Int.J.Curr.Microbiol.App.Sci (2019) Special Issue-9: 370-384

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-9 pp. 370-384**
Journal homepage: http://www.ijcmas.com

Original Research Article

Comparative Analysis of Different Situations for Climate Resilience Management in Eastern Dry Zone of Karnataka

M.A. Murthy[1], K. Naghabhushanam[1], K. Shivaramu[1] and Prabhu Iliger[2]

[1]Directorate of Extension, University of Agricultural Sciences, Hebbal, Bengaluru, Karnataka, India
[2]Department of Agricultural Extension Education, College of Agriculture, Hanumanamatti, Karnataka, India

**Corresponding author*

A B S T R A C T

The present study was conducted in Eastern Dry Zone of Karnataka state India. To measure the adoption of climate resilient practices a scale was developed. The data was collected from 180 farmers using structured interview schedule. The collected data was analyzed and tabulated using Chi- square, ANOVA, Correlation and Principal Component analysis. In rain fed situation half of the farmers (50.00%) had low level of climate resilience management followed by 25.55 per cent had high and 24.45per cent of farmers had medium level of climate resilience management. Whereas in irrigated situation 36.67 per cent of farmers belonged to low climate resilience management level followed by 36.66 per cent had high and 26.67 per cent had medium level of climate resilience management. This gets the support of the significant results of the chi-square test and F- test. In rain fed situation the profile characteristics like awareness about diversification, farming experience, extent of natural capital, farm mechanization level, economic motivation, organizational participation, and extension contact, were found to have significant relationship with climate resilience management at one per cent level. Whereas, in irrigated situation, profile characteristics such as awareness about diversification, economic motivation, farming experience, organizational participation, scientific orientation, extension contact and mass media exposure were found to have significant relationship with climate resilience management at one per cent level.

Keywords

Climate change, Resilience management level, Rain fed, Irrigated

Introduction

Climate is one of the main determinants of agriculture. Throughout the world there is significant concern about the effects of climate change and its impact on agricultural production. Researchers and administrators are concerned with the extent of damages and benefits that may arise in future from climate change eventually impacts on agriculture. Further, agriculture production and food security will be affected severely in developing countries, where 11 per cent of arable land could be affected by climate change, including a reduction of about 16 per cent of agricultural GDP (FAO, 2007). Dependence of majority of population on agriculture, excessive pressure on natural resources and poor coping mechanisms made counties like India more vulnerable to climate change. Adverse climate conditions determine the carrying capacity of the earth

to produce enough food for the human population and domestic animals. Agriculture is affected severely than other sectors of the economy by extreme climatic aberrations like floods, droughts, cold spells, cyclones, heat waves, typhoons, salinity intrusion and soil degradation. Despite some advantages like increasing length of growing period, relaxation from severe cold, increasing availability of land to the higher latitude regions, it has contradictory impact to the rest of the world.

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 are prepared for constant change in the farming practices. Farmers are 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 resilience practices are being followed by farmers depending on the micro climate change in their situation. With this in view the present research study was undertaken with the following specific objectives.

1. To ascertain the Climate Resilience Management level among the farmers in Rain fed and Irrigated situations.
2. To find out the Relationship between Climate Resilience Management level and profile characteristics of farmers in Rain fed and Irrigated situations; and
3. To estimate the contribution of profile characteristics of farmers to the climate resilience management level in Rain fed and Irrigated situations.

Materials and Methods

The study was conducted in Eastern Dry Zone (Zone-5) of Karnataka, India. It covers six districts viz., Tumkur, Banglore (Rural), Bangalore (Urban), Kolar, Ramanagar and Chickballapur. Based on the existence of high range of variability in rainfall and temperature (since 20 years), six taluks were selected. Viz., Chickballapur, Dodddballapur, Anekal, Kolar, Gubbi and Ramanagar. From each of the selected taluks two villages were selected randomly. Thus, 12 villages were considered for the study. From each of the selected village 15 farmers were selected through proportionate random sampling. Thus, the total sample for the study was 180 respondents. The selected respondents were personally interviewed using pre-tested interview schedule. The data was tabulated and analyzed using Chi- square, ANOVA, Correlation and Principal Component analysis. Further, a scale was developed on adoption of Climate Resilience management level. In total there were 60 Climate Resilience management Practices. For each practice a score of 5,4,3,2 and 1 was assigned to the responses fully in vogue, undecided, partially in vogue and not in vogue. Thus, the minimum and maximum scores one could get 60 and 300 respectively. Higher the scores indicate high management level of farmers towards climate resilience management and lesser the score indicate low management level.

