



**FACTORS INFLUENCING ON CHICKEN SMALLHOLDERS
ADOPTION BEHAVIOR OF MANAGEMENT INTERVENTION
PACKAGES IN EGYPTIAN RURAL**

M.A. El-Menawey¹, R.E. Hamouda² and Y.A. Abdel-Aziz²

¹Dep. of Anim. Prod., Fac. of Agric., Cairo Uni., Giza, Egypt.

²Dep. of Anim. Prod. Sys. Res., Anim. Prod. Res. Inst., Agric. Res. Center, Minis. of Agric., Dokki, Giza, Egypt

Corresponding author: reda_arc.system@yahoo.com

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ABSTRACT:The study was conducted in Al-Sharkia and El-Fayoum governorates, Egypt. This study aimed to determine the socio-economic factors that influencing on chicken smallholder's adoption behavior of management intervention packages in Egyptian rural sector. Samples of two hundred individual households' were randomly selected, through semi-structured interviews with questionnaires to collect data through monthly visits from January to December 2015. The results indicated that adoption of the management intervention package was influenced by gender, smallholder's experience, smallholder's education level, group membership, distance to the market, access to extension and training programs, veterinary services and marketing information. Smallholders with a lower education level were likely to adopt housing, chick rearing, improved strains and feed supplementation; and improved strains packages, whereas, smallholders with a higher education level increased the likelihood of adopting the full package. Males were more likely to adopt the full package, while females more likely to adopt components of management intervention packages. Smallholder experience in raise indigenous chicken had a positive significant and marginal effect on adoption of the full package. Access to training and extension services increased the probability of adopting disseminated packages, the ability to selective from the packages and the adoption of full packages. A decrease in distance to the market increased the probability of adopting the full package, but reduces the probability of adopting feed supplementation and vaccination. It could be recommended that, it should to encourage the chicken smallholders, in Egyptian rural sector, to work in self-help groups and create awareness through training. Micro-credit providers should provide credit in order to encourage adoption of the management intervention package.

Key words: Management interventions – adoption - rural sector - disseminate.

INTRODUCTION

Intensification of agricultural production and diversification into relatively more profitable and competitive livestock enterprises is one of the options to increase food production and reduce rural poverty. Poultry production, generally, considered secondary agricultural activities by smallholder smallholders and its makes an important contribution to supplying indigenous populations with additional income and high quality protein. Poultry products can be sold to meet essential family needs such as medicine, clothes and school fees. Abadi (2017a) reported that, the management intervention package was designed to improve productivity of indigenous chicken and includes housing; feed supplementation, vaccination, brooding, chick rearing and improved strain. Ochieng et al. (2013) revealed that there were three homogeneous types of smallholder's adopters of the full management intervention package as disseminated, adopters of feed supplementation and vaccination, and adopters of feed supplementation and brooder. The management interventions will only be sustainable if they suit the limited physical and economic resources of farming householders. According to Ochieng et al. (2011), rate and extent of adoption can be affected by various factors including smallholder's age, family size, education and access to credit. Young age may positively influence both extent and decision of adoption. Family size as a proxy to labour availability may positively influence adoption of technology as its availability reduces labour constraints faced in poultry production (Ochieng et al., 2011). Also, they stated that, the education is one of the important factors which

accelerates growth and development of any enterprise. Level of education increases ability to receive and understand information relevant to making innovation decision. Availability of interrelated inputs such as vaccines, extension services, market access and supplementary feeds for chickens may also enhance the efficiency of making adoption decisions (Ochieng et al., 2013). Therefore, this study sought to determine the socio-economic factors that influencing on chicken smallholder's adoption behavior of management intervention packages in Egyptian rural sector.

MATERIALS AND METHODS

Description of the study area

The study was conducted in two governorates, in Egypt, Al-Sharkia and El-Fayoum. The first governorate, Al-Sharkia located in the northern part of Egypt, about 86 Km from the capital, Cairo. The second governorate, El-Fayoum, is located in the middle part of Egypt, about 130 km south west of Cairo.

Data collection

The data used in this work were collected through structured interviews and focus group discussions were held during farm householders visits. The farm householders data of interest included data about labour, householders age, householders education level, credit, training, gender, distance to market, socio-economic characteristics, chicken management interventions, access to extension services, group membership, veterinary services and householders experience years. Samples of two hundred householders of poultry producers were randomly chosen, one hundred and seven from Al-Sharkia governorate and ninety three from El-Fayoum governorate. The data were

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obtained through monthly visits to the householders' chickens producers during the period from January to December 2015.

Statistical analysis

Enumeration data of the field survey were tested by chi-square procedure (Snedecor and Cochran, 1993). Cluster Analysis (CA) was employed to determine homogenous groups of smallholders adopting different management interventions package (Anderberg, 1973). Logistic regression analyses were performed using SAS (2004), to determine and quantify the relations between the smallholder's preference for particular components of the management intervention package and some hypothesized explanatory variables. The statistical model was used mainly to test socio-economic characteristics that influence the smallholders' preference for given components of the package. Expressing management intervention packages were considered to be the dependent variable. The independent factors included the smallholder experience (years), smallholder age, gender, education level, membership of self-help group, distance to the market, access to extension services, marketing information, access to veterinary services, access to credit, and access to training.

