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Determinants of avocado commercialization among smallholder farmers in Shebediono Woreda, Sidama Zone SNNPRS of Ethiopia

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A B S T R A C T

This study describes the characteristics of household market participation in avocado production. It investigates the approach required to overcome determinants of market participation among smallholders of avocado farmers in Shebedino woreda, SNNPRS, Ethiopia. The primary sources of the data are farm household surveys, focus group discussions, and key informant interviews. Two hundred twenty-eight households were selected using a purposive sampling technique. The data obtained were evaluated using Double-hurdle econometric models. The results of the binary probit model revealed that in the decision to sell, land size, family size, distance from the nearest market center, market information, access to media, and the total amount of avocado produced played a significant role. The truncated regression model indicated that the age of the household head, family size, market information and the total amount of avocado produced significantly affected the level of commercialization. The result showed that enhancing the efficient utilization of the existing limited farmland, family size, access to market information, and the total amount of avocado produced had a higher value and was seen as a critical opportunity to improve the lower-income farm households. As a result, better market information, family planning, and new technology like improved verity are required to increase demand for avocado produce and income generation. Concerned bodies need to establish a market center for the farmers around their home, increasing the probability of avocado market participation. The findings of this study may help in the development of appropriate policy intervention mechanisms to promote smallholder avocado commercialization in Sidama Zone.

Keywords: Avocado, Commercialization, Double-hurdle models, Market

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Introduction

More than 96% of Ethiopia's agricultural land is farmed by smallholder farmers, who tend less than one hectare of land per farmer on average (EEA, 2006). Farmers are less motivated to produce for the market because of the agricultural production's fragmentation, which raises transaction costs. For many developing nations that depend on agriculture, switching from subsistence to commercial agriculture production is a vital alternative. Goletti (2005) defines agricultural commercialization as the transition from subsistence-oriented production to a more complex production and consumption system based on the market; this includes, in addition to marketing agricultural output, product selection, input use, and decision-making based on the maximization of profit principle (Pingali and Rosegrant, 1995). Linkages between the market's input and output sides are supported by commercialization.

Avocado is an agricultural crop with a global production of over 3.8 million tons (FAOSTAT, 2010). Different regions of Ethiopia are suitable for growing temperate, subtropical, and tropical fruits. Our country's agroecology is diverse, with a total area of 1.13 million km². , More extensiveregions in the south and southwest of the country receive enough rain daily to produce fruit adapted to their respective climatic conditions. Fruits like avocados are of great importance in Ethiopia, with potential for domestic and export markets and industrial processing. The main fruits produced and exported are bananas, citrus, mangoes, avocados, papaya, and grapefruit (Zeberga, 2010).

Today avocados are produced daily in several countries, with Ethiopia being the 10th largest producer and 6th largest consumer in the world (FAOSTAT, 2010). Avocado was first introduced in 1938 by private fruit growers in Hirna and Wondogenet, Ethiopia, and production gradually spread to rural areas, where cultures adapted to different agro-ecologies (Woyessa and Berhanu, 2010; Zekarias, 2010). Avocados are her second

largest production in Ethiopia after bananas (Joosten, 2007). Ethiopia's annual avocado production is 25,633.16 tons. This crop is produced by 1,149,074.00 farmers nationwide on more than 8,938.24 hectares of land (CSA, 2013).

Ethiopian agricultural markets are limited due to limited traders, farmers, information systems, transportation, handling costs, and an underdeveloped sector (Mulat, 2000). The low-level participation in the market by the smallholders has been contributed by different reasons, such as low prices received for staple foods commodities and farmers' desires to increase their return; thus, there appear to be divergent trends on the demand and supply side. Despite several benefits of agricultural commercialization, also it has been documented to have adverse consequences on household welfare, as commercialization combined with failure in institution policies or marketing can be damaging (Pingali and Rosegrant, 1995).

At the local level, commercialization is also affected by many factors, including agro-climatic conditions and risks; access to markets and infrastructure; community and household resource and asset endowments; development of local commodity, input, factor markets; laws and institutions; cultural and social factors affecting consumer preferences, production, market opportunities, and constraints (Pender *et al.*, 2006). These factors influence commercialization by affecting commodity supply and demand conditions, output and input prices, transaction costs, and risks farmers, traders, and others face in the agricultural production and marketing system.

