# Determinants of Honey Marketing in Domestic Market Channel: The Case of Bahir Dar Zuria Woreda, Amhara Region, Ethiopia

***Tadesse Adgo*** [*] and ***Abrham Seyoum*** [**]

## Abstract

This study was aimed at analysing the determinants affecting the market channel choices of honey producers in Bahir Dar Zuria Woreda of West Gojjam Administration Zone. The study largely used primary data collected from 125 randomly selected beekeepers in the Woreda through structured questionnaire. Both descriptive statistics and econometric models were used for analysis. The descriptive statistics result indicated that 69.6% of sample households chose collector market channel, 9.6% chose cooperative market channel and 20.8% chose consumer market channel to sell their honey. Multivariate probit model was used to identify determinants of market channel choices and the results showed that experience of beekeeping, cooperative membership, transport facility and time of selling of honey product had significant effect on honey producers' choice of market outlets. The probability of choosing local collector, cooperatives and consumer outlets is 60.7%, 19.6% and 34.9%, respectively. Local collectors were the most likely chosen market outlets while cooperatives were the less likely chosen market outlets. The combined probabilities of households to jointly choose the three market outlets was 0.07%, which was lower than the likelihood of not choosing all market outlets (which was 6%). This suggested the need to invest on improving the present transportation facilities, market information delivery system and establishing strong farmers' cooperatives to assist beekeepers so that they choose the more rewarding market channels.

**Keywords:** market channel choice, honey, multivariate probit model, Bahir Dar Zuria district

[*]Project Coordinator, Nature and Biodiversity Conservation Union Project, E-Mail: tadesseadgo@gmail.com.

[**]Assistant Professor, Center for Rural Development, College of Development Studies, Addis Ababa University.

## 1. Introduction

Beekeeping is the rearing of bees with the aim of exploiting its products such as honey, pollen grain, propolis, and brood (Onwumere et al. 2012). Beekeeping is considered as biodiversity-conserving and environmentally friendly activity because of its plant pollination services (Gidey and Teferi 2010). In addition to this, its contributions in poverty reduction and sustainable development activities have been well recognized and emphasized by the Government of Ethiopia (Guesh and Asaminew 2016). Consequently, the government has identified beekeeping sub-sector as one of the engines of economic growth with its potential in poverty reduction and conservation.

According to Belets and Berhanu (2014), beekeeping is a promising off-farm enterprise, which directly and indirectly contributes to the national economy, in general, and smallholders' income, in particular. Besides, beekeeping is eco-friendly activity that does not required more extensive land and it is an activity of rural smallholders that can be operated side by side with other activities to augment their income (Workneh 2011; Desalegne 2011).

Ethiopia is one of the top 10 producers of honey in the world, and it is the largest in Africa (USAID and AGP-AMD 2012). The country's potential for honey production, the variety of natural honey flavours associated with the country's diverse sources of bee forage, and the desirable qualities of its honey, such as low moisture content, have been widely recognized (Bekalu and Workalemahu 2019). However, according to MoA and ILRI (2013), enhancing the ability of poor farmers' access to market outlets is still a great challenge that undermines the contribution of the sector to both local and foreign markets.

A number of studies have been carried out on value chain analysis of various products in Ethiopia (Shewaye 2016; Atsbaha 2015). However, studies on value chain analysis are scant in Amhara Region and the existing few studies are focused on cereals and vegetables (Tadesse 2018). A thesis by Mulugeta (2018) dealt on value chain analysis of honey in North Showa

of the Amhara Region and there are no available studies on honey value chain analysis in Bahir Dar Zuria Woreda. Besides, earlier studies on the determinants of market channels by smallholders employed Multinomial Logit and Heckman's Two Stage models, which did not effectively handle the existence of overlapping choices of market channels by rural households. Moreover, Bahir Dar Zuria Woreda is believed to have diversified types of vegetation and cultivated crops and is expected to be potential for beekeeping activities. Though there is significant number of bee colony and honey production in the Woreda, so far there is no compiled and reliable information on honey marketing system in the area. The numbers of beekeepers, bee colonies, amount of honey, type of beekeeping practiced and marketing constraints were not known. The total hive population (bee colony) in the Woreda was 7608 hives and 11.7 tone honey were produced (BDWoA 2017). However, the research on beekeeping in the study area mostly focused on yield enhancement and production practices and bee disease (USAID 2012). Irrespective of the substantial honey production in the study area, there was no organized marketing system attracting beekeepers. Therefore, this study would help to generate ideas for improvement on the marketing situation of the honey at domestic or local level. Accordingly, the overall objective of the study was to analyse the determinants of honey marketing in domestic market supply chain in Bahir Dar Zuria Woreda.

