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Climate resilience management level among farmers in eastern dry zone of Karnataka

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Abstract

The present study was conducted in Eastern Dry Zone of Karnataka state in India during 2018-19. The data was collected from 180 farmers using structured interview schedule. The collected data was analyzed and tabulated using Chi-square, ANOVA and Correlation. Profile characteristic farming experience, mass media exposure, and farm mechanization level comes under low level category. Majority 43.33 per cent of farmers had low level of climate resilience management followed by high (31.11%) and medium (25.56%) level. The chi-square test value is found to be 53.55** turn out to be significant at one per cent level indicating a highly significant variation in the overall climate resilience management level among the farmers. Variables like economic motivation, mass media exposure, distance to market, innovative proneness, irrigational potential, education, risk orientation and extent of natural capital were found to have positive and significant association at one per cent level with climate resilience management level. Non-availability of labour and higher cost of the agricultural inputs were the major constraints faced by farmers. Supply inputs is the most important suggestion to mitigate ill effects of climate change. Climate resilience management in Eastern Dry Zone expected to provide opportunity for the farmers to meet their needs, develop new resilience management practices with farmers to solve their problem which helps to get better management.

Keywords: Climate change, resilience management level, association, relationship

1. Introduction

Climate change is one of the biggest challenges facing the world today. Agriculture and Climate are mutually dependent. There is a need to understand the effect of climate change on agricultural sector both at Global and as well as at regional level especially from the point of view of providing food to vulnerable section of the population. Changing climatic conditions can have the big effect on our life and our environment. In fact, it is the greatest environmental threat faced by the planet earth. Change in weather conditions can be best observed through the extreme rise in temperature, melting of glaciers and sudden rise in sea level. These changes are causing serious problems to human and other forms of life. It has become common knowledge that the poor are likely to be hit hardest by climate change and the capacity to respond to climate change is lowest in developing countries. Some changes will affect agriculture through their direct and indirect effects on crops, soils, livestock, fisheries and pests. Tropical countries are likely to be affected more compared to the countries situated in temperate regions. The brunt of environmental changes is expected to be very high in India due to greater dependence on agriculture, limited natural resources, alarming increase in human and livestock population, changing pattern in land use and socio-economic factors that pose a great threat in meeting the food, fiber, fuel and fodder requirement. There is a likelihood of a considerable impact on agricultural land-use due to availability of irrigation, frequency and intensity of inter- and intra- seasonal droughts and floods, soil organic transformation, soil erosion and availability of energy as a consequence of global warming, impacting agricultural production and hence, the nations' food security. Global warming due to greenhouse effect is expected to impact hydrological cycle viz. precipitation, and soil moisture etc., which would pose new challenges for agriculture. Climate change although a global phenomena but the real cost of it is being paid by the poorest of the poor. With unpredictable weather farmers keep changing crop management practices by growing resistant varieties and be prepared for constant change in the farming practices. Farmers focus to take steps to alter their farming practices due to decrease in water availability, reduce in rain fall, temperature raise as well as depletion of soil health due to heavy use of chemicals. Many climate resilient practices are being followed by farmers depending on the micro climate change in their situation. With this in view the present research topic on climate resilience management among farmers in eastern dry zone of Karnataka is under taken to know the

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methods/practices followed and test/verify the practices followed by farmers with the following specific objective.

- 1) To ascertain the level of climate resilience management among farmers in eastern dryzone.

2. Methodology

The research was conducted in Eastern dry zone of Karnataka. Based on the variability in temperature and rainfall during past 20 years, 6 taluks were selected viz., Chickballapur, Doddballapur, Anekal, Kolar, Gubbi and Ramanagar for conducting research. From each taluk two villages were selected randomly. Thus, 12 villages were considered for the research. From each of so selected village, 15 farmers were selected by applying random sampling method. Thus, the total sample size for the research was 180 respondents. By using a detailed constructed interview schedule. The data were collected by employing personal interview method. Ex-post-facto research design was used for the research. The data were scored as per the set standards and tabulated. Keeping in view the objectives of the study and amenability, the data were subjected to different statistical tests. These tests include mean, standard deviation, frequency and percentage grouping which are used or simple comparison of different categories. The other statistical tools like chi-square test (χ^2), student t-test, and correlation coefficient were also used in analyzing the data.

