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IMPACT OF MANAGEMENT INTERVENTIONS ADOPTION ON CHICKEN PRODUCTIVITY UNDER FAMILY POULTRY PRODUCTION SYSTEM IN EGYPTIAN RURAL

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ABSTRACT: The study was conducted in two governorates Al-Sharkia and El-Fayoum, to investigate the impact of management interventions packages on poultry productivity under family chicken production system in Egyptian rural. The management intervention packages included housing, vaccination, chick rearing, improved strains and feed supplementation. All data collected during the period from January to December 2015. The target population was smallholder keeps indigenous chicken and management interventions had been disseminated by extension services. Samples of two hundred individual householders' were randomly chosen, through semi-structured interviews with questionnaires to collect data through monthly visits. The results indicate that 45% of the smallholders adopted the management interventions package as disseminated. Majority (50%) selective components of the management interventions package were considered full packages; feed supplementation and improved strains; feed supplementation and vaccination. The highest average in flock size was observed at full package adopters (96.47 birds) followed by feed supplementation and improved strains adopters packages (73.22 birds) and feed supplementation and vaccination adopters (45.76 birds). There were highly significant differences between management intervention packages in hen's and cocks sexual maturity age, hen's age at the end of egg production period age. The highly average of egg number/hen/year was reported for chicken raised under full packages group (183.26 eggs) with highly average weight of 44.26 gm during the shortest period of 46.40 weeks. However, the lowest average of egg number/hen/year was produced by chicken raised under non-adoption packages group (86.50 eggs) with lowest average weight of 28.60 gm during longest period of 94.00 weeks. Therefore, it could be recommended that the government and development partners should design a management intervention adoption program based on the demographic and socio-economic conditions of smallholder farmers to increase indigenous chicken productivity.

Key words: Management intervention - family chicken production system - indigenous.

INTRODUCTION

The FAO (2014) has predicted the global population will reach nine billion by 2050. It was also reported that, currently, 805 million people, which are equal to one in nine, live below the poverty line and are food insecure with food security defined as the state of having reliable access to a sufficient quantity of affordable, nutritious food. As a significant number of the world's poor is food insecure, the demand for animal products in emerging economies continues to increase (Foresight, 2011). The big challenge is not only to provide food security to all people in the world, but to, in parallel, allow for these changing dietary preferences of improving economies. Poultry is one of the contributors to the solution as it provides a source of animal protein and has an important role in food security. In Egypt, poultry products account approximately a third of expenditure on animal protein products and represent around 31% of the total food Bill (AAFC, 2011). The importance of poultry in income generation for the poor and landless households, in particular, was quite evident when studying the household income structure by income quintile in Egypt (Croppenstedt, 2006). According to Nnadi and George (2010) and Ochieng et al. (2011) illustrated that, indigenous chickens which constitute 80% of the poultry population in Africa, are farmed in traditional scavenging systems. Indigenous chicken in rural areas are usually kept under scavenging production systems often with very limited application of management interventions. To increase productivity of indigenous chicken, extension service has continuously disseminated management intervention package to smallholders for mitigating these constraints. Njue et al. (2006) and Abadi (2017) noted that, the management intervention package designed to improve productivity of indigenous chickens includes housing, vaccination, chick rearing, feed supplementation, brooding and using the improved strains. Ochieng et al. (2013) stated that only a few smallholder farmers are able to adopt management interventions package. Therefore, the present study aimed to give insights on the effect of management intervention packages adoption on productivity and economics efficiency of indigenous chicken in Egyptian rural family chicken production system.

MATERIALS AND METHODS

1. Description of the study area

This study was conducted in two governorates, Al-Sharkia and El-Fayoum in Egypt. The first governorate, Al-Sharkia located in the northern part of Egypt, about 86 Km from Cairo. Al-Sharkia governorate is considered the first governorate in production of improved native chicken which is estimated to be about 30.5 million birds, about 0.87 million birds of multiple baladi chicken, approximately 7.65 million birds of breeding baladi chicken and 523 baladi hatcheries (M.A.L.R, 2015). The second governorate, El-Fayoum, is located in the middle part of Egypt, about 130 km south west of Cairo. Chicken producers in El-Fayoum governorate rearing improved native chicken which is estimated to be about 7.46 million birds, about 0.13 million birds of multiple baladi chicken and 139 baladi hatcheries (M.A.L.R, 2015).

2. Sampling area and period

The target population was smallholder farmers in Al-Sharkia and El-Fayoum governorates who keep native chicken for food and income. The management

interventions had been disseminated by extension services through semi-structured interviews with questionnaires to collect data. 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 obtained through monthly visits to the householders' chickens producers during the period from January to December 2015.

3. Data collection

The random sampling technique was used to choose the householders within the study area. Data used in this work were collected structured interviews and focus group discussions were held during farm householders visits to collect data. The farm householder data of interest included data about chicken management interventions, flock size, flock structure, flock production performance, incubation, mortality rate and economic efficiency.

4. Statistical analysis

The data collected on flock size were statistically analyzed by the least squares procedure of the general linear model (GLM) of SAS software (SAS, 2004). The separation of means was done using the Duncan's New Multiple Range Test (Duncan, 1955) for comparisons among the significant means. The fixed model used in the analysis was:

$Y_{ijk} = \mu + G_i + M_j + GM_{ij} + \varepsilon_{ijk}$ Where:

Y_{ijk} = is the value of the respective variable

μ = is the overall mean of the respective variable

G_i = is the effect due to the i^{th} governorates, i = 1, 2 (1= Al-Sharkia, 2= El-Fayoum)

M_j = is the effect of the j^{th} management intervention (j= 1, 2……. 9)

GM_{ij} = is the effect of interaction.

ε_{ijk} = is a random error associated with the ijk^{th} observation.

RESULTS

1. Disseminated management interventions and pattern of their adoption by chicken smallholders

Management interventions are technologies used by local chicken smallholders to improve the production and profitability of the enterprises. In study area pattern adoption of management intervention packages by chicken smallholders was 45% of the smallholders adopted the management interventions package as disseminated by the extension service. These management intervention packages were included housing, vaccination, chick rearing, improved strains and feed supplementation. Majority (50%) selective components of the management interventions package were considered full packages; feed supplementation and improved strains; feed supplementation and vaccination adopters. The remained (5%) were non-adoption any management intervention packages.

2. The effects of management intervention adoption on chickens productivity

a. Flock size and structure

As shown in Table 1, the flock size was significantly lower in El-Fayoum governorate (48.74 birds) than Al-Sharkia governorate (52.75 birds). The results indicated that, the differences in flock size between management intervention packages and their interaction with two areas were significant ($P<0.0001$). The highest size was observed at full package adopters (96.47 birds) followed by feed supplementation and improved strains adopters (73.22 birds) and then feed supplementation and vaccination adopters (45.76 birds). However, the lowest size

was observed at non-adoption group (15.20 birds) followed by housing (23.80 birds) and vaccination (27.25 birds) then chick rearing (29.33 birds) groups. Concerning the flock structure, the data indicated there were insignificant differences observed between the two governorates in mean numbers of chicks, pullets and cocks per householder in both of Al-Sharkia and El-Fayoum governorates. Also the results mentioned that there were highly significant differences ($P<0.0001$) between two governorate in mean numbers of hens per householder (10.27 vs. 8.26 hens respectively). The differences, in flock structure between management intervention packages were statistically significant ($P<0.0001$) as shown in Table 1. The highest average in all ages was observed at full packages adopters followed by feed supplementation and improved strains adopters and feed supplementation and vaccination adopters, then the remained in order are feed supplementation, improved strains, chick rearing, vaccination, housing and non-adoption adopters. Results indicated that the lowest average observed in non-adoption group with average mature hens per householder were 2.40 birds and one cock, 4.40 pullets and 7.40 chicks. As shown in Table 1 there was statistically significant ($P<0.0001$) different on flock structure due to the interaction between studied areas (Al-Sharkia and El-Fayoum governorates) and management intervention packages. The highest average in all ages was observed at full packages adopters followed by feed supplementation and improved strains adopters and feed supplementation and vaccination adopters. While the remained packages in order feed supplementation, improved strains, chick rearing, vaccination, housing and non-adoption adopters.

