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An analytical study on dairy farmers awareness on climate change

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Abstract
A study was undertaken to study the characteristics of dairy farmers and to assess the relationship between characteristics of dairy farmers and awareness level, in coastal districts of Tamil Nadu. A sample of 240 respondents was selected from sixteen villages by using random sampling method. Fourteen independent variables and one dependent variable were selected to analyze the relationship of characteristics of dairy farmers with awareness. The data were collected with the help of a well-structured and pre-tested interview schedule. The collected data were analyzed with suitable statistical tools. The results of the study revealed that majority of the dairy farmers had medium level (6-27 years) of experience in dairy farming. Little more than one-third of the respondents were engaged in agriculture as primary occupation and dairy farming as secondary occupation. Less than half (40.80%) of the respondents had medium level of community participation. The variables, Experience in dairy farming, Annual income, Mass media exposure had positive and significant relation with awareness at five percent level of significance.

Keywords: Awareness, community participation, annual income, dairy, Tamil Nadu

Introduction
The earth's climate is dynamic and always changing through a natural cycle. What the world is more worried about is that the changes that are occurring today have been speeded up because of man's activities. Thus, it is clear that climate change will adversely affect socio-economic sectors, that include agriculture, animal husbandry, forestry, fisheries, water resources, ecological systems and human health in many parts of the world. (CRIDA, 2013) [2].
Climate change poses a great challenge to dairy farming because of the sensitivity of dairy animals to excessive temperature and humidity, unpredictable climatic variations. Warmer and drier conditions increase the likelihood of heat stress in cattle. climate change affect quantity and quality of feed and fodder resources such as pastures, forages, crop residues, and the severity and distribution of livestock diseases and parasites and thus the production performance. Changes in rainfall patterns affects pasture growth patterns thereby affecting the quality and quantity of both feed grains and fodder produced. (Coetzer, 2016) [1]. Effect of increase of heat stress associated with climatic change on the dairy industry negatively affects milk production of cows and half of this reduction relates to reduced feed. (Silanikove, 2000) [4]. In the present scenario, farmers are seriously affected by climate change as it affects the production performance of crops and dairy animals in particular. So, it is important to find suitable ways to reduce the negative effects of climate change on dairy farming. Researchers need to know that how farmers are likely to respond for climate change, because those responses can amplify the impacts. Policy makers need to know what the farming community wants, in order to design appropriate policies so that the farming communities adapt to everyday changes in patterns of rainfall, temperature, crops & animals pest & diseases and also deal with the disaster when it occurs. For the understanding, farmers awareness on climate change and its consequences on dairy farming is essential for policy discussions and to take effective action. The present study has been designed to make an empirical probe with the following specific objectives:
1. To study the profile of the farmers
2. To analyze the relationship between characteristics of dairy farmers and awareness level

Methodology
Tamil Nadu has twelve coastal districts and out of twelve, four districts were selected randomly for the study.

Two blocks from each district and two villages from each block were selected randomly. A sample of 240 respondent farmers were selected from sixteen villages using random sampling method. Fourteen independent variables viz., age, education, occupation, experience in dairy farming, herd size, annual income, fodder sources, land holding, Social participation, Extension agency contact, Mass media exposure, Preparedness to act, Market distance, Community participation and awareness as dependent variable were selected for the study. The data were collected with the help of a well-structured and pre-tested interview schedule. The collected data were analyzed with suitable statistical tools.

Results and Discussion

Profile of the respondents

The data collected on the profile of respondent farmers were analyzed and presented in Table 1.

