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Determinants of cassava production and its marketing channel efficiency - an assessment

[a]Dr. R. Dayanandan
[b]Tadele Yaya Ataro

[a]Professor, Hawassa University, Ethiopia; e-mail: afianand@gmail.com
[b]Research Scholar, Hawassa University, Ethiopia

ABSTRACT: Cassava production has got an international attention and currently different organizations and foundations are involved in research and development activities. But cassava producers in the study area are facing different challenges in production system and marketing for cassava products. Hence, the main focus of this research paper is to see the determinants of cassava production and its marketing channel efficiency in the study area. Both primary and secondary data sources were used to address the objectives and the primary data was collected from 181 sample farmers drown from three cassava producer rural villages using multi-stage sampling technique. Descriptive statistics such as frequency, percentage, mean and standard deviation were used to summarize the data. Furthermore, inferential statistics like multiple linear regression model was employed to identify the determinants of cassava production. The study results indicate that the production trend of cassava in the area has been increasing time to time. The regression analysis results also disclosed that educational level, access to agricultural input, age of the farmers, pests attack, extension visit, fertility of the soil, farm size, irrigation, experience and family size were the variables that significantly influence households cassava production. It is also found that direct sale (producers sell their cassava products to the final consumers) brings the biggest price share (35%) for the farmers and it is the best channel to increase efficiency and the wealth of farmers. The challenging factors influencing the cassava producers in the study area are shortage of farm landholding, marketing chain efficiency, soil fertility, high population pressure, and drought etc. Therefore, the researcher recommends that the government, non-government, cooperatives and agricultural research centers should support the cassava producer farmers by giving improved variety and promote the non-producer farmers to participate in cassava production and create market chain in the study area.

Key words: Cassava production; Determinants; Marketing Channel Efficiency

1. Introduction

Ethiopia is an agrarian economy pre-dominantly depends on traditional subsistance agriculture. The country with the population of 102,942,996 and the second most populate country in Africa next to Nigeria. Accourding to latest United Nation's estemate 2017, the population is growing at an annaul rate of 2.9%. From the total inhabitants, around 85% of the population is living in the rural areas (CSA, 2017). The agriculture sector supports the livelihoods of more than 83 per cent of the population, and this proportion has remained consistent for several years with no sign of decline. The agricultural sector is the major source of food in Ethiopia the contribution of the sector to the national economy is presently estimated to be 41.6 per cent of the country's total Gross Domestic Product (GDP). The agricultural sector has also contributed to more than 70 per cent of Ethiopia's total foreign exchange earnings with little diversification of export commodities. Despite such contributions, the agricultural sector depends on seasonal rains and is highly vulnerable to shocks. Of the total 13.3 million hectares of cultivated land, only 1.2 per cent is irrigated; as a result, in most cereal producing areas, production is possible only once a year as rain fed agriculture accounts for over 97 per cent of annual production (CSA, 2015).

Cassava is a very important food crop in tropics, that is, cassava leaves also have excellent potential and are extensively used in Africa and Asia, as either human food or animal feed. Cassava is the fourth most important commodity after rice,wheat and maize, and is a basic diet of many millions of people (FAO and IFAD 2012). In addition to the economic value of the products and byproducts obtained from cassava, it offers other recognized advantages; tolerance of drought capacity to produce considerable yield in degraded soil, resistant to insect pests and diseases, tolerance of acid soils, and flexibility in planting and harvesting time (Bernardo and Hernan, 2012).

Cassava produces bulky storage roots with a heavy concentration of carbohydrates, a bout 80 per cent. The shoots grow into leaves that constitute a good vegetable rich in proteins, vitamins and minirals. New knowledge of the biochemistry of the crop has proved that the proteins embedded in the leaves are equal in quality to the protein in egg. Cassava leaves and roots, if properly processed, can therefore provide a balanced deit protecting millions of African childern against malnutrition (Taye, 2015).

The Ofa district is one of the drought prone and food insecure area in the region. The significant factors that are affecting farmers in the study area are production and productivity, lack of technology transfer, storage facilities, lack of transportation access ,

agricultural inputs, marketing information, extension visit, training support, pest and disease, high population pressure, shortage of farm landholding, soil fertility, erratic rainfall, and drought. Also it is reported that the cassava producers are not getting adequate price for their products due to many factors. Therefore, the purpose of this study is to assess the determinants of cassava production and its marketing channel efficiency in the study area.

2. Statement of the Problem

It is well known fact that as the scale of human activities expands the capacity of the eco-systems to regenerate the natural resource base becomes an increasingly binding constraint to further growth and development with respect to agriculture, the combined effect of population growth on the developing countries faces the same challenges to the developing countries (Kostals, 2001). The socio-economic progress of Ethiopia rests on the performance of the agricultural sector, which is dominated by smallholder farmers. As it is well known, in peasant agriculture the goal of development is undoubtedly changing the scope and efficiency of food crops production (Nord and Andrews, 2002).

The impact of recurrent drought has decreased the asset base of the households. The problem deepens when resource poor or people with no assets are further affected by extended drought. Drought also affects the physical availability of food in market. Higher food prices limits demand for food. Majority of rural people in the study area are dependent on agriculture but the sector is at the mercy of variable annual rains. Because of the limited amount and uneven distribution of rainfall in time and geographic scope at the study sites, rainfall represents the most limiting factor for agricultural and livestock production. Elders of the study area remember well the droughts that have occurred in the during in 1985, 1995, 2000, 2005, 2008 and 2010 since 2015/16. In addition, erratic and unreliable nature of rainfall distribution is also another challenge for crop production and productivity in the area.

In order to mitigate the consequences of the drought, government and non-governmental organization have been implementing different development and emergency activities in the area. Cassava production has got an international attention and currently different organizations and foundations are involved in research and development activities. Cassava initiatives were assisting farmers in planting high yielding cassava varieties that grow in relatively dry conditions to insuring food security and enhance incomes for thousands of families in sub-Saharan Africa (Alwang and Siegel, 2003).

In the study area there is high potential for cassava production while the farmers are facing different problems in production system and marketing of cassava products in the market. Hence, the researcher intends to see the determinants of cassava production and its marketing efficiency in the study area.