b. Production performance of chickens in Egyptian rural

b. 1. Age at sexual maturity and age at end of the egg production period

The performance traits of the chickens under the study area are present in Table 2. The results revealed that, chickens in study area Al-Sharkia and El-Fayoum governorates reached sexual maturity at 21.98 and 22.15 weeks of age, respectively. There were insignificant differences between the two study areas in hen's sexual maturity. The same results are showed in hen's age at end of the egg production period (83.09 and 82.83 weeks of age), respectively, while, the cocks sexual maturity age were 22.54 and 22.90 weeks in Al-Sharkia and El-Fayoum governorates, respectively. Moreover, results in Table 2 presented that, there were highly significant differences among management intervention packages in hen's sexual maturity age, hen's age at end of the egg production period and cocks sexual maturity age. The results indicated that, hens under the non-adoption packages reached sexual maturity age later (34 weeks of age) than those under adoption packages. Also, hens under the non-adoption packages reached age at end of the egg production period later (128 weeks of age) than those under full packages (75 weeks of age). The cock's sexual maturity ages were 36.40 and 20.66 weeks of age in non-adoption and full packages, respectively. Furthermore, in groups, they were selective components from packages hens reached sexual maturity, hen's age at end of the egg production period and cocks sexual maturity later than those adoption packages as disseminated.

b. 2. Egg production

Overall means of the egg production period, egg number/hen/year and egg weight of the chickens raised in Al-Sharkia governorate (127 eggs) with an average weight of 38.42 gm during period of 59.02 weeks were significantly ($p<0.0001$), more than those in El-Fayoum governorate (123 eggs) with an average weight of 37.64 gm during period 60.68 of weeks (Table 3). Differences in the averages of egg number/hen/year, egg weight and egg production period among adopted different management interventions packages were significant (Table 3). The highly average of egg number/hen/year reported for chicken raised under full packages group was 183.26 eggs with highly average weight of 44.26 gm during the short period (46.40 weeks), follow by chicken raised under feed supplementation and improved strains packages group (149.57 eggs) with average weight of 40.52 gm during the period of 53.57 weeks, then chicken raised under feed supplementation and vaccination packages group (122.25 eggs) with average weight of 38.62 gm during the period of 60.83 weeks. The lowest average of egg number/hen/year reported for chicken raised under non-adoption packages group was 86.50 eggs with the lowest average weight of 28.60 gm during the longest period of 94.00 weeks.

b. 3. Body weight

As shown in Table 4 the results revealed that, there was no significant differences between the two study areas in hen's sexual maturity body weight (1.13 kg and 1.12 kg in Al-Sharkia and El-Fayoum governorates, respectively). The same trend was observed in hen's mature body weight (1.79 kg and 1.78 kg) and cocks sexual maturity body weight (1.41 kg and 1.40 kg) in Al-Sharkia and El-Fayoum governorates, respectively. Results in Table 4 presented that, there were highly significant differences ($P<0.0001$) among the management intervention packages in hens sexual maturity body weight, hens mature body weight and cocks sexual maturity body weight. The results indicated that, hens in the non-adoption packages group were the lightest of the sexual maturity body weight (0.81 kg) than those under other adoption packages. Also, hens under the non-adoption packages were lighter mature body weight (1.39 kg) than those under full packages (2.25 kg). The cock sexual maturity body weights were 1.01 kg and 1.80 kg in non-adoption and full packages, resp., with significant differences. Furthermore, in groups they are selective components from packages hens' sexual maturity body weight, hen's mature body weight and cocks sexual maturity body weight heavier than those adoption packages as disseminated.

b. 4. Hatchability performance

There were no significant differences in hatchability performance of local hens between the two governorates Al-Sharkia and El-Fayoum (Table 5). The average number of eggs set per hen was 7.29 and 7.25. The hatched chicks per hen were 4.80 and 5.07 in Al-Sharkia and El-Fayoum governorate, respectively. However, the hatchability percent were 64.26% and 68.84% in Al-Sharkia and El-Fayoum governorate, respectively. The results indicated that, there were highly significant differences ($P<0.0001$) in hatchability production performance between adoption packages. The non-adoption packages were highest average number of eggs set per hen (16.20 eggs), of which 13.20 chicks hatched, this lead to 81.16% hatchability.

b. 5. Mortality rate

There are insignificant differences, in mortality percent of chickens between the two governorates, Al-Sharkia and El-Fayoum (Table 6). The average mortality number of chicks set per householder until 2 months of age was 14.37% and 14.09%, from 2-6 months of age was 4.60% and 4.96%, after 6 months of age was 4.23% and 4.44% and survived until consumption or sale was 72.78% and 71.70% of chicks in Al-Sharkia and El-Fayoum governorates, respectively. Moreover, results in Table 6 presented that, there were highly significant differences ($P<0.0001$) between the management intervention packages in mortality percent. The present study indicated that, chicks raise under non-adoption group had the highest mortality percent in allover periods (26.20%, 14.60% and 9.00%) of chicks until 2 months of age, from 2-6 months of age and after 6 months of age, respectively. The lowest value in survival percent (50.20% of chick), was recorded in the non-adoption group as compared to the other groups. The packages adoption group had the lowest mortality percent in whole periods (8.53%, 4.73% and 2.21% of chicks until 2 months of age, from 2-6 months of age and after 6 months of age, respectively.

3. Economic features

a. Total variables cost

As showed in Table 7, opportunity cost approach was adopted for economic analysis in this study rather than financial analysis of cost of inputs and revenues of outputs. Cash values of variable costs included price of purchased chickens, feed, labour, veterinary services and drugs, litter, water and power. As most of the labour used in the rural sector is unpaid family labour, the cost of labour was estimated according to the current rates in the studied areas. There was no significant between the two study area Al-Sharkia and El-Fayoum governorates, in variable cost the total variable cost per bird per year was 39.79 LE and 39.37 LE in Al-Sharkia and El-Fayoum governorates, respectively. However, there were highly significant ($P<0.0001$) differences among management intervention packages in variable cost (Table 7). The total variable costs per bird per year are more in full packages group than in non-adoption packages group. It reached about 45.86 LE and 26.60 LE for both groups, respectively.

b. Total revenue and gross margin

As showed in Table 8, revenues of the layer production included price of eggs, culled birds after termination of the laying season, and manure and Revenues of meat production. Measures of economic efficiency were estimated for the different management intervention packages in the study area besides comparing the total variable cost to the gross revenues of the farms. There were insignificant differences between the study area, Al-Sharkia and El-Fayoum governorates, in egg revenue, meat revenue, litter revenue and total revenue per bird per year. On the other hand, there were highly significant ($P<0.0001$) differences among management intervention packages in egg revenue, meat revenue, manure revenue and total revenue per bird per year (Table 8). The total egg revenue, meat revenue and manure revenue per bird per year were more in the full packages group than in the non-adoption packages group. It reached about 135.00 LE, 37.75 LE, 3.29 LE and 176.04 LE in full package group, respectively, and 54.00 LE, 36.39 LE, 3.03 LE and 93.42 LE in non-adoption group. The measures of economic efficiency showed that full package was more

efficient since the gross margin was equal to 130.26 LE as compared to 66.70 LE for non-adoption. However, the ratio of the total revenues/total variable costs was found to be 3.85% in full package which was higher than non-adoption of 3.53%.

