proportional to size. Finally, based on the sampling frame drawn from each kebele, snowball sampling technique was applied to select the sample soybean producer farmers.

Trader's sampling

This survey includes intermediary value chain actors involved in soybean marketing such as collector's wholesalers, retailers, processors, exporters and consumers. Selection of these actors is range from the study area to the major towns and marketing centers such as Dimitu, Asendebo and Jimma. These actors were selected purposively based on their direct involvement in the soybean value chain coming from the production point of the study area up to the final market.

Table 1. Sample size determination of selected soybean producers' sample Kebeles

Name of Woreda	Name of selected kebele	Total number of Soybean producers HH	Sample Ratio	Number of samples HH
Tiro-Afta	Dacha Nade	76	0.31	47
	Riga Siba	61	0.25	38
	Tach Kajelo	68	0.27	42
	Tiyo	43	0.17	26
Total	Four kebele	248	1.00	153

Source: Owen survey time Sketches, 2016

Because of lack of secondary data record on soybean traders, trace ability and snow ball sampling technique were employed to select wholesalers, collectors and processors. Retailers were selected randomly from Dimitu town, Asendebo town and Jimma town.

Accordingly, 1 wholesaler, 7 retailers, 4 collectors, 2 exporters and 1 processor were selected purposively based on their involvement in transaction of soybean originating from the study district.

Sample size determination

The level of precision, the level of confidence or risk and the degree of variability in the attributes being measured. The sample size was determined using the formula below as reported by Yamane (1967) with 95% confidence interval. (Table 1)

$$\boldsymbol{n = \frac{N}{1+N(e)^2} = \frac{248}{1+248(0.05)^2} = 153 \ \ldots\ldots\ldots 1}$$

n=sample size
N= total population of households in four soybeans producing kebeles
e=margin of error at 5%

METHODOLOGY

Types of data

Both qualitative and quantitative types of data were used for the study. Qualitative data collected include actors and their respective functions, marketing condition, support services aligned along value chain, socioeconomic characteristics of soybean producers, soybean production systems, value additions of soybean, soybean distribution pattern in the area, etc. Quantitative data like direct and overhead costs incurred by each actor, market margin, percentage share of soybean value chain actors, income from sale of soybean, age of the actors, volume of soybean sold and bought, selling and buying price of the soybean in unit of measurement, distance to the nearest market, additional sources of income, etc. were collected.

Sources of data

In this study, both primary and secondary sources of data were used. The primary sources of the data include sample respondents, key informants, focus group discussion, extension workers, Agriculture and natural resource officers and soybean traders.

To generate the secondary data on soybean production and marketing, the data was collected from different published and unpublished sources. The secondary data collected from central statistical authority (CSA), reports, and documents of agriculture and natural resource officers, research centers, cooperative development office and trade, NGO (facilitator for change) and industry office.

Method of data collection

To capture enough data for the study, both close ended and open ended (semi- structured) questionnaire was prepared and to collect the data, personal interview and community based participatory approach (KIF and FGD) were used. Document review was made to take secondary data related with the study. Finally, qualitative information's were gathered through FGD and KII were conducted accordingly.

Methods of Data Analysis

Both descriptive and inferential statistics, value chain analysis and econometric analysis were employed. Maps in the process of examining and describing marketing functions, facilities, services and respondents' characteristics were used to illustrate the overall system of soybean production and marketing in the area.

