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Determinants of adoption of poultry technology by the farmers of adopted and non-adopted villages in North Eastern states of India

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Abstract

This study to analyse the determinants of adoption of poultry farming practices in North East Region was conducted in 13 purposively selected KVK districts in the region with 130 sample size from each adopted and non-adopted villages selected through proportionate random sampling. Data collection from the selected respondents was made with the help of pre-tested structured schedule through personal interview method. The study reveals that majority of the respondents in KVKs adopted villages had medium level of adoption of improved poultry farming practices, while over half of the total respondents in non-adopted villages were found having low to medium adoption level of the same poultry practices. Respondents of non-beneficiary farmers was found with little adoption of specific recommendations of selected poultry farming practices like stocking of birds, brooding and rearing and health care as shown by their corresponding total scores compared to beneficiary farmers. The study further reveals that out of 13 independent variables under study, primary occupation, trainings received, mass media exposure and extension contact of the respondents were found having positively significant relationship with the extent of adoption of poultry farming practices. While four variables namely, primary occupation, size of operational land holding, trainings received and extension contact had emerged as the most dominant factors influencing farmers for adoption of poultry farming practices in the region.

Keywords: Poultry technology, adoption**,** adopted villages, non-adopted villages, North eastern region

The poultry sector in India has undergone major shift in structure and operation during last two decades transforming from a mere extensive production system (backyard rearing) into a major commercial activity with successful implementation of contract poultry farming on a large scale. This sector, besides providing direct or indirect employment to people, is also a potent tool for subsidiary income generation for many landless and marginal farmers. It also provides food and nutritional security especially to the rural poor. In addition, the primary business of poultry farming has given rise to a number of supporting and allied industries like poultry processing, compounded feed, equipments, machinery, pharmaceuticals etc (Ithika, 2013).

In North Eastern Region of India, poultry development has been a household activity since time immemorial. This sector has been gaining its popularity from entirely unorganized farming practice to commercial production system with technological interventions and concerted efforts of the government through policies, focused research and the initiatives taken by the private sector. Although the poultry sector holds an important position for economic development and food security in North Eastern region, it lags behind in terms of production and productivity mainly

because of the extensive system of rearing coupled with poor adoption of improved management practices and lack of improved poultry breeds.

Information regarding use of exotic poultry breeds and associated improved management practices (feeding, housing, health etc.) is very limited. In fact, many small and marginal farmers in the region whose livelihood largely depends on poultry farming are finding themselves driven to wall. It is often suggested that these farmers should strive for higher adoption of the scientific practices to improve their production efficiencies. Past studies recognised that socio-economic characteristics, inputs supply, technical supports, technology characteristics, limitations and constraints may influence the probability of the technology elements adoption (Ermias *et al*., 2015).

Of late, however, attention has been directed towards the crucial role farmers in the sustainable production and management of poultry technologies. There is a need to identify the factors that contribute positively to the adoption of new poultry and livestock technologies as well as those that represent main constraints for the diffusion /adoption process (Nell *et al.,* 1998).

However, no systematic studies have been conducted to assess the rate and intensity of adoption of improved poultry farming practices in the region and farmers' response to improved poultry technologies as a whole. Studies on factors influencing farmers' decision to invest on poultry production technologies are non-existent. It may be depicted by a discrete choice, whether or not to utilize an innovation, or by a continuous variable, that indicates to what extent an innovation is used. The purpose of this study, therefore, is to examine the rate and extent of adoption of improved poultry production and management practices and to identify and quantify factors that influence adoption of poultry production technologies of the farmers in North Eastern Region.

Understanding of the technology characteristics, limitations, constraints and adoption opportunities may help to improve the technology approach for better successes. Such studies are of paramount importance and lead to in-depth understanding of the factors influencing the rate and intensity of adoption, helping institutions involved in poultry technology development and transfer to ensure their efficiency and effectiveness in attaining their objectives. Their key environmental and socio-economic factors have significant influence towards adoption and diffusion of agriculture technologies (Lestrelin *et al.,* 2012). The outcomes of the study will be helpful in setting future location specific policy and program directions in the light of socio-economic development of poultry farming community in the region.

