ORIGINAL ARTICLE

Commercialization of smallholder farmer's maize producer in Bilo Nopa district of Ilu Aba Bor zone, Oromia region, Ethiopia: market orientation and market participation

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ABSTRACT

Maize is one of the widely cultivated cereal crops in Ethiopia. Government recognizes importance of maize for economic development and emphasized its production and marketing in the strategies and policies for agricultural transformation. However, maize is mainly subsistent crop with very low marketed proportion. This study was set out to assess commercialization of smallholder maize producers. Crossectional data was collected from randomly selected 184 sample households using structured questionnaires. Statistical tool such as descriptive statistics, Tobit and Double hurdle models were used for data analysis. The result shows the degree of maize commercialization and market orientation was 29.97% and 10%, respectively. Tobit model shows that age, sex, education, family size and fertilizer use had positive while distant to the market had negative effect on smallholder maize producer's market orientation. Double-hurdle econometric model indicates that age, education, family size, extension contact, oxen and land allocated to maize production had positive effect while distance from market had negative effect on market participation decision., The intensity of maize sale was positively affected by age, education level, perception on lagged market price, number of oxen, membership to cooperative and land allocated to maize. The study indicates that level commercialization was low in the study area. Therefore, the strategies and policies aiming at promoting smallholders commercialization should be focused on improving provision of rural infrastructure, education, agricultural extension service, provision of inputs, institutional arrangement like cooperatives.

Keywords: commercialization, maize, market orientation, market participation, smallholder farmers

INTRODUCTION

Ethiopia was one of the top performing economies in sub-Saharan African countries where agricultural sector plays a crucial role in the life and livelihood of many smallholders (FAO, 2014). Agricultural sector contributes about 36.3% Gross Domestic Product (GDP) in Ethiopian economy (UNDP, 2018; USAID, 2018) and crop production accounts for about 27.4% from total share of agriculture (NPC, 2016). The sector further contributes about 70% of export earnings and provides 72.7% of employment opportunities (USAID, 2018). About 97% of crops are grown by smallholders who usually keep some livestock too (CSA and WFP, 2014).

Commercializing smallholder farmers is part of agricultural transformation process in which individual farms shift from a highly subsistence-oriented production towards more specialized production targeting markets both for their input procurement and output supply (Moti et al., 2009). Commercialization comprises of agricultural production decision intended for market based on market signals (market orientation) and produce offered for sale and use of purchased inputs (market participation) (Berhanu and Moti, 2010). The main source of economic growth in Ethiopia is agricultural sector in which a bulky of the growth originates from smallholder farmers agriculture (MoFED, 2010; NPC, 2016). Thus, Ethiopia has adopted commercialization of smallholder agriculture as a strategy for agricultural development (Berhanu and Moti, 2010; Leykun and Jema, 2014). Ethiopia's rural development policy and strategies prioritize the transformation of smallholder subsistence agriculture to commercial agriculture through market-orientated production system (ATA, 2017). With regard to maize, the Government of Ethiopia recognizes the importance of maize to the country's economic and social development and has emphasized maize production and marketing in its strategies and policies for agricultural transformation (Abu and Teddy, 2014)

World Bank (2018) report reveals that Ethiopia is the leading maize producer in East Africa. Maize ranks first in total production and second interms of total area coverage in Ethiopia. Accordingly, Out of the 80.71% of total grain area under cereal crops, maize covers about 16.79% of total grain area with production of approximately 27.43% of the total grain production (CSA, 2018). Out of the cereals, maize is one of the most important cereal crop produced by a number of smallholder farmers than any other crops. Besides, maize hold second rank next to teff in terms of total area of lands cropped by cereals crop and ranks first in terms of total amount of production in quintal followed by teff and sorghum (CSA, 2017 and 2018).

According to ATA (2016) remarkable increments in overall cereal production including maize has been observed. However, the gains in agricultural sector are not yet translating into market development and overall transformation due to subsistence-based orientation. The commercialization of maize production (in case of output side) was very low according to World Bank (2018) report. It states that maize production was 7.8 million tons in the 2016/17 meher planting season, of which 95% is produced by smallholder producers with Oromia and Amhara accounts for about 58% and 25% of maize total production, respectively. Despite this huge production and emphasis given by government in maize production and marketing, maize remains predominantly a subsistence crop with only 13% of total production being marketed (Ibid).

Private asset accumulation, public infrastructure and services are the prerequisites for the smallholders to escape from subsistence production and produce marketable surplus (Barret, 2008). However, Majority of smallholder farmers are located in remote area with poor transport, market infrastructures and missing reliable market information. Poor infrastructure and weak institutions alter production and market participation decisions by raising transaction costs (Ouma *et al.*, 2010).

Commercialization includes both market orientation and market participation (Berhanu and Moti, 2010). In spite of this, commercialization was considered to be the same as market participation in most of previous study. As a result, different study which focuses on commercialization fails to include market orientation. Example: Tura *et al.*, (2016); Tadele *et al* (2017); Leta (2018) and Addisu (2018). Despite this, there are a few studies in Ethiopia which deal with only determinants of market orientation by ignoring market participation. (Examples: Tefera, 2014; Samuel *et al.*, 2017). Moreover, study conducted by (Berhanu and Dirk, 2008; Berhanu and Moti, 2010; Alelign, 2017) incorporates both market participation and orientation. Specifically to maize commercialization, the study by Yalew (2016) also fails to cover market orientation part.

