I INTRODUCTION

Global climate changes are posing a unique challenges and become a researchable issue at present day agriculture. Climate constitutes complex inter-related factors such as cloudiness, evaporation, temperature, rainfall, wind speed and sun shine, which play a vital role. Change in one factor triggers changes in other factors. There is a weak link between factors such as cloudiness and wind, but temperature, evaporation and rain fall are strongly correlated. 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. The climate change is that any change in climate over time that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere in addition to natural climate variability observed over comparable time periods (IPCC, 2007). Studies have shown a significant effect of change in climatic factors on the average crop yield. More over in developing countries, climate change will cause yield decline for the most important crops where in South Asia will be particularly hard hit (IFPRI, 2009).

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.

As per the Indian meteorological department report an annual mean average surface warming over the Indian subcontinent is range between 3.5 and 5.5°C over the region by 2080s. These projections showed that more warming in winter season over summer and kharif. The spatial distribution of surface warming suggests a mean annual rise in surface temperatures in north India by 3°^{C} or more by 2050. Similarly it is predicted that the rise in average annual temperature by 1.3°C in the state of Karnataka by 1990. On the rainfall front, the scenario over the past half century, the world ocean has absorbed about 20 times much heat to a substantial depth. As a result of this warming, the water vapor content over the ocean has increased by 4.00 per cent since 1970, which has led to a more frequent and intensive cyclone.

The increase in greenhouse concentration may lead increase in the rainfall of about 1.00 to 4.00 mm per day. There is a uneven distribution in of rainfall pattern in the atmosphere over the years, in some areas receiving higher and in some areas receiving lower rainfall. There is a variation in the timing of rainfall, some areas may receive early and some areas may receive late onset of rainfall from the predicted period where it affects the agricultural operations. In Indian context, the rainfall is highly variable with greater spatial variability across regions and seasons. The trend analysis of rainfall data from 1140 meteorological stations carried out at CRIDA (Rao and Sinha 1994) showed negative trend among the stations situated in deep southern parts, southern peninsular, central India and parts of north Indian regions. Positive deviation is seen at Gujarat, Maharashtra, coastal A.P., Rayalseema and Orissa. However, parts of country in the areas of central parts covering eastern U.P., eastern M.P., east coast and greater parts of North West India did not show any changes. The summer monsoon rainfall during 1901-2000 has shown significant decreasing trends in the subdivision of North East India, viz., Nagaland, Manipur, Mizoram etc. It is measures that by the end of the 21st century rainfall will increase by 15.00 to 31.00 per cent and the mean annual temperature will increase by 3°C to 6°C in the country.

Past experience on global warming have an increase in rainfall in some areas, which would lead to an increase of atmospheric humidity and the duration of wet seasons. Combined with higher temperatures, these could favor the development of fungal diseases and vector borne diseases which affect human health. Pathogens and insect population strongly dependent upon temperature and humidity, changes (increase) in the atmospheric parameter would change their population dynamics resulting in crop production loss. It has become common knowledge that the poor are likely to be hit hardest by climate change and that capacity to respond to climate change is lowest in developing countries and among the poorest people in those countries. It seems clear that vulnerability to climate change is closely related to poverty, as the poor are least able to respond to climatic stimuli.

States like Assam, Bihar and parts of Karnataka are exposed to the dry spells, where as Andhra Pradesh, parts of Bihar, Maharashtra, Southern Gujarat and Western Karnataka were hit by the flood. There is a un even distribution of rain fall pattern found in country. Reduction in crop production in the country in the last decades due to the anticipated rise in the temperature. There is threat in the near future India is going to face the challenges that include unwanted pressure from the growing population, and changing scenario of world trade in agriculture.

The rise in average annual temperature by $1.3^{\circ\,C}$ in the state of Karnataka during 1950 to 1990 has been observed. The mean annual rainfall trend from 1901 to 2000 has been reported as declining. There is evidently reviewed that definite declining trend in rainfall in Kodagu, Chikmaglur, South canara, Bangalore, Tumkur and Kolar districts from 1950 to 2006 have shown considerable increasing trend in the annual rainfall (Rajegowda *et al.*, 2009).

Karnataka's agriculture mainly depends on rain fed agriculture around 68 per cent of areas prone to drought, Karnataka is next only to Rajasthan, 54 per cent of Karnataka's geographical area is under drought prone. Karnataka is likely to be more vulnerable to climate change than other states. More ever agriculture is the major occupation for a majority of the rural population. As per the population Census 2011, agriculture supports 13.74 million workers, of which 23.61 per cent are cultivators and 25.67 per cent agricultural workers. A total of 123,100 km^2 of land is cultivated in Karnataka constituting (64.60%) of the total area of the state. The agricultural sector of Karnataka is characterized by drought prone and sporadic patches of irrigated region. Thus, a large portion of agricultural land in the state is exposed to the vagaries of monsoon with severe agro-climatic and resource constraints.

There are 10 agro-climatic zones in Karnataka state. Among them zone-5 is primarily agrarian in character with about 47.16 per cent of its population depend on agriculture. It has semi-arid type of climate characterized by typical monsoon tropical weather with hot summers; mild winters and is drought prone. This makes the zone sensitive to current climate variability, and the vulnerability of the zone could potentially increase in future. Further, this zone has experienced and is experiencing the ill effects of rising temperature and deficit rainfall which is predominantly experienced in the entire Karnataka state in general and zone 5 is in particular. Farmers are facing lot of problems due to impact of climate change. There is adequate scientific evidence to show that climate change has already affected crop productivity, forest biodiversity, hydrological satus, and human health adversely. Thus, it is very important for Karnataka state to understand the impact of climate change and vulnerabilities and to develop coping strategies to deal with the current climate vulnerability and build resilience to climate change impact.

Climate change under the situation refers to a change of climate that is attributed directly or indirectly to human activities that alters the composition of the global atmosphere in addition to natural climate variability observed over comparable time periods. Occurrence of disasters related to meteorological, hydrological and climate hazards cause significant loss of life. obstruct social and economical development.

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. India significant negative impact have been implied with medium-term (2010-2039) climate change , predicted to reduce yield by 4.5 to 9 per cent, depending on magnitude and distribution of warming. Since agriculture makes up roughly 15 per cent of India GDP, 4.5 to 9 per cent of negative impact on production implies a cost of climate change to be roughly up to 1.5 per cent of GDP per year (Venkateswarlu *et al,.* 2013). Various factors including pests, weeds, and diseases, biodiversity losses, rise in sea level, saline water instruction in costal belts, poor quality of irrigation water, decline in soil fertility and irregularities in onset of monsoon, cold wave,heat wave, drought and cyclone, together brought out the yield fall. Climate changes have both positive and negative effect on crop production. The type of crop cultivation would be determined by climate variability through impacting agricultural inputs like water for irrigation and availability of solar radiation.

Climate Resilience Management

Resilience management practices are more visible in many areas to enhancing agricultural productivity and it is critical for ensuring food and nutritional security for poor of the poorest. Therefore, it is of utmost importance to promote the resilience agriculture to climate change is gaining importance.

Resilience is the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazards event in a timely and efficient manner, including through ensuring, preservation, restoration, or improvement of its essential basic structure and functions (Venkateswarlu *et al*,. 2013). It refer to the ability of a system to absorb shocks and recover as quickly as possible to normal condition when external environment improves. Planned adoption is essential to increase agricultural production under adverse climatic conditions tend support climate change adoptions because they increase resilience and reduce yield variability under variable climate and extreme events. The potential adoption strategies' are crop diversification, developing cultivars tolerant to heat and salinity stress and registrant to floods and droughts, modifying crop management practices, improving water management, adopting new farm techniques such as resource conservation techniques, improving pest management, better weather forecasting and crop insurance and harshening indigenous technical knowledge of farmers. To sustain life on pale blue planet, to fetch the last thingy of greenery planet as well thought out but a potential and sudden solutions embraced. The technologies now evolved by scientific community as well as common people can adopt and cope with extreme climate events. It can reduce the risks associated with climate change and strengthen backbone sector of economy.

Extension has a major role to play in helping farmers to adapt and mitigate climate change vulnerability. To capture this potential role, adaptation and mitigation funds could be used to support extension efforts that deliver new technologies, information, and education about increasing carbon sequestration and reducing Green House Gases (GHG) emissions and climate resilience management. and it can help link practice in the field to new policies regarding climate change. All of these roles can be explore in a cost-effective way to help farmer's especially resource-poor smallholders to deal with the climate change that will so radically affect their livelihoods. The most important purpose for extension today is to bring about the empowerment of farmers, so that their voices can be heard and they can play an important role in mitigate and adapt to climate resilience management practices.

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

SPECIFIC OBJECTIVES OF THE STUDY

1. To Develop scale to Measure the Climate Resilience Management of Farmers.
2. To Ascertain the Level of Climate Resilience Management among Farmers in Eastern Dry Zone.
3. To Know the Association between Climate Resilience Management Level and Profile Characteristics of Farmers.
4. To Document the Climate Resilient Practices Followed by the Farmers to Mitigate the Climate Change.
5. To Understand Constraints Experienced by Farmers due to Climate Change.

HYPOTHESES OF THE STUDY

1. There is no Difference in the Climate Resilience Management Level among Farmers.
2. There is no Association between Climate Resilience Management Level and Profile Characteristics of Farmers.
3. There is no Relationship between Independent Variables and Dependent Variables.
4. There is no Documentation of Climate Resilient Practices Followed by the Farmers to Mitigate the Climate Change.
5. There are no Constraints Exists due to Climate Change.

SCOPE AND IMPORTANCE OF THE STUDY

One of the main aims of the study is to know the climate resilience management level of farmers in eastern dry zone, is to cope with ill effects of climate change variability, what are all the management practices and activities initiated by them to manage the climate change, document the adoptability of climate resilience management practices followed by the farmers and also know the constraints faced by the farmers in eastern dry zone, at the same time to document the suggestions from the farmers to overcome the climate change vulnerability.

The present study is a pioneering attempt of its kind which aims to measure the climate resilience management level of farmers in eastern dry zone. It brings to enlighten the various dimensions of the climate resilience management. The identified management aspects would greatly help the administrators and policy makers for measuring the climate resilience management level of the farmers. The climate resilience management level scale which constructed as part of the study is expected to serve as an effective tool to measure the climate resilience management level of farmers not only in Eastern Dry Zone but also elsewhere under similar conditions exists.

The analysis of research data would reveal valuable research priorities to be focussed and identify the aspects of concern for climate resilience management by providing relevant and appropriate management, if any. The lacuna in the research priorities would be fulfilled in developing the management practices. The findings of the study may help the administrators and policy makers to know about the climate resilience management of farmers and may help them to come out with the suitable policies and programmes to improve the climate resilience management aspect of farmers. The study may also help in further investigations in the similar area with other dimensions.

LIMITATION OF THE STUDY

The study was conducted by a student researcher who had limited time and other resources; the research was confined to eastern dry zone. The study did not suffer due to any unusual limitations other than the common ones like, finance, mobility and physical facilities.

In spite of these, every effort was made to conduct the study as objective as possible by deliberately following all norms of the scientific research by carrying out the investigation in the actual place by involving farmers selected very systematically. Hence, the findings can be generalised in all such regions where similar conditions exist. However, the expressed opinions of the respondents may not be free from their individual subjective perception and biases in spite of the researcher's effort to get them as objectively as possible.

OPERATIONAL DEFINITION OF THE CONCEPT USED IN THE STUDY

Climate Change

Climate change refers to a change of climate (general weather conditions prevailing in an area over a long period) which is attributed indirectly or directly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Climate Resilience Management

Climate resilience management is operationally defined as the capacity for a socio-ecological system to absorb stresses and maintain function in the face of external stresses imposed by climate change and adopt, reorganize, and evolve into more desirable management practices that improve the sustainability of the system and better prepared for future climate change impacts.

Impact of Climate Change

Impact of climate change is operationally defined as the degree to which, severity of climatic parameters like rainfall and temperature, and their ill effects on agriculture and other related factors like crop production and water resource availability.

Adoptability of Climate Resilience Practices

Adoptability is operationally defined as survival strategies undertaken by the farmers to face the vulnerability of climate change and also anticipated future impacts. These actions are broadly focused on pest and disease resistant varieties, drought tolerant varieties, intercropping, crop substitution, alteration in sowing/ planting dates, integrated farming system approach, organic farming practices, establishing wind breaks, alteration in fertilizer usage, Establishing soil& water conservation structures, micro irrigation systems, soil moisture conservation measures, use of organic manures, integrated nutrient management practices, crop rotation, soil test based fertilizer application, integrated weed management practices, measures towards disease resistance in animals, use of suitable breeds, high yielding & drought resistant forage crops, mulching and farm pond.

ORGANISATION OF THE THESIS

In addition to the introduction chapter, five more chapters have been organised in a logical sequence. The chapter first of the thesis included the clarification on the statement of the problem, the objectives of the study. It also throws light on the scope, limitations and definition of the terms used in the study.

Subsequently, the chapter second viz,. Review of literature dealt with the theoretical orientation of the problem with the reviews of literature related to the research.

The third chapter i.e, methodology was mainly concerned with the aspects like methodology adopted to measure the dependent and independent variables, the location of the study, sampling procedure and statistical tools used for the analysis of data.

The findings and discussion is of fourth chapter dealt with the findings derived from research and discussion, the possible reasons for the results were explained in this chapter to the objectives set forth for the study.

The fifth summary chapter comprised of summary and conclusions of the study based on the results obtained. The implications and suggestions for further research were also included.

The references and appendices relation to the study were included at the end of the thesis.

II REVIEW OF LITERATURE

The reviews of past research have been collected to have a proper understanding of the research problem and to have an idea on the development and have been chronologically organized. Acquaintances with earlier, pertinent studies have been felt necessary to develop good understanding of the present study and to formulate appropriate research methodology. Since, there were limited studies related to climate resilience management level, efforts made to put together some of the closely related and available literature. The culminated reviews are presented under the following headings.

2.1 Concept of Climate Change

2.2 Scale Development on Climate Resilience Management

2.3 Concept of Climate Resilience Management

2.4 Profile Characteristics of Respondents

2.5 Level of Climate Resilience Management Practices Followed by the Respondents

2.6 Association between Climate Resilience Management Level and Profile Characteristics of Respondents

2.7 Relationship between Climate Resilience Management Level and Profile Characteristics of Respondents

2.8 Contribution of Profile Characteristics to Climate Resilience Management

- 2.9.1 Document the Climate Resilience Practices Followed by the Farmers to Mitigate Climate Change
- 2.9.2 Eco-friendly Practices Initiated by the Farmers to Overcome Vulnerability due Climate Change

2.10 Level of Adoptability in Climate Resilience Management Practices Followed by the Farmers

2.11 Association between Adoptability of Climate Resilience Management Practices and Profile Characteristics of Respondents

2.12 Relationship between Adoptability of Climate Resilience Management Practices and Profile Characteristics of Respondents

2.13 Contribution of Profile Characteristics to Adoptability of Climate Resilience Management Practices

2.14 Constraints Faced by the Farmers due to Climate Change

2.15 Farmers Suggestions to Mitigate the Ill Effects of Climate Change

2.1 Concept of Climate Change

IPCC (TAR) (2001) climate change refers to statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land-use.

ISRD (2004) climate change refers to the climate of a place or region is changed if over an expended period (typically decades) there is a statically significant change in measurements of either the mean state or variability of the climate for that place or region.

Meehl *et al*., (2007) as a result of global warming, the type, frequency and intensity of extreme events, such as tropical cyclones (including hurricanes and typhoons), floods, droughts and heavy precipitation events, are expected to rise even with relatively small average temperature increases. Changes in some types of extreme events have already been observed, for example, increases in the frequency and intensity of heat waves and heavy precipitation events.

Anonymous (2010) climate change means change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

IPCC (2014) suggests that with higher confidence that there now is a global temperature increase of ~4°C, above the late 20th- century level. Combined with increasing food demand, this will result in more food insecurity globally. Wheat, rice and maize production in the tropical and temperate regions is projected to be negatively impacted by local temperature increases of 2°C or more above late 20th- century levels.

Ogunlade *et al.*, (2014) reported that extension agents of Department of Agriculture possessed high awareness of concept of climate change and need for farmers to be expose to new technology.

Niles *et al.*, (2015) in a study on "How limiting factors drive agricultural adoption to climate change" observed from their study that 47.00 per cent of respondents expressed that annual rainfall increased over time (47.00%) followed by floods and water availability increased (44.00%) winter and summer temperature increased (18.00%) and drought increased (8.00%).

Yearbook of Global Climate Action (2017) Climate change is one of the greatest challenges humanity has ever faced. Left unchecked, it threatens to destabilize the natural world, our foundation for security, prosperity and peace.

Atteridge and Remling (2018) argue that climate vulnerable communities could become more and more-generalized due to risks or vulnerabilities being transferred to them through others' adaptation actions. Once vulnerability reduction is occurring, it becomes more effective to engage in present and future disaster risk reduction (DRR). Together, these actions collectively form the foundation to build and enhance long-term social-ecological system resilience.

2.2 Scale Development on Climate Resilience Management

Edward (1969) has discussed the problem of assessing attitude by direct questioning and observation and concluded that both the methods would give crucial classification of attitude. He further added that for a quick convenient as well as reliable quantitative measurement of attitude of large group, an attitude scale yields fruitful results. An attitude scale, therefore serves as a mean of assessing degree of positive or negative affect that individual is associated with some psychological objects. Among the techniques available for the construction of scales, the oldest Thrustone's Equal appearing interval scale and likert's summated rating scale are quite well know during present time also the combination of Thrustone and likert's techniques known as "Scale product method" is also used to construct an attitude scale.

Sanjit (2013) recommended that 't' value for scale value should not smaller than 0.70 when used for research purpose, at least 0.80 for applied settings, and greater than 0.90 or even 0.95 for high stake, individual –based educational, diagnostic, or clinical purpose. Here scale had crossed the cut-off marks (0.70) successfully. It may concluded that developed scale measure the Adoption strategies on climate change among livestock rearers at different contexts.

Vinay (2015) stated that the climate induced crisis management scale developed was administrated to 30 farmers practicing both agriculture and fishiry in Varkala village of Chirayinkeezhu taluk of Thiruvanthapuram District in Kerla State. The scale was consisting of statements was prepared and used for personally interviewing of climate crisis management of farmers from fishiry based farming system on five point continuum from non samplae area. The split-half method also employed to test readability of crisis management scale. The value of correlation coefficient was 0.9108 which was highly significant at one per cent level indicating the high reliability of the scale. It concluded that the climate change crisis management scale constructed was reliable.

Deepthi (2016) reported that after computing the 't' values for all the statements, there were total 22 statements present in the final scale. The statements present in the final scale. The statements comprising of eleven positive and elven negative statements with't'value equal or greater than 1.75 were finally selected and included in the scale development to measure the attitude of agripreneures towards agri entrepreneurship.

Kowsalaya (2017) in her study, the validity co-efficient for the scale was 0.9303, which is greater than the standard requirement of 0.70, hence the validity coefficient was also found to be most appropriate and suitable for the tool developed. Hence, the scale is valid. Thus, the developed scale to measure the nutritional security of small and marginal farmers was feasible and appropriate.

Patil (2018) reported that to test the reliability of the scale the SPSS Statistics 22 version software was used and the reliability coefficient was calculated on performing the analysis. Co-efficient of correlation is r=0.536. The reliability co-efficient thus obtained, indicated the internal consistency of the scale developed for the study was high.

2.3 Concept of Climate Resilience Management

Adger (2000) differentiates the resilience as social and ecological. The social resilience result due to social, political and environmental changes and it is the ability of groups or communities to cope with external stresses and disturbances. While ecological resilience is the characteristic of ecosystems to maintain themselves in the face of disturbance.

IPCC (2007) according to the Fourth Assessment Report of IPCC, resilience is defined as "ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change.

UNFCCC (2007) for adapting to climate change, appropriate measures for lessening its impact should be prioritized mainly by adjusting to it and making changes that includes the developing technological options, behaviour changes, better management of natural resources, improved risk management etc. A major challenge for dealing with climate change is to determine how, where and in what form the projected impacts will occur which is complicated by a number of factors such as relationship between changes in climatic variables, impacts and system response and many others which are not clear.

Harley *et al*., (2008) resilience has three distinct characteristics, i.e., system capacity to undergo change and still be in the same state, have capability of self-organization and have ability to build and increase capacity of learning and adaptation.

Further, resilience can be viewed as layered concept which ranges from individual to household, community, ethnic group and global level.

Jordan (2009) stated that resilience is a complex and multi-interpretable which has contested definitions and relevance.

Speranza (2010) defined that resilience in general sense means the system ability to deal with stresses and disturbances and also maintaining its basic structure and ways of functioning, capacity for self-organisation, and capacity to learn and adapt to change. So, resilience is about managing the changes and adapting to the test of current and future climate risks.

IPCC (2012) defined resilience as the ability of a system and its component parts to anticipate , absorb, accommodates, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation , restoration or improvement of its basic structure and functions.

Simonsen *et al.*,(2014) climate resilience is a approach to sustainability focuses on how to build capacity to deal with unexpected change; this approach moves beyond viewing people as external drivers of ecosystem dynamics and rather looks at how we are part of and interact with, the air, water, and land that surrounds the planet and in which all life is found.

Bene *et al.*, (2015) stated that ability to anticipate, absorb, accommodate, or recover from cli-mate change in a timely and efficient manner.

Wardekker (2018) climate resilience is a sufficient capacity to buffer climate-related disturbances, preventing impacts to some extent or slowing them down. This is achieved through policy, spatial, and structural measures. Spatial planning and infrastructure have made provisions and can withstand to a certain extent the impacts that do take place.

2.4 Profile Characteristics of Respondents

2.4.1 Age

Feder and Umali (1993) reported that it is often found that aged farmers are less likely to adapt soil conservation practices because of their shorter planning horizons and a less than perfect capitalization of such benefits because of underdeveloped land markets.

Narmatha (1994) observed that age produced a negative tendency towards all aspects of farming life due to the nature of hardship and they carried more responsibility than younger people.

Loren (1995) opined that as a farmer ages and gains experience, he or she may become more productive with improved managerial ability.

Lakshmi (2009) revealed that 35.83 per cent of farmers belonged to high age group followed by low (34.17%) and medium (30.00%) age groups.

Sangeetha (2013) observed that 45.50 per cent of the respondents were belonged to old age group followed by 43.00 per cent in middle age group and 11.50 per cent were seen in the young age group.

Savitha *et al.,* (2011) reported that majority of the respondents fell in the middle (43.13%) followed by old age groups (31.88%) and young accounted for one-fourth (25.00%) of the respondents in the study area.

Palanisami and Ranganathan (2014) reported that in his study area the majority of farmers were in the age group of 30 to 50 years implying that there is a good chance for adapting new technologies that can mitigate the climate change impact.

Yashodhara (2015) revealed that more than half (55.0%) of farmers were belonged to middle followed by 25.6 and 19.4 per cent of farmers were young and old age group, respectively in pooled situation.

Brar (2016) indicated that age of the respondents varied from 30-80 years. More than half of the respondents i.e. 54.66 per cent of respondents belonged to the age group of 30-46 years while, 32.66 per cent of them were in the age group of 47-63 years and rest of respondents (12.68%) was belonging to the age group of 64-80 years. It can be concluded that maximum numbers of the respondents were of the young age group i.e. 30-46years.

Patel (2017) in his study Age is an important factor as that reveals the maturity of a 46.88 per cent of the farmers belonged to old age category followed by middle (39.38 %) and young age (13.75 %).

Raviya (2017) It is observed that half (50.00 per cent) of the farmers belonged to middle age group followed by old age (36.70 per cent) and young age (13.30 per cent) groups, respectively.

2.4.2 Education

Pandeti (2005) revealed that majority of small farmers (60.00%) were illiterates, while an equal percentage (37.50%) of medium and big farmers were educated up to middle and high school.

Adesope and Matthews (2012) indicated that 26.70 per cent of the farmers had no formal education, 33.3 per cent had adult education, 22.2 per cent of the farmers had primary education while 6.7 per cent of the farmers attained primary education and 11.1 per cent received tertiary education. The findings show that higher proportion of the respondents had adult education qualification (33.3%).

Ajah (2012) stated that educated farmers are in a better position to access farm production resources including agricultural extension services, he also revealed that there is a gradual decrease in access to agricultural extension services from farmers who had no formal education and observed that education was a significant determinant of adoption of maize varieties in Ghana. By implication, this means that education can equally improve farmer’s access to other farm inputs which are, in most cases, being disseminated by extension agents in Nigeria.

Sangeetha (2013) reported that more than fifty per cent (52.00 %) of the paddy farmers had medium level of annual income. Nearly one – third (29.50 %) of the paddy farmers were falling under lower category and about 18.50 per cent of the respondents were falling under higher category.

Rokonuzzaman (2013) carried out a study on "Training needs of tribal people regarding income generating activities in Sherpur district of Bangladesh" and revealed that 43.16 per cent of them had primary education followed by illiterates (32.63%), secondary education (23.16%) and above secondary education (1.05%).

Anonymous (2015) indicated that illiteracy of farmers and their ignorance in the field of modern agricultural practices and technology, hampered by high costs and impracticality in the case of small land holdings and also stated that, a recent Government study estimated that 32 per cent of India's rural population is illiterate, compared to 15 per cent in urban areas. For farmers, that percentage may be even higher.

Neelam (2016) stated that 39.16 per cent of the farmers were illiterates, 8.35 per cent farmers were able to read and write, 9.17 per cent had primary school education and 9.17 per cent had middle school education, 25.83 per cent of the farmers had high school education, 4.16 per cent attained PUC education and 4.16 per cent had graduation.

Sounam (2017) showed that out of the total farmers, 2.40 per cent and 6.40 per cent of the farmers come in the category of illiterate and can read and write, 16.80 per cent farmers had received education up to primary level and 30.40 per cent had up to middle school, where as 24.00 per cent farmers were having education up higher secondary, 13.60 per cent viewers had college level education and 6.40 per cent viewers had post graduate level.

2.4.3 Dependency Ratio

Lakshmi (2009) observed that more than half of the respondents (57.50 %) had low family dependency ratio while 23.33 per cent had high and 19.17 per cent had medium family dependency ratio.

Devarajaiah (2010) explain that among small farmers, 71.00 per cent fit in low dependency ratio which is followed by 19.00 per cent medium dependency ratio and10.00 per cent high dependency ratio. With respect to marginal farmers equal percentage of them belonged to low (41.00%) and high (41.00%) dependency ratio next is medium dependency ratio (18.00%).

Saha and Bhaal (2010) reported that majority of diversifiers (74.78) had low dependency ratio.

Khatun and Roy (2012) found that majority of respondents (64.50) had high level of dependency ratio.

Mamathalakshmi (2013) highlighted that 47.14 per cent of the respondents had medium dependency ratio afterward low (33.81%) and high (19.05%) dependency ratio.

Parvez *et al.*, (2013) reported that majority of the farmers (56.68 per cent) had medium level of dependency ratio followed by 30.64 and 12.68 percent had low and high level of dependency ratio respectively.

Raisurendra (2015) reveled that more than half of the respondents (55.50) had high dependency ratio followed by 29.50 and 15.00 per cent of them were fall in medium and low dependency category.

2.4.4 Farm Size

Anonymous (2008) stated that nearly 75 per cent or about 57 lakh farmers have land holding of about 2 hectares or less.

Anonymous (2013) reported that more than 73 per cent of the farmers fall into the category of small and marginal farmers with an average holding of less than one hectare of land and also reported that Small and marginal farmers (operating < 2 ha) account for 76 per cent of the holdings and share roughly 37 per cent of the operated area in Karnataka. The average size of operated area of all the land size classes is declining. This clearly indicates the increasing fragmentation of land holdings in the state.

Ayyappan (2013) stated that the decline in land size lead to smaller size of the holdings and more clusters per holding. Semi-medium and medium operational holdings (2.0 ha–10.0 ha) constitute about 14.30 per cent of the total holdings with 44.77 per cent of the total operated area, and the large holdings (10.0 ha. and above) constitute 0.73 per cent of the total number of holdings with a share of 10.92 per cent in the total operated area. Thus, it can be seen that 85 per cent of the farmers cultivate about 44 per cent and 15 per cent farmers cultivate 56 per cent of the operated area. Small and marginal farmers, although, have higher productivity from small holdings compared to large sized holdings, have low marketable surplus and profit.

Anonymous (2014) showed that 14 per cent of the farmers who took part in the survey were found to be landless or without any land of their own. Sixty per cent are small farmers (those who own 1-3 acres of land), 19 per cent fall in the category of medium farmers (own 4-9 acres of land) and 7 per cent are large farmers (own 10 or more acres of land).

Swathilakshmi et.al., (2014) stated that there is an inverse relationship between farm size and productivity.

Aravind (2015) stated that more than 75 per cent of the farmers engaged in dry farming are small and marginal.

Satindra (2017) indicated that majority of the respondents (45.83%) had small size of operational land holding, followed by respondents having marginal size (31.67%), semi-medium size (7.50%), medium size (5.83%), landless size (4.16%) and large size (1.67%), respectively.

Sounam (2017) concluded that 67.50 per cent of beneficiaries were small farmers followed by 32.50 per cent marginal farmers. Also reveals that 75.00 per cent of non-beneficiaries were small farmers followed by 25.00 per cent marginal farmers.

2.4.5 Farming Experience

Palaniswamy (1984) reported that more than half of the farmers had high level of experience in cultivation.

Maddison (2006) indicated that experience in farming increases the probability of uptake of adaptation measures to climate change.

Shankara (2010) revealed that 43.33 per cent of respondents belong to low level of farming experience category followed by high (33.34%) and medium (23.33%) level of farming experience.

Adesope and Matthews (2012) findings showed that 56.7 per cent of the respondents had 6 to 10 years farming experience.

Ravindra (2012) stated that nearly 38 per cent of the respondents had low farming experience whereas 35.33 per cent of the respondents had high farming experience followed by 26.66 per cent of the respondents had medium farming experience in agriculture.

Muttanna (2013) his study stated that up to 44.16 per cent of farm women belong to high level of farming experience category with more than 20 year experience followed by medium (39.17%) and low (16.67%) level of farming experience.

Palanisami and Ranganathan (2014) found that the experienced farmers have a higher probability of perceiving changes in climate as they have been exposed to a longer span of farming during their life.

Kavad (2015) revealed that majority 72.50 per cent of the farmers of APMCs of non- tribal area found in the medium level farming experience category followed by 13.75 per cent each had higher and lower level farming experience.

Brar (2016) reported that the more than three fourth (77.33%) farmers had 15-26 years while, 17.33 per cent had 27-38 years of farming experiences, respectively. Only 5.33 per cent of the farmers had 39-50 years of farming experience.

Sharada (2016) revealed that two- third of men were found in medium farming experience (66.67%) followed by high (20.00%) and low farming experience (13.33%) while, cent per cent of women were found in the category of low farming experience.

Satindra (2017) indicated that majority of the respondents (60.83) were having medium (15.40 to 46.00) years farming experience, followed by 26.67 per cent low experience (below 15.4 years) and 12.50 per cent high (above 46.00 years) farming experience, respectively.

2.4.6 Annual Income

Sanghi *et al.*,(1998) reported that a rise in mean temperature of 2^0 C and a 7 per cent increase in mean precipitation will reduce net revenues by 12.3 per cent for the country as a whole. Agriculture in the coastal regions of Gujarat, Maharashtra and Karnataka is likely to be affected negatively. Small losses are also indicated for the major food grain producing regions of Punjab, Haryana and western Uttar Pradesh.

Samal and Pandey (2005) observed that abiotic stresses have been found to cause flood or submergence to different degrees in 5 years, drought in 3 years and cyclone in one year out of the total 8 years, causing production losses to rice. The maximum losses to rice crop have been observed during 1999 kharif season due to cyclone. The average annual income of the farmers has been noticed to vary from Rs.23, 329 for marginal farmers to Rs.84,072 for large farmers over the period 1997-98 to 1999-2000. The marginal and small farmers have been found to compensate their rice income loss from sources like wage earnings, jute and rabi/summer rice.

Anonymous (2008) stated that due to the small size land holding, the farmers subsist on low income. This is about Rs. 10,500.

Mahatab (2010) found that majority (60.00 %) of the aerobic growers belonged to the medium range of annual income followed by 33.33 per cent belonging to the high income category and 06.67 per cent with low annual income.

Shankara (2010) with respect to annual income concerned majority of the farmers belongs medium level of income (52.50%) followed by low level (32.50%) and high (15.00%) annual income groups.

Muttanna (2013) in his study indicated that majority of the farm women belongs low level of income (38.33%) followed by medium level (33.33%) and high (28.34%) level family income groups.

Sangeetha (2013) reported that more than fifty per cent (52.00 %) of the paddy farmers had medium level of annual income. Nearly one-third (29.50 %) of the paddy farmers were falling under lower category and about 18.50 per cent of the respondents were falling under higher category.

Swathilakshmi *et.al.,* (2014) in her study finds that the small farm in India is superior in terms of production performance, it is weak in terms of generating adequate income and sustaining livelihood. Tiny holdings below 0.8 ha do not generate enough income to keep a farm family out of poverty despite high productivity. Nearly three-fourth of small farmers in India fall under poverty if they do not get income from non-farm sources.

Vinay and Umesh (2015) in his study on perceptions and adaptation of the farmers to climate change found that the share of income from crop production to the total household income has decreased after 2005 compared to before 2005.

Shalini (2017) in her study observed that 60.00 per cent of the hybrid paddy growers belonged to medium income category whereas, 17.50 per cent and 22.50 per cent of the sugarcane growers belonged to low and high income categories, respectively.

2.4.7 Economic Motivation

Srinivasa (1995) conducted a study in Kolar district of Karnataka state and reported that 40.00 per cent of the mango growers had high level of economic motivation followed by medium (34.0%) and low (26.0%) economic motivation, respectively.

Chandran (1997) in her study on tapioca growers in Ernakulam district of Kerala state revealed that, 46.66 per cent of the respondents belonged to medium economic motivation category.

Sawanth (1999) in his study on effect of different modes of presentation of information of mushroom cultivation on Maharashtra state reported that 78 per cent of the respondents belonged to medium economic motivation category.

Sandesh (2004) in his study reported that majority (51.67%) of the respondents belonged to medium level of economic motivation. Whereas, 28.33 per cent and 20.00 per cent of the respondents belonged to high and low level of economic motivation categories, respectively.

Meena and Fulzele (2008) conducted a study in the Udaipur and Banswara districts of Rajasthan with the four tribes groups namely meena, bhil, garasia and damor. The findings showed that majority of meena (53.33%), bhil (94.00%), garasia (71.11%) and damor tribes (84.45%) exhibited low level of economic motivation. Besides 25.00 per cent of the meena tribe community belonged to medium level of economic motivation followed by bhil (6.00%), garasia (28.89%) and damor tribes (15.55%). Surprisingly none of bhil, garasia and damor tribes were found in high level of economic motivation. Only meena tribe was found in high economic group (21.67%).

Raksha *et al.,* (2012) reported that while, conducting a study on constraints faced by rural women in procurement and utilization of credit facilities in Hisar district identified that57.00 per cent of them had high economic motivation which is followed by medium(34.00%) and low (9.00%) economic motivation categories.

Preethi (2015) stated that majority (59.00 %) of the farm youth had medium level of economic motivation, followed by low (25.0%) and high (16.0%) levels.

Neelam (2016) revealed that 35.56 per cent of farmers under bore well condition had medium level of economic motivation followed by high (30.33%) and low (31.11%). It also revealed that 36.67 per cent of farmers under non bore well condition had medium level of economic motivation followed by low (32.22 %) and high (31.11 %).

Prabhu (2017) observed that 55.00 per cent of the beneficiaries had medium economic motivation, subsequently 23.13 per cent and 21.87 per cent had high and low economic motivation, respectively. Whereas, more than half of the non-beneficiaries had low (57.50 %) economic motivation followed by 27.50 per cent and 15.00 per cent had medium and high economic motivation, respectively.

2.4.8 Mass Media Exposure

Prameelamma (1990) found that 65 per cent of the rural women had low mass media use whereas, 35 per cent had high mass media use.

Narmatha (1994) in her study more than half of the total respondents (53.40 per cent) had medium level of mass media exposure, 30.70 per cent of them had low level of media utilization and only 15.90 per cent had high level of mass media exposure.

Neelaveni *et al.*,(2002) revealed that half of the respondents belonged to medium (53.30 %) mass media exposure category followed by low (32.50 %) and high (14.20 %) mass media exposure.

Ganesh (2006) indicated that most of the turmeric growers in Chamarajnagar District had high level mass media participation (47.50%).

Devarajaiah (2010) observed that among small farmers 40.00 per cent had low mass media exposure followed by medium (31.00%), very low (25.00%) and only 4.00 per cent had high mass media exposures. With regards to marginal farmers 38.00 per cent had low mass media exposure followed by 25.00 per cent very low and medium mass media exposure each and 12.00 per cent had high mass media exposure.

Gopala (2010) reported that majority of the groundnut farmers had medium level of mass media use (40.00%).

Preethi (2012) reveals that 42.22 per cent of the agro-met advisory service (AAS) farmers had low mass media participation while, 30.00 per cent of the respondents had high mass media participation followed by medium mass media participation (27.78%). In case of non-AAS farmers, it was observed that 47.78per cent of the respondents had low mass media participation, while, 33.33per cent of the respondents had high mass media participation and 18.89 per cent of the respondents had medium mass media participation.

Shilpa (2014) in her study technology has helped the farmers a lot, farmers are getting better weather forecasts so that they can plan when to sow seeds or spray the plants otherwise they would have spent lot of money and labour on their fields and the unexpected rains would have washed everything away. Technology like mass media is helping the farmers to increase the profits and reduce the losses.

Swathilakshmi *et al.*, (2014) in her study indicate that radio was the most popular media used by the farm women probably due to its less cost, easy availability and portability.

Satindra (2017) shows that majority (65.00%) of the respondents had medium mass media exposure group, while, 27.50 per cent and 7.50 per cent of respondents had low and high mass media exposure group, respectively.

Shalini (2017) observed that 39.16 per cent of the farmers belonged to medium mass media participation category. Whereas, 31.16 per cent and 29.16 per cent of the farmers belonged to high and low mass media participation categories, respectively.

Raviya (2017) revealed that majority (67.50 per cent) of the respondents had medium level of mass media exposure whereas, 20.00 and 12.50 per cent of them had low and high level of mass media exposure, respectively.

2.4.9 Risk Orientation

Pandeti (2005) observed that majority of small farmers (47.50%) had low risk taking ability whereas, 47.50 per cent of medium and 37.50 per cent of big farmers had medium and high risk taking ability, respectively.

Chaudhari (2006) in his study reported that 58.00 per cent of trained dairy farmers had medium followed by high (33.00%) risk orientation whereas, 53.00 per cent of untrained dairy farmers had medium followed by low (37.00%) risk orientation.

Nagesh (2006) conducted a study and observed that most (85.84%) of the farmers had medium risk orientation while only 10.00 and 4.16 per cent of farmers had low and high risk orientation, respectively.

Vijaya (2011) in his study reported that most of 54.17 per cent of the producers had medium risk orientation followed by 30.00 and 15.83 per cent of the respondents having low and high risk orientation, respectively.

Vipin and Rampal (2012) concluded that majority of the respondents were placed in average and above average risk orientation scores. This means that they had the ability to take risk.

Mamathalakshmi (2013) reported that 47.15 per cent of the respondents had medium risk orientation subsequently low (29.52%) and high (23.33%) risk orientation categories.

Preethi (2015) reveled that majority of farm youth (66.6%) were having medium level of risk orientation followed by high (18.5%) and low (15.5%) levels of risk orientation.

Vara (2016) indicated that 56.67 per cent of farmers were having high level of risk orientation, followed by 28.89 per cent had medium and 14.44 per cent belonged to low level of risk orientation. Whereas, 33.67 per cent of non beneficiary farmers belonged to medium level of risk orientation, followed by 33.33 per cent low level and 32.22 per cent were having high level of risk orientation.

Patel (2017) documented that majority 78.57 per cent of respondents had medium level of risk orientation and by 21.43 per cent had low level risk orientation while, none of them possessed high level of risk orientation.

2.4.10 Scientific Orientation

Raghavendra (1997) observed that scientific orientation of South canara district areca nut growers was highly significantly related with their knowledge.

Chandrani (2008) undertaken a study on sustainability of farming system and livelihood security among rural households in Tripura and accounted that almost all respondents (97.50%) fall under medium scientific orientation category followed by very little percentage belonged to high (1.66%) and low (0.83%) scientific orientation categories.

Lavanya (2010) studied on assessment of farming system efficiency in Theni district of Tamil Nadu and conferred that 35 per cent of the farmers had low level of scientific orientation followed by medium (33.3%) and high (31.7%).

Preethi (2012) observed that 43.33per cent of the agro-met advisory service (AAS) farmers had high scientific orientation while 35.56per cent of the respondents had medium scientific orientation followed by low scientific orientation (21.11%). In case of non-AAS farmers, it was observed that 55.56 per cent of the respondents had low scientific orientation while 22.22 per cent of the respondents had medium and high scientific orientation.

Mamathalakshmi (2013) notified that 39.05 per cent of the respondents had low scientific orientation followed by 36.67 per cent and 24.29 under high and medium scientific orientation categories, respectively.

Neelam (2016) showed that 80.00 per cent respondents were having medium level (14 to 2 0 score) of scientific orientation followed by 13.33per cent respondents had low level (less than 14 score) of scientific orientation and only 6.67 per cent respondents were high level(more than 20 score) of scientific orientation.

Patel (2017) reported that slightly more than half of the respondents (61.87 %) had high scientific orientation followed by 33.13 per cent and 5.00 per cent fell under medium and low scientific orientation categories. Whereas, 47.50 per cent of the non-beneficiaries had medium scientific orientation followed by 42.50 per cent and 10.00 per cent had low and high categories.

2.4.11 Extension Contact

Shamna (2009) in the study on village resource centers reported that majority of the participants (59.00 %) were having low level of extension contact followed by a little more than one- third of the participants (36.00 %) with high level of extension contact and five per cent of the participants were having medium level of extension contact.

Shankara (2010) stated that majority of the respondents belongs to medium level of extension agency contact (44.17%) followed by low (35.83%) and high (20 %) level of extension agency contact category.

Sahana (2013) observed a medium level of extension contact of contract farmers in crops like tomato (47.50 %), gherkin (42.50 %), marigold (45.00 %), watermelon (62.50 %) and pearl millet (45.00 %). Whereas, (45.00 %) level of extension contact was found among cotton farmers.

Sandeep (2013) in his study found that 37.56 per cent of the Village Forest Committee (VFC) members had contacted foresters for getting information regarding Joint Forest Programme Management (JFPM). The next important officials consulted by the

VFC members for getting more information on JFPM were Forest Guards (30.00%) and Range Forest Officers (2.13 %). The proportion of VFC members contacting Deputy Conservator of Forest and Assistant Conservator of Forest for information about JFPM was 1.94 and 3.06 per cent.

Sanjit (2013) depicted that 86.45 per cent and 53,75 per cent of livestock rearers costal and alpine region low and medium, respectively, reported that they had contact with different extension agency for their livestock as well as they also seek information on climate change.in over all , livestock rearers of alpine region (8.32) were having high extension contact then their counterparts of costal region(5.76).

Yashashwini (2013) reported that nearly two-third of the farmers were under medium extension contact category followed by high (17.50 %) and low (15.83 %)level of extension contact.

Darsana (2014) reported that two third of the members in the NABARD farmers club (65.50 %) had medium level of extension agency contact followed by high (18.30 %) and low (16.70 %) level of participation.

Brar (2016) indicates that more than half (56%) had medium extension contacts followed by 40.00 per cent had low and 4.00 per cent had high extension contacts respectively.

Sharada (2016) inferred that 48.33 per cent of men belongs to medium extension contact followed by high 43.33 per cent and low extension contact 8.34 percent while a greater proportion of women were grouped in low extension contact 86.67 per cent followed by medium 10.00 per cent and high extension contact accounts 3.33 per cent only.

Satindra (2017) shows that 55.83 per cent respondents had medium extension contact category, while 34.17 per cent had low and 10.00 per cent had high extension contact.

Shalini (2017) reported that majority (38.33 %) of the farmers belonged to medium extension contact category. Whereas, 35.83 and 25.82 percent of farmers belonged to low and high extension contact categories, respectively.

2.4.12 Cosmopoliteness

Suresh (2004) reported that 45.00 per cent of respondents had low level of cosmopoliteness, 44.17 per cent of them had medium level and 10.83 per cent had high level of cosmopoliteness.

Anand (2007) conducted a study on "Sustainable livelihoods of lambani farmers in Hyderabad Karnataka" and inferred that nearly half (49.33%) of the lambani farmers had low urban contact followed by medium urban contact (25.33%) and high urban contact (25.33%).

Basavaraj (2008) in his study on "Impact of income generating activities on sustainable rural livelihoods of Karnataka Watershed Development Society (KAWAD) project beneficiaries", identified that nearly half of the beneficiaries (49.17%)had low urban contact, followed by 38.33 and 12.50 per cent of beneficiaries had medium and high urban contact.

Lakshmi (2009) observed that 46.67 per cent had high level of cosmopoliteness followed by 35.83 and17.50 per cent had low and medium cosmopoliteness, respectively.

Devarajaiah (2010) showed that more than half (55.00%) of the small farmers had medium cosmopoliteness followed that 38.00 per cent low, six per cent high and only one per cent had very low cosmopoliteness. In case of marginal farmers, 44.00 per cent had low cosmopoliteness followed by medium (25.00%), very low (13.00%) and high (8.00%) level of cosmopoliteness.

Lavanya (2010) carried out an investigation on "Assessment of farming system efficiency in Theni district of Tamil Nadu" and observed that 40.0 per cent of the respondents had high cosmopoliteness and an equal number (30.0% each) of the farmers had low and medium cosmopoliteness.

Mamathalakshmi (2013) conducted study on “An analysis of livelihood security among agricultural labours in Karnataka” and reported more than half of the respondents (57.62%) belonged to medium cosmopoliteness group followed by 24.28 per cent and18.10 per cent had high and low cosmopoliteness.

Rokonuzzaman (2013) studied on “Training needs of tribal people regarding income generating activities in Sherpur district of Bangladesh” and accounted that nearly half (48.42%) of them had low cosmopoliteness followed very low cosmopoliteness (40.00%) and medium cosmopoliteness (11.58%).

Mani (2016) in his study on Sujala watershed project revealed that 55.83 per cent of the beneficiaries had medium level of cosmopoliteness followed by low (30.84%) and high (13.33 %) level of cosmopoliteness.

Nithish (2017) reported that more than half of the non-beneficiaries were having low level of cosmopoliteness (57.50 %) followed by 22.50 and 20.00 per cent of them were having high and medium level of cosmopoliteness, respectively.

2.4.13 Distance to Market

Shinde (1997) reported that the average distance of village to farm yard-1 was 7.24 Km and yard –II was 18.00Kms. The average distance of the selected villages from the market yard was 12.62Kms.

Srinivasan (1997) found that famers in the near by villages used regulated markets more than those in the distant villages. As the distance of the markets from farm increased, the proportion of quantity marketed through regulated markets in the marketed surplus declined considerably.

Chhikara *et al.,* (1998) studied the problems and prospects of agricultural markets in Haryana and suggested that Marketing facilities should be made available to the farmers within a radius of 5 km.