Ethiopia is one of the top five Avocado producers in sub-Saharan Africa. The Sidama zone is one of the potential sources of avocado fruit for the Southern Nation Nationality People Region state and Ethiopian markets. In our country, the farmer marketing system usually relies heavily on intermediaries, mainly in fruit marketing. Producers and consumers often make bad deals, intermediaries dominate the market but do not add much value. A company dominating the market without adding value will make less profit. Today, the demand for fruits like avocado is increasing day by day, and they usually become an important part of the daily diet. However, small studies have been conducted on avocado production and marketing systems in the region. Therefore, this study aimed to assess the determinants of avocado commercialization by smallholder farmers in the Shebedino district of the Sidama Zone of SNNPRS.

Description of the study area

The study was conducted in Shebedino Woreda, Sidama zone, SNNPR, Ethiopia. Shebedino woreda is one of the 19 woredas found in Sidama zone. It is located 27 km southeast of Hawassa-(the capital of the SNNP regional state) and 302 km south of Addis Ababa. The woreda has 29 rural Kebeles and 3 town Kebeles located in the central city of the woreda, Leku.

Based on CSA (1999), the total population of the woreda is about 232,912, where 117,511 are males and 115,401 are females. Children in the year 2012, the woreda was about 37,658**.** With an estimated 500 people per square km, the woreda is the second most densely populated in the SNNP region. The average household size is about 5 people and extends to 7 to 10 persons in the poorest households.

The majority of the population belongs to Sidama ethnic group (93%) and "Sidamigna" is the official language of the woreda. The woreda has an area of 411.7 square kilometers, where 0.2% of it is covered with forest, 72.3% under cultivation, 19.6% grazing land, and 3.4% potential land for future development. The major livelihood sources in the woreda are crop production, livestock rearing, petty trade, unskilled labor, and semi-skilled labor like carpentry. The major crops grown are inset, coffee, and chat; maize, barley, wheat, and bean coffee are cash crops. Seasonal food insecurity and malnutrition characterized the woreda.

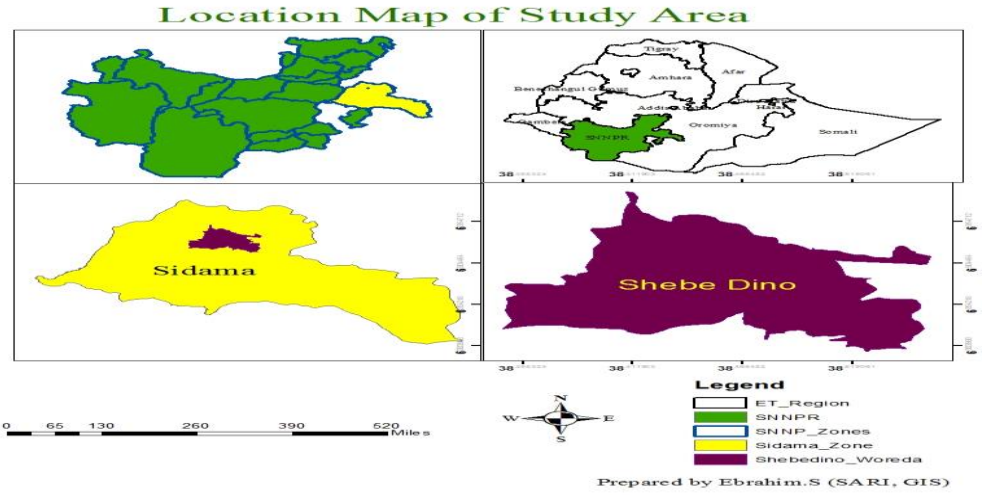

Figure 1. Map of the study area.

Type and sources of data

There are two types of data that were used in this study. These are primary and secondary data. Primary data was collected from smallholder avocado producers. Moreover, offices of agriculture and extension agents were key informants of the study. On the other hand, secondary data was collected from different books, previously undertaken research papers, central statistical agencies, and publications.

Research design

The study used a cross-sectional research design. In this design, data were collected at a single point in time. This research design was used because of the limited time in fieldwork and the fact that it was deemed adequate for addressing the study objectives.

Sample size selection and sampling technique

This study relies on the purposive sample selection technique based on agro-ecology suitability and its potential production of avocado. The sample size was determined by using the rule of thumb i.e. N ≥50 + 8P suggested by Green (1991),

Where, N is the sample size of the study,
P is a number of independent variables.

