Extent of Adoption of Improved Pig Farming Practices by the Farmers and their Effective Determinants in North Eastern States of India

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ABSTRACT

This study to determine the extent of adoption of pig farming practices in North Eastern Region of India 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 over half of the respondents in KVKs adopted villages had medium level of adoption of improved pig farming practices, while majority with over half of the total respondents in non-adopted villages were found poor adoption level of the same piggery practices. Respondents of non-beneficiary farmers was found little adoption of specific recommendations of selected farming practices like housing, breeding, feeding and health care as shown by their corresponding mean values compared to beneficiary farmers.

1. Introduction

Animal husbandry is an important sub-sector of agriculture in India and most households in tribal, hilly and other marginalized groups rely on livestock for their livelihoods. Piggery is the sector that directly influences the socio-economic status of the rural poor, more particularly the hilly and tribal population of the country as it acts as an insurance coverage for the downtrodden and socially weaker section of the society (Anon 2011). The North Eastern Region of India, because of its social, cultural and religious acceptance, the consumption of meat is relatively higher and that of milk and milk products is lower. Piggery is widely distributed in all the eco-regions of the country and is an important occupation of the rural society especially the tribal masses in the region. According to FAO records, India's pig population is 13.84 million (FAOSTAT 2011) and it constitutes 1.47% of world pig population and out of total pig population in

India, 28% are grown in this region (Anon. 2003) and 60-90% of rural families in the region keep a few pigs as primary source of income for livelihood (Deka and Thorpe 2008). Pig farming has a numerous advantages such as pigs convert inedible feeds, forages, certain grain by-products obtained from mills, meat by-products, damaged feeds and garbage *etc.* into valuable nutritious products. Pig grows fast and is a prolific breeder, farrowing 10 to 12 piglets at a time. With a small investment on building and equipment, proper feeding and sound disease control programme, the farmer can profitably utilize his time and labour in this subsidiary occupation. The faeces of pigs are used as a manure to maintain soil fertility. Pig farming can be profitably practiced by small, marginal and landless farmers, part time earning for educated youth having agriculture as occupation, uneducated / unemployed youth and Farm women. Pig keeping also contributes to socio-cultural obligations and risk diversification and converts existing resources and low value

waste products into high-value animal source food for home consumption and/or sale. The commonly grown breeds in the region are Hampshire, large white Yorkshire, HS X I, landrace, Ghungroo and Indigenous *etc*. However, increasing population pressure and changing lifestyle of the people, has posed challenges for meeting the livelihood needs and sustaining their environmental resource due to poverty, natural resource degradation and depleting returns for production systems. Piggery sector in the region is gaining slow and steady momentum during past several years. However, a significant proportion of landless labourers, small and marginal farmers has access to livestock resources and the acceleration in the growth of livestock sector in North Easter Region offers significant opportunities for household income augmentation and employment generation. Moreover, increased instances of transition from shifting cultivation to more integrated farming have been reported among the farmers. The challenge is to ensure that the region can produce enough pork for the domestic demand while ensuring benefit to pig producing families from the growing market by: (i) increase the levels of productivity in a sustainable manner and to increase marketable surplus. This requires access to appropriate technologies including better animal breeds, feeds and health services as well as credit facilities and risk reduction mechanisms such as insurance; (ii) ensuring that producers can access markets through appropriate institutional arrangements that allow markets to function efficiently; and (iii) ensuring an enabling policy environment that encourages and promotes the appropriate input supplies and services. Of late, however, attention has been directed towards the crucial role farmers in the sustainable production and management of livestock technologies. There is a need to identify the factors that contribute positively to the adoption of new livestock technologies as well as those that represent main constraints for the diffusion /adoption process (Nell *et al.,* 1998). Their key environmental and socio-economic factors have significant influence towards adoption and diffusion of agriculture technologies (Lestrelin *et al.,* 2012). Hence, the present study was undertaken to see the adoption behaviour of the farmers between adopted and non-adopted villages with respect to piggery farming and its important determinants. The outcomes of the study will be helpful to know what and to what extent changes in pattern of adoption have been taken place and help in setting future location specific policy and program directions in the light of socio-economic development of farming community in the region.

2. Materials and Methods

The study was conducted during 2012-14 by the ICAR-Zonal Project Directorate, Zone-III as part of the institute research project-"Impact Analysis of Krishi Vigyan Kendras (KVKs) 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 piggery in his own farming system on regular basis for last fifteen years was considered as respondent (beneficiary) for the present study. While a farmer in non-adopted village who is practicing piggery 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 piggery farming practices was considered as the dependent variable, which was operationally defined as the level of adoption of recommended pig farming practices by the respondents in their farming system. To determine the extent of adoption, improved pig 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.

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

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 piggery 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, B=regression co-efficient, $\hat{s}$= 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.