Mamathalakshmi (2009) conducted study on performance evaluation of chrysanthemum growers in Mandya District of Karnatakaand enlight that three fourth of the farmers (75.00%) had medium distance of accessibility of flower market followed by far distance (16.70%) and nearer distance (8.30%) of accessibility of flower market.

Sanjit maiti (2013) stated that average distance to purchase critical inputs of livestock rearers of coastal region and alpine region was 3.255 KM and 5.167 KM, respectively. Whereas distance to sell farm output was 2.882 KM and 3.100KM for the livestock rearers of costal and alpine region, respectively.

Alagh (2014) shows that majority (60.00per cent) of the farmers had sold in local ,market across farm size followed by 40.00 per cent of them had sold in distance markets. The average distance to market is around 10.00KMs. It was also observed that farmers generally prefer to sale at local market and average transport cost per quintal was highest for large farmers.

Holngwane *et al.*,(2014) in their study on "Analysing the factors affecting the market participation of maize farmers" found that half (50.50per cent) of the respondents sold their produce in distance market between 5to 10Kms followed by 37.40 and 12.10 per cent sold their produce in less than 5Kms more than 10Kms range respectively.

Kavad (2015) revealed that majority 62.50 per cent of the farmers of APMCs of non- tribal area found in the moderate market distance category followed by 25.00and 12.50 per cent of them belongs to far away market and short market distance categories respectively.

Mahentesh (2015) in his study little more than half of the units were situated less than 20-50 km distance from the district place.45 per cent of units were situated less than 20 km away from district place. Only one unit was farther from the district. Since mushroom is supplied mostly to urban vegetable markets they are trying to be close to city. The inputs required other than dry straw/ bagasse are also available in major cities is the reason to see the units being situated close to a district head quarter or a major town.

2.4.14 Awareness about Diversification

Lyama, *et al.,* (2008) observed that the African farmers diversify their livelihood strategies through on-farm and off-farm activities. We cluster households according to similar livelihood diversification strategies and explore the implications for income levels and sustainable soil management practices. Five main livelihood diversification strategies were being pursued. Households with off-farm income, and those pursuing higher return agricultural activities earned more than twice as much as the lowest income groups, which were the least diversified.

Nagaraja *et al.* (2011) reported that the diversification of enterprises and especially inclusion of livestock and other activities in a farm plans not only helps in increase the farm income but also reduce the risk in farming. The farming system approach helps to organize the farm business to get sustained stable income from the farm as a whole. Among the existing farming systems in small farms crop+ sericulture system would generate higher income than the existing system by 13.9%.

Anonymous (2013) stated that in the years of poor rainfall or other natural calamities they are highly vulnerable to distress caused by loss of income and livelihood. It is therefore necessary that each farmer's household is enabled to develop multiple sources of income, at least a minimum of two sources. This can be achieved by promoting diversification of farming and also reported that livestock farming including rearing of dairy animals, poultry units, sheep, goats, pigs, etc., can be taken up as a source of supplementary income by virtually all farmers and improving the economic condition of farmers particularly the small and marginal farmers. Sericulture and Apiculture can be developed in combination with field and expressed that Karnataka's Dairy industry is one of the most successful initiatives undertaken to increase farmers' income in the recent years. Unlike crop husbandry, dairy farming generates a continuous stream of assured income throughout the year meeting the cash needs of the households. Crops in most parts of Karnataka. While Sericulture can be sustained with only a small part of an agricultural holding being used for the purpose, Apiculture does not require any additional land. Both of them can provide supplementary income while Sericulture can even be a main source of income and employment.

Mandavi (2013) stated that diversification can be started through initiatives at the grassroots level, with the coordinated and collaborated efforts of various stakeholders, but should include government support in promoting eco-agriculture practices and creating a sustainable agricultural system in India.

Jasna (2015) reported that diversification of various crops were determined on the basis of income obtained from each crop. Based on t-test , the parameters was compared between both groups of farmers and the data indicated that National initiative on climate resilient agriculture (NICRA) farmers obtained a higher diversity index (3.04) than non-NICRA farmers (2.07) findings were highly significant.

Vinay and Umesh (2015) found that the farmers have started diversifying their farming activities in recent days. Most of the farmers had dairy as a subsidiary enterprise on their farm.17 farmers were having poultry along with dairy, 6 farmers were having petty shop and pointed out that the possible reasons for stating the subsidiary enterprises was to get additional income, because farmers might have felt that there is fall in the crop yields because of changes in the climatic parameters and the loss in income due to crop failures may be made good enough through diversification of enterprises.

Stefanie (2016) stated that Bio diversity is fundamental for agricultural production, food security, and environmental conservation.

Ravindra (2016) in his study farmers in rain fed areas tend to grow several varieties simultaneously for several regions. Diversity can result from farmers attempts to match varietal characteristics with agro climatic needs, socio-economic needs food and market considerations, reduction of risks and personal choice etc.

Satindra (2017) revealed that in the first component that is variety which shows that the majority of the respondents (84.17%) were aware about short duration varieties, followed by benefit of direct seeded rice were 65.83 per cent, disease resistant varieties were 68.33 per cent, insect-pest resistant varieties 66.67 per cent, and drought tolerance varieties 77.50 per cent, respectively. This shows that the farmers in the area were much aware about varieties of crops.

2.4.15 Extent of Natural Capital

Katar (1991) revealed that people participate in watershed management projects when expected private benefits from participation is higher than private costs of the participants.

Anand (2007) majority of the Lambani farmers (46.00%) had low natural capital followed by medium (35.33 %) and high (18.67 %). It could be inferred that these are natural resources endowed by the farming community.

Bagdi *et al.,*(2002) reported that people participation in planning and designing of soil and water conservation programme was low (28 percent), implementation of the programme activities was medium level (62 .00%)and repair and maintenance of soil and water conservation was also at medium level (57.00 %) The overall people participation index was low (43.87%).

Ravindra (2012) reported that natural capital computed by considering the different resources like land, livestock, water, and material possession. Farm resources were found to be low among 52.00 per cent of farmers followed by high (40.00%) and medium (8.00%).

Wani *et al.,* (2012) stated that integrated watershed management approach enabled farmers to diversify the system along with increasing agricultural productivity through increased water availability while, conserving the natural resource base. House hold income increased sustainability leading to improved living and building resilience of the community and natural resources.

Mandavi (2013) observed that agriculture is an activity directly related to the use of natural resources. We now often see and hear of crop failures due to climatic influences. This is compounded by farming practices that pay little heed to the rules of ecosystem balance and environmental conservation, which will in turn have an impact on agriculture itself.

Pradeep (2016) stated that natural capital activities namely soil conservation Bunding, countering and use of vegetative barriers) water conservation activities (construction of check dams, stop dam, water harvesting etc.) and occupational activities i.e.gotary, dairy, poultry.

2.4.16 Innovative Proneness

Hareesha (1994) found that 45.83 per cent of the respondents had high innovative -ness while, 37.5 per cent had low innovativeness.

Raghupathi (1994) reported that 42.50 per cent of command area farmers were in the medium innovative proneness category, whereas only 15.00 per cent were in low innovativeness category.

Reddy (1995) revealed that majority (62.00%) of the farmers had medium innovativeness, 20 per cent had high and 18 per cent had low innovativeness.

Vijaya (2001) indicated that 47.50 per cent of respondents fell in low innovative proneness category followed by 31.66 per cent in medium category and 20.84 per cent in high category.

Bhagyalaxmi *et al.,* (2003) observed that majority (69.44%) of the respondents had medium innovativeness followed by 15.56 and 15.00 per cent of respondents having high and low innovativeness, respectively.

Shashidhar (2004) reported that higher percentages (47.50%) of the respondents were in medium innovativeness category followed by low (31.66%) and high (20.83%) innovativeness category.

Suresh (2004) indicated that the milk producers in the district had medium, high and low innovativeness in the order of 55.00, 24.58 and 20.42 per cent, respectively.

Lavanya (2010) carried out a study on "Assessment of farming system efficiency in Theni district of Tamil Nadu" and reported that 40.0 per cent of the farmers had medium level of innovativeness followed by 35 per cent and 25 per cent of them having low and high level of innovativeness, respectively.

Raksha *et al.,* (2012) while conducting a study on "Constraints faced by rural women in procurement and utilization of credit facilities in Hisar district", observed that 65.00 per cent of them had medium innovative proneness followed by high (28.00%) and low (7.00%) innovative proneness categories.

Shalini (2017) reported that majority of respondents (37.50%) belong to medium level of innovative proneness followed by 35.00 per cent had high level innovative proneness followed by and 27.50 per cent belongs to low level of innovative proneness.

Prabhu (2017) revealed that 60.00 per cent of the farmers belonged to medium innovative proneness category followed by high (21.25%) and low (18.75%) categories, respectively.

2.4.17 Farm Financial Literacy

Hopkins *et al.,* (1994) in their study on women's income and household expenditure pattern found that in case of total expenditure, the gender of the income earns matters, since annual income is not pooled and both of the flow of overall household income and flow of gender-specific income are important determinants of expenditures.

Shakuntala and Chaman (2000) in their study found that average monthly expenditure on food items of families was Rs.981/-, 47.00 per cent of this was spent on cereals, 12.00 per cent of pulses, 15.20 per cent on meat and only 34.00 per cent on vegetables and out of the average money spent on no food items (Rs.694/month), higher percentage of it was spent on clothing (37.90%) and education (23.90%).

Anand (2007) reported that average mean monthly expenditure pattern of the respondent in 2005-06, during the year as a 1,803.22 with minimum expenditure of 950 and maximum expenditure of Rs.5100.

Shankara (2010) depicted that expenditure of the farmers on inputs before and after 2000. The data in the table shows, that there was increase in the expenditure on fertilizer (154 %) followed by plant protection chemicals (120%), seeds (112 %), labour wage (75 %) and farm yard manure (39 %). The trend in overall expenditure on inputs after 2000 was higher side in the expenditure on all inputs up to an extent of 79 per cent when compare to before 2000.

Sanjit (2013) clearly depicts that in aspect of climate change adoption the livestock rearers of costal and alpine region expanded 12.512 per cent and 4.87 per cent of their total expenses.

Seema (2014) reported that there was a variation in the expenditure pattern among the farmers. Majority of the respondents (72.66per cent) had low expenditure up to 55,000/- followed by little less than one fifth (19.34%) farmers had medium expenditure Rs55,000to 11,000/-and 8.00 per cent farmers had high expenditure above 11,000/- of expenditure.

Raviya (2017) stated that there is a variation in the expenditure pattern among the farmers. Majority of the respondents (82.67per cent) had low expenditure up to 55,000/- followed by (16.67%) farmers had medium expenditure Rs55,000to 11,000/-and 0.66 per cent farmers had high expenditure above 11,000/- of expenditure.

2.4.18 Irrigation Potential

Loede *et al*., (2001) opined that it is important to note that irrigation water is also subject to impacts from climate change. Use of irrigation technologies need to be accompanied by other crop management practices such as use of crops that can use water more efficiently. Important management practices that can be used include, efficient management of irrigation systems, growing crops that require less water, and optimizing of irrigation scheduling and other management techniques that help reduce wastage.

Fischer *et al.*, (2002) reported that irrigation demand in arid and semi-arid regions of Asia is estimated to increase by at least 10 per cent for an increase in temperature of 1°C.

Kurukulasuriya and Mendelssohn (2006) explored the importance of water availability in the Ricardian model by estimating the role of irrigation as an adaptation measure against unfavourable climatic conditions.

Shankara (2010) reported that nearly 46.99 per cent of respondents belongs to medium level of irrigation potential fallowed by low (32.53 %) and high (20.48 %) level of irrigation potential.

Narayan (2011) reported that the dug well or bore well owing farmers had to incur a huge extra cost on account of modification of their wells in order to cope up with the fast declining ground water level, further reported that the majority of farmers have incurred substantial cost on altering the existing well structures that increase their capital cost of well substantially. The modification cost alone accounted for about 33-48 per cent of the real capital of bore wells and dug wells.

Anonymous (2013) openined that irrigation plays an important role in improving production and productivity of agriculture. It facilitates adoption of improved technologies and increases cropping intensity thereby making optimum use of a finite resource i.e., land.

Muttanna (2013) stated that nearly 43.33 per cent of farm women belongs to low level of irrigation potential followed by medium (38.33 %) and high (18.34 %)level.

Preethi (2012) in her study majority of the category of agro-met advisory service (AAS) farmers i.e. 44.45per cent of the respondents had high, 33.33 per cent had medium irrigation potential while, 22.22per cent of the respondents had low Irrigation potential. In case of Non-AAS farmers, majority of the category of respondents i.e. 41.11per cent of the respondents had medium irrigation potential while, 37.78per cent of the respondents had low irrigation potential and 21.11per cent had high irrigation potential.

Anonymous (2014) observed that only 40 per cent of the farmers said that irrigation facilities were available for their entire farming land. The most common sources for irrigation are private pumps, bore wells/boring and tube wells. 45 per cent of the farmers cited these as their main source of irrigation. 38 per cent of the farmers have access to canals in their villages for irrigation. Traditional sources of irrigation like pond and well continue to be important. 34 per cent of the farmers depend on wells while 30 per cent of the farmers said they depend on the pond to irrigate their land. Only 18 per cent of farmers said that they have the facility of Govt. tube wells for irrigation.

Rajput (2016) reported that more than two-third (68.75 per cent) respondents having bore well as irrigation facility. Whereas 20.00 per cent respondents were found using well for irrigation for irrigating their crops, only 11.25 per cent respondents had check dam to irrigate their crop.

Raviya (2017) showed that more than half (55.83 per cent) of respondents having bore well as a source of irrigation. Whereas,39.17 per cent of respondents had well for irrigating their crops. Only 5.00 per cent respondents had check dam to irrigate their crops.

2.4.19 Organizational Participation

Srinivasa (1995) conducted a study on mango growers in Kolar district of Karnataka reported that.57.00 per cent of the mango growers had medium level of organizational participation followed by 33.00 per cent with low level and 10.00 per cent with high organizational participation.

Thangavel *et*, *al*. (1996) reported that 53.00 per cent of the participants had medium level of organizational participation followed by low and high organizational participation with 37.00 per cent and 20.00 per cent of respondents respectively.

Kumar (1998) in his study on banana growers in Bangalore district of Karnataka reported that, 53.00 per cent had low organizational participation, followed by medium (27.00%) and high (20.00%) organizational participation.

Devarajaiah (2010) reported that among the small farmers 44.00 per cent had no social participation followed by 32.00 per cent had membership in one organization, 19.00 per cent had membership in two or more organizations and only five per cent of them were office bearer. In case of marginal farmers 43.00 per cent fall under no social participation category. While 29.00 per cent had membership in one organization, 23.00 per cent had membership in two or more organizations and only five per cent of them were office bearers.

Saha and Bahal (2010) reveled that out of 120 respondents 47.50 per cent of respondents had low organizational participation, 29.17 per cent had medium organizational participation, whereas 23.33 per cent were having high organizational participation.

Pallavi (2011) stated that majority (43.34 per cent) of teachers had medium organizational participation whereas, 18.33 per cent had low participation , only a small percentage of them 3.33 per cent had high participation and 35.00 per cent of the teachers had no organizational participation.

Sudha (2016) observed that 40.00 per cent of bore well farmers had high level of organizational participation while, 38.89 per cent of them had medium organizational participation and 21.11 per cent had low organizational participation. Regarding farmers under non bore well, 42.22 per cent had medium participation followed by 35.56 per cent low and 22.22 per cent high level of organizational participation

Shalini (2017) concluded that 46.66 per cent of hybrid paddy growers belonged to medium organizational participation category followed by high (30.00%) and low (23.33 %) organizational participation categories.

2.4.20 Farm Mechanization Level

Gangappa (1975) found that the small farmers lacked the most important implements which are required for satisfactory level of production.

Gastrell (1977) suggested that increase in material possession status among the poor, might result in as much as or more of the innovation acceptance.

Saha and Bhaal (2010) reported that majority of the diversifiers (46.09per cent) had modrate material level and 26.09 per cent high level where as (40.00 per cent) of the non diversifier had low material level.

Shankara (2010) stated that 39.17 per cent of the respondents possess medium level of materials followed by low (35 %) and 25.83 per cent had high level of material possession.

Suresh (2011) observed that in garden land 66.60 per cent of respondents were found to operate medium level of farm holdings followed by high (17.80) and low (15.60) level. In case of dry land majority (68.90) of respondents belongs to medium level category, followed by high (17.80) and low (13.30) level category.

Sangeetha (2013) revealed that more than fifty per cent (58.50) of farmers possessed medium farm status followed by 25.00 per cent and 16.50 per cent with low and high farm power status respectively.

Sanjit (2013) clearly stated that only 46.67 per cent and 48.33 per cent of rearers of costal and alpine region, respectively, used modern farm equipment's, livestock rearers of costal region were using cream separator, power tiller, pump, chaff cutter, paddy thresher etc. but livestock rearers of alpine region were using one farm equipment i.e. cream separator, crop farming virtually exists in alpine region and alpine region farmers mainly depend on grazing ground.

Anonymous (2014) reported that 36 per cent farmers live either in a hut or a kuchha house. 44 per cent live in a kuchha, pucca or mixed house. Only 18 per cent of them have a pucca independent house.

Nagendra (2017) reported that mechanization level of the farmers of the Bundelkhad region is very poor because almost 46.80 per cent of rural population of the Bundelkhad region was living in below poverty line. So they cannot afford the expensive farm machines and also they have not much agriculture fields that's why they only hire the farm machines when it needed.

2.5 Level of Climate Resilience Management Practices Followed by the Respondents

Darling and Vasanthakumar (2004) conducted a study on botanical pesticides in Kanyakumari district of Tamil Nadu had indicated that more than half of the respondents

(51.66%) were found with low level of adoption, followed by medium (43.44 %) level regarding adoption of botanical pesticides.

Mamathalakshmi (2009) revealed that 43.34 per cent of chrysanthemum growers had low management orientation followed by high (31.66%) management orientation and medium (25.00%) management orientation category.

Onyeneke and Madukwe (2010) identified the adaptation methods in Rain Forest Zone of Nigeria were portfolio diversification (20.00%) followed by the use of irrigation method (3.30%) and 43.30 per cent of the farmers did not taken any adaptation methods.

Shankara (2010) reported that majority of the farmers (55.83%) had adopted high adaptation measures followed by 33.34 per cent had low and medium (10.83%) level of adaptation to climate change after 2000.

Somashekar (2010) indicated that a considerable majority of the respondents belongs to high (36.66%) followed by medium (33.33%) and low (30%) level irrigation water crisis management among farmers with higher mean score of 170.93 and standard deviation of 13.70.

Ofuokus (2011) reported that 39.69 per cent of the farmers have not adapted to climate change and those who adapted to climate change conducted various adaptation strategies such as planting trees (21.37 %), applying soil conservation (15.26 %), changing planting dates (6.10 %), cooling livestock pens with fans (1.52 %), using heat tolerant species (3.05 %), irrigation (5.34 %) and using different crop varieties (7.63%).

Sofoluwe *et. al*., (2011) observed that majority (66.00 %) of the respondents employed late planting, planting trees, irrigation and soil conservation, 2.80 per cent adapted planting different varieties and 28.20 per cent did not responded by taking adaptation measures in Osun state, Nigeria.

World Bank (2013) report reviews the risks a warming climate poses to agriculture, water resources, and health in India. In India, over 60 percent of crops are rain-fed, which makes these agricultural areas very vulnerable to changes in precipitation due to climate change. With 15 percent of India's groundwater tables already overexploited, changes in precipitation will further affect the water supply. It has been predicted that the mean temperature will rise by 2°C globally by 2040; if this happens, crop production in South Asia is expected to drop by 12 percent. This will then cause a decline in food availability, which will cause severe health problems, including an increase in childhood stunting by 35 percent by 2050. As a result, the World Bank is supporting projects to help communities conserve their watersheds better, and it is sponsoring groups that are developing environmentally sustainable hydropower in India. However, if the warming is held below 2°C, there is a chance that the worst effects stemming from climate change can be avoided. Action on climate change needs to happen fast, though, because this window of opportunity to stabilize the global warming is closing quickly.

Anonymous (2014) reported that the farmers have changed the way of growing rice, the old method was to grow small rice saplings and move these plants to the rice paddy. Now they plant direct seeded rice, which means seeds are put directly in the paddy field. This method uses much less water than the old one.

Aravind (2015) stated that the use of improved crop varieties should be done which can withstand stress. For moisture conservation in the soil, deep tillage, surface cultivation and stubble mulching need to be practiced. Deep tillage is required to break plough soles and layers because repeated ploughing over centuries has resulted in the growth of hard compacted layers which restrict infiltration and movement of water and penetration of water.

Lisa (2015) found that from mid-century on, climate change is projected to have more negative impacts on crop and livestock across the country, a trend that could diminish the security of food supply of U.S, the national climate assessment report says that many U.S farmers have not done much to adopt to a changing climate, but India's farmers increasingly see the need to do so.

Jasna (2015) indicated that within climate resilience indicators, non –NICRA farmers were most aware 100 per cent about the potential of drought tolerant varieties in combating climate change shocks in their field. They were least aware of direct seeded rice and its contribution towards reduction of emission of harmful greenhouses gases (5.00%).

Vinay (2015) reported that 29 per cent of farmers belonged to low crisis management group with the mean crisis management score of 311.13. Nearly half percent (43.33%) of farmers belonged to medium crisis management group having the mean crisis management score of 326.36. It was interesting to note that the high crisis management group comprising 27.92 per cent of farmers with the highest mean crisis management value of 345.20.

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 (80% agro-met advisory service (AAS) and 45% control) 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. Majority of farmers, particularly AAS category have started adopting few soil and water conservation practices. Farmers have also changed the spacing, quantity of seeds used, fertilizer application and frequency of irrigation.

Yashodhara (2015) reported that in irrigated situation, 44.4 per cent of farmers had high level of livelihood status, followed by medium (37.8 %) and low level of livelihood status (17.8 %). Whereas, in rainfed situation, 43.3 per cent of farmers had low level of livelihood status followed by 38.9 per cent had medium and 17.8 per cent had high level of livelihood status.

Lalitha (2016) revealed that 41.68 per cent of the farmers had low level crisis preparedness followed by high and medium level crisis preparedness with 39.16 and 19.16 per cent, respectively.

Kowsalya (2017) showed that 40.50 per cent of the respondents belonged to medium level of livelihood security which is followed by 31.00 per cent and 28.50 per cent had low and high levels of livelihood security, respectively.

Raviya (2017) clearly indicated that the level of adoption was found very high (more than 70 per cent) in practices like, method of sowing (rank I), land preparation (rank II), seed rate (rank III), inter culturing (rank IV) and spacing (rank V). The moderate level of adoption (more than 50 per cent) was found in practices like improved varieties (rank VI), gap filling (rank VII), time of sowing (rank VIII), weed management (rank IX) and organic manures (rank X). The low level of adoption (less than 50 per cent) was found in practices like seed treatment (rank XI), plant protections measures (rank XII), irrigation (rank XIII).

Nitesh (2017) revealed that a majority (57.50 %) of the green army beneficiaries were belonging to high level of standard of living, while 37.50 and five per cent of the beneficiaries were belonging to medium and low level of standard of living, respectively.

Satindra (2017) revealed that majority of 63.33 per cent of the respondents had medium level adoption category, followed by 24.17 per cent of low and 12.50 per cent of high level adoption category.

2.6 Association Between Climate Resilience Management Level and Profile Characteristics of Respondents

Norris and Batie (1987) found that higher level of education is believed to be associated with access to information on improved technologies and higher productivity to cope up with climate change.

Kebede *et al.*,(1990) reported that age of the head of household can be used to capture farming experience. On the one hand, studies in Ethiopia have shown a positive association with number of years of experience in agriculture and the adaptation of improved agricultural technologies in order sustain under changing climate.

Saxena (1992) found that because of the total labour required for growing eucalyptus is much less than for seasonal crops it was preferred by labour constrained households in Uttar Pradesh to take up adaptation measures.

Feder and Umali (1993) reported that it is often found that aged farmers are less likely to adapt soil conservation practices because of their shorter planning horizons and a less than perfect capitalization of such benefits because of underdeveloped land markets.

Pomp and Burger (1995) consider the adaptation of new technologies for cocoa production by Indonesian smallholders. They discover that some early adapters are more likely to be copied by others, depending on their socioeconomic characteristics, and term this as a peer group effect. Adaptations by more educated individuals are more likely to influence others.

Shiferaw and Holden (1998) indicate that there was non significant association between age and adaptation of improved soil conservation practices under changed climate.

Schuck *et al.,* (2002) find that land tenure issues may limit the effectiveness of extension education in Cameroon. They examine the extent to which extension education can promote adaptation of cropping systems other than slash and burn, and whether or not land tenure issues reduce the effectiveness of extension education. Their results indicate that higher visit by extension personnel reduce the likelihood of farmers choosing slash and burn agriculture, but farmers with lower levels of land ownership are less likely to adapt alternatives than those with higher levels of land ownership under changing climatic condition.

Asfaw and Admassie (2004) observed that male-headed households are more likely to get information about new technologies and undertake risky businesses than female-headed households.

Johnson and Masters (2004) argued that besides the socio-economic characteristics of the farmer to take up adaptation measures, complementarities among interrelated innovations may explain the location and timing of productivity growth and may be particularly important in transforming semi subsistence agrarian economies. They studied the cases of cassava in West Africa, where both mechanized processors and new varieties are more widespread in Nigeria than in neighbouring countries. Historically, mechanization came first but the later development of new varieties made mechanization much more profitable and the two then spread together.

Tenge *et al.,* (2004) reported that female head of household may have negative effects on the adaptation of soil and water conservation measures, because women may have limited access to information, land, and other resources due to traditional social barriers.

Anonymous, (2006) stated that in Climate change and African agriculture review report observed that, the level of education (measured in years) also greatly increases the probability of adaptation.

Maddison (2006) indicated that experience in farming increases the probability of uptake of adaptation measures to climate change.

David (2007) find that by using Heckman's sample selectivity probitmodel, reveals that although experienced farmers are more likely to perceive climate change, it is educated farmers who are more likely to respond by making at least one adaptation. In terms of policy implications it appears that improved farmers education would hasten adaptation. The provision of free extension advice may also play a role in promoting adaptation. In so far as distance to the market is a significant determinant of whether a farmer adapts to climate change, it may be that improved transport links would improve adaptation. Farmers who have enjoyed free extension advice and who are situated close to the market are also more likely to adapt to climate change.

Nhemachena and Hassan (2007) found that female-headed households are more likely to take up adaptation options to climate change. The possible reason for this observation is that in most rural smallholder farming communities in the region much of the agricultural work is done by women. Since women do much of the agricultural work and men are more often based in towns, women have more farming experience and information on various management practices and change them based on available information on climatic conditions and other factors such as markets and food needs of the households.

Yirga (2007) reported that households with large families may be forced to divert part of the labour force to off-farm activities in an attempt to earn income in order to ease the consumption pressure imposed by a large family during aberrant weather condition.

Mamathalakshmi (2009) revealed that there was positive and significant association at one per cent level between age, economic dependency, family size, family type, occupational status and management orientation with knowledge level whereas, the variables like area under chrysanthemum, material status, annual income and mass media utilization had positive and significant association at five per cent level with knowledge level of the respondents. Other variables like education, land holding, social dependency, farm power status, socio-economic status, chrysanthemum growing experience, social participation, extension participation, economic motivation, innovative proneness and cosmopoliteness had non-significant association with knowledge.

Andrew and Luiza (2011) observed that strategic investments in agriculture are often lumpy and irreversible, with significant impacts on fixed costs. The implication is that large mechanized farms will probably be the first to adapt to climate change.

Mamathalakshmi (2013) reported as chi-square value clearly showed that age, area under chrysanthemum, family size and family type had significant association at one per cent with their adoption behaviour. While the variables like occupational status, economic motivation, mass media utilization and management orientation had significant association at five per cent with their adoption behaviour. There was a non-significant association found between education, land holding, social dependency, economic dependency, farm power status, material status, socio-economic status, chrysanthemum growing experience, annual income, social participation, extension participation, innovative proneness, cosmopoliteness and adoption behaviour.

Deressa *et al.*, (2011) in their study reported that farmers' perception of climate change was significantly associated to the age of the head of the household, wealth, knowledge of climate change.

Preethi (2012) revealed that mass-media exposure, farming experience and irrigation potential had a positive significant association at 5 per cent level whereas, age, education, family size, land holdings, cosmopoliteness, extension participation, material possession, and scientific orientation were non-significant with the knowledge level of non- agro-met advisory service (AAS)farmers towards climate change.

Sudha (2016) revealed that out of twenty independent variables, all the variables *viz.*, age, family size, family type, caste, extension contact, extension participation, mass media participation, information seeking behavior, credit orientation, level of aspiration, scientific orientation, management orientation, economic motivation, risk orientation, fatalism / scienticism, localite/ cosmopoliteness, farming experience, achievement motivation and deferred gratification were highly significant at one per cent level.

Nitesh (2017) revealed that among 14 selected independent variables, the variable such as source of information, institutional linkage, cosmopoliteness, achievement motivation, aspiration level, social participation, mass media participation, extension agency contact and extension participation were found significantly associated with the standard of living of Green Army beneficiaries, while the other variables such as age, education size of family, land holding and fatalism scientism had no significant association with the standard of living of Green Army beneficiaries.

Prabhu (2017) revealed that 28.75 per cent of the Bt cotton growers with small family size possessed less favourable attitude, while large family size (3.70%) possessed more favourable attitude. Further chi-square test revealed highly significant association between family size and attitude at one per cent level.

2.7 Relationship Between Climate Resilience Management Level and Profile Characteristics of Respondents

Igoden *et al.*,(1990) observed that there is a positive relationship between the education level of the household head and the adoption of improved technologies and adaptation to climate change. Therefore, farmers with higher levels of education are more likely to adapt better to climate change.

Annand (2007) reported that among the personal, socio-economic and psychological factors, age, family size, land holding, technology utilization and economic motivation were found significant at 1 percent level of probability with sustainable rural livelihoods.The factor like expenditure pattern was negatively significant at 1 percent level of probability and occupational status was negatively significant at 5 percent level.

Sowmya (2009) revealed that farm experience (0.448) had positive and significance relationship with managerial ability at 1% percent level of significance. Whereas, age (0.358), occupation (0.398), level of aspiration (0.265) had positive and significant relationship at 5 percent level of significance. Other variable such as education, marital status, number of children, family size, family labour force, size of land holding, total income, cosmopoliteness, extension system link, mass media participation, organizational participation, deferred gratification, value orientation were found to have non-significant relationship with managerial ability.

Shankara (2010) showed that the findings on 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 of climate change

Jayasree (2013) observed that variable such as education, family size, area under Jhum,annual income, cosmopoliteness, material possession and extension participation had positive and significant relationship with sustainability level of Jhum at one percent level of significance. Whereas number of family member involved in Jhum, Jhum cycle had positive significant relationship with sustainability level of Jhum at five percent level of significance. Other variable such as age, livestock possession, credit orientation and mass media participation had non-significant relationship with sustainability level of Jhum.

Yashodhara (2015) revealed that the variables such as land holding (r=0.307), mass media participation (r=0.271), cosmopoliteness (r=0.274), extension participation (r=0.365), risk orientation (r=0.371) and innovative proneness (r=0.442) had positive and significant relationship with livelihood status at one per cent level. Similarly annual income (r=0.246), extension contact (r=0.216) and deferred gratification (r=0.226) had positive and significant relationship with livelihood status at five per cent level. The remaining variables *viz.*, age (r= 0.015), education (r=0.184), family size (r=0.011), family type (r=-0.010), social participation (r=0.119), credit orientation (r=0.199) and farming system practiced (r=0.023) had non-significant relationship with status of farmers in rainfed area.

Lalitha (2016) observed the correlation test confirmed that, there was 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. The variables like land holding, management orientation, decision taking ability and mass media participation had positive and significant relationship at 1 per cent level, whereas, variables like age, family size and extension participation had positive and non-significant relationship and the variables like farming experience, land fragmentation and achievement motivation had negative and non-significant relationship with agro bio-diversity level.

Grecequet *et al*., (2017) showed that the relationship between climate and migration relationship also is a “two-way street”. On the one hand, climate change affects the vulnerability of people and thus patterns of migration. On the other hand, migration also affects vulnerability to climate change which, in turn, may act as a catalyst for future migration.

Kowsalya (2017) reported that the independent variables such as land holding (r =0.361), management orientation (r = 0.466), economic motivation (r = 0.335), extension participation (r = 0.371), mass media exposure (r = 0.416) and social participation (r =0.344) had positive and significant relationship with livelihood security at one per cent level. Similarly, income generation (r = -0.310), risk orientation (r = -0.346) and achievement motivation (r = 0.341) had negative and significant relationship with livelihood security at one per cent level and entrepreneurship behavior (r = 0.246),employment generation (r = 0.307), innovative proneness (r = 0.339), cosmopoliteness (r= 0.248) had positive and significant relationship with livelihood security at five per cent level. The remaining variables *viz.*, age (r = -0.146), education (r = 0.058), family size (r= 0.096), scientific orientation (r = 0.084), credit orientation (r = 0.138) and deferred gratification (r = 0.152) had non-significant relationship with livelihood security.

Shalini (2017) reported that the relationship between knowledge, achievement motivation and innovative proneness were found to have significant association at one per cent level of significance whereas, the age, education, occupation, land holding, annual income, exposure to mass media extension agency contact, and cosmopoliteness were found to be significant at five per cent level of significance with economic performance. The remaining variables such as extension participation and social participation had non-significant association with behaviour of the farmers

2.8 Contribution for Profile Characteristics to Climate Resilience Management

Shashidhar (2006) revealed that the two independent variables namely achievement motivation and risk orientation were significant at 1 per cent level of probability, in influencing the level of adoption of eco-friendly management practices. Co-efficient of determination was 0.5028, which revealed that 50.28 per cent of variation in the adoption of eco-friendly technologies was explained by the variables selected for the study.

Sowmya (2009) revealed that contribution of independent variables to entrepreneurial behaviour. The analysis showed that variables such as age, occupation, annual income, farm experience, level of aspiration had contributed to the entrepreneurial behaviour of rural women entrepreneurs.

Shankara (2010) reported that 78.00 per cent of variation on the level of perception was explained by all the fifteen variables included in the study the results revealed that age and education had significantly contributed at 1 per cent level whereas, farming experience, occupation, income, land holding, innovative proneness and extension contact had influenced the perception level of farmers about climate change significantly at 5 per cent level.

Somshekara (2010) reported that irrigation water crisis management among mid reach farmers is directly related to the inter dependent factors like institutional factors and social factors in the first component followed by technological factors, adoptability factors and social factors in the second component. The first component extract 31 per cent of variation and in the second component 73 per cent of variation.

Jayasree (2013) showed that age, family size, number of family member involved in Jhum, area under Jhum, Jhum cycle, cosmopoliteness, livestock possession, material possession, credit orientation, extension participation, mass media participation are fitted together in the regression model explained 75.4% variation in perception of tribal people about sustainability level of Jhum.

Mahentesh (2015) reported that principal component martrix shows the higher influence of extension conact, training, competation orientation, mass media participation, education and deffered gratification in forming the first principal component. Hence, the first principal component can be said as educational variable. Hence, second component is result of age. Self reliance in the third component and credit orientation fourth component were other important variables in influencing the principal components.

Kowsalaya (2017) reveled that the five components contribute to over sixty seven per cent of the total variation. As all the five variables forming nutritional security index emerged important in the first component itself, the first component describes the relationship between nutritional security levels of beneficiaries with socio-economic factors meaningfully. Analysis of first principal component clearly showed that generally some of socio-economic variables such as, management orientation, economic motivation, extension participation, employment generation and social participation had strongly influenced the nutritional security in positive direction.

2.9.1 Document the Climate Resilience Practices Followed by the Farmers to Mitigate Climate Change

Knight (1980) called for the system documentation of traditional farmers' knowledge into an information bank from which agronomists, extension workers and other farmers can draw enlighten and insight.

Vivekanandan (1993) described that conducting village level workshops, group discussion with farmers and publication of newsletters in local language for exclusive communication of traditional farm technologies are some of effective means of identification, documentation and dissemination of traditional technologies and also means of getting feedback from the people.

Balmatti (2000) documented several of ITKs, through field investigation .however , some of ITKs which are farmers innovations or technologies and combination of practices that are unique and have not been documented elsewhere were identified. These mainly use of botanicals in the pest, disease and nutrient management.

Kumar (2009) documented indigenous technological practices on rain-water management ,soil and water conservation , wind erosion , tillage practices , crop and cropping systems pests and disease management, soil fertility management ,farm implements, post-harvest technology, grain or seed storage, waste water management and low cost housing material and ethnic food.

Shankara (2010) documented important adaptation measures initiated by farmers in response to climate change were studied in brief. Majorly crop production, soil and water conservation practices initiated by farmers were analyzed and three major crops like ragi, rice and mulberry crop production were considered based on more area under these crops in the study area.

Vinay (2015) documented that major percentage of small (60%) and marginal (81%) farmers were practicing mono cropping system. Nearly 26 per cent of farmers practicing double cropping, only negligible per cent i, e.12.50 per cent of farmers doing triple cropping system.

Lalitha (2016) documented that 100.00 per cent of the farmers had not initiated farm pond before, 95.84 per cent of the farmers had initiated farm pond now, 4.16 per cent of the farmers had not initiated the farm pond. Around 15.00 per cent of the farmers had initiated contour bunds before,85 per cent of the farmers had not initiated them before,37.50 per cent of the farmers initiated contour bunding and 62.50 per cent of the farmers had not initiated it now also. With respect to the graded bunds, 14.16 per cent of the farmers had initiated graded bunds,85.84 per cent of the farmers had not initiated it before,30.84 per cent of the farmers had initiated graded bunds now,69.16 per cent of the farmers has not yet initiated,21.60 per cent of the farmers had initiated ridges and furrows before, 78.40 per cent of the farmers had not initiated them before,78.34 per cent of the farmers initiated ridges and furrows and 21.66 per cent of the farmers had not initiated it now also,19.16 per cent of the farmers had initiated mulching, 80.84 per cent of the farmers had not initiated it before, 85.00 per cent of the farmers had initiated mulching now,15 per cent of the farmers has not yet initiated. Cent per cent of the farmers has not initiated drip irrigation before and now,17.50 per cent of the farmers had initiated additional bore wells and 82.50 per cent of the farmers had not initiated it before,67.50 per cent of the farmers had initiated additional bore well now,32.50 per cent of the farmers has not yet initiated. Cent per cent of the farmers has not initiated deepening of bore well before and now.

Brar (2016) documented that 95.94 per cent of farmers planting more trees problem of climate can be tackled while 45.27 per cent and 34.45 per cent thought by practicing organic farming and the limiting the use of machinery respectively the problem of climate change could be tackled**.**

Satindra (2017) recorded in case of climate resilience management 60.00 per cent of respondents acknowledged awareness on the crop-tree systems, followed by crop livestock system 91.67 per cent, change in cropping pattern and calendar of planting 79.17

per cent, mixed cropping 91.67 per cent, crop rotation 89.17 per cent and reduce tillage 37.50 per cent respectively.

2.9.2 Eco-friendly Practices Initiated by Farmers to Overcome Vulnerability of Climate Change

Downing *et al.,* (1991) showed that adaptation has the potential to reduce food deficits in Africa from 50 to 20 per cent.

Vernon (1994) reported that the farmers has changed crop varieties, were conserving soil and water, intensified water harvesting and planting trees. Some farmers have expressed that, migration or shifting from crops to livestock farming. Few farmers find it relatively easy to alter planting schedules or use of different tillage methods but need to do much more, such as using seed varieties designed to survive climate change.

Rosenzweig and Parry (1994) showed that there is great potential to increase food production under climate change in many regions of the world if adaptation is taken into consideration.

Smith *et al.,* (1997) point out that there are many varieties of corn with differing suitability to climate, Canadian farmers appear to adjust their hybrid selection on the basis of the previous year's climatic conditions. Farmers are recommended to match hybrid seeds climatic requirements to 30-year climate averages at their locations but frequently choose strains above or below the averages. About 30 per cent of farmers said that this was because of the previous year's weather.

Mendelssohn and Dinar (1999) reported that adaptation was estimated to reduce the potential damages from climate change from 25 to 15-23 per cent in Indian agriculture.

William (1999) shows that the adaptation measures made by the farmers includes the translocation of crops across natural climate gradients, the rapid introduction of new crops such as soybeans in the USA and canola in Canada, and resource substitutions prompted by changes in prices of production inputs. A wide selection of modelling studies is reviewed which suggests several agronomic and economic adaptations strategies that are available to agriculture. Agronomic strategies include changes in crop varieties and species, timing of operations, and land management including irrigation. Economic strategies including investment in new technologies, infrastructure, and labor, and shifts in international trade. Over all, such agronomic strategies were found to offset either partially or completely the loss of productivity caused by climate change. Economic adaptations were found to render lowering the agriculture costs of climate change.

Reilly and Schimmelpfenning (1999) defined the following are the “major classes of adaptation to climate change”: seasonal changes and sowing dates; different variety or species; water supply and irrigation system; other inputs (fertilizer, tillage methods, grain drying, other field operations); new crop varieties; forest fire management, promotion of agro forestry, adaptive management with suitable species and silvicultural practices.

Loede *et al.*, (2001) reported that it is important to note that irrigation water is also subject to impacts from climate change. Use of irrigation technologies need to be accompanied by other crop management practices such as use of crops that can use water more efficiently. Important management practices that can be used include: efficient management of irrigation systems, growing crops that require less water, and optimizing of irrigation scheduling and other management techniques that help reduce wastage.

Orindi and Eriksen (2005) stated that Agricultural adaptation involves two types of modifications in production systems. The first is increased diversification that involves engaging in production activities that are drought tolerant and or resistant to temperature stresses as well as activities that make efficient use and take full advantage of the prevailing water and temperature conditions. Among other factors, crop diversification can serve as insurance against rainfall variability as different crops are affected differently by climate events. The second strategy focuses on crop management practices geared towards ensuring that critical crop growth stages do not coincide with very harsh climatic conditions such as mid-season droughts. Use of irrigation has the potential to improve agricultural productivity through supplementing rainwater during dry spells and lengthening the growing season.

Climate change and African agriculture review (2006) reported that, changes in temperature and precipitation cause changes in crop selection, changes in the use of shading and sheltering, and changes in soil conservation. In addition, changes in precipitation are also met by changes in planting dates, a shorter growing season, and increased use of water conservation techniques.

Kurukulasuriya and Mendelssohn (2006) explored the importance of water availability in the Ricardian model by estimating the role of irrigation as an adaptation measure against unfavourable climatic conditions.

Jawahar and sangi (2006) reported that adaptation measures can be supply-side measures (such as providing more water), demand side measures (such as reuse of water) and combinations of both (such as changing crop varieties). While some measures may be taken at the individual or farm level, others require collective action (rainwater harvesting) or investments at the agency or government level (for example, building dams, releasing new cultivars that are more water efficient).

IISD (2006) reported that improving the adaptive capacity of disadvantaged communities requires ensuring access to resources, income generation activities, greater equity between genders and social groups, and an increase in the capacity of the poor to participate in local politics and actions.

Seo and Mendelssohn (2006) used multinomial logic models to analyze crop and livestock choice as adaptation options. The study showed that crop choice is climate sensitive and farmers adapt to changes in climate by changing crops. The results from choice models from the livestock study showed that farmers in warmer temperatures tend to choose goats and sheep as opposed to beef cattle and chicken. Goats and sheep can do better in dry and harsher conditions than beef cattle.

Nhemachena and Hassan (2007) indicated that common adaptation methods in agriculture include use of new crop varieties and livestock species that are better suited to drier conditions, irrigation, crop diversification, adaptation of mixed crop and livestock farming systems, and changing planting dates, using different crop varieties, changing planting and harvesting dates, increased use of water and soil conservation techniques, and diversifying from farm to non–farm activities to cope up with climate change.

Gahendar and Dinanath (2008) revealed that the farmers of the chitwan district of central Nepal has taken up number of adaptations against climate change, they constructed check dams and other infrastructures, some of them replaced rice by maize, the stream beds have risen because of deposition of debris, making water inaccessible for irrigation during stress period.

Melissa and Sathis (2008) reported that in tsunami affected Srilankan coastal areas resilience measures included integrating tree component in home gardens, off farm supplementary livelihoods like mushroom cultivation.

Raj and Prakash (2008) reported that the farmers of Himachal Pradesh region converted the climate change problem in to opportunity where apple farmers affected by climate change have shifted to crops like kiwi and pomegranate and getting good yield.

Ronak and Niranjan (2008) point out that in Dhala region of Rajasthan the farmers have been blending traditional and improved farming practices to adapt to changes in climate they are experiencing. By including practices like mulching, new seeds or vermin composting, crop diversification, green manuring in their agriculture system.

Pathak *et al*., (2012) identified ten adaption options having the highest priority in mitigating climate vulnerability following experts ranking. These options were climate ready crop varieties, water saving technologies, changing planting dates, integrated farming system, growing different crops, integrated pest management, crop insurance, conservation agriculture, improved weather-based agro-advisory and improved nutrient management.

Nagraj *et al*., (2013) found that diffusion of innovations, provision of quality seeds, efficient input delivery and market linkage, more than 75 per cent of farmers benefitted through bridging the productivity gaps and thereby enhanced incomes in both crop and livestock sector.

Sarkar (2014) showed that adaptive capacities of the farmers were enhanced through different technological intervention and through capacity building programme of National initiative on climate resilient agriculture (NICRA).

Ignaciuk, (2015) explained that adaptive measures, known to be beneficial for the sector's resilience to climate change, are not being adopted by farmers for a number of reasons. For instance, information gaps may prevent farmers from adopting a larger number of practices that encourage resilience; financial constraints may prevent farmers in a number of regions to invest in irrigation or cooling system for livestock; while misaligned incentives may encourage farmers to avoid adopting suitable crop varieties. Autonomous adaptation appears to be insufficient in response to projected climate change, prompting the increased need for public policies.

Anita *et al.*, (2017) observed that agriculture faces a wide range of diverse barriers to the adoption of climate friendly practices. Some of these barriers are directly linked to government policy, while others relate to farmers' own decisions but can potentially be influenced by policy. This multitude of barriers also matches the diversity in environmental conditions, types of farmers, institutional and policy environment.

Krishnapillai (2017) found that the potential of integrated volcanic soil management strategies, alternate crop production practices, and mosic restoration efforts in regarding degraded landscape and brining fresh promise to the displaced communities. A special emphasis is given to the climate smart adoption strategies' under the umbrella of pacific American climate funding facility to enhance the livelihood opportunity of the displaced atoll population across yap.

2.10 Level of Adoptability in Climate Resilience Management Practices Followed by the Respondents

Shasidhar (2004) revealed that 68.75 per cent of the respondents belonged to medium adoption category. Whereas, 16.88 and 14.37 per cent of them in high and low adoption categories of eco-friendly technologies, respectively.

Khin (2005) revelles that 22.33, 24.16 and 52.50 per cent of the respondents belong to high, low and medium adoption categories, respectively.

Nhemachena and Hassan (2007) showed that less than 40 percent of the respondents are not adopting any adaptation strategies. The adaptation options can be classified into two main modifications in the production systems including increased diversification and escaping sensitive growth stages through crop management practices that ensure that critical crop growth stages do not coincide with very harsh climatic conditions in the season such as mid-season droughts. Increased diversification through engaging in production activities that are more drought-tolerant and or resistant to temperature stresses as well as activities that make efficient use and take full advantage of the prevailing water serve as an important form of insurance against rainfall variability. Growing a number of different crops in the same plot or in different plots reduces the risk of complete crop failure as different crops are affected differently by climate events.

