International Journal of Livestock Research, Vol. 11 (4) Apr' 2021
http://www.ijlr.org
eISSN: 2277-1964

Original Research

Impact of Training Programmes on Adoption of Layer Farming Practices among Layer Farmers in Uttar Pradesh

Maina Kumari[1]*, M. P. Sagar[2] and Kamlesh Kumar Dhawal[3]

[1]Assistant Professor, Department of Veterinary and Animal Husbandry Extension Education, Apollo College of Veterinary Medicine, Jaipur (Rajasthan), INDIA
[2]Principal Scientist, Central Avian Research Institute, Izatnagar (Uttar Pradesh), INDIA
[3]Veterinary Officer, Animal Husbandry Department, Bikaner, Rajasthan, INDIA

*Corresponding Author: mainadhaka1591@gmail.com

How to cite this paper: Kumari, M., Sagar, M., & Dhawal, K. (2021). Impact of Training Programmes on Adoption of Layer Farming Practices among Layer Farmers in Uttar Pradesh. *International Journal of Livestock Research*, 11(4), 105-113. https://doi.org/10.5455/ijlr.20201007122157

Received : Dec 09, 2020
Accepted : Feb 23, 2021
Published : Apr 30, 2021

Abstract

The present study was conducted to assess the impact of training programmes on adoption of layer farming practices by comparison of trainee and non-trainee layer farmers in Uttar Pradesh state. Total 108 respondents were selected, in which 54 were trainee and 54 were non-trainee layer farmers. Out of these 54 trainees, 30 were adopters and 24 were non-adopters. Data were collected through structured mailed questionnaire and telephonic survey. Data analysis elicited that average age of poultry farmers was 41.54 years, educationally graduated or post graduated, small family size, low level experience in poultry farming and possessing small size poultry farm. Mostly, trainees had medium to high level of adoption while, non-trainees had medium level of adoption in layer farming management practices viz., brooding, housing, feeding, bio security & health care management and vaccination. Adoption of layer farming management practices by trainee layer farmers was positively and significantly correlated with education, extension agency contact, layer farming experience and poultry farm size. Training is positive and impactful tool for the layer farmers to overcome the difficulties and soothing of management of layer farm. So, managemental training programmes should be organized for non-trainee layer farmers by CARI to bring them as far with trainee layer farmers.

Keywords: Adoption, Brooding, Extension agency, Housing, Management, Training

Introduction

The Indian poultry sector has witnessed one of the fastest annual growth of about 6-8 per cent in production with 16.80 per cent growth in poultry population (20th Livestock Census) amongst all animal-based sectors over the previous 19th Census (Annual Report, DAHD&F, GoI, 2019-20). Poultry farming may be a viable commercial activity and possesses immense scope for growth in India. Poultry rearing serves as a good subsidiary occupation that supplements the income of smallholder farm families and rural households in most developing countries (Ugwuoke *et al.,* 2017). Indian poultry sector has undergone a paradigm shift in both structure and operation which has been its revolution from a mere backyard activity into a major commercial agricultural-based industry over the last four decades. However, scientific poultry production in India gained momentum during the last four decades, it is due to concerted efforts of the govt of India through policies, institutions and focused research besides the initiatives taken by the private sector (Sheikh *et al,* 2018). in India development of high yielding layer (310-340 eggs) and broiler (2.4-2.6 kg at 6 weeks of age) varieties together with a standardized package of practices on nutrition, housing, management and disease control have contributed to impressive growth rates in the egg (6-8% per annum) and broiler production (10-12% per annum) during the last four decades (BAH&FS, 2019). The speedy growth of the poultry industry in India was possible as a result of many factors working together; widespread adoption of scientific management practices of poultry farming and availability of inputs. (Lenka and Behra, 2015).

