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# Factors That Determine Poultry Market Participation Decision and Its Supply to the Market in Adwa Wereda, Central Zone of Tigray, Ethiopia

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**Abstract**
The objective of this study was to identify factors that determine poultry market participation decision and its supply to the market in Adwa wereda, Central Zone of Tigray, Ethiopia. A total of 200 poultry producing sample households from four potential poultry producing Tabias of the wereda were surveyed. Heckman two stage econometric model was used to identify factors determining market participation decision and value of poultry sales. Results obtained from the first stage of the model indicated that sex of the household head, number of chickens owned and extension contact were the variables that influenced the decision to participate in poultry and egg market positively while distance to the wereda market influenced the decision to participate in poultry and egg market negatively. Results from second stage of the model shows that the number of chickens owned and access to extension contact influenced the value of poultry sales by the market participants positively while distance to the wereda market and exotic poultry breed influenced volume of poultry sold by the participants negatively. Results from second stage of the model also shows that, number of poultry owned, access to credit, exotic poultry breed, education status and years of experience in farming influenced the value of egg sales positively while age of the household head were found to be influence egg supply to the market negatively.
**Keywords**: Value Chain Mapping, Value Addition, Profit Margin, Econometric

## 1. Introduction

Livestock production is an integral part of Ethiopia's agricultural sector and plays a vital role in the national economy. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. Livestock contributes about 20% of the GDP, supporting the livelihoods of 70% of the population and generating about 11% of annual export earnings (SPS-LMM, 2010). Ethiopia has an estimated 52.13 million cattle, 24.2 million sheep, 22.6 million goats, and 44.89 million poultry birds, which exists in private holdings (CSA, 2012).

Ethiopia ranks first in Africa and tenth in the world with respect to the livestock population (Gebregziabher, 2010). However, livestock production is constrained by traditional technologies, limited supply of inputs (feed, breed and water), high diseases prevalence, poor or non-existent of extension service, limited credit services, lack of marketing support service, poor marketing infrastructure and lack of market information. The Ethiopian poultry value chain is not well developed and is traditional. Marketing of poultry and poultry products at open markets is common throughout the country and both live birds and eggs are sold on road sides (Demeke, 2007).

Poultry contributes to household nutrition, as many rural poor households rely on their own poultry production to supply most of their animal food. Poultry provides not only protein but also highly-bioavailable essential micronutrients, such as iron, vitamin A and zinc, which are crucial especially for child nutrition and health (Iannotti *et al*., 2008). USAID (2010) reveals that, the indigenous poultry sector constitutes over 99% of all poultry produced and consumed in Ethiopia.

Livestock and Irrigation Value Chains for Ethiopian Smallholders (LIVES) project was initiated with the objective to transform smallholders into more commercial farmers through value chain based interventions in high value livestock commodity development (ILRI, 2013). Efforts to promote market oriented poultry production in the study area have not succeeded mainly due to limited scale of production, severe feed supply, poor genetic potential and poor veterinary services (ILRI, 2013). Therefore, poultry productivity and marketing problems can be solved by creating functional value chain in the study area.

## 2. Materials and Methods

### 2.1 Description of the Study Area

Adwa wereda is located between 14$^{o}$ 19' 25" North latitude & 39$^{o}$ 4' 27" East longitude in central zone of Tigray. It is found about 925 km North of Addis Ababa and 235 km west of Mekelle. The distance of the study Tabias (Endamariam Shewito, Wedikeshi, Betehanes and Debregenet) from Adwa Town are 14 km, 6 km, 10 km and 18 km respectively.

 