Basvaraj, (2008) revealed that maximum of 45.71 per cent of the respondents belonged to medium level of adoption category, followed by 31.42 per cent and 22.87 per cent of the respondent’s belonged to high and low level of adoption category, respectively. The reasons for majority in medium level of adoption category might be their literacy and acquired knowledge, medium level of exposure towards mass media, and comparative extension contact and tendency medium level risk bearing ability.

Shilpa (2010) revealed that 50.00 per cent of big farmers possessed high adoption level about improved potato cultivation practices. About 30.00 per cent farmers had medium adoption level, where 20.00 per cent potato growers had low adoption level about improved potato cultivation practices. Followed by 40.00 per cent of small farmers had medium adoption level, while 33.34 per cent farmers had low adoption level, where as only 26.66 per cent potato growers had low adoption level. Subsequently, 40.00 per cent of marginal farmers had low adoption level, while 36.66 per cent farmers had medium adoption level, and 23.34 per cent of potato growers had low adoption level.

Mahatab (2010) showed that majority (56.67 %) of the respondents belonged to medium adoption category. Whereas, 22.22 and 21.11 per cent of the respondents belonged to low and high adoption categories, respectively.

Brar (2016) revealed that majority of the farmers (82.43%) were availing weather forecast they mitigate the effect of climate change in paddy production. More than three fourth (76.35%) of the respondents opined that by using laser land management practices like leaser leveler they mitigate the effect of climate change during paddy production. While 26.35 per cent by using resource conservation technologies, 28.37 per cent by adopting soil moisture conservation methods, 11.48 per cent by stopping the burning of crop residue and only 10.81 per cent by using insect pest management techniques they mitigate the effect of climate on paddy production

Satindra (2017) revealed that majority of 63.33 per cent of the respondents had medium level adoption category , followed by 24.17 per cent of low and 12.50 per cent of high level adoption category.

Shalini (2017) reported that Cent percent of hybrid paddy growers had fully adopted draining water from the field 10-15 days before harvesting practice. Majority (71.66, 61.66 and 65.00%) of the respondents had partially adopted soil fertility maintenance, soil erosion control and related practices and water level to be maintained at field level practices respectively. A considerable percentage 39.16 per cent of the hybrid paddy farmers had partially adopted proper irrigation during tillering stage practice.

2.11 Association Between Adoptability of Climate Resilience Management Practices and Profile Characteristics of Respondents

Gangappa (1975) reported that the adoption behaviour of small and marginal farmers was positively and significantly associated with their material possession status.

Johnson and Masters (2004) argued that besides the socio-economic characteristics of the farmer to take up adaptation measures, complementarities among interrelated innovations may explain the location and timing of productivity growth and may be particularly important in transforming semi subsistence agrarian economies. They studied the cases of cassava in West Africa, where both mechanized processors and new varieties are more widespread in Nigeria than in neighbouring countries. Historically, mechanization came first but the later development of new varieties made mechanization much more profitable and the two then spread together.

Tenge *et al.,* (2004) reported that female head of household may have negative effects on the adaptation of soil and water conservation measures, because women may have limited access to information, land, and other resources due to traditional social barriers.

Anonymous, (2006) stated that in Climate change and African agriculture review report observed that, the level of education (measured in years) also greatly increases the probability of adaptation.

Maddison (2006) indicated that experience in farming increases the probability of uptake of adaptation measures to climate change.

David (2007) find that by using Heckman's sample selectivity probitmodel, reveals that although experienced farmers are more likely to perceive climate change, it is educated farmers who are more likely to respond by making at least one adaptation. In terms of policy implications it appears that improved farmers education would hasten adaptation. The provision of free extension advice may also play a role in promoting adaptation. In so far as distance to the market is a significant determinant of whether a farmer adapts to climate change, it may be that improved transport links would improve adaptation. Farmers who have enjoyed free extension advice and who are situated close to the market are also more likely to adapt to climate change.

Nhemachena and Hassan (2007) suggested that mixed crop and livestock farmers are associated with positive and significant adaptation to changes in climatic conditions compared to specialized crop and or livestock farmers. The mixed farming systems are better able to cope with changes to climatic conditions by taking up various changes in management practices and opined that, households with access to electricity, tractors, heavy machines and animal power have better chances of taking up adaptation options against climate change. With access to technology farmers are able to vary their planting dates, switch to new crops, diversify their crop options and use more irrigation, apply water conservation techniques, and diversify into non-farming activities. However, large capital stock in farming would make it much more expensive to go into non-farm activities. Farmers with better technologies usually have access to markets and they produce for sale, which is generally based on strong flows of communication and information. Ensuring availability of cheap technologies for smallholder farmers can significantly increase their use of other adaptation options.

Mahatab (2010) in his study knowledge and adoption of aerobic rice growers in Eastern dry zone of Karnataka found that age, education, land holding and mass media exposure of aerobic rice growers were significantly related to their knowledge level at 0.05 percent level of significance and innovativeness of the aerobic rice growers was significantly related to their knowledge level at 0.01 per cent level of significance.

Shilpa (2010) reveled that the chi-square test shows that out of 13 independent variables,1 variable namely social participation of potato growers were significantly related with their adoption level of potato farmers at 0.01 level and Age, education, farming experience, risk orientation and mass media participation of potato growers were significant relationship with their adoption level at 0.05 level. And, other characteristics namely family size, land holding, annual income, extension contact, extension participation, innovativeness and economic motivation were not related to their adoption level.

Kalea *et al.*, (2012) showed that diversification in occupation had highly significant association with livelihood security.

Mamathalakshmi (2013) reported as chi-square value clearly showed that age, area under chrysanthemum, family size and family type had significant association at one per cent with their adoption behaviour. While the variables like occupational status, economic motivation, mass media utilization and management orientation had significant association at five per cent with their adoption behaviour. There was a non-significant association found between education, land holding, social dependency, economic dependency, farm power status, material status, socio-economic status, chrysanthemum growing experience, annual income, social participation, extension participation, innovative proneness, cosmopoliteness and adoption behaviour.

Vidyadhara (2015) revealed that the education, land holding, annual income, source of irrigation, scientific orientation and innovativeness exhibited significant association at 1 per cent level. Whereas, social participation, cosmopoliteness, training undergone, extension contact, extension participation and mass media participation were found to be significant at 5 per cent level of significance. age, family type, farming experience, family dependency ratio, material passion and economic motivation were found to be non-significant.

Sudha (2016) revealed that out of twenty independent variables, all the variables *viz.*, age, family size, family type, caste, extension contact, extension participation, mass media participation, information seeking behavior, credit orientation, level of aspiration, scientific orientation, management orientation, economic motivation, risk orientation, fatalism / scienticism, localite/ cosmopoliteness, farming experience, achievement motivation and deferred gratification were highly significant at one per cent level

2.12 Relationship Between Adoptability of Climate Resilience Management Practices and Profile Characteristics of Respondents

Pandya and Vekeria (1994) revealed that scientific orientation of banana farmers had highly significant relationship with their knowledge level.

Basavaprabhu (1996) found that scientific orientation had a positive and significant relationship with knowledge level of cabbage and tomato farmers of Bangalore district.

Shiferaw and Holden (1998) indicated that there was negative relationship between age and adaptation of improved soil conservation practices under changed climate.

Shasidhara (2006) revealed that the correlation co-efficient of 10 characteristics *viz.*, annual income, achievement orientation, innovative proneness, scientific orientation, risk orientation, extension participation, institutional participation, cosmopoliteness, mass media utilization, and attitude towards chemical fertilizers exhibited positively significant of knowledge eco-friendly management practices. But the characteristics like age, education, land holding, deferred gratification and economic motivation had non-significant relationship with knowledge of eco-friendly management practices.

Annand (2007) reported that among the personal, socio economic and psychological factors, age, family size, land holding, technology utilization and economic motivation were found significant at 1 percent level of probability with sustainable rural livelihoods. The factor like expenditure pattern was negatively significant at 1 percent level of probability and occupational status was negatively significant at 5 percent level.

Sowmya (2009) revealed that farm experience (0.448) had positive and significance relationship with managerial ability at 1% percent level of significance. Whereas, age (0.358), occupation (0.398), level of aspiration (0.265) had positive and significant relationship at 5 percent level of significance. Other variable such as education, marital status, number of children, family size, family labour force, size of land holding, total income, cosmopoliteness, extension system link, mass media participation, organizational participation, deferred gratification, value orientation were found to have non-significant relationship with managerial ability.

Mahatab (2010) reveals that education, land holding, extension contact, extension participation of aerobic rice farmers were significantly related to the extent of adoption level of aerobic rice farmers at 0.05 level and annual income was significant at 0.01 level. Whereas the other characteristics namely age, family size, irrigation, cosmopoliteness, mass media exposure, livestock possession, Social participation, economic motivation and Innovativeness and risk orientation were not significantly related adoption level.

Shankara (2010) showed that the findings on 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 of climate change

Somshekara (2010) that ten variables vize, age, education, farming experience, landholding, annual income, livestock possession, extension contact, economic motivation, innovativeness and decision making ability were significantly related to productivity of sugarcane crop among farmers in Cauvery command area.

Ravindra (2012) observed that age, mass media exposure, organizational participation, size of land holding, and farm resources, had a positive and non-significant relationship with farmers adaptation to climate change. While education, farming experience, innovative proneness, risk orientation, extension contact, social participation, and scientific orientation, had a positive and significant relationship with farmers adaptations to climate change, at 0.01 per cent level.

Jayasree (2013) observed that variable such as education, family size, area under Jhum,annual income, cosmopoliteness, material possession and extension participation had positive and significant relationship with sustainability level of Jhum at one percent level of significance. Whereas number of family member involved in Jhum, Jhum cycle had positive significant relationship with sustainability level of Jhum at five percent level of significance. Other variable such as age, livestock possession, credit orientation and mass media participation had non-significant relationship with sustainability level of Jhum.

Vinaykumar (2015) stated that in aspect of innovative proneness the correlation coefficient estimated was 0.111, which did not match approach significance level even at 0.05 level of probability, nothing that innovative proneness of the village had no significant association with management level of farmers.

Shalini (2017) revealed that education, occupation, land holding, annual income, extension agency contact and cosmopoliteness were significantly related to their extent of economic performance of hybrid paddy growers at 5 per cent level and knowledge, achievement motivation and innovative proneness was significant at 1 per cent level.

Whereas, the other characteristics namely, exposure to age, mass media, social participation and extension participation were not significantly related.

2.13 Contribution of Profile Characteristics to Adoptability Climate Resilience Management Practices

Shashidhar (2004) revealed that two independent variables namely achievement motivation and risk orientation were significant at 1 per cent level of probability, in influencing the level of adoption of eco-friendly management practices. The “F value” was significant and co-efficient of determination was 0.5028, which revealed that 50.28 per cent of variation in the adoption of eco-friendly technologies was explained by the variables selected for the study.

Sowmya (2009) indicates the contribution of profile characteristics of rural women to managerial ability. The results of multiple linear regression analysis showed that variables such as education, occupation, farm experience and level of aspiration were significantly contributed to the managerial aspect of rural women entrepreneurs

Shankara (2010) indicated that 78.00 per cent of variation on the level of perception was explained by all the fifteen variables included in the study as evidenced by R^2 value. The results revealed that age and education had significantly contributed at 1 per cent level whereas, farming experience, occupation, income, land holding, innovative proneness and extension contact had influenced the perception level of farmers about climate change significantly at 5 per cent level.

Somashekara (2010) revealed that first five components together explained 54.7 per cent (0.547 cumulative variation) of the variation. The table indicated that, irrigation water crisis management among mid reach farmers directly related to the variables such as education, land holding, cosmopoliteness, mass media participation, opinion leadership, decision making ability and deferred gratification where as in case of second component variables like age, education, farming experience, social participation, innovativeness and deferred gratification were contributed for higher variance. In the third component age, farming experience, livestock possession, and decision making ability, where as in case o fourth component age, farming experience and annual income were contributed for higher variance. Lastly in fifth component, the variables like material possession, extension contact and decision making ability were contributed for higher variance.

Jayasree (2013) showed that age, family size, number of family member involved in Jhum, area under Jhum, Jhum cycle, cosmopoliteness, livestock possession, material possession, credit orientation, extension participation, mass media participation are fitted together in the regression model explained 75.4% variation in perception of tribal people about sustainability level of Jhum.

Mahentesh (2015) five principal components with eigen values of more than 1 together accounted for nearly 62 per cent of cumulative variability. The first component accounted for nearly 23 per cent of cumulative variability observed in all the independent variables together.

Preethi (2015) observed that the KMO measure of sampling adequacy of 0.736 indicated that all the variables were necessarily measuring different components and also there is presence of multi co-linearity among those components. Ten principal components with eigen value of more than 1 were sufficient to account for 70 per cent of the cumulative variability. It also reveal that 18.01 per cent of variance caused by component 1, followed by 8.90 per cent variation by component 2 and as follows. If there is higher amount of correlation between independent variables, cumulative variance is explained at initial stages itself. In the present study, it indicates that there is less correlation between independent variables revealing good selection of independent variables for the study.

Yashodhara (2015) found that the five components contribute to over 64 per cent of the total variation. As all the five variables forming livelihood status index emerged important in the first component itself, the first component describes the relationship between livelihood status levels of farmers with socio-economic factors meaningfully. Analysis of first principal component clearly showed that generally some of socio-economic variables such as annual income, land holding and extension participation had strongly influenced the livelihood status in positive direction.

2.14 Constraints Faced by the Farmers in due to Climate Change

David (2007) opined that lack of information about weather and climate, lack of knowledge about adaptations, rationing of key inputs including water, lack of appropriate seed, insecure property rights and lack of market access. Few farmers perceived lack of information about the weather or long-term climate change to be a barrier to adaptation. Likewise, few believed they lacked knowledge about the appropriate adaptations. In Ethiopia a quarter of respondents felt that they lacked information about climate change. A large number felt, however, that lack of credit or savings represented a barrier to adaptation. Among adaptations made in response to climate change, planting different varieties of the same crop and changing dates of planting are important everywhere.

Patrick (2009) stated that 70 per cent of the cotton farmers faced the barriers to climate change were lack of access to timely weather forecasts, climate change information and credit facilities that were needed to motivate them to engage in water conservation strategies.

Shankara (2010) revealed that major constraints faced by farmers to take up adaptation measures to overcome ill effects of climate change were, high temperature which restrict them to work in the field for longer time, higher cost of the agricultural inputs, non availability of timely inputs (seeds, chemicals, fertilizers etc.), low price for the produce in the market, non availability of labours in the village, higher labour wage and poor supply of uniform electricity (Rank I) were rated as major constraints, followed by lack of information about long term climate change (Rank II). non availability of irrigation facility was ranked as III, followed by Lack of knowledge regarding appropriate adaptations (Rank IV), lack of credit/ loan from the banks(Rank V), Lack of storage facility for produce in the village (Rank VI), absence of processing units in the village (Rank VII), lack of knowledge about (Post Harvest Technologies) processing (Rank VIII), grading (Rank IX), storage (Rank X), long distance of the regulated markets from the village (Rank XI) and poor transport facilities (Rank XII) were other constraints expressed by farmers in the order of their experience.

Henry (2011) reported that majority (87.4 0%) of respondents indicated no access to water as an important barrier to adaptation method. 78.90 per cent of the respondents perceived lack of information about climate change, 87.40 per cent of the respondents attributed lack of knowledge about adaptation option, 85.30 per cent of the respondents attributed lack of credit and poverty.

Ofuokus (2011) reported that the reasons for the failure to adapt to climate change were lack of information (38.93%), lack of money (22.90%), inadequate labour supply (9.92%), inadequate land (17.55%) and lack of potential for irrigation (10.68%).

Coretha and Edwin (2012) observed that the constraints faced by small holder farmers in Tanzania include lack of funds (25.90%), shortage of water (27.30%), poor planning (7.60%) and shortage of seeds (3.20%).

Preethi (2012) revealed that lack of technical skills and capacities for adoption of technologies ranked first followed by lack of awareness and sensitization to the development and utilization of new technologies (Rank 2), non availability of timely inputs (Rank 3), lack of information about long term climate change (Rank 4), adoption of new technology costs money (Rank 5), lack of extension services in technology dissemination (Rank 6) and lack of investment capital and land tenure issues (Rank 7).

Philip *et.al.*, (2013) reported that 97.00 per cent of the household perceived that lack of financial resources as a serious barrier to climate adaptation followed by 65.00 per cent of respondents perceived that a lack of information on climate change characteristics, 33.00 per cent reported that a lack of institutional capacity to facilitate agricultural adaptation and 26.00 per cent social barriers and 7.00 per cent lack of infrastructural development in Sub-Saharan Africa.

Ifeanyi and Issa (2013) observed that the barriers faced by the cassava farmers in adapting to climate change were land and labour constraints, non - accessibility/ availability of farm inputs, non-availability/high cost of farm facilities, farming practices and traditional belief, information constraints, poor agricultural extension service delivery, income constraints and government non chalet attitude towards climate change issues.

Vinay (2015) revealed that major constrains faced by farmers to take up management measures to overcome ill effects of climate change were, non availability of labour wage rate (Rank I) followed by Low price for produce in the market (Rank II) this could be due lack of minimum support price fixed by the government. Less market price reduce the income of the farmers and this hampered them from purchasing the necessary farm inputs meant for adoption to climate change, absence of government policy on climate change (Rank III)followed by non availability of inputs and high cost of inputs.

Lalitha (2016) in her study graded the constraints like difficult to work in the field due to severe temperature obtained Ist rank, higher labour wages ranked II and lack of information on causalities of climate change ranked III.

Anita *et al.*,(2017) observed that several of the identified barriers are created by existing policies: first, through misaligned policies targeting other aims, such as input subsidies designed to support production in marginal areas; second, by creating resentment and stress among farmers regarding their ability to meet the regulations; and third, by exacerbating existing financial vulnerabilities that weaken farmers' adaptive capacities. The first barrier can be addressed through policy reform and ensuring policy coherence. The second and third may be avoided with effective planning.

Raviya (2017) inferred that respondents also faced the constraint on moderate level were: "non availability of information about future aberrant weather conditions including cyclone" with weightage mean score 1.075 followed by "no timely availability of chemical fertilizers (1.017)", "non-availability of finance in time (0.942)", "high price of organic manures (0.908)", "scarcity of Farm yard mannure/Compost fertilizers (0.850)", "lack of knowledge about the new recommended technologies (0.825)", "lack of knowledge to diagnose the pests and diseases in the crop (0.783)" and "not information about radio programmes related to agriculture (0.767)" with rank eleventh, twelfth, thirteenth, fourteenth, fifteenth, sixteenth, seventeenth and eighteenth respectively.

2.15 Farmers Suggestions to Mitigate the Ill Effects of Climate Change

Baethgen *et.al*., (2003) argued that availability of better climate and agricultural information helps farmers make comparative decisions among alternative crop management practices and this allows them to better choose strategies that make them cope well with changes in climatic conditions.

IISD (2006) suggested that improving the adaptive capacity of disadvantaged communities requires ensuring access to resources, income generation activities, greater equity between genders and social groups, and an increase in the capacity of the poor to participate in local policy.

Nhemachena and Hassan (2007) argued that the impact of climate change on rural farming communities can be reduced by distributing information about seasonal climate forecasts to farmers on time, so that they can make more informed farming decisions and adapt to changing conditions. They also reported that farmers with access to both input and output markets have more chances to implement adaptation measures. Input markets allow farmers to acquire the necessary inputs they might need for their farming operations such as different seed varieties, fertilizers, and irrigation technologies.

Shankara (2010) revealed that the majority of the farmers suggested early warning has to be given to the farmers about environmental changes, creating awareness to the farmers about appropriate adaptation measures against climate change and development departments should take up measures in providing production inputs at appropriate time in the villages (Rank I) followed by extending subsidies for the crops to make up the cost of cultivation (Rank II), extending insurance benefits to all crops (Rank III), providing financial support for soil nutrient enrichment (Rank VI), incentives/support for adapting the green manuring (Rank V), support to all the crop produce based on cost of cultivation (Rank VI) and creating awareness/support for adapting organic farming technologies (Rank VII) were the major suggestions offered by the farmers to mitigate ill effects of climate change.

Vinay (2015) reported that majority of farmers suggested that early warning has to given to the farmers about environmental changes (Rank I) creating awareness to the farmers about appropriate measures against climate change and development department should ensure supply of production inputs at appropriate time in villages, support for increasing green manuring (Rank II) to minimise the production cost. Creating awareness about appropriate adoption measures against climate change (Rank III) the official of department of agriculture, gear up the efforts to disseminate available practices followed by training and crop insurance has to be extended all crops.

Vinay and Umesh (2015) observed that the foremost suggestion made by the group of farmers was providing early warning signals about the environmental changes, followed by creating awareness about appropriate adaptation measures against climate change, ensuring supply of production inputs at appropriate time. Creating awareness on organic farming technologies and support for increasing the green mannuring were the less important suggestions quoted by the farmers. It may be because that the farmers might have felt that providing early warning signals and creating awareness on appropriate adaptation technologies are more relevant than creating awareness on organic farming technologies and providing incentives on green manuring.

Brar (2016) revealed that more than half of the respondents (52.70%) suggested that there should be varieties that are resistant to various insect-pest and weeds followed by 45.27 per cent respondent those suggested that varieties resistant to lodging should be developed.

Lalitha (2016) graded that providing awareness on adoption of measures against climate change obtained rank I, early warning has to be given to the farmers about environmental changes ranked II and providing financial support for soil health enrichment ranked III.

Nitesh (2017) suggested that the farmers who availed the services of green army to overcome the problem faced by the Green Army. All the cultural operations in rice should be undertaken (Rank I), diversification of activities (Rank II), use and maintenance of improved machinery (Rank III), involve younger people (Rank IV), increase the interaction of members with farmers (Rank V), reduction in the service charges and full payment after completion of work (Rank VI) and additional training should be given to maintenance of farm machinery and equipment (Rank VII).

Raviya (2017) reported that the most important suggestions offered by more than 80 per cent of the respondents to overcome the constraints in adoption of recommended practices were Support price of the production should be higher (90.00 per cent), followed by farmers should be protected by crop insurance during crop failure (90.83 per cent), inputs should be made available at subsidized rate (86.67 per cent), market facilities should be strengthened for remunerative price (82.50 per cent), as well as improved and certified seed should be provided by government at cheaper rate (81.67 per cent), with rank first, second, third, fourth and fifth respectively.

III METHODOLOGY

The present study was conducted with aspects covered mainly climate resilience management level of farmers. Keeping the objectives of the research in mind, the material and methods employed in the research are presented under different headings as given below.

3.1 Locale of the study

3.2 Selection of taluks

3.3 Selection of villages and respondents

3.4 Description of study area

3.5 Research design

3.6 Variables used in the study

3.7 Development of scale to measure climate resilience management

3.8 Documentation in adoptability of climate resilience management practices

3.9 Operationalisation and measurement of profile characteristics

3.10 Constraints faced by the farmers due to climate change

3.11 Suggestions of farmers to mitigate the ill effects of climate change

3.12 Development of Interview schedule

3.13 Data collection

3.14 Statistical tools used for analysis of data

3.1 LOCALE OF THE STUDY

3.1 Locale of the Study

The study was conducted in the Eastern Dry Zone (Zone-5) of Karnataka. It covers six districts *viz.,* Tumkur, Banglore rural, Bangalore urban, Kolar, Ramanagar and Chickballapur. The taluks coming under each district under Eastern Dry Zone (Zone-5) are listed below.

Table 1: Districts and Taluks Coming Under Eastern Dry Zone (Zone-5)

Sl. No.	District	Taluk
1.	Tumkur	Tumkur, Gubbi
2.	Bangalore rural	Devanahalli, Doddaballapur, Nelamangala, Hosakote
3.	Bangalore urban	Bangalore North, Bangalore South, Anekal.
4.	Kolar	Kolar, Malur, Bangarpete, Srinivasapura, Mulabagilu
5.	Chickballapur	Chickballapur, Shidlagatta, Bagepalli, Gowribidanur, Gudibande, Chinthamani
6.	Ramanagar	Ramanagar, Kanakpura, Chennapatna, Magadi.

3.2 Selection of Taluks

Based on the existence of high range of variability in rainfall and temperature (since 20 years), six taluks were selected. Accordingly the taluks selected were Chickballapur, Dodddballapur, Anekal, Kolar, Gubbi and Ramanagar.

3.3 Selection of Villages and Respondents

From each of the selected taluks two villages were selected randomly. Thus, 12 villages were considered for the study. From each of so selected villages farmers were selected by applying random sampling procedure. Thus, the total sample size for the study was 180 respondents. The selection of respondents to get the reliable data as researchable subject the criteria were selected. The details of the districts, taluks, villages and number of respondents selected for the study are given in the Table-2. The selection of respondents sarting from 45 years as they might be having the farming ranges from 15 to 20 years. Such of farmers would be much useful to provide the change in the climate resilient management thus, the data were collected from such respondents and used.

Table 2: District, Taluks and Villages Selected for the Study

Sl. No.	District	Taluk	Village	Irrigated situation (90)	Rainfed situation (90)
1	Chickballapur	Chickballapur	Muddenhallli	15	-
			Kalavara	-	15
2	Banglore rural	Doddaballapur	Doddarayapanahalli	15	-
			Channapura	-	15
3	Banglore urban	Anekal	Surajakkanahalli	15	-
			Gollahalli	-	15
4	Kolar	Kolar	Medihala	15	-
			Hoohalli	-	15
5	Tumkur	Gubbi	Hodaluru	15	-
			Heruru	-	15
6	Ramanagar	Ramanagar	Vaderhalli	15	-
			Rampur doddi	-	15
	Total			**90**	**90**

3.4 Description of Study Area

3.4.1 General Description of the Eastern Dry Zone (Zone-5)

Zone-5 is spread over a total geographical area of 17,96,838 ha. covering 9.42 per cent of the geographical area of the state. It is situated in the deccan plateau and with 80 per cent area having an altitude of 800-900 mts. above mean sea level (MSL). Higher elevations of 1500 mts. and more occur in certain taluks with hilly areas like Hosakote, Shidlagatta, Gudibande and Chickballapur. Zone-5 is geographically located with a latitude $13^{0}15'$ east and longitude $78^{0}24'$.

The zone has a population density of 556.2 per sq.km., the highest in the state and total population of the zone is 73,01,151 constituting for 19.66 per cent of the state population. Out of this 36, 48, 286 are urban (49.96%) and remaining 36,54,865 are rural (50.04%).It has a population growth rate of 28.50 per thousand per annum. The zone-5 is primarily agrarian in character with about 47.165 per cent of its population depend on agriculture and related activities for their livelihood.

3.4.2 Physiography

The Eastern Dry Zone (Zone-5) in general is an undulating plateau with an elevation of 800-900 mts. above MSL. Hills ranging from 900-1500 mts. The 500mts. above MSL also occur in Bangalore and Kolar destricts. The greater part of Bangalore district is situated in Arkavathi river valley. There are stretches of hill ranges starting west of Nelamangala travelling through Magadi, Channapatna, Kanakpura to Shivaganga. Higher elevations of zone-5 are habituated by shrub forest while the lower elevations are occupied by medium to larger tanks, which are the source of irrigation for late kharif rice. The western part of the zone is characterized with ravines and scattered hills and valleys. The important seasonal rivers in Kolar destricts are Palar and north and south pinkini.

3.4.3 Soil

The zone has three major soil types red loamy 48.90 per cent, red sandy 17.61 per cent and red lateritic 33.49 per cent. The eastern taluks of the zone are largely composed of red sandy soils while the western taluks have red loamy soils. The central part of the zone has laterite soils and laterite gravelly soil to a limited extent. The soil fertility varies from low to medium in organic carbon and P_2O_5 and high in potash under dry situations. In wet situations the fertility is low in organic carbon, medium in P_2O_5 and high to medium in K_2O_5.

3.4.4 Climate

The eastern dry zone has a semi arid type of climate. The annual rainfall of this zone is 679.1mm. The mean annual rainfall is 768.47mm. June receives less rainfall when compared to the months of May, July, August and September. The north east monsoon accounts for about 28 per cent (215.03mm) of the total rainfall-received between September- October. The months of January- February remain particularly dry with very little or no rains and weather during this period is cool with a minimum temperature of around 14^{o}C.The Average season wise rainfall distribution of zone-5 is as below

Season	Period	Name of the Monsoon	Rainfall (mm)	Rainfall (%)
Kharif	June-Sept.	Southwest	406.24	52.86
Rabi	Oct-Dec	Northwest	215.03	27.98
Early kharif	Mar-May	Pre-monsoon	136.30	17.76
Winter	Jan-Feb.	Hot weather period	10.90	1.40
Total			**768.47**	**100.00**

The rainfall distribution has two peaks; one in May and the other in September. The southwest monsoon starts picking up from mid July and peaks in late August/September. More than 50 per cent of the rains are received between June and September.

3.4.5 Temperature

The mean monthly maximum temperature ranges between 25.9^{o}C in December to 33.4^{o}C in April. The mean monthly minimum temperature varies between 15^{o}C in January to 21.2^{o}C in April. The season wise monthly maximum and minimum temperatures computed for the zone are given below

Season	Period	Mean monthly temperature for season (^{o}C)	
		Maximum	Minimum
Kharif	June-Sept	27.75	19.25
Rabi	Oct-Dec	26.56	17.13
Pre-monsoon	Mar-May	32.80	20.43
Winter	Jan-Feb	28.30	15.75

3.4.6 Land use Pattern

Zone-5 has a total geographical area (TGA) of 17.96 lakh ha which is 9.42 per cent of the state TGA. The net cropped area (NCA) is 8.47 lakh ha constituting 47.16 per cent of the zonal TGA. The area under forest is 1.71 lakh ha (9.52%). The uncultivated area (pasture, grazing land, miscellaneous trees crops and cultivable waste) is about 3.16 lakh ha accounting for 17.59 per cent of TGA. The area under fallow is 1.57 lakh ha 8.76 per cent. The area not available for cultivation (non agricultural, barren and other uncultivable land) is about 1.80 lakh ha 10.00 per cent. The uncultivable land available for cultivation (3.16 lakh ha) which can be brought under cultivation with suitable soil and water conservation measures to augment agricultural production.

3.4.7 Irrigation

The zone has a net irrigated area of 1,80,145 ha which is about 21.25 per cent of the total cropped area of 8,47,483 ha. The rest 78.75 per cent cropped area of the zone is under rainfed making the zone essentially a dry farming. The main sources of irrigation are the open wells and tanks irrigating 87,191 and 79,573 ha respectively.

3.4.8 Socio-economic Characters, Population and Land Holding Pattern

The zone-5 has a total population of 73, 01,151 i.e. about 20.46per cent of the state, out of which 36,54,865 is rural and 36,48,286 is urban. The zone has a population density of 556.2 per sq.km with a growth rate of 28.50 per thousand per annum. More than 75 per cent of the population depends on agriculture for their livelihood either directly or indirectly. The holdings of 1-2 ha cover 24.17 per cent of the number of holdings and account for 20.53per cent of the NCA (Net Cropped Area). The holdings of more than 10 ha are only 1.26 per cent, while they occupy nearly 13 per cent of the total net cropped area (NCA). Largest number of holdings lie in the size class of less than 2 ha 75.39 per cent of the total holdings) indicating that majority of land owners are marginal and sub marginal farmers. Agriculture by this sector is primarily subsistence farming.

3.4.9 Major Crops

The Eastern Dry Zone has a total geographical area of 17,96,838 ha (9.42% of the state) of which 8,47,483 ha are cultivated. In addition to field crops, zone-5 is known for its production of a variety vegetables, mulberry cultivation and silk production. The major crops of the zone are finger millets, rice, groundnut, horsegram, dolichos and redgram.

Sorghum is a less important crop of the area and cultivated on a limited area of 6,742ha. The varieties of fruits (mango, grapes, guava and sapota), vegetables (tomato, brinjal, cabbage, chilies etc.) and flowers (chrysanthemum, roses, Crossandra, jasmine) which have an interstate and international market are also grown in this zone.

3.5 Research Design

According to Kerlinger (1973) the research design is the plan, structure and strategy of investigation conceived to find answers to research questions and to control variance. Since, the variables of respondents were difficult to manipulate, 'ex-post facto research design' was used in the present research study. According to Robinson (1976), there is no scope for manipulation of many independent variables as they have already occurred. It is possible to deduce theories, identify progressiveness and explore conditions under which the phenomenon has occurred.

3.6 Variables Used in the Study

Keeping the objectives of the study in mind, the climate resilience management level was taken as dependent variables. age, education, dependency ratio, farm size, farming experience, annual income, economic motivation, mass media exposure, risk orientation, scientific orientation, extension contact, cosmopoliteness, distance to market, awareness about diversification, extent of natural capital, innovative proneness, farm financial literacy, irrigation potential, organizational participation and farm mechanization level

The independent variables used in the study and details of their empirical measurement are presented in Table-3

Table 3: Variables and their Empirical Measurement

Sl. No.	Variable	Empirical Measurement
I.	**Dependent variable**	
1	Climate resilience management level	Scale developed for the study.
2	Adoptability of climate resilience practices	Scale developed for the study.
II.	**Independent variable**	
1	Age	Schedule developed for the study.
2	Education	Schedule developed for the study.
3	Dependency ratio	Scale developed by Savitha (2004) used.
4	Farm size	Scale developed by Khin (2005) used.
5	Farming experience	Procedure followed by Lakshminarayan (1997) used.
6	Annual income	Schedule developed for the study.
7	Economic motivation	Scale developed by Supe (1969) used.
8	Mass media exposure	Schedule developed for the study.
9	Risk orientation	Scale developed by Supe (1969) used.
10	Scientific orientation	Scale developed by Supe and Singh (1969) used.
11	Extension contact	Procedure followed by Hiremath (2000) used.
12	Cosmopoliteness	Scale developed by Desai (1975) used.
13	Distance to market	Schedule developed for the study.
14	Awareness about diversification	Schedule developed by Lalitha (2016) used.
15	Extent of natural capital	Schedule developed for the study.
16	Innovative proneness	Scale developed by Feaster(1968) used.
17	Farm financial literacy	Schedule developed for the study.
18	Irrigation potential	Schedule developed for the study.
19	Organizational participation	Procedure followed by Trivedi(1963) used.
20	Farm mechanization level	Scale developed by Mansingh (1993) used.

3.7 Development of Scale to Measure Climate Resilience Management Level

In order to cope up with the ill effects of climate change farmers are manage new technologies to overcome the risks and uncertainties in the farming due to variations in the rainfall and temperature etc. As a scale it is very important measure the climate resilient management level and helps in take up the decisions in the policy making

3.7.1 Operationalisation of Climate Resilience Management Level

It is operationally defined as the capacity for a socio-ecological system to absorb stresses and maintain functions in the face of external stresses imposed by climate change and adopt, reorganize, and evolve into more desirable management practices that improve the sustainability among the system and better prepared for future climate change impacts. Enlisted possible components which were relevant to measure the climate resilience management level of the respondents with reference to zone 5 through literature reviews, experts' opinion and informal discussion with the subject experts, and twenty two such components were identified.

The selected components were provided to 40 judges who had subject knowledge related to the study. They were asked to give their judgment the relevancy of the components on five point continuum like, "most relevant", "relevant", "somewhat relevant", "least relevant" and "not relevant" as indicated in above Table-4 for measuring the climate resilience management level of the respondents.

The judges rating were pooled by assigning the score value. As 'most relevant' score 4, for'relevant' score 3,for 'somewhat relevant 'score 2, for 'least relevant' score 1 and for 'not relevant 'response score 0 was given. Later, relevancy percentage for each component was calculated by using the relevancy formulae.

$$\text{Relevancy percentage} = \frac{4\times \text{MR (No.)} + 3\times \text{R(No.)} + 2\times \text{SR (No.)} + 1\times \text{LR (No.)} + 0\times \text{NR (No.)}}{\text{Total Number of Judges (40)}}$$

Table 4: List of possible components to measure the climate resilience management level

Sl. No.	Component	Most relevant	Relevant	Some what relevant	Least relevant	Not relevant
1.	Behavioral attributes					
2.	Economical status					
3.	Socialeleness					
4.	Cognitive state					
5.	Neighborhood relation					
6.	Natural resource degradation					
7.	Agricultural resources management					
8.	Knowledge on climate resilient management practices					
9.	Coping strategies					
10.	Planning skills					
11.	Crisis management					
12.	Dependency level					
13.	Adaptive capacity					
14.	Access to basic services					
15.	Sensitiveness					
16.	Environmental parameters					
17.	Health and wellness					
18.	Situational parameters					
19.	Ecological security					
20.	Transformation over a period					
21.	Livelihood security					
22.	Communication proficiency					

Table 5: Final Components Selected to Measure the Climate Resilience Management Level

Sl. No.	Component	Relevancy Percentage
1.	Environmental parameters	0.97
2.	Ecological security parameters	0.94
3.	Natural resource degradation parameters	0.92
4.	Agricultural resources/ non agricultural resources management parameters	0.90

Based on discussion with the experts and based on the relevancy percentage which was above 90, four components were selected for measuring climate resilience management level of the respondents. Four such selected components of climate resilience management level are *viz.*, environmental parameters, ecological security parameters, natural resource degradation and agricultural resources/ non agricultural resources management parameters

3.7.2 Collection and Editing of Items

The next step in the construction of scale was to collect exhaustive statements/items pertaining to climate resilience management level were drafted. Tentative list of 130 statements pertaining to Climate Resilience Management level was prepared based on the available literature and discussion with experts from selected areas.

The statements were edited as per the 14 criteria suggested by Edwards (1969), and Thurstone and Chave (1929). As a consequence 29 statements were eliminated and the remaining 101 statements were included for the study**.** Draft statements101 were mailed to 100 experts in the agricultural extension and other related fields working in SAUs, ICAR institutions in Karnataka as well as other states and State Department of Agriculture. The judges were requested to critically evaluate the relevancy of each component viz., Most Relevant (MR), Relevant (R), Somewhat Relevant (SWR), Less Relevant (LR) and Not Relevant (NR) later the score of 5, 4, 3, 2 and 1, respectively were assigned to consolidate the response. The judges were also requested to make necessary modifications and additions or deletion of statements, if they desire so. A total of 60 experts returned the questionnaires duly completed were considered for further processing. From the data gathered, 'relevancy percentage' and 'mean relevancy score' were worked out for 101 statements. The statements were analyzed for their relevancy using the following formulae.

$$\text{Relevancy Weightage} = \frac{(\text{MR} \times 5) + (\text{R} \times 4) + (\text{SWR} \times 3) + (\text{LR} \times 2) + (\text{NR} \times 1)}{\text{Maximum Possible score}}$$

$$\text{Mean Relevancy Score} = \frac{(\text{MR} \times 5) + (\text{R} \times 4) + (\text{SWR} \times 3) + (\text{LR} \times 2) + (\text{NR} \times 1)}{\text{Number of Judges responded}}$$

The results on the relevancy weightage and mean relevancy weightage score obtained after analysis . Accordingly statements having 'relevancy weightage of more than 75 and above and 'mean relevancy score' of 3.65 and above were considered for final selection. The details were presented in Annexure. Sixty statements were retained after relevancy test and these statements were suitably modified and written as per the comments of the judges wherever applicable. These sixty statements along with relevancy weightage are enlist in Annexure-II.

3.7.3 Item Analysis

To delineate the statements based on the extent to which they can differentiate the Climate Resilience Management level as lower or lower management level, item analysis was carried out on the statements selected in the first stage. For item analysis, statements were arranged in ascending order based on relevancy score. The 't' value of the statements were calculated by using following formula.

$$\text{t} = \frac{X_H - X_L}{\sqrt{\dfrac{\sum X^2 H - \dfrac{\left(\sum XH\right)^2}{\text{n}} \text{ x } \sum X^2 L - \dfrac{\left(\sum XL\right)^2}{\text{n}}}{\text{n}(\text{n}-1)}}}$$

Where,

$\sum X^2 H$ = Sum of the squares of the individual scores of high group

$\sum X^2 L$ = Sum of the squares of the individual scores of low group

X_H = The mean score for a given item of high group

X_L = The mean score for a given item of low group

n = Number of respondents

Based on the item analysis (t value), all the 60 statements which were statistically significant at 5 per cent and 1 per cent were retained in the final scale to measure climate resilience management level.

3.7.4 Reliability and Validity of the Scale

Study was conducted in Chickmanglore district of Karnataka where 30 farmers were selected from, non sample area of kasaba hobli in Kadur taluk. Split half method developed by Brown prophecy was employed to measure the reliability of the scale. The calculated value of correlation coefficient was 0.8595 and this was further calculated by using Spearman Brown formula (Guilford and Fruchter 1978) and obtained the reliability coefficient of the whole test. The value of the scale was 0.9223 which was highly significant at 1 per cent level indicating high reliability of the scale. The validity of coefficient of the scale was 0.9603 which was also statistically significant at 1 per cent level of probability indicates the higher validity of the developed scale. Hence, the scale is said to be valid. Thus, the developed scale to measure the Climate Resilience Management level was feasible and appropriate.

The final scale consists of 60 statements for determining the climate resilience management level of which include both positive statements negative statements. The response were collected from respondents on a five point continuum, namely, fully in vogue, in vogue, undecided, partially in vogue, and not in vogue as mentioned in Table-6 with assigned score of 5, 4, 3, 2 and 1, respectively for positive statements and vice versa for negative statements. Thus, the minimum and maximum score one could get is 60 and 300, respectively. Higher the score indicates the high management level of farmers towards climate resilience management level and lesser the score indicates low management level. Individuals' scores were used for further analysis and presented in results chapter.

Table 6: Statements Considered to Measure the Climate Resilience Management Level Among the Farmers

Sl. No.	Management Practice	Measurement				
		Fully in Vogue	In Vogue	Un-decided	Partially in vogue	Not in Vogue
I	**Natural Resource Degradation Management parameters**					
1	Sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment					
2	Non-adoption of soil-conservation management practices leads to desertification of the agricultural land					
3	Steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements					
4	Cost effective and efficient methods of water conservation and use					
5	Encouraging crop rotation patterns					
6	Environmental consciousness through education and mass awareness programs which can reduces the natural resource degradation					
7	Prevent and control the future deterioration in land, water and air which constitute our life-support systems					
8	Ensure that development projects are correctly sited so as to minimize their adverse environmental consequences					
9	Ensuring land for different uses based upon land capability and land productivity					
10	Encouragement for improvement in traditional methods of rain water harvesting and storage					
11	Developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases					

Sl. No.	Management Practice	Measurement				
		Fully in Vogue	**In Vogue**	**Un-decided**	**Partially in vogue**	**Not in Vogue**
12	Development and promotion of methods of sustainable farming, especially organic and natural farming					
13	Raising of green belts with pollution tolerant species can protect the natural resources					
14	Efficient use of inputs including agro-chemicals with minimal degradation of environment					
15	Inorganic fertilizer, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment					
II	**Agricultural Resource / Non-agricultural Resource Management parameters**					
1	Organic farming is effective in increasing the texture and fertility of soil					
2	Integrated pest management is a boon to reduce the chemical use for plant protection					
3	Integrated farming system is one of the best methods to use the agricultural resource management					
4	Measures for increasing the efficiency of water-use, water conservation and recycling					
5	Setting up of biogas plants based on cowdung and vegetable wastes					
6	Restoration and protection of grazing lands					
7	A movement towards greater efficiency in resource use including recycling					
8	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices					
9	Development of integrated pest management and nutrient supply system					

Sl. No.	Management Practice	Measurement				
		Fully in Vogue	In Vogue	Un-decided	Partially in vogue	Not in Vogue
10	Afforestration on common lands by the local communities through government schemes					
11	Improvement in genetic variability of indigenous population					
12	Incentives for environmentally clean technologies, recycling and conservation of natural resources					
13	Concerted efforts for development and propagation of non-conventional renewable energy generation systems					
14	Improvement of infra-structural facilities such as water supply, solid waste disposal, energy recovery systems					
15	Encouraging efficient utilization of forest produces					
III	**Environmental Protection**					
1	Environmental change causes negative effect on health people and animals					
2	Organic farming can improve soil fertility and soil structure					
3	Willing to give up part of my profit for environmental conservation					
4	Create environmental consciousness through education and mass awareness programs					
5	Climate resilience reduces environmental degradation					
6	Environmental factors play an important role in climate change					
7	Crop cover may protect the soil climate					
8	Climate resilience efficient in mitigating climate change effects					
9	Less risk of pollution in climate resilience practices					

Sl. No.	Management Practice	Measurement				
		Fully in Vogue	**In Vogue**	**Un-decided**	**Partially in vogue**	**Not in Vogue**
10	Raising of green belts with pollution tolerant species					
11	Increasing temperature and variation in rain fall are the main indicators of change and modify the cropping pattern					
12	Inorganic fertilizers and pesticides cause long term harmful effects to the environment					
13	Pesticides and chemical fertilizers will reduce the number of soil micro organisms					
14	Practicing the afforestration activities helps in increasing environmental conditions					
15	Climate change reduces mineral output to the environment					
IV	**Ecological Security Management parameters**					
1	Conservation of natural and domesticated ecosystems, and of wild and domesticated species to the fullest extent possible and the restoration and regeneration					
2	Protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity					
3	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					
4	Concentrating on Common Property Resources as these offer a single platform to collectively address issues of ecological restoration and poverty alleviation					
5	Development and promotion of methods of sustainable farming, especially organic and natural farming					

Sl. No.	Management Practice	Measurement				
		Fully in Vogue	**In Vogue**	**Un-decided**	**Partially in vogue**	**Not in Vogue**
6	Development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology					
7	Encouraging private individuals and institutions to regenerate and develop their wastelands					
8	Support for protecting traditional skills and knowledge for conservation of resources					
9	Conservation of micro-fauna and micro-flora which help in reclamation of wastelands					
10	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices					
11	Restriction on introduction of exotic species of animals without adequate investigations					
12	Discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation					
13	Taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand					
14	Reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority					
15	Development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation					

3.8 Documentation in Adoptability of Climate Resilience Practices

Adoptability is operationally defined as survival strategies undertaken by the farmers to face the vulnerability of climate change and also anticipated future impacts. These actions are elaborately attain practices like pest and disease resistant varieties, drought tolerant varieties, intercropping, crop substitution, alteration in sowing/ planting dates, integrated farming system approach, organic farming practices, establishing wind breaks, alteration in fertilizer usage, establishing soil and water conservation structures, micro irrigation systems, soil moisture conservation measures, use of organic manures, integrated nutrient management practices, crop rotation, soil test based fertilizer application, integrated weed management practices, measures towards disease resistance in animals, use of suitable breeds, high yielding & drought resistant forage crops, mulching and farm pond. documentation in adoptability of climate resilience practices was done by using scale developed by Vinay (2015) with slight modification which was given here under.

In an attempt of documentation in adoptability of climate resilience practices is done by including maximum number of adaptability of climate resilience practices of farmers under different farm aspects on basis of review of literature, experts and field extension workers consultancy and pilot study were undertaken. List of adaptability of climate resilience practices was prepared and presented on the headings: adoptability related to crop production and soil and water conservation. Under each aspect sufficient scope was provided to enable farmers to indicate their adoptability of climate resilience practices which are not in the list.