It could be observed from Table 1 that majority i.e, 45.00 percent of the respondents were of middle-aged category (35-50 years) followed by old (>50 years) and young age category (Up to 35 years) which accounts for 44.60 percent and 10.40 percent respectively. Now a days, most of the youngsters prefer only white collar jobs than doing farming even though they have their own lands. Further, the farmer who are having agriculture as the main occupation also did not want to engage their children in farming occupation, since it is perceived as risky occupation. This may be the probable reason for less number of farmers in the young aged category. sizable proportion of the dairy farmers were illiterate (22.10%) which was closely followed by farmers had education up to middle school (15.80%), functionally literate (15.00%), high school (14.60%), secondary (12.50%), primary school (12.10%), graduate & above (7.90%). This level of literacy could be due to poor financial situations, lack of awareness among the farmers about the importance of education, unavoidable situations in the family. 35.80 percent of the respondents were involved in agri + dairying occupation followed by dairying alone (22.10%), agri + dairy + labour (18.80%), service + agri + dairying (9.60%), business + agri + dairying (6.30%), agri + dairy + business (5.40%), agri + dairy + service (2.10%). It is evident that majority of the farming community in India practice dairying as their allied operation along with farm operations as it caters their immediate needs of daily life. Apart from that, feed and fodder for the animals can be easily sourced from their field and animal by-products can be used as farm yard manure in most cases. More than two-third (70.00%) of the dairy farmers had medium level of experience in dairy farming followed by high (17.10%) and low (12.90%) level of experience in dairy farming. This was probably due to the fact that majority of the dairy farmers in the research area belonged to middle age and old age group. Table 1 clearly enunciated that majority (70.00%) of the dairy farmers had medium herd size and were rearing 3-5 animals. Whereas, 17.10 percent of the dairy farmers had more than 5 animals and 12.90 percent farmers were having up to 2 dairy animals in their herd. The average herd size was 3 animals but few farmers were rearing dairy animals up to 10 animals. Majority (80.00%) of the dairy farmers had low level of annual income followed by medium (17.50%) and low (2.50%) annual income; respectively. The probable reason for this might be due to the fact that the majority of the respondents were having medium herd size which is unable to generate subsistence income and dairy farming is one of the main sources of income in this region. These findings are in line with Sachan (2013) [5]. Another reason may be attributed to low productivity of agriculture.

Table 1: Distribution of Respondents based on their Profile

(n = 240)

S. No	Category	Frequency	Percentage
1.	**Age**		
	Young (upto 35)	25	10.40
	Middle (36 – 50)	108	45.00
	Old (above 50)	107	44.60
2.	**Education**		
	Illiterate	53	22.10
	Functionally literate	36	15.00
	Primary	29	12.10
	Middle	38	15.80
	High school	35	14.60
	Senior secondary	30	12.50
	Graduate	19	7.90
3.	**Occupation**		
	Only dairying	53	22.10
	Agri + dairying	86	35.80
	Agri + dairy + business	13	5.40
	Agri + dairy + service	5	2.10
	Agri + dairy + labour	45	18.80
	Service + agri + dairying	23	9.60
	Business + agri + dairying	15	6.30
4.	**Experience in dairy farming**		
	Low	31	12.90
	Medium	168	70.00
	High	41	17.10
5.	**Herd size**		
	Small herd (Up to 2 Dairy animal)	31	12.90
	Medium herd (3-5 Dairy animal)	168	70.00
	Large herd (>5 Dairy animal)	41	17.10
6.	**Annual income**		
	Low (<Rs. 235555)	192	80.00
	Medium (Rs. 235555-Rs. 506666)	42	17.50
	High (>Rs. 506666)	6	2.50
7.	**Fodder sources**		
	Purchased from fellow farmer/market	36	15.00
	Collected from grazing land	48	20.00
	Own Production	11	4.58
	Combination of all	145	60.41
8.	**Land holding**		
	Landless (0 hectare)	43	17.91
	Marginal (Up to 1 hectare)	90	37.50
	Small (1-2 hectare)	21	8.75
	Semi- Medium (2-4 hectare)	48	20.00
	Medium (4-10 hectare)	38	15.83
	Large (10 hectare and above)	0	0
9.	**Social participation**		
	Low (<6.94)	22	9.2
	Medium (6.94-15.58)	190	79.2
	High (>15.58)	28	11.7
10.	**Extension agency contact**		
	Low	32	13.3
	Medium	165	68.8
	High	43	17.9
11.	**Mass media exposure**		
	Low	5	2.1
	Medium	205	85.4
	High	30	12.5
12.	**Preparedness to act**		
	Low	19	7.9
	Medium	183	76.3
	High	38	15.8
13.	**Market distance**		
	To buy critical input	2.272917	5
	To sell produce	2.397917	7
14.	**Community participation**		
	Low (<3.85)	93	38.8
	Medium (3.85-8.85)	98	40.8
	High (>8.85)	49	20.4