## 2. Description of the Study Area

This study was conducted in Bahir Dar Zuria Woreda in 2018. The woreda was selected based on its huge potential for honey production and the relatively better experience of farming households in beekeeping.

The Woreda is located 565 kms North West of Addis Ababa and is bordered by Yilmana Densa to south, Mecha to the southwest, North Achefer to northwest and South Achefer to west. Lake Tana in the north, and the Abay River in the east separate the Woreda from the Debub Gondar Zone. The Woreda falls within the cool semi-humid climatic zone that represents an altitude of 1800–2400 masl and a mean annual temperature of 18.50 $^{0}$C. The mean annual rain fall is 1447 mm ranging from 895mm to 2036 mm. The

rainy season occurs between June to September with the highest mean recorded in July (4490mm) and the minimum rainfall in September (BDWoA 2017).

The dominant agricultural farming system in the study area is characterized by mixed farming with huge diverse livestock resources including 7,806 honey bee colonies. Honey producers in the study area were faced with marketing problem due to distance to market, lack of market information and lack of access to extension services. As a result, farmers supplied very low amount of honey to the market (Awraris et al. 2012). Thus, marketing channel choice was one of the important decisions of beekeepers and it had a great impact on household income (Shewaye 2016).

## 3. Methods

### 3.1. Survey and Design Data

The study was cross-sectional and quantitative and qualitative methods were employed to collect data from primary and secondary sources. The primary data were collected from sample respondents by using pre-tested and structured questionnaire. For the purpose of data collection, appropriate enumerators were selected and trained.

A multistage sampling technique was applied to select the sample respondents required for the study. Bahir Dar Zuria Woreda was selected from west Gojjam zone purposively based on its high honey production as it is located near to Lake Tana area where water and bee forage resources are available in a better condition than other woredas. In the second stage, out of the total 32 Kebeles of the Woreda, 4 potential honey producer Kebeles were identified purposively. In the third stage of sampling, 125 sample farmers were selected from beekeepers using probability proportional to size sampling technique following Yamane (1967) formula as indicated below:

$$n = \frac{N}{1 + N(e^2)} = \frac{12300}{1 + 12300(0.09^2)} = 125$$

Where, n = sample size, N= Population size and e = level of precision assumed 9%.

### 3.2. Method of Data Analysis

To analyse the determinants of market channel choice, Multivariate Probit model was applied as in Kassa et al. (2017). The observed outcome of market channel choice can be modelled following random utility formulation. Consider the **i**th farm household (i=1, 2….. N), facing a decision problem on whether or not to choose available market outlets. Let $U_0$ represent the benefits to the farmer who chooses wholesalers, and let $U_k$ represent the benefit of **i**th farmer to choose the $K^{t\square}$ market outlet: where K denotes choice of local collectors ($Y_1$), cooperatives ($Y_2$), Consumers and ($Y_3$). The farmer decides to choose the $K^{t\square}$ market outlet if:

$$Y_{ik}^{*} = U_k^{*} - U_0 > 0 \qquad (1)$$

The net benefit ($Y_{ik}^{*}$) that the farmer derives from choosing a market outlet is a latent variable determined by observed explanatory variable ($X_i$) and the error term ($\varepsilon_i$):

$$Y_{ik}^{*} = X_i\beta_k + \varepsilon_i w\square ereK = Y_1, Y_2 and Y_3 \qquad (2)$$

Using the indicator function, the unobserved preferences in equation below translates into the observed binary outcome equation for each choice as follows:

$$Y_{ik} = \begin{cases} 1\ if Y_{ik}^{*} > 0 & w\square ereK = Y_1, Y_2 and Y_3 \\ 0\ ot\square erswise \end{cases} \qquad (3)$$

