Factors Influencing the Choices of Coffee Marketing Channels by Smallholder Farmers in Jimma Zone, Oromia Region, Southwestern Ethiopia

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This study was conducted with the approval of the Institutional Review Board (IRB) of Aligarh Muslim university. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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By

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ABSTRACT

Coffee is one of the most important agricultural commodities with significant contributions to the growth and well-functioning of Ethiopia's economy, and the social stability of the country (Alemseged, 2012). Despite its importance, the performance of the sector has been unsatisfactory due to various production- and marketing-related factors. This study was thus conducted with the objective of identifying the factors influencing the choices of marketing channels for selling dry-processed or red coffee cherries. Cross-sectional survey data were collected from 377 sample farmers selected from Gomma and Limmu Kossa districts of Jimma zone in southwestern Ethiopia through a multistage stratified simple random sampling technique. The data were collected from October 2019 to January 2020 after pretesting the questionnaire. Descriptive statistics and a multivariate probit (MVP) econometric model were used to analyse the data. The results obtained from separate MVP regression model analyses reveal that sex, coffee land size and productivity, average dry-processed coffee selling price, frequency of visits by the DA, cooperative membership, access to credit, training, off- and non-farm income sources, and distance to cooperatives' and private traders' marketing centers influenced the choices of local consumers, traders or cooperatives for selling dry-processed or red coffee cherries. The findings suggest that farmers should be provided with coffee production- and productivity-enhancing technologies that could increase yield and productivity and the marketed supply of coffee. Moreover, farmers should be provided with information regarding the importance of cooperatives and training on ways to improve coffee production and productivity. Finally, cooperatives should incorporate credit schemes at peak coffee production and during the marketing season so that members prefer to supply their coffee to the cooperatives and earn better coffee income at the end.

***Keywords**: Smallholder farmers, sample survey, coffee marketing channel, cooperatives, multivariate probit model.*

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1. INTRODUCTION

1.1. Background

Coffee is one of the most important agricultural commodities with significant contributions to the growth and well-functioning of Ethiopia's economy and the social stability of the country (Alemseged, 2012). Through various taxes levied on the crop, it also serves as an important source of government revenue (Boansi and Crentsil, 2013). The crop, for example, generated 909.4 million USD), accounting for 25.14% of the total value of exports (f.o.b.) in 2020/21 (NBE, 2022). It also provides income to more than 15 million people in the country through provision of jobs for farmers, local traders, processors, transporters, exporters and bankers (MoT, 2012).

Despite its importance, coffee production and marketing performance in Ethiopia have been unsatisfactory due to various reasons. All coffee production is rain-fed; thus, precipitation is the most important production factor. Smallholder farmers produce about approximately 95% of Ethiopia's coffee on a farm land farmland, averaging less than 2 hectares in various environments, including forests, semi-forests, gardens, and plantation coffee (Minten, 2017b; GAIN, 2019). The lack of improved seeds, proper tree management, and price incentives for coffee producers and the promotion of irrigation systems in areas where irrigation is possible are, for example, major bottlenecks to coffee production and productivity (Abu, 2016; GAIN, 2019). The coffee sector also suffers from product assembly, storing, handling, processing, quality inspection and grading, and transparent grading systems (Bastin and Matteucci, 2007; ECEA, 2008; Minten *et al*., 2015). High transaction costs, lack of factor and weak capital markets, market information and poor infrastructure add to domestic marketing problems.

Consequently, small-scale farmers in Ethiopia receive minimal benefits from the efforts they put into farming (Tium, 2013). The effects of these problems are manifested in increasing poverty among coffee growers (Samuel and Ludi, 2008; Minten *et al*., 2014, 2015).

The choice of a marketing channel is one of the key ingredients in the successful marketing of both agricultural and non-agricultural products, as different channels are characterized by different magnitudes of profit and costs. Market development commonly parallels the development of a region's or a nation's economy (Solomon *et al*., 2016). Therefore, understanding the marketing behaviors of smallholder farmers, including their market outlet choices, and the variables affecting decisions in particular can be highly important in the development of sound policies with respect to coffee marketing, prices, and exports and in meeting the overall rural and national development objectives of the country.

1.2. Statement of the Problem

Although coffee is produced in different parts of Ethiopia, the largest volume of coffee is produced in the Oromia and Southern Nations, Nationalities and Peoples (SNNPs) regions, mainly by smallholder farmers, who practice mainly mixed crop–livestock farming systems (Sentayhu, 2011; Abu, 2012; Minten *et al*., 2014). As such, 64% and 35% of coffee production comes from Oromia and SNNP regions, respectively. The remaining 1% comes from Gambela regional state of the country (MoT, 2012). In Oromia region, Guji, West Guji, Jimma, Bunno Bedelle, Ilu Aba Bor, Kellam, West and East Wellega and Horro Guduru Wellega zones are known as major coffee growing zones (ECCSA, 2020).

Jimma zone is one of the major coffee growing zones not only in the Oromia region but also in the country, with approximately 105,140 hectares of land covered with coffee, which includes smallholder farmers as well as state- and private-owned plantations (Berhanu *et al*., 2015; Dagne *et al*., 2015a; ECCSA, 2020). Out of the 40–55 thousand tons of coffee annually produced in the zone, approximately 28–35 thousand tons are sent to the central market, while the remaining is locally consumed (Alemayehu *et al.,* 2008). Jimma Zone covers a total of 21% of the export share of the country and 43% of the export share of the Oromia Region (Nasir, 2020).

Despite its importance to the livelihoods of a significant number of rural households in Jimma zone and economic development of the country at large, coffee production and marketing performance have been unsatisfactory for various reasons. The lack of sufficient and weakly coordinated provisions of institutional support services and poor coffee production management and post-harvest handling practices among smallholder farmers are the major

bottlenecks hindering the production and market supply of quality coffee from such high-potential and major coffee-growing areas of the country in particular (ECEA, 2008; Babur, 2009, Anwar, 2010; Amsaya, 2015).

