Factors Affecting Women Access to Agricultural Extension Services: Evidence from Poultry Producer Women’s in Northwestern Tigray, Ethiopia

Alem Tadese Atsbeha¹ and Girma Gezimu Gebre²*

Abstract: Rural poultry production is an appropriate system for supplying the fast-growing human population with quality food and provides additional income to resource-poor farmers, especially women to improve their livelihoods. The main objective of this study was to identify factors that affect the access of women to poultry extension services in Northwestern, Tigray, Ethiopia. Multistage sampling techniques based on probability proportional to size were used to select districts, tabia (peasant association) and women poultry producers in the Northwestern Tigray. Variables on socio-economic characteristics of women poultry producers, access to information, access to training, access to credit service and times of visit by extension agents were generated from primary data collected from the study area. Data were subjected to logit econometric regression analysis. The result of the logistic regression model estimate revealed that out of the 10 factors, 6 variables were found to have a significant influence on the probability of women’s access to poultry extension service. These variables included household size, age of women, farmland size, information about poultry extension service, number of visits by extension agent and access to poultry production training. The coefficients of access to information about poultry extension service and the number of visits by extension agent were statistically significant at 1% probability level of significance, whereas household size, age of women poultry producers, farmland size and access to poultry production training were statistically significant at 5% probability level of significance.

ABOUT THE AUTHOR

Alem Tadese Atsbeha (Mr) is assistant professor at the Department of Animal Production and Technology, College of Agriculture, Aksum University, Shire Campus, Shire, Tigray, Ethiopia. Girma Gezimus Gebre (PhD) is assistant professor at the Department of Agribusiness and Value Chain Management, Faculty of Environment, Gender and Development Studies, College of Agriculture, Hawassa University, Ethiopia. Dr. Gebre's research focus includes agricultural value chain, gender, technology adoption, agricultural production, agricultural policy, innovation, sustainability, climate change, and food security.
Subjects: Gender Studies; Gender Development; Gender & Development; Sociology of Education; Art & Gender; Women’s; Gender History; Archaeological Theory; Cultural Studies

Keywords: extension service; intervention; poultry; women

1. Introduction

Women contribute about 60% to 80% labour force to the agricultural sector in África (Palacios-López et al., 2017). They contribute about two-thirds of the world’s 600 million poor livestock keepers (FAO, 2020; FAO and SPC, 2019). However, their works and responsibilities are not fully recognized (G.G. Gebre et al., 2021; Hassan et al., 2012), their importance and contributions are less acknowledged (Fleischner & Kenney, 2014; Lemma et al., 2020) and, as such, they are usually undervalued (Beevi et al., 2018). This is because of the socially constructed gender norms, which assigned different roles to men and women in agriculture. The gender division of labour in agriculture means that women and men farmers usually have different extension needs (Elias et al., 2015; Gebre et al., 2019; Hassan et al., 2012). However, the worldwide extension service systems reach more men than women farmers (Beevi et al., 2018), and it fails to meet the very different needs of men and women farmers or the very different roles they may have in agriculture (Jafry & Sulaiman, 2013a). Indeed, the agricultural extension services in Ethiopia do not always consider women to be farmers (G.G. Gebre et al., 2021; Rogasa et al., 2013), instead they consider women as helpers for men working on the farm but not as farmers because women spend more time working in the homestead (G.G. Gebre et al., 2021). That is, like in many other countries, agricultural extension services programs in Ethiopia is also focused on male farmers leaving the women outside the mainstream of information even when they are engaged in the activity covered (Leta et al., 2017). This neglect of women by extension services contributes to women’s continued food and income insecurity.

Due to socially defined roles and identities, women in many developing countries lack access to extension services, land, agricultural inputs and professional opportunities in agricultural extension (Gebre et al., 2019; Jafry & Sulaiman, 2013b; Lamontagne-Godwin et al., 2017; Lemma et al., 2020). Evidence shows that when women are the targets of extension services, both women and their children benefits, as women invest more portion of their income in the family than their male counterparts (World Bank, 2012). If extension services are to be useful to women, they must take into account the unique social, cultural and economic contexts of women. The gender of the facilitator can also be an important part of the context. It is widely believed that women in sub-Saharan Africa prefer working or need to work with women’s extension agents (Hassan et al., 2012; I. I. Diaz & Najjar, 2017). Increasing the number of female extension agents to overcome cultural barriers in communication between male extensionists and female farmers, which so far have resulted in few visits to female farmers.

