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Qualifying factors influencing adoption of improved dairy farming practices by the farmers in North Eastern Region of India

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Abstract

This study to assess the extent of adoption and its determining factors of improved dairy farming practices by the farmers was conducted in 13 selected districts in the region with 130 sample size from each KVKs 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 (53.85%) in KVKs adopted villages had medium level of adoption of improved dairy farming practices, while over half of the total respondents (53.08%) in non-adopted villages were found in low adoption level of the same dairy farming practices. Specific recommendations like natural feeding/ grazing and sufficient supply of clean water under feeding practice, providing drainage facilities and milking lactating animals regularly under housing management and deworming and grooming under health care were found adoption by all the respondents (100%) in both categories. The study further shows that out of 13 independent variables under study, only three variables namely; education, farming experience and training received of the two categories of respondents were found having positively significant relationship with their extent of adoption of dairy farming practices. While four variables such as education, type of primary farming activities, training received and extension contact in case of beneficiary farmers and three variables namely; annual income, farming experience and training received in case of non-beneficiary farmers had emerged as the most dominant factors influencing for adoption of improved dairy farming practices.

Keywords: Adoption, dairy farming, adopted village, non-adopted village, north eastern region, KVK

Introduction

The Indian agricultural system is predominantly a mixed crop-livestock farming system, with the livestock segment supplementing farm incomes by providing employment, draught animals and manure. Livestock is directly linked with poor landless agricultural labourers as well as small and marginal farmers for their livelihood. India has vast resources of livestock, which play an important role in the national economy and also in the socio-economic development of millions of rural households. The dairy sector provides over 80 million farm households with the triple benefits of nutritive food, supplementary income and productive employment for family labour, mainly for women, contributing about 5.3 per cent to India's agricultural GDP (Belhekar and Dash, 2016) [2]. The country has one of the largest stocks of cattle and buffaloes: more than 50 percent of the world's buffaloes and 20 percent of its cattle. In India over 65 percent of the population is engaged in agriculture and rearing of livestock and its contribution seems to be quite substantial in agricultural economy as well as national economy (Godara *et al.* 2018) [6]. In North Eastern region of India, livestock is an important component of mixed farming system due to preference of meat in their diets. Consumption of milk and milk products is lower in this part in comparison to Northern states of India due to food habit and less availability of milk, however, with the increase in per capita income and changes in life style, demand for milk and milk products is also growing in the region (Feroze *et al.* 2010) [5]. Hence, enhancement of milk production especially in landless, small and marginal households may be of prime importance. The region has the potential to meet the growing demand for milk, but the immediate need is to adopt and follow better technologies of dairy farming by the farmers. It is therefore, often suggested that the farmers should strive for higher adoption of the scientific practices of dairy farming to improve their production efficiencies. Past studies, however, 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) [4]. As reported by Kafle (2011) [7], As reported by Kafle (2011) [7], adoption of a new technology is also influenced by physical,

socio-economic and mental factors including farmers' attitude. Socio-economic factors have an effect on improved dairy management practices and decision making process (Belay *et al.* 2012) [1]. These factors will therefore, affect the dairy management, production and adoption level of the farmers. The present study, therefore, intends to assess the extent of adoption of improved dairy farming practices by the farmers in both KVKs adopted and non-adopted villages and identify the key socio-economic factors influencing adoption.

Materials and Methods

Location of study

The study was conducted in 13 districts covering 8 states of

North Eastern region of India namely; Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura during 2016-18. The study was confined to those districts where KVKs were functional for the last 20 years with full strength of scientific staff having infra-structural facilities. From thirteen districts- 4 from Assam, 2 each from Mizoram and Tripura and 1 each from Arunachal Pradesh, Manipur, Meghalaya, Nagaland and Sikkim (Table 1), two villages each-one adopted and one non-adopted village were selected for the present study.

