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RESEARCH ARTICLE

DETERMINANTS OF ADOPTION OF IMPROVED CHICKEN PACKAGES: THE CASE OF WOLAITA ZONE, SOUTHERN ETHIOPIA

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ABSTRACT

The majority of Ethiopia's farmers have been using the traditional way of agricultural practices. This has contributed to the low productivity of the agricultural sector both for crops as well as livestock sectors. The Objectives of the study were to identify factors affecting the adoption of improved chicken packages and analyze the existing conditions. A total of 123 respondents were selected by a simple random sampling technique and interviewed using an interview schedule and checklists. Inferential statistics such as chi-square test and t-test, and binary logistic regression were employed to analyze the data. The result of cross-tabulation with chi-square test and mean comparison with t-test show that age, education status, farm size, livestock holding, access to credit and contact of extension agents have significantly associated with the adoption of improved chicken packages. Also, the result of the binary logistic regression analysis revealed that age, education status, farming experience, distance to market and access to credit have a significant relation with the adoption of improved chicken packages which are considered as determinants of adoption of improved chicken packages. It can be concluded that to increase and improve the adoption of improved chicken packages some crucial steps in improving the education status of households and facilitating access to credit from concerned bodies should be taken into consideration.

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INTRODUCTION

According to the Ministry of Agriculture, in Ethiopia, like many African countries, attempts have been made at various times to improve local chicken production through the introduction of exotic chicken breeds. Distribution of pullets, cockerels, DOCs, and fertile eggs, layers and duals breeds, has been one of the poultry extension packages accomplished by the Regional Office of Agriculture, for the last 20 years, aiming at improving chicken production and productivity. Despite this huge distribution of exotic chicken breeds, the contribution of improved chicken breeds in the current production system of the region is very low (Tekelewold *et al.*, 2006). The majority of this chicken is maintained under a traditional system with little or no inputs for housing, feeding, and health care. The greater part of the feed for village chicken is obtained through scavenging, which includes the household cooking waste, cereal and cereal by-products, pulses, roots and tubers, oilseeds, shrubs, fruits and animal proteins (CSA, 2013/14).

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Village poultry technology package adoption may vary across agro-ecologies. Moreover, socio-economic characteristics, inputs supply, technical supports, technology characteristics, limitations, and constraints may influence the probability of adoption. Understanding of the technology characteristics, limitations, constraints and adoption opportunities may help to improve the technology approach for better successes (Teklewold *et al.,* 2006). The majority of Ethiopia's farmers have been using a traditional way of agricultural practices including the study area. This has contributed tothe low productivity of the agricultural sector both for crops as well as livestock sectors. To solve these problems, governmental and non-governmental bodies have made restless efforts to bring about change in the agricultural production system of rural farmers. They have introduced improved agricultural technologies like the use of fertilizers, high yielding varieties of seeds or breeds of livestock, improved farm implements, etc in relation to crops as well as livestock which seem better in yield or production. However, the introduced technologies are not widely accepted by farmers in different parts of the county as expected (Mekonnen, 2005; Teklewold *et al.,* 2006). The same thing is also true for the study area. This indicates that there are different factors directly or indirectly influencing the adoption of technologies that believed to bring change in smallholder farmers' productivity.

Even though, efforts have been made by disseminating technology inputs in different agro-ecologies of the country as well as the target area, the determinant factors of the improved chicken package were not studied so far in the study area. Therefore, this study conducted to assess the factors that influence improved chicken package adoption and to analyze the existing conditions of the improved chicken packages in the area.

MATERIALS AND METHODS

Description of the Study Area: Wolaita Zone is located at about 380km south of Addis Ababa in Southern Ethiopia. It is part of the so-called 'ensete' zone of Ethiopia. It is roughly located 6.4^0 -7^0 Nand 37.4^0 - 38.2^0 E. The Zone has a total population of 1,691,867 (CSA, 2000). The area of the Zone is 451170 hectares or 4511.7 km^2. The study area, Damot Gale, is one of the 12 districts in the Zone. Livestock production is the source of livelihood in the area. In addition, other sources of income in the district include petty trade, migrant wage labor, and local employment. Of all food crops covered under the new extension package program, maize receives the highest attention owing to its wider cultivation and significance in its share of croplands.