3. Results and Discussion

3.1 Profile characteristics of farmers in eastern dry zone

The profile characteristics included were age, education, dependency ratio, farm size, farming experience, annual income, economic motivation, mass media exposure, risk orientation, scientific orientation, extension contact, cosmopolitanism, distance to market, awareness about

diversification, extent of natural capital, innovative proneness, farm financial literacy, irrigation potential, organizational participation and farm mechanization level presented here.

The profile characteristics showed that 37.78 per cent of farmers were belonged to above 55 years age group. (35.56%) farmers were found high education category, (44.44%) of farmers had high scientific orientation and 58.89 per cent farmers opened that there increasing in expenditure and come under high level category. Where as to 69.44 per cent had medium levels of income, (37.22%) of respondents had medium level of economic motivation, (48.33%) had medium level of cosmopolitanism, 67.22 per cent farmers had medium distance for marketing, 48.33 per cent had medium level of innovative proneness and 40.00 per cent had medium level of organizational participation. With respect to low level 43.33 per cent of the respondents had low dependency ratio, (49.44%) of farmers were small farmers, 46.11 per cent respondents were low farming experience 43.33 per cent had low level of mass media exposure, (39.44%) farmers were having low level of risk orientation, (34.44%) of farmers had low level of extension contact, (41.67%) of respondents opened that their crop diversity had decreased due to vulnerability compared to before, 37.22 per cent respondents opened that their extent of natural capital has decrease due to vulnerability of climate change compared to before, 50.00 per cent farmers had low irrigation potential and (40.00%) farmers had low mechanization level. Probable reason for the above findings are majority of farmers are small and marginal farmers and it may not economical for them to possess all material required for agricultural operations. Further, the availability of implements with neighbor farmers also might have contributed for observed results. The results are in acceptance with the studies of Shankara (2010)^[8] and Lalitha (2016)^[3].

Table 1: Profile Characteristics of Farmers in Eastern Dry Zone (N=180)

Variable	Characteristic	Number	Per cent
1. Age	Age between 45 to 50 years	58	32.22
	Age between 51 to 55 years	54	30.00
	Age above 55 years	68	37.78
2. Education	Low (Below 0.91 score)	57	31.66
	Medium (0.92-2.52 score)	59	32.78
	High (Above 2.52 score)	64	35.56
3. Dependency Ratio	Low (Below 4.04 score)	78	43.33
	Middle(4.05-6.53 score)	61	33.89
	High (Above 6.53 score)	41	22.78
4. Farm Size	Marginal (Below 2.5 acres)	53	29.44
	Small (2.51 to 5 acres)	89	49.44
	Big (Above 5 acres)	38	21.12
5. Farming Experience	Low (Below 10 years)	83	46.11
	Medium (11 to 20 years)	64	35.56
	High (Above 20 years)	33	18.33
6. Annual Income	Low (Up to Rs 36,000)	29	16.11
	Medium (Rs 36,001 to 75,000)	125	69.44
	High (More than Rs 75,000)	26	14.45
7. Economic Motivation	Low (Below 16.20 score)	60	33.33
	Medium (16.21-21.49 score)	67	37.22
	High (Above 21.49 score)	53	29.45
8. Mass Media Exposure	Low (Below 4.57 score)	78	43.33
	Medium (4.58-8.13 score)	45	25.00
	High (Above 8.13 score)	57	31.67
9. Risk Orientation	Low (Below 9.22 score)	71	39.44
	Medium (9.23-12.01 score)	41	22.78
	High (Above 12.01 score)	68	37.78
10. Scientific Orientation	Low (Below 8.63 score)	66	36.67
	Medium (8.64-11.45 score)	34	18.89

