ANTECEDENTS OF PARTICIPATION IN COLLECTIVE MARKETING AND ITS IMPACT ON FARMERS' INCOME: IN THE CASE OF AVOCADO PRODUCERS OF SELAM FRUIT AND VEGETABLE DEVELOPMENT AND MARKETING COOPERATIVE, AMHARA REGIONAL STATE, ETHIOPIA

A THESIS SUBMITTED TO THE COLLEGE OF BUSINESS AND ECONOMICS PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN INTERNATIONAL BUSINESS MANAGEMENT (INVESTMENT STRATEGIC MANAGEMENT), ADDIS ABABA UNIVERSITY

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DECLARATION

I, ASCHALEW LEMMA WOLDEAREGAY, hereby declare that the research paper I submitted to the College of Economics and Business at Addis Ababa University for the Master of Science in International Business Management (Investment Strategic Management) is original to me and has not been submitted for the award of any other diploma or reported for any university or institution. The paper is titled "ANTECEDENTS OF PARTICIPATION IN COLLECTIVE MARKETING AND IMPACT ON FARMERS' INCOME: IN THE CASE OF AVOCADO PRODUCERS OF SELAM FRUIT AND VEGETABLE DEVELOPMENT AND MARKETING COOPERATIVE, AMHARA REGIONAL STATE, ETHIOPIA."

Name_____Signature_____Place_____Date_____

CERTIFICATION

I certify that **Mr. Aschalew Lemma**, who conducted the research on my advice, is the original author of the study **"Antecedents of Participation in collective marketing and Impact on farmers' Income: in the Case of avocado producers of Selam Fruit and vegetable development and marketing cooperative, Amhara Regional State, Ethiopia."**

Yitbarek Tekle (PHD Signature _____Date_____

APPROVAL

ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF MANAGEMENT

"Antecedents of Participation in Collective Marketing and its Impact on Farmers' Income: in the case of Avocado producers of Selam Fruit and Vegetable Development and Marketing Cooperative, Amhara Regional State, Ethiopia"

By

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Abstract

The agricultural sector is vital for economic development in Sub-Saharan Africa, particularly in Ethiopia, where smallholder farmers face significant challenges such as limited access to quality inputs and inadequate infrastructure. This study addresses the problem of smallholder avocado farmers' inability to penetrate high-value markets due to weak institutional frameworks and fragmented supply chains. Utilizing a sample of 115 farmers selected through non-probability sampling from four kebeles in the Amhara Regional State, both probit regression and endogenous switching regression analyses were employed to examine the relationship between farmers' participation in collective marketing and their income outcomes. The findings reveal that participation in collective marketing significantly enhances farmers' avocado income share. The Average Treatment Effect on the Treated (ATT) shows that farmers engaged in collective marketing enjoyed an average avocado income share of 34.985%. In contrast, if they had opted out, their income share would have dropped to 26.410%, resulting in an ATT of 8.574%, significant at the 1% level. This positive impact implies that collective marketing participation provides advantages such as improved market access, better pricing, and economies of scale.

Furthermore, the Average Treatment Effect on the Untreated (ATU) indicates that non-participants currently have an avocado income share of 25.490%, but this could rise to 34.952% if they participated, leading to an ATU of 9.462%. The statistically insignificant heterogeneity effect (HE) of 0.033% suggests that income variations between participants and non-participants are not driven by unobservable factors but are primarily attributed to the structural advantages of the collective marketing system itself. Overall, these results underscore the importance of collective marketing in enhancing the economic outcomes of smallholder farmers by facilitating better market access and pricing. To bolster collective marketing participation, the study recommends promoting educational programs for farmers, enhancing infrastructure, strengthening cooperative benefits, increasing access to inputs, and improving marketing channels. These strategies aim to improve the economic outcomes for smallholder farmers and promote sustainable income growth within the avocado supply chain.

Keywords: Collective marketing, avocado supply chain, probit, endogenous switching regression.

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ACRONYMS

ACC= Agricultural Commercialization Cluster

ATA = Ethiopian Agricultural Transformation Agency

CSA = Central Statistical Agency

ECC = Ethiopian Customs Commission

ENB = Ethiopian National Bank

FAO = Food and Agriculture Organization

FBPAI = Food and Beverage Processing and Auxiliary Industry

FGD = Focus Group Discussion

GDP = Gross Domestic Product

GoE = Government of Ethiopia

Global GAP = Global Good Agricultural Practices

HFPC = Horticulture Farmers Production Cluster

Ha = Hectare

IMF = International Monetary Fund

KII = Key Informant Interview

MoA = Ministry of Agriculture

NAD = National Avocado Development

NMIS = National Market Information System

PAs = Peasant Associations

SFVDMC = Selam Fruit and Vegetable Development and Marketing Cooperative

SSA = Sub-Sahara Africa

USD = United States Dollar

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

In Sub-Saharan Africa, especially in Ethiopia, where it contributes significantly to GDP and employment, the agricultural sector continues to be a cornerstone of economic development (FAO, 2013; Benjamin et al., 2014). Despite its significance, the region's smallholder farmers—who make up the majority—face a number of obstacles that make it difficult for them to engage in both domestic and foreign markets. Low productivity and income levels are a result of these issues, which also include a dependence on traditional farming methods, poor infrastructure, and restricted access to high-quality inputs (Key & Runsten, 1999).

International markets provide smallholder farmers a special chance to increase their revenue, especially for high-value agricultural products. When compared to local markets, these markets are more expensive and need higher-quality goods, which make them a desirable choice for enhancing lives (Yee et al., 1993; Minten et al., 2009). However, because of their limited ability to meet quality standards, high transaction costs, and price volatility, smallholders frequently find it difficult to reach these markets (Poulton et al., 2004). In order to address these issues, practical methods for assisting smallholders in integrating into high-value supply chains have been presented, including contract farming and collective marketing via farmer cooperatives (Barrett et al., 2012).

Specifically, collective marketing has shown to be a successful strategy for smallholder farmers to combine their resources, lower transaction costs, and strengthen their negotiating position when entering marketplaces. Farmers can increase their market access, bargain for better prices, and lower the risks related to input costs and market fluctuations by forming cooperatives (Okello & Swinton, 2007). This strategy is particularly pertinent when it comes to high-value crops like avocados, which are becoming more and more crucial for smallholder farmers trying to increase their earnings.

Globally, there has been a notable increase in the demand for avocados, and developing nations are essential to meeting this need. Since the late 1990s, the production of avocados has increased by 7% yearly, and smallholders are beginning to view avocados as a high-value commodity with substantial economic potential (Anonymous, 2001; Yeshitla, 2004). Although avocado farming has grown significantly in Ethiopia in recent years, there are still several obstacles facing the sector. Ethiopian avocado growers have not been able to fully capitalize on the increasing worldwide demand due to traditional farming methods, a lack of institutional support, and restricted access to export markets (Assessment et al., 2013).

To address these issues, programs like the National Avocado Development Project (NAD) and the establishment of avocado production clusters have been put into place with the goal of boosting output and enhancing market accessibility. Over the previous five years, these activities have increased export value by 29% and increased avocado output by 12% (ATI Analysis, 2022). Smallholder farmers still only participate in a small portion of these high-value marketplaces, especially in areas like Amhara where institutional capacity and market integration are still growing.

This small percentage of Ethiopian exports is due to obstacles that prevent avocado farmers from engaging in the export market. These obstacles are typically linked to small-scale producers' weak institutional capacity, their failure to meet the internationally recognized set of farm standards that importing nations require, their poor vertical coordination practices, their poor product quality, their lack of access to reliable market information, their limited ability to access the market infrastructure that the commodity requires, and their high transaction costs, which have an impact on the competitiveness of the nation.

Based in Ethiopia's Amhara region, the Selam Fruit and Vegetable Development and Marketing Cooperative is a crucial case study for comprehending how collective marketing affects farmers' earnings. This project seeks to strengthen the negotiating power, market accessibility, and income of smallholder avocado growers by uniting them into a cooperative. Nevertheless, the cooperative is still in its infancy, Consequently, the full impact of this technique on farmer earnings has not yet been observed. the full effect of this strategy on farmer incomes has not yet been felt, despite the potential advantages of collective marketing.

Thus, the purpose of this study is to evaluate how the Selam Fruit and Vegetable Development and Marketing Cooperative's avocado growers' revenues are affected by their collective marketing involvement. The goal of the study is to advance knowledge of how collective action can enhance market participation, smallholder farmers' livelihoods, and farmers' income in Ethiopia by investigating the factors that impact farmers' decisions to engage in collective marketing and analyzing the distribution of marketing margins within the avocado supply chain.

1.2. Problem Statement

The production of avocados in particular has the potential to significantly improve Ethiopia's smallholder farmers' standard of living by giving them access to profitable domestic and foreign markets. Smallholder avocado growers still have several obstacles that keep them from taking full advantage of this expanding market, despite the opportunity. According to research, these farmers' ability to effectively participate in formal markets is severely limited by a number of factors, including fragmented business practices, low

bargaining power, poor infrastructure, high post-harvest losses, and inability to obtain market information (Amao, 2020; Maertens et al., 2012; FBPAI Strategy, 2020).

Ethiopian avocado growers find it difficult to break into international markets, even with the introduction of the highly sought-after Hass cultivar and the country's ideal growing circumstances. Due to a lack of collective marketing structures, poorly managed supply chains, and insufficient institutional frameworks, smallholder farmers are unable to take advantage of lucrative international market prospects. Farmers are consequently frequently forced to stay in unofficial, disorganized local marketplaces, where they are exploited by middlemen and get cheap prices (Faris, 2016; ATA, 2020).

Empirical studies have demonstrated that collective marketing, facilitated by cooperatives or analogous frameworks, may effectively tackle numerous obstacles. Research on other crops, such as bananas and maize, has shown that cooperative marketing increases farmers' negotiating power, lowers transaction costs, and raises produce prices, all of which enhance farmers' standard of living. Additionally, it has been demonstrated that collective marketing gives farmers easier access to resources like technical assistance, agricultural loans, and better market knowledge (Barrett, 2008; Nyikahadzoi et al., 2011; Murang'a County, 2019). Smallholder farmers can negotiate higher prices and boost their overall income by joining cooperatives, which gives them better access to export markets and increases their negotiating power (Niguse & Mebratu, 2023; Gurmis & Melese, 2022).

The lack of traders with enough capital and resources continues to hinder Ethiopian agricultural marketing, giving smallholder farmers minimal negotiating power (Mulat, 2000). This is especially true in the avocado industry, where insufficient infrastructure and disjointed supply chains further disadvantage smallholders, denying them access to high-value markets (Johnny et al., 2019; Amare et al., 2019; Key & Runsten, 1999).

The majority of studies conducted on collective marketing in Ethiopia have concentrated on staple products like rice and maize. Though Ethiopia is growing its output of avocados, high-value tree crops like these have received less attention despite rising worldwide demand. This creates a significant research gap in understanding how collective marketing affects the sub-sector and smallholder avocado farmers' incomes in the country.