Management aims to supply the conditions that make sure the optimum performance of the poultry. Poultry management involves monitoring the poultry's health, ensuring that the poultry house maintaining appropriate brooding, rearing, growing, and laying conditions, ensuring that recommended vaccinations are given and appropriate feeding programmes are used (Bell and Weaver, 2001). A new dimension has been added to it with a growing realization that poultry farming can play an effective role in the upliftment of the farmers, for which adoption of appropriate scientific farming practices is the must for obtaining optimum returns. Despite the increased productivity of the industry in recent years, the industry has been faced challenges i.e., high cost of feed and poor knowledge and adoption of management practices of the enterprise (Eziebe *et al.,* 2014). To overcome these challenges, improved technological interventions are required in form of selection and training of experienced poultry owners, provision of improved indigenous germplasm, better housing and management are needed to promote this enterprise for enhanced nutritional and livelihood security (Thakur *et al.,* 2013). Training changes the knowledge level and skills of the farmer and provides information regarding the identification of improved layer poultry birds, disease management, climatic stresses, feed ingredients and poultry waste management (Kshandakar *et al.,* 2018). Thus, the present study aims to assess the impact of training programmes on adoption of layer farming practices among layer farmers in Uttar Pradesh.

Materials and Methods

The study was conducted purposively in Uttar Pradesh state as majority of the trainees who had undergone training from CARI (Central Avian Research Institute, Izatnagar) resided in this state. Data were collected through structured mailed questionnaire. A total of 54 of each trainees and non-trainees were selected from same 5 agro-climatic zones out of 9 zones of the state. Thus, total sample size was 108 only. Out of 54 trainees, 24 of them had not adopted the layer farming. So, in the case of adoption level, a comparison of 30 trainee was done with 54 non-trainee layer farmers and the total sample size was reduced to 84 only.

Adoption Level

The level of adoption is operationalized as the extent to which one makes use of scientific layer farming practices or adopts the recommended practices in his/her daily life. In this study the various layer farming practices were enlisted in a structured questionnaire in the form of questions. Each question had two possibilities i.e., adopted and not adopted. The scoring was given in the form of 1 and 0 to adopted and not adopted, respectively. The extent of adoption was calculated on the basis of total score secured by the respondent. The respondents were categorized into low, medium and high level of adoption based on the standard deviation and mean method. The adoption level calculated by formula:

$$Adoption\ Index = \frac{Obtained\ Score}{Obtainable\ score} \times 100$$

Where,

Obtained score = 1(X) + 0(Y)
Maximum obtainable score = X+Y

Where,

X = Number of practices layer farmers have adopted,
Y= Number of practices layer farmers have not adopted.

Results and Discussion

Age

We can infer from table 1 that fifty per cent of the trainee layer farmers belonged to middle age (37-46 years). While, maximum percentage of non-trainee layer farmers (51.86%) were of old (47-56 years) age. The respective average ages of trainee and non-trainee layer farmers were 37.22 and 45.87 years, respectively. Present findings were similar to reported by Jhirwal *et al* (2018) that 50 percent of poultry entrepreneurs belonged to middle age group in Ajmer district of Rajasthan.

Education

It is shown in table 1 that majority (87.04%) of trainee layer farmers were graduate and above, rest (12.96%) of the layer farmers had education up to higher secondary level. While, in case of non-trainees, majority (74.08%) had education up to graduate and above, followed by higher secondary (14.81%) and high school level (11.11%).

Family Size

Data presented in table 1 shows that majority (72.22%) of trainee and 48.14 per cent of non-trainee layer farmers had small family size (up to 6 members). The average family size of the trainee and non-trainee layer farmers was 5.74 and 7.48 members, respectively.

Land Holding

It is clearly visible from table 1 that 33.33 per cent of the trainee layer farmers were belonging to marginal land holding (up to 4.99 acres). While, 44.44 per cent of non-trainee layer farmers were belonging to small (5- 9.99 acres) land holding, none of them was belonged to landless and large (>25 acres) land holding categories. The average land holdings of the trainee and non-trainee layer farmers were 6.61 and 6.70 acres, respectively.

Experience in Layer Farming

Data presented in table 1 revealed that all the trainee layer farmers had low (2-8 years) layer farming experience, none of them had medium (8-14 years) and high (>14 years) layer farming experience. While, in the case of non-trainee layer farmers, an overwhelming majority (92.60%) of respondents had a low level of experience in layer farming, followed by medium and high (both 2.38% each) experience in layer farming. The average layer farming experience for the trainee and non-trainee layer farmers were 3.97 and 5.74 years, respectively. These results are contrary to the findings of Jhirwal *et al* (2018) as they reported that 35 per cent of entrepreneurs had experience of 10 to 15 years.