In equation (1), X_i is a vector of explanatory variables, β_j is the matrix of parameters to be estimated and Y is the response variable, which was multiple in nature such that Probability ($Y_i = j$) is the probability of an individual smallholder i having adopted a given component of management interventions j . A general formalization of the multinomial logit (MNL), according to Schmidt and Strauss (1975), for the probability that individual smallholder i choose alternatives j and m

is the number of alternatives expressed in equation (1):

$$pr\ ob(Y_i = j) = \frac{e^{\beta_j x_i}}{1 + \sum_{k=1}^j e^{\beta_k x_i}}, = j = 1, 2, \dots, J \tag{1}$$

It is convenient to normalize the above model to solve the problem of indeterminacy by setting $\beta_0 = 0$, this arises because the probabilities sum to one, so only J parameter vectors are needed to determine $J+1$ probability. Therefore the probabilities as shown in equation (2) are that:

$$pr\ ob(Y_i = j|x_i) = \frac{e^{\beta_j x_i}}{1 + \sum_{k=1}^j e^{\beta_k x_i}} = j = 1, 2, \dots, J, \beta_0 = 0 \tag{2}$$

The J log-odds ratio from equation (2) is shown in equation (3):

$$\ln\left(\frac{P_{ij}}{P_{ik}}\right) = x_i(\beta_j - \beta_k) = x_i(\beta_j), \text{ if } \dots k = 0 \tag{3}$$

The reduced linear form of the MNL model as shown in equation (4) becomes:

$$Y = \beta_0 + \sum_{i=1}^i \beta_j x_i + \varepsilon \tag{4}$$

Where Y is the probability that household i chooses management interventions j , β_0 is the intercept term, β_i , β_j and β_k are vectors of parameters to be estimated (each of which is different, even though X_i is constant across alternatives), X_i , are characteristics perceived to be influencing the pattern of adoption of management interventions and ε is the disturbance term, which is assumed to be logistically distributed. The coefficients in this model are difficult to interpret and associating the β_j and j^{th} outcome is misleading (Greene, 2008). Therefore, marginal probabilities of choice (marginal effects) were obtained from the MNL results to

facilitate interpretation of the results, as shown in equation (5):

$$\frac{\partial P_j}{\partial x_i} = P_j \left[\beta_j - \sum_{k=0}^J P_k \beta_k \right] = P_j [\beta_j - \bar{\beta}], = j = 1, 2, 3 \dots J \quad (5)$$

The marginal effects are the partial derivatives of probabilities with respect to individual-specific characteristics.

RESULTS AND DISCUSSION

a. Disseminated management interventions and pattern of their adoption by village chicken smallholders producer

In the study area management intervention packages disseminated to smallholders by government or non-government extension service comprise housing, vaccination, chick rearing, improved strains and feed supplementation. A combined approach of Principal Component Analysis (PCA) and Cluster Analysis (CA) was first step to determine homogenous groups of smallholders adopting different management interventions package, generated nine homogenous groups of smallholders. These nine groups contain most of the variation relevant to characterization of smallholder local chicken smallholders in terms of adoption of management interventions. The results from Principal Component Analysis (PCA) and Cluster Analysis (CA) which yielded nine homogenous groups, considering the characteristics and the manner in which this group of smallholders adopted management interventions disseminated by government or non-government extension service. These results indicated that 45% of the smallholders adopted the management interventions package as disseminated by the extension service were considered to be housing (room

inside or beside house), vaccination (vaccine against Newcastle disease and bird flu H5N1), chick rearing (lighting, litter, improved raring methods and cleaning water), improved strains (crossed breeds) and feed supplementation management (commercial ration or balanced homemade ration) intervention packages, they were presented 6.50%, 3.50%, 8%, 18% and 9%, respectively. While (50%) selectively adopted components of the management interventions package were considered full packages; feed supplementation and improved strains; feed supplementation and vaccination management interventions package, presented 12%, 30.50% and 7.50% respectively, that suited their socio-economic conditions and production circumstances.

Moreover, a few smallholders only 5% reject adopted management interventions in study area they considered as traditional smallholders. Our results are in agreement with Abadi (2017a), he mentioned that, the disseminated management interventions package in rural Africa includes housing, feed supplementation, vaccination, brooding, chick rearing and improved strain. Furthermore, Ochieng et al. (2013) reported that, in Kenya, there were three homogeneous groups of smallholder's selective component from disseminated management intervention package; include adopters of full packages, adopters of feed supplementation and vaccination and adopters of feed supplementation and brooder. It worth mentioned there are no data available about management intervention packages adoption in Egypt.

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b. Demographic characteristics and institutional support of respondents

Socio-economic characteristics in Table 1 and 2, of respondents considered in the analysis comprised gender, average smallholder age, experience years, education levels. The institutional support characteristics considered in the analysis comprised access to extension services, access to credit services, training, group membership, access to market information and distance to market. Females were the majority of owned flocks in group adoption packages as disseminated. Females represented 69.24%, 68.75%, 86.11% and 83.33% in housing, chick rearing, improved strain and feed supplementation, respectively. While, the males were the majority of owned flocks in group selective component of disseminated packages. Males represented 100%, 67.21% and 80% in full; feed supplementation and improved strains and feed supplementation and vaccination groups, respectively. Moreover, in vaccination groups males represented 57.14% and females 42.86%. On non-adoption groups females represent 100%. Our results are in agreement with Ochieng et al. (2011), in Kenya, stated that, smallholders keeping indigenous chicken, females were the majority (76%) with males representing only 24%. The average smallholder's age in groups' adoption packages as disseminated (housing, vaccination, chick rearing, improved strain and feed supplementation) were 49.34, 43.10, 44.80, 45.80 and 44.05 years old, respectively. While in non-adoption group the average age was 58.10 years old. The average smallholder's ages in groups' selective component of disseminated packages were 41.90, 42.55 and 42.71 years old, respectively.