3. Specific Objectives

- To examine the extent and trend of cassava production in the study area.
- To assess the determinants of cassava production in the study area.
- To analyse the marketing channels of cassava products and its efficiency
- To find out the mechanisms to improve the production and marketing efficiency for cassava in the study area

4. Methodology followed

The present research is a descriptive one based on both primary and secondary sources of data. Primary data was collected from sample cassava producers and secondary data was gathered from published and unpublished document. In addition, focus group discussion and key informant interview were also conducted. Semi-structured interview schedule was developed and fine tuned for household survey. A multi-stage sampling procedure was used to select the district, villages and the respondents. In the first stage, among the three potential cassava producer rural districts in the zone, one district was selected purposefully based on highest potential cassava production, backwardness of the area and marketing problem for cassava producers, less extension services given to cassava producers. In the second stage, all 21 rural villages of the study district are stratified into three strata according to the agro-climatic zone namely highland, midland and low land. Cassava products are produced in two agro-ecological zones (midland and low land). One village from seven villages under midland, and two villages from nine villages in low land were selected randomly as sample villages which are having more cassava producers. In the third stage, out of 1599 total cassava producers in the sample villages, to determine the sample size of 181, Yemane (1967) formula was used. Finally, the sample size was distributed proportionate to the selected villages and the sample households were identified through simple random sampling.

The collected data were analysed using SPSS (version 21) and descriptive statistics such as frequency, percentages, mean and standard deviation were used to arrive the meaningful results. In addition, inferential statistics like multiple linear regression analysis was carried

out to find out the factors influencing cassava production. The multiple linear regression model description is Y = f(X_1, X_2, X_3, X_4, X_5, D_1, D2, D_3, D_4, D_5). $Yi = B0 + B1X1 + B2X2 + B3X3 + B4X4 + B5X5 + D1 + D2 + D3 + D4 + D5$

Where:

Y is total amount of cassava production in quintals per year

$B_0$is intercept constant of Yi

$B_1$is slope coefficient of Yi

X_1 is age of sample household heads

X_2 is family size of sample households

X_3 is the land holding of sample households in hectare

X_4 is the farming experiences of sample household heads in years

X_5 is the extension contacts of both farmers and agricultural development agents

D1, D2, D3, D4 and D5 are dummy variables representing; soil fertility, access to irrigation, educational level, access to agricultural inputs and pests and diseases respectively. These discrete variable take the values 1, if the participants in cassava production have; irrigation access, agricultural inputs, and 0, otherwise and others with their prospective.

To assess the marketing efficiency of cassava products, marketing margin analysis was used. Especially comparison of prices at different levels of marketing over the same period was used. Computing the total gross marketing margin (TGMM) is always related to the final price or the price paid by the end consumer and is expressed in percentage (Mendoza, 1995). Accordingly the formulae to calculate the marketing margin are as follows:

$$TGMM = \frac{\textbf{Consumer price} - \textbf{Producer price}}{\boldsymbol{Consumer\ price}} \text{x } 100$$

It is useful to introduce the idea of farmers' participation, farmer's portion, or farmers Gross Marketing Margin (GMMP) which is the portion of the price paid by the consumer that goes to the farmer. The farmer's margin is calculated as

$$GMM = \frac{\text{End buyer price} - \text{Gross Marketing Margin}}{End\ buyer\ price} \text{x } 100$$

Another parameter related to marketing margin is the producer's share. The producer's share is the ratio of producer price to consumer price (retail) (Mudiantono, 1990). The product's share can be expressed as

$$\text{Producers Share} = \frac{\text{End buyer price} - \text{Gross Marketing Margin}}{End\ buyer\ price} \text{ x } 100$$

5. Results and Discussion

5.1. Background Characteristics of Respondents

Demographic characteristics refers to the respondents' profile regarding their age, education level, main occupation and family size which are important for analysis and to arrive appropriate inferences. Both continuous and discrete variables were used in order to describe the characteristics.

Age of the Respondents: Age determines the active and productive capacity of a head of household. Age has also been found to affect the rate of household adoption of innovations, which in turn, affects household productivity and livelihood improvement strategies (Amaza et al., 2009). The study result shows that 47.5 percent of the households were under the age between 35-45 actively productive age groups and 9.9 percent of the households are above 64 which are old age groups.

As age of household head increases, it is assumed that farmers could acquire more knowledge and experience. They are more risk averter and the chance of a household to become more food secure increases along an increase in age (Sisay et al, 2003). Again, a study by Idrisa (2008) has also revealed that age has correlation with farming experience and significance on the decision making process of farmers with respect to risk aversion, adoption of improved agricultural technologies and other production related decisions.

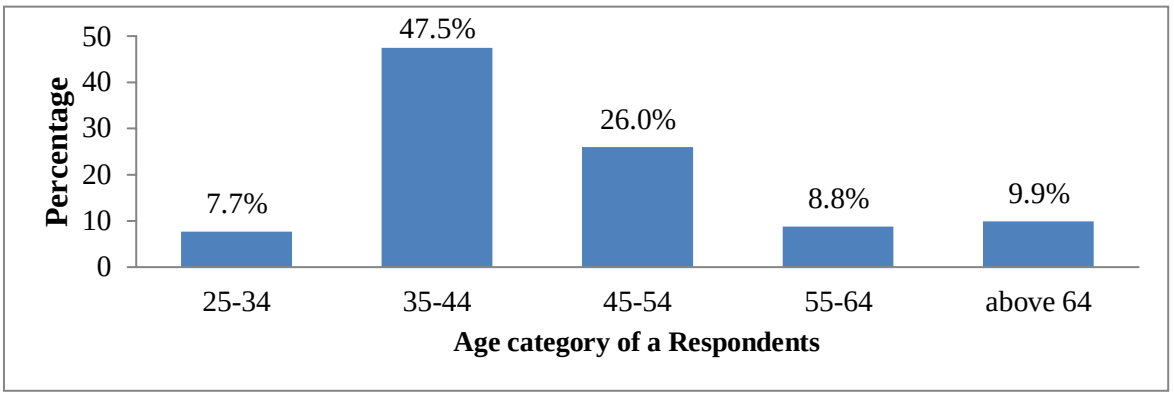

Figure1: Age category of sample Households

Educational Status: Education is the action of teaching a person in a particular skill or type of behavior and is the process of receiving or giving systematic instructions, especially at school or university. It is believed to contribute positively towards cassava production and food security. The level of education is believed to influence the use of improved technology in agriculture and hence, farm productivity.