Poultry Farm Size

Table 1 further revealed that majority (70.00%) of the trainee layer farmers had small farm size (15000-60000), followed by medium (61000-105000) (16.67%) and large (106000-150000) (13.33%) farm size. Similar findings were also found in the case of non-trainee layer farmers like majority (70.37%) of them had small farms, followed by medium (18.52%) and large (11.11%) farm size.

Extension Agency Contacts

The results presented in table 2 concluded that trainee layer farmers contacted to CARI was "often" (72.22%) by farmers at rank I, followed by Venkys ("oftenly", 72.22%, II rank), SDAH (State Department of Animal Husbandry) "oftenly" (55.56%, III rank) and KVKs occasionally (75.93%, IV rank), NGOs and cooperatives societies were never used by trainee layer farmers. While, in case of non-trainee layer farmers, SDAH "oftenly" (90.74%, I rank), followed by KVKs ("occasionally", 61.11%, II rank) and Venkys ("oftenly", 50.00%, III rank), CARI, NGOs and cooperatives societies were never used by non-trainee layer farmers. It may be inferred from the results that majority of non-trainees are more efficiently connected to SDAH and KVK than trainees, while trainees were getting information from CARI more efficiently. All the respondents were found to contacting to one or more extension agencies. Babalola (2014) and Esiobu *et al.* (2014) also reported that majority of poultry famers had middle level of organizational participation.

Table 1: Distribution of respondents according to various socio-economic character

Socio-economic character	Trainees (n=54)	Non-trainees (n=54)	Pooled (n= 108)
Age (in years)			
Young (27-36)	25 (46.30)	5 (9.26)	30 (27.78)
Middle (37-46)	27 (50.00)	21 (38.88)	48 (44.44)
Old (47-56)	2 (3.70)	28 (51.86)	30 (27.78)
Education			
Illiterate	0 (0.00)	0 (0.00)	0 (0.00)
Functional literate	0 (0.00)	0 (0.00)	0 (0.00)
Primary	0 (0.00)	0 (0.00)	0 (0.00)
Middle	0 (0.00)	0 (0.00)	0 (0.00)
High school	0 (0.00)	6 (11.11)	6 (5.55)
Higher secondary	7 (12.96)	8 (14.81)	15 (13.89)
Graduation & above	47 (87.04)	40 (74.08)	87 (80.56)
Family size			
Small (Up to 6 members)	39 (72.22)	26 (48.14)	65 (60.19)
Medium (7-10 members)	14 (25.93)	21 (38.89)	35 (32.41)
Large (> 10 members)	1 (1.85)	7 (12.97)	8 (7.40)
Land holding (in acres)			
Landless (0.00)	8 (14.82)	0 (0.00)	8 (7.40)
Marginal (up to 4.99)	18 (33.33)	19 (35.18)	37 (34.26)
Small (5-9.99)	15 (27.78)	24 (44.44)	39 (36.11)
Medium (10-24.99)	12 (22.22)	11 (20.38)	23 (21.30)
Large (25 and above)	1 (1.85)	0 (0.00)	1(0.93)
Experience in layer farming (In years)			
	Trainee (n=30)	**Non-trainee (n= 54)**	**Pooled (n=84)**
Low (2-8)	30 (100)	50(92.60)	80 (95.24)
Medium (9-14)	0 (0.00)	2 (3.70)	2 (2.38)
High (15-20)	0 (0.00)	2 (3.70)	2 (2.38)
Poultry farm size (in numbers)			
Small (15000-60000)	21(70.00)	38 (70.37)	59 (70.24)
Medium (61000-105000)	5 (16.67)	10 (18.52)	15 (17.86)
Large (106000-150000)	4 (13.33)	6 (11.11)	10 (11.90)