Extension need of women in agriculture poultry is the sub-sector of agriculture. Women play a significant role in poultry production; hence, a large percentage of poultry farmers are women. As a result, poultry contribute directly to household food security and the well-being of children. It is one of the productions systems that help to address gender inequality in agriculture. However, in many countries, women in poultry production operate under greater constraints (Tabler et al., 2020). The common constraints that women in poultry sector faces are lack of education, limited access to credit and input, land availability and tenure, lack of suitable farm and household technology and training centers (Hassan et al., 2012). Rural women in Ethiopia contribute significantly in almost all activities related to poultry production. As women in Ethiopia spent most of their time in the homestead (G.G. Gebre et al., 2021), they are heavily engaged in backyard poultry production. In most cases, they are noted for backyard poultry keeping along with their prominent role in post harvest handling (Umunna et al., 2012). Their poultry products are important sources of food and income in the country (Milkias, 2018). Poultry are generally maintained by rural women that supply adequate eggs and meat to their
personal family's diet and are the most common item women commercialize in the market that generates cash revenue (Padhi, 2016), and 90% of the income under the control of women is channeled back into their households (Wong et al., 2017). Hence, women’s involvement in backyard poultry production helps the household to reduce poverty and food insecurity (De Bruyn, 2015; Padhi, 2016) through increased distribution of resources to women’s family members. Though women are heavily engaged in backyard poultry production, the agricultural extension services do not reach the majority of the women in the poultry sector in Ethiopia. This applies to this study area too. Therefore, this study identifies the factors that affect women’s access to poultry extension services in Ethiopia, specifically, to examine the social, cultural and economic factors that affect women’s access to poultry extension services in northwestern, Tigray, Ethiopia.

2. Methodology

The study was conducted in three districts of the Northwestern zone in Tigray region, Ethiopia. This zone is one of the potential areas for backyard poultry production in Ethiopia. The demand for poultry meat and egg consumption is high due to the presence of dense populations such as military camps, refugee and urban residents in the study area. Northwestern Tigray is estimated to lie in between 14°00'N latitude to 37°50'E longitude and 14.20°N latitude to 38.25°E longitude. It is located about 1078 km to the north of Addis Ababa, the capital city of Ethiopia. The altitude of the area ranges from 1600 to 2200 m above sea level. The study area receives an annual rainfall ranging from 700 to 1135 mm, with a maximum and minimum daily temperature of 35°C and 18°C, respectively. The livelihood of the Northwestern Tigray is based on a mixed crop–livestock production system.

Multistage sampling techniques based on probability proportional to size\(^1\) were used to select districts, tabia\(^2\) (peasant association) and women poultry producers in the Northwestern Tigray. In the first stage, three districts named Tahtay-Koraro, Asgede-Tsimbla and Medebay-zana were selected based on their poultry production potential. In the second stage, two tabias producing poultry were selected from each district. In the third stage, on average, 30 women producers were selected from each tabia based on whether they produce poultry during survey period. This was done with the assistance of agricultural development agents who keep in constant contact with the farm households in each tabia. Accordingly, a sample of 183 women poultry producers was obtained for the survey.

Prior to the actual survey, the questionnaire was pre-tested in one tabia to examine and to correct some technical mistakes. Then, a woman who is most responsible for poultry production in the household was interviewed by using a semi-structured questionnaire. Moreover, information on the type of poultry extension services provided in each district and tabia were collected from the district and tabia agriculture and rural development offices.

