**FOOD SCIENCE & TECHNOLOGY | RESEARCH ARTICLE**

**Determinants of agricultural commercialization in Offa District, Ethiopia**

Alula Tafesse¹*, Guta Regasa Megerssa² and Bogale Gebeyehu³

**Abstract:** The Agricultural policies in Ethiopia to improve the commercial orientation of farmers require identification of challenges at farmer level and in-depth action to shift the sector. It needs more works to be done to transform the country’s current subsistence oriented production system of smallholder farmers. Considering this fact, the current study aimed to identify the factors affecting the degree of agricultural commercialization of smallholder farm outputs in the Offa district of Ethiopia. Primary data was collected from 120 randomly selected households using a semi-structured questionnaire. The data were analyzed using descriptive and inferential statistics to describe the output market participation and difference. Furthermore, the Tobit econometric model was used to find determinants of the degree of agricultural commercialization of smallholder farms. A total of 11 explanatory variables were considered in the regression. Total cultivated land size, education, household head age, and access to transport were found significantly determining the intensity of farm output side commercialization. Concerning development authorities should focus on these variables in design, promotion, and implementation of policies and programs to increase rural household participation in commercialization and to secure its benefits in the area.

**Subjects:** Development Studies; Sustainable Development; Rural Development; Economics

**Keywords:** Market participation; smallholder farm; Tobit; Wolaita; Ethiopia

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**PUBLIC INTEREST STATEMENT**

It is known that Agriculture is the mainstay of Ethiopian economy. However, the sector is embedded with several constraints. Advancing the commercial orientation of smallholder farmers will have higher implications in improving the country’s agricultural sector. The government nowadays is trying to improve the market participation of smallholder farmers. However, it needs more works to be done in improving it for the several direct and indirect benefits that could be obtained from it. This research has observed the determinants of Agricultural output market participation of farmers in southern Ethiopia. The policymakers are required act on the possible means to minimize the challenges of marketing farm outputs. Particularly it requires capacitating farmers through education and providing access to transportation and improving market access.
1. Introduction
Agriculture has been the mainstay of the Ethiopian economy and the most volatile sector mainly due to its dependence on rain and the seasonal shocks that are frequently observed. The sector has been unable to realize its potential and contribute significantly to economic development (Teshome, 2006).

The rate of agricultural growth in Ethiopia depends on the speed with which the current subsistence-oriented production system is transformed into a market-oriented production system (Tilaye, 2010). Considering this fact, the orientation of the government policy today is to enhance the commercial orientation of farmers, i.e. letting farmers produce for the market based on the demand of the consumers and make them partners in the value chain (Ministry of Finance and Economic Development (MoFED), 2016).

Moreover, it promotes the production and marketing of high-value agricultural products to increase competitiveness in domestic, regional, and international markets. Besides, there also activities of the shift in the paradigm of strategy for food security from food production-oriented to improving food access through improving household income and promoting market-oriented production that has opened the window for engagement of smallholder farmers in market-oriented production (Ministry of Finance and Economic Development, 2010 as cited in Tufa et al., 2014).

It is mentioned that smallholder access to markets for higher-value agricultural products is recognized as a vital opportunity to enhance and diversify the livelihoods of lower-income farm households and reduce rural poverty more generally (Mondiale, 2008). In Ethiopia as Tafesse et al. (2012) indicated in 2007/08, smallholder farmers accounted for 12.8 million farmers that cultivated 12 million hectares of land or 96.3 % of the total area cultivated. The majority (more than 80%) of Ethiopian farmers are smallholders and more than 85% of the rural population relies on agricultural production for their livelihoods (Aragie, 2013).

However, in agriculture-based economies in general, the smallholder agricultural production is characterized by low output, lack of access to inputs such as land, improved seed, and fertilizer and less access to an irrigation system, little access to know-how (risk management, technology, and skill), low level of market orientation, shortage of infrastructural and institutional factors (Emana & Gebremedhin, 2007; Jaleta, 2007; Ministry of Finance and Economic Development 2010, 2010, 2014). Particularly, some works of the literature indicated that smallholder agricultural commercialization broadly affected by institutional factors, infrastructural and market-related factors, household resource endowments, and household-specific characteristics (Bekele et al., 2010; Gebremedhin & Jaleta, 2010; Gebremedhin et al., 2009; Goitom, 2009; Pender & Alemu, 2007).