To this end, this study looks at how smallholder avocado growers in the Amhara Regional State of Ethiopia Selam Fruit and Vegetable Development and Marketing Cooperative earn money from participating in collective marketing. It will specifically evaluate the farmers' collective marketing participation in the avocado supply chain on their income.

1.3. Objectives of the Study

The general objective of the study is to identify the antecedents of participation in collective marketing and evaluate its impact on farmers' income in the case of avocado producers in the study area.

The specific objectives of the study are:

- To assess the determinants of farmers' participation in collective marketing in the avocado supply chain.
- To evaluate the impact of collective marketing participation on farmers' income in the avocado supply chain.

1.4. Research Questions

This study was guided by the following research questions:

- What are the key determinants of farmers' participation in collective marketing within the avocado supply chain?
- How does collective marketing participation impact the income of farmers in the avocado supply chain?

1.5. Significance of the Study

The evidence from farmers who are members of the SFVDMC and are located in the Amhara region helps to identify the effect that collective marketing participation has on farmers' revenue in the avocado supply chain. Furthermore, there are insufficient research on the avocado value chain, particularly in the study area, despite some studies on vertical coordination (farmers' group marketing) on various value chains, such as honey and other fruits and vegetable commodities. By analyzing the factors that influence farmers' perceptions of their involvement in group marketing, the study, according to the researcher, adds to the body of knowledge already available on farmers' use of collective marketing to enhance their participation in the export market. The research also adds insights into the mechanism to strengthen the avocado value chain that supports the achievement of the program designed by the government.

1.6. Scope of the Study

The study's scope is restricted to determining the factors that encourage growers of avocados to join SFVDMC as a group marketing initiative. Additionally, growers with more than two years of experience in the avocado industry were the focus of the poll. This is because farmers who are members of the marketing cooperative have access to a wider variety of Hass avocado fruit, which is more in demand in the export market and provides a larger amount of marketable surplus.

1.7. Organization of the Paper

The structure of the research report is as follows. The historical and empirical literature pertinent to the study's goal is reviewed in the next section. The research design and methods for gathering data are described in the third part. The fourth portion discusses the findings and debate. The final portion contains the conclusions, suggestions, and implications for additional study.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

In this section, the researcher has reviewed related theoretical and empirical literature. Furthermore, different administration literature written on Ethiopia's avocado production and marketing performance was reviewed.

2.2. Definitions and Basic concepts

Food and Agriculture Organization of the United Nations, 2005, describes a value chain as A 'value chain' in agriculture that specifies the collection of characters and actions that bring a basic agricultural product from production in the field to final consumption, where at each stage value is added to the commodity. A value chain comprises the steps of processing, packing, storing, transporting, and distributing goods. It can also be thought of as a network or a vertical relationship between several separate corporate groups. It is common to use the phrases "value chain" and "supply chain" interchangeably. Numerous small retailers and producers engaging in spot market transactions often manage conventional agricultural value chains. Vertical coordination, supply base consolidation, agro-industrial processing, and standardization across the chain are the hallmarks of contemporary value chains.

Governance in agri-food value chains: determining the kinds of connections and systems for coordination that exist amongst value chain participants. It describes the chain's business environment in depth and delineates the power dynamics inside the value chain. Value chain governance is categorized in the following hierarchy, per Gereffi et al. (2005).

Vertical coordination: market-based governance refers to ad hoc, usually anonymous transactions carried out based on the going rate.

Modular governance: transactions contain some degree of bespoke design or made-to-order products by the supplier for the buyer, although these depend on the provider's capabilities or current technologies. Put differently, the buyer does not have any particular investment in the supplier; coordination is solely based on the parameters provided by the consumer.

Relational governance: transactions between buyers and suppliers are more complex and require mutual reliance. Various unofficial social, ethnic, or other links often run them.

Captive governance: the buyer and supplier engage in transactions where the supplier depends on the buyer for markets, materials, inputs, etc. These governance models involve a great deal of oversight and monitoring.

Hierarchy Governance: Vertical integration: Under these conditions, the buyer directly owns the supplier, and business dealings between the two parties take place inside the company. Buyer-driven and producer-driven value chains are the two categories of value chains that can be distinguished by their governance structures (Kaplinisky and Morris, 2000). Buyer-driven chains are particularly significant in international development and agriculture because they are typically labor-intensive businesses. In certain sectors of the economy, purchasers take the initiative to coordinate and shape product specifications. essential producers in producer-driven value chains, which are typically more capital-intensive, have a say over product specifications and take the initiative to coordinate the numerous links. They also typically control essential technologies. Some value chains may exhibit no governance at all, or very thin governance. In most value chains, there may be multiple points of governance, involved in setting rules, monitoring performance, and/or assisting producers.

Marketing is generally understood to be a social and managerial process that allows people and organizations to create and exchange value with one another to get what they need and want. Its focus is on recognizing, projecting, and fulfilling consumer wants in a way that generates revenue for the company.

Agricultural marketing: Numerous academics have characterized agricultural marketing and included the crucial components of place, timing, form, and utility of passion. Here are some descriptions of some of the definitions offered by various academics. Agricultural marketing, according to Phillip Kotler, is any human endeavor that aims to fulfill needs and desires through the process of exchange. Agricultural marketing is also defined by the American Marketing Association as the conduct of commercial operations that control the flow of products and services from producers to consumers. Pre- and post-harvest operations, assembling, grading, storing, transportation, and distribution are all included in the process of agricultural marketing, which begins with the decision to produce a marketable farm commodity. It also encompasses all aspects of the market structure or system, both financial and institutional, based on technical and economic considerations (National Commission on Agriculture, 1976).

Gross market margin: According to FAO (2002), marketing margin is the portion of the final price that the marketing operations occupy as a percentage. The primary players in the research area for avocado marketing are producers, distributors, retailers, and consumers. The portion of the ultimate selling price that is acquired by a certain player in the marketing chain is measured by their marketing margin. Analyzing

and contrasting the value share of the marketing margin of important market participants in the research area according to the prices received and paid at each step of the market was one of the researcher's interests.

2.3. Horticulture and Avocado fruit production in Ethiopia

Because they produce nutrient-dense food locally, tropical and subtropical fruits can have a major direct impact on small-scale farmers' ability to survive, particularly when other crops aren't in season. Additionally, selling processed and fresh fruit goods brings in money that supports farm households and serves as a national economic cushion. One of the main fruits grown by smallholder farmers for the market and for personal consumption is the avocado. Mexico and Central America are the birthplaces of the avocado (Persea Americana). The fruit is becoming more and more valuable on the global market due to its medical and cosmetic applications in addition to its nutritive worth.

2.4. Avocado Production and Marketing in Ethiopia

A vast range of tropical, sub-tropical, and temperate horticulture crops (fruits, vegetables, flowers, spices, and herbs) can be grown in Ethiopia due to its ideal agroclimatic conditions. Increasing the nation's fruit and vegetable production and marketing both fresh and processed produce will bring in money that smallholder farmers can use as a safety net and seasonal protection for their continued livelihoods. Furthermore, teenagers and women can be the opportunity to work and engage in a variety of production, processing, and marketing activities by diversifying the nation's fruit and vegetable export and production.

Smallholder farmers produce the majority of it, mostly for on-the-spot marketplaces, sustenance, and export. Moreover, the commercial production of avocados is growing these days. The goal of the Ethiopian government (GoE) is to replace the outdated, low-productivity, low-quality conventional avocado production system with a contemporary one that will greatly benefit all parties involved in the value chain as well as the nation as a whole.

However, the fruit is currently receiving attention from the government due to its continued rise in demand in the global market and its economic benefits, which include the ability to earn foreign exchange through exports, the fruit's use as a source of raw materials for agro-processing, the fruit's potential to involve women and youth in the value chain by creating job opportunities, the fruit's ability to support smallholder farmers financially, and its high nutritional value. In order to do this, the Ethiopian government has created a number of projects and programs to improve the fruit's value chain system. The main development

initiatives aimed at bolstering the horticulture industry include the 10-year development plan, 10-in-10 plan, horticulture farmer production cluster projects (created by ATI and carried out in conjunction with the Ministry of Agriculture), and the National Avocado Development Project (NAD).Because of these efforts, much progress has been achieved. Among the achievements the expansion of the new Hass avocado variety which is highly demanded by the export market reached 14,048 ha within the last three years (ATI 2022/23 report).

Importers of fruits and vegetables from major Middle Eastern, Asian, and European countries are becoming more interested in the newly developed truck train-sea transportation corridor between Ethiopia and Djibouti and Europe. This is because of the country's close proximity to international markets.

One of the main goals of Ethiopia's 10-Year Perspective Development Plan (2020–2030) is to expand the commercialized production of horticulture crops and grow the subsector. Ethiopia has therefore started to increase the production of horticulture crops. Vegetables and fruits are significant horticulture crops, and the nation is increasing its output of them. In this regard, horticulture crops are produced, distributed, benefit, and sold by a vast number of farmers, farmers' unions, and private investors in the country (Banjaw, 2017).

The Ethiopian government has given the Ethiopian Agricultural Transformation Institute (ATI) the authority to conduct studies to identify systemic bottlenecks in agricultural development, assist partners in putting creative solutions into practice, and develop and implement creative projects to address the bottlenecks. In light of this, eight systemic bottlenecks were found, and the ATI has been working to address each one by assisting the MoA commodities value chains on a number of important fruit products, including avocados, oil crops, and selected cereal crops.

The Ethiopian Agricultural Transformation Institute (ATI) has been working to increase smallholder farmers' sustainable, market-driven avocado output through its flagship Agricultural Commercialization Cluster (ACC) Programs. As a result, between 2010–11 and 2020–22, the area covered by avocado plants grew gradually from roughly 5000 hectares to 20,000 hectares (Figure 1). Additionally, according to CSA (2022) (Figure 2), the crop's output climbed from roughly 5000 quintals in 2010–11 to 2,000,000 quintals in 2020–21. Conversely, from 80 quintals per hectare in 2010–2011 to 20 quintals per hectare of land in 2013–2014, avocado productivity decreased. Then, from 2014–15 to 2020, it increased once more to 40 quintals per hectare of land, and then it fell to around 70 quintals per hectare in 2021/22 (CSA, 2022).

The information above suggests that smallholder farmers have steadily increased the quantity of land they have set aside for avocado cultivation during the past 10 years. The crop's average productivity hasn't really

increased, though. Furthermore, from 2010–11 to 2021/22, there were notable variations in the amount of avocados produced annually. Many things could be the cause of this, such as avocado plantations' subpar management techniques, inadequate post-harvest handling, and restricted access to the avocado fruit market. Farmers may have been discouraged from increasing the crop's production per unit area of land and from expanding the area under cultivation as a result of these issues.

In 2021, Ethiopia produced 193,362.5 tons of avocados (CSA, 2022). This amounted to 37.8% less than 2020, the prior year. According to historical records, the nation's avocado production peaked in 2020 at 245,336 tons. However, the crop's output reached a record low of 13,888 in 2001 (https://www.freshelaexporters.com/avocado/).

