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ANALYSIS OF FACTORS AFFECTING ADOPTION OF EXOTIC CHICKEN BREED PRODUCTION IN NORTH WESTERN ZONE OF TIGRAY, ETHIOPIA

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Abstract

Exotic chicken breed were promoted and disseminated in the rural and peri-urban parts of Ethiopia, to improve the productivity of the poultry to increase the income of farmers. The study was conducted to explore the factors affecting adoption of exotic chicken breed in Tselemti and Tahtay Koraro districts of North western zone of Tigray Region, Ethiopia. A multi-stage random sampling technique was followed to select 264 respondents from the six randomly selected Kebelles of the two districts. Primary data were collected using semi-structured interview questionnaire from the respondents. Descriptive statistics and binary logistic regression model were used for analyzing the collected quantitative data. The results of the logit model indicates that family size, sex of the household head, education status of the household head, livestock holding size, extension contact, availability of exotic chicken breed, distance to the nearest market and availability of training on poultry production could play a significant roles on the probability of exotic poultry breed adoption. Thus, the dissemination of different exotic chicken

breeds needs to be supported with giving training to the farmers before intervention of the technology, extension backup on how to manage and awareness creation on the benefits of exotic chicken breed and giving focus in delivering and making available the chicks of exotic poultry breeds to the farmers.

Keywords: Adoption, exotic poultry breed, factors, binary logit model, exotic chicken, farmers, technology, Ethiopia

INTRODUCTION

Family poultry is important for food security, religious reasons and poverty alleviation in developing countries including Ethiopia (Gueye, 2005). Poultry production is the most suitable technology that is practiced in every rural and peri-urban parts of Ethiopia which requires a small land and capital for investing (Tadelle *et al.,* 2003). In Ethiopia there is no any cultural taboo on egg and chicken meat consumption (Aklilu *et al*., 2007). The type of poultry that reared in Ethiopia is chicken (Solomon, 2008 and Tadelle *et al.,* 2003a).

The chicken meat and egg production in Ethiopia in 2015 was 49,000 tonnes and 419 million, respectively (LMP, 2015). Ethiopian livestock Master Plan Roadmaps for growth and transformation has estimated that by the year 2020 poultry annual chicken meat and egg production in Ethiopia would raise to 164,000 tonnes and 3.9 billion, respectively, and increasing the share of chicken meat consumption to total meat consumption from the 4% in 2015 to 27% by 2030, by distributing improved chicken breeds (LMP, 2015).

In Ethiopia at national level poultry population is estimated to be 56.87 million CSA, 2015). Of these in breed type 95.86%, 2.79% and 1.35% of the total poultry are indigenous, hybrid and exotic, respectively. The total chicken population of Tigray Region is estimated to be 6.2 million, which accounts 10.4% of the national chicken population and contributing about 10.8% of the total national egg production (CSA, 2015).

To improve the chicken production so as to increase the chicken contribution to income and dietary diversity of the household; Ministry of Agriculture and Rural Development of the country have been multiplied and disseminated several exotic chicken breeds to the farmers over the last 50 years in different parts of the country (Solomon, 2008). North western zone of Tigray is one of the six zones of Tigray region. The zone is potential in producing poultry having 2,365,451 chickens which accounts 38.2% of the total chicken population of the Region (CSA, 2015). Similarly to other parts of Ethiopia, in Tigray particularly in north western zone of Tigray, great attempt has been executed to improve the chicken production by introducing and

distributing exotic chicken breeds for the last 15 years (OoFED, 2016). Bovans Brown, Rhode Island Red and Koekoek are the most common exotic poultry breed types that disseminated to the farmers in the study area. The distribution of these exotic poultry breed had been done through the collaborative efforts of the governmental and non-governmental organizations. The breeds are distributed to the beneficiaries when they are two months old (OoARD, 2016).