Methodology

The study was conducted during 2012-14 by the ICAR-Agricultural Technology Application Research Institute (ATARI), Zone-III as part of the institute research project-"Impact Analysis of KVK Activities in North Eastern Region".

Location of study

The study was conducted in purposively selected 13 districts of North Eastern Region which consists of eight states. Only those districts in the region where KVKs are in existence for last 15 years with full strength of scientific staff and infra-structural facilities were selected for the study. A pre-tested well structured schedules comprising all aspects of personal and socio-economic variables of the respondents as well as mandated activities such as demonstrations, training programmes and other extension activities conducted by KVKs were prepared for data collection from the respondents. Any farmer who has been directly associating or receiving help and technical support in carrying out of farming activities particularly poultry in his own farming system on regular basis for last fifteen years was considered as respondent (beneficiary) of adopted village for the present study. While a farmer in non-adopted village who is practicing poultry farming practices in his farming system with no/ least technical support and assistance from the KVK was considered as respondent (non-beneficiary) for the present study.

Selection of Farmers

From the selected 13 districts of the region (i.e; Assam-4, Arunachal Pradesh-1, Manipur-1, Meghalaya-1, Nagaland-1, Mizoram-2, Tripura-2 and Sikkim-1), two villages-one adopted village based on production potential of different farming

systems and relatively higher proximity with the respective KVK in farming activities and one non-adopted village where least/ no KVK interventions/ activities have been taken place during last 15 years were selected from each district. On consultation with the available records of the KVK as well as local leaders and extension workers, a list of farmers representing two different categories was prepared for each village. From the individual list of farmers from each village, ten farmers respondents each from adopted and non-adopted village were randomly selected, which made 20 respondents (10 beneficiary and 10 non-beneficiary) from each district. Thus a total of 260 farmer respondents were finally selected for data collection from 13 districts of the region.

Measurement of Variables

The independent variables *viz.*, age, education, caste, family type and family size were measured with the help of scales developed by Trivedi and Pareek (1964). The variables- primary occupation, annual income, size of operational land holding, type of primary farming activities, farming experience, trainings received, mass media exposure and extension contact were measured with the help of schedules structured for the study.

Extent of adoption of improved poultry farming practices was considered as the dependent variable, which was operationally defined as the level of adoption of recommended poultry farming practices by the respondents in their farming system. To determine the extent of adoption, improved poultry farming practices were listed out and a schedule consisting of questions against each selected practice was administered to the intended respondents in a 4-point Likert type scale namely; "to a great extent", "to a significant extent", "to a little extent", "not at all" with scores as 3, 2, 1 and 0 respectively. For the purpose of analysis, the mean adoption scores were calculated separately for each of the practice as well as for all the practices. Finally, on the basis of scores obtained, the respondents were classified into 3 categories by following the procedure as adopted by Dasgupta (1989).

Data Collection

Data collection from randomly selected respondents was made by using pre-tested "Structured Schedule" through personal interview method followed by group discussion. For this purpose, an interview schedule was constructed for data collection from the respondents in the light of the objectives of the study. The selected respondents were personally approached and interviewed at their place of residence/field by the investigators along with the scientific staff of the concerned KVK and their responses were carefully recorded in the schedule.

Statistical analysis

The collected data were coded, tabulated and analysed in accordance with the objectives of the study using appropriate statistical tests. The rank order correlation of coefficients were calculated to see the strength of association between the rankings produced by dependent and independent variables by using the formula given.

$$r_s = 1 - \frac{6\Sigma d^2}{n\left(n^2 - 1\right)}$$

Where, r_s = Spearman's rank order correlation coefficients

d^2 = square of the difference of corresponding rank

While mathematical measure like regression analysis was used to ascertain the contribution of independent variables on dependent variable. The formula is given below.