Despite being dominantly produced cereal crop s in Bilo Nopa district, the production is mainly cha racterized by subsistent oriented that is mainly for c onsumption. Besides, no prior study was made to in vestigate smallholder farmers' commercialization of maize production. Hence, this study is aimed to an alyse smallholder farmers' commercialization of ma ize production and specifically to identify determin ants of market orientation and participation level of smallholder maize producers in the study area.

METHODOLOGY

Description of the Study Area

The study was conducted in Bilo Nopa district of Ilubabor [1] Zone of Oromia regional state, Ethiopia. The district is located at 18 Km distance from Mettu town, which is administrative seat of Ilubabor zone and 615 Km distant from Addis Ababa (Finfinne),

capital of the country. The district consist 16 *kebeles* and bordered with Mettu woreda on the south and south west direction, Hurumu woreda on south east, Dorani woreda on the east, Darimu and Alge Sachi woredas on the northern direction. Moreover, Darimu, Dorani and Alge Sachi woredas are bordered with the woreda through Gebba River. The total population of the woreda in 2017/18 was 39848, of whom 22,269 were men and 17,579 were women.

Majority of the population are rural dwellers with 34,474 and 5374 urban population. The district has 37009 total hectare of land. Majority of the population of the district engaged in agriculture and agriculture related activities. Dominant crops produced in the district are maize, sorghum, finger millet and teff. Livestock rising like cattle, sheep, goat and donkey are also dominant one (BNDADO, 2018).

Data Source and Sampling Procedure

Both primary and secondary data sources were used. Primary data were collected using structured questionnaires from smallholder maize producers. Key informant interview was also used to supplement survey questionnaire. Secondary data sources such as CSA, FAO, different journals, unpublished materials and data from woreda agricultural development office were used along with primary data. A two stage random sampling procedure was followed to select representative sample. Accordingly, four *kebele*s were selected by random sampling method from the total of 16 *kebele* of the district in the first stage. In the second stage, sample of 184 maize producing households were selected randomly based on probability proportionate to size of maize producing households in the selected *kebeles*. Then, sample size was determined by following the simplified formula provided by Yamane (1967). The required sample size at 95% confidence level; level of precision equal to 7% was used to determine a sample size required to represent the population.

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

$$n=\frac{1886}{1+1886(0.07)^2}\approx 184$$

Where, N- Total number of households (1886); *e*- denotes the desired precision level (taking 7%); n- denotes sample size

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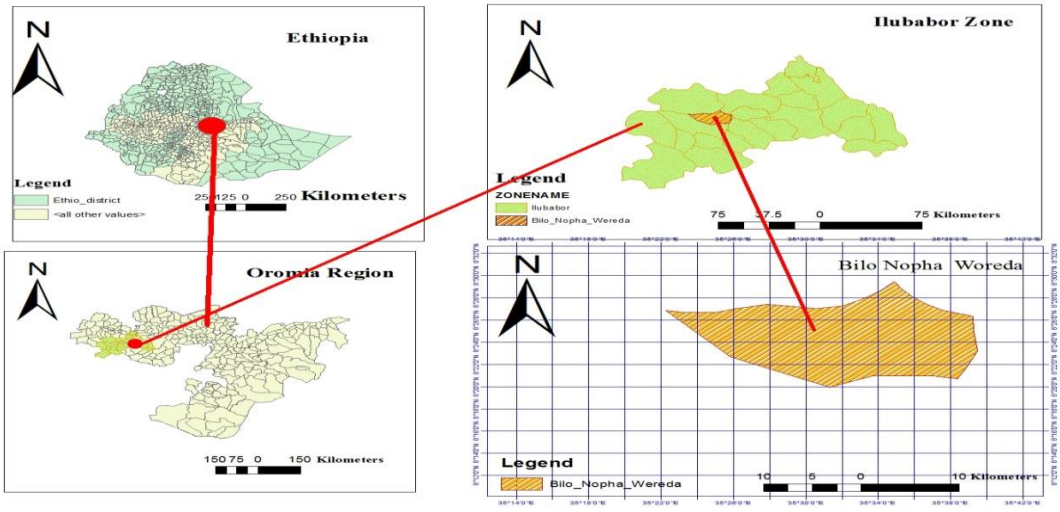

Figure 1: Geographical location of the study area (Source: Ethio-GIS, 2019)

Table 1. Sample size determination

Kebeles	Maize producing household	Sample proportion	Sample
Suli	388	21	38
Jato	232	12	23
Abbu	565	30	55
Dizi	701	37	68
Total	1886	100	184

Source: Own calculation from BNDADO (2019)

Method of Data Analysis

The collected data was analyzed using statistical software tools such as SPSS version 20 and STATA version 13. Moreover, descriptive statistics, inferential statistics and econometric models were used to analyses the data. Descriptive statistics tools like mean, standard deviation, frequency and percentages were used to describe the data. Furthermore, inferential statistics like t-test and chi-square were employed along with descriptive statistical tools to compare the difference between market participant and non-participant with regard to dummy and continuous explanatory variables.