As the study considers 13 independent variables, the sample size for this particular study must be greater than or equal to 154. Therefore, 163 households from the participant side and 65 households from non-participants, with 228 households, are taken for this study.

Methods of data collection

A structured questionnaire was designed to collect primary data through direct interviewing. The questionnaire consists of questions about the research topic and relevant variables that help the study. Key informant interviews and focus group discussions were used to triangulate the data. Secondary data sources were from agriculture and natural resources districts and relevant published and unpublished reports.

Method of data analysis

Data analysis used both descriptive statistical and econometric approaches. Information collected through key informant interviews, rapid observation, and focus group discussions will be analyzed qualitatively. The quantitative household survey data were coded and entered into a computer for analysis using a computer software program called STATA version 13.

Descriptive statistics

Descriptive statistics such as mean, standard deviation, percentages distribution, and percentages were used to describe and analyze the characteristics of the sample household, Chi² Square test and t-tests were also used to compare market participants and non-participants regarding explanatory variables.

7.1 Econometric models

This section attempts to cover the model specification part of the current study to analyze the factors determining market participation, the volume of the avocado supplied to the market. The Double-hurdle model was applied to analyze the determinants of avocado commercialization regarding output market participation. A Double-hurdle model was preferred over the Heckman model because the data had no sample selection problem. The Double-hurdle model, originally formulated by Cragg (1971), assumes that households make two decisions separately regarding their decision to sell their product and the volume of sale, each of which is determined by a different set of explanatory variables. Two hurdles must be passed to observe a positive level of marketed output. An additional latent variable is used to model each decision process, with a probit model to determine participation and a truncated regression model to determine the level of intensity of volume of sale (Holloway *et al.*, 2005).

The Double-hurdle model was specified and used as follows:

$Y_{i1}^* = \alpha \mathbf{zi} + v_i$ (Participation decision equation) ----------eq1
$Y_{i2}^* = \beta \mathbf{xi} + \varepsilon i$, (Level of participation equation) ----------eq2
$y_i = Xi+Ui$ if $Yi1^*>0$ and $Yi2^* >0$
$y_i=0$ otherwise

Where, Y_{i1}^* = is a latent variable describing the household's decision to participate in the output market, Y_{i2}^*= is a latent variable describing the household level of participation in the crop output market. **yi** = is the observed dependent variable (level of participation of the households in avocado marketing), zi = is a vector of variables explaining the participation decision, xi = is a vector of variables explaining the level of participation decision, vi and εi = are respective error terms assumed to be independent and distributed α & β= Parameters of the models as vi ~ N(0, 1) and ui ~ N(0, σ^2) The model was estimated using maximum likelihood estimation procedures.

Demographic characteristics of sample

Households

Among 228 samples respondent, 163 of them were participants, whereas the rest 65 respondent were non-participants. The mean number of years spent in formal school by participants was 6.44 and 5.06 years for non-participants. The years spent in school significantly differed between the two groups at 1% significance level. This indicates that participants were more educated than non-participants. The result of gender distribution is displayed in Table 2; about 77% of household heads are male, while about 23% are female-headed.

Table 1. Descriptive statistics for continuous variables.

Variable	Total HH (n=228)		Participant (n=163)		Non-participant=65)		t-value	P value
	Mean	SD	Mean	SD	Mean	SD		
Eduhh	6.05	2.84	6.44	2.68	5.06	3.02	2.60	0.0017
Landsize	0.83	0.73	1.10	0.69	0.18	0.24	-14.29	0.0000
Mktdis	8.18	4.48	6.19	1.92	13.20	5.13	10.71	0.0000
Avoprod	2279	1638	2819	1427	923	1323	-9.54	0.0000

Source: Own survey result (2018)

Institutional services provided for farm households

About 50% of the sample respondents reported that they had contact with agricultural extension agents. Farmers sold their avocado products, on average, at a distance of about 8.18 km of care transportation from the nearest market center, Hawassa market. The mean difference in distance to the nearest market between market participants and non-participants is statistically significant at 1% (Table 1). The minimum and maximum distances avocado-producing households travel to the nearest market were 0 and 12 km, respectively. About 61% of the sample respondents reported having access to information related to the avocado market, and 39% had no access to information. Table 2 below shows that 68% of sample household heads who participated in the avocado market had access to avocado market information; for non-participants, farmers were 43%.

Table 2. Descriptive statistics for dummy variables.

