

# Economic Analysis on Factors Affecting Quantity Supply of Honey the Case of Damot Gale Woreda, Wolaita Zone, Southern Ethiopia

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## Abstract

Economic analysis on honey production and demand is important to encourage beekeepers to enhance their income, adopt the technology. However, analysis of profitability and productivity of box and modern hives is not adequately available in the study area. Data for the study was collected from 120 rural beekeeping households from four kebeles. Both primary and secondary source were employed to obtain necessary information. Multi-stage sampling technique was used to meet with respondents/study units/households in the selected kebeles. Descriptive and econometric analysis was used to identify the effect of independent variables on dependent variable. With descriptive analysis percentages, graphs, charts and tables were presented. The socio-economic characteristics of the beekeeping households, market chain, performance, the result shows that out of 120 households 105 (87.5%) were male and 15 (12.5 %) were female households who were producing honey, average family size of the beekeeping farmers in the study area during survey period was 5.5 persons, with maximum and minimum family size of 12 and 2 persons, respectively and the result shows when family size increases quantity supply of honey to the market decreases due to increase in household consumption. Quantity supply of honey computed to different explanatory variables by employing the econometric analysis i.e. multiple linear regression analysis and the regression result revealed out of 13 explanatory variables, 10 of the variables:- household age, household family size, education, price, distance from market, year of experience, credit access, land size, modern hives and annual income have a significant effect on quantity supply of honey at 1 percent, 5 percent and 10 percent.

**Keywords:** Honey Supply, Market price, Damot Gale, Multiple regression, Wolaita Zone

## 1. INTRODUCTION

### 1.1. Background of the Study

Beekeeping play important role in food security and poverty alleviation in Ethiopia. beekeeping does not affect this much by intermittent rainfall conditions as that of growing of annual crops (Melaku et al., 2008). In creating job opportunity in the country many people are engaged in trading of honey at different levels and also in production and selling of honey made tej. Based on the season of honey production (high honey flow period) a number of honey tej and breweries operating in different parts of the country which create job opportunities for large number of citizens. Apart from this there are also a number of people engaged in hive and hive equipment production and selling (Desalegn, 2007)

According to ( MoARD,2008) report in Ethiopia around two million farm households were engaged in market chain of honey production. This is attributed to the qualitative nature of honey produced from different floral / nectar sources in different geographical regions. According to international trade center (ITC) (2003), the total world production of honey is estimated 1.3million metric tons (MT) per annum, valued at US\$ 452 million. However, only about 400,000 MT of the honey is traded in the export market annually, indicating a dominance of domestic markets of honey is within the producing countries about 67 percent (ITC,2003). But currently, the annual honey and beeswax production of the country has been estimated at 53,680 and 3,658 tons respectively (CSA, 2011).

The total volume of honey production in Ethiopia in years 2007 to 2011 was 163,257.42 tons, of which 99.2 percent was consumed domestically and 0.8 percent was exported, and the total volume of Ethiopian honey exports in years 2007 to 2011 was 1,297,716 kg, with a total value of US\$4,066,528 (CSA, 2011). Relatively, the volume of honey exported increases slightly, but the total volume of honey exports are still very low compare to Ethiopia's total honey production (CSA.2012a). SNNPR is one of the potential areas of honey production which accounts 15 percent of the total bee colonies and 17 percent of the total honey production in the country. According the report of CSA (2010), annually SNNPR produces 5,724,001 kg honey with average production capacity of 7 kg per hive.

According livestock office report even though there is a potential for honey production there is few honey producers were actively participating in each kebele, besides this lack of information about marketing chain actors and the whole linkage, No research has conducted so far to address existing problems in study area,

## 1.2. General Objective of the Study

The general objective of the study is to assess factors affecting honey supply the case of Damot Gale Woreda, Wolaita Zone, Ethiopia

### 1.2.1. Specific objectives

- To examine factors that affect quantity supply of honey in the study
- To identify honey marketing channels and their linkage in the study area.

