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Analysis of Sheep Value Chain: The Case of Abera (Hula and Dara), Sidama Zone, SNNPR, Ethiopia

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***Abstract*— Though sheep value addition is common in Abera, producers complain that their margin from the practice is low. Abattoirs also complain that they are working below their potential due to lack of sheep supply. Therefore, this study is aimed to identify factors affecting performance of sheep supply and marketing chain in terms of value chain analysis. To do that, data were collected from randomly selected 134 sheep producers, 4 cooperatives, 27 traders, 10 processors and 25 consumers. The data collected were analyzed using descriptive statistics, mapping approach and econometric model. The result indicated that there were 5 main value chain actors in Abera. Namely, input suppliers, producers, traders, processors and consumers. Feed, veterinary, transport,training/advisory; and credit suppliers were identified as support chain actors. 22 sheep flow channels were identified. Channels I, II, VI, VII, and XV were long and sophisticated. Large volume of sheep was flowed through channel XXI from which farmers got low margins. The mean profit of producers was birr 427.25; of traders was birr 507.13; and of processors was birr 3097. Largest profit was earned by processors and the smallest by producers. 13 variables were hypothesized to determine intensity of participation in sheep value addition. Of these, 6 variables, total income, experience, family size, education, total land holding and credit use, were found to be significantly affecting households' extent of participation in sheep value addition. The study indicated the need to establish linkage among farmers; shorten long supply chain; expand formal education, supply credit; introduce IGAs; and provide experience sharing mechanisms.**

***Index Terms*— Value chain analysis, Abera sheep, value addition, sheep flow channels.**

I. INTRODUCTION

A. Background and Rationale

Sheep and goats constitute the majority of the ruminant population in developing countries and contribute significantly to household economy (Shija, et.al, 2012). In

Ethiopia, sheep is the second most important species of livestock next to cattle. It is found in all types of agro ecologies from cool alpine climate of the mountains to the arid pastoral areas of the lowlands. The sheep and goats population of Ethiopia, including expert estimates of the pastoral areas, is 66 million head of which around 35 million are sheep (Negassa et al. 2011). They provide 46% of national meat consumption and 58% of the value of hide and skin production (Awgichew et al. 1991) cited in (G. Legese, 2014).

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However About 99.6% of the total sheep populations of Ethiopia is made up of indigenous breeds (CSA, 2008) which are owned and managed by resource poor smallholder farmers and pastoralists under traditional and extensive production systems. Due to this, the level of production and productivity of sheep in the country is generally low and market oriented or commercial production is almost non-existent (Solomon, et.al. 2010).

On the other hand, the demand and prices for sheep are increasing internationally and domestically due to increased population, urbanization and increased income.According to the Ethiopian Institute of Biodiversity Conservation (IBC, 2004), the demand for sheep is especially pressing given that the current population of the country is expected to rise to about 129 million by the year 2030.It is also reported that the export abattoirs are operating at 56% of their operational capacities due to poor supply chain. In its five-year plan for growth and transformation, the Government of Ethiopia has also decided to increase meat exports to 110,000 t in 2015 with the aim of earning USD 1 billion a year.

Several factors affect the performance of the existing sheep supply system. First, there is a lack of well-functioning marketing systems that effectively link smallholder producers and their cooperatives with domestic and international markets. The existing livestock marketing system is fragmented and disorganized and the supply chain linking smallholder producers with domestic consumers and export markets is long and extended. This depresses farm gate prices and denies producers from receiving better prices as a multitude of brokers and middlemen tap a large proportion of the price paid by the consumers and exporters without adding value to the product

Therefore, cost-effective marketing channels and coordinated supply chains that reduce the transaction costs among different actors along the supply chain are needed. In order to identify these cost effective channels, it needs an understanding of market performance, conduct and functions, and business linkages as well as constraints and opportunities along the value chain.

Abera is a place which is found between Hula and Dara woredas of Sidama zone. It is a combination of 2 kebeles from hula and 4 kebeles from dara. It is highland agro-ecologically and has high potential of sheep. Sheep of abera is being marketed widely up to regional market. Almost all farmers in abera produce sheep and supply to the market. Howevere its economic role to the producer farmers, the channel it follows and opportunities and constraints in the production and marketing of Abera sheep was not studied and documented yet.

Therefore, this study is aimed to assess actors participating in Abera sheep production and marketing, and determinants of sheep value addition, in the form of value chain analysis. In doing that, the study identified various leverage points that various development organs can intervene to enhance performance of Abera sheep value chain. The intervention of various development organs is believed to improve sheep value addition efforts of farmers in one hand and to enable government's goal of increasing small ruminants export in the other hand.

B. Objectives

The general objective of this study was to analyze the value chain of Abera sheep to improve chain performance and its specific objectives were:-

- ❖ To identify the major value chain actors, their function in the value chain in sheep production and marketing in the study area
- ❖ To identify and map value addition channel of Abera sheep
- ❖ To estimate Costs and margins in the value chain
- ❖ Determinants of level/intensity of participation in sheep value addition

II. METHODOLOGY

A. Data Types, Sources and Method of Data Collection

Both primary and secondary data were used to conduct this study. Primary data were collected from 134 sheep producer farmers, 4 cooperatives, 27 traders (2 local collectors, 20 local small traders, 3 small traders in towns, and 2 large traders in towns), 10 processors (Hotels and restaurants) and 25 consumers.

Secondary data were collected from different organizational reports and documents, and from different published and unpublished sources. Data have been collected from primary data sources using data collection instruments such as observation, pre-tested semi structured questionnaire and check lists. During observation, availability of sheep and its amount, the farming system, the feed used, feeding materials and barns used have been observed. Check lists were used to collect data from agricultural experts working in the study district to have the overall outlook on the production and marketing of sheep in the study district. Interview method has been employed to collect data from farmers, cooperatives, traders, processors and collectors using pre-tested semi-structured separate questionnaires.