Hypothesis and Definition of the Variables

Dependent variable

Independent variables

Review of literatures on factors influencing smallholder farmers' soybean market participation and the level of

Table 2. Description of dependent and independent variables used in soybean supply to market

Variables	Description	Category	Measured	Effect
QUASYSPP	Quantity soybean Supplied	Continuous	Kilogram	
SEX	Sex of the Respondent	Dummy	1=male, 0=female	-ve
AGE	Age of the Respondent	Contiguous	Year	+ve/
TOTALFSZ	Total Family size	Continuous	Number	+ve
EDULV	Educational level of the Respondent	Continuous	Grades of schooling	+ve
EXPPRODU	Experience of production	Continuous	Number of years	+ve
TRTTPYE	Training service	Dummy	1=Yes, 0=No	+ve
ACCMKTINFO	Access to market Information	Dummy	1=Yes, 0=No	+ve
FEXTVIST	Frequency of Extension contact	Continuous	Number of extensions contact	+VE
COOPMB	Cooperative membership	Dummy	1=Yes,0=No	+ve
TRNSNFAC	Transportation facility	Dummy	1=Yes,0=No	+ve
DSMRKWAR	Distance to the nearest market	Continuous	Walking hour	+ve
NUMBOXEN	Number of oxen owed	Continuous	Number of oxen owed	+ve

marketed surplus among smallholder farmers. Knowledge on soybean market participation and value addition which is scant locally. Almost previous research concentrated on biophysical aspects of soybean production. Therefore, understanding smallholder marketing of soybean is vital for increased participation which may lead to increased farmer incomes. Both continuous and discrete variables were hypothesized based on economic theories and the findings of different empirical studies. (Table 2)

RESULTS AND DISCUSSION

Of the total sample, 84.3% were male-headed households and only 15.7% were female-headed households. With regards to educational status, 83% and 17% of the respondents were illiterate and literate, respectively. Farming was the main occupation and source of livelihood for all sample farmers (100%) in the study area. (Table 3 & 4)

Result of Value Chain Analysis (VCA)

Actors and their functions in soybean value chain

The value chain map highlighted the involvement of diverse actors who are participated directly or indirectly in the value chain. According to Kit *et al. (*2006), the direct actors are those involved in commercial activities in the chain and indirect actors are those that provide financial or non-financial support services, such as credit agencies, business service providers, government, NGOs, cooperatives, researchers and extension agents. The primary actors in soybean value chain in both districts include soybean seed and other input suppliers, farmers, traders and consumers. Each of these actors adds value in the process of changing product title. Some functions or roles are performed by more than one actor, and some actors perform more than one role.

Input suppliers

Input suppliers are the first actors involved in the soybean value chain. Currently, office of agriculture and rural development and Jimma agricultural research center are the main source of input supply in Tiro Afeta district, responsible to supply agricultural inputs like fertilizers, herbicides, pesticides and farm implements, which are essential inputs at the production stage. For all soybeans produced in Tiro Afeta district, soybean producers used input from office of agriculture and rural development, research centers and facilitator for change (FC).

Table 3. Sex and education status of respondents

Variables	Category	Frequency	Percentages
Sex	Male	129	84.3
	Females	24	15.7
Education status	Illiterate	127	83
	Literate	26	17

Source: Own Survey result, 2016

The mean age of the respondents of the study area was 43.32 years. The average total household family size of the respondents was 6.66. The average years of farming experience related to soybean production was 4.53.

Table 4. Age and family size of the respondents

Variables	N	Mean	Std. Deviation
Age	153	43.32	5.87
Family size	153	6.66	1.23
Soybean farming experience	153	4.53	0.89

Source: Survey result, 2016

Table 5. Land holding allocation yield and quantity sold to major crops produced (ha/HH)

Variables	**N**	**Mean**	**Std.dev.**
Total landholding size	153	1.6952	0.43846
Land used for Soybean production (ha)	153	0.4298	0.11268
Yield(qt)	153	4.78	0.62189
Mean productivity (qt/ha)	153	10.39	5.6690
Quantity sold (qt)	153	4.469	0.62091

Source: Own survey result (2016)

Regarding fertilizers, some farmers used only organic fertilizer, while others used both inorganic and organic fertilizers depending on the land size allocated to soybean and the soil fertility status as perceived by the farmers. Mostly private vendors supply pesticides.