	High (Above 11.45 score)	80	44.44
	Low (Below 12.37 score)	62	34.44
11. Extension Contact	Medium (12.38-16.50 score)	60	33.33
	High (Above 16.50 score)	58	32.23
	Low (Below 7.58 score)	56	31.11
12. Cosmopolitaness	Medium (7.59-12.35 score)	87	48.33
	High (Above 12.35 score)	37	20.56
	Nearer (Below 5.91 Kms)	21	11.67
13. Distance to Market	Medium (5.92-7.05 Kms)	121	67.22
	Far (Above 7.05 Kms)	38	21.11
	Decrease (Below 15.73 score)	75	41.67
14. Awareness about Diversification	No change (15.74-21.80 score)	43	23.89
	Increase (Above 21.80 score)	62	34.44
	Decrease (Below 12.15 score)	54	30.00
15. Extent of Natural Capital	No Change (12.16-17.64 score)	67	37.22
	Increase (Above 17.64 score)	59	32.78
	Low (Below 16.59 score)	46	25.56
16. Innovative Proneness	Medium (16.60-26.20 score)	87	48.33
	High (Above 26.20 score)	47	26.11
	Low (Below 4.86 score)	53	29.44
17. Farm Financial Literacy	Medium (4.87-7.54 score)	21	11.67
	High (Above 7.54 score)	106	58.89
	Low (Below 21.08 score)	90	50.00
18. Irrigation Potential	Medium (21.09-37.62 score)	42	23.33
	High (Above 37.62 score)	48	26.67
	Low (Below 4.63 score)	63	35.00
19. Organizational Participation	Medium (4.64-10.36 score)	72	40.00
	High (Above 10.36 score)	45	25.00
	Low (Below 3.27 score)	72	40.00
20. Farm Mechanization Level	Medium (3.28-5.76 score)	41	22.78
	High (Above 5.76 score)	67	37.22

3.2 Farmers based on climate resilience management level in eastern dry zone

Majority 43.33 per cent of farmers had low level of climate resilience management followed by high (31.11%) and medium (25.56%) level.

The possible reason for low climate resilience management might be that it is relatively a new concept to many farmers and still in the stage of acceptance by farmers and hence, they might have felt it was a complex practice. This implied that farmers need to be educated regarding impact and advantages of climate resilience management for their acceptance. Thus, it could be inferred that management practices involving low/no cost were accepted by majority of the respondents. Whereas, the management involving complex knowledge, skill, high cost and inadequate availability of input were found to be accepted by relatively lesser proportion of the farmers. Findings were in accordance with Darling and Vasantha (2004)^[1], Vinay and Umesh (2015)^[9].

3.3 Farmers based association with climate resilience practices in eastern dry zone

Chi-square test was applied to test the association among the category of farmers regarding climate resilience management level in Eastern Dry zone. The chi-square test value is found to be 53.55** turn out to be significant at one per cent level indicating a highly significant variation in the overall climate resilience management level among the farmers in different agricultural situations *viz.*, irrigated and rainfed conditions.

This could be due to climate resilience management in different situations expected to provide opportunity for the farmers to meet their needs, develop new resilience management practices with farmers to solve their problem which helps to get better management and further improvement in the standard of living in sustainable manner. The results of the study matched with findings of the Pomp

and Burger (1995)^[6], Johnson and Masters (2004)^[2] and Lisa (2015)^[4].

Table 2: Farmers Based on Climate Resilience Management Level in Eastern Dry Zone and Its Association (N=180)

Management Level	Agricultural situation	
	Number	Percent
Low	78	43.33
Medium	46	25.56
High	56	31.11
	Mean=170.16	
	S.D=45.24	

Chi-square Value=53.55**

** : Significant at 1 per cent level

3.4 Association between profile characteristics and climate resilience management level in eastern dry zone

The chi-square test was applied to know the nature of association of profile characteristics with climate resilience management in Eastern Dry zone and the outcomes obtained were as follows. Variables like economic motivation (29.916), mass media exposure (23.38), distance to market (19.338), innovative proneness (18.002), irrigational potential (17.974), education (16.698), risk orientation (15.38) and extent of natural capital (13.539) were found to have positive and significant association at one per cent level. Other variables like farm size (11.461), farm financial literacy (9.789) and dependency ratio (9.003) were found to have positive and significant association at five per cent level similarly scientific orientation (7.695), age (5.31), extension contact (5.205), organizational participation (4.881), cosmopolitaness (4.358), farming experience (4.157), annual income (3.801), mechanization level (3.362) and awareness about diversification (2.215) were having non-significant association with climate resilience management level.

Variables like economic motivation, mass media exposure, distance to market, innovative proneness, irrigational potential, education, risk orientation and extent of natural capital were found to have positive and significant association at one per cent level with climate resilience management level which directly influence the adoption climate resilience management. This study is in conformity with Yashodhara (2015)^[10] and Kowsalya (2017)^[5].