B. Sampling Method

i. Producers Sampling

A two stage sampling method was used for the selection of the sheep producers. First, 3 Kebeles were randomly been selected from AberaKebeles. In the second stage, Sample farmers were randomly drawn from randomly selected 3 Kebeles employing systematic sampling.

ii. Cooperatives, Traders, Processors and Consumers Sampling

Of the total 6 cooperatives established to produce and market sheep in Abera, 4 were used as samples for this particular study. 27 traders have been sampled for this study. The traders were 2 local collectors, 20 local small traders, 3 small traders in towns, and 2 large traders in towns.

C. Method of Data Analysis

The data collected was analyzed using descriptive statistics and econometric model (multiple linear regression model). Descriptive statistics such as mean, standard deviations and frequency tables were employed to summarize the socio-economic and demographic characteristics related to sample respondents. Mapping method was used to map all the product flow chains and linkage of actors, the margins produced at all stages, the support chain involved and the enabling environment/legal framework involved.

The econometric model (multiple linear regression model) was used to analyze the degree of value addition of sheep at households' level. As stated in Tizazu et al., (2017), the multiple linear regression model was specified as Y (level/intensity of sheep value addition) =f(various explanatory variables). The estimated coefficients indicate the amount of change in the dependent variable due to a unit change in the independent variables. In matrix form, the supply function can be specified as:

$$Y = \beta X + U$$

Where, Y=intensity of sheep value addition

β= a vector of estimated coefficient of the explanatory variables

X= a vector of explanatory variables

U = Disturbance term

STATA computer program was employed to analyze the data. Omitted variable and heteroscedasticity detection tests were conducted in STATA using Ramsey test and Breusch-Pagan (BP) test respectively. Variance Inflation Factor (VIF) was employed to test the existence of Multi co-linearity problem among explanatory variables.

Definition, Measurement and Hypothesis of Study Variables

Dependent Variable

The dependent variable is the degree of sheep value addition and it is in natural logarithm (ln) form. It is a continuous variable representing actual volume of sheep being reared in 2017/18 production year by individual households to the market and measured in number.

Independent Variables

These were explanatory variables expected to influence the dependent variable. Some of them were continues, some were discrete and some others were dummy. They include sex of the household head, experience in sheep value addition

(years), family size (EMU), education level of household heads (grade), total land holding (hectare), one year lag price (birr), extension contact, credit use, market distance, total income, membership to cooperatives, Market formation and Training participation. Their category, measurement unit and expected effect on the dependent variable are all discussed on table 1 below.

Table 1. Definition, Measurement and Hypothesis (expected effect) of study variables

Variables	Category	Measurement	Expected effect
Volume of sheep reared (Dependent)	Continuous	Number	
One year lag price	Continues	Birr	+
Market distance (ln)	Continues	Hours	-
Total income (ln)	Continues	Birr	+
Experience in value addition	Continues	Years	+
Sex of household head	Discrete	1-if male; 0-otherwise	+
Total family size (EMU)	Continues	Number	+
Education level	Discrete	Grades	+
Membership to cooperatives	Dummy	1-if member; 0-otherwise	+
Total Land holding	Dummy	1-if used ; 0-otherwise	+
Market information	Dummy	1-if farmers get market information; 0-otherwise	+
Training participation	Dummy	1-if participated; 0-otherwise	+
Extension contact	Dummy	1-if they get; 0-otherwise	+
Credit use	Dummy	1-if used; 0-otherwise	+

Source, Reviewed from literatures, 2017

III. RESULTS AND DISCUSION

Socio-Economic Characteristics of Actors

Sex and Marital Status of Producers

Of the total sheep producers interviewed, 74.6% were male headed households and the rest 25.4% were female headed households. Regarding marital status, 9% were single, 84.3% were married and the rest 6.7% were widowed.

Table 2. Distribution of producers by sex and marital status

Variables		Frequency	Percent
Sex of producers	Female	34	25.4
	Male	100	74.6
Marital status of respondents	single	12	9.0
	married	113	84.3
	widowed	9	6.7

Source: Survey data, 2018

Age, Family Size and Education Level of Producers

The mean age of producers is around 39 years with minimum of age 20 and maximum of age 90. The minimum family size was a household with a single person and the maximum household size was a household with 19 individuals. The mean family size was around 7 individuals. The maximum grade achieved by producers was grade 14 (10 + 2). The mean education level of household heads was grade 5. The result in table indicated that there were producers who did not attend any formal education.

Table 3. Distribution of producers by age, total family size and education level

Variables	Min	Max	Mean	Std. Dev
Age of the household head	20.00	90.00	39.3594	13.11
Total family size	1	19.00	6.7985	3.48
Education level of household head	.00	14.00	5.2090	4.09

Source: Survey data, 2018

Number of Sheep Sold and Experience in Sheep Production and Marketing

The mean amount of sheep producers sold in 2009/2010 E.C. were 5 sheep with minimum amount sold of 1 and maximum of 28. The mean experience of producers in sheep production and marketing was 12 years with minimum experience of 1 year and maximum of 55 years

Table 4. Distribution of producers by number of sheep sold and experience in sheep production and marketing

Variables	Min	Max	Mean	Std. Dev.
amount of sheep/goat the respondent sold in 2009/2010 E.C.	1.00	28.00	5.25	4.05
Experience in sheep production and marketing	1.00	55.00	12.35	11.11

Source: Survey data, 2018

Sex and Marital Status of Traders

Of all traders interviewed for this particular study, 90% were males and the rest 10% were female. 83.3% were married and the rest 16.7% were single (table 3).

Table 5. Distribution of traders by sex and marital status.

Variables		No	%
Sex of household head	Female	2	8
	Male	23	92
Marital status of household head	single	4	16
	married	21	84

Source: survey data, 2018

Age, Family Size, Education Level and Experience in Sheep Value Addition of Traders

The mean age of traders was 39 years with minimum age of 20 and maximum of age 56. The minimum family size of traders is 1 and the maximum is 18. The mean family size was 6 individuals in one household. The maximum education level attained by traders was grade 10 and the minimum education level was grade 3. The mean grade level was around grade 7. The minimum and maximum years of experience in sheep trading of traders were 1 year and 26 years respectively with mean year of experience of 6 years (table 4).

