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Determinants of Honey Market Supply: The Case of Shebedino District, Sidama Zone, Snnpr, Ethiopia

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Abstract
This study was conducted in Shebedino district with the objective of analyzing determinants of market supply of honey at households' level. To achieve this objective both primary and secondary data were collected. A total of 156 honey producer households (138 male headed and 18 female headed) were selected randomly from a list of 1622 beekeepers found in 3 randomly selected peasant associations. The data were generated by individual interview using pre-tested semi-structured questionnaire and focus group discussion. Secondary data were collected from different published and unpublished sources. The data collected were analyzed with the help of descriptive statistics and econometric model (multiple linear regression model). The study result showed that four variables were affecting market supply significantly and positively. These were number of modern hives, credit use, training participation and number of days of extension contact. The study result indicated the need to strengthen farmers' cooperatives, facilitate conditions to deliver modern beehives at affordable prices, provide credit including training packages, and strengthening extension service for honey producers.
Keywords: honey producers, market supply, honey supply determinants

1. Introduction

Honey production is an activity that can generate considerable income for those who are engaged in its production and marketing. Regarding this, Ethiopia is the largest producer of honey in Africa and ninth in the world (Gemechis, 2015). As per USAID (2012) report, about 24% of Africa's and of 2% of the world's honey comes from Ethiopia. However, Ethiopia is supplying less than 10% of its potential (CSA, 2015). Shebedino district is one of the 19 districts found under Sidama zone in SNNPR of Ethiopia. It was the second highest producer of honey in Sidama Zone (124.32tone), next to Aroresa district (160.72tone) in 2015/2016. However, this amount was only 55% of the estimated potential of the district as per Sidama zone Livestock and Fish development coordination unit (LFDCU, 2015/2016). Therefore, this study was focused on determinants of honey market supply in Shebedino district where there is high production of honey in Sidama Zone.

2. Empirical Review on Determinants of Honey Market Supply

A number of studies are conducted about factors affecting supply of agricultural commodities to the market. For instance, Samuel (2014) used multiple linear regression model to analyze factors that determine volume of honey marketed by the sample households. He found eight variables being significant determinants of the level of honey volume marketed. These variables were age of household, previous year price, family size, beekeeping training, agro-ecology, literacy status of household, size of livestock holding and total number of modern hives used in production by household heads. Assefa (2009) also employed multiple linear regression model to analyze factors affecting market supply of honey. He investigated 10 factors that affect market supply of honey in the study area namely, sex of the household, age of the household, education level of household, experience in beekeeping, extension access, quantity of honey of produced, price of honey, access to credit, distance to the nearest market and market information. Getachew (2009) employed Heckman two stage model and identified income from farm and nonfarm activities, beekeeping experience, beekeeping training, apiary visit, and access to improved beekeeping equipments as the major factors that significantly and positively affect the supply of honey by households.

Therefore, multiple linear regression model was employed for this particular study to analyze those factors that affect households' market supply of honey in the intended study area.

3. Methodology

Shebedino district is one of the 19 districts of Sidama zone found in SNNPR of Ethiopia which is located at the North-central part of Sidama zone at a distance of 27 km from the capital city of SNNPR, Hawassa. Astronomically it is situated in the coordinates of 6^0 46′ to 7^0 45′ North latitude and 39^0 34′ to 39^0 53′ East longitudes. There were around 294179 people in the *Woreda* who live being clustered in 35 peasant associations, out of which 49.2% (145728) were females and the rest 50.8% (148451) were males, as per the 2015 statistics of the *Woreda* Bureau of Finance and Economic Development (BoFED, 2015). The total household size was 55007. Regarding honey production, the district was ranked the second highest producer of honey in Sidama zone next to Aroresa district. There were 5008 honey producing farm households living in the district and total amount of