The data collected were subjected to both descriptive statistics and econometric analysis, such as two-sample t-test (mean comparison) and binary logit regression. To examine the effects of demographic, socio-cultural and economic characteristics on women’s access to poultry extension services and the likelihood of women poultry producers of having access to extension services, data were collected on variables such as age, household size, education level and farm size of poultry producer women. Moreover, data on women’s access to information, training, credit services, contact with extension agent, other farm visits and participation on different extension events were collected for the analysis. On the assumption that the probability of women having access to poultry extension services is determined by the underlying response variable that capture the true socio-economic status of women poultry producers; the underlying variable in the case of binary status was defined by binary logit regression relation.
Following Gujarati (1995) and Green (2003), the functional form of logit model is specified as:

\[
P(Y_i = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}}
\]  

(1)

For ease of exposition, we write Equation (1) as:

\[
P(Y_i = 1) = \frac{1}{1 + e^{-Z_i}}
\]  

(2)

where \( P(Y_i = 1) \) is the probability that women have access to poultry extension service, \( Z_i \) is the function of a vector of \( n \) explanatory variables, \( e^{-} \) represents the base of natural logarithm, and equation (2) is the cumulative distribution function. If \( P(Y_i = 1) \) is the probability that women have access to poultry extension service, then \( 1 - P(Y_i = 0) \) represents the probability of women not having access to poultry extension service and is expressed as:

\[
1 - P(Y_i = 1) = 1 - \frac{1}{1 + e^{-Z_i}} = \frac{1}{1 + e^{-Z_i}}
\]  

(3)

Therefore, we can write:

\[
\frac{P(Y_i = 1)}{1 - P(Y_i = 1)} = 1 - \frac{1 + e^{Z_i}}{1 + e^{Z_i}} = e^{Z_i}
\]  

(4)

Equation (4) simply is the odds ratio, the ratio of the probability that a women producer will have access to poultry extension service to the probability that she will have no access to poultry extension service. Taking the natural log of equation (4), we obtain

\[
L_i = \ln\left(\frac{P(Y_i = 1)}{1 - P(Y_i = 1)}\right) = Z_i
\]  

(5)

where \( L_i \) is the log of the odds ratio, which is linear not only in the explanatory variables but also in the parameters.

Thus, introducing the stochastic error term \( (u_i) \), the logit model can be written as.

\[
Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + u_i
\]  

(6)

where:

\( \beta_0 \) is an intercept

\( \beta_1, \beta_2, \ldots, \beta_n \) are slopes of the equation in the model

\( X_i \) = the vector of relevant household characteristics.

2.1. Diagnoses of the logit model

In order for our analysis to be valid, our analysis has to satisfy the assumptions of logistic regression. When the assumptions of logistic regression analysis are not met, the analysis may have problems, such as biased coefficient estimates or large standard errors for the logistic regression coefficients, and those problems may lead to invalid statistical inferences.

One of the potential problems in logistic regression is multicollinearity or correlation between two or more explanatory variables included in the model analysis. Therefore, before fitting the logit model, it was important to check whether a serious problem of multicollinearity and association exists among and between the potential continuous and discrete explanatory variables. The problem of multicollinearity can be expressed as a violation of the assumption that the covariance between variables
should be equal to zero. Hence, the avoidance of such problems enables the explanatory variable to separately contribute to the variation in the dependent variable. For this purpose, Variance Inflation Factor (VIF) and contingency coefficients were computed for the continuous and discrete variables, respectively. The value of VIF greater than or equal to 10 is an indicator of the existence of a serious problem of multicollinearity problem, and it is important to omit such variables from model estimation. In the present analysis, the VIF of all continuous variables were found to be less than 10 indicating no potential multicollinearity problem among continuous explanatory variables.

### 2.2. Description of the variables
The study used 10 explanatory variables. The code, type and variable descriptions included in the model analysis are presented in Table 1.