Figure in parenthesis indicate percentage

Table 2: Distribution of the respondents according to extension agency contact

Extension agency contact	Trainees (n=54)					Non-trainees (n=54)					Pooled (n=108)				
	Often	Occasionally	Never	W. mean	Rank	Often	Occasionally	Never	W. mean	Rank	Often	Occasionally	Never	W. mean	Rank
SDAH	30 (55.56)	8 (4.82)	16 (29.62)	1.3	III	49 (90.74)	5 (9.26)	0 (0)	1.91	I	79 (73.15)	13 (12.04)	16	1.64	I
KVK	13 (24.07)	41 (75.93)	0 (0)	1.24	IV	21 (38.89)	33 (61.11)	0 (0)	1.39	II	34 (31.49)	74 (68.51)	0 (0)	1.36	III
CARI	39 (72.22)	13 (24.08)	2 (3.7)	1.68	I	0 (0)	0 (0)	54 (100)	0 (0)	IV	39 (36.11)	13 (12.03)	56 (51.86)	0.88	IV
VENKY	39 (72.22)	7 (12.97)	8 (14.81)	1.57	II	27 (50)	17 (31.49)	10 (18.51)	1.31	III	66 (61.11)	24 (22.22)	18 (16.67)	1.5	II
NGO	0 (0)	0 (0)	54 (100)	0 (0)	V	0 (0)	0 (0)	54 (100)	0 (0)	IV	0 (0)	0 (0)	108 (100)	0	V
Cooperative society	0 (0)	0 (0)	54 (100)	0 (0)	V	0 (0)	0 (0)	54 (100)	0 (0)	IV	0 (0)	0 (0)	108 (100)	0	V

Figure in parenthesis indicate percentage

The Extent of Adoption of Layer Farming Practices

The adoption of layer farming practices was studied concerning about brooding, housing, feeding and health care & biosecurity layer farming managemental practices.

a) *Adoption level of brooding management practices*

Table 3 indicated that majority of trainee (63.33%) and non-trainee (51.85%) layer farmers had a medium level of adoption of brooding management practices. The mean adoption scores among trainee and non-trainees layer farmers were 10.70 and 7.85, respectively. Singh *et al* (2019) reveals that majority of contract and non-contract broiler farmers (58.33% and 51.67%) had medium level of adoption of brooding management practices.

b) Housing management practices

Data presented in table 3 revealed that overwhelming majority (96.67%) of trainee layer farmers had high and rest of them (3.33%) had medium level of adoption of housing management practices. In case of non-trainee layer farmers, 48.15 per cent of each had high and medium level of adoption of housing management practices. The mean adoption score among trainee and non-trainee layer farmers were 10.30 and 8.26, respectively.

c) Feeding management practices

It is evident from table 3 that majority (73.33%) of trainee layer farmers had high and rest (26.67%) of them had the medium level of adoption of feeding management practices. While, in case of non-trainee, majority (64.81%) of layer farmers had medium and 27.78 per cent had high level of adoption of feeding management practices. The mean adoption score among trainee and non-trainee layer farmers were 7.73 and 6.91, respectively. Sharma *et al.* (2014) also concluded that majority (47.27%) of the farmers had medium level of adoption of feeding practices.

d) Bio security & health care management practices

Table 3 indicated that majority (83.33%) of the trainee layer farmers had high and rest (16.67%) of them had medium level of adoption of bio security & health care management practices. While, in case of non-trainees, majority (57.41%) of layer farmers had medium and 33.33 per cent had high level of adoption of biosecurity & health care management practices. The mean adoption score among trainee and non-trainee layer farmers were 10.50 and 9.00, respectively. These finding got support from Susilowati *et al.* (2010) who reported that majority (49%) of layer smallholders adopted high level of biosecurity measures. In the case of vaccination status of layer birds, overwhelming majority (96.67%) of trainee layer farmers had high level of adoption. While, in case of non-trainees, majority (59.26%) had high and 37.04 per cent had medium level of adoption of vaccination schedule. The mean adoption score among trainee and non-trainee layer farmers were 7.97 and 7.31, respectively. Mandavkar *et al.* (2020) also found that majority (66.67%) of respondent had high, followed by medium (33.33%) level of adoption of vaccination in Raigad District of Maharashtra state.

