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Determinants of Market Outlet Choice of the Smallholder Rice Producers in Northwest Ethiopia

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Abstract
Some studies have been conducted on determinants of rice market participation in fogera plain. Different studies recommended to have studies on determinants of rice market outlet choice. Additionally, this investigation has recommended from the context that rice production volume is increasing from year to year and farmers are complaining about poor service quality on rice processing. Therefore, this study was conducted to identify determinants of market outlet choice of smallholder rice producers in Fogera district. To achieve this objective, both primary and secondary data were collected in 2020 cropping season. Descriptive statistics and multivariate probit model were used to analyze the data of 212 sample rice producers. From sampled rice producers, about 69.81% of them choices processor outlet choice and about 21.23% of sampled households choices retail market outlet choices. The result of the study indicated that sex, farming experience of rice, distance from the nearest road, market information and distance from the nearest market were significantly influence the rice market outlet choice at different level of significance. Wholesaler rice market outlet choice was negatively influenced by sex and rice farming experience at 5% and 10% significance level, and positively influenced by access to market information at 10% of significance level. Processor rice market outlet choice was positively influenced by rice farming experience and access to market information at 10 % and 1% significance level, and negatively influenced by distance to the nearest road at 5% significance level. Retailors market outlet choice was negatively influenced by sex and access to information at 5% significance level. Based on the findings of the study, it has suggested that strengthening cooperatives to a level of giving milling service to rice producers is vital.
Keywords: market outlet, multivariate probit model, Rice
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INTRODUCTION

About 80% of Ethiopia's population of 110 million live in rural areas. Agriculture is the dominant sector in the economy, accounting for 35% of Gross Domestic Product (GDP), 65% of employment, and over 80% of the country's export values (World Bank Report, 2019). According to CSA (2017), over 341 million quintals of crops including cereals (81.19%), pulses (12.9%) and oil seeds (5.9%) were produced across 12.97 million hectares of cultivated land. From cereals, rice shares 0.81 % and 0.89% of cultivated area coverage and production, respectively (CSA, 2020).

Rice is one of the major staple crops globally and is the most rapidly growing food commodity in Sub-Saharan Africa (SSA). The region consumes 30 per cent of the world's production of rice while representing only 10 per cent of its total population (Seck *et al.*, 2013). The introduction of rice to Ethiopia was linked to resettlement programs and food security. Accordingly, it is about 43 to 50 years since it was introduced to Ethiopia. The rice cultivation trend is increasing in terms of area and production. To mention, it's cultivated area has increased from 57, 575. 72 to 85, 288.87 hectares in 2019 and 2020 and its production has increased from 1.7 million to 2.68 million tons in 2019 and 2020, respectively. Despite this fact, the import of rice is increasing from year to year due to the increasing pattern of rice consumption. Rice producer farmers, in the study area, are selling rice to the market for different choices. These include processors, retailers, wholesalers, and collectors. Farmers in the study area are complaining about the quality of the processed rice and related issues. To mention, about 87 percent of the rice processing machines were found to be old and inefficient. Consequently, farmers complained about the poor service they received from the processors as the processed grain from these machines is generally of, a low quality. Only 13 processing machines identified during this study were built for rice processing, with the capacity to provide additional services such as grain-milling. Other milling machines were originally built for the milling of grain only. Grading of the processed product is not a common practice in the area (Dawit and John, 2020). As a result, farmers are selling their produce to different outlet choices. Therefore, the objective of this study is to analyze the determinants of market outlet choice of the smallholder rice producers in Northwest Ethiopia.