Table 6. Distribution of traders by age, family size, education level and experience in sheep trading

Variables	Min	Max	Mean	Std. Dev.
Age of the respondent	20	56	39.08	12.57
Family size of the respondent	1	18	6.25	4.69
Education level of the respondent	3	10	6.92	2.54
Experience in sheep trading	1	26	6.42	7.02

Source: Survey data, 2018

Actors in Sheep Value Chain

Actors in sheep value chain have been categorized in 2 as main value chain actors and support chain actors. Support chain actors are service providers and actors in the enabling environment. All are discussed below.

Main Value Chain Actors and Their Roles

Five main value chain actors have been identified in sheep value chain in the study area. These were input suppliers, sheep producers, sheep traders, processors and consumers. Producers include cooperatives and traders include collectors, wholesalers and retailers.

Input (breed) suppliers

Abera sheep is a local breed produced in a place called Abera found in Hula and Dara weredas. The name Abera is given from the name of the place where the sheep is naturally produced. Farmers are the main suppliers of the breed. Hawassa agricultural research center have been selecting rams from Abera sheep for reproduction purpose and supplying it for cooperatives established by the center itself in collaboration with the concerned government entity. Then the cooperatives have been using these rams for reproductive purpose and multiplying and are marketing them (buying and selling). Therefore, farmers are the main suppliers of Abera sheep for sale to the open market. Hawassa agricultural center characterizes and supplies Abera sheep to cooperatives for the purpose of reproduction as per the survey result. As an input supplier, farmers and cooperatives produce sheep, provide housing, feed, and supply to the market.

Producers

Some farmers buy sheep from cooperatives for the reproduction purpose. The sheep they buy are those which are improved by selection (characterization) and can yield better offspring. Cooperatives are also producers who receive Abera sheep from farmers through Hawassa Agricultural Research Center, then produce and supply the sheep back to farmers and other customers. Therefore, farmers and cooperatives have been identified as the major producers of Abera sheep in the chain. As producers, the buy sheep, feed sheep until fattened, provide housing, medication, and then sell it. Cooperatives use local feeds (natural grazing) since their sheep is used for breeding and not allowed to be fattened as per the data found from cooperatives during survey. They receive characterized sheep from Hawassa Agricultural Research Center, produce, wholesale and retail sheep as a major role. They are formed by Hawassa Agricultural research Center with the help of cooperative bureau. There were 6 cooperatives organized for this purpose in place called Abera (found under Dara and Hula Woredas). They mostly sell the sheep they produced to cooperatives formed in other woreds by the order of woredas and to different customers.

Traders (Local assemblers, wholesalers, and retailers)

Of the total 25 traders interviewed for this particular study, 80% were local small traders, 8% were local collectors and the rest 12% were small traders in towns).

Local collectors

These were farmers who collect Abera sheep from rural areas, store for a while, feed and resell as a major function. They mainly sell the sheep they collected for wholesalers and small scale traders in urban areas.

Wholesalers

These were licensed traders who purchase and transport Abera sheep to other woredas (A/wendo, Bore, Dila and Hawassa). As a major function, they purchase sheep from collectors, farmers and cooperatives, transport it and sell to the market. Local collectors confessed that there are wholesalers, who come from A/wendowored, Bore and Hawassa.

Small traders in the study area and towns

Some of these individuals (20%) were producers themselves and the rest were traders who, as a major function buy sheep (from producers, wholesalers and rural assemblers), store it for a while and sell it for consumers mostly. They are found in all market (Hula, Dara, A/wendo, Dila, Bore and Hawassa).

Consumers

These are the end chain actors identified in the value chain whose role is to buy and consume sheep.

Support-Chain Actors

These are value chain actors whose role is supplying various services for sheep production and marketing. They have no direct contact with the product being produced but have roles of facilitating its performance in the value chain. They are important segments of the value chain. Without them, it is impossible to add values. They include:-

Feed Suppliers

Three main types of feeds are being used as feeds for Abera sheep in the study area (Table). These were crop resides, hay and concentrate. Of the total sampled farmers, only 10.4% responded that they are using purchased feed to feed their sheep. The rest 85% of the farmers were using crop residues produced at farm and naturally found feeds.

Table 7. Distribution of producers by types of feed they commonly use

Types of feeds used	No	%
Crop residues	66	49.3
Concentrates	14	10.4
Hay	7	5.2
Natural occurring leafs and grasses	47	35.1
Total	134	100.0

Source: Survey data, 2018

The main purchased feed used to feed their sheep was concentrate which is being supplied by small shops found in Hula and Dara woredas. These shops bring the feed from Hawassa feed shops in bulk and retail it to livestock owners in the woredas. Therefore, feed suppliers were one of the value chain actors under Abera sheep value chain. As a major role, they buy feeds from the regional market and sell to Abera sheep producers, especially of the farmers.

Veterinary Service Suppliers

Vet service suppliers were another sheep sub-value chain actors. Most of the farmers (71.6%) responded that there were veterinary service suppliers in their locality though most of them were public. 88.8% of the total producers responded that there were no private vet. service suppliers in their locality and due to that they have been depending only on public vet. service suppliers for vet. request where the medications are not sometimes effective as per their responses.

Table 8. Distribution of respondents by availability of Vet. Services and public Vet. Services

Variables		No	%
Availability of Veterinary service suppliers	Not available	39	29.4
	Available	95	71.6
Availability of private Vet. service suppliers	Not available	118	88.8
	Available	16	11.8

Source, Survey data, 2018

Transport Service Suppliers

It is traders who mostly use transport services for their sheep. They mostly use lorry (ISSUZE) to transport sheep from Hula to other areas. All wholesalers and some retailers, processors and consumers who buy sheep from Hula and sell it or consume it out of Hula use these transport services. Almost all of these service suppliers were private individuals. Some consumers use government cars en-rought as they come to other works.