Producers

Soybean producers are the first link in the marketing channel and the second actors in the soybean value chain. They are the major actors who perform most of the value chain functions right from farm inputs preparation on their farms or procurement of the inputs from other sources to post harvest handling and marketing. The diverse agro-climatic conditions can make growing soybean crops highly cost-effective and competitive, and provide vast opportunities in study areas. Unluckily, these opportunities have not been exploited by the farmers due to the lower profit margin they receive for their produce in the markets. Soybean production in the district is based on rain fed system. Post-harvest handling, which includes different activities like sorting, packing, transportation, loading and unloading is done by the farmers themselves or traders. (Table 5)

Assemblers /Local collectors/

It is the first link between producers and other traders. According to Emana (2008), these are small trading individuals who collect the product in small quantity directly from producers and resell to brokers/wholesalers, oil millers and exporters in a more marketable quantity. They act as intermediaries who do not add value but merely snatch the benefit that could have accrue to the producers. They use their financial resources and their local knowledge to bulk soybean from the surrounding area. They play important role and they do know areas of surplus well. Collectors are the key actors in the soybean value chain, responsible for the trading of soybean from production areas to wholesale and retail markets in the

Tiro Afeta Woreda.

Wholesalers

Survey result indicates that wholesale markets are the main assembly centers for soybean in their respective surrounding areas. They have better storage, transport and communication access than traders in the study area. More than 90% of the respondents sell their products to wholesalers found in the nearest urban center.

Retailers

Retailers are also important primary actors in the soybean value chain in the study area. Their duty is to buy the product from farmers, collectors and wholesalers and store it to their temporary storage. Then by sorting and packing, they sell raw soybean to nearby consumers by negotiation.

Union and Cooperatives

One sales outlet of the small-scale farmer is the cooperatives and unions. Unions collect soybean from each farm household through their member cooperatives. The cooperatives in turn collect the soybean mainly from their member farmers. The unions store and clean the soybean and look for export sale outlets. The unions prefer to participate in the ECX marketing framework as buyers rather than as sellers. This is because they have developed the necessary financial and organizational capacity to export. The government and/or concerned governmental organizations are doing their best to encourage unions to undertake high-value addition activities, including export and import of commodities and inputs.

Processors

There are different soybean processing companies in Ethiopia especially around Addis Ababa. Some of these processing factories or companies in Ethiopia include; Fafa food share company, Seka business group, Hilina enriched food processing center and Health care food manufacturing. These companies are intensively working in processing soybean in different solid and liquid forms and make it available in easily consumable forms. They buy the raw soybean from wholesalers mainly from Messalemia and after processing they sell the different forms of it to hotels, supermarkets, ET Fruits wholesalers and consumers.

Consumers

Consumers are those who purchase the products for consumption. Ethiopia is well known in soybean production but the product has been consumed a little. But now days by knowing its importance, soybean is being consumed by different forms like *Nifero*, *Kolo* etc. and in processed form like soya blended flour, soya milk, soya oil and tasty soya, etc. Consumers get different forms of it from processors, wholesalers, retailers, supermarkets and hotels. About three types of soybean consumers were identified: households, restaurants and institutions. The private consumers are employees, and urban and rural dwellers who purchase and consume. The processed form especially soya oil demand is currently very high.

Exporters

These public and private firms buy the seed from collectors and wholesalers to sell in the export market after processing and packing. The major operator in the soybean market is the exporter. These are the largest buyers of soybean from the wholesalers. These large-scale exporters, mostly located in Addis Ababa, have their own buying branches. These buyers buy most of the exported soybean using different instruments. They buy on the spot market, on cash from anyone, competing merely on prices. In addition to spot purchasing, they have introduced foreword markets. Only few of the largescale commercial farmers are involved in the export business. According to the study result, all of producers of soybean do not directly export their produce themselves. They instead sell their produce to different types of traders, which constitute the different sale outlets for the farmer.

Supporting actors

Such actors are those who provide supportive services including training and extension, information, financial and research services. According to Martin *et al*. (2007), access to information or knowledge, technology and finance determines the state of success of value chain actors. Oromia agricultural and natural resource management bureau, primary cooperatives, micro finance, NGOs and trade and market development office, research centers and university are main supporting actors who play a central role in the provision of such services.