However, fewer young engaged in family chicken production activities. Smallholders experience years divided into three categories the majority was ranged between 20-40 years old were 61.54%, 85.71%, 62.50%, 55.66% and 55.50% of smallholders' response with highly significant differences between housing, vaccination, chick rearing, improved strain and feed supplementation, respectively. While, in non-adoption group the majority was more than 40 years old (60%). But, on groups selective component of disseminated packages all of respondents in three groups ranged between 20-40 years old. The majority of the smallholders were 20%, 46.14%, 57.14%, 56.25%, 61.11% and 50% had attained intermediate education level in non-adoption, housing, vaccination, chick rearing, improved strain and feed supplementation, respectively, while there were 60% and 30.10% in non-adoption and housing groups, respectively, with no formal education. On the other hand, the majorities of the smallholders were 95.83%, 45.90% and 93.33% had attained high education level in full; feed supplementation and improved strains and feed supplementation and vaccination groups, respectively. Similarly results with Ochieng et al. (2011), reported that, there were few smallholders (4.2%) with no formal education while over half (59.2%) had attained basic primary education level in Kenya. In most extensive production systems, chicken production receives limited institutional support services such as veterinary services, extension services, credit and training. In study area 7.69%, 100% and 5.55% in housing, vaccination and improved strains, respectively, had access to

veterinary services, while the remained groups had no access to veterinary services. Moreover, 75%, 16.39% and 53.33% in full; feed supplementation and improved strains and feed supplementation and vaccination groups, respectively, had access to veterinary services. Our results showed that, 100%, 92.31%, 85.71%, 87.50%, 94.44% and 83.33% of respondent had no access to extension services in non-adoption, housing, vaccination, chick rearing, improved strain and feed supplementation, respectively. While, 41.67%, 13.11% and 33.33% of respondent had access to extension services in full; feed supplementation and improved strains and feed supplementation and vaccination groups, respectively. The results showed that, in the study area, there were no accesses to market information and formal credit; all of smallholders depend on self-credit to production (100%), while only 28.57% of vaccination group working in group membership. In the study area distance to the market was on average 3.20, 3.18, 3, 3.69, 3.15 and 3.89km away reflecting good access to markets for these smallholders in non-adoption, housing, vaccination, chick rearing, improved strain and feed supplementation, respectively. furthermore, there are 29.17%, 6.56% and 13.33% had accesses to market information and 16.67%, 8.20% and 13.33% had access to credit, while 62.50%, 16.39% and 53.33% had access to training, moreover, 41.67%, 8.20% and 53.33 working in group membership in full; feed supplementation and improved strains and feed supplementation and vaccination groups, respectively. In the study area distance to the market was on average 2.16, 2.42 and 2.58km away reflecting good access to markets for

these smallholders in full; feed supplementation and improved strains and feed supplementation and vaccination groups, respectively. The importance of indigenous chicken production to rural households can be increased through proper and timely access to veterinary and extension services.

c. Factors influence on adoption of management interventions package as disseminated

1. Factors influence on adoption of housing management interventions package

Table 3 presents the estimated marginal effects for components of the housing management intervention package adopted by smallholder smallholders in the study area. The model log likelihood ratio χ^2 (29.4849) is highly significant ($p < 0.0001$), indicating that the explanatory variables included are significant in explaining the adoption of housing management interventions packages by the smallholders. The results observed significantly estimated marginal effects for smallholder age (-0.5142), access to training (0.5643), extension services (0.8918) and access to credit (0.714) on the smallholders' adoption of housing packages. Extension services were found to be the most important variable affecting the adoption of housing packages decision followed by smallholders' age (inverse relationship). Education level, gender, experience years, veterinary services, distance to market, market information and work in group membership had no significant effect on the smallholders' adoption of housing packages. It is worth mentioning Sodjinou (2011) indicated that access to extension services and training has a positive and significant effect on the adoption of henhouses. These imply that

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producers have access to extension services and training is more likely to adopt henhouse buildings than producers have not access to extension services and training. Indeed, access to credit has a positive and significant influence on the adoption of henhouses and chick-houses. Also, household size has a positive and significant effect on the adoption of chick-houses.