### 3. Results and discussion

#### 3.1. Descriptive results

**3.1.1. Socio-economic characteristics of women poultry producers**
Table 2 summarizes the statistics of the variables of our interest. Out of the total sampled women poultry producers, 60.65% (111) and 39.35% (72), respectively, have access to extension services and no access to extension services in the study area. Age was assumed as one of the factors that determine whether women have access to poultry extension or not. The average age of women poultry producers with access to extension service was 41.7 years, while women with no access to extension service was 43.7 years. This difference is statistically significant at the 5% level. This finding is consistent with Elias et al. (2013) who reported that the average age of extension-participant women farmers were slightly less than non-participants. The present result indicates that most of the poultry producer women in Northwestern Tigray are within the productive age range. More specific analysis show that about 60% of the respondent women were in the age group between 25 and 45 years. This age range is similar to the report of Hassan et al. (2012), which stated that 51.07% of the respondents fall under the category of 26 to 50 years, but this is slightly higher than the report of Umunna et al. (2012) from Nigeria that most of the farmers (50.7%) were within the age range of 20–29 years. The average family size was 5.24 and 3.12 for the producers who have and do not have access to extension service, respectively, implying that women with a relatively large family size are more involved in poultry production. The current result is lower than the finding of Adisa and Akinkunmi (2012), who reported that majority (60.3%) of the women household size were between six and eight people. The average farmland size of women producers who have access to extension service (0.59 hectares) was significantly ($P < 0.01$)
Table 2. The mean values of socio-economic characteristics of the sampled women poultry producers

| Variables                              | Extension accessed | Extension not accessed | Mean difference |
|----------------------------------------|--------------------|------------------------|-----------------|
| Age of women producer                  | 41.70              | 44.70                  | 3.00**          |
| Family size of women producer          | 5.24               | 3.12                   | 2.12***         |
| Education level of women producer      | 4.10               | 3.80                   | 0.30            |
| Farmland size of household in ha       | 0.59               | 0.71                   | 0.12**          |
| Access to information (1 = yes)        | 0.86               | 0.54                   | 0.32***         |
| Times of visit by extension agents     | 3.27               | 1.83                   | 1.44***         |
| Access to training (1 = yes)           | 0.89               | 0.61                   | 0.28**          |
| Access to credit service (1 = yes)     | 0.73               | 0.49                   | 0.24**          |
| Experience sharing visit (1 = yes)     | 0.65               | 0.54                   | 0.11            |
| Participation on extension event (1 = yes) | 0.95           | 0.77                   | 0.18            |
| N                                      | 111                | 72                     |                 |

Source: own survey result. ** Significant at the 1% level; ***Significant at the 5% level.

lower than the average farmland size of women who have no access to extension service (0.71 ha). This result was not in agreement with the findings of Tolobonse et al. (2013) who reported that majority of the participant and non-participant women in extension service have 1 ha and 3 ha farmland sizes, respectively. This implies that households with small land size are more involved in poultry extension services. Owning large farmland size could lead the households to focus on other farming activities like crop production than poultry production. Thus, their participation in extension services would be more skewed to crop production extension services than poultry extension services. Access to information, access to training, access to credit service and times of visit by extension agents was significantly higher in women producers who have access to extension service.

Result shows that more than 80% of the respondents were not trained on any of the poultry management practices, indicating that the agricultural extension is favored towards men than women. With a similar essence, I.I. Diaz and Dina (2019) concluded that conditions of women’s inequality will persist if gender is not integrated into agricultural extension, which will, in turn, limit the efficacy of extension. Distribution of improved breeds is not only the way to improve productivity of poultry but also capacitate the knowledge and skill of the producers through training is indispensable. Poultry producers in the study area revealed that training had a positive impact on the improvement of egg production. Similarly, previous findings (Abida et al., 2013) revealed that egg production per bird was higher after (75.2%) training than before (37.7%) training.

Majority of the women producers (82.9%) who have access to poultry extension service had constructed separate poultry houses (Table 3). This finding is in line with Mbuza et al. (2017) who reported that 63% of poultry farmers had constructed permanent structures. On the other side, 58.33% of the women producers who have no access to extension service had no separate poultry houses. Findings (Mazimpaka et al., 2018; Olaniyan & Camara, 2018) also
Table 3. Poultry housing and health management

| Household’s response       | Access to extension | No access to extension | $X^2$ Value | $P$ value |
|----------------------------|---------------------|------------------------|-------------|----------|
| Separate poultry house     |                     |                        |             |          |
| Yes                        | 82.9%               | 41.67%                 |             |          |
| No                         | 17.1%               | 58.33%                 | 15.974      | 0.000    |
| Total                      | 100%                | 100%                   |             |          |
| Vaccination                |                     |                        |             |          |
| Yes                        | 54.05%              | 18.06%                 | 12.163      | 0.002    |
| No                         | 45.95%              | 81.94%                 |             |          |
| Total                      | 100%                | 100%                   |             |          |