3.8.1 Collection of Items

Tentative list of 60 practices pertaining to the adoptability of climate resilience of farmers was prepared based on the available literature and discussion with the experts in agricultural extension and the other experts from selected areas.

3.8.2 Editing of items

A list of 60 items/ practices reflecting adoptability of climate resilience practices of farmers was prepared through review of literature and discussion with scientists/ subject matter specialist. The items/practices identified were carefully edited in the light of 14 criteria suggested by Edwards (1969), and Thurstone and Chavue (1929). As a consequence 15 practices were eliminated and the remaining 45 practices were included for the study**.** selected statements/practices were mailed to 100 experts in the agricultural extension and other related fields working in SAUs, ICAR institutions in Karnataka State Department of Agriculture to critically evaluate the relevancy of each component by including Most Relevant (MR), Relevant (R), Somewhat Relevant (SWR), Less Relevant (LR) and Not Relevant (NR) and later they were assigned the score of 5, 4, 3, 2 and 1, respectively. The judges were also requested to make necessary modifications and additions or deletion of statements, if they desire so. A total of 50 experts returned the questionnaires duly completed were considered for further processing. From the data gathered, 'relevancy percentage' and 'mean relevancy score' were worked out for 45 practices. The statements were analyzed for their relevancy using the following formulae.

$$\text{Relevancy Weightage} = \frac{(\text{MR} \times 5) + (\text{R} \times 4) + (\text{SWR} \times 3) + (\text{LR} \times 2) + (\text{NR} \times 1)}{\text{Maximum Possible score}}$$

$$\text{Mean Relevancy Score} = \frac{(\text{MR} \times 5) + (\text{R} \times 4) + (\text{SWR} \times 3) + (\text{LR} \times 2) + (\text{NR} \times 1)}{\text{Number of Judges responded}}$$

The results on the relevancy weightage and mean relevancy weightage score obtained after analysis . Accordingly pratices having 'relevency percent more than 70 and relevancy weightage of more than 0.75 and above and 'mean relevancy score of 3.5 and above were considered for final selection. Finally, 34 practices were retained after relevancy test and these practices were suitably modified and written as per the comments of the judges wherever applicable.

3.8.3 Item Analysis

To delineate the practices based on the extent to which they can differentiate the adoptability of climate resilience practices as lower or lower adoptability level, item analysis was carried out on the statements selected in the first stage. For item analysis, statements were arranged in ascending order based on relevancy score. The ‘t’ value of the statements were calculated by using following formula.

$$t = \frac{X_H - X_L}{\frac{\sqrt{\sum X^2 H - \frac{(\sum XH)^2}{n} \text{ x } \sum X^2 L - \frac{(\sum XL)^2}{n}}}{n(n-1)}}$$

Where,

$\sum X^2 H$ = Sum of the squares of the individual scores of high group

$\sum X^2 L$ = Sum of the squares of the individual scores of low group

X_H = The mean score for a given item of high group

X_L = The mean score for a given item of low group

n = Number of respondents

Based on the item analysis (t value), all the 22 statements which were statistically significant at 5 per cent and 1 per cent were finally retained in the scale.

3.8.4 Reliability and Validity of the Scale

Study was conducted in Chickmanglore district of Karnataka where 30 farmers were selected from non sample area of kasaba hobli in Kadur taluk. Split- half method developed by Brown prophecy was employed to measure the reliability of the scale. The value calculated of correlation coefficient was 0.9108 and this was further calculated by using Spearman brown formula (Guilford and Fruchter 1978) and obtained the reliability coefficient of the whole test. The validity of coefficient of the scale was 0.95441 which was also statistically significant at 1 per cent level of probability indicates the higher validity of the developed scale. Hence, the scale is said to be valid. Thus, the developed scale to measure the adoptability of climate resilience practices was feasible and appropriate.

The final scale consists of 22 practices for determining the adoptability of climate resilience practices level of which include both positive statements negative statements. The response were collected on a five point continuum, namely, fully followed, followed, un decided, partially followed and not followed as mentioned in the subsequent Table-7 with assigned score of 5, 4, 3, 2 and 1, respectively for positive statements and vice versa for negative statements. Thus, the minimum and maximum score one could get is 22 and 110, respectively. Higher the score indicates the high adoptability level of farmers towards adoptability of climate resilience practices level and lesser the score indicates low adoptability level.

The task of documentation was accomplished using a structured pre-tested schedule to know different adoptability of climate resilience practices to follow in mitigate ill effects of climate change. Thus, for their practices and preference pertaining to adoptability of climate resilience practices was given as fully followed, followed, un decided, partially followed and not followed based on their preference practices were documented. The measurements were classified as low, medium and high adoptability level on the basis of their score obtained by using mean and standard deviation.

Category	**Criteria**
Low	<(Mean – ½ SD)
Medium	(Mean $\pm$ ½SD)
High	> (Mean + ½ SD)

3.9 Operationalisation and Measurement of Independent Variables

The details regarding the operationalisation and measurement of selected 20 profile characteristics are mentioned in the ensuing paragraphs.

Table 7: Climate Resilience Practices Considered for Documentation of Response of Farmers in Eastern Dry Zone

Sl. No.	Statement	Fully followed		Followed		Un decided		Partially not followed		Not followed	
		Score	%	Score	%	Score	%	Score	%	Score	%
1.	Pest and disease resistant varieties										
2.	Drought tolerant varieties										
3.	Intercropping										
4.	Crop substitution										
5.	Alteration in sowing/ planting dates										
6.	Integrated farming system approach										
7.	Organic farming practices										
8.	Establishing wind breaks										
9.	Alteration in fertilizer usage										
10.	Establishing soil and water conservation structures										
11.	Micro irrigation systems										
12.	Soil moisture conservation measures										
13.	Use of organic manures										
14.	Integrated nutrient management practices										
15.	Crop rotation										
16.	Soil test based fertilizer application										
17.	Integrated weed management practices										
18.	Measures towards disease resistance in animals										
19.	Use of suitable breeds										
20.	High yielding & drought resistant forage crops										
21.	Mulching										
22.	Farm pond										

3.9.1 Age

Age refers to the number of chronological years of the respondents. Age was measured as the number of calendar years completed by the respondent at the time of enquiry. The selection of respondents sarting from 45 years as they might be having the farming ranges from 15 to 20 years. Such of farmers would be much useful to provide the change in the climate resilient management thus, the farmers who belonged to between 45to 50 years age considered as a low age group whereas, farmers who belonged to age group between 51 to 55 years medium age group and farmers who belonged to age group of above 55 years considered as a high age group.

3.9.2 Education

Education is the process of producing desirable changes in the behavior of an individual. In this study, this variable referred to the amount of formal schooling undergone by agricultural farmers in terms of number of years of formal education attained. The respondents were asked to indicate the level of education they had, later quantifying education and scores assigned were as under.

Educational level	**Score**
Illiterate	0
Functional literate	1
Primary school	2
Middle school	3
SSLC	4
PUC / Diploma	5
Graduate and above	6

Mean and standard deviation was calculated for these scored data and categories as low, medium and high education level.

Category	Criteria	Range
Low Less than	(Mean - 1/2 SD)	Below 0.91 score
Medium	(Mean ± 1/2 SD)	0.92-2.52 score
High More than	(Mean + 1/2 SD)	Above 2.52 score

3.9.3 Dependency Ratio

Dependency ratio was operationalised as the ratio of number of non-earning family members to the total number of earning members in the family.

It refers to the family dependents who don't participate in any farming activities or wage activities and are entirely dependent on the family head for their life requirements. The children below 14 years and adults above 60 years were normally treated as dependents by the economists and score considered in the study. However, the individuals even above 15 years, who are studying and usually don't take part in farming or wage earning activities, should also be treated as dependents. Therefore, dependency of each family member was got clarified by directly verifying with the respondents.

The score were assigned and calculated dependency ratio of the respondents was used to group them into three categories by using the mean and standard deviation as a measure of check.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 4.04 score
Medium	(Mean ± ½SD)	4.05-6.53 score
High	> (Mean + ½ SD)	Above 6.53 score

3.9.4 Farm Size

Farm size is operatinally defined as extent of land actually possessed by the farmers at the time of investigation was recorded and categorization of respondents is done in the following manner as followed by Khin (2005).

Category	Land holding (acres)
Marginal Farmers	Below 2.5 acres
Small Farmers	2.51 to 5 acres
Big Farmers	Above 5 acres

3.9.5 Farming Experience

This was operationalised as the number of completed years of experience in farming by the respondents. The completed years of experience of the respondent was considered for analysis purpose. The respondents with above 20 years of farming experience are said to have high farming experience, the respondents with less than 10 years of farming experience are said to have low farming experience and rest were categorized as medium experience.

3.9.6 Annual Income

Annual income of the respondents was operationalised as the total income of the family from all the sources during previous year and expressed in terms of rupees. Based on the total annual family income, the respondents whose annual income would be below Rs 36,000 were considered to have low annual income, the respondents whose annual income is between Rs 36,000 and 75,000 were considered to have medium income group and the respondents with annual income above Rs 75,000 were considered to have high annual income.

3.9.7 Economic Motivation

Economic motivation refers to the values or attitude for which the farmer attached greater importance to profit maximization. This was quantified by using the scale developed by Supe (1969). The scale consists of six statements, of which first five statements were positive and the last one was negative. The responses were recorded on five point continuum ranging from strongly agree, agree, undecided, disagree and strongly disagree with scores of 5, 4, 3, 2 and 1 for positive statements and 1, 2, 3, 4, and 5 for negative statements, respectively. Maximum and minimum scores obtained by the individual on the scale were 30 and 6, respectively. By considering the total score obtained by each respondent they were equally divided into three groups as low, medium and high economic motivation based on the mean and standard deviation.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below16.20 score
Medium	(Mean ± ½SD)	16.21-21.49 score
High	> (Mean + ½ SD)	Above 21.49 score

3.9.8 Mass Media Exposure

Mass media exposure operationalised as the frequency of usage of various mass media like TV, radio, news paper and other magazines by respondents in their day to day life. In order to assess the extent of use of mass media by the respondents, different mass media were listed and respondents were asked to how often they used these mass media. The scoring pattern adopted was on the variability of reading habit of respondents in respect of score considered in the study as well as listening habit in case of radio, listening and viewing habit in television as detailed in the below table. The total score obtained by each respondent formed the mass media score.

Sl. No.	Source	Extent of mass media participation		
		Regular	Occasionally	Never
1	Radio	2	1	0
2	Television	2	1	0
3	News paper	2	1	0
4	Magazines	2	1	0

Further, the respondents were asked for their ownership or subscription on the above sources and the scoring pattern is given as below.

Sl. No	Mass medias	Owner/subscriber	Non - owner/subscriber
1	Radio	1	0
2	Television	1	0
3	News paper	1	0
4	Magazines	1	0

Considering the total score obtained by an individual response, the respondents were grouped into three categories based on the mean and standard deviation.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 4.57 score
Medium	(Mean $\pm$ ½SD)	4.58-8.13 score
High	> (Mean + ½ SD)	Above 8.13 score

3.9.9 Risk Orientation

This variable was operationalized as the degree to which farmers were willing to undergo risk while climate resilience management. The risk orientation scale developed by Supe (1969) was used in this study with modification. All Seven statements were positive. The responses were obtained on a three point continuum viz., 'agree' 'undecided' and 'disagree' with a scoring pattern of 3, 2 and 1 respectively. The summated score indicated the innovativeness of the farmer. The maximum possible score was 21 and minimum was 7. The respondents were grouped into three categories as low, medium, and high based on the mean and standard deviation as a measure of check.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 9.22 score
Medium	(Mean $\pm$ ½SD)	9.23-12.01 score
High	> (Mean + ½ SD)	Above12.01 score

3.9.10 Scientific Orientation

Scientific orientation was operationalised as degree to which a respondent is oriented to the use of scientific methods in farm activities.

The scale developed by Supe and Singh (1969) was used with modifications in the statements to suit the present study. The scientific orientation scale consisted of five statements.The responses were collected on a five point continuum namely, ‘strongly agree’, ‘agree’,’ undecided’, ‘disagree’ and ‘strongly disagree’. The statements were given scores of 5, 4, 3, 2 and 1, respectively.

The summation of the score obtained by an agricultural farmers for all the six statements indicates their scientific orientation. The total score ranged from 5 to 25. The level of scientific orientation was categorized by keeping mean and standard deviation as measure of check which is indicated below.

Category	**Criteria**	**Range**
Low	<(Mean – ½ SD)	Below 8.63 score
Medium	(Mean ± ½SD)	8.64-11.45 score
High	> (Mean + ½ SD)	Above 11.45 score

3.9.11 Extension Contact

This variable was operationalised as the contact farmers in different extension educational activities organized by extension personnel. This variable was quantified by following the procedure as followed by Hiremath (2000).

In order to assess the extent of participation of the agricultural farmers in extension activities, different activities were listed and respondents were asked to indicate their participation as regularly, occasionally and never with 3, 2 and 1 scores, respectively. The maximum and minimum score obtainable were 33 and 11, respectively. By considering the total score obtained by each respondent they were grouped into three categories viz., low, medium and high extension contact based on the mean and standard deviation.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 12.37 score
Medium	(Mean ± ½ SD)	12.38-16.50 score
High	> (Mean + ½ SD)	Above16.50 score

3.9.12 Cosmopoliteness

Cosmopoliteness is defined as the degree to which an individual is oriented to his immediate social system outside. The Cosmopolite farmer is likely to be a unique individual that he is motivated to look beyond his environment when most others are content to maintain a legalistic frame of reference. The respondents were asked to indicate the number of visits made by them to taluk and district head quarters and also purpose of visit during the last one year. The variable was measured using the scale developed by Desai (1975). Two dimensions of the variable were considered in this case.

a. The frequency of visit to the nearest town

b. The purpose of visit to the town.

The items and scoring pattern followed in quantifying the frequency of visit are as follows.

Sl. No.	Category	Response
1.	Every day	9
2.	Once in two days	8
3.	More than twice in a week	7
4.	Once in a week	6
5.	Twice in a week	5
6.	Thrice in a week	4
7.	Once in a fortnight	3
8.	Once in a month	2
9.	Seldom	1
10.	Never	0

The items and scoring pattern followed in quantifying the purpose of visit are as follows.

Sl. No.	Category	Response
1.	Relating to gram Panchayath	5
2.	Relating to farming	4
3.	Personal/Domestic	3
4.	Entertainment	2
5.	Others	1
6.	No purpose	0

The cumulated maximum score obtainable was 17 and the minimum was 8. The mean and standard deviation of cosmopoliteness score of the respondents was considered for categorizing the respondents into low, medium and high.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Above7.58 score
Medium	(Mean ± ½ SD)	7.59-12.35 score
High	> (Mean + ½ SD)	Above 12.35 score

3.9.13 Distance to Market

Distance to market was operationally defined as the number of kilo meters from cultivation area to marketing area which has to be travel by the farmer to market their produce.

The maximum and minimum distance travelled by the farmers to market their produce was 60 and 3 Kms.

Category	Range
Very Nearer	Below 5.91Kms
Nearer	5.92-7.05 Kms
Far	Aobe7.05 Kms

3.9.14 Awarness about Diversification

Awareness about diversification was operationally defined as the variance in the types of crops and number of crops grown in a particular location.

To measure the diversity of crops over the period due to climate change**,** the respondents were asked to give the details of the crops which they were growing before 20 years and the crops which they are growing now in 3 seasons like kharif, rabi and summer. The crops which had lost over the years and the crops which were introduced in adaptation to the climate change were documented.

Season	**Diversity of Crops**	
	Before	Now
Kharif		
Rabi		
Summer		

If the crop diversity was increase the score of 2 was given, if the crop diversity has decreased the score of 1 was given, if there was no change then score 0 was given

Category	**Score**
Increased	2
Decreased	1
No change	0

Next, diversity of crops over the period due to climate change before and after was compared by using paired‘t’ test, to know the variation in the variable. The mean, standard deviation as well as the standard error were calculated to arrive the difference.

Category	**Criteria**	**Range**
Decrease	<(Mean – ½ SD)	Below 15.73 score
No change	(Mean $\pm$ ½ SD)	15.74-21.80 score
Increase	> (Mean + ½ SD)	Above21.80 score

3.9.15 Extent of Natural Capital

Extent of natural capital operationally defined as availability of farm resources like land and water which are available on the farm for agriculture purpose.

Extent of natural capital was measured by taking the information on land and water resources more specifically on land utilization, land productivity, water availability and water quality before 20 years and now.

Land Utilization for Agriculture

Information on land utilization was collected from respondents. If the land utilization was increased score 2 was given, if the land utilization was decreased score 1 was given and if the land utilization remained same score 0 was given.

Land Productivity over the Years

The relevant data on land productivity were collected from the respondents and scores were assigned 2 score for increase in land productivity 1 score for decreased land productivity and zero for no change situation.

Availability of Water for Irrigation

Similarly the availability of water for irrigation was also measured by assigning the score, for excess compared to before score 1 was assigned, if it was shortage score 1 was given, if it was optimum before and now score 0 was given. Thus, the score for each respondent were computed

Water Quality

As done earlier if the quality of the water increased compared to before score 2 was given, if the quality had decreased score 1 and if there is no change in the water quality before and now score 0 was given. Later the score for each respondent were calculated.

The scores so calculated were summation of scores of land utilization, land productivity, water availability and water quality constitute the diversity on farm resources of the individual.Based on the total scores, the respondents were categorized into three groups as decrease, no change and increasing using mean and standard deviation as a check.

Category	Criteria	Range
Decrease	<(Mean – ½ SD)	Below12.15 score
No Change	(Mean ± ½ SD)	12.16-17.64 score
Increase	> (Mean + ½ SD)	Above17.64 score

3.9.16 Innovative Proneness

Innovative proneness was defined as the socio-psychological orientation of an individual to get linked or closely associated with change, adopting innovative ideas and practices. The variable was quantified by using the scale of Feaster (1968) and as modified by Prasad (1983) was used in the study. Sixteen statements were included for the present study with three response categories as yes, and no. Score of two was assigned to yes response, a score of one to no response. The summation of the score obtained by the participants for all eight statements indicated the innovation proneness of each respondent. The total score ranged from 16 to 32. The respondents were classified into three categories taking mean and standard deviation as a measure of check.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 16.59 score
Medium	(Mean ± ½ SD)	16.60-26.20 score
High	> (Mean + ½ SD)	Above 26.20 score

3.9.17 Farm Financial Literacy

Farm financial literacy referred to the investment pattern of the respondents in different activities like consumption, ceremonies, investment, health, education and miscellaneous. Further, the respondents were asked to indicate their percentage of investment in different activities mentioned above. The responses were expressed in frequency and percentages. Based on the total scores, the respondents were categorized into three groups as low, medium and high using mean and standard deviation as a check.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 4.86 score
Medium	(Mean ± ½ SD)	4.87 to 7.54 score
High	> (Mean + ½ SD)	Above 7.54 score

3.9.18 Irrigation Potential

Irrigation potential is defined as net agriculture area through the year. All possible sources of irrigation like well,bore well,tank,pond etc, were considered for calculation purpose and is calculated by using following formula

$$\text{Irrigation Potential} = \frac{\text{Irrigated area(acres)}}{\text{Total area(acres)}} \times 100$$

Later, the respondents were classified as low, medium and high irrigation potential farmers based on mean and standard deviation as a measure of check

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 21.08 score
Medium	(Mean ± ½ SD)	21.09-37.62 score
High	> (Mean + ½ SD)	Above 37.62 score

3.9.19 Organizational Participation

Organizational participation is the degree of involvement of the respondents from mere membership to occupying position in organization and active participation in the activities of formal organization like Co-operative society, Mahila Mandal and Taluk Panchayath, Zilla Panchayath etc. this was quantified using the method followed by Trivedi (1963) with slight modifications in items is as under.

Sl. No.	Item	Score
1	Member in any organization	1
2	Not a member in any organization	0
3	Office bearer	1
4	Not a office bearer	0

5	Extent of participation in the organization	
	Never	0
	Occasional	1
	Regular	2

The range of score was from 0 to 28. The respondents were further classified into three categories taking mean and standard deviation as a measure of check.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 4.63 score
Medium	(Mean ± ½ SD)	4.64-10.36 score
High	> (Mean + ½ SD)	Above10.36 score

3.9.20 Farm Mechanization Level

Farm mechnizaional level was operationalised as the extent of possession of agricultural implements and machinery for the use of agricultural operations by the respondents. This was measured by assigning scores as suggested by Mansingh (1993). The details are as follow

Sl. No.	Item	Score
1.	Country Plough	1
2.	Iron Plough	2
3.	Working Animals	3
4.	Milch Animals	4
5.	Power Sprayer	5
6.	Oil Engine	6
7.	Bullock Cart	7
8.	Cattle Shed	8
9.	Pump Set	9
10.	Tractor	10
11.	Harrows	11
12.	Power Tillers	12
13.	Cultivators	13

The total score was computed for each respondent by adding the scores assigned to different response categories on the above items by using mean and standard deviation.

Category	Criteria	Range
Low	<(Mean – ½ SD)	Below 3.27 score
Medium	(Mean ± ½ SD)	3.28-5.76 score
High	> (Mean + ½ SD)	Above 5.76 score

3.10 Constraints Faced by the Farmers due to Climate Change

Constraints are operationalised as the problems faced by the farmers in dry land farming. To know the constraints faced by the farmers in dry land farming. 16 statements were taken and the responses of the respondents were taken on three point continuum like ‘more severe’, ‘severe’ and ‘less severe’, for more severe score 2 was given, for severe score 1 was given and for less severe score 0 was given. The score for each statement was summed up and based on the score rank was assigned and arranged in descending order.

3.11 Suggestions of Farmers to Mitigate the Ill Effects of Climate Change

Suggestions are operationalised as the ideas given by the farmers to overcome the ill effects of climate change. Suggestions were taken from the respondents to mitigate the ill effects of climate change. Their suggestions are taken on 6 statements based on the responses category like ‘more important’, ‘important’, ‘less important’ and ‘ignored’. For more important score 3 was assigned, for important score 2 was assigned, for less important score 1 was assigned and for ignored score 0 was assigned. Based on the total score of each statement, the statement with highest score was given highest rank and the statement with lowest score was given least rank.

3.12 Development of Interview Schedule

Taking into consideration of the scope and objectives of the study, an interview schedule was prepared by including the items relating to the independent and dependent variables with all the relevant scales, schedule items, indices, etc., for measuring the variables included in the study. Pre-testing of the schedule was made and suitable changes were incorporated in the formation of items, questions and their sequences. Adequate caution was exercised to make the schedules unambiguous, clear, complete, comprehensive and understandable. The final version of the interview schedule has been appended in the Annexure-I.

3.13 Collection of Data

The data were collected from the respondents who were included in the sample. The data were collected with the personal interview with the respondents. A preliminary visit along with local extension workers was undertaken to each village to get acquaintance with the local leaders and the farmers. During this visit, they were informed about the purpose of study. This helped in eliminating the suspicious attitude of the farmers.

The personal interview was conducted under in formal atmosphere. Each question was explained to the respondents and equal emphasis was given in explaining the questions to all the respondents. The onlooker's influence was avoided as far as possible throughout the data collection period.

3.14 Statistical Tools Used for Analysis of Data

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 in simple comparison of different categories. The other statistical tools like chi-square test (x^2), student t-test, correlation coefficient and principal component analysis were also used in analyzing the data. A brief description of these tools is given below.

3.14.1 Mean

Mean is the sum of the observed values of a set divided by the number of observations in the set is called a mean or an average. The calculated mean was used for grouping the respondents.

3.14.2 Standard Deviation

The positive square root of the variance is called standard deviation. It explains the average amount of variation on either side of the mean.

The mean and standard deviation were used to classify the farmers into three following categories.

Category	Criteria
Low	<(Mean - $^1/_2$ SD)
Medium	(Mean ± $^1/_2$ SD)
High	>(Mean + $^1/_2$ SD)

3.14.3 Relevancy Analysis for Development of Scale

$$\text{Relevancy Percentage} = \frac{(MR \times 4) + (R \times 3) + (SWR \times 2) + (NR \times 1)}{\text{Maximum Possible score}} \times 100$$

$$\text{Relevancy Weightage} = \frac{(MR \times 4) + (R \times 3) + (SWR \times 2) + (NR \times 1)}{\text{Maximum Possible score}}$$

$$\text{Mean Relevancy Score} = \frac{(MR \times 4) + (R \times 3) + (SWR \times 2) + (NR \times 1)}{\text{Number of Judges responded}}$$

3.14.4 Frequencies

A frequency distribution was used to quantify the different personal, social, psychological and economical characteristics of the farmers. It was also used in the response analysis of climate resilience management level.

3.14.5 Percentage

Percentage was used to make the simple comparison of different groups where ever needed.

3.14.6 Karl Pearson Correlation Coefficient/Half-test Reliability ($r_{1/2}$)

This was used to calculate the degree of relationship between odd numbered scored judges and even numbered scored judges.

$$r1/2 = \frac{NN(\sum XXYY(\sum XX)(\sum YY)}{\sqrt{[NN.\sum XX^2 - (\sum XY)^2][N.\sum YX^2 - (\sum YY)^2]}}$$

Where,

X = sum of the scores of odd numbered responses of respondents

Y = sum of the scores of even numbered responses of respondents

Σx = sum of the scores of all odd numbered responses of respondents

Σy = sum of the scores of all even numbered responses of respondents

Σx^2 = sum of squares obtained from odd numbered responses of respondents

Σy^2 = sum of squares obtained from even numbered responses of respondents

N = Total number of paired odd and even numbered responses of respondents

3.14.7 Spearman-Brown Formula (r_{11})

This tool was used to determint the reliability co-efficient of scores obtained from odd and even numbered responses obtained from the respondents of the pilot study

$$r_{11} = \frac{2.r_{1/2}}{1 + r_{1/2}}$$

Where,

r_{11}= whole-test reliability

$r_{1/2}$ = half-test reliability

3.14.8 Statistical Validity

$$V = \sqrt{r_{11}}$$

Where,

r11= whole-test reliability

3.14.9 Chi-square test (x^2)

The chi-square test was used to measure the association between dependent variables by categorizing into low, medium and high.

3.14.10 Student 't' Test

This test was used to know the comparison between characteristics of dependent variable under irrigated and comparison between the farming systems of eastern dry zone.

3.14.11 Correlation Coefficient

This was used to find out the relationship between the independent and dependent variables as well as between the farmers practicing different farming systems and also between the farmers of different agro-climatic zones.

3.14.12 Principal Component Analysis

The principal component analysis was used to know the interdependent factors contributing as a component. The level at which inclusion of each variable contributes for the cumulative extent of variation. It also includes the proportion in which each component highlights its significance.

IV RESULTS AND DISCUSSION

The chapter mainly meant to express the findings resulted from the present study. To have better comprehension of the results, these have been presented in section wise. Each section gives a detailed account of the findings reported under study. Presented an analytical view of the results by discussing its various dimensions and supported with the relevant references at the appropriate places. An effort has been made to present the findings objective-wise under different heads and sub-heads as mentioned below:

4.1 Profile Characteristics of Farmers in Different Situations in Eastern Dry Zone

4.2 Climate Resilience Management Level among the Farmers

4.3 Association between Profile Characteristics and Climate Resilience Management Level in Eastern Dry Zone

4.4 Relationship between Profile Characteristics and Climate Resilience Management Level among Farmers

4.5 Contribution of Management Practices in Association with Profile Characteristics for Variation in Climate Resilience Management Level

4.6 Pattern of Climate Resilience Management Level among the Farmers

4.7 Documentation in Adoptability of Climate Resilience Management Practices in Response to Climate Change in Eastern Dry Zone

4.8 Adoptability of Climate Resilience Management Practices Level among the Farmers

4.9 Association between Profile Characteristics and Adoptability of Climate Resilience Management Practices of Farmers

4.10 Relationship between Profile Characteristics and Adoptability of Climate Resilience Management Practices

4.11 Contribution of Profile Characteristics to their Adoptability of Climate Resilience Management Practices

4.12 Constrains Encountered by Farmers due to Climate Change in Eastern Dry Zone

4.13 Suggestions of Farmers to Face Climate Change in Eastern dry zone

Profile Characteristics of Farmers in Eastern Dry zone

The profile characteristics included are age, education, dependency ratio, farm size, farming experience, annual income, economic motivation, mass media exposure, risk orientation, scientific orientation, extension contact, cosmopoliteness, distance to market, awareness about diversification, extent of natural capital, innovative proneness, farm financial literacy, irrigation potential, organizational participation and farm mechanization level. The results pertaining to this presented in Table-8 and explained in separate headings.

4.1 Profile Characteristics of Farmers in Different Situations in Eastern Dry Zone

The profile characteristics of farmers in different situations *viz*., irrigated, rainfed and total situation were analyzed and presented here under.

4.1.1 Age

Age is an important factor as it directly adds to the experience of the farmer in farming, higher the age more will be the knowledge of the person about the climate change. Data presented in Table-8 in irrigated situation highlights that 50.00 per cent of the farmers were belonged to age group of above 55 years followed by 37.78 per cent of the farmers were belonged to between 45to 50 years age and 12.22 per cent of the farmers belonged to age group between 51 to 55 years. Whereas, in case of rainfed situation 36.67 per cent farmers belonged to 45 to 55 age group followed by (35.55%) above 55years age group and (27.78%) had between 45to 50 years age group.

In total, 37.78 per cent farmers were above 55 years age group followed by (32.22%) between 45to 50 years age group and (30.00%) between 51 to 55 years age group.

The purposive selection of respondents ranged from 45 years and above to have the clarity on the changes experienced by the old people. Presuming that the respondents having 45 years who have 15 to 20 years experience and thus, the trend of results were notices. The results are in line with the findings reported by Feder and Umali (1993), Lakshmi (2009), Sangeetha (2013) and Patel (2017).

Table 8: Profile Characteristics of Farmers in Eastern Dry Zone

Variable	Characteristic	Irrigated (n_1=90)		Rainfed (n_2=90)		Total (N=180)	
		Number	Per cent	Number	Per cent	Number	Per cent
1. Age	Age between 45 to 50 years	34	37.78	25	27.78	58	32.22
	Age between 51 to 55 years	11	12.22	33	36.67	54	30.00
	Age above 55 years	45	50.00	32	35.55	68	37.78
2. Education	Low (Below 0.91score)	38	42.22	50	55.56	57	31.66
	Medium (0.92-2.52 score)	11	12.22	11	12.22	59	32.78
	High (Above 2.52 score)	41	45.56	29	32.22	64	35.56
3. Dependency Ratio	Low (Below 4.04 score)	26	28.89	22	24.44	78	43.33
	Middle (4.05-6.53 score)	37	41.11	30	33.33	61	33.89
	High (Above6.53 score)	27	30.00	38	42.23	41	22.78
4. Farm Size	Marginal (Below 2.5 acres)	27	30.00	40	44.44	53	29.44
	Small (2.51 to 5 acres)	35	38.89	23	25.56	89	49.44
	Big (Above5 acres)	28	31.11	27	30.00	38	21.12
5. Farming Experience	Low (Below 10 years)	36	40.00	22	24.44	83	46.11
	Medium (11 to 20 years)	24	26.67	25	27.78	64	35.56
	High (Above 20 years)	30	33.33	43	47.78	33	18.33
6. Annual Income	Low (Up to Rs 36,000)	28	31.11	36	40.00	29	16.11
	Medium (Rs 36,001 to 75,000)	34	37.78	34	37.78	125	69.44
	High (More than Rs 75,000)	28	31.11	20	22.22	26	14.45
7. Economic Motivation	Low (Below16.20 score)	31	34.44	31	34.44	60	33.33
	Medium (16.21-21.49 score)	27	30.00	25	27.78	67	37.22
	High (Above 21.49 score)	32	35.56	34	37.78	53	29.45
8. Mass Media Exposure	Low (Below 4.57 score)	41	45.56	52	57.78	78	43.33
	Medium (4.58-8.13 score)	14	15.56	17	18.89	45	25.00
	High (Above 8.13 score)	35	38.88	21	23.33	57	31.67
9. Risk Orientation	Low (Below 9.22 score)	35	38.89	34	37.78	71	39.44
	Medium (9.23-12.01 score)	17	18.89	29	32.22	41	22.78
	High (Above12.01 score)	38	42.22	27	30.00	68	37.78
10. Scientific Orientation	Low (Below 8.63 score)	35	38.89	25	27.78	66	36.67
	Medium (8.64-11.45 score)	05	5.56	53	58.89	34	18.89
	High (Above11.45 score)	50	55.55	12	13.33	80	44.44

Variable	Characteristic	Irrigated (n_1=90)		Rainfed (n_2=90)		Total (N=180)	
		Number	Per cent	Number	Per cent	Number	Per cent
11. Extension Contact	Low (Below 12.37 score)	25	27.78	42	46.67	62	34.44
	Medium (12.38-16.50 score)	37	41.11	17	18.89	60	33.33
	High (Above 16.50 score)	28	31.11	31	34.44	58	32.23
12. Cosmopoliteness	Low (Below 7.58 score)	46	51.11	39	43.33	56	31.11
	Medium (7.59-12.35 score)	20	22.22	9	10.00	87	48.33
	High (Above 12.35 score)	24	26.67	42	46.67	37	20.56
13. Distance to Market	Nearer (Below 5.91Kms)	23	25.56	39	43.33	21	11.67
	Medium (5.92-7.05Kms)	43	47.78	09	10.00	121	67.22
	Far (Above7.05Kms)	24	26.66	42	46.67	38	21.11
14. Awareness about Diversification	Decrease (Below 15.73 score)	26	28.89	33	36.67	75	41.67
	No change (15.74-21.80 score)	27	30.00	34	37.78	43	23.89
	Increase (Above 21.80 score)	37	41.11	23	25.55	62	34.44
15. Extent of Natural Capital	Decrease (Below 12.15 score)	25	27.78	22	24.44	54	30.00
	No Change (12.16-17.64 score)	38	42.22	47	52.22	67	37.22
	Increase (Above17.64 score)	27	30.00	21	23.34	59	32.78
16. Innovative Proneness	Low (Below16.59 score)	26	28.89	24	26.67	46	25.56
	Medium (16.60-26.20 score)	06	6.67	38	42.22	87	48.33
	High (Above 26.20 score)	58	64.44	28	31.11	47	26.11
17. Farm Financial Literacy	Low (Below 4.86 score)	31	34.44	24	26.67	53	29.44
	Medium (4.87-7.54 score)	27	30.00	39	43.33	21	11.67
	High (Above 7.54 score)	32	35.56	27	30.00	106	58.89
18. Irrigation Potential	Low (Below 21.08 score)	37	41.11	62	68.89	90	50.00
	Medium (21.09-37.62 score)	10	11.11	10	11.11	42	23.33
	High (Above 37.62 score)	43	47.78	18	20.00	48	26.67
19. Organizational Participation	Low (Below 4.63 score)	30	33.33	39	43.33	63	35.00
	Medium (4.64-10.36 score)	29	32.22	29	32.22	72	40.00
	High (Above10.36 score)	31	34.45	22	24.45	45	25.00
20. Farm Mechanization Level	Low (Below 3.27 score)	33	36.67	32	35.56	72	40.00
	Medium (3.28-5.76 score)	8	8.89	32	35.56	41	22.78
	High (Above 5.76 score)	49	54.44	26	28.88	67	37.22

4.1.2 Education

From the study it is clear that in irrigated situation 45.56 per cent of farmers had high education group followed by low (42.22%) and (12.22%) medium education group, respectively. In rainfed situation 55.56 per cent of farmers had low education group followed by (32.22%) high and (12.22%) medium education group.

In total, 35.56 per cent farmers were found high education category followed by 32.78 per cent had medium and 31.66 per cent belongs to low education group.

Majority of respondents fell in high education group probable reason might be that education is one of the important factors determining status of farmers. Many educational programmes are undertaken by the government to create awareness about need of education in life and also availability of good transportation facility might have encouraged the farmers to peruse education. The findings of Ajah (2012) mirrored the results of the present study.

4.1.3 Dependency Ratio

The present study revealed that 41.11 per cent of respondents had medium dependency ratio reaming farmers had high i.e., 30.00 per cent and low (28.89 %). Subsequently, in case of rainfed situation 42.23 per cent had high dependency ratio followed by 33.33 per cent of middle and 24.44 per cent were low dependency ratio.

In total 43.33 per cent of the respondents had low dependency ratio whereas, it was found medium (33.89%) and high (22.78%) dependency ratio among respondents.

The present study revealed that majority of the respondents had low dependency ratio. Majority of farmers had dependency on earning members from other source of the villages. Under the existing situations the agriculture can't give continuous income and it's a seasonal base, more ever depend on allied activities. These conditions play a greater role in study area. This might be the likely reason for this type of findings. The findings of this study are in agreement with findings of study conducted by Saha and Bhaal (2010) and Devarajaiah (2010).

4.1.4 Farm Size

It could be seen from Table-8 that 38.89 per cent of the respondents belonged to small farmers' category followed by big 31.11 per cent and marginal farmers accounted for 30.00 per cent. Whereas, in rainfed situation 44.44 per cent were marginal farmers followed by 30.00 per cent of big farmers and 25.56 per cent were small farmers.

In overall, 49.44 per cent of farmers were small farmers followed by marginal (29.44%) and big farmers (21.12 %).

Majority of farmers were small followed by marginal with respect to their farm size in all situations like irrigated, rainfed and total. The reason for possession of marginal and small farm size could be due to fragmentation of land because of separation of families, more over small farms might feel easier to employ the latest technology rather than big farms. The findings are in line with the studies of Anonymous (2008), Aravind (2015) and Sounam (2017).

4.1.5 Farming Experience

Data with respect to farming experience in Table-8 revealed that 40.00 per cent of respondents had low farming experience followed by high 33.33per cent and 26.67 per cent of the farmers had medium farming experience in irrigated situation. Further, in rainfed situation 47.78 per cent of farmers had high farming experience followed by medium (27.78%) and low (24.44%) farming experience.

In total 46.11 per cent of respondents were low farming experience followed by 35.56 per cent of medium and 18.33 per cent had high farming experience.

Majority of respondents belong to low level of farming experience. It implies that low experience farmers have low knowledge on climate change and to take up low adaptation measures than others. In general 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. The study is line with the results of research conducted by Shankara (2010) and Brar (2016).

4.1.6 Annual Income

The data in Table-8 revealed the information on annual income of farmers it could be seen that 37.78 per cent of farmers in irrigated area were having medium level of annual income followed by an equal number i.e., 31.11per cent of farmers belonged to low and high level of income, respectively. Where, 40.00 per cent of farmers in rainfed area had low level of income, followed by 37.78 per cent having medium and 22.22 per cent having high level of annual income.

In total majority had medium level i.e., 69.44 per cent of income followed by low (16.11%) and high (14.45%) level of annual income getting by the farmers.

Majority of farmers belonged to medium income group. The probable reasons for their medium income would be as the respondents are mainly depend on agriculture, their realisation from agriculture reflect on the returns. Another reason would be that less number of earning members engaged in different occupations other than agriculture might have resulted contributed to medium level of income. The above findings are in line with the findings of Shankara (2010), Sangeetha (2013) and Shalini (2017).

4.1.7 Economic Motivation

Economic motivation of farmers in irrigated, rainfed and over all situations was studied and the findings presented in the Table-8 revealed that 35.56 per cent of farmers in irrigated situation had high level of economic motivation followed by low (34.44 %) and medium (30.00%) level. Whereas, in rainfed situation 37.78 per cent of farmers had higher level of economic motivation followed by low (34.44 %) and Medium (27.78%) level.

In total, 37.22 per cent of the farmers had medium level of economic motivation followed by low (33.33%) and high (29.45%) level.

Majority of farmers had medium economic motivation. The likely reason might be that economic motivation is the basic character upon which other motives, drives and other attribute build, it is psychological condition an individual to orient him to achieve higher income in addition to farmers attached greater importance to profit maximization. The finding of this study was supported by the results of study conducted by Chandran (1997), Sawanth (1999), Sandesh (2004) and Neelam (2016).

4.1.8 Mass Media Exposure

A glance at Table-8 revealed that 45.56 per cent of the farmers in irrigated area had low mass media exposure followed by high (38.88%) and 15.56 per cent had medium mass media exposure. In case of farmers in rainfed situation, it was observed more than half of the respondents (57.78 %) had low mass media exposure, while, 23.33 per cent of the respondents had high and medium (18.89 %) mass media exposure.

In total, 43.33 per cent had low mass media exposure, followed by high (31.67%) and medium (25.00%) level of mass media exposure.

Majority of farmers had low mass media exposure. Probable reason for such type of results is that mass media did not carry much information on climate change and resilience management aspects. The finding of this study is supported by the results of study conducted by Prameelamma (1990) and Devarajaiah (2010).

4.1.9 Risk Orientation

Data pertaining to the risk orientation of farmers are presented in Table-8. The results indicated that 42.22 per cent of farmers were having high level of risk orientation followed by 38.89 per cent having lower and medium risk orientation (18.89%) found in irrigated farmers. Further, 37.78 per cent of farmers in rainfed situation were having low level of risk orientation, followed by 32.22 per cent and 30.00 per cent are having medium and were having higher level of risk orientation, respectively.

In over all, majority of farmers i.e., 39.44 per cent were having low level of risk orientation followed by high (37.78%) and medium (22.78%) level of risk orientation.

Majority of the farmers belongs to low level of risk orientation. Probable reason that the farmers might have made up their mind to take risk and have put efforts to adopt new agricultural technology. But it is a contradictory to general results because in adverse conditions farmers agitate to take risk because variation in climatic factors likes low rainfall and uneven distribution of rainfall. The results were supported by the findings of Pandeti (2005) and Vipin and Rampal (2012).

4.1.10 Scientific Orientation

Adoption of modern scientific technologies would reduce the risk in farming. With respect to scientific orientation of the respondents, it could be observed that more than half of (55.55%) of the farmers in irrigated situation had high level of scientific orientation followed by 38.89 per cent of the respondents had low and only 5.56 per cent had medium scientific orientation. In case of rainfed area 58.89 per cent of farmers belonged to medium scientific orientation followed by (27.78%) low and high (13.33%) scientific orientation respectively.

In overall 44.44 per cent of farmers had high scientific orientation followed by low 36.67 per cent and 18.89 per cent had medium of scientific orientation.

A slightly more than half of the respondents had high scientific orientation. Feasible reason for the above type of findings might be due to the fact that who had high level of education increasing awareness on climate change impacts through various initiatives and contribute to the scientific orientation. The results of the present study are in conformity with the findings of Preethi (2012) and Patel (2017).

4.1.11 Extension Contact

It is observed the results from Table-8 that 41.11 per cent of farmers in irrigated area had medium level of extension contact followed by (31.11 %) and (27.78 %) of farmers having high and low level of extension contact respectively. From the study it is also confirmed that 46.67 per cent of farmers in rainfed area had low level of extension contact followed by (34.44 %) and (18.89%) had high and medium level of extension contact, respectively,

In total 34.44 per cent of farmers had low level of extension contact followed by medium (33.33%) and (32.23 %) had high level of extension contact.

The results indicated that majority of farmers had low extension contact. Probable reason that farmers may not find time to contact extension officials. Further, the financial constraints might also contribute low level of extension contact. The finding of this study is supported by the results of study conducted by Shamna (2009) and Sanjit (2013).

4.1.12 Cosmopoliteness

Data pertaining to the cosmopoliteness is presented in Table-8 indicated that 51.11 per cent of the farmers in irrigated area had low level of cosmopoliteness while, 26.67 per cent of them had high level and 22.22 per cent had medium cosmopoliteness. In case of rainfed situation 46.67 per cent had high level followed by low (43.33%) and only ten per cent had medium cosmopoliteness.

In over all situation higher number of farmers i.e., 48.33 per cent had medium level of cosmopoliteness whereas, 31.11 per cent had low level and 20.56 per cent had high level of cosmopoliteness.

Majority of farmers had medium cosmopoliteness because frequent contacts with individuals outside their social system. This would provide an opportunity for interpersonal communication with people outside their social system. Thus, they are more likely to get clue regarding improved technology. The cosmopolitans have extra local interest, whereas, the locals are more immediately concerned with direct interpersonal relations. On one end it is to read more about the great world outside, while the other to act on the little world inside. The findings of this study is supported by the results of study conducted by Devarajaiah (2010) and Mani (2016).

4.1.13 Distance to Market

Data on distance to market from farmers place it is enlightened that 47.78 per cent of irrigated farmers located medium distance of accessibility range from 5.92-7.05 kms followed by far distance (26.66%) range from more than 7.05 kms and nearer distance (25.56%) of accessibility of market distance around 5.91 kms. In rainfed situation 46.67 per cent of farmers located in far off distance followed by 43.33 per cent nearer and ten per cent located in medium distance.

In total 67.22 per cent of farmers located in medium distance followed by high distance (21.11%) and located nearer distance (11.67 %) to farmers.

Majority of farmers were located medium distance from the city. Since farm produce is supplied mostly to urban vegetable markets that they are trying to be close to city. The inputs required like fertilizers and pesticides are also available in major cities is the major reason**.** The results are in acceptance with the studies of Alagh (2014), Hlongwane *et al.* (2014), Kavad (2015) and Mahentesh (2015).

4.1.14 Awareness about Diversification

It is clear from Table-8 that 41.11 per cent of the irrigated respondents expressed that their crop diversity had increased compared to previous years, while, 30.00 per cent of the respondents opined that their crop diversity had not changed when compared previous years and 28.89 per cent of the respondents said that their crop diversity had decrease due to climate change compared to earlier. Coming to the rainfed situation 37.78 per cent of respondents opined that their crop diversity had not changed compared with earlier followed by 36.67 per cent said that their crop diversity had decrease due to climate change compared with before and 25.55 per cent of respondents expressed that their crop diversity had increased when compared to previous years.

In overall situation 41.67 per cent of respondents expressed that their crop diversity had decreased due to climate change compared to previous years followed by 34.44 per cent of respondents expressed that their crop diversity had increased when compared to previous years and 23.89 per cent of respondents opined that their crop diversity has not changed compared to before the year 2008.

Majority of farmers had openined that crop diversity had decreased due to climate change compared to previous years followed by some had increases and some had not changed. This type of results realizes that farmer aware of impact of climate change and they capable to manage through climate resilience activities. Similar findings were reported by Jasna (2015), Vinay and Umesh (2015), and Ravindra (2016).

4.1.15 Extent of Natural Capital

It is clear from Table-8 that 42.22 per cent of the irrigated respondents expressed that their extent of natural capital has not changed compared to previous years, 30.00 per cent of the respondents opined that their extent of natural capital had increase compared to before 2008 and 27.78 per cent of the respondents said that their extent of natural capital had decrease due to climate change compared to before 2008. Coming to the rainfed situation more than half of (52.27 %) respondents opined that their extent of natural capital has not changed when compared to before followed by 24.44 per cent said that their extent of natural capital had decreased when compared to before 2008 and 23.34 per cent respondents expressed that their extent of natural capital had decreased due to climate change compared to previous years.

In overall situation 37.22 per cent of respondents expressed that their extent of natural capital had not changed compared to previous years followed by 32.78 per cent respondents expressed that their extent of natural capital had increased due to climate change compared to previous years and 30.00 per cent of respondents opined that their extent of natural capital had decreased due to climate change compared to before the year 2008.

Majority of farmers openined that extent of natural capital not changed followed by decreasing. The probable reason may be that the farm resources are slowly deteriorating due to climate change over a period. Further, they may loose the resources at faster rate. The results are in acceptance with the study of Bagdi *et al.* (2002), Wani *et al.*, (2012) and Pradeep (2016).

