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Onion Market Chain Analysis in Humbo District of Wolaita Zone, Southern Ethiopia

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***Abstract* – This study tried to analyze the market chains of onion in Humbo Woreda of Wolaita zone in SNNPR with the specific objectives of investigating marketing costs and margins, market participants and their roles plus constraints and prospects of onion production and marketing. Attempts were also made to identify factors affecting the supply of onion in Humbo Woreda of Wolaita Zone. Structure Conduct Performance approach was used to examine marketing costs and margins, market participants, their roles, and linkages. In addition, the Multiple Linear Regression Model was employed to see factors that determine the supply of onion. Results of the study have shown that the productivity as well as post-harvest management was by far poor. However, farmers sold a large amount of onion out of which the collectors, commission-men and semi-wholesalers respectively have bought 80 %, 15% and 5 % in 2014. Sample markets were inefficient though not characterized by oligopolistic market structure. The findings of this research have also suggested that developing farmers' ability to produce and negotiate via cooperatives is best way of improving the market structure. The traders first deal each other and set the maximum price limit below which the negotiation takes place. The structure of markets has also shown that capital is a key barrier to entry. However, license was not barrier to entry. Market information is not evenly disseminated. High marketing margins and low producers' share are also characteristics of the markets. Moreover, the study has evaluated the main factors affecting the supply of onion based on the Multiple Linear Regression Model. Thus, the econometric model has identified price per kilogram of onion to be the most important variable affecting (positively) the supply of onion. As a result, the findings of this work have suggested Government, NGOs and other stockholders can play a vital role in addressing the problem of price variation. Further, income from the sale of onion significantly and positively affected the volume of onion sold. Thus, much more should be done so as to improve the producers' share in the market. Similarly, number of livestock owned significantly and positively affected the volume of onion supplied. The results of this manuscript also suggested building household assets (i.e. livestock) through household asset building programs will remedy the case.**

***Keywords* – Chain Analysis, Market, Onion, Vegetable.**

I. INTRODUCTION

1.1. Background of the Study

Ethiopia has a variety of vegetable crops grown in different agro ecological zones by small farmers, mainly as a source of income as well as food. The production of vegetables varies from cultivating a few plants in the backyards, for home consumption, to large-scale production for the domestic and home markets. According to CSA (2003), the area under these crops (vegetables and root crops) was estimated to be 356,338.82 hectares with a total production of 12.5 million tons.

According to Dawit *et.al* (2004), vegetable crops are produced in the country through commercial and small farmers. The type is limited to few crops and production was concentrated to some pocket areas. Production varied from cultivating a few plants in the backyards for home consumption up to a large-scale production for domestic and export markets. Bezabih and Hadera (2007) explored this reality in their study of constraints and opportunities of horticulture production in Eastern Ethiopia. They argued that production is seasonal and price is inversely related to supply. During the peak supply period, the prices decline. The situation is worsened by the perishability of the products and poor storage facilities. Along the market channel, 25 percent of the product isspoiled.

Despite the potential of the zone forvegetable production, its productivity is low. Moreover, the nature of the product on one hand and lack of organized market system on the other hand frequently resulted in low producers' price. There are production and marketing problems challenging vegetable development in the zone. These are input supply, pest and disease, low productivity, production seasonality from the production side and lack of transport, storage, post handling facilities, organized market system from the marketing side (Wolaita zone Agriculture office 2013, unpublished annual report).

1.2. Statement of the Problem

Based on personal information obtained from Wolaita zone marketing and cooperatives office, vegetable marketing in the zoneis characterized by inefficient market, even if there is an increasing trend in the production of vegetables for one season (fluctuated production based on price signals).It has been constrained with lots of problems such as unstable prices, lack of storage facilities, lack of transportation facilities, poor linkages with traders, low quality controlling mechanisms, weak market information (outdated market information) and other factors need to be further investigated thoroughly and alternative solution need to be suggested and implemented so as to benefit producers and other marketing agents involved in the production of vegetables.

Despite the potential of the zone for vegetable production, its productivity is low due to use of low level

of improved agricultural technologies, risks associated with climatic conditions, diseases and pests. Moreover, the nature of the product on one hand and lack of organized market system on the other hand frequently resulted in low producers' price(profit margin). No studies have been carried out to identify what the vegetable marketing systems look like, what market opportunities and constraints are there and no corrective measures are taken so far (personal information from bureau of agriculture, Wolaita zone).

Thus one may appreciate the paradox (high potential for vegetable production against low income level) and it is natural and rational thinking to posing questions as "why the contribution of vegetable production to the livelihood of rural families is not as expected? What has happened to the income from the sub-sector to move out the rural households from poverty and household food security?" These were pressing and critical to the study area in particular and need to be researched and measures have to be taken to help the producers assume a fair income from the sector and help them improve their living standard. As a result, this demanded an intensive study of the sector in the form of market opportunities, constraints and chain analysis; and the social, cultural and institutional factors that determine participation decision and supply level for vegetables to be identified and analyzed to provide solutions for the raised questions.

1.3. Objectives of the Study

The overall objective of the study is to analyze the market chain of onion in Wolaita zone. The specific objectives of the study include:

- To identify the market actors and activities in theonionmarket chain;
- To analyze the structure, conduct and performance of onion market;
- To identify factors affecting the volume (quantity) sold in onion marketing.
- To identify major constraints, opportunities of production and supply

1.4. Significance ofExpected Results

The smallholder producers have currently limited access to market due to low level of productivity; poor product quality and market barriers, such as poor infrastructure, lack of favorable trade policy and shortage of finance and lack of collective bargaining power. Thus, there is a strong need to help small producers in Wolaita zone to achieve sustainable and fair access to vegetable market in order to increase their income and secure their livelihoods. This research project is also significant in creating baseline information that may be extrapolated to other woredas and zones of the region.