Results and Discussion

Over all Climate Resilience Management Level of farmers in Rain fed and Irrigated situation

In rain fed situation half of the farmers (50.00%) had low level of climate resilience management followed by 25.55 per cent had high and 24.45per cent of farmers had medium level of climate resilience management (Table 1). Whereas in irrigated situation 36.67 per cent of farmers belonged to low climate resilience management level followed by 36.66 per cent had high and

26.67 per cent had medium level of climate resilience management. The chi-square test value 53.35** turn out be significant at one per cent level indicating a highly significant variation in the climate resilience management level among the farmers in different agricultural situations viz., rain fed and irrigated.

Further, F- test showed that there was a significant difference (F- value 3.20*) in climate resilience management level among farmers in different situations *viz.*, rain fed and irrigated (Table 2)

Item wise analysis of climate resilience management level of farmers in rain fed and irrigated situations

There were 60 climate resilience management practices which were grouped into four categories and in each category there were 15 practices each. The results were presented in Table 3.

Natural resource degradation management level of farmers in rain fed and irrigated situations

In both rain fed and irrigated situation the management practice efficient use of inputs including agro-chemicals with minimal degradation of environment ranked first, non-adoption of soil-conservation management practices leads to desertification of the agricultural land ranked second and Inorganic fertilizers, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment ranked third.

Agricultural resource / non-agricultural resource management level of farmers in rain fed and irrigated situations

In both rain fed and irrigated situation the management practice measures for increasing the efficiency of water-use, water conservation and recycling ranked first, improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems ranked second and encouraging efficient utilization of forest produces ranked third.

Environmental protection level of farmers in rain fed and irrigated situations

In both rain fed and irrigated situation the management practice raising of green belts with pollution tolerant species ranked first and climate resilience reduces environmental degradation ranked second.

Further, in rain fed situation the management practice increasing temperature and variation in rain fall are the main indicators of environmental chang**e** and modify the cropping pattern ranked third.

On the other hand in irrigated situation management practice environmental factors play an important role in climate change ranked third.

Ecological security management level of farmers in rain fed and irrigated situation

In both rain fed and irrigated situation the management practice encouraging private individuals and institutions to regenerate and develop their wastelands ranked first, conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land ranked second and bringing together the representatives of village institutions, civil society groups, academics and government functionaries on a common platform, so as to achieve better stewardship of the area ranked third.

Relationship between profile characteristics and climate resilience management level of farmers in rain fed and irrigated situation

In rain fed situation the profile characteristics like awareness about diversification (0.375), farming experience (0.364), extent of natural capital (-0.310), farm mechanization level (-0.288), economic motivation (0.220), organizational participation (r=0.218), and extension contact (0.217), were found to have significant relationship with climate resilience management at one per cent level (Table 4). Only farm size (-0.215) had significant relationship with climate resilience management at five per cent level. Whereas, in irrigated situation, profile characteristics such as awareness about diversification (0.510), economic motivation (0.480), farming experience (0.454), organizational participation (0.421), scientific orientation (0.372), extension contact (0.369) and mass media exposure (0.345) were found to have significant relationship with climate resilience management at one per cent level. Similarly extent of natural capital (0.262), education (-0.222) and farm financial literacy (0.173) were found to have significant relationship with climate resilience management at five per cent level.

Contribution of profile characteristics to the climate resilience management level of farmers in rain fed and irrigated situation

The factors which contribute to the variation in climate resilience management among the farmers have been analysed by using "Principal Component Analysis" in rain fed and irrigated situations (Table 5).