honey produced in the year 2015/16 was 124.32 tons of honey according to the reports of Sidama Zone Livestock and Fish Development Coordination Unit (LFDCU, 2016). From list of 1622 honey producing households found in 3 peasant associations in Shebedino districts, a total of 156 farm households were selected randomly to conduct this study. The sample size was determined using the formula of Yamane (1967). Both descriptive statistics and econometric model were employed to analyze the data. The descriptive statistics was employed to analyze the socio-economic and demographic characteristics related to the study area. The econometric model (multiple linear regression model) was used to analyze determinants of marketed surplus of honey at households' level. The multiple linear regression model was specified as Y=f(beekeeping experience, number of modern hives, credit use, family size, beekeeping training participation, distance to the nearest market, education level of household heads, livestock holding, total cash income other than honey source, number of days of extension contact). The estimated coefficients indicate the amount of change in the dependent variable due to a unit change in the independent variable.

In matrix form, the supply function can be specified as:

$$Y = \beta X + U$$

Where, $\gamma =$ the volume of honey supplied to the market

$\beta =$ a vector of estimated coefficient of the explanatory variables

$X =$ a vector of explanatory variables

$U =$ Disturbance term

STATA computer program was employed to analyze the data. Omitted variable and heteroscedasticity detection tests have been conducted in STATA using Ramsey test and Breusch-Pagan (BP) test respectively. Variance Inflation Factor (VIF) was employed to test the existence of Multi-colliniarity problem among explanatory variables.

4. Results and Discussion

4.1. Demographic and Socio-economic characteristics of respondents

The result of descriptive analysis showed that 88.5% of producer households were male headed and the remaining 11.5% were female headed. Their average age was 44.34 years. Their average family size was 7, and the mean educational level achieved in grades was around grade 6. Their mean experience of honey production was 10.11 years. The average land holding was 0.923ha. The mean colony holding and livestock holding were 12.83 and 2.32 TLU respectively. The total production of honey by sample respondents in 2015/2016 was 26951 kg and of this amount, 96.7% was marketed.

4.2. Determinants of honey market supply

Shebedino *Woreda* is where there was high production of honey in 2015/2016 in Sidama Zone as per the reports of Sidama Zone Livestock and Fish Development coordination unit (2015/2016). Honey was produced mainly for market and was one of the most important cash commodities in the *Woreda*. As per the data collected from sampled respondents, only 3.3% of the total honey produced in 2015/2016 production year was consumed at home for various purposes. According to the survey result, all the sampled households were good suppliers of honey to the market during the survey period. However, the woreda LFDCU argued that the current supply of the district is only 55% of its potential. Variables expected to determine supply of honey were hypothesized.

All the hypothesized explanatory variables were checked for the existence of multi-co linearity and heteroscedasticity problems (appendix 1). Variance inflation factor was analyzed to investigate the degree of multi-co linearity among explanatory variables. The results for all VIF values were ranging between 1.08 and 2.05. The mean VIF value was 1.49. Hence, multi-co linearity was not a serious problem among explanatory variables. Heteroscedasticity was tested for all variables by running Breusch-Pagan / Cook-Weisberg test for heteroscedasticity using STATA. There was no problem of heteroscedasticity in the model. The existence of omitted variables was also checked by using Ramsey Reset test. The result showed that there was no omitted variables problem (appendix 1). The overall goodness of fit of the regression model was measured by the coefficient of determination (R^2). It tells what proportion of the variation in the dependent variable was explained by the explanatory variables.

Ten explanatory variables were hypothesized to determine the household level marketed supply of honey. These variables were beekeeping experience, number of modern hives, credit use, family size, beekeeping training participation, distance to the nearest market, education level of household head, livestock holding, Total cash income other than income from honey source, and number of days of extension contact. Among these hypothesized 10 variables, only four variables, namely number of modern hives, credit use, training participation, and number of days of extension contact were found to be significantly affecting the households' marketed supply of honey (Table 1). The remaining six variables, namely beekeeping experience, family size, distance to the nearest market, education level of the household head, livestock holding, and total cash income other than honey source were found to have no significant effect on marketed supply of honey at households' level.