The implication is that there was a need to undertake research and generate information to identify alternative mechanisms in which the vegetable producers and other actors can overcome the trade barriers, improve market participation and supply to their products, and become stronger negotiators in local, regional, and international markets, thereby improving their profit from sale of vegetables . The information generated from this research can be used by local practitioners and be used as input in the formulation of vegetable market development strategies and policies.

II. Literature Review

2.1. Marketing Channels

Marketing channel analysis is intended to provide a systematic knowledge of the flow of goods and services from producers to their consumers (Mendoza, 1995). This can be achieved by studying the market participants as the primary step to determine what and which final markets are. Formally, a marketing channel is a business structure of interdependent organizations that reach from the point of product origin to the consumer with the purpose of moving products to their final consumption destination (Kotler and Armstrong, 2003).

2.2. Supply and Marketable Surplus

According to Welday (1994), market supply refers to the amount actually taken to the markets irrespective of the need for home consumption and other requirements where as the market surplus is the residual with the producer after meeting the requirement of seed, payment in kind and consumption by peasant at source. Agricultural products differ from manufactured goods in terms of supply and demand. Supply is peculiar because of the seasonal biological nature while their demand is relatively stable throughout the year.

Marketable surplus is the quantity of produce left out after meeting the farmer's consumption and utilization requirements for kind payments and other obligations such as gifts, donation, charity, etc. This marketable surplus shows the quantity available for sale in the market. The marketed surplus shows the quantity actually sold after accounting for losses and retention by the farmers, if any and adding the previous stock left out for sale (Thakur *et al.*, 1997). A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Within each organization, such as manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service (Chopra *et al.*, 2004).

2.3. Market Chain and Supply Chain Analysis

Hobbs *et al.* (2000) defined supply chain as the entire vertical chain of activities, i.e., from production on the farm, through processing, distribution, and retailing to the consumer. In other words, it is the entire spectrum, from gate to plate, regardless of how it is organized orhow it functions. Agricultural commodities are produced by large numbers of farmers and consumed by large numbers of households. With the exception of food stuffs consumed on-farm or sold locally, they are bought and sold a number of times between the farm gate and the final consumer.

While moving between these two points, the commodity is transported, stored, cleaned, graded and processed. It is the path one good follow from their source of original production to ultimate destination for final use. According to Kotler (2003), supply chain is a longer channel stretching from raw materials to final products that are carried to final buyers.

2.4. Methods of Evaluating the Marketing System

2.4.1. Structure of the market

Market structureis defined as characteristics of the organization of a market, which seem to influence strategically the nature of the competition and pricing within the market.Market structure refers to the number, size, and diversity of participant at different levels of marketing system. Market structure includes the characters of the organization of a market that appear to exercise a strategic influence on the nature of competition and pricing within the market. The most important aspects or dimensions are sellers and buyers' concentration, the degree of product differentiation among the outputs of the various sellers in the market, and barriers to entry and freedom of exit (Wolday, 1994).

2.4.2. Conduct of the market

Conduct of marketing includes activities such as reliability, timeliness, quality control, standardization and soon. In addition Market conduct refers to the patterns of behavior that firms follow in adopting or adjusting to the markets in which they sell or buy. Such a definition implies the analysis of human behavior patterns that are not readily definitely, obtainable, or quantifiable. In other words, conduct focuses on trader's behavior with respect to various aspects of distinctive elements characterizing the functioning of agricultural commodity market. It is the patterns of behavior, which enterprises follow in adapting or adjusting to the market in which they sell or buy, or in other words, the strategies of the actors operating in the market. Elements of marketing conduct include: buying, selling, transport, storage, information and finance (Bain, 1968).

2.4.3. Performance of the market

Market performance refers to the composite of end results which firms in the market arrived at by pursuing whether lines of conduct they espouse-end result in the dimension of price, output production and selling cost, product design and so forth (Bain,1968).

2.5. Methods of Evaluating Marketing Performance

2.5.1. Marketing margin

A marketing margin is defined as the difference between price received by producers and that paid by consumers. Both producers and consumers are concerned about the size of marketing margins, change in marketing margins and the incidence of change in margins. Alternatively, a marketing margin can be defined as the difference between the price paid by consumers and that obtained by producers or the price a collection of marketing services that is the outcome of the demand for and the supply of such services(Tomek and Robinson, 1990).

According to Jema (2008), a marketing margin is the whole price in excess of farm price and he found that the marketing margin is affected by the volume traded positively and significantly.

2.5.2. Marketing costs

Marketing costs refer to those costs, which are incurred to perform various marketing activities in the shipment of goods from producers to consumers. Marketing cost includes: handling cost (packing and unpacking, loading and unloading putting inshore and taken out again), transport cost, product loss, storage costs, processing cost, capital cost (interest on loan), market fees, commission and unofficial payments (Heltberg *et al.*, 2001).

2.6. Supply Response of Agricultural Commodities

Supply has a specialized meaning in price behavior theory. When a whole commodity market reported that supplies were light today or supplies were heavy, reference is to quantities actually offered for sale. A more sophisticated meaning of supply is the schedule of different quantities that will be offered for sale at different market prices (Branson and Norvell, 1983).