DISCUSSION

The results of this study indicated that, the flock size in non-adoption group (traditional scavenging system) lower than other groups (adoption groups). Also, smallholders who selective packages could able to raise more numbers of chicken compare with they applied management intervention packages as disseminated. Our results are in agreement with Gharib et al. (2012) who mentioned that, means of the flock size were lower under traditional scavenging rural family production system (7.25 birds), than enhanced management on medium scale family chicken production system (28.30 birds).

Our results indicated that, adoption of management intervention packages like enhanced housing, health care represented in vaccination program, chick rearing, selecting the best qualities in local poultry species for improved strains and balanced diet (feed supplementation) led to reduced mortality and increased productive performance compare with non-adoption groups (traditional or small scale chicken production system) in Egyptian villages. These results may be due to that farmers, in general, do not really benefit from advances in technology and most of them lack access to important inputs, such as commercial feeds, high quality stock, and extension services. These results are in agreement with those reported by Dessie et al. (2011). They reported that, on native ecotypes in the tropics, the chicken genetics potential for egg production and growth are very low under smallholder farmer's management conditions. However, under improved feeding, housing and healthcare conditions, levels of production increased significantly. The mean body weight gain of local chickens of Ethiopia, under station management was higher than traditional management (Dessie and Ogle, 2001; Tadelle, 2003). In comparison study between vaccinated and unvaccinated backyard village chicken in Bangladesh, Barman et al. (2010) stated that, mortality due to disease was significantly higher in the unvaccinated birds (21.6%) than vaccinated birds (4.9%). In unvaccinated birds' mortality were significantly higher in growing pullets than in chicks and mature birds. Therefore, vaccination could significantly improve backyard poultry production. Škrbić et al. (2008 and 2009) established that enhanced housing system and improved genotype of chicken have significant positive influence on certain production performance and meat quality. Also, they stated that, adoption of proper separated housing with adequate ventilation and space increased the chicken vitality and helped to reduce mortality caused by diseases and predators which in turn led to enhancement of productivity.

Moreover, Tadelle (1996) and Ochieng et al. (2010), reported that, small management changes, such as regular watering, night enclosures, discouraging hens from getting broody, vaccination against common diseases, feed and protein supplementation and caging chicks can bring about significant improvements in the productivity of indigenous birds. Pavlovski et al. (2009) reported that, chickens reared in the enhanced housing considerably higher body mass compared to free range chickens. Zhao et al. (2014); Taylor et al. (2017) and Li et al. (2017),

reported that, the broilers with an outdoor housing system (scavenging system) run had significantly higher preening, dust-bathing, and lower feather pecking, and engaged more in standing, walking and investigating but less lying than the indoor housing system chicken. Although weekly feed intake was not found to be significantly different between the two systems, but there are a significantly higher finishing body weight. Abdelqader et al. (2007) reported that there is significant improvement in performance (flock size, hatchability, survivability, number of clutches, egg weight, and egg mass) of native fowl of Jordan with improving the rearing system alone. Sarkar and Golam (2009), in Bangladesh, noted that the changes in traditional rearing practices can improve the performance of native chicken. Our results indicated that, the total variable costs and total revenue per bird per year are more in adoption groups than non-adoption group. In study on the family poultry production systems, Abdel-Aziz et al. (2013) mentioned that, in Egypt, the total variable costs per bird per year are more in the medium-scale (enhanced management practices), than in the small-scale (scavenging system) family chicken production system. It reached about 42.89 LE and 25.44 LE for both systems, respectively. Moreover, the total revenues in the medium-scale system were higher than that of the small-scale system (about 93.95 LE and 67.58 LE respectively per hen/year).

CONCLUSION

In Egypt, rural chicken production is mainly hampered by feed shortage, low production of local strains. Adoption of full management intervention package has higher influence on productivity of indigenous chicken. Farmers who had adopted fully management intervention package had higher productivity than farmers who modified and selectively adopted components of management intervention package. It could be recommended that, the government and development partners should design programs to encourage smallholders to adoption management intervention packages through training to improve indigenous chicken productivity.

Management intervention - family chicken production system - indigenous.

Table (1): Least square mean ± standard errors for chicken flock size and structure as affected by different management intervention packages in Al-Sharkia and El-Fayoum governorates

Items	Flock size	Chicks	Pullets	Hens	Cocks
	M±SE	M±SE	M±SE	M±SE	M±SE
Governorate					
Al-Sharkia	52.75±2.51^{A}	23.88±1.31	14.88±0.77	10.27±0.44^{A}	3.71±0.14^{A}
El-Fayoum	48.74±2.20^{B}	22.76±1.03	14.34±0.86	8.26±0.29^{B}	3.36±0.14^{B}
Management interventions packages					
Non-adoption	15.20±2.26^{i}	7.40±1.12^{g}	4.40±0.60^{g}	2.40±0.60^{f}	1.00±0.05^{e}
Housing	23.80±0.48^{h}	10.00±0.07^{f}	6.40±0.40^{f}	5.00±0.04^{e}	2.40±0.40^{d}
Vaccination	27.25±0.47^{g}	10.00±0.12^{f}	6.50±0.28^{f}	6.75±0.25^{d}	4.00±0.06^{b}
Chick rearing	29.33±0.28^{f}	13.55±0.37^{e}	7.33±0.40^{ef}	5.88±0.38^{de}	2.55±0.24^{d}
Improved strains	34.00±0.43^{e}	14.87±0.23^{de}	9.62±0.23^{e}	6.43±0.28^{d}	3.06±0.11^{c}
Feed supplementation	39.80±0.44^{d}	15.50±0.26^{d}	11.40±0.30^{d}	9.50±0.22^{c}	3.40±0.22^{bc}
Full package	96.47±2.39^{a}	46.93±1.26^{a}	32.40±0.94^{a}	13.33±0.46^{b}	3.80±0.28^{b}
Feed supplementation and improved strains	73.22±2.72^{b}	33.44±1.58^{b}	19.91±0.80^{b}	14.72±0.56^{a}	5.13±0.21^{a}
Feed supplementation and vaccination	45.76±0.78^{c}	19.15±0.38^{c}	13.38±0.46^{c}	9.69±0.28^{c}	3.53±0.26^{bc}
Interaction Al-Sharkia					
Non-adoption	15.20±2.26^{k}	7.40±1.12^{j}	4.40±0.60^{i}	2.40±0.60^{g}	1.00±0.03^{e}
Housing	23.80±0.48^{i}	10.00±0.21^{i}	6.40±0.40^{gh}	5.00±0.34^{e}	2.40±0.40^{c}
Vaccination	27.25±0.47^{h}	10.00±0.31^{i}	6.50±0.28^{gh}	6.75±0.25^{de}	4.00±0.16^{ab}
Chick rearing	29.33±0.28^{g}	13.55±0.37^{g}	7.33±0.40^{j}	5.88±0.38^{e}	2.55±0.24^{c}
Improved strains	34.00±0.43^{f}	14.87±0.23^{fg}	9.62±0.23^{ef}	6.43±0.28^{de}	3.06±0.11^{b}
Feed supplementation	39.80±0.44^{e}	15.50±0.26^{f}	11.40±0.30^{e}	9.50±0.22^{c}	3.40±0.22^{b}
Full package	100.44±0.44^{a}	51.22±0.57^{a}	32.00±0.74^{a}	14.22±0.84^{a}	3.00±0.40^{b}
Feed supplementation and improved strains	73.22±2.72^{c}	33.44±1.58^{c}	19.91±0.80^{c}	14.72±0.56^{a}	5.13±0.21^{a}
Feed supplementation and vaccination	45.76±0.78^{cd}	19.15±0.38^{e}	13.38±0.46^{d}	9.69±0.28^{c}	3.53±0.26^{b}
El-Fayoum					
Non-adoption	20.60±1.16^{j}	9.60±0.60^{ij}	5.00±0.20^{h}	4.20±0.48^{f}	1.80±0.20^{d}
Housing	27.62±0.53^{h}	12.25±0.31^{h}	7.62±0.18^{g}	5.50±0.18^{e}	2.25±0.25^{c}
Vaccination	29.66±0.33^{g}	13.66±0.33^{g}	8.66±0.33^{f}	5.00±0.21^{e}	2.33±0.33^{c}
Chick rearing	31.57±0.42^{fg}	14.85±0.14^{fg}	8.57±0.20^{f}	5.28±0.18^{e}	2.85±0.14^{c}
Improved strains	36.70±0.52^{ef}	15.95±0.35^{f}	11.15±0.18^{e}	6.05±0.15^{de}	3.55±0.16^{b}
Feed supplementation	41.75±0.41^{d}	19.87±0.44^{e}	10.00±0.32^{e}	8.62±0.26^{d}	3.25±0.25^{b}
Full package	90.50±0.50^{b}	40.50±0.50^{b}	33.00±0.45^{a}	12.00±0.32^{b}	5.00±0.21^{a}
Feed supplementation and improved strains	70.40±2.94^{c}	33.48±1.17^{c}	21.44±1.53^{b}	11.36±0.18^{b}	4.12±0.38^{ab}
Feed supplementation and vaccination	48.00±0.76^{cd}	24.36±0.41^{d}	11.36±0.27^{e}	9.63±0.27^{c}	2.63±0.15^{c}