In rain fed situation the management factor 1 (efficient use of inputs including agro-chemicals with minimal degradation of environment) strongly associated with profile characteristics such as age, dependency ratio, farming experience, economic motivation, mass media exposure, scientific orientation, extension contact, awareness about diversification and organizational participation. The next important factor 2 (non-adoption of soil-conservation management practices leads to desertification of the agricultural land) where climate resilience management is strongly associated with the variables such as education, annual income, risk orientation and distance to market. But negative sign of the co- efficient dependency ratio (-0.429) and farm size (-0.404) indicated an inverse association with climate resilience management factor. The management factor 8 (development and promotion of methods of sustainable farming, especially organic and natural farming), displayed strong association with the variables such as farm size, risk orientation, extent of natural capital and farm mechanization level. But negative sign of the co- efficient was with age (-0.728) and distance to market (-0.365) indicated an inverse association with the climate resilience management factor. The important variables such as innovative proneness, farm financial literacy and irrigation potential displayed strong association with management factor 7 (sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment), but negative sign of the co-efficient was found in cosmopoliteness (-0.323) and farm mechanization level (-0.572) indicated an inverse association with climate resilience management factor. Later, the factor 6 (cost effective and efficient methods of water conservation and use), display association with dependency ratio, cosmopoliteness and distance to market but negative sign of the co- efficient distance to mass media exposure (-0.353) and innovative proneness (-0.301) indicated an inverse

association. Whereas, in irrigated situation, the profile characteristics such as age, farming experience, economic motivation, mass media exposure, scientific orientation, extension contact, awareness about diversification and organizational participation were strongly associated with management factor 1 (efficient use of inputs including agro-chemicals with minimal degradation of environment). But negative sign of the co- efficient expressed in extent of natural capital (-0.321) and farm financial literacy (-0.421) indicated an inverse association with the climate resilience management factor. The next important factor is 8 (steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements) where climate resilience management is strongly associated with the variables such as education, annual income, extent of natural capital, farm financial literacy, irrigation potential and farm mechanization level. Management factor 7 (development and promotion of methods of sustainable farming, especially organic and natural farming) is positively associated with variables such as education, dependency ratio, risk orientation and distance to market. Age and annual income displayed strong association with management factor 2 (non-adoption of soil-conservation management practices leads to desertification of the agricultural land), but negative sign of the co-efficient of profile characteristics like risk orientation (-0.47) and cosmopoliteness (-0.711) indicated an inverse association. The factor 6 (cost effective and efficient methods of water conservation and use), which is positively associated with farm size and farming experience.

Table.1 Over all climate resilience management level in rain fed and irrigated situation

Management Level	Agricultural situation					
	Rain fed(n=90)		Irrigated(n=90)		Total (N=180)	
	Number	Per cent	Number	Per cent	Number	Per cent
Low	45	50.00	33	36.67	78	43.33
Medium	22	24.45	24	26.67	46	25.56
High	23	25.55	33	36.66	56	31.11
Total	**90**	**100.00**	**90**	**100.00**	**180**	**100.00**

Chi-square Value=53.55** ** = Significant at 1 per cent level

Table.2 Climate resilience management level of farmers in rain fed and irrigated situations

(N=180)

Situation	Sample Size	Management Level		'F' Value
		Mean	S.D	
Rainfed	**90**	170.46	44.95	
Irrigated	**90**	169.82	45.50	
Total	**180**	170.16	45.24	**3.20***

* = Significant at 5% level;

Table.3 Climate resilience management level of farmers in rainfed and irrigated situations

