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Dryland Farmer's Knowledge towards Climate Change and Constraints in Adoption of Climate Resilient Practices

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: To understand the dryland famer's knowledge towards climate change, its causes and its impacts. And to find the constraints associate in adoption of climate resilient practices in the region.
Study Design: For the present descriptive study, cross-sectional survey design was used.
Place and Duration of Study: The study was conducted in Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad during the year 2018.
Methodology: Climate change study in dryland region is very relevant; so a study was conducted at Sivakasi (a highly industrialized taluk) of Tamil Nadu which falls under dryland region. The data collection was done using structured interview schedule with 120 farmers. Method of data collection is face to face interview.
Results: The study revealed that the level of knowledge towards climate change is medium and it is influenced by various factors like education, mass media exposure, extension contacts, innovativeness, risk orientation, scientific orientation and social participation positively. The major constraints in the adoption of climate resilient practices are high cost, lack of awareness and lack of adequate infrastructure. Some of the suggestions expressed by the farmers to improve adoption for

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the open ended questions are categorized as, improving advisory, strengthening infrastructure and extending policy support.
Conclusion: The results of the research would help the extension workers to understand dryland farmer's needs for effective programme implementation.

Keywords: Dryland; climate change; knowledge; factors; constraints.

1. INTRODUCTION

About 38% of the world population lives in dryland and farming in dryland agriculture is a challenging task, frequent drought and unseasonal rainfall disturbs farming. The climate change makes the farmers of dryland to face these uncertainties more frequent; because, the dryland is one of the most sensitive and vulnerable to climate change. Semi-arid regions are expanded to drylands since, the early 1960's. This expansion will reduce carbon sequestration and enhance regional warming. The developing countries will be the prey for this ill-effects (land degradation and desertification) caused by dryland expansion [1]. Droughts have caused food grains loss that can be used to feed as many as 81 million people every day [2]. The state of Maharashtra in India has reported 33% of the total area is affected due to unseasonal rainfall, which approximately affected 103.52 lakh farmers [3]. And the another state Tamil Nadu in India has sought for Rs. 39,656 crore from the union government for mitigating the losses caused by drought in the year of 2016-17 [4]. The above facts and figures emphasize the importance of drought, unseasonal rainfall and effects of dryland expansion in the present scenario; which eventually makes to think of climate change, its causes and its impacts. Many studies suggest that farmers have perceived climate change in various extents [5,6]. The causes of climate change are mainly because of increase in Green House Gases (GHG) and deforestation; and its impacts are broadly classified as: economic impacts (less agricultural production, less agricultural productivity, diseases on livestock, income and employment), environmental impacts (sea level rise, cyclones, floods, heat waves, droughts, loss of biodiversity, forest fires, unseasonal rainfall and increase in surface temperature) and social impacts (public health, food security, employment, income, livelihood, gender, education, housing and poverty). Even after the climate change is being perceived by the farmers, the adoption of climate resilient practices/ climate smart practices are relatively less [7]. Hence, an attempt has been made to study the level of knowledge on climate change, its causes and its impacts; and to study the constraints perceived by the dryland farmers in adoption of climate resilient practices.

2. RESEARCH METHODOLOGY

2.1 Research Design and Selection of Area

The study was conducted in Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad during the year 2018. For the present descriptive study, cross-sectional survey design was used. The selection of state, district and taluk was purposeful; the criteria for the selection are as follows: Tamil Nadu state was selected, as it is one of the driest states [8], Virudhunagar district was selected, as the district receives scanty rainfall of 829 mm annually [9], and Sivakasi was selected, as the Taluk's agriculture is affected due to climatic fluctuations. And another reason for selection of Sivakasi – the nation's firework capital which contains 90% of India's fireworks industries [10] – is the industrialization in the town and neighbouring areas, where farmers also being the part of the industries as labourers.