Overall Adoption Level of Layer Farming Managemental Practices

Data presented in table 3 showing that majority (86.67%) of trainee layer farmers had high and rest (13.33%) of them had medium level of adoption of layer management practices. While, in case of non-trainees, majority (81.48%) of layer farmers had medium and 12.96 per cent had low level of adoption of layer management practices. Results revealed that trainee layer farmers had high level of adoption of layer management practices compare to non-trainee layer farmers. The mean adoption score among trainee and non-trainee layer farmers were 47.20 and 39.33, respectively. Singha *et al.* (2016) also reported that more than half (51.54%) of the respondents had adopted improved poultry farming practices at medium level by the beneficiary respondents followed by high (26.15%) and low by 22.31% respondents.

Table 3: Extent of adoption of layer farming practices among trainee and non-trainee layer farmer

S no.	Practices	Adoption level	Trainees (n=30)	Non-trainees (n=54)	Total (n=84)
1	Brooding	Low (4-7)	0 (0.00)	24 (44.45)	24 (28.57)
		Medium (8-10)	19 (63.33)	28 (51.85)	47 (55.95)
		High (11-13)	11 (36.67)	2 (3.70)	13 (15.48)
2	Housing	Low (3-5)	0 (0.00)	2 (3.70)	2 (3.38)
		Medium (6-8)	1 (3.33)	26 (48.15)	27 (32.14)
		High (9-11)	29 (96.67)	26 (48.15)	55 (65.48)
3	Feeding	Low (4-5)	0 (0.00)	4 (7.41)	4 (4.76)
		Medium (6-7)	8 (26.67)	35 (64.81)	43 (51.19)
		High (8-9)	22 (73.33)	15 (27.78)	37 (44.05)
4	a. bio security & health care management	Low (6-7)	0 (0.00)	5 (9.26)	5 (5.95)
		Medium (8-9)	5 (16.67)	31 (57.41)	36 (42.86)
		High (10-11)	25 (83.33)	18 (33.33)	43 (51.19)
	b. vaccination	Low (4-5)	0 (0.00)	2 (3.70)	2 (2.38)
		Medium (6-7)	1 (3.33)	20 (37.04)	21 (25.00)
		High (8-9)	29 (96.67)	32 (59.26)	61 (72.62)
5	Overall	Low (27-35)	0 (0.00)	7 (12.96)	7 (8.34)
		Medium (36-44)	4 (13.33)	44 (81.48)	48 (57.14)
		High (45-52)	26 (86.67)	3 (5.56)	29 (34.52)

The above findings categorically indicated that trainee layer farmers had a huge advantage on adoption of layer farming management practices. The training given to them by CARI enhanced their knowledge about layer management which motivated them to adopt new and improved technology as well as scientific farm management. Trainees shown the positive attitude towards the training which helped them improved farm practices. Trainee layer farmers adopted the better brooding and housing practices for birds. They were giving recommended feed in appropriate ratio to the birds in all growing stages. Vaccination and disease prevention measures were also followed in a proper manner to reduce the infestation/ infection and mortality which play a significant role in better utilization of layers and farm. Adoption of recommended practices made the trainees to get more profit than the non-trainee layer farmers.