Technical Training and Advisory Suppliers

Of the total 134 producer farmers, 56.7% responded that they took trainings on sheep production. 84.3% of the producers responded that the main supplier of trainings is woreda agriculture office. The rest 15.7% responded that they took trainings given by Hawassa Agricultural Research center, Hawassa University, and other NGOs. All cooperatives responded that they were taking training and advisory services provided by Hawassa Agricultural research center, woreda cooperative bureau, woreda agricultural bureau, and sometimes experts from zonal and regional cooperative and agriculture offices. Therefore, as technical and advisory support suppliers, these organizations have been training producers on various skills of sheep production as well as advising and supporting technically.

Credit Suppliers

Of the total producers, around 24.6% responded that they got credit for sheep production. 66.4% of them complain that there was no financing available for effective sheep production. Of those who received credit, 76.1% complain that the available credit do not satisfy the demand.

Table 9. Distribution of producers in credit use, Availability of financing and satisfaction

Variables		No	%
Trainings on sheep production and management	Not participated	58	43.3
	Participated	76	56.7
Main supplier of advisory and trainings services	Woreda Livestock and Fishery development office	113	84.3
	Others (HARC, HU, NGOs)	21	15.7
Credit	Not used	101	75.4
	Used	33	24.6
Availability of financing for effective sheep production	Not available	89	66.4
	Available	45	33.6
Weather the credit amount satisfies the available demand	Do not satisfy	102	76.1
	Satisfies	32	29.9

Source:- Survey result, 2018

Product Flow Channels and Actors Linkage in the Value Chain

The survey result indicated that sheep marketing channels in the study area were more sophisticated in nature. The main participants in sheep value chain were producers, traders, processors and consumers. Figure 2 below shows the flow of sheep from producers up to the end users (consumers)

In its flow from producers to consumers, 22 product flow channels have been identified. These identified sheep flow channels indicated the pathway through which the marketed sheep flowed from producer farmers (where it originated) to consumers (where it ended). It also entailed linkage among sheep market participants. These flow channels were indicated as follows:

I. Producers → L.S. traders → La. traders in towns → S. traders in towns → hotels → consumers
II. Producers → L.S. traders → La. traders in towns → S. traders in towns → consumers
III. Producers → L.S. traders → hotels → consumers in towns = 1.4% (10 sheep)
IV. Producers → L.S. traders → consumers in towns = 1.4% (10 sheep)
V. Producers → L.S. traders → local consumers = 11.22% (79 sheep)
= 14% (98 Sheep)
VI. Producers → L. collectors → L.S. traders → La. traders in towns → S. traders in towns → Hotels → Consumers
VII. Producers → L. collectors → L.S. traders → La. traders in towns → S. traders in towns → Consumers
1.1% (8 Sheep)
VIII. Producers → L. collectors → L.S. traders → hotels → consumers = 0.14% (1 sheep)
IX. Producers → L. collectors → L.S. traders → consumers in towns = 0.14% (1sheep)
X. Producers → L. collectors → L.S. traders → local consumers = 1% (7 sheep)
XI. VI. Producers → L. collectors → La. traders in towns → S. traders in towns → Hotels → Consumers
6.5 % (46 Sheep)
XII. Producers → L. collectors → La. traders in towns → S. traders in towns → Consumers
XIII. Producers → L. collectors → local consumers = 1% (7 sheep)
XIV. Producers → cooperatives → La. traders in towns → S. traders in towns → hotels → Consumers
XV. Producers → cooperatives → La. traders in towns → S. traders in towns → Consumers
XVI. Producers → cooperatives → cooperatives in other woredas = 7.95% (56 sheep)
2.7% (19 Shee
XVII. Producers → cooperatives → farmers = 2% (14 sheep)
XVIII. Producers → cooperatives → local consumers = 0.7% (5 sheep)
XIX. Producers → hotels = 0.7% (5 sheep)
XX. Producers → consumers in town = 3.13% (22 sheep)
XXI. Producers → producers = 37.8% (266 sheep)
XXII. Producers → local consumers = 7% (49)

Fig 1. Marketing channels of abera sheep

As indicated in the figure above, some of the channels such as channel I, II, VI, VII, XII, XIV and XV were long and sophisticated. Channel XXI is a channel through which large number of sheep is flowed and where farmers got low margins provided that they sold most of the sheep they produced locally back to farmers for further value addition.