According to Tomek and Robinson (1990), empirical studies of supply relationships for farm products indicate that changes in product prices typically (but not always) explain a relatively small proportion of the total variation in output that has occurred over a period of years. The weather and pest influence short run changes in output, while the long run changes in supply are attributable to factors like improvement in technology, which results in higher yields. The principal causes of shifts in the supply are changes in input prices, and changes in returns from commodities that compete for the same resources.

The market supply refers to the amount actually taken to the markets irrespective of the needs for home consumption and other requirements. Whereas, the marketed surplus is the residual with the producer after meeting the requirement of seed, payment in kind, and consumption by farmer (Wolday, 1994).

Bezabih and Hadera (2007) explored this reality in their study of constraints and opportunities of horticulture production in Eastern Ethiopia. They argued that production is seasonal and price is inversely related to supply. During the peak supply period, the prices decline. The situation is worsened by the perishability of the products and poor storage facilities. Along the market channel, 25 percent of the product isspoiled.

2.7. Review of Empirical Studies in Ethiopia

The behavior of marketed surplus to changes in prices and non price factors like irrigation, acreage and productivity is of critical importance. The most important factor, which increases marketed surplus significantly, is the increased production or output followed byconsumption and payments in kind which should be reduced to keep up the quantity of marketed surplus of food grains (Thakur *et al.*, 1997).

A study conducted by Moraket (2001) indicated that households participating in the market for horticultural commodities are considered to be more commercially

inclined due to the nature of the product. Horticulture crops are generally perishable and require immediate disposal. As such, farmers producing horticulture crops do so with intent to sell. In his study it was found that 19% of the sample households are selling all or a proportion of their fruits and vegetable harvest to a range of market outlets varying from informal markets to the large urban based fresh produce markets. Typically, many of the households producing fruits and vegetables also have access to a dry land plot where they commonly produce maize and/or other filed crops Bezabih and Hadera (2007), in their research identified pest, drought, shortage of fertilizer, and price of fuel for pumping water as the major constraints of horticulture production in Eastern Ethiopia. Other problems which they reported also include poor know how in product sorting, grading, packing, and traditional transporting affecting quality.

According to Moti (2007) a farm gate transaction usually happens when crops are scarce intheir supply and highly demanded by merchants or when the harvest is bulk in quantity andinconvenient for farmers to handle and transport to local markets without losing productquality. For crops like tomato, farm gate transactions are important as grading and packingare done on the farm under the supervision of the farmer. Therefore, households are expectedto base their crop choice on their production capacity, their ability to transport the harvestthemselves and their preferred market outlet.

A study conducted by Bossena (2008) cotton marketing in Metema woreda identified that four variables affect cotton marketable supply. Owen oxen number, access to credit, land allocated to cotton, productivity of cotton in 2005/06 were the variables affecting positively cotton supply. Similar study on sesame at Metema by Kinde (2007) also pointed out six variables that affect sesame marketable supply. Yield, oxen number, foreign language spoken, modern input use, area, time of selling were the variables affecting positively sesame supply and unit cost of production was found to negatively influence the supply. Similarly, Abay (2007) in his study of vegetable market chain analysis identified variables that affect marketable supply. According to him, quantity production and total area owned were significant for onion supply but the sign for the coefficient for total area of land was negative. For tomato supply, quantity of production, distance from Woreta and labor were significant. Similarly, Rehima (2007) in her study of pepper marketing chain analysis identified variables that affect marketable supply. According to her, access to market, production level, extension contact, and access to market information were among the variables that influence surplus.

III. RESEARCH METHODOLOGY

3.1. Description of the Study Area

Humbo Woreda is located some 20 km south of the *Wolaita Sodo* town following the tarmac road that passes through the town to *Arbaminch.*Wolaita Sodo is the town of the zone. The *Woreda* has a total area of about 866 Km^2 and is composed 42 rural *kebeles*. The population of *Humbo Woreda* is about 155,495 of which 49.8% are male and 51.2% are female (CSA, 2007). The annual population growth rate of the zone is 2.3%. The area is divided into two Agro-ecological zones: 70% *Kola* (lowland <1500m) and 30% *Woina-Dega* (mid-altitude 1500-2300m).

Rainfall is bimodal, with an average amount of about 1000mm (lower in the *kola* and higher in the *Woina-Dega*). Mean monthly temperature vary from 29^0C in January to 11^0C in August. As far as the soil structure is concerned, it constitutes vertisols (45%), sandy soil(20%), clay soil(35%) and others(5%).Maize, haricot-bean, sorghum, and *teff* are among the cereal crops grown in the area. The cultivation of oil crops like sesame is also very common in the area. Red onion, cabbage, tomato, and pepper are also among the widely cultivated horticultural crops in the area. As far as the livestock population is concerned, cattle (140,266), sheep (20,683), goat (34,684), mule (52), donkey (11,324), and poultry (80,589) are commonly reared.

3.2. Data Requirements and Data Source

3.2.1. Secondary data

Secondary data wasobtained from various sources such as reports of bureau of agriculture at different levels, NGOs, CSA, woreda administrative office, previous research findings, internet and other published and unpublished materials, which will be relevant to the study.

3.2.2. Primary data

Primary data was collected through personal and face-to-face interview using structured and pre-tested interview schedule that was filled up by recruited and trained enumerators under the close supervision of the researcher.

3.3. Sample Size and Sampling Design

3.3.1. Farmers' sampling method

Three *kebeles* were purposively selected out of the total 42*kebeles* in the *woreda* based mainly on their maximum area of land allocated for onion. Then, a complete and separate list of onion producers in each *kebeles* was prepared. Finally, the total of 98 producers was selected based on proportional probability sampling i.e. according to the number of onion producers in each *kebele*.