4.1.16 Innovative Proneness

Table-8 revealed that 64.44 per cent of farmers had high level of innovative proneness followed by (28.89 %) had low and only 6.67 per cent had medium level of innovative proneness found in irrigated situation whereas, 42.22 per cent of farmers in rainfed situation had medium level of innovative proneness followed by higher (31.11 %) and low (26.67%) level of innovative proneness.

In total, majority of farmers 48.33 per cent had medium level of innovative proneness followed by 26.11 per cent having high and 25.56 per cent were having low innovative proneness.

Majority of farmers had medium level of innovativeness probable reason is that innovativeness plays a greater role in the individuals' personality. The person with higher innovative proneness can do things rapidly and more precisely than others. This also may be attributed to the fact that these respondents had high schooling and pre-university/diploma had high innovative proneness. Generally, higher the formal education level, more favorable will be the attitude towards innovations. In such conditions, respondents try to seek more information and try out new ideas and technologies within their budget and limits. Similar in case of rainfed farmers who are prone to innovations will try to gather information regarding the new technology from various aspects, they wanted to learn new ways of farming, improved cultivation practices and adopt those technologies at faster rate with maximum accuracy. Similar findings were reported by Raghupathi (1994), Reddy (1995) and Suresh (2004).

4.1.17 Farm Financial Literacy

Farm financial literacy deals with expenditure of the irrigated farmers on inputs before and after the year 2008. The data showed that 35.56 per cent of respondents openined that there was increase in the expenditure followed by 34.44 per cent openined decreasing expenditure and 30.00 per cent openined that had no change on expenditure, Whereas, in rainfed 43.33 per cent of farmers openined that had no change in expenditure followed by 30.00 openined that there is increasing expenditure and 26.67 per cent openined that there is decrease in expenditure.

In overall more than half 58.89 per cent of farmers openined that there is increasing in expenditure followed by 29.44 per cent had openined that there is decreasing expenditure and 11.67 per cent of respondents openined that there has no change on expenditure.

Majority of farmers openined that inputs cost was increased since decades, which adversely affecting the farmers to stay in the farming and in turn due to increased cost of production many farmers are not showing interest to cultivate crop in their field and felt to leave the land fallow. This implied that, due to increase in the expenditure on inputs it was difficult on the part of the farmers to take up adaptation measures against ill effects of climate change. The results are in line with the studies conducted by Shakuntala and Chaman (2000), Shankara (2010) and Sanjit (2013).

4.1.18 Irrigation Potential

Distribution of respondents according to their irrigation potential, it is seen from the Table- 8 that nearly 47.78 per cent of irrigated farmers belonged to high irrigation potential fallowed by low (41.11 %) and medium (11.11%) level. in case of rainfed situation 68.89 per cent had low irrigation potential followed by high (20.00%) and medium (11.11%) level of irrigation potential.

In total half of (50.00 %) farmers had low irrigation potential level followed by 26.67 per cent high and 23.33 per cent had medium irrigation potential.

Majority of farmers had low irrigation potential. Probable reason is availability of water for agriculture was deficit, the rainfall received was less more ever uneven distribution of rainfall and depth of bore well exceeds thousand feet in the area. So, irrigation potential is less in the area and avalibality of irrigation directly influences the climate resilience management. The results are in line with the studies of Kurukulasuriya and Mendelssohn (2006), Narayan (2011) and Muttanna (2013).

4.1.19 Organizational Participation

The results on organizational participation revealed that 34.45 per cent of farmers in irrigated situation had high level of organizational participation while, 33.33 per cent of respondents had low level and 32.22 per cent of them had medium level of organizational participation. In rainfed situation around 43.33 per cent of farmers had low level of organizational participation followed by 32.22 per cent in medium and 24.45 per cent had high level of organizational participation.

In total 40.00 per cent had medium level of organizational participation, whereas, 35.00 per cent had low and 25.00 per cent had high organizational participation level.

Majority of farmers had medium level organizational participation. Probable reason is that was natural that the respondents with high level of education had medium level of organizational participation and this result indicates interest of respondents in political issues which in turn helps the farmers to participate more in such matters. This study is in conformity with Srinivasa (1995), Pallavi (2011) and Shalini (2017).

4.1.20 Farm Mechanization Level

Table-8 revealed that more than half 54.44 per cent of the irrigated farmers possess high mechanization level followed by low (36.67%) and only 8.89 per cent had medium mechanization level whereas, in rainfed situation an equal number of farmers (35.56%) had low and medium mechanization level respectively, and 28.88 per cent farmers had high mechanization level.

In overall 40.00 per cent farmers had low mechanization level followed by 37.22 per cent had high mechanization level and 22.78 per cent had medium 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 posses all material required for agricultural operations. Further, the availability of implements with neighbour farmers also might have contributed for observed results. The results are in acceptance with the studies of Gangappa (1975), Sangeetha (2013) and Sanjit (2013).

4.2 Climate Resilient Management Level Among Farmers

An attempt is made in the study to construct a scale to measure climate resilience management level among farmers (Detailed procedure presented in Methodology chapter). The method of summated rating procedure was followed in the construction of climate resilience management scale. Based on review of literature and discussion with experts, 110 items were enlisted. The relevancy weightage was obtained from 60 judges in the concern area. All those items with the relevancy weightage of 0.75 and above were selected for the inclusion in the climate resilience management level scale. Sixty items retained in the scale to measure the climate resilience management level. The scale developed was found reliable (0.9223) and valid (0.9603). The final scale consists of 60 practices for determining the climate resilience management level of which includes both positive and negative statements. The response for all the statements were collected on a five point continuum, namely, fully in vogue, in vogue, undecided, partially in vogue, and not in vogue with assigned score of 5, 4, 3, 2 and 1, respectively for positive statements and vice versa for negative statements. Thus, the minimum and maximum score one could get is 60 and 300, respectively. Higher the score indicates the high management level of farmers towards Climate Resilience Management level and lesser the score indicates low management level. Developed scale used for measuring the climate resilience management level among farmers in different situations *viz.*, irrigated, rainfed and pooled in eastern dry zone the responses was analysed and the results are presented here under.

4.2.1 Farmers based on Climate Resilience Management Level in Different Agricultural Situations

The results on the level of climate resilience management in different situations *viz.*, irrigated, rainfed and pooled situations of eastern dry zone are presented in Table-9.

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. Likewise, in rainfed 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.

In total 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), Ofuokus (2011), Vinay and Umesh (2015).

4.2.2 Association with Climate Resilience Practices in Different Agricultural Situations

Chi-square test was applied to test the association among the category of farmers regarding climate resilience management level in different situations. The chi-square test value is found to be 53.55** turn out 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), Johnson and Masters (2004) and Andrew and Luiza (2011).

Table 9: Farmers Based on Climate Resilience Management Level in Different Agricultural Situations of Eastern Dry Zone and Its Association

Management Level	Agricultural situation					
	Irrigated (n_1=90)		Rainfed (n_2=90)		Total (N=180)	
	Number	Per cent	Number	Per cent	Number	Per cent
Low	33	36.67	45	50.00	78	43.33
Medium	24	26.67	22	24.45	46	25.56
High	33	36.66	23	25.55	56	31.11
	Mean=170.46 S.D=44.95		**Mean=169.82 S.D=45.5**		**Mean=170.16 S.D=45.24**	
Chi-square Value=53.55**						

**: Significant at 1 per cent level

4.2.3 ANOVA on Climate Resilience Management Level of Farmers in Different Agricultural Situations

The data were subjected to F- test its significance the results obtained were presented in Table-10. It showed that there was a significant difference (F- value 3.20*, P>0.05) in climate resilience management level among farmers in different situations *viz.*, irrigated and rainfed condition. The probable reasons for the above trend of results could be climate resilience management of farmers have immensely contributes to improve the agricultural situations The findings of the study is supported by Nitesh (2017) and Prabhu (2017).

Table 10: ANOVA on Climate Resilience Management Level of Farmers in Different Agricultural Situations

(n=180)

Situation	Sample Size	Management Level		'F' Value
		Mean	S.D	
Rainfed	**90**	169.82	45.05	**3.20***
Irrigated	**90**	170.46	44.95	
Total	**180**	170.16	45.24	

*: Significant at 5per cent level;s

4.3 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 different agricultural situations *viz.*, irrigated and rainfed situations and the outcomes obtained were as follows.

4.3.1 Association between Profile Characteristics and Climate Resilience Management Level in Different Situations

Results Table-11 it could be observed that in irrigated situation, independent variables like in order economic motivation (15.918), distance to market (15.47),farm financial literacy (12.507), risk orientation (12.49), mass media exposure (12.31) and dependency ratio(12.09), were found to have positive and significant association at one per cent level. Other variables like *viz.*, innovative proneness (11.497) and extent of natural capital (11.02) were found to have positive and significant association at five per cent level. Similarly, farm size (6.08) ,education(5.009), farming experience (4.505),age (4.148), farm mechanization level (3.923), cosmopoliteness (3.57), annual income (3.047), awareness about diversification(2.729), extension contact (2.413), irrigation potential (2.002), scientific orientation (1.596) and organizational participation (1.535) were having non-significant association with climate resilience management level.

In rainfed situation profile characteristics like dependency ratio (19.405), risk orientation (18.207), education (18.178), economic motivation (13.32), irrigation potential (13.03), innovative proneness (12.48) and extent of natural capital (12.064) were found to be significant association at one per cent level. Other variables like *viz.*,mass media exposure (10.917), annual income (9.504) farm financial literacy(9.220), extension contact (8.228) and cosmopoliteness (8.261) were found to have positive and significant association at five per cent level similarly scientific orientation (6.983) , farming experience (5.096), awareness about diversification (4.88), farm size(3.857), organizational participation (3.14), farm mechanization level (2.63) age (2.47) and distance to market (1.669) were having non-significant association with climate resilience management level.

In total, 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), cosmopoliteness (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.

Table 11: Association Between Profile Characteristics and Climate Resilience Management Level in Eastern Dry Zone

Sl. No.	Characteristic	Chi-square value		
		Irrigated (n_1=90)	Rainfed (n_2=90)	Pooled (N=180)
1	Age	4.148NS	2.474NS	5.316NS
2	Education	5.099NS	18.178**	16.698**
3	Dependency ratio	12.09**	19.405**	9.033*
4	Farm size	6.087NS	3.857NS	11.461*
5	Farming experience	4.505NS	5.096NS	4.157NS
6	Annual income	3.047NS	9.504*	3.801NS
7	Economic motivation	15.918**	13.32**	29.916**
8	Mass media exposure	12.31**	10.917*	23.38**
9	Risk orientation	12.49**	18.207**	15.38**
10	Scientific orientation	1.596NS	6.983NS	7.695NS
11	Extension contact	2.413NS	8.288*	5.205NS
12	Cosmopoliteness	3.573NS	8.261*	4.358NS
13	Distance to market	15.47**	1.699NS	19.338**
14	Awareness about diversification	2.729NS	4.88NS	2.215NS
15	Extent of natural capital	11.02*	12.064**	13.539**
16	Innovative proneness	11.497*	12.48**	18.022**
17	Farm financial literacy	12.507**	9.220*	9.789*
18	Irrigation potential	2.002NS	13.03**	17.974**
19	Organizational participation	1.535NS	3.14NS	4.881NS
20	Farm mechanization level	3.923NS	2.638NS	3.362NS

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

The possible reasons for the profile characteristics having association with climate resilience management level are given in following paragraphs.

4.3.1 Age and Climate Resilience Management

It was found that age had non significant association with climate resilience management taken up by farmers to mitigate the ill effects of climate change. primarily the purposive selection of respondents were made those are having age above 45 years. This might be the reason and old age farmers had strong attitude base of previous experience and change of such attitude is slow process. More ever old age having less retention and retrievable capacity of the acquired information. Therefore, the old age farmers might have not responded quickly to the new concept of climate resilience management practices. The findings of the study are supported by Kebede *et al.,* (1990), Shiferaw and Holden (1998).

4.3.2 Education and Climate Resilience Management

Education was found to have significant association at one per cent level with climate resilience management of farmers in rainfed and overall situation. Primarily the purposive selection of respondents were made those are having age above 40 years probable reason that education of individual determines their knowledge and mental status of individual helps in better climate resilience management. The findings of the study are supported by Norris and Batie (1987), Pomp and Burger (1995) and Anonymous, (2006).

4.3.3 Dependency Ratio and Climate Resilience Management

Dependency ratio in all the three agricultural situations namely irrigated, rainfed and in overall situation had significant association with climate resilience management of farmers. The reason might be that as dependency ratio increased by adopting climate resilience management practices. Decreases the dependency of non earning members. The earning members from allied activities do adopt climate resilience activities which helps in getting income on sustainable manner. The results are in acceptance with the study of David (2007), Nhemachena and Hassan (2007) and Mamathalakshmi (2009).

4.3.4 Farm Size and Climate Resilience Management

Farm size of farmers had significant association with climate resilience management in overall situation. Whereas in irrigated and rainfed situation found non-significant. The possible reason might be that majority of farmers are small and marginal and it might be easier to employ climate resilience management in small farms rather than big farms. Such, findings were in accordance with the findings of Schuck *et al.*,(2002) and Johnson and Masters (2004).

4.3.5 Farming Experience and Climate Resilience Management

In all the three agricultural situations namely irrigated, rainfed and also in overall situation farming experience had non significant association with climate resilience management of farmers. Farming experience as a factor get sufficient period of time to show its influence. Might be probable reason for above findings. The results are in acceptance with the study of Maddison (2006), David (2007) and Nhemachena and Hassan (2007).

4.3.6 Annual Income and Climate Resilience Management

Annual income had non-significant association in irrigated and overall situations with climate resilience management of farmers. The likely reason might be climate resilience management is a long term process suddenly it may not reflect on the income level. At adoption stage the income level reduces. The results are in acceptance with the studies of Schuck *et al.*, (2002), Shankara (2010) and Shalini (2017).

4.3.7 Economic Motivation and Climate Resilience Management

The economic motivation had a positive and highly significant at one per cent association with climate resilience management of farmers in all situations like irrigated, rainfed and overall situations. The likely causes might be that as economic motivation increases respondents attached greater importance to profit maximization thereby, resulted climate resilience management. The results are in acceptance with the study of Sawanth (1999) Johnson and Masters (2004) and Sudha (2016).

4.3.8 Mass Media Exposure and Climate Resilience Management

The results reported that there is mass media exposure highly significant and positive association with climate resilience management of farmers in irrigated and pooled situations. The extent of exposure to mass media like radio, television, newspaper, farm magazines etc, have helped the farmers to acquire knowledge about improved agriculture practices. The findings of the study are supported by Preethi (2012) and Nitesh (2017).

4.3.9 Risk Orientation and Climate Resilience Management

In all the three agricultural situations namely irrigated, rainfed and overall situation risk orientation had highly significant association with climate resilience management of farmers. Agriculture is an occupation having risks of water scarcity, drought, pests, diseases, market failure etc. In this context, farmers having risk orientation (how to manage and overcome from these risks) will be having the ability to take up different measures to overcome from the risk and to have better climate resilience management. These findings are in line with the results of Mamtha lakshmi (2009) and Vipin and Rampal (2012)

4.3.10 Scientific Orientation and Climate Resilience Management

In all the three agricultural situations namely irrigated, rainfed and also in overall situation scientific orientation had non-significant association with climate resilience management of farmers. The feasible reasons might be that climate resilience management is a new concept it's a difficult to the farmers to understand. Those have scientific orientation might be having higher climate resilient management the results have found less scientific orientation on climate resilience management. Hence, the non significant. The findings of the study are supported by Asfaw and Admassie (2004) and David (2007).

4.3.11 Extension Contact and Climate Resilience Management

Extension contact had non-significant association with climate resilience management of farmers. Probable reason that lack of Government initiatives to mitigating climate change is a major factor. Another reason is farmers may not find time to contact extension officials and financial constraints might also contribute low level extension contact. The findings of the study are supported by Preethi (2012) and Sanjit (2013).

4.3.12 Cosmopoliteness and Climate Resilience Management

The results indicated cosmopoliteness had non-significant association with climate resilience management in irrigated and overall situations. Cosmopoliteness will expose the individuals to the external world, but climate resilience management requires individual effort rather than group. The results of the present study are in conformity with the findings of Mamathalakshmi (2009) and Devarajaiah (2010).

4.3.13 Distance to Market and Climate Resilience Management

Distance to market in two agricultural situations namely irrigated and overall situation farmers highly significant association. Probable reason is market distance mainly influence the management of climate resilience practices like near distance farmers grow more perishable product whereas, far distance farmers grow storable produces like commercial crops and influence resilience management indirectly. The findings of the study are supported the results of David (2007) and Mamathalakshmi (2013).

4.3.14 Awareness about Diversification and Climate Resilience Management

In all the three agricultural situations namely irrigated, rainfed and overall situation farmers had non-significant association with climate resilience management. The results on the awareness about diversity respondents expressed that their crop diversity had decreased due to climate change over the period. The reason may be due to the variations in the climatic parameters like rainfall and temperature. The results are in compliance with the Kale *et al.,* (2012) and Lalitha (2016).

4.3.15 Extent of Natural Capital and Climate Resilience Management

Extent of natural capital in all the three agricultural situations namely irrigated, rainfed and pooled, farmers had significant association with climate resilience management. Probable reason is extent of natural capital mainly depend on availability of resource like land, water, distribution of rainfall and temperature play important role that directly influences the climate resilience management. The results are in acceptance with the study of Mandavi (2013) and Lalitha (2016).

4.3.16 Innovative proneness and Climate Resilience Management

Innovative proneness had significant association with climate resilience management of farmers in different situations like irrigated, rainfed and overall situations. The feasible reason might be that innovative proneness of an individual closely associated with change, adopting innovative ideas and practices higher the innovative proneness had higher climate resilience management. The findings of the study are supported by Pomp and Burger (1995) Kebede *et al.*, (1990) and Kowsalya (2017).

4.3.17 Farm Financial Literacy and Climate Resilience Management

Farm financial literacy had significant association with climate resilience management of farmers in different situations like irrigated, rainfed and total. Proper farm financial management helps initiating climate resilience management practices that directly influence the management level. The findings of the study are supported David (2007) and Shankara (2010).

4.3.18 Irrigation Potential and Climate Resilience Management

Irrigation potential had highly significant association in rainfed and overall situations with climate resilience management. Irrigation plays an important role in improving production and productivity of agriculture. It facilitates adoption of improved technologies and increases cropping intensity. Thus, the results indicated that highly significant. The results are in line with the studies of Narayana (2011) and Muttanna (2013).

4.3.19 Organizational Participation and Climate Resilience Management

Organizational participation in all the three agricultural situations namely rainfed, irrigated and overall situation farmers had non-significant association with climate resilience management. Probable reason was natural that the respondents with low level organizational participation leads to low knowledge and low resilience management due lack of awareness on improved practices. The study results are in conformity with Srinivasa (1995), and Nhemachena and Hassan (2007).

4.3.20 Farm Mechanization Level and Climate Resilience Management

Farm mechanization level in all the three agricultural situations namely irrigated, rainfed and overall farmers had non-significant association with climate resilience management. Farmer may spend more amount on materials by hiring and it may increase the cost of production. Thats is why majority of farmers may not show much interest for mechanization and borrowing implements may not play an important role in study area. The findings of the study are supported by Tenge *et al.*, (2004), Yirga (2007) and Shankara (2010).

4.4 Relationship between Profile Characteristics and Climate Resilience Management Level Among Farmers

The correlation test was employed to arrive the type of relationship between profile characteristics of farmers and dependent variables (climate resilience management level) in different agricultural situations *viz*., irrigated, rainfed and total. The results were presented in Table -12 and explained here under.

4.4.1 Relationship between Profile Characteristics and Climate Resilience Management Level in Different Situations

In irrigated situation, profile characteristics such as awareness about diversification (0.510), economic motivation (0.480), farming experience (0.454), organizational participation (r=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 significant relationship with climate resilience management at five per cent level. Other variables such as annual income, distance to market, dependency ratio and irrigation potential, farm mechanization level, age, farm size and risk orientation had non-significant relationship with climate resilience management level.

Table 12: Relationship between Profile Characteristics and Climate Resilience Management Level of Farmers in Eastern Dry Zone

Sl. No.	Characteristic	Correlation Coefficient (r)		
		Irrigated (n_1=90)	Rainfed (n_2=90)	Pooled (N=180)
1	Age	0.054NS	0.091NS	0.019NS
2	Education	-0.222*	-0.157NS	0.204**
3	Dependency Ratio	0.071NS	0.125NS	0.094NS
4	Farm Size	0.033NS	-0.215*	-0.110NS
5	Farming Experience	0.454**	0.364**	0.350**
6	Annual income	0.109NS	0.031NS	0.046NS
7	Economic Motivation	0.480**	0.220**	0.284**
8	Mass media Exposure	0.345**	0.139NS	0.206**
9	Risk Orientation	-0.020NS	-0.075NS	-0.158*
10	Scientific Orientation	0.372**	0.075NS	0.198**
11	Extension Contact	0.369**	0.217**	0.266**
12	Cosmopoliteness	-0.128NS	0.136NS	-0.025NS
13	Distance to Market	0.078NS	0.139NS	0.133NS
14	Awareness about Diversification	0.510**	0.375**	0.419**
15	Extent of Natural Capital	-0.262*	-0.310**	-0.278**
16	Innovative Proneness	-0.109NS	-0.079NS	-0.106NS
17	Farm financial Literacy	-0.173*	-0.035NS	-0.148*
18	Irrigation Potential	0.071NS	0.016NS	-0.075NS
19	Organizational Participation	0.421**	0.218**	0.309**
20	Farm Mechanization Level	-0.071NS	-0.288**	-0.198**

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

In rainfed situation the relationship results indicated that 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 significant relationship with climate resilience management at one per cent level. Only farm size (-0.215) had significant relationship with climate resilience management at five per cent level. Other variables like education, mass media exposure, distance to market, cosmopoliteness dependency ratio, age innovative proneness, scientific orientation risk orientation, farm financial literacy, annual income and irrigation potential had non-significant relationship with climate resilience management level.

In total, 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, cosmopoliteness and age had non-significant relationship with climate resilience management level.

The possible reasons for having different types of profile characteristics relationship with climate resilience management level are given in following paragraphs.

4.4.1 Age and Climate Resilience Management

It was found that age had non-significant relationship with adaptation measures taken up. Old are not enough to take action to mitigate the ill effects of climate change. The result implies that with an increase in age who are the age, farmers would take less adaptation measures related to climate resilience management practices, who are middle aged, are enthusiastic to know and try different technologies as adaptation measures. This means that, variation in the age level of respondents had directly influenced the adaptation.

The possible reasons could be that even though, age being a physical characteristic but might have influenced to take up adaptation measures in farming activities. This study is in conformity with Yashodhara (2015) and Kowsalya (2017).

4.4.2 Education and Climate Resilience Management

Education was found to have positive and significant relationship at one per cent level with climate resilience management in irrigated and overall situations. It could be due to the fact that as education opens wider doors on knowledge and awareness on practices for better management of climate resilience practices. The findings of the study are supported by Igoden *et al.*, (1990) and Schuck *et al.,* (2002).

4.4.3 Dependency Ratio and Climate Resilience Management

In all the three agricultural situations namely rainfed, irrigated and also in overall situation dependency ratio had negative relationship with climate resilience management of farmers. The likely reason might be that majority of farmers mainly depend on earning members from other activates/employ members because agriculture can’t give continues income, it’s a seasonal based that’s why the results showed negative relationship. The results are in line with the studies of Maddison (2006), Grecequet *et al*., (2017).

4.4.4 Farm Size and Climate Resilience Management

Farm size had non-significant relationship with climate resilience management in rainfed situation. The possible reason might be that farm size is the major asset more ever marginal and small farmers might be easier to employ the latest technologies/ climate resilience management practices rather than big farmers. The results are in acceptance with the study of Swathilakshmi *et al.,* (2014) and Lalitha (2016).

4.4.5 Farming Experience and Climate Resilience Management

In all the three agricultural situations namely irrigated, rainfed and overall situation dependency ratio had highly significant relationship at one per cent with climate resilience management of farmers. There will be increased knowledge, skill as the experience in farming increases. Hence, there is significant relationship between farming experience and climate resilience management. The results are in line with the studies of Palanisami and Shankara (2010).

4.4.6 Annual Income and Climate Resilience Management

In all the three agricultural situations namely irrigated, rainfed and also in overall situation annual income had non significant relationship with climate resilience management of farmers. The likely reason might be majority of farmers fell under low and medium group with marginal and small farm size, they can't offer new technologies to adopt in farm due to low financial aspects. The results are in line with the studies of Swathilakshmi *et.al.*, (2014) and Shalini (2017).

4.4.7 Economic Motivation and Climate Resilience Management

The economic motivation had a positive and highly significant at one per cent level with climate resilience management level of farmers in all situations like irrigated, rainfed and overall situation. The likely causes might be that as economic motivation increases respondents attached greater importance to profit maximization. So, economic motivation resulted highly significant relationship with climate resilience management of farmers. The results are in acceptance with the study Meena and Fulzele (2008) and Raksha *et al.*, (2012).

4.4.8 Mass Media Exposure and Climate Resilience Management

The results reported that there is significant and positive relationship between mass media exposure with climate resilience management of farmers in irrigated and overall situation. The extent of exposure to mass media like radio, television, newspaper, farm magazines etc, has helped the farmers to acquire knowledge about improved agriculture practices. The findings of the study are supported by Prameelamma (1990) and Shilpa (2014).

4.4.9 Risk Orientation and Climate Resilience Management

The results inferred that there is native significant relationship between risk orientation with climate resilience management in pooled situation. Agriculture is an occupation having risks of water scarcity, drought, pests, diseases, market failure etc. In this context, farmers having risk orientation (how to manage and overcome from these risks will be having the ability to take up different measures to overcome from the risk, but non availability of practices relevant to mitigate climate change of farmers could not do so. Hence, the negative relationship resulted. These findings are in the line with the results of Mamathalakshmi (2009) and Devarajaiah (2010).

4.4.10 Scientific Orientation and Climate Resilience Management

In agricultural situations namely irrigated and overall situation scientific orientation had positive and significant relationship with climate resilience management of farmers. The feasible reasons might be that a scientific orientation leads to know new ways of opportunities, helps to learn new ways of farm practices also enhances their skills to do varied works. The results are in acceptance with the Pandya and Vekeria (1994) and Basavaprabhu (1996).

4.4.11 Extension Contact and Climate Resilience Management

In all the three agricultural situations namely irrigated, rainfed and overall situation farmers had positive and significant relationship with climate resilience management of farmers. Probable reason for this 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. The results are in acceptance with the Shankara (2010) and Sharada (2016).

4.4.12 Cosmopoliteness and Climate Resilience Management

The results indicated that there is non-significant relationship between cosmopoliteness and climate resilience management in different situation like irrigated, irrigated and overall situation. Cosmopoliteness will expose the individuals to the external world, but climate resilience management requires individual effort rather than group exposure. The none expose with climate resilience management practices they may not get knowledge on the aspects. The results of the present study are in conformity with the findings of Devarajaiah (2010) and Mamathalakshmi (2013).

4.4.13 Distance to Market and Climate Resilience Management

Distance to market in all the three agricultural situations namely irrigated, rainfed and overall situation farmers had non-significant relationship with climate resilience management of farmers. Probable reason is distance of market can't influence climate resilience management because management aspects implemented in farm level more over rural infrastructure are very poor when compare to urban. The results are in acceptance with the study Srinivasan (1997) and Mahentesh (2016).

4.4.14 Awareness about Diversification and Climate Resilience Management

In all the three agricultural situations namely irrigated, rainfed and overall farmers had highly significant relationship with climate resilience management. The results on the awareness about diversity respondents expressed that their crop diversity had decreased due to climate change over the period, as per above results farmers are well aware regarding climate change and their impacts and it helps in climate resilience management. The results are in compliance with the Vinay and Umesh (2015).

4.4.15 Extent of Natural Capital and Climate Resilience Management

Extent of natural capital in all the three agricultural situations namely rainfed, irrigated and overall situation farmers had highly significant relationship with climate resilience management.

Probable reason is that extent of natural capital mainly depend on availability of resource like land, water and rain etc, by proper management helps in climate resilience management. The results are in acceptance with the study Katar (1991) and Mandavi (2013).

4.4.16 Innovative Proneness and Climate Resilience Management

Innovative proneness had non-significant relationship with climate resilience management of farmers in overall situation. The feasible reason might be that climate resilience itself new concept it's difficult to adopt by farmers unless and until create awareness on climate change impact and their management. The results are in acceptance with the study of Vinay (2015) and Shalini (2017).

4.4.17 Farm Financial Literacy and Climate Resilience Management

Farm financial literacy had negative significant relationship with climate resilience management in irrigated situation. All agricultural inputs cost was increased since decades, which adversely affecting the farmers to stay in the farming and in turn due to increased cost of production many farmers are not showing interest to cultivate crop in their field and felt to leave the land fallow. This implied that due to increase in the expenditure on inputs it was difficult on the part of the farmers to take up adaptation measures against ill effects of climate change. The results of the present study are in conformity with the finding of Hopkins *et al.,* (1994).

4.4.18 Irrigation Potential and Climate Resilience Management

Irrigation In all the three agricultural situations namely irrigated, rainfed and overall situation farmers had non-significant relationship with climate resilience management. Since the study area was dry land the availability of water for agriculture was deficit, the rainfall amount was less and there was uneven distribution of rainfall in this area. The depth of bore well exceeds thousand feet in the area. So, irrigation potential is less in the area. The results are in line with the studies of Kurukulasuriya and Mendelssohn (2006) and Lalitha (2016).

4.4.19 Organizational Participation and Climate Resilience Management

Organizational participation in all the three agricultural situations namely irrigated, rainfed and pooled situation farmers had highly significant relationship with climate resilience management. probable reason was natural that the respondents with medium level of education had medium level of organizational participation and this result indicates interest of respondents in political issues which helps the farmers to participate more in such matters. This study is in conformity with Srinivasa (1995) and Nhemachena and Hassan (2007).

4.4.20 Farm Mechanization Level and Climate Resilience Management

Farm mechanization had negatively highly significant in rainfed and overall situation with climate resilience management. Probable reason is farm mechanization level plays an important role on the part of farmers to take up adaptation measures against climate change, but may spend more amount on machinery by hiring and it may increase the cost of production. Those who could afford to use mechanization resulted in higher level climate resilience management level. The results are in line with the studies of Shankara (2010) and Andrew and Luiza (2011).

4.5 Pattern of Climate Resilience Management Level among Farmers

Enlisted possible dimensions which were relevant to measure the climate resilience management level of the respondents through literature reviews, experts' opinion and informal discussion with the subject experts, twenty two dimensions were selected which are given to 40 judges who had subject knowledge related to the study and to rank the relevancy of the components on five point continuum like, "most relevant", "relevant", "somewhat relevant", "least relevant" and "not relevant" for measuring the climate resilience management level of the respondents. For 'most relevant' score 4, for 'relevant' score 3, for 'somewhat relevant 'score 2, for 'least relevant' score 1 and for 'not relevant 'response score 0 was given. Later, relevancy percentage for each dimension was calculated by using the relevancy formula. Based on discussion with the experts and based on the relevancy percentage which was above 90, four dimensions were selected for measuring climate resilience management level of the respondents. four such selected dimensions are *viz.,* environmental management, ecological security management, natural resource degradation management and agricultural resources/ non agricultural resources management were major dimensions. Table 19 deals the dimension wise and item wise analysis of pattern of climate resilience management among farmers in irrigated, rainfed and pooled situation were separately analyzed and presented as follows.

4.5.1 Dimension wise Climate Resilience Management Level among Farmers

The dimension wise analysis of pattern of climate resilience management level among farmers in irrigated , rainfed and pooled situation were presented in Table 13. In irrigated situation natural resource degradation management (35.15, ranks I) play an important role followed by ecological security management (31.25%, ranks II), environment protection (30.82%, ranks III) and agricultural resource/ non agricultural resource management (29.41% ranks IV) were the major dimensions of climate resilience management level among farmers.

Likewise in rainfed situation natural resource degradation management (35.29, ranks I) stood first followed by ecological security management (35.01%, ranks II), agricultural resource/ non agricultural resource management (33.58% ranks III) and environment protection (33.08%, ranks IV) were major dimensions playing an important role in climate resilience management level among farmers.

Table 13: Dimensions Wise Climate Resilience Management Level among Farmers in Eastern Dry Zone

Sl. No.	Dimension	Irrigated (n_1=90)			Rainfed (n_2=90)			Total (N=180)		
		Score	Per cent	Rank	score	Per cent	Rank	Score	Per cent	Rank
1	Natural Resource Degradation Management	256	35.15	**I**	255	35.29	**I**	511	35.22	**I**
2	Agricultural Resource / Non Agricultural Resource Management	306	29.41	**IV**	268	33.58	**III**	574	31.35	**IV**
3	Environmental Protection	292	30.82	**III**	272	33.08	**IV**	564	31.91	**III**
4	Ecological Security Management	287	31.35	**II**	257	35.01	**II**	544	33.08	**II**

In total natural resource degradation management was lead (35.22, ranks I), followed by ecological security management (33.08%, ranks II) environment protection (31.91%, ranks III) and agricultural resource/ non- agricultural resource management (31.35% ranks IV) were main dimensions in climate resilience management level among farmers.

Probable reason for above findings are natural resource degradation management is prime factor which determine resource availability and management influence on climate resilience management afterwards ecological security management with life of all creature on earth and their support for living beings later agriculture/ non-agriculture resource management mainly deal with agriculture crops and their management in field level related to crop production and their management to mitigate ill effect of climate change. The results are in acceptance with the results reported by Kowsalaya (2017).

4.5.2 Contribution of Management Factors in Association with Profile Characteristics for Variation in Climate Resilience Management Level

The factors which contribute to the variation in climate resilience management among the farmers have been analysed by using "Principal Component Analysis" separately for irrigated, rainfed and overall situations. This was done in order to identify the various groups of factors, which operate together and have a bearing on the climate resilience management level of the farmers. The description of results are presented.

4.5.2.1 Contribution of Management factors for Interdependent Variation in Climate Resilience Management with Profile Characteristics in Irrigated Situation

In irrigated situation the Table-14 gave an idea that the eigen values, percentage, variation and cumulative variation of the management practices. The climate resilience management factors of farmers in irrigated situation are the focused here. The first management factor contribute approximate by 31.45 per cent of total variation of 60 management factor the secured level factors i.e. 8th management factor account for cause more than 75 per cent of the variation.

It is possible to obtained the zero order correlation co-efficient between climate resilience management factor and variables from the co-efficient of eigen vectors. This correlation is the square of the co-efficients associated with the factor vector. It can be observed from the Table -15 that only 1, 8,7,2, and 6 factors contributed the maximum variation in climate resilience management in irrigated situation

While examining the factor wise contribution to profile characteristics in irrigated situation, Table-16 it was noticed that, 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 first management factor. 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 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, which 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, 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, which is positively associated with farm size and farming experience.

Major findings above results are the first management practice contribute approximately 31.45 per cent of total variation out of 60 management factor ,8 management factors account for cause more than 75 per cent of the variation. While examining the variation by variables, it was observed that, climate resilience management factors directly contributed to variables such as age, farming experience, economic motivation, mass media exposure, scientific orientation, extension contact, awareness about diversification and organizational participation. The findings of this study are in agreement with findings of study conducted by Somshekar (2010) Mahentesh (2015) and Kowsalaya (2017).

Table 14: Contribution of Management Factors for Interdependent Variation in Climate Resilience Management in Eastern Dry Zone

Factor	Irrigated(n_1=90)			Rainfed(n_2=90)			Total (N=180)		
	Eigen Values	% of Variance	Cumulative %	Eigen Values	% of Variance	Cumulative %	Eigen Values	% of Variance	Cumulative %
1	6.606	31.457	31.457	5.202	24.773	24.773	5.627	26.795	26.795
2	1.974	9.399	40.856	2.299	10.950	35.723	3.693	17.584	44.379
3	1.601	7.623	48.479	1.688	8.038	43.761	1.371	6.528	50.906
4	1.377	6.558	55.037	1.595	7.597	51.358	1.244	5.924	56.830
5	1.270	6.046	61.084	1.352	6.440	57.798	1.061	5.050	61.880
6	1.100	5.239	66.322	1.229	5.851	63.649	1.002	4.771	66.652
7	0.936	4.459	70.782	1.070	7.096	68.745	0.959	4.568	71.220
8	0.887	4.223	75.005	1.023	4.869	75.845	0.923	4.394	75.614
9-60			100.00			100.00			100.00
Extraction Method: Principal Component Analysis.									

Table 15 Variation of Climate Resilience Management Level broken Down into Characteristics in Eastern Dry Zone

Factors	**Irrigated (n_1=90)**			**Rainfed (n_2=90)**			**Total (N=180)**		
	Eigen roots	Zero order correlation co-efficient with resilience management level	Cumulative variation	Eigen roots	Zero order correlation co-efficient with resilience management level	Cumulative variation	Eigen roots	Zero order correlation co-efficient with resilience management level	Cumulative variation
1	2.570	2.333	54.471	2.281	2.327	54.162	2.372	2.240	50.199
2	1.405	0.410	1.685	1.516	0.698	4.885	1.921	1.150	13.225
3	1.265	0.144	0.210	1.299	0.269	0.727	1.1708	0.078	0.062
4	1.173	-0.046	0.0215	1.262	0.108	0.117	1.115	-0.070	0.049
5	1.127	-0.185	0.342	1.163	-0.112	0.123	1.030	-0.229	0.524
6	1.049	-0.334	1.118	1.108	-0.261	0.683	1.001	-0.331	1.097
7	0.967	-0.469	2.200	1.034	-0.418	1.750	0.979	-0.423	1.795
8	0.942	-0.556	3.091	1.012	-0.515	2.658	0.960	-0.510	2.605
9-60			100.00			100.00			100.00

Table 16: Contribution in Proportion of Variation in Inter Dependent Factors and Profile Characteristics Explaining the Significance on the Climate Resilience Management in Different Situations

Sl. No.	Characteristic	Irrigated situation (n_1=90)					Rainfed situation (n_2=90)				
		Climate resilience factor					Climate resilience factor				
		1	8	7	2	6	1	2	8	7	6
1.	Age	0.511			0.476		0.350		-0.728		
2.	Education	-0.483	0.534	0.343				0.729			
3.	Dependency Ratio			0.689			0.313	-0.429			0.458
4.	Farm Size					0.767		-0.404	0.480		
5.	Farming Experience	0.846					0.849				
6.	Annual Income		0.310		0.377	0.446		0.665			
7.	Economic Motivation	0.838					0.757				
8.	Mass media Exposure	0.774					0.789				-0.353
9.	Risk Orientation			0.513	-.0472			0.652	0.330		
10.	Scientific Orientation	0.867					0.714				
11.	Extension Contact	0.885					0.905				
12.	Cosmopoliteness				-0.711					-0.323	0.532
13.	Distance to Market			0.731				0.445	-0.365		0.314
14.	Awareness about Diversification	0.911					0.911				
15.	Extent of Natural Capital	-0.321	0.696						0.531		
16.	Innovative Proneness									0.582	-0.301
17.	Farm Financial Literacy	-0.421	0.368							0.596	
18.	Irrigation Potential		0.370							0.419	
19.	Organizational Participation	0.861					0.844				
20.	Farm Mechanization Level		0.808						0.416	-0.572	
	Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.										

4.5.2.2 Contribution of Management factors for Interdependent Variation in Climate Resilience Management with Profile Characteristics in Rainfed Situation

In rainfed situation The Table-14 gives the eigen values, percentage, variation and cumulative variation of the management factors. The climate resilience management factor of farmers is focused here. The first factor contribute approximate 24.773 per cent of total variation of 60 management factors, the secured factor i.e., 8 management factor account cause more than 75 per cent of the variation.

It is possible to obtain the zero order correlation co-efficient between climate resilience management factors and variables from the co-efficient of eigen vectors. This correlation is the square of the co-efficient associated with factor in the vector. If can be observed from the Table-15 that, only 1,2, 8,7 and 6 management factors contributed the maximum variation in climate resilience management in rainfed situation.

While examining the factor wise contribution in Table-16 it was noticed that, first management factor in rainfed situation 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 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.

Management factor 8, 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, 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, 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

Major findings of above results are the first management factor contribute approximately 24.773 per cent of total variation out of 60 management factor, 8^{th} management factor account for cause more than 75 per cent of the variation. While examining the variation by factors, it was observed that, climate resilience management factors in rainfed situation is directly related to variables such as age, dependency ratio, farming experience, economic motivation, mass media exposure, scientific orientation, extension contact, awareness about diversification and organizational participation. The results are in line with the studies of Sowmya (2009), Jayasree (2013) and Mahentesh (2015)

4.5.2.3 Contribution of Management factors for Interdependent Variation in Climate Resilience Management with Profile Characteristics in Pooled Situation

In total the Table-14 gives the eigen values, percentage, variation and cumulative variation of the factors. The climate resilience management factors of farmers are focused here. The first factor contribute approximate 26.795 per cent of total variation of 60 management practices, 8^{th} management factor account for cause more than 75 per cent of the variation.

It is possible to obtain the zero order correlation co-efficient between climate resilience management factors and variables from the co-efficient of eigen vectors. This correlation is the square of the co-efficient associated with factors in the vector, if can be observed from the Table- 15 that only 1,2,8,7 and 6 management factor contributed the maximum variation in climate resilience management in pooled situation.

While examining the factor wise contribution in Table-17 it was noticed that, the first climate resilience management factor in pooled situation strongly associated with variables such as age, farming experience, economic motivation, mass media exposure, scientific orientation, extension contact, awareness about diversification and organizational participation. But the negative sign of co-efficient education (-0.329) indicated an inverse association with climate resilience management factor.

The next important management factor is 2, strongly associated with profile characteristics such as education, annual income, risk orientation, extent of natural capital farm financial literacy, irrigation potential and farm mechanization level were positively associated with climate resilience management level. The management factor 8 displayed strong association with profile characteristics such as farm size, extent of natural capital and irrigation potential. But negative sign of the co- efficient found in age (-0.515) and distance to market (-0.526) indicated an inverse association with the climate resilience management. Annual income displayed strong association with management factor 7 but negative sign of the co- efficient cosmopoliteness (-0.795) indicated an inverse association. Later management factor 6, display association with innovative proneness but negative sign of the co-efficient distance to market (-0.366) indicated an inverse association with climate resilience management.

Conclusion of above findings are the first management factor contribute approximate 26.795 per cent of total variation of 60 management practices, 8th management factor account for cause more than 75 per cent of the variation. While examining the variation by factor, it was observed that climate resilience management in pooled situation is directly related to variables such as age, farming experience, economic motivation, mass media exposure, scientific orientation, extension contact, awareness about diversification and organizational participation. The results are in acceptance with the results of Mahentesh (2015) and Kowsalaya (2017).

4.6 Inter Dependent Contribution of Dimensions for Variation in Climate Resilience Management Level in Eastern Dry Zone

Keeping the objectives of the study in mind. Enlisted possible dimensions which were relevant to measure the climate resilience management level of the respondents with reference to zone 5 through literature reviews, experts' opinion and informal discussion

Table 17: Contribution in Proportion of Variation in Inter Dependent Factors and Profile Characteristics Explaining the Significance on the Climate Resilience Management in Eastern Dry Zone

(N=180)

Sl. No.	Profile Characteristic	Climate Resilience Management factor				
		1	2	8	7	6
1.	Age	0.432		-0.515		
2.	Education	-0.329	0.667			
3.	Dependency Ratio					0.827
4.	Farm Size			0.695		
5.	Farming Experience	0.844				
6.	Annual Income		0.554		0.482	
7.	Economic Motivation	0.827				-0.692
8.	Mass media Exposure	0.767				
9.	Risk Orientation		0.664			
10.	Scientific Orientation	0.833				
11.	Extension Contact	0.896				
12.	Cosmopoliteness				-0.795	
13.	Distance to Market			-0.526		0.445
14.	Awareness about Diversification	0.921				
15.	Extent of Natural Capital		0.635	0.508		
16.	Innovative Proneness					
17.	Farm Financial Literacy		0.662			
18.	Irrigation Potential		0.706	0.305		
19.	Organizational Participation	0.843				
20.	Farm Mechanization Level		0.669			

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

with the subject experts, twenty two dimension were identified. The selected dimensions were provided to 40 judges who had subject knowledge related to the study. They were asked to give their judgment the relevancy of the components on five point continuum like, “most relevant”, “relevant”, “somewhat relevant”, “least relevant” and “not relevant”. The judges rating were pooled by assigning the score value. As ‘most relevant’ score 4, for‘relevant’ score 3,for ‘somewhat relevant ‘score 2, for ‘least relevant’ score 1 and for ‘not relevant ‘response score 0 was given. Later, relevancy percentage for each dimension was calculated by using the relevancy formulae and Based on discussion with the experts and based on the relevancy percentage which was above 90, four dimensions were selected for measuring climate resilience management level of the respondents. Four such selected components of climate resilience management level are *viz.*, environmental aspects, ecological security, natural resource degradation and agricultural resources/ non agricultural resources management. Detailed procedure for selection of dimensions mentioned in methodology chapter.

Whereas, in section the dimensions which contribute to the variation in climate resilience management among the farmers have been analysed using “Principal Component Analysis” separately for irrigated, rainfed and pooled situations. This was done in order to identify the various groups of factors, which operate together, and have a bearing on the climate resilience management of the farmers. The results are presented in this section

4.6.1 Contribution of dimensions for Variation in Climate Resilience Management Level for Eastern Dry Zone

Principal component analysis was carried out with all dimensions and results furnished in Table 18 and 19 that gives the eigen values, percentage, variation and cumulative variation of the dimensions. Accordingly, irrigated climate resilience management dimensions focused here, based on that first dimension having eigen value of 3.212 and cause approximate 80.30 per cent of total variation out of 4 dimensions. Major inter dependent contributors of above variations are environmental protection (0.942) followed by agriculture resource/ non agriculture resource management (0.932), natural resource degradation management (0.886) and ecological security management (0.861).

Subsequently, in rainfed situation also Principal component analysis was carried out with all dimensions and results furnished from Table 18 and 19 and that gives the eigen values, percentage, variation and cumulative variation of the dimensions. The dimensions which have more than one eigen value were alone selected. Accordingly, rainfed climate resilience management dimensions focused here, based on that first dimension having eigen value of 3.272 and cause approximate 81.791 per cent of total variation out of 4 dimensions. Major inter dependent contributors of above variations are agriculture resource/ non agriculture resource management (0.932) followed by environmental protection (0.931), ecological security management (0.879) and natural resource degradation management (0.875).

In overall situation also principal component analysis was carried out with all dimensions and results furnished from Table 18 and 19 and that gives the eigen values, % variation and cumulative variation of the dimensions. The dimensions which have more than one eigen value were alone selected. Accordingly, pooled situation climate resilience management dimensions focused here based on that first dimension having eigen value of 3.241 and cause approximate 81.035 per cent of total variation out of 4 dimensions. Major inter dependent contributors of above variations are agriculture resource/ non agriculture resource management (0.931) followed by environmental protection (0.927), and natural resource degradation management (0.871) ecological security management (0.870).

Probable reason for above such type of results are 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. The results are in acceptance with the Mahentesh (2015).