2.2 Sampling and Data Collection

Out of 41 revenue villages in the selected taluk [11], 8 taluk was selected randomly; and from each village 15 farmers were selected randomly to make the sample size 120. Face to face interview method was adopted for the present study using well constructed and pre-tested interview schedule. The statements of knowledge test and constraints identification were carefully selected after consulting various literature and experts consultation. For knowledge test, the scoring was given in three point continuum as, fully correct, partially correct and not correct; and for constraints, the scoring was given in three point continuum as, very severe, severe and not severe respectively. Suggestions were collected from the farmers based on their perception, qualitatively, using open ended questions.

2.3 Statistical Analysis

The collected data was cleaned and tabulated in MS Excel 2007; and given frequency and

percentage. Further, statistical analysis like Z-test and Karl Pearson's correlation were applied to find the degree of knowledge and its relationship with other socio-economic variables. The categorization of Knowledge scores was done using range method.

3. RESULTS AND DISCUSSION

3.1 Distribution of the Respondents Based on Their Knowledge on Climate Change

From the Table 1, it is found that 90.00 per cent of the respondents are having good knowledge on economic impacts of climates change followed by environmental impacts (45.80%) and social impacts (45%) respectively. Majority are having partial knowledge on climate change (59.20%) and its causes (61.70%) respectively. About 85.80% of the respondents are having poor knowledge on green house gases.

The Table 2 reveals the distribution of respondents based on their level of Knowledge towards climate change. 58.33% of the respondents are having medium level of knowledge followed by low (30.83%) and high (10.83%) respectively.

3.2 Z - Test for the Knowledge on Climate Change

Z-test for knowledge on climate change and its impacts was done to find the degree of correctness of the responses. From the results of Z-test, significant difference (in both positive and negative) in knowledge of particular aspect of climate change is identified and highlighted. The Table 3 reveals that the degree of correctness of knowledge on green house gases, environmental impacts, economic impacts and social impacts found positively significant at 0.05% level of significance, which denotes high level of knowledge on those aspects. Knowledge on impacts were perceived and understood by the respondents while knowledge on GHGs was not understood by the respondents. Knowledge on climate change and causes perceived and understood moderately by the majority of the respondents.

3.3 Relationship of Selected Independent Variables with Knowledge about Climate Change and Its Impacts

Karl Pearson's correlation coefficient (r) value helps to understand the relationship between the independent variables viz, age, education, income, etc. with knowledge of respondents on climate change and its impacts. The Table 4 reveal the relationship of independent variables with knowledge on climate change and its impacts. Variables like age, family type, income, farming experience, and land holding found no significant relationship with knowledge on climate change and its impacts, while variables like education, mass media exposure, extension contacts, innovativeness, risk orientation and scientific orientation has significant relationship with knowledge at 0.01% level of significance. Social participation found to be positively related at 0.05% level of Significance [12].

Table 1. Distribution of the respondents based on knowledge about climate change

S. No.	Statements	Knowledge level					
		FC		PC		NC	
		F	%	F	%	F	%
1.	Climate change	18	15.00	71	59.20	31	25.80
2.	Causes of Climate change	20	16.70	74	61.70	26	21.70
3.	Green House Gases	10	8.30	7	5.80	103	85.80
4.	Impacts on Environment	55	45.80	50	41.70	15	12.50
5.	Impacts on Economy	108	90.00	12	10.00	0	0
6.	Impacts on Society	54	45.00	47	39.20	19	15.80

Table 2. Level of knowledge on climate change

S. No.	Level of knowledge (7 -18)	Frequency	Percentage
1.	Low (7-10.67)	37	30.83
2.	Medium (10.67-14.34)	70	58.33
3.	High (14.34-18)	13	10.83
Total		120	100.00

Parentheses shows knowledge test scores

Table 3. Z-test values for the knowledge on climate change

S. No.	Statements	Mean	S.D.	Z – Value
1.	Climate change	1.89	1.13	-1.067^{NS}
2.	Cause of Climate change	1.90	1.10	-1.000^{NS}
3.	Green House Gases	1.23	0.52	-16.040*
4.	Environmental impacts	2.33	1.39	2.598*
5.	Economic impacts	2.90	0.87	11.390*
6.	Social impacts	2.29	1.42	2.248*

*^{NS}= Not Significant *= Significant at 0.05%*

Table 4. Relationship of independent variables with knowledge on climate change and its impacts