A better understanding of farmers' selling decisions is therefore important for producing empirical evidence for cooperative leaders and for policy makers to design appropriate policies and strategies that can increase the income of coffee farmers (Mekonin, 2017; Dejen, 2018; Nasir, 2020; Alemayehu and Alemu, 2022). There are no or limited empirical studies that have investigated determinants of the choices of marketing channels separately for selling dry-processed and red coffee cherries from the same sample population in Jimma zone in particular and in the country at large (Dejen, 2018). This study is relevant because it provides evidence on whether the determinants of the choices of marketing channels for selling dry-processed coffee beans and red coffee cherries are similar or varied. This study was thus conducted with the aim of understanding observed marketing channels, the choices of observed marketing channels and the determinants of such choices for selling both dry-processed and red coffee cherries by smallholder farmers in Jimma zone of Oromia Region, southwestern Ethiopia.

1.3. Objectives of the Study

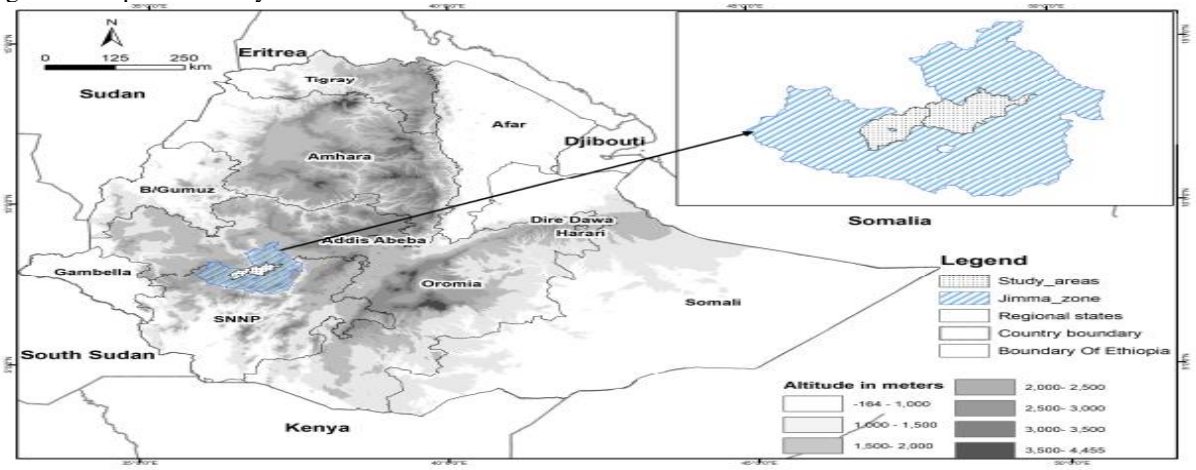
The main objectives of this study were therefore to identify the observed choices of marketing channels and the determinants of the choices for selling dry-processed coffee beans or red coffee cherries by smallholder coffee farmers in Jimma zone of Oromia region, southwestern Ethiopia.

2. RESEARCH METHODOLOGY

2.1. Description of the Study Area

Ethiopia is a federal country divided into 11 regional states and 2 city administrations. Each region is subdivided into zones and zones into *woredas (districts),* which are roughly equivalent to a county in the United States or UK. Woredas, in turn, are divided into peasant associations (PAs), or *kebeles*, which are administrative units consisting of a number of villages (Dercon *et al*., 2008). This study was conducted in Gomma and Limmu Kossa districts of Jimma zone, Oromia National Regional State of the country (see Figure 1). The zone is located in the southwestern part of the country approximately 360 km away from Addis Ababa, the capital city of the country. The zone extends between $7^0$13'- 8^o56' North latitudes and $35^0$49'-$38^0$38' East longitudes. Jimma zone is one of the major coffee-producing areas with approximately 105,140 hectares of land covered with coffee, which includes smallholder farmers as well as state- and privately owned plantations (Berhanu *et al*., 2015; Dagne *et al*., 2015). Approximately 30–45% of the people in Jimma Zone directly or indirectly benefit from the coffee industry (Anwar, 2010). However, coffee is widely produced in eight districts, namely, Gomma, Manna, Gera, Limmu Kossa, Limmu Seka, Seka Chokorsa, Kersa and Dedo districts. Gomma and Limmu Kossa districts are among the top coffee-producing districts in Jimma zone. The majority of smallholder farmers in these districts are engaged in coffee production and marketing as their main livelihood acclivity and means of cash income (BoCPA, 2018).

Figure 1. Map of the study area.



2.2. Data and Methods of Data Collection

Secondary and primary sources of data were used to undertake the study. However, primary data collected through semi-structured cross-sectional sample survey constituted the main source of data for this research.

2.3. Sample size and sampling technique

The question of how large a sample to take arises early in the planning of any survey or experiment. This is an important question that should not be treated lightly. Sample size determination, however, can be performed on the basis of whether the samples are needed for estimating the population mean or percentage or proportion under study (Kothari, 2004; Daniel and Cross, 2013). Since the aim of this study was to identify factors influencing the choices of coffee marketing channels by smallholder farmer portions, the initial sample size (n_0) was determined by using the formula for estimating the population proportion or percentage as given by the aforementioned authors as follows:

$$n_0 = \frac{z^2 pq}{d^2} \qquad (1)$$

$n_0 = 384.$

where n_0 is the initial desired sample size; Z = 1.96 for a 95% confidence level, p is the estimated population percentage or proportion (which is usually set at 0.5 for a population proportion that is unknown *a priori*), q = 1-q = 1-0.50 = 0.50, and d = ±0.05 for a 95% desired precision level.

Then, 10% of the sample size was added to the original sample size (*i.e.*, 384), making the final sample size 423 in compensation for possible drop out of respondents and/or incomplete survey questionnaires (see Table 1 for details).