Even though a number of exotic chicken are distributed annually to the farmers adoption of the exotic chicken breed at country level is very low. So far out of the total poultry production at the country level (95.86%) is endowed with local breed of scavenging types (CSA, 2015). But, the output (egg and meat) of the local breed is low when comparing to exotic chickens (Alganesh *et al.*, 2003).

The reasons for non-adoption of the improved chicken breed is due its hindrance by a set of factors including sub-optimal management, lack of supplementary feed and high mortality rate due to diseases and predators (Tadelle *et al.,*2003 and Teklewold *et al.*,2006).

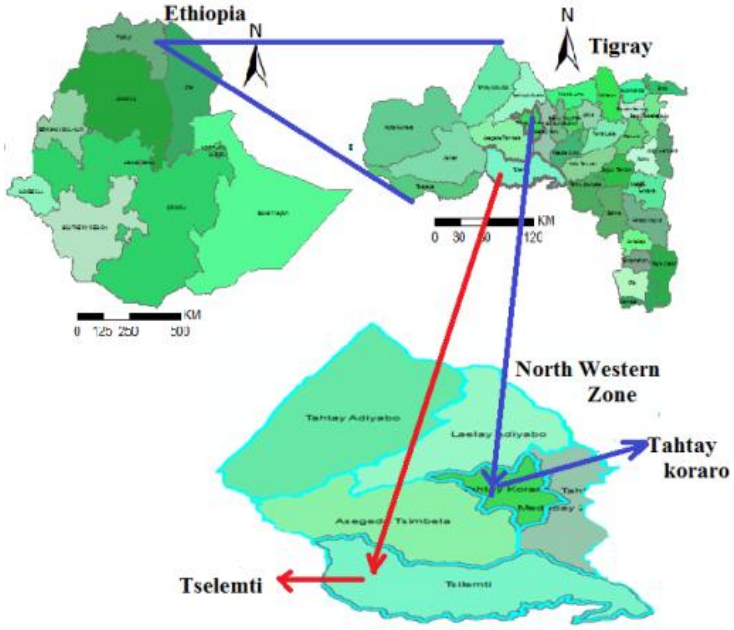
However, up to the knowledge of the authors no study has been conducted so far on factors affecting adoption of exotic chicken breed in Tigray Region. Thus, the purpose of this study is to investigate the factors that influence the adoption of exotic poultry breeds in the study areas.

RESEARCH METHOD

Description of the Study Area

This study was carried out in six selected villages from two Woredas of the north western zone of Tigray. Tigray regional state is located in the Northern part of Ethiopia. North western Zone is one of the six administrative Zones in Tigray Region which is located 304 km west of Mekelle and 1087 km from Addis Ababa. The zone is known in its livestock production; particularly poultry production. The zone has 1,858,256 cattle, 175,587 sheep 1,971,601 goats and 2,365,451 chickens (CSA, 2015). Tselemti and Tahtay Koraro districts of the Zone were selected for the study. Tselemti district is found 1172 km from Addis Ababa, 389km west of Mekelle and 85km south of Shire; while, Tahtay Koraro district is located 1087 km from Addis Ababa and 304 km west of Mekelle.

Figure 1. Map of the study area



Sampling Procedure

In this study, multi stage sampling procedure was employed in selecting the respondent households. In the first stage, Tselemti and Tahtay Koraro districts were selected purposively based on their potential exotic poultry breed production from north western zone of Tigray, of the eight districts of the zone. Then, among the identified Kebelles, three Kebelles from each of the two Woredas was selected using simple random sampling method. 132 farm households from each of the two Woredas, a total of 264 sample households were selected for the study. The number of sample respondents from each of the selected Kebelles, the adopters and non adopters were identified based on the probability proportionate to sample size in each of the selected Woredas. Finally, respondents were selected using systematic random sampling from both strata (adopters and non-adopters) in each Kebelles. Adopters are those producers who are involved in exotic poultry production either in pure or cross breed forms during the survey year and given a value of 1, whereas, non-adopters are those producers of poultry who have not kept exotic chicken before and given a value of 0. The total sample size was determined by using Kothari (2004) formula as follows:

$$n = \frac{Z^2.p.q.N}{e^2(N-1)+Z^2.p.q}$$

Where; n = sample size determined from the total household, N = Total poultry producer household of the two Woredas (29907), Z = confidence level, p = (0.5), = 1- p, e = allowable

error in the study (e=6%). Accordingly, the number of respondents in each Kebelles/Villages is shown in table 1.