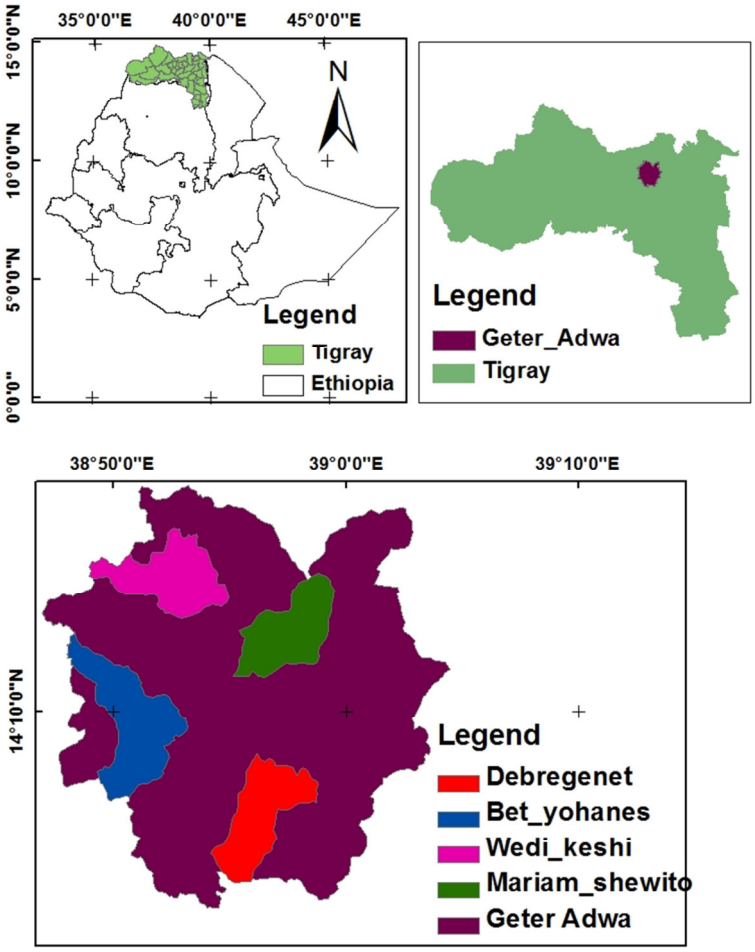


Figure 1: Map of the study area

**Altitude, Temperature and Rainfall**

The altitude of Adwa wereda ranges from 1805-2258 masl. The temperature of the area ranges from 18-28°c and mean temperature of 23°c. The mean annual rainfall of the area ranges from 600-850mm with mean of 725mm (ILRI, 2013).

**Human Population**

The total population of the wereda was 89,052. Of these population, 44,391(49.8%) and 44,661(50.2%) represented males and females respectively. this number was obtained from agricultural extension of the wereda. Tigrigna is the mother tongue for the population. The cultural food commonly used in the wereda is Injera with dero wet, shiro and keywet.

**Livestock Production**

Dairy, sheep, goats, poultry and honey bees productions are practiced in the wereda. Most of the production system is traditional and local poultry were dominant in the wereda (ILRI, 2013). Table 1 shows the types of livestock population in the study wereda.

Table 1: Livestock population

| | Number | | |
|---|---|---|---|
| Type | Local | Improved | Total |
| Cattle | 57,216 | 173 | 57,389 |
| Sheep | 46,573 | - | 46,573 |
| Goats | 85,326 | - | 85,326 |
| Poultry | 90,613 (81%) | 21602 (19%) | 112,215 |
| Honey bee colonies | 11,372 | 4,268 | 15,640 |

Source: ILRI, 2013.

**2.2 Research Design**

Descriptive type of research was adopted in this study. A cross sectional research design was employed because; the study was conducted only in a time manner on small portion of sampled population.

 

### 2.3 Data type and source

Both qualitative and quantitative types of data were collected from the study area. In order to get the overall picture of poultry value chain in the study area, the study used both primary and secondary sources of data. The primary data on the poultry value chain functions were collected from poultry value chain actors through interview and focus group discussion.

### 2.4 Method of Sampling and Sample Size

With regard to sample size, it is believed that more sample households could have better representation of the target population. However, to make the research more manageable (both in time and resources) sample households were selected from the selected sample Tabias. The total numbers of Tabias found in the study area were 18 from which four Tabias were selected purposively based on information obtained from the wereda's bureau of Agriculture and Rural Development Office, accessibility to undertake the research, poultry potential and interest of LIVES project. Households that have chicken were the sampling frame for the study. Based on this, 6,066 households constituted the sampling frame. Totally, 200 respondents were selected according to the sample size determination table at alpha 0.05 (Bartlett *et al*., 2001). Then, respondents were taken using sample proportionate to size. The respondents were stratified in to female and male household heads. Finally, the households were listed with the assistance of DAs and then simple random sampling method was used to select respondents from each selected Tabias. 142 male and 58 female headed households were selected randomly from the listed sampling frame.

Table 2: Number of poultry producer households and sample taken from each Tabia

| Name of Tabias | Poultry producers* | | | Sampled HH | | |
|---|---|---|---|---|---|---|
| | Male | Female | Total | Males | Females | Total Sampled |
| Endamariam Shewito | 1161 | 503 | 1664 | 38 | 17 | 55 |
| Betyehanes | 936 | 268 | 1204 | 31 | 9 | 40 |
| Wediqeshi | 1025 | 446 | 1471 | 33 | 15 | 48 |
| Debregenet | 1204 | 523 | 1727 | 40 | 17 | 57 |
| Total | 4326 | 1740 | 6066 | 142 | 58 | 200 |

*Source: Office of agriculture and rural development and Tabias administrative data, 2015.