4.6.2 Item Wise Analysis of Climate Resilience Management Level of farmers in Eastern Dry Zone

Tentative list of 130 management practices pertaining to Climate Resilience Management level was prepared based on the available literature and discussion with

Table 18: Interdependent Contribution of Dimensions for Variation in Climate Resilience Management of Eastern Dry Zone

Component	Irrigated(n_1=90)			Rainfed(n_2=90)			Total (N=180)		
	Eigen values	% of Variance	Cumulative %	Eigen values	% of Variance	Cumulative %	Eigen values	% of Variance	Cumulative %
1	3.212	80.300	80.300	3.272	81.791	81.791	3.241	81.035	81.035
2	0.477	11.921	92.220	0.426	10.660	92.451	0.452	11.288	92.322
3	0.241	6.022	98.242	0.234	5.847	98.299	0.238	5.941	98.264
4	0.070	1.758	100.00	0.068	1.701	100.00	0.069	1.736	100.00
Extraction Method: Principal Component Analysis.									

Table 19: Dimensions wise Interdependent Contribution for Variation in Climate Resilience Management in Eastern Dry Zone

Sl. No.	Component	Irrigated (n_1=90)	Rainfed (n_2=90)	Total (N=180)
1.	Natural Resource Degradation Management	0.866	0.875	0.871
2.	Agricultural Resource / Non Agricultural Resource Management	0.932	0.932	0.931
3.	Environmental Protection	0.942	0.931	0.927
4.	Ecological Security Management	0.861	0.879	0.870
Extraction Method: Principal Component Analysis.				

experts from selected areas. The statements were edited as per the 14 criteria suggested by Edwards (1969), and Thurstone and Chave (1929). As a consequence 29 statements were eliminated and the remaining 101 practices were included for the study**.** Hundred and one statements were mailed to 100 experts in the agricultural extension and other related fields working in SAUs, ICAR institutions in Karnataka State Department of Agriculture to critically evaluate the relevancy of each component viz., Most Relevant (MR), Relevant (R), Somewhat Relevant (SWR), Less Relevant (LR) and Not Relevant (NR) with the score of 5, 4, 3, 2 and 1, respectively. The judges were also requested to make necessary modifications and additions or deletion of statements, if they desire so. A total of 60 experts returned the questionnaires duly completed were considered for further processing. From the data gathered, 'relevancy percentage' and 'mean relevancy score' were worked out for 101 statements. The statements were analyzed for their relevancy using the formulae. Statements having 'relevancy weightage of more than 75 and above and 'mean relevancy score' of 3.65 and above were considered for final selection. Sixty statements were retained after relevancy test and these practices were suitably modified and written as per the comments of the judges wherever applicable. To better understand the climate resilience management level of farmers in irrigated, rainfed and pooled areas the responses were collected and analysed the each item.

4.6.2.1 Natural Resource Degradation Management under Irrigated Situation

The results in Table-20 showed that in natural resource degradation management under irrigated situation, majority of farmers opinioned that efficient use of inputs including agro-chemicals with minimal degradation of environment (Rank I) followed by non-adoption of soil-conservation management practices leads to desertification of the agricultural land (Rank II), inorganic fertilizer, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment (Rank III), encouraging crop rotation patterns (Rank IV), and sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment and Prevent and control the future deterioration in land, water and air which constitute our life-support systems placed in Rank V were considered as most important items under natural resources degradation management for climate resilience management.

Subsequently, some of other items were cost effective and efficient methods of water conservation and use (Rank VI), development and promotion of methods of sustainable farming, especially organic and natural farming (Rank VII), steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements (Rank VIII), environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation and Raising of green belts with pollution tolerant species can protect the natural resources placed (Rank IX) and ensure that development projects are correctly located so as to minimize their adverse environmental consequences Rank X placed in ordered and considered as a second level of important items in natural resource degradation management for climate resilience management.

Least important items were, ensuring land for different uses based upon land capability and land productivity (Rank XI), developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and green house gases (Rank XII) and encouragement for improvement in traditional methods of rain water harvesting and storage Rank XIII placed in order in natural resource degradation management.

4.6.2.2 Natural Resource Degradation Management under Rainfed Situation

The results in the Table-20 showed that efficient use of inputs including agro-chemicals with minimal degradation of environment stood Rank I followed by non-adoption of soil-conservation management practices leads to desertification of the agricultural land (Rank II), inorganic fertilizer ,insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment (Rank III), encouraging crop rotation patterns (Rank IV), and sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment and Prevent and control the future deterioration in land, water and air which constitute our life-support systems placed Rank V were considered most important items under natural resource degradation management in rainfed situation for climate resilience management.

Table 20: Item Wise Climate Resilience Management Level in Eastern Dry Zone

Sl. No.	Statement	Irrigated (n_1=90)			Rainfed (n_2=90)			Total (N=180)		
		Score	Per cent	Rank	Score	Per Cent	Rank	Score	Per cent	Rank
I	**Natural Resource Degradation Management**									
1.	Sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment	263	58.44	V	258	57.33	VII	519	57.67	V
2.	Non-adoption of soil-conservation management practices leads to desertification of the agricultural land	288	64.00	II	284	63.11	II	568	63.11	I
3.	Steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements	254	56.44	VIII	251	55.78	X	499	55.44	VIII
4.	Cost effective and efficient methods of water conservation and use	262	58.22	VI	259	57.56	VI	513	57.00	VI
5.	Encouraging crop rotation patterns	268	59.56	IV	265	58.89	IV	523	58.11	IV
6.	Environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation	253	56.22	IX	254	56.44	IX	495	55.00	IX
7.	Prevent and control the future deterioration in land, water and air which constitute our life-support systems	263	58.44	V	260	57.78	V	509	56.56	VII
8.	Ensure that development projects are correctly sited so as to minimize their adverse environmental consequences	249	55.33	X	249	55.33	XI	482	53.56	XI
9.	Ensuring land for different uses based upon land capability and land productivity	248	55.11	XI	246	54.67	XIII	476	52.89	XII

Sl. No.	Statement	Irrigated (n_1=90)			Rainfed (n_2=90)			Total (N=180)		
		Score	Per cent	Rank	Score	Per Cent	Rank	Score	Per cent	Rank
10.	Encouragement for improvement in traditional methods of rain water harvesting and storage	219	48.67	XIII	209	46.44	XV	408	45.33	XV
11.	Developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases	241	53.56	XII	236	52.44	XIV	453	50.33	XIV
12.	Development and promotion of methods of sustainable farming, especially organic and natural farming	259	57.56	VII	255	56.67	VIII	488	54.22	X
13.	Raising of green belts with pollution tolerant species can protect the natural resources	253	56.22	IX	247	54.89	XII	472	52.44	XIII
14.	Efficient use of inputs including agro-chemicals with minimal degradation of environment	295	65.56	I	293	65.11	**I**	558	62.00	III
15	Inorganic fertilizer, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment	282	62.67	III	280	62.22	III	560	62.22	II
II	**Agricultural Resource / Non Agricultural Resource Management**									
1.	Organic farming is effective in increasing the texture and fertility of soil	281	62.44	V	278	61.78	V	555	61.67	IV
2.	Integrated pest management is a boon to reduce the chemical use for plant protection	274	60.89	VIII	270	60.00	IX	542	60.22	V
3.	Integrated farming system is one of the best method to use the agricultural resource management	246	54.67	XIII	246	54.67	XIV	484	53.78	XV
4.	Measures for increasing the efficiency of water-use, water conservation and recycling	297	66.00	I	296	65.78	I	583	64.78	I

Sl. No.	Statement	Irrigated (n_1=90)			Rainfed (n_2=90)			Total (N=180)		
		Score	Per cent	Rank	Score	Per Cent	Rank	Score	Per cent	Rank
5.	Setting up of biogas plants based on cow-dung and vegetable wastes	262	58.22	XI	259	57.56	XII	509	56.56	XII
6.	Restoration and protection of grazing lands	261	58.00	XII	258	57.33	XIII	505	56.11	XIII
7.	A movement toward greater efficiency in resource use including recycling	281	62.44	V	276	61.33	VII	541	60.11	VI
8.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices	266	59.11	IX	263	58.44	X	511	56.78	XI
9.	Development of integrated pest management and nutrient supply system	279	62.00	VI	277	61.56	VI	536	59.56	VIII
10.	Afforestration on common lands by the local communities through government schemes	263	58.44	X	262	58.22	XI	503	55.89	XIV
11.	Improvement in genetic variability of indigenous population	274	60.89	VIII	271	60.22	VIII	521	57.89	X
12.	Incentives for environmentally clean technologies, recycling and conservation of natural resources	275	61.11	VII	276	61.33	VII	525	58.33	IX
13.	Concerted efforts for development and propagation of non-conventional renewable energy generation systems	284	63.11	IV	284	63.11	IV	540	60.00	VII
14.	Improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems	296	65.78	II	295	65.56	II	561	62.33	III
15.	Encouraging efficient utilization of forest produces	289	64.22	III	289	64.22	III	576	64.00	II

Some of other items like cost effective and efficient methods of water conservation and use (Rank VI), sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment (Rank VII), development and promotion of methods of sustainable farming, especially organic and natural farming (Rank VIII), environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation (Rank IX), steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements placed Rank X were considered as a second level important items in natural resource degradation management.

Least important items under natural resource degradation management were ensure that development projects are correctly sited so as to minimize their adverse environmental consequences (Rank XI), raising of green belts with pollution tolerant species can protect the natural resources (Rank XII), ensuring land for different uses based upon land capability and land productivity (Rank XIII), developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and green house gases (Rank XIV) and encouragement for improvement in traditional methods of rain water harvesting and storage Rank XV were in ordered .

4.6.2.3 Natural Resource Degradation Management under Overall Situation

Most important items under natural resource degradation management in total situation were presentenced accordingly non-adoption of soil-conservation management practices leads to desertification of the agricultural land was found to be Rank I followed by inorganic fertilizer ,insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment (Rank II), efficient use of inputs including agro-chemicals with minimal degradation of environment (Rank III), encouraging crop rotation patterns (Rank IV), sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment placed Rank V were most important for climate resilience management.

Subsequently, cost effective and efficient methods of water conservation and use (Rank VI), Prevent and control the future deterioration in land, water and air which constitute our life-support systems (Rank VII), steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements (Rank VIII), environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation (Rank IX), development and promotion of methods of sustainable farming, especially organic and natural farming Rank X were in ordered and considered as a second level of important items in climate resilience management.

Least important items were ensure that development projects are correctly located so as to minimize their adverse environmental consequences (Rank XI), raising of green belts with pollution tolerant species can protect the natural resources (Rank XII),developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and green house gases (Rank XIV) and encouragement for improvement in traditional methods of rain water harvesting and storage, placed Rank XV were in ordered in pooled situation.

Majority of farmers opinioned that natural resource degradation management deals with efficient use of inputs agro chemicals and reduce degradation because exhaustive use of inorganic inputs and chemicals create many hazards like declining of soil fertility and soil erosion its directly influences the climate change, followed by non-adoption of soil-conservation management practices leads to desertification of the agricultural land , inorganic fertilizer ,insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment, encouraging crop rotation patterns and sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment and Prevent and control the future deterioration in land, water and air which constitute our life-support system are the major management practices under natural resource degradation management. The findings of the study conducted by Devarajaiah (2010) supported the results of present research.

4.6.2.2.1 Agricultural Resource / Non-Agricultural Resource Management under Irrigated Situation

Most important items in irrigated situation for climate resilience management under agricultural resource / non-agricultural resource management were measures for increasing the efficiency of water-use, water conservation and recycling (Rank I) followed by improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems (Rank II), encouraging efficient utilization of forest produces (Rank III), concerted efforts for development and propagation of non-conventional renewable energy generation systems (Rank IV) and organic farming is effective in increasing the texture and fertility of soil and a movement toward greater efficiency in resource use including recycling placed Rank V .

Subsequently, development of integrated pest management and nutrient supply system (Rank VI), incentives for environmentally clean technologies, recycling and conservation of natural resources (Rank VII), improvement in genetic variability of indigenous population and integrated pest management is a boon to reduce the chemical use for plant protection placed (Rank VIII) respectively, protection and sustainable use of plant and animal genetic resources through appropriate laws and practices (Rank IX Afforestration on common lands by the local communities through government schemes, Rank X were considered as second level of important items for climate resilience management under agricultural resource / non-agricultural resource management.

Least contributed items for climate resilience management were setting up of biogas plants based on cow-dung and vegetable wastes (Rank XI), restoration and protection of grazing lands (Rank XII) and integrated farming system is one of the best method to use the agricultural resource management place Rank XIII were in ordered under agricultural resource / non-agricultural resource management.

4.6.2.2.2 Agricultural Resource / Non-Agricultural Resource Management under Rainfed Situation

Majority of farmers in rainfed situation under agricultural resource / non-agricultural resource management opinioned that measures for increasing the efficiency of water-use, water conservation and recycling (Rank I) followed by improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems (Rank II), encouraging efficient utilization of forest produces (Rank III), concerted efforts for development and propagation of non-conventional renewable energy generation systems (Rank IV), organic farming is effective in increasing the texture and fertility of soil and a movement toward greater efficiency in resource use including recycling placed Rank V and considered most important items for climate resilience management.

Some of other important items climate resilience were, development of integrated pest management and nutrient supply system (Rank VI), incentives for environmentally clean technologies, recycling and conservation of natural resources (Rank VII), improvement in genetic variability of indigenous population and integrated pest management is a boon to reduce the chemical use for plant protection placed(Rank VIII) afforestration on common lands by the local communities through government (Rank IX) protection and sustainable use of plant and animal genetic resources through appropriate laws and practices Rank X were in ordered.

Least important items were Afforestration on common lands by the local communities through government (Rank XI), setting up of biogas plants based on cow-dung and vegetable wastes (Rank XII) restoration and protection of grazing lands (Rank XIII), integrated farming system is one of the best method to use the agricultural resource management placed Rank XIV in ordered and considered as least contributed items for climate resilience management under agricultural resource / non-agricultural resource management.

4.6.2.2.3 Agricultural Resource / Non-Agricultural Resource Management under Overall Situation

Most important items in pooled situation for climate resilience management were measures for increasing the efficiency of water-use, water conservation and recycling (Rank I)followed by encouraging efficient utilization of forest produces (Rank II), improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems (Rank III), a movement toward greater efficiency in resource use including recycling (Rank IV) and integrated pest management is a boon to reduce the chemical use for plant protection placed Rank V.

Important items for climate resilience management were development of integrated pest management and nutrient supply system (Rank VI), concerted efforts for development and propagation of non-conventional renewable energy generation systems (Rank VII), development of integrated pest management and nutrient supply system (Rank VIII) incentives for environmentally clean technologies, recycling and conservation of natural resources (Rank IX) improvement in genetic variability of indigenous population Rank X were in ordered

Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices (Rank XI), setting up of biogas plants based on cow-dung and vegetable wastes (Rank XII) restoration and protection of grazing lands (Rank XIII), afforestration on common lands by the local communities through government (Rank XIV) and integrated farming system is one of the best method to use the agricultural resource management placed Rank XV were in ordered and considered as least items for climate resilience management under agricultural resource / non-agricultural resource management.

In all the agricultural situations *viz*., rainfed, irrigated and total it was observed that 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 natural resource followed by improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems for crisis management, Encouraging efficient utilization of forest produces for alternative income source , improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems to overcome crisis management, concerted efforts for development and propagation of non-conventional renewable energy generation systems and organic farming is effective in increasing the texture and fertility of soil and a movement toward greater efficiency in resource use including recycling agricultural resource are the major practice helps in agricultural resource / non agricultural resource management. This finding is supported by Chandrani (2008) and Lavanya (2010).

4.6.2.3.1 Environmental Protection under Irrigated Situation

The results in Table-20 showed that most important items in irrigated situation for climate resilience management were raising of green belts with pollution tolerant species (Rank I) followed by climate resilience reduces environmental degradation (Rank II), environmental factors play an important role in climate change (Rank III), Increasing temperature and variation in rain fall are the main indicators of environmental chang**e** and modify the cropping pattern (Rank IV), environmental change causes negative effect on people health and animals placed Rank V under Environmental Protection management.

Later, create environmental consciousness through education and mass awareness programmes (Rank VI), inorganic fertilizers and pesticides cause long term harmful effects to the environment and willing to give up part of my profit for environmental conservation placed (Rank VII) respectively, practicing the afforestration activities helps in increasing environmental conditions (Rank VIII) less risk of pollution in climate resilience practices (Rank IX) climate resilience efficient in mitigating climate change effects placed Rank X in ordered and considered as important items for climate resilience management.

Least, items were Pesticides and chemical fertilizers will reduce the number of soil micro organisms (Rank XI) crop cover may protect the soil climate (Rank XII) climate change reduces mineral output to the environment (Rank XIII) and organic farming can improve soil fertility and soil structure placed Rank XIV in ordered under Environmental Protection management.

4.6.2.3.2 Environmental Protection under Rainfed Situation

Majority of farmers in rainfed situation opinioned that raising of green belts with pollution tolerant species (Rank I) followed by climate resilience reduces environmental degradation (Rank II), increasing temperature and variation in rain fall are the main indicators of environmental chang**e** and modify the cropping pattern (Rank III), inorganic fertilizers and pesticides cause long term harmful effects to the environment (Rank IV), environmental change causes negative effect on people health and animals placed Rank V were considered as a most important items for climate resilience management.

Second level of important items for climate resilience management under environmental protection management. were environmental factors play an important role in climate change (Rank VI), practicing the afforestration activities helps in increasing environmental conditions (Rank VII), willing to give up part of my profit for environmental conservation and create environmental consciousness through education and mass awareness programmes placed (Rank VIII)respectively, Pesticides and chemical fertilizers will reduce the number of soil micro organisms (Rank IX) and Less risk of pollution in climate resilience practices placed Rank X in ordered.

Least items for climate resilience management were climate resilience efficient in mitigating climate change effects (Rank XI) crop cover may protect the soil climate (Rank XII) climate change reduces mineral output to the environment (Rank XIII) and organic farming can improve soil fertility and soil structure Rank XIV were in ordered under environmental protection management.

4.6.2.3.3 Environmental Protection under overall Situation

Most important items for climate resilience management in pooled situation were climate resilience reduces environmental degradation (Rank I) followed by raising of green belts with pollution tolerant species (Rank II), environmental change causes negative effect on people health and animals (Rank III), inorganic fertilizers and pesticides cause long term harmful effects to the environment (Rank IV) and willing to give up part of my profit for environmental conservation and Create environmental consciousness through education and mass awareness programmes placed Rank V under environmental protection management.

Whereas, increasing temperature and variation in rain fall are the main indicators of environmental chang**e** and modify the cropping pattern (Rank VI), inorganic fertilizers and pesticides cause long term harmful effects to the environment (Rank VII), Practicing the afforestration activities helps in increasing environmental conditions (Rank VIII) and climate change reduces mineral output to the environment, Less risk of pollution in climate resilience practices and climate change reduces mineral output to the environment placed Rank IX in ordered and considered as important items for climate resilience management.

Least items for climate resilience management were Pesticides and chemical fertilizers will reduce the number of soil micro organisms (Rank X), crop cover may protect the soil climate (Rank XI) and organic farming can improve soil fertility and soil structure Rank XII were in ordered under environmental protection management.

Environmental protection management majorly deals with raising of green belts with pollution tolerant species because reduce carbon dioxide concentration influence the rainfall and reduce the impact of climate change directly followed by climate resilience reduces environmental degradation its major factor proper management of climate resilience through various agricultural management practices reduce environmental degradation, Increasing temperature and variation in rain fall are the main indicators of environmental change so need modify the cropping pattern, environmental change causes negative effect on people health and animals due to variation temperature and humidity and required group effort by create environmental consciousness through education and mass awareness programmes are the major management practices comes under environment protection management. This finding is supported by Lavanya (2010) and Mamathalaxmi (2013).

4.6.2.4.1 Ecological Security Management under Irrigated Situation

The results in Table-20 showed that in irrigated situation majority of farmers opinioned that encouraging private individuals and institutions to regenerate and develop their wastelands (Rank I) followed 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 and Conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land placed (Rank II) respectively, reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority Rank III were considered most important items for climate resilience management.

Other items contributing climate resilience management were concentrating on common property resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation (Rank IV), development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology and Support for protecting traditional skills and knowledge for conservation of resources placed (Rank V)respectively, restriction on introduction of exotic species of animals without adequate investigations (Rank VI), Development and promotion of methods of sustainable farming, especially organic and natural farming (Rank VII), and discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation Rank VIII in ordered.

Least contributed items for climate resilience management were protection and sustainable use of plant and animal genetic resources through appropriate laws and practices (Rank IX) 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 and Taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand placed (Rank X) respectively, protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity Rank XI in ordered.

4.6.2.4.2 Ecological Security Management under Rainfed Situation

Most important items in rainfed situation for climate resilience management were encouraging private individuals and institutions to regenerate and develop their wastelands (Rank I) followed by conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land placed (Rank II) 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 (Rank III), reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority and development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation placed (Rank IV)and development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology Rank V under the ecological security management.

Subsequently, concentrating on common property resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation (Rank VI), development and promotion of methods of sustainable farming, especially organic and natural farming (Rank VII), Restriction on introduction of exotic species of animals without adequate investigations (Rank VIII) development and promotion of methods of sustainable farming, especially organic and natural farming (Rank IX), protection and sustainable use of plant and animal genetic resources through appropriate laws and practices placed Rank X in ordered and considered as important items for climate resilience management.

Least items for climate resilience management were discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation and Taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand placed (Rank XI), 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 (Rank XII), and protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity Rank XIII were in ordered for climate resilience management.

4.6.2.4.3 Ecological Security Management under Overall Situation

Majority of farmers in pooled situation under ecological security management opinioned that encouraging private individuals and institutions to regenerate and develop their wastelands (Rank I) followed by 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 (Rank II) concentrating on common property resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation and conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land placed Rank III were considered as most important items for climate resilience management.

Whereas, other items for climate resilience management were development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology (Rank IV) , Development and promotion of methods of sustainable farming, especially organic and natural farming Support for protecting traditional skills and knowledge for conservation of resources and Reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority placed (Rank V) respectively, development and promotion of methods of sustainable farming, especially organic and natural farming and Restriction on introduction of exotic species of animals without adequate investigations placed (Rank VI) respectively, 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 and development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation placed Rank VII in ordered in ecological security management.

Least, items for climate resilience management were followed like protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity (Rank VIII) protection and sustainable use of plant and animal genetic resources through appropriate laws and practices (Rank IX), discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation (Rank X) and taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand Rank XI under ecological security management.

Probable reason for all the three agricultural situations namely irrigated, rainfed and overall situation respondents indicated that main 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, 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 for better performance and 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 and development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation are the major management practice found under ecological security management. The results of present study were in consonance with the studies of Chandrani (2008) and Lavanya (2010).

4.6.3 Principal Components in which Practice Wise Interdependent Contribution in Proportion of Variation in Climate Resilience Management in Eastern Dry Zone

The practice wise contribute to the variation in adoptability in climate resilience practices among the farmers has been analysed using "Principal Component Analysis" separately for irrigated, rainfed and overall situation. This was done in order to identify the various groups of factors, which operate together, and have a bearing on the climate resilience management of the farmers. The results are presented in this section.

4.6.3.1 Contribution of Natural Resource Degradation Management for Climate Resilience Management in Irrigated situation

The results in Table-21, gave contribution of management factors in climate resilience management under the natural resource degradation management in irrigation situation comprise 15 management aspects namely cost effective and efficient methods of water conservation and use contributed interdependent variation (0.848) followed by steps for restoration of ecologically degraded areas and for environmental improvement in rural settlements (0.732), sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment (0.722),

Table 21: Principal Component in which Practice Wise Contribution in Proportion of Variation of Inter Depended Factors in Climate Resilience Management of Eastern Dry Zone

Sl. No.	Statement	Irrigated (n_1=90)	Rainfed (n_2=90)	Total (N=180)
I	**Natural Resource Degradation Management**			
1.	Sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment	0.722	0.609	0.672
2.	Non-adoption of soil-conservation management practices leads to desertification of the agricultural land	0.640	0.511	0.585
3.	Steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements	0.732	0.710	0.717
4.	Cost effective and efficient methods of water conservation and use	0.848	0.774	0.807
5.	Encouraging crop rotation patterns	0.704	0.676	0.691
6.	Environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation	0.463	0.410	0.435
7.	Prevent and control the future deterioration in land, water and air which constitute our life-support systems	0.388	0.260	0.338
8.	Ensure that development projects are correctly sited so as to minimize their adverse environmental consequences	0.531	0.393	0.469
9.	Ensuring land for different uses based upon land capability and land productivity	0.449	0.108	0.304
10.	Encouragement for improvement in traditional methods of rain water harvesting and storage	0.133	-0.051	0.074
11.	Developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases	0.465	0.410	0.457
12.	Development and promotion of methods of sustainable farming, especially organic and natural farming	0.555	0.490	0.543
13.	Raising of green belts with pollution tolerant species can protect the natural resources	0.508	0.510	0.531

Sl. No.	Statement	Irrigated (n_1=90)	Rainfed (n_2=90)	Total (N=180)
14.	Efficient use of inputs including agro-chemicals with minimal degradation of environment	0.625	0.648	0.644
15.	Inorganic fertilizer, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment	0.642	0.665	0.666
II	**Agricultural Resource / Non Agricultural Resource Management**			
1.	Organic farming is effective in increasing the texture and fertility of soil	0.815	0.785	0.805
2.	Integrated pest management is a boon to reduce the chemical use for plant protection	0.739	0.467	0.621
3.	Integrated farming system is one of the best method to use the agricultural resource management	0.661	0.550	0.614
4.	Measures for increasing the efficiency of water-use, water conservation and recycling	0.770	0.458	0.626
5.	Setting up of biogas plants based on cow-dung and vegetable wastes	0.735	0.566	0.662
6.	Restoration and protection of grazing lands	0.754	0.549	0.660
7.	A movement toward greater efficiency in resource use including recycling	0.829	0.783	0.807
8.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices	0.821	0.787	0.809
9.	Development of integrated pest management and nutrient supply system	0.866	0.811	0.846
10.	Afforestration on common lands by the local communities through government schemes	0.811	0.797	0.799
11.	Improvement in genetic variability of indigenous population	0.839	0.852	0.845
12.	Incentives for environmentally clean technologies, recycling and conservation of natural resources	0.872	0.827	0.850
13.	Concerted efforts for development and propagation of non-conventional renewable energy generation systems	0.836	0.800	0.820
14.	Improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems	0.838	0.768	0.809
15.	Encouraging efficient utilization of forest produces	0.706	0.665	0.686

Sl. No.	Statement	Irrigated (n_1=90)	Rainfed (n_2=90)	Total (N=180)
III	**Environmental Protection**			
1.	Environmental change causes negative effect on people health and animals	0.722	0.638	0.687
2.	Organic farming can improve soil fertility and soil structure	0.776	0.747	0.765
3.	Willing to give up part of my profit for environmental conservation	0.911	0.861	0.889
4.	Create environmental consciousness through education and mass awareness programmes	0.879	0.800	0.847
5.	Climate resilience reduces environmental degradation	0.891	0.758	0.823
6.	Environmental factors play an important role in climate change	0.851	0.778	0.817
7.	Crop cover may protect the soil climate	0.805	0.747	0.772
8.	Climate resilience efficient in mitigating climate change effects	0.873	0.785	0.823
9.	Less risk of pollution in climate resilience practices	0.810	0.785	0.793
10.	Raising of green belts with pollution tolerant species	0.797	0.689	0.745
11.	Increasing temperature and variation in rain fall are the main indicators of environmental change and modify the cropping pattern	0.745	0.637	0.695
12.	Inorganic fertilizers and pesticides cause long term harmful effects to the environment	0.829	0.725	0.775
13.	Pesticides and chemical fertilizers will reduce the number of soil micro organisms	0.655	0.479	0.585
14.	Practicing the afforestration activities helps in increasing environmental conditions	0.597	0.511	0.564
15.	Climate change reduces mineral output to the environment	0.628	0.468	0.558
IV	**Ecological Security Management**			
1.	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	0.599	0.501	0.567
2.	Protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity	0.664	0.765	0.720

Sl. No.	Statement	Irrigated (n_1=90)	Rainfed (n_2=90)	Total (N=180)
3.	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	0.584	0.635	0.621
4.	Concentrating on Common Property Resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation	0.609	0.629	0.634
5.	Development and promotion of methods of sustainable farming	0.766	0.707	0.743
6.	Development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology	0.522	0.604	0.576
7.	Encouraging private individuals and institutions to regenerate and develop their wastelands	0.821	0.784	0.811
8.	Support for protecting traditional skills and knowledge for conservation	0.708	0.790	0.759
9.	Conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential	0.721	0.715	0.727
10.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices	0.731	0.631	0.690
11.	Restriction on introduction of exotic species of animals without adequate investigations	0.763	0.630	0.706
12.	Discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation	0.728	0.623	0.687
13.	Taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand	0.821	0.713	0.769
14.	Reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority	0.742	0.814	0.785
15.	Development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation	0.721	0.715	0.727

Encouraging crop rotation patterns 0.704 were considered as a major factors contributed for climate resilience management.

Subsequently, inorganic fertilizer ,insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment(0.642), non-adoption of soil-conservation management practices leads to desertification of the agricultural land (0.640), efficient use of inputs including agro-chemicals with minimal degradation of environment (0.625), development and promotion of methods of sustainable farming, especially organic and natural farming (0.555), ensure that development projects are correctly sited so as to minimize their adverse environmental consequences (0.531), raising of green belts with pollution tolerant species can protect the natural resources (0.508) considered as a medium factors contributed for climate resilience management under the natural resource degradation management.

Least contributed factors were placed in following ordered like developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases (0.465), environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation (0.463), ensuring land for different uses based upon land capability and land productivity (0.449), prevent and control the future deterioration in land, water and air which constitute our life-support systems (0.388) and encouragement for improvement in traditional methods of rain water harvesting and storage (0.133) factors were contributed accordingly to the climate resilience management.

4.6.3.2 Contribution of Natural Resource Degradation Management for Climate Resilience Management in Rainfed situation

Major Contributed of management factors under natural resource management in rainfed situation for climate resilience management were consisting of 15 management aspects namely cost effective and efficient methods of water conservation and use (0.774) followed by steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements (0.710), encouraging crop rotation patterns (0.676), inorganic fertilizer, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment (0.665), efficient use of inputs including agro-chemicals with minimal degradation of environment 0.648 were contributed to the climate resilience management

Medium contributed factors such as sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment (0.609), non-adoption of soil-conservation management practices leads to desertification of the agricultural land (0.511), raising of green belts with pollution tolerant species can protect the natural resources (0.510), development and promotion of methods of sustainable farming, especially organic and natural farming (0.409) and developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases and environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation were share equal place (0.410) in ordered contributed to the climate resilience management.

Least contributed factors were ensure that development projects are correctly sited so as to minimize their adverse environmental consequences (0.393), prevent and control the future deterioration in land, water and air which constitute our life-support systems (0.260), ensuring land for different uses based upon land capability and land productivity (0.108), encouragement for improvement in traditional methods of rain water harvesting and storage (0.0051) management practices are the least contributor accordingly for climate resilience management.

4.6.3.3 Contribution of Natural Resource Degradation Management for Climate Resilience Management in Overall situation

Major contributors in pooled situation were cost effective and efficient methods of water conservation and use contributed interdependent variation (0.807) followed by steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements (0.717) which directly contributed to climate resilience management.

Medium contributed factors were encouraging crop rotation patterns(0.691), sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment (0.672), inorganic fertilizer

,insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment (0.666), efficient use of inputs including agro-chemicals with minimal degradation of environment (0.644), non-adoption of soil-conservation management practices leads to desertification of the agricultural land (0.585), developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases development and promotion of methods of sustainable farming, especially organic and natural farming (0.543) and raising of green belts with pollution tolerant species can protect the natural resources 0.531 in ordered under natural resources degradation management.

Least contributed factors were developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases(0.457), environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation (0.435), prevent and control the future deterioration in land, water and air which constitute our life-support systems(0.335) and encouragement for improvement in traditional methods of rain water harvesting and storage (0.074) were least contributors in natural resource degradation management for climate resilience management.

Contribution of management factors under natural resource degradation to the climate resilience management are cost effective and efficient methods of water conservation and use practices contribute more because water is major natural resource based on availability of water resource cropping pattern decided more ever scarcity of water can be reduce by adopting proper climate resilience practice like check dam, nala bund and contour farming practices subsequently Steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements for better management later Sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment is a major thing and avoid Inorganic fertilizer ,insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment are the major practices contributors in natural resource degradation management. The results are in acceptance with the Jayasree (2013) and Mahentesh (2015)

4.6.3.2.1 Contribution of Agricultural Resource / Non Agricultural Resource Management for Climate Resilience in Irrigated Situation

Major contributors under agricultural resource / non Agricultural resource management In irrigated situation were incentives for environmentally clean technologies, recycling and conservation of natural resources contributed interdependent variation (0.872) followed by development of integrated pest management and nutrient supply system (0.866), improvement in genetic variability of indigenous population (0.839), Improvement in genetic variability of indigenous population(0.838), concerted efforts for development and propagation of non-conventional renewable energy generation systems(0.836), a movement toward greater efficiency in resource use including recycling (0.829), protection and sustainable use of plant and animal genetic resources through appropriate laws and practices(0.821), organic farming is effective in increasing the texture and fertility of soil (0.815), afforestration on common lands by the local communities through government schemes (0.811), measures for increasing the efficiency of water-use, water conservation and recycling (0.770), restoration and protection of grazing lands (0.754), integrated pest management is a boon to reduce the chemical use for plant protection (0.739), setting up of biogas plants based on cow-dung and vegetable wastes (0.735), encouraging efficient utilization of forest produces 0.706 were play a important role in climate resilience management.

Medium contributed factors were integrated farming system is one of the best method to use the agricultural resource management (0.661) are the medium management factors contributed accordingly to the climate resilience management. and non of factors found least factors i.e., less than (0.500) category.

4.6.3.2.2 Contribution of Agricultural Resource / Non-Agricultural Resource Management for Climate Resilience in Rainfed Situation

Major contributors in rainfed situation were, improvement in genetic variability of indigenous population contributed interdependent variation (0.852) followed by incentives for environmentally clean technologies, recycling and conservation of natural resources (0.827), development of integrated pest management and nutrient supply system (0.811), concerted efforts for development and propagation of non-conventional renewable energy generation systems (0.800), protection and sustainable use of plant and animal genetic resources through appropriate laws and practices (0.787), organic farming is effective in increasing the texture and fertility of soil (0.785), a movement toward greater efficiency in resource use including recycling (0.783), afforestration on common lands by the local communities through government schemes (0.797), Improvement of infra-structural factors, which directly influences the climate resilience management.

Medium contributed factors were facilities such as water supply, sewerage, solid waste disposal, energy recovery systems(0.768), encouraging efficient utilization of forest produces (0.665), setting up of biogas plants based on cow-dung and vegetable wastes (0.566) and restoration and protection of grazing lands (0.549) in ordered under agricultural resource / Non -agricultural resource management

Least contributed factors were integrated pest management is a boon to reduce the chemical use for plant protection (0.467) and measures for increasing the efficiency of water-use, water conservation and recycling(0.458) are management least contributed factors accordingly to the climate resilience management.

4.6.3.2.3 Contribution of Agricultural Resource / Non Agricultural Resource Management for Climate Resilience in Overall Situation

Major Contributed factors in pooled situation were, incentives for environmentally clean technologies, recycling and conservation of natural resources contributed interdependent variation (0.850) followed by development of integrated pest management and nutrient supply system (0.846), improvement in genetic variability of indigenous population (0.845), concerted efforts for development and propagation of non-conventional renewable energy generation systems (0.820), protection and sustainable use of plant and animal genetic resources through appropriate laws and practices and improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems having (0.809) respectively, a movement toward greater efficiency in resource use including recycling (0.807),organic farming is effective in increasing the texture and fertility of soil (0.805), afforestration on common lands by the local communities through government schemes (0.799) factors directly influences the climate resilience management.

Medium contributed factors were Encouraging efficient utilization of forest produces (0.686), setting up of biogas plants based on cow-dung and vegetable wastes (0.662), restoration and protection of grazing lands (0.660), measures for increasing the efficiency of water-use, water conservation and recycling (0.626), integrated pest management is a boon to reduce the chemical use for plant protection (0.621) and integrated farming system is one of the best method to use the agricultural resource management (0.614) are the medium factors contributed accordingly to the climate resilience management. None of the factors found in least contributed factor category.

Major contributors under agricultural resource / non agricultural resource management to the climate resilience management practices are to provide Incentives for environmentally clean technologies, recycling and conservation of natural resources like zero budgeting farming and organic farming its encourage the farmers to adopt more number of farmers as a results better climate resilience management subsequently, development of integrated pest management and nutrient supply management to avoid use of exhaust use of chemical and non- organic fertilizers later improvement in genetic variability of indigenous population also manage vulnerability due to climate change and put concerted efforts for development and propagation of non-conventional renewable energy generation systems to avoid energy crisis are the major contributors in resource / non agricultural resource management. Results of Sowmya (2009) and Kowsalaya (2017) supported the findings.

4.6.3.3.1 Contribution of Environmental Protection management for Climate Resilience Management in Irrigated Situation

Major contributed factors in irrigated situation were willing to give up part of my profit for environmental conservation contributed interdependent variation (0.911) followed by climate resilience reduces environmental degradation (0.891), create environmental consciousness through education and mass awareness programmes (0.879), climate resilience efficient in mitigating climate change effects (0.873), environmental factors play an important role in climate change (0.851), inorganic fertilizers and pesticides cause long term harmful effects to the environment(0.829), less risk of pollution in climate resilience practices (0.810), crop cover may protect the soil climate(0.805), raising of green belts with pollution tolerant species(0.797), organic farming can improve soil fertility and soil structure(0.776), increasing temperature and variation in rain fall are the main indicators of environmental chang**e** and modify the cropping pattern (0.745), environmental change causes negative effect on people health and animals 0.722 contributed to climate resilience management

Subsequently medium contributed factors were pesticides and chemical fertilizers will reduce the number of soil micro organisms (0.655), climate change reduces mineral output to the environment (0.628) and practicing the afforestration activities helps in increasing environmental conditions (0.597) were contributed accordingly to climate resilience management. No factors comes under least contributed category.

4.6.3.3.2 Contribution of Environmental Protection management for Climate Resilience Management in Rainfed Situation

Major contributors in rainfed situation were willing to give up part of my profit for environmental conservation contributed interdependent variation (0.861) followed by create environmental consciousness through education and mass awareness programmes (0.800), climate resilience efficient in mitigating climate change effects and less risk of pollution in climate resilience practices having (0.785) respectively, environmental factors play an important role in climate change (0.778), climate resilience reduces environmental degradation (0.758), organic farming can improve soil fertility and soil structure and crop cover may protect the soil climate (0.747), inorganic fertilizers and pesticides cause long term harmful effects to the environment 0.725 directly influence climate resilience management

Subsequently, medium contributors were raising of green belts with pollution tolerant species (0.689), Environmental change causes negative effect on people health and animals (0.638), Increasing temperature and variation in rain fall are the main indicators of environmental chang**e** and modify the cropping pattern (0.637), Practicing the afforestration activities helps in increasing environmental conditions 0.511 in ordered under environmental protection management.

Least, contributors were pesticides and chemical fertilizers will reduce the number of soil micro organisms (0.479) and climate change reduces mineral output to the environment (0.468) practices are contributed accordingly to climate resilience management.

4.6.3.3.3 Contribution of Environmental Protection management for Climate Resilience Management in Overall Situation

Under environmental protection management in pooled situation major contributors were willing to give up part of my profit for environmental conservation contributed interdependent variation (0.889) followed by create environmental consciousness through education and mass awareness programmes (0.847), climate resilience reduces environmental degradation and climate resilience efficient in mitigating climate change effects having (0.823) respectively, environmental factors play an important role in climate change (0.817), less risk of pollution in climate resilience practices(0.793), Inorganic fertilizers and pesticides cause long term harmful effects to the environment (0.775),crop cover may protect the soil climate 0.772 contributed accordingly.

Subsequently, increasing temperature and variation in rain fall are the main indicators of environmental change and modify the cropping pattern (0.695), environmental change causes negative effect on people health and animals (0.687), pesticides and chemical fertilizers will reduce the number of soil micro organisms (0.585), practicing the afforestration activities helps in increasing environmental conditions (0.564) and climate change reduces mineral output to the environment 0.558 were medium factors influences climate resilience management.

Major contributors under environmental protection management to the climate resilience management practices are willing to give up part of my profit for environmental conservation is the main moto of group effort more than indusial its helps in proper management subsequently create environmental consciousness through education and mass awareness programmes in related to climate change and their impact for better management and also proper management climate resilience practices helps in efficiently mitigating climate change effects more ever Environmental factors play an important role in climate change and Inorganic fertilizers and pesticides cause long term harmful effects to the environment are the major contributors of environmental protection management. The finding of this study is supported by the results of study conducted by Shasidhar (2006) and Shankara (2010).

4.6.3.4.1 Contribution of Ecological Security Management for Climate Resilience Management in Irrigated Situation

Major contributors under ecological Security management in irrigated situation were, encouraging private individuals and institutions to regenerate and develop their wastelands and taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand had contributed interdependent variation (0.821) respectively, followed by restriction on introduction of exotic species of animals without adequate investigations (0.763), development and promotion of methods of sustainable farming, especially organic and natural farming (0.776), reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority (0.742), protection and sustainable use of plant and animal genetic resources through appropriate laws and practices (0.731), conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land and development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation having (0.721) respectively, Support for protecting traditional skills and knowledge for conservation of resources (0.708) factors were contributed accordingly to climate resilience management.

Subsequently, protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity (0.664), 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 (0.559), 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 (0.584) and development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology (0.522) practices were medium contributors accordingly to climate resilience management . None of the factors belonged to least contributed category.

4.6.3.4.2 Contribution of Ecological Security Management for Climate Resilience Management in Rainfed Situation

In rainfed situation major contributors were , reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority contributed interdependent variation (0.814) followed by support for protecting traditional skills and knowledge for conservation of resources (0.790), encouraging private individuals and institutions to regenerate and develop their wastelands (0.784), protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity (0.765) conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land and development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation having (0.715) respectively, taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand (0.713) and development and promotion of methods of sustainable farming, especially organic and natural farming (0.707) were influence the climate resilience management

Subsequently, 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 (0.635), concentrating on common property resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation (0.629), development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology (0.604) and 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 (0.501) practices are medium contributed accordingly to climate resilience management. No factor found less than (0.500) in least contributed category.

4.6.3.4.3 Contribution of Ecological Security Management for Climate Resilience Management in Overall Situation

In pooled situation major contributors were encouraging private individuals and institutions to regenerate and develop their wastelands contributed interdependent variation (0.811) followed by reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority (0.785), taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand (0.769), support for protecting traditional skills and knowledge for conservation of resources (0.759), development and promotion of methods of sustainable farming, especially organic and natural farming (0.743), Conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land and development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation having (0.727) respectively, protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity (0.720) and restriction on introduction of exotic species of animals without adequate investigations (0.706) contributed accordingly to climate resilience management.

Later, protection and sustainable use of plant and animal genetic resources through appropriate laws and practices(0.690), discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient (0.687), concentrating on common property resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation (0.634), 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 (0.621), development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology (0.576) and 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 (0.567) practices were contributed accordingly to climate resilience management.

Major contributors under ecological Security management to the climate resilience practice are encouraging private individuals and institutions to regenerate and develop their wastelands because cause more erosion directly influence the climate change subsequently, reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the priority in climate resilience management later support for protecting traditional skills and knowledge for conservation of resources through indigenous knowledge next is conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land and development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation are the major contributors of ecological security. The finding of this study is supported by the results of study conducted by Shankara (2010) and Jayasree (2013).

4.7 Documentation in Adoptability of Climate Resilient Practices in Response to Climate Change in Eastern Dry Zone

In order to cope up with the ill effects of climate change farmers are adopting new technologies to overcome the risks and uncertainties in the farming due to variations in the rainfall and temperature etc. As a documentation it is very important to take up the decisions in the policy making. The task of documentation was accomplished using a structured pre-tested schedule to know different adoptability of climate resilience practices to follow in mitigate ill effects of climate change. Thus, their practices and preference pertaining to adoptability of climate resilience practices was given like fully followed, followed, un decided, partially followed and not followed based on their preference practices were documented. These documentation of climate resilience practices were presented here under and results are presented in Table 22.

4.7.1 Documentation in Adoptability of Climate Resilient Practices in Response to Climate Change In Irrigated Situation

In Table-22 the results deals with the documentation in adoptability of climate resilient practices in response to climate change in irrigated Situation of majority of farmers fallowed drought tolerant varieties (Rank I), followed by intercropping (Rank II), pest and disease resistant varieties (Rank III), establishing wind breaks (Rank IV) and crop substitution Rank V were practices considered as a fully followed practices to mitigate the ill effect of climate change.

Subsequently, alteration in fertilizer/pesticide usage (Rank VI), alteration in sowing/ planting dates (Rank VII), organic farming practices (Rank VIII), Integrated farming system approach(Rank IX),and establishing soil& water conservation structures Rank X in ordered and those were considered as a followed practices to mitigate the ill effect of climate change.

Whereas, soil moisture conservation measures and Integrated nutrient management practices placed (Rank XI) respectively, use of organic manures (Rank XII), crop rotation(Rank XIII), micro irrigation systems (Rank XIV), farm pond (Rank XV), use of suitable breeds /varieties for climate, High yielding & drought resistant forage crops/varieties and soil test based fertilizer application placed (Rank XVI) respectively, integrated weed management practices, Measures towards disease resistance in animals and mulching placed Rank XVII in ordered and those practices were considered as a partially followed to mitigate the ill effect of climate change.

4.7.2 Documentation in Adoptability of Climate Resilient Practices in Response to Climate Change in Rainfed Situation

In Table-23, gave the picture on documentation in adoptability of climate resilient practices in response to climate change in rainfed Situation majority of farmers fallowed Intercropping (Rank I), followed by drought tolerant varieties (Rank II), pest and disease resistant varieties (Rank III), establishing wind breaks(Rank IV) and crop substitution Rank V practices were fully followed.

Subsequently, followed practices were alteration in sowing/ planting dates (Rank VI), organic farming practices (Rank VII), integrated farming system approach (Rank VIII), establishing soil& water conservation structures (Rank IX), and soil moisture conservation measures and integrated nutrient management practices placed Rank X in ordered.

Whereas, use of organic manures (Rank XI), crop rotation (Rank XII), crop Micro irrigation systems (Rank XIII), use of suitable breeds /varieties for climate and High yielding & drought resistant forage crops/varieties placed (Rank XIV) respectively, soil test based fertilizer application , integrated weed management practices, measures towards disease resistance in animals and farm pond placed (Rank XV) and mulching stood at Rank XVI practices were considered as a partially followed practices to mitigate the ill effects of climate change.

