AN APPRAISAL ON THE LEVEL OF ADOPTION OF DAIRY INNOVATIONS AMONG DAIRY FARMERS IN ANDHRAPRADESH

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Abstract: A sample of 360 dairy farmers from three districts *viz*., Visakhapatnam, Krishna and Chittoor comprising all the three regions of Andhra Pradesh i.e., North-coastal, Coastal and Rayalaseema were selected purposively for the study in view of their highest rate of adoption of innovations suggested by the State Department of Animal Husbandry. Nine innovations namely Package of practices for feeding and management of heifers, pregnant and lactating animals; Formulation and feeding of complete feed blocks; Feeding of area specific mineral mixture; Cultivation and feeding of hydroponic fodder; Cultivation and feeding of Azolla; Strategies for enhancement of milk yield and quality; Use of milking machine; Marketing strategies to improve milk sales and Use of information and communication technologies were considered for adoption study in the present investigation. The findings on the overall adoption of the respondents indicated that majority of the dairy farmers belonged to medium level of adoption category (51.46%) followed by 42 pe rcent with low and 6.54 per cent with high rate of adoption respectively. The results of adoption index further revealed that, majority of the dairy farmers adopted recommended dairy innovations to a partial extent in the following rank order such as, package of practices for rearing heifers, pregnant and lactating animals, (75.6% - I); feeding of area specific mineral mixture (72.4% - II); strategies for enhancement of milk yield and quality (68.7% - III); marketing strategies to improve milk sales (66.3% - IV); use of information and communication technologies in adoption of dairy innovations (61.8% - V); cultivation and feeding of Azolla (41.4% - VI); Use of milking machine (28.7% -VII); Cultivation and feeding of hydro phonic fodder (38.4% - VIII) and Feeding of complete feed blocks (5.6% - IX) respectively.
Keywords: Level of Adoption; Adoption Index; Dairy innovation.

INTRODUCTION

Dairy sector assumed a sustained growth rate for the past 5 decades and stood first in world's milk production with 146.3 million metric tonnes by the year 2014 -15. Dairying ensures stable income to the farmers and plays a pivotal role in providing employment and income generating opportunities to the rural families. Dairying now has become a commercial enterprise and needs technology adoption for higher milk yield and lower per unit costs. Various organizations like State Veterinary Universities, State Department of Animal

Husbandry, Research organizations and Livestock extension services are acting at different levels to generate and transfer technologies amongst livestock farmers. Despite these efforts the adoption of recommended technologies/innovations has not been wide spread as anticipated (Lethadevi G). The need of the hour is to critically appraise how far the existing technologies are adopted by dairy farmers and the reasons for non-adoption. The non-adoption of technologies is attributed to low extension agent to farmers' ratio of 1:1500 or farmers risk averse towards new technologies or linear top-down approach of technology development and transfer. (Andrew Hall *et al.,* 2003, The World Bank, 2006).

The linear-top-down approach of extension delivery is restrictive in nature and this hinders its ability to stimulate the much needed break through to promote innovation and adoption among farmers by disregarding other traditional knowledge sources. (Byerlee *et al.,* 2007). When technologies are developed in isolation with regard to final users, they may serve as a disincentive for adoption while introduced to them. The lack of innovation spirit among farmers is generally due to asymmetry of information relating to the innovation introduced, technical know-how, market trends and infrastructural platform. The supply and demand of improved technologies involves a multifaceted interaction among all the stakeholders to trigger innovation, adoption and diffusion. (Egyir I.S *et al.,*2011).

The acceptance or rejection of a particular technology by the farmers depends upon the characteristics of the technology, the quality and density of extension personnel, farmers' attitude towards the technology and accessibility to technical inputs and services essential for adoption of an innovation. Keeping this in view, a study was undertaken with the specific objective to study the adoption level of dairy innovations by the dairy farmers as well as the factors associated with adoption of dairy innovations in Andhra Pradesh.

METHODOLOGY

The present study was carried out purposively in three regions i.e., North Coastal, Coastal and Rayalaseema regions of Andhra Pradesh. Based on the highest cattle population and best rank in adoption of recommended dairy innovations, three districts namely Visakhapatnam, Krishna and Chittoor were selected from the North coastal, Coastal and Rayalaseema regions respectively. Three mandals from each district and two villages from each mandal, i.e., 6 villages from each district totaling to 18 villages were finally selected for the study using simple random sampling technique.

Among the selected 18 villages, a list of dairy farmers adopting recommended dairy innovations in each village was prepared in consultation with local Veterinary Assistant

Surgeons, heads of dairy co-operatives and supervisors of milk collection centres. From the list prepared, 20 dairy farmers were selected from each village through random sampling technique thus to form a sample size of 360 respondents for the study. Semi-structured interview schedule was used to collect the data, through personal interview method.