Table 1. The number of households selected from each Kebelles.

No	Woreda	Kebelle	Total Number of Households in the sampled Kebelles			Sample households selected		
			Adopter	Non- adopter	Total	Adopter	Non-adopter	Total
1	Tselemti	Wuhdet	550	830	1380	21	31	52
		Medhanalem	625	739	1364	23	28	51
		Mai-ayni	324	452	776	12	17	29
		Sub total	1499	2051	3520	56	76	132
2	Tahtay Koraro	Selam	458	687	1145	18	26	44
		Adigdad	550	790	1340	21	30	51
		Haftom	387	578	965	15	22	37
		Sub total	1395	2055	3450	54	78	154
		Grand total	2894	4076	6970	110	154	264

Source: Computed from Secondary data, 2016

Sources and Methods of Data Collection

Primary and secondary data were collected and used for this study. Primary data was collected from sample respondents through interviewing using semi-structured questionnaire. The survey was conducted from October - December 2016 through hiring enumerators. Secondary data were gathered from different relevant sources such as reports of Woreda Office of Agriculture Rural Development, Central Statistical Authority, Research Center, different published and unpublished documents, research studies, websites, etc.

Method of data analysis

Based on the objective of the study appropriate techniques of analysis such as descriptive statistics, inferential statistics (t-test) were used to see the difference between adopter and non-adopter. Binary logit model was used to identify the factors affecting adoption of exotic poultry breed in the study area.

Before running the Logit model all the hypothesized explanatory variables was checked for the existence of multi-collinearity problem. Variance Inflation Factor (VIF) for association among the continuous explanatory variables and contingency coefficients for dummy variables were employed in this study to detect the existence of multi-collinearity. As a rule of thumb, if

the VIF of a continuous variable exceeds 10 that variable is said to be highly collinear. For dummy variables, if the value of contingency coefficient is greater than 0.75, the variable is said to be collinear (Gujarati, 2004).

RESULTS AND DISCUSSION

Result of Descriptive Statistics

Table 2. Value of the continuous explanatory variable between adopters and non-adopters

No	Variables	Adopter (n=110) Mean (SD)	Non-adopter (n=154) Mean (SD)	t-test	p-value
1	Age of the household head	41.28 (8.78)	47.64 (7.87)	7.32***	0.000
2	Family size	6.55 (1.12)	4.51 (0.94)	2.57***	0.000
3	Poultry farming experience	11.68 (7.80)	13.89 (8.74)	2.30NS	0.221
4	Livestock holding	4.3 (3.92)	7.82 (4.69)	6.69***	0.000
5	Market distance	7.29 (15.68)	9.22 (25.09)	10.86***	0.000

Sources: Computed from own survey, 2016

*** Significant at 1% level of significance and NS = Not Significant,

SD = Standard divisions

The mean age of the respondents is 44.46 years. The average age of adopters and non-adopters were 41.28 and 47.64, respectively. This might indicate that young farmers were becoming interested in trying and adopting exotic chicken breed than aged farmers.

The average family size of the sample households was 5.5 persons. The average family size for adopters and non-adopter were 6.5 and 4.5 persons, respectively. The household that have large family size were better in adopting the chicken technology. This could show that having large family size enables farmers to manage their exotic poultry in a well manner. The average livestock holding in TLU of the adopters and non-adopters sample households was 4.3 and 7.82 TLU, respectively. However, the average distance taken for the household to sale their chicken product from their residence to the nearest market place is 7.29 km and 9.22 km, respectively, for adopters and non-adopters.