$^{A-B}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

$^{a-b-c\ldots\ldots\ etc.}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

$^{a-b-c\ldots\ldots\ etc.}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

Table (2): Least square mean ± standard errors for chicken ages as affected by different management intervention packages in Al-Sharkia and El-Fayoum governorates

Items	Hen sexual maturity age (wk)	Cock sexual maturity age (wk)	Hen age at end of egg production period (wk)
	M±SE	M±SE	M±SE
Governorate			
Al-Sharkia	21.98±1.32	22.54±0.39	82.09±1.20
El-Fayoum	22.15±1.39	22.90±1.41	82.83±1.45
Management intervention packages			
Non-adoption	34.00±2.00^{a}	36.40±2.41^{a}	128.00±3.57^{a}
Housing	21.23±0.53^{b}	23.38±0.61^{c}	95.38±1.09^{b}
Vaccination	21.71±0.88^{b}	24.00±0.08^{b}	86.28±2.11^{c}
Chick rearing	21.50±0.50^{b}	22.50±0.50^{cd}	83.50±1.50^{c}
Improved strains	21.00±0.29^{b}	22.88±0.32^{cd}	78.88±0.66^{d}
Feed supplementation	22.00±0.48^{b}	22.22±0.48^{cd}	83.33±0.87^{c}
Full package	20.53±0.36^{b}	20.66±0.25^{e}	66.93±2.61^{f}
Feed supplementation and improved strains	21.44±0.24^{b}	21.18±0.23^{d}	75.01±0.57^{e}
Feed supplementation and vaccination	22.16±0.41^{b}	21.66±0.41^{d}	83.00±0.69^{c}
Interaction			
Al-Sharkia			
Non-adoption	32.80±3.44^{b}	36.00±3.87^{a}	124.80±6.11^{b}
Housing	21.60±0.97^{c}	24.00±1.26^{b}	95.20±1.49^{c}
Vaccination	22.00±1.15^{c}	24.00±1.02^{b}	87.00±3.00^{d}
Chick rearing	21.33±0.66^{c}	22.22±0.70^{bc}	83.11±1.85^{de}
Improved strains	21.25±0.47^{c}	22.75±0.47^{bc}	79.25±1.18^{e}
Feed supplementation	22.00±0.66^{c}	22.00±0.66^{bc}	83.60±0.93^{de}
Full package	20.44±1.44^{c}	20.44±0.29^{c}	66.66±0.94^{g}
Feed supplementation and improved strains	21.33±1.31^{c}	21.11±0.29^{bc}	74.77±0.72^{f}
Feed supplementation and vaccination	22.15±0.57^{c}	21.84±0.57^{bc}	82.76±0.83^{de}
El-Fayoum			
Non-adoption	35.20±2.33^{a}	36.80±3.34^{a}	131.20±3.87^{a}
Housing	21.00±0.65^{c}	23.00±0.65^{bc}	95.50±1.59^{c}
Vaccination	21.33±1.33^{c}	24.00±1.03^{b}	85.33±3.52^{d}
Chick rearing	21.71±0.80^{c}	22.85±0.73^{bc}	84.00±2.61^{de}
Improved strains	20.80±1.36^{c}	23.00±0.39^{bc}	78.60±2.83^{e}
Feed supplementation	22.00±1.75^{c}	22.50±0.73^{bc}	83.00±1.64^{de}
Full package	20.66±1.66^{c}	21.00±0.84^{bc}	67.33±1.66^{g}
Feed supplementation and improved strains	21.60±1.40^{c}	21.28±0.98^{bc}	75.36±2.94^{f}
Feed supplementation and vaccination	22.18±0.62^{c}	21.45±1.68^{bc}	83.27±1.18^{de}

a-b-c…… etc. Means, within a column, with different superscripts difference significantly (P<0.0001)

a-b-c…… etc. Means, within a column, with different superscripts difference significantly (P<0.0001)

Management intervention - family chicken production system - indigenous.

Table (3): Least square mean ± standard errors for chicken egg production as affected by different management intervention packages in Al-Sharkia and El-Fayoum governorates