Sample respondents were also selected from the other value chain actors on the basis of their size and availability and were interviewed based on their respective functions in the chain. Therefore, 10 collectors, 2 wholesalers, 17 retailers, 12 processers and 52 consumers were selected in the study area and Adwa town using random and purposive sampling techniques. All licensed (8) and 21 non licensed traders were selected using purposive and simple random sampling techniques respectively. Processors and consumers were also selected randomly.

### 2.5 Method of Data Collection

Enumerators were recruited and trained for data collection. The questionnaire was translated in to Tigrigna and backward to English languages. Then, the questionnaire was pre-tested to evaluate its design and time taken for the interview. Hence, appropriate modifications were made on the questionnaire. During data collection, the trained interviewers collected enough and accurate information or data from poultry producers in each selected Tabias to achieve the objectives of the study and avoid potential bias from the sampled households in responding to questions. Data were collected under continuous supervision of the researcher. The filled-in interview schedule was thoroughly checked for completeness and consistency. Similarly, informal surveys are employed to study the marketing systems of poultry and eggs to obtain additional supporting information for the study. Data was also collected from traders and processors through administering a structured and semi-structured questionnaire. Key informant interview was utilized to get the relevant data that shows current poultry value chain in the study area. The key informants' interview was including: extension workers, input and output marketing experts, collectors, retailers, processors, end users, NGOs workers in the study area and poultry experts from BoARD.

#### 2.5.1 Focus group discussion

A checklist was developed to guide the sequence of information to be collected from the focus group discussions. Members of the focus group discussion were selected from different groups such as elders, religion leader, Tabia administrator, Tabia's women affairs, model farmers and youth associations so as to collect accurate information or data about poultry value chain functions and the current constraints on value chain of poultry in the study area. Discussions were conducted in each selected Tabias with the size of 8 persons per selected Tabia. The focus group discussion was facilitated and monitored by the researcher and every member of the group was given equal chance to express his/her ideas. Information concerning poultry value chain functions, services, constraints and opportunities were collected from the focus group discussions using checklist.

 

### 2.6 Data Processing and Analysis

The collected data were coded and entered in to Microsoft excel to be ready for analysis. The data collected from respondents were analyzed by using SPSS 16 and STATA 10 software packages. *Heckman*'s *two stage econometric* model was used to identify the factors that affect farmers' participation decision in the supply of poultry and eggs to the market on the one hand and determinants of the volume of poultry and eggs supply to the market on the other hand.

#### 2.6.1 Econometric analysis

Econometric model was used to identify the factors that affect farmers' participation decision in the supply of poultry and eggs to the market on the one hand and determinants of the volume of poultry and eggs supply to the market on the other hand. Most literatures adopt is Heckman's two stage model' to identify factors that affect producers' participation in the poultry supply (sale of poultry) or not and also identify the factors that determine the level of poultry (chicken and egg) supplied to market. Ideally, the OLS model is applicable when all households participate in the market. In reality not all households participate in poultry market. If the OLS regression is estimated excluding the nonparticipants from the analysis, a sample selectivity bias is introduced into a model. Such a problem can be overcome by following a two-step procedure as suggested by Heckman (1979). The first stage of the Heckman two-stage model a 'participation equation,' attempts to capture factors affecting participation decision. This equation is used to construct a selectivity term known as the 'inverse Mills ratio' (which is added to the second stage 'outcome' equation' that explains factors affecting volume of poultry supply. The inverse Mill's ratio is a variable for controlling bias due to sample selection (Heckman, 1979 as cited in Gebregzabher, 2010). The second stage involves including the Mills ratio to the poultry supply equation and estimating the equation using Ordinary Least Square (OLS). If the coefficient of the 'selectivity' term is significant then the hypothesis that an unobserved selection process governs the participation equation is confirmed.

**The participation Equation**

$$Y_{1i} = \chi_{1i}\beta_1 + u_{1i} \qquad u_{1i} \sim N(0,1) \qquad (1)$$

$$PMP = 1 \text{ if } Y_{1i} > 0 \qquad (1a)$$

$$PMP = 0 \text{ if } Y_{1i} \le 0$$

Where: $\gamma_{1i}$ is the latent dependent variable, which is not observed?

$\chi_{1i}$ is vectors that are assumed to affect the probability of sampled household poultry market participation

$\beta_1$ is a vector of unknown parameter in participation equation

$u_{1i}$ are residuals that are independently and normally distributed with zero mean and constant variance.