Table 1. Distribution of population and sample size of the study by district and farmers' associations

District	Kebele/PA	Population size	Sample size
Gomma	Bulbulo	851	39
	Choche Lemi	901	41
	Ilbu	1061	48
	Omo Beko	1159	52
	Omo Guride	1330	60
	Subtotal	**5302**	**240**
Limmu Kossa	Tencho	444	20
	Gena Denbi	412	19
	Chime	330	15
	Mito Gundub	421	19
	Chefe Ilfeta	510	23
	Babu	493	22
	Debello	404	18
	Harewa Jimate	345	16
	Kacho Tirtira	670	31
	Subtotal	**4029**	**183**
Grand total		**9331**	**423**

Source: Cooperative promotion agencies in Jimma, Gomma and Limmu Kossa districts (2019)

2.4. Methods of Data Analysis

Both descriptive statistics and a multivariate probit (MVP) econometric model were used to analyse the data collected. As such, frequency, percentage and chi^2 tests and t tests were used to describe the socioeconomic characteristics, access to institutional support services, and infrastructure of the sample farmers against the marketing channels they chose for selling dry-processed or red coffee cherries in the 2017/18 coffee season. To analyse the factors influencing the choice of observed local marketing channel (*i.e.*, consumers, private traders or

cooperatives) for selling dry-processed coffee beans or red coffee cherries, two separate MVP models were run. STATA version 14.2 statistical package was used to analyse the data.

The MVP econometric model was used to identify factors influencing the choice of one, two or three local coffee marketing channels (CMCs), *viz.*, consumers, private traders or cooperatives. The selection of a local coffee market channel *i* by farmer *j* is defined as the choice of farmer *j* to transact in coffee market channel *i* or not, expressed as follows:

$$Y_{ij}^{A} = \begin{cases} 1 & \text{if} \quad 1 \text{ if } Y_{ij}^{A} = x_{ij}^{A}\alpha_{ij} + \varepsilon^{A} \geq 0 \Leftrightarrow X_{ij}^{A} \geq -\varepsilon^{A} \\ 0 & \text{if} \quad 0 \text{ if } Y_{ij}^{A} = x_{ij}^{A}\alpha_{ij} + \varepsilon^{A} < 0 \Leftrightarrow X_{ij}^{A} < -\varepsilon^{A} \end{cases} \quad (2) \quad (1)$$

where α_{ij}^{A} is a vector of estimators and ε^{a} is a vector of error terms under the assumption of a normal distribution; Y_{ij}^{A} is the dependent variable for the local coffee market channel choice of consumers, private traders or cooperatives; and X_{ij}^{A} is the combined effect of the explanatory variables.

The econometric model specification for choosing an observed local coffee market channel (*i.e.*, consumers, private traders or cooperatives) is as follows:

$$\begin{aligned} Consumrs_j &= X_1^{'}\beta_1 + \varepsilon^{A} \\ \Pr vtraders_j &= X_2^{'}\beta_2 + \varepsilon^{B} \\ LCoop_j &= X_3^{'}\beta_3 + \varepsilon^{C} \end{aligned} \quad (2)$$

$$\begin{pmatrix} \varepsilon^{A} \\ \varepsilon^{B} \\ \varepsilon^{C} \end{pmatrix} \cdots\cdots N\left[\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}\begin{pmatrix} 1 & \rho_{12} & \rho_{13} \\ \rho_{21} & 1 & \rho_{23} \\ \rho_{31} & \rho_{32} & 1 \end{pmatrix}\right] \quad (3)$$

Where each Consumersj, Prvtradersj or LCoopj local marketing channel is a binary response variable and takes a value of 1 if a sample farmer j selects consumers, local private traders or local cooperatives, respectively, or 0 otherwise;
X1 to X3 are vectors of independent variables determining the respective marketing channel choice variables;
βs are vectors of the simulated maximum likelihood (SML) parameters to be estimated;
ε^{A} to ε^{C} are correlated disturbances in a seemingly unrelated multivariate probit model; and
ρ's are tetrachoric correlations between endogenous variables.

In the trivariate case, however, there are eight joint probabilities corresponding to the eight possible combinations of successes (a value of 1) and failures (a value of 0). As such, if we focus on the significance that every outcome is a success, for instance, the probabilities that enter the likelihood function of the market channel choices simulation are explained as:

$$\begin{aligned} &\Pr(\text{Consumrsj} = 1, \text{Prvtradersj} = 1, \text{LCoopj} = 1) \\ &\quad = \phi 3(\beta'_1 X_1, \beta_2' X_2, \beta_3' X_3', \rho) \end{aligned}$$

$$\Pr(\varepsilon A \leq \beta X_1, \ \varepsilon B \leq \beta X_2, \varepsilon C \leq \beta X_3) \quad (4)$$

where ϕ_3 is the multivariate normal density function.

Table 2 below presents the socioeconomic variables, access to institutional support services and infrastructure-related variables hypothesized to influence the choices of observed local consumers, private traders or

cooperatives for selling dry-processed coffee beans or red coffee cherries by the sample farmers in the 2017/18 coffee season.