Items	Egg production period (wk)	N. of egg/hen/year	Average egg weight (gm)
	M±SE	M±SE	M±SE
Governorate			
Al-Sharkia	59.02±1.98^{B}	127.28±2.72^{A}	38.42±0.37
El-Fayoum	60.68±1.17^{A}	123.96±2.93^{B}	37.64±1.42
Management intervention packages			
Non-adoption	94.00±2.08^{a}	86.50±1.50^{e}	28.60±0.42^{g}
Housing	74.15±1.16^{b}	100.30±0.20^{d}	31.53±0.31^{f}
Vaccination	64.57±1.36^{c}	102.42±0.89^{d}	33.57±0.29^{e}
Chick rearing	62.00±1.36^{cd}	101.68±0.71^{d}	36.50±0.34^{d}
Improved strains	57.88±0.64^{e}	101.30±0.45^{d}	37.11±0.24^{d}
Feed supplementation	61.33±0.64^{cd}	121.16±0.46^{c}	38.77±0.39^{c}
Full package	46.40±0.52^{g}	183.26±1.25^{a}	44.26±1.26^{a}
Feed supplementation and improved strains	53.57±0.48^{f}	149.57±1.95^{b}	40.52±0.26^{b}
Feed supplementation and vaccination	60.83±0.72^{d}	122.25±0.75^{c}	38.62±0.53^{c}
Interaction			
Al-Sharkia			
Non-adoption	92.00±3.57^{a}	87.00±2.00^{e}	28.80±0.58^{f}
Housing	73.60±2.03^{b}	100.00±2.04^{d}	31.60±1.59^{ef}
Vaccination	65.00±1.91^{c}	102.25±1.31^{d}	33.75±0.47^{e}
Chick rearing	61.77±1.77^{d}	101.00±0.60^{d}	36.55±0.44^{d}
Improved strains	58.00±0.96^{de}	101.06±0.45^{d}	37.25±0.37^{cd}
Feed supplementation	61.60±0.88^{d}	122.10±0.72^{c}	38.60±0.54^{c}
Full package	46.22±1.71^{f}	183.77±1.81^{a}	44.22±0.27^{a}
Feed supplementation and improved strains	53.44±0.62^{e}	146.91±2.63^{b}	40.55±0.33^{b}
Feed supplementation and vaccination	60.61±0.99^{d}	121.92±1.02^{c}	38.84±0.74^{c}
El-Fayoum			
Non-adoption	96.00±2.19^{a}	86.00±2.44^{e}	28.40±0.67^{f}
Housing	74.50±1.50^{b}	100.50±0.32^{d}	31.50±0.42^{ef}
Vaccination	64.00±2.39^{c}	102.66±1.45^{d}	33.33±0.33^{e}
Chick rearing	62.28±2.28^{d}	102.57±1.44^{d}	36.42±0.57^{d}
Improved strains	57.80±2.89^{de}	101.50±3.73^{d}	37.00±1.33^{cd}
Feed supplementation	61.00±1.00^{d}	120.00±2.75^{c}	39.00±0.59^{c}
Full package	46.66±2.84^{f}	182.50±3.71^{a}	44.11±1.33^{a}
Feed supplementation and improved strains	53.76±1.82^{e}	153.40±2.77^{b}	40.48±1.43^{b}
Feed supplementation and vaccination	61.09±1.09^{d}	122.63±3.15^{c}	38.36±1.81^{c}

$^{A-B}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

$^{a-b-c\ldots\ldots\ etc.}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

$^{a-b-c\ldots\ldots\ etc.}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

Table (4): Least square mean ± standard errors for chicken body weight as affected by different management intervention packages in Al-Sharkia and El-Fayoum governorates

Items	Hen sexual maturity body weight (kg)	Cock sexual maturity body weight (kg)	Hen mature body weight (kg)
	M±SE	M±SE	M±SE
Governorate			
Al-Sharkia	1.13±0.04	1.41±0.03	1.79±0.03
El-Fayoum	1.12±0.04	1.40±0.03	1.78±0.03
Management intervention packages			
Non-adoption	0.81±0.01^{f}	1.01±0.01^{e}	1.39±0.03^{f}
Housing	0.98±0.09^{e}	1.28±0.01^{d}	1.40±0.06^{f}
Vaccination	1.02±0.01^{e}	1.25±0.07^{d}	1.52±0.01^{e}
Chick rearing	1.03±0.01^{e}	1.28±0.01^{d}	1.53±0.02^{e}
Improved strains	1.04±0.01^{e}	1.30±0.07^{d}	1.80±0.05^{d}
Feed supplementation	1.16±0.05^{d}	1.50±0.04^{c}	2.00±0.03^{c}
Full package	1.50±0.04^{a}	1.80±0.06^{a}	2.25±0.03^{a}
Feed supplementation and improved strains	1.31±0.04^{b}	1.73±0.01^{b}	2.13±0.02^{b}
Feed supplementation and vaccination	1.23±0.03^{c}	1.53±0.01^{c}	2.00±0.06^{c}
Interaction Al-Sharkia			
Non-adoption	0.81±0.02^{e}	1.02±0.02^{e}	1.41±0.04^{e}
Housing	0.99±0.06^{de}	1.28±0.02^{d}	1.42±0.10^{e}
Vaccination	1.02±0.02^{d}	1.25±0.03^{d}	1.52±0.02^{d}
Chick rearing	1.02±0.02^{d}	1.28±0.01^{d}	1.55±0.03^{d}
Improved strains	1.04±0.01^{d}	1.29±0.01^{d}	1.80±0.09^{d}
Feed supplementation	1.17±0.03^{cd}	1.50±0.02^{c}	2.00±0.01^{b}
Full package	1.51±0.07^{a}	1.81±0.08^{a}	2.25±0.02^{a}
Feed supplementation and improved strains	1.32±0.05^{b}	1.70±0.02^{b}	2.11±0.03^{b}
Feed supplementation and vaccination	1.24±0.05^{c}	1.53±0.01^{c}	2.00±0.04^{b}
El-Fayoum			
Non-adoption	0.81±0.03^{e}	1.00±0.03^{e}	1.38±0.05^{f}
Housing	0.96±0.02^{de}	1.28±0.01^{d}	1.40±0.08^{e}
Vaccination	1.03±0.03^{d}	1.25±0.04^{d}	1.53±0.03^{d}
Chick rearing	1.04±0.01^{d}	1.28±0.02^{d}	1.50±0.02^{d}
Improved strains	1.04±0.01^{d}	1.30±0.09^{d}	1.80±0.07^{c}
Feed supplementation	1.15±0.07^{cd}	1.50±0.05^{c}	2.00±0.21^{b}
Full package	1.48±0.08^{a}	1.79±0.12^{a}	2.25±0.08^{a}
Feed supplementation and improved strains	1.30±0.06^{b}	1.70±0.01^{b}	2.16±0.04^{b}
Feed supplementation and vaccination	1.23±0.06^{c}	1.53±0.01^{c}	2.00±0.03^{b}

a-b-c…… etc. Means, within a column, with different superscripts difference significantly (P<0.0001)

a-b-c…… etc. Means, within a column, with different superscripts difference significantly (P<0.0001)

Management intervention - family chicken production system - indigenous.

Table (5): Least square mean ± standard errors for chicken hatchability as affected by different management intervention packages in Al-Sharkia and El-Fayoum governorates

Items	Average N. of eggs incubated/hen	Average N. of chicks hatched/hen	Hatchability (%)
	M±SE	M±SE	M±SE
Governorate			
Al-Sharkia	7.29±0.24	4.80±0.23	64.26±1.02^{B}
El-Fayoum	7.25±0.26	5.07±0.23	68.84±2.78^{A}
Management intervention packages			
Non-adoption	16.20±0.67^{a}	13.20±0.67^{a}	81.19±0.75^{a}
Housing	7.15±0.40^{bc}	4.53±0.33^{bc}	62.83±1.74^{b}
Vaccination	6.57±0.48^{c}	4.28±0.35^{bc}	65.49±3.38^{b}
Chick rearing	7.06±0.39^{bc}	4.75±0.32^{b}	66.94±2.28^{b}
Improved strains	6.80±0.27^{c}	4.55±0.23^{bc}	66.54±1.54^{b}
Feed supplementation	5.72±0.28^{d}	3.66±0.25^{c}	64.12±3.07^{b}
Full package	6.00±0.32^{cd}	3.86±0.25^{bc}	64.34±2.22^{b}
Feed supplementation and improved strains	7.29±0.18^{b}	4.88±0.17^{b}	66.30±1.17^{b}
Feed supplementation and vaccination	6.62±0.27^{c}	4.29±0.19^{bc}	65.03±1.63^{b}
Interaction			
Al-Sharkia			
Non-adoption	16.60±1.07^{a}	13.60±1.07^{a}	81.63±1.14^{a}
Housing	7.40±0.67^{b}	4.60±0.50^{b}	61.76±1.57^{bc}
Vaccination	6.50±0.64^{b}	4.00±0.40^{b}	61.57±2.01^{bc}
Chick rearing	7.33±0.57^{b}	4.66±0.44^{b}	63.47±2.79^{bc}
Improved strains	6.93±0.41^{b}	4.31±0.32^{b}	61.96±2.31^{bc}
Feed supplementation	5.80±0.38^{b}	3.40±0.33^{b}	58.60±4.41^{c}
Full package	6.00±0.44^{b}	3.77±0.27^{b}	63.57±3.34^{bc}
Feed supplementation and improved strains	7.22±0.23^{b}	4.80±0.24^{b}	65.53±1.69^{bc}
Feed supplementation and vaccination	6.61±0.38^{b}	4.23±0.31^{b}	64.06±2.79^{bc}
El-Fayoum			
Non-adoption	15.80±0.91^{a}	12.80±0.91^{a}	80.76±1.08^{a}
Housing	7.00±0.53^{b}	4.50±0.46^{b}	63.51±2.71^{bc}
Vaccination	6.66±0.88^{b}	4.66±0.66^{b}	70.71±6.93^{b}
Chick rearing	6.71±0.52^{b}	4.85±0.51^{b}	71.39±3.24^{b}
Improved strains	6.70±0.37^{b}	4.75±0.33^{b}	70.21±1.72^{b}
Feed supplementation	5.62±0.46^{b}	4.00±0.37^{b}	71.01±2.85^{b}
Full package	6.00±0.51^{b}	4.00±0.51^{b}	65.51±2.69^{bc}
Feed supplementation and improved strains	7.40±0.28^{b}	5.00±0.22^{b}	67.41±1.17^{bc}
Feed supplementation and vaccination	6.63±0.41^{b}	4.36±0.24^{b}	66.17±1.43^{bc}