The personal, socio-economic, psychological and communicational variables of the livestock farmers were considered as the independent variables for the study. Adoption level of the dairy innovations is the dependent variable. Package of practices for feeding and management of heifers, pregnant and lactating animals, Formulation and feeding of complete feed blocks, Feeding of area specific mineral mixture, Cultivation and feeding of hydroponic fodder, Cultivation and feeding of Azolla, Strategies for enhancement of milk yield and quality, Use of milking machine, Marketing strategies to improve milk sales and Use of information and communication technologies for adoption and diffusion of innovations were the innovations considered for the study.

A range of adoption is provided for these practices facilitating adjustments based on local conditions. An index for adoption is constructed to measure the rate of adoption using the following formula.

$$\text{Adoption quotient} = \frac{\text{No. of practices adopted}}{\text{No. of practices recommended}} \times 100$$

Each practice adopted within the range by a farmer was given a score of one. Based on the number of practices, the maximum possible score for dairy innovations was nine. An adoption quotient was computed for each farmer. Based on the adoption quotient, the respondents were categorized into 3 groups as high, medium and low level of adoption categories. Statistical techniques like frequency distribution, percentage, mean, standard error, correlation and multiple regression analysis were used to analyse the data.

RESULTS AND DISCUSSION

The results of the study revealed that majority of the dairy farmers adopted only half of the recommended innovations in the following rank order such as, package of practices for rearing heifers, pregnant and lactating animals (I), feeding of area specific mineral mixture (II), strategies for enhancement of milk yield and quality (III), marketing strategies to improve milk sales (IV), use of information and communication technologies in adoption of dairy innovations (V), whereas the practices like cultivation and feeding of Azolla (VI), Use of milking machine (VII), Cultivation and feeding of hydro phonic fodder (VIII) and Feeding of complete feed blocks (IX) were adopted by a very meager percent of the respondents.

Table 1: Distribution of dairy farmers based on adoption of dairy innovations

Sl.No	Practice	Adopted		Non-Adopted	
		N	%	N	%
1.	Package of practices for rearing for heifers, pregnant and lactating animals	272	75.6	88	24.40
2.	Feeding of area specific mineral mixture	261	72.4	99	27.60
3.	Strategies for enhancement of milk yield and quality	247	68.7	113	31.30
4.	Marketing strategies to improve milk sales	239	66.3	121	33.70
5.	Use of information and communication technologies to adopt dairy innovations	222	61.8	138	38.20
6.	Cultivation and feeding of Azolla	174	48.4	186	51.60
7.	Use of milking machine	103	28.7	257	71.30
8.	Cultivation and feeding of hydrophonic fodder	48	13.4	312	86.60
9.	Formulation and feeding of complete feed blocks	20	5.6	340	94.40

Package of practices for rearing heifers, pregnant and lactating animals: Three-fourths of the dairy farmers i.e., 75.6 per cent adopted the innovation Package of practices for rearing heifers, pregnant and lactating animals in which 54 percent adopted the innovation to a medium extent followed by 12.4 and 9.2 percent of the dairy farmers with high and low rates of adoption respectively. 24.4 per cent of the farmers did not adopt the innovation as they were unaware of the importance of Package of practices for rearing heifers, pregnant and lactating animals.

Feeding of area specific mineral mixture: On the whole it could be noticed that 72.4 per cent of the dairy farmers adopted the practice Feeding of area specific mineral mixture in which 52.8 per cent of the respondents adopted to a medium extent followed by 14.3 per cent of the respondents with high and 5.3 per cent of the respondents with low per cent of adoption respectively. The fact that about 27.6 per cent of the farmers did not adopt the innovation suggests that the farmers are aware of the benefits of Feeding area specific mineral mixture but expect a free cost of operation.

Strategies for enhancement of milk yield and quality: 68.7 per cent of the dairy farmers adopted the innovation Strategies for enhancement of milk yield and quality. 50.2 per cent of

the farmers adopted the innovation to a moderate extent followed by 14.4 per cent with high and 4.1 per cent with low adoption which is an indication that this innovation plays a dominant role in improving production levels as well as economic returns to the dairy farmers.

Marketing strategies to improve milk sales: The results pertaining to this innovation presented in Table 1 revealed that 63 per cent of the dairy farmers adopted the innovation Marketing strategies to improve milk sales which clearly suggests that the farmers are making rapid strides towards profit maximisation and hence the above trend.