Ethiopia is rising to the top of the African avocado exporting league. When it comes to avocado output worldwide, the nation is placed 12th out of 60. Only in 2021 did Ethiopia's avocado exports begin to increase; the Netherlands (43%), France (43%), United Arab Emirates (38%), United Kingdom (26%), and Saudi Arabia were the countries importing the avocados, in that order. Just over 3,2880 tons of avocado were exported from Ethiopia in 2021. Compared to the prior year, there had been a 10% increase (ECC, 2022).

2.5. Empirical Review

Hailu & Derbew (2015) state that exporting avocados depends on preserving the crop's quality. This can be attributed to the fruit's cordial character, the protracted shipping, and problems in the supply chain. Inadequate post-harvest management techniques generally result in the loss of 20–50% of the nation's horticulture produce production. Because avocados spoil quickly once they are collected, the loss might be substantially higher. Additionally, because of lengthy transit durations and challenges in the supply chain, quality issues frequently damage the reputation of avocados from East Africa (Muluberhan Amare et al, 2019).

Numerous studies have emphasized how crucial collective marketing is to raising smallholder farmers' incomes, particularly in developing nations. Farmers that take part in collective action can access higher-value markets by pooling resources, lowering transaction costs, and strengthening their bargaining position. Smallholder farmers encounter major obstacles when trying to reach formal markets because of inadequate infrastructure, low capital, and weak market linkages. Markelova, Meinzen-Dick, Hellin, and Dohrn (2009) emphasized that smallholder farmers must work together to overcome these obstacles. Through collaborative efforts, farmers can surmount these challenges, bolster their competitiveness, and augment their earnings (Markelova et al., 2009).

Research by Bernard et al. (2008) and Barham and Chitemi (2009) shown that farmers can boost their earnings by using collective marketing to assist them aggregate their produce, lower transaction costs, and gain better market access. The two main advantages of taking part in-group marketing campaigns are having access to superior market intelligence and having the power to bargain for higher rates.

Unquestionably, Ethiopia has a great deal of potential for growing and exporting avocados due to its ideal agro ecological conditions, cheap production costs, and closer physical distance to international markets. However, if the challenges associated with avocado production and export are not addressed, the potential will stay just that potential. Ethiopia's avocado production is currently only about 4.2 tons/ha, a significant yield gap compared to the global average of 7 tons/ha (Jalata, 2021).

Ethiopian smallholder farmers frequently find it difficult to access high-value opportunities through effective participation in global chains and market integration (Muluberhan Amare et al., 2019), grow the crop. However, compared to local markets, foreign agricultural markets typically expect higher quality at higher pricing. The smallholders' incomes may increase if they produce for these markets (Minten et al., 2009). However, due to inadequate infrastructure and resources, smallholder farmers have a harder time reaching export markets, mostly because of their reduced ability to grow avocados of a grade that satisfies export-market criteria (Key and Runsten, 1999).

According to Hailemariam et al. (2012), social capital in the form of involvement in rural institutions, credit constraints, spouse education, asset ownership, distance to markets, mode of transportation, rainfall, and plot-level disturbances, as well as the number of relatives and traders the farmer knows both inside and outside of his village, the farmer's faith in government assistance in the event of a crop failure, and the farmer's confidence in the competence of extension agents, all affect the likelihood and extent of adoption of sustainable agricultural practices. The study looks into the variables that affect rural Ethiopians' adoption of sustainable farming techniques using multivariate probit and ordered probit models.

Faris (2016), find out that, dealers are now in a stronger position to control pricing because there are less group marketing platforms and structured institutions. In his research, it is stated that avocados are typically sold to brokers or in unofficial, unorganized markets where growers receive little money. Thus, one of the marketing techniques that has been suggested to address the marketing challenges encountered by avocado growers is collaborative marketing (Faris, 20216). One of the challenges facing Ethiopia's rural practices is the lack of a robust vertical coordinating marketing mechanism for the majority of agricultural commodities, including avocados (ATA, 2020).

Additionally, research by Amare et al. (2019) and Key and Runsten (1999) revealed that smallholder avocado farmers frequently struggle to access high-value opportunities and integrate into markets by successfully participating in global chains. These challenges stem from low-quality production, a lack of varieties demanded by the export market, a lower capacity to produce high-quality avocados that meet export-market standards, poor infrastructure, a lack of capital, asymmetry of market information, and an unstable market.

Mulat (2000) further states that the biggest barrier to Ethiopian agricultural marketing is the small number of dealers who combine a high number of farmers with a small quantity of capital, giving the farmers little leverage in negotiations. This is not an issue exclusive to the suggested study region.

2.6. Conclusion of the literature review and knowledge gaps

Studies on the difficulties of value chains for fruits and vegetables, honey, and other commodities, as well as vertical coordination, have been conducted by a variety of academics. Due to the fruits' lack of attention, despite their significant economic impact, not enough research has been done on the effectiveness of avocado marketing schemes. Smallholder farmers encounter difficulties in reaching the export market, despite the fact that the output of the highly sought-after Hass avocado variety, which is in great demand worldwide, has increased in the study area. Therefore, it is predicted that the findings will offer awareness of marketing interventions by highlighting the main issues discovered in the field. It serves as a starting point for additional investigation of the cases by other researchers.

2.7. Conceptually Frameworks

The conceptual framework is centered on comprehending the connections among the factors that influence farmers' involvement in collective marketing in the avocado supply chain, the involvement itself, and the effects that arise on the income share of avocados and farmers' total income. The model makes it easier to see how different factors affect farmers' decisions to participate in collective selling and how that participation ultimately impacts their revenue levels.

The conceptual framework illustrates how a number of independent variables, including age, sex, education level, family size, annual income shares from avocados, number of avocado trees, distance from the main road, years of farming and marketing experience, membership benefits, motivating factors, and challenges in collective marketing, affect farmers' participation in collective marketing. Together, these elements influence farmers' market participation, which in turn affects their total revenue and market results. Improving farmers' revenue from avocados requires increased engagement through cooperative membership, education, and successful marketing techniques.

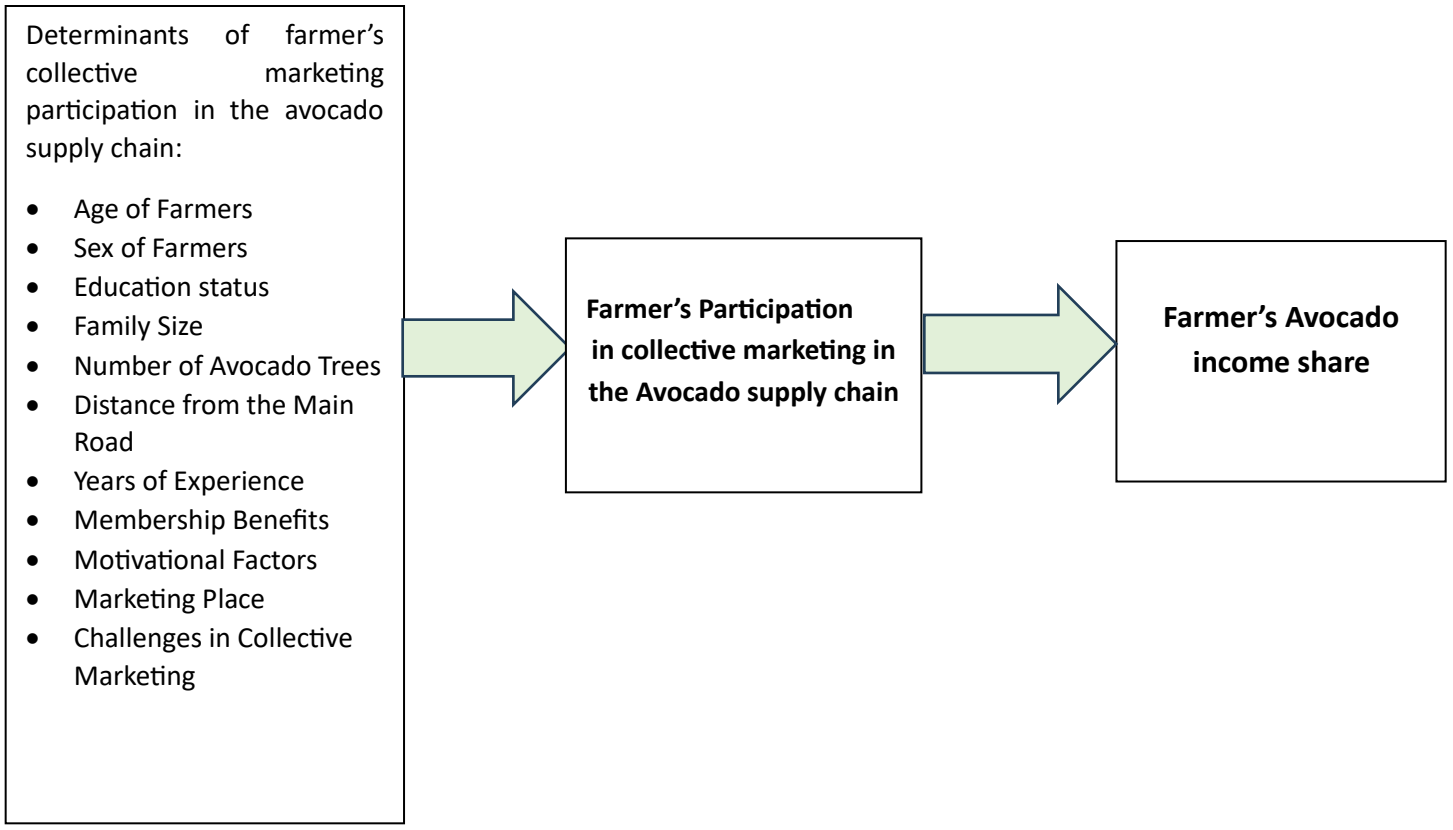


Fig 1 Conceptual frameworks

source: Own Construction Based on literature, 2024.

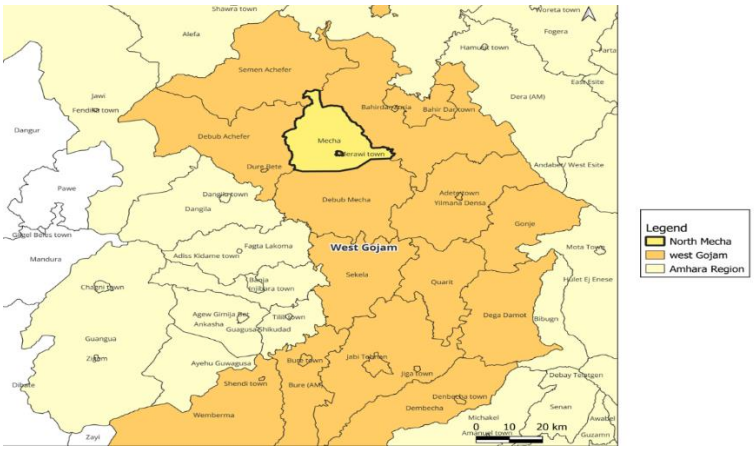
CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

This chapter consists of topics such as the description of the study area, methodologies, sampling procedures, types and sources of data, data collection instruments, and data analysis tools.