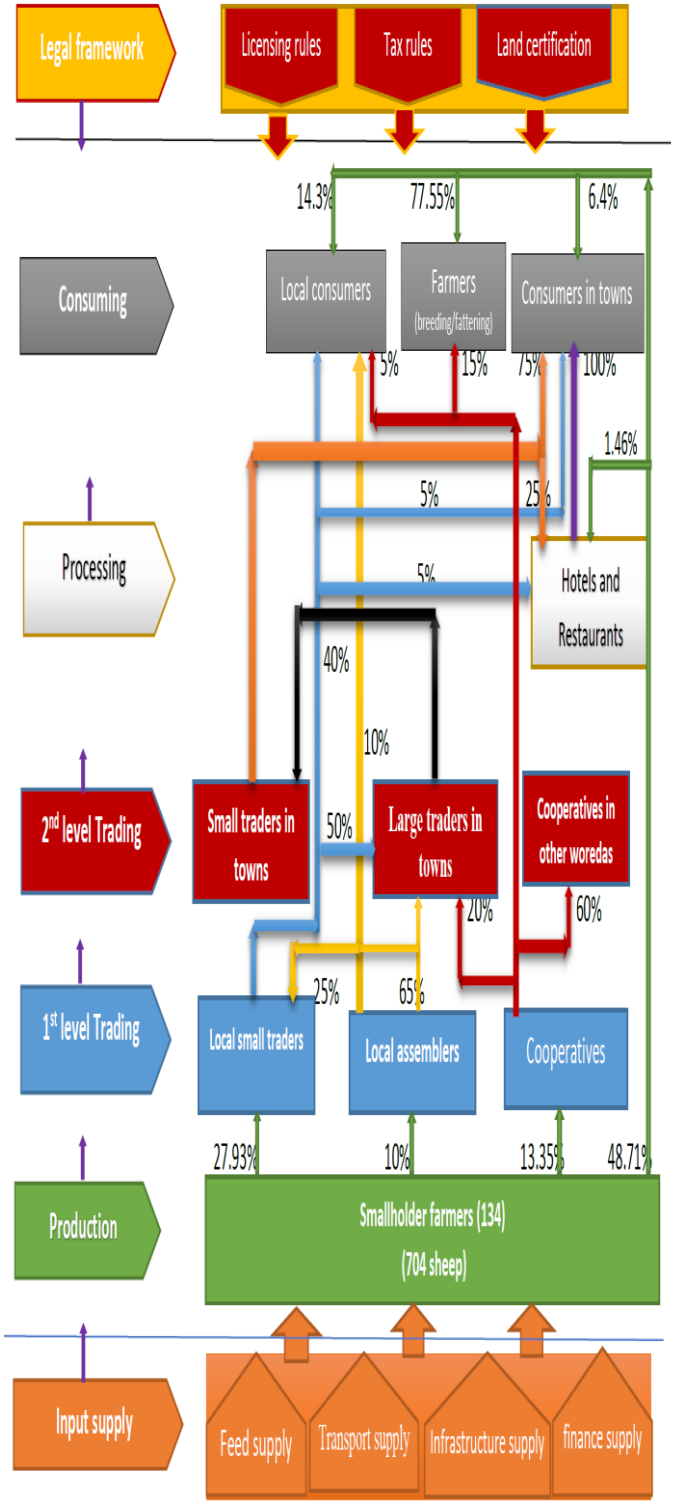

Fig 2. Value chain map of Abra sheep

Marketing Roots of Abera Sheep

Abera sheep flows from Hula and Dara woredas to Bore in the west of Hula, Dila in south of Dara and Hula, A/wendo and Hawassa in the north. Nonetheless, only 30.37% of the total marketed sheep in 2009/10 E.C is sold out of Hula and Dara. The figure below shows number of sheep flowed to each woreda.

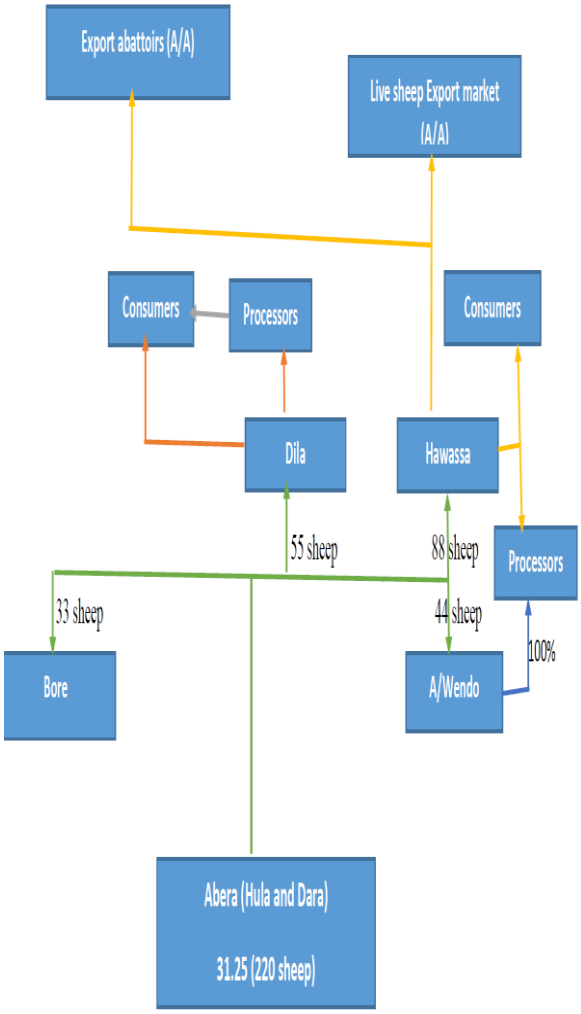

Fig. 3. Flow of marketed sheep across woredas

Costs and Margins in the Value Chain

Cost, Margins and Profits of Producers

Production and marketing costs

Costs of production includes cost of feed and cost of labor (management). Marketing cost is about transportation and brokerage costs.

Feed cost

The survey result indicated that around 15% of the farmers use purchased source of feed for their sheep. The other 15% responded that they are using all sources of feed including purchased feeds (table 3).

Table 10. Sources of feed used by farmers to feed their sheep

Sources of feed used	No	%
Own production	33	24.6
Purchased	20	14.9
Nature	61	45.5
All	20	14.9
Total	134	100.0

Source: Survey data, 2018

The main purchased feed in the study area is concentrate (Furushka). The average price of 1kg of concentrate in the study area is birr 7 as per the survey data. The mean amount of months farmers keep/feed sheep until selling is around 4 months with a maximum of 15 months and minimum of 2 months (table 4). They purchase a minimum of 2 kg per week and maximum of 14 kg per week for a single sheep

Table 11. Distribution of producers by number of months they feed their sheep and amount they purchase in a week for one sheep

Variable	Min	Max	Mean	Std. Dev.
Number of months farmers feed their sheep	2.04	15 m	4.21	2.441
Amount of concentrate farmers purchase for one sheep per week (KG)	2	14	7	3.122
Price of concentrate (furushka)	5	10	7.01	

Source: Survey result, 2018

Therefore, the estimated minimum amount of birr farmers incur for feed per sheep until they sell it is birr 252.96, the maximum is birr 1770.73 with a mean amount of birr 885.36 (Table 4)

Cost of labor

The labor used to produce/rear sheep in the study area (Abera) is family labor. There is no trend of considering wage value of family labor in the study area. Farmers argue that they spend a maximum of 1 labor hours per day to feed and water 1 sheep. The wage value for 8 hours work in the study area is 30 birr on average. This implies that it will be birr 3.75 for 1 hour work. Therefore, a mean amount of labor cost in the study area until the sheep is got sold is birr 473.625 with minimum labor cost of birr 229.5 and maximum of birr 1687.5. The number of labor was estimated in man equivalent unit. The cost of labor is calculated by multiplying the number of months farmers keep sheep until they sale (Table 2) by daily wage value of the area.