METHODOLOGY

Fogera district is located in South Gondar Zone of the Amhara National, Regional State in Northwestern

Ethiopia. The district is bounded by the Farta district in the East, Dera district in the South, Lake Tana in the West and Libokemkem district in the North (FDARD, 2019). Its Altitude ranges from 1774 to 2410 meters above sea level with mean annual rainfall of 1216 mm and mean annual temperature of 19 0c. The farming system is mixed provided that the share of livestock raring is decreasing which is related with the introduction of rice in the area. Farmers are producing cereals and related crops in the rainy season and vegetables (tomato and onion) in the dry season using irrigation. Rib and Gumara are the two major rivers that cross many of rice producing kebeles and flooding the plain. These two rivers have economic importance to the areas as they are used for irrigation purpose for vegetable production during the dry season. Agro-ecologically, the district is characterized as majorly mid and high land. Topographically, the flat area accounts for 76 %, mountain and hills 11 % and the valley bottom area 13 %. The total area of the district is 117, 414 hectares. The land use pattern of the district is characterized by 59.03% cultivated land, 22.73% grazing land, 18.24% water bodies and the rest for others (Fogera district agriculture office, 2019). The major crops in the study area are rice, maize, finger millet, tef and barely (FDARD, 2019).

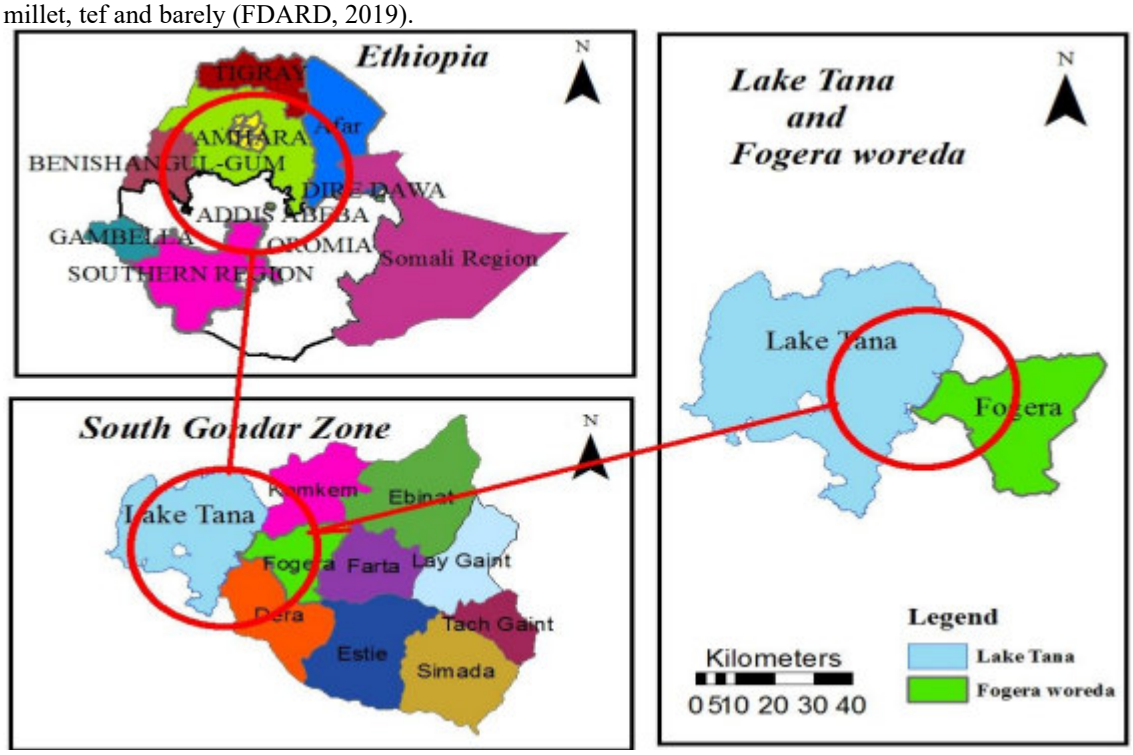

Figure1 location map of the study area Source: Ethio Geospatial data

The samples for this study were drawn from rice producing farmers in Fogera district. A three-stage sampling technique was employed to select sample households. Fogera district have a total of 33 rural kebeles. From these, 16 kebeles were identified as potential for rice production. Three Kebeles were selected using simple random sampling technique. Then, systematic random sampling technique was employed to select sample rice producers. The main reasons for using a systematic random sampling technique were the homogenous nature of the population in terms of socio-economic characteristics, institutional set up and means of livelihood. The other reason is the availability of sampling frame (List of the household heads) at each kebele. The sample size was determined using Yemane's formula (1967). This is because the population size is known and the precision level is considered.