2. Factors influence on adoption of vaccinations management intervention package

The model log likelihood ratio χ^2 (55.6380) is highly significant ($p < 0.0001$), indicating that the explanatory variables included are significant in explaining the adoption of vaccinations management interventions packages by the sampled smallholders (Table 3). The results indicated that, the estimated marginal effects for education levels (0.4636), smallholder age (-0.5142), access to training (0.5674), extension services (0.5194), veterinary services (0.5165), distance to market (0.3941), access to credit (0.7714) and work in group membership (-0.8426) had significant effects on the smallholders' adoption of vaccinations packages. Smallholder age (inverse relationship) was the most important variable affecting the adoption of vaccinations packages decision followed by access to training, veterinary services, access to credit and inverse relationship by group membership. The results presented in Table 3 showed that the gender, experience years, and market information have no significant influence on the smallholders' adoption of vaccinations packages. Similar results were observed by Sodjinou (2011) they reported that the access to extension services and training had a positive significant effect on the

adoption of vaccination. The probability of adopting poultry vaccination is higher for the smallholders who had access to extension services and training than those had not access to training. The access to extension services and training, as an approach based on community, facilitates the smallholders' initial exposure to the vaccination and thus their appreciation of its benefits. On the other hand, gender has no significant effect on the adoption of village poultry vaccination (Table 3).

3. Factors influence on adoption of chicken rearing management intervention package

The results in Table 3 indicated that, the model log likelihood ratio χ^2 (44.8798) is statistically highly significant ($p < 0.0001$), indicating that the explanatory variables included are significant in explaining the adoption of chicken rearing management interventions packages by the sampled smallholders. The estimated marginal effects for smallholder age (-1.2742), access to training (0.5945), distance to market (-0.3983), extension services (0.4139) and access to credit (0.8623) had significant influence on the smallholders' adoption of chicken rearing packages. Smallholder age (inverse relationship) was found to be the most important variable affecting the adoption of chicken rearing packages decision followed by access to credit. However, education levels, gender, experience years, veterinary services, market information and group membership had no significant effects on the smallholders' adoption of chicken rearing packages. Epiphane and Arne (2012) mentioned that unavailability of chicken rearing technologies usually prevents smallholders from overcoming traditional chicken farming behavior's thereby unable to increase income and reduce

poverty. Also, smallholders should be initially advised to adopt low cost technologies like chicken house construction using local materials, vaccinations and feed supplementation in that order as the three have shown to enhance the survival rate of chicken. Limited access to veterinary, extension services and chicken production skills in the study area is common in most extensive chicken production systems, chicken productivity usually increases when proper and timely veterinary and extension services are provided to smallholders (Ochieng et al., 2013).

4. Factors influence on adoption of improved strains management intervention package

The estimated marginal effects for components of the improved strains management intervention package adopted by smallholder smallholders in the study sample area are presented in Table 3. The model log likelihood ratio χ^2 (49.0070) was highly significant ($p < 0.0001$), indicating that the explanatory variables included are significant in explaining the adoption of improved strains management interventions packages by the sampled smallholders. The results indicate that, the estimated marginal effects for experience years (-1.0485), gender (1.2742), smallholder age (-1.1813), access to training (0.914), extension services (1.218), veterinary services (0.8595) and distance to market (-0.6089) had significantly effects on the smallholders' adoption of improved strains packages. Smallholder age (inverse relationship), experience years (inverse relationship), access to training, extension services and veterinary services was found to be the most important variable affecting the adoption improved

strains packages decision followed by gender and distance to market (inverse relationship). The education levels, access to credit, market information and group membership had no significant influenced the smallholders' adoption of improved strains packages. Our results are in agreement with those reported by Justus et al. (2012) he reported that the variable sex was found to have a significant and positive influence on adoption of exotic poultry breeds. The positive sign implies that the males headed households were better in adopting the improved chicken strains than females headed households. This could be due to the reason that males headed households have better financial capacity to buy improved chicken strains and have better information access about the technology than their counterpart. Hence, this can encourage males headed households to adopt improved chicken strains. This is similar with the findings in previous of Abadi (2017b) who justified that males headed smallholders were better in adopting chicken strains. Ermias et al. (2015) indicated that as hypothesized smallholders' contact with extension agents positively influenced the adoption of improved chicken strains at 5% level of significance. This implies that smallholders 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 smallholders who do not have extension contact. Hence, smallholders having contact with extension agents could have a higher probability of adopting improved chicken strains than those who have not. Sisay et al. (2013) and Dehinet et al. (2014) observed that, in Ethiopia, smallholders' participation in training organized in relation to poultry

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production influenced the adoption of improved chicken strains significantly and positively. This indicated that smallholders participating in training acquire sufficient knowledge and skill about the use of improved chicken strains which make helps respondents more likely to adopt the improved chicken strains. Also, participation of smallholders in training had a positive and significant influence on the probability of adoption of modern technologies. Simegnew et al. (2015) revealed that distance to market had significantly negative effect on the adoption of improved chicken strains. In the same line with this the findings by Abadi (2017b), who reported that the distance of smallholders' residence from the nearest market center was significantly and negatively associated with improved chicken strains adoption decision. This is due to the fact that as the smallholders reside far from the nearest market as they face high transportation cost for selling their output and also have low market information which can reduce smallholders' decision to adopt improved chicken strains.