SI. No.	*Climate Resilience*	*Rainfed (n=90)*			*Irrigated (n=90)*		
		Score	*Per cent*	*Rank*	*Score*	*Per cent*	*Rank*
I	**Natural Resource Degradation Management**						
1.	Efficient use of inputs including agro-chemicals with minimal degradation of environment	293	65.11	**I**	295	65.56	I
2.	Non-adoption of soil-conservation management practices leads to desertification of the agricultural land	284	63.11	II	288	64.00	II
3.	Inorganic fertilizers, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment	280	62.22	III	282	62.67	III
4.	Encouraging crop rotation patterns	265	58.89	IV	268	59.56	IV
5.	Prevent and control the future deterioration in land, water and air which constitute our life-support systems	260	57.78	V	263	58.44	V
6.	Cost effective and efficient methods of water conservation and use	259	57.56	VI	262	58.22	VI
7.	Sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment	258	57.33	VII	263	58.44	V
8.	Development and promotion of methods of sustainable farming, especially organic and natural farming	255	56.67	VIII	259	57.56	VII
1.	Environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation	254	56.44	IX	253	56.22	IX
2.	Steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements	251	55.78	X	254	56.44	VIII
3.	Ensure that development projects are correctly sited so as to minimize their adverse environmental consequences	249	55.33	XI	249	55.33	X
4.	Raising of green belts with pollution tolerant species can protect the natural resources	247	54.89	XII	253	56.22	IX
5.	Ensuring land for different uses based upon land capability and land productivity	246	54.67	XIII	248	55.11	XI

SI. No.	*Climate Resilience*	*Rainfed (n=90)*			*Irrigated (n=90)*		
		Score	*Per cent*	*Rank*	*Score*	*Per cent*	*Rank*
6.	Developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases	236	52.44	XIV	241	53.56	XII
7.	Encouragement for improvement in traditional methods of rain water harvesting and storage	209	46.44	XV	219	48.67	XIII
II	**Agricultural Resource / Non Agricultural Resource Management**						
8.	Measures for increasing the efficiency of water-use, water conservation and recycling	296	65.78	I	297	66.00	I
9.	Improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems	295	65.56	II	296	65.78	II
10.	Encouraging efficient utilization of forest produces	289	64.22	III	289	64.22	III
11.	Concerted efforts for development and propagation of non-conventional renewable energy generation systems	284	63.11	IV	284	63.11	IV
12.	Organic farming is effective in increasing the texture and fertility of soil	278	61.78	V	281	62.44	V
13.	Development of integrated pest management and nutrient supply system	277	61.56	VI	279	62.00	VI
14.	Incentives for environmentally clean technologies, recycling and conservation of natural resources	276	61.33	VII	275	61.11	VII
15.	A movement toward greater efficiency in resource use including recycling	276	61.33	VII	281	62.44	V
16.	Improvement in genetic variability of indigenous population	271	60.22	VIII	274	60.89	VIII
17.	Integrated pest management is a boon to reduce the chemical use for plant protection	270	60.00	IX	274	60.89	VIII
18.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices	263	58.44	X	266	59.11	IX
19.	Afforestration on common lands by the local communities through government schemes	262	58.22	XI	263	58.44	X
20.	Setting up of biogas plants based on cow-dung and vegetable wastes	259	57.56	XII	262	58.22	XI
21.	Restoration and protection of grazing	258	57.33	XIII	261	58.00	XII

SI. No.	*Climate Resilience*	*Rainfed (n=90)*			*Irrigated (n=90)*		
		Score	*Per cent*	*Rank*	*Score*	*Per cent*	*Rank*
	lands						
22.	Integrated farming system is one of the best method to use the agricultural resource management	246	54.67	XIV	246	54.67	XIII
III	**Environmental Protection**						
23.	Raising of green belts with pollution tolerant species	301	66.89	I	301	66.89	I
24.	Climate resilience reduces environmental degradation	583	64.78	II	298	66.22	II
25.	Increasing temperature and variation in rain fall are the main indicators of environmental chang**e** and modify the cropping pattern	284	63.11	III	284	63.11	IV
26.	Inorganic fertilizers and pesticides cause long term harmful effects to the environment	280	62.22	IV	278	61.78	VII
27.	Environmental change causes negative effect on people health and animals	559	62.11	V	282	62.67	V
28.	Environmental factors play an important role in climate change	558	62.00	VI	286	63.56	III
29.	Practicing the afforestration activities helps in increasing environmental conditions	274	60.89	VII	272	60.44	VIII
30.	Willing to give up part of my profit for environmental conservation	547	60.78	VIII	278	61.78	VII
9.	Create environmental consciousness through education and mass awareness programmes	547	60.78	VIII	279	62.00	VI
10.	Pesticides and chemical fertilizers will reduce the number of soil micro organisms	267	59.33	IX	262	58.22	XI
11.	Less risk of pollution in climate resilience practices	264	58.67	X	264	58.67	IX
12.	Climate resilience efficient in mitigating climate change effects	263	58.44	XI	263	58.44	X
13.	Crop cover may protect the soil climate	258	57.33	XII	258	57.33	XII
14.	Climate change reduces mineral output to the environment	255	56.67	XIII	255	56.67	XIII
15.	Organic farming can improve soil fertility and soil structure	476	52.89	XIV	242	53.78	XIV
IV	**Ecological Security Management**						
46.	Encouraging private individuals and institutions to regenerate and develop their wastelands	300	66.67	I	298	66.22	I