**The observation equation/the supply equation**

$$MPV = Y_{2i} = \chi_{2i}\beta_2 + u_{2i} \qquad u_{2i} \sim N(0, \delta^2) \qquad (2)$$

$Y_{2i}$ is observed if and only if $PMP = 1$. The variance of $u_{1i}$ is normalized to one because only $PMP$, not $Y_{1i}$ is observed. The error terms, $u_{1i}$ and $u_{2i}$, are assumed to be bivariat, normally distributed with correlation coefficient, $\rho$. $\beta_1$ and $\beta_2$ are the parameter vectors.

$Y_{2i}$, is regressed on the explanatory variables, $\chi_{1i}$, and the vector of inverse Mills ratios ( $\lambda_i$ ) from the selection equation by ordinary least squares.

Where: $\gamma_{2i}$ is the observed dependent variable

$\chi_{2i}$ is vectors that are assumed to affect sale volume

$\beta_2$ is vector of unknown parameter in the supply equation

$u_{2i}$ is residuals in the supply equation that are independently and normally distrusted with zero mean and constant variance.

$$\lambda_i = \frac{f(\chi\beta)}{1 - F(\chi\beta)} \qquad (3)$$

$f(\chi\beta)$ is density function and 1-F ( $\chi\beta$ ) is distribution function

 

## 3. Result and discussion

### 3.1 Determinants of Poultry Market participation and its Supply

All of the selected sample households in Adwa wereda keep poultry but not all sell chicken or egg. The Heckman's procedure results for both outcome and selection variables are presented and discussed in the next subsection. Multi co-linearity was checked before running the econometric model for both the continuous and dummy variables. According to Gujarati (2003), multicollinearity refers to a situation where it becomes difficult to identify the separate effect of independent variables on the dependent variable because of existing strong relationship among them. Variance inflation factor (VIF) was used to check whether there was multi co-linearity or not among the continuous variables. The result obtained through checking variance inflation factor of the variables ranged 1.05- 4.67. As a rule of thumb, if the VIF is greater than 10, the variable said to be highly collinear (Gujarati, 2003). Moreover, contingency coefficient was also computed to check whether there was multicollinearity or not among the dummy or discrete variables. The value ranges between 0 and 1, with 0 indicates no association between the variables and value close to 1 indicating a high degree of association between variables. Hence, multi-co linearity was not a serious problem both among the hypothesized continuous and dummy variables (Appendix Table 1 and 2). Heteroscedasticity was also checked using SPSS16 soft ware to check the degree of homoskedasticity and linear relationship among the variables. So, there was no a serious problem of hetroscedasticity and linearity problem.

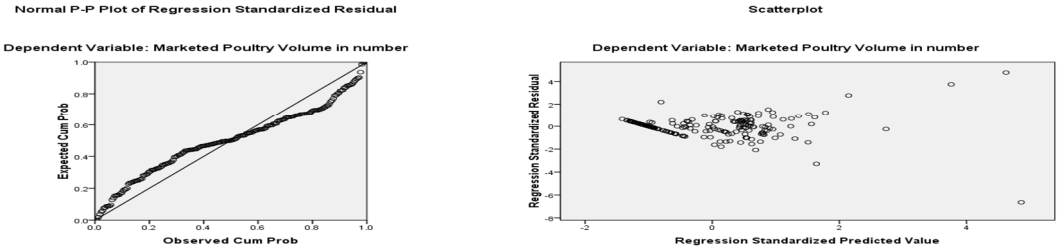


Figure 2: Linearity and homoskedasticity
Source: SPSS software package output, 2015.

#### 3.1.1 Factors determining poultry market participation decision

In order to examine what factors affect Adwa wereda farmers' decision to sell or not to sell of their poultry, fifteen variables which are sex of the household head, age of the household head, family size of the household head, education status of the household head, distance to the market, market information, extension service, number of chickens owned, credit access, feed supplement, experience in crop farming, grain availability, off-farm income, type of breed and income from other livestock were the hypothesized variables for poultry market participation decision. Based on the Heckman selection assumption, one variable, which is market information, was included in the participation equation but not in the observation equation. Among the 15 hypothesized variables, sex, grain availability, number of chickens owned, extension service and distance to the market) have statistically significant influence on market participation decision (Table 3).

**Sex of the household head:** Being female influenced the probability market participation decision of poultry positively and in statistically significant manner at ($p< 0.01$). The most probable reason for this result might be that female-headed households keep poultry, they may have good management practices; this in turn would increase the amount of production. As a result, they may be more likely to participate in poultry market and use the produced chicken and egg for sale. The marginal effect also indicated that, if the household head is female the probability to participate in poultry market increases by 30 percent. Similarly, previous study conducted by Zeberga (2010) found that sex of the household head has a significant and positive relationship with the farmers' market participation decision.