### 1.3. Research questions

- What are the major honey marketing channels and their linkage in the study area?
- What are the structure, conduct and performance of honey market in the study area?
- What are the factors affecting the honey supply to market in the study area?

### 1.4. Scope of the study

The study was focused on analysis of factors affecting honey supply by producers in the Damot Gale Woreda in Wolaita Zone. To see market channels and market destination at surrounding Zone of up to wolyita sodo town and Addis Ababa was included.

## 2. METHODOLOGY OF THE STUDY

### 2.1. Description of Study Areas

Damot Gale is one of 12 woreda's in Wolayta zone of SNNPR in Ethiopia. It is located at 139km South West of the Hawassa town which is the capital of Southern Regional State and 365km from Addis Ababa in the southern direction. Geographically, it is located between 6° 53' - 7° 6' 30" North latitude and 37° 46' - 37° 58' 40" East longitude. It has an altitude ranging from 1501- 2950 meters above mean sea level. Mount Damota is the highest peak in the area. The study area covers an area of 24285.861 hectare.

Damot Gale woreda is divided in to agro-ecologic zones such as Dega or highland (25.3%), Woina dega or midland (61.2%) and Kola or lowland (13%) Damot Gale woreda agricultural and rural development office report ( 2014). Woina dega dominates the study area which has bimodal distribution of rainfall. Mean annual rainfall ranges between 1001-1400 mm (RFEDB, 2013) as cited in (Tesema, 2015).

The study area is bordered on the South West by Sodo Zuria, on the North West by Boloso Sore and Damot Pulassa, on the North by Hadiya zone, on the East by Duguna Fango, and on the South East by Damot Woyde. Based on the CSA (2011) estimation and Woreda Finance And Economy Development report, Damot Gale has a population of 177,570 out of this 103,011 are male and 74,559 are female. The total households of the district are 30,767 of which male households, 26,417 and female 4,350 and has a total of 31 rural kebeles. Like other parts of the region agriculture is the main means of livelihood for the population both in terms of crop production and livestock.

### 2.2. Data Type and Source

In this study both primary and secondary data were used. Primary data was collected from farmers focused on factors affecting honey market supply, size of output, market information, credit access, access to market, number of beehives owned, honey production cost, annual return from honey, extension service, annual income from non-honey source and demographic characteristics of the household. Moreover, the questionnaire for traders includes type of business (wholesaler, retailer, assembler, etc.), buying and selling strategies, initial capital, current working capital, source of working capital, source of market information, demographic characteristics of the traders and other related data was collected. Secondary data was collected from different published and unpublished sources, such as government institutions, the District/zone offices, reports and websites were used to generate relevant data.

### 2.3. Sample Size determination and Sampling Technique

A multi stage sampling technique was used to select representative sample for this study. Before selection of Kebeles and sample farm households, consultation with district agricultural experts and development agents was made. Wolaita Zone has a total of 12 rural districts and three urban administration. In first stage, Damot Gale District was selected purposively. At the second stage, 4 Kebeles namely Damot Mokonissa, Mokonissa woyge, Harto Burkuto and Damot off were selected from 31 total rural kebeles on the basis of honey production and marketing potential. Finally, 120 sample households were selected randomly from 930 target population. The target population of each kebeles is based probability proportion sampling techniques. Cochran (1977) developed the Equation given below to yield a representative sample for proportions.

$$N_o = \frac{z^2 p q}{e^2} \text{-----(1)}$$

Where n is the sample size, Z is equals the desired confidence level at 95%, p is the estimated proportion of an

attribute that present in the honey producers

$$N_o = \frac{1.96^2 \cdot 0.1 \cdot 0.9}{0.05^2} = 138 \text{ ----- (2)}$$

In order to calculate the final sample size, we have considered the total population of the study area. Therefore, Cochran's (1977) correct formula was used to calculate the final sample size in the study area.

$$no = \frac{n}{1 + \left(\frac{n}{N}\right)} \text{ ----- (3)}$$

$$n = \frac{138}{1 + \frac{138}{930}} = 120 \text{ ----- (4)}$$

## 2.4. Data Collection Method

Before undertaking data collection, the first draft household survey questionnaire was developed in English. Three enumerators were recruited from each kebele and trained for one day on the contents of the questionnaires and on how to administer data. Before data collection, the questionnaire was pre tested. Primary data was collected by the formal survey through interviews with farmers and traders. The secondary data was collected from district offices.