reported that most of the respondents kept their birds in kitchen and family dwellings. The construction of separate poultry houses observed in the study area encourages the producers to increase their number of chickens. In agreement to this, Dumas et al. (2016) reported that farmers using separate poultry housing had significantly larger flock sizes compared to those housing the birds in the family home. Housing is highly associated ($P < 0.000$) with access to extension services. Lack of knowledge and awareness and poor attention to poultry extension services provided by the bureau of agriculture were some of the reasons for not constructing separate poultry houses. Construction of a proper house provides adequate ventilation for the birds to lay eggs in nest boxes, as well as to feed and sleep in comfort and for security purposes.

Poultry vaccination was significantly ($P<0.05$) higher in women poultry producers who have access to extension service than those who have no access. The highest percentage of the households who did not vaccinate their chickens was from the non-participants of extension services. This might be due to lack of information; hence, their contact with the extension agents could be very low. This is in agreement with the report that the number of farmers using modern medicine was small because of low veterinarian accessibility, lack of awareness and inadaptability to use modern medicines (Melkamu & Wube, 2013). And according to Mazimpaka et al. (2018) modern approaches to poultry disease management were still very less. Commonly, the awareness of the producers on poultry vaccination in the study area is minimal. Biosecurity is the best method available for keeping flocks safe. However, most smallholder poultry producers across East Africa do not understand biosecurity and disease prevention (Tabler et al., 2020).

3.2. Model estimation results

The results of the logistic regression model estimate revealed that out of the 10 factors, 6 variables were found to have a significant influence on the probability of women to access poultry extension services (Table 4). These variables include the age of women poultry producers, household size, farmland size, access to information about poultry extension service, number of visits by the extension agent and access to poultry production training. The coefficients of access to information about poultry extension service and the number of visits by the extension agent were statistically significant at 1% probability level of significance, whereas household size, age of women poultry producers, farmland size and access to poultry production training were statistically significant at 5% probability level of significance. The coefficients of four explanatory variables, namely education level of women poultry producer, access to credit service, experience sharing visit to other place and participation on different extension events, were not statistically different from zero at the conventional levels of significance.
Table 4. Logit results for factors affecting the access of women to poultry extension services

| Variables       | Coefficient | St. Err | P-value | Odds ratio |
|-----------------|-------------|---------|---------|------------|
| Age             | -0.97       | 0.058   | 0.046** | 1.103      |
| Family Size     | 1.107       | 0.543   | 0.042** | 3.024      |
| Education       | -0.754      | 0.513   | 0.142   | 0.471      |
| Farmland        | -3.943      | 2.132   | 0.044** | 0.019      |
| Information     | 5.628       | 2.137   | 0.008***| 278.222    |
| Extvisit        | 2.019       | 0.730   | 0.006***| 7.527      |
| Training        | 4.144       | 1.925   | 0.031** | 63.041     |
| Credit          | 2.059       | 1.311   | 0.116   | 7.837      |
| Expvisit        | 1.593       | 1.310   | 0.224   | 4.918      |
| Part ind exser  | 0.432       | 0.610   | 0.479   | 1.540      |
| Number of obs   | 183         |         |         |            |
| LR chi2 (10)    | 66.15       |         |         |            |
| Prob > chi2     | 0.0000      |         |         |            |
| Pseudo R2       | 0.6149      |         |         |            |

Source: own survey result, *** Significant at the 1% level; **Significant at the 5% level,

In light of the above summarized model results, possible explanations for each significant independent variable is given consecutively as follows:

**Age of the women poultry producers**: As per the logit model results, younger women poultry producers tend to participate in extension services. The coefficient for the age of women was found to be negatively associated with access to extension service and statistically significant at 5% probability level. This implies that young females have better understanding and awareness on agricultural extension service to participate, whereas the elders are mostly conservative and want to stay on the traditionally customized system.