SI. No.	*Climate Resilience*	*Rainfed (n=90)*			*Irrigated (n=90)*		
		Score	*Per cent*	*Rank*	*Score*	*Per cent*	*Rank*
47.	Conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land	275	61.11	II	273	60.67	II
48.	Bringing together the representatives of village institutions, civil society groups, academics and government functionaries on a common platform, so as to achieve better stewardship of the area	273	60.67	III	272	60.44	III
49.	Reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority	272	60.44	IV	269	59.78	IV
50.	Development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation	272	60.44	IV	252	56.00	VIII
51.	Development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology	271	60.22	V	265	58.89	V
52.	Concentrating on Common Property Resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation	269	59.78	VI	269	59.78	IV
53.	Support for protecting traditional skills and knowledge for conservation of resources	267	59.33	VII	265	58.89	V
54.	Restriction on introduction of exotic species of animals without adequate investigations	263	58.44	VIII	261	58.00	VI
55.	Development and promotion of methods of sustainable farming, especially organic and natural farming	256	56.89	IX	256	56.89	VII
56.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices	253	56.22	X	251	55.78	IX
57.	Discouragement of monoculture and	252	56.00	XI	252	56.00	VIII

SI. No.	*Climate Resilience*	*Rainfed (n=90)*			*Irrigated (n=90)*		
		Score	*Per cent*	*Rank*	*Score*	*Per cent*	*Rank*
	plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation						
58.	Taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand	252	56.00	XI	250	55.56	X
59.	Conservation of natural and domesticated ecosystems, and of wild and domesticated species, to the fullest extent possible and the restoration and regeneration of degraded ecosystems	250	55.56	XII	250	55.56	X
60.	Protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity	249	55.33	XIII	249	55.33	XI

Table.4 Relationship between profile characteristics and climate resilience management level of farmers in rain fed and irrigated situation

Sl. No.	**Characteristics**	**Correlation Coefficient (r)**	
		Rain fed (n=90)	**Irrigated(n=90)**
1	Age	0.091NS	0.054NS
2	Education	-0.157NS	-0.222*
3	Dependency Ratio	0.125NS	0.071NS
4	Farm Size	-0.215*	0.033NS
5	Farming Experience	0.364**	0.454**
6	Annual income	0.031NS	0.109NS
7	Economic Motivation	0.220**	0.480**
8	Mass media Exposure	0.139NS	0.345**
9	Risk Orientation	-0.075NS	-0.020NS
10	Scientific Orientation	0.075NS	0.372**
11	Extension Contact	0.217**	0.369**
12	Cosmopoliteness	0.136NS	-0.128NS
13	Distance to Market	0.139NS	0.078NS
14	Awareness about Diversification	0.375**	0.510**
15	Extent of Natural Capital	-0.310**	-0.262*
16	Innovative Proneness	-0.079NS	-0.109NS
17	Farm financial Literacy	-0.035NS	-0.173*
18	Irrigation Potential	0.016NS	0.071NS
19	Organizational Participation	0.218**	0.421**
20	Farm Mechanization Level	-0.288**	-0.071NS

NS: Non-Significant; *: Significant at 5% level; **: Significant at 1% level.