Table 1: Sample Size.

Name of kebele	Total No. of producers	Total cultivated area(ha)	Sample size (Farmers)
Abaya-Guricho	256	32	38
Ampo-Koysha	216	27	32
Abala-Faracho	198	25	28
Total	670	84	98

Source: Own survey, 2014

3.3.2. Wholesalers, assemblers and retailers sampling

Accordingly, selection of sample traders was made based on the number of, wholesalers' assemblers and retailers participating in vegetable marketing. To select sample traders, first the sites where vegetable market

conducted were identified, then, out of the total traders identified,40 traders (wholesalers, assemblers and retailers) were selected randomly based on proportion to the number of wholesalers, assemblers and retailers in the identified market.

3.4. Methods of Data Collection

Interviewing questionnaires were prepared for vegetable producing farmers. Then interview questionnaires were tested prior to the actual data collection. Along with the formal survey, rapid appraisal using group discussion, key informant discussions and also direct observation were undertaken along the market chain.

3.5. Methods of Data Analysis

Both descriptive statistics and econometric analysis were used for the analysis of the data that was obtained from the survey.

3.5.1. Descriptive statistics analysis

In this method of data analysis, ratios, percentages, means, variances and standard deviations were used to examine the relevant variables under consideration.

Structure Conduct Performance (S-C-P) Model

This model investigates the relationship between market structure, conduct and performance. The model has been used by different market researchers to address their objectives. As indicators of the market S-C-P, market concentration ratio and marketing margin analysis were used along with the description of the conduct of the vegetable market.

Market concentration measure

It refers to the number and relative size distribution of buyers/sellers in a market. It is generally believed that higher market concentration implies non-competitive behavior and thus inefficiency. The common measures of market concentration are concentration ratio, Hirshman Herfindahi Index (HHI), and Gini-coefficient.

Concentration Ratio (C)

The concentration ratio is the numerical index widely used by industrial organizations for measuring the size of firms in market (Shughart, 1990).

Kohl and Uhl (1985) suggested that as rule of thumb a four largest enterprises concentration ratio of 50 percent or more is an indication of a strongly oligopolistic industry, 33-50 percent, a weak oligopoly, and less than that, indicates unconcentrated industry. The problem associated with this index is the arbitrary selection of the number of firms that are taken to calculate the ratio and the ratio does not indicate the size difference of the firms. Concentration ratio refers to the number and relative size of buyers in the market. The concentration of firms in the market is estimated using the common measure of market concentration ratio.Concentration ratio is one of the commonly used to measure of market structure, which it is given as:

$$C = \sum_{i=1}^{r} S_i \quad i = 1,2,3,4. \qquad (1)$$

Where

sí= the percentage market share of the i^{th} firm and

r = the number of relatively larger firms for which the ratio is going to be calculated.

❖ Thus market concentration ratio was employed to analyze the market concentration of the identified markets in the study woredas.

Marketing Margin

The cost and price information obtained from the survey was used to evaluate the gross marketing margin.Total Gross Marketing Margin (TGMM) is always related to the final pricepaid by the end buyer and is expressed as percentage (Mendoza, 1995).

The method of analysis of marketing margin is as follows,

$$TGMM = \frac{\text{End buyer price - First seller price}}{\text{End buyer price}} X100 \qquad (2)$$

Where, TGMM = Total gross marketing margin

The TGMM was useful to calculate 'producer's gross margin' (GMMp) which is the portion of the price paid by the consumer that goes to the producer.

The producer's margin is calculated as:

$$GMMp = \frac{\text{End buyer price - marketing gross margin}}{\text{End buyer price}} X100 \qquad (3)$$

Where, GMMp = the producer's share in consumer

$$NMM = \frac{\text{Gross margin – Marketing costs}}{\text{End buyer price}} X100 \qquad (4)$$

Where, NMM = Net marketing margin

3.5.2. Econometric analysis

According to Greene (2003), the multiple linear regression model is specified as Y= f(price, onion output, access to extension service, education level, access to market information, experience in onion production, sex of house hold head, access to credit, age, etc…). The econometric model specification of supply function in a matrix notation is estimated by

$$Y_i=\beta_0 + \beta_i X_i + U_i \qquad (5)$$

Where

Y_i= amount of onion supplied to the market

β_0= the constant intercept

β_i= a vector of estimated coefficient of the explanatory variables

X_i=a vector of explanatory variables

U_i=disturbance term

3.5. Hypothesis, Variable construction and Definition

The data covers information necessary to make farm level indices of social, economic, demographic and environmental outcomes and efficiency indicators comparable in the onion market.

3.5.1. Dependent Variable

Quantity of onion supplied (GMQ_i): It is continuous variable that represents volume of onion supplied to market. It is a dependent variable and other explanatory variables may have a negative or positive relation to the variable (Gujarati, 2003).

3.5.2. Independent (Explanatory) Variables (Xi)

These are variables that are assumed to influence quantity supply of onion. Selection of these variables needs to consider that the omission of one or more relevant variables or inclusion of one or more irrelevant

variables may result in specification error which may reduce the capability of the model in exploring the economic phenomena empirically.

Land size (SA): This is the total land area that the farmer actually owns. It is a continuous variable measured in hectares. They can allocate this for different crops like maize, haricot bean, sweat potato, etc. However, it is obvious that the size of acreage that can be allocated for onion increases with larger land size (Rehima, 2008). Hence, it is assumed that this variable is positively related to volume of market supply of onion.

