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RESEARCH ARTICLE

Awareness level of climate change among paddy farmers

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SUMMARY

This study examined the awareness level of paddy farmers on climate change. Among the 29 districts of Tamil Nadu, Nagapattinam district was selected to conduct the present study. This is situated in coastal area and very often subjected to natural calamities which were mainly reflected on the rice cultivation to the worst status. Data for the study were collected from 200 respondents selected through simple random sampling technique. The study revealed that majority (71.50 %) of the respondent had medium level of awareness of climate change followed by high (17.00 %) and low (11.50 %) category. More than eighty per cent of the respondents were aware about the issues *viz.,* receipt of low rain fall (90.50 %), uneven distribution of rain fall (89.00 %), frequent cyclone (87.00 %) and reduction in number of rainy days (86.50 %). The awareness level was found to be minimum in the issues like acid rain (34.50 %), variation in wind speed and direction (44.50 %), increasing heat and cold waves (48.00 %). The study concluded that the majority of farmers were aware of climate change but some of them were lacked in detail information about climate change. Therefore, it is suggested that extension education should be strengthened to boost farmers' awareness level on climate change in detailed and prepare them for adaptation measures and that appropriate technologies be promoted for adaptation by farmers.

Key Words : Awareness, Climate change, Paddy farmers

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The growing problems of climate change are becoming more threatening to sustainable economic development and the totality of human existence (Adejuwon, 2004). Climate change is a long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period. Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. (IPCC, 2007). The most obvious manifestation of climate change is the rising of average worldwide temperature, popularly termed as global warming. The average annual temperature of the Earth's surface has risen over the

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last century. Not only is the temperature rising, but the rate of warming itself is increasing too. The mean global annual temperature increased between 0.4 to 0.7°C (Singh, 2008). In ecological terms, this is a very rapid change. Water scarcity is a direct result of the overall decline in rainfall but also to other related hydrological stresses, such as a lowering of the ground water table and an increase in evapotranspiration as a result of higher temperatures (Mbow *et al.*, 2008).

Most of the countries are facing the problems of rising temperature, melting of glaciers, rising of sea-level leading to inundation of the coastal areas, changes in precipitation patterns leading to increased risk of recurrent droughts and devastating floods, threats to biodiversity, an expansion of plant diseases and a number of potential challenges for public health. The average global temperature has increased with many unprecedented changes observed over decades to millennia (IPCC, 2013). Adverse impact on agriculture due to climatic changes will have telling effect on national economy and livelihood. The climate change features such as drought, flood, and soil degradation are among the major factors responsible for the low agricultural productivity (Asrat and Simane, 2017 and Yirga, 2007). Several global studies have indicated that India is particularly vulnerable to climate change, and is likely to suffer with damage to agriculture, food and water security, human health and cattle populations. Assessment of the effects of global climatic variations on agriculture is imperative to adapt farming and to enhance agricultural production (Fraser *et al.,* 2008). Like most other developing countries, people in India are depending to a large extent on its natural resources for livelihood and economy. Any adverse impacts on these natural resources will have repercussion on the nation's livelihood security and economy and widen the gap between the rich and the poor. The climate change knowledge is needed to be dispersed among the farmers and they should be made capable of dealing with the harmful costs of climate change (Safdar, 2014). Though research initiatives are afoot in physical and biological sciences, it is imperative to assess the awareness level of climatic change to prepare a roadmap for capacity building of people for effective adaptation and mitigation of adverse effects for sustainable livelihood and development. Hence, the present study was designed to analyse the awareness level of climate change among paddy farmers in Nagapattinam district of Tamil Nadu.