$$n = \frac{N}{1 + N(e^2)}$$

Where n is Sample size, N is population size (rice producer farmers in the production year 2018/2019) which is 3554 and e is the precision level which was 0.07 for this study due to the fact that the population in the study area is relatively homogeneous in the socio-economic set up. Based on the above formula, 193 sample respondents were selected using systematic random sampling technique. Then, to make the sample size more representative, additional 19 respondents were added to 193. As a result, the total sample size was found to be 212. The sample size for each kebele was determined based on their proportion to the total households in each kebele.

Cross sectional data were collected. Both primary and secondary types of data were collected from primary and secondary sources, respectively. Primary data types include; socio-economic, institutional and market. On

the other hand, secondary data were collected from journal articles, published books and reports (published and unpublished) through critical review. The data collection methods used were key informant interview, structured questionnaire-based interview and focus group discussion. Key informant interview was used to collect general information from model rice producers and development agents who have knowledge about the study area. The structured questionnaire-based interview was used to collect primary data from rice producing farmers. The questionnaire was designed with Cspro software version 7.2 to make data collection easy. Three focus group discussions were employed to take opinions from rice producing farmers so that to triangulate the reliability of model outputs.

Model Specification

Random utility model was used to analyze the market outlet choice determinants. It is appropriate for modeling discrete choice decisions such as; market outlet choice. It is assumed that farmers are rational decision makers that their choice of market depends on the profit maximization. This rational objective of farmers may lead their decision to choose more than one market outlet to address their multiple needs. According to the study by Tura and Kaso (2018), Hawlet *et al.* (2019), Chala and Chalchisa (2017), farmers are more likely to choose more than one market outlets simultaneously. It works with the assumption that selection of different market outlets depends on producers' willingness to maximize their profit and conditional to socioeconomic, institutional and production related factors. Following the literature, a producers' decision to sell in an advantageous market derives from the maximization of profit he or she expects to gain from these markets. For this study the optional models include multivariate probit/logit, multivariate probit/logit, and conditional logit. According to the study by Tura and Kaso (2018) and Gizachew et al. (2018), multivariate probit model was used to identify determinants of market outlet choice of tomato and pepper producers. Whereas the study of Kifle *et al.* (2015) used multinomial logit model to analyze determine factors of producers' market outlet choice. Choosing multiple market outlet, does mean farmers have relationships with more than one market outlet. In this case the multivariate probit model is appropriate. however, for producers who decided to sell their produce to specific outlet choice, the multinomial probit model crucial. For this study, the multivariate probit model is appropriate. And the model can be specified as follows:

$y_{ti} = b_{xi} + e_{ti}$ where y is 1 if y>0 and 0 otherwise, t_i is the market outlet choices available, x_i is the vector of explanatory variables, b is the vector of parameters to be estimated and e_i is the error term distributed normally with mean zero and constant variance.

Table 1 hypotheses of Variables

Variables	Definitions	Type	Expected sign			
			Processor	Retailor	wholesaler	collector
Age	Age of the household head in completed years	Continuous	+	+	-	+
Sex	Sex of the household head (1 for male and o for female	Dummy	+/-	+/-	-	-
Farming experience	Rice farm experience of the household in completed years	Continuous	+	+	+	+
Marketing experience	Market experience of the household in completed years	Continuous	+	+	+	+
Distance to the road	Distance from the nearest road in kilometers	Continuous	+	-	-	+
Credit use	1 for credit use and 0 otherwise	Dummy	+	-	+	+
Household size	Number of persons in the household	Dummy	+	-	-	-
Education status	Education status of the household head in completed years	Continuous	+	-	+	-
Distance to the nearest market	Distance from the nearest market in kilometers	Continuous	+	-	-	+
Access to market information	1 for having access to market information and 0 otherwise	Dummy	+	-	+	-
Cooperative membership	1 for members and 0 otherwise	Dummy	+	-	+	-