Table 1: State and Host-wise distribution of selected KVKs for the study

| State | KVK | Host Institute | Year of Establishment |
|-------------------|-----------------|--------------------------------------------------------------|-----------------------|
| Assam | Cachar | Assam Agricultural University | 1994 |
| Assam | Golaghat | Assam Agricultural University | 1994 |
| Assam | Kokrajhar | Assam Agricultural University | 1985 |
| Assam | Sonitpur | Assam Agricultural University | 1979 |
| Arunachal Pradesh | West Siang | ICAR Research Complex for NEH Region | 1979 |
| Manipur | Imphal West | ICAR Research Complex for NEH Region | 1979 |
| Meghalaya | West Garo Hills | ICAR Research Complex for NEH Region | 1979 |
| Nagaland | Dimapur | ICAR Research Complex for NEH Region | 1979 |
| Mizoram | Kolasib | Dept. of Agriculture, Research & Education, Govt. of Mizoram | 1979 |
| Mizoram | Lunglei | Dept. of Agriculture, Research & Education, Govt. of Mizoram | 1994 |
| Sikkim | East Sikkim | ICAR Research Complex for NEH Region | 1982 |
| Tripura | South Tripura | ICAR Research Complex for NEH Region | 1984 |
| Tripura | West Tripura | Sri Ram Krishna Seva Kendra, Kolkata (NGO) | 1979 |

Selection of farmers

The study comprised of 260 randomly selected farmers, 20 farmers per district (10 beneficiaries and 10 non-beneficiaries). The beneficiary farmers were those farmers in adopted villages who had been directly benefitted for their farming activities including dairy farming through KVKs during the last 20 years. While non-beneficiary farmers were those farmers in non-adopted villages with a minimum distance of 20 kms from the nearest adopted village who received no technical support and assistance from the KVK in their farming activities.

Measurement of variables

The independent variables viz., 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 in the study and were measured with the help of schedules structured for the purpose. The extent of adoption of improved dairy farming practices was considered as the dependent variable. To determine the extent of adoption, improved major dairy 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 continuum scale namely; "to a great extent", "to a significant extent", "to a little extent" and "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 (Mean \pm S.D.) as adopted by Dasgupta (1989) [3].

Data collection

A pre-tested well structured schedule comprising of all aspects of personal, socio-economic and psychological variables of the respondents as well as package of recommended practices of dairy farming was prepared for data collection from the intended respondents. 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 for data collection during 2017-18 and their responses were carefully recorded in the schedule.

Statistical analysis

The collected data were coded, tabulated and analysed 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

The 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 dairy 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' was 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.

Results and Discussion

Adoption level of dairy farming practices

Data presented in Table 2 show that over half (53.85%) of the respondents in adopted villages were found medium adoption of dairy farming practices followed by high (23.85%) and low (22.30%). The mean value of 22.25 indicates that by and large, farmers in adopted villages had medium level of adoption on improved practices of dairy farming. The finding is in conformity with that of the study in Mizoram conducted by Rahman (2007) [12] on adoption of livestock farming practices. Mariyappan *et al*, (2018) [9] in their study on adoption Level of improved dairy farming technologies in Thanjavur district of Tamil Nadu also reported that majority of the dairy farmers had medium level of adoption of dairy technologies followed by low and high levels. While majority respondents (53.08%) in non-adopted villages had reported low adoption level of dairy farming practices followed by medium (43.85%) and high (3.07%) respectively. The Mean score difference of 4.87 between beneficiary and non-beneficiary respondents clearly shows that respondents in adopted villages were much higher in adoption level of improved dairy farming practices than non-beneficiary respondents.

Table 2: Extent of adoption of dairy farming practices by the farmers

| 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 | <17.64 | 29 | 22.30 | 22.25 | 4.61 | 69 | 53.08 | 17.38 | 5.07 | 4.87 |
| 2. | Medium | 17.64 -26.86 | 70 | 53.85 | | | 57 | 43.85 | | | |
| 3. | High | >26.86 | 31 | 23.85 | | | 4 | 3.07 | | | |
| | Total | | 130 | 100.00 | | | 130 | 100.00 | | | |