Market orientation index

Based on the proportion of total amount sold to total production at farming level, a crop specific marketability index was computed for maize

produced at farm level. Marketability indices of all crops produced by households were determined as the consumption and production quotient of each analyzed commodity in the farming systems (Degye *et al*., 2012). The higher proportion of land a household allocates to the more marketable crops, the more the household is market oriented (Berhanu and Moti, 2010). The marketability index value of one indicates that the entire production was intended for the commercial market and zero value of marketability index indicates the same production and consumption. Hence, once crop specific marketability index for maize is calculated, household's market orientation index in land allocation (MOIi) was computed from the land allocation pattern of the household weighted by the marketability index of the crop.

$$\alpha k_i = \frac{\sum_{i=1}^{N} Sk_i}{\sum_{i=1}^{N} Qk_i}$$

Where, $Sk_i \geq Qk_i$ and $0 \leq \alpha k_i \leq 1$

Where, Ski refers to total amount of maize sold to the market by ith farmer in quintal Qki refers to the total amount of maize produced by ith farmer in quintal

$$MOI = \frac{\sum \alpha_{ki} L_k}{LT_i}$$

Where, MOI refers to market orientation index of smallholder farmer i,
αk_i refers to marketability index of maize crop

Lki refers to total amount of land allocated for maize production by ith farmer in hectare,
LT_i refers to total crop land operated by ith farmer in hectare.

Degree of maize commercialization

Basically, the commercialization index proposed by Govereh *et al*. (1999); Strasberg *et al*. (1999) and Von Braun *et al*. (1994) was applied in computing household input and output commercialization. Therefore, maize commercialization index (MCI) which is expressed in the form of the ratio of marketed amount to produced amount in quintal was employed to determine the level of maize commercialization, provided that commercialization of maize production was assessed from output side. Musah *et al*. (2014); Yalew (2016); Abdu *et al*. (2016); Tadele *et al*. (2017); Addisu (2018) also used ratio of marketed to produced amount in quintals to determine level or degree of commercialization. Thus, the commercialization index for maize production can be defined as follows:

$$MCI(\alpha ki) = \frac{QS}{QP} \text{ X } 100\%$$

Where, MCI refers to maize commercialization index

QS refers to total value all maize of sold by household quintals

QP refers to total value all maize of produced by household in quintals

Specification of econometric model

i. Econometric model for analyzing determinants of maize producers' market orientation

It is crucial to identify dependent and independent variables prior to selection of econometrics models applied for the data analysis. Thus, maize market orientation index is used as dependent variable along with different set of explanatory variables. With respect to data analysis, a different empirical study has been conducted and the models used for data analysis vary depending on the nature of the data. Ordinary least square (OLS) was employed in the study conducted by Berhanu and Moti (2010); Gani and Hussein (2016) and Samuel *et al* (2017). Tobit model was used by Adenegan *et al* (2013); Tewodros (2014) and recently Alelign (2017) used Double hurdle model for analyzing determinants of market orientation.

Normally, the value of the dependent variable, market orientation index ranges between 0 and 100 in percentage or bounded between 0 and 1. However, in this study, since all maize producers were not market participant, market orientation index becomes zero for those non- participant and greater than zero but less than one for market participant households. Therefore, Tobit model was employed using maize market orientation index as dependent variable and different set of explanatory variables. According to Tobin (1958), Tobit model can be specified as:

$$Y^{*} = \beta_o + \beta iXi + \varepsilon$$

$$Y = Y^{*}, \text{ if } \beta_o + \beta iXi + \varepsilon i > 0 \text{ , And}$$

$$Y = 0, \text{ if } \beta_o + \beta iXi + \varepsilon i \leq 0$$

Where, yi* refers to a latent variable, which is unobserved for values less than 0 and greater than 1 that representing market orientation index of ith farmer,
Xi refers to vector of explanatory variables which is factors affecting market orientation level of smallholder maize producers,
Y refers to observable variable is defined to be equal to the latent variable whenever the latent variable is above zero,
$\boldsymbol{\beta}_i$ refers to Vector of unknown parameters to be estimated and
$\boldsymbol{\varepsilon}_i$ refers to the error term which is normally distributed with mean 0 and variance σ.

ii. Econometric model for analyzing determinants of market participation

Double hurdle model was preferred to Tobit, Heckman two step and Heckman maximum likelihood model depending on statistical test result.

The maximum likelihood estimator of double hurdle model produces first and second hurdle results. The first hurdle can be obtained from probit estimator. Then, the maximum likelihood estimator (MLE) for the second hurdle can be estimated from truncated normal regression model (Burke, 2009; Greene, 2012). Due to the separability of Cragg's likelihood function, the estimation results was identical whether estimation is made simultaneously or one regression at a time. On other hand, while using Craggit makes estimation more coherent, separate use of probit and truncated regression for Double hurdle model would not change results (Burke, 2009). Following Greene (2012), double hurdle model is specified as follows:

1. Participation equation

$$Y_i^* = Z_i\delta + u_i, \qquad u_i \approx N(0, 1)$$

$$P_i = \begin{cases} 1 \text{ if } z_i\delta + u_i > 0 \\ 0 \text{ if } z_i\delta + u_i \leq 0 \end{cases}$$

2. Intensity equation

$$Y_i = X_i\beta + \varepsilon_i, \qquad \varepsilon_i \approx N(0, \delta^2)$$

$$Y_i = \begin{cases} Y_i^* \text{ if } Y_i^* > 0 \text{ and } P_i = 1 \\ 0, \qquad \text{Otherwise} \end{cases}$$

Where: $corr(u_i,\varepsilon_i)=\rho$ refers to unobserved factors affecting participation may or not affect intensity of participation.

Where, Y_i^* refers to latent variable describing the household's decision to participate in the output market.

Zi refers to vector of explanatory variables explaining the participation decision

δ refers to unknown parameter to be estimated in the model

Y_i refers to dependent variable that describing the intensity of maize sale measured maize participation index or commercialization index for market participant households,

β refers to unknown parameter to be estimated in the model,

ε_i *and* u_i refers to are respective error terms assumed to be independent and distributed.