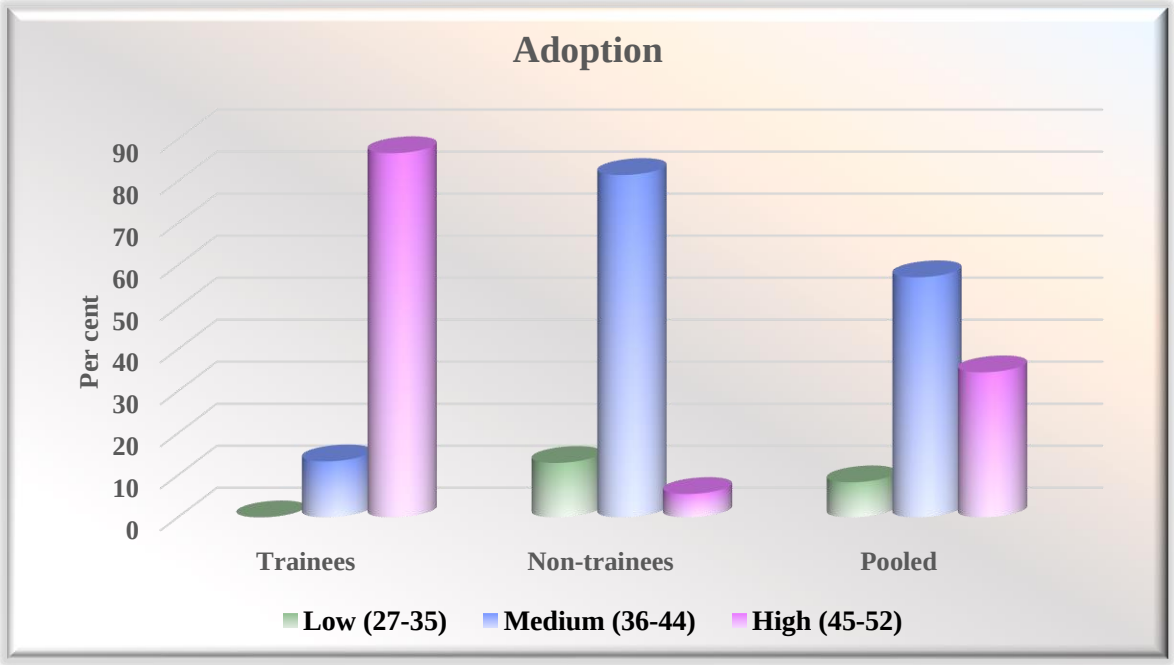

Figure 1: Graph representing distribution of trainee and non-trainee layer farmers according to overall adoption of layer farming management practices

Relationship of Adoption Level with the Various Socio-Economic Characteristics of Layer Farmers

It is evident from table 4 that adoption of the layer farming management practices by trainee layer farmers was positively and significantly ($p \leq 0.01$) correlated with education, extension agency contact, layer farming experience and poultry farm size, whereas, land holding was found associated positively and significantly ($p \leq 0.05$). However, family size and age were associated negatively and significantly at 5% and 1% level of significance, respectively. A positive correlation with education shows that as the education level of layer farmers increased, the adoption level also increased. A positive correlation with layer farming experience indicates that with an increase in experience of layer farming, the adoption of layer farming management practices also increases. The positive correlation with extension agency reveals that increased contact with extension agency helped the layer farmers to get the latest scientific information and technology and assured proper guidance which facilitated the layer farmers to adopt scientifically recommended layer farming practices at a higher level. While, in case of non-trainee layer farmers, adoption of scientific layer farming management practices was positively and significantly ($p \leq 0.01$) correlated with education and layer farming experience whereas, age, extension agency contact and poultry farm size were found associated positively and significantly ($p \leq 0.05$). However, family size and land holding were positively and non-significantly correlated with the adoption level. The positive correlation with age, education, layer farming experience, extension agency contacts and poultry farm size indicate that increase in these characteristics of non-trainee layer farmers, adoption of scientific layer farming management also increases.

Table 4: Relationship of adoption level with the various socio-economic characteristic of trainee and non-trainee layer farmers

Variables	Correlation coefficient (r)	
	Trainees	Non-trainees
Age	-0.630**	0.293*
Education	0.663**	0.502**
Family size	-0.377*	0.058^{NS}
Land holding	0.456*	0.214^{NS}
Layer farming experience	0.504**	0.360**
Poultry farm size	0.455**	0.284*
Extension agency contact	0.671**	0.312*

*r = Pearson's correlation coefficient; * p≤0.05; ** p≤0.01*

Conclusion

The extent of adoption of layer farming management practices was found at high level and medium level in case of trainee and non-trainee layer farmers, respectively. Hence, it is concluded that training had positive impact on layer farmers with respect to adoption of scientific layer farming practices, as the adoption score of trainee layer farmers was greater than non-trainee layer farmers. Education level, layer farming experience, extension agency contact and farm size are important determinants of adoption of layer management practices by farmers. The farmers can able to cultivate the best and innovative ways of layer farming by practicing the scientific method of layer farming. So, based on the results of the study, the researchers recommend introducing more training programmes for non-trainee layer farmers by CARI, which are more suitable to the skill needed at work, as well as giving equal opportunities for attending the training courses. Using modern methods for delivering the content of the training is also recommended.

Conflict of Interests

There is no conflict of interest.

Publisher Disclaimer

IJLR remains neutral concerning jurisdictional claims in published institutional affiliation.