5. Factors influence on adoption of feed supplementation management intervention package

The model log likelihood ratio χ^2 (24.1311) is statistically highly significant ($p < 0.0001$), indicating that the explanatory variables included are significant in explaining the adoption of feed supplementation management interventions packages by the sampled smallholders (Table 3). The results indicated that, the estimated significant marginal effects for education levels (1.474), gender (1.1089), experience years (1.8055), smallholder age (-1.2742), access to training (1.1819), extension

services (1.2314), distance to market (1.4746) and access to credit (1.2379) influence on the smallholders' adoption of feed supplementation packages. The education level, smallholder age (inverse relationship), experience years, access to training, distance to market and access to credit was found to be the most important variable affecting the adoption feed supplementation packages decision followed by gender and extension services. The veterinary services, market information and group membership had no significant effect on the smallholders' adoption of feed supplementation packages. Our results are in agreement with Sodjinou (2011) he reported that, in Benin, access to extension services and training have a significantly higher probability of adopting improved feed. The producers who have access to extension services and training adopt this technology more often than producers have not access to extension services and training. Age of the smallholder has a significant effect on the adoption of improved feed or feed supplementations. The value of age that maximizes the linear prediction is 40.55 years. To put it another way, producers are open to the use of improved feed for village poultry production until the age of 40.55, before and after which they become less receptive to the technology (Sodjinou, 2011).

Furthermore, he stated that education has a positive and significant effect on the adoption of improved feed. This indicates that more educated smallholders are more willing to adopt the technology than less educated smallholders. The adoption of improved feed or feed supplementations is highly and significantly influenced by the producer's access to credit.

d. Factors influence on adoption pattern of selective components of management interventions

1. Factors influence on adoption of full management interventions packages

Table 4 presents the estimated marginal effects for components of the full management intervention package adopted by smallholder smallholders in the study area. The model log likelihood ratio χ^2 (28.5145) is statistically highly significant ($p < 0.0001$), indicating that the explanatory variables included are significant in explaining the adoption of full management interventions packages by the smallholders. The results indicated that, the estimated significant marginal effects for education levels (1.8513), gender (-1.1669), experience years (0.851), smallholder age (-0.5142), access to training (1.3151), extension services (0.7495), veterinary services (1.0255), distance to market (-1.0611), access to credit (0.8943), market information (0.9855) and group membership (-1.3612) on the smallholders' adoption of full packages. Education level and group membership (inverse relationship) was found to be the most important variable affecting the adoption of full packages followed by gender, smallholder age (inverse relationship) and access to training. Experience years, extension services, veterinary services, distance to market (inverse relationship), access to credit and market information were observed as less important.

This explain is in conformity with the findings of Ochieng et al. (2013), he reported that higher education is advantageous for adoption of farm innovations and makes smallholders more responsive to many agricultural extension programs and policies. Education level had a positive marginal effect on the

adoption of full package. These results may be due to that the high education level help smallholder to decrease the risk aversion behavior and increase the rate of adoption. The gender males' were more likely to adopt the full package, while females were more likely to adopt components of it. These results indicated that males were risk averse and thus unable to adopt the full package. Our results in agreement with Ochieng et al. (2013), who reported that, males able to adopted full packages this is maybe due to the challenges faced by females smallholders in accessing productive resources, especially as regards obtaining credit and access to land. Ochieng et al. (2011) and Ochieng et al. (2013) stated that females are often deprived of the rights and opportunities that males enjoy, and are denied access to financial and economic resources. However, the male smallholders have easier access to economic resources, were risk takers and commercially motivated since most preferred to adopt the full package in order to increase local chicken productivity and get more returns. Females and males headed households differ in their adoption behavior and this could be explained by their differences in access to income, assets, education and technologies. Experience year in local chicken farming had a significant and positive marginal effect on adoption of the full package. A longer experience in local chicken production increased the probability of adopting the full package. These results mean that experienced smallholders were more knowledgeable about the application of the full package as a way of increasing flock productivity. However, the smallholders with less experience were likely to adopt components of management intervention

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packages. Smallholders' age had a significant inversely marginal effect on the adoption of all management intervention packages. Increased access to training and extension services increased the probability of adopting disseminated packages and had ability to selective from them also adopt full packages (Table 4). This implies that regular visits by an extension worker are necessary to enhance the adoption of management interventions because extension services provide information, knowledge and skills that enable smallholders to apply interventions.

Increased access to veterinary services increased the probability of adopting feed supplementation and improved strains, feed supplementation and vaccination and full packages. Distance to the market played a vital role in the adoption of management interventions. A decrease in distance to the market increased the probability of adopting the full package and feed supplementation and vaccination packages. This is may be because of feed supplements and vaccines at cheap prices are only available in major markets. This means that poor market access for smallholders located in remote places increases the transaction costs. Access to credit, however, was significant at all for the adoption of the packages.

According to Ochieng et al. (2013) reported that, smallholders had no access to credit in fact reduce the probability of adopting packages. Smallholder groups were important in influencing the adoption of the full package. This could be due to pooling of resources and easy access to extension through groups as well as reduction of information asymmetry.

2. Factors influence on adoption of feed supplementation and improved strains management interventions packages

The model log likelihood ratio χ^2 (28.5145) is statistically highly significant ($p < 0.0001$), indicating that the explanatory variables included are significant in explaining the adoption of feed supplementation and improved strains management interventions packages by the smallholders (Table 4). The results indicated that, there were estimated significant marginal effects for smallholder age (-0.714), gender (-1.3665), extension services (0.8691), veterinary services (1.1988), distance to market (-0.5142), access to credit (1.1697) and group membership (-0.6885) on the smallholders' adoption of feed supplementation and improved strains packages. Extension services and veterinary services were the most important variable affecting the adoption feed supplementation and improved strains packages decision followed by gender, distance to market (inverse relationship) and access to credit. On the other hand, education levels, experience years, access to training and market information had no significant effects on the smallholders' adoption of feed supplementation and improved strains packages (Table 4). Access to market information had insignificant effects on adoption of feed supplementation and improved strains management interventions packages. This may be due to the smallholders sold chicken product in their areas. Our results in agreement with Oching (2012) who reported that, males were expected to adopt the full package only. Our results indicated that, males had significant effects on adoption of feed supplementation and improved strains management (Table 4).