3.2. Description of the study area

The Selam Fruit and Vegetable Development and Marketing Cooperative (SFVDMC), located in North Mecha Woreda, Amhara Regional State, Ethiopia, was the site of the study survey. The district's elevation varies greatly, from 1885 to 3131 meters above sea level, and its slope is from almost flat to extremely steep. Based on the Ethiopian Central Statistical Agency's (CSA, 2013) population forecast, the district has 334,789 residents, of which 166,065 are women and 168,724 are men. The entire land area of the North Mecha district is 1481.64 square kilometers. 110 farmers (three of whom are women) who grow avocados founded Farmer Cooperative Selam Fruit and Vegetable Development and Marketing Cooperative (SFVDMC) in September 2020. As of right now, its member farmers have harvested 183 (five female) avocado trees. Out of these 115 farmers were those who have more than two years of experience in the avocado business.



Location of the study area: Google Map

3.3. Type and Source of Data

Both primary and secondary sources were employed to answer the research questions and accomplish the study's goals on the effect of collective marketing participation in the avocado supply chain on farmers' income. Using a variety of data collection techniques, primary data were gathered directly from avocado growers and important stakeholders. Agricultural specialists, extension agents, and cooperative leaders were also important study informants. Secondary data was gathered from various published and unpublished sources to enhance and supplement the primary data.

3.4. Sampling Technique and Sample Size

To examine the effect of farmers' involvement in collective marketing on their earnings within the avocado supply chain in the Selam Fruit and Vegetable Development and Marketing Cooperative (SFVDMC), Amhara Regional State, Ethiopia, 115 avocado farmers were chosen as the study's sample size. The avocado producers in the sample were chosen using a non-probability sampling technique. A list of homes drawn from four chosen kebeles made up the sampling frame. Kothari (2004) states that non-probability sampling is appropriate for purposive selection in this study environment since it does not permit predicting the likelihood that every item in the population will be included.

All farmers who were registered members of the SFVDMC and had more than two years of experience in the avocado industry met the selection requirements. By using a purposive sampling technique, the study was guaranteed to include seasoned farmers who actively engage in collective selling, offering pertinent insights into the variables affecting their participation. Additionally, kebeles were selected based on their capacity to produce avocados and ease of access for data collection, after consulting with the Woreda Agriculture Development Office. This guaranteed that the sample was representative of the region's major avocado-producing regions.

The sample size was determined using Cochran's formula, which is commonly used to calculate sample sizes when the population proportion is unknown or estimated. The formula is expressed as:

$$\mathbf{S} = \frac{\boldsymbol{z^2 \times P(1-P)}}{\boldsymbol{C^2}}$$

Where:

- **S** = Sample size
- **Z** = Z value or score, representing the critical value of the normal distribution at the desired confidence level. For a 95% confidence level, Z = 1.96.
- **P** = the estimated sample proportion of the study population. A conservative estimate of 50% was used to maximize the sample size.
- **C** = Margin of error, expressed as a decimal. For this study, a margin of error of 0.0565 was used.

Using the above formula with a 95% confidence level (Z = 1.96), a proportion of 50% (P = 0.5), and a margin of error of 0.0565 (C), the sample size calculation was as follows:

$$\mathbf{S = (1.96)^2 \times 0.5 \times (1 - 0.5) / (0.0565)^2 = 115}$$

The study may gather pertinent information on the factors influencing farmers' involvement in collective marketing within the avocado supply chain thanks to the sample size's careful calculation, which guarantees adequate representation of the target population. The sample size and sampling strategy were created to offer a solid basis for evaluating the particular difficulties and variables affecting avocado growers' participation in the Amhara region's cooperative marketing system**.**

3.5. Methods of data collection

Direct interviews were used to gather primary data using a standardized questionnaire. Questions concerning the research topic and pertinent variables that support the investigation are included in the questionnaire. The data was triangulated using focus group discussions (FGD) and key informant interviews (KII). The Central Statistics Agency (CSA), Ethiopian Agricultural Transformation Institute (EATI), Ministry of Agriculture (MoA), and pertinent public and unpublished studies served as secondary data sources.

3.6. Method of Data Analysis

The influence of farmer participation in the collective market on income will be analyzed in this study using both descriptive and econometric models. The socioeconomic and demographic traits of the respondents were compiled using descriptive statistics (mean and standard deviation). The Statistical Package for Social Research (SPSS) version 21 and Excel were used to code and analyze the quantitative household survey data.

1.7.1. Descriptive Statistics

The features of the sample units were depicted with descriptive statistics including mean, standard deviation, frequency distribution, and percentages. Additionally, t-tests and the chi-square test will be employed to compare members' and non-members' avocado production with to explanatory variables.

1.7.2. Econometric model

1.7.2.1. Probit Regression Model

Like a binary logistic model, a probit regression model examines the relationship between a binary dependent variable and one or more independent variables. Instead of using the logistic function to estimate the dependent variable's probability, the probit model uses the cumulative standard normal distribution function. When the dependent variable is a binary outcome with values of 0 or 1, like whether a farmer participates in the collective market or not, this model is appropriate (Gujarati, 1995).

Because the probabilities are limited to 0 and 1, the probit model has an advantage over linear probability models such as the logit model. Furthermore, the model of probit assumes a nonlinear relationship between the explanatory and response variables. The primary distinction between the logistic and probit models is that the logistic model assumes a logistic distribution, whereas the probit model assumes the error term follows a conventional normal distribution. Because of variations in tail behavior, the probit curve approaches the axes faster than the logistic curve (Gujarati, 1995).

The probability of participating in collective marketing is modeled as:

$$Pi = E(Y = 1|\, Xi) = \Phi\,(\beta 0 + \beta 1\, Xi) \ldots\ldots\ldots\ldots Eq.(1)$$

For ease of exposition, Eq. (1) can be expressed as:

$$P_i = \Phi\,(Z_i) \ldots\ldots\ldots\ldots Eq.(2)$$

$$Zi = \beta 0 + \beta j\, X\{ji\}\, \forall j \in V, \forall i \in N$$

Here, V is a set of explanatory variables and N represents all observations. If P_i is the probability of being a a collective market participant, then the probability of not being a a participant is given by:

$$1 - Pi = 1 - \Phi(Z\_i) \ \ldots\ldots\ldots\ Eq.(3)$$

Therefore, the odds ratio in the probit model becomes:

$$\frac{P_i}{1-P_i} = \frac{\Phi(\text{Z\_i})}{1/\ (1 - \Phi(\text{Z\_i}))} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Eq. (4)}$$

Then Probit model specification is given by:

$$Z_i = \beta_0 + \beta_1 \text{AGEF} + \beta_2 \text{EDU} + \beta_3 \text{DIST} + \beta_4 \text{EXP} + \beta_5 \text{NUMT} + \beta_6 \text{FAMS} + \beta_7 \text{SEX} + \beta_8 \text{MOTF} + \beta_3 \text{CHALCM} + \beta_{10} \text{MARKP} + \beta_{11} \text{MEMB} + \beta_{12} \text{AIS} + U_i \ldots\ldots\ldots\ Eq.(5\ \ )$$

Where the variables are defined as:

• Yi – Dummy variable (1 = farmers participate in collective marketing, 0 otherwise)

• AGEF– Age of farmers

• FAMS – Family size

• EDU – Education Status

• EXP– Years of experience

• AIS— Avocado income share

• DIST– Distance to the main road

• NUMT – No. of avocado trees

• SEX – Sex of the farmer

• CHALCM – Challenges in Collective Marketing

• MEMB – Membership Benefits

• MOTF – Motivational Factors

• MARKP – Marketing Place

1.7.2.2. Endogenous Switching Regression Model (ERSM)

Two problems come up when calculating the effect of farmers' participation in collective marketing on their earnings. The first is that farmers who participate in collective marketing and those who do not are heterogeneous. Farmers' income might not be unaffected by the state of the market. As a result, estimating techniques that combine all sample observations to calculate a farmer's revenue using the collective market as a determinant or an input might not be suitable. Its important to look at distinct functions for collective market participants and non-participants.

Endogeneity is the second problem. Farmers that engage in collective marketing may possess some intangible traits that increase their earnings and increase their likelihood of participating. Therefore, through certain unobservable characteristics that may influence both participation and income, farmers' involvement in collective marketing is statistically related to farmers' income.

To correct for sample selection bias, a control for latent variables is needed. An endogenous switching regression model (Maddala, 1983) that accounts for both endogeneity and heterogeneity is therefore will be used in this study.

The function that indicates the farmers' participation status is specified as:

$$C_i = \begin{cases} 1, & C_i^* > 0 \; if \; farmers \text{ participate} \\ 0, & otherwise \end{cases}$$

Let Y_i denotes the average income earned by farmer members, which depends on both exogenous and endogenous variables; the latter includes access to a collective market. Thus, Y_i can be presented as follows:

$$Y_i = X_i\beta + \alpha C_i + U_i$$

$$C_i^* = \gamma Z_i + U_i$$

The number of average income earned by farmer's members in two participation regimes is presented as;

Regime 1 $Y1_i = X_{1i}\beta_1 + U_{1i}$ if $C_i = 1 \; if$ participate

Regime 2 $Y2_i = X_{2i}\beta_{2i} + U_{2i}$ if $C_i = 0$ if no participate

$Y1_i \; and \; Y2_i$ are the expected number of incomes earned in regimes 1 and 2, respectively; X_{ij} is a set of independent variables which explain the outcome variable.

In the ESR framework, the error terms in the above equations are assumed to have a trivariate normal distribution, with zero mean and covariance matrix (Khonje *et al.*, 2015) of the following form:

$$Cov(U_{1i}, U_{2i}\ , \eta) = \begin{bmatrix} \sigma_\eta^2 & \sigma_{\eta 1} & \sigma_{\eta 2} \\ \sigma_{\eta 1} & \sigma_1^2 & . \\ \sigma_{2\eta} & . & \sigma_2^2 \end{bmatrix}$$

Where σ_η^2 is the variance of the error term in the; σ_1^2 and σ_2^2 are the variances of the error terms (U_{1i}, U_{2i}) $\sigma_{\eta 1}$ is covariance of η and U_{1i} and $\sigma_{\eta 2}$ is the covariance of η and U_{2i} . The variance (σ_η^2) is assumed to

be equal to 1 since the coefficients (β) are estimable only up to a scale factor. Covariance between $U_{1i}, and\ U_{2i})$ is not defined since Y_1 and Y_2 are not observed simultaneously (Maddala *et al*., 1986).

3.7. Definition of variables and their expected sign

Dependent variable:

Farmers' Participation in Collective Marketing: This dummy variable has a value of 1 if farmers engage in collective marketing and 0 otherwise. The degree of farmers' participation in cooperatives is tracked over time by collective marketing, a continuous variable. It increases the access to export markets and bargaining power of Ethiopian avocado growers. Cooperative membership aids farmers in meeting export requirements and negotiating better prices, according to studies (Niguse & Mebratu, 2023; Gurmis & Melese, 2022). Consequently, group marketing increases export potential and market involvement.