$^{A-B}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

$^{a-b-c\ldots\ldots\ etc.}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

$^{a-b-c\ldots\ldots\ etc.}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

Table (6): Least square mean ± standard errors for chicken mortality at different intervals of age and survived percent ages as affected by different management intervention packages in Al-Sharkia and El-Fayoum governorates

Items	Mortality until 2 months of age (%)	Mortality from 2-6 months of age (%)	Mortality after 6 months of age (%)	Survived until consumption or sale (%)
	M±SE	M±SE	M±SE	M±SE
Governorate				
Al-Sharkia	14.37±0.43	9.60±0.30	4.23±0.19	72.78±2.89^{A}
El-Fayoum	14.09±0.50	9.96±0.33	4.44±0.21	71.70±1.02^{B}
Management intervention packages				
Non-adoption	26.20±0.38^{a}	14.60±0.54^{a}	9.00±0.29^{a}	50.20±0.85^{g}
Housing	20.61±0.93^{b}	13.23±0.34^{b}	6.23±0.20^{b}	60.53±1.16^{f}
Vaccination	9.71±0.47^{ef}	4.85±0.50^{e}	2.00±0.30^{e}	83.85±1.07^{b}
Chick rearing	14.18±0.43^{d}	11.00±0.25^{c}	5.50±0.22^{bc}	69.37±0.65^{d}
Improved strains	16.30±0.31^{c}	12.05±0.25^{bc}	5.41±0.16^{bc}	66.22±0.45^{e}
Feed supplementation	15.66±0.44^{c}	12.88±0.26^{b}	4.83±0.16^{c}	66.22±0.46^{e}
Full package	8.53±0.23^{f}	4.73±0.20^{e}	2.21±0.15^{f}	86.53±0.53^{a}
Feed supplementation and improved strains	11.08±0.22^{e}	8.03±0.21^{d}	3.52±0.14^{d}	77.47±0.54^{c}
Feed supplementation and vaccination	10.16±0.29^{e}	8.33±0.48^{d}	3.58±0.32^{d}	77.95±1.03^{c}
Interaction				
Al-Sharkia				
Non-adoption	26.20±0.58^{a}	14.60±0.81^{a}	9.00±0.44^{a}	50.20±1.28^{e}
Housing	20.60±1.72^{b}	13.40±0.60^{b}	6.20±0.37^{b}	59.80±2.13^{d}
Vaccination	9.25±0.47^{ef}	5.00±0.70^{f}	2.00±0.40^{g}	83.75±1.43^{a}
Chick rearing	14.33±0.57^{cd}	11.11±0.35^{cd}	5.66±0.33^{bc}	68.88±0.97^{c}
Improved strains	16.25±0.47^{c}	12.12±0.39^{c}	5.37±0.25^{bc}	66.25±1.74^{c}
Feed supplementation	15.80±0.55^{cd}	12.80±0.35^{c}	4.90±0.23^{c}	66.50±1.67^{c}
Full package	8.55±0.29^{f}	4.55±0.29^{f}	2.00±0.22^{g}	86.11±2.75^{a}
Feed supplementation and improved strains	11.22±0.29^{e}	8.22±0.29^{e}	3.55±0.18^{e}	77.00±2.72^{b}
Feed supplementation and vaccination	10.15±0.38^{ef}	8.38±0.64^{e}	3.69±0.45^{d}	77.76±1.45^{b}
El-Fayoum				
Non-adoption	26.20±0.58^{a}	14.60±0.81^{a}	9.00±0.44^{a}	50.20±1.28^{e}
Housing	20.62±1.17^{b}	13.12±0.44^{b}	6.25±0.25^{b}	61.00±1.43^{d}
Vaccination	10.33±0.88^{ef}	4.66±0.88^{f}	2.00±0.57^{g}	84.00±2.00^{a}
Chick rearing	14.00±0.69^{d}	10.85±0.48^{d}	5.28±0.28^{bc}	70.00±2.81^{c}
Improved strains	16.35±0.42^{c}	12.00±0.34^{c}	5.45±0.22^{bc}	66.20±2.61^{c}
Feed supplementation	15.50±1.62^{cd}	13.00±0.42^{b}	4.75±0.25^{cd}	65.87±2.63^{c}
Full package	8.50±0.42^{f}	5.00±0.25^{f}	2.50±0.22^{f}	87.16±2.71^{a}
Feed supplementation and improved strains	10.88±0.36^{ef}	7.76±0.32^{e}	3.48±0.24^{e}	78.16±2.83^{b}
Feed supplementation and vaccination	10.18±0.46^{ef}	8.27±0.75^{e}	3.45±0.49^{e}	78.18±1.65^{b}

$^{A-B}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

$^{a-b-c\ldots\ldots\ etc.}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

$^{a-b-c\ldots\ldots\ etc.}$ Means, within a column, with different superscripts difference significantly (P<0.0001)

Table (7): Least squares mean ± standard errors for chicken cost LE/bird/year as affected by different management intervention packages in Al-Sharkia and El-Fayoum governorates