## 2.5. Methods of Data Analysis

In this study the researcher employed both descriptive and econometric methods of data analysis . The descriptive analysis uses percentages, graphs, charts, frequencies, and tabulations to explain honey production, market channel and linkages and Econometric method was used mainly to attain the first objective i.e. factors affecting quantity supply of honey in the study area.

### 2.5.1. Econometric analysis

Multiple linear regression model was used to analyze factors affecting quantity supply of honey to the market in the study area. Econometric model specification of supply function is specified in the following form.

$$Q_{ss} = \beta_0 + \beta_1 FS + \beta_2 DS + \beta_3 P + \beta_4 Age + \beta_5 Sex + \beta_6 Ex + \beta_7 Exser + \beta_8 ED + \beta_9 AcCr + \beta_{10} Mhive + \beta_{11} AIncome + \beta_{12} Ls + \beta_{13} Tra + \epsilon \text{ ----- (3.12)}$$

### 2.5.2. Variables and their expected sign

Variables	Explanations	Categories	Measurement	Expected sign
Qss	Quantity supplied	Continuous	Kilo game	Dependent variab
FS	Family size	Continuous	Number	-
DS	Distance to market	Continuous	Kilometers	-
P	Price of honey	Continuous	Birr	+
Age	Age of the household	Continuous	Number of years	+
Sex	Sex of the househo head	Dummy	0=female, 1=male	+
EX	Experience	Continuous	Number of years	+
EXser	Extension service	Dummy	0=no, 1=yes	+
ED	Education level	Continuous	Years of schooling	+
AcCr	Access to credit	Dummy	0=no, 1=yes	+
Mhive	Modern hives	Continuous	Number	+
AIncome	Annual income	Continuous	Birr	+
LS	Land size	Continuous	Hectare	+
Tra	Training	Dummy	0=no, 1=yes	+

## 3. Results and Discussions

This chapter deals with the results of descriptive statistics and multiple liner regression results of the honey market chain and factors affecting quantity supply of honey in the study area. The analysis was done in line of the objectives of the study. Section 4.1 deals with descriptive analysis and section 4.2 presents the results of the econometric analysis.

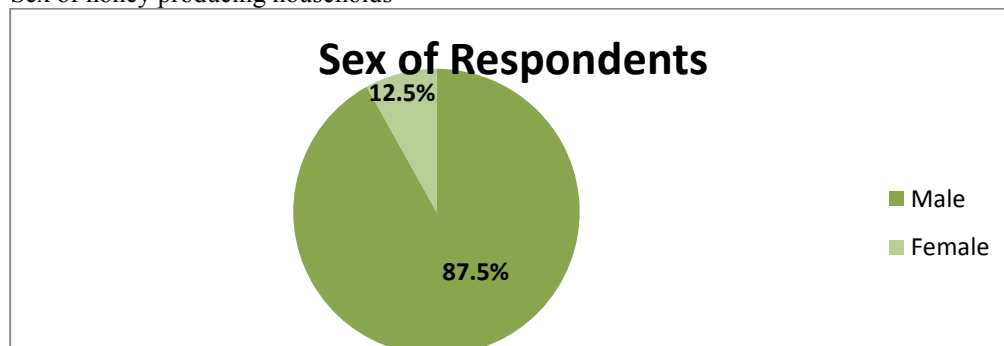
### 3.1. Descriptive Analysis

#### 3.1.1. Household characteristics of Honey Producers

The respondents' age category shows that 79 % of the households heads were in the age group of 30-45 with an average age of 38.5 and 15 % of the sample respondent were in the age group of 46-65 years with an average age of 47. About 6 % of the household heads lies in the age range of greater than 65.