Independent variables

Age of farmers: Farmers' involvement in Ethiopia's avocado export markets is strongly influenced by the age of farmers, a continuous variable expressed in years. Because of their outdated approaches and lack of familiarity with modern marketing strategies, older farmers typically steer clear of export markets (Niguse & Mebratu, 2023; Amare et al., 2019). According to studies, these farmers are less inclined to embrace innovations required for participation in export markets and are more risk averse. Age thus serves as a deterrent to market participation**.**

Farmers' sex: In Ethiopia, farmers' involvement in collective selling is greatly influenced by their sex, which is frequently measured as a dummy variable (male = 1, female = 0). Because they have greater access to resources like land, credit, and extension services, men farmers are more likely than female farmers to engage in market activities, according to research. According to studies, households led by women encounter obstacles in collective marketing, such as less market access and decision-making authority than their male counterparts do. For example, male farmers often make the majority of decisions on marketing channels in southern Ethiopia, while women in agricultural markets pay greater transaction costs and obtain lower producer prices (Gebre et al., 2021; Wakweya, 2021; Ampaire et al., 2020). These gender differences emphasize the necessity for interventions to improve women's market participation and access to cooperative resources.

Education Levels: To evaluate its impact on market involvement, the educational attainment of a farmer's household might be represented as a dummy variable. Education in this context is classified as follows: 0 is allocated if the head of the home is illiterate, and 1 is assigned if the head of the household has completed at least primary school. According to research, farmers with higher levels of education are more likely to adopt market-oriented practices, make well-informed decisions, and have access to vital resources like credit and extension services, all of which increase their profitability (Ojulu, 2021; Megerssa et al., 2020; Dalango et al., 2018). This binary classification effectively captures the effect of basic education on market engagement**.**

Family size: In Ethiopia's avocado market, farmers' decisions to participate in the market are greatly influenced by family size, which is frequently assessed as a continuous variable in terms of the number of household members. According to Gurmis and Melese (2022) and Niguse and Mebratu (2023), larger households are more likely to prioritize their subsistence needs over market participation. Research indicates that labor allocation policies may improve market participation (Yohannes, 2014)**.**

Avocado annual income share: The percentage of total farm income that comes from avocado sales, stated as a percentage of the household's total agricultural income, is known as the avocado annual income share. Avocado income is a continuous data type that is calculated from the total household income. Previous research has demonstrated that farmer involvement in collective markets, such cooperatives, considerably increases this income share in the Ethiopian avocado market by improving access to market information, lowering transaction costs, and strengthening bargaining power. Farmers benefit from increasing avocado sales volumes and income because of this involvement (Gurmis & Melese, 2022). Yohannes (2014).

Number of avocado trees: A farmer's market participation is directly correlated with the number of avocado trees they own, which is frequently referred to as a continuous variable. Higher productivity, which is usually associated with more trees, raises the probability of engaging in collective markets and the level of involvement. Due to their ability to meet demand and adhere to market norms, farmers who own larger avocado estates typically have greater access to high-value export markets. Market access and profitability are further supported by the fact that people who participate in these markets are more likely to be members of organized farmer groups (Amare et al., 2019; Gyau et al., 2016).

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avocado estates typically have greater access to high-value export markets. Market access and profitability are further supported by the fact that people who participate in these markets are more likely to be members of organized farmer groups (Amare et al., 2019; Gyau et al., 2016).

Years of experience in avocado farming and marketing: This variable, which indicates how long a farmer has been involved in these activities, is continuous. It affects market participation because more seasoned farmers frequently have easier access to resources, networks, and market information, which makes it easier to participate in collective markets. According to research conducted in Ethiopia, farmers' decisions to engage in markets and the amount they give are greatly influenced by factors like agricultural experience (Gurmis & Melese, 2022). (Yohannes, 2014). Participation in group marketing campaigns is directly impacted by this experience, which is frequently associated with increased productivity and market access.

Membership Benefits: If the farmer benefited from belonging to a cooperative or marketing group, the value of this dummy variable is 1, and if not, it is 0. Cooperative membership has been demonstrated to increase participants' access to financial services, technical training, and markets, improving their economic results. Due to greater market connections, lower transaction costs, and stronger negotiating power, studies have repeatedly shown that engaging in collective marketing increases income and asset holdings (Fischer & Qaim, 2012; Mango et al., 2017). Compared to non-members, farmers who profited from membership are more likely to have greater household incomes (Mutonyi, 2019). For members who have benefited from involvement, this variable should have a favorable impact on income.

Motivational Factors: This is a dummy variable that returns 0 if the farmer is not inspired by the cooperative's services and 1 otherwise. Services that promote their involvement in collective marketing, such as market access, loans, technical training, and better input supplies, frequently serve as motivators for farmers. By giving farmers access to resources, improved prices, and market connections, these services raise their incomes and lower risks (Arouna, 2018). Cooperative service motivation is essential for farmers' continued participation because it boosts income, asset holdings, and general well-being (Mishra et al., 2004). For motivated individuals, this variable should therefore have a favorable impact on income..

Challenges in Collective Marketing: If the farmer participated in a cooperative and faced difficulties in the avocado value chain, this variable receives a value of 1; if not, it receives a value of 0. Farmers frequently deal with issues like insufficient infrastructure, high transaction costs, restricted market access, and a lack of funding or technical assistance. For farmers producing high-value goods like avocados, these barriers may limit revenue development and lessen the efficacy of group marketing initiatives (Mutonyi,

2019). Cooperatives also frequently have organizational inefficiencies, which can make it more difficult for farmers to succeed in the marketplace (Markelova & Mwangi, 2010). Because of this, farmers who encounter these difficulties can gain less from cooperative involvement than those who do not.

Marketing Place: If the farmer sells their goods primarily through a marketing cooperative, this dummy variable has a value of 1, and if they rely on other market channels, it has a value of 0. Farmers who sell through marketing cooperatives have access to bigger, more official markets, lower market risks, and improved price negotiating. Farmers can obtain better market intelligence, higher prices, and logistics that are more efficient by using the collective negotiating power those cooperatives give (Fischer & Qaim, 2012). However, farmers who sell in unofficial markets frequently deal with unstable markets, lower pricing, and increased transaction expenses. Therefore, by providing more safe and lucrative market options, involvement in marketing cooperatives is anticipated to have a favorable impact on household income.

Table 1: Summary of Description and Expected sign of the variables

Variables	Definition	Type of Data	sign
Age of Farmers	Chronological age of the primary decision-makers in farming households	Continuous (years)	+
Sex of Farmers	Gender of the farmer (male or female)	Dummy	-/+
Years of Education	The educational status of a farmer's household,	dummy	+
Family Size	The number of individuals living in a farmer's household who share resources and responsibilities	Continuous	+/-
Annual Income Share of Avocado	Percentage of the household's income that comes from avocado farming	Continuous (%)	+
Number of Avocado Trees	Total number of avocado trees owned by the farmer	Continuous (number)	+
Distance from Main Road	The distance between the farmer's household or farm and the nearest main (asphalt) road	Continuous (kilometers)	-
Years of Experience in Avocado Farming	The number of years the farmer has been engaged in avocado farming and marketing activities	Continuous (years)	+
Membership Benefits	Perceived benefits from being part of a collective marketing group (e.g., better prices, reduced costs)	dummy	+
Motivational Factors	Key drivers that motivate farmers to participate in collective marketing	dummy	+
Challenges in Collective Marketing	Barriers to participation in collective marketing (e.g., lack of infrastructure, poor market access)	dummy	–
Marketing Place	Type of market where avocados are sold	dummy	-/+

3.8. Diagnostic Tests

Diagnostic tests are essential in econometric modeling to guarantee the validity and dependability of the model used to examine how farmers' income is affected by collective marketing participation. Potential problems that could skew the results, such as multicollinearity, heteroscedasticity, misspecification, endogeneity, or non-normality of error terms, are identified using these tests.

Multicollinearity Test

A high correlation between two or more independent variables is known as multicollinearity, and it can result in inflated standard errors and inaccurate estimations. One popular tool for identifying multicollinearity is the Variance Inflation Factor (VIF). A multicollinearity issue is indicated if the VIF value is greater than 10 (Gujarati, 2004).

Heteroscedasticity Test

Inefficient estimates may arise from heteroscedasticity, which is the unequal variance of the error components across observations. Heteroscedasticity is found using the Breusch-Pagan test. Heteroscedasticity is present when the p-value is significant (less than 0.05) (Greene, 2018). It is recommended to use robust standard errors if heteroscedasticity is found.

Model Specification Test

Accurate results depend on a properly specified model. Model misspecification is checked using the Linktest. The model may be mis-specified, suggesting missing variables or an improper functional form, if the squared predicted values (hatsq) have a p-value of less than 0.05 (Wooldridge, 2010).

Goodness-of-Fit Test

Goodness-of-fit measures how well the model explains the variation in the dependent variable. The Pseudo-R^2 (McFadden's R^2) is often used in models to assess fit. A higher Pseudo-R^2 value suggests a better fit, while low values may indicate that important variables are missing (Long & Freese, 2014).

CHAPTER FOUR: RESULT AND DISCUSSION

This chapter presents the results of the data analysis and a discussion of the major findings of the study. It is divided into two broad sections. The first section presents the descriptive analysis of the socio-demographic characteristics of the respondents. The second section discusses econometrics results from the quantitative data in relation to the specific objectives and hypotheses of the study.

4.1. Descriptive Analysis

4.1.1. Socio-Demographic Characteristics of the Respondents

The respondents' sociodemographic details provide essential background information regarding the participants in this study. The data gathered includes key variables such as age, gender, education level, and family size, all of which have significant implications for understanding farmers' character towards collective marketing.

The Gender of the Farmer Household Head: the gender distribution among the farmer household heads who participated in the Selam Fruit and Vegetable Development and Marketing Cooperative in the avocado supply chain reveals a significant difference in membership status between male- and female-headed farmer households.

Source: own's computation, 2024.

Among cooperative members, 52 were male-headed farmer households, representing 81.25% of the total membership, while female-headed farmer households accounted for 12 members, or 18.75%, which shows that the majority of cooperative participants are male-headed farmer households. For non-members, 45 were male-headed farmer households, making up 88.24% of the non-members, whereas 6 non-members were female-headed farmer households, representing 11.76%. Overall, the total participation, including both members and non-members, consists of 97 male-headed farmer households (84.35%) and 18 female-headed farmer households (15.65%). These figures highlight the gender distribution among participants and non-participants of the cooperative.

Age of the Farmer's Household Head: The analysis of the age distribution of farmers who participate in the collective marketing cooperative for the avocado supply chain in the Selam Fruit and Vegetable Development and Marketing Cooperative shows a slight variation between members and non-members.