Table 2. Summary of hypothesized explanatory variables used in econometric model

Variable	Type	Measurement	Expected sign	
Age of HH	Continuous	Years	+/-	+/-
Sex of HH	Dummy	Male/Female	+	+
Family size	Continuous	adult equivalent	+/-	+/-
Education of HH	Continues	years of schooling	+	+
Distance from market	Continuous	Hours	-	-
Extension contact	Continuous	Number	+	+
Market information	Dummy	Yes/No	+	+
Perception on lagged price	Dummy	High/low	+	+
Non/off farm income	Continuous	ETB	+/-	+/-
Credit utilization	Dummy	Yes/No	+	+
Cooperative membership	Dummy	Yes/No	+	+
Fertilizer use	Dummy	(Yes/No)	+	+
Livestock	Continuous	TLU	+/-	+/-
Number of oxen	Continuous	numbers of oxen	+	+
Land allocated to maize	Continuous	hectares	+	NU

HH, TLU and NU refers to household head, Tropical Livestock unit and not used, respectively. Hint: under expected sign, the first column is for market participation and the second column is for market orientation. The variable land allotted to maize was not used in market orientation due to due to suspicion of endogeniety problem.

RESULTS AND DISCUSSION

Descriptive statistics for dummy variables

The distribution of total sampled maize producers on their position in maize market participation showed that 112 (60.87%) of them were market participants. whereas the rest 72 (39.13%) were non-participants. This indicates that majority of sampled maize producers are market participant.

Among the sample households, 78.26 % of them were male headed household and the rest 21.74 % were female headed households. The chi-square test result shown in the Table 3 below indicated that, sex of household head was found to be statistically significant at 1% significance level. Therefore, there was statistically significant association between sex of market participant and non-participant households. The implication is that participation of female headed household in maize output market was very low.

Credit was assumed to play crucial role for increasing maize production so that producer participate in the market and sell the surplus. In the study area, the main source of credit for the sampled household was Oromia saving and credit share company. About 61.41% of the total sample households had taken credit and the rest 38.59% were not. Among the market participants 70.54 % and from non-participants 47.22 % had access to credit. The chi-square test revealed that there was significant association between market participant and non-participant in terms of the credit received at 1% significance level.

The result showed that from the total sample households, 63.04% of them replied that the lagged market price of maize was high while 36.96 % of them replied it was low. The chi-square result showed that, the percentage difference between market participant and their counterparts regarding their perception of the previous year maize output price was statistically insignificant.

Table 3. Summary statistics of dummy variables used in the analysis

Characteristics		Total sample		Participant		Non-participant		χ^2 test
		Freq.	%	Freq.	%	Freq	%	
Sex of HH	Female	40	21.74	25	34.72	15	13.39	11.72***
Lagged market price	Male	144	78.26	47	65.28	97	86.61	
	Low	68	36.96	40	35.71	28	38.89	0.19
	High	116	63.04	72	64.29	44	61.11	
Fertilizer use	Yes	124	67.39	89	79.46	35	48.61	18.98***
	No	60	32.61	23	20.54	37	51.39	
Membership to cooperative	Yes	112	60.87	79	70.54	33	45.83	11.23***
	No	72	39.13	33	29.46	39	54.17	

Note: '***' implies statistically significant at 1 significance level.
Source: Author's computation from own survey data, 2019.

Descriptive statistics for continuous variables

The average age of sample respondents was 40.45 years with minimum of 24 and maximum of 67 years. The average age of market participant was 40.86 years and that of non-participant was 39.83 years. It is expected that aged households are more experienced than their counterparts since there is no so much difference between age of households and their respective experience in maize production. However, t-test result shown in the table 4 below indicated insignificant mean difference between age of market participant and non-participant households.

The average family size of sample households was 5.08 which is greater than national average 3.8 with minimum and maximum of 1.75 and 11.75 in adult equivalent, respectively. The mean difference in average family size of market participant and non-participant households was found to be insignificant. The average educational level of household head in terms of year of schooling was 2.43 years with standard deviation of 2.42. The maximum and minimum grade completed in formal schooling was 0 and 8 grades, respectively. The independent sample t-test indicated that the difference between average market participant household (2.88) and non-participant (2.13) on average was found to be statistically significant at 1%. The implication is that the more household becomes educated, the more their participation in maize output market becomes as a result of their ability to obtain production and marketing related information.

The average total land size owned by the sample households was 2.27 hectare with minimum and maximum of 0.75 and 5.5 hectares, respectively. The average area of land allocated for maize production was 0.63 hectares with minimum and maximum of 0.25 and 1.25 hectares, respectively. The difference between average land allocated to maize by market participant (1.34) and non-participant (0.89) was statistically significant at 1%. This implies households those participated in the market have more hectares of land and land allocated for maize than their counterpart so that they produce and sell large quantity of output.

The average livestock owned excluding oxen was 3.27 TLU. The minimum and maximum livestock owned by sample of maize producing household was 0 and 11.66 TLU. The result of t-test shown in the table 4 below indicated that the difference between average livestock owned by market participant household (3.58) and non-market participant (2.81) in TLU was found to be insignificant which meanings that there was no substantial difference between average livestock owned by market participant and non-participant. The minimum and maximum oxen owned by sample maize producing household was 0 and 5. Each household own 1.80 oxen on average with standard deviation of 1.4. Regarding distribution of the number of oxen, from the total sample households, 19.57% of them did not had any oxen. The rest 27.17%, 24.46%, 15.76% and 13.04% of them had one, two, three and greater than four number of oxen, respectively. The t-test result showed that there was statistically significant mean difference between market participant and non-participant in terms of the number of oxen they had at 1% significance level. The average income from non/off farm activities of the sample households is 1542.48 birr per year with standard deviation of 1616.37. The t-test result showed difference between average non/off farm income of participant (1465.53 birr) and non-participant household (1662.18 birr) was insignificant.

