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Mapping the Value Chain: Key Characteristics of Ethiopia's Avocado Production

Megdelawit Temesgen[1*], Beza Erko[1]

Ethiopian Institute of Agricultural Research, Jimma, Ethiopia.

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Abstract: Agriculture plays a central role in increasing food availability and incomes, supporting livelihoods and contributing to the overall economy and a key factor to improve food and nutrition security. This study aims at identifying the chain actors, functions and their relationships, mapping the value chain of avocado, the production and marketing constraint the farmers face in different stage face. The study was conducted by the mini research grant from African Women in Agricultural Research (AWARD) and the data was collected by Ethiopian Institute of Agricultural Research (EIAR) in major avocado producing districts in the country. Descriptive statistics such as mean, maximum, minimum, percentage and frequency were used to describe quantitative data. The information generated was summarized by tables and figures. According to the survey result the major constraints of production includes high price of input, incidence of diseases and pests, knowledge gap in production of avocado in addition to that of production constraints farmers also faces marketing constraints include, low price for the products, large number of middlemen in the marketing system, lack of marketing institutions, lack of coordination among the marketing constraints. Based on the major findings, recommendations such as organizing the traders, the government and producers to work as partners and building their business capacity and overcoming their constraints and capacitating them to use market information are drawn so the supporting organization by collaborating with the government must have to support the system.

Keywords: Value Chain, Value Chain Actors, Value Chain Map.

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Introduction

Background of the Study

Agriculture plays a central role in increasing food availability and incomes, supporting livelihoods and contributing to the overall economy and a key factor to improve food and nutrition security. The agricultural sector accounts for 55% to the Gross Domestic Product and provides 85% of employment. Ethiopia produces mainly a variety of cereals, pulses, oilseeds, and coffee. Grains are the most important field crops and the main element in the diet of most Ethiopians followed by pulses. Vegetable and fruit production and consumption is relatively limited. Small-scale farmers, who account for 90% of the agricultural output, cultivate an estimated 96% of total cropped land [5]. The country favorable climate, an attractive investment package and a proactive and supportive government have boosted the development of the Ethiopian horticultural sector and in particular stimulated the export of flowers. Although there are growth opportunities for the fruit and vegetable sector as well, the export of fruit and vegetables are still limited [4]. The Government of Ethiopia gives high priority to the development of the horticulture sector and in 2008 the Horticultural Development Agency has been established with a specific focus to promote and support the further development of the horticulture sector. The number of small-scale producers involved in horticulture is estimated at 5.7 million farmers [9, 13]. The further development of the fruit and vegetable sector in Ethiopia for export to Europe and the Middle East has good perspectives and provides interesting opportunities for foreign investors. The sector is however still in its infant stage.

Ethiopia is endowed with diverse agro-ecologies that are favorable to grow a variety of fruit and vegetable crops. The agro-ecological conditions and low labor cost as well as proximity to export market destinations to the neighboring countries and the Middle East and Europe give the country a comparative advantage. However, local production and consumption of fruits and vegetables are much less when compared to staple grains. Studies have shown that daily and annual fruits and vegetables intake by an adult Ethiopian is in short of the minimum standard of 146kg per person per year. Millions of Ethiopian smallholder farmers produce fruit and vegetable crops for food and income. However, government figures indicate that an estimated 30 percent of fruits and 3 vegetables are lost along postharvest activities such as transportation, storage and consumption. Smallholder farmers lack the awareness, training and access to intermediate processing technologies to effectively manage fruits and vegetables after harvest [7]. They do not have appropriate on-farm processing and value addition technologies such as drying and cleaning of fruits and vegetables to reduce spoilage due to damages [8]. And Ethiopia is among the 5 top sub-Saharan African country in which avocado is mostly produced. Avocados are also grown as a monoculture, which means that the same crop

***Corresponding Author**
Megdelawit Temesgen*
Ethiopian Institute of Agricultural Research, Jimma, Ethiopia

(avocado trees) grows in the same land year after year, for many years. This mass-scale agricultural technique may be (economically) more interesting for investors or producers it is perennial crop and generate income for the rural household for many consecutive years this lead farmers and other actors which participate in the chain to generate income [2,6].