Items	Chick price	Feed cost	Labour cost	Litter cost	Vaccine and medicine cost	Water and electrics cost	Total variables cost
	M±SE	M±SE	M±SE	M±SE	M±SE	M±SE	M±SE
Governorate							
Al-Sharkia	3.33±0.04	24.41±0.30	8.57±0.08	1.02±0.01	1.86±0.05	0.60±0.01	39.79±0.39
El-Fayoum	3.30±0.05	24.11±0.32	8.63±0.09	1.01±0.01	1.84±0.05	0.59±0.01	39.37±0.42
Management intervention packages							
Non-adoption	2.44±0.15^{f}	14.20±0.38^{g}	8.20±0.13	0.82±0.02^{d}	0.60±0.04^{e}	0.23±0.04^{e}	26.60±0.45^{e}
Housing	2.90±0.09^{d}	22.15±0.41^{f}	8.76±0.12	0.93±0.01^{c}	0.89±0.01^{d}	0.44±0.02^{d}	37.07±1.34^{d}
Vaccination	2.64±0.07^{ef}	27.85±1.01^{b}	8.28±0.18	0.98±0.07^{bc}	2.00±0.21^{b}	0.54±0.03^{c}	42.28±1.14^{b}
Chick rearing	2.79±0.08^{e}	23.18±0.41^{e}	8.75±0.19	0.99±0.03^{bc}	1.58±0.05^{c}	0.56±0.03^{c}	37.93±0.43^{d}
Improved Strains	3.59±0.05^{b}	24.13±0.18^{de}	8.55±0.11	0.97±0.01^{bc}	1.67±0.02^{bc}	0.62±0.02^{b}	39.55±0.32^{c}
Feed supplementation	3.27±0.07^{c}	25.38±0.24^{c}	8.88±0.07	1.00±0.03^{bc}	1.70±0.03^{bc}	0.61±0.02^{b}	40.72±1.32^{bc}
Full package	3.91±0.03^{a}	28.93±0.15^{a}	8.53±0.21	1.19±0.02^{a}	2.61±0.04^{a}	0.72±0.02^{a}	45.86±0.29^{a}
Feed supplementation and improved strains	3.41±0.03^{bc}	24.24±0.18^{d}	8.40±0.13	1.05±0.01^{b}	1.92±0.03^{bc}	0.63±0.01^{b}	39.70±1.30^{c}
Feed supplementation and vaccination	3.45±0.06^{bc}	25.83±0.23^{c}	8.50±0.18	1.03±0.02^{b}	2.41±0.03^{a}	0.64±0.02^{ab}	41.75±0.31^{bc}

Table (7): Continued

Items	Chick price	Feed cost	Labour cost	Litter cost	Vaccine and medicine cost	Water and electrics cost	Total variables cost
	M±SE	M±SE	M±SE	M±SE	M±SE	M±SE	M±SE
Interaction Al-Sharkia							
Non-adoption	2.44±0.23^{f}	14.20±0.58^{f}	8.20±0.20	0.82±0.03^{d}	0.60±0.06^{f}	0.23±0.06^{e}	26.60±0.67^{g}
Housing	2.95±0.16^{d}	22.00±0.71^{e}	8.80±0.20	0.94±0.02^{cd}	0.89±0.02^{e}	0.45±0.04^{d}	37.00±0.63^{f}
Vaccination	2.68±0.11^{e}	27.50±1.44^{a}	8.25±0.25	0.98±0.01^{c}	2.00±0.28^{b}	0.54±0.04^{cd}	42.00±1.58^{b}
Chick rearing	2.80±0.18^{e}	23.33±0.55^{d}	8.77±0.27	1.00±0.04^{c}	1.57±0.07^{d}	0.55±0.04^{cd}	38.11±0.58^{e}
Improved strains	3.59±0.08^{b}	24.12±0.28^{c}	8.56±0.18	0.98±0.02^{c}	1.66±0.03^{d}	0.62±0.03^{b}	39.56±0.51^{d}
Feed supplementation	3.28±0.09^{cd}	25.50±0.34^{bc}	8.90±0.10	1.02±0.05^{c}	1.70±0.04^{d}	0.61±0.04^{bc}	40.90±1.45^{c}
Full package	3.88±0.04^{a}	28.88±0.20^{a}	8.44±0.29	1.17±0.03^{a}	2.61±0.06^{a}	0.71±0.02^{a}	45.66±1.42^{a}
Feed supplementation and improved strains	3.44±0.05^{c}	24.27±0.28^{cd}	8.38±0.17	1.05±0.01^{b}	1.96±0.05^{c}	0.63±0.02^{ab}	39.80±1.42^{de}
Feed supplementation and vaccination	3.42±0.09^{c}	25.84±0.31^{b}	8.53±0.24	1.02±0.03^{c}	2.40±0.05^{a}	0.64±0.02^{ab}	41.76±0.42^{bc}
El-Fayoum							
Non-adoption	2.44±0.23^{f}	14.20±0.58^{f}	8.20±0.20	0.82±0.03^{d}	0.60±0.06^{f}	0.23±0.06^{e}	26.60±0.67^{g}
Housing	2.87±0.11^{d}	22.25±0.52^{e}	8.75±0.16	0.93±0.01^{cd}	0.88±0.01^{e}	0.44±0.03^{d}	37.12±0.44^{f}
Vaccination	2.58±0.08^{e}	28.33±1.66^{a}	8.33±0.33	0.99±0.06^{c}	2.00±0.40^{b}	0.54±0.06^{cd}	42.66±2.02^{b}
Chick rearing	2.78±0.13^{e}	23.00±0.65^{d}	8.71±0.28	0.97±0.04^{c}	1.59±0.09^{d}	0.57±0.04^{c}	37.71±0.68^{e}
Improved strains	3.60±0.07^{b}	24.15±0.24^{c}	8.55±0.15	0.97±0.02^{c}	1.67±0.02^{d}	0.62±0.03^{b}	39.55±1.42^{d}
Feed supplementation	3.26±0.12^{cd}	25.25±0.36^{bc}	8.87±0.12	0.97±0.05^{c}	1.69±0.06^{d}	0.60±0.04^{bc}	40.50±1.46^{c}
Full package	3.95±0.04^{a}	29.00±0.25^{a}	8.66±0.33	1.21±0.01^{a}	2.60±0.07^{a}	0.73±0.03^{a}	46.16±0.41^{a}
Feed supplementation and improved strains	3.36±0.05^{c}	24.20±0.21^{cd}	8.44±0.22	1.05±0.02^{b}	1.85±0.05^{c}	0.63±0.02^{ab}	39.56±0.42^{de}
Feed supplementation and vaccination	3.50±0.09^{c}	25.81±0.37^{b}	8.45±0.28	1.05±0.04^{b}	2.42±0.06^{a}	0.63±0.03^{ab}	41.72±0.50^{bc}

a-b-c…… etc. Means, within a column, with different superscripts difference significantly (P<0.0001)

a-b-c…… etc. Means, within a column, with different superscripts difference significantly (P<0.0001)

Table (8): Least square mean ± standard errors for chicken revenue and gross margin LE/bird/year as affected by different management intervention packages in Al-Sharkia and El-Fayoum governorates

Items	Egg revenues	Meat revenues	Manure revenues	Total revenues	Gross margin	Total revenues/total variable cost
	M±SE	M±SE	M±SE	M±SE	M±SE	M±SE
Governorate						
Al-Sharkia	93.79±2.17	36.96±0.03	3.33±0.01	133.79±2.21	94.18±1.99	3.36±0.04
Al-Fayoum	92.56±2.18	36.94±0.03	3.31±0.09	132.99±2.22	93.35±2.05	3.38±0.05
Management intervention packages						
Non-adoption	54.00±3.63^{e}	36.39±0.03^{f}	3.03±0.02^{c}	93.42±3.63^{e}	66.70±3.59^{e}	3.53±0.14^{b}
Housing	75.00±1.89^{d}	36.40±1.06^{f}	3.23±0.03^{b}	114.64±3.07^{d}	77.61±1.33^{d}	3.09±0.02^{cd}
Vaccination	76.50±0.71^{d}	36.52±1.01^{e}	3.30±0.03^{ab}	116.32±2.72^{d}	74.00±1.81^{d}	2.75±0.06^{e}
Chick rearing	75.28±1.19^{d}	36.53±1.02^{e}	3.28±0.02^{ab}	115.09±2.17^{d}	77.18±1.49^{d}	3.04±0.03^{cd}
Improved Strains	76.04±1.38^{d}	36.80±1.05^{d}	3.31±0.01^{a}	116.16±3.38^{d}	76.55±1.46^{d}	2.94±0.02^{d}
Feed supplementation	90.00±1.21^{c}	37.00±1.01^{c}	3.29±0.02^{ab}	130.29±1.02^{c}	89.44±1.25^{c}	3.19±0.02^{c}
Full package	135.00±2.07^{a}	37.75±1.35^{a}	3.29±0.02^{ab}	176.04±2.02^{a}	130.26±1.26^{a}	3.85±0.02^{a}
Feed supplementation and improved strains	111.76±1.48^{b}	37.13±0.02^{b}	3.27±0.01^{ab}	152.17±1.51^{b}	112.44±1.57^{b}	3.83±0.04^{a}
Feed supplementation and vaccination	91.25±2.58^{c}	37.00±1.24^{c}	3.28±0.01^{ab}	131.53±1.57^{c}	89.66±1.49^{c}	3.14±0.02^{c}