Table 1 shows that, 30.4% of the respondents are illiterate (cannot read and write), 40.9% respondents attained 1-8 grade, 19.9% of them have completed grade 9-12 and 8.8% of the respondents attained above grade 12 (certificate and diploma). These results imply that, primary education level was very high among the respondents in the study area in which it can be interpreted as opportunity to application for modern technology in various productive activities. The results concurred with many studies (Amaza et al., 2009) which revealed that, the level of education helps farmers to use production information efficiently, as a more educated person acquires more information and to that extend, it is a better producer.

Table 1: Demographic Characteristics of Sample Households

Variables	Categories	Frequency	Percentage
Educational status	No formal education	55	30.4
	Grade 1- 8	74	40.9
	Grade 9 – 12	36	19.9
	Above 12	16	8.8
	Total	**181**	**100**
Family size	1 – 2	19	10.5
	3 – 4	56	30.9
	5 – 6	63	34.8
	7 and above	41	22.7
	Total	**181**	**100**

Source: Primary Data

Family size: Family size refers to number of people living in the same residence. A large number in a family could be beneficial or could exert pressure on household capacities. The large family members, the more labour force available for production process, contribute more for household income. Cassava production is labour intensive activity; therefore a large family size is a medication of availability of more labour. The significance of household size in agriculture and food security depends on the fact that availability of labour for farm production, the total area cultivated for different crop farming, the amount of farm produce retained for domestic consumption and the marketable surplus are all determined by the size of the family household (Amaza et al., 2009).

According to the results in the Table 1, 34.8% of the households have five to six (5-6) members, 30.9% of the households have three to four (3-4) members, 22.7% has above seven (> 7) members and 10.5% has one to two(1-2) members. These results reveal further that more than 53.6% of the sample households have at most above five members. This

shows that the average household size in the study area is higher than the regional average of 4.5 members (CSA, 2017).

This implies that the size of most of the households is big and this could be attributing to the extended nature of many families whereby parents live together with sons and grandchildren thus, requiring much spending for their daily sustenance. This enabled farmers to engage more in agricultural production because of the labour force available in the household; many times it is farmers with more labour that are able to take advantage of the available resource in agricultural production resulting into high yields.

Farm size: Farm refers to the land area that was actually used for crop production during the surveying year. The average land size is ranged from 0.26–1.03ha in the study area. Majority (53%) of the respondents has farm size between 0.52- 0.77ha and only 9.4 percent has farm size above 1.03ha. However, many farm households operated small and fragmented plots in the study area used for cultivation of different crops.

Table 2: Economic Characteristics of Sample Households

Variables	Categories	Frequency	Percentage
Farm size in hectare	0.26 – 0.51	08	4.4
	0.52 – 0.77	96	53.0
	0.78 – 1.03	60	33.2
	Above 1.03	17	9.4
	Total	**181**	**100**
Land for cassava production in hectare	Less than 0.25	14	7.7
	0.26 – 0.51	77	42.5
	0.52 – 0.77	61	33.7
	0.78 – 1.03	27	14.9
	Above 1.03	02	1.1
	Total	**181**	**100**

Source: Primary Data

Households with more access to income generating activities (production of cash crop) are more food secured than households who do not have these benefits. Diversifying household activities are essential for small landholders to improve food security and it cannot be achieved by subsistence farming alone.

Land for cassava production: The result disclosed that, as the cultivated land size for cassava production increases, the households were able to diversify the crops on the cultivated land and this may in turn imply increased income and consumption. This has a great role in ensuring households' food security. The result shows that, 42.5 percent of the sample households has land for cassava production ranges from 0.26-0.51ha and 1.1

percent has land ranges from 1.03- 2.0ha.The result of this study suggests that rural households with less land size and hence gain less. The growth of non-farm income sources might be expected to reduce the need for landless rural dwellers to carry out extractive practices in local environments for survival. These results are also in line with Adugna (2008), Yishak, (2014). The implication is that access to farmland is the most critical issue for farm households since those with promising farmland do not need to involve in off-farm activities even if there are other challenges. Many studies revealed that farm land holdings in many rural parts of Ethiopia are too small for adequate food production to meet household consumption. Focus Group Discussion participants have reported that having large number of children have brought change in farmland size by sharing part of farmland to the children.

Soil fertility status: The better the land quality, the higher the production level. The long run impact on food security is determined by whether the program leads on soil conservation or not. Households who got fertile land planted with crops, the probability of getting enough harvest for home consumption increases and bring additional income to household (Gray and paddock, 1993).

In the study area, soil fertility is a major problem but cassava production does not need highly fertile soil since cassava plant is stress resistant crop. Majority (65.2%) of the respondents said that they have soil fertility problem and consider infertile, 26.5% of them considered their land as moderate fertile and 8.3% of them considered as fertile. Thus, in this study, not only access to farm land that matters, but also the fertility status or quality of the farmland and access to availability of labour to work on the farm land.

Pest and disease affect on cassava production: One of the constraints of food security is a problem associated with the control of pests. Agriculture today is plagued by wide increase of pests and diseases. Pests and diseases are among the factors limiting crop production and cause food deficit (Ehrlich and Ehrlich, 1993). The study results show that, 48.6 percent of households have reported that the effect of pest and disease were medium and 1.1 percent considered the effects of pests and disease on cassava production had no effect. In the study area an incidence of pests and diseases are major problems and highly affecting cassava production.

Table 3: Economic Characteristics of Sample Households

Variables	Categories	Frequency	Percentage
Soil fertility	Fertile	15	8.3
	Moderate	48	26.5
	Infertile	118	65.2
	Total	**181**	**100**
Effect of Pest and Disease	Has no effect	20	11.1
	Low	31	17.1
	Medium	78	43.1
	High	52	28.7
	Total	**181**	**100**
Technology adoption*	Use of Improved verities	134	61.2
	Fertilizer application	21	9.6
	Use of herbicides	24	11
	Application of insecticides	40	18.2
	Total	**219**	**100**

Source: Primary Data
Notes: * shows that multiple responses is possible

Technology adoption: Using agricultural technologies have contribution to increase agricultural yields and food production, income and food security. Various studies in Ethiopia have proven that appropriate application of modern farm inputs such as chemical fertilizers; improved seeds and herbicides increase crop yields and productivity (Degefa, 2002). Because of this, farmers in the study area have been encouraged to adopt utilization of modern farm inputs. However, some poor farmers fail to use expensive inputs since they do not afford the cost. It is observed that, majority (61.2%) of the respondents used improved cassava varieties, 18.2% of them applied insecticides, 11% of them used herbicides to control weeds and 9.6% of them used fertilizer. The findings could be associated with farmer's awareness that the use of improved technologies increase crop yields, income and better living standard while non-adoption of improved technologies is one of the major reasons for low productivity of small scale farmers. A possible explanation of this could be high cost of inputs; unavailability of agro-chemicals and technical knowhow associated with the use of improved technologies. Gezhagne et al (2004) reported that the major factors that hinder the adoption of recommended practices are the expensive nature of farm inputs and ignorance on the part of the farmers. In the study area technology adoption strategies were not a major problem that affects cassava production since cassava products are stress resistant crop than other cereal crops.