Amount of improved seed available (AIS): This is a continuous variable measured in quintal. Improved seed is obviously more productive than local variety (Woldemicheal, 2008). Thus, this variable is hypothesized to have a positive effect up on the market participation and the volume of market supply.

Age of the household head (AgHH): It is a continuous variable measured in years. As to Rehima (2006), age is a proxy measure of farming experience of households. Aged household are believed to be wise in resource use, and it is expected to have a positive effect on marketable supply.

Family Size (FS): It is a continuous variable measured in adult equivalent (*Storck et al*., 1991) i.e. the availability of active labor force in the household, which affects farmers' decision to market participation. Since production is the function of labor, availability of labor is assumed to have positive relation with volume of supply. However, family size might have positive or negative effect on market participation and marketable surplus of food crops. A study conducted by Wolday (1994) identified that family size has a significant positive effect on quantity of teff marketed and negative effect on quantity of maize marketed.

Education of the household head (EdHH): Intellectual capital or education, measured in terms of formal schooling the household head is a continuous variable and assumed to have a positive effect on sales decision. Sometimes, however, because of cultural and socio economic characteristics, education has opportunity costs in alternative enterprises (Lapar et. al., 2002). So it is impossible to have a definite expectation of the effect of education on market participation and sales volume.

Sex of the household Head (SxHH): It is a dummy variable of the form 1=male; 0=female. Obviously both men and women take part in crop production in mixed farming. Generally, men contribute more labor in cultivating, weeding, etc. Women also participate in weeding, fertilizer application like compost etc. However, it is male who participate dominantly in such activities. Therefore, it is assumed that male headed household participates more in onion market and vice versa for females.

Number of extension visits (ExVis): The number of extension visit made by the extension agent measures the variable. Extension visits improves the households' intellectual capital, which improves vegetable(onion) production and divert production resources to markets. Therefore, number of extension visits has a direct effect on market participation decision and sales volume.

Access to market information (MI): This is also a dummy variable which takes the form 1=yes; 0=no. Farmers marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. Therefore, it is expected that market information is positively related market participation and marketable surplus. Study conducted by Gotez (1992) on food marketing behavior identified better information significantly raises the probability of market participation for potential selling households.

When the assumptions of the Classical Linear Regression model (CLR) are dishonored, the parameter estimates of the OLS model may not be Best Linear Unbiased Estimator (BLUE). For this reason, it is essential to see the case of multicollinearity and hetroscedasticity between the variables that affect the supply of ginger in the study area. Hence, before fitting significant variables into the model, it is necessary to check these problems among the continuous variables and see the association between the discrete variables, which seriously affect the parameter estimates. According to Gujarati (2003), multicollinearity refers to a situation where it becomes difficult to identify the separate effect of explanatory variables on the dependent variable as there exists strong relationship among them. Alternatively, multicollinearity is a situation where the explanatory variables are highly correlated. There are two measures which suggest the existence of multicollinearity. They are Variance Inflation Factor (VIF) for continuous variables association and Contingency Coefficient (CC) for dummy variable association.

In order to detect the multicollinearity problem for continuous variables, the Variance Inflation factor (VIF) $= \frac{1}{1-R_j{}^2}$, for each coefficient in a regression as a diagnostic statistic is used, where R_j represents a coefficient for determining the subsidiary or auxiliary regression of each independent continuous variable X. As a rule of thumb, if VIF value of a variable exceeds 10, which will happen if R_j^2 exceeds 0.9, there exists high degree of multicollinearity (Gujarati, 2003). Hence, in this study, Variance Inflation Factor (VIF) was employed to estimate the degree of multicollinearity among the explanatory continuous variables of the supply function. The same way, Contingency Coefficient (CC) was employed for the dummy variables. On other hand, test for heteroscedasticity will be undertaken in the study. Among the many test statistics for heteroscedasticity, the Breusch and Pagan test of hetroscedasticity was used especially for its simplicity. Thus, Breusch and Pagan devised a Lagrange Multiplier test of the hypothesis that:

$$\sigma_i^2 = \sigma^2 f(\alpha_0 + \alpha' Z_i) \qquad (6)$$

Where, Z_i is a vector of independent variables. The model is homoscedastic if $\alpha = 0$. The test was carried out with a simple regression:

LM = $\frac{1}{2} explainedsumofsquaresintheregressionof\ e_i^2 / (e'e / n) on Z_i$ (9)

The null hypothesis can be tested by the usual t-test or F-test.

IV. Results and Discussion

4.1. Demographic Characteristics of the House-holds

Table 2: Age and family size of the House-hold heads

Variables	Minimum	Maximum	Average	T-Value
Age(years)	22	92	43	-0.1
Family Size(numbers)	1(0.8)	10(8.96)	5(3.00)	0.123
N=98				

NB: numbers in parenthesis indicate family size in adult equivalent.
Source: Own survey, 2014

As can be seen in (Table 2) above, the average age of sample household heads is 43 years with minimum and maximum of 22 years and 92 years, respectively. Thus, the household heads are on the average in active working age. The T-test again ratifies this evidence as T-value (-0.1) is insignificant at any level of significance. The negative T-value also shows that the age of most household heads is below the average (43 years).Similarly, the average family size in numbers is 5 with minimum and maximum of 1 and 10, respectively. However, the average family size is 3 in adult equivalent with minimum and maximum of 0.8 and 8.95, respectively. This shows that most family members are dependent on their heads. The T-test also confirms this as T-value (0.123) is insignificant at any level of significance.