Statement of the Problem

Lack of effective postharvest management not only affects individual farmers but also foreign exchange earnings and economic growth of the country as quality is required to make successful competition in the international market. Globally, insufficient intake of fruit and vegetables has been linked to 2.7 million deaths per year, due to associations between fruit and vegetable intake and: micronutrient intake, risks of chaemic heart disease and stroke as well as risk of type 2 diabetes mellitus [4 ,10]. Vegetables and fruits contribute considerably to improving the quality of diet and human nutrition and income. Beside a huge potential of the zone in production of tropical fruit the sector is not providing much to the economy these is due to many factors like insufficient quantities/lack of critical mass, crop varieties, packaging, cold Storage/logistics, technical knowhow, research and extension, market information, domestic market, input supply are major constraints the farmer face in production of fruit [11 ,12]. Fruit production is a recent production system in the country to be introduced so there is a huge problem of knowledge in both the farmer and the extension worker in seedling propagation, postharvest management, disease controlling mechanism and other. Since Post-harvest management of horticultural crops have not been give satisfactory considerable loss occurs at harvest and post-harvest phases and majority of post-harvest losses for horticulture produce are difficult to measure. Even though the horticulture sector in Ethiopia is growing there is low and insufficient support for the improvement and reduction of postharvest loss and quality deterioration of horticultural crops was reported. On the other hand, an estimate of 15 to 70% of post-harvest losses of horticultural crops in Ethiopia was reported. Thus, such losses during harvest are a major source of food loss and could be seen from food security and poverty reduction aspects in the country as such losses have direct impact on people's livelihood and economy of the country as whole [3].

Methodology

Description of the Study Area

Mana is one of the woredas in the Oromia Region of Ethiopia. Part of the Jimma Zone. The 2007 national census reported a total population for this woreda of 146,675, of whom 74,698 were men and 71,977 were women. The altitude range 1774 up to 2410m.a.s.l. Crop-livestock mixed farming system is highly practiced. Dominantly classified as woinadega and coffee, chat avocado banana and orange are predominantly produced perennial crops whereas maize, finger millet, wheat and bean are cereal crops produce by the farmer.

Sokoru is one of the woredas in the Oromia Region of Ethiopia. Part of the Jimma Zone. The 2007 national census reported a total population for this woreda of 161,338, of whom 81,462 were men and 79,876 were women. The altitude range 1200 up to 3020m.a.s.l. Crop-livestock mixed farming system is highly practiced. Dominantly classified as dega and coffee, chat avocado banana and orange are predominantly produced perennial crops whereas maize, finger millet, wheat and bean are cereal crops produce by the farmer.

Gomma is one of the woredas in the Oromia Region of Ethiopia. Part of the Jimma Zone. The 2007 national census reported a total population for this woreda of 112,395, of whom 56,488 were men and 55,907 were women. The altitude range 1390 up to 2980m.a.s.l. Crop-livestock mixed farming system is highly practiced. Dominantly classified as dega and coffee, chat avocado banana and orange are predominantly produced perennial crops whereas maize, finger millet, wheat and bean are cereal crops produce by the farmer.