**Grain availability** influenced the probability of market participation decision of poultry negatively and statistically significant at less than 10 percent significance level. Contrary to the expectation grain availability of the household was found to influence market participation decision negatively and significant. The most probable reason for this result might be that even if the households have better grain availability, they may give less attention for feed supplement and they may see the poultry business as minor things; this in turn would increases the death rate. As a result, they may not participate in the poultry production for market. The marginal effect indicated that, if the grain availability increases by one, the probability to participate in poultry market decreases by 23.3 percent.

**Number of chicken owned** influenced the probability of farmers' poultry market participation decision positively and statistically significant at ($p<0.01$). This could be because of the fact that, the larger the flock size, the more likely the producers sell chicken. The larger the number of chickens owned, the higher the quantity of chicken produced hence the probability of participation in poultry marketing increases and vice versa. The marginal effect also indicated that, if the number of chickens owned increases by one, the probability to

 

participate in poultry market increases by 17.3 percent.

**Access to Poultry Production Extension Service:** influenced the probability of poultry market participation positively and statistically significant at ($p<0.01$). This can be because of the fact that extension service widens the household's knowledge with regard to the use of improved poultry production technologies and has positive impact on volume of poultry marketed and also extension visits improves the household's intellectual capitals or knowledge concerning poultry production system particularly relating to modern poultry production, management and handling methods, which improves poultry production and increases the amount of chicken and egg production hence the participation in poultry marketing. Furthermore, the marginal effect shows that, the probability that poultry producers those who received extension services participate in poultry market increases by 32 percent.

**Distance to nearest market** influenced the probability of market participation decision negatively and statistically highly significant at ($p< 0.01$). The most probable reason for this result could be that households, which are far away from wereda market, incur high transportation and other related costs. Incurring high transportation and other related costs due to long distance to market will discourage them to participate in the market. The marginal effect also indicated that as the distance to wereda market increases by one kilometer the probability to participate in poultry market decreases by 38.3 percent. This is in line with Gebregziabher (2010).

Table 3: Heckman selection Model (two-steps) estimates of poultry market participation

| Variable | Coefficient | Marginal effects | P-value |
|---|---|---|---|
| Cons | -3.362 | | 0.272 |
| SEXHH | 0.297*** | 0.297 | 0.007*** |
| AGEHH | 0.059 | 0.059 | 0.351 |
| FAS | 0.214 | 0.214 | 0.219 |
| EDHH | 0.093 | 0.093 | 0.317 |
| YEF | 0.056 | 0.060 | 0.350 |
| Grain availability | -0.232* | -0.232 | 0.078* |
| OI | 0.00003 | 0.00003 | 0.752 |
| FIOLS | -0.0002 | -0.0002 | 0.241 |
| FS | 0.613 | 0.613 | 0.341 |
| BT | -0.115 | -0.115 | 0.847 |
| No. chicken owned | 0.173*** | 0.173 | 0.003*** |
| Access to extension | 0.316*** | 0.316 | 0.003*** |
| AC | -1.111 | -1.111 | 0.240 |
| MI | 0.074 | 0.074 | 0.917 |
| Distance to market | -0.383*** | -0.383 | 0.007*** |

Source: Survey result, 2015.

**3.1.2 Factors affecting the amount of poultry supply to the market**

In the second stage of Heckman model, fourteen variables were hypothesized to influence volume of poultry marketed. These variables were sex of the household head, age of the household head, family size of the household head, education status of the household head, distance to the nearest market, extension service, number of chickens owned, credit access, feed supplement, experience in crop farming, grain availability, off-farm income, type of breed and income from other livestock.

**Type of poultry breed** influenced the volume of chicken supply to the market negatively and statistically significant at ($p<0.10$) significance level. This can be explained as farmers possessing exotic breed produce lower volume of chicken than those who use the local one. This could be due to the reason that exotic chicken are sensitive to diseases and could not incubate their eggs to hatch chicks by their nature as local breeds do. The less they produce, the less they tend to supply poultry to the market. As indicated in Heckman selection model(two-steps) estimates of value of poultry sales (Table 4), at the same time as a poultry producers gets one more unit of exotic poultry breed leads a 3.8 value decreased in the quantity of chicken supplied to the market being other variables held constant.

**Number of poultry/chicken Owned** by the household influenced the volume of poultry sale positively and statistical significant at ($p<0.01$). This indicates that farmers with more number poultry can produce more volume of chicken and egg and not only having of better marketable surplus but will able to sell in bulk and create an opportunity to the producers to negotiate for better prices as well as contracts with major buyers in which case therefore, are assured of a constant market. A unit increase in the number of poultry owned will lead a 0.42 increment in the value of poultry sales being other variables held constant.