Table 1. Econometric model variables hypothesized to influence the choices of coffee marketing channels by the sample farmers

Variable name	Description	Hypothesized influence
Dependent variable: Coop_(1= Yes; 0 otherwise)	Membership status of a household to (Fairtrade, Organic or dual Fairtrade and Organic) certified coffee marketing cooperative (1= Yes; 0 otherwise)	
Independent variable:		
Sex (Sex)	Sex of household head (1 = male, 0= female)	-
Age (Age)	Age of the household head in years.	+
Marital status (Marstat)	Marital status of the household head (1= Married, 0 = Single, divorced or Separated).	-
Literacy level (Literacy)	Literacy level of the household head (1 Literate= reads and/or writes, 0 Illiterate (cannot read and/or write at all)	+
Family size (FamS_ME)	Total number of family members (in adult equivalent).	+
Total livestock holding size	Total livestock holding in TLU.	-
Total land size under coffee production (LANDCP)	Land size land under coffee production in ha.	+
Coffee farming experience (CFarming_EXP)	Full years of experience in coffee farming.	+
Access to extension services (Access_extension)	It refers to whether the farmer had access to extension services (1= Yes, 0 otherwise).	+
Social capital (SCapital)	Membership to traditional rural organizations (e.g., *idir*[1]or *ekub* (rotating saving and credit association) (1= Yes, 0 otherwise).	+
Access to credit (Access_Credit)	It refers to whether the household head had access to credit services (1= Yes, 0 otherwise)	+
Off-farm income sources (Off_farm_Income)	Participation in off-farm income earning activities (such as serving as daily laborers on others farms) (1= Yes, 0 otherwise).	-
Nonfarm income sources (Nonfrm_Income)	Participation in nonfarm income earning activities (such as carpentry and nonfarm labour markets) (1= Yes, 0 otherwise).	-
Distance to development agents' offices (DISTDAWM)	Walking distance travelled to reach to development agents' offices in minutes.	+
Distance to coffee marketing centers (DISTTRCMC)	Walking distance travelled to reach to coffee marketing centers in minutes .	-
Distance to cooperative's office (DISTCOOPWM)	Walking distance travelled to reach to cooperative's office in minutes.	+
Distance to all-weather road (DISTTRAWR)	Walking distance travelled to reach to the nearest all-weather road in minutes.	-

3. RESULTS AND DISCUSSION

3.1. Descriptive Statistics

3.1.1. Socioeconomic characteristics of marketing channels chosen for selling dry-processed coffee

Table 3 below presents descriptive statistics of the socioeconomic characteristics (categorical variables) of the sample farmers by marketing channels chosen for selling dry-processed coffee in the 2017/18 coffee season. The

[1]Is a traditional association which provides insurance for members during death and other accidents (Degnet and Mekbib, 2013).

results show that consumers and private traders (collectors) were the observed local marketing channels chosen for selling dry-processed coffee by smallholder farmers. However, there were significant differences in terms of marital status, literacy status, cooperative membership status, access to extension services, training, and off-farm income sources between sample households (HHs) who chose and did not choose local consumers for selling dry-processed coffee beans. The sample HHs also significantly differed in terms of their average family size, quantity of coffee harvested and dry-processed coffee sold and price received (ETB/kg), respectively.

On the other hand, the sample HHs who chose local private traders significantly differed in terms of their literacy status, social capital, access to extension services and off-farm income sources, average family size, coffee land size, coffee farming experience and total quantity of harvested coffee. Regarding the choice of cooperatives, there were significant differences between those who chose and those who did not choose cooperatives in terms of their marital status, literacy status, social capital, access to extension services and off-farm income sources. Additionally, these sample HHs significantly differed in their average age, coffee land size, coffee farming experience and total quantity of coffee harvested.

Table 2. Descriptive statistics of categorical variables by marketing channel chosen for selling dry-processed coffee beans, 2017/18

Continuous variable		*Combined sample*		*Local marketing channel chosen*								
				Consumers			Private traders			Cooperatives		
		Freq.	%	Freq.	%	*Chi² test*	Freq.	%	*Chi² test*	Freq.	%	*Chi² test*
Sex (Yes = Male)	No	21	5.57	10	6.33	0.585	13	4.56	0.133	5	4.63	0.614
	Yes	356	94.43	148	93.67		272	9544		103	95.37	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**	**100.00**	
Marital status (1= Yes)	No	219	58.09	7	4.43	**0.004****	30	10.53	0.256	3	2.78	**0.005****
	Yes	158	41.91	151	95.57		255	89.47		105	97.22	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**	**100.00**	
Literacy (1= Yes)	No	219	58.09	17	10.76	**0.035****	50	17.54	**0.041****	11	10.12	**0.076***
	Yes	158	41.91	141	89.24		235	82.46		97	89.84	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**		
Coop Membership (1=Yes)	No	143	37.93	76	48.10	**0.001****	108	37.89	0.980	40	37.04	0.821
	Yes	234	62.07	82	51.89		177	62.11		68	62.96	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**	**100.00**	
Social capital (1=Yes)	No	219	58.09	138	87.34	**0.003****	219	76.84	**0.005****	102	94.44	**0.000*****
	Yes	158	41.91	20	12.66		66	23.16		6	5.64	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**	**100.00**	
Contact with DA (1= Yes)	No	219	58.09	10	6.33	0.122	29	10.18	0.168	7	6.09	0.276
	Yes	158	41.91	148	93.67		256	89.82		108	93.91	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**115**	**100.00**	
Extension access (1= Yes)	No	17	4.51	2	1.27	**0.010***	15	5.26	0.214	0	0.00	**0.008***
	Yes	360	95.49	156	98.73		270	94.74		108	100.00	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**	**100.00**	
Training access (1= Yes)	No	48	12.73	6	3.78	**0.000**	42	14.74	**0.040****	4	3.70	**0.001****
	Yes	329	87.27	152	96.20		243	85.26		104	96.30	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**	**100.00**	
Off-farm income access (Yes = 1)	No	238	63.13	99	62.66	0.872	157	55.09	**0.000*****	77	71.30	**0.037****
	Yes	139	36.87	59	37.34		128	44.91		31	28.70	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**	**100.00**	
Non-farm income access (Yes = 1)	No	325	86.21	123	77.85	**0.000*****	248	87.02	0.422	94	87.04	0.767
	Yes	52	13.79	35	22.15		37	12.98		14	12.96	
	Total	**377**	**100.00**	**158**	**100.00**		**285**	**100.00**		**108**	**100.00**	

Source: Own survey data (2019).
***, ** and * represent probabilities at the 1%, 5% and 10% significance levels, respectively.