3. Factors influence on adoption of feed supplementation and vaccination management interventions packages

As presents in Table 4, the model log likelihood ratio χ^2 (28.5145) is statistically highly significant ($p < 0.0001$), indicating that the explanatory variables included are significant in explaining the adoption of feed supplementation and vaccination management interventions packages by the sampled smallholders. The results indicated that, the estimated marginal effects for smallholder age (-1.1819), education level (3.8498), gender (-1.6548), extension services (1.1813), veterinary services (1.212), group membership (-3.0402) and access to credit (1.1461) had significantly effects on the smallholders' adoption of feed supplementation and vaccination packages. Education level, gender, extension services, veterinary services and group membership (inverse relationship) were the most important variable affecting the adoption feed supplementation and vaccination packages decision followed by smallholder age (inverse relationship), then access to credit. However, the experience years, access to training, distance to market and market information had no significant effects on the smallholders' adoption of feed supplementation and vaccination packages (Table 4). Our results in agreement with Ochieng et al. (2011) and Ochieng et al. (2012), they stated that, smallholder smallholders with more years of experience tend to be less conservative and hence more likely to adopt the full package only. Also, smallholder smallholders closer to the market were expected to adopt the full package, while those living further from the market were expected to modify and selectively adopt components of the package.

CONCLUSION

Despite the potential of indigenous chicken farming for reducing poverty in Egypt, the recommended management interventions to increase productivity have not been fully adopted by smallholder smallholders. Adoption of the management intervention package was influenced by gender, smallholder's experience, smallholder's education level, group membership, distance to the market, access to extension and training programs, veterinary services and marketing information. It could be recommended that, to encourage adoption of management intervention packages must be deal with the socio-economic circumstances of smallholder. Also, it should to encourage the chicken smallholders, in Egyptian rural sector, to work in self-help groups and create awareness through training. Micro-credit providers should provide credit in order to encourage adoption of the management interventions packages.

Table (1): Demographic characteristics and institutional support of respondent's adoption management intervention packages as disseminated

Items	Non-adoption		Housing		Vaccination		Chick rearing		Improved strains		Feed supplementation	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Gender												
Females	10	100	9	69.24	3	42.86	11	68.75	31	86.11	15	83.33
Males	0	0.00	4	30.76	4	57.14	5	31.25	5	13.89	3	16.67
Experience (years)												
Less than 20 years	0	0.00	1	7.69	1	14.29	3	18.75	11	30.54	3	16.67
20-40 years	2	20	8	61.54	6	85.71	10	62.50	20	55.66	10	55.50
More than 40 years	8	80	4	30.77	0	0.00	3	18.75	5	13.80	5	27.83
Education (levels)												
Illiteracy	6	60	3	30.10	0	0.00	0	0.00	0	0.00	0	0.00
Read and write	2	20	4	30.76	1	14.29	6	37.50	13	36.11	8	44.44
Intermediate	2	20	6	46.14	4	57.14	9	56.25	22	61.11	9	50
High	0	0.00	0	0.00	2	28.57	1	6.25	1	2.78	1	5.56
Veterinary services												
Yes	0	0.00	1	7.69	7	100	0	0.00	2	5.55	0	0.00
No	10	100	12	92.31	0	0.00	16	100	34	94.44	18	100

Table (1): continued

Items	Non-adoption		Housing		Vaccination		Chick rearing		Improved strains		Feed supplementation	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Access to extension												
Yes	0	0.00	1	7.69	1	14.29	2	12.50	2	5.55	3	16.67
No	10	100	12	92.31	6	85.71	14	87.50	34	94.44	15	83.33
Access to credit (self-credit)												
Yes	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
No	10	100	13	100	7	100	16	100	36	100	18	100
Access to training												
Yes	0	0.00	2	15.38	1	14.29	2	12.50	2	5.55	2	11.11
No	10	100	11	84.62	6	85.71	14	87.50	34	94.44	16	88.89
Group membership												
Yes	0	0.00	0	0.00	2	28.57	0	0.00	0	0.00	0	0.00
No	10	100	13	100	5	71.43	16	100	36	100	18	100
Access to market information												
Yes	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
No	10	100	13	100	7	100	16	100	36	100	18	100
Average distance to market (km)	3.2		3.81		3		3.69		3.15		3.89	
Average smallholder age (years)	58.1		49.34		43.1		44.8		45.8		44.05	

Difference in management interventions group within gender ($\chi^2 = 11.23$, $P = 0.041$) Difference in management interventions group within experience years are significant ($\chi^2 = 25.16$, $P = 0.005$)

Difference in management interventions group within education levels are significant ($\chi^2 = 56.09$, $P = <0.0001$) Difference in management interventions group within veterinary services are significant ($\chi^2 = 68.75$, $P = <0.0001$)