In multivariate model, where the choice of several market outlets is possible, the error terms jointly follow a multivariate normal distribution (MVN) with zero conditional mean and variance normalized to unity (for identification of the parameters) where $(\mu_{y1}, \mu_{y2}, \mu_{y3})MVN \sim (0\Omega)$ and the symmetric covariance matrix Ω is given by:

$$\Omega = \begin{bmatrix} 1 & \rho_{y_1 y_2} & \rho_{y_1 y_3} \\ \rho_{y_2 y_1} & 1 & \rho_{y_2 y_3} \\ \rho_{y_3 y_1} & \rho_{y_3 y_2} & 1 \end{bmatrix} \qquad (4)$$

Of particular interest are off-diagonal elements in the covariance matrix, which represent the unobserved correlation between the stochastic components of the different type of outlets. This assumption means that equation (3) generates a MVP model that jointly represents decision to choice particular market outlet. This specification with non-zero off-diagonal elements allows for correlation across error terms of several latent equations, which represents unobserved characteristics that affect the choice of alternative outlets.

Following the form used by Cappellarri and Jenkins (2003), the log-likelihood function associated with a sample outcome is then given by;

$$lnL = \sum_{i=1}^{N} \omega_i ln\Phi(\mu_i, \Omega) \qquad (5)$$

Where, $\omega$ is an optional weight for observation i, and $\Phi$ is the multivariate standard normal distribution with arguments $\mu_i$ and $\Omega$, where $\mu_i$ can be denoted as:

$$\mu_i = \left(K_{i1}\beta_1' X_{i1}, K_{i2}\beta_2' X_{i2}, K_{i3}\beta_3' X_{i5}\right) with\, K_{ik} = 2y_{ik} - 1, for\, each\, j,k = 1, \ldots, 3 \qquad (6)$$

$$\Omega\, as\, elements\, \Omega_{jk}, where\, \Omega_{jj} = 1\, for\, j = 1, \ldots, 3;\ \Omega_{21} = \Omega_{12} = K_{i1}K_{i2}\rho_{21}, \Omega_{31} = \Omega_{13} = K_{i3}K_{i1}\rho_{31}, and\, \Omega_{31} = \Omega_{13} = K_{i3}K_{i2}\rho_{32}.$$

## 4. Results and Discussion

In this section, results of the data gathered from 125 respondents and analysed using both descriptive (demographic, socio-economic and marketing features) and econometric (the determinants of market channel choices of households) analyses are presented and discussed.

### 4.1. Types of hives owned by Households

Ethiopian honey production is characterized by the widespread use of traditional technology, resulting in relatively low honey supply and poor quality of honey harvested when compared to the potential honey yields and

quality gains associated with modern beehives. In Ethiopia, honey production remains traditional as 94 to 97% of bees are still kept in traditional hives. The study households used three different types of bee hives, namely 'traditional', 'top bar' (Transitional) and 'modern' beehives for honey production (Karealem et al. 2009) (Table 1).

Table 1. Type of hives owned by sample households (N=125)

| **Type of hives** | **Number of hives** | **Per cent** |
|---|---|---|
| Traditional hives | 1694 | 85.1 |
| Top bar hives | 283 | 14.2 |
| Modern hives | 13 | 0.7 |
| **Total number of beehives** | **1990** | **100** |

***Source:*** Survey result (2019)

According to the survey result, the majority of the beekeepers owned traditional hives. That is probably because it is easy to make traditional hives from locally available materials like bamboo and other shrubs. The use of traditional hives would result in lower supply of honey to the market as productivity of traditional hives is low.

### 4.2. Major problems of honey production and marketing

The major problem that affected honey production in the study area were lack of forage, chemical spray, shortage of skill and training, and bee predators (Johannes 2005).

**Problems of honey production:** the study result showed that 57.6% of honey production problem was chemical spray intended to kill pests on crops but also killed foraging bees especially at flowering period when bees busily collected nectar and pollen. Lack of skilled and trained producers, lack of bee forage during dry season and effect bee predators, especially ants and termites, contributed to the problems of honey production at varying degrees (Table 2). Our result is similar to findings of Kosgei et al. (2011), Tessega (2009), and Workneh (2007).