4.2. Production and Productivity of Onion

Table 3: Production and Productivity of Onion

Items	Minimum	Maximum	Average	T-Value
Land allocated for onion(ha)	0.125(0.25)	1(9)	0.41(3.13)	0.2
Production(qt)	3(11.2)	124(208)	33.1(76.2)	0.003
N=98, Total onion produced(qt)=3244				

Figures in parenthesis indicate average land owned (ha) and productivity of onion *(qt/ha) in the first and second rows respectively.*
Source: Own survey, 2014

The average land allocated for onion is about 0.41 ha out of 3.13 ha owned with the minimum and maximum shown in (Table 3). This implies very least area of land (i.e. on average about 13.1%) is allocated for onion out of the average cultivable land owned by the sample households. And, there is no significant variation among the land allocated for onion as the T-value (0.2) is insignificant at any level of significance. Likewise, on average about 33.1 quintals of onion is harvested by the households with minimum and maximum of about 3 and 124 quintals respectively. The average productivity of onion is about 76.2 quintals per hectare with minimum and maximum of 11.2 and 208 quintals per hectare. And, production as well as productivity is uniform among the sample households as T-value (0.003) is insignificant at any level of significance.

4.3. Income and Return

Table 4: Average Annual Income and Net Return (ETB)

Items	Minimum	Maximum	Average	T-Value
Annual income(000)	4.15(0.1)	93(1)	49.9(0.44)	0.001
Production cost(000)	0.02	20.80	6.43	-0.005
Net Return (000)	0.4	72.17	15.53	-0.002
N=98.				

NB: *Figures in parenthesis indicatethe share of onion income in annual income.*
Source: Own survey, 2014.

The average annual income of sample households is in ETB about 49,900 with minimum and maximum of 4,150 and 93,000 respectively. As can be seen in (Table 4), about 44% out of the average annual income was found to

be the share of onion income with the corresponding minimum and maximum of about 10% and 100% respectively. This implies farmers are not as such specializing in the production of onion irrespective of its immense potential there. Alternatively, one can easily perceive the incentive in markets is not as such attractive for the farmers to do so. The T-test also confirms the same generalization as the T-value (0.001) is insignificant at any accepted level of significance. Similarly, the average net return (i.e. average onion income less average production cost) is about 15,530 birr with the corresponding minimum and maximum shown in (Table 4).One can observe at least two facts in this analysis: On one side, there are farmers who earn only about 400 birr (net return) from onion. Thus, it is possible to conclude these farmers are not with as such sufficient incentive in onion business. On the other corner, there are also farmers who earn about 72,170 birr (net return) from onion. However, it is not possible to generalize most farmers are too because the T-test confirms that there is no significant variation as the T-value (-0.002) is not significant at any accepted level of significance. The negative T-value also shows that most farmers earn below average net return (i.e. <15,530 birr).

4.4. Structure Conduct performance

4.4.1. Onion Marketing Participants, their Role and Linkage

Producers: Farmers were the origin of all onion flowing in the channels. Producers of onion in the study area were obviously the small scale farmers. The formal survey has revealed that the farmers might sell their produce to *kebele* collectors, commission men, and semi-wholesalers. As shown in (Table 6), the amount of onion flowing to directly to collectors was relatively higher (80 %) followed by commission agents (15 %) and low in semi-wholesalers outlet (5%).

Table 5: Farmers' Market Outlet

Agents	Volume of onion (%)
Collectors	80
Commission Agents	15
Semi-wholesalers	5

Source: Own survey, 2014

Kebele collectors: These were small and informal traders who usually buy onion from the farmers and make available for sale in wholesale markets. Close observation of traders has identified that the *kebele* collectors were with no license.

Commission Agents: The commission men were also traders who usually buy onion from farmers, collectors on the behalf of semi-wholesalers. They usually gain the price difference that semi-wholesalers agreed to pay and what they (the agents) actually pay.

Semi-wholesalers: The semi-wholesalers were traders who bear the characteristic of both retailers and wholesalers. These traders were to some extent larger than the retailers; and were all licensed. They were observed to buy onion mostly through the commission men and sometimes via their employee.

Brokers: Brokers are agents who work for commission on the behalf other participants. Thus, they perform mainly bringing buyers and sellers together.

Consumers: Onion is widely home consumed agricultural product in the study area. Thus, it is common to use onion in *wots* and *hayta tukkiya*

4.4.2. Structure of Onion Market

Table 6: Degree of Market Concentration

Items	The Concentration Index for the first four Largest Firms (%)
Collectors	28
Commission-Men	15
Semi-Wholesalers	35
Retailers	12
N=40	

Source: "Own survey, 2014"

As shown in (Table 7), the concentration index for the first four largest traders was computed for collectors, commission-men, semi-wholesalers, and retailers. Thus, it was relatively larger for semi-wholesalers (35%) and lower for retailers (12%). But none of them were concentrated as per the criteria set by Kohls and Uhl (1985).

4.4.3. Marketing Chains of Onion

Market Channels of Onion: Abbot (1958) define marketing channel as the sequence of intermediaries through which goods pass from producer to consumer. This channel may be short or long depending on kind and quality of the product marketed, available marketing services, and prevailing social and physical environment (Islam et al., 2001). Accordingly, the formal survey has identified about five marketing channels:

I. Farmer →collectors → semi-wholesaler → consumers (I): This is the most frequent channel which accounts for the total flow of about 80% onions in the chain (i.e. 2,595.5 quintals).