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + b_{12}x_{12} + b_{13}x_{13}$$

Where,

Y = dependent variable (extent of adoption of poultry farming practices)

a = constant, b = regression co-efficient

x_1=age , x_2= education , x_3= caste, x_4= family type, x_5= family size, x_6= primary occupation, x_7= annual income, x_8= size of operational land holding, x_9= type of primary farming activities, x_{10}=farming experience, x_{11}= training received, $x_{12=}$mass media exposure and x_{13}=extension contact. The calculated value of 't' were compared with the table value of 't' at 0.05 and 0.01 level of probability.

Fisher 't' test, $t = r\sqrt{\frac{n-2}{1-r^2}}$ with (n-2) d. f.

Where, r = observed co-efficient of correlation, n = number of observation

d. f. = degree of freedom, and t = $\frac{B}{\hat{s}}$ with (n-k) d.f.

Where, =regression co-efficient, ŝ = standard error, n=number of observation, K= number of independent variables were applied to respective rank order correlation coefficients and multiple regression to identify the significant cause effect relationship i.e. to ascertain the role of independent variables on the dependent variable.

Results and Discussion

Extent of adoption of poultry farming practices

It is observed from Table 1 that more than half of the respondents (51.54%) had adopted improved poultry farming practices at medium level by the beneficiary respondents followed by high (26.15%) and low by 22.31% respondents. While 46.15% respondents in non-adopted villages had adopted poultry farming practices followed by low (43.08%) respondents and high (10.77%) respectively. The mean value of 28.80 indicates that farmers, by and large, in adopted villages had medium level of adoption on improved practices of poultry farming practices. The findings were in conformity with those of the study conducted by Rahman (2007) and Ithika *et al.* (2013). While in case of non-adopted villages, the corresponding mean value of 22.58 indicates that farmers in general were in the category of poor to medium level of adoption of improved poultry farming practices. The mean score difference of 6.22 clearly indicates that there was wide difference between the two categories of the respondents in adoption of improved poultry farming practices which focuses on urgent requirement of technical interventions by the concerned stakeholders including KVKs for hand-on training programmes for farmers particularly those of non-adopted villages.

Practice- wise extent of adoption of poultry farming practices

The practice-wise extent of adoption of poultry farming is presented in Table 2. The data presented in the table show that the specific recommendations such as provide well ventilations under housing management, provide clean water at all times under feeding and nutrition, select a healthy and strong cock under brooding and rearing and weeding out of uneconomical birds and non-producers under culling were found adopted by all (100%) the beneficiary respondents. While only one recommendation under feeding and nutrition like provide clean water at all times was found adopted by all the non-beneficiary farmers. The table further indicates that the extent of adoption by the beneficiary farmers was much higher compared to that of non-beneficiary farmers as shown by their corresponding total core values in recommendations such as recommended stocking density (257 and 193) under stock of birds, provide well ventilations (312 and 239) under housing management, select a hen that is broody, does not abandon her eggs during hatching and looks after her chicks well (232 and 165), select a healthy and strong cock (283 and 202) and chick after hatching should be housed at a temperature between 30-33^{0}C at a relative humidity between 40-46% for 28 days (189 and 110) under brooding and rearing and vaccination preferably at 3 weeks of age (143 and 42), dust floor of house with an insect powder approved for use with chicken (190 and 106) and de-worm once during dry season

Table 1: Extent of adoption of poultry farming technology by the respondents of adopted and non-adopted villages

Sl. No.	Category	Score Range	Distribution of Respondents								Mean Difference
			Adopted Village (n_1=130)				Non-Adopted Village (n_2=130)				
			f	%	*Mean*	*S.D.*	*f*	%	*Mean*	*S.D.*	
1.	Low	<21.46	29	22.31			56	43.08			6.22
2.	Medium	21.46-36.14	67	51.54	28.80	6.34	60	46.15	22.58	6.29	
3.	High	>36.14	34	26.15			14	10.77			
	Total		**130**	**100.00**			**130**	**100.00**			

Table 2: Practice-wise extent of Adoption of poultry farming practices by the farmers