As described above solving the challenges of smallholder farmer's agricultural commercialization challenges at the district level through a well-designed policy will have a big implication in shifting the most volatile sector in the country. It will have also big implications for the national economy. Therefore, it is important to identify the factors that determine the degree of commercialization of smallholder farms at the district level to use it as an input in policy designing. This study identified specific factors determining agricultural commercialization in the Offa district where no past empirical evidence addressed the issue in the area.

2. Research methodology

2.1. Description of the study area
Offa district is one of 16 districts (Woredas) in Wolaita Zone and is located at 383 km south of Addis Ababa on the Sodo Gofa main road. The district is subdivided into 21 Kebeles and has a total area of 37,356 hectares. Gasuba is the administrative center of the Offa district. In 2007 the total human population was estimated to be 127,387 and 51.5% of this were women (Central Statistical Agency, 2007). The Offa district, altitude ranges 1200 around river Gogia in the south, 2800 m above sea
level in the north (Offa Woreda Burau of Agriculture and Rural Development, 2016). Geographically Offa is located in Latitude of 6° 44’ 59.99” N and Longitude of 37° 29’ 59.99” E. Figure 1 below shows the study area map.

2.2. Types and source of data
The quantitative data was used to analyze the information that was collected using a structured household survey questionnaire from a representative sample of 120 household heads selected from the Offa district of Wolaita zone. Furthermore, secondary sources on the price of crops from different market agents (producer, broker, retailer, and consumer), etc. in the zones and districts were collected from different sources, such as government institutions, the kebele administrations, trade offices, and websites and journal articles to back up the findings from primary sources.

2.3. Sampling technique and sample size
The research has followed a three-stage sampling procedure to select the respondents.

First, from 16 districts in the Wolaita zone, the Offa district randomly selected. Next, due to the equal opportunity of smallholder farmers to participate in agricultural marketing 4 random kebeles from 21 Offa district kebeles were selected. Lastly, a list of all household heads was acquired from the respective agricultural and rural development offices of the respective kebeles (Table 1), and 120 household-head respondents were identified from identified kebeles using the simple random sampling method assisted by probability proportional to a household size of kebeles.

The Yamane (1967) sampling formula below (equation 1) was used to determine the sampling size.

| Table 1. Size of Sampled and Total Households in Selected Kebeles |
|---------------------------------------------------------------|
| **Kebeles** | **Number of Households** | **Proportional Sample Size** |
| Wachika-Esho | 413 | 28 |
| Sere-Esho | 458 | 32 |
| Busha | 514 | 35 |
| Geleko | 356 | 25 |
| **Total** | **1741** | **120** |
| Source: Authors | | |
\[ n = \frac{N}{1 + N(e)^2} = \frac{1741}{1 + 1741(0.1)^2} \approx 95 \] (1)

Where \( n \) is the sample size, \( N \) is the population size, and \( e \) is the level of precision equals 0.1.

However, to increase the reliability of the research the sample size was set to 120.

2.4. Data analysis

Descriptive and inferential statistical and econometric methods were used to analyze the primary data collected from smallholder household heads using a structured questionnaire. Descriptive and inferential statistical methods are such as measures of averages and percentages; chi-square and t-test were used to describe and analyze the household-level characteristics. Tobit regression analysis was also used to identify factors determining the decision and level of farm output commercialization of smallholder farmers. A stata software package (version 14) was used to run Tobit regression. The model checked for problems of multicollinearity and heteroscedasticity and found no serious problem, Variance Inflation Factor (VIF) is less than 10 for continuous explanatory variables and Contingency Coefficient (CC) for dummy variables found below 1 and the Breusch-Pagan test result shows a chi-square value of 0.52 (Prob > chi2 = 0.4722), respectively. According to Greene (2008), the Tobit regression model is referred to as the censored regression model or the Tobit model by Tobin (1958) where the model was first proposed. The general formulation is usually given in terms of an index function. The lower and upper censoring was made at 0 and 1 respectively considering the level of farm output commercialization (the ratio of sales to total production) that lies in ranges of 0 and 1. The model is specified in the following equation 2 below;

\[ y^* = x'\beta + \mu_i, \] (2)
\[ y = 0 \text{ if } y^* < 0, \]
\[ y = y^* \text{ if } y^* \geq 0 \]

Where,

\( y^* \) = dependent variable that measures the level of agricultural commercialization that is the ratio of sales to output ranging in between 0 and 1

\( \beta \) = vector of parameters to be estimated

\( x' \) = set of explanatory variables and

\( \mu_i \) = the disturbance term with \( i = 1, ..., N \) are independently distributed with mean and variance of 0 and \( \sigma^2 \), respectively.

Table 2 below shows the hypothesized effects of independent variables on the dependent variable.

3. Results and discussions

3.1. Statistical analysis results

As displayed in Table 3 below in household head age, cultivated land size, sex, number of family size, off-farm participation, and access to credit and irrigation the agricultural output market participants and non-participants are significantly different. However, in the level of education, the number of oxen ownership, distance to market, and transport access there is no significant difference. The proportion of male-headed market participant households is 77.5% that is quite
| Variables Name             | Description                                                                 | Measurement                                                                 | Expected sign |
|----------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------|
| Level of commercialization | Households sales to output ratio                                            | The ratio of sales to output ranges between 0 and 1                           |               |
| Sex                        | Whether the household head is male or female                                | 1 if male and 0 otherwise                                                    | +             |
| Age                        | Household head age                                                          | Years                                                                        | +             |
| Education                  | Level of formal education of the household head                             | 0 if illiterate, 1 if the primary (1–4), 2 if secondary (5–12), and 3 if tertiary (> 12). | +             |
| Family size                | Number of household members measured in the adult equivalent                | Adult equivalent                                                             | +             |
| Total cultivated land      | Amount of cultivated land size in hectar                                    | Hectare                                                                      | +             |
| Number of oxen owned       | Number of oxen owned by household in TLU                                    | TLU                                                                          | +             |
| Irrigation access          | Whether Household have access to irrigation                                  | 1 if yes and 0 otherwise                                                     | +             |
| Transport access           | Household distance to an all-weather road                                    | Kilometer                                                                    | -             |
| Distance to market         | The distance of the household to the nearest market                         | Kilometer                                                                    | -             |
| Nonfarm participation      | Whether household participated in nonfarm activities                        | 1 if yes and 0 otherwise                                                     | -             |
| Access to Credit           | Whether the household received credit from credit institutions in the 2016/17 production year | (1) if yes and 0 otherwise                                                   | +             |

higher than non-market participant male-headed households of 22.5% (Table 3). On the other hand, the mean average age of sampled market participant households is 42.63 years, and for non-participant 36.63 years that has a difference of 6 years. On average a typical market participant household attended formal basic education (1.40) ranging from 1–4 grades of schooling and that is almost similar to non-participants (1.45). The average sample market participant households have 3.15 family numbers and the non-participants have 2.52 members in adult equivalent. On the other side, on average about 1.22 ha of market participants’ land is cultivated or covered by crops while their counterparts have cultivated 0.77 ha. There is a significant mean cultivated land difference between market participants and non-participants that is about 0.51 ha. The average oxen ownership of market participants is 1.59 (TLU) and 1.14 oxen ownership in counter. Table 3 also showed that the proportion of market participant households accessing irrigation is about 17.56%; meaning 82.44% of households has no irrigation access in the study area. The average distance of households to the all-weather road for market participants is 0.71 km and their counterparts are 0.65 km. The T-test result revealed that access to transportation (all-weather road) has no significant difference. Distance to the market is, on the other hand, is another among the important factors that significantly affecting commercialization in the study area. The market participants’ average distance to the market is 8.82 km while non-participant is 9.52. From this, we can understand that households nearer to the market commercialize their agricultural output more than from households far apart from the market. In general, the 62.87% sampled households participated in the agricultural output market with
Table 3. The Demographic and Socioeconomic Characteristics of Household Heads in Offa, Ethiopia

| Variables                      | Obs | Mean/% | Std. Dev. | Min | Max |
|--------------------------------|-----|--------|-----------|-----|-----|
| **Dependent variables**        |     |        |           |     |     |
| Market participation           | 120 | 61.87  | -         | 0   | 1   |
| Commercialization              | 120 | 23.89  | 21.52     | 0   | 80  |
| Subsistent                     | 46  | 38.33  | -         | 0   | 25  |
| Transition                     | 58  | 46.67  | -         | 25.51 | 50 |
| Commercialized                 | 18  | 15.00  | -         | 50.79 | 80 |
| **Market Participant (N = 74)**|     |        |           |     |     |
| **Non-market Participant (N = 46)**| | | | | |
| **Continuous independent variables** | | | | | |
| Age                            | 42.63 | 8.36 | 36.63 | 6.69 | 6.01*** |
| Family size (ad.eq)            | 3.15  | 1.62  | 2.52   | 1.39 | 0.63** |
| Education                      | 1.40  | 0.84  | 1.45   | 1.18 | -0.05 |
| Oxen (TLU)                     | 1.59  | 0.73  | 1.14   | 0.35 | 0.45 |
| Land size                      | 1.22  | 0.67  | 0.71   | 0.48 | 0.51*** |
| Transport access               | 0.71  | 0.45  | 0.65   | 0.48 | 0.06 |
| Distance to market             | 8.82  | 5.07  | 9.52   | 4.31 | -0.70 |
| **Dichotomous independent variables** | | | | | |
| Sex                            | Male = 0 | 61 | 82.43 | 32 | 69.56 | 2.69* |
| Off-farm participation         | Participation = 1 | 12 | 16.21 | 33 | 71.73 | 4.14** |
| Credit access                  | Yes | 40 | 54.05 | 15 | 32.60 | 4.83*** |
| Irrigation access              | Yes | 13 | 17.56 | 0 | 0 | 9.06*** |

Note: *, ** and *** represent statistical significance at 10, 5 and 1%, respectively. 
Source: Research field survey result, 2015/16
a mean level of commercialization of the research area of 23.89 with a minimum of 0 and a maximum of 80%.

3.2. Determinants of agricultural commercialization

Commercialization, in general, lacks clarity in its meaning and may result in misconception and a hindrance in the transformation of policy into practice. Commercialization can occur on either side; on the output side with increased market surplus or input side with the increased use of inputs (Leavy & Poulton, 2007). The current research considered the output side commercialization. According to Gebremedhin et al. (2007), the sales-to-output ratio measures the gross value of all agricultural sales by a household as a percentage of the total gross value of its agricultural production. This approach was used in this research by including livestock in agricultural sales and gross values to measure the level of commercialization and to find the determinants of the level of commercialization. The inclusion of livestock in this approach is based on the Negassa and Jabbar (2008) concept which considered gross and market livestock off-take rates at the household level. The gross off-take rate measures the overall rate of inventory changes of livestock in a household. It categorizes births, gifts received, and purchases as incoming animals whereas deaths, sales, gifts, and slaughters are considered as outgoing ones. However, the current research included only the gross and sales value of livestock with crops. Thus, the following Table 4 represents the Tobit estimation of determining factors of the level of agricultural commercialization.

The overall significance and fitness of the model can be checked with the LR value; accordingly, Prob > chi2 = 0.00 indicates that the independent variables reliably predict the dependent variable.

The Tobit regression analysis revealed that the age of household head, education of household head, access to transport, and total cultivated land are the main variables that are a statistically significant effect on household-level of commercialization.

It is indicated that the age of the household has a positive effect on the level of commercialization, at a significance level of 1%. The marginal effects of the output indicate that a year increase in household head age will increase the probability of commercialization by 0.3 %. This result has consistency with Kirui and Njiraini (2013) that age has a positive significant effect on

| Table 4. Tobit estimate of determinants of the level of Commercialization of agricultural output in Offa, Ethiopia |
|---------------------------------------------------------------|
| **Tobit regression estimate**                                  |
| **Level of commercialization**                                 | **Coeff.** | **Std. Err.** | **P-value** | **dy/dx** | **Std. Err.** | **P-value** |
| Sex                                                           | -0.0037    | 0.0286       | 0.895       | -0.0030   | 0.0232       | 0.895       |
| Age                                                           | 0.0041***  | 0.0015       | 0.008       | 0.0033*** | 0.0012       | 0.006       |
| Education level                                              | 0.0246*    | 0.0144       | 0.092       | 0.0199*   | 0.0116       | 0.087       |
| Family size                                                  | -0.0053    | 0.0099       | 0.592       | -0.0043   | 0.0080       | 0.591       |
| Total cultivated land                                        | 0.0851***  | 0.0206       | 0.000       | 0.0689*** | 0.0162       | 0.000       |
| Number of oxen owned                                         | 0.0247     | 0.0196       | 0.976       | 0.0200    | 0.0159       | 0.976       |
| Nonfarm participation                                        | 0.0219     | 0.0224       | 0.212       | 0.0177    | 0.0159       | 0.208       |
| Access to credit                                             | 0.0301     | 0.0239       | 0.332       | 0.0244    | 0.0193       | 0.329       |
| Irrigation access                                            | -0.0011    | 0.0171       | 0.009       | -0.0009   | 0.0300       | 0.007       |
| Transport access                                             | -0.0965*** | 0.0360       | 0.212       | -0.0782***| 0.0289       | 0.207       |
| Distance to market                                           | -0.0038    | 0.0037       | 0.306       | -0.0031   | 0.0030       | 0.302       |
| Constant                                                     | 0.1201     | 0.0840       | 0.156       | -         | -            | -           |

Note: *, ** and *** represent statistical significance at 10, 5 and 1%, respectively.