Marketing costs

Marketing costs include cost of transportation and brokerage cost. Almost all of the farmers bring their sheep to the central market by foot. Therefore, no transportation fee is incurred. Brokers are common in Abera Sheep markets. Those farmers who sold their sheep in the nearby markets argue that they are paying for brokers. They search for buyers in the market and bring them to defined sellers whom they are sure to pay them for their brokerage acts. They receive from birr 10 to 20 in each sheep from both sellers and buyer independently. Some of Producer farmers also stated that they are incurring cost for medication of sheep in time of seek.

Therefore, the total cost producers incur during producing and marketing a given sheep is the sum of feed cost, labor cost, medication cost and brokerage cost. Therefore, the mean total cost incurred by Abera sheep producers is birr 1405.98

with minimum cost of birr 502.46 and maximum of birr 1870.73.

Table 12. Distribution of producers in costs of sheep production and marketing

Variables	Mean	Min	Max	Std. Dev.
Cost of feed	885.4	253	1770.7	1073.2
Labor cost	473.6	229.5	1687.5	10301
Brokerage cost	15	10	20	7.1
Medication cost	32.0	10.00	80.00	49.5
Total cost	1406	502.5	1870.73	967.5

Source: Survey data, 2017

Margins and profits of producers

Producers' margin is about the total revenue producers got from sale of a give sheep. It is the price multiplied by the number of sheep sold. Since the price of sheep varies with the size of the sheep, the margin farmers get from each sheep varies accordingly. On average it varies from birr 600 to birr 2550. The mean gross margin farmers get from sheep sale in the study area is birr 1813.97.

The profit from Abera sheep sale is total revenue from sheep sale less total cost up to sale. It varies from birr 65 to 361.56. The mean profit from Abera sheep sale is birr 427.25.

Table 13. Distribution of producers by

Variables	Mean	Min	Max	Std. Dev.
Total revenue	1813.97	600	2550	1378.9
Total cost	1405.98	502.5	1870.7	967.5
Profit	407.99	97.5	679.3	411.3

Source, Survey data, 2017

Costs and Margins of Traders

Costs of traders

The main costs of traders include, purchase price, feed cost until sale, medication cost, labor cost storage cost, transportation cost, cost in terms of tax and brokerage cost (Table 2). The mean purchase price reported by traders is birr 1370.75 with minimum of birr 750 and maximum of birr 2650. The mean cost of traders incurred in sheep trading is birr 226.56 with minimum of birr 110 and maximum of birr 434 excluding purchase price. Therefore, the total cost incurred in a given sheep until its sale ranges from 860 to 3084 with mean value of 1572.60

Table 14. Distribution of traders by costs incurred in sheep marketing.

Variables	Min	Max	Mean	Std. Dev.
Purchasing price	750	2650	1370.8	1343.5
Feed cost	50	100	75.9	35.4
Transportation cost	20	50	32	21.2
Labor cost	20	250	91.7	162.6
Cost in terms of tax	10	14	12	2.8
Brokerage cost	10	20	15	7.1
Total cost(including purchase price)	860	3084	1597.3	1572.7

Source: Survey Data, 2017

Margins and profits of traders

According to the data collected from local traders in the study area, the average minimum price of a sheep was birr 850 and the maximum price was birr 3600 with mean value of 2104.44. Therefore, the mean profit is birr 507.13 with minimum of birr 15.71 and maximum of birr 516 which is total revenue less total cost (table 5).

Table 15: distribution of traders by total revenue, total cost and profit.

Variables	Mean	Minimum	Maximum	Std. Deviation
Traders total revenue	2104.4	875.71	3600	1926.4
Total cost	1597.3	860	3084	1572.6
Traders profit	507.13	15.71	516	353.76

Source: Survey data, 2018

Costs and Margins of Processors

Costs of processors

As per the survey result, costs of processors include purchasing price of sheep, brokerage cost, costs of processing inputs, labor cost, transportation cost and cost in terms of tax. The mean purchase price of sheep for processors was birr 2000 with minimum of birr 1800 and maximum of birr 3000. The mean brokerage cost processors have been paying is birr 15 with minimum of birr 10 and maximum of birr 30. The mean cost of processors to process and sale a single sheep is birr 320 with minimum of birr 273 and maximum of birr 448 (table). The mean labor cost to process and sale a single sheep is estimated by processors to be birr 50 with minimum of birr 30 and maximum of birr 100. The mean brokerage cost was birr 13.37 with minimum of birr 10 and maximum of birr 20. It costs birr 40 on average to bring a single sheep from market to processors shop. They mostly use Shepard's labor and sometimes use Motor-Bick to transport sheep. The mean cost in terms of tax is birr 16.28 with minimum of birr 10 and maximum of 25 (table 6).

Table 16. Distribution of processors in terms of processing costs

Variables	Min	Max	Mean	Std. Dev.
Purchase price	1800	3000	2000	848.5
Transportation cost	30	50	40	14.1
costs of processing inputs	273	448	320	123.7
Labor cost	30	100	50	49.5
Cost in terms of tax	10	25	16.28	10.6

Brokerage cost	10	30	15	14.1
Total cost (including purchase price)	2153	3653	2441.28	1060.7

Source: Survey data, 2017

Margins of processors

According to processors, 13-18kg of sheep meat will be drawn from a single sheep with mean meat amount of 15kg. They argue that the mean revenue they get from these 15kgs of sheep meal is birr 6000 with minimum of birr 5000 and maximum of birr 7000. This implies that the profit of processors ranges from birr 2847 to birr 3347 with mean amount of birr 3097.