Table (8): Continued

Items	Egg revenues	Meat revenues	Manure revenues	Total revenues	Gross margin	Total revenues/total variable cost
	M±SE	M±SE	M±SE	M±SE	M±SE	M±SE
Interaction Al-Sharkia						
Non-adoption	43.50±1.01^{f}	36.41±0.04^{d}	3.03±0.03^{f}	82.94±1.96^{e}	56.40±1.87^{e}	3.13±0.06^{cd}
Housing	75.00±1.02^{d}	36.42±0.11^{d}	3.22±0.05^{e}	114.64±2.14^{d}	77.60±1.60^{d}	3.09±0.05^{d}
Vaccination	76.68±0.98^{d}	36.52±0.02^{d}	3.30±0.04^{b}	116.51±2.97^{d}	74.50±1.32^{d}	2.78±0.09^{f}
Chick rearing	75.25±1.25^{d}	36.55±0.03^{d}	3.27±0.03^{c}	115.08±2.22^{d}	77.00±1.60^{d}	3.03±0.05^{de}
Improved strains	75.93±1.54^{d}	36.80±0.09^{c}	3.26±0.02^{cd}	116.01±1.53^{d}	76.43±1.71^{d}	2.93±0.03^{e}
Feed supplementation	90.00±1.24^{c}	37.00±1.01^{b}	3.25±0.03^{d}	130.25±2.03^{c}	89.30±1.36^{c}	3.17±0.03^{c}
Full package	135.00±2.01^{a}	37.75±1.02^{a}	3.26±0.03^{cd}	176.01±2.03^{a}	130.44±2.37^{a}	3.85±0.03^{ab}
Feed supplementation and improved strains	109.58±1.98^{b}	37.11±0.03^{b}	3.22±0.01^{e}	149.92±2.01^{b}	110.08±2.14^{b}	3.78±0.06^{b}
Feed supplementation and vaccination	91.15±1.78^{c}	37.00±1.06^{b}	3.23±0.02^{e}	131.39±2.76^{c}	89.53±1.67^{c}	3.13±0.02^{cd}
El-Fayoum						
Non-adoption	64.50±1.83^{e}	36.38±0.05^{d}	3.03±0.03^{f}	103.91±1.85^{e}	77.00±2.09^{d}	3.92±0.12^{a}
Housing	75.00±1.04^{d}	36.40±0.08^{d}	3.24±0.04^{de}	114.64±2.09^{d}	77.62±1.41^{d}	3.08±0.03^{d}
Vaccination	76.25±1.25^{d}	36.53±0.03^{d}	3.30±0.05^{b}	116.08±1.23^{d}	73.33±0.88^{d}	2.72±0.09^{f}
Chick rearing	75.32±1.32^{d}	36.50±0.09^{d}	3.29±0.04^{bc}	115.11±2.29^{d}	77.42±1.86^{d}	3.06±0.06^{d}
Improved strains	76.12±2.55^{d}	36.80±1.07^{c}	3.34±0.01^{ab}	116.27±1.54^{d}	76.65±1.62^{d}	2.94±0.03^{e}
Feed supplementation	90.00±2.01^{c}	37.00±0.08^{b}	3.35±0.01^{a}	130.35±2.01^{c}	89.62±1.37^{c}	3.20±0.03^{c}
Full package	135.00±1.22^{a}	37.75±0.68^{a}	3.34±0.01^{ab}	176.09±2.01^{a}	130.00±2.36^{a}	3.94±0.03^{a}
Feed supplementation and improved strains	114.90±2.10^{b}	37.16±0.04^{b}	3.34±0.09^{ab}	155.41±2.15^{b}	115.84±2.25^{b}	3.81±0.07^{b}
Feed supplementation and vaccination	91.36±1.91^{c}	37.00±0.14^{b}	3.34±0.01^{ab}	131.70±2.91^{c}	89.81±1.77^{c}	3.14±0.03^{cd}

a-b-c…… etc. Means, within a column, with different superscripts difference significantly (P<0.0001)

a-b-c…… etc. Means, within a column, with different superscripts difference significantly (P<0.0001

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المستخلص العربي

تأثير تبني الحزم الفنية الرعائية على إنتاجية الدجاج تحت نظام إنتاج الدجاج العائلي في الريف المصري

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أجريت الدراسة في محافظتي الشرقية والفيوم وذلك لدراسة تأثير الحزم الرعائية علي إنتاجية الدجاج تحت نظام إنتاج الدواجن العائلي لدي صغار المربيين في الريف المصري. وتضمن هذة الحزم الرعائية نظام الإسكان، والتحصين، طرق التربية، السلالات المحسنة والإضافات الغذائية. خلال الفترة الممتدة من يناير إلي ديسمبر 2015. أستهدفت صغار مربي الدجاج المحلي في مناطق تم نشر المدخلات الرعائية بها عن طريق الخدمات الإرشادية، تم إختيار مائتي مربي عشوائيا. تم تجميع البيانات عن طريق إستمارة إستبيان منتظمة مع مقابلات شخصيه شهرية. أوضحت النتائج أن 45% من صغار المربيين تبنوا المدخلات الرعائية التي تم نشرها كما هي. الأغلبية (50%) تبنوا بصورة إنتقائية مابين المدخلات الرعائية المنشورة والتي تمثلت في تبني الحزم الكاملة، وحزم الإضافات الغذاية مع السلالات المحسنة و حزم الإضافات الغذائية مع التحصين. أظهرت النتائج أن أعلي حجم للقطيع لوحظ عند متبنوا حزم الرعائية كاملة (96.50طائر)، ثم حزم الإضافات الغذائية مع السلالات المحسنة (73.22 طائر)، ثم حزم الإضافات الغذائية مع التحصين (45.76 طائر). أوضحت النتائج أن هناك تأثير معنوي واضح لتبني أساليب الرعاية المنشورة علي عمر إناث الدجاج والديوك عند النضج الجنسي. أوضحت النتائج أن الذين يتبنون أساليب الرعاية المنشورة كاملة حققوا أعلي معدل لإنتاج البيض سنويا 183.26 بيضة/دجاجه مع أعلي متوسط لوزن البيضة 44.26 جم خلال فترة إنتاج حوالي 46.40 أسبوع مقارنة بالذين لم يتبنوا أي من حزم الرعاية والذين حققوا معدلات إنتاجية تتمثل في أقل معدل لإنتاج البيض سنويا 86.50 بيضة/دجاجه مع أقل متوسط لوزن البيضة 28.50 جم خلال فترة إنتاج حوالي 94 أسبوع. ولذلك نوصي الحكومة وشركاء التنمية ينبغي تصميم برنامج للحزم الرعائية استناداً إلى الخصائص السكانية والاجتماعية والاقتصادية للمزارعين أصحاب الحيازات الصغيرة لزيادة الكفاءة الإنتاجية للدجاج المحلي.

الكلمات الدالة: المدخلات الرعائية، نظام إنتاج الدجاج العائلي، الأصيلة.