The sampled maize producing household has contacted with the extension agents in their *kebeles* 6.18 days per production to harvesting of maize. Moreover, the t-test in indicated that there was statistically significant mean difference regarding households contact with extension agents between market participant and non-participant at 1% significance level. The distance from home to the nearest market place where farmers sold their maize produce was an average of 1.59 hours of walk with standard deviations of 0.35. The minimum and maximum distance that maize producing households travel to the nearest market was 1 and 2.5 hours,

respectively. The mean difference between distance to the nearest market among market participant and non-participant was statistically significant at 1% significance level.

Table 4. Summary statistics of continuous variables used in the analysis

Characteristics	Total sample		Participant		Non-participant		t-value
	Mean	SD	Mean	SD	Mean	SD	
Age of HH	40.46	10.17	40.87	10.80	39.80	9.16	-0.7
Education of HH	2.43	2.42	2.88	2.48	1.72	2.13	3.26***
Family size	5.09	2.41	5.11	2.59	5.05	0.104	-0.13
Total land	2.27	1.00	2.53	1.02	1.88	0.84	5.94***
Land for maize	0.63	0.23	0.75	0.176	0.45	0.17	-11.42***
Livestock without oxen	3.27	3.14	3.57	3.50	2.81	2.43	-1.63
Number of oxen	1.80	1.39	2.276	1.156	1.055	1.39	-6.45***
Non-farm income	1542.5	1616.4	1465.52	1563.9	1662.2	1699	0.804
Extension contact	6.18	3.42	7.63	3.32	3.92	2.09	-8.47***
Distance from nearest market	95.38	20.88	88.71	18.63	105.76	20.03	5.88***

Note: *** implies significant at 1% significance level, SD = standard deviation
Source: Author's computation from survey data, 2019.

Market orientation level of smallholder maize producers

The market orientation index is computed for specific crops produced in during 2017/18 production season. The distribution of sampled maize producer's in terms of their market orientation level revealed that 39.13% of the sampled household was non-market oriented in maize production in general since their market orientation indices is zero. In addition, 57.07% (105) and 3.8% (7) of the sampled maize producers had market orientation index which ranges between 0-25% and 25-50%, respectively. Moreover, the result indicated that, there was no sampled maize producer whose market orientation index is greater than 50%.

The average market orientation index of maize was approximately 10%, with the minimum and maximum of 0 and 37.7% maize market orientation index, respectively, suggesting less market orientation of smallholder farmers in the study area. Moreover, market orientation index of other crops produced by households were also computed as indicated in the table 5 below. Accordingly, the average market orientation level of sorghum, teff and finger millet was 3.52%, 2.61% and 3.98%, respectively.

Level of commercialization of smallholder maize producers

There is no common standard for measuring degree of commercialization. However, proportion of marketed output was used as a proxy for measuring degree of commercialization in different previous studies. Therefore, the proportion of maize sold to the market was also applied in this study to compute degree of commercialization. Following the study by Musah *et al.* (2014); Tadele *et al.* (2017); Gutu (2017) and Addisu (2018) level of smallholder's commercialization is grouped into Subsistent, less commercialized, semi-commercialized, commercialized farmers. Subsistent farmers are those who did not participate in market; less commercialized farmers are who sell from 1% up to 25% of output; semi-commercialized farmers are who from sell 25% up to 50% of output of their produce and commercialized farmers are households who sold more than 50% of their produce. Therefore, following the category, commercialization index of 72 households was to be found zero suggesting that they are fully subsistent in maize production. About 3 (1.63%) are less commercialized, most of the sample households 59 (32.07%) fall under semi-commercialized category and 50 (27.17%) are commercialized farmers. Moreover, the degree or extent of commercialization of maize producers was 29.77%, on average which is fall under category of Semi commercialization level. The possible explanation for this case is that maize is staple crop cultivated mainly for consumption, and households in the study area were mainly concentrated to coffee production as cash crop.

Table 5. Market orientation indices of maize producers` in the study area

Type of crop	N	Market orientation index	
		Mean	Standard deviation
Maize	184	0.099	0.090
Sorghum	131	0.035	0.041
Teff	113	0.026	0.032
Finger millet	121	0.040	0.034

Where, N refers to total observation
Source: Own calculation from survey data, 2019

Table 6. Level of commercialization of maize producers

Commercialization category	Frequency	Percent
Subsistent/ Non-commercial (0%)	72	39.13
Less-commercialized farmers (1 - 25%)	3	1.63
Semi-commercialized farmers (26 – 50%)	59	32.07
Commercialized farmers (≥50%)	50	27.17
Total	184	100.00

Source: Author's calculation from survey data, 2019

Determinants of market orientation level of maize producers

Market orientation index of maize producers was used as dependent variable in the analysis of factor affecting market orientation level of maize producers in the study area. Tobit model was employed to identify factor affecting market orientation level of maize producers by using Stata software version 13 were described below. Age of household head was found to affect market orientation of maize producers positively and significantly at less than 5% significance level. Marginal effect showed that as age of household head increases by a year, the probability of smallholder maize producers' to be market oriented in maize production would be increased by 0.63%, on average, keeping other factor constant. The result also revealed that, a year increments of age of household head leads to increases the intensity of maize producer's market orientation by 0.1% and 0.14% for market oriented and the entire sample, respectively. The result is similar with the finding of Onubuogu and Onyeneke (2012). However, this result is not in line with the previous finding of Adenegan *et al*. (2013) and Tewodros (2014). This inconformity could be due to the fact that aged households have higher working experience than the younger households.