Sample Size and Sampling Techniques: All districts in the Zone have the same farming system and the way of chicken production is almost similar. A multi-stage sampling technique was employed to select sample respondents. Among the twelve districts in the zone, first, Damot Gale district was selected purposively based on accessibility and potential. Second, five kebeles were selected randomly from the selected district based on technology package interventions. Third, smallholder poultry producers and non-producers were selected randomly based on representativeness of the population through simple random sampling technique and probability proportional to the size and finally sampled farmers were interviewed using an interview schedule.

According to the Woreda finance and economic development office(2015) statistical data, the total population of the district is 138,292, of which 67,539 are males and 70,753 are female populations. There are 36,178 households in the district of which 26,646 are male-headed families whereas 9,532 are female-headed households. The sample households were selected by using simple random samplingand probability proportional to size from each kebele. Therefore, a total of 123 household heads were selected in which 68 adopters and 55 non-adopters. A simplified formula for determining sample size as suggested by Yamane(1967) is used to calculate the sample sizes. Assuming a 95% confidence level.

Data types and sources: For this study, both primary and secondary data were collected from different sources. The primary data were collected from the target respondents. And the secondary data were collected from different published and unpublished literature. Both qualitative and quantitative data types were collected.

Methods of Data Collection: Data for this study were collected using interview schedules and checklists for focus group discussions and key informant interviews.

Methods of Data Analysis: Demographic and socio-economic conditions of sample households and institutional factors were analyzed by descriptive statistics like mean, frequency, standard deviations, and percentages using SPSS version 20 software. As well as binary log it model and inferential statistics like t-test and chi-square test were used. The qualitative data gathered through key informant interviews and focus group discussions were analyzed descriptively and interpreted through case analysis.

RESULTS AND DISCUSSION

The descriptive statistics part provides the demographic and socio-economic characteristics of the respondents. The binary logistic analysis is employed to assess the determinants of adoption of improved chicken packages and to predict the odds of adoption of improved chicken packages.

Demographic and socio-economic characteristics of the respondents: The average farm size of the sampled household was 0.47ha. The result indicated that the average farm size of the sampled adopters of improved chicken packages and non-adopters was 0.48 and 0.46, respectively and the standard deviation of the farm size of adaptors and non-adaptors were 0.29 and 0.49, respectively. Thus, the average result revealed that there was no large difference among the farm size of adopters and non-adopters with respect to their farm size this can be evidenced from the result of t-value which indicates that there was no statistically significant mean difference (t-value= -0.228; p=0.820) between the mean farm size of adopters and non-adopters (table 1).

In the same fashion, age plays a vital role in the adoption of improved chicken packages. The result revealed that the average age of all sampled households was 37.06 years. Also, the result for the age of adopters of improved chicken packages and non-adopters was 38.41 and 35.71 years, respectively. Thus, the average result showed that there was a significant mean difference (t-value= -1.591, p-value=0.053) among the age of adopters and non-adopters of improved chicken packages (table 1). As shown in table 1, the average distance traveled by the adopters and non-adopters to the market center was 2.68 and 2.29 km and the standard deviation of the average distance from the market center of adopters and non-adopters were 0.84 and 1.1 km, respectively. It was indicated that non-adopters traveled a long distance to access market in the study area. The mean difference between adopters and non-adopters from the market center was statistically significant (t= -2.228; P=0.028). Households found closer to the center relatively have less expense than those households located far.

Education status plays an important role in affecting the adoption of improved chicken packages. Based on table 2, the percentages of respondents who don't read and write for adopters of improved chicken packages were lower than non-adopters whereas adopters completed secondary level was larger than non-adopters of improved chicken packages. The chi-square test result indicated that (χ^2 =6.353; p= 0.012) there is a statistically significant difference between adopters and non-adopters of improved chicken packages with respect to educational status at less than 5% probability level (Table 2). The percentages of households having 1-4 family size for non-adopters of improved chicken packages were lower than adopters whereas adopters family size 5-8 were larger than non-adopters of improved chicken packages. But, the chi-square test result indicated that (χ^2 = 0.653; p= 0.722) there was no statistically significant association between family size

Table 1. Relationship of age, farm size and market distance with adoption of improved chicken package (n=123)

	Adoption of Improved Chicken Package					
	Age		Farm size		Market Distance	
	Adopters	Non- Adopters	Adopters	Non- Adopters	Adopters	Non- Adopters
N	68	55	68	55	68	55
Mean	38.41	35.71	0.48	0.46	2.68	2.29
Std. Dev.	10.2	8.21	0.2852	0.49	0.84	1.1
t-value	-1.591*		-0.228NS		-2.228**	
P-value	0.053		0.820		0.028	