On the other hand, the results in Table 4 below show descriptive statistics of the relevant continuous socioeconomic and other proximity to offices and infrastructure-related characteristics of the sample farmers. As such, the results show that the age of the total sample respondents ranged from 19--100 years, with a mean age of 43.17 years. The average family size was 3.63 adult equivalents. On average, a sample farmer had 4.77 livestock holdings in the tropical livestock unit and 2.18 ha of agricultural land. Cereals, flowering and oil crops, coffee, khat (Katha edulis), vegetables and sugarcane were the main crops cultivated by the sample farmers. However, fruit crops such as orange, mango, avocado, papaya and sugar apple have also been grown on mini plots on land. In terms of coffee production,

the sample farmers, on average, had 1.15 ha of land under coffee production in the 2017/18 G.C. coffee season, with an average of 18.86 years of coffee farming experience. However, a sample farmer needed to walk on average for 29.40, 36.15 and 55.14 minutes to reach his/her nearest coffee plots, development agent (DA) office and nearest coffee marketing center, respectively. There is a significant difference in the means of the walking distances travelled in minutes to reach the DA's office between coop member and non-coop member households at the 5% probability level. The implication is that non-cooperative member farmers need to walk longer than their counterparts do, but cooperative member farmers need to reach to the DA's office.

The sample farmers on average needed to walk for 36.32 minutes to reach the all-weather road. However, there is a significant difference in the average walking time needed to reach to the all-weather road between non-coop and coop member farmers at the 5% probability level. The implication is that coop member farmers are relatively closer to all-weather roads than the non-coop member farmers are. The results on income earned indicate (in Table 3) that the sample farmers earned incomes from three income sources, *viz.,* on-farm, off-farm and non-farm income sources. On average, they earned ETB 13253.20, 6784.79 and 5440.10 gross annual income from on-farm, off-farm and non-farm income earning sources, respectively. The total average gross annual income earned by the sample farmers was ETB 41745.64. However, the gross annual incomes earned by the coop member and non-coop member farmers were ETB 48358.36 and 30924.81, respectively. However, there is no significant difference in the average gross annual income earned between the two groups.

Table 4. Descriptive statistics of continuous variables by marketing channel chosen for selling dry-processed coffee beans, 2017/18

Variable	**Combined (N= 377)**	**Local marketing channel chosen**		
		Consumers (n_1=varies)	**Private traders (n_2= varies)**	**Cooperatives (n_3= varies)**
Age, year	43.17 (11.19)	41.49 (10.99)**	43.74 (11.16)*	41.37 (10.39)**
Family size, AE	3.60 (1.60)	3.81 (1.43)**	3.69 (1.70)**	3.62 (1.39)
Livestock holding, TLU	4.80 (2.40)	4.76 (2.17)	5.05 (2.46)	4.24 (2.32)
Total land size, ha	2.18 (2.02)	1.87 (1.28) **	2.42 (2.22)	1.62 (0.95)
Total coffee land size, ha	1.15 (1.24)	0.93 (0.65)**	1.29 (1.37) **	0.78 (0.44) **
Coffee farming experience, year	18.86 (8.61)	17.31 (8.51)**	19.47 (8.57)**	16.31 (7.89)**
Total quantity of coffee harvested, kg	1586.67 (1609.00)	1729.76 (1673.10)	1690.33 (1769.30) **	1132.93 (817.98)**
Total quantity of dry-processed coffee sold, kg	192. 62 (335.55)	195.14 (338.23)	192.62 (401.35)	97.52 (65.00)

Source: Own survey data (2019).
***, ** and * represent probabilities at the 1%, 5% and 10% significance levels, respectively.

3.1.2. Socioeconomic characteristics by marketing channel chosen for selling red coffee cherries

This subsection presents the results in Tables 5 and 6 on descriptive statistics of socioeconomic characteristics (both categorical and continuous explanatory variables) of the sample farmers against their choices of observed marketing channels chosen for selling red coffee cherries in the 2017/18 coffee season.

As such, the Chi^2 results in Table 5 below show that there were significant differences between the sample farmers who chose and did not choose local consumers, private traders or cooperatives for selling red coffee cherries in terms of sex, literacy status, cooperative membership, social capital, contact with the DA, and access to off-farm and non-farm income sources.

Table 5. Descriptive statistics of categorical variables by marketing channel chosen for selling red coffee cherries, 2017/18

Continuous variable		*Combined sample*		*Local marketing channel chosen*								
				Consumers			Private traders			Cooperatives		
		Freq.	%	Freq.	%	*Chi² test*	Freq.	%	*Chi² test*	Freq.	%	*Chi² test*
Sex	No	21	5.57	4	13.79	**0.044****	6	3.75	0.186	14	94.51	0.922
(Yes = Male)	Yes	356	94.43	25	86.21		154	96.25		241	5.49	
	Total	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Marital status	No	36	9.55	2	6.90	0.613	11	6.87	0.129	28	10.98	0.172
(1= Yes)	Yes	341	90.45	27	93.10		149	93.13		227	89.02	
	Total	**344**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Literacy	No	58	15.38	0	0	**0.017****	28	17.50	0.328	36	14.12	0.324
(1= Yes)	Yes	319	84.62	29	100.00		132	82.5		219	85.88	
	Total	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Coop	No	143	37.93	8	27.59	0.232	63	39.38	0.620	66	25.88	**0.000*****
Membership	Yes	234	62.07	21	72.41		97	60.63		189	74.12	
(1=Yes)	**Total**	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Social capital	No	302	80.11	21	72.41	0.280	137	85.63	**0.021****	206	80.78	0.633
(1=Yes)	Yes	75	19.89	8	27.59		23	14.37		49	19.22	
	Total	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Contact with DA	No	34	9.02	5	17.24	0.108	19	11.88	**0.096***	22	8.63	0.702
(1= Yes)	Yes	343	90.98	24	82.76		141	88.12		233	91.37	
	Total	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Extension access	No	17	4.51	0	0.00	0.223	8	5.00	0.693	13	5.10	0.426
(1= Yes)	Yes	360	95.49	29	100.00		152	95.00		242	94.90	
	Total	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Training access	No	49	13.00	1	3.45	0.119	22	13.75	0.611	30	11.76	0.415
(1= Yes)	Yes	329	87.00	28	96.55		138	86.25		225	88.24	
	Total	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Off-farm income	No	238	63.13	28	96.55	**0.000*****	107	66.88	0.196	154	60.39	0.111
access	Yes	139	36.87	1	3.45		53	33.12		101	39.61	
(Yes = 1)	**Total**	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	
Non-farm income	No	325	86.21	29	100.00	**0.025****	129	80.63	**0.007****	216	84.71	0.222
access	Yes	52	13.79	0	0.00		31	19.37		39	15.29	
(Yes = 1)	**Total**	**377**	**100.00**	**29**	**100.00**		**160**	**100.00**		**255**	**100.00**	