Use of information and communication technologies to adopt dairy innovations: It is evident from the results of the Table 1 that 61.8 per cent of the respondents' utilised information and communication technologies like mobile phones, multimedia modules and what's app groups to gain information regarding dairy innovations which increased their knowledge levels persuading them to adopt the innovation.

Cultivation and feeding of Azolla: The dairy farmers are aware of the innovation Cultivation and feeding of Azolla, as the State Department of Animal Husbandry, Govt. of Andhra Pradesh implemented the scheme at mandal level in all the districts.Though aware of the innovation the adoption percent is found to be only 48.4 which might be attributed to skill involvement and regular monitoring aspects involved in cultivation of azolla like cleaning of pits, change of mother culture every week, drying before feeding etc.

Use of milking machine: The innovation use of milking machine is adopted by only 28.7 per cent of the dairy farmers who are progressive in nature and maintaining milch animals over and above ten on an average. 71.3 per cent of the dairy farmers are not using milking machine owing to small herd size of 2-3 animals and misbelief that the machinery may injure the udder.

Cultivation and feeding of Hydrophonic fodder: The innovation Cultivation and feeding of hydrophonic fodder was adopted by only 13.4 per cent of the dairy farmers which may be attributed to high cost involved, infrastructure and technology required for cultivation of hydrophonic fodder.

Formulation and feeding of complete feed blocks: Formulation and feeding of complete feed blocks was adopted by only 5.6 per cent of the dairy farmers maintaining commercial dairy farms where as remaining 94.4 percent of the dairy farmers are unaware of this innovation.

Overall adoption of common dairy farming technologies: Majority of the dairy farmers were found belonging to medium level of adoption behaviour (51.46%) followed by 42 percent with low and 6.54 per cent with high rate of adoption respectively (Table 2).

Table 2: Distribution of dairy farmers based on their overall rate of adoption of dairy innovations

Sl.No.	Category	Frequency	Percentage
1.	Low rate of adoption	144	42
2.	Moderate rate of adoption	185	51.46
3.	High rate of adoption	31	6.54
	Total	**360**	**100**

Relational analysis of adoption of Dairy innovations and other independent variables

Table 3: Relationship between adoption of dairy innovations and profile characteristics of dairy farmers

S.No.	Independent variables	Correlation coefficient r-value
1.	Age	-0.286**
2.	Gender	0.138[NS]
3.	Education	0.215[NS]
4.	Land holding	0.366*
5.	Experience	0.328**
6.	Herd size	0.265**
7.	Milk production	0.304**
8.	Income	0.480**
9.	Innovativeness	0.198[NS]
10.	Decision making ability	0.389**
11.	Risk bearing ability	0.182[NS]
12.	Economic orientation	0.333**
13.	Scientific orientation	0.178[NS]
14.	Perception	0.325**
15.	Attitude	0.282[NS]
16.	Information seeking behaviour	0.392**
17.	Communication channels	0.465**

 * Correlation is significant at 0.05 level
**Correlation is significant at 0.01 level

The results of Table 3 revealed that the computed 'r' values between profile characteristics i.e., land holding, experience, herd size, milk production, income, decision making ability, economic orientation, perception, information seeking behavior and communication channels were positively and significantly related while age is negatively and significantly related at 0.01 percent probability with adoption level of dairy farmers. The variables gender,

education, innovativeness, scientific orientation and communication channels correlated non-significantly with rate of adoption of dairy farmers.

  Majority of the dairy farmers belonged to middle age group, willing to try new technologies and bear risk whereas old age group members were risk averse and rigid to try new technologies which might have lead to negative correlation. Dairying in our country is an age old practice where both male and female counter parts of the family share the work at different stages of dairy farming which might be the plausible reason for its positive and non-significant relation. Majority of the respondents in the study area were illiterate and fell in early majority group of adopters which indicates that education had shown a positive impact on adoption of innovations.

Land holding exerted a positive and highly significant correlation with adoption of innovations. Farmers with sizeable land holdings had opportunity to maintain more number of animals, possessed sound knowledge on farming practices, had optimal risk bearing ability which facilitated them to adopt innovations at a faster pace. The farmers in the present study had an average experience of 15 years which increased their accessibility to various innovations in the dairy farming sector. Herd size is a critical factor in enhancing farming performance since outcome of new technology introduced is visible on a large scale which resulted in significant positive correlation. Gangasagar and Karanjkar (2009).

Majority of the farmers produced around 11 liters of milk /day on an average. Due to their regular contact with the milk societies the farmers became aware of the quality assurance of milk, clean and hygienic production of milk, importance of fat and SNF per cent etc., in milk which paved a way for highly significant co-relationship. Since most of the innovations suggested in the present study involved production and simple technology aspects, income had shown a positive and significant correlation.