II. Farmer →commission-men → semi-wholesaler → consumers (II): This is the second most frequent channel which accounts for the total flow of about 15% of onion. In other words, the annual flow of about 486.6 quintals of the onion was through this channel.

III. Farmer →collectors → brokers→semi-wholesaler → consumers (II): This is the channel which accounts for the total flow of about 2% i.e. about 64.88 quintal onion.

IV. Farmer → semi-wholesaler → consumers (III): Similarly, this channel also accounts for the total flow of about 2% (i.e. about 64.88 quintals of onion).

V. Farmer →collectors → semi-wholesaler →retailers → consumers (V): This is the least frequent channel which accounts for the total flow of about 1% of onion in the chain (i.e. about 32.44 quintal).

The formal survey has revealed that the market chain for onion was not complex (Figure 1). As shown in (Table 2), the total onion produced by the sample households was about 3244 quintal. And, farmers sell this via three outlets; namely collectors (80% or 2595.2 quintal), commission-

men (15% i.e. 486.6 quintals), and semi-wholesalers (5% i.e. 162.2 quintals). Similarly, collectors sell the onion through two outlets: semi-wholesalers (95% i.e. 2465.44 quintal) and brokers (5% i.e. 129.76 quintal). The commission-men and brokers both sell only to semi-wholesalers. Thus, the semi-wholesalers receive onion (3244 quintal) from collectors, farmers, commission-men, and brokers which they in turn sell to consumers (95% i.e. 3081.8 quintal) and retailers (5% 162.2 quintals). Retailers also sell the onion at their hand to the consumers.

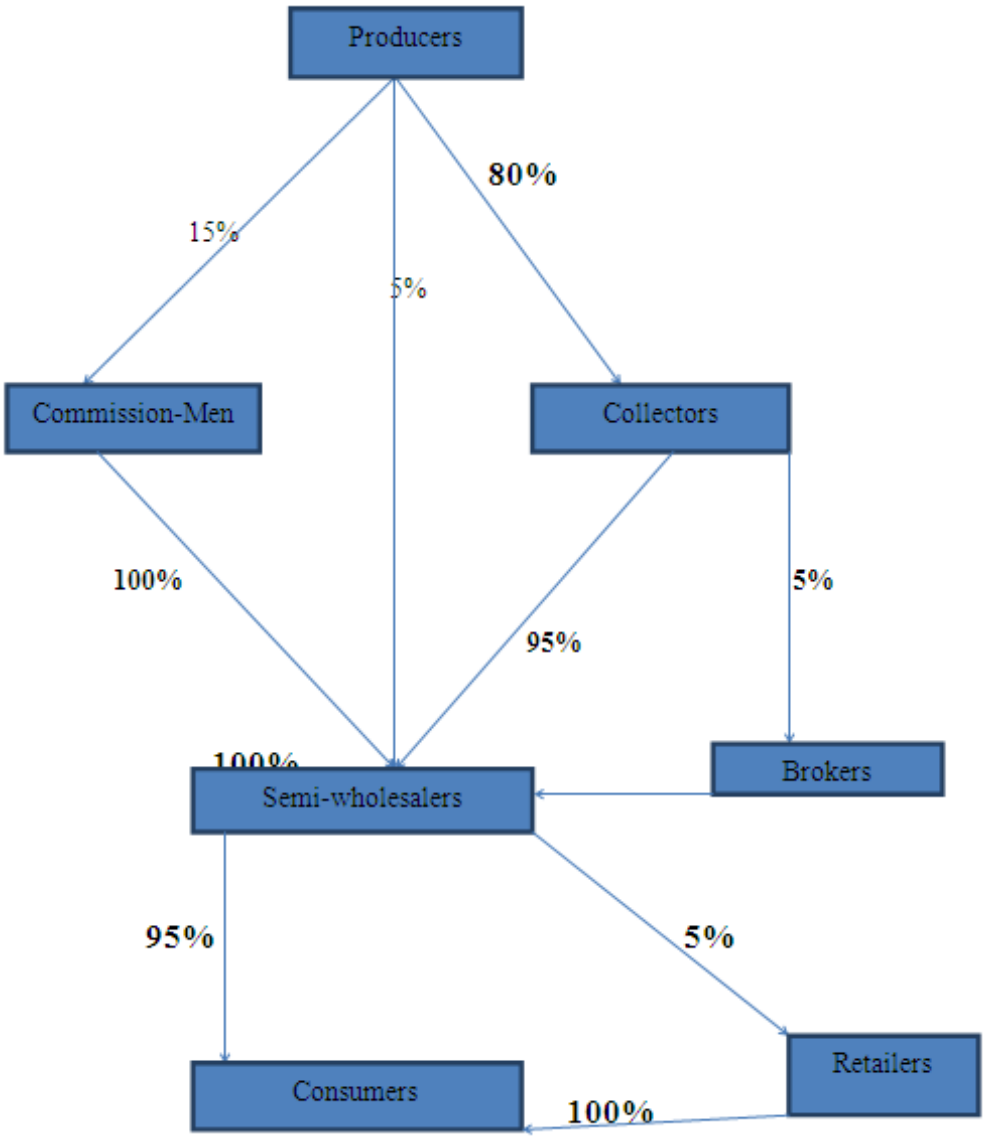

Fig.1. Market Chain of onion
Source: Own survey, 2014

4.5. Performance of onion Market

Table 7: Marketing Margin

Items	Gross Marketing Margin (%)
Producer-semi wholesaler	4.5
Producer-collector	36.4
Collector-semi wholesaler	25
Semi wholesaler-Retailers	9.1
N=40, producers' share= 58%, Average =35	

Source: Own computation, 2014

4.6. Results from Econometric Analysis: Factors Affecting the Supply of Onion

Table 8: Results of the Multiple Linear Regression Model.