Institutional Characteristics of Sample Households

Extension visit: District Agriculture and Rural Development office is the major source of agricultural extension service in the study area. The responsibility of extension service at grass root level was given by Village Development Office. Extension service here refers to advice about farming systems, animal management (artificial insemination), and training, marketing information, demonstration and distribution of input (seed, chemicals and fertilizer distributions). According to the available results, 76.8 percent of the sample households have received the extension service while the rest (23.2%) did not get extension service. According to FGDs and KII, extension services for cassava producers was very low than other crop production and the cassava producers uses less technology inputs than other crops but cassava production contributes more for addressing food security status at household level.

Table 4: Institutional Characteristics of Sample Households

Variables	Categories	Frequency	Percentage
Extension visit	Yes	42	23.2
	No	139	76.8
	Total	**181**	**100**
Access to agriculture credit	Yes	46	25.4
	No	145	74.6
	Total	**181**	**100**
Training support	Yes	72	39.8
	No	109	60.2
	Total	**181**	**100**
Access to Agricultural input	Yes	112	61.9
	No	69	38.1
	Total	**181**	**100**
Distance to local market (Km)	1 – 5	35	19.3
	6 – 10	51	28.2
	11 – 15	81	44.8
	16 – 18	14	7.7
	Total	**181**	**100**

Source: Primary Data

Access to agricultural credit service: The main source of agricultural credit services in the study area was micro finance institution (Agricultural office). From the sample households; 23.2% got agricultural credit services while 76.8% did not take agricultural credit services; due to various reasons. Sample respondents from cassava producers had different opinion regarding the prevailing agricultural credit services situation; 18% of the respondents reported that agricultural credit is dangerous if not properly handled, 57% of

the respondents said that credit service is not necessary or not needed for cassava production because of its production cost is low than other crops and 25% said that credit service is not provided or accessible for cassava production in the study area.

Training support on cassava production: Training is the action of teaching a person in a particular skill or type of behavior. According to Khatn and Roy, (2012), training is one of the factors that determine the performance of crop production. Therefore, training access increases the possibility of getting more production. The results of the survey revealed that the variable under consideration is positively related and significant with food security. Farmer trainings are very important for their farm improvement, management ability, and technology adoptions and to use it. It is observed that majority (60.2%) of sample households did not have training supports and only 39.8 percent of the sample have got training. The feasible justification is that training supports the household a chance to be occupied in income generating activities so that gained revenue increases their financial capacity and purchasing power to escape from risk of food insecurity

Distance to local market: The proximity to market centers creates access to additional income by providing off-farm/ non-farm employment opportunities, easy access to inputs and transportation. The results show that, 44.8 percent of the sample households have a distance between 11-15kms and 7.7 percent have a distance of 16-18kms distance to the local market. Therefore, it is hypothesized that there is positive association between access to the nearest market center and household food security (Tesfaye et al, 2013).

Access to agricultural input: Use of agricultural inputs such as fertilizer, seeds of improved crop varieties, access to agricultural credit, extension services boost agricultural productivity and production and thus improve the status of household food security. Any farm input that enhances agricultural productivity and production would be expected to boost the overall farm production and contributes towards attaining household food security (Degefa, 2002). The result of the survey revealed that, 61.9 percent of the households have access to agricultural inputs and 38.1 percent of the sample has not access to agricultural inputs.

5.2. Extent of cassava production in the study area

Cassava is a perennial woody shrub with an edible root, which grows in tropical and sub tropical areas of the world. Today, it is a dietary staple in much of tropical Africa. It is rich in carbohydrates, calcium, vitamins B and C, and essential minerals. However, nutrient composition differs according to variety and age of the harvested crop, and soil conditions,

climate, and other environmental factors during cultivation. It is one of the most important food crops that constitute a considerable portion of the daily diet of the people and also serves as a major source of carbohydrate. Despite its importance for cassava production in the study area has different constraints and opportunities. It is mainly cultivated by small resource poor farmers on smallholding plots of land. Now-a-day, it is increasingly becoming a source of industrial raw material for production of starch, ethanol, waxy starch, bio-plastics, and glucose, bakery and confectionery products.

Cassava production contributes to the national or international economy in several ways. In Ethiopia, cassava grows in vast area mainly in South Region. According to Feleke (1997), Cassava was introduced by some NGOs in drought prone areas and it is the most widely grown of the root crop through the year in the study area. Production amounts of cassava aggressively increasing from time to time in the study area since both a food security crop and a source of household income (cash crop).

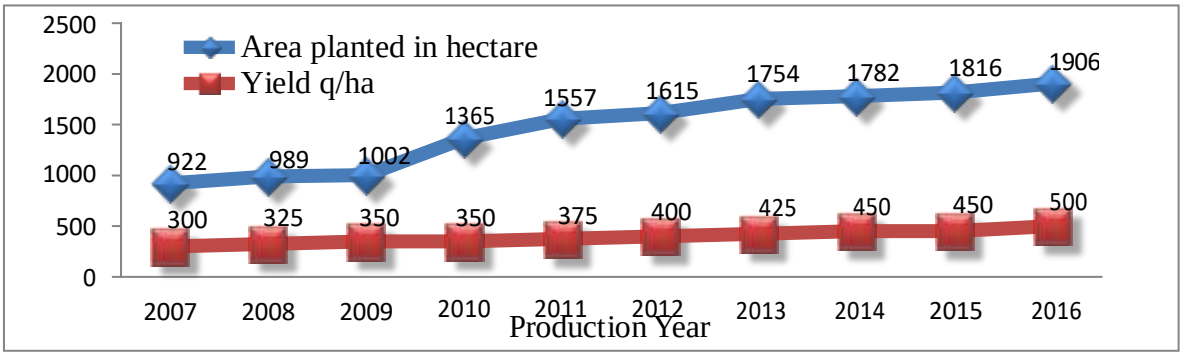

Figure 2: Area planted in hectare and amount of yield produced quintal per hectare
Source: District Agricultural Office Report (2017)

From the figure 2, it can be inferred that area under cultivation of cassava has been increasing and the productivity also increased time to time due to technology adoption.