More than two-fifth (44.20%) of the respondents sourced fodder for their animals from combination of all, i.e. purchased from fellow farmer, purchased from market, collected from grazing land, own production. 30.40 percent of the respondents collected fodder from grazing land followed by own production (20.80%), purchased from fellow farmer (2.50%), and purchased from market (2.10%) respectively. Majority (37.5%) of the respondents were marginal farmers having land holding up to one hectare followed by 20.0 percent were having land holding between 2 to 4 hectares, 17.90 percent were landless, 15.80 percent had land holding between 4 to 10 hectares and 8.8 percent were small farmers having 1 to 2 hectares. None of the respondents were in the category of large farmers. i.e. land holding of ten and more hectares. Majority (79.2%) of the respondents had medium level of social participation followed by 11.7 percent of the respondents had high level and the remaining 9.2 percent of the respondents had low level of social participation. 68.80 percent of the dairy farmers were having medium level of extension contact, whereas 17.90 and 13.30 percent of them were found in high and low level of extension contact respectively. Majority (85.40%) of the dairy farmers had medium level of mass media exposure and 12.50 percent of them maintained high exposure, whereas, 2.10 percent of them had low level of mass media exposure.

Majority (76.30%) of the respondents had medium level of preparedness to act followed by 15.80 percent and 7.90 percent with high and low level of preparedness to act.The reason behind might be due to the fact that farmers in the study area had medium level of annual income, extension agency contact, mass media exposure, social participation and majority were illiterate, and as a result farmers were unable to get as well as utilize weather and climate information regularly. It can be concluded that farmers of the study area had medium level of preparedness to act in majority but small fraction of the informed respondents had high level of preparedness to act as they might be knowing the future adverse impacts of climatic problems.

Market distance of household was measured in two ways i.e., distance to purchase critical inputs and distance to sell farm produce. Table 1 stated that average distance and maximum distance to purchase critical inputs was 2.27 KM and 5 KM, respectively. Whereas, average and maximum distance to sell farm produce was 2.39 KM and 7 KM respectively. More than two-fifth (40.80%) of the respondents had medium community participation. 38.80 percent of the farmers had low level community participation, whereas 20.40 percent of the respondents in the study area had high level of community participation.

Association and Contribution of Respondents' Characteristics with Awareness level

The relationship of selected 14 independent variables with the awareness level was studied through simple correlation and multiple regression analysis. The results have been presented in Table 2.

Table 2: Correlation and Multiple Regression Analysis between Respondents' Characteristics and their Awareness Level

(n = 240)

Variable no	Variables	B	Standard Error	t	Sig
X_1.	Age	.446	.035	12.575	.000**
X_2.	Educational Status	.322	.233	1.378	.169
X_3.	Occupational status	.349	.214	1.630	.104
X_4.	Experience in dairy farming	.089	.036	2.459	.015*
X_5.	Herd size	.025	.246	.101	.919
X_6.	Annual income	7.66	.000	2.497	.013*
X_7.	Fodder sources	.090	.409	.221	.825
X_8.	Land holdings	.140	.326	.429	.668
X_9.	Social participation	.021	.051	.410	.682
X_{10}.	Extension agency contact	.008	.137	.060	.952
X_{11}.	Mass media exposure	.193	.096	2.017	.045*
X_{12}.	Preparedness to act	.313	.062	5.054	.000**
X_{13}.	Market distance	-.271	.241	-1.126	.261
X_{14}.	Community participation	-.108	.177	-.608	.544