The average family size of the sample farmers in the study area during the survey period was 5.5 persons per household, with maximum and minimum family size of 12 and 2, respectively. Out of 99 sampled households 91 (92.08 percent) were male-headed and 8(7.92 percent) were female headed households as we can see figure below.

Sex of honey producing households



Source: survey data, 2018.

### 3.1.2. Price and quantity supply of honey

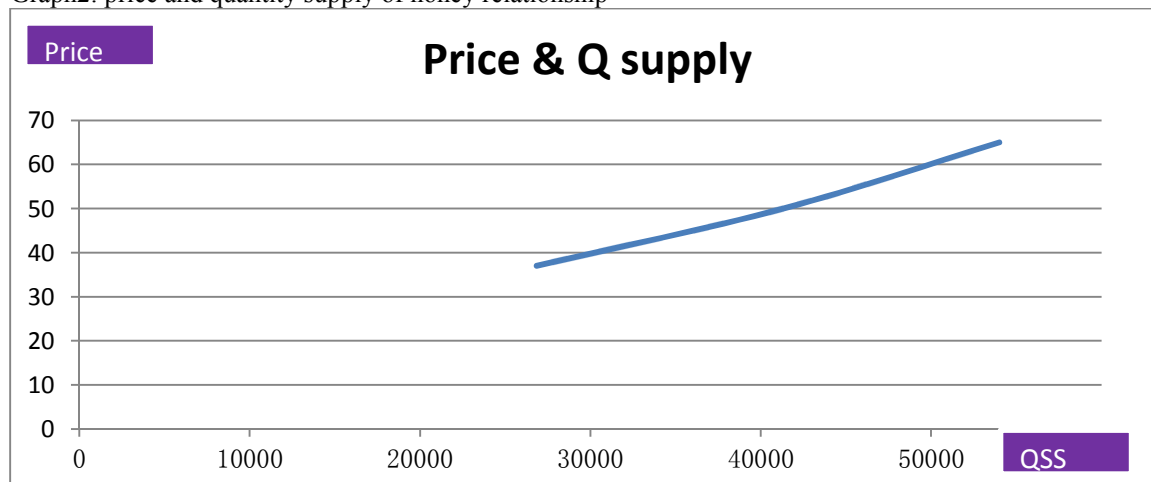
Price of honey was taken as major factor affecting quantity supply and the result of this study shows that the average price in year 2018 was about 45.5 birr per kg, minimum price level 37 birr and the maximum 65 birr per kg of honey. When price level is 37 birr-42birr quantity produced is about 18134 kg, quantity consumed 2163 kg and quantity supplied to the nearby market 15971 kg and price level 43 birr – 55 birr the amount of quantity produced 21379 kg, honey consumed 3572 kg and quantity supplied to the market 17807 kg. The result clearly indicates that price and quantity supply are directly related, other factors remain constant which is in line with law of supply.

price and quantity supply

Price of Honey	Total quantity Q Produced = Q Supplied to Mkt + Q Consumed		
	Male headed		
	Quantity produced	Consumed by household	Quantity supplied to market
< 37birr	0	0	0
37birr -42	18134	2163	15971
	29267		
	29267		
	29267		
43birr – 55 birr	21379	3572	17807
56birr – 65 birr	25497	2987	22510