**Access to Poultry production Extension service** as expected influenced poultry marketed volume positively and statistically significant at ($p<0.05$). This can be because of the fact that extension service widens the household's knowledge with regard to the use of improved poultry production technologies and has positive impact on volume of poultry marketed and also extension visits improves the household's intellectual capitals or

 

knowledge concerning poultry production system particularly relating to modern poultry production, management and handling methods, which improves poultry production and increases the amount of chicken production. Furthermore, the coefficient shows that, poultry producers those who received poultry production extension services supply 11.27 number of more poultry than those who didn't receive extension services. This study is in line with Abebe (2009).

**Distance to nearest market:** significantly at ($p<0.01$) and negatively affects the volume of poultry sold. In relation to this, market accessibility by the producer households can also be vital for boosting value of poultry sale. Moreover, the estimation result (Table 4) shows that distance to markets is inversely related to the volume of chickens marketed from the chicken keeping activity. The most probable reason for this result could be that households, which are far apart from nearest market, incurred high transportation and other related costs will discourage them to supply large number of chicken to the market. The coefficient of estimation of volume of poultry sold with respect to distance to markets indicate that a 1 km increase in distance to markets leads to a 1.05 number reduction in the volume of poultry sales being other variables held constant. A study conducted by Tadesse (2012) states that those households closer to markets benefited from higher farm gate prices and vital information concerning prices, which contributes to earn higher farm income.

Table 4: Heckman selection Model (two-steps) estimates of value of poultry sales

| Variable | Coefficient | Stan.error | P-value |
|---|---|---|---|
| Cons | 8.114 | 11.755 | 0.490 |
| SEXHH | 3.289 | 2.239 | 0.142 |
| AGEHH | -0.175 | 0.212 | 0.410 |
| FAS | 0.069 | 0.696 | 0.921 |
| EDHH | -0.149 | 0.288 | 0.604 |
| YEF | 0.228 | 0.197 | 0.247 |
| Grain availability | -0.118 | 0.379 | 0.757 |
| OI | -0.00018 | 0.0002 | 0.389 |
| FIOLS | 0.00016 | 0.0004 | 0.706 |
| FS | 2.132 | 3.742 | 0.569 |
| BT | -3.839* | 2.092 | 0.067* |
| No. of chicken owned | 0.423*** | 0.049 | 0.000 *** |
| Extension service | 11.269** | 4.685 | 0.016 ** |
| AC | 1.234 | 1.98 | 0.534 |
| Distance to market | -1.046*** | 0.365 | 0.004*** |
| Lambda | 9.85576 | | 0.037** |
| rho($\rho$) | 1.000 | | |
| Sigma | 9.85576 | | |

Wald chi2 (28) = 138.06 Prob > chi2 = 0.0000

Source: Survey result, 2015.

Rho$(\rho)$ is the correlation between the error terms of the substantive and selection models. Rho has a potential range between -1 and +1 and can give some indication of the likely range of selection bias. A correlation with an absolute value of 1 would occur if the regression coefficients of the selection model and the regression coefficients of the substantive model were estimated by identical processes (i.e., potential selection bias). Conversely, a value of rho closer to zero would suggest that data are missing randomly or the regression coefficients of the selection model and the regression coefficients of the substantive model were estimated by unrelated processes (i.e., less evidence of selection bias) (Cuddeback *et al*.,2004).

**Inverse Mill's ratio (LAMBDA):** The inverse Mill's ratio had positive relation with the volume of poultry surplus to the markets and significant at ($p<0.05$) and it confirms that in Heckman two-stage model, the correction for selectively bias is significant. This result suggests that there appears to be no unobserved factors that might affect both probability of producers market entry decision and marketable supply.

### 3.1.3 Factors determining egg market participation decision

To observe the factors mainly affect farmers' decision to sell or not to sell of their egg in the study area, fifteen variables which are sex of the household head, age of the household head, family size of the household head, education status of the household head, distance to the market, market information, extension service, number of chickens owned, credit access, feed supplement, experience in crop farming, grain availability, off-farm income, type of breed and income from other livestock were the hypothesized variables for egg market participation decision. Among the 15 hypothesized variables, four of them (sex, grain availability, number of chickens owned, extension service and distance to the market) have statistically significant influence on market participation decision (Table 5).