Source: Own survey data (2019).

***, ** and * represent probabilities at the 1%, 5% and 10% significance levels, respectively.

On the other hand, the t test results in Table 6 below indicate that average family size, total land size, coffee land size, coffee farming experience, and the quantity of coffee harvested and red coffee cherries sold were the main continuous explanatory variables that were significantly different between the sample farmers who chose and did not choose local consumers, private traders and cooperatives for selling red coffee cherries.

Table 6. Descriptive statistics of continuous variables by marketing channel chosen for selling red coffee cherries, 2017/18

Variable	**Combined (N= 311)**	**Local marketing channel chosen**		
		Consumers (n_1= varies)	**Private traders (n_2= varies)**	**Cooperatives (n_3= varies)**
Age, year	43.17 (11.19)	44.55 (11.09)	42.79 (11.45	42.96 (10.89)
Family size, AE	3.60 (1.60)	4.08 (1.29)*	3.58 (1.46)	3.64 (1.58)
Livestock holding, TLU	4.80 (2.40)	4.72 (2.02)	4.75 (2.45)	4.93 (2.40)
Total land size, ha	2.18 (2.02)	1.75 (0.95)	1.99 (1.39)	2.49 (2.18)***
Total coffee land size, ha	1.15 (1.24)	0.95 (0.77)	1.07 (0.77)	1.29 (1.22)**
Coffee farming experience, year	18.86 (8.61	21.79 (11.96) **	18.86 (8.61)	17.76 (16.87)**
Total quantity of coffee harvested, kg	1586.67 (1609.00)	2263.48 (2611.53)**	1787.13 (1494.48)**	1865.76 (1669.40)***
Total quantity of red coffee cherries sold, kg	894.72 (843.81	1413 (1197.78) **	962.70 (864.45)	931.01 (849.71)

Source: Own survey data (2019).

***, ** and * represent probabilities at the 1%, 5% and 10% significance levels, respectively.

3.2. Econometric Model Results

3.2.1. Factors influencing dry-processed coffee marketing channel choices

The expected multivariate interdependence of the selection of particular marketing channels of local consumers, private traders, and certified coffee marketing cooperatives was accounted for by employing the multivariate probit (MVP) model (Table 6). The model fitness for the data was checked by the Wald test result (200.887), which is significant at the 1% level, showing that the subsets of the coefficients are jointly significant and that the independent variables inserted in the model are acceptable. Moreover, the likelihood ratio test in the model ($\rho21 = \rho31 = \rho32 = 0$) is significant at the 1% level. Therefore, the null hypothesis that all the ρ (Rho) values are jointly equal to 0 is rejected, indicating the goodness-of-fit of the model or implying that the decisions to choose these market channels are interdependent. Hence, the use of a multivariate probit model is justified for determining the factors influencing the choice of market channels. Furthermore, there are differences in market channel choice behaviors among farmers, which are reflected in likelihood ratio statistics (Abebe *et al*., 2018; Yadeta and Temesgen, 2018; Taye *et al*, 2018).

The ρ values (ρij) indicate the degree of correlation between market channel choices. The ρ21 (correlations between the choices of the assembler and wholesaler market outlets) and ρ32 (correlations between the choices of the retailer and wholesaler market outlets) are both negative and statistically significant at the 1% level (Table 6).

The MVP regression model results in Table 6 show that the choice of local consumers (spot markets) for selling dry-processed products was significantly influenced by land size under coffee production (ha), coffee productivity (yield in kg/ha), average dry-coffee selling price (ETB/kg), frequency of visits by the DA, cooperative membership, access to credit, access to non-farm income earning sources and walking distance to the cooperative's coffee marketing center.

On the other hand, the choice of local private traders (collectors) for selling dry-processed coffee beans was significantly influenced by sex, land size under coffee production (ha), coffee productivity, average selling price of dry-processed coffee (ETB/kg), frequency of visits made by development agents (DA), access to credit, off-farm and non-farm income earning sources, and walking distance to cooperatives and private coffee marketing centers.

The choice of local cooperatives for selling dry-processed coffee, however, was significantly influenced by land size under coffee production, the average selling price of dry-processed coffee, cooperative membership status, access to credit, off-farm and non-farm income earning sources, and walking distance to the nearest cooperative and private coffee marketing centers.