Table 2. Major problems of honey production

| Type problems | Frequency | Percent | Rank |
|---|---|---|---|
| Lack of bee forage | 18 | 14.4 | 3 |
| Chemical spray | 72 | 57.6 | 1 |
| Lack of Skill and training | 20 | 16.0 | 2 |
| Bee predators (ants, termites) | 15 | 12.0 | 4 |
| ***Total*** | ***125*** | ***100.0*** | **-** |

**Problems of honey marketing**: According to 41.6% of the respondents, the major honey marketing problem in the study areas was supply of low-quality product to market which resulted either in producers getting less price or total rejection of the product by buyers. Another market problem (35.2%) was lower availability of honey product in the market which discouraged door to door collection by local collectors. Producers, thus, had to go long distances to sell their honey. Other problems included price variation (7%), mainly related to honey yield quality, honey colour, time of selling and storage facilities and lack of marketing information (7%). Respondents believed that lack of market information was due to absence of well-organized marketing channel for honey which resulted in lack of grading and standardizing of the product, poor quality control, and inadequate and inconsistent supply to the next users in the chain as observed by Yetimwork (2015).

### 4.3. Honey market channel choice and determinants of channel choice

Respondents in this study sold their honey using different marketing outlets. The common market channel choices in the study area were local collectors' cooperatives and consumers. Table 3 below revealed that various proportions of sample beekeepers chose to sell their honey for local collectors, cooperatives and consumers. The total amount of honey yield sold by respondents for different market channels was 9638 kg in 2018 production year.

Table 3. Honey market channel choice of producers

| Market channel | Producers | Per cent | Sold amount (kg) |
|---|---|---|---|
| Local collectors | 87 | 69.6 | 6708.0 |
| Cooperatives | 12 | 9.6 | 925.3 |
| Consumers | 26 | 20.8 | 2004.7 |
| Total | 125 | 100.0 | 9638.0 |

***Source:*** survey result (2019)

The main marketing channel is producers-collectors=consumers. The proportion sold through cooperatives was just small (9.6%). The average age of the respondents was 35.05 years for local collectors, 44.75 for cooperatives, and 33.5 for consumers (Table 4). The results revealed that older beekeepers significantly preferred cooperatives ($p<0.01$) to other market channels to sell their honey (Table 5), probably due to long-standing relationships and trust established between the beekeepers and the cooperatives, as previously reported by Tezera (2013).

Table 4. Summary of results of continuous independent variables

| Variable | Mean across choice of market channel | | | F- value |
|---|---|---|---|---|
| | *Collectors* | *Cooperatives* | *Consumers* | |
| Age of household head | 35.05 | 44.75 | 33.5 | **2.011**$^{***}$ |
| Ave. no. of beehives owned | 16.8 | 13.9 | 13.6 | **133.639**$^{***}$ |
| Total honey produced (kg) | 89.6 | 63.7 | 66.4 | **35.353**$^{***}$ |
| Price of honey (ETB) | 153.22 | 155.83 | 155.19 | **0.469** |

***Note:*** $^{***}$ denotes 1% level of significance.

Households who owned the highest average number of hives (16.8) chose local collectors as best market channel, whereas those with a comparable average number of hives (i.e., 13.9 and 13.6) chose cooperatives and consumers as best market channel, respectively. The difference in honey market channel choice was significant ($p<0.01$) and agreed with findings of Assefa (2009). With respect to total production and choice of market channel, the study showed that producers of higher amount of honey (on average, 89.6 kg) chose local collectors as best market channel, whereas producers of relatively comparable amount of honey (63.7 and 66.4 kgs)

chose cooperatives and consumers as best market channel, respectively ($p<0.010$). Field observations and information gathered from key informants indicated that there were often competitions among local traders and cooperative in collecting honey from producers in the study area. In most cases beekeepers preferred local traders over cooperatives as the local traders collected honey door to door at their villages. Similar to the observations of Melaku et al. (2008), selling honey to local traders decreased cost of transport and saved time spent in going to and dealing in markets to sell the product.

Of the nine independent variables considered in this study, five had significant association to market channel choices of honey market (Table 5).