4.7.3 Documentation in Adoptability of Climate Resilient Practices in Response to Climate Change in Overall Situation

In Table-24, indicated the adoptability of climate resilient Practices in response to climate change in pooled Situation majority of farmers fully followed drought tolerant varieties (Rank I), followed by intercropping (Rank II), pest and disease resistant varieties (Rank III), establishing wind breaks (Rank IV), crop substitution Rank V were fully followed to mitigate the ill effects of climate change.

Practices with second level were alteration in fertilizer/pesticide usage (Rank VI), alteration in sowing/ planting dates (Rank VII), organic farming practices (Rank VIII), integrated farming system approach (Rank IX), use of organic manures at Rank X in ordered.

Whereas, establishing soil& water conservation structures (Rank XI), soil moisture conservation measures and Integrated nutrient management practices placed (Rank XII) respectively, crop rotation (Rank XIII), micro irrigation systems (Rank XIV), use of suitable breeds /varieties for climate, High yielding & drought resistant forage crops/varieties and farm pond placed (Rank XV) respectively, soil test based fertilizer

Table 22: Documentation adoptability of Climate Resilient Practices in Response to Climate change in Irrigated Situation of Eastern Dry Zone **(n_1=90)**

Sl. No.	Statement	Fully followed		Followed		Un decided		Partially not followed		Not followed		Rank
		Score	%	Score	%	Score	%	Score	%	Score	%	
1.	Pest and disease resistant varieties	11	12.23	40	44.45	0	0.00	15	16.66	24	26.66	III
2.	Drought tolerant varieties	24	26.66	33	36.66	0	0.00	11	12.23	22	24.45	I
3.	Intercropping	16	17.77	45	50.00	6	6.66	19	21.12	4	4.45	II
4.	Crop substitution	6	6.66	38	42.23	29	32.23	13	14.44	4	4.44	V
5.	Alteration in sowing/ planting dates	2	2.23	39	43.33	24	26.66	11	12.23	14	15.55	VII
6.	Integrated farming system approach	2	2.23	31	34.44	13	14.44	25	27.77	19	21.12	IX
7.	Organic farming practices	8	8.88	30	33.34	14	15.56	16	17.77	22	24.45	VIII
8.	Establishing wind breaks	9	10.00	38	42.23	12	13.34	5	5.55	26	28.88	IV
9.	Alteration in fertilizer/pesticide usage	9	10.00	33	36.66	14	15.55	3	3.34	31	34.45	VI
10.	Establishing soil& water conservation structures	10	11.12	20	22.22	14	15.55	12	13.34	34	37.77	X
11.	Micro irrigation systems	4	4.44	11	12.22	21	23.34	19	21.12	35	38.88	XIV
12.	Soil moisture conservation measures	9	10.00	16	17.77	14	15.56	18	20.00	33	36.66	XI
13.	Use of organic manures	9	10.00	15	16.67	19	21.12	14	15.55	33	36.67	XII
14.	Integrated nutrient management practices	9	10.00	16	17.78	18	20.00	14	15.56	33	36.66	XI
15.	Crop rotation	2	2.23	15	16.66	9	10.00	19	21.11	45	50.00	XIII
16.	Soil test based fertilizer application	2	2.23	10	11.12	8	8.88	21	23.33	49	54.44	XVI
17.	Integrated weed management practices	2	2.23	9	10.00	7	7.77	24	26.66	48	53.34	XVII
18.	Measures towards disease resistance in animals	2	2.23	9	10.00	9	10.00	23	25.55	47	52.22	XVII
19.	Use of suitable breeds/varieties for climate	3	3.34	9	10.00	8	8.89	23	25.55	47	52.22	XVI
20.	High yielding & drought resistant forage crops/	3	3.34	9	10.00	8	8.89	16	17.77	54	60.00	XVI
21.	Mulching	3	3.34	8	8.89	8	8.89	15	16.66	56	62.22	XVII
22.	Farm pond	4	4.44	9	10.00	4	4.44	14	15.56	59	65.56	XV

Table 23: Documentation of adoptability of Climate Resilience Practices in Response to Climate Change in Rainfed Situation of Eastern Dry Zone **(n_2=90)**

Sl. No.	Statement	Fully followed		Followed		Un decided		Partially not followed		Not followed		Rank
		Score	%	Score	%	Score	%	Score	%	Score	%	
1.	Pest and disease resistant varieties	9	10.00	40	44.45	0	0.00	17	18.88	24	26.67	III
2.	Drought tolerant varieties	21	23.34	34	37.77	0	0.00	13	14.45	22	24.44	II
3.	Intercropping	14	15.55	45	50.00	7	7.77	20	22.23	4	4.45	I
4.	Crop substitution	5	5.55	37	41.11	31	34.45	13	14.44	4	4.45	V
5.	Alteration in sowing/ planting dates	0	0.00	40	44.45	25	27.77	11	12.23	14	15.55	VI
6.	Integrated farming system approach	0	0.00	31	34.44	14	15.55	25	27.78	20	22.23	VIII
7.	Organic farming practices	8	8.88	27	30.00	16	17.78	17	18.89	22	24.45	VII
8.	Establishing wind breaks	9	10.00	36	40.00	13	14.45	6	6.67	26	28.88	IV
9.	Alteration in fertilizer/pesticide usage	9	10.00	31	34.45	15	16.66	4	4.45	31	34.44	VI
10.	Establishing soil & water conservation structures	9	10.00	18	20.00	15	16.67	13	14.45	35	38.88	IX
11.	Micro irrigation systems	2	2.22	8	8.88	23	25.55	20	22.00	37	41.11	XIII
12.	Soil moisture conservation measures	8	8.88	13	14.45	15	16.67	19	21.12	35	38.88	X
13.	Use of organic manures	8	8.88	12	13.34	20	22.23	15	16.67	35	38.88	XI
14.	Integrated nutrient management practices	8	8.88	13	14.45	19	21.12	15	16.67	35	38.88	X
15.	Crop rotation	0	0.00	12	13.33	10	11.11	20	22.23	48	53.33	XII
16.	Soil test based fertilizer application	0	0.00	8	8.89	8	8.89	22	24.45	52	57.77	XV
17.	Integrated weed management practices	0	0.00	8	8.89	8	8.89	24	26.67	50	55.55	XV
18.	Measures towards disease resistance in animals	0	0.00	8	8.89	9	10.00	24	26.66	49	54.45	XV
19.	Use of suitable breeds /varieties for climate	0	0.00	9	10.00	8	8.89	24	26.66	49	54.45	XIV
20.	High yielding & drought resistant forage crops	0	0.00	9	10.00	8	8.89	18	20.00	55	61.11	XIV
21.	Mulching	0	0.00	8	8.89	8	8.89	17	18.88	57	63.34	XVI
22.	Farm pond	1	1.11	8	8.89	4	4.44	16	17.78	61	67.78	XV

Table 24: Documentation of Adoptability Climate Resilience Practices in Response to Climate Change in Eastern Dry Zone

(N=180)

Sl. No.	Statement	Fully followed		Followed		Un decided		Partially not followed		Not followed		Rank
		Score	%	Score	%	Score	%	Score	%	Score	%	
1.	Pest and disease resistant varieties	20	11.12	80	44.45	0	0.00	32	17.77	48	26.66	III
2.	Drought tolerant varieties	45	25.00	67	37.22	0	0.00	24	13.33	44	24.45	I
3.	Intercropping	30	16.66	90	50.00	13	7.22	39	21.68	8	4.44	II
4.	Crop substitution	11	6.12	75	41.66	60	33.34	26	14.44	8	4.44	V
5.	Alteration in sowing/ planting dates	2	1.11	79	43.88	49	27.22	22	12.23	28	15.56	VII
6.	Integrated farming system approach	2	1.11	62	34.45	27	15.00	50	27.78	39	21.66	IX
7.	Organic farming practices	16	8.88	57	31.66	30	16.67	33	18.34	44	24.45	VIII
8.	Establishing wind breaks	18	10.00	74	41.12	25	13.88	11	6.12	52	28.88	IV
9.	Alteration in fertilizer usage	18	10.00	64	35.55	29	16.12	7	3.88	62	34.34	VI
10.	Establishing soil& water conservation structures	19	10.55	38	21.11	29	16.12	25	13.88	69	38.34	XI
11.	Micro irrigation systems	6	3.33	19	10.55	44	24.44	39	21.67	72	40.00	XIV
12.	Soil moisture conservation measures	17	9.44	29	16.12	29	16.12	37	20.55	68	37.77	XII
13.	Use of organic manures	17	9.44	27	15.00	39	21.67	29	16.12	68	37.77	X
14.	Integrated nutrient management practices	17	9.44	29	16.11	37	20.55	29	16.12	68	37.78	XII
15.	Crop rotation	2	1.11	27	15.00	19	10.55	39	21.67	93	51.67	XIII
16.	Soil test based fertilizer application	2	1.11	18	10.00	16	8.89	43	23.88	101	56.12	XVI
17.	Integrated weed management practices	2	1.11	17	9.44	15	8.34	48	26.66	98	54.45	XVII
18.	Measures towards disease resistance in animals	2	1.11	17	9.44	18	10.00	47	26.12	96	53.33	XVII
19.	Use of suitable breeds	3	1.66	18	10.00	16	8.89	47	26.12	96	53.33	XV
20.	High yielding & drought resistant forage crops	3	1.66	18	10.00	16	8.89	34	18.89	109	60.56	XV
21.	Mulching	4	2.23	15	8.33	16	8.88	32	17.78	113	62.78	XVIII
22.	Farm pond	5	2.77	17	9.44	8	4.45	30	16.67	120	66.67	XV

application (Rank XVI), integrated weed management practices and measures towards disease resistance in animals placed (Rank XVII) and mulching at Rank XVIII were considered as a partially followed practices to mitigate the ill effects of climate change.

Major findings in documentation of adoptability of climate resilience practices were drought tolerant varieties are placed prime because they manage drought effectively in un even distribution system and withstand crucial situations subsequently inter cropping play an important role soil moisture conservation and nutrient management acts as natural insurance guard in crop failure of subordinate crop next is adoption of pest and disease resistant varieties acts as safe guards in adverse situation because variation in climate factors pest and infections are more followed by adoption of alternative sowing and planting dates based distribution of rainfall and establishing wind breaks to avoid damage from wind and also maintain soil moisture in the field are the major practices documented. The results are in line with the studies of Balmatti (2000), Kumar (2009) and Vinay (2015).

4.8 Adoptability of Climate Resilience Practices Among Farmers

Adoptability of climate resilience practices scale was developed and it consists of 22 practices for determining the adoptability of climate resilience practices level. The response collected on a five point continuum, namely, fully followed, followed, un decided, partially followed and not followed with assigned score of 5, 4, 3, 2 and 1, respectively for positive statements. Thus, the minimum and maximum score one could get is 22 and 110, respectively. Higher the score indicates the high adoptability level of climate resilience practices level and lesser the score indicates low adoptability level. Based on that examination of the results in Table-25 indicates the adoptability of climate resilience practices in different situations of eastern dry zone.

4.8.1 Farmers based on Adoptability of Climate Resilience Practices in Different Agricultural Situations

In irrigated situation, 38.88 per cent of farmers belonged to low adoptability followed by 33.34 per cent had high and 27.78 per cent had medium adoptability of climate resilience practices. Likewise, in rainfed situation, 41.11per cent of farmers had medium adoptability of climate resilience practices followed by 32.22 per cent had low adoptability and 26.67 per cent had high adoptability of climate resilience practices.

In total majority (60.55%) of farmers had medium adoptability of climate resilience practices, followed by high (20.00%) and low (19.45%) adoptability.

Majority of farmers fell under medium to low adoptability of climate resilience practices category this might be due to the reason that , rainfall received was less and there was uneven distribution of rainfall in the study area It directly affects the adoption of improved technologies and lack of awareness on climate resilience practices are the major issue in study area. The study supported by Darling and Vasantha (2004) and Vinay and Umesh (2015).

4.8.2 Association of Adoptability of Climate Resilience Practices in Different Agricultural Situations

Chi-square test was applied to know the association of overall adoptability of climate resilience practices among the farmers under different situations which is 86.938** turn out to be significant at one per cent level indicating a significant variation in the overall adoptability of climate resilience practices among the farmers in different agricultural situations *viz.,* irrigated, rainfed and total. This could be due to adoptability resilience practices in different situations expected to provide opportunity for the farmers to meet their needs, develop new resilience practices with farmers to solve their problem which helps to get better adoption and further improvement in the standard of living in sustainable manner. The results of the study was match with findings of the Nitesh (2017) and Prabhu (2017).

4.8.3 ANOVA on Adoptability of Climate Resilience Practices Among Farmers in Different Situations in Eastern Dry Zone

As data was subjected to its significance by F- test, the results obtained were presented in Table 26. It showed that there was a significant difference (F- value 3.02*,P>0.05) in adoptability of climate resilience practices among farmers in different situations *viz.,* irrigated and rainfed Above trend could be adoptability climate resilience practices of farmers have immensely contributes to improve the agricultural situations The findings of the study is supported by Nitesh (2017).

Table 25: Farmers Based on Adoptability of Climate Resilience Practices in Different Agricultural Situations of Eastern Dry Zone and its Association

Adoptability	Agricultural situation					
	Irrigated(n_1=90)		Rainfed(n_2=90)		Total(N=180)	
	Number	Per cent	Number	Per cent	Number	Per cent
Low	35	38.88	29	32.22	35	19.45
Medium	25	27.78	37	41.11	109	60.55
High	30	33.34	24	26.67	36	20.00
	Mean=32.36 S.D=24.62		**Mean=30.32 S.D=14.34**		**Mean=31.32 S.D=26.82**	
Chi-square Value=86.938**						

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

Table 26: ANOVA on Adoptability of Climate Resilience Practices Among Farmers in Different Situations in Eastern Dry Zone

(N=180)

Adoptability	Sample size	Adoptability		'F' Value
		Mean	S.D	
Irrigation	**90**	**32.36**	**24.62**	**3.02***
Rainfed	**90**	**30.32**	**14.34**	
Total	**180**	**31.32**	**26.82**	

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

4.9 Association between Profile Characteristics and adoptability of Climate Resilience Practices of Farmers

The chi-square test was applied to know the nature of association between profile characteristics with adoptability of climate resilience practices followed by farmers in different agricultural situations *viz*., irrigated, rainfed, and overall situations and the outcomes obtained were as follows and results are presented in Table-27.

4.9.1 Association between Profile Characteristics and Adoptability of Climate Resilience Practices Followed in Irrigated Situation

In irrigated situation, profile characteristics like mass media exposure (27.304), economic motivation (23.986) age (23.524), awareness about diversification (21.578), distance to market (21.105), annual income (21.101), risk orientation(21.008), farm size (20.201), cosmopoliteness (18.872) and education (17.976) were found significant association at one per cent level. Other variables like *viz.*, extension contact (15.752), farming experience (13.618), scientific orientation (11.595), irrigation potential (10.584), innovative proneness(10.538) and organizational participation (10.155) were found to have positive and significant association at five per cent level. Whereas, farm mechanization level farm financial literacy, extent of natural capital, and dependency ratio were having non-significant associations with adoptability of climate resilience practices level of farmers.

4.9.2 Association between Profile Characteristics and Adoptability of Climate Resilience Practices Followed in Rainfed Situation

In rainfed situation, independent variables like education (36.589), age (33.172), mass media exposure (33.161), economic motivation (29.716), dependency ratio (24.380), farm size(22.67) and risk orientation (21.633) were found significant association at one per cent level. Among variables annual income (16.901) had leading which followed by scientific orientation (16.141), awareness about diversification (15.764), innovative proneness (15.400), farm experience (15.486), distance to market (10.549) and farm financial literacy (10.078) were found to have positive and significant association at five per cent level.

Table 27: Association between Profile Characteristics and Adoptability of Climate Resilience Practices Followed in Eastern Dry Zone

Sl. No.	Characteristic	Chi-square value		
		Irrigated (n_1=90)	Rainfed (n_2=90)	Total (N=180)
1.	Age	23.524**	33.172**	23.848**
2.	Education	17.976**	36.589**	7.202NS
3.	Dependency Ratio	6.398NS	24.380**	24.745**
4.	Farm Size	20.201**	22.67**	14.472*
5.	Farming Experience	13.618*	15.486*	5.457NS
6.	Annual Income	21.101**	16.901*	14.562*
7.	Economic Motivation	23.986**	29.716**	21.096**
8.	Mass Media Exposure	27.304**	33.161**	23.819**
9.	Risk Orientation	21.008**	21.633**	16.278*
10.	Scientific Orientation	11.595*	16.141*	15.659*
11.	Extension Contact	15.752*	5.006NS	7.704NS
12.	Cosmopoliteness	18.872**	6.208NS	10.732*
13.	Distance to Market	21.105**	10.549*	10.205*
14.	Awareness about Diversification	21.578**	15.764*	11.668*
15.	Extent of Natural Capital	9.077NS	1.606NS	4.410NS
16.	Innovative Proneness	10.538*	15.400*	6.491NS
17.	Farm Financial Literacy	9.096NS	10.078*	11.288*
18.	Irrigation Potential	10.584*	8.035NS	3.051NS
19.	Organizational Participation	10.155*	5.275NS	6.833NS
20.	Farm Mechanization Level	9.292NS	6.505NS	1.971NS

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

Similarly, irrigation potential, farm mechanization level, cosmopoliteness, organizational participation, extension contact and extent of natural capital were having non-significant association with adoptability of climate resilience practices level of farmers.

4.9.3 Association between Profile Characteristics and Adoptability of Climate Resilience Practices Followed in Overall Situation

In pooled situation variables like dependency ratio (24.745), age (23.848), mass media exposure (23.819) and economic motivation (21.096), were found significant association at one per cent level. Other variables like risk orientation (16.278) which followed by scientific orientation (15.659), annual income (14.562) farm size (14.472) , awareness about diversification (11.668) farm financial literacy (11.288), cosmopoliteness (10.732) and distance to market (10.205) were found significant association at five per cent level. whereas, extension contact, education, organizational participation, innovative proneness farming experience, extent of natural capital, irrigation potential and farm mechanization level were having non-significant association with adoptability of climate resilience practices level of farmers.

The possible reasons for the profile characteristics having significant association with adoptability of climate resilience practices are given in the following paragraphs

4.9.1.1 Age and Adoptability of Climate Resilience Practices

It was found that age had highly significant association in irrigated, rainfed and pooled situation with adaptation measures taken up by farmers to mitigate the ill effects of climate change. This means that, as increasing in the age level of respondents had directly influenced the adaptation of climate resilience practices based on previous experience. The study is confirmed with results of Shilpa (2010) and Preethi (2012).

4.9.1.2 Education and Adoptability of Climate Resilience Practices

Education was found that, in irrigated and rainfed situation had highly significant association with adoptability of climate resilience practices. Education enhances the thinking ability and influences the selection of alternative actions and judicious use of resources. The findings of the study are supported with the results reported by Anonymous, (2006), Mahatab (2010) and Vidyadhara (2015).

4.9.1.3 Dependency Ratio and Adoptability of Climate Resilience Practices

In two agricultural situations namely rainfed and overall situation dependency ratio had highly significant association with adoptability of climate resilience Practices. The likely reason might be by adopting climate resilience practices helps in engaging the non earning members on allied activities which helps in getting income on sustainable manner and reduce the burden on family.The results are in acceptance with the study of Mamathalakshmi (2013).

4.9.1.4 Farm Size and Adoptability of Climate Resilience Practices

Farm size of farmers of had highly significant association in irrigated and rainfed situation with adoptability of climate resilience practices. The possible reason might be farmers have accessibility of innovations and adopt them demands, strong financial position of the farmers needed, which is directly linked to the size of land holding of farmers. Normally the farmer with medium to larger holdings will have high income and intends to adopt innovations. This, findings were in accordance with the findings of Mahatab (2010) and Vidyadhara (2015).

4.9.1.5 Farming Experience and Adoptability of Climate Resilience Practices

In agricultural situations namely irrigated and rainfed situation had highly significant association with adoptability of climate resilience practices of farmers. Main reason for above results is number of years a farmers" is exposed to crisis situation provide a learning opportunity where an individual changes in behavior come about through practice and experience. Further, prior exposures help to evaluate the coping strategies, related to farm and also to choose the appropriate strategies to mitigate the ill effects of climate change. The results are in acceptance with the study of Maddison (2006).

4.9.1.6 Annual Income and Adoptability of Climate Resilience Practices

Annual income had significant association in all situations namely irrigated, rainfed and overall situation with adoptability of climate resilience practices of the farmers. Economic dimension is the major determinant of adoption of any process and to continue in it. Similarly in agriculture also if there is assured income from agriculture, farmers will have positive attitude and better adoption of climate resilience practices. The findings of the study are supported by the results reported by Johnson and Masters (2004) and Shilpa (2010).

4.9.1.7 Economic Motivation and Adoptability of Climate Resilience Practices

The economic motivation had highly significant association in irrigated, rainfed and overall situations with adoptability of climate resilience practices of farmers. The likely cause might be high economic motivation of farmers is an indicator of their higher economic capability to invest on productive purposes. The results are in acceptance with the study of Nhemachena and Hassan (2007) Mamathalakshmi (2013).

4.9.1.8 Mass Media Exposure and Adoptability of Climate Resilience Practices

The mass media exposure had highly significant association in irrigated, rainfed and overall situation with adoptability of climate resilience practices. The probable reason for this may be that in mass media often there will be krishi programs, talks on agriculture and market forecast providing information and opportunities which help beneficiaries to get a clear cut picture about the prevailing conditions as well as future outlook for various practices aspects. The findings of the study are supported by the results of Sudha (2016) and Nitesh (2017).

4.9.1.9 Risk Orientation and Adoptability of Climate Resilience Practices

The results inferred that there is positive highly significant in irrigated and rainfed situation with adoptability of climate resilience practices. In this context, risk orientation is the quality of any individual to excel their activity which might have influenced the ability to take up different measures to overcome from the risk and to have better adoption of climate resilience practices. These findings are in line with the results of Shilpa (2010).

4.9.1.10 Scientific Orientation and Adoptability of Climate Resilience Practices

In all situations namely irrigated, rainfed and total had significant association with climate resilience practices. The plausible reason might be that, farmers with scientific orientation could be more receptive to the latest technologies, employ scientific methods in making the decisions as well as, acquired and adopt efficient factors of management of agricultural activities. The findings of the study are supported by the studies results of Preethi (2012).

4.9.1.11 Extension Contact and Adoptability of Climate Resilience Practices

Extension contact in irrigated situation showed significant association where as rainfed and overall situation showed non-significant relation with adoptability of climate resilience practices of farmers. Probable reason for this is extension contact faster clear understanding of the farmers position, alert him to changes occurring and promoting informed decision making. Also, provide facts and probabilities to sound decision making. Further, extension guidance of development departments would also help farmers to explore the development opportunities available from different programmes. The findings of the study are supported by Nhemachenad and Hassan (2007) in their study.

4.9.1.12 Cosmopoliteness and Adoptability of Climate Resilience Practices

Cosmopoliteness in irrigated situation had highly significant association whereas overall showed significant subsequently, rainfed showed non-significant association with adoptability of climate resilience. It is well accepted that cosmpoliteness of farmer increases his contact with outside world where an individual will be exposed to new ideas and experiences of a variety of people. This interaction provide him a benefit of vicarious experience thereby decision making ability and application of new ideas by the individuals will be efficient leading to higher management of crisis. Also, the cosmopoliteness help to expose him to developmental opportunities like credit or government subsidy programmes to undertake suitable permanent measures. The results of the present study are in conformity with the findings of Sudha (2016), and Mamathalakshmi (2013).

4.9.1.13 Distance to Market and Adoptability of Climate Resilience Practices

Distance to market in all the three agricultural situations namely rainfed, irrigated and total situation farmers had significant association with adoptability of climate resilience practices of farmers. Market access directly related to distance to market. Specific market distance helps in profit maximization through growing perishable products where as far market distance reduce the profit but can be over by adopting high-technology like storage etc,. The findings of the study are supported with the results reported by Mamathalakshmi (2009).

4.9.1.14 Awareness about Diversification and Adoptability of Climate Resilience Practices

Awareness about diversification in all situations like irrigated, rainfed and overall situation had significant association with adoptability of climate resilience practices. Awareness about diversification help to evaluate the coping strategies, related to farm activities and also to choose the appropriate strategies to mitigate the ill effects of climate change.Results are in compliance with the results of Kale *et al.,*(2012).

4.9.1.15 Extent of Natural Capital and Adoptability of Climate Resilience Practices

Extent of natural capital in all the three agricultural situations namely, irrigated, rainfed and overall situation farmers had non significant association with adoptability of climate resilience practices. The probable reason may be that the natural capital/ farm resources are slowly deteriorating due to climate change in next few years they may start deteriorating at the faster rate. The findings of the study are supported by the results obtained by Deressa *et al.*, (2011).

4.9.1.16 Innovative Proneness and Adoptability of Climate Resilience Practices

Innovative proneness showed significant association with adoptability of climate resilience practices of farmers in different situations like irrigated and rainfed situation, whereas overall situation showed non-significant association. The feasible reason might be innovative proneness is a cognitive aspect of change, which affects the readiness of an individual to accept new technology. Further, majority of the respondents from irrigated and pooled situations would like to achieve higher returns by adopting the innovations intensively related to climate resilience practices.The findings of the study are supported by the results found by Vidyadhara (2015).

4.9.1.17 Farm Financial Literacy and Adoptability of Climate Resilience Practices

Farm financial literacy had significant association with adoptability of climate resilience practices in rainfed and overall situation, where as irrigated situation showed non-significant association. Farm financial literacy helps an individual to maintain records, estimate input-output relationship and become aware of the market prices and others, which contribute for achieving higher level of adoptability of climate resilience practices. The findings of the study are supported with the results of Nhemachena and Hassan (2007).

4.9.1.18 Irrigation Potential and Adoptability of Climate Resilience Practices

Irrigation potential in irrigated situation had significant association where rainfed and overall situations had non-significant association with adoptability of climate resilience practices. The factors of irrigation facility contribute for adoptability of climate resilience practices. This decided the cropping pattern. Therefore, farmers follow the systematic procedure to make decisions while selecting crop enterprises to be tried in the irrigated as well as rainfed situations. Where as in rainfed situations irregular rains affecting agricultural crops, but farmers owning bore wells or tanked lands intensity their efforts on irrigated lands to make good of probable loss in the dry lands. So, it is logical that irrigation situation significantly associated with adoptability of climate resilience practices. The findings of the study are supported by Lalitha (2016) in their study.

4.9.1.19 Organizational Participation and Adoptability of Climate Resilience Practices

In irrigated situation showed significant association whereas rainfed and pooled situation showed non-significant association with adoptability of climate resilience practices. The person who is participating in different rural organizations can perceive the trends of climate change more effectively and try to acquire relevant technologies. Its helpful in adoptability of climate resilience practices. This study is in conformity with the results reported by Vidyadhara (2015).

4.9.1.20 Farm Mechanization Level and Adoptability of Climate Practices

Farm mechanization in all situations namely irrigated, rainfed and pooled situation had non- significant association with adoptability of climate resilience practices. Probable reason is Majority of farmers are marginal and small farmers in study area they can't offer more cost for mechanization. The findings of the study are in line with the results of Shankara (2010).

4.10 Relationship between Profile Characteristics and Adoptability of Climate Resilience Practices

It is evident from the Table 28 that, the correlation test was carried out to identify the type of relationship between profile characteristics with adoptability of climate resilience practices in different agricultural situations *viz*., irrigated, rainfed and total and the results gained were presented in following manner.

4.10.1 Relationship between Profile Characteristics and Adoptability of Climate Resilience Practices Followed in Irrigated Situation

In irrigated situation, profile characteristics such as education (0.322), organizational participation (-0.275), annual income (0.255), risk orientation (-0.235) and innovative proneness (0.191), were found to be significant relationship with adoptability climate resilience practices at one per cent level. Whereas, awareness about diversification (-0.187),extension contact (-0.186), cosmopoliteness (0.183), farming experience (0.171) farm mechanization level (0.171),mass media exposure (0.169) scientific orientation (0.130) , irrigation potential (-0.129) and economic motivation (0.120) were found to be significant relationship with adoptability of climate resilience practices at five per cent level. Other variables such as distance to market, age, farm financial literacy, farm size dependency ratio, and extent of natural capital had non-significant relationship with climate resilience practices.

4.10.2 Relationship between Profile Characteristics and Adoptability of Climate Resilience Practices Followed in Rainfed Situation

In rainfed situation, the profile characteristics like cosmopoliteness (-0.276) followed by organizational participation (0.218) education (-0.212), awareness about diversification (0.196) and risk orientation (0.193), were found to be significant relationship with adoptability of climate resilience practices at one per cent level. Other variables such as innovative proneness (0.186), scientific orientation (-0.182), dependency ratio (-0.171), farming experience (0.162), economic motivation (-0.145) and mass media exposure (0.144) were found to be significant relationship with adoptability of climate resilience practices at five per cent level. Other variables like, annual income, extent of natural capital, irrigation potential, distance to market, extension contact, farm size and farm financial literacy, farm mechanization level, and age had non-significant relationship with adoptability of climate resilience practices.

4.10.3 Relationship between Profile Characteristics and Adoptability of Climate Resilience Practices followed in overall Situation

In overall situation profile characteristics such as education (0.234) risk orientation (0.223), extension contact and organizational participation have similar level of relationship (-0.192) at 1 per cent level. Whereas, farming experience (0.175), scientific orientation (0.171), mass media exposure (-0.160) dependency ratio(-0.157), innovative proneness (-0.155), cosmopoliteness (0.143) and awareness about diversification (-0.141) had found significant relationship with adoptability of climate resilience practices at five per cent level. While economic motivation, ,irrigation potential, farm size, distance to market, annual income, age, farm mechanization level and extent of natural capital had non-significant relationship with adoptability of climate resilience practices.

The possible reasons for the independent variables having significant relationship with adoptability of climate resilience practices are given in following paragraphs

Table 28: Relationship between Profile Characteristics and Adoptability of Climate Resilience Practices Followed in Eastern Dry Zone

Sl. No.	Characteristic	Correlation Coefficient (r)		
		Irrigated (n_{1}= 90)	Rainfed (n_{2}=90)	Total (N=180)
1.	Age	-0.075NS	-0.003NS	-0.037NS
2.	Education	0.322**	-0.212**	0.234**
3.	Dependency Ratio	0.047NS	-0.171*	-0.157*
4.	Farm Size	0.066NS	-0.071NS	-0.058NS
5.	Farming Experience	0.171*	0.162*	0.175*
6.	Annual Income	0.255**	-0.092NS	-0.049NS
7.	Economic Motivation	0.120*	-0.145*	-0.118NS
8.	Mass Media Exposure	0.169*	0.144*	-0.160*
9.	Risk Orientation	-0.235**	0.193**	-0.223**
10.	Scientific Orientation	0.130*	-0.182*	0.171*
11.	Extension Contact	-0.186*	0.080NS	-0.192**
12.	Cosmopoliteness	0.183*	-0.276**	0.143*
13.	Distance to Market	-0.093NS	0.085NS	0.050NS
14.	Awareness about Diversification	-0.187*	0.196**	-0.141*
15.	Extent of Natural Capital	0.07NS	-0.090NS	-0.005NS
16.	Innovative Proneness	-0.191**	0.186*	-0.155*
17.	Farm Financial Literacy	-0.072NS	-0.071NS	0.023NS
18.	Irrigation Potential	-0.129*	0.088NS	-0.096NS
19.	Organizational Participation	-0.275**	0.218**	-0.192**
20.	Farm Mechanization Level	0.171*	-0.040NS	0.027NS

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

4.10.1.1 Age and Adoptability of Climate Resilience Practices

It was found that age had non-significant relationship with adaptation measures taken up by farmers to mitigate the ill effects of climate change. The result implies that age is an uncontrolled biological factor. During aging process how an individual moulds his actions by engaging himself with physical and social environments around him is important for any consequential changes observed among the individuals. Some persons achieve certain things as age advance against others who complete their tenure of life without any productive achievements. Therefore, age itself many times do not contribute significantly for individual actions and attainments, although it provides foundation for other personality characters to be erected on it. Also, the assumption of aging corresponds to improved level of experience and skills due to increased interaction are questionable. In view of modernization of social systems the attainment or acquisition of something which would have taken several years in the past, require a few years now. As a consequent of this causal influence of farmers age on adoptability of climate resilience practices is not very prominent. This results of the study is in conformity with results of Shiferaw and Holden (1998), and Shasidhara (2006).

4.10.1.2 Education and Adoptability of Climate Resilience Practices

Education was found to have positive and highly significant relationship at one per cent level with adoptability of climate resilience practices of farmers in all situation viz. irrigated, rainfed and overall situation. Education is a basic element for human development. Education was found to have significant influence on rational decision making by farmers. Also, it was reported that education had higher pay off in a technological dynamic economy where the scope for exercise of discretionary abilities, adaptability of climate resilience practices and decision making ability were higher. The results are in acceptance with the results of Ravindra (2012).

4.10.1.3 Dependency Ratio and Adoptability of Climate Resilience Practices

In two agricultural situations namely rainfed and also in overall situation dependency ratio had negative significant relationship with adoptability of climate resilience practices of farmers. Dependents are those who do not earn for their living. The number of dependents in a family increases the number of mouths to be fed by the farmers. This forced situation obviously, makes a farmer under economic pressure to nurse these dependents. Also, if the dependents are perusing studies, farmer has to meet their food and economic needs arriving from schooling. Whereas, with respect to old age dependents he has to satisfy their food and ill-health induced economic needs. Therefore, the farmers have to sort out the ways and means of raising his family agricultural production and income. This results are in conformity with the results of the study conducted by Jayasree (2013).

4.10.1.4 Farm Size and Adoptability of Climate Resilience Practices

Farm size of farmers of had non-significant relationship with adoptability of climate resilience practices in all situations like irrigated, rainfed and overall adoptability of climate resilience practices irrespective of their farm size. More ever and small size might be easier to employ the latest technologies/ climate resilience practices rather than big size. The results are in acceptance with the study of Somshekar (2010).

4.10.1.5 Farming Experience and Adoptability of Climate Resilience Practices

In agricultural situations namely irrigated, rainfed and overall situation farming experience had significant relationship with adoptability of climate resilience practices. Higher the experience of farmers in farming, it is quite natural that the farmers might have exposed to various climatic aberration situation over a period of time. Hence, respondents with higher farming experience might have understood the climate change over a period in a greater extent. This study is in conformity with the results of Shankara (2010).

4.10.1.6 Annual Income and Adoptability of Climate Resilience Practices

Annual income had highly significant in irrigated situation where as in rainfed and overall situation annual income had non-significant relationship with adoptability of climate resilience practices of farmers. The reason may be that income of the family is most important factor in fulfilling individual and or family needs. The annual income of the respondents directly influences the economic viability, stability and rational behaviour of an individual and hence the increase in the income levels increases the adoptability of climate resilience management. Where as in rainfed situation contradictory results obtained to due to limitation of resources. The results are in line with the studies of Shalini (2017).

4.10.1.7 Economic Motivation and Adoptability of Climate Resilience Practices

The economic motivation had significant at relationship with adoptability of climate resilience practices of farmers in irrigated and rainfed situation. In general, economic motivation is the basic character upon which other motives, drives and other attributes are built. It is psychological conditions an individual to orient himself to achieve higher income. One could set higher level of economic motivation. When one develops higher levels of economic motivation and to achieve it, he could strive hard and get internalize him about different aspects of adoptability of climate resilience pratices besides aiming profit maximization. Hence, it is quite natural to expect the significant relationship.. This study is in conformity with Annand (2007).

4.10.1.8 Mass Media Exposure and Adoptability of Climate Resilience Practices

The results found that there is significant relationship between mass media exposure and adoptability of climate resilience of farmers in all situations like irrigated, rainfed and overall situation. The reason is that the higher levels of exposure to mass media would facilitate the farmers to develop the habits of gathering more information about new practices through radio, television, newspaper and other literature related to climate change. Further, farmers had better mass media exposure, which provided them better opportunity to get new technologies thus farmers would like to take positive steps towards adoptability of climate resilience practices, which in turn may have helped the farmers to maximize profit. The findings of the study are supported by Mamathalakshmi (2013) and Shasidhara (2006).

4.10.1.9 Risk orientation and Adoptability of Climate Resilience Practices

The results inferred that there is positive highly significant in all situations like irrigated, rainfed and overall situation with adoptability of climate resilience practices. This may be because higher the risk taking ability of the farmers able to adoptability of climate resilience practices. It helps to overcome from the risk and to have better adoptability climate resilience practices. These findings are in the line with the results of Shankara (2010) and Ravindra (2012).

4.10.1.10 Scientific Orientation and Adoptability of Climate Resilience Practices

In agricultural situations namely irrigated, rainfed and overall situation scientific orientation had significant relationship with adoptability of climate resilience practices of farmers. It may be due to the reason that high scientific orientation might have helped the farmers to enhance their knowledge subsequently, increasing the adoptability of climate resilience practices. The findings of the study are supported by the results of Pandya and Vekeria (1994),

4.10.1.11 Extension Contact and Adoptability of Climate Resilience Practices

Extension contact in the two agricultural situations namely irrigated and overall situation farmers had negative and significant relationship with adoptability of climate resilience practices of farmers. Whereas, rainfed showed non-significant relationship. Probable reason for this extension contact would help to provide the opportunities for contrived experiences and serve as reinforcement in gaining knowledge about agricultural innovations leading to quick decision to adopt innovations.. The results are in line with the studies of Shalini (2017).

4.10.1.12 Cosmopoliteness and Adoptability of Climate Resilience Practices

Cosmopoliteness in irrigated and pooled situation had significant relationship where as in rainfed situation shows higly significant relation with adoptability of climate resilience practices. Possible reason is cosmopolite ness makes individuals to deviate from village norms by way of travel to city, by contact with change agents and opportunity to expose to modern agricultural world. By virtue of cosmopolite ness, individuals are exposed to many channels of communication, including some of the effective interpersonal relations with officials of development departments. Higher cosmopolite ness might have prompted them to be considered as progressive by others in the social system.The results of the present study are in conformity with the findings of Mahatab (2010).

4.10.1.13 Distance to Market and Adoptability of Climate Resilience Practices

Distance to market In all the three agricultural situations namely, irrigated, rainfed and total farmers had non-significant relationship with adoptability of climate resilience practices of farmers. Probable reason is distance of market can't influence climate resilience adoptability. As a market distance increases the cost of transportation increases it directly influence the cost of production it directly affects adoptability of climate resilience practices because majority of respondents were small and marginal farmers they can't offered high production cost. The results of the present study are in conformity with the findings of Mamathalaxmi (2013).

4.10.1.14 Awareness about Diversification and Adoptability of Climate Resilience Practices

Awareness about diversification in irrigated and pooled situation had significant relation with adoptability of climate resilience practices. Awareness about diversification help at the grassroots level of local communities to manage better the adverse impact of climate change and adoptability of climate resilience practices. The results are in compliance with the results reported by Vinay and Umesh (2015).

4.10.1.15 Extent of Natural Capital and Adoptability of Climate Resilience Practices

Extent of natural capital in all the three agricultural situations namely rainfed, irrigated and overall situation farmers had non-significant relationship with adoptability of climate resilience t practices. Majority of farmers openined that extent of natural capital decrease. The possible reasons would be due to the fact that the variation in the climate and degradation of natural resources, the farmers are constraining to go for low level of adoptability of climate resilience practices. The results are in acceptance with the studies of Jayasree (2013).

4.10.1.16 Innovative Proneness and Adoptability of Climate Resilience Practices

Innovative proneness had significant relationship with climate resilience practices of farmers in different situations like irrigated, rainfed and overall situation. Innovative proneness play an important role in acquiring knowledge of sustainable cultivation practices. This implies that farmers who had favourable orientation towards adoptability of climate resilience practices and also helps higher profit making and achieve higher levels of satisfaction. The results are in acceptance with the study of Vinay (2015).

4.10.1.17 Farm financial literacy and Adoptability of Climate Resilience Practices

Farm financial literacy had non-significant relationship with adoptability of climate resilience practices in irrigated, rainfed and overall situation. The probable reason for this might be low annual income, mismatch between expenditure and return, and high cost of cultivation.The results are in line with the studies of Shankara (2010).

4.10.1.18 Irrigation Potential and Adoptability of Climate Resilience Practices

Irrigation in all the three agricultural situations namely rainfed and overall situation farmers had non-significant relationship where as in irrigated situation showed significant relation with climate resilience practices. Since the study area was dry land the availability of water for agriculture was deficit so restrict the adoptability of climate resilience practices. The results are in line with the studies of Mahatab (2010).

4.10.1.19 Organizational Participation and Adoptability of Climate Resilience Practices

Organizational participation in irrigated, rainfed and overall situation had highly significant relationship with adoptability of climate resilience practices with adoptability of climate resilience practices. Organizational participation would help farmers to undertake crisis mitigating strategies of long run or short run nature. Further, extension guidance of development departments would also help farmers to explore the development opportunities available from different programmes. It directly helps the adoptability of climate resilience practices. This study is in conformity with Sowmya (2009).

4.10.1.20 Farm mechanization level and Adoptability of climate resilience practices

Farm mechanization in irrigated situation showed significant relation whereas in rainfed and overall situation shows non-significant relationship with adoptability of climate resilience practices. Probable reason that rainfed farming is less economic compared to the irrigated farming. Majority of the farmers in rainfed area belonged to small and marginal group and not economical to them to posses high cost implements and machineries, barrowing them play a major role in the study area. The results are in line with the study of Shankara (2010).

4.11 Contribution for Adoptability of Climate Resilience Factors to Profile Characteristics

The factors which contribute to the variation in adoptability in climate resilience factors among the farmers has been analysed using "Principal Component Analysis" separately for irrigated, rainfed and pooled situations. This was done in order to identify the various groups of factors, which operate together, and have a bearing on the adoptability of climate resilience practices of the farmers. The results are presented in this section.

4.11.1 Contribution of Adoptability of Climate Resilience Factors to Profile Characteristics in Irrigated Situation

In irrigated situation the Table-29 gives the eigen values, percentage, variation and cumulative variation of the factors. Adaptability of climate resilience factors of farmers is focused here. The first factor contributed approximate 40.469 per cent of total variation of 22 factors, 8th factor account for cause more than 75 per cent of the variation.

It is possible to obtained the zero order correlation co-efficient between adoptability of climate resilience practices and variables from the co-efficient of eigen vectors. This correlation is the square of the co-efficients associated with factors in the vector. If can be observed from the Table 30,that only 1, 2,9,8,3,7,6 and 5 factors contributed the maximum variation in adoptability of climate resilience factors in irrigated situation.

While examining the practices wise contribution in Table-31 it was noticed that the adoptability of climate resilience factor 1 in irrigated situation displayed strong association with variables such as education, economic motivation, extension contact, distance to market and organizational participation. but negative sign of the co- efficient farm size (-0.322) and farming experience (-0.466) indicated an inverse association with the factors.

Table 29: Contribution in Adoptability of Climate Resilience Practices for Interdependent Variation in Climate Resilience Practices in Eastern Dry Zone

Factor	Irrigated (n_1=90)			Rainfed (n_2=90)			Total (N=180)		
	Eigen Values	**% of Variance**	**Cumulative %**	**Eigen Values**	**% of Variance**	**Cumulative %**	**Eigen values**	**% of Variance**	**Cumulative %**
1.	4.400	20.951	20.951	5.646	26.886	26.886	4.865	23.168	23.168
2.	2.957	14.081	35.032	3.743	17.822	44.708	2.881	13.718	36.886
3.	2.286	10.887	45.919	2.544	12.112	56.821	2.548	12.135	49.021
4.	2.022	9.628	55.547	2.461	11.720	68.541	1.816	8.647	57.668
5.	1.599	7.614	63.161	1.550	7.383	75.924	1.378	6.564	64.231
6.	1.367	6.511	69.673	1.225	5.833	81.757	1.214	5.783	70.014
7.	1.224	5.830	75.503	0.968	4.611	86.368	1.078	5.131	75.145
8.	1.094	5.209	80.711	0.734	3.495	89.863	0.907	4.319	79.464
9-22.			100.00			100.00			100.00
Extraction Method: Principal Component Analysis.									

Table 30: Variation in Adoptability of Climate Resilience Practices Broken down Into Characteristics in Eastern Dry Zone

Factors	**Irrigated (n_1=90)**			**Rainfed (n_2=90)**			**Total (N=180)**		
	Eigen roots	Zero order correlation co efficient with resilience adoptability level	Cumulative variation	Eigen roots	Zero order correlation co efficient with resilience adoptability Level	Cumulative variation	Eigen roots	Zero order correlation co efficient with resilience adoptability level	Cumulative variation
1.	2.098	2.011	40.469	2.376	1.979	39.147	2.206	2.231	49.786
2.	1.719	1.031	10.634	1.935	0.994	9.870	1.697	1.038	10.788
3.	1.512	0.515	2.657	1.595	0.3601	1.299	1.596	0.695	4.830
4.	1.422	0.238	0.569	1.569	0.1623	0.263	1.347	0.202	0.410
5.	1.264	-0.096	0.094	1.245	-0.293	0.858	1.174	-0.112	0.126
6.	1.169	-0.313	0.980	1.107	-0.500	2.508	1.102	-0.278	0.776
7.	1.106	-0.471	2.223	0.983	-0.665	4.424	1.038	-0.421	1.780
8.	1.045	-0.614	3.775	0.857	-0.804	6.477	0.952	-0.570	3.253
9.	0.898	-0.824	6.794	2.376	-1.230	15.154	0.898	-0.676	4.576

Extraction Method: Principal Component Analysis

Table 31: Contribution in Proportion of Variation in Inter Dependent Factors and Profile Characteristics Explaining the Significance on the Climate Resilience Different Situations

Sl. No.	Characteristic	Irrigated (n_1=90)								Rainfed (n_2=90)					
		Adoptability Factor								Adoptability Factor					
		1	2	9	8	3	7	6	5	1	9	3	8	7	6
1.	Age							0.891				-0.376		-0.793	
2.	Education	0.808								0.809				.390	
3.	Dependency Ratio				-0.312	0.686	-0.325			0.605	-0.376				0.312
4.	Farm Size	-0.322			0.665							0.867			
5.	Farming Experience	0-.466						0.721		-0.487				-0.724	0.319
6.	Annual Income						0.808			0.320			0.356		
7.	Economic Motivation	0.504		0.415						0.777	0.323				0.332
8.	Mass media Exposure					0.890							0.825		
9.	Risk Orientation			0.596		0.544	0.301						0.883		
10.	Scientific Orientation		0.452	0.688								0.313	0.425		0.690
11.	Extension Contact	0.903								0.919					
12.	Cosmopoliteness			0.910							0.946				
13.	Distance to market	0.332	-0.711								0.946				
14.	Awareness about Diversification								0.938		0.487			0.467	0.451
15.	Extent of Natural Capital				0.915							0.882			
16.	Innovative Proneness				-0.803	0.331						-0.584	0.539		
17.	Farm Financial Literacy		-0.467	0.559			0.383								0.783
18.	Irrigation Potential		0.832								-0.804				
19.	Organizational Participation	0.905								0.925					
20.	Farm Mechanization Level	0.387	0.746							0.438	-0.385	0.685			
	Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.														

The next important adoptability factor is 2 where, adoptability of climate resilience practices is strongly associated with profile characteristics such as scientific orientation, irrigation potential and farm mechanization level. But negative sign of the co- efficient distance to market (-0.711) and farm financial literacy (-0.467) indicated an inverse association with the adoptability factor.