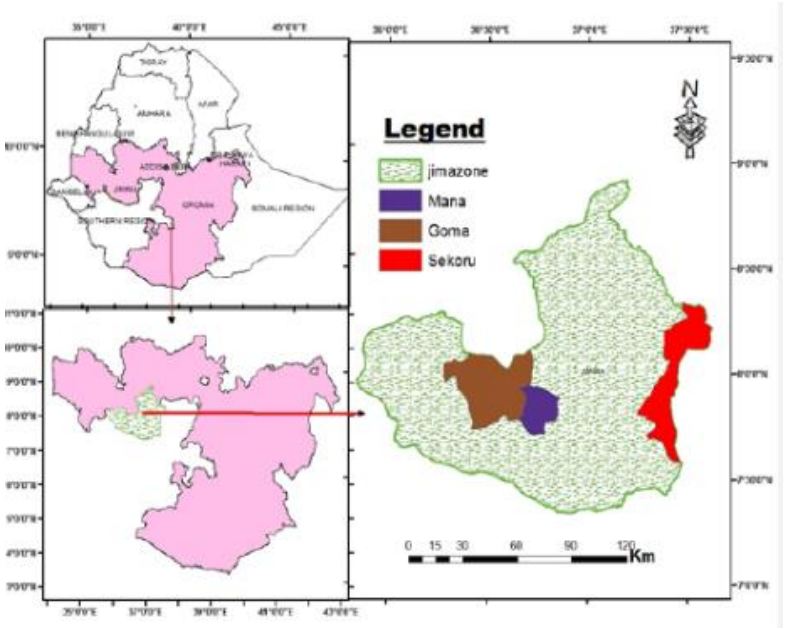

Figure 1. *Map of the study area.*

Data Collection Method

For this study, both primary and secondary qualitative and quantitative data source were used. Primary data type was collected from the primary data source by using CSPro software. Secondary data source was also used as additional information to strengthen the primary

information provided by the sample farmers, and other actors participate in the chain. It was collected from relevant sources such as woreda agricultural office, trade and market development office, Published and unpublished documents were also reviewed to secure relevant secondary information. Moreover, secondary data sources on output, number of licensed vegetable traders and data on other socioeconomic variables were taken.

Sampling Techniques

Multistage sampling techniques were used to select a sample. In the first stage Purposive sampling, also known as judgmental sampling from non-probability sampling method was taken to select the potential district in the zone and three district selected Mana, Gomma and Sokoru. After selecting a potential district three Keble from each selected district were selected based on non-probability sample selection techniques and from Mana district Lemi lelisa, Kenteri and Gube bossoka from Gomma district Yachi, Choche, and kasohiti keble selected and lastly form Sokoru district Andode, kalta and Wolmara kebele selected the reason behind following a non-probability sampling method for selecting a keble to select a potential district in avocado production. After selecting a potential keble to minimize sampling error a simple probability sampling followed from probability sampling techniques was selected to select the sample from each Simple random sampling from probability sampling techniques was used so every member of the farmer in the district has an equal chance of being selected.

Sampling Techniques

The sample size was verified with a standard method of sample size determination. Proportionate to size sampling methodology as specified by [5] as follows for a finite population would be used. The primary data was collected from 188 households' which produce and participate in value chain of avocado. From those samples 130 famers' 70 of them produce avocado for home consumption only and 60 produce both for home consumption and marketing. 35 retailer, 6 9 wholesalers, 13 processors, and 4 consumers also involved in collection of data as a primary data source.

Data Analysis

Descriptive and econometric methods were used to analyze data collected. Descriptive method was used to characterize and give socioeconomic explanations of the respondent and the econometric methods helps to analysis of different variable.

Result and Discussion

This chapter presents the findings of the study from descriptive results. It describes demographic, socio-economic, and institutional and market characteristics of avocado sample respondents using mean, percentage, standard deviation and frequency distribution.

Descriptive Statistics of Avocado Producers

Characteristics of Sampled Households

Demographic and socio-economic characteristics of sampled avocado producers are presented below. From total avocado producer sampled respondents about 99% were male headed, 1% were male-headed in Gomma district and 98% were male-headed in Mana the remaining 2% avocado producer sample households were female headed. In Sokoro district about 99% of the respondents were male headed and the other 1% was female headed. Table below shows the socio-economic characteristics of sampled household.

The education level of the household in the three districts from the survey result is expressed below in figure. As seen from the figure below from Gomma district about 19% of the sample is illiterate, 32% were taken primary school, 35% were taken secondary education and 13.51% can read and write. In Mana district 10% of the population have Bachelors and about 3% of the sample is illiterate, 35% were taken primary education, 47% were taken secondary education and 5% can read and write. In Sokoru district about 42% of the sample is illiterate, 23% were taken primary school, 23% were taken secondary education 12% can read and write. From the whole three districts about 3% of the samples have a Bachelor degree, 22% were illiterate, 30% primary education and 10% had taken secondary education. Education is an important parameter that help the farmers is different production position as [1] explained those educated households have better knowledge about production and marketing practice thus produce more Avocados to the market so focusing in detail in education status of respondent helps to see the effect in detail.