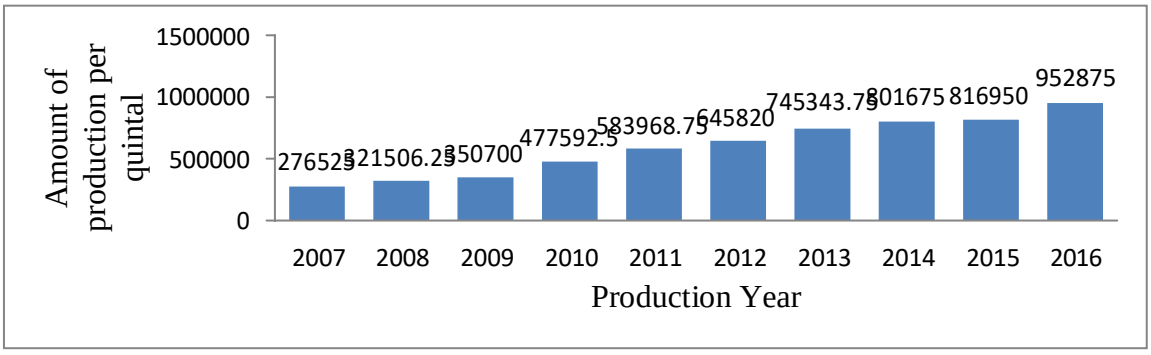

Figure 3: Trends of Cassava Production in the study district (in quintal)
Source: District Agricultural Office Report (2017)

Figure 3 shows that, production of cassava in the study district has been increasing time to time which indicates that farmers are intensively cultivating the crops every year.

Constraints of cassava production: There are constraints for cassava production in the study area such as late maturity, shortage of high yielding cultivars, insect pest invasion, shortage of land, moisture stress and low market demand or price were the most serious problem encountered by cassava producers. The statements from the respondents indicate that shortage of land (42.2%), lack of extension visit (7.8%), and low price for the product (22.9%) were the constraints of cassava production. A study by Galunde (2009), has also mentioned that lack of (and erratic) rainfall, soil degradation or loss of soil fertility, and crop infestation are main causes of decline of crop harvest leading to low production. FGD participants indicate that, rapidly growing number of population in the study area increase the demand for food, resources, land and other basic needs for life, especially during drought time the problem will be challenging for the community.

Table 5: Constraints of Cassava Production

Variables	Categories	Frequency	Percentage
Constraints of cassava Production*	Pests and Disease	20	10.4
	Cultivation land shortage	81	42.2
	Labour shortage	32	16.7
	Poor crop price	44	22.9
	Low extension visit	15	7.8
	Total	**192**	**100**
Soil type	Loam	07	3.9
	Clay	174	96.1
	Total	**181**	**100**
Production experience	Increasing	165	91.2
	Decreasing	05	2.8
	The same	11	6.0
	Total	**181**	**100**
Crop varieties used	Qulle	117	64.6
	Kelo	62	34.3
	Local	02	1.1
	Total	**181**	**100**
Participate Irrigation	Used	22	12.2
	Not used	159	87.8
	Total	**181**	**100**

Source: Primary Data
Notes: * shows that multiple responses is possible

Soil types: Cassava production majorly determined by soil types because all types of soils are not suitable for cassava. Cassava is sensitive to soil types but soil fertility is not a major

problem because cassava production does not need fertilizers or fertile soil since cassava plant is stress resistant crop. The study results shows that, 96.1 percent of the respondents have clay (red) type of soil and it produce more production and 3.9 percent of the respondents said that their soil type was loam (black) and it produce very less production. From the FGD participants, KIIs and field observation by the researcher proved that in the study area except clay (red) soil other type were not suitable for cassava production, but majority of the participants responds that they did not have soil fertility problems for cassava production.

Experience in Cassava Production: Cassava usually is a sole crop as well as intercropped/ mixed with maize, haricot bean, sweet potato and yam. Farmers do not use fertilizer for cassava. Cassava is mainly cultivated by small resource poor farmers on smallholding plots of land. Average storage root yield obtained per a given plot of cassava is as low as 100quintals per hectare despite the potential yield of 600 quintals per hectare. This low yield might be due to the cultivation of local, low yielding, and late maturing cultivars. Cassava varieties which characterized by its low moisture stress indicating that cassava can resist/tolerate low moisture stress and give comparative yield provided that other factors are not limiting (Bernardo and Hernan, 2012). The result of the study shows that, 91.2 percent of respondent's experience increasing from time to time, and only 2.8 percent have less experience.

Varieties of Cassava Production: Cassava is one of the most important food crops that constitute a considerable portion of the daily diet and also serves as one of the major source of carbohydrate. White fleshed and short type cassava varieties are preferred for home consumption as of the sampled farmers. Those varieties considered by the respondents as sweeter and palatable while prepared by local dish (other name kelo). The varieties with the characters such as shorter height, long storage root, red skin color and bigger size were preferred for market because of their higher flour content after drying. Problems of the local cultivars were late maturity; low yield and susceptibility to pests specifically scales insect. The study results show that, 64.6 percent of respondents producing improved varieties of' qulle' and 34.3 percent producing improved varieties of 'kelo' and 1.1 percent of the respondents producing local varieties. The study revealed that, in the study area improved variety of qulle was more produced and preferable for home consumption and marketable.

Irrigation practices: In the study area access to modern irrigation practice was positively related to household food security. Irrigation practice enables households to grow more other crops than cassava production to ensure increased and stable agricultural production, income and consumption thereby improving food security of the households. According to the study results, 87.8% of the respondents were not used irrigation to produce cassava and 12.2% were used irrigation to produce cassava. From FGD and KII discussion and field observation, clay soil type is better for moisture holding and cassava production was high drought resistance and no need of irrigation.