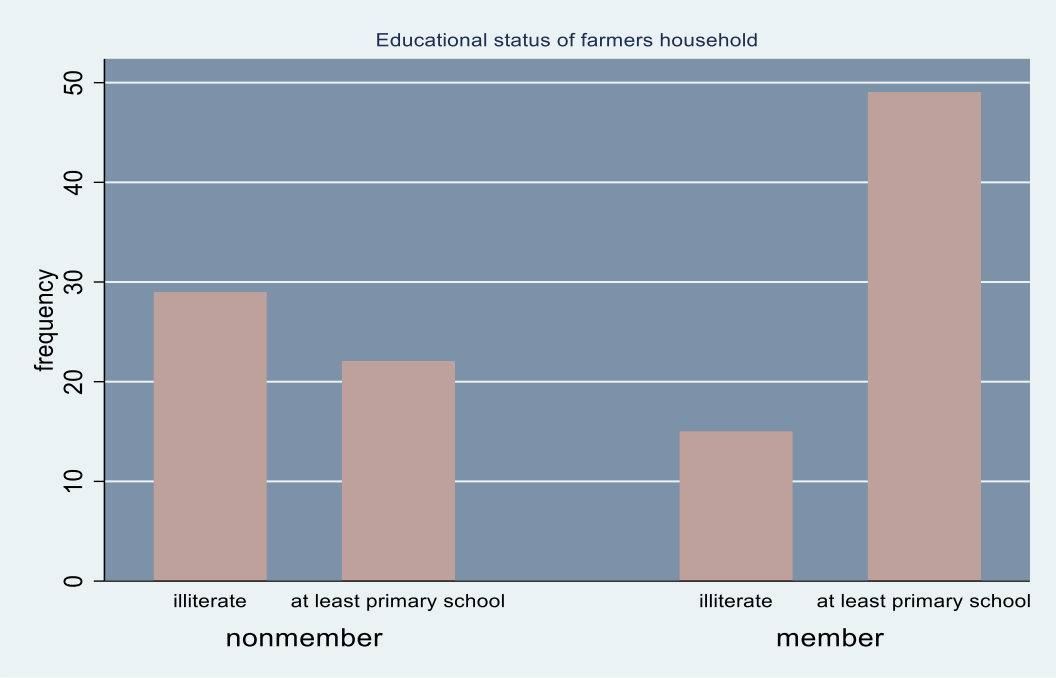
Summary statistics: N mean sd min max by (Membership)

Membership	N	Mean	SD		Min	Max
member	64	49.016	9.481		34	76
nonmember	51	49.804	10.014		28	74

Source: own's computation, 2024.

Among cooperative members, the average age is 49.02 years, with a standard deviation of 9.48. The ages of members range from 34 to 76 years, indicating that a wide range of middle-aged to older farmers are involved in collective marketing. For non-members, the average age is 49.80 years, with a standard deviation of 10.01**,** and their ages range from 28 to 74 years. While the mean age of non-members is slightly higher than that of members, both groups have similar age distributions. The overall analysis shows that the age of farmer household heads in both groups, members, and non-members, falls within a similar range, with the majority being middle-aged or older. This is consistent with Gicheha K. et al. (2015), who found that households' ages had a beneficial impact on their decision to engage in group marketing. Their research indicates a correlation between farmers' age and their ability to make logical marketing judgments.

Educational Status of Famer's Household: The analysis of the education levels among farmer household heads participating in the Selam Fruit and Vegetable Development and Marketing Cooperative reveals a clear difference in literacy and educational attainment between members and non-members.



Source: own's computation, 2024.

Among the 51 non-members, 29 household heads (56.9%) are illiterate, while 22 (43.1%) have at least primary education. This indicates that a majority of non-members lack formal education. In contrast, among the 64 cooperative members, only 15 (23.4%) are illiterate, while 49 (76.6%) have attained at least primary education. This shows that a significantly larger proportion of cooperative members have received formal education compared to non-members. Overall, of the 115 total respondents, 44 (38.3%) are illiterate, while 71 (61.7%) have at least primary education. The breakdown highlights those cooperative members tend to have higher educational levels than non-members.

Family Size of Farmers' Household: The summary statistics for family size, grouped by membership status, show notable differences between cooperative members and non-members in terms of the average family size and its variability.

Summary statistics: N mean sd min max by (Membership)

Membership	N	Mean	SD	Min	Max
member	64	3.453	1.208	1	6
nonmember	51	2.392	0.723	1	3

Source: own's computation, 2024.

For the 64 cooperative members, the mean family size is 3.453, with a standard deviation of 1.208. The minimum family size is 1, and the maximum is 6. This indicates that cooperative members tend to have a moderately larger family size, with a relatively wide range of family sizes. In contrast, the 51 non-members have a mean family size of 2.392, with a standard deviation of 0.723. The minimum family size is 1, and the maximum is 3. This suggests that non-members generally have smaller families and show less variation in family size compared to members. Overall, these statistics suggest that cooperative members tend to have larger and more diverse family sizes compared to non-members.

4.1.2. Descriptive statistics of Factors affecting farmers' participation in collective marketing in the avocado supply chain

Descriptive Summary of Factors affecting farmer's participation in the collective market for continuous Variables

The descriptive statistics for the key variables in the study provide insights into the characteristics of the sample

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Membership	115	.557	.499	0	1
Avocado income share	115	30.774	9.346	8	65
Years of experience	115	8.183	2.703	2	15
Distance main road	115	5.017	1.951	1	9
Number trees	115	296.722	110.453	100	645

Source: own's computation, 2024.

Membership: Out of 115 observations, the mean value is 0.557, with a standard deviation of 0.499. The minimum value is 0 (non-member), and the maximum value is 1 (member), indicating that slightly more than half of the sample are members of the cooperative.

Avocado income share: The average share of income from avocado farming is 30.774%, with a standard deviation of 9.346. The minimum income share is 8%, and the maximum is 65%, indicating a wide variation in how much households depend on avocado farming for their income.

Years of experience: The mean farming experience is 8.183 years, with a standard deviation of 2.703. The minimum number of years of experience is 2, while the maximum is 15, showing a range of experience among the farmers. Distance to the main road: The average distance from the household to the main road is 5.017 km, with a standard deviation of 1.951. The shortest distance is 1 km, while the longest is 9 km, suggesting varied access to infrastructure. Number of avocado trees: The average number of avocado trees

per household is 296.722, with a standard deviation of 110.453. The minimum number of trees is 100, and the maximum is 645, indicating significant differences in tree ownership among the farmers.

Descriptive Summary Factors affecting farmer's participation in the collective market for continuous Variables by Membership status

The summary statistics for key variables, grouped by membership status, highlight the differences between cooperative members and non-members in avocado income share, years of experience, distance to the main road, and number of avocado trees.

Summary statistics: N mean s.d min max by(Membership)

Membership status of HH	Variables	N	Mean	SD	Min	Max
Member	Avocado income share	64	34.984	8.041	20	65
	years of experience	64	9.078	2.994	2	15
	Distance main road	64	4.016	1.496	1	7
	Number trees	64	321.531	115.379	125	645
Nonmember	Avocado income share	51	25.49	8.157	8	45
	years of experience	51	7.059	1.748	4	10
	Distance main road	51	6.275	1.721	2	9
	Number trees	51	265.588	96.258	100	452

Source: own's computation, 2024.

Avocado income share: For the 64 cooperative members, the average income share from avocado is 34.984%, with a standard deviation of 8.041. The minimum share is 20%, and the maximum is 65%. For the 51 non-members, the average income share is lower at 25.49%, with a standard deviation of 8.157. The minimum is 8%, and the maximum is 45%. This indicates that cooperative members tend to derive a higher proportion of their income from avocado farming compared to non-members.

Years of experience: Cooperative members have an average of 9.078 years of farming experience, with a standard deviation of 2.994. The minimum is 2 years, and the maximum is 15 years. Non-members have slightly less experience, averaging 7.059 years, with a standard deviation of 1.748. The minimum is 4 years, and the maximum is 10 years. This suggests that cooperative members generally have more years of farming experience than non-members.

Distance to the main road: The average distance to the main road for members is 4.016 km, with a standard deviation of 1.496. The minimum distance is 1 km, and the maximum is 7 km. Non-members live farther from the main road, with an average distance of 6.275 km and a standard deviation of 1.721. The minimum distance is 2 km, and the maximum is 9 km. This shows that cooperative members tend to have better access to infrastructure compared to non-members.

Number of avocado trees: Cooperative members own an average of 321.531 avocado trees, with a standard deviation of 115.379. The minimum number of trees is 125, and the maximum is 645. Non-members have fewer trees, with an average of 265.588 and a standard deviation of 96.258. The minimum is 100 trees, and the maximum is 452. This indicates that cooperative members generally own more avocado trees than non-members.

Descriptive Summary Factors affecting farmer's participation in the collective market for Dummy Variables by Membership status.

Membership Benefits: The analysis of membership benefits in the Selam Fruit and Vegetable Development and Marketing Cooperative reveals a clear distinction between members and non-members in terms of perceived advantages.

membership benefits by Membership

Benefited from member	Membership status of HH		
	nonmember	member	Total
No	41	6	47
yes	10	58	68
Total	51	64	115

Source: own's computation, 2024.

Among the non-members, 41 households (80.4%) reported that they did not benefit from the cooperative, while only 10 households (19.6%) indicated that they had received some benefit despite not being members. In contrast, a significant majority of cooperative members, 58 households (90.6%), reported benefiting from their membership, while only 6 households (9.4%) did not perceive any advantages. Overall, out of the total 115 respondents, 68 households (59.1%) reported benefiting from the cooperative, and the data shows that the vast majority of these beneficiaries are members.

Motivational Factors: The analysis of motivation factors based on cooperative membership status highlights notable differences between members and non-members regarding their perception of the services provided by the cooperative.

Motivation factors by Membership

Do Service in Cooperative Motivates You	Membership Status of HH		
	Nonmember	Member	Total
No	34	15	49
Yes	17	49	66
Total	51	64	115

Source: own's computation, 2024.

Among the 51 non-members, the majority, 34 households (66.7%), reported that the services provided by the cooperative did not motivate them, while 17 households (33.3%) found the services motivating despite not being members. In contrast, among the 64 cooperative members, a larger proportion, 49 households (76.6%), reported being motivated by the services offered by the cooperative, while only 15 households (23.4%) did not find the services motivating. Overall, out of the 115 total households, 66 households (57.4%) reported being motivated by the cooperative's services, with the majority of these being members. This suggests that cooperative members are more likely to feel motivated by the services provided, indicating that participation in the cooperative enhances household motivation in the avocado supply chain.

Challenges farmers households faced in the collective market of farmer's cooperatives: The analysis of challenges faced in the avocado value chain by membership status reveals differences between cooperative members and non-members.

Challenge situations by Membership.

Did you face challenges in the avocado value chain?	Membership status of HH		
	nonmember	member	Total
no	14	26	40
yes	37	38	75
Total	51	64	115

Source: own's computation, 2024.