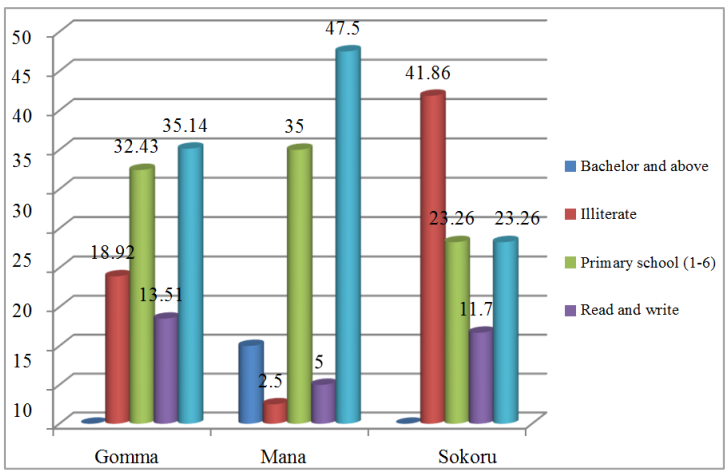

Figure 2. *Education level of Sampled Household*

Socio Economic Characteristics of Household

It is often measured as a combination of education, income and occupation. Examinations of socioeconomic status often reveal inequities in access to resources, plus issues related to privilege, power and control. The table below shows the socio-economic characteristics of sampled household as seen in the table below the mean of age is 42.6 years with a standard deviation of 11.71. On average the households have 6 family members with standard deviation of 2.5.

Table 1. *Descriptive statics of Sampled Household.*

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	130	42.625	11.714	22	80
Family size	130	6.391	2.593	2	13
Experience in planting of Avocado	130	14.61	7.37	3.40	40
Total land owned	130	1.265	.81	.063	3
Walking distance to the	130	28.458	29.444	0	180
Number of months available to transport	130	10.84	2.687	0	12
Total livestock number (TLU)	130	4.4622	2.373	1.2	6.4
Distance to cooperative	130	26.471	26.639	0	120
Distance to extension agent	130	19.742	16.146	0	90

Avocado Production and Marketing Characteristics

Avocado Production

As seen in the table below farmers use of irrigation for production of avocado is very negligible about 99% of the farmers not use irrigation for production of avocado. As avocado fruit is a perennial crops farmers use owned land to grow it. The extension services the farmers' access on production of avocado is very week this leads the farmers to loss above half of their product due to disease, pests and other pre harvest and post-harvest problem and also beside a favorable agro ecology in production of avocado in the three district it minimizes farmers potential in production of avocado because extension service have a vital role in agriculture.

Table 2. *Avocado production characteristics.*

Variable		Mean	Std. Dev.	Min	Max
Fruit tree size in number		8.74	11.512	1	80
Total number of bearing avocado trees		5.982	7.33	1	40
Total number of non-bearing avocado trees		5.938	6.747	1	40
Quantity harvested per tree		2.751	6.223	0.2	50
Quantity sold in quintal		11.33	24.445	0	160
Price per kg		4.166	3.605	0	15
Total consumed at home		1.475	1.746	0	8.3
Post-harvest loss in %		9.447	21.283	0	99
Variable	Category		Percent		
Irrigation	Yes		1		
	No		99		
Land ownership	Owned		99		
	Rented		1		
Cropping system	Sole		85		
	Intercropping		15		
extension service	Yes		5		
	No		95		