Variable	Category	Participant		Non-participant		Total HH		X^2	p-value
		Freq.	%	Freq.	%	Freq.	%		
Sexhh	Male	126	77	30	46	156	68	20.86	0.000
	Female	37	23	35	54	72	32		
	Total	163	100	65	100	228	100		
Mcoop	Yes	125	77	23	65	148	65	34.80	0.000
	No	38	23	42	35	80	35		
	Total	163	100	65	100	228	100		
Landown	Yes	152	93	26	40	178	78	76.96	0.000
	No	11	7	39	60	50	22		
	Total	163	100	65	100	228			
Media	Yes	138	85	31	48	169	74	33.11	0.000
	No	25	15	34	52	59	26		
	Total	163	100	65	100	169	74		
Extnco	Yes	91	56	24	37	115	50	6.64	0.010
	No	72	44	41	63	113	50		
	Total	163	100	65	100	228	100		
Mktinf	Yes	111	68	28	43	139	61	12.20	0.000
	No	52	32	37	57	89	39		
	Total	163	100	65	100	228	100		

Source: Own survey result (2018)

Socio-economic characteristics of farm households

The estimated average land holding size of the respondents is 0.83 hectare (stdv. 0.73) with a minimum of 0.2 hectare and the maximum holding size of about 3.25 hectare. The average Avocado production by the sample farmers was about 2,252 kg. This average makes differences in production, where the maximum production was 7,060 kg, and the minimum production was 250 kg. The average production was about 2,819 kg per household for participant farmers, while it was about 830 kg for non-participant farmers. The mean comparison between the two groups is statistically significant. The result is consistent with the findings of Omiti *et al.* (2009) and Astewel (2010), who confirmed that increasing the volume of production increases market participation. Of the sample households, 74% get media access, while 26% do not. The comparison by participants in avocado marketing revealed that about 85% of participants and 48% of non-participants get access to media services. From

the sample households, 65% of farmers are cooperative members, while 35% are not. The comparison of participants in avocado marketing revealed that about 77% of participants and 65% of non-participants are a member of cooperatives. The mean production of avocados for market participants and non-participants was 2,819 kg and 923 kg, respectively.

Table 3. Determinants of market participation.

Avosold	Coef.	Std. Err	Z	P>/Z/	Marginal effect
Sexhh	-1.099115	0.8844763	-1.24	0.214	-0.0112558
Age	-0.0160822	0.0335576	-0.48	0.632	-0.0001267
Edulhh	0.0200212	0.1184251	0.17	0.866	0.0001218
Land size	4.875208	1.6560030	2.94	0.003***	0.0350228
Family size	-0.3868479	0.1841496	-2.10	0.036**	-0.0040947
Mktdis	-0.4534048	0.1363272	-3.33	0.001***	-0.0048305
Extnco	-0.8536699	0.7373545	-1.16	0.247	-0.014986
Mktinf	-1.885997	0.7963659	-2.37	0.018**	-0.0233049
Credit	-1.179109	0.8028318	-1.47	0.142	-0.0133358
Media	1.550396	0.8647673	1.79	0.073*	0.0450468
Mcoop	1.000412	0.7076998	1.41	0.157	0.0662397
Avoprod	0.0014015	0.0004961	2.83	0.005***	0.0000146
_cons	3.298067	1.5809200	2.09	0.037	2.548732
Log-likelihood= -73		Number of obs= 400			
LR chi2(38)= 167		Prob>chi2 = 0.0000		Pseudo R2 =0.5319	

Source: Computed from own survey data collected in 2020.
****and ** Significant at p<1% and 5% level.*

Table 4 also indicates that the estimated coefficients of the Probit regression revealed that the explanatory variables 'land size', 'access to media', and 'amount of avocado produce' positively and significantly influence the farmers' decision to participate in the market with Avocado sales. On the other hand, 'family size', 'market distance', and 'access to market information', has a significant and negative impact on the decision of the smallholder farmers to participate in the market.

The land size was also found to positively and significantly influence farmers' likelihood to participate in the avocado market at a 1% significant level. The result indicates that one timad (0.125 ha) of additional land the household allocate for Avocado production would increase the farmers' likelihood of market participation by 3.5%. This may be because access to more arable land will encourage farmers to grow more avocado fruit, leading to surplus production for the market.