Table 5. Summary of results of dummy independent variables

| Variable | Percentage proportion across Choice of market channel | | | $c^2$- value |
|---|---|---|---|---|
| | *Collectors* | *Cooperatives* | *Consumers* | |
| **1. Education level of the household head** | | | | **6.033**** |
| Illiterate | 40.2 | 75.0 | 34.6 | |
| Literate | 59.8 | 25.0 | 65.4 | |
| **2. Experience of beekeeping** | | | | **2.630** |
| 2-5 years | 20.7 | 8.3 | 30.8 | |
| 6-10 years | 50.6 | 58.3 | 46.2 | |
| 10 and above years | 28.7 | 33.3 | 23.1 | |
| **3. Member of cooperatives** | | | | **13.331***** |
| No | 74.7 | 16.7 | 84.6 | |
| Yes | 25.3 | 83.3 | 15.4 | |
| **5. Access to extension** | | | | **10.233**** |
| No | 57.5 | 83.3 | 30.8 | |
| Yes | 42.5 | 16.7 | 69.2 | |

| Variable | Percentage proportion across Choice of market channel | | | $c^2$- value |
|---|---|---|---|---|
| | *Collectors* | *Cooperatives* | *Consumers* | |
| **5.Access to market information** | | | | **3.768** |
| **No** | 16.1 | 8.3 | 30.8 | |
| Yes | 83.9 | 91.7 | 69.2 | |
| **6.Access to transport facility** | | | | **9.402**** |
| on foot | 70.1 | 75.0 | 38.5 | |
| by car | 29.9 | 25.0 | 61.5 | |
| **7.Honey quality criteria** | | | | **9.850** |
| Free from brood and pollen grain | 66.7 | 58.3 | 80.8 | |
| Free from adulteration | 19.5 | 16.7 | 15.4 | |
| Moisture content | 0.0 | 0.0 | 3.8 | |
| Free from smoke | 13.8 | 25.0 | 0.0 | |
| **8. Time of selling** | | | | **3.576** |
| Immediately after harvest | 9.2 | 25.0 | 19.2 | |
| At any other time | 90.8 | 75.0 | 80.8 | |
| **9. Place of selling** | | | | **6.844 *** |
| Home\farm gate | 43.7 | 58.3 | 19.2 | |
| Far from home | 56.3 | 41.7 | 80.8 | |

***, **, * significant at 1, 5 and 10%, respectively

The chi-square test conducted on the independent variables indicated that market channel choices significantly differed due to differences in education level of the household head, membership to cooperatives, access to extension, access to transport and place of selling, whereas no substantial differences were observed due to experience of bee keeping, access to market information, honey quality criteria and time of selling.

As depicted in Table 5, larger proportions of the households headed by literates preferred consumers and local collectors while those headed by

illiterates inclined more to cooperatives as choices of market channels for selling their honey products ($p<0.05$). This was due to the fact that illiterate heads were largely members of the cooperatives and would be attracted by relatively higher prices, regulations and other benefits coming from being members of cooperatives. Similarly, members of cooperatives used dominantly cooperatives while non-members largely preferred local collectors and consumers as market channel choices ($p<0.01$) mainly because cooperatives had binding rules and regulations as well as benefits for their members as noted by Addisu (2016).

Membership to extension services was strongly associated with preference to consumer market channel while non-members were found to dominantly choose local collectors and cooperatives. The non-correspondence between membership to extension service and cooperatives indicated that extension services were not strongly linked with the benefits of cooperatives for beekeepers. Likewise, access to transport and place of selling were important in market channel choices. Beekeepers who transported their honey product by car largely preferred consumers while those on foot chose local collectors and cooperatives. Strong association between access to transportation and choices of market channel was also noted by Fikru et al. (2017), Households who sold honey at their farm preferred cooperatives while those who sold away from their home largely chose local collectors and consumers. Kindie (2017) confirmed that the importance of selling place influenced households' choices of market channels.