Sl. No.	Practice	Distribution of Respondents (n_1=130, n_2=130)											
		To a great extent (3)		To a significant extent (2)		To a little extent (1)		Not at all (0)		Total Adoption		Total Score	
		AV (f_1)	NAV (f_2)	AV (n_1)	NAV (n_2)	AV (n_1)	NAV (n_2)	AV (n_1)	NAV (n_2)	AV (n_1)	NAV (n_2)	AV (n_1)	NAV (n_2)
1.	**Stock of birds** (recommended stocking density)	34	16	69	61	17	23	10	30	120	100	257	193
2.	**Housing management**												
	i. Raise house to protect birds from predators	24	11	61	56	33	40	12	23	118	107	227	185
	ii. Provide well ventilations	55	23	72	70	3	30	0	7	130	123	312	239
3.	**Feeding and Nutrition**												
	i. Provide a balanced diet	31	17	66	57	13	40	20	16	110	114	238	205
	ii. Provide clean water at all times	50	41	70	72	10	17	0	0	130	130	300	284
4.	**Brooding and Rearing**												
	i. Select a hen that is broody, does not abandon her eggs during hatching and looks after her chicks well	23	5	68	45	27	60	12	20	118	110	232	165
	ii. Select a healthy and strong cock	42	12	69	58	19	50	0	10	130	120	283	202
	iii. Chick after hatching should be housed at a temperature between 30-33°C at a relative humidity between 40-46% for 28 days	17	2	45	22	48	60	20	46	110	84	189	110
5.	**Culling** (weeding out of uneconomical birds and non-producers)	48	23	77	75	5	27	0	5	130	125	303	246
6.	**Health care**												
	i. Vaccination preferably at 3 weeks of age	15	0	33	12	32	18	50	100	80	30	143	42
	ii. Dust floor of house with an insect powder approved for use with chicken	17	0	46	27	47	52	20	51	110	79	190	106
	iii. De-worm once during dry season and again at start of rainy season or chicken look weak	39	13	65	58	17	50	9	9	121	121	264	205

Note: *AV-Adopted village, NAV-Non-adopted village and Figure in parentheses indicates percentage*

and again at start of rainy season or chicken look weak (264 and 205) under health care.

Relationship and influence of personal and socio-economic characteristics of respondents with and on their extent of adoption poultry farming practices

In order to study the nature of relationship between personal and socio-economic characteristics and extent of adoption poultry farming practices, the rank order correlation co-efficients were calculated with the help of computer software SAS 9.2. The results are given in Table 3. From the table, it is seen that out of 13 independent variables under study namely; age, education, caste, family type, family size, primary occupation, annual income, size of operational land holding, type of primary farming activities, farming experience, trainings received, mass media exposure and extension contact, three variables viz. primary occupation, trainings received and mass media exposure were found having positively significant correlation with the extent of adoption of poultry farming practices as evident from their corresponding 'r' values having significant at 0.01 and 0.05 levels of probability in case of beneficiary respondents. This indicates that higher the level of those positively significant variables of the respondents higher would be their extent of adoption towards improved poultry farming practices. The findings are supported by the results obtained by Kumar *et al*. (2007) in case of primary occupation as the primary occupation of the household had a significant role in the decision-making for adopting a livestock enterprise among the farmers.

While only two variables- primary occupation and extension contact were found positively significant relationship with the extent of adoption of poultry farming practices in case of non-beneficiary respondents. Teklewold *et al.* (2006) also reported similar findings in case of extension services and contact with the adoption of poultry technology. While Rahman (2007) observed that adoptions of improved livestock (piggery) farming technologies were associated with education, farming experience and training received. Hence, the concerned stakeholders in the region should pay care and much attention on these personality traits of the farmers while taking up any transfer of technology

Table 3: Relationship and contribution of independent variables towards dependent variable