**Sex of the household head:** Being female influenced the probability market participation decision of egg

 

positively and in statistically significant manner at ($p< 0.01$). The most probable reason for this result might be that female-headed households keep poultry, they may have good management practices; this in turn would increase the amount of egg production. As a result, they may be more likely to participate in egg market and use the produced egg for sale. The marginal effect also indicated that, if the household head is female the probability to participate in poultry market increases by 29.7 percent. Similarly, previous study conducted by Zeberga (2010) found that sex of the household head has a significant and positive relationship with the farmers' market participation decision.

**Grain availability** influenced the probability of market participation decision of egg negatively and statistically significant at less than 10 percent significance level. Contrary to the expectation grain availability of the household was found to influence market participation decision negatively and significant. The most probable reason for this result might be that even if the households have better grain availability, they may give less attention for feed supplement and they may see the poultry business as minor things; this in turn would increases the death rate. As a result, they may not participate in the egg production for market. The marginal effect indicated that, if the grain availability increases by one the probability to participate in egg market decreases by 23.3 percent.

**Number of chicken owned** influenced the probability of farmers' egg market participation decision positively and statistically significant at ($p<0.01$). This could be because of the fact that, the larger the flock size, the more likely the producers produce and sell eggs to the market. The larger the number of chickens owned, the higher the quantity of eggs produced hence the probability of participation in egg marketing increases and vice versa. The marginal effect also indicated that, if the number of chickens owned increases by one the probability to participate in egg market increases by 17.3 percent.

**Access to Poultry Production Extension Service** influenced the probability of egg market participation positively and statistically significant at ($p<0.01$). This can be because of the fact that extension service widens the household's knowledge with regard to the use of improved poultry production technologies and has positive impact on volume of egg marketed and also extension visits improves the household's intellectual capitals or knowledge concerning poultry production system particularly relating to modern poultry production, management and handling methods, which improves poultry production and increases the amount of egg production hence the participation in egg marketing. Furthermore, the marginal effect shows that, the probability that poultry producers those who received extension services participate in egg market increases by 31.6 percent.

**Distance to nearest market** as expected influences the probability of egg market participation decision negatively and statistically highly significant at ($p< 0.01$). The most probable reason for this result could be that households, which are far away from wereda market, incur high transportation and other related costs. Incurring high transportation and other related costs due to long distance to market will discourage them to participate in the market. In addition to that travelling long distance to sell eggs may be very tiresome for the farmers. The marginal effect also indicated that as the distance to wereda market increases by one kilometer the probability to participate in egg market decreases by 38.3 percent. This is in line with Gebregziabher (2010).

Table 5: Heckman selection Model (two-steps) estimates of egg market participation

| Variable | Coefficient | Marginal effects | P-value |
|---|---|---|---|
| Cons | -3.362 | - | 0.272 |
| SEXHH | 0.297*** | 0.297 | 0.007*** |
| AGEHH | 0.059 | 0.059 | 0.351 |
| FAS | 0.214 | 0.214 | 0.219 |
| EDHH | 0.093 | 0.093 | 0.317 |
| YEF | 0.056 | 0.060 | 0.350 |
| Grain availability | -0.232* | -0.232 | 0.078* |
| OI | 0.00003 | 0.00003 | 0.752 |
| FIOLS | -0.0002 | -0.0002 | 0.241 |
| FS | 0.613 | 0.613 | 0.341 |
| BT | -0.115 | -0.115 | 0.847 |
| No. chicken owned | 0.173*** | 0.173 | 0.003*** |
| Access to extension | 0.316*** | 0.316 | 0.003*** |
| AC | -1.111 | -1.111 | 0.240 |
| MI | 0.074 | 0.074 | 0.917 |
| Distance to market | -0.383*** | -0.383 | 0.007*** |

Source: Survey result, 2015.

### 3.1.4 Factors affecting the amount of egg supply to the market

Fourteen variables were hypothesized to influence volume of egg marketed in the second stage of Heckman model. These variables were sex of the household head, age of the household head, family size of the household head, education status of the household head, distance to the nearest market, extension service, number of

 

chickens owned, credit access, feed supplement, experience in crop farming, grain availability, off-farm income, type of breed and income from other livestock. Out of these, six variables were found to be the factors which determine the volume of egg market surplus by poultry producers significantly (Table 6).

**Age of the household head:** Influenced the volume of egg sale negatively and statistically significant at ($p<0.01$) significance level. The aged household could stay at home and produce more eggs than less aged. But, the negative result could be because of the fact that, aged households cannot travel long distance and supply eggs to the market. A unit increases in the age of household will lead a 22 decrease in the value of egg supply to the market being other variables held constant.