5.3. Determinants of Cassava Production

In this sub-section, as specified in the methodology determinants of cassava production were analyzed using multiple linear regressions (MLR) model. Ten possible determinant factors such as age, family size, experience, extension visit, farm size, fertility status, irrigation, and access to agricultural input, pests, education were included in the model. The results of the function are calculated as blow.

$$\mathbf{Yi= 438-228X_1+543X_2+163X_3- 95X_4+ 2204X_5+613D_1-267D_2+815D_3-776D_4-1427D_5}$$

Where

- ***Yi*** is total cassava production in quintals
- ***438*** Is constant production without any additional assisting factors.
- X_1 Age of household
- X_2 Family size of household
- X_3 Experience of the farm
- X_4 Extension visit
- X_5 Farm size
- D_1 Soil Fertility status
- D_2 Irrigation availability
- D_3 Access to agricultural input
- D_4 Pests
- D_5 Education of respondents

Table 6: Regression Model Summery

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.892a	.796	.784	35.58

a. Predictors: (Constant), a. Predictors: (Constant), education, AAI, age, pests, extension visit, fertility, farm size, irrigation, experience, family size

According to the model summary, the R value of the model is 0.892 which shows the highest degree of relationship between independent and dependent variables. The adjusted R^2 value of the regression model is 0.784, indicating that 78.4 percent of variance in cassava production is accounted by the predefined independent variables.

Table 7: Results of ANOVA Output

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2512.032	10	837.344	77.812**	.000
	Residual	1904.719	170	10.761		
	Total	4416.751	180			

Note: ** significance at 1% probability level

The ANOVA table results indicated that the multiple regression model itself is statistically significant or not significant. Because R^2 is not a test of statistical significance (it only measures explained variation in Y from the predictor Xs), the F-ratio is used to test whether or not R^2 could have occurred by chance alone. In short, the F-ratio found in the ANOVA table measures the probability of chance departure from a straight line. The results of the output found in the ANOVA table is statistically significant when age, family size, experience, extension visit, family size, soil fertility status, irrigation, access to agricultural input, pests and education level were included ($F=77.812$, $p<0.01$). Therefore, the overall equation was found to be statistically significant.

Multiple Linear Regression Model Analysis Results

As stated in the methodology, ten explanatory variables were included to identify the factors that determine cassava production among the sample farmers. Among these variables, six variables namely age, family size, experience, farm size, pests and education of the sample households, were found to be significantly influencing the cassava production at household level (Table 8). The remaining four variables (extension visit, soil fertility status, access to agricultural input and irrigation) were found to have no significant effect on cassava production.

***Age of household heads*:** Age of the household head is found to be negatively associated with cassava production. As the farmer gets older, their managerial ability is expected to decrease. It is having the negative effect with the standardized coefficient of 227.8 and its effect is approved to be significant at one percent level. A one unit increases in the household head's age, decreases the cassava production by 227.8units.

Family size: The family size which is statistically significant at 1% probability level and have positive relationship with the cassava production. As the family size of sample households increases, the cassava production increases by 543 units. The possible explanation is if more number of members in the family, the households requires to producing more to feed their family members. So this has a direct relationship with cassava production.

Table 8: Results of Multiple Linear Regression model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Colinearity Statistics	
	B	SE	Beta			Tolerance	VIF
1 (Constant)	438.107	1978.997		.221	.825		
Age	-227.833	14.239	-.560	-16.01	.000**	.978	1.023
Family size	543.409	70.947	.276	7.659	.000**	.925	1.081
Experience	162.570	66.663	.087	2.439	.016*	.932	1.073
Extension visit	-95.086	65.389	-.051	-1.454	.148	.972	1.029
Farm size	2204.216	907.424	.088	2.429	.016*	.921	1.086
Soil fertility	612.874	562.081	.039	1.090	.277	.934	1.071
Irrigation	-267.022	586.912	-.016	-.455	.650	.954	1.048
Access to Agricultural Input	815.366	476.430	.060	1.711	.089	.979	1.022
Pests	-776.148	300.494	-.090	-2.583	.011*	.983	1.017
Education	1426.903	96.093	.532	14.85	.000**	.934	1.071

Note: B= Regression coefficient (Estimate), SE=Standard Error, Dependent variable= Cassava production
* and ** show the significance at 5% and 1% probability level respectively

Experience of sample farmers: The experience of the sample household heads was statically significant at 5% probability level and had positive relationship with the cassava production. As a year of farm experience increase the cassava production increase by 163 quintals.

Farm size: The farm size of the sample respondents was statically significant at 5% probability level and had positive relationship with the cassava production. The farm size of sample households increase, the cassava production also will increase by 2204 quintals. Cassava production is a labour intensive activity and it creates employment opportunities for rural dwellers.

Pests and disease: Pests and disease availability was statically significant at 5% probability level and had negative relationship with the cassava production. Pests and disease affect cassava production decreases by 776quintals.

Educational level: The educational level of the sample households was statistically significant at 1% probability level had positive relationship with the cassava production. A year of formal school increase increases the cassava production by 1426 quintals. This indicated that people with education and experiences were most likely to be productive in cassava production. According to (Belay, 2004) an educated household head is often tends to adopt new skills, ideas.

5.4. Marketing Chain Efficiency of Cassava Products

One of the objectives of this paper is to analyze the market chain efficiency of cassava products. Market chain 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 consumer destination. The analysis of marketing channels is intended to provide a systematic knowledge of the flow of goods and services from their origin (producer) to their final destination or consumer (Assefa, 2009). This knowledge can be gained through studying about the agents in the market to have economic benefit in the market.

5.4.1 Cassava Marketing agents and their roles

This section describes different stakeholders of the market such as producers, cassava collectors, whole sellers, retailers and consumers in the study area and their roles in increasing the marketing efficiency of cassava product.

Table 9: Cassava market agents and their respective price

Cassava Marketing Agents	Marketing price in Birr for Kg		
	Minimum	Maximum	Mean
Producer	03	06	5.00
Collector	07	10	9.00
Whole seller	10	12	11.00
Processors	12	15	14.00
Retailer	15	17	16.00
Consumer	18	21	20.00

Source: District Trade and Industry Office

Producers: Producers are small scale farmers and they sell their cassava products to different buyers or participants of cassava market. There are different buyers those purchase cassava from farmers directly. As the data collected from respondents show that,

farmers used to sell their products directly to different parties such as final consumers, cassava collectors, retailers, and whole sellers. The framers sales their cassava products with low prices when comparing the other agents only average price is 5 Birr per kg.