Result of the econometric analysis

The chi-square goodness-of-fit test statistics of the model show that the model fits the data at1% level of significance. This shows that the explanatory variables included in the model were

able to explain the farm households' decisions to the adoption of exotic poultry breed. The model results show that the logistic regression model correctly predicted 97.7% of the sample households. The sensitivity (correctly predicted of exotic poultry users) and specificity (correctly predicted non-users) of the logit model are 98.2% and 97.4%, respectively. Hence, the model predicts both groups accurately.

Based on the model results, livestock holding and market distance were found to have a negative sign, while the remaining variables: education, sex, family size, extension contact, access to exotic poultry breeds and participating in training have a positive sign.

Table 2. The maximum likelihood estimation of the binary logit model

No	Variable	Coefficient	P-value	Odds ratio
1	Age of the household head	-0.033	0.614	0.967
2	Sex of the household head	3.914**	0.018	50.087
3	Education status of the household head	3.070**	0.015	21.540
4	Family size	2.440***	0.000	11.473
5	Poultry farming experience	0.118	0.115	1.125
6	Off-farm income	1.318	0.299	3.736
7	Livestock holding	-0.402***	0.008	0.669
8	Access to exotic chicken breed	2.380*	0.096	10.803
9	Access to vaccination service	0.545	0.906	1.724
10	Access to credit	0.107	0.944	1.113
11	Market distance	-0.072*	0.052	0.931
12	Extension contact	3.143**	0.029	23.166
13	Participation in training	4.062***	0.003	58.114
	Constant	19.06	0.010	0.000
Chi-square		324.196		
-2log likelihood		34.418		
Over all prediction		97.7		
Sensitivity		98.2		
Specificity		97.4		
Number of cases		264		

The effect of the model estimates was interpreted in relation to the significant explanatory variables in the model as follows;

Sex of the household head: The variable sex was found to have a significant and positive influence on adoption of exotic poultry breeds. The result was in line with that of the expectation.

The model result indicated that all other factors kept constant, the probability of adopting exotic poultry increases by a factor of 50.087 for male headed households. The positive sign implies that the male headed households were better in adopting the exotic poultry breeds than female headed households. This could be due to the reason that male headed households have better financial capacity to buy exotic poultry breeds and have better information access about the technology than their counterpart. Hence, this can encourage male headed households to adopt exotic poultry breeds. The result is similar with the findings of Justus (2012) which justified that male headed farmers were better in adopting chickens.

Education status of the household head: As expected, education status of household heads is found to have a significant and positive relationship with the probability of adoption of exotic poultry breeds at the 5% level of significance. The logit model result indicated that other factors kept constant, if the household heads were literate the odds-ratio in favor of adopting exotic poultry breed increases by a factor of 21.54 than those who were illiterate. This may be due to the fact that educated farmers are more analytical, have access to information and observe the advantages of new technologies easily which influence them to adopt the new technologies. The result agrees with the findings of Ermias *et al.* (2015), justified that the literate farmer was more likely to adopt village poultry technology packages than the illiterate farmers.

Family size: Family size is an indication of labor availability. As expected it had a positive sign influence on adoption of exotic poultry breeds. The result of the model indicates that other factors kept constant, as the family size increases by one unit adoption of exotic poultry breed increases by a factor of 11.473. This might be due to reason that having a large family enables a given household to manage its poultry properly and have no problem to sale chicken products. The result of this study is compatible with the finding of Dehinenet *et al* .(2014) and Teklewold *et al.* (2006) which indicated that having large family size affects positively for adoption of improved dairy and exotic poultry technologies, respectively.