Access to agricultural extension services

The survey results revealed that all most all of the sampled have been taken advice service on the soybean value chain in Tiro Afeta district. Siziba *et al*., (2011) revealed that access to agricultural extension service positively influences the likelihood of participating in soybean markets. The results demonstrate the importance of improved technology and support services in promoting soybean market participation. On other

Table 6. Proportion of households accessing to services

Categories		Frequency	%
Marketing information (Yes)		153	100
Frequency of agricultural extension visit	Once per week	21	13.7
	Two ways per month	31	20.3
	per month	101	66
		153	100

hands, Ezeh *et al.* (2012) found positive and significant relation between access to extension contact on market supply of the output.

Development agents are the major actor who provides information and advisory service on soybean production and management practices. In addition, the contact of development agents with producer farmers was not frequent and regular. Furthermore, sample farmers indicated that they are getting information particularly of input availability and price from primary cooperatives, Jimma Agricultural research centre and Kebele administration, facilitator for change. (Table 6)

Access to market information

From the sampled more than 89% households have accessed market information. At local level friends, client traders, personal visit of the market and nearby farmers, and rarely radio served as the sources of market information. For the better off traders the main information source has been the internet. Despite the availability of these formal sources, none of the studied individuals neither producers nor traders responded using newspapers as a source. The main reason is that the information is not timely and reliable. Some producers tried to get scanty and out dated price information from their respective cooperatives. Even there are times to change the price within a day. Soybean exporters had better access to all information through electronic media, the internet and played significant role in price decision. In the existing marketing system, cooperatives and small traders followed the price trends of big institutional buyers and exporters in their price setting.

CONCLUSIONS

Analysis of the value chain in the study area indicated as trader's profit margin was by far higher than that of soybean producers. Sex of household head, distance from nearest market, cooperative membership, frequency of agricultural extension visit was found important factors positively affecting the quantity of soybean supply to the market in the study area. Soybean production was a common practice among the farmers of the area that can be considered as an opportunity. This is because of the existence of nearby research center and university advice. Soybean in demanding industry, adequate temperature and rainfall and cooperative support from NGO's working in the district. Poor linkage with value chain actors, limited access to finance, low negotiation or bargaining power of producers and low price of the non-value-added product were found the major constraints in the production and marketing of soybean.

RECOMMENDATIONS

To increase market supply of soybean, and value chain improvement the following recommendations are forwarded.

To increase market supply of soybean, and value chain improvement the following recommendations are forwarded.

- ✓ Efficiently support the producer to minimize transaction cost, the benefit share of farmers at the study area was less than the other actors.
- ✓ Need to promote awareness of smallholder sale their products to the Ethiopian Commodity Exchange (ECX) market.
- ✓ Escalating producers participate in cooperative membership and developments of farmers marketing organization (FMOS).
- ✓ Reduce the unnecessary chain actors in the market, and bond producers directly to processing company.
- ✓ Revisit strategies of promotion of cooperatives member's promoters and establishes multi-purpose cooperatives (MPCs).
- ✓ Most of the female household's head soybean producers cannot sale her soybean products at preferable market other than collectors, so establish promotion of the female sales agent model. Build the capacity of women on negotiation skills, business skills, financial management, etc.
- ✓ Improving transportation access to the farmers is essential to make soybean market efficient in addition to developing road infrastructures.
- ✓ Develop and capacitates physically powerful cooperative to empower membership's concerned bodes supply of all required inputs at the right time cooperatives improve understanding of members about market and strengthen the relationship among members.
- ✓ Frequently agricultural extension service increase in soybean production technique has a significant effect to increase production then by market supply. Hence,

frequently agricultural extension access that would change the attitude of farmers. Therefore, concerned body need to provide frequently agricultural extension service to the marketing of soybean in the study area.

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