Econometric regression model results (Table 6) indicated that farmers selling their honey to the local collector outlets were less likely to deliver to cooperatives and consumers outlets. (Diagnostic tests of Multicollinearity and Heterosckedasticity were passed and the results are presented annexes 1 and 2). Similarly, those farmers marketing honey to the cooperative outlet were less likely to deliver to consumers and collectors market outlets (Table 6). The result was a reflection of the binding rules existing in the cooperatives for members to strictly supply their products through their channel and the longstanding and strong attachment created between honey producers and local collectors was of paramount importance.

Table 6. Determinants of honey producers market channel choices using Multivariate Probit

| **Variables** | **Local collectors** | **Cooperatives** | **Consumer** |
|---|---|---|---|
| Education of the house hold head (Base: Illiterate) | -0.139(0.255) | -0.218(0.287) | 0.167(0.279) |
| Experience of beekeeping in years | -0.304(0 .238) | -0.349(0.278) | 0.771***(0.277) |
| Total number of hives owned | -0.026(0.018) | -0.006(0.021) | 0.025(0.023) |
| Total honey production in kg | 0 .005(0.004) | 0.004(0.004) | -0.006(0.004) |
| Quality criteria of honey by households | -0.128(0.161) | -0.017(0.177) | 0.048(0.354) |
| Access to Extension service (Base: No access) | 0.763(0.558) | 0.149(0.604) | -0.945(0.611) |
| Cooperative membership (Base: No membership) | -0.923*(0.547) | 1.347**(0.594) | -0.280(0 .570) |
| Selling place of the product (Base: far away from home) | 0.202(0.359) | -0.385(0.449) | -0.170(0.371) |
| Transport facility of households (Base: have some form of transport facility) | 0.114(0.417) | 1.02**(0.451) | -0.378(0.452) |
| Access to market information (Base: No Access) | -0.764*(0.426) | 0.125(0.399) | 0.710*(0.405) |
| Time of selling of honey (Dummy: not immediately selling after harvest) | -1.452**(0.59631 | 0.277(0.537) | 0.357(0.812) |
| Price of honey in ETB per kg | -0.003(0.016) | -0.005(0.015) | 0.003(0.016) |
| constant | 3.44(2.54) | 0.056(2.84) | -3.216(2.930) |
| **Predicted probability** | 0 .6077348 | 0 .1960053 | 0.349388 |
| Joint probability of success | 0.0007288 | | |
| Joint probability of failure | 0.060082 | | |
| Number of draws (SML, # draws) | 5 | | |
| Number of observations | 125 | | |
| Log Likelihood | -162.24766 | | |
| Wald chi2(36) | 61.88 | | |
| Prob > chi2 | 0.0046 | | |
| **Estimated correlation matrix** | | | |
| | **$\rho$1** | **$\rho$2** | **$\rho$3** |
| $\rho$1 | 1 | | |
| $\rho$2 | -0.325*(0.187) | 1 | |
| $\rho$3 | -0.832***(0.142) | -0.123(0.192) | 1 |
| Likelihood ratio test of $\rho$21 = $\rho$31 = $\rho$32 = 0: | | | |
| chi2(3) = 71.3098 Prob > chi2 = 0.0000 | | | |

**Note**: '***', '**' and '*' indicate significance at 1%, 5% and 10% levels respectively.

The likelihood of choosing local collector outlet was relatively higher (60.7%) as compared to the probability of choosing cooperative outlet (19.6%) and consumer outlet (39.4%) (Table 7). This indicated that local collector was the most likely chosen market outlet by farmers as cooperative outlet had limited capacity to purchase more honey at a time. It was also noted that local collectors were preferred over the other outlets as honey producers found it convenient to supply their honey at the farm gate thereby saving time, transportation cost and unwanted troubles and hustles in the market. The likelihood of households to jointly choose the three outlets was low (0.07%) experience of beekeeping practice, access to market information, cooperative membership, transport facility of households and time of selling the honey produce was found to significantly affect the market outlet choice behaviour of honey producers.

Experienced farmers had significantly more relation directly with consumers to avoid unwanted bargain with middle man or broker in the honey market ($p<0.01$). Similarly, Atsbaha (2015), found that experienced beekeepers were better to produce more and more likely to choose supplying to consumers directly. Cumulative knowledge of honey producers informed them to supply directly to consumers so that they could avoid the margins of profit taken by middlemen and brokers.