Avocado Marketing

Farmers' avocado marketing characteristics' is expressed below in the table. The farmers major market to sell their avocado products are farm gate and village market this is due to different reason like better price, accessibility, reliability, time payment and other factors but among this the major factor the farmers consider in selecting markets are accessibility and better price from the total respondents about 52% of the respondent use accessibility of the channel or the availability of the channel as a major factor in selection of market the next major factor of is better price it account about 28% of farmers selection criteria in selection of market channel the others minor factor include time payment reliability and other related factors. The transaction relationship among the actors takes one forms that is transaction without agreement. The payment is done immediately after marketing for the whole farmer in the three districts. The farmer information source about the marketing of avocado if personal observation, broker, trader, other farmer and the buyer themselves are sources of information for the farmer. 50% of the farmer determine their product price by market force and 30% use the production cost as a main factor for determine their product price and the other use 10% use the middle man factor for determining their product price the other use other farmer price and collective action group as a factor for determine their product price. The farmers use different fruit characteristics to sort their avocado fruit products among them color, shape, size and test of the fruits are the major 39% of the farmers' use shape to sort their avocado product 31% use size as a major determining factor in determine price of avocado products bigger size a better price color, test also used as a product sorting. October, July, June march and April months are the best months in which most marketing of avocado takes places. Absence of quality assuring and standardizing institution was also mentioned as a challenge, although kilogram and pieces were used as main units of measurement.

Table 3. *Avocado Marketing Characteristics of farmer.*

Variables	Category	Percent
Market the farmer uses	Farm gate	49
	Village Market	45
	District Market	5
Reason for farmer choice of market	Better Price	28
	Accessibility	52
	High volume	5
	Reliable	4
	Time payment	4
	Another factor	6
Price of Avocado relative to cost	Above Average	1
	Below Average	13
	Fair and Average	86
The price determining factor	Market force	50
	Middle man	10
	Others farmer	4
	Production cost	30
Fruit characteristics the farmer use to determine their product price	Colour	21
	Shape	39
	Size	31
	Taste	8
Main months the farmer use to sell avocado	October	25
	July	24
	June	15
	March	10
	April	10
	Other months	16

Production and Market Constraint of Avocado Production

As seen from the table below production of avocado is constrained by two major factors these are production constraints and market constraints. Under the production constraints lack of seedling, diseases, pests, high input price and knowledge gap in production of avocado are the major production constraints that affect production of avocado as the graph below shows avocado is highly affected by pests and disease in those three districts.

Marketing of avocado is constrained by so many factors like poor infrastructure, distant market, lack of storage because the fruit type highly perishable and it needs high quality storage material, the poor market linkage between actors to farmer and other factor create a gap in marketing of avocado. In addition to that the three districts have a huge potential of avocado but there is no supporting organization in production of avocado. The farmers in those districts don't sell their product with cooperative and about 65% of the avocado producer famers even don't know the existence of cooperative. The table below shows the primary production and market constraints of the farmer that limit their production and marketing of avocado.

Table 4. *Production and market constraints.*

Production constraints	Percent	Marketing constraints	Percent
Land shortage	30	Low price of fruits	15
Pests	10	Distant markets	10
Diseases	15	Lack information	25
High input price	25	Lack storage facilities	45
Lack of credit	5	Poor market linkages	75
Lack of seedling	15		
Labor constraints		Poor infrastructure	55
Input timely available	40	Perishability and Seasonal maturity	65
Poor quality product	55	Low market demand	15
Knowledge gap	56		

As seen in the graph below due to pest and diseases the farmers loss high quantity of their yield. Estimated yield loss due to pest and diseases 18% and 23% respectively. The infected avocado show different symptoms major symptoms are fruit damage leaf damage and flower damage. The major source of infection for production of avocado weather, variety type and other factors are the major source of infection for the farmers. The farmers use different kinds of method to control the disease and pests but most them not use any kind of controlling mechanisms to diseases and pests. The graph below shows the mechanisms percentage the farmers use to control diseases and pests.