Practice-wise adoption of dairy farming practices

A perusal of data depicted in Table 3 discloses that specific recommendations like natural feeding/ grazing and sufficient supply of clean water under feeding practice, providing drainage facilities and milking lactating animals regularly under housing management and deworming and grooming under health care were found adoption by all the respondents (100%) in both categories. However, the specific recommendations in dairy farming followed by over three-fourths of the beneficiary respondents in adopted villages were breeding practice using exotic breed selection (86.15%), feeding concentrate feed to ensure nutritional needs of animals (93.85%), providing housed animals with adequate ventilations in housing management (92.30%) and providing suitable flooring and footing in housing (90.76%). In case of non-adopted villages, only 2 (two) practices namely; providing housed animals with adequate ventilations (84.61%) and providing suitable flooring and footing in

housing (84.61%) were found adopted by over three-fourths of the respondents. The table also indicates that none of the respondents in both categories of respondents were reported adoption of breeding practice using AI. The study also shows that none of the respondent in non-adopted villages followed vaccination programme for their domestic cattle. It is also interesting to note that systematic practice of grooming under health care was followed to a great extent by most of the non-beneficiary respondents as evident from its total score of 294 higher than that of beneficiary respondents (290). However, the corresponding total scores presented in the table further indicates that the beneficiary farmers were relatively higher than non-beneficiary farmers in the level of adoption of the specific recommendations like exotic breed selection, providing concentrate feed to ensure nutritional needs of animals and providing suitable flooring and footing in housing.

Table 3: Practice-wise extent of adoption of improved dairy 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. | Breeding practice | | | | | | | | | | | | |
| | i. Exotic breed selection | 37 | 0 | 65 | 20 | 10 | 23 | 18 | 92 | 112 (86.15) | 38 (29.23) | 251 | 63 |
| | ii. Breeding using AI | 0 | 0 | 0 | 0 | 0 | | 130 | 130 | 0 (0.00) | 0 (0.00) | 0 | 0 |
| 2. | Feeding | | | | | | | | | | | | |
| | i. Natural feeding/ grazing | 48 | 29 | 77 | 89 | 5 | 12 | 0 | 0 | 130 (100.00) | 130 (100.00) | 303 | 277 |

| | | | | | | | | | | | | | |
|----|----------------------------------------------------------------------------|----|----|----|----|----|----|----|-----|-----------------|-----------------|-----|-----|
| | ii. Concentrate feed to ensure nutritional needs of animals | 27 | 0 | 51 | 32 | 34 | 58 | 18 | 40 | 112 (93.85) | 90 (69.23) | 217 | 122 |
| | iii. sufficient supply of clean water | 32 | 28 | 74 | 61 | 24 | 41 | 0 | 0 | 130 (100.00) | 130 (100.00) | 268 | 247 |
| 3. | Housing Management i. Provide housed animals with adequate ventilations | 29 | 11 | 56 | 46 | 35 | 53 | 10 | 20 | 120 (92.30) | 110 (84.61) | 234 | 178 |
| | ii. Provide drainage facilities | 32 | 10 | 78 | 67 | 20 | 53 | 0 | 0 | 130 (100.00) | 130 (100.00) | 272 | 217 |
| | iii. Provide suitable flooring and footing in housing | 21 | 3 | 46 | 38 | 51 | 69 | 12 | 20 | 118 (90.76) | 110 (84.61) | 206 | 154 |
| | iv. Milk lactating animals regularly | 34 | 21 | 84 | 87 | 12 | 22 | 0 | 0 | 130 (100.00) | 130 (100.00) | 282 | 259 |
| 4. | Health care i. Vaccination | 21 | 0 | 32 | 0 | 40 | 0 | 37 | 130 | 93 (71.54) | 0 (0.00) | 167 | 0 |
| | ii. Deworming | 39 | 2 | 64 | 66 | 27 | 62 | 0 | 0 | 130 (100.00) | 130 (100.00) | 272 | 200 |
| | iii. Grooming | 40 | 46 | 80 | 72 | 10 | 12 | 0 | 0 | 130 (100.00) | 130 (100.00) | 290 | 294 |

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

Personal and socio-economic factors influencing adoption of dairy farming practices

In order to study the nature of relationship between personal and socio-economic characteristics and extent of adoption of dairy farming practices, the rank order correlation coefficients were calculated with the help of computer software SAS 9.2. The results are given in Table 4. 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, five variables *viz.* education, primary occupation, farming experience, trainings received and extension contact were found having positively significant correlation with the extent of adoption of dairy farming practices as evident from their corresponding 'r' values having significant at 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 dairy farming practices. The findings are supported by the results obtained by Kumar *et al.* (2007) ^[8] 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 four variables of the respondents in non-adopted villages namely; education, caste, farming experience and training received had positively significant correlation with the extent of adoption of dairy farming practices. Okunlola *et al.* (2011) ^[11] and Mariyappan *et al.* (2018) ^[9] also reported similar finding in case of level of education of the farmers with their adoptions of improved dairy farming technologies. The findings were also supported by those of Ofuoku *et al.* (2008) ^[10] in fish production technologies. Hence, the concerned stakeholders in the region should pay much attention on these personality traits of the farmers while taking up transfer of technology programmes and strategies related to dairy farming among the farmers.