Sex of household head was found to be statistically significant at 10% significance level. On average, being male headed household would increase the probability and level of maize producers' market orientation by 14.8% and 3%, respectively. Consistent with this result Tewodros (2014) found that being male headed increases the haricot bean producers' market orientation. As hypothesized so far, educational level of household head was positively related with maize producer's market orientation at 10% significance level. The marginal effect depicted that as educational level of household head increases by one year of schooling, the likelihood of being market oriented in maize production would be increased by 2.4%, on average, keeping other factor constant. It also increases market orientation level of maize producers by 0.55% and 0.39%, on average for the entire sample and for those markets oriented, respectively. This implies that as an individual get access to more education, he/she is empowered with the information and skill of production and marketing that will results in individuals to allocate more land for more market oriented product. It is consistent with the prior finding of Onubuogu and Onyeneke (2012); Adenegan *et al*. (2013); Tewodros (2014) and Samuel *et al*. (2017).

Family size had positive relationship with maize producers` market orientation and significantly at 10% significance level. The marginal effects showed that an increment in family size by one adult equivalent increases the probability of being market oriented in maize production by about 2.1%, on average. Despite the results' consistency with the finding of Onubuogu and Onyeneke (2012), the result is not similar with most of the previous study like Berhanu and Moti (2010) and Samuel *et al*. (2017). This could be due to the fact that household with a number of family size have more labour forces which contributes more to the production and marketing of maize which in turns enhances maize market orientation level.

Distance between farmer's house and the nearest market place in hours of walking time negatively and significantly influenced the market orientation level of maize producers at 1% significance level. The marginal effect revealed that one hour increments in the distance to the nearby market decreases the probability and market orientation level of maize producers by 23.3% and 5.35 %, on average, respectively. This implies that the producers who are found at nearby market produce more maize and would be more market oriented than the one that found at distant from the nearby market. The result is consistent with the finding of Degye *et al*. (2012).

Frequency of extension contacts had positive and significant effect on maize producers' market orientation at 1% significance level. This means increments in the frequency of contacting with extension agents by one day would increases the probability and level of market orientation in maize production by 3.3% and 0.76% on average, respectively, keeping other factor constant. This result implies that the technical advice provided for farmers by development agent and other concerned bodies have substantial effect on driving maize producer to be more market oriented. It is consistent with the finding of Onubuogu and Onyeneke (2012) and Gani and Hossain (2016).

Households with a large number of oxen are expected to plough more land for production that enable them produce more maize and get market oriented in maize production. This finding indicates that number of oxen was found to be statistically significant at 5% significant level. The marginal effects showed that as having one more extra oxen would increases the probability and level of maize

producers' market orientation. The result was found consistent with finding of Berhanu and Dirk (2007) and Samuel *et al.* (2017).

Fertilizer use is strongly affected market orientation maize producers positively and significantly at 5% significance level as hypothesized earlier. This study showed, the probability and level of maize producer's market orientation would be increased if household uses fertilizer. The result also showed that if fertilizer is used in maize production, the maize producer's market orientation conditional on being market oriented would be increased by 2.3%, provided that other factor kept constant. Alelign (2017) found that using more chemical fertilizer increases market orientation decision of producers. In other way, the more chemical fertilizer is used, the more cost incurred for its purchase would be. Thus, the finding of Tewodros (2014) confirmed this statement.

Table 7. Tobit model estimates of determinants of maize market orientation level

MMOI	Coefficient	Std. Err.	t-value	Marginal effects		
				Pr(y>0)	E(y/y>0)	E (y*/y>0)
AGHH	0.0019**	0.001	2.04	0.006	0.001	0.0014
SXHH	0.0433*	0.023	1.88	0.148	0.021	0.0301
EDUHH	0.0075*	0.004	1.80	0.024	0.004	0.0055
FMLZDLT	0.0065*	0.004	1.84	0.021	0.003	0.0048
DSTMKT	-0.0725***	0.027	-2.72	-0.233	-0.038	-0.0535
MKTINFO	0.0115	0.018	0.64	0.037	0.006	0.0085
EXTNS	0.0103***	0.003	3.63	0.033	0.005	0.0076
LnCBRNF	-0.0029	0.003	-1.17	-0.009	-0.002	-0.0022
CRDTUSE	0.01556	0.018	0.87	0.050	0.008	0.0114
LMPM	0.01299	0.019	0.70	0.042	0.007	0.0095
FERTLZ	0.04582**	0.020	2.27	0.153	0.023	0.0325
TLUU	-0.00097	0.003	-0.38	-0.003	-0.001	-0.0007
NOXN	0.0166241**	0.007	2.30	0.053	0.009	0.0123
COOPMR	0.0276592	0.019	1.49	0.090	0.014	0.0201
_cons	-0.1326693	0.076	-1.75			
/sigma	0.101421	0.007				

'***', '**' and '*' shows significant at 1%, 5% and 10% respectively. Log likelihood = 50.58; Prob > chi2= 0.00;
Pr (y>0) = the probability of being market oriented
E (y*/y>0) = the level (intensity) of market orientation for entire sample
E(y/y>0) = Market orientation level conditional on being market oriented
Source: Author's calculation from survey data, 2019 and Stata result

Determinants of market participation and intensity of maize producers

The possible econometric model expected to be employed in the analysis of market participation decision and intensity was Tobit model, Heckman two-step, Heckman maximum likelihood model and Double-hurdle model. Therefore, it is very important to identify which econometric model to use when dealing with such kinds of the problem. Likelihood ratio (LR) test was used for comparing the goodness of fit of Tobit and Double-hurdle model in this study. The test statistic for log likelihood ratio at 15 degrees of freedom (Γ = 204.20) was statistically significant with Prob > chi2 = 0.00. In other way, Akaike Information Criteria (AIC) also shows that double-hurdle is preferred to Tobit model since the value of the test statistic from Double hurdle model (48.388) is lower than that of Tobit (123.813). The implication for this case is that Tobit model was rejected in favor of Double-hurdle for analyzing factor affecting market participation and intensity in maize output market.