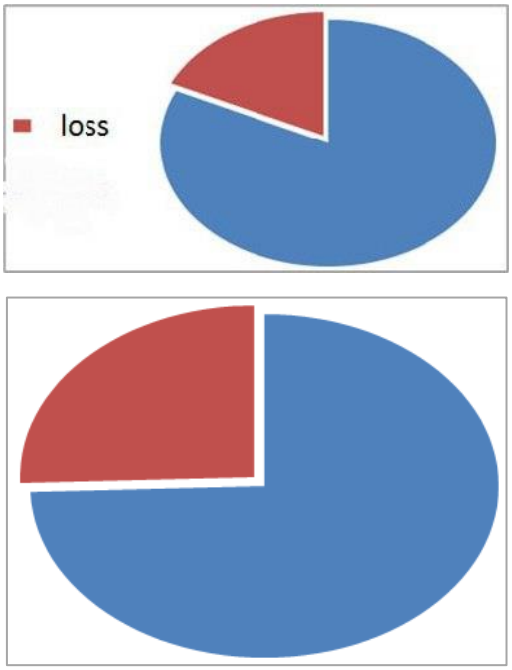

Figure 3. *Loss due to Disease and Pest respectively.*

As seen in the graph above due to pest and diseases the farmers loss high quantity of their yield. Estimated yield loss due to pest and diseases 18% and 23% respectively. The infected avocado show different symptoms major symptoms are fruit damage leaf damage and flower damage. The major source of infection for production of avocado weather, variety type and other factors are the major source of infection for the farmers. The farmers use different kinds of method to control the disease and pests but most them not use any kind of controlling mechanisms to diseases and pests. The graph below shows the mechanisms percentage the farmers use to control diseases and pests.

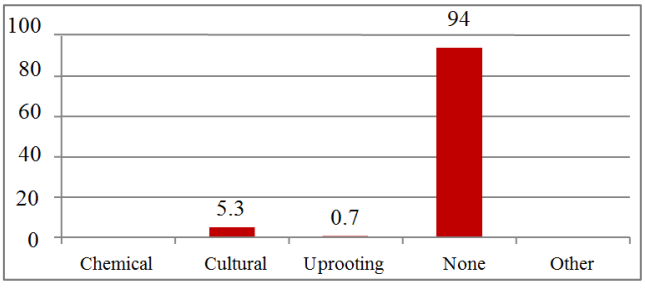

Figure 4. *Avocado Diseases and pest controlling mechanisms.*

The Avocado Value Chain

To analyze and map the avocado chain, cooperatives and farmers and respective buyers were considered (Figure above). More specifically, the avocado value chain is composed of suppliers of technology and input such as the government and non-government organizations, the farmers (cooperatives and individuals), processors and distributors (hotels, restaurants, retailers) and consumers. The rural households participate in avocado marketing. Rural households gain economy benefits from avocado sales and employment and feed households contributing to household food security/nutrition. The fruit subsector hence diversified sources of income for rural households.

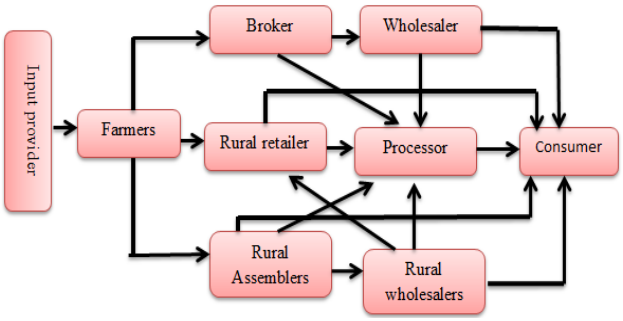

Figure 5. *Avocado value chain map.*

Actors' Definition and Their Role in Value Chain of Avocado

Input providers: Agricultural inputs are defined as products permitted for use in organic farming. Production of avocado need many inputs like seedling, fertilizers, insecticide, extension service credit and other input which is necessary for efficient production of avocado. In Jimma zone the resulted of collected data from the three districts shows that the major input sources for the farmers are government the government agricultural office like FTC and other governmental organization provide the major inputs for production of avocado like avocado seedling and other inputs which necessary for production of avocado. Input providers in value chain of avocado are those who supply necessary inputs for the farmers. Next to governmental organization cooperatives and other non-governmental organization provide a minor support for the farmers in other crop production not in production and marketing of avocado. Due to this beside that of higher production potential and favorable agro ecology the production of avocado is not that much relative to the potential of the areas.

Farmers: farmers are the second actor in value chain of avocado they are the producers of avocado which use different inputs form input providers and sell their products to different actors involved in value chain of avocados. A farmer is a person engaged in agriculture, raising living organisms for food or raw materials. The term usually applies to people who do some combination of raising field crops, orchards, vineyards, poultry, or other livestock.