Source; Survey data,2018

Graph2: price and quantity supply of honey relationship

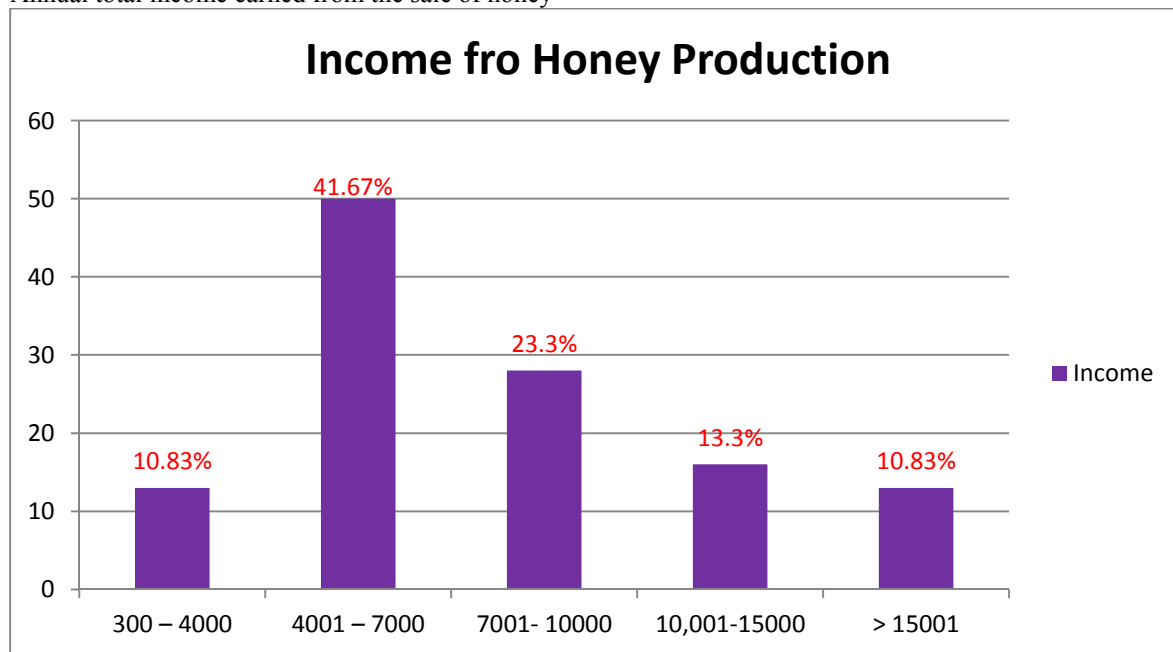


Source: Own survey, 2018

### 3.1.3. Annual income from honey production

The annual gross income of respondents from the sale of honey product ranged from Birr 350 to Birr 17913. As shown in chart-3 below, out of 120 sampled respondents 50(41.67%) earning an annual gross income of between 4001 to 7000 Birr and about 28(23.3%) earning annual income of 7001-10,000 Birr. On the other hand, rest of the respondents earn annual income of 300-4000, 10,001- 15000 and greater than 15001, with percentage participation 13(10.83)%, 16(13.3%) and 13(10.83%) respectively. Likewise, the mean annual gross income per sampled households during the survey time was about Birr 5601.

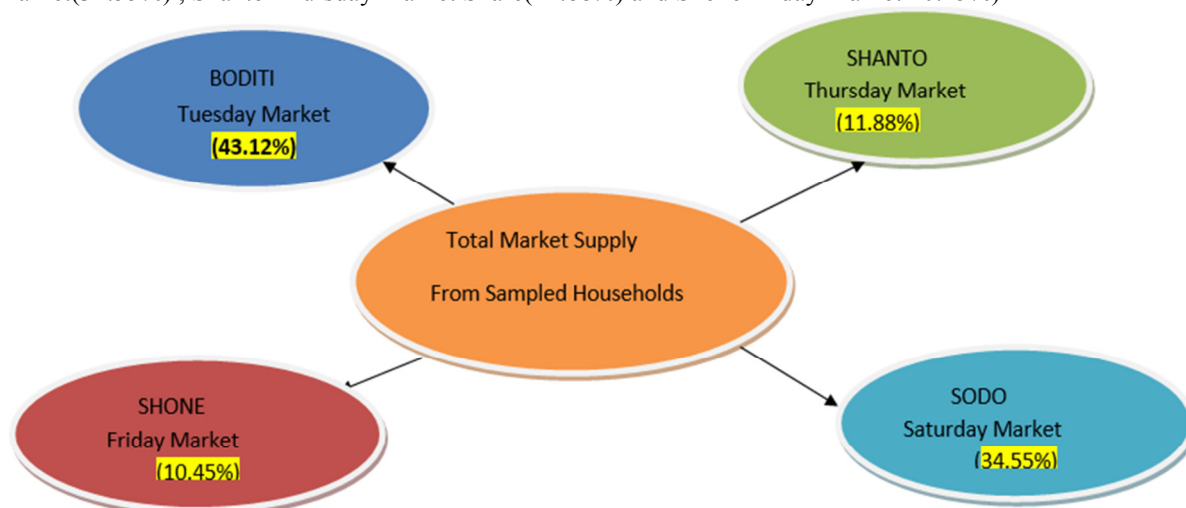
Annual total income earned from the sale of honey