MATERIAL AND METHODS

The choice for selection of the district had fallen on coastal ecosystems of Tamil Nadu state for the conduct of the present study. Coastal belts are more prone to devastating impact of climate change. The geographical setting of Tamil Nadu makes the state vulnerable to natural disasters such as cyclones (Mascarenhas and Jayakumar, 2007) floods and earthquake-induced tsunami. Among the 29 districts of Tamil Nadu, Nagapattinam district is very often subjected to natural calamities which were mainly reflected on the rice cultivation to the worst status. Since 10 years, the district has high range of variability in rainfall and temperature. The district is one among those districts having more area under rice cultivation. The district has eleven blocks, of which five blocks *viz.,* Thalainayar, Kuttalam, Mayiladuthurai, Kilvelur and Sembanar Koil were selected based on the maximum area covered under rice cultivation and high range of variability in rainfall and temperature. In order to select the villages for the study, the list of revenue villages in each of the five selected blocks was collected. Five villages from each of the selected blocks were identified purposively based on the maximum area under rice cultivation. The respondents for the present study were paddy farmers from the selected villages. A sample size of 200 was fixed for the study. Sample of 40 paddy farmers were selected from each of the 5 blocks by adopting simple random sampling method.

The capacity of farmers to adapt to climate change can be significantly influenced by the level of awareness about climate change in their communities. In this regard, Tol (1998) suggested that awareness about climate change has great capacity to drive farmers to improvise local technologies to aid adaptation. Awareness which is more of cognitive behaviour was operationalised as the level or extent to which the respondents were familiar with climate change pattern. Awareness was measured on a two point continuum *viz.,* aware and not aware as followed by Athimuthu (1990) studying awareness of on climate change pattern two score was assigned and for the unawareness, one score was assigned. The score obtained by the respondents were added to arrive at the final score which was classified into high, medium and low using cumulative frequency.

RESULTS AND DISCUSSION

Climate plays a crucial game with agriculture,

particularly rainfall. Agriculture basically depends on monsoon and other climate parameters, even narrow fluctuation in normal rainfall can affect the farming more severely. With this, it is important to know the awareness level of farmers on climate change.

It could be inferred from the Table 1 that the majority (71.50 %) of the respondent had medium level of awareness of climate change followed by high (17.00 %) and low (11.50 %) category.

The possible reason for the medium level of awareness might be due to majority of the respondents were found in medium to higher level of farming experience and more contact with extension agency contact in the study area. This finding is in line with the findings of Suresh (2011) and Raghuvanshi *et al.* (2017). In his study he founded that majority of the farmers had medium level of awareness on climate change.

From the above Table 2, it could be seen that more than eighty per cent of the respondents were aware about the issues *viz.,* receipt of low rain fall (90.50 %), uneven distribution of rain fall (89.00 %), frequent cyclone (87.00 %) and reduction in number of rainy days (86.50 %). This finding is in accordance with the findings of Adewale and Owolade (2010) who found that 87.5 per cent of farmers have heard about climate change.

The awareness level was found to be minimum in the issues like acid rain (34.50 %), variation in wind speed and direction (44.50 %), increasing heat and cold waves (48.00 %). This findings is associated with the findings of Sarkar and Padaria (2010)

The above findings revealed that majority of the paddy farmers were aware about change in rain fall pattern. Rainfall is very important to farms to make sure that the crops that are being grown receive the right amount of moisture so that the crops harvested are maximized. Rainfall is the first source of water. Irrigation can supplement rainfall to supply crop water need. The above result might be due to the respondents might have higher level of farming experience, more contact with extension agency contact.

The reason for minimum awareness on acid rain, variation in wind speed and direction, increasing heat and cold waves might be due the fact that the study area might not be experienced such issues because of the

Table 1: Distribution of respondents according to their awareness on climate change **(n = 200)**

Sr.No.	Category	Number	Percentage
1.	Low	23	11.50
2.	Medium	143	71.50
3.	High	34	17.00
	Total	200	100.00