Table 3: Association between Profile Characteristics and Climate Resilience Management Level in Eastern Dry Zone (N=180)

S. No.	Characteristic	Chi-square value
1	Age	5.316NS
2	Education	16.698**
3	Dependency ratio	9.033*
4	Farm size	11.461*
5	Farming experience	4.157NS
6	Annual income	3.801NS
7	Economic motivation	29.916**
8	Mass media exposure	23.38**
9	Risk orientation	15.38**
10	Scientific orientation	7.695NS
11	Extension contact	5.205NS
12	Cosmopolitaness	4.358NS
13	Distance to market	19.338**
14	Awareness about diversification	2.215NS
15	Extent of natural capital	13.539**
16	Innovative proneness	18.022**
17	Farm financial literacy	9.789*
18	Irrigation potential	17.974**
19	Organizational participation	4.881NS
20	Farm mechanization level	3.362NS

NS: Non-Significant;

*: Significant at 5per cent level;

**: Significant at 1per cent level.

3.5 Relationship between profile characteristics and climate resilience management level in eastern dry zone

The correlation test was employed to arrive the type of relationship between profile characteristics of farmers and dependent variables (climate resilience management level) in Eastern dry Zone. profile characteristics such as awareness about diversification (0.419), farming experience (0.350), economic motivation(0.284), extent of natural capital (-0.278), organizational participation (0.309), extension contact (0.266), mass media exposure (0.206), education (0.204), scientific orientation(0.198) and farm mechanization level (-0.198) had significant relationship with climate resilience management at one per cent level. Some of variables like risk orientation (-0.158) and farm financial literacy (-0.148) had significant relationship with climate resilience management at five per cent level. While, distance to market farm size, innovative proneness dependency ratio, irrigation potential, annual income, cosmopolitaness and age had non-significant relationship with climate resilience management level.

Variables such as awareness about diversification, farming experience, economic motivation (0.284), extent of natural capital, organizational participation, extension contact, mass media exposure, education, scientific orientation and farm mechanization level play a grater role in climate resilience management. The results are in line with the studies of Shankara (2010)^[8] and Lisa (2015)^[4].

Table 4: Relationship between profile characteristics and climate resilience management level of farmers in eastern dry zone (N=180)

S. No.	Characteristic	Correlation Coefficient (r)
1	Age	0.019NS
2	Education	0.204**
3	Dependency Ratio	0.094NS
4	Farm Size	-0.110NS
5	Farming Experience	0.350**
6	Annual income	0.046NS
7	Economic Motivation	0.284**
8	Mass media Exposure	0.206**
9	Risk Orientation	-0.158*
10	Scientific Orientation	0.198**
11	Extension Contact	0.266**
12	Cosmopolitaness	-0.025NS
13	Distance to Market	0.133NS
14	Awareness about Diversification	0.419**
15	Extent of Natural Capital	-0.278**
16	Innovative Proneness	-0.106NS
17	Farm financial Literacy	-0.148*
18	Irrigation Potential	-0.075NS
19	Organizational Participation	0.309**
20	Farm Mechanization Level	-0.198**

NS: Non-Significant;

*: Significant at 5 per cent level;

**: Significant at 1per cent level.

3.6 Constrains encountered by farmers due to climate change in eastern dry zone

The results showed that non availability of labour (Rank I) followed by other constraints like, higher cost of the agricultural inputs (Rank II), non availability of inputs (seeds, plant protection chemicals, fertilizers) and low price for the produce in the market placed(Rank III) respectively, higher labour wage rate and poor supply of uniform electricity placed (Rank IV) and non availability of inputs (seeds, plant protection chemicals, fertilizers) (Rank V) were considered as major constraints due to climate change. Moreover higher percentage of respondents indicated that constraints like difficult to work in the field due to severe temperature (Rank VI), lack of knowledge regarding appropriate adaptations (Rank VII), poor transport facility and high cost (Rank VIII), lack of storage facility in the village (Rank IX), absence of processing units in the village and lack of knowledge about post-harvest technology placed Rank X in ordered. Whereas, long distance of the regulated market from the village (Rank XI), were considered as a least constraints due to climate change.

The probable reasons for the constraints given by the farmers are based on their experience what they face due to ill effect of climate change are majority of farmers faced constraints like non availability labors place a prime place because due to migration of farmers as well as labours from rural areas to urban area labor problem become more critical subsequently lack of irrigation facilities major constraint because of un distribution of rainfall where as The depth of bore well exceeds thousand in addition to poor supply of uniform electricity for farm land is major factor followed by non availability of inputs like seeds, plant protection chemicals, fertilizers another hand Low price for the produce in the market also major constraint and lack of knowledge regarding appropriate adaptations are the major constraints faced by farmers. The results of the present study are in line with that of Shankara (2010)^[8], Preethi (2012)^[7] and Lalitha (2016)^[3].