Source: Own Survey, 2018

### 3.1.4. Market Channel, Share and beekeeping households' linkage to market

Households' who were engaged in beekeeping activity supply their honey either directly to nearby market or sell to honey merchants (wholesalers, retailers, consumers etc) in place where honey produced. The market supply share of markets which are near to the sampled households Boditi Tuesday Market (43.12%), Sodo Saturday Market(34.55%) , Shanto Thursday Market Share(11.88%) and Shone Friday Market 10.45%)



### 3.2. Econometric analysis

In addition to descriptive analysis, multiple linear regression analysis was employed to identify the factors affecting quantity supply of honey in the study area .The variables included in the model were tested for the existence of multi-co linearity, if any. Contingency coefficient and variance inflation factor were used for multi-collinearity test of dummy and continuous variables, respectively. Contingency coefficient value ranges between

0 and 1, and as a rule of thumb variable with contingency coefficient below 0.75 shows weak association and value above it indicates strong association of variables. In this study the contingency coefficient test for the discrete variables included in the model was less than 0.75 that didn't suggest multi-collinearity to be a serious concern. As a common practice continuous variable having variance inflation factor of less than 10 are believed to have no multi-collinearity and those with VIF of above 10 are subjected to the problem and should be excluded from the model (Gujarati, 2009)

So as to identify the factors affecting quantity supply of honey, taking quantity supply of honey as the dependent variable along with different demographic, social and economic variables as explanatory variables, was presented in Table below and estimation result with R-squared = 0.9746, Adj R-squared = 0.9703 shows that about 97% of the variation in the dependent variable was explained by the variation in the explanatory variables. The F value, with degrees of freedom F (13, 106), = 423.14, Prob > F = 0.0000, shows that explanatory variable can significantly predict the dependent variable this indicates that, overall, the model applied can statistically significantly predict the dependent variable, quantity supply of honey. .

. Regress quantity supply sexHH, AgeHH, FSHH , EduHH, Mprice, Dsmkt, Traing, Extse, Yearexp, Accrdit, Ls, Mhive ,Income

Quantity Supply	Coef.	Std. Err.	T	P>t
SexHH	10.6328	6.36694	1.67	0.152
AgeHH	4.186053	1.24584	3.36	0.001 ***
FsHH	-4.37960	1.955178	-2.24	0.038 **
EduHH	6.05683	2.320624	2.61	0.005 ***
MPrice	5.02468	0.998942	5.03	0.000 ***
Dsmkt	-6.14790	1.580437	-3.89	0.000 ***
Traing	9.202986	6.526940	1.41	0.179
Extse	8.13528	7.674792	1.06	0.289
Yearexp	7.105730	1.686173	4.39	0.000 ***
AcCrdit	33.12807	11.70603	2.83	0.004 ***
Ls	8.124730	4.253785	1.91	0.069 *
Mhive	13.39760	1.933275	6.93	0.000 ***
Income	.0007694	0.0003359	2.29	0.032 **
cons	-531.516	99.53483	-5.34	0.000
Number of obs = 120				
F( 13, 106) = 423.14				
Prob > F = 0.0000				
R-squared = 0.9746				
Adj R-squared = 0.9703				
Root MSE = 47.165				

**NB: \*\*\* significant at 1% , \*\* significant at 5% and \* significant at 10%,**

As Econometric Model we employed shows variables that are positively related with the quantity supply of honey are household sex, age, family size, education, price, training, and extension service, year of experience, credit, land size, modern hives and annual income. The variables that are negatively correlated with the quantity supply of honey were family size and distance from market.