Rural wholesalers: A rural wholesaler is a company or a person that earns money by buying large quantities of avocados then selling in bulk to small retailers in farm gates or village markets. In the three districts the rural wholesalers buy bulk of avocado from the farmers and sell to processers, retailers and consumers. A wholesaler acts as an intermediary or middleman in the supply chain.

Rural retailers: A rural retailer is a person that purchase avocado from farmers or rural wholesalers in farm gates or village markets. They purchase avocados from a producer's farmers or a wholesaler and sell these goods to consumers in small quantities. Rural retailing is the distribution process of a retailer obtaining avocado selling them to customers for use. Rural retailers in the three districts buy avocado from farmers and from rural

wholesalers and sell in the village market or zone market for the consumers.

Broker: A broker is an individual or firm that acts as an intermediary between an investor and a securities exchange broker most of the time not involve in selling and buying of avocado but they have a higher influence in price determine. They considered as sellers with research, investment plans and market intelligence.

Wholesalers: A wholesaler is a company or a person that earns money by buying large quantities of goods then selling in bulk to smaller businesses. A wholesaler acts as an intermediary or middleman in the supply chain. Wholesalers bring in volume shipments from farmers and efficiently deliver items directly to many different retailers, processers and other actors. Wholesalers break bulk. Manufacturers focus on quality and efficiency, not small packaging and small shipments. Wholesalers break bulk so retailers get the appropriate quantity.

Rural assemblers: Rural assemblers are the rural collector that collect avocado from the farmers, rural retailers, rural wholesalers, brokers or other actors in value chain of avocado and resell to wholesalers or other retailers with some profit. The farmers use this channel to sell large quantity of their products.

Processers: processing is preparation of fruit for human consumption. Processing (canning, drying, freezing, and preparation of juices, jams, and jellies) increases the shelf life of fruits and vegetables. Processing steps include preparation of the raw avocado (cleaning, trimming, and peeling followed by cooking, canning, or freezing. Processing of avocado fruits are helpful in offering a high-moisture, a variety of flavor, aroma, color, prolonging shelf life and texture to the avocado. Food processing aims to make food more marketable and attractive to potential consumers, often giving the processed food a longer shelf-life. Processing of fruits and vegetables is very important to produce products for direct consumption and as food ingredients. Both small scale processer and large-scale processor are participated in this activity of avocado but for this study only small-scale processors are interviewed due to budget and time constraints.

Consumers: At one end of the agricultural value chain are the consumers. Who are capable of eating the avocado by buying from various actors listed above.

Summary and Conclusion

This study was conducted on value chain analysis of avocado production in Jimma zone, in case of Gomma, Manna, and Sokoru district. Those districts naturally endowed with favorable agro ecology to produce that encourage farmers to produce avocado Objective of the study were to identify value chain actor and their roles in avocado value chain, to analyze impact of avocado marketing in rural household income, to identify determinant of market supply of avocado producer in the study areas.

Primary and secondary data source were used. Primary data sourced from different avocado value chain actors like retailers, farmers, wholesalers and consumers, focus group discussion with avocado producers and sample farmers and traders' interview. Secondary data were generated from study areas district agricultural offices, district and regional trade and websites. Primary data were collected formally by face-to-face personal interview using structured (open- ended and close ended) questionnaires. Primary data obtained from 130 avocado sample producers from the three study area districts. Multi-stage sampling technique was used to select sample producer and also primary data obtained from 62 traders were selected randomly from Jimma, Agaro and district market sites.

Actors of avocado value chain were input supply, producers, assemblers, wholesalers both urban and rural wholesalers, retailers the rural and urban retailers, processors and consumers. Avocado producers in the study area had weak horizontal linkage with each other and weak vertical linkage with avocado trader.

Avocado production constraints lack of seedling, diseases, pests, high input price and knowledge gap in production of avocado are the major production constraints that affect production of avocado. The Marketing of avocado constrained by so many factors like poor infrastructure, distant market, lack of storage because the fruit type highly perishable and it needs high quality storage material, the poor market.

Conflict of Interest

The Autor declares no conflict of interest.

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