Table 2 : Climatic - issue wise awareness level of the respondents **(n = 200)**

Sr. No.	Particulars	Aware	Per cent	Not aware	Per cent
1.	Receipt of low rain fall	181	90.50	19	9.50
2.	Uneven distribution of rain fall	178	89.00	22	11.00
3.	Reduction in number of rainy days	173	86.50	27	13.50
4.	Could not able to predict rainy days	159	79.50	41	20.50
5.	Unseasonal precipitation	112	56.00	88	44.00
6.	Variation in temperature	139	69.50	61	30.50
7.	Variation in wind speed and direction	89	44.50	111	55.50
8.	Variation in relative humidity	103	51.50	97	48.50
9.	Heavy summer	120	60.00	80	40.00
10.	Heavy winter	102	51.00	98	49.00
11.	Sea level rise	158	79.00	42	21.00
12.	Occurrence of flash flood	145	72.50	55	27.50
13.	Frequent cyclone	174	87.00	26	13.00
14.	Acid rain	69	34.50	131	65.50
15.	Increasing heat and cold waves	96	48.00	104	52.00

climate change.

Earlier, farmers in the rice ecosystems much benefited from timely distribution of rainfall. But now frequent cyclone, reduction in number of rainy days low and uneven distribution of rainfall increases the risk involved in crop production and shattered hopes for most paddy farmers in the Nagapattinam district.

Association and contribution of profile of paddy farmers with their awareness level:

Further efforts have been made to study the association and contribution of profile characteristics with awareness level of paddy farmers on climate change. The association and contribution have been studied using correlation and regression methods and the findings have been presented in Table 3.

From the above table it could be inferred that out of seventeen variables, eight variables *viz.,* educational status (X_2), farming experience (X_6), contact with extension agency (X_9), information seeking behaviour (X_{10}), social participation (X_{11}), innovativeness (X_{13}), risk orientation (X_{15}) and attitude towards rehabilitation programme (X_{16}) had shown positive and significant association with awareness at one per cent probability level, whereas the attitude towards influence of climate change (X_{17}) had shown negative and significant association with awareness at the same level of probability.

The other variables age (X_1) and decision making behaviour (X_{14}) had shown positive and significant relationship at five per cent probability level. However, variables such as annual income (X_3), occupation (X_4), area under rice cultivation (X_5), irrigation source (X_7), farm power status (X_8) and fatalism (X_{12}) depicted their non significant association with that of dependent variable awareness.

The multiple regression analysis was further performed to find out the extent of contribution of each variable towards the awareness level of paddy farmers on climate change.

Table 3 depicts the R^2 value was 0.515 which revealed that 51.50 per cent variation in the awareness level of paddy farmers on climate change, which was explained by seventeen variables selected for the study. The 'F' value (11.35) was significant at one per cent level of probability.

Since the 'F' value was significant, the prediction equation was fitted for the awareness level of paddy farmers on climate change and the same is given below.

$$\mathbf{Y = 8.060 + 0.387\ X_1 + 0.400^{**}X_2 + 0.210\ X_3 + 0.215\ X_4 + 0.077}$$

Table 3 : Correlation and multiple regression analysis of profile of paddy farmers with their awareness level

Variable No.	Name of variables	'r'	Regression co-efficient	Std.error	't' value
1.	Age	0.148**	0.387	0.276	1.402NS
2.	Educational status	0.362***	0.400	0.176	2.270**
3.	Annual income	0.123	0.210	0.284	0.740NS
4.	Occupation	0.131	0.215	0.209	1.026NS
5.	Area under rice cultivation	0.100	0.077	0.271	0.284NS
6.	Farming experience	0.500***	1.392	0.309	4.502***
7.	Irrigation source	0.103	1.167	0.859	1.358NS
8.	Farm power status	0.070	-0.031	0.055	-0.550NS
9.	Contact with extension agency	0.393***	0.182	0.057	3.201***
10.	Information seeking behaviour	0.356***	0.034	0.031	1.101NS
11.	Social participation	0.306***	0.042	0.021	1.986*
12.	Fatalism	0.081	0.021	0.141	0.148NS
13.	Innovativeness	0.277***	0.594	0.236	2.521**
14.	Decision making behaviour	0.156**	0.008	0.025	0.329NS
15.	Risk orientation	0.278***	0.058	0.036	1.617NS
16.	Attitude towards rehabilitation programme	0.396***	0.217	0.059	3.654**
17.	Attitude towards influence climate change	-0.284***	-0.086	0.052	-1.654NS