*Source: survey result, 2018: **, *, significant at less than 5% and 10% probability level, respectively; NS=non-significant*

Table 2. Relationship of educational status with adoption of improved chicken package

Education status	Adoption of Improved Chicken Package						χ 2 -value	p-value
	Adopters		Non- Adopters		Total			
	No	(%)	No	(%)	No	(%)		
don't read & write	18	26.5	24	43.6	42	34.1		
Primary Level	25	36.8	15	27.3	40	32.5		
Secondary Level	16	23.5	13	23.6	29	23.6	6.353**	0.012
Certificate and Above	9	13.2	3	5.5	12	9.8		
Total	68	100	55	100	123	100		

Source: survey result, *2018*: ** significant at less than 5% probability level

Table 3. Relationship of family size and adoption of improved chicken package

Family size	Adoption of Improved Chicken Package						χ 2 -value	p-value
	Adopters		Non- Adopters		Total			
	No	(%)	No	(%)	No	(%)		
1-4	12	17.6	7	12.7	19	15.4		
5-8	40	58.8	33	60.0	73	59.3	0.653NS	0.722
Above 8	16	23.5	15	27.3	31	25.2		
Total	68	100	55	100	123	100		

Source: *survey result, 2018: NS = Not Significant*

Table 4. Relationship of farming experience with adoption of improved chicken package

Farming experience	Adoption of Improved Chicken Package						χ 2 -value	p-value
	Adopters		Non- Adopters		Total			
	No	(%)	No	(%)	No	(%)		
1-3	6	8.8	7	12.7	13	10.6		
4-6	4	5.9	10	18.2	14	11.4	5.523*	0.064
Above 6	58	85.3	38	69.1	96	78		
Total	68	100	55	100	123	100		

Source: survey result, *2018*: * significant at less than 10% probability level

Table 5. Relationship of livestock holding with adoption of improved chicken package

Livestock holding	Adoption of Improved Chicken Package							
	Adopters		Non- Adopters		Total		χ 2 –value	p-value
	No	(%)	No	(%)	No	(%)		
Yes	50	73.5	35	63.6	85	69.1	-1.375NS	0.279
No	18	26.5	20	36.4	38	30.9		
Total	68	100	55	100	123	100		

Source: survey result, *2018*: NS = Not Significant

Table 6. Relationship of extension agent contact with adoption of improved chicken package

Extension agent contact	Adoption of Improved Chicken Package						χ 2 -value	p-value
	Adopters		Non- Adopters		Total			
	No	(%)	No	(%)	No	(%)		
2 times a week	45	66.2	44	80.0	89	72.4		
4 times a week	14	20.6	8	14.5	22	17.9	4.311**	0.043
More than 4 times a week	9	13.2	3	5.5	12	9.8		
Total	68	100	55	100	123	100		

Source: survey result, *2018*: ** significant at less than 5% probability level

Table 7. Distribution of respondents by credit access

Access to credit	Adoption of Improved Chicken Package						χ 2 -value	p-value
	Adopters		Non- Adopters		Total			
	No	(%)	No	(%)	No	(%)		
Yes	31	45.6	16	29.1	47	38.2	7.617***	0.005
No	37	54.4	39	70.9	76	61.8		
Total	68	100	55	100	123	100		

Source: survey result, *2018*: *** significant at less than 1% probability level

Table 8. Respondents' distribution by engagement in off/non-farm activities

Farmers engaged in off/non-farm activities	Adoption of Improved Chicken Package						χ 2 -value	p-value
	Adopters		Non- Adopters		Total			
	No	(%)	No	(%)	No	(%)		
Yes	44	64.7	43	78.2	87	70.7	1.667NS	0.102
No	24	35.3	12	21.8	36	29.3		
Total	68	100	55	100	123	100		

Source: survey result, *2018*: NS = Not Significant

Table 9. Relationship of access to health service with adoption of improved chicken package

Access to health service	Adoption of Improved Chicken Package						χ 2 -value	p-value
	Adopters		Non- Adopters		Total			
	No	(%)	No	(%)	No	(%)		
Yes	56	82.4	40	72.7	96	78		
No	12	17.6	15	27.3	27	22	1.644NS	0.208
Total	68	100	55	100	123	100		