Table 4: 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 | .052 | .052 | .083 | -.063 | .843 | -.581 |
| Education | .198* | .191* | .251 | .098 | 2.297* | .857 |
| Caste | .066 | .186* | .045 | -.083 | .444 | -.891 |
| Family type | .003 | .003 | .050 | .029 | .428 | .241 |
| Family size | .063 | .063 | -.064 | .006 | -.593 | .044 |
| Primary occupation | .196* | .021 | -.029 | -.026 | -.294 | -.265 |
| Annual income | .075 | .053 | -.183 | .201 | -1.735 | 1.902* |
| Size of operational land holding | .101 | .111 | .057 | .172 | .602 | 1.845 |
| Type of primary farming activities | .098 | .077 | .254 | -.040 | 2.735** | .380 |
| Farming experience | .204* | .205* | .061 | .328 | .669 | 3.027** |
| Trainings received | .187* | .190* | .191 | .187 | 1.932* | 1.895* |
| Mass media exposure | .128 | .028 | .267 | -.047 | .843 | -.442 |
| Extension contact | .221* | .121 | .048 | .050 | 2.297* | .270 |
| R ² -value | | | 0.458 | 0.339 | | |

*Significant at 0.05 level of probability

** Significant at 0.01 level of probability

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 4). The thirteen independent variables under study 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 (R²). To test the statistical significant of the regression co-efficients, the 't' values were

also calculated. The results depicted in Table 4 reveal that 4 (four) out of 13 (thirteen) independent variables *viz*; education, type of primary farming activities, training received and extension contact of the beneficiary respondents, as shown by their significant 't' values, had significant contribution to their extent of adoption of dairy farming practices. The study further revealed that annual income, farming experience and training received of the respondents had positively significant contribution towards adoption of improved dairy farming practices in case of non-beneficiary farmers and were considered as the most dominant factors affecting the extent of adoption improved dairy farming practices. Farmers' access to funds and level of annual income also played significant role towards adoption of dairy farming practices. This signifies that those positively significant variables had the highest contribution to the extent of adoption improved dairy farming practices in study areas. The R² value of 0.458 and 0.339 clearly indicate that all the thirteen independent variables taken together helped in explaining about 45.80% and 33.90% of the total variation in beneficiary and non-beneficiary respondents' extent of adoption in improved dairy farming practices respectively. These personal and socio-economic variables are capable of inducing change in the mental ability of the farmers which facilitate them to take mental decisions and adoption of improved dairy farming practices in their farming situations.

Conclusion

It is concluded from the study that some of the practices although very important in terms of potential growth of dairy farming, were poorly adopted their specific recommendations by the majority of the respondents in both categories of farmers. Extension programmes and activities 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 improved dairy farming technologies. Practices with complicated and highly technical components and required more time, money and labours such as investment on exotic breeds, use of AI(Artificial Insemination) under breeding practices and vaccination under health care were difficult for farmers to adopt in their farming systems. The study further revealed that due to various scientific and innovative approaches taken up by KVKs in study areas, most of the farmers in adopted villages, by and large, had the highest benefit/ profit of dairy farming per year by improving their practical knowledge and skills on different practices in their farming system compared to that of farmers in non-adopted villages. From the findings, it can be inferred that the socio-economic circumstances influence adoption of technologies to a great extent, and these factors are the ones that determine the unique adoption process of improved dairy farming practices. Hence, extension personnel and other stakeholders while planning and taking up any dairy development programme should pay priority on those significant factors to accelerate the development of dairy sector in the North Eastern region. Proper technical guidance through systematic extension efforts including specific demonstration, awareness campaigns and training programmes on different components of dairy technology should be organised on regular basis by the concerned line departments as well as Krishi Vigyan Kendras (KVKs) so that farmers could exploit the opportunities to their advantage not only to improve income for their families but also meet the growing demand for dairy products in the region.

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