Table.5 Contribution of profile characteristics to the climate resilience management level of farmers in rain fed and irrigated situation

S.I N0.	Characteristics	Rain fed situation(n=90)					Irrigated situation(n=90)					
		Climate resilience practices					Climate resilience practices					
		1	2	8	7	6	1	8	7	2	6	5
1.	Age	0.350		-0.728			0.511			0.476		
2.	Education		0.729				-0.483	0.534	0.343			
3.	Dependency Ratio	0.313	-0.429			0.458			0.689			
4.	Farm Size		-0.404	0.480							0.767	
5.	Farming Experience	0.849					0.846					
6.	Annual Income		0.665					0.310		0.377	0.446	
7.	Economic Motivation	0.757					0.838					
8.	Mass media Exposure	0.789				-0.353	0.774					
9.	Risk Orientation		0.652	0.330					0.513	-.0472		
10.	Scientific Orientation	0.714					0.867					
11.	Extension Contact	0.905					0.885					
12.	Cosmopoliteness				-0.323	0.532				-0.711		
13.	Distance to Market		0.445	-0.365		0.314			0.731			-0.305
14.	Awareness about Diversification	0.911					0.911					
15.	Extent of Natural Capital			0.531			-0.321	0.696				
16.	Innovative Proneness				0.582	-0.301						0.791
17.	Farm Financial Literacy				0.596		-0.421	0.368				
18.	Irrigation Potential				0.419			0.370				
19.	Organizational Participation	0.844					0.861					
20.	Farm Mechanization Level			0.416	-0.572			0.808				
21	Climate Resilience management Level		0.385							0.484		0.591
	Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.											

In rain fed situation half of the farmers had low level of climate resilience management followed by high and medium level of climate resilience management level. Whereas in irrigated situation farmers belonged to low level followed by high and medium level of climate resilience management. The chi-square test and F-test values were significant indicating a highly significant variation in the climate resilience

management level among the farmers in different agricultural situations viz., rain fed and irrigated. The possible reasons may be that it is relatively a new concept to many farmers and still it is in the stage of acceptance by the farmers and hence they might have felt it is a complex practice. 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. The above trend of results gets the support of Shankara (2010) reported that majority of farmers (43.33%) had low adoption followed by (33.34%) per cent had medium and high (23.33%) adoption level of climate related activities because of lack awareness regarding adoption strategies. Manjunath (2018) reported that the Tail end area farmers had medium-high adoption level as compared to the Head reach farmers who had low-medium adoption level which may be due to the situational factor like acute water shortage and Tail end farmers had more extension contact with the subject matter specialists (SMS's) of Krishi Vignan Kendra (KVK) and they were participated in extension educational activities like demonstrations, group meetings, field days etc., to a greater extent. Further, the farmers in head reach area had obtained a relatively lesser mean score, while the farmers in Tail end area had a higher mean score with respect to adoption scores. The t-value showed significant difference between adoption level of Head reach and Tail end farmers at 5 per cent level of probability. Similarly Balakrishnan and Vasanthakumar (2010) revealed that more than half of respondents had medium level of knowledge followed by high level of knowledge and low knowledge level about SRI technology. Also, Thiyagarajan (2011) revealed that majority of the respondents had medium level of knowledge followed by low level and high level of knowledge on SRI cultivation. Further, Jasna (2015) reported that in Karnataka and Jharkhand NICRA farmers had a higher resilient index score than the non- NICRA farmers.