Items	β	Std. Error	T	Sig.
Constant	54.7	5.2	10.6	
Age of the HHH(years)	0.16	0.07	2.10**	0.04
Family size(adult equivalent)	0.45	0.55	0.82	0.42
Livestock owned(TLU)	0.26	0.15	1.72*	0.09
Land owned(ha)	-0.05	0.38	-0.13	0.9
Extension contact per month(Numbers)	0.08	0.6	0.13	0.89
Alternatives for market information(Numbers)	4.12	2.14	1.95*	0.05
Production cost(ETB)	-0.000	0.000	-0.14	0.89
Price per kilogram	8.7	0.7	12.35***	0.00
Income from onion in thousands (ETB)	1.6	0.7	22.9***	0.00

N=98, R^2 =0.69, Regression sum of squares=66910.92, df=9, mean square=7434.55, Residual sum of square=3910.36, df=88, mean square=44.44, F=167.31

Source: Own survey, 2014.

After running the multiple linear regressions, five variables, namely age of the HHH, Livestock owned, Alternatives for obtaining market information, Price per kilogram of onion and income from onion were found to be significant (Table 5). Before fitting the significant variables in to the model multicollinearity among the explanatory variables and hetroscedasticity were checked. Thus, variance inflation factor (VIF) was used to check the multicollinearity among explanatory variables and, the result shows that there was no severe multicollinearity problem as VIF was below 10 for all variables. Similarly, the Breuch-Pagan/Cook-Weisbrg test of hetroscedasticity suggested that the problem was insignificant.

Age of household head: As hypothesized, age of house-hold head positively and significantly (at 5% significance level) affected the amount of onion sold. Thus, a year increase in the age gives rise to 0.16% of onion sold. The principle is that aged households have wider experience which helps them produce large and sell more.

Number of livestock owned (TLU): Livestock owned also positively and significantly (at 1.0% significance level) affected the dependent variable. Thus, a marginal increase in number of livestock (TLU) increased the amount of onion sold by 0.26%. The rationale is that an increased livestock obviously increases soil fertility by contributing manures. Improved fertility of land in turn results in increased production of onion thereby increased marketable surplus. Moreover, households owning dairy cows might sell some dairy products (e.g. butter) and buy inputs like onion seed there by increase onion production and its marketable surplus.

Alternative sources of Market information: Access to market information has positively and significantly (at 5% level of significance) affected the amount of onion supplied to market. Thus, a unit increase in alternative sources of market information accessible for farmers on average increased the volume of onion sold by 4.12%. This implies that if farmers get adequate, consistent, and timely price information they will adjust their production accordingly and supply sufficient amount of onion to market.

Price per kilogram of onion: Price has negatively and significantly (at1% level of significance) affected the amount of onion sold as hypothesized so far. Thus, as shown in (Table 5), a birr increase in price per kilogram of onion gives rise to 8.7% increase in the amount of onion sold and vice versa. This is obvious that farmers elevate production of onion if price per kilogram of onion in the prevailing market is attractive but lower it if the corresponding price falls.

Income from onion: As expected, income earned from the sale of onion has positively and significantly (at 1% level of significance) affected the amount onion sold. Thus, if income increases by one thousand, the amount of onion sold also increase by 1.6%. The logic is forward that if there is incentive in market, farmers will produce more onion and sell more and vice versa.

V. CONCLUSION

This study tried to analyze the market chains of onion in Humbo Woreda of Wolaita zone with the specific objectives of investigating marketing costs and margins, market participants and their roles plus constraints and prospects of onion production and marketing. Attempts were also made to identify factors affecting the supply of onion in the Woreda. Structure Conduct Performance approach was used to examine marketing costs and margins, market participants, their roles, and linkages. In addition, the Multiple Linear Regression Model was employed to see factors that determine the supply of onion. Results of the study shown that the productivity as well as post-harvest management were by far poor. However, farmers sold a large amount of onion out of which the collectors, commission-men and semi-wholesalers respectively bought 80%, 15% and 5% in 2014. Sample markets were inefficient though not characterized by oligopolistic market structure. The traders first deal each other and set the maximum price limit below which the negotiation takes place. The structure of markets has also shown that capital is a key barrier to

entry. However, license was not barrier to entry. Market information is not evenly disseminated. High marketing margins and low producers' share are also characteristics of the markets. The econometric model has identified price per kilogram of onion to be the most important variable affecting (positively) the supply of onion. Further, income from the sale of onion significantly and positively affected the volume of onion sold. Similarly, number of livestock owned significantly and positively affected the volume of onion supplied.

RECOMMENDATIONS

The econometric model has identified price per kilogram of onion to be the most important variable affecting (positively) the supply of onion. As a result, the findings of this work suggested that government, NGOs and other stakeholders shall play a vital role in addressing the problem of price variation. Further, income from the sale of onion significantly and positively affected the volume of onion sold. Thus, much more should be done so as to improve the producers' share in the market. Similarly, number of livestock owned significantly and positively affected the volume of onion supplied. The results of this study suggested building household assets (i.e. livestock) through household asset building programs will remedy the case. The findings of this study also suggested that developing farmers' ability to produce and negotiate via cooperatives is best way of improving the market structure.

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