Table 1. Determinants of honey market supply in Shebedino *Woreda*

Variables	Coefficients	Std. error	t-value
Family size	0.0101	0.0104	0.97
Education	0.00199	0.00652	0.31
Distance	-0.0104	0.0155	-0.67
Experience	-0.00226	0.00339	-0.67
Number of modern hives	0.143***	0.0158	9.06
Credit	0.199***	0.0484	4.11
Training	0.144***	0.0402	3.59
TLU	-0.00360	0.0104	-0.35
Extension contact days per year	0.00587**	0.00230	2.56
Non-honey source income (ln)	-0.0106	0.0158	-0.67
Constant	4.790***	0.170	28.22

Dependent variable = volume of market supply (ln), N=156, R-Squared = 0.756, Adjusted R-squared = 0.741. The *** and ** show statistically significant variables at 1% and 5% respectively

4.2.1. Number of Modern Hives

Total number of modern hives affected marketed supply positively and significantly at 1% significance level as expected. As per the model result in Table 1 above, addition of one modern beehive leads to an increase in supply of honey by households by 14.3%. The positive and significant relationship indicated that increase in number of modern hive increases total average production and which in turn increases marketed surplus

4.2.2. Credit Use

According to the model result discussed in table 1 above, credit was one of the variables affecting volume of honey supplied to the market at household level in Shebedino *Woreda*. It was a dummy variable and affected the market supply of honey positively and significantly at 1% significance level. The model result predicted that as compared to those households who did not receive credit for beekeeping, the marketed supply of honey for those households who received credit increases by 19.9%.

4.2.3. Training participation

The model result in table 1 also showed that participation in beekeeping training was significantly affecting the volume of honey supplied at households' level in Shebedino *Woreda*. It was a dummy variable and significant at 1% significance level. It is known that giving trainings for producers on beekeeping can fill the knowledge gap that constrained production and productivity. The model result predicted that as compared to those households who did not participate in beekeeping trainings, the marketed supply of honey for those households who participated in beekeeping trainings increases by 14.4%.

4.2.4. Number of Days of Extension Contact

Extension contact was also affecting marketed supply of honey positively and significantly as discussed in table 1 above. It was statistically significant at 5% significance level. Extension contact and its frequency have a significant impact in adoption of new technologies and ideas as stated in Bruk, (2015). This increases volume of output and then amount supplied to the market. The model result in table 1 indicated that increase in extension contact by one day increases households' marketed supply of honey by 0.59%.

5. Conclusion

Honey is one of major income generating commodities in Shebedino district. The district has high potential in honey production. It was the second highest producer of honey in Sidama Zone (124.32tone), next to Aroresa district (160.72tone) in 2015/2016. Ten variables were hypothesized to determine market supply of honey in the study district. The result showed that four variables namely number of modern hives, credit use, training participation and number of days of extension contact were found to be significantly affecting market supply of honey with the expected signs. The model result predicted that addition of one modern beehive leads to 14.3% increase in supply of honey at households level; amount of honey supplied by those households who received credit for beekeeping increases by19.9% compared to those households who did not receive credit; volume of honey supply by those households who attended trainings increases by 14.4% compared to those households who did not attend trainings; and one day increase in Number of days of extension contact increases households' marketed supply of honey by 0.59%.

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7. APPENDIXES

I. Tests for Omitted Variables, Heteroscedasticity and Multi-co linearity

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. ovtest

Ramsey RESET test using powers of the fitted values of lnmarketedsupply2008EC
       Ho:  model has no omitted variables
                 F(3, 142) =      1.65
                  Prob > F =      0.1802
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnmarketedsupply2008EC

         chi2(1)      =     0.17
         Prob > chi2  =   0.6760
. vif
```

Variable	VIF	1/VIF
recievedcr~t	2.05	0.487457
modernhives	1.98	0.505003
visitdays	1.86	0.538465
training	1.61	0.623049
experience~d	1.57	0.636923
distance	1.31	0.765415
tlu	1.20	0.833050
lntotalincom	1.13	0.887254
education	1.11	0.901565
familysize	1.08	0.929284
Mean VIF	1.49	