**Education level of the household head:** Education has a positive effect on egg sale quantity per household per year. It is statistically significance at less than 10% significance level. The model output verifies that, one additional formal year education level leads to the poultry producing household to increase yearly egg production by 20.3 in number. This is in line with Abebe (2009). In fact, educated household can know and improve the nutritional status of the family by consuming the produced eggs at home. But, the positive and significant relationship indicates that, education improves the household ability to acquire new idea related to poultry production and market information, which in turn improves egg productivity and thereby increase marketable supply of eggs.

**Years of experience in farming:** Contrary to the expectation, it influenced the volume of egg sale positively and statistically significant at ($p<0.05$) significance level. This could be because of the fact that farmers having more farming experience can produce more grain and this grain can serve as feed supplement for the poultry. As a result, the poultry can increase their egg productivity due to feed supplement. A unit increase in one year of farming experience of the household will lead an 18.4 value increment in the quantity of egg supplied to the market being other variables held constant.

**Breed type:** Influenced the volume of egg sale positively and statistically significant at ($p<0.10$) significance level. This can be explained as farmers possessing exotic breed produce higher volume of egg than those who use the local one and the more they produce, the more they tend to supply eggs to the market. As indicated in Heckman selection model(two-steps) estimates of value of egg sales (Table 6), at the same time as a poultry producers gets one more unit of exotic poultry breed results to 145.12 value increment in the quantity of egg supplied to the market being other variables held constant.

**Number of chicken owned** by the household influenced the volume of egg sale positively and statistically significant at ($p<0.01$) significance level. This could be because of the fact that farmers with more number poultry can produce more volume of egg and not only having of better marketable surplus but will able to sell in bulk and create an opportunity to the producers to negotiate for better prices as well as contracts with major buyers in which case therefore, are assured of a constant market. This is in line with Gebregzabher (2010). A unit increase in the number of poultry owned leads to an 11.4 increment in the value of egg supplied to the market being other variables held constant.

**Access to credit service** Credit access for poultry production also has positive influence on volume of egg sold and statistically significant at less than 5%. This is in line with Mesfin, (2012). This could be because of the fact that if the poor households get a credit access especially in-kind credit, they can be encouraged to rear chicken and produce more eggs. As a result, they tend to supply eggs to the market and at the same time as a poultry producers get a credit for one more chicken (in-kind credit) results to 185.7 value increment in the quantity of eggs supply to the market being other variables held constant.

 

Table 6: Heckman selection Model (two-steps) estimates of value of egg sales

| Variable | Coefficient | Stan. Error | P-value |
|---|---|---|---|
| Cons | 497.03 | 472.04 | 0.29 |
| SEXHH | -16.376 | 89.078 | 0.854 |
| AGEHH | -22.022*** | 8.415 | 0.009*** |
| FAS | -4.808 | 28.033 | 0.864 |
| EDHH | 20.349* | 11.449 | 0.076* |
| YEF | 18.427** | 7.833 | 0.019** |
| Grain availability | 1.018 | 15.122 | 0.946 |
| OI | 0.011 | 0.008 | 0.168 |
| FIOLS | 0.0269 | 0.017 | 0.108 |
| FS | -42.139 | 153.998 | 0.784 |
| BT | 145.118* | 83.213 | 0.081* |
| No. of chicken owned | 11.399*** | 1.961 | 0.000 *** |
| Extension service | -58.263 | 187.224 | 0.756 |
| AC | 185.680** | 77.993 | 0.017** |
| Distance to market | -11.862 | 14.548 | 0.415 |
| Lambda | 19.619 | 210.629 | 0.926 |
| rho$(\rho)$ | 0.50 | | |
| sigma | 385.7 | | |

Wald chi2 (28) = 125.19 Prob > chi2 = 0.0000, N=200
Source: Survey result, 2015.

**Conclusion**

The study was aimed at value chain analysis of poultry in Adwa Wereda, Central Zone of Tigray, Ethiopia The specific objectives of the study include factors that determine poultry market participation decision and its supply to the market in the study area.

Determinants of farmers participation decision in the supply of chicken and eggs to the market and intensity of the volume of supply was analyzed and key determinant factors were identified. The sample poultry producers were grouped as market participants and non participants. From the variables hypothesized to influence market participation decision, sex of the household head, number of chickens owned extension contact and distance to wereda market were significantly influencing the market participation decision of poultry and eggs. From the variables that were expected to affect poultry supply, number of poultry owned access to extension contact, distance to the wereda market and type of poultry breed were found to influence the value of poultry sales. From the variables that were expected to affect value of egg sales, number of poultry owned, access to credit, breed type, education status and age of the household head were found to influence egg supply to the market.

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