Table 5: Constrains Encountered by Farmers due to Climate Change in Eastern Dry Zone (N=180)

S. No.	Constraints	Score	Per cent	Rank
1.	Difficult to work in the field due to severe temperature	227	25.22	VI
2.	Higher cost of the agricultural inputs	249	27.67	II
3.	Non availability of inputs (seeds, plant protection chemicals, fertilizers)	243	27.00	III
4.	Low price for the produce in the market	243	27.00	III
5.	Non availability of labour	251	27.89	I
6.	Higher labour wage rate	241	26.78	IV
7.	Poor supply of uniform electricity	241	26.78	IV
8.	Lack of information about long term climate change	233	25.89	V
9.	Non availability of irrigation facility	243	27.00	III
10.	Lack of knowledge regarding appropriate adaptations	214	23.78	VII
11.	Lack of credit /loan from the banks	195	21.67	X
12.	Lack of storage facility in the village	201	22.33	IX
13.	Absence of processing units in the village	191	21.22	X
14.	Long distance of the regulated market from the village	190	21.11	XI
15.	Lack of knowledge about post-harvest technology	191	21.22	X
16.	Poor transport facility and high cost	208	23.11	VIII

3.7 Suggestions of farmers to face climate change in eastern dry zone

To mitigate the ill effects of climate change, suggestions were taken from the farmers in Eastern dry zone, as their suggestions are very important to take up the decisions in the policy making. These suggestions were presented here under. Timely supply inputs (seeds, plant protection chemicals, fertilizers) is very important and it ranked I, followed by subsidies/compensation has to be given for the crops to make up the cost of cultivation due to weather aberrations (Rank II), creating awareness to the farmers about appropriate adoption measures against climate change Rank III were considered as a most important suggestion to mitigate ill effects of climate change. Subsequently, providing financial support for soil nutrient enrichment (Rank IV), early warning has to be given to the farmers about environmental changes (Rank V), insurance has to be extended to all crops Rank VI were in ordered and considered as a other important suggestions.

The probable reasons for the suggestions given by the farmers based on the problems what they face to mitigate ill effect of climate change. They have faced the major constraints like availability of necessary inputs like seeds and fertilizers in time as in agriculture delaying to take up activities by one day also lead to a greater loss, subsequently Subsidies/compensation has to be given for the crops to make up the cost of cultivation due to weather aberrations its helps in build up confidence on farmers followed by creating awareness among farmers about appropriate adoption measures against climate change for better management later providing financial support for soil nutrient enrichment through soil mini kit and soil testing and insurance has to be extended to all crops because it's meant for commercial crops but it need to be extend agricultural crops like pulses and cereals, these are the major suggestion given by the farmers. The findings were in accordance with the findings reported by Shankara (2010) [8] and Lalitha (2016) [3].

Table 6: Suggestions of farmers to face climate change in eastern dry zone (N=180)

S. No.	Suggestion	Score	Per cent	Rank
1.	Early warning has to be given to the farmers about environmental changes	368	40.89	V
2.	Creating awareness to the farmers about appropriate adoption measures against climate change	420	46.67	III
3.	Timely supply inputs (seeds, plant protection chemicals, fertilizers)	455	50.56	I
4.	Subsidies/compensation has to be given for the crops to make up the cost of cultivation due to weather aberrations	437	48.56	II
5.	Insurance has to be extended to all crops	366	40.67	VI
6.	Providing financial support for soil nutrient enrichment	384	42.67	IV
7.	Incentives/support for increasing the green manuring	348	38.67	VII
8.	Support price has to be given to all the crop produce based on cost of cultivation	347	38.56	VIII
9.	Creating awareness/ Support for adoption of organic farming technologies	346	38.44	IX

4. Conclusion

Study showed that climate resilience management in Eastern Dry Zone expected to provide opportunity for the farmers to meet their needs, develop new resilience management practices with farmers to solve their problem which helps to get better management and further improvement in the standard of living in sustainable manner. There is a necessary to improve the climate resilience management system which brings awareness among the people to provide early warning in order to avoid the ill effects of climate change. Development departments could initiate appropriate measures in advance to forecast climate change effects and suggest suitable mitigating measures to overcome the effects in near future.

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