No significant difference in management interventions group within access to extension ($\chi^2 = 3.37$, $P = 0.643$) No significant difference in management interventions group within access to credit ($\chi^2 = 2.41$, $P = 0.872$) Difference in management interventions group within access to training ($\chi^2 = 12.60$, $P = 0.02$)

Difference in management interventions group within group membership ($\chi^2 = 17.11$, $P = 0.0531$)

No significant difference in management interventions group within access to market information ($\chi^2 = 2.97$, $P = 0.82$)

Table (2): Demographic characteristics and institutional support of respondent's selective component from disseminated management intervention packages

Items	Full package		Feed supplementation and improved strains		Feed supplementation and vaccination	
	N	(%)	N	(%)	N	(%)
Gender						
Females	0	0.00	20	32.79	3	20
Males	24	100	41	67.21	12	80
Experience (years)						
Less than 20 years	0	0.00	8	13.11	0	0.00
20-40 years	24	100	53	86.89	15	100
More than 40 years	0	0.00	0	0.00	0	0.00
Education (levels)						
Illiteracy	0	0.00	0	0.00	0	0.00
Read and write	0	0.00	0	0.00	0	0.00
Intermediate	1	4.17	33	54.10	1	6.67
High	23	95.83	28	45.90	14	93.33
Veterinary services						
Yes	18	75	10	16.39	8	53.33
No	6	25	51	83.61	7	46.67

Table (2): continued

Items	Full package		Feed supplementation and improved strains		Feed supplementation and vaccination	
	N	(%)	N	(%)	N	(%)
Access to extension						
Yes	10	41.67	8	13.11	5	33.33
No	14	58.33	53	86.89	10	66.67
Access to credit (self-credit)						
Yes	4	16.67	5	8.20	2	13.33
No	20	83.33	56	91.80	13	86.67
Access to training						
Yes	15	62.50	10	16.39	8	53.33
No	9	37.50	51	83.61	7	46.67
Group membership						
Yes	10	41.67	5	8.20	7	53.33
No	14	58.33	56	91.80	8	46.67
Access to market information						
Yes	7	29.17	4	6.56	2	13.33
No	17	70.83	57	93.44	13	86.67
Average distance to market (km)	2.16		2.42		2.58	
Average smallholder age (years)	41.90		42.55		42.71	

Difference in management interventions group within gender ($\chi^2 = 10.54$, $P = 0.005$)

Difference in management interventions group within experience years are significant ($\chi^2 = 5.55$, $P = 0.06$)

Difference in management interventions group within education levels are significant ($\chi^2 = 25.10$, $P = <0.0001$)

Difference in management interventions group within veterinary services are significant ($\chi^2 = 27.97$, $P = <0.0001$)

Difference in management interventions group within access to extension ($\chi^2 = 6.52$, $P = 0.03$)

No significant difference in management interventions group within access to credit ($\chi^2 = 1.36$, $P = 0.50$)

Difference in management interventions group within access to training ($\chi^2 = 19.85$, $P = <0.0001$)

Difference in management interventions group within group membership ($\chi^2 = 17.50$, $P = 0.0002$)

Difference in management interventions group within access to market information ($\chi^2 = 7.78$, $P = 0.02$)

Table (3): Marginal effects of factors that influence on adoption of management interventions package as disseminated

Parameters	Housing packages		Vaccinations packages		Chicken rearing packages		Improved strains packages		Feed supplementation packages	
	Estimate marginal effects	P	Estimate marginal effects	P	Estimate marginal effects	P	Estimate marginal effects	P	Estimate marginal effects	P
Intercept	6.587	Ns	0.3511	Ns	0.3574	Ns	2.4214	***	-1.2069	Ns
Education (levels)	6.0005	Ns	0.4636	*	0.279	Ns	0.5018	Ns	1.479	**
Gender (females 1, males 0)	0.4511	Ns	0.0483	Ns	0.3201	Ns	1.2742	**	1.1089	*
Experience (years)	-0.2908	Ns	-0.2376	Ns	-0.2402	Ns	-1.0485	***	1.8055	**
Smallholder age (years)	-0.5142	**	-0.8918	***	-1.2742	***	-1.1813	***	-1.2742	**
Training (access 1, otherwise 0)	0.5643	*	0.5674	**	0.5945	***	0.914	***	1.1819	**
Extension (access 1, otherwise 0)	0.8918	***	0.5194	*	0.4139	*	1.218	***	1.2314	*
Veterinary services (access 1, otherwise 0)	0.411	Ns	0.5165	**	0.0156	Ns	0.8595	***	0.4192	Ns
Distance to market (km)	-0.1984	Ns	0.3941	*	-0.3983	*	-0.6089	**	1.4746	**
Credit (access 1, otherwise 0)	0.714	*	0.7714	**	0.8623	**	0.2614	Ns	1.2379	**
Market information (access 1, otherwise 0)	0.4124	Ns	-0.3435	Ns	0.1173	Ns	0.3904	Ns	0.5591	Ns
Group membership (member 1, otherwise 0)	-0.3226	Ns	-0.8426	**	-0.1401	Ns	-0.3846	Ns	-0.1781	Ns

Log likelihood ratio for housing=29.4849, p-chisq<0.0001, Ns, no significant, ***, significant at 0.001, ** 0.01 and *0.05.