**Household size**: As pinpointed in various literatures, household size is identified as one of the important demographic factors that affect women’s access to poultry extension services. In this study, the household size was found to significantly affect women’s access to poultry extension services. The coefficient for household size was found to be positively related with access to extension service and statistically significant at 5% probability level. This indicates that women living within larger-sized households have more access to poultry extension service compared to smaller-sized households in the study area. Women are busy with both productive and reproductive roles in the household, so access to family labor for their poultry production is crucial. This result supported the findings of Adisa and Akinkunmi (Adisa & Akinkunmi, 2012) who reported that a positive and significant relationship was found between participation in extension package and household size. The odds ratio implies that, other things being constant, the women’s probability of having access to poultry extension service increases by a factor of 3.024 as household size increases by one more additional member.

**Farmland size**: This variable affects the status of women’s access to poultry extension service negatively and significantly at 5% probability level in the study area. The negative relationship implies that women who have more farmland have less interest to access poultry extension services than women owning a small land size. This is possible because large farm size women use their land for crop production so that they use extension service for crop production rather than poultry production. This implies that small-scale poultry production is an appropriate sector and provides a significant economic importance to those with small farmland size and landless women. Similarly, Wong et al. (Wong et al., 2017) reported that small-scale poultry production requires few inputs and no land, making it particularly accessible to those with limited income sources. The odds ratio of 0.019 implies that, other things being constant, the odds ratio in favor of
having access to poultry extension service decreases by a factor of 0.019 as farmland size increases by a hectare.

**Access to information:** This variable affects women's access to poultry extension service positively and significantly at 1% probability level. The positive relationship indicates that women who have access to information on poultry extension service are more poultry extension service beneficiary and participant than that of less informant women. Producers that have contact with technological information can improve their production more efficiently than those who are not (Aboki et al., 2013). The odds ratio of 287.222 implies that, other things being constant, the odds ratio in favor of having access to poultry extension service increases by a factor of 287.222.

**Number of extension agent visits:** The sign of the coefficient of this variable showed a positive relationship with access to extension service and is significant at 1% probability level. The positive relationship implies that women who were visited more frequently by extension agents are more likely to access poultry extension services than less visited women in the study area. This is because most of the information was addressed to farmers through extension agents (Buehren et al., 2017; Umunna et al., 2012). However, majority of the producers have been visited at a maximum of once a month. This fortifies the mentioned limitations of poultry extension services. The odds ratio of 7.527 implies that, other things being constant, the odds ratio in favor of having access to poultry extension service increases by a factor of 7.527 as extension agents visit women within farm household one extra time.

**Access to training on poultry production:** This variable is significant at 5% probability level. It has a positive relationship with access to extension services in the study area. The positive relation indicates that women who have access to training on poultry production are more likely to benefit from poultry extension service than those with no access. This result supported the findings of Azanaw and Tassew (Azanaw & Tassew, 2017) who reported that more than half of the respondents have information and participated in at least one of the extension packages. According to Abida et al. (2013), the flock size per household of the women poultry keepers increased after training. This could be attributed to the increased knowledge of poultry management and the role of rural chickens in household income generation. The odds ratio of 60.041 implies that, other things being constant, the odds ratio in favor of having access to poultry extension service increases by a factor of 60.041 as women have access to a unit for training on poultry production.

**3.3. Conclusion and recommendation**
Based on this study, we conclude that poultry production is a more appropriate sector for landless women or women with a small size of farmland and large family size. Out of the 10 variables included in the econometric model estimation, household size, farmland size, access to information about poultry extension service, number of visits by extension agent and access to poultry production training were found to have a significant influence on the probability of women to access poultry extension service. That means the coefficients of access to information about poultry extension service and the number of visits by extension agent was statistically significant at 1% probability level of significance, whereas household size, age of women producer, farmland size and access to poultry production training were statistically significant at 5% probability level of significance in the study area. Therefore, the promotion of gender-responsive extension delivery approaches, expanding access to women-friendly information, training and advisory services should be given special attention in this study area, particularly for landless women or women with small size landholdings and larger family size.

**Acknowledgements**
The authors would like to acknowledge Aksum University for the grant to conduct this research. The authors are also indebted to the Bureau of Agriculture and Rural Development of North Western Zone of Tigray for the provision of data and facilities.