3. Results and Discussions

Extent of adoption of piggery farming practices

The findings related to farmers' extent of adoption indicate that over half of the respondents (61.54%) had medium level of adoption of improved practices of piggery farming. While 32.32% and 13.85% respondents had low and high level of adoption of improved practices of piggery farming in case of the farmers of adopted villages (Table 1). The mean value of 28.39 indicates that by and large, farmers of adopted villages in the study area had medium level of adoption on improved practices of pig farming. The finding is in conformity with that of the study in Mizoram conducted by Rahman (2007). In case of farmers of non-adopted villages, majority of the respondents (50.00%) were found in low category of adoption level followed by medium (46.15%) and high (3.85%) respectively. The corresponding mean value of 24.21 indicates that farmers in non-adopted villages were poor in adoption of improved pig farming practices. The mean difference of 4.18 between the adoption levels of two categories of respondents further, focuses urgent requirement of KVK interventions including for hand-on training programmes for farmers particularly those of non-adopted villages.

Table 1. Extent of adoption of piggery 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	<23.75	42	32.31			65	50.00			4.18
2.	Medium	23.75-43.03	80	61.54	28.39	7.64	60	46.15	24.21	5.88	
3.	High	>43.03	18	13.85			5	3.85			
	Total		130	100.00			130	100.00			

Practice- wise extent of adoption of piggery farming practices

The practice-wise extent of adoption of piggery farming is presented in Table 2. It is noticed from the table that all the respondents (100%) of both adopted and non-adopted villages were found adoption of specific recommendations like construct shed on dry and properly raised ground and provide proper shade and cool drinking water in summer under housing practice, breed the animals when it is in peak heat period (12-24 hrs. of heat) under breeding practice, use waste from kitchen/cold storage/ ware houses *etc.* in replacing the balanced rations to minimize the cost of production under feeding practice and deworm the animals regularly and wash the animals from time to time to promote sanitation under the practice of health care. The table further shows that four specific recommendations such as provide proper shade and cool drinking water in summer, use waste from kitchen/cold storage/ ware houses *etc*. in replacing the balanced rations to minimize the cost of production, consult the nearest veterinary aid centre for help if illness is suspected, deworm the animals regularly and wash the animals from time to time to promote sanitation were found adopted to a significant extent to a great extent as evident by their corresponding mean score above 2.00 among the respondents of adopted villages. The symbolic adoption of various pig management practices was also observed to a significant extent of over half of the respondents by Sasikala (2011). While seven specific recommendations were observed very poorly adopted by respondents in non-adopted villages as shown by their corresponding mean score less than 1.00. These recommendations were floor should be pucca/ hard, even, non-slippery, well sloped (3cm per metre) and properly drained to remain dry and clean (0.96), individual pens for boars and lactating sows should be constructed (0.91), breeding, select upgraded/cross bred exotic stock in good health for commercial pig farming (0.64), vaccinate the newly purchased animals against diseases (0.62), 2 farrowings in a year by adopting optimal management condition (0.89), for every 10 sows one boar must be maintained for maximum fertility (0.74) and strictly follow the recommended vaccine (0.57) respectively.

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

In order to study the nature of relationship between personal and socio-economic characteristics and extent of adoption piggery farming practices, the rank order correlation co-efficient 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, four variables *viz*. primary occupation, farming experience, trainings received and extension contact were found having positively significant correlation with the extent of adoption of piggery 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 piggery 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- education and extension contact were found positively significant relationship with the extent of adoption of piggery farming practices in case of non-beneficiary respondents. Rahman (2007) also reported that adoptions of improved 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 programme related to piggery farming among the farmers.

Table 2. Practice-wise extent of Adoption of piggery 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		Mean 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 (f_1)	NAV (f_2)	AV (n_1)	NAV (n_2)
1.	Housing i. Construct shed on dry and properly raised ground	16	9	89	82	25	39	0	0	130 (100.00)	130 (100.00)	1.93	1.77
	ii. Floor should be pucca/ hard, even, non-slippery, well sloped (3cm per metre) and properly drained to remain dry and clean	2	0	86	54	12	17	30	59	100 (76.92)	71 (54.61)	1.46	0.96
	iii. Provide proper shade and cool drinking water in summer	32	12	88	90	10	28	0	0	130 (100.00)	130 (100.00)	2.17	1.87
	iv. Individual pens for boars and lactating sows should be constructed	12	5	51	46	27	12	40	67	90 (69.23)	63 (48.46)	1.27	0.91
2.	Breeding i. Select upgraded/cross bred exotic stock in good health for commercial pig farming	23	0	65	35	12	13	30	82	100 (76.92)	48 (36.92)	1.62	0.64
	ii. Vaccinate the newly purchased animals against diseases	9	0	47	29	33	23	41	78	89 (68.46)	52 (40.00)	1.18	0.62
	iii. Two farrowings in a year by adopting optimal management condition	4	0	40	46	46	24	40	60	90 (69.23)	70 (53.85)	1.06	0.89
	iv. For every 10 sows one boar must be maintained for maximum fertility	3	0	43	36	32	24	52	70	78 (60.00)	60 (46.15)	0.98	0.74
	v. Breed the animals when it is in peak heat period (12-24 hrs. of heat)	7	11	91	88	32	31	0	0	130 (100.00)	130 (100.00)	1.81	1.85
	vi. Follow judicious culling of old animals after 10-12 farrowings.	13	8	46	39	44	35	27	48	103 (79.23)	82 (63.07)	1.35	1.05
3.	Feeding i. Feed the animals with best feed including	3	0	45	40	72	64	10	26	120 (92.31)	104 (80.00)	1.31	1.11