Heckman two-step model is an econometric model developed to correct for sample-selection bias (Heckman, 1979). In this study, the result from the Heckman two-step showed that inverse mills ratio (IMR) or lambda (0.49) which is statistically insignificant which indicates no sample selection bias in the data which implies rejection of heckman two step model. Moreover, the results of LR test of independence equation in Heckman maximum likelihood model output was insignificant which in turn implies the two equations are independent. The independence of the two equations suggests permissibility of analyzing the two equations separately using probit and truncated regression model which is double hurdle model. Hence, the double hurdle model was employed in this study.

The overall significance and goodness of fit of the double hurdle model was checked with the value of Wald chi square value of 52.30 at 15 degree of freedom shows that the result is significant at less than 1% significance level. The log pseudo likelihood value of 57.194 which indicates that the assumption of null hypothesis that all explanatory variable in the regression model are simultaneously equal to zero is rejected at less than 1% level of significance.

Table 8. Double Hurdle model estimates of determinants of maize market participation decision and intensity of maize participation

	Market participation decision			Intensity of market participation	
Variables	Coefficient	Std error	Marginal effect	Coefficient	Std error
Age of HH	0.046**	0.019	0.0066	0.00027	0.0010
Sex of HH	0.311	0.385	0.0446	-0.0096	0.0280
Education of HH	0.246***	0.079	0.0353	0.00306	0.0044
Family size	0.163**	0.075	0.0234	0.00535	0.0038
Distance from market	-0.01*	0.0076	-0.1224	-0.0522*	0.0315
Market information	0.279	0.3149	0.04007	-0.0022	0.0212
extension contact	0.112*	0.0622	0.01602	-0.0006	0.0035
Non-farm income	-0.02	0.0453	-0.0036	0.00300	0.0028
Credit use	0.270	0.3092	0.03874	0.00135	0.0212
Lagged market price	-0.123	0.3611	-0.0176	0.05069**	0.0205
Fertilizer use	0.776**	0.3537	0.11139	0.02842	0.0244
Livestock (TLU)	0.078	0.0550	0.01120	-0.0006	0.0026
Number of oxen	0.187	0.1253	0.02678	0.0244**	0.0099
Land to maize	6.106***	1.1475	0.87649	0.0332	0.0662
Cooperative membership	0.103	0.3112	0.01476	0.0425*	0.0225
Constant	-7.215***	1.7613		0.20068**	0.0943
Sigma				0.09493	0.0063

Note: ***, ** and * show significant at 1%, 5% and 10% significant level, respectively
Source: model result of household survey data, 2019.

Age of household head (AGHH): The result shows that age of household head is found significant and positively related to the probability of participation in maize output market at 1% significance level. The marginal effect result revealed a year increases in the age of household head would results in 0.66% increases in the probability of participation in the market on average, *ceteris paribus*. As age was taken as proxy for experience in some of the previous research, here, it is also obvious that aged households in the study area were the most experienced in maize production. This result is consistent with the finding of Adenegan *et al*. (2012) and Shewaye (2015).

Educational status of household head (EDUHH): It was hypothesized to affect household decision to participate in maize output market since it is assumed that increments in educational level of household head increase the probability of participation in the market. As it was hypothesized, the econometric model result shows that there is positive and significant relationship between educational status of household head and decision to participate in maize output market at 1% significance level. It shows that as educational level of household head increase by 1 year of schooling, the probability of participation in the market would be increased by 3.5% on average, keeping other factor constant. This could be due to the fact that household head with more educational level have better market networking and bargaining power and good managerial skill of enterprises. This result is consistent with the previous finding conducted by Yaynabeba and Tewodros (2014) and Yalew (2016).

Family size (FMLZADLT): Family size measured as adult equivalent was hypothesized to have either positive or negative effect on probability of market participation decision in maize output market. As hypothesized so far, it was found to be positive and have significant influence on probability of participating in maize output market at 5% significance level. The marginal effect shows that as the member of household increased by one adult equivalent, the probability of participation in maize output market would be increased by 2.34%. This result is found as expected because households with more household member have more of labour force that tends to produce more. This finding is similar with the previous findings of Tadie and Lemma (2018).

Distance from the nearest market (DSTMKT): As it was hypothesized earlier, the econometric model result shows that there was negative and statistically significant relationship between distance from the nearest market and households' decision to participate in maize output market at 5% significant level. The marginal effects shows that as the distance from household's house to the nearest market increase by one hour, the probability of participation in the market decrease by 0.2% on average, keeping other factor constant. This implies that being a distant from the nearest market reduce the chance of supplying the produced maize to the market. This result is in agreement with previous finding conducted by Yaynabeba and Tewodros (2014); Aman *et al*. (2014); Alelign (2017) and Leta (2018). As it was hypothesized earlier, the econometric model result indicated that there was negative and statistically significant relationship between distance from the nearest market and intensity of households' participation in maize output market at 5% significant level. The marginal effects shows that as the distance

from household's house to the nearest market increase by one hour, the intensity of participation in maize output market decrease by 5.22% on average, keeping other factor constant. This implies that being a distant from the nearest market reduce the chance of supplying the produced maize to the market. This result is consistent with previous finding of Aman *et al*. (2014); Yalew (2016); Tadele *et al* (2017) and Leta (2018).