Independent variables	Adoption of technologies by the farmers (Dependent variable)					
	'r' value		Std. 'b' value		't' value	
	AV	NAV	AV	NAV	AV	NAV
Age	-.092	-.092	.019	-.109	.202	-1.027
Education	-.127	-.127	.164	-.170	1.566	-1.522
Caste	-.031	-.031	.057	-.044	.592	-.486
Family Type	-.090	-.090	.331	-.101	2.973**	-.855
Family Size	-.087	-.087	-.024	-.071	-.233	-.557
Primary Occupation	.236**	.226**	-.063	.259	-.662	2.660**
Annual Income	.102	.012	-.088	.142	-.874	1.362
Size of Operational Land Holding	.015	.015	.344	.014	3.822**	.151
Type of Primary Farming Activities	.034	.034	-.113	.087	-1.276	.845
Farming Experience	-.157	-.157	-.095	-.150	-1.090	-1.419
Trainings Received	.184*	0.042	-.033	.236	-.297	2.297*
Mass Media Exposure	.189*	-0.069	.003	.012	.031	.115
Extension Contact	.133	.193*	.027	.392	.255	2.183*
R^2-value			0.232	0.178		

**Significant at 0.05 level of probability*

*** Significant at 0.01 level of probability*

programme related to poultry farming among the farmers.

AV-Adopted Village, NAV-Non-Adopted Village

The multiple regression analysis was employed to determine the relative influence of each independent variable in explaining the variation in the dependent variable (Table 3). The thirteen independent variables namely; age, education, caste, family type, family size, primary occupation, annual income, size of operational land holding, type of primary farming activities, farming experience, trainings received, mass media exposure and extension contact were included for the purpose of this study. The predictive power of each multiple regression was estimated by working out the value of co-efficient of determination (R^2). To test the statistical significant of the regression co-efficients, the 't' values were also calculated. The results presented in Table 3 show that 3 (three) out of 13 (thirteen) independent variables viz; family type and size of operational land holding of the beneficiary respondents, as shown by their significant 't' values, had significant contribution to their extent of adoption of poultry farming practices and were considered as the most dominant factors affecting the extent of adoption improved poultry farming practices. The joint family type of the farmers played important role in adoption of such poultry practices which might be attributed due to the fact that sufficient availability of family labour facilitated the livestock rearing including poultry.

It is also observed from the table that the variables-primary occupation, trainings received and extension contact of the non-beneficiary respondents had positively significant contribution towards adoption improved poultry farming practices, indicating that these variables had significant influence towards adoption of poultry farming practices. This signifies that those positively significant variables had the highest contribution to the extent of adoption improved poultry farming practices in study areas. The R^2 value of 0.232 and 0.178 clearly indicate that all the thirteen independent variables taken together helped in explaining about 23.20% and 17.80% of the total variation in beneficiary and non-beneficiary respondents' extent of adoption in improved poultry farming practices respectively.

Conclusion

It can be concluded that some of the practices although assumed very important in terms of potential growth of different poultry breeds, were poorly adopted their specific recommendations by the majority of the respondents in both adopted and non-adopted villages. Extension programmes conducted by the concerned stakeholders for farmers in remote area and information transmitted orally among trained farmers in adopted villages were not enough to increase adoption level of poultry technologies. Technologies with complicated components or required more time and labours were difficult for farmers to apply recommended specific practices in their farming systems.

The study further reveals that due to various scientific and innovative approaches taken up by KVKs in study area, farmers in adopted villages had the highest benefit of poultry farming in terms of its production and productivity per year by improving housing management, feeding and nutrition, health care etc. in their farming system among the respondents in adopted villages compared to that of farmers of non-adopted villages. The findings also indicate that the variables such as primary occupation, training received and extension contact of the respondents had significant association with the adoption level of poultry technologies, while family type, primary occupation, size of operational land holding and training received of the respondents shown significant contribution towards adoption of improved poultry practices as evident by their corresponding significant 't' values of multiple regression co-efficients.

These factors should be addressed to accelerate the development of poultry sector in the North Eastern Region, which is an important source of livelihood for million of poor people. This calls for extension agencies and other concerned departments to manipulate these crucial factors in order to bring about desirable changes in the adoption behaviour of farmers towards improved poultry technologies. Necessary technical guidance through extension efforts including specific demonstration and training programmes followed by other extension programmes such as awareness camps may be taken up by the concerned line departments and other stakeholders including Krishi Vigyan Kendras (KVKs). Farmers should be encouraged to make

use of all the improved poultry production and management practices to achieve the desired result of profitability and sustainability in poultry sector in the region.

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