In the table above shows out of 13 explanatory variables included in the model 10 of the variables:- household age, household family size, education, price, distance from market, year of experience, credit access, land size, modern hives and annual income have a significant effect on quantity supply of honey at 1 percent, 5 percent and 10 percent. The negative values of explanatory variables in the table above indicate that when the unit changes in independent variable leads to decrease in quantity supply of honey.

**Age of the household:** is positively related with quantity supply of honey and the variable is statistically significant at 1 percent level. As it was hypothesized as age increases households would acquire knowledge and experience through continuous learning which would help them to actively participate in honey production and enhance quantity supply of honey. Therefore, the finding shows that as age increase by a year quantity supply of honey increase at about 4.18 kg, keeping other variables constant at their mean values

**Family Size of the household:** In this study family size is inversely related with quantity supply and the coefficient is statistically significant at less than 5 percent level. Ceteris paribus, as family size increase by one individual quantity supply decrease at about 4.37 kg. This result was due to the fact that when family size increases household consumption of honey increases and at the same time quantity supply of honey to the market decreases.

**Education level of the household head:** Educational status of the surveyed households is directly related with the quantity supply and the coefficient is statistically significant at 1% level. Holding other variables constant

education of the household leads to increase in quantity supply by about 6.056kg. This result is due to the fact that educational status have great importance for better understanding of current as well as future economic activities with appropriate earning. Therefore, in this study respondents with better educational status quantity supply of honey is greater than their counterparts. This is because the role of education on working efficiency, competency, diversify income, adopting technologies and becoming visionary in creating conducive environment to educate dependants with long term target to ensure better living condition than illiterate ones.

**Age of the Households:** - Age is one of the explanatory variables employed in this study. It is positively correlated with quantity supply of honey and statistically significant at 1 percent level. As it was expected that as age increases households would acquire knowledge and experience through continuous learning which help them to actively participate in different activities that help them improve the production of honey. Therefore, other model variables are held constant at their mean value, as age increase by a unit the households' quantity supply of honey increase at about 4.186053kg.

**Market Price of honey:** - In this study it was hypothesized that price of honey was one of the major determinants of quantity supply. The finding shows price of honey is positively related to quantity supply and statistically significant at 1 percent level. Other variables remain constant at their mean value, as price of honey increase, quantity supply of honey increase at about 5.02468 kg additional amount of honey supplied to the market because most of the time people are price sensitive).

**Land Size:-** is one of explanatory variable that can determine quantity supply of honey. As it was hypothesized the variable is positively related and coefficient is statistically different from zero at less than 10 percent level. Keeping other variables constant, a unit increase in land size leads to increase in quantity supply of honey at about 8.124730 kg. The finding is due to the fact increase in land gives an opportunity to have sizable place for honey production purpose

**Distance from the market:** The results of the survey revealed that the variable under consideration is negatively related and significant at 1% level with quantity supply of honey. Holding other things constant, as distance from market increase by one unit quantity supply of honey decrease at about 6.14790 kg. The possible explanation is that access to markets gives the household an opportunity to be involved in the market and get price information in the market easily and it will give the opportunity to sale their products with fair price.

**Years of experience:-** *Beekeeping experience of the household is one of the factors affecting quantity supply of honey. As it was expected that experience has positive relation with quantity supply of honey and the coefficient is different from zero with 1% significance level. Ceteris paribus,, increasing experience by one unit (one more year experience), leads increase in quantity supply of honey about 7.105730 kg. The possible reason for this finding is experience enhance the capacity to capture technology, it may help to use improved inputs for beekeeping practices.*

**Income of the households:-** As it was hypothesized in this study income is directly related with quantity supply of honey and the coefficient is statistically different from zero with less than 5 present levels. Keeping other variables constant at their mean value a unit (one birr) increase in income of the beekeeping households' quantity supplied of honey increase by 0.0007694 kg.