S. No.	Independent variables	Correlation (r) value
1.	Age	-0.02207^{NS}
2.	Family type	-0.03632^{NS}
3.	Income	0.089064^{NS}
4.	Education	0.657498*
5.	Farming experience	-0.04953^{NS}
6.	Land holding	-0.10708^{NS}
7.	Mass Media Exposure	0.733307*
8.	Extension contacts	0.492926*
9.	Social participation	0.26743**
10.	Innovativeness	0.436724*
11.	Risk orientation	0.857078*
12.	Scientific orientation	0.662708*

*^{NS}= Not Significant *= Significant at 0.01% **= Significant at 0.05%*

3.4 Constraints in the Adoption of Climate Resilient Technologies by the Respondents

Constraints perceived as important by the respondents are tabulated in the Table 5.

High cost of implementation ranks first followed by lack of proper advisory systems (II), lack of awareness about climate resilient technologies (III), high cost of water saving irrigation methods and lack of awareness about climate change (IV), lack of awareness about drought tolerant varieties/crops (VI), Delayed response from the implemented climate resilient practices (VII), poor awareness of weather based insurance schemes (VIII), not having proper fodder storage facilities (IX) and More reliance on conventional method of farming (X). In nutshell, high cost, lack of awareness and poor infrastructure are the major constraints expressed by the farmers [13,14].

3.5 Suggestions Expressed by the Respondents

The major suggestions expressed by the respondents for better adoption of climate resilient practices and mitigating climate change for the open ended questions are categorized as follows:

3.5.1 Advisory

- More awareness should be created to farmers: Especially to young and middle age groups.
- Proper implementation of weather based insurance schemes
- Proper weather advisory systems.
- Training programmes would be conducted on water saving irrigation methods, water harvesting methods and soil and water conservation techniques.

3.5.2 Infrastructure

- Bunds, contours and other Soil and Water Conservation engineering works at subsidized price.
- Establishment of post harvest management for vegetable crops.
- Removal of water and soil depleting plants like *Prosopis juliflora* (Seemai Karuveelam in Tamil).
- Promoting tree planting, agroforestry and maintaining.

Table 5. Constraints in the adoption of climate resilient practices by the respondents

S. No.	Particulars	Rating						Rank
		Very severe		Severe		Not severe		
		F	P	F	P	F	P	
1.	Lack of proper awareness about Climate resilient technologies	51	42.50	69	57.50	0	0	III
2.	Lack of awareness about climate change	68	56.70	52	43.30	0	0	IV
3.	Lack of awareness about drought tolerant varieties	76	63.33	44	36.66	0	0	VI
4.	Lack of proper weather advisory systems	43	35.80	77	64.10	0	0	II
5.	High cost for implementing water harvesting and conservation measures	48	40.00	72	60.00	0	0	I
6.	More reliance on conventional method of farming	57	47.50	30	25.00	33	27.5	X
7.	Delayed response from the implemented Climate resilient technologies	82	68.30	38	31.70	0	0	VII
8.	High cost of water saving irrigation methods	68	56.66	52	43.33	0	0	IV
9.	Not having proper fodder storage facilities	63	52.50	34	28.33	23	19.17	IX
10.	Poor awareness of weather based insurance schemes	73	60.80	33	27.50	14	11.70	VIII

3.5.3 Policy

- Special attention in terms of programmes and policies to be given to drought influenced districts.
- Increasing the number of extension workers per village.
- Regulations for the establishment of firework industries.

4. CONCLUSION

The knowledge towards climate change is influenced by variables like education, mass media exposure, extension contacts, innovative-ness, risk orientation, scientific orientation and social participation. Meanwhile, high cost, lack of awareness and poor infrastructure are the major constraints expressed by the farmers that inhibit their adoption of climate resilient practices. Famers suggest some notable ways to improve adoption, which includes suggestions pertaining to advisory services, infrastructure development and policy. The medium level of knowledge on climate change and its impacts is promising that a slight motivation would eventually result in good adaptation to climate change. And the physical constraints like high cost of some resilient practices and poor infrastructure for storage and processing can be eliminated by evolving definite climate mitigation programme for the development of dryland.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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