In natural resource degradation management level of farmers in rain fed and irrigated situations in both rain fed and irrigated situation the management practice efficient use of inputs including agro-chemicals with minimal degradation of environment ranked first, non-adoption of soil-conservation management practices leads to desertification of the agricultural land ranked second and Inorganic fertilizers, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment ranked third. In agricultural resource/non-agricultural resource management level of farmers in rain fed and irrigated situations. In both rain fed and irrigated situation the management practice measures for increasing the efficiency of water-use, water conservation and recycling ranked first, improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems ranked second and encouraging efficient utilization of forest produces ranked third. The in environmental protection level of farmers in rain fed and irrigated situation in both rain fed and irrigated situation the management practice raising of green belts with pollution tolerant species ranked first and climate resilience reduces environmental degradation ranked second. Further, in rain fed situation the management practice increasing temperature and variation in rain fall are the main indicators of environmental change and modify the cropping pattern ranked third and in irrigated situation management practice environmental factors

play an important role in climate change ranked third. The ecological security management level of farmers in rain fed and irrigated situation in both rain fed and irrigated situation the management practice encouraging private individuals and institutions to regenerate and develop their wastelands ranked first, conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land ranked second and Bringing together the representatives of village institutions, civil society groups, academics and government functionaries on a common platform, so as to achieve better stewardship of the area ranked third. The above trend of results may be due to the fact that natural resource degradation management play an important role in climate resilience management because it focus on how to manage the land, water and soil more ever it deals with managing the way in which people and natural resource interact. It brings together land use planning, water management, soil conservation and future sustainability of agriculture. Where as in Agricultural resource / non agricultural resource management deals with increasing the efficiency of water-use, water conservation and recycling because scarcity of water is major problem found in research area more ever it decide the cropping pattern and its major agriculture resource for effective management. Proper management of various agricultural management practices reduce environmental degradation and also need modify the cropping pattern in management aspects and required group effort by create environmental consciousness through education and mass awareness programmes are for effective environmental management and ecological security management through encouraging private individuals and institutions to regenerate and develop their wastelands to avoid become barren lands and maintain soil conservation and indirectly reduce impact of climate change. And play crucial role in management aspect ecological security management. The results of present study were in consonance with the studies of Ofuokus (2011) reported that the farmers have adapted the climate change practices like planting trees, applying soil conservation, changing planting dates cooling livestock pens with fans, using heat tolerant species, irrigation and using different crop varieties. Sofoluwe *et al*., (2011) observed that majority of the respondents employed late planting, planting trees, irrigation and soil conservation in Osun state, Nigeria. Mahentesh (2015) stated that agriculture resource/ non agriculture resource management felt more important place because its farm level management its helps mobilization and proper utilization of farm level resources in climate resilience management followed by environmental security management, natural resource degradation management and ecological security management. Vinay and Umesh (2015) observed that the farmers have adapted several coping mechanisms in crop production and soil and water conservation practices in response to changes in climatic parameters. Majority of farmers have changed from growing of long duration varieties to short duration varieties. Similarly, a sizable proportion of farmers have changed their cropping pattern that instead of growing ragi alone, they shifted to red gram, vegetable and grapes. Farmers have also changed the spacing, quantity of seeds used, fertilizer application and frequency of irrigation.

In rain fed situation the profile characteristics like awareness about diversification, farming experience, extent of natural capital, farm mechanization level, economic motivation, organizational participation, and extension contact, were

found to have significant relationship with climate resilience management at one per cent level. Whereas, in irrigated situation, profile characteristics such as awareness about diversification, economic motivation, farming experience, organizational participation, scientific orientation, extension contact and mass media exposure were found to have significant relationship with climate resilience management at one per cent level. The significant association between the personal characteristics viz., farming experience, economic motivation, extension contact, awareness about diversification and organization participation with climate resilience management of farmers may be due the fact that there will be increased knowledge, skill as the experience in farming increases. Economic motivation increases respondents attached greater importance to profit maximization. Extension contact would help the farmers to expose them to farm technologies promoted by the extension workers. Frequent contact with the extension workers has motivated farmers to participate in agriculture and allied activities. Further, organizational participation of respondents in political issues and organizations helps the farmers to participate more in educational activities on climate resilience management. The results are in line with the studies of Shankara (2010) reported the relationship of independent variables with perception of climate change, revealed that, out of fifteen variables viz., age, education, family size, farming experience, income, land holding, innovative proneness and extension agency contact had a positive significant relationship with the farmers perception on climate change. Lalitha (2016) observed that, there was a positive and significant relationship between education, annual income, cropping intensity, irrigation potential, risk orientation, scientific orientation and perception of farmers on climate change with agro bio-diversity level at five per cent level. Nithish (2017) indicated that environmental activities participation had a highly significant association with the standard of living of beneficiaries at one per cent level in Green army members. Prabhu (2017) revealed that chi-square test had highly significant association between profile characteristics and management level at one per cent level.