Source: survey result, *2018*: NS = Not Significant

Table 10. Relationship of training with adoption of improved chicken package

Attended agricultural training	Adoption of Improved Chicken Package						χ 2 -value	p-value
	Adopters		Non- Adopters		Total			
	No	(%)	No	(%)	No	(%)		
Yes	27	39.7	28	50.9	55	44.7		
No	41	60.3	27	49.1	68	55.3	2.543**	0.044
Total	68	100	55	100	123	100		

Source: *survey result, 2018:* ** significant at less than 5% probability level

Table 11. Logistic Regression Estimates for Factors Affecting Adoption of Improved Chicken Packages

Explanatory Variables	Estimated Coefficient(B)	S.E.	Wald statistics	Sig. level	Odds ratio Exp(B)
AGE	0.074	0.031	5.619	0.018**	1.077
EDU	0.453	0.228	3.950	0.047**	1.573
FAMSIZE	0.733	0.474	2.394	0.122	0.480
EXPRC	0.870	0.451	3.724	0.054*	2.386
FARMSIZE	-0.195	0.643	0.092	0.761	0.823
MKTDIST	-0.740	0.262	7.986	0.005***	2.097
LIVHOLD	-0.766	0.462	2.053	0.297	0.465
EXTVST	0.014	0.384	.001	0.970	1.015
CREDIT	0.933	0.530	3.099	0.078*	0.394
NONFARM	0.507	0.542	0.876	0.349	1.661
HEALTH	-0.603	0.557	1.171	0.279	0.547
TRAIN	0.479	0.540	0.786	0.375	0.619
Constant	2.681	2.647	1.025	0.311	0.069

Pearson- χ^2 value = 31.014***df =12P = 0 .000
-2log Likelihood = 138.124
Prediction success = 85.6
Correctly predicted non adopter = 83.7
Correctly predicted adopter = 81.5
*, **, *** significant at 10%, 5% and 1% probability level, respectively
AGE= Age of household head; EDU= Education status; FAMSIZE= Family size of the household; EXPRC= Farm experience of the household; FARMSIZE= Farm size of the household; MKTDIST= Market distance; LIVHOLD= Livestock owned by the household; EXTVST= ; CREDIT= Acess to credit; NONFARM= Non farm income ; HEALTH= Access to health service; TRAIN= Attained training
Source: *Model output*

and adoption of improved chicken packages (Table 3). Farming experience plays an important role in affecting the adoption of improved chicken packages. The chi-square test result indicated that (χ^2 =5.523; p= 0.064) there is a statistically significant difference between adopters and non-adopters of improved chicken packages with respect to farming experience at less than 10% probability level(Table 4). Livestock is the most important asset in the study area. Households in the study area undertake livestock production activities. The chi-square test result (χ^2 =1.375; p= 0.279) indicated that there was no statistical association between adopters and non-adopters with respect to their livestock holding. Table 6 showed the contact of agricultural extension agents of sampled households and their adoption status of improved chicken packages. The chi-square test result (χ^2 = 4.311; p= 0.043) indicated that there is a statistically significant difference between adopters and non-adopters of improved chicken packages with respect to extension agent contact at less than 5% probability level (Table 6). Credit can increase households' access to essential resources and stimulate economic growth. The Chi-square test result (χ^2= 7.617; p= 0.005) indicated that there is statistically significant association between credit access and adoption decision of improved chicken package sat less than 1% probability level. This finding was similar to the finding of Gezahegn *et al.,* 2009. Non/off-farm activities of sampled households were assessed as indicated in Table 8. The Chi-square test result ($\boldsymbol{\chi^2}$= 1.667; p= 0.102) indicated that there is no statistically significant association between non-farm activities and the adoption decision of improved chicken packages. The Chi-square test result (χ^2= 1.644; p= 0.208) indicated that there is no statistically significant association between access to health service and adoption decision of improved chicken packages. Based on the result in table 10, the percentage of non-adopters who had attended agricultural training was higher, and the Chi-square test result (χ^2= 2.543; p= 0.044) indicated that there is statistically significant association between attending agricultural training and adoption decision of improved chicken packages.

The existing conditions of improved chicken packages in the study area: During focus group discussions and key informant interviews, the participants were asked to explain the existing conditions of improved chicken packages in the area. And also they were asked how they differentiate existing conditions of improved chicken packages than free-range or village chicken. Most of the participants explained that the common chicken breed disseminated in the area is Red Island Rode (RIR). This is due to the dual purpose of the breed; they are meat and egg chicken breeds. As the participants reported, the other reason why this breed is selected in the area rather than other improved chicken breed is due to their color they are not exposed to predators. The current condition for improved chicken packages in the area at distribution rate based on group discussion and secondary data, 20% of total area coverage, but packages are decreasing from time to time. Regarding the husbandry system and feeding system, training was offered by extension workers even if it is not sufficient. During group discussion, most of the participants agreed that concentrated feeds, tap water, good housing system provided for improved chicken packages by farmers than village chicken production.