Log likelihood ratio for vaccinations=55.6380, p-chisq<0.0001, Ns, no significant, ***, significant at 0.001, ** 0.01 and *0.05.

Log likelihood ratio for chicken rearing=44.8798, p-chisq<0.0001, Ns, no significant, ***, significant at 0.001, ** 0.01 and *0.05.

Log likelihood ratio for improved strains=49.0070, p-chisq<0.0001, Ns, no significant, ***, significant at 0.001, ** 0.01 and *0.05.

Log likelihood ratio for feed supplementation=24.1311, p-chisq<0.0001, Ns, no significant, ***, significant at 0.001, ** 0.01 and *0.05.

Table (4): Marginal effects of factors that influence on adoption pattern of selective components of management interventions

Parameters	Full packages		Feed supplementation and improved strains packages		Feed supplementation and vaccination packages	
	Estimate marginal effects	P	Estimate marginal effects	P	Estimate marginal effects	P
Intercept	0.2581	Ns	3.6286	***	2.0691	***
Education (levels)	1.8513	***	0.4143	Ns	3.8498	***
Gender (females 1, males 0)	-1.1669	**	-1.3665	**	-1.6548	***
Experience (years)	0.851	*	0.5097	Ns	0.2451	Ns
Smallholder age (years)	-0.5142	**	-0.714	*	-1.1819	**
Training (access 1, otherwise 0)	1.3151	**	0.3087	Ns	0.9999	Ns
Extension (access 1, otherwise 0)	0.7495	*	0.8691	***	1.1813	***
Veterinary services (access 1, otherwise 0)	1.0255	*	1.1988	***	1.212	***
Distance to market (km)	-1.0611	*	-0.5142	**	0.116	Ns
Credit (access 1, otherwise 0)	0.8943	*	1.1697	**	1.1461	*
Market information (access 1, otherwise 0)	0.9855	*	0.6658	Ns	0.4062	Ns
Group membership (member 1, otherwise 0)	-1.3612	**	-0.6885	*	-3.0402	***

Log likelihood ratio for full=28.5145, p-chisq<0.0001, Ns, no significant, ***, significant at 0.001, ** 0.01 and *0.05.

Log likelihood ratio for feed supplementation and improved strains=44.8227, p-chisq=<.0001, Ns, no significant, ***, significant at 0.001, ** 0.01 and *0.05.

Log likelihood ratio for feed supplementation and vaccination=31.2631, p-chisq=<.0001, Ns, no significant, ***, significant at 0.001, ** 0.01 and *0.05.

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المستخلص العربي

العوامل المؤثرة علي سلوك تبني صغار مربى الدجاج للحزم الرعائية في الريف المصري

محمد عبد الرحمن المناوي¹، رضا السيد حموده²، ياسر أحمد عبدالعزيز²

1. قسم الإنتاج الحيواني، كلية الزراعة، جامعة القاهرة، جيزة، مصر.

2. قسم بحوث نظم الإنتاج الحيواني، معهد بحوث الإنتاج الحيواني، مركز البحوث الزراعية، وزارة الزراعة، الدقي، جيزة، مصر

أجريت الدراسة في محافظتي الشرقية والفيوم بمصر. هدفت هذه الدراسة إلى تحديد العوامل الاجتماعية والاقتصادية التي تؤثر على سلوك تبني صغار مربى الدجاج للحزم الرعائية في القطاع الريفي المصري. تم إختيار مائتي مربى عشوائيا، تم تجميع البيانات عن طريق إستمارة إستبيان منتظمة مع مقابلات شخصية شهرية في الفترة من يناير إلى ديسمبر 2015. أوضحت النتائج أن تبني الحزم الرعائية تأثر بالجنس ومستوي الخبرة للمزارعين، ومستوى التعليم، العمل بمجموعات، و المسافة إلى السوق، والقدرة علي الحصول على الإرشاد وبرامج التدريب، والخدمات البيطرية، ومعلومات التسويق. المزارعين ذات مستوى تعليم منخفض يتبنوا نظم الإسكان، وبرامج التحصين، طرق التربية، السلالات المحسنة أو الإضافات الغذائية، بينما المزارعين ذات مستوى التعليم العالي يتبنوا الحزم كاملة. الذكور أكثر تبني للحزم كاملة، بينما النساء أكثر تبني لمكونات الحزم الرعائية منفردة. خبرة صغار المربين في مجال تربية الدجاج المحلي كان لها تأثير إيجابي واضح علي معدل تبني الحزم الرعائية كاملة. إمكانية الحصول علي الخدمات التدريبية والإرشادية زاد من معدل تبني الحزم الرعائية التي تم نشرها كما هي وكذلك زاد من القدرة علي الإختيار من بينها وكذلك تبني الحزم الرعائية كاملة. قصر المسافة إلى السوق يزيد من تبني الحزم الرعائية كاملة، في حين يقلل من تبني الإضافات الغذائية مع برامج التحصين. ولذلك نوصي، بأنه ينبغي تشجيع تشكيل مجموعات للعمل ذاتيا وكذلك خلق الوعي من خلال التدريب. ينبغي توفير الائتمانات الصغيرة من الجهات المانحة بهدف تشجيع المربين علي تبني الحزم الرعائية.

الكلمات الدالة: المدخلات الرعائية، تبني، القطاع الريفي، نشر.