Table 7. Multivariate regression results of factors influencing the choices of marketing channels for dry-processed coffee

Variable	Marketing channel chosen								
	Local consumers			Local private traders			Local coops		
	Coef.	*Std. Err.*	*P>|t|*	Coef.	*Std. Err.*	*P>|t|*	Coef.	*Std. Err.*	*P>|t|*
Dependent variable (1= Local consumers; 2 = Local private traders; or 3= Local coops)									
Independent variables:									
Coop membership (1=Yes, 0=No)	-0.1791802	0.0451939	**0.000*****	-0.1465969	0. 0409572	**0.026****	0.0754683	0.0436035	**0.085***
Age, years	-0.0146112	0.008626	0.074*	0.0055036	0 .0073974	0.457	-0.0114345	0.0078753	0.148
Religion (1= Muslim; 0= (Orthodox or Protestant)	0.0474315	0.0558021	0.396	-0.2041995	0.050571	**0.000*****	0.1267572	0.0538385	**0.019****
Marital status (1= Married; 0 =(single, separated or divorced))	0.1203395	0.0828308	0.147	-0.2404023	0.075066	**0.002****	0.0961985	0.0799161	0.230
Literacy (1= Literate; 0= Illiterate)	-0.0178215	0.0276771	0.520	-0.0417868	0.0250571	**0.097***	-0.0325796	0.0267032	0.223
Family size in adult man equivalent	0.0471508	0.0159676	**0.003****	0.0112828	0.014438	0.436	0.00702	0.0154058	0.649
Land size under coffee production, ha	-0.1850711	0.0566419	**0.001*****	0.1143742	0.0513321	**0.027****	-0.1591333	0.0546487	**0.004****
Total quantity of harvested coffee, kg	0.0001459	0.0000322	**0.000*****	-0.0000567	0.0000291	**0.052***	0.0000304	0.000031	0.329
Contact with DA, 0=No, 1=Yes	0.1011005	0.083861	0.229	-0.1569615	0.0759996	0.040**	-0.0667708	0.08091	0.410
Social capital, 0=No, 1=Yes	-0.0366366	0.057324	0.524	0.0964461	0.0520485	**0.065***	-0.2328132	0.05562	**0.000*****
Access to credit, 0=No, 1=Yes	0.396616	0.0586366	**0.000*****	-0.1972303	0.0531398	**0.000*****	0.494943	0.0565732	**0.000*****
Saving account, 0=No, 1=Yes	0.1166762	0.050659	**0.022****	0.0412917	0.04591	0.369	0.0032634	0.0488763	0.947
Off farm income, 0=No, 1=Yes	-0.0674628	0.0479687	0.161	0.1797504	0.0434719	**0.000*****	-0.0425879	0.0462807	0.358
Non-farm income, 0=No, 1=Yes	0.3468971	0.0649766	**0.000*****	-0.1123793	0.0588855	**0.057***	0.0566306	0.0626901	0.367
Distance to DA's office, walking minutes	0.0035244	0.001277	**0.006***	-0.0007021	0.0011573	0.544	0.0012297	0.001232	0.319

Source: Results obtained from computation of own sample survey data, 2017/18.

Key: ***, **, and * refer to significance at the 1%, 5% and 10% probability levels, respectively.

Table 7. Multivariate regression results of factors influencing the choices of marketing channels for dry-processed coffee (Continued)

Variable	Marketing channel chosen								
	Local consumers			Local private traders			Local coops		
	Coef.	***Std. Err.***	***P>|t|***	**Coef.**	***Std. Err.***	***P>|t|***	**Coef.**	***Std. Err.***	***P>|t|***
Dependent variable (1= Local consumers; 2 = Local private traders; or 3= Local coops)									
Independent variables:									
Distance to cooperative's office, walking minutes	-0.0040004	0.0012135	**0.001*****	0.0039214	0.0010997	**0.000*****	-0.0034262	0.0011708	**0.004****
Distance to all-weather road, minutes	-0.0019524	0.0009512	**0.041****	-0.000457	0.000862	0.596	-0.0006632	.0009177	0.470
Constant	0.1060566	0.3443833	0.758	1.623182	0.3120998	**0.000*****	0.0505457	0.3322648	0.879
Number of obs.	**329**			**329**			**329**		
Parms	**30**			**30**			**30**		
RMSE	**0.3591037**			**0.3254402**			**0.3464672**		
"R-sq"	**0.5214**			**0.4425**			**0.4688**		
F	**11.2345**			**8.183475**			**9.099471**		
P	**0.0000*****			**0.0000*****			**0.0000*****		

Source: Results obtained from computation of own sample survey data, 2017/18 coffee season.
Key: ***, **, and * refer to significance at the 1%, 5% and 10% probability levels, respectively.

3.2.2. Factors influencing red coffee cherry marketing channel choices

The expected multivariate interdependence of the selection of particular marketing channels of local consumers, private traders, and certified coffee marketing cooperatives was accounted for by employing a multivariate probit regression model (Table 7). The model fitness for the data was checked by the Wald test result (130.24), which is significant at the 1% level, showing that the subsets of the coefficients are jointly significant and that the independent variables inserted in the model are acceptable. Moreover, the likelihood ratio test in the model ($\rho 21 = \rho 31 = \rho 32 = 0$) is significant at the 1% level. Therefore, the null hypothesis that all the ρ (Rho) values are jointly equal to 0 is rejected, indicating the goodness-of-fit of the model or implying that the decisions to choose these market channels are interdependent. Hence, the use of a multivariate probit (MVP) regression model is justified for identifying the factors influencing the choices of local consumers (LCs), private traders (PTs), or cooperatives (C) for selling red coffee cherries by the sample farmers in 2017–2018. Furthermore, there are differences in market channel choice behaviors among farmers, which are reflected in likelihood ratio statistics (Abebe *et al*., 2018; Yadeta and Temesgen, 2018; Taye *et al*, 2018).

The MVP regression model results (see Table 8) show that the decision to choose local consumers (LCs) for selling red coffee cherries was significantly influenced by land sex, coffee farming experience, frequency of visits by the DA and access to credit. However, the choice of local private traders was significantly influenced by sex, coffee yield (productivity) (kg/ha), average red coffee cherry price (ET/kg), cooperative membership status, access to training and non-farm income earning sources. On the other hand, the choice of local cooperatives for selling red coffee cherries was significantly influenced by coffee farming experience, land size under coffee production, cooperative membership status, access to credit, access to non-farm income earning sources, and walking distance to cooperatives and private coffee marketing centers.