**Funding**
The authors received no direct funding for this research.

**Author details**
Alem Tadesse Atsbeha¹
Girma Gezimu Gebre²
Diaz, I. L., & Nojar, D. (2017). Gender and agricultural extension: Why a gender focus matters? ICARDA, Science for Better Livelihoods in Dry Areas. https://tapipedia.org/

Dumani, S. E., Langu, L., Mulambya, N., Daka, W., McDonald, E., Steubing, E., Lewis, T., Backel, K., Jange, J., Lucio-Martinez, B., Lewis, D., & Travis, A. J. (2016). Sustainable smallholder poultry interventions to promote food security and social, agricultural, and ecological resilience in the Luangwa Valley, Zambia. Food Security, 8, 507–520.

Ellos, A., Nomhi, M., Yasonobu, K., & Ishida, A. (2013). Effect of agricultural extension program on smallholders’ farm productivity: Evidence from three peasant associations in the Highlands of Ethiopia. Journal of Agricultural Science, 3(8), 163–181. https://doi.org/10.5539/jas.v3n8p163

Ellos, A., Nomhi, M., Yasonobu, K., & Ishida, A. (2015). Does gender division of labour matters for the differences in access to agricultural extension services? A case study in North West Ethiopia. Journal of Agricultural Science, 7(1), 138.

FAO, 2020. The female face of farming | Gender | Food and Agriculture Organization of the United Nations. http://www.fao.org/gender/resources/infographics/thefemale-face-of-farming/en/

FAO and SPC. (2019). Country gender assessment of agriculture and the rural sector in Tonga. Nuku’alofa. http://www.fao.org/3/c6864en/c6864en.pdf

Flenscherer, D., & Kenney, L. (2015). Rural women’s access to financial services: Credit, savings, and insurance. Gender in Agriculture, 187–208. https://doi.org/10.1007/978-94-017-8616-4_8

Gebre, G. G., Isoda, H., Rahut, B. D., Amekawa, Y., & Nomura, H. (2020). Gender gaps in market participation among individual and joint decision-making farm households: Evidence from Southern Ethiopia. The European Journal of Development Research. https://doi.org/10.1057/s41287-020-00289-

Gebre, G. G., Isoda, H., Rahut, D. B., Amekawa, Y., & Nomura, H. (2019). Gender differences in the adoption of agricultural technology: The case of improved maize varieties in southern Ethiopia. Women’s Studies International Forum, 76, 102264. https://doi.org/10.1016/j.wsif.2019.102264

Gebre, G. G., Isoda, H., Rahut, D. B., Amekawa, Y., & Nomura, H. (2021). Gender differences in agricultural productivity: Evidence from maize farm households in southern Ethiopia. GeoJournal, 86(2), 843–864. https://doi.org/10.1007/s10708-019-10098-y

Hassan, M. Z. Y., Butt, T. M., Khalid, M. F., Mahmud, K.,unnisa, M., Rehman, A. U., Iftikhar, N., Mukhtar, N., & Hussain, M. (2012). Impact of poultry extension services for the rural women. Afric J. Agric. Res, 7(12), 1893–1900.

Jofry, T., & Sulaimon, R. (2013a). Gender-sensitive approaches to extension programme design. The Journal of Agricultural Education and Extension, 19 (5), 469–485. https://doi.org/10.1080/1389224X.2013.817345

Jofry, T., & Sulaimon, R. (2013b). Gender inequality and agricultural extension. The Journal of Agricultural Education and Extension, 19(5), 433–436. https://doi.org/10.1080/1389224X.2013.824166

Lamontagne-Godwin, J., Williams, F., Thilakasiri Bandara, W. M. P., & Appiah-Kubi, Z. (2017). Quality of extension advice: A gendered case study from Ghana and Sri Lanka. The Journal of Agricultural Education and Extension, 23(1), 7–22. https://doi.org/10.1080/1389224X.2016.1230069
Lemma, M., Gizaw, S., Etato, A., Mulema, A., & Wieland, B. (2020). Gender integration in the Ethiopian agricultural extension system: A literature review. ILRI.