**Modern hive use of the household:** - As it was expected modern hive use is positively related with quantity supply of honey and the coefficient is statistically significant at 1 percent level. Ceteris paribus, a unit increase in modern hive leads to increase in quantity supplied of honey at about 13.39760 kg. The possible reason for this result is the use of improved hive is directly related with the amount of honey produced, supplied to the market and return earned by beekeepers. If a producer uses more improved hive, this would increase production and productivity thus, increase the marketable supply.

#### 4. Conclusion and Policy Recommendation

##### 4.1. Conclusion

The study was conducted in Damot Gale woreda to assess factors affecting quantity supply of honey. Data for the study was collected from 120 rural beekeeping households from four kebeles. To attain the objectives of the study the researcher used both descriptive and econometric analysis to identify the effect of independent variables on independent variable. With descriptive analysis percentages, graphs, charts and tables were presented. To identify the socio-economic characteristics of the beekeeping households, market chain, performance, the descriptive analysis result shows that average family size of the beekeeping farmers in the study area during survey period was 5.5 persons, with maximum and minimum family size of 12 and 2 persons, respectively and the result shows when family size increases quantity supply of honey to the market decreases due to increase in household consumption. Out of the total sampled households in the study area, 105(87.5 %) were male-headed and 15(12.5%) were female headed households.

Among 120 respondents 99(82.5%) harvest honey twice within a year, whereas 21(17.5%) harvest once in a year in the same period. The respondents that any production obtained in the remaining periods of the year would be left as food for the colony to strengthen it for the next harvest. Price is one of the factor affecting quantity

supply of honey and the result of this study shows that average price in year 2018 was about 45.5 birr per kg, minimum price level 37 birr and the maximum 65 birr per kg of honey. When price level is 37 birr-42birr quantity produced is about 18134 kg, quantity consumed 2163 kg and quantity supplied to the nearby market 15971 kg and price level 43 birr – 55 birr the amount of quantity produced 21379 kg, honey consumed 3572 kg and quantity supplied to the market 17807 kg. The result clearly indicates that price and quantity supply are directly related.

Quantity supply of honey computed to different explanatory variables by employing the econometric analysis i.e. multiple linear regression analysis and the regression result revealed out of 13 explanatory variables, 10 of the variables:- household age, household family size, education, price, distance from market, year of experience, credit access, land size, modern hives and annual income have a significant effect on quantity supply of honey at 1 percent, 5 percent and 10 percent.

#### 4.2. Policy recommendations

- Family planning and related measures should be taken to limit household family size.
- Access to credit is also positively correlated with quantity supply of honey in the study area. It helps the beekeeping households to improve their productivity, to buy modern hives, to smooth consumption flows but with a prior saving used as pre requisite to qualify for credit in the form of group lending hinders credit access to the poor in the area. However, poor farmers find group lending inconvenient to access credit from MFI since they are rejected from the group by better offs on one hand and pre requisite saving requirement on the other. Therefore, accommodative credit policy should be employed; meaning that MFIs and other development agencies need to introduce credit policies targeting poorest of the poor.
- Market access improves household's quantity supply of honey and can enhance income of households; hence efforts should intensify to create some sort of market in the vicinities of households and improve road and other infrastructure facilities to established markets.
- We have found that female-headed households were less likely to be participated in beekeeping than men headed households. Promoting female education, empowering the female heads of households, introduction of agricultural packages knowledge that can be easily managed by women may enhance such household's income among other factors.
- Strong attention should be given for providing training to develop skills and establishing licensing system for unlicensed honey collectors to enhance quality of honey production this is because the reasons for quality problem could be low beekeeping skills and there are unlicensed traders/honey collectors who might be mixing honey with sugar.

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