Table 83. Multivariate regression model results of factors influencing marketing channel chosen for selling red coffee cherries, 2017/18.

Variable	Marketing channel chosen								
	Local consumers			Local private traders			Local cooperatives		
	Coef.	***Std. Err.***	***P>|t|***	**Coef.**	***Std. Err.***	***P>|t|***	**Coef.**	***Std. Err.***	***P>|t|***
Dependent variable (1= Local consumers; 2 = Local private traders; or 3= Local cooperatives)									
Independent variables:									
Coop membership (0=No, 1=Yes)	0.0909423	0.0388546	**0.020****	-0.2588235	0.066046	**0.000*****	0.2372921	0.0464043	**0.000*****
Sex (1= male; 0= female)	-0 2009958	0.094133	**0.034****	-0.3079094	0.1600096	**0.055***	0.0644772	0.1124235	0.567
Religion (1= Muslim; 0 otherwise (Orthodox or Protestant))	0.1363208	0.0432622	**0.002****	-0.0633922	0.07205	0.389	0.0442288	0.0516683	0.393
Literacy (1= Literate; 0= Illiterate)	0.0258391	0.022375	0.249	-0.1109712	0.0380335	**0.004****	0.0408357	0.0267225	0.128
Coffee farming experience, years	0.0069131	0.0029599	**0.020****	-0.0024096	0.0050314	0.632	-0.0104154	0.0035351	**0.004****
Coffee productivity, kg/ha	-7.00e-06	0.0000134	0.601	0.0000381	0.0000227	0.095*	-8.31e-06	0.000016	0.603
Social capital,, 0=No, 1=Yes	0.0044895	0.0456717	0.922	-0.1740289	0.0776338	**0.026****	-0.0175213	0.0545459	0.748
Saving account, (1=Yes; 0=No)	0.0632655	0.0407608	0.122	-0.033382	0.0692861	0.630	0.1000176	0.0486808	**0.041****
Off farm income, (1=Yes; 0=No)	-0.1028855	0.0408758	**0.012****	-0.0479637	0.0694816	0.491	0.1473849	0.0488182	**0.003*****

Source: Results obtained from computation of own sample survey data, 2017/18.
Key: ***, **, and * refer to significance at the 1%, 5% and 10% probability levels, respectively.

Table 84. Multivariate regression model results of factors influencing the marketing channel chosen for selling red coffee cherries, 2017/18 (Continued)

Variable	Marketing channel chosen								
	Local consumers			Local private traders			Local cooperatives		
	Coef.	*Std. Err.*	*P>|t|*	Coef.	*Std. Err.*	*P>|t|*	Coef.	*Std. Err.*	*P>|t|*
Dependent variable (1= Local consumers; 2 = Local private traders; or 3= Local cooperatives)									
Independent variables:									
Walking distance to the nearest coffee marketing center, minutes	-0.0011381	0.0006094	**0.063***	0.0008008	0.0010358	0.440	0.0009011	0.0007278	0.217
Walking distance to cooperative's office, minutes	0.000433	0.0009937	0.663	-0.0042747	0.0016891	**0.012****	-0.0025847	0.0011868	**0.030****
Walking distance to all-weather road, minutes	0.0007132	0.0008137	0.382	-0.0047612	0.0013831	**0.001****	0.0016358	0.0009718	**0.094***
Constant	**-0.0086118**	**0.288588**	**0.976**	**0.7018469**	**0.4905488**	**0.154**	**0.070906**	**0.3446621**	**0.837**
Number of obs.	**286**			**286**			**286**		
Parms	**31**			**31**			**31**		
RMSE	**0.2688634**			**0.4570205**			**0.321105**		
"R-sq"	**0.2926**			**0.2551**			**0.3418**		
F	**3.516565**			**2.910728**			**4.413284**		
P	**0.0000**			**0.0000**			**0.0000**		

Source: Results obtained from computation of own sample survey data, 2017/18.
Key: ***, **, and * refer to significance at the 1%, 5% and 10% probability levels, respectively.

4. CONCLUSIONS AND RECOMMENDATIONS

The findings of the study show that local consumers, private traders or cooperatives were the marketing channels available for the sample farmers for selling dry-processed coffee beans or red coffee cherries harvested in the 2017/18 coffee season. The MVP regression model analyses performed separately for dry-processed coffee beans and red coffee cherries reveal that the choices of the aforementioned channels for selling dry-processed coffee beans or red coffee cherries were significantly influenced by sex, coffee land size and productivity, average dry-processed coffee selling price, frequency of visits by the DA, cooperative membership, access to credit, training, off- and non-farm income earning sources, distance to cooperatives and private traders' coffee collection centers.

As such, various policy measures should be taken regarding factors that significantly influence the choices of the observed marketing channels. Given that the intention of the government is to ensure the supply of higher quantity and better quality coffee to central markets through cooperatives, there is a need to work on factors that positively and significantly influence the choices of cooperatives for selling coffee by smallholder farmers. Moreover, appropriate measures should be taken against the factors that positively and significantly influence the choices of local consumers and private traders to encourage farmers to prefer cooperatives to these marketing channels, as former providers benefit both the farmer and the government better.

On the other hand, farmers should be provided with coffee production- and productivity-enhancing technologies that could increase yield and productivity and the marketed supply of coffee by smallholder farmers. Moreover, the provision of extension services and training programs aimed at providing information on the importance of joining cooperatives and knowledge and skills for improving coffee production and productivity are needed. Moreover, cooperatives should incorporate credit schemes during peak coffee production and marketing seasons so that members prefer to supply their coffee to the cooperatives and earn better coffee income at the end.

Last but not the least, cooperatives are advised to establish nearby farmers' vicinity so that not only members but also non-members will supply their coffee more likely to the cooperatives and earn better coffee income.

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