NS -Non significant
*** - Significant at 0.01 level
** -Significant at 0.05 level
* - Significant at 0.1 level of probability

F = 11.35
R^2 = 0.515
Constant = 8.060

$X_5 + 1.392^{***} X_6 + 1.167 X_7 - 0.031 X_8 + 0.182^{***} X_9 + 0.034 X_{10} + 0.042^{*} X_{11} + 0.021 X_{12} + 0.594^{**} X_{13} + 0.008 X_{14} + 0.058 X_{15} + 0.217^{**} X_{16} - 0.086 X_{17}$

The Table 3 explained that out of seventeen variables, two variables namely farming experience (X_6) and contact with extension agency (X_9) had shown positive and significant contribution with the awareness level of paddy farmers on climate change at one per cent level of probability.

Educational status (X_2), innovativeness (X_{13}) and attitude towards rehabilitation programme (X_{16}) had shown positive and significant contribution at five per cent level of probability, whereas the variable social participation (X_{11}) had shown positive significant contribution at ten per cent level of probability.

The variables such as educational status (X_2), farming experience (X_6) contact with extension agency (X_9), social participation (X_{11}), innovativeness (X_{13}) and attitude towards rehabilitation programme (X_{16}) were found to have positively significant contribution with awareness. A unit increase in educational status, farming experience, contact with extension agency, innovativeness and attitude resulted in an increase of 0.400, 1.392, 0.182, 0.042, 0.594 and 0.217 units *Cetaris paribus* in overall awareness level of paddy farmers.

Farming experience had a positive and signification relationship with dependent variable awareness. Those who had more experience in farming activity ultimately experienced the adverse effect of climatic conditions. To withstand the climate change crisis, farmers have acquired information about climate change. This would have induced positively significant relationship with awareness among the respondents. This result is in line with the findings of Maddison (2007) and Danso Abbeam *et al.* (2014).

Extension agency plays a vital role in the implementation of rehabilitation programmes. The farmers with more extension agency contact would have understand and gained the information of climate change. Thus, extension agency contact supported the awareness level of paddy farmers on climate change. This finding is associated with the findings of Sharmin (2005) and Afsar (2019).

The other variables namely educational status, innovativeness and attitude towards rehabilitation programme had its own significant contribution to the dependent variable. Education, innovative mind and positive attitude acted as supplementary and complementary effects of the dependent variable. This finding is in line with the findings of Martey *et al.* (2013) and Enete and Igbokwe (2009).

It is accepted in general that the farmers possessed certain traits like higher level of farming experience, extension agency contact, educational status, optimal innovativeness and favourable attitude towards rehabilitation programme showed strengthened awareness level on climate change. Thus the farmers who have possessed such qualities are confident enough to assess himself through SWOC and outweighed the issues, which stood as a roadmaps to develop a higher level of awareness on climate change.

Conclusion:

From this study it is concluded that most of the paddy farmers were aware of changing climate. But some of them lacked in detail information about climate change. Complete climate change awareness should be created for proper adaptation to the impacts of climate change. The extension services provide an important source of information on climate change as well as modern cultivation practices, market information and knowledge about ongoing government schemes. Policy makers and development departments should implement suitable programmes to build confidence and to improve status of farmers by making farming as a profitable occupation. Communication plays an important role in creating awareness among the farmers. As the setting up of monsoon is unpredictable these days the government officials should disseminate any information regarding rainfall pattern, and farming activities as early as possible. In one way, mobile technology to the farmers can be effectively used to communicate with the local farmers and the medium of communication should be as simply as possible in the most preferred local language, so that the illiterate farmers can be aware about the pros and cons of arriving monsoon.

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