Cassava collectors: The cassava collectors participate in the markets by purchasing the cassava directly from farmers in a small village markets for resell to other retailers, and consumers who come from different areas of the District. They are small and fragmented participants but they play significant role in collecting and supplying cassava to the market. Even though their role enables farmers to reduce the cost of transportation and other market related costs, they purchase cassava from farmers with low price as compared with other purchasers. Cassava collectors receive the product from the farmers with the average price of Birr 5 per kg and sell an average price of 9 Birr per kg.

Whole sellers: They are bulky purchasers as compared to other agents of the market from the farmers or from the retailers and from cassava collectors and distribute cassava produce to other retailers, processors and final consumers. There are few whole sellers of cassava product in the study area and they play an important role in linking the product to different resellers and consumers. Whole sellers receive the product from the collectors with the average price of 9 Birr per kg and sell an average price of 11Birr per kg.

Retailers: Retailers are the participants involved in the selling of cassava product to ultimate consumers. There are super markets and other retailers who divide large-amount of produce and sell it to consumers in small units. These are the final agents in the channel that delivered cassava to end users. The majority of retailers found at the different market center, having their own retail in the market place. Retailers receive the products from the processors or whole sellers with the average price of 14 Birr per kg and sell an average price of 16 Birr per kg.

Processors: Processors are flour factories' owners and they purchase dried cassava from different marketing participants like cassava collectors and whole sellers. Then they prepare processed flour for different consumers. The important role of these processers is cassava flour mixing with wheat, maize and tef flour for food consumption and for industrial purposes. However, there was no appropriate market link and they face marketing problems. There are no other private enterprises those process cassava products for national market than local consumption in the area. Processors receive the product from cassava collectors and whole sellers with the average price of 11 Birr per kg and sell an average price of 14 Birr per kg.

Consumers: They are the end users of cassava product through purchasing from different market agents. In the study area, cassava has been consumed in different way by boiling the tuber and supplied with sauce of hot pepper and mixed with tef, maize and wheat flour for making bread.

Due to inaccessibility, marketing agents cannot fulfill their roles and function in the marketing activity. Farmers do not supply their all marketable cassava products to the market because of transportation problem. In addition, producers do not processing and bring to the market. Therefore, the contribution of marketing agents was insignificant to increase the marketing efficiency of cassava market. Less coordination between market participants contributes for inefficient market. Out of all participants, cassava collectors play the vital role by supplying significant amount of cassava to the market. There is a long market channels from producer to reach end users and the consumers have to pay high price in the market.

5.4.2 Marketing Margin Analysis

Marketing margins are the difference between prices at two market levels. The term market margin is most commonly used to refer to the difference between producer prices of an equivalent quantity and quality of a commodity. However, it may also describe price differences between other points in the marketing chain, for example, between producer and wholesaler, or wholesale and retail prices. It is used to analyze the marketing efficiency through marketing agents. Marketing margin relates with the price variation at stage of each market and the price paid by each participant in the market. To study marketing margin, different prices at different markets are collected. As the data shows, the price paid by the collector to the farmers at farm gate is Birr 5. The price paid by the retailers to the cassava collectors is Birr 9 that is without value addition they receive Birr 4 markup per kg immediately. If the producers sell their product to the retailers directly they can generate additional income without additional capital. But the bottle necks are poor road infrastructure and market linkage problem to sell their product in the market that offer relatively high price.

The price paid by the final consumer in the center of the district is Birr 9 per kg and the price of cassava flour for one kg in city market is Birr 20. Therefore, big portion of the profit goes to non-producers and different intermediaries due to inadequate market information about the price and other related marketing situation. Poor infrastructure also affects the farmers' movement from one market to another either to sell their product or to

gather information about their production and marketing way and unnecessarily elongated market channels engulf the profit of the producers. Despite such challenges, farmers are continuing their production for ten years and they accept the price offered by their buyers because they are not aware about the price at different marketing end. The share of different market participants calculated as follows.

$$\text{Producers Share} = \frac{\text{Producers}}{\text{End price}} \text{x } 100 = \frac{5}{20} \text{x} 100 = 25 \text{ percent}$$

The retailers share calculated as follows

$$\text{Retailers' share} = \frac{\text{retail price} - \text{Producers price}}{\text{consumer price}} \text{ x } 100 = \frac{9-5}{20} \text{x} 100 = 20 \text{ percent}$$

$$\text{Whole sellers' share} = \frac{\text{whole sellers price} - \text{retailers price}}{\text{whole sellers price}} \text{ x} 100 = \frac{20-9}{20} \text{x } 100 = 55 \text{ percent}$$

As it is observed from the calculation, the farmers' share from the total share of the price is only 25 percent and the remaining big (75%) portion goes to the intermediaries in different marketing channels. As the computation shows the biggest share of the price is received by the whole sellers.

To identify the efficient channel, the major marketing margin for each channel was calculated and analyzed below: One of the identified channels for the cassava product in the study area is the direct channel that is farmers selling their product to the final consumers at Birr 9.

Therefore, the marketing margin for this channel estimated as:

$$\text{Producers Share} = \frac{\text{Producers' price}}{\text{End price}} \text{x } 100 = \frac{9}{20} \text{x } 100 = 45 \text{ percent.}$$ This shows that if producers sell their product to the local final consumers, they receive 45 percent share out of end price of their product.

Another important channel is producer to the processors and farmers sell their cassava product at the price of Birr 7 as identified in the study. Thus marketing margin of this channel presented as follows.

$$\text{Producers Share (PRs)} = \frac{\text{Producers price}}{\text{End price}} \text{x } 100 = \frac{7}{20} \text{x} 100 = 35 \text{ percent}$$

Producer to local wholesalers which contains 25% of cassava flow and its margin is:

$$\frac{\text{local whole sellers price} - \text{producer price}}{\text{End price}} \text{x } 100 = \frac{8-5}{20} \text{x} 100 = 15 \text{ percent}$$

In the long channel that carries 15% of cassava flow and the farmers share in this channel is calculated blow.

$$\frac{\text{final consumer} - \text{producer price}}{\text{End price}} \times 100 = \frac{9-5}{20} \times 100 = 30 \text{ percent}$$

As indicated above, direct sale (producers sell their cassava products to the final consumers) brings the biggest price share (35%) for the farmers. Therefore, direct channel (producer to consumer) is the best channel to increase efficiency and the wealth of farmers. But due to different constraints especially the absence and high cost of transportation service, farmers prefer to sell their products to the cassava collectors at insignificant price so this channel carries only 15 percent of the market or sold cassava in the market.