Econometric results and factors influencing adoption of improved chicken packages: Table 11 depicts the results of the binary logit model estimations of factors significantly influencing the adoption of improved chicken packages and the model was found to be significant at 1%, 5%, and 10% significance level. The logit model analysis emphasizes on considering the combined effect of variables between adopter and non-adopter households in the study area. Out of the total variables; five of the variables were found to be significant while the remaining were not significant in explaining the variations in the dependent variable.

The maximum likelihood estimates of the binary logistic regression model showed that age, education status, farming experience, distance to market and access to credit were important factors influencingthe adoption of improved chicken packages in the study area. Most of the variables family size, livestock holding, extension agent contact, engagement in off/non-farm activities, access to health service and attended agricultural training were not powerful in explaining adoption status in the study area.

Interpretation of the Model Results

Out of the hypothesized twelve independent variables five were found to influence the adoption of improved chicken packages in the study area. These are the age of household head (AGE), education status (EDU), farming experience (EXPRC), distance to market (MKTDIST) and access to credit (CREDIT). These significant variables are discussed in detail in the following section.

Age: Age was hypothesized to have a negative effect on the adoption of improved chicken packages but the model result showed that age had a statistically significant and positive effect on adoption status in the study area. Other factors being constant, the odds ratio in favor of adopting improved chicken packages increased by a factor of 1.077 as the age of household head increases by one year. The result is consistent with findings of Hailemarium *et al*., 2006reported that younger and literate household heads were more likely to decide to adopt the utilization of commercial concentrate feeds for small ruminants in the highland of Ethiopia.

Education status: education increases the analytical ability of individuals to process information received from any source. As the model results in table 11 revealed, education status is statistically significant and positively influences adoption status, and it is in line with the hypothesis. This shows as households are getting educated, they are more likely to adopt improved chicken packages. Keeping the influences of other variables constant, the odds ratio in favor of adopting improved chicken package increases by a factor of 1.573 as the education status of household head increases by one year of schooling. The possible explanation for this is that education helps to adopt improved chicken packages and because the capacity created would help them to analyze, interpret and make use of it than illiterate household heads.

Experience of farming: this variable was found to influence the adoption of improved chicken packages positively and significantly at 10% probability level. Keeping other factors constant, the odds ratio in favor of adopting improved chicken package increases by a factor of 2.386 as the experience of farming increases by one year.

Distance to market: this variable was found to influence adoption improved chicken package negatively and significantly at 1% probability level. The odds ratio of 2.097 indicates that under the constant assumption, the odds ratio in favor of adopting improved chicken package decreases by a factor of 2.097 as the distance of the homestead from the market center increases by one km. The possible explanation for this is that as the sampled households' are close to the market they would have more access to adopt than the others.

Access to credit: this variable was found to influence adoption improved chicken package positively and significantly at 10% probability level. Keeping other factors constant, the likelihood of households with access to credit relative to the base category increased by 0.394 when access to credit increases. This implies that households with more access to credit would have a higher tendency to adopt more.

Conclusion

The result of the study indicated that demographic, economic and institutional factors significantly affected the adoption of improved chicken packages in the study area. These are age, education status of the household, the experience of farming, distance to market and access to credit. According to the model result, educational status of sampled households was found to have a significant and positive association with the adoption of improved chicken packages. So, emphasis should be given towards strengthening different educational and training opportunities. The result of the study revealed that credit access had a positive and statistically significant effect on households' adoption status. In order to make non-adopter households to adopt, financial institutions should have awareness creation, counseling programs and provide productive loans and follow up their credit utilization so that they can use it to generate additional income and this, in turn, motivates households to adopt improved chicken packages. The result of the study also revealed that distance from the market had a positively and statistically significant effect on the adoption status of improving chicken packages. Hence, Governmental and Non-governmental organizations have to facilitate market opportunities by connecting the marketing route of this locality with big market players. In addition, policy interventions should focus on increasing the availability and accessibility of financial institutions in areas to promote the adoption of improved chicken packages. Overall extension support should be provided by research institutes and agricultural offices to improve institutional arrangements and management aspects.

Conflict of Interest: The authors declare no conflict of interest.

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