Cooperative membership had negative and significant relation with the likelihood of choosing local collector outlet at 10% significance level, and positive and significant relation with the likelihood of choosing cooperative outlets at 5% significant level. Consistent with the findings reported by Fikru et al. (2017), our result indicated that the binding rules existing in the cooperatives for members to supply via the cooperative channel, made it impossible for members of the cooperatives to choose the local collectors outlet.

Transport facility of households was positively and significantly related to the choice of cooperative market channel at 5% level of significance. Beekeepers who did not have transport facility, like car access or pack animals, to carry honey, preferred to sell to cooperatives nearby their area. Respondents mostly used car for transportation if they wanted to sell honey

five kilometres away from their home; otherwise, they preferred to go to market on foot. Addisu (2016) and Fikru et al. (2017) also found that access to transport facility was better for delivering output to the final market outlet.

Access to Market Information is negatively and significantly associated with the choice of local collectors at 10% significance level, whereas it is positively and significantly associated with the choice of consumer at 10% significance level. Consistent with the findings of Atsbaha (2015), access to market information might help producers to choose the convenient market channel so that they could sell the output directly and easily to consumers at the market.

Honey producers who sold produce right after harvest did not prefer local collectors as market channel compared to those who sold any other time depending on their convenience and interests ($p<0.05$). The largest proportion of respondents sold their products to collectors their preferred time. This indicated that local collectors allowed more time to producers to sell their produces in their time of convenience.

## 6. Conclusions and Recommendations

The study indicated that households in the study area predominantly used traditional beehives with low productivity and the supply of highly productive modern beehives was in short supply. This was true at the national level attributing to low productivity of the sector in the country. A concerted effort should be made by concerned stakeholders to modernize bee-keeping and thereby increasing honey yield.

Providing continuous and consistent trainings for beekeepers and rural extension agents on how to increase the product volume, how to produce quality honey, and transfer market information through development agents would improve the honey marketing. Establishing honey collection centres in potential production areas and equipping them with the necessary facilities, including quality control mechanism, would encourage honey producers and enable them to sell their product at better price and reduce the level of honey adulteration. Besides, establishment of active cooperatives

and creating linkage with their collection centres will bring better marketing chances and profits. The low preference of cooperatives as market channel indicated the low level of cooperatives development in the area despite the benefits of cooperatives to bee-keepers in many aspects. This result calls for reconsiderations of the establishment of cooperatives and their roles in honey production and marketing.

Government and other stakeholders should focus on making market information more accessible, enhancing transport facilities and improving access to adult education. Strengthening the linkage among market actors is vital for effective honey market channel development. There is a need to create awareness of actors regarding honey marketing through trainings. Especially, creating positive attitudes toward partnership and networking need to be nurtured among the honey market actors. Therefore, linking potential beekeepers with local collectors, cooperatives and consumers is critical intervention to improve honey marketing. Establishing responsible honey collecting agent or establishing honey collection centres with a reasonable price close to honey producers would improve the existing market channel choice. Beekeepers should be updated with current market information in order to choose easily available market channels to sell their product. This could be accomplished through rural extension agents and/or Woreda office of agriculture. Organizing experience sharing platforms between less experienced and experienced beekeepers would be important for knowledge sharing and motivating beekeepers.

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## Annexes

**Annex I. Multicollinearity test results**

| Variables | VIF | 1/VIF |
|---|---|---|
| EDUCHH | 1.15 | 869616 |
| EXBK | 2.03 | 492799 |
| TNHIVE | 7.09 | 140986 |
| THPRDN | 7.07 | 141519 |
| QLHH | 1.21 | 827820 |
| EXS | 4.17 | 240051 |
| COOPMEMB | 3.88 | 257464 |
| SPLC | 2.08 | 481362 |
| TFHH | 2.53 | 395590 |
| ACMKI | 1.40 | 713954 |
| TSHH | 1.44 | 696014 |
| PH | 1.86 | 538184 |
| Mean VIF | 2.85 | |

**Annex II:** Heteroskedasticity test results

Brush pagan/cook-weisberg test for heteroskedasticity

$H_0$: constraint variance variables: fitted values of MRKTCH

Chi $^2$ (1) = 20.92

Prob > $Chi^2$ = 0.1414