6. Conclusion and Recommendations

Cassava is one of the most important food crops in the daily diet of the people and also serves as a major source of carbohydrate in Southern Ethiopia. Despite its importance cassava production has different constraints and opportunities. It is mainly cultivated by small resource poor farmers on smallholding plots of land. Root crops are growing diversely in the area than cereals and pulse. The trend of cassava production during the last ten years is increasing. There are many influential factors are found to be determinants of cassava production in the study area.

Currently climate change effects which are erratic rainfall and drought happen frequently and improved varieties of seeds and artificial fertilizers are also used below the recommendation rate. Mostly farmers sell their cassava product at the farm gate, local market and nearby town market. The major marketing problems for cassava products are: market information, price fluctuation and consumers awareness. In addition, crop disease and pest infestation, cultivation land shortage, water problem, input shortage and low extension services also found as problems by the farmers. Following recommendations are forwarded to improve the production and marketing efficiency of cassava products in the study area.

- Proper attention should be given by the government to create access of land by arranging resettlement programme for the farmers to overcome severe farm land shortage.
- Improvement in access to agricultural inputs, extension services, agricultural credit, and productivity improvement technologies should be given more attention by government and non-governmental organizations.

- Different agencies such as Food and Agricultural Organization (FAO), Ministry of Agriculture (MoA), NGOs and Research Foundations should give attention for promoting cassava production by providing improved verities, and to create market linkages.
- Education is important for technology transfer and it is an important variable for cassava production. Illiterate households are not better in participation of cassava production than their counter parts. Therefore, the ministry of education in collaboration with the district education office should provide adult education program for those illiterate households.
- It is found that the farmers' product was not well linked to the market due to the lack of healthy marketing institutions. Therefore, Cooperatives Union and the Government should have to take the responsibility to form new cassava producers farmer cooperatives in the study area to support the farmers.
- The study indicates that extension visit significantly influence cassava producers, the extension agents, when disseminating information on improved farm practices should pay proper and close attention to have enhanced exposure and use information from extension services to improve agricultural production and productivity.

7. References

1) Adugna Eneyew Bekele. 2008. Livelihood Strategies and food security in Wolaita, Southern Ethiopia: The Case of Boloso Sore District. M.Sc Thesis, Haramaya University.
2) Alwang, J., and B.P. Siegel. 2003. Measuring the impacts of agricultural research on poverty reduction. *Agricultural Economics*, Vol. 29, pp.1-14.
3) Assefa Abebe. 2009. Market Chain Analysis of Honey Production in Atsbi Wemberta District, Eastren zone of Tigray National State, M.Sc. Thesis. Haramaya University.
4) Bernardo Ospina and Hernan Ceballos. 2012. Cassava in the third millennium Modern Production, Processing, Use and Marketing Systems. CIAT pubilication No. 377, Colombia, pp 574
5) Central Statistical Agency (CSA), 2017. Ethiopians' Demography and Agricultural Products Estimates, Ethiopia, Addis Ababa, http/www.csa.gov.et.

6) Central Statistical Agency (CSA). 2015. Ethiopians' Demography and Agricultural Products Estimates, Ethiopia, Addis Ababa.
7) Degefa T., 2002. Household Seasonal Food Insecurity in Oromiya Zone, Ethiopia: Case Organization for Social Science Research in Eastern and Southern Africa.Research Report No. 26 Addis Ababa, Ethiopia.
8) Ehrlich, R., H. Ehrlich, C. Daily., 1993. Food Security, Population and Environment, *Population and Development Review*. Vol. 19 (1). NewYork.
9) Feleke A. (1997). Participatory rapid rural appraisal of Abaya Woreda, North Omo, FARM Africa, Addis Ababa, Ethiopia.
10) Food and Agricultural Organization (FAO), 2012. Proceedings of the workshop on processing technology for cassava and other tropical root and tubers in Africa. Abidjan. Ivory Coast, I and II.
11) Galunde Waketa. 2009. NGO Approaches to sustainable Food Security: The Case of YFSSIFS Project in Konso Woreda, Ethiopia, MSc Thesis. International School of Social Studies, The Hague, Netherlands.
12) Gezhagne A., S. Omamo and Eleni G., 2004. The state of food security and agrcultural marketing in Ethiopia. Proceeding of a policy forum jointly sponsored by the Ethiopia Development Research Institute (EDRI) and East African food policy network of the international food policy research institute. Addis Ababa, Ethiopi, pp. 3-5.
13) Gray, R. and B. Paddock. 1993. Land Set Aside: Is It Food Security, *Canadian Journal of Agricultural Economics.*
14) Idrisa, Y.L.Gwary.M.M. andShehu H. 2008. Analysis of food security status among farming households. *Journal of Tropical Agriculture, Food, Environment and Extension, Vol.* 7(3), pp 199-205.
15) IFAD (International Fund for Agricultural Development). (2012). Rural poverty report: the challenge of ending rural poverty, Rome.
16) Kostals, G.Stamoulis, 2001. Food, agriculture and rural development: current and emerging issues for economic analysis and policy research, FAO:Rome, Italy.
17) Nord and M. Andrews. 2002. Household food security in the United States, Economic Research Service, U.S. Department of Agricultural, Washington D.C.:
18) Sisay Asefa and Tesfaye Zegeye. 2003. Rural poverty, food insecurity and environmental degradetion in Ethiopia: A Case study from south central Ethiopia

paper presentation at 2nd EAF international symposium on contemporary development issues in Ethiopia, July 11-13, Addis Ababa, Ethiopia.

19) Taye Babaleye. 2015. Cassava, Africa's Food Security Crop, Accessed from http://www.worldbank.org/html/cgiar/newsletter/mar96/4cas2.htm,

20) Tesfaye Tadesse, GetahunDegu, Ermias Shonga, Shiferaw Mokonen, Temesgene Addis and Birhanu Yakob, 2013. Current status, Potentials and challenges of Cassava production, processing, marketing and utilization: Evidence from Southern Ethiopia. *Greener Journal of Agricultural Sciences, V*ol. 3 (4), pp.262-270.

21) Yemane, T.1967. Statistics: an introductory analysis, 2nd edition, Harpr and Row, New York

22) Yishak Gecho. 2014. Determinants of Adoption of Improved Maize Technology in Damot Gale Woreda, Wolaita, Ethiopia, M.Sc. Thesis, Alemaya University.

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