Among the 51 non-members, a significant majority, 37 households (72.5%), reported facing challenges in the avocado value chain, while 14 households (27.5%) did not encounter any challenges. Similarly, among the 64 cooperative members, 38 households (59.4%) indicated that they faced challenges, while 26 households (40.6%) did not experience challenges in the avocado value chain. Overall, out of the 115 total households, 75 households (65.2%) reported facing challenges in the avocado value chain, while 40

households (34.8%) did not. The data suggests that both members and non-members face challenges in the avocado value chain, although non-members are slightly more likely to encounter difficulties compared to cooperative members.

Marketing Place: The analysis of major marketing channels used by farmer households for selling their avocado produce, based on membership status, shows clear differences between cooperative members and non-members.

Marketing Place by Membership

Major marketing channel for your product	Membership status of HH		
	nonmember	member	Total
Other Markets	34	14	48
Marketing Cooperatives	17	50	67
Total	51	64	115

Source: own's computation, 2024.

Among the 51 non-members, the majority, 34 households (66.7%), primarily sell their produce through other markets, while only 17 households (33.3%) sell their produce through cooperative markets. In contrast, among the 64 cooperative members, a large majority, 50 households (78.1%), sell their produce through cooperative markets, with only 14 households (21.9%) utilizing other markets. Overall, out of the 115 total households, 67 households (58.3%) sell their produce through cooperative markets, while 48 households (41.7%) rely on other markets. This indicates that cooperative members are much more likely to use cooperative markets for selling their avocado produce, reflecting the important role of cooperatives in providing organized marketing channels for their members.

4.2. Econometrics Result Analysis

4.2.1. Determinants of Farmer's Collective Marketing Participation in Avocado Supply Chain on Farmers' Income

The following probit model results illustrate the factors influencing farmers' income from participation in the collective marketing of avocados in the Selam Fruit and Vegetable Development and Marketing Cooperative. Key variables such as educational status, years of experience, distance from the main road, number of avocado trees, membership benefits, motivation factors, marketing place, and family size are identified as significant determinants of income of avocado share. These factors provide insights into the

dynamics of income generation within the collective marketing system. Below is a detailed interpretation of each variable based on its marginal effects (Mfx), significance levels, and the direction of correlation.

Educational Status: A one-unit increase in the educational status of a farmer increases the likelihood of earning higher income by 14.8%. Education enhances farmers' ability to engage in profitable decision-making, interpret market trends, and take full advantage of collective marketing benefits. Better-educated farmers are likely to have more knowledge about market access, negotiations, and quality control, which in turn improves their income outcomes.

Years of Experience: An additional year of experience in avocado farming increases the likelihood of earning higher income by 2.1%. More experienced farmers have better knowledge of farming practices, market conditions, and collective marketing mechanisms, which allows them to make more informed decisions and optimize their production and sales strategies.

Distance from the Main Road: For every one-unit increase in the distance from the main road, the likelihood of earning higher income decreases by 4.4%. Farmers living farther from main roads face higher transportation costs, reduced market access, and limited ability to participate in collective marketing. This makes it harder for them to benefit from better market prices, leading to reduced income.

Number of Avocado Trees: A one-unit increase in the number of avocado trees increases the likelihood of earning higher income by 0.1%. Having more trees directly correlates with higher production volumes, allowing farmers to generate more income, especially when they can sell larger quantities through collective marketing channels.

Membership Benefits: Farmers who receive benefits from their cooperative membership are 36.9% more likely to earn higher income. Cooperative benefits, such as access to better markets, collective bargaining, and shared resources, significantly improve the income potential for farmers. This highlights the importance of strong cooperative support systems in enhancing the financial success of members.

Motivation Factors: A one-unit increase in motivation to participate in the cooperative increases the likelihood of earning higher income by 17.1%. Motivated farmers are more actively involved in cooperative activities, decision-making processes, and marketing efforts, which boosts their income. Motivation drives farmers to be more committed and engaged, leading to better outcomes.

Marketing Place: Farmers who sell their produce through collective marketing channels are 19.5% more likely to earn higher income. Selling through the cooperative ensures better access to profitable markets,

reduces the influence of intermediaries, and improves the price farmers receive for their products. This highlights the importance of cooperatives as efficient marketing platforms.

Family Size: A one-unit increase in family size increases the likelihood of earning higher income by 8.7%. Larger families may contribute more labor to avocado production and marketing activities, allowing the farmer to increase productivity and income. This effect can be attributed to the availability of family labor in managing farm operations.

Sex of Farmers: The sex of the farmer does not significantly influence income. This suggests that both male and female farmers experience similar income outcomes in the collective marketing of avocados. **Age of Farmers**: Age does not have a significant effect on farmers' income. This implies that younger and older farmers have comparable income levels when participating in collective marketing, likely due to the overriding influence of other factors like experience and education.

Challenge Situations: Challenges faced by farmers do not significantly affect their income. This may indicate that despite encountering difficulties, farmers can overcome them through cooperative support and collective marketing structures.

Table 3: Probit estimate to identify factors that affect Collective Marketing Participation in the Avocado Supply Chain on Farmers' Income

Membership	Coef.	St.Err.	t-value	p-value	Mfx	Sign
Sex_farmers	-.008	.075	-0.11	0.914	-0.008	
Age_farmers	.003	.003	0.92	0.36	0.003	
Educational_Status	.148	.058	2.54	0.013	0.148	**
years_experiance	.021	.011	2.00	0.048	0.021	**
Distance_main_road	-.044	.016	-2.72	0.008	-0.044	**
Number_trees	.001	0	2.47	0.015	0.001	**
membership_benefits	.369	.071	5.16	0.000	0.369	**
Motivation_factors	.171	.059	2.91	0.004	0.171	**
Challenge_situations	.051	.057	0.90	0.371	0.051	***
Marketing_Place	.195	.056	3.46	0.001	0.195	**
Family_size	.087	.024	3.60	0.000	0.087	**
Constant	-.507	.272	-1.87	.065		*
Mean dependent var		0.557				
R-squared		0.732				
F-test		25.510				
SD dependent var		0.499				
Number of obs		115				
Prob > F		0.000				

The asterisks *** and ** indicate significance levels at 1% and 5% respectively.

Source: Authors' own estimate, 2024.

4.2.2. Impacts of Collective Marketing Participation in Avocado Supply Chain on Farmers' Income

The Probit model was used to estimate the factors influencing farmers' avocado income share within the context of collective marketing participation. By employing the Average Treatment Effect on the Treated (ATT) and the Average Treatment Effect on the Untreated (ATU), the analysis captures the impacts on farmers who either participate in collective marketing or opt out of it. The results from Table 4 below highlight the systematic income variations between participants and non-participants, providing a basis for understanding the role of collective marketing in improving farmers' income from avocado sales.

The average treatment effects show that collective marketing has a significant influence on farmers' income share from avocado production. The treatment effects—ATT and ATU—are statistically significant, confirming that participation in collective marketing provides economic advantages for farmers. The inclusion of base heterogeneity (HE) allows for a more accurate estimation of these effects, taking into account unobservable factors that might otherwise skew the results.

As indicated by the ATT results, farmers who participated in the collective marketing system for avocados enjoyed an average avocado income share of 34.985%. In contrast, had they chosen not to participate, their income share from avocado sales would have dropped to 26.410%, resulting in an ATT of 8.574%. This positive impact of collective marketing participation, significant at the 1% level, implies that participation boosts avocado income share by 8.574%. This suggests that participants benefit from advantages like improved market access, better pricing, and economies of scale, which are critical for enhancing income through agricultural value chains.

The ATU results demonstrate that non-participants of collective marketing currently have an avocado income share of 25.490%. However, if they had chosen to participate in the scheme, their income share would have increased to 34.952%, leading to an ATU of 9.462%. This result is also statistically significant and indicates that non-participating households miss out on significant economic benefits by opting out of collective marketing. The 9.462% increase suggests that if non-participants engaged in collective marketing, they could increase their share of income from avocado sales due to better market positioning and access to collective resources.

The heterogeneity effect (HE) between participants and non-participants is 0.033%, and it is statistically insignificant. This suggests that the observed income variations between the two groups cannot be explained by unobservable factors such as farmer motivation or inherent abilities. Instead, the income gains are largely

attributed to the structural advantages of the collective marketing system itself, which levels the playing field for farmers, regardless of their initial characteristics.

The Probit model analysis confirms the significant positive impact of collective marketing participation on farmers' avocado income share. Participants' income from avocado sales is 8.574% higher than it would be without participation, while non-participants could increase their avocado income share by 9.462% if they joined the collective marketing initiative. These results underscore the importance of collective marketing in improving farmers' economic outcomes by facilitating better market access, pricing, and efficiency. The statistically insignificant heterogeneity effect (HE) reinforces the conclusion that the benefits derived from collective marketing are not linked to unobservable individual differences, but rather to the structural opportunities provided by the marketing system.

Table 4: Impacts of Collective Marketing Participation in Avocado Supply Chain on Farmers' Income: ESR model outcome.

Outcome variables	**Treatment effect category**	**Decision stage**		**Average treatment effects**
		To participate	Not to Participate	
Avocado income share	ATT	[a] 34.985	[c] 26.410	8.574**
	ATU	[d] 34.952	[d] 25.490	9.462**
	HE	0.033	0.92	0.888**

The asterisks ** denotes a 5% level of significance.

Source: Authors' Own estimate, 2024

4.3 Diagnostic Tests for the Probit Model

To ensure the reliability of the Probit model estimating the factors influencing farmers' income share in collective avocado marketing, diagnostic tests were performed to assess the presence of heteroscedasticity

and multicollinearity. These tests are critical for verifying the robustness of the model's estimates and ensuring the assumptions of the model hold true.

Heteroscedasticity Test

The Breusch–Pagan/Cook–Weisberg test was conducted to check for heteroscedasticity in the model, which occurs when the variance of the error terms is not constant across all levels of the independent variables. The results of the test are as follows (see Appendix)

Chi-squared (χ^2) = 0.47

Prob > χ^2 = 0.4924

Given that the p-value is greater than 0.05 (at a 5% significance level), we fail to reject the null hypothesis of homoscedasticity (constant variance). This implies that there is no evidence of heteroscedasticity in the model, and the assumption of constant error variance holds, ensuring that the model's error terms are normally distributed.

Multicollinearity Test

Multicollinearity, or high correlation between independent variables, can distort the interpretation of regression coefficients. To check for multicollinearity, the Variance Inflation Factor (VIF) was calculated for each variable. The rule of thumb is that a VIF greater than 10 indicates problematic multicollinearity (See appendix)

The Mean VIF for the model is 1.288, which is well below the threshold of concern. All individual variables have VIF values below 2, indicating low multicollinearity. Thus, the results suggest that multicollinearity is not an issue in this model, meaning that the estimates of the independent variables' coefficients are reliable and not inflated due to correlation among predictors.

Both diagnostic tests indicate that the Probit model is well-specified, with no issues of heteroscedasticity or multicollinearity that would affect the interpretation of the results. This supports the robustness of the findings regarding the impact of collective marketing participation on farmers' avocado income share.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

This study examined the determinants of farmers' income through participation in collective marketing within the avocado supply chain. The analysis incorporated econometric results, descriptive statistics, and supportive literature to provide a comprehensive understanding of key variables.