Table 17. Distribution of processors by total cost, total revenue and profit

Variables	Mean	Min	Max	Std. Dev
Total revenue	6000	5000	7000	1414.2
Total cost of processors (including price of sheep)	2441.3	2153	3653	1060.7
Profit	3558.7	2847	3347	353.6

Source, Survey data, 2018

Distribution of Added Values in a Value Chain (Revenue)

As shown in figure 4 below, the largest value was taken by processors and the smallest was taken by traders.

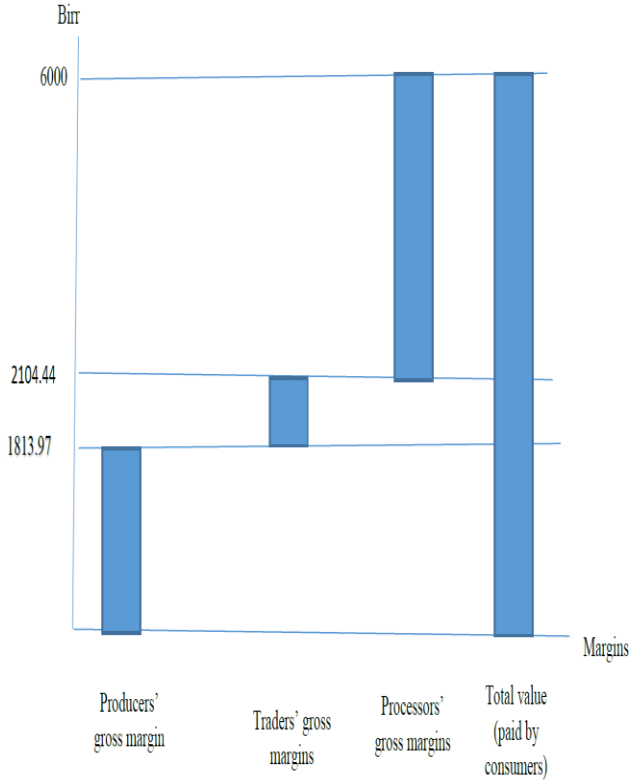

Fig 4. Distribution of added value in the value chain

Distribution of Profits and Costs in the Value Chain

Profit from sheep value addition increases as sheep moves from producers to consumers (fig). As shown in fig above, the largest profit is earned by processors and the smallest is earned by producers. This implies that the largest margin from sheep marketing goes to middle actors and producers are not much benefited from the sheep they produced while consumers are complaining for an ever increasing price. The one who suffered more (producer) to add value was getting less profit.

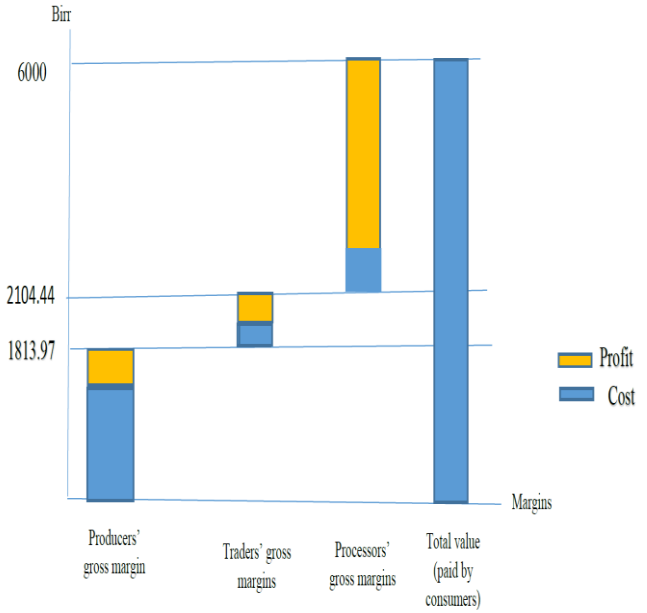

Fig 5. Distribution of profits and costs in the value chain

Determinants of level/intensity of participation in sheep value addition

Sheep value addition in this study is to mean the practice of producing or purchasing sheep for the purpose of sale for income generation. Variables expected to determine level of participation in sheep value addition were hypothesized. All the hypothesized explanatory variables were checked for the existence of multi-co linearity and heteroscedasticity problems (appendix 1). Variance inflation factor was analyzed to investigate the degree of multi-co linearity among explanatory variables. The results for all VIF values were ranging between 1.07 and 1.79. The mean VIF value was 1.34. Hence, multi-co linearity was not a serious problem among explanatory variables. Heteroscedasticity was tested for all variables by running Breusch-Pagan / Cook-Weisberg test for heteroscedasticity using STATA. The result indicated that there was no problem of heteroscedasticity in the model. The existence of omitted variables was also checked by using Ramsey Reset test. The result showed that there was no omitted variables problem (appendix 1). The overall goodness of fit of the regression model was measured by the coefficient of determination (R2). It tells what proportion of the variation in the dependent variable was explained by the explanatory variables.

Thirteen (13) explanatory variables were hypothesized to determine intensity of participation in sheep value addition at household level. These variables were sex of household head, experience in sheep value addition, credit use, family size,

training participation in sheep value addition, distance to the nearest market, education level of household head, Total income, extension contact, membership to sheep value addition cooperatives, land allocated to sheep rearing, market information and one year lag price. Among these hypothesized 13 variables, 6 variables, namely, total income, experience in sheep value addition, total family size, education level of household head, total land holding and credit use were found to be significantly affecting the households' extent of participation in sheep value addition practice (Table 18). The remaining 7 variables namely, sex of household head, one year lag price, membership to cooperatives, distance to the nearest market, market information, training participation, and extension contact were found to have no significant effect on intensity of sheep value addition practice at households' level.