References

1. Annual report (2019-20), Department of Animal Husbandry, Dairying and Fisheries, GOI.
2. Babalola, D.A. (2014). Determinants of Farmers Adoption of Agricultural Insurance: The Case of Poultry Farmers in Abeokuta Metropolis of Ogun State, Nigeria. *British Journal of Poultry Science 3*(2): 36-41.
3. Bell, D.D. and Weaver, W.D. (2001). Commercial chicken meat and egg production, 5th edition. Los Angeles, California, USA, Kluwer.
4. Basic Animal Husbandry Statistics. (2019). Government of India, Ministry of Agriculture, Department of Animal Husbandry, Dairying & Fisheries, New Delhi, India.
5. Esiobu, N.S., Onubuogo, G. C., and Okoli, V.B.N. (2014). Determinants of Income from Poultry Egg Production in Imo State, Nigeria: An Econometric Model Approach. *Global Advanced Research Journal of Agricultural Science 3*(7): 186-199.
6. Ezeibe, A.B.C., Okorji, E.C., Chah, J.M. and Abudei, R.N. (2014). Impact of entrepreneurship training on rural poultry farmer's adoption of improved management practices in Enugu State, Nigeria. *African Journal of Agricultural Research 9*(20):1904- 1920.
7. Jhirwal, A., Goswami, S., Choudhary, V., Singh, V. and Mishra, G. (2018). Influence of Socio-economic Factors on the Knowledge Level of Poultry Entrepreneurs in Ajmer District of Rajasthan. *International Journal of Livestock Research 8*(12): 168-174.
8. Kshandakar, S., Singh, N.K. and Nishashree, N. (2018). Impact of training on livelihood of rural poultry farmers. *International Journal of Current Microbiology and Applied Sciences 7*(5): 241-245.
9. Lenka, B. and Behera, B.S. (2015). Study on adoption of scientific poultry Management practices by farmers of Cuttack district of Odisha. *International Journal of Social Relevance & Concern 3*(10): 23-46.
10. Mandavkar, P. M., Hanmante, A. A., Talathi, M. S. and Manjarekar, R. G. (2020). Knowledge and Adoption Level of Poultry Farming Practices in Raigad District of Maharashtra State. *J Krishi Vigyan 8* (2): 199-204.
11. Sharma, S. K., Thorat, G. N., Trivedi, M. S., Mishra, R. and Singh, G. (2014). Adoption dynamics of poultry entrepreneurs in relation to poultry management practices. *The Journal of Rural and Agricultural Research. 14*(2): 21-23.
12. Sheikh, I.U., Nissa, S.S., Zaffer, B., Akand, A.H., Bulbul, K.H., Hasin, D., Hussain, I. and Hussain, S.A. (2018). Propagation of backyard poultry farming for nutritional security in rural areas. *International Journal of Veterinary Sciences and Animal Husbandry 3*(4): 03-06.
13. Singh, A.K., Sagar, M.P. and Thakur, D. (2017). Adoption of scientific broiler farming practices among contract and non-contract broiler farmers. *International Journal of Science, Environment and Technology*. *6*(1):721-728.
14. Singha, A.K., Jat, P.C., Bordoloi, R., Singha, J.K., Devi, M. and Bhuyan, P.C. (2016). Determinants of adoption of poultry technology by the farmers of adopted and non-adopted villages in North Eastern states of

India. *Economic Affairs*. *61*(4):633-640.
15. Susilowati, S.H., Iqbal, M. and Patrick. I. (2010). The relationship between biosecurity and farm characteristics. Proceeding Towards the Adoption of Cost-Effective Biosecurity on NICPS Farms in Indonesia. *Bogor-Indonesia 8*(9): 5-12.
16. Thakur, D., Sharma, A.K., Chander, M. and Katoch, S. (2013). Adoption of scientific backyard poultry rearing practices in hills of Himachal Pradesh. *Indian Journal of Poultry Science 48*(3): 357-361.
17. Ugwuoke, C.U., Ezebuiro, F. N., Okwo, C. R. and Nnadi, A.C. (2017). Management of poultry farms through the use of electronic facilities for enhanced food security in enugu state, Nigeria. *Global Journal of Biology, Agriculture and Health Sciences 6*(4): 1-7.

****