In conclusion, the level of climate resilience management in different situations *viz.*, rain fed and irrigated had low management since it is relatively a new concept to many farmers and still in the stage of acceptance by the farmers and hence they might have felt it was a complex management. This implies that the farmers need to be educated regarding impact and advantages of climate resilience management for their acceptance**.** The personal characteristics economic motivation, mass media exposure, and distance to market, innovative proneness, irrigational potential, education, risk orientation and extent of natural capital were the most influencing characteristics of climate resilience management among farmers. This calls for the government to promote integrated farming system with better management of climate resilience practices. Further, there is a need for specialized training programmes in order to increase the awareness regarding climate resilience management and motivate them to excel in their life endeavours. In addition, the personal characteristics awareness about diversification, farming experience organizational participation, extent of natural capital, extension contact, mass media exposure education, scientific orientation and farm mechanization level, were the prime factors of climate resilience management. Therefore, the government, developmental departments such as department of agriculture / horticulture/

forestry /animal husbandry, department of rural development and NGO"s to focus their efforts towards amplification of these factors through their developmental programmes and schemes in order to ensure enhancement of climate resilience management. Further, developmental schemes to focus exclusively on climate resilience management of the farmers need to be designed and implemented.

References

Balakrishnan, T. and Vasanthakumar, J. (2010) Knowledge level of System of Rice Intensification (SRI). Technology among farmers in Cuddalore district of Tamil Nadu. *International Journal of Current Research.* 9: 65-68.

FAO, (2007) Adaptation to climate change in agriculture, forestry and fisheries: perspectives, frame work and priorities, FAO, Rome.

Jasna, V.K. (2015) Impact of Climate Resilient Technologies in Rainfed Agroeco system. *M.Sc. Agri Thesis(unpublished).IARI, New Delhi.*

Lalitha, M. (2016) A Study on impact of climate change on agro bio-diversity among Rain fed farmers in Chickballapur district of Karnataka State *M.Sc. (Agri) Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

Manjunath, K.V. (2018) Knowledge and Adoption Climate Resilient Technologies among Paddy growers in Mandya district. *M.Sc. (Agri) Thesis (Unpub.),* Univ. Agric.Sci., Bangalore.

Nithish Babu, M. (2017) Impact of green army labour bank on standard of living of beneficiaries in Thrissur district of Kerala.*M.Sc. (Agri) Thesis,* (Unpub.), Univ.Agric.Sci., Bangalore.

Ofuokus, A.U. (2011) Rural farmers' perception of climate change in central agricultural zone of Delta state, Nigeria. *Indonesian J. Agric. Sci.*, 12(2): 63-69.

Prabhu Iliger (2017) An analytical study on attitude and technological gap of Bt-cotton growers in Northern Dry Zone of Karnataka. *Ph.D. (Agri) Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

Shankara. M. H. (2010) A study on farmers perception of climate change and their adaptations. *M.Sc. (Agri.) Thesis (Unpub).* Univ. Agric. Sci., Bangalore.

Sofoluwe, N. A., Tijani, A. A. and Baruwa, O. I. (2011) Farmers' perception and adaptation to climate change in Osun state, Nigeria. *African J. Agric. Res.*, 6(20): 4789-4794.

Thiyagarajan, M. (2011) Impact analysis of System of Rice Intensification (SRI) among the Paddy farmers of Coimbatore District. M.Sc. (Agri.) Thesis (Un published). Tamil Nadu Agricultural University, Coimbatore, India.

Vinay Kumar, C.T. and Umesh, K.B. (2015) Perception and adaptation of the framers to climate change. *Karnataka J. Agric. Sci.*, Spl. Issue 28(5): 822-827.