Age of Household Head: Age was found to have no significant effect on income within the econometric model, suggesting both younger and older farmers can achieve similar income levels through collective marketing. This is consistent with findings by Gyau et al. (2016), who noted that while older farmers benefit from experience, younger farmers bring innovative strategies that contribute to effective market participation. Sex of Household Head: the study revealed that the sex of the household head does not significantly influence income, indicating equitable income opportunities in collective marketing for both male and female farmers. This finding suggests that gender disparities in marketing outcomes can be mitigated when women are actively involved in cooperatives, as supported by Muriithi & Kabubo-Mariara (2020).

Educational Status: the econometric results indicate that a one-unit increase in educational status significantly increases the likelihood of higher income by 14.8%. Educated farmers are better equipped to navigate market dynamics, quality control, and negotiation processes, leading to enhanced income through collective marketing. This aligns with previous studies (Gurmis & Melese, 2022) that highlight education as a critical factor in improving market participation and income levels. Years of Experience: the econometric results show that each additional year of farming experience increases the likelihood of higher income by 2.1%. Experienced farmers possess better insights into market trends and cooperative marketing, which enhances decision-making and income. This finding is consistent with Mossie et al. (2020), who emphasize the role of experience in improving market engagement and income.

Distance from the Main Road: the study found that greater distance from the main road decreases the likelihood of higher income by 4.4%. Farmers closer to infrastructure benefit from reduced transportation costs and better market access, which improves income. This aligns with Niguse & Mebratu (2023), highlighting the importance of infrastructure in market participation.

Number of Avocado Trees: An increase in the number of avocado trees by one unit raises the likelihood of higher income by 0.1%. More trees correlate with greater production capacity, facilitating enhanced

participation in collective marketing and income generation. This is supported by Mossie et al. (2020), who found that larger holdings boost market participation.

Membership Benefits: membership benefits significantly increase the likelihood of higher income by 36.9%. Cooperative membership provides access to better markets, credit, and resources, enhancing income potential. This finding supports Abdul-Rahaman & Abdulai (2020), who noted the positive impact of cooperatives on market participation and income.

Motivation Factors The econometric results indicate that increased motivation to participate in cooperatives raises the likelihood of higher income by 17.1%. Motivated farmers are more actively involved, leading to better utilization of cooperative benefits and improved income outcomes. This aligns with Kebede & Lemma (2020), who emphasized the role of motivation in enhancing market engagement.

Challenge Situations: While challenges in the avocado value chain exist, the study found that they do not significantly affect income levels. Collective marketing structures help mitigate these issues, providing support that enhances income potential. This is consistent with Barham & Chitemi (2009), who noted that collective action can overcome market challenges.

Marketing Place: Selling through collective marketing channels increases the likelihood of higher income by 19.5%. Cooperative marketing provides better prices and reduces intermediary influence, improving income. This supports Helyanda (2020), who found that collective marketing reduces transaction costs and ensures better farmer prices.

Family Size: A larger family size increases the likelihood of higher income by 8.7%. More family members contribute to labor, enhancing productivity and income through collective marketing. This finding is in line with Niguse & Mebratu (2023), who highlighted the positive impact of family labor on market participation.

The analysis of the impacts of participation in collective marketing on farmers' avocado income share provides clear evidence that collective marketing plays a significant role in improving farmers' economic outcomes. The Probit model results, coupled with the estimation of Average Treatment Effects (ATT and ATU), demonstrate that farmers who participate in collective marketing benefit from higher income shares from avocado sales compared to those who do not participate. This result aligned with (Niguse & Mebratu, 2023; Gurmis & Melese, 2022), in that smallholder farmers can negotiate higher prices and boost their overall income by joining cooperatives, which gives them better access to export markets and increases their negotiating power.

Specifically, the Average Treatment Effect on the Treated (ATT) indicates that participants in the collective marketing system experience an 8.574% increase in their avocado income share, a statistically significant result at the 5% level. This suggests that collective marketing offers participants enhanced market access,

better pricing, and opportunities to leverage economies of scale, leading to a substantial improvement in their incomes.

Additionally, the Average Treatment Effect on the Untreated (ATU) shows that non-participating farmers could potentially increase their avocado income share by 9.462% if they were to join the collective marketing system. This result highlights the missed opportunities for non-participants and emphasizes the potential economic benefits they could gain by engaging in collective marketing initiatives.

The statistically insignificant heterogeneity effect (HE) suggests that unobservable factors, such as individual motivation or innate abilities, do not drive the observed income differences between participants and non-participants. Instead, the benefits of collective marketing are attributed to the structural advantages provided by the system itself, which creates an equal opportunity for farmers to improve their market positioning and income, regardless of their personal characteristics.

In conclusion, collective marketing participation has a significant and positive impact on farmers' income from avocado sales. The results demonstrate that collective marketing initiatives can be an effective strategy for enhancing farmers' income by improving market access, securing better prices, and enabling farmers to benefit from collective resources. Expanding such initiatives could be key to promoting sustainable income growth for smallholder farmers engaged in agricultural value chains.

5.2. Recommendations

Policy Recommendations for Enhancing Collective Marketing Participation in Avocado Supply Chain; based on the findings from the Probit model analysis and the significant impact of collective marketing on farmers' avocado income, the following policy recommendations are proposed to strengthen and expand collective marketing participation, ultimately improving farmers' economic outcomes:

- ✓ **Promote Educational Programs for Farmers**: Given that educational status significantly increases the likelihood of earning higher income through collective marketing, policies should focus on improving farmers' access to education. Agricultural extension services can provide training on market access, negotiation skills, and quality control, empowering farmers to make more informed and profitable decisions within the collective marketing framework.
- ✓ **Enhance Infrastructure Development**: Distance from the main road negatively impacts income potential due to limited market access and higher transportation costs. Governments and development agencies should prioritize building and maintaining rural infrastructure, particularly roads, to ensure that farmers can easily transport their produce to markets and participate in

collective marketing. This would reduce barriers for farmers located in remote areas and help them access better market prices.

- ✓ **Strengthen Cooperative Membership Benefits**: The results highlight the substantial income benefits from cooperative membership, with cooperative advantages like access to better markets, collective bargaining power, and shared resources. Policies should support cooperatives by providing them with financial assistance, capacity-building programs, and better regulatory frameworks that enhance their operational efficiency. Ensuring cooperatives are well-resourced and properly managed can significantly boost farmers' income.
- ✓ **Encourage Farmer Motivation and Participation in Cooperatives**: Motivation is a key determinant of farmers' income from collective marketing. Policies should encourage greater farmer participation by offering incentives such as financial literacy programs, improved access to credit, and recognition programs that reward active participation. This would increase farmer engagement in cooperative activities, leading to better income outcomes.
- ✓ **Increase Access to Avocado Trees and Farming Inputs**: As the number of avocado trees directly correlates with increased income, government policies should focus on expanding access to avocado seedlings, inputs (such as fertilizers), and technologies that can improve farm productivity. Initiatives such as subsidized input programs and technical training can help farmers increase their production volumes and overall income from collective marketing.
- ✓ **Promote Gender Equality in Collective Marketing**: Since the sex of the farmer does not significantly affect income outcomes, policies should continue to support equitable access for both male and female farmers in collective marketing systems. Gender-inclusive policies, such as promoting women's active involvement in cooperatives and decision-making processes, will ensure that all farmers benefit equally from collective marketing opportunities.
- ✓ **Improve Marketing Channels and Reduce Intermediary Influence**: Selling through collective marketing channels has a positive impact on farmers' income, as it improves market access and reduces intermediary exploitation. Policymakers should promote the establishment of more cooperative-based marketing centers, offering farmers direct access to buyers and better prices. This would strengthen the role of cooperatives in the supply chain and improve the transparency and fairness of the marketing process.

By implementing these policy recommendations, governments, development organizations, and cooperatives can foster an enabling environment for collective marketing to thrive, enhancing the income and livelihoods of smallholder farmers within the avocado supply chain.

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1. APPENDIX

Appendix Table 1: Second stage ESR estimates of Avocado income share

Variables		**members**	**nonmembers**	
Avocado_incomeshare	Coef.	St.Err.	Coef	St.Err.
Sex_farmers	-1.729	2.736	0.40	.688
Age_farmers	-.04	.112	1.05	.301
years_experiance	-.174	.362	2.61	.013
Distance_main_road	-.748	.691	0.23	.817
Number_trees	.01	.009	0.05	.957
membership_benefits	-1.097	3.776	0.17	.866
Motivation_factors	2.228	2.517	0.82	.415
Challenge_situations	3.343	2.068	0.90	.372
Marketing_Place	1.119	2.575	-0.54	.591
Family_size	-1.502	.887	-1.49	.144
Constant	41.19	11.908	0.54	.593
Mean dependent var		34.984	Mean dependent var	25.490
R-squared		0.183	R-squared	0.199
F-test		1.189	F-test	0.994
Akaike crit. (AIC)		456.480	Akaike crit. (AIC)	368.490
SD dependent var		8.041	SD dependent var	8.157
Number of obs		64	Number of obs	51
Prob > F		0.319	Prob > F	0.465

Source: Authors' estimate, 2024

Appendix Table 2: Marginal effects of participation in collective marketing of avocado supply chain

Delta-method

	Mfx dy/dx	std.	err.	t	P>t	[95%	CI
Sex_farmers	-0.008	0.075	-0.110	0.914	-0.158	0.141	0.1411885
Age_farmers	0.003	0.003	0.920	0.360	-0.003	-.0029684	0.008
Educational_Status	0.148	0.058	2.540	0.013	0.032	0.263	0.263062
years_experiance	0.021	0.011	2.000	0.048	0.000	0.042	0.0422941
Distance_main_road	-0.044	0.016	-2.720	0.008	-0.076	-0.012	-0.0118605
Number_trees	0.001	0.000	2.470	0.015	0.000	0.001	0.0010693
membership_benefits	0.369	0.071	5.160	0.000	0.227	0.511	0.5107501
Motivation_factors	0.171	0.059	2.910	0.004	0.054	0.288	0.2881095

Challenge_situations	0.051	0.057	0.900	0.371	-0.062	0.165	0.1647669
Marketing_Place	0.195	0.056	3.460	0.001	0.083	0.307	0.3066587
Family_size	0.087	0.024	3.600	0.000	0.039	0.134	0.1344586

Table 5: Heteroscedasticity test

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity

Assumption: Normal error terms

Variable: Fitted values of Membership

H0: Constant variance

chi2(1) = 0.47

Prob > chi2 = 0.4924

Table 6: Multicollinearity Test: Variance inflation factor

	VIF	1/VIF
membership benefits	1.92	.521
Distance main road	1.518	.659
Motivation factors	1.319	.758
years experience	1.268	.789
Educational Status	1.241	.806
Marketing Place	1.198	.835
Family size	1.176	.85
Sex farmers	1.164	.859
Challenge situations	1.152	.868
Age farmers	1.125	.889
Number trees	1.082	.924
Mean VIF	1.288	.