In factor 9, which is by far more important factor in analysis adoptability of climate resilience facor is positively associated with profile characteristics like economic motivation, risk orientation, scientific orientation, cosmopoliteness and farm financial literacy. Whereas, Farm size and extent of natural capital had displayed strong association with factor 8, but negative sign of the co- efficient dependency ratio (-0.312) and innovative proneness (-0.803) indicated an inverse association with the adoptability of climate resilience practices.

The facor 3, which also important in analysis in adoptability of climate resilience facor which is positively associated with farm size and farming experience. Whereas in factor 7, display positive association with annual income, risk orientation, and financial literacy but negative sign of the co- efficient dependency ratio (-0.305) indicated an inverse association with the adoptability of climate resilience factor. Whereas, factor 6 strongly associate with age and farming experience later, factor 5 associated with farming experience.

Major findings are the first adoptability factor contributed 40.469 per cent of total variation of 22 factors, 8^{th} factor account for cause more than 75 per cent of the variation. While examining the variation by factors, it was observed that adoptability of climate resilience facors in irrigated situation is directly related to variables such as education, economic motivation, extension contact, distance to market and organizational participation. The finding of this study is supported by the results of study conducted by Preethi (2015) and Yashodhara (2015).

4.11.2 Contribution of Adoptability Climate Resilience factors to Profile Characteristics for in Rainfed Situation

In rainfed situation the Table-29 gives the eigen values, per cent, variation and cumulative variation of the factor. Adoptability of climate resilience factors of farmers is focused here. The first factor contributed approximate 39.147 per cent of total variation of 22 factors ,6 th factor account for cause more than 75 per cent of the variation.

It is possible to obtained the zero order correlation co-efficient between adoptability of climate resilience factors and variables from the co-efficient of eigen vectors. This correlation is the square of the co-efficients associated with factors in the vector. If can be observed from the Table -30 that only 1,9,3,8,7 and 6 facors contributed the maximum variation in adoptability of climate resilience factors in rainfed situation.

While examining the factor wise contribution in Table-31 it was noticed that, The adoptability of climate resilience factor one in rainfed situation displayed strong association with profile characteristics such as education, dependency ratio, annual income, economic motivation, extension, organizational participation and farm mechanization level. But negative sign of the co- efficient farming experience (-0.487) indicated an inverse association with adoptability

The next important factor is 9, where adoptability of climate resilience factor is strongly associated with variables such as Economic motivation, cosmopoliteness, distance to market, awareness about diversification. But negative sign of the co- efficient dependency ratio (-0.376), irrigation potential (-0.804) and farm mechanization level (-0.385) indicated an inverse association with the adoptability of climate resilience factor..

factor 3, displayed strong association with variables such as , farm size, scientific orientation, extent of natural capital and farm mechanization level. But negative sign of the co- efficient age (-0.376) and innovative proneness (-0.584) indicated an inverse association with the adoptability of climate resilience factor. Whereas, factor 8 display strongly associated with profile characteristics such as annual income, mass media exposure, risk orientation, scientific orientation and innovative proneness.

factor 7, display association with dependency ratio, cosmopoliteness and awareness about diversification but negative sign of the co- efficient age (-0.793) and farming experience (-0.724) indicated an inverse association with adoptability factors. Whereas, dependency ratio, farming experience, economic motivation, scientific orientation, awareness about diversification and farm financial literacy displayed strong association with factor six.

Above findings showed that the first factor contribute approximate 39.147 per cent of total variation of 22 factors,6th factor account for cause more than 75 per cent of the variation. The adoptability of climate resilience factors in rainfed situation displayed strong association with profile chacterstics such as education, dependency ratio, annual income, economic motivation, extension, organizational participation and farm mechanization level. The finding of this study is supported by the results of study conducted by Somshekar (2010)and Mahentesh (2015)and Yashodhara (2015).

4.11.3 Contribution of Adoptability of Climate Resilience Factors to Profile Characteristics in Overall Situation

In pooled situation the Table-29 gives the eigen values, percentage, variation and cumulative variation of the factors. The climate resilience management factors of farmers are focused here. The first factor approximate of 49.786 per cent of total variation out of 22 factor,6th factor account for cause more than 75 per cent of the variation.

It is possible to obtained the zero order correlation co-efficient between adoptability of climate resilience factors and variables from the co-efficient of eigen vectors. This correlation is the square of the co-efficients associated with factors in the vector. If can be observed from the Table 30,that only 1,2,3,9,8 and 7 factors contributed the maximum variation in adoptability of climate resilience factors in pooled situation.

While examining the practices wise contribution in Table 32, it was noticed that, the climate resilience factor 1 in pooled situation strongly associated with profile characteristics such as education, economic motivation, extension contact, organizational participation and farm mechanization level.

Table 32: Contribution in Proportion of Variation in Inter Dependent Factors and Profile Characteristics Explaining the Significance on the Climate Resilience practices in Eastern Dry Zone

(N=180)

Sl. No.	Characteristics	Adoptability Factors					
		1	2	3	9	8	7
1.	Age				0.788		
2.	Education	0.761			-0.315		
3.	Dependency Ratio		0.594			0.399	
4.	Farm Size			0.840			
5.	Farming Experience	-0.460			0.746		
6.	Annual Income						0.740
7.	Economic Motivation	0.773					
8.	Mass Media Exposure					0.841	
9.	Risk Orientation					0.785	0.418
10.	Scientific orientation	0.404	0.574				0.449
11.	Extension Contact	0.917					
12.	Cosmopoliteness		-0.808				
13.	Distance to Market		-0.832				
14.	Awareness about Diversification						
15.	Extent of Natural Capital			0.869			
16.	Innovative Proneness			-0.672			
17.	Farm Financial Literacy				0.387		0.629
18.	Irrigation Potential		0.821				
19.	Organizational participation	0.891					
20.	Farm Mechanization Level	0.428		0.561			
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							

But the negative sign of co-efficient farming experience (-0.460) indicated an inverse association with adoptability climate resilience factor. The next important factor 2 where climate resilience factor strongly associated variables such as dependency ratio, scientific orientation, and irrigation, but negative sign of the co- efficient cosmopoliteness (-0.808) and distance to market (-0.832) indicated an inverse association with the adoptability of climate resilience factor.

The adoptability of climate resilience factor 3 displayed strong association with variables such as farm size, extent of natural capital and farm mechanization level. But negative sign of the co-efficient innovative proness (-0.672) indicated an inverse association with the adoptability of climate resilience factor. Whereas, age, farming experience, and farm financial literacy displayed strong association with adoptability of climate resilience factor 9, but negative sign of the co- efficient education (-0.315) indicated an inverse association with the adoptability. Whereas, factor 8, display association with annual income, risk orientation, scientific orientation and farm financial literacy were positively associated with adoptability of climate resilience factors. Later, awareness about diversification variable is strongly associated is factor 7. This is positively associated with adoptability of climate resilience factors.

Major findings are the first practice approximate of 49.786 per cent of total variation of 22 practices, 6th factor account for cause more than 75 per cent of the variation. The adoptability of climate resilience factors in all situations strongly associated with profile characteristics such as education, economic motivation, extension contact, organizational participation and farm mechanization level. Somshekar (2010), Jayasree (2013) and Mahentesh (2015) in their study results the similar trend of results reported.

4.12 Constrains Encountered by Farmers due to Climate Change in Eastern Dry Zone

It is obvious that farmers are facing lot of problems in farming due to changes in the climatic factors, high input cost, low market price for their produce etc., and these conditions are restricting the farmers to take up the adjustments in their farming. With this background efforts have been made to know the constraints experienced by farmers to initiate and mitigating strategies to cope up with the ill effects of climate change in different situations. These constraints were presented here under.

4.12.1 Constrains Encountered by Farmers due to Climate Change in Irrigated Situation

It is clear from the Table-33 that non availability of labour and non availability of irrigation facility place (Rank I) followed by poor supply of uniform electricity (Rank II), higher cost of the agricultural inputs ,higher labour wage rate and low price for the produce in the market placed (Rank III) respectively, non availability of inputs (seeds, plant protection chemicals, fertilizers (Rank IV) and lack of information about long term climate change Rank V were considered as a major constraints due to climate change.

Next level of constraints were found to be poor transport facility and high cost (Rank VI), lack of knowledge regarding appropriate adaptations (Rank VII), difficult to work in the field due to severe temperature (Rank VIII), lack of storage facility in the village (Rank IX), lack of knowledge about post-harvest technology Rank X in ordered.

Where as lack of credit /loan from the banks, absence of processing units in the village and long distance of the regulated market from the village placed Rank XI were considered as lower constraints faced by the farmers due to climate change.

4.12.2 Constrains Encountered by Farmers due to Climate Change in Rainfed Situation

The results in the Table-33 showed that in rainfed situation majority of farmers expressed their major constraints were non availability of labour and non availability of irrigation facility place and (Rank I) subsequently poor supply of uniform electricity (Rank II), higher cost of the agricultural inputs , Higher labour wage rate and low price for the produce in the market placed (Rank III), low price for the produce in the market (Rank IV), non availability of inputs (seeds, plant protection chemicals, fertilizers) Rank V due to climate change.

Next level constraints were poor transport facility and high cost (Rank VI), lack of knowledge regarding appropriate adaptations(Rank VII), difficult to work in the field due to severe temperature (Rank VIII), lack of storage facility in the village (Rank IX), lack of knowledge about post-harvest technology Rank X in ordered due to climate change.

Whereas, long distance of the regulated market from the village (Rank XI), lack of credit /loan from the banks and Absence of processing units in the village placed Rank XII considered as lesser extent constraints due to climate change.

4.12.3 Constrains Encountered by Farmers due to Climate Change in Overall Situation

The results of Table-33 showed that in pooled situation, 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

Table 33: Constrains Encountered by Farmers due to Climate Change in Eastern Dry Zone

Sl. No.	Constraints	Irrigated (n_1=90)			Rainfed (n_2=90)			Total (N=180)		
		Score	Per cent	Rank	Score	Per cent	Rank	Score	Per cent	Rank
1.	Difficult to work in the field due to severe temperature	116	25.78	VIII	113	25.11	VIII	227	25.22	VI
2.	Higher cost of the agricultural inputs	127	28.22	III	126	28.00	III	249	27.67	II
3.	Non availability of inputs (seeds, plant protection chemicals, fertilizers)	126	28.00	IV	123	27.33	V	243	27.00	III
4.	Low price for the produce in the market	127	28.22	III	124	27.56	IV	243	27.00	III
5.	Non availability of labour	131	29.11	I	130	28.89	I	251	27.89	I
6.	Higher labour wage rate	127	28.22	III	126	28.00	III	241	26.78	IV
7.	Poor supply of uniform electricity	128	28.44	II	127	28.22	II	241	26.78	IV
8.	Lack of information about long term climate change	125	27.78	V	124	27.56	IV	233	25.89	V
9.	Non availability of irrigation facility	131	29.11	I	130	28.89	I	243	27.00	III
10.	Lack of knowledge regarding appropriate adaptations	118	26.22	VII	116	25.78	VII	214	23.78	VII
11.	Lack of credit /loan from the banks	110	24.44	XI	107	23.78	XII	195	21.67	X
12.	Lack of storage facility in the village	114	25.33	IX	111	24.67	IX	201	22.33	IX
13.	Absence of processing units in the village	110	24.44	XI	107	23.78	XII	191	21.22	X
14.	Long distance of the regulated market from the village	110	24.44	XI	108	24.00	XI	190	21.11	XI
15.	Lack of knowledge about post-harvest technology	112	24.89	X	109	24.22	X	191	21.22	X
16.	Poor transport facility and high cost	121	26.89	VI	119	26.44	VI	208	23.11	VIII

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), Preethi (2012) and Lalitha (2016).

4.13. 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 different situations, as their suggestions are very important to take up the decisions in the policy making. These suggestions were presented here under.

4.13.1 Suggestions of Farmers to Face Climate Change in Irrigated Situation

The results of Table-34 showed that major suggestions are given by the farmers. In irrigated situation to face climate change are 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

Other important suggestion were providing financial support for soil nutrient enrichment (Rank IV), insurance has to be extended to all crops (Rank V), early warning has to be given to the farmers about environmental changes Rank VI in ordered to mitigate the ill effects of climate change.

Whereas, incentives/support for increasing the green manuring, Support price has to be given to all the crop produce based on cost of cultivation and creating awareness/ support for adoption of organic farming technologies placed Rank VII were considered minor suggestion to mitigate ill effects of climate change.

4.13.2 Suggestions of Farmers to Face Climate change in Rainfed Situation

In rainfed situation the Table-34 showed that majority of the farmers suggested that timely supply inputs (seeds, plant protection chemicals, fertilizers) is most 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 most important suggestion to mitigate the ill effects of climate change.

Next important suggestion were providing financial support for soil nutrient enrichment (Rank IV), insurance has to be extended to all crops (Rank V), early warning has to be given to the farmers about environmental changes Rank VI were in ordered to mitigate the ill effect of climate change.

Whereas, creating awareness/ support for adoption of organic farming technologies (Rank VII), support price has to be given to all the crop produce based on cost of cultivation (Rank VIII) and incentives/support for increasing the green manuring (Rank IX) were considered as a least suggestions to mitigate the ill effects of climate change reported by lesser respondents.

4.13.3 Suggestions of Farmers to Face Climate Change in Overall Situation

In pooled situation 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.

Table 34: Suggestions of Farmers to Face Climate Change in Eastern Dry Zone

Sl. No.	Suggestion	Irrigted (n_1=90)			Rainfed (n_2=90)			Total (N=180)		
		Score	Per cent	Rank	Score	Per cent	Rank	Score	Per cent	Rank
1.	Early warning has to be given to the farmers about environmental changes	187	41.56	VI	183	40.67	VI	368	40.89	V
2.	Creating awareness to the farmers about appropriate adoption measures against climate change	213	47.33	III	211	46.89	III	420	46.67	III
3.	Timely supply inputs (seeds, plant protection chemicals, fertilizers)	231	51.33	I	230	51.11	I	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	223	49.56	II	222	49.33	II	437	48.56	II
5.	Insurance has to be extended to all crops	189	42.00	V	187	41.56	V	366	40.67	VI
6.	Providing financial support for soil nutrient enrichment	199	44.22	IV	197	43.78	IV	384	42.67	IV
7.	Incentives/support for increasing the green manuring	182	40.44	VII	180	40.00	IX	348	38.67	VII
8.	Support price has to be given to all the crop produce based on cost of cultivation	182	40.44	VII	181	40.22	VIII	347	38.56	VIII
9.	Creating awareness/ Support for adoption of organic farming technologies	182	40.44	VII	182	40.44	VII	346	38.44	IX

Some extent few respondents were also suggested the reasons like incentives/support for increasing the green manuring (Rank VII), support price has to be given to all the crop produce based on cost of cultivation (Rank VIII), creating awareness/ support for adoption of organic farming technologies Rank IX in ordered to mitigate ill effects of climate change.

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 its 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) and Lalitha (2016).

V SUMMARY

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 and be 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, increase in temperature as well as soil health depletion 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 on climate resilience management among farmers in eastern dry zone of Karnataka is under taken to know the methods/ practices followed and test verify the practices followed by farmers with the following specific objectives.

1. To Develop Scale to Measure the Climate Resilience Management of Farmers.
2. To Ascertain the level of Climate resilience management among farmers in Eastern Dry Zone.
3. To Know the Association between Climate Resilience Management Level and Profile Characteristics of Farmers.
4. To Document the Climate Resilient Practices Followed by the Farmers to Mitigate the Climate Change.
5. To Understand Constraints Experienced by Farmers due to Climate Change.

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, Dodddballapur,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 (x^2), student t-test, correlation coefficient and principal component analysis were also used in analyzing the data.

Salient Findings of the Study

The important findings are presented here under.

1. In irrigated situation the results indicated that 50.00 per cent of the farmers were belonged to above 55 years group and other results like (45.56 %) had high education (35.56%) of farmers had high level of economic motivation, (42.22%) of respondents were having high level of risk orientation, (55.55%) of the farmers had high level of scientific orientation, (41.11%) of farmers expressed that diversity had increased due to vulnerability of climate change compared to before, (42.22%) of farmers expressed that their extent of natural capital has increase compared to previous years, 64.44 per cent farmers had high level of innovative proneness, (35.56%) of respondents openined that there was increase in the expenditure, (47.78%) of farmers found high level of irrigation potential, 34.45 per cent had high level of organizational participation, and (54.44%) of farmers possess high mechanization level.

2. With regarding to medium level 41.11 per cent of farmers had medium dependency ratio, (37.78%) of them belonged to medium level of annual income, (41.11%) of farmers had medium level of extension contact and (47.78%) had medium distance of accessibility range from 5.92-7.05 kms.

3. With respect to low level 38.89 per cent of the respondents comes under small farm size category, (40.00%) of respondents had low farming experience, (45.56%) had low mass media exposure 51.11 per cent respondents had low level of cosmopoliteness.

4. In rainfed situation 42.23 per cent farmers had high dependency ratio, 47.78 per cent farmers had high farming experience, (37.78%) of farmers belongs to higher levels of

economic motivation, 46.67 per cent had high level cosmopoliteness and 46.67 per cent farmers had far distance and (35.56%) of farmers had high mechanization level

5. With regarding medium level 36.67 per cent of farmers belongs to age between 51 to55 years age group, (44.44%) were marginal farmers, (58.89 %) of respondents belonged to medium scientific orientation, 37.78 per cent respondents express their opined that crop diversity has constant due to climate change compared to before years, (52.22%) of respondents opined that their extent of natural capital has constant compared to before, (43.00%) of respondents openined that there has no change expenditure and 42.22 per cent respondents had medium level of innovative proneness

6. With respect to low level 40.00 per cent respondents had low level of income, (57.78%) had low mass media exposure, (37.78%) of respondents had low level of risk orientation, (46.67%) of respondents belongs to low extension contact, 68.89 per cent had low irrigation potential, (43.33%) of farmers had low level of organizational participation and (35.56%) of respondents had low mechanization level.

7. In overall situation 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 openined that there increasing in expenditure.

8. With regarding to medium level 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 cosmopoliteness, 67.22per 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.

9. 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 openined that their crop diversity had decreased due to vulnerability compared to before, 37.22 per cent respondents openined 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.

10. Over all climate resilience management in irrigated situation, 36.67 per cent of respondents belonged to low climate resilience management level followed by (36.66%) of high and (26.67%) had medium level of climate resilience management level.
11. Whereas, in rainfed situation, half of the farmers 50.00 per cent had low level of climate resilience management followed by had high level (25.55%) and (24.44%) of farmers belongs to medium climate resilience management level
12. In overall situation 43.33 per cent of farmers had low level of climate resilience management, followed by high (31.11%) and medium (25.56%) levels.
13. Chi-square test was applied to test the performance of climate resilience management level among the farmers in different situations the results indicated i.e., 53.55** turn out to be significant at one per cent level indicating a significant variation in the overall climate resilience management level among the farmers in different agricultural situations *viz.,* irrigated and rainfed.
14. The F-test showed that there was a significant difference (F- value 3.20*, P>0.05) in climate resilience management level among farmers in different situations *viz.*, irrigated and rainfed. This could be climate resilience management of farmers have immensely contributes to improve the agricultural situations.
15. Chi-squre test was applied to know the association with profile characteristics and climate resilience management. Accordingly in irrigated situation, independent variables like economic motivation, distance to market, farm financial literacy, risk orientation, mass media exposure, dependency ratio, were found significant association at 1 per cent level. Other variables *viz.* innovative proneness and extent of natural capital l were found to have significant association at 5 per cent level.
16. Whereas, in rainfed situation, variables like dependency ratio, risk orientation, education, economic motivation, irrigation potential, extent of natural capital, innovative proneness were found significant association at 1 per cent level. Other

variables like *viz.,* mass media exposure followed by annual income, farm financial literacy, extension contact, cosmopoliteness were found significant association at five per cent level.

17. In overall situation, variables like mass media exposure, economic motivation, and distance to market, innovative proneness, irrigational potential, education, risk orientation and extent of natural capital were found significant association at 1 per cent level. Other variables like farm size, farm financial literacy and dependency ratio, were found significant association at 5 per cent level.

18. Correlation test was carried out to know the relationship between profile characteristics and climate resilience management accordingly in irrigated situation, independent variables such as economic motivation, awareness about diversification, farming experience, organizational participation, scientific orientation, mass media exposure and extension contact were found significant relationship with depended variable at one per cent level. Similarly extent of natural capital, farm financial literacy and education were found significant relationship with dependent variable at five per cent level.

19. Whereas, in rainfed situation, the variables like farming experience, awareness about diversification, extent of natural capital, farm mechanization level, organizational participation, extension contact, were found significant relationship with dependent variable at one per cent level. Only farm size has significant relationship with management at five per cent level.

20. In overall situation, variables such as awareness about diversification, farming experience, extent of natural capital, organizational participation, extension contact, mass media exposure, education, scientific orientation and farm mechanization level have positive and significant relationship with resilience management at one per cent level. Other profile characteristics like risk orientation and farm financial literacy have significant relationship with climate resilience management at five per cent level.

21. Principal component analysis test was carried out to know the contribution of management actors accordingly the first factor approximately 31.457 cumulative variation out of 60 management factor,8th management factor accounts for cause more

than 75 per cent of the variation.. It can be observed that only 1, 8,7,2,6 and 5 management factors contributed the maximum variation in climate resilience management in irrigated situation. While examine the contribution of variables shows variables such as age, economic motivation, mass media exposure, farming experience, scientific orientation, extension contact, awareness about diversification and organizational participation contributed the maximum variation in management.

22. Subsequently in rainfed situation context the first factor approximately 24.773 cumulative variation out of 60 management factor,8th management factor accounts for cause more than 75 per cent of the variation. It can be observed that only 1, 2, 8, 7, 6 5 and 4 management factors contributed the maximum variation in management in rainfed situation. Whereas, variables such as age, dependency ratio, farming experience, economic motivation, mass media exposure, scientific orientation, extension contact, awareness about diversification and organizational participation contributed the maximum variation in management.

23. In overall situation the first practice contribute approximately 26.795 per cent of total variation out of 60 management factors,8th management factor accounts for cause more than 75 per cent of the variation. It can be observed only 1,2,8,7 and 6 management factors contributed the maximum variation in resilience management. Coming to contribution of variables age, farming experience, economic motivation, mass media exposure, scientific orientation, extension contact, awareness about diversification and organizational participation contributed the maximum variation in climate resilience management.

24. The dimension wise analysis done to know the pattern of climate resilience management level of farmers in, irrigated, rainfed and pooled situation were presented. In irrigated situation natural resource degradation management (35.15, ranks I) followed by ecological security management (31.25%, ranks II), environment protection (30.82%, ranks III) and agricultural resource/ non agricultural resource management 29.41 per cent ranks IV were the major dimensions of management level among farmers.

25. In rainfed situation natural resource degradation management (35.29, ranks I) followed by ecological security management (35.01%, ranks II), and agricultural resource/ non agricultural resource management (33.58% ranks III) and environment protection (33.08%, ranks IV) were the major dimensions of management level among farmers.

26. In overall situation natural resource degradation management (35.22, ranks I), ecological security management (33.08%, ranks II) environment protection (31.91%, ranks III) and agricultural resource/ non agricultural resource management 31.35 per cent ranks IV were the major dimensions of climate resilience management level among farmers.

27. In overe all adoptability of climate resilience practices in irrigated situation, 38.88 per cent respondents belonged to low adoptability followed by 33.34 per cent had high and 27.78 per cent had medium adoptability of climate resilience management practices.

28. Subsequently in rainfed situation, 41.11per cent of farmers had medium adoptability followed by 32.22 per cent had low and 26.67 per cent had high adoptability of climate resilience management practices.

29. In overall situation, majority i.e.,60.55 per cent of farmers had medium adoptability of climate resilience management practices, followed by high (20.00%) and low (19.45%) adoptability.

30. Chi-square test applied to test the overall performance in adoptability of climate resilience management practices among the farmers in different situations which is 86.938** turn out to be significant at one per cent level indicating a significant variation in the overall adoptability among the farmers in different agricultural situations *viz.,* rainfed, irrigated and pooled.

31. F- test showed that there was a significant difference (F- value 3.02*,P>0.05) in adoptability of climate resilience management practices among farmers in different situations *viz.,* irrigated and rainfed. Adoptability could be immensely contributes to improve the agricultural situations.

32. Chi-sure test was applied to know the association with profile characteristics and adoptability of climate resilience practices accordingly in irrigated situation, profile characteristics like education, organizational participation, annual income, risk orientation, innovative proneness, were found to have significant association at one per cent level. Other variables like *viz.*,awareness about diversification, extension contact, cosmopoliteness, farm mechanization level, scientific orientation, and irrigation potential were found to have significant association at five per cent level.

33. Whereas, in rainfed situation, profile characteristics like, extension contact, organizational participation and risk orientation were found to have significant association at one per cent level. Other variables like *viz.*, innovative proneness, dependency ratio, scientific orientation and economic motivation were found to have significant association at five per cent level.

34. In overall situation, profile characteristics like extension contact and organizational participation found to have significant association at one per cent level. Other variables like farm scientific orientation, , dependency ratio, innovative proneness mass media exposure and awareness about diversification were found to have significant association at five per cent level.

35. Correlation test was carried out to know the relationship between profile characteristics and adoptability of climate resilience practices accordingly in irrigated situation, independent variables such as education, organizational participation, annual income, risk orientation and innovative proneness, were found to have significant relationship with adoptability climate resilience management practices at one per cent level. Similarly, awareness about diversification extension contact, cosmopoliteness, farm mechanization level, scientific orientation and irrigation potential were found significant relationship with adoptability at five per cent level.

36. Whereas, in rainfed situation the variables like organizational participation, cosmopoliteness and risk orientation, were found significant relationship with adoptability at one per cent level. Other variables such as innovative proneness, scientific orientation, dependency ratio and economic motivation were found significant relationship with adoptability at five per cent level

37. In overall situation profile characteristics like extension contact and organizational participation found to have significant relationship with adoptability at one per cent level. Other variables like, mass media exposure, dependency ratio, risk orientation, innovative proneness and awareness about diversification have significant relationship with adoptability at five per cent level.

38. Principal component analysis test carried out to know the contribution of adoptability of climate resilience factors in irrigated situation. The first actor approximately 40.469 cumulative variation out of 22 factors, 8th factor accounts for cause more than 75 cumulative variation. This statics depicted that only 1, 2,9,8,3 and 7 factors contributed the maximum variation in adoptability of irrigated situation. Variables such as education, economic motivation, extension contact, distance to market and organizational participation were contributed the maximum variation in adoptability

39. Whereas, in rainfed situation the first factor approximately 39.147 cumulative variation out of 22 factors, 6th factor accounts for cause more than 75 cumulative variation. This statics depicted that only 1, 9,3,8,7 and 6 factors contributed the maximum variation in adoptability of climate resilience level. Profile chacterstics such as education, dependency ratio, annual income, economic motivation, extension, organizational participation and farm mechanization level were contributed the maximum variation in adoptability of climate resilience practices.

40. In overall situation the factor approximately of 49.786 cumulative variation out of 22 factors, 6th factor accounts for cause more than 75 per cent of the variation. This statics depicted that only1,2,3,9,8 and 7 actors contributed the maximum variation for adoptability of climate resilience level. profile characteristics such as education, economic motivation, extension contact, organizational participation and farm mechanization level were contributed the maximum variation for adoptability.

41. Documentation of adoptability of climate resilient management in response to vulnerability of climate change in irrigated Situation shows that majority of farmers fallowed drought tolerant varieties(Rank I), followed by intercropping (Rank II), pest and disease resistant varieties(Rank III).

42. Whereas, in rainfed Situation shows that majority of farmers fallowed Intercropping (Rank I), subsequently drought tolerant varieties (Rank II), pest and disease resistant varieties(Rank III).

43. In overall situation shows that majority of farmers fallowed drought tolerant varieties Rank I), followed by intercropping (Rank II), pest and disease resistant varieties (Rank III).

44. In irrigated situation majority of farmers faced constraints are non availability of labour and non availability of irrigation facility place (Rank I) followed by poor supply of uniform electricity (Rank II), higher cost of the agricultural inputs ,higher labour wage rate placed (Rank III).

45. Whereas, in rainfed situation majority of farmers expressed their problems were non availability of labour and non availability of irrigation facility place and (Rank I) respectively, subsequently poor supply of uniform electricity (Rank II),higher cost of the agricultural inputs and Higher labour wage rate (Rank III).

46. In overall situation majority of farmers expressed their problems are non availability of labour (Rank I) and other constraints like, higher cost of the agricultural inputs (Rank II), non availability of inputs (seeds, plant protection chemicals, fertilizers) placed (Rank III).

47. Important suggestions are given by the respondents in irrigated situation to face climate change are 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 about adoption measures against climate change Rank III were the major suggestion to mitigate ill effects of climate change.

48. Where as in rainfed situation, majority of the farmers suggested that 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 about adoption measures against climate change (Rank III),

49. In overall situation majority of farmers openined that 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 about adoption measures against climate change (Rank III).

Implications of the Study

1. The results indicated that, the farmers belonged to low category in case of farming experience, mass media exposure, and farm mechanization level. This reflects that there is required for organizing intensive trainings, demonstrations, seminars, exhibitions, field days and field visits effectively and follow-up activities by concerned authority for achieving higher level of management in developmental programmes and training experience. The training should focus on climate resilience management practices. The information on latest technologies on climate resilience management has to be provided to the farmers through training programmes.
2. As the extension contact of the farmers was found to be low it calls alarm for strengthening of field level extension functionaries of State Department of Agriculture, State Department of Horticulture, Research Station/KVKs of state agricultural universities, voluntary organizations and business houses. Further, there is a required to place specialized personnel to provide timely technical assistance to the farmers through climate resilience management programmes like NICRA and other climate protection related programmes.
3. As the study noticed that the level of climate resilience management in different situations *viz.*, rainfed, irrigated and pooled in eastern dry zone had low management due to 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 management. This implied that farmers need to be educated regarding impact and advantages of climate resilience management for their acceptance**.**
4. From the findings it is found that variables like 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. Therefore, government promotes 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.

5. The study enunciated that variables such as 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. Thus, government, developmental departments such as department of agriculture / horticulture, department of rural development and NGO's should 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 design and implement.

6. Majority of the farmers experienced the constraints like non-availability of labour and other constraints like, higher cost of the agricultural inputs, non availability of inputs, higher labour wage rate and poor supply of uniform electricity, non availability of inputs (seeds, plant protection chemicals, fertilizers), difficult to work in the field due to severe temperature, lack of knowledge regarding appropriate adaptations, were the major problems experienced by farmers due to vulnerability of climate change. The problems have to be suitably addressed by the development departments, NGOs, social groups etc. to make the agriculture a profitable proposition.

Suggestion for Future Research

1. In the research, an attempt has been made to study the climate resilience management level among the farmers in eastern dry zone, that's only one zone selected, therefore, the findings cannot be generalized for the larger universe. Thus, it is guided to conduct similar type of investigation in different areas so that the findings could be more

meaningful and relevant. Therefore, it is suggested that further investigation may be taken up in different areas.

2. The indicators which were selected in the study are limited due to researcher's constraints like time and finance. The relevant indicators may further be included and studied to establish climate resilience management among the farmers.

3. Suggestions offered by farmers to tackle the vulnerability of climate change were, timely supply inputs (seeds, plant protection chemicals, fertilizers) is very important, subsidies/compensation has to be given for the crops to make up the cost of cultivation due to weather aberrations, creating awareness to the farmers about resilience management against climate change, providing financial support for soil nutrient enrichment, create awareness about environmental changes, insurance has to be extended to all crops etc., and above findings could be considered seriously to include in the development programmes to avoid the vulnerability of climate change

4. 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.

5. 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.

VI REFERENCES

ADESOPE, O.M. AND MATTHEWS, N.S., 2012, Effect of socio- economic characteristics on their adoption of organic farming practices. Dept. Agric. Extn., *Federal Univ. Tech.,* Nigeria.

ADGER, W. N., 2000, Social and ecological resilience: are they related. Progress in Human Geography, **24**(3): 347-364.

AJAH JULIUS, 2012, Effects of farmer's level of education and cooperative membership on access to agricultural extension services in Abuja, Nigeria. *Trends in Agric. Economics*, **5**:104-114.

ALAGH, M. 2014, Assessment of Marketed and Marketable Surplus of Major food grains in Gujarat.*Ind.Jour.Agril.Mktg.,***28**(2):60-80.

ANAND, R. RATHOD, 2007, A study on sustainable livelihoods of Lambani farmers in Hyderabad, Karnataka. *M.Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Dharwad.

ANDREW. P., BARNES, AND LUIZA TOMA, 2011, A typology of dairy farmers perceptions towards climate change,**112**:507-522.

ANITA WREFORD, ADA IGNACIUK, AND GUILLAUME GRUERE., 2017, Overcoming barriers to the adoption of climate-friendly practices in agriculture. OECD Food, *Agric. Fisheries*, pp. 101.

ANONYMOUS, 2006, Climate change and African agriculture, Policy Note No.10, August, CEEPA.

ANONYMOUS, 2008, Report on per capita income of Karnataka farmers.

ANONYMOUS, 2010, Americans climate change: Panel on advancing the science of climate change, *National Res. Council*, Washington, D.C.

ANONYMOUS, 2013, Agriculture profile of Karnataka state, Government of Karnataka Report.

ANONYMOUS, 2014, Climate smart villages agriculture technology farming.Voa News.

ANONYMOUS,2015, Agricultural condition in India. http://www.indiaonline.in /about/Profile/Economy/Economic Issues/Agriculture.html

ARAVIND SINGH, 2015, Need to enhance agricultural production for combating hunger and malnutrition and improving the plight of famers. Dry land agriculture in India.

ASFAW, A. AND ADMASSIE, A., 2004, The role of education on the adoption of chemical fertilizer under different socioeconomic environments in Ethiopia. *Agric. Economics,* **30**(3): 215–228.

ATTERIDGE, A., AND REMLING, E., 2018, Is adaptation reducing vulnerability or redistributing it? WIREs climate change, https://doi.org/10.18438/B8HC87

AYYAPPAN, S., 2013, Presidential address on family farms: Farm, feed and flourish.

BAETHGEN, W.E., MEINKE, H. AND GIMENE, A.,2003, Adaptation ofagricultural production systems to climate variability and climatechange: lessons learned and proposed research approach. Paper presented at climate adaptation. net conference "Insights and toolsfor adaptation: learning from climate variability," 18-20 November, Washington, DC.

BAGDI, G.L., SAMRA, J.S. AND KUMAR, V., 2002, People's participation in soil and water conservation programme in SardarSarovar Project Catchment. *Indian J. Soil Conservations*, **30** (2): 179-182.

BALAMTTI, A., 2000, Indigenous technologies in agriculture cropping system in North Karnataka. M. Sc. (Agri.) Thesis (Unpub.), Univ. Agric. Sci., Dharwad

BASAVARAJ N BIRADAR, 2008, A study on impact of income generating activities on sustainable rural livelihoods of Karnataka Watershed Development Society (KAWAD) project beneficiaries. *M.Sc. (Agri.) Thesis (Unpub.)*, Univ. Agric. Sci., Dharwad

BASAVAPRABHU, V. J., 1996, Knowledge and adoption behaviour of integrated pest management practices of tomato and cabbage by the vegetable growers of Bangalore North District. *M.Sc. (Agri) Thesis,* (Unpub.), Univ. Agric. Sci., Bangalore.

BENE, C., NEWSHAM, A., DAVIES, M., ULRICHS, M. AND GODFREY-WOOD, R., 2015'Resilience, poverty and development', *J. Int.Development,***26**: 598–623.

BHAGYALAXMI, K., GOPALKRISHNA RAO, V. AND SUDARSHAN REDDY, M., 2003, Profile of the rural women micro entrepreneur. *J. of res.* Acharya N.G. Ranga Agric. Uni. Hyderabad (Andhra Pradesh), **31**(4): 51-54.

BRAR HARSIMRANJIT SINGH, 2016, Perception and adaptation strategies of Punjab paddy growers towards climate change. *M.Sc. (Agri.) Thesis (Unpub.),* Punjab Agric. Univ., Ludhiana, India.

CHANDRAN, B., 1997, A study on knowledge and adoption of farmers cultivating tapioca in Ernakulam district of Kerala state.*M.Sc. (Agri.) Thesis,*(Unpub.), Uni. Agric. Sci. Dharwad.(India).

CHANDRANI SAHA, 2008, A study on sustainability of farming system and livelihood security among rural households in Tripura. M. Sc. (Agri.) Thesis (Unpub.), Univ. Agric. Sci., Bangalore.

CHAUDHARI RATAN RANUJI, 2006, A study on entrepreneurial behaviour of Dairy farmers, *Ph.D. Thesis, (Unpub.),* Univ. of Agric. Sci., Dharwad.

CHHIKARA, O.P., KUMAR, K. AND SINGH, H. 1998. Agricultural regulated Markets. CLIMATE CHANGE AND AFRICAN AGRICULTURE, 2006, *Policy Note No.10, August*, CEEPA.

CORETHA KOMBA AND EDWIN MUCHAPONDWA, 2012, Adaptation to climate change by small holder farmers in Tanzania. *Economic Res. Sourthern Africa*. Working paper, pp 299.

DARLING, B. SUJI AND VASANTHAKUMAR, J., 2004, Knowledge and adoption of botanical pesticides.*J. Ext. Edu.*, **15** (2 & 3):3655-3658.

DARSANA, S., 2014, Determinants of effective functioning of farmers' clubs in Kerala state. *M. Sc. (Agri.) Thesis,* (Unpub.), TNAU, Coimbatore.

DAVID MADDISON, 2007, The perception and adaptation to climate change in Africa, CEEPA discussion paper No.10.

DEEPTHI, V., 2016, A critical study on entrepreneurial behaviour of agri entrepreneurs in Andhra Pradesh.*M. Sc. (Agri.) Thesis,* (Unpub.), Acharya N.G. Ranga Agric. Uni. College of Agriculture, Rajendranagar (Andhra Pradesh),

DERESSA, T.T., HASSAN, R.M. AND RINGLER., 2011, Perception of and adaptationto climate by farmers in the Nile basin of Ethiopia. *J. Agric. Sci.*, **149**(1): 23-31.

DESAI, A. R., 1975, A study on adoption of recommended practices and information sources consulted by potato growing farmers of Belgum taluk of Karnataka. M.Sc. (Agri.) Thesis (Unpub.), Univ. of Agric. Sci., Bangalore

DEVARAJAIAH, K., 2010, A study on livelihood diversification of small and marginal farmers in kolar district of Karnataka. *Ph.D. Thesis* (Unpub.), The school of agricultural sciences Yashwantra Chavan Maharashtra Open University.

DHALIWAL, A.J.S. AND SOHAL, T.S., 1965, Extension contact in relation to adoption of agricultural practices and socio-economic status of farmers. *Indian Res. J. Extn. Edn.*, **1** (1) : 58-62.

DOWNING.T.E.,RINGIUS,L.,HULME,M. AND WAUGHRAY,D., 1991,*Adopting to climate change in Africa, Mitigation and adoption strategies for Global change*, **2**:19-44.

EDWARDS, A.L., 1969, *Techniques of Attitude scale construction.* VIkils, Feger and simons Pvt. Ltd., 9, Sport Road, Ballard Estate, Bombay

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

FEASTER, J. Y., 1968, Measurement and determinants of innovativeness among primitive agriculturists. *Rural Sociology,* **33**: 339-348.

FEDER, G. AND UMALI, D., 1993, The adoption of agricultural innovations: Areview. *Technological Forecasting and Social Change* **43**: p215–239.

FISCHER, G., SHAH, M. AND VAN VELTHUIZEN,2002, Impacts of climate on agro-ecology. Chapter 3 in “Climate change and agricultural vulnerability”. *Report by the International Institute for Applied Systems Analysis.* Contribution to the World Summit on Sustainable Development, Johannesburg.

GAHENDAR BAHADUR AND DINANATH BHANDARI,2008, An integrate approach to climate change adaptation. *LIESA INDIA, AME foundation*: **10**(4): 10-12.

GANESH PRASAD, T. S., 2006, An analysis of adoption, marketing and constraints of turmeric growers in Chamarajanagar district. *M.Sc. (Agri) Thesis* (Unpub.), Univ. of Agric. Sci., Bangalore.

GANGAPPA, G. N., 1975, Study of adoption behaviour consultancy pattern and information source credibility of small farmers in Mysore district of Karnataka state. *M.Sc(Agri) Thesis (*Unpub.*)*, College of Agriculture, Dharwad.

GASTRELL, J.V., 1977, Inequality and innovation the green revolution in Andra Pradesh. India, *American Sociological Review*. **42**(2): 318-337.

GEISLER, C. AND CURRENS, B,. 2017, Impediments to inland resettlements under conditions of accelerated sea level rise. Land use policy, p. 322- 330.

GOPALA, H.S., 2010, Analysis of adoption, productivity and economic performance of groundnut growers. *M.Sc. (Agri) Thesis (Unpub.)*, Univ. of Agric. Sci., Bangalore.

GRECEQUET, M., J. DEWAARD, J. J. HELLMANN, and G. ABEL. 2017. Climate vulnerability and human migration in global perspective. Sustainability**9**: 720.

GUILFORD, J.P. AND FRUCHTER, B. (1978) Fundamental statistics in psychology and education. Singapore: McGrawHill Book Co.

HAREESHA, N., 1994, Awareness and attitude of farmers and extension personnel towards the ill-effects of agricultural chemicals. *M.Sc. (Agri.) Thesis, (Unpub.)*, Uni. Agric. Sci. Bangalore (India).

HARLEY, M., HORROCKS, L., HODGSON, N., AND MINNEN, J. V. 2008, Climate change vulnerability and adaptation indicators. *European Topic Centre on Air and Climate Change.*

HENRY DE- GRAFT ACQUAH, 2011, Farmers' perception and adaptation to climate change: A willingness to pay analysis. *J. sustainable Development in Africa*.**13**(5).

HIREMATH, N. S., 2000, Participation of rural youth in farm and nonfarm activities in Dharwad taluk. *M. Sc. (Agri.) Thesis (Unpublished)*, University of Agricultural Sciences, Dharwad.

HOLNGWANE, J. J., LEDWABA, L.J. AND BELET, A., 2014, Analyzing the factors affecting the market participation of maize farmers:a case study on small-scale farmers in greater Giyani Local Municipality of the Mopani District, Limpopo Province. *Afr. J. Agric. Res*.,**9**(10):895-899.

HOPKINS,J., LEVIN, C. AND HADDAD, L., 1994, Womens,s income and household expenditure patterns: gender or flow? Evidence from Niger. *American journal of Agricultural Ecology*,**76**(5):1219-1225

IFEANYI-OBI, C.C. AND ISSA, F.O., 2013, Barriers faced by cassava farmers in adapting to climate change in oron agricultural zone of AkwaIbom state. *J. Agric. Vete. Sci.*, **4**: 19-26.

IGODEN, C., P. OHOJI. AND J. EKPARE., 1990, Factors associated with the adoption of recommended practices for maize production in the Lake Basin of Nigeria. *Agricultural Administration and Extension* **29** (2):149–156.

IGNACIUK, A., 2015, "Adapting agriculture to climate change; a role for public policies", OECD Food, Agriculture and fisheries papers, No. 85, OECD Publishing, Paris.

IFPRI (International Food policy Research Institute), 2009, Climate Change Impact on Agriculture and Costs of Adaptation. *IFPRI Research Report*. Washington, D.C.

IISD (International Institute for Sustainable Development), 2006, Understanding adaptation to climate change in developing countries. http://www.iisd.org. Accessed, November 20.

IPCC (TAR) (Intergovernmental panel on climate change) 2001, Third assessment Report.

IPCC (Intergovernmental panel on climate change) 2007, Climate change Impacts, adaptation, and vulnerability summary for policy makers, contribution of working groups II to the *fourth assessment report of the IPCC.*

IPCC (Intergovernmental panel on climate change) 2012, Managing the risks of extreme events and disasters to advance climate change adoption summary for policy makers, special report of intergovernmental panel on climate change .Accessed on 14th March 2015.

IPCC (Intergovernmental panel on climate change) 2014, Climate change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the fifth assessment report of the intergovernmental panel on climate change. [Core Writing Team, R.K. Pachauri and L.A. EMeyer (eds.)]. Geneva, Switzerland (151 pp.)

ISDR (Inter-agency secretatantriants of international strategy for disaster reduction) 2004, living with risks-A global review of disaster reduction initiatives.

JASNA, V.K., 2015, Impact of climate resilience technologies in agro ecosystem. *M.Sc Thesis (Unpub.).*ICAR- Indian Agricultural Research Institute, New Delhi.

JAWAHAR, P. AND SANGI, S. M., 2006, BMZ workshop summary report on Adoption to climate change, Preoria, South Africa, Pretoria, April 24-28,2006.

JAYASREE DATTA, 2013**,** Sustainability of Jhum Cultivation as Perceived By The Triba People of Tripura And Their Livelihood Status. *(Agri) Thesis (Unpub.),* Univ. Agric.Sci., Bangalore.

JOHNSON, M. AND MASTERS, W., 2004, Complementarities and sequencing of innovations: New varieties and mechanized processing for cassava in West Africa. *Economics of Innovation New Tech.*,**13**: 19–25.

JORDAN, J., 2009, Rethinking community resilience to climate change: Does a social capital lens help? Current crises and new opportunities. coleraine: development studies association. Retrieved from http://www.devstud.org.uk/aqadmin /media /uploads /4ab779d a220b71 -jordan-dsa 09.pdf.

KALEA, N. M, MANKAR, D.M. AND WANKHADE, P.P., 2012, Livelihood sustainability of suicide prone farmers families of Vidarbha. *Indian Res. J. Extn. Edu.,***8**(1):252-260.

KAVAD SHAMJI BHAIDULA BHAI, 2015, Stratagic analysis of Market-led extension activities of APMCs of South Gujrath. *Ph.D. Thesis (Unpub.),* Navasari agric. Univ.

KATAR SINGH, 1991, Determinants of people participation in watershed development and management. An exploratory study. *Indian J. Agric. Economic*, **39**: 47-49.

KEBEDE, Y., KUNJAL. AND G. COFFIN., 1990, Adoption of new technologies in Ethiopian agriculture: The case of Tegulet-Bulga District, Shewa Province. *Agric. Econ.,***4**: 27– 43.

KERLINGER, F.N., 1973, Foundation of behavioural research. Holt Rinc Hart Winston International, New York.

KHATUN, D. and ROY, B.C (2012) Rural. Livelihood diversification in West Bengal: Determinants and Constraints. *Agricultural Economics Research Review,* **25**(1):115-124

KHIN MAR OO, 2005, Knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka

KNIGHT, C. GREGORY, 1980, *Ethano Science and African Farmer: Rationale and Stratergy*.In:Brokensha, D.W.,Warren D. M. and O.Werner (eds.).Indigenous Knowledge system and Development.Boston: University Press of America.

KRISHNAPILLAI, M. V., 2017, Climate friendly adoption stratagies for the displaced atoll population in Yap. *In Climate Change Adoption in Pacific Countries*, **14**(2):101-117.

KUMAR, H. S., 1998, A study on knowledge adoption and economic performance of banana growers. *M. Sc. (Agri.) Thesis, (Unpub.), Univ.* Agric. Sci., Bangalore.

KUMAR, V., 2009, Indigenous technical knowledge in agriculture (Indegenous knowledge) www.dealindia.org.

KURUKULASURIYA, P. AND R. MENDELSOHN.,2006, Endogenous irrