Trends and determinants of coffee commercialization among smallholder farmers in southwest Ethiopia

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Transforming agricultural output from subsistence to commercial based is being the crucial option for many agriculture dependent developing countries. This study was aimed to assess coffee commercialization trends and factors that affect coffee commercialization level. Primary data was collected from 156 households of three coffee potential districts of Jimma zone through personal interviews. Descriptive statistics and econometric models were used to analyze the data. The result of the study revealed that the mean coffee consumption level was 21.6 % and the overall mean commercialization level was 68 % which is higher at Manna district (74 %). The results of Tobit model also shows distance to main market and distance to marketing cooperatives, transport cost and land allocated for other crops affects level of coffee commercialization negatively and significantly. However, total land holding of the household head, coffee price and volume of coffee produced affects level of commercialization positively and significantly. It is recommended support towards developing institutional sectors like marketing cooperatives and improving physical access to market places could yield positive results towards coffee commercialization by smallholder coffee producers.

Key words: Coffee, Commercialization, Marketing cooperatives, Subsistence, Tobit model

INTRODUCTION

In Ethiopia, over 96% of total agricultural land is cultivated by smallholder farmers and on average those smallholders cultivate less than one hectare of land (EEA, 2006). This fragmented agricultural production increases transaction costs and reduces farmers’ incentives to produce for the market. Transforming agricultural output from subsistence to commercial based is being the crucial option for many agriculture dependent developing countries. Agricultural commercialization is the percentage of agricultural outputs that is sold or marketed. The yardstick of agricultural commercialization at household level differs among authors. Govereh et al., (1999) and Strasberg et al., (1999) used a household commercialization index, which is a ratio of the gross value of all crop sales per household per year to the gross value of all crop production. The closer the index is to 100, the higher the degree of commercialization. It can also be measured in terms of net market position according to Gebremedhin et al., (2007). The market position of a household is evaluated using the ratio of volume of sales to the total volume of stock which is the sum of storage from the previous production year and production in the current year.

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Results of different empirical studies shows demographic, social, economic and institutional factors affect commercialization (market participation) and its extent. Tufa et al., (2014) used truncated regression model to identify factors affect household’s horticultural crops commercialization level. The result shows education of the household head, irrigation availability, farm size and livestock ownership by the head affected the level of commercialization of horticultural crops positively and significantly. However, household size and distance to the market affected commercialization level negatively and significantly. Tobit estimation was used by Gebremedhin and Jaleta, (2007) to analyze determinants of crop output market participation. Accordingly, education of the household head, number of oxen owned and market orientation index affected participation or commercialization level positively and significantly while distance to settlement center to nearest market place affected the participation level negatively and significantly. Agwu et al., (2013) used multiple regression to identify factors affect commercialization level of smallholder farmers. Household size and distance to market was negatively and significantly affected commercialization decision. However, income of the household, farming experience, farm size, farmer’s membership to associations and accessibility to credits affected commercialization positively and significantly. Tobit estimation was also used by Goshu et al., (2012) to determine intensity of commercialization (%) for both crop and livestock. The size of cultivated land, quantity of fertilizer needed annually for crop production, livestock holding and family size affected commercialization intensity of livestock positively and significantly while distance to development stations affected negatively and significantly. On other hands, quantity of fertilizer needed annually for crop production, production of major cash crop and distance to major town affected crop commercialization intensity positively and significantly. Gebreselassie and Ludi, (2008) used linear regression to assess the proportion of output sold to the market and determinants of market participation. The result identified value of output produced and specialization in coffee production affected extent of market participation positively and significantly and proportion of food purchase affected extent of market participation negatively and significantly. The degree of coffee commercialization was higher among households with smaller families, households headed by women and households headed by older persons. However, neither the demographic and household factors considered (gender, age, and family size) nor farm size had any significant effect on the observed variation in the degree of coffee commercialization among sampled households. Martey et al., (2012) used Tobit model to identify factors determining the intensity of cassava commercialization. The authors found marital status, household head’s age, extension access, distance to market places and access to market information affected cassava commercialization intensity negatively and significantly. However, number of adults in the household, farming experience, volume of cassava produced, farm size, cassava price and off farm income affected positively and significantly.

Coffee is the mainstream of Ethiopian economy. It directly or indirectly affects the livelihood of 15 million Ethiopians. Coffee contributes 25% to total export earnings (USDA, 2013). Despite its gigantic socio economic contribution to the country, smallholder farmers dominate its production (95% of coffee production) which resulted to limited market participation (McMillan et al., 2003). Regarding commercialization, the research finding of Gebreselassie and Ludi, (2008) revealed that the index of household coffee commercialization ranged from zero (for 10% of households) to 100% (for 10.6% of households) across the sampled house-holds, with the mean value of 59%. Ghibmi and Gomma districts sold 66% and 63% of their coffee output respectively. Concomitantly, Aleta Wondo and Yirgachefe districts’ coffee commercialization index was 53% and 56% respectively. The result of the study also revealed that coffee contributed 70% to the total value of output sold in the market by the average farmer.

Studies witnessed there is very low level of commercialization among smallholder farmers in Ethiopia (Jaleta and Gardebroek, 2008; Adane, 2009; Bedaso et al., 2012). The commercial behavior of smallholders and the commercialization extent at which they are operating is a crucial research question to be addressed. Although there is relatively rich body of literature, analyzing the extent and trends of commercialization in coffee sector have received little attention not only in the study area but also in the country. The main objective of the study was to identify coffee commercialization and utilization trend in Jimma zone. The specific objectives of the study was to: assess level of coffee production, consumption and commercialization by smallholder farmers of the study area; to analyze institutional and socio economic factors affecting smallholder coffee commercialization extent; to suggest policy analysts and extensionists the way coffee production and commercialization could be enhanced and promoted in a sustainable manner.

**MATERIALS AND METHODS**

**The study area**

The study was conducted in Jimma zone which is located 335 km to the South west of Addis Ababa in the Ethiopia – Africa. The zone extends between 7°13’ – 8°56’ North latitudes and 35°49’-38°38’ East longitudes. It is bordered with East Wollega zone in the North, with East Shoa zone and Southwest Shoa zone in North East, with south nation, nationalities and people’s administration in the South East and South part, and with Ilu-Ababora zone in the West.
The zone is characterized by a tropical highland climate with heavy rainfall, warm temperatures and a long wet period. The mean annual rainfall ranges between 1,200 mm and 2,500 mm. Coffee is produced in 13 of 18 districts of Jimma zone; meaning coffee is the major contributor to the socio economic well-being of the zone as well as for Ethiopia. Jimma town is the capital of Jimma zone.

Limu-kosa, Gomma and Manna districts of the zone were randomly selected from the coffee potential districts for this specific study. Gomma district is located 397 km to southwest of capital Addis Ababa and 50 km away from Jimma town. The annual rainfall varies between 800-2000 mm. The agro climate of the district is highland (8%); intermediate high land (88%) and low land (4%). Manna is another major coffee producing district in Jimma zone, which is located at 368 km southwest of Addis Ababa and 20 km west of Jimma town. The district constitutes 12% highland, 65% intermediate highland and 23% lowland with altitude ranges between 1470–2610 m.a.s.l. Limu-kosa is also another coffee producing district in Jimma zone, which is located at 421 km from the capital Addis Ababa and 20 km from north of Jimma town. The agro climate of the district is intermediate highland (65%), highland (25%) and lowland (10%).

Sampling procedure

A three stage sampling procedures were followed to select sample households. In the first stage, coffee potential districts were identified in collaboration to Jimma zone coffee staff. In the second stage, peasant associations of the districts were picked randomly and finally a random of households were identified with development agents of the respective peasant association. Farmers from three districts and twelve peasant associations as well as sixty four villages were randomly chosen for the survey.

Data type and collection

Primary data was collected from 156 coffee producing households of the selected districts, peasant associations and villages of the zone. All attitudinal, institutional, demographic and socioeconomic factors related to the farmers were collected through personal interviews. Structured questionnaire prepared for household heads were filled by the help of selected and well trained enumerators. Few secondary data like socio economic data of the study areas was also gathered from zonal and district bureaus of agriculture and natural resource development to supplement the primary data.

Data analysis

The Statistical Package for the Social Sciences (SPSS version-20) was used for data entry while STATA 12.1 was used for data cleaning and analysis. Descriptive statistics and econometric models were implemented to analyze the data collected from households. Tobit model was used to determine factors determining level of commercialization of coffee. The Tobit regression model is employed to quantify the magnitude and direction of the effects of the factors influencing commercialization of smallholder agriculture. Most studies have modeled agricultural commercialization as a two-step analytical approaches involving the unobservable decision to commercialize and the observed degree or extent of commercialization (Alene et al., 2008). The structural equation of Tobit model is:

$$y_i^* = X_i \beta + \epsilon_i$$

Where: $\epsilon_i \sim N(0, \sigma^2)$, $y_i^*$ is a latent variable that is observed for values greater than $\Gamma$ and censored otherwise. The observed $y$ is defined by the following measurement equation

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases}$$

The likelihood function for the censored normal distribution in Logit model is:

$$L = \prod_{i=1}^{N} \left( \frac{1}{\sigma} \phi \left( \frac{y_i - \mu}{\sigma} \right) \right)^{d_i} \left[ 1 - \Phi \left( \frac{\mu - \Gamma}{\sigma} \right) \right]^{1-d_i}$$

Where, $\Gamma$ is the censoring point. In the traditional Tobit model, we set $\Gamma = 0$ and parameterize $\mu$ as $X \beta$. This gives us the likelihood function for the Tobit model:

$$L = \prod_{i=1}^{N} \left( \frac{1}{\sigma} \phi \left( \frac{y_i - X_i \beta}{\sigma} \right) \right)^{d_i} \left[ 1 - \Phi \left( \frac{X_i \beta}{\sigma} \right) \right]^{1-d_i}$$

The log-likelihood function for the Tobit model is:

$$\ln L = \sum_{i=1}^{N} \left\{ d_i (-\ln \sigma + \ln \phi \left( \frac{y_i - X_i \beta}{\sigma} \right)) + (1 - d_i) \ln [1 - \Phi \left( \frac{X_i \beta}{\sigma} \right)] \right\}$$

The overall log-likelihood is made up of two parts. The first part corresponds to the classical regression for the uncensored observations, while the second part corresponds to the relevant probabilities that an observation is censored. Expected value of the latent variable $y^*$:

$$E[y^*] = X_i \beta$$

Marginal effect on the latent dependent variable, $y^*$:

$$\frac{\partial E[y^*]}{\partial X_i} = \beta_k$$

The reported Tobit coefficients indicate how a one unit change in an independent variable $X_k$ alters the latent dependent variable (Sigelman, 1999; Wooldridge, 2002).
The Tobit model, in our case, analyses factors determining level of coffee commercialization (0 to 100% of coffee supplied to the market) on the study area. The following independent variables were used on the model considering model specification methods. The description and hypothesized sign of those variables are explained above on the table 1.
RESULTS AND DISCUSSION

Characteristics of respondents

Of the total 156 households, 92% are men headed and 8% are women headed households. Regarding the educational status of the households, 17% were non educated, 43% read and write, 27% attended primary education and 13% were attended secondary education and above. Out of the total respondents, the means of livelihood for 94% of them were farming and the means of livelihood of 6% of respondents was farming plus petty trade. Manna district farmers were relatively aged and had relatively high farming experience. The average family size of respondents is 4.53 where the highest family size is at Manna (4.98) and lowest family size is at Limu-kosa (3.99). The average coffee land holding was high at Limu-kosa (2.08 hectares) and the lowest was seen at Manna district (1.81 hectares). Similarly, the average total land holding was high at Limu-kosa (3.63 hectares) and low at Manna (2.24 hectares) (Table 2).

Institutional accessibility of respondents by districts shows that Manna district is more accessible to village market and Gomma district farmers are less accessible. Similarly, Manna district is more accessible to cooperatives and extension services. However, Gomma district is less accessible to main market, cooperatives and extension services. Comparatively, Limu-kosa district farmers are more accessible to main market (Table 3).

Coffee production trends

The result of the survey shows huge fluctuation of coffee production in the last five years of production. The mean peak year of production of the individual coffee farmers was 2014 on all districts and the lowest production was seen on 2011(Figure 2) on both Manna and Gomma district while it was on 2015 on Limu-Kosa district (1722 kg).

Coffee utilization trends

The survey found that the higher mean per capita coffee was produced at Manna district (2843 kg) and the least mean coffee was produced among Gomma farmers (1720 kg).
Figure 2. Coffee production trend by year

Table 4. Coffee utilization trends

<table>
<thead>
<tr>
<th>Coffee</th>
<th>Manna Mean ± S.D</th>
<th>Gomma Mean ± S.D</th>
<th>Limu-kosa Mean ± S.D</th>
<th>Overall Mean ± S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Production (kg)</td>
<td>2843.6 ± 4532.71</td>
<td>1719.8 ± 821.53</td>
<td>1721.9 ± 1436.8</td>
<td>2094.9 ± 2263.7</td>
</tr>
<tr>
<td>Mean Sale (kg)</td>
<td>2108.9 ± 1477.51</td>
<td>1102.5 ± 664.11</td>
<td>1079.2 ± 859.34</td>
<td>1430.2 ± 1000.3</td>
</tr>
<tr>
<td>Paid in kind for land (kg)</td>
<td>25.3 ± 21.17</td>
<td>67.4 ± 33.73</td>
<td>-</td>
<td>30.88 ± 18.3</td>
</tr>
<tr>
<td>Paid in kind for labor (kg)</td>
<td>55.4 ± 104.86</td>
<td>146.4 ± 132.41</td>
<td>188.7 ± 337.22</td>
<td>130.17 ± 191.49</td>
</tr>
<tr>
<td>Payment for others (kg)</td>
<td>15.5 ± 13.82</td>
<td>25.6 ± 17.95</td>
<td>34.7 ± 22.21</td>
<td>25.27 ± 17.99</td>
</tr>
<tr>
<td>Gift/Donation (kg)</td>
<td>31.9 ± 33.93</td>
<td>15.3 ± 15.61</td>
<td>32.7 ± 32.91</td>
<td>26.64 ± 27.48</td>
</tr>
<tr>
<td>Consumption</td>
<td>197.1 ± 55.77</td>
<td>160.9 ± 43.18</td>
<td>198.2 ± 79.13</td>
<td>185.4 ± 59.36</td>
</tr>
<tr>
<td>In stock for consumption (kg)</td>
<td>409.5 ± 127.33</td>
<td>201.4 ± 168.89</td>
<td>188.4 ± 123.33</td>
<td>266.4 ± 139.85</td>
</tr>
</tbody>
</table>

kg). Few of the coffee produce serve as a payment for land, labor and other payments though gift and donation of coffee is also common in the areas. The extent of coffee consumption on all districts ranges from 21-22.5% and the mean overall consumption level was 21.6% (Table 4). This shows no wider fluctuation was seen in coffee consumption among districts and individual farmers.

The figure below also summarizes the overall coffee utilization trend in the study area. The result revealed that 68% was sold and 22% was consumed at home. On other hands, 6% of coffee was paid in kind for labor which is very common in the study area (Figure 3). During peak coffee picking period, labor shortage hinderances coffee picking. The only option to use is payment of coffee in kind as the laborers prefer this type of payment.

The result of the survey on the study area shows difference in the extent of coffee commercialization among different geographical locations. The overall mean commercialization level was 68% as mentioned above and Manna district farmers sold more coffee (74%) of their total production and Gomma and Limu-kosa farmers sold 64% and 63% of their coffee produce respectively (Figure 4).

Coffee marketing outlets

The result of the survey also shows only 3% of coffee was sold by women; 51% of coffee was sold by men in the married households and 46% of the coffee was sold by
both men and women indifferently. More than 69% of coffee was sold from December to January and the rest 31% was sold in all months through the year except on August, September and October. The mode of transport for coffee used on the study area was truck, public transport, donkey, cart and back (head) load. However, more than 70% of respondents used donkey as a mode of transport for coffee. The market outlet preference by farmers showed that 73% of respondents used formal coffee trader and 15%, 9% and 3% of respondents used informal buyers, cooperatives and brokers respectively as summarized on below (Figure 5).

Farmers were raising different reasons for the preference of market outlet they sold for. The criteria of the respondents include market accessibility, trustworthy of the trader, market cost, optimum price and lack of other market outlet alternatives. The descriptive result shows accessibility and optimum offer (price) of the trader accounts more than 47% and 23% respectively though market transaction cost, trustfulness of the buyer and lack of further alternatives were important criteria they considered.

**Determinants of coffee commercialization**

Percentage of coffee sold relative to the produced was a dependent variable for the Tobit model and some demographic factors, economic factors and institutional factors was considered as independent variables. The
result of Tobit model showed that location difference, distance to cooperatives, distance to main market and transport cost to the main market, coffee produced by the farmer and land holding affects coffee commercialization level significantly.

**District**

The result of the survey shows that amount of coffee supplied to the market or commercialized was higher and significant at Manna district. The coefficient of Manna...
The result of trend also shows positive and significant relation between the volume of coffee produced and commercialized (coefficient= 0.454) which is in line with the hypothesized sign. The marginal effect was also significant at 1% significance level and the marginal effect was also significant at 1%. The result is in line with the findings of Goshu et.al., (2012) and Martey et al., (2012) which witnessed positive relation between volume produced and commercialization intensity. They also found the positive relation between commodity price and commercialization volume or output supplied to the market which corroborate with the finding of this study.

Coffee volume and price

The result of the study also shows positive and significant relation between the volume of coffee produced and commercialized (coefficient= 0.454) which is in line with the hypothesized sign. The marginal effect was also significant at 1% significance level. On other hands, there was a positive relation between level of coffee commercialized and coffee price (coefficient= 0.435) which was significant at 1% significance level and the marginal effect was also significant at 1%. The result is in line with the findings of Goshu et.al., (2012) and Martey et al., (2012) which witnessed positive relation between volume produced and commercialization intensity. They also found the positive relation between commodity price and commercialization volume or output supplied to the market which corroborate with the finding of this study.
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Accepted 14 July, 2016.


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