Leto, G., Kelboro, G., Stellmacher, T., & Hornidge, A. K. (2017). The agricultural extension system in Ethiopia: Operational setup, challenges, and opportunities. ZEF Working Paper Series, 1864-6638, Center for Development Research, University of Bonn.

Mazimpaka, E., Micheal, T., Anselme, S., & Gatari, E. N. (2018). Poultry production and constraints in Eastern Province of Rwanda: Case study of Rukomo sector, Nyagatare district; Tropical Animal Health and Production. 50, 753–759.

Mbuza, F., Manishimwe, R., Mahoro, J., Simbankabo, T., & Nishimwe, K. (2017). Characterization of broiler poultry production system in Rwanda. Tropical Animal Health and Production, 49(1), 71–77. https://doi.org/10.1007/s11250-016-1160-0

Melkamu, B. Y., & Wube, A. (2013). Constraints and opportunities of village chicken production in Debson TiKara Keble at Gonder Zuria Woreda, North Gonder, Ethiopia. International Journal of Scientific and Research Publications, 3(9), 1–8.

Milikias, M. (2018). Productive and reproductive performance of indigenous chickens in Ethiopia. International Journal of Livestock Production, 9(10), 253–259. https://doi.org/10.5897/IJLP2018.0451

Olanjyan, O. F., & Camara, S. (2018). Rural household chicken management and challenges in the Upper River region of the Gambia. Tropical Animal Health and Production, 50(8), 1921–1928. https://doi.org/10.1007/s11250-018-1649-9

Padhi, M. K. (2016). Importance of indigenous breeds of chicken for rural economy and their improvements for higher production performance. Scientifica. 2016, Article ID 2604685, 9 pages, 2016. https://doi.org/10.1155/2016/2604685

Palacios-López, A., Christensen, L., & Klic, T. (2017). How much of the labor in African agriculture is provided by women? Food Policy, 67, 52–63. https://doi.org/10.1016/j.foodpol.2016.09.017

Ragas, C., Berhane, G., Tadesse, F., & Taffesse, A. S. (2013). Gender differences in access to extension services and agricultural productivity. The Journal of Agricultural Education and Extension, 19(5), 437–468. https://doi.org/10.1080/1389226X.2013.817343

Tabler, T., Khoitsa, M. L., Mbago, S. H., Jeckoniah, J. N., Moon, J., & Ans Wells, J. (2020). Poultry extension personnel needed across East Africa. Mississippi State University- Extension. Publication 3494(PD-07-20). https://www.poultryproducer.com/global/poultry-extension-personnel-needed-across-east-africa

Tolobaonse, E. B., Jibrin, M. M., Auta, S. J., & Domisa, M. A. (2013). Factors influencing women participation in Women In Agriculture (WIA) Programme of Kaduna State Agricultural Development Project. Nigeria. International Journal of Agricultural Economics and Extension, 1(7), 047–054.

Umunna, M. O., Adeeko, A., Onifade, O. T., Adigun, O. S., & Appa, A. N. (2012). Poultry farmers’ access to extension services in Atisbo Local Government Area of Oyo State, Nigeria. African Journal of Basic & Applied Sciences, 4(6), 221–225.

Wong, J. T., de Bruyn, J., Bagnol, B., Grieve, H., Lie, M., Pym, R., & Alders, R. G. (2017). Small-scale poultry and food security in resource-poor settings: A review, Global Food Security. 15, 43–52.

World Bank (2012). World Development Report 2012: Gender equality and development. https://openknowledge.worldbank.org/handle/10986/4391

© 2021 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:
Share — copy and redistribute the material in any medium or format.
Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:
Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.
No additional restrictions

You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Cogent Social Sciences (ISSN: 2331-1886) is published by Cogent OA, part of Taylor & Francis Group.

Publishing with Cogent OA ensures:
• Immediate, universal access to your article on publication
• High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
• Download and citation statistics for your article
• Rapid online publication
• Input from, and dialog with, expert editors and editorial boards
• Retention of full copyright of your article
• Guaranteed legacy preservation of your article
• Discounts and waivers for authors in developing regions

Submit your manuscript to a Cogent OA journal at www.CogentOA.com