Source: Research field survey result, 2015/16
commercialization. This finding also conforms with Rabbi et al. (2019), Agwu et al. (2013), Agwu and Ibeabuchi (2011) and Enete and Igboke (2009) that the effect of age on market participation has a positive and statistically significant effect and which is attributed to farming experience because older farmers have more experience of farming and are well aware of changes in weather, pesticide use, and production. Besides, the young generation does not like farming and they want to find employment in the urban area especially in the service sector (Rabbi et al., 2019; White, 2012). On the other hand, it contradicts Randela et al. (2008) finding that stated younger farmers are innovative and they understand the need for the day and are aware of the benefits which commercialization provides. In addition to this Akinlade et al. (2013) study on vegetable farmers in Southwest Nigeria, explained at intermediate ages, market participation increases with age.

Household head education level is also an important factor in having a positive effect on the level of commercialization of smallholders in the study area. It has positive relations and significant at a 10% confidence level. The marginal effect result shows that, for a level increase in education, it increases the probability of commercialization of output by 1.99 %. This implies that if the level of education increases by one, then the probability of commercialization increases by 1.99 %. Rabbi et al. (2019) also indicated that vocational training has a positive effect on the level of commercialization of smallholder farms. This implies that households with a higher level of education will have more information about the market and benefits obtained from commercializing the agricultural outputs.

Total cultivated land is another important factor in affecting the probability of commercialization of smallholders in the study area. It has positive relations and significant at a 1% confidence level. The marginal effect result shows that for an increase in the size of cultivated land in hectare then the probability of commercialization increases by 6.89 %. This implies that if the cultivated land increases by one hectare, at mean value, then commercialization increases by 6.89 %. Ele et al. (2013) also found a similar result that the size of land used for cultivation is an important factor determining the level of commercialization of smallholder farms. This implies that households with a higher size of cultivated land will have a higher amount of marketable surplus.

Finally, it was identified that access to transport also has negative relations and significant at a 1% confidence level. The marginal effect of the Tobit regression result shows that if a typical smallholder farmer distance to all-weather road increase in one kilometer; the probability of commercializing agricultural output will decrease by 7.82%. The result is in line with that of Fredriksson et al. (2017) that indicated inadequate market and transport infrastructure affects negatively the share of output sold. This implies that a typical farmer will commercialize his/her output market if it is not difficult to get transport. This is due to higher/lower transaction costs. Deterioration in the road condition reduces the number of animals offered for sale. This is because road transportation by truck is the most important mode of transporting trade cattle across the cattle corridor (Ruhangaweboere, 2010).

4. Conclusions and policy implications
The current research analyzed the factors determining the market participation of smallholder farmers of agricultural output, level of market participation of smallholder farmers in the Offa district of SNNPR state of Ethiopia. The study result found that households in the research area are subsistence with a mean level of commercialization of 23.89%.

The descriptive and inferential statistical results of the study have indicated that farmers operating at different levels of commercialization. Female-headed households are less concentrated in agricultural output market participation (17.57%) and the majority of male-headed households are involved in the agricultural output market that is significantly different. Moreover, there is also a significant difference between market participants and nonparticipants in the age of household head, cultivated land size, number of family size, access to credit and irrigation, and participation in nonfarm activities.
Lastly, the study finding has revealed that the age of household head, household level of education, access to transport, and total cultivated land are the main variables that are statistically significant factors determining household-level of commercialization. All except access to transport are positively influenced by the level of commercialization.

Thus, the following recommendations were set. It needs increased investment on infrastructure (especially transport access) to sustain benefits from participating in commercializing activities of farming outputs that can contribute to improved livelihood of smallholder farmers. Furthermore, it also requires greater investment in education and training marketing of agricultural commodities to improve the level of commercialization and to equip smallholder farmers to secure good livelihoods. Finally, in design, promotion, and implementation of policies and programs related to increase rural household agricultural commercialization and to secure benefits household head age and land size should be considered.

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Competing Interests
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Note
1. The smallest administrative unit of Ethiopia, similar to a ward, a neighborhood or a localized and delimited group of people

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