Livestock holding: Livestock holding is hypothesized to have a negative relationship with the adoption of exotic poultry breeds. It was influenced as expected. The result of the odds-ratio shows that other factors kept constant, as livestock holding of a household increased by one TLU, the logs of odds-ratio in favor of household adoption of exotic poultry breeds decreased by a factor of 0.669. This result shows that those farmers with large number of livestock are less likely to adopt exotic poultry breed than those who own small number of livestock. This is due to the fact that as a farmer own large number of livestock in TLU, he/she could generate enough

cash from the livestock and their trend to adopt exotic poultry breeds becomes lower. The reason could be due to the reason that the focus of farmers tend to produce other animals rather than poultry. The result of this study is consistent with the findings of Wondmeneh *et al.*(2014) which revealed that holding of large livestock affect adoption of exotic poultry breeds significantly and negatively.

Extension contact: As hypothesized farmers' contact with extension agents positively influenced the adoption of exotic poultry at 5% level of significance. Other factors kept constant, the odds-ratio in favor of adopting exotic poultry breed increases by a factor of 23.166 for the farmers who had extension contact than those who did not have extension contact. This implies that farmers who have contact with extension agents become aware of and informed about new technologies in relation to poultry production packages becomes more effectively than the farmers who do not have extension contact. Hence, farmers having contact with extension agents could have a higher probability of adopting exotic poultry breeds than those who have not. The finding of the study is consistent with the findings of Ermias *et al.* (2015) which suggest that contact of extension agents with the farmers affect the adoption significantly and positively.

Participation in training: Farmers' participation in training organized in relation to poultry production influenced the adoption of exotic poultry breeds significantly and positively, as expected, at less than 1% significance level. The logit model result indicates that, keeping other factors constant, if a household participates in training, the odds-ratio in favor of the household adoption of exotic poultry breed increases by a factor of 58.114. This indicates that farmers participating in training acquire sufficient knowledge and skill about the use of exotic poultry breeds which make helps respondents more likely to adopt the new breeds. The result of this study is in agreement with the findings of Sisay *et al.* (2013) and Dehinenet *et al.* (2014) which justified that participation of farmers in training had a positive and significant influence on the probability of adoption of modern bee hive and dairy technologies, respectively.

Market distance: As expected, the distance of farmers' residence from the nearest market center was significantly and negatively associated with exotic poultry adoption decision at 10% level of significance. The result of the odds-ratio indicated that, other factors being constant, as the distance of the farmer's residence from the nearest market center increases by one kilometer, the probability of farmers to adopt exotic poultry breed decreases by a factor of 0.931. This is due to the fact that as the farmers reside far from the nearest market they face high transportation cost for selling their output and also have low market information which can

reduce farmers' decision to adopt exotic poultry breeds. In line with this study's findings, the findings by Simegnew *et al.* (2015) revealed that distance to market to have significantly and negatively affect the adoption of exotic poultry breeds.

Access to exotic chicken breeds: The logit model result indicates that the variable access to exotic poultry breeds had a significant and positive influence on the likelihood of adopting exotic poultry breeds. By keeping other factors constant, the odds-ratio in favor of adopting exotic poultry breed increases by a factor of 10.803 for the farmers who have access of exotic poultry breed than those who did not have access. This indicates that if farmers have access to exotic poultry breeds, the probability of adopting exotic poultry breeds also increases. This study is consistent with the findings of Wondmeneh *et al.* (2014) which revealed that access of exotic poultry breed was one of the factors that influence the probability of adopting exotic poultry breed.

CONCLUSIONS AND RECOMMENDATIONS

This study indicates that access to exotic poultry breed, family size, extension services, training on poultry, access to market distance, sex of household head, education status of household head and the size of holding livestock played a significant roles on the probability of exotic poultry technology adoption in the study area. Thus, this study emphasizes that introduction and dissemination of different exotic poultry breeds needs to be supported with a continuous training and extension backup on how to manage and create awareness on the benefits of producing exotic chicken breed as well. More women should also be considered to increase complete understanding about the adoption of exotic chickens in rural areas. Furthermore, there is a need to give focus in delivering and making available chicks of exotic poultry breeds to the farmers. Further study needs to identify the common diseases and predators that attack exotic chickens, assessing intensity of adoption of exotic poultry breeds and impact of exotic poultry on socio economic condition of farm households in the study area.

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