* - Significant at 5% level $R^2 = 0.603$

** - Significant at 1% level F = 24.366

NS – Non Significant

Simple correlation analysis

It could be seen from table 2, there existed a positive and significant relationship between age (X1), preparedness to act (X_{12}) with awareness level at one percent level of significance. This might be due to the reasons that as age increases the experience in years also increases and awareness on climate change and its consequences gradually increases. Since, respondents in the study area experience extreme climatic events like flood, drought, cyclones frequently, their preparedness to act has significant place with regard to information on climate change and its consequences.

The variables Experience in dairy farming (X_4), Annual income (X_6), Mass media exposure (X_{11}) had positive and significant relation with awareness at five percent level of significance. As most of the respondents had agriculture plus dairying alone as their occupation since many years, they were conscious about the changes in climate and this might be the possible reason for significant relation between experience in dairy farming and awareness. Respondents in the study area had medium level of exposure to mass media especially radio and few on magazines like MSSRF Kaalnadai valarpu thagaval maiyam, Kalnadai kathir, Vivasaya nanban, Youtube videos and this might be the possible reason for significant relation between mass media exposure and awareness. The other variables did not show any relationship with awareness..

In general, more the age, experience, annual income, extension agency contact, mass media exposure, experience in dairy farming, the more will be the chances for knowing and

understanding the climate change and its consequences and hence, the variables showed positive and significant relationship with awareness.

Multiple regression analysis

Multiple regression analysis was performed to find out the extent of contribution of each variable towards awareness level of dairy farmers on climate change. R^2 Value 0.603 revealed that 60.30 percent of variation in awareness level was explained by fourteen independent variables selected for the study. F value was also significant at 1 percent level of significance.

The prediction equation was fitted for awareness level of the respondents and is given below.

$$Y_2 = 101.698 + 0.446\ (X_1)^{**} + 0.322\ (X_2)^{ns} + 0.349\ (X_3)^{ns} + 0.089\ (X_4)^{ns} + 0.025\ (X_5)^{ns} + 7.66\ (X_6)^{ns} + 0.090\ (X_7)^{ns} + 0.140\ (X_8)^{ns} + 0.021\ (X_9)^{ns} + 0.008\ (X_{10})^{ns} + 0.193\ (X_{11})^{ns} + 0.313\ (X_{12})^{**} - 0.271(X_{13})^{ns} - 0.108\ (X_{14})^{ns}$$

As evident from the results that values of regression coefficient of the variables, age, preparedness to act was found to be positive and significant at 1% level of probability. This suggested a unit increase in age and preparedness to act would increase the awareness level by 0.44 and 0.313 units respectively. Other variables were found as non-significant variables respectively.

Conclusion

The most damaging effects of global climate change are predicted to occur in developing countries because of their over-reliance on low-input rain-fed agricultural production and their low adaptive capacity. Need for a study which focuses on the awareness of dairy farmers in coastal regions of Tami Nadu was realised that would bring about the understanding of dairy farmers experience towards climate change and coping strategies to overcome the consequences of climate change. Adaptation level of people to adverse effects of climate change depends on their awareness level. To push forward adaptation measures, its imperative to promote awareness on climate change causes and consequences on dairy farming among farmers through appropriate communication pathways that are available to farmers such as extension services, farmer groups, input and output dealers, radio and televisions, leaflet, folder, hand out and magazine. The State Meteorological department and Directorate of Agriculture & Animal Husbandry should make arrangements for the dissemination of weather and climate related information to the farmers through mobile connectivity. Efforts should be made to put in place integrated approaches for the adaptation and sustainable way to achieve this through education and capacity building by involving all the stakeholders.

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