									AV	NAV	AV	NAV
	concentrates in the ration											
	ii. Feeding of piglets with high quality and more fortified diets	17	0	78	62	25	43	10	25	120 (92.31)	105 (80.77)	1.78	1.28
	iii. Use waste from kitchen/cold storage/ ware houses etc. in replacing the balanced rations to minimize the cost of production	42	38	83	86	5	6	0	0	130 (100.00)	130 (100.00)	2.28	2.25
	iv. The feeding regime adopted should take care of all the nutrient requirements of various categories of pigs.	15	10	61	67	26	37	28	16	102 (78.46)	114 (87.69)	1.48	1.55
4.	Health care i. Protect the animals against common diseases	16	4	49	45	31	37	34	44	96 (73.85)	86 66.15)	1.36	1.07
	ii. Consult the nearest veterinary aid centre for help if illness is suspected	37	18	87	77	6	26	0	9	130 (100.00)	121 93.07)	2.24	1.80
	iii. Deworm the animals regularly	33	20	90	96	7	14	0	0	130 (100.00)	130 (100.00)	2.20	2.05
	iv. Wash the animals from time to time to promote sanitation	36	17	81	94	13	19	0	0	130 (100.00)	130 (100.00)	2.18	1.98
	v. Strictly follow the recommended vaccine	11	0	44	31	30	12	45	87	85 (65.38)	43 (33.07)	1.16	0.57

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

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 of this analysis are given in Table 3. The table shows that 3 (three) out of 13 (thirteen) independent variables *viz*., family type, family size and farming experience of the beneficiary respondents, as shown by their significant 't' values, had significant contribution to their extent of adoption of piggery farming practices and were considered as the most dominant factors affecting the extent of adoption improved piggery farming practices.

The large family size of the farmers played important role in adoption of such piggery practices which might be attributed due to the fact that sufficient availability of family labour facilitated the livestock rearing including piggery. It is interesting to note that the variable- size of operational land holding of the respondents had negatively significant contribution towards adoption improved piggery farming practices, indicating that the respondents' level of size of operational land holding showed negative impact on their level of adoption of the practices. While only one variable namely; type of primary farming activities had yielded significant contribution to their extent of adoption of piggery farming practices in case of non-beneficiary respondents.

This signifies that those positively significant variables had the highest contribution to the extent of adoption improved piggery farming practices in study areas. The R^2 value of 0.391and 0.281 clearly indicate that all the thirteen independent variables taken together helped in explaining about 39.10% and 28.10% of the total variation in beneficiary and non-beneficiary respondents' extent of adoption in improved piggery farming practices respectively.

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	-.058	-.058	-.121	.013	-1.255	.118
Education	.088	.188*	-.037	.052	-.349	.439
Caste	-.160	-.160	-.037	-.154	-.371	-1.598
Family Type	-.099	-.099	.229	-.042	2.002*	-.334
Family Size	-.045	-.045	.239	-.063	2.257*	-.463
Primary Occupation	.185*	.155	.039	.104	.401	1.008
Annual Income	.033	.033	.084	.100	.814	.903
Size of Operational Land Holding	-.015	-.015	-.228	.017	-2.475*	.179
Type of Primary Farming Activities	.071	.071	.015	.239	.161	2.249*
Farming Experience	.192*	.062	.173	-.049	1.986*	-.438
Trainings Received	.237**	.027	-.009	-.229	-.076	-1.188
Mass Media Exposure	-.045	-.045	-.083	-.085	-.779	-.784
Extension Contact	.197*	.197*	-.106	.343	-.982	.841
R^2-value			**0.391**	**0.281**		

*Significant at 0.05 level of probability

** Significant at 0.01 level of probability

AV-Adopted Village, NAV-Non-Adopted Village

Conclusion

From the study, it is concluded that some of the practices although very important in terms of potential growth of different breeds of pigs, were poorly adopted their specific recommendations by the majority of the respondents. 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 of piggery 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 pig farming per year by increasing different housing, breeding, feeding and health care practices 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 education, primary occupation, farming experience training received and extension contact of the respondents had significant association with the adoption level of piggery technologies, while family type, family size and farming experience of the beneficiary respondents shown significant contribution towards adoption of improved piggery practices as evident by their corresponding significant 't' values of multiple regression co-efficients. These factors should be addressed to accelerate the development of livestock 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 piggery 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 rice cultivation and other management practices to achieve the desired result of sustainability in agriculture and boosting rice production in the region.

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