 Innovativeness showed a positive but non-significant effect on adoption of innovations. Dairy farmers advocated rationality in decision making and adopted useful technologies from moderate to high extent. Pooja Patel *et al.,*(2014) and Surkar S.H *et al.,* (2014). The respondents were not prepared to accept the element of risk to an optimal extent which resulted in non-significant co-relation.

Economic orientation is essential for any farmer to enhance profitability and sustainability of his enterprise which exerted a positive and significant relationship. The positive and non-significant relation with scientific orientation suggests that it is imperative to provide access to latest technologies through trainings, demonstrations, expert systems etc., which might

push the farmers towards high scientific orientation. The adoption of new technologies is facilitated by how best the innovation is perceived by the farmer as profitable, compatible, simple in execution, trialable and practicable in his own situations. The innovations recommended in the study were perceived to meet the above attributes and hence a highly significant positive correlation. The farmers had a favourable attitude but only to a moderate extent towards recommended innovations.

Information seeking behaviour exerted a direct bearing on the adoption of innovations by the dairy farmers. Manisha C and Kansal S.K (2014) and Kassahun *et al.,* (2014). Communication channels, like news papers, radio, T.V, ICT tools like expert systems, multi media modules, web-portals, what's app groups etc., have brought out revolution in communication by providing access to information within fraction of seconds. Majority of the farmers in the study area utilized these channels from moderate to high extent which resulted in positive and significant relationship.

Prediction of contribution of independent variables on rate of adoption of dairy farmers

Table 4: Multiple linear regression analysis of independent variables with adoption of dairy farmers

S. No.	Variables	Regression coefficient (b)	SER	t value
1.	Age	-0.895	0.285	-2.438**
2.	Gender	0.058	0.160	0.175
3.	Education	0.005	0.137	0.072
4.	Land holding	0.935	0.236	1.813[NS]
5.	Experience	3.916	0.893	2.787**
6.	Herd size	-0.131	0.046	-0.875
7.	Milk production	0.147	0.056	1.339[NS]
8.	Income	0.550	0.186	3.777**
9.	Innovativeness	0.705	0.283	0.928
10.	Decision making ability	0.329	0.089	0.497**
11.	Risk bearing ability	0.690	0.287	2.407**
12.	Economic orientation	4.105	2.658	3.885**
13.	Scientific orientation	2.342	1.235	1.818
14.	Perception	0.887	0.234	0.361
15.	Attitude	0.229	0.013	1.446
16.	Information seeking behaviour	1.088	0.372	3.567**
17.	Communication channels	1.252	1.087	2.129

$R^2 = 0.587$,   F value = 12.22**

* Significant at 0.05 level of probability
** Significant at 0.01 level of probability

The R^2 value (0.587) indicated that all the independent variables put together explained variation in adoption of dairy farmers to an extent of 58.7 per cent. The computed F-value (12.22) was found to be highly significant.

Prediction of independent variables which contributed for maximum variation on adoption levels of dairy farmers

Table 5: Step down multiple regression analysis for predicting the influence of selected profile characteristics with adoption of dairy farmers

S. No.	Variables	Regression coefficient (b)	t-value
1.	Age	-3.218	-4.208**
2.	Experience	0.049	3.870**
3.	Herd size	2.741	43.549**
4.	Milk production	1.673	2.172*
5.	Income	0.049	3.128**
6.	Risk bearing ability	0.0872	0.1825
7.	Economic orientation	1.312	3.374**
8.	Information seeking behaviour	0.594	3.184**

R^2 = 0.564, F value = 11.584**
* Significant at 0.05 level of probability
** Significant at 0.01 level of probability

The results of Table 5 confirmed that eight variables viz., age, experience, herd size, milk production, income, risk bearing ability, economic orientation and information seeking behaviour significantly contributed to 56.4 per cent variation in adoption of innovations by dairy farmers. The variance ratio (11.584) was found to be significant at 1% level of probability.

Conclusion

The results of the study indicate that livestock farmers in Andhra Pradesh have been exposed to dairy innovations/technology diffusion programmes. Majority of the dairy farmers adopted the innovations but the rate of adoption of these technologies is far from desired. Therefore, enhancing the dissemination of information and knowledge about dairy farming technologies, ensuring relationship between farmers, researchers and extension officers,

distribution of input facilities among livestock owners is highly recommended. Rate of adoption and diffusion index need to be developed for each and every innovation to focus on identified components for profit maximisation.

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