Frequency of extension contact (EXTNS): As hypothesized, frequency of extension contacts had positive effect on households' decision to participate in maize output market and the marginal effect from the first hurdle showed that how frequently household contacted with extension agent was found statistically significant at 5% significance level. The result meanings that increments in the frequency of contacting with extension agents by one day would increase the probability participating in maize output market. This result implies that the technical advice provided for farmers by concerned body on maize production and marketing have a great effects on households participation in the market. The result is consistent with the finding of Addisu (2018).

Fertilizer use (FERTLZ): As hypothesized so far, the econometric model result from the first hurdle model showed positive and significant effects of using fertilizer on household's decision to participate in maize output market at 5% significance level. The marginal effect showed that, households those use fertilizer for maize production have approximately 11.14% more probability of participating in maize output market compared to non-users. In other way, if household who did not use fertilizer starts to use fertilizer, the probability of market participation would be increased by 11.14% on average, keeping other factor constant. The result was in conformity with previous study conducted by Abafita *et al.* (2016) and Alelign (2017).

Land allocated for maize production (LNDAMZ): land allocated for maize production was positively and significantly affected household's decision to participate in maize output market at 1% significance level. The marginal effect indicates that allocating one extra hectare of land to maize production would increase the probability of participation in maize output market by 87.65% on average, keeping other factor constant. This result implies that those households allocating one more additional hectare of land by any means, i.e., from self-owned, rented-in or shared-in land raises probability of participation in maize output market. This result is consistent with the previous findings of Yaynabeba and Tewodros (2013); Shewaye (2015); Yalew (2016); Addisu (2018) and Leta (2018).

Perception on lagged market price (LMPM): The perception on the lagged price of maize was hypothesized to have significant and positively influenced the intensity or level of participation in maize output market and it was found significant as expected earlier at 5% significance level. In other way, market participation level of households' those who perceive high lagged market price would be 5.1% more than those who perceives low lagged market price. The implication is that if households perceive the lagged market price of maize to be high, the farmers would be reacted to this high price and more interested to produce and supply their production. The result is consistent with the finding of Tariku (2018).

Number of oxen owned (NOXEN): Having oxen is play vital role in farming activity. It was found positive and statistically significant at 5% significance level as hypothesized earlier. The econometric result showed that having one more extra oxen could increase the level of participation in maize output market by 5.44% on average, keeping other constant. This implies that compared to the household those own less number of oxen, the household with a number of oxen will sale more quintals of maize to the market. This result is found to be consistent with the finding of Abafita *et al*. (2016) and Leta (2018) which shows direct relationship between the quantity of crop sold and teff sold with the number of oxen respectively.

Membership to cooperative (MCOOP): It was positive and statistically significant at 1%, which means that being a member of cooperative leads to increase the intensity or level of participation in maize output market by 4.25% on average, keeping other factor constant. The implication is that membership in cooperative could have better access of market information, inputs, extension services and/or technical advice, and access to credit facilities important to production and marketing decisions. This agrees with the findings of Shewaye (2015) that being a member of producer group motivate farmers to participate in the market through networking and provision of up.

CONCLUSION

Commercial transformation of smallholder farmers is crucial to improve the well-being of farm households. This paper analyses the commercialization of smallholder maize producers in Bilo Nopa district of Ilu Ababor zone, Ethiopia using randomly selected 184 maize producers. The result showed 39.13% of sample households have not participated in the market so that their degree of commercialization was zero. The average degree of maize commercialization was 29.77% which indicates that they fall under semi commercialized category in terms of marketed maize output. This could be due to the fact that maize is mainly used as staple food despite dominantly produced crop in the area. Our result indicates that the significant determinants of market orientation level of maize producer in the study area are age of household head, Sex of the household head, family size, educational level of household head, frequency of extension contact, numbers of oxen, using fertilizer

and distance from the nearest market. Therefore, we suggest that careful attention should be given to those factors to alleviate market orientation level of maize producers in study area. The result also shows maize market participation decision is affected by age of household head, educational level of household head, family size, distance from the nearest market, frequency of extension contact, fertilizer use and allocated for maize production, Whereas the determinants of intensity of maize sale was significantly affected by distance from the nearest market, membership to cooperative, number of oxen and household perception on lagged market price. Distance from the nearest market is the only variable which has negative effect on both market orientation and market participation. Therefore, we recommend that the existing infrastructural facilities should be improved; Small holder farmer should be given training which focus on not only production but also marketing of maize produce in consultation with extension agents; strengthening linkage between smallholder farmer and extension agents. Finally, Timely provision of fertilizer at appropriate cost and arranging the means of borrowing so that smallholder maize producer's will be initiated to produce for the market and their market participation will get improved. This in turn paves the way to become commercialized. In general, this study tried to cover market orientation and market participation of maize producer so as to be called commercialization. However, it is limited to commercialization of single crop which is maize from output side in subject matter and one district which is Bilo Nopa in terms of area coverage. Therefore, we suggest that future research should focus on widening the scope interms of both area coverage and subject matter with inclusion of input side of commercialization.

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