Distance to the nearest market negatively affected households' likelihood of selling avocados and was statistically significant at 1%. An increase in the distance the households would travel to the nearest market by one walking hour would decrease the probability of the households to market participation. Despite the perishable nature of the products and the unavailability of post-harvest technologies that improve the shelf life of the fruit increased in travel time and cost. Thus, farmers in distant and remote villages were less likely to participate in avocado markets. This is consistent with the findings (Tufa *et al.*, 2014; Berhanu and Moti, 2010).

Furthermore, the number of active family laborers is among the significant factor explaining farmers' decisions regarding the extent of Avocado market participation in the study area.

The quantity of avocados produced as expected positively influenced household decision to enter the market and was significant at 1% significant level. The amount of avocado produce increases the likelihood of market participation because it enables households to have a marketable surplus (Mather *et al.*, 2011). Therefore, interventions targeting promoting and delivering technology packages to smallholder farmers that increase avocado production and link them with the avocado market are good options to enhance their market participation.

Determinate market participation

The probit estimation shows that the likelihood of household participation in the avocado market as a seller was influenced by cultivated land size, family size and distance to the nearest market, market information, access to media, and amount of avocado produce, all with expected signs.

Determinants of the level of Avocado Market Participation

The truncated regression is used in this case, which is the second stage of the double-hurdle model, to analyze the problem. At this stage, only farm households selling avocados are considered in this analysis.

Table 4. Results of truncated regression for the level of commercialization of avocado (in kg).

Avosoll	Coef.	Robust Std. Err	Z	P>/Z/
Sexhh	-143.2177	135.9844	-1.05	0.292
Agehh	-12.5138	5.9917	-2.09	0.037**
Edulhh	3.0931	21.9269	0.14	0.888
Landown	-209.7891	259.1347	-0.81	0.418
Landsize	40.2035	116.6606	0.34	0.730
Familysize	-176.0121	31.6366	-5.56	0.000***
Mktdis	13.5135	17.3030	0.78	0.435
Extnco	62.5439	105.2158	0.59	0.178
Mktinf	-195.1704	103.1759	1.89	0.059**
Credit	-28.7878	107.2901	-0.27	0.789
Media	84.3130	158.3411	0.53	0.594
Mcoop	-93.0087	133.2692	-0.70	0.485
Avoprod	0.6308	0.0439	14.37	0.000***
_cons	1670.9000	424.3062	3.94	0.000

****, ** and * implies statistically significance at 1%, 5%, and 10% level respectively. Source: Model output, 2018*

Table 4 above shows that younger households are more likely to devote a significant amount of supply more avocado than older households. One more unit (year) decrease in farmer's age increases the level of market participation of avocado increase by 12.5% at 5% significant level. The age of the household head negatively and significantly affected the level of avocado market participation. As the age of the household increased, the avocado market participation decision decreased. This suggests that younger farmers are more likely to wish to participate in avocado marketing than older farmers. Family size affects households' level of participation in avocado marketing negatively and significantly at 1% significance level. It was disclosed that as the household members increase by one, they retain an additional 176 kilogram of avocado for consumption that would otherwise be marketed. This indicates that the family size of the household significantly matters in the proportion of avocados to be dealt once the household decides to sell their avocado. The higher the family size, the lower the amount of avocado marketed.

Summary and Conclusion

About the point of sale of avocado (70%) of the sample, households sell it at local markets. It was also revealed that 55% of the sample households used donkeys to transport their avocado product to the market. Results of the double hurdle model depict that land size, market information, access to media, membership in cooperatives, and amount of avocado produced affect households' decision to participate in the avocado market positively and significantly. In contrast, the distance to the nearest market area and the family size affected the same decision negatively and significantly. Similarly, in the second hurdle, the age of the household head and the amount of avocado produced were found to affect the intensity of the volume of avocado provided to the market positively and significantly. In contrast, family size and market information were negatively and significantly affected. In addition, access to market information, the amount of avocado produced, and the family size influenced both households' decision to participate in the avocado market and the intensity of participation, so it was observed as a crosscutting variable.

Recommendation

To increase the market participation of smallholder farmers, concerned bodies need to establish a market center for the farmers around their homes, increasing the probability of avocado market participation. Encouraging access to price information should be through introducing radio agriculture programs, which was also crucial in deciding to enter the avocado market. Households with large family sizes could also not sell more of their avocado produce in the market since the consumption will take most of it, so the families will have planned family size and be able to produce more surpluses for the market.

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