1. RESULTS AND DISCUSSION

1.1. Socio economic Characteristics of Households

The descriptive statistics analysis of rice producers was analyzed using frequency, mean, t test and chi-square. The mean age of rice producers selling their produce to collectors was 41 years. In terms of ag, there is a significant difference between farmers selling their rice to collectors. This means that farmers who are selling their rice to collectors are younger. The average amount of rice sold to processors were greater than wholesalers, retailors and collectors.

Table 2 Demographic Characteristics of rice farmers

Variables	Wholesaler		Processor		Retailor		Collector	
	Mean/percent	T/Ch2	Mean/proportion	T/Ch2	Mean/proportion	T/Ch2	Mean/proportion	T/Ch2
Age	45.7	-0.2	45	0.05	45	0	41	1.95*
Experience rice	9.6	1.85*	13.4	-2.85***	11.2	1.5	12.5	0
Education status	2	0.4	2.40	-0.8	2.2	0.3	2	0.55
Quantity of rice produced	22	3.2***	32.0	-1.75*	29.5	0.8	31	-0.6
Market Info	8.02	0.56	69.81	3.45	21.23	7.89***	13.21	6.5**

Source: Survey data, 2020

As indicated in table 2 from the total sampled households about 69.81% of them choices processor outlet choice, about 21.23% of sampled households choices retail market outlet choices and about 13.21% of the sample respondents' choices collectors market outlet choice. The result indicated, most of the rice producer's choice to sell their rice was processors.

Table 3 Market outlet choices of rice producers

Outlet choices	Wholesaler		Processor		Retailor		Collector	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	17	8.02	148	69.81	45	21.23	28	13.21
No	195	91.98	64	30.19	167	78.77	184	86.79

Source: Survey data, 2020

1.2. Econometrics analysis on determinants of Market Outlet Choice of the Smallholder Rice Producers

Out of nine explanatory variables included in multivariate probit model, three variables significantly affected wholesaler market outlets; three variables significantly affected processor market outlets, two variables significantly affected retailor market outlet choices and three variables significantly affected collectors market outlets (Table 4). The Multivariate probit model fitness was reasonably good and explanatory power of the independent variables in the model is satisfactory as indicated by Wald test ($\chi2$ (44) = 82.77, p = 0.0004)) that is significant at the 1%. The model is significant because the null hypothesis that market outlet choice decision of the four market outlets is independent was rejected at 10% significance level. The likelihood ratio test in the model (LR $\chi2$ (6) = 81.8106, $\chi2$ > p = 0.0000) indicates the null hypothesis that the independence between market outlet choice decision (rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0) is rejected at 1% significance level and there are significant joint correlations for four estimated coefficients across the equations in the models. This verifies that separate estimation of choice decision of these outlets is biased, and the decisions to choose the four rice marketing outlets are interdependent for household decisions. Sex negatively affected the rice farmer's market outlet choice that showed that female rice farmers may produce more output and hence be able to sell in bulk to the market outlets; wholesalers and retailers. This result is consistent with the findings of Lapar *et al.* (2009). The farming experience has a negatively and positively affected rice farmer's market outlet choice of wholesaler and processor outlet at 10% levels of significance, respectively. Rice producers who have more years of experience prefer to sell their produce in smaller volume than those who have less years of experience. The experienced farmers choose processors because the buyers are millers and may buy the products in large, which reduces the transportation cost of the producers. The computed coefficient depicted that a unit increase in farming experience would lead to 0.03% probability of choosing the processors; a unit decrease in farming experience would lead to -0.042% probability of choosing the wholesalers. This finding is similar to Takele *et al.* (2017). Distance to road has negatively affected rice farmer's market outlet choice of processor outlet at 5% significance level. A unit increase in distance to the road decrease the probability of the households' choice decision for processor only market outlets. Cooperative membership negatively affected rice farmers market outlet choice of collectors. Farmers who are not members of the cooperatives are selling their