Table 18. Determinants of level/intensity of participation in sheep value addition

Variables	Coef.	Std. Err.	t-value
One year lag price	0.0000628	.00012	-0.52
Market distance (ln)	-0.0644169	.0663	-0.97
Total income (ln)	0.1555***	.0489	3.18
Experience in value addition	0.010879**	.0051	2.13
Sex of household head	-0.0255289	.1375	-0.19
Total family size (EMU)	0.0816***	.0262	3.11
Education level (grade)	0.03693***	.0155	2.39
Membership to cooperatives	0.21217	.1518	1.40
Total land holding	0.3504***	.1279	-2.74
Market information	-0.08945	.1066999	-0.84
Training participation	.0053987	.1098971	0.05
Extension contact	.0281	.106133	0.26
Credit use	0.237*	.1365022	1.74
Constant	.1201909	.5331857	0.23

Dependent variable = amount of sheep kept for market (ln), N=156, R-Squared = 0.772, Adjusted R-squared = 0.751.The ***, ** and * show statistically significant variables at 1%, 5% and 10% respectively

Total income

Total income is one the variables that affected household's participation in Abera sheep value addition in Hula wereda positively and significantly as showen in table 2 above. It was continuous variable that affected level of participation in Abera sheep value addition positively and significantly at 1% significance level. The model output in table 2 above predicted that as total income increases by 1%, extent of households participation in Abera sheep value addition by 15.55%. The reason might be that as households gain more and more additional income, households' will be in a better position to finance sheep value addition practice which is also another means of income.

Experience in sheep value addition

Experience in sheep value chain addition implies sheep production and marketing experience of producers. It affected households' participation in Abera sheep value addition positively as expected. It was a discrete variable that affected level of participation in Abera sheep value addition significantly at 5% significance level. The model result in table 2 indicated that as households' experience in sheep value addition increases by 1 year, households' level of participation in sheep value addition increases by 1.09%. The justification is that as farmers experience in value addition increases, they get to experience the benefits of adding value on agricultural commodities and be attracted to the practice.

Total family size

This variable affected level of participation in Abera sheep value addition practice positively and significantly as hypothesized. It was statistically significant at 1% significance level. The model output in table 2 above indicated that increase in one additional labor leads households' to increases level of participation in Abera sheep value addition by 8.2%. The justification is thatas members of households are high in number, there will be high amount of labor to operate sheep value addition practice.

Education level of household heads

Education level of the household heads affected level of participation in Abera sheep value addition practice positively and significantly as hypothesized. It was statistically significant at 1% significance level. The model output in table 2 above indicated that increase in one additional formal year education leads households' to increases yearly level of participation in Abera sheep value addition by 3.69%. The positive and significant relationship indicates that education improves the households' ability to acquire new idea related to value addition and market information, which in turn improves productivity and thereby increases participation.

Total land holding

Total land holding is also one those variables that affected intensity of sheep value addition positively and significantly at 1% significance level. The model output in table 2 above indicated that as total landholding increases by 1 hectare, intensity of participation in sheep value addition increases by 35%. It is justified as that as total land holding increases, households will have more land to accommodate more sheep and construct barn for them.

Credit use

The model result discussed in table 2 above indicated that credit use was one of the variables affecting households' participation in sheep value addition in the study area. It was a dummy variable and affected level of participation in sheep value addition positively and significantly at 10% significance level. The model result predicted that compared to those households who did not receive credit for sheep value addition, level of participation in sheep value addition for those households who received credit increases by 23.7%. The justification is that as farmers who received credit are supposed to purchase more sheeps and produce more. This

will intern increases households' participation in sheep value addition.

IV. SUMMARY, CONCLUSION AND RECOMMENDATION

This study was conducted to identify value chain actors and their linkage, product flow channels, costs and margins share among the value chain actors from sheep value addition practice and determinants of the degree of participation in sheep value addition practice. The result indicated that 5 main value chain actors were identified in the study area. These were, input (breed) suppliers, producers, traders, processors and consumers. Feed, veterinary, transport, technical training and advisory; and credit suppliers were identified as support chain actors. 22 sheep flow channels were identified. Channels I, II, VI, VII, and XV were long and sophisticated. Large volume of sheep flowed through channel XXI and farmers got low margins. The mean profit of producers was birr 427.25; of traders was birr 507.13; and of processors was birr 3097. Largest profit was earned by processors and the smallest by producers. Thirteen variables were hypothesized to determine intensity of participation in sheep value addition. Of these, 6 variables namely, total income, experience, family size, education, total land holding and credit use were found to be significantly affecting households' extent of participation in sheep value addition. Finally the study recommended that:-

Cooperative offices, woreda Livestock and Fish development office, and other concerned organ should try to link farmers to purchase inputs for sheep value addition, so that the margins producers get from sheep value addition will be enhanced.

The wereda Trade and Industry office, woreda cooperative offices, and other concerned organ should work to shorten the long supply chain, so that the supply chain linking smallholder producers with domestic consumers and export markets will be efficient and producers can get better margins from the sheep they produced.

The econometric model result stated in table 5 above indicated that total income, experience in sheep value addition, total family size, education level of household heads, land allocated to sheep production and Credit use were factors significantly affecting sheep value addition at farm households level. Therefore, woreda livestock and fish development office, education office, cooperatives office and financial institutions in the woreda (such as omo micro finance and vision fund) should cooperate with producer farmers in order to enhance Abera sheep value addition process.

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Appendix

```
. ovtest

Ramsey RESET test using powers of the fitted values of lnamountsheeporgoat
      Ho:  model has no omitted variables
                F(3, 117) =      0.67
                 Prob > F =      0.5710

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of lnamountsheeporgoat

        chi2(1)      =    0.40
        Prob > chi2  =   0.5293

. vif
```

Variable	VIF	1/VIF
grade	1.79	0.557561
sex	1.61	0.620541
creditshee~n	1.56	0.642634
exprience	1.44	0.693049
trainingsh~n	1.30	0.769743
lndistance~a	1.29	0.776322
marketinfo~n	1.28	0.780910
cooperamem~p	1.25	0.797539
extensiona~s	1.25	0.797985
totalFSRMU	1.21	0.828583
lntotalinc~e	1.20	0.832607
amountland~n	1.10	0.912539
pricefatte~t	1.07	0.930999
Mean VIF	1.34	

```
.
end of do-file

. outreg2 using shevc
unrecognized command:  outreg2
```