produce to collectors. It implies non-members to cooperatives may not have an opportunity to sell their produce may decide to sell to rural collectors. This result is in line with the findings of Gizachew *et al.* (2018). Access to market information positively affected rice farmers market outlet choices wholesaler, processor and collectors. However, access to market information negatively affected retailors rice market outlet choice. It implies, farmers who did not have access to market information sell their produce to the retailors. Marketing distance positively affected the collector market outlet choice. It implies, the increase in market distance increases the probability of choosing to sell for collectors.

Table 4 Multivariate probit model result

Variables	Wholesaler	Processor	Retailor	Collector
Sex	-0.694**	0.188	-0.543**	0.2
	(0.334)	(0.264)	(0.261)	(0.348)
Age	0.004	-0.002	-0.003	-0.013
	(0.011)	(0.008)	(0.009)	(0.01)
Education	-0.059	0.023	-0.009	-0.029
	(0.048)	(0.033)	(0.035)	(0.042)
Farming experience rice	-0.042*	0.030*	0.003	0.015
	(0.024)	(0.016)	(0.016)	(0.018)
Household size	-0.107	0.039	-0.05	0.035
	(0.077)	(0.052)	(0.054)	(0.062)
Distance road	-0.036	-0.085**	-0.016	0.035
	(0.087)	(0.026)	(0.06)	(0.069)
Cooperative	-0.407	0.111	0.284	-0.474*
	(0.291)	(0.209)	(0.223)	(0.248)
Credit use	0.038	0.141	-0.329	-0.438
	(0.403)	(0.266)	(0.30)	(0.358)
Information	0.603*	0.131***	-0.519**	0.665**
	(0.355)	(0.024)	(0.225)	(0.311)
Cultivated rice land	-0.211	0.379	-0.321	-0.244
	(0.555)	(0.386)	(0.404)	(0.49)
Marketing distance	0.013	0.006	0.023	0.047**
	(0.026)	(0.019)	(0.02)	(0.023)
Constant	0.148	-0.173	0.278	-0.225
	(1.053)	(0.742)	(0.778)	(0.915)
Log likelihood -304.75027				
Wald chi 2 (44) 82.77***				
Likelihood ratio test of rho 81.8106***				
Observation 212				

Source: Survey data, 2020

2. CONCLUSION AND RECOMMENDATIONS

This study was about the determinants of market outlet choice of the Smallholder Rice Producers in Northwest Ethiopia. Different determinants affect rice market outlet choices differently. The result indicated, female rice farmers may produce more output and hence be able to sell to wholesalers and retailers. Rice farmers having more years of experience prefer to sell their produce in smaller volume than those who have less years of experience. The experienced farmers choose processors because the buyers are millers and may buy the produce in large. A unit decrease in farming experience would lead to -0.042% probability of choosing the wholesalers. A unit increase in distance to the road decrease the probability of the households' choice decision for processors. Farmers who are not members of the cooperatives are selling their produce to collectors. It implies non-members to cooperatives may not have an opportunity to sell their produce that they may decide to sell to rural collectors. Access to market information positively affected rice farmers market outlet choices wholesaler, processor, and collectors. However, access to market information negatively affected retailors rice market outlet choice. It implies farmers who did not have access to market information sell their produce to the retailors. Marketing distance positively affected the collector market outlet choice. It indicated, the increase in market distance increases the probability of choosing collectors. Based on the findings of the study, it has suggested that strengthening cooperatives to a level of giving milling service to rice producers is vital. Because cooperatives can give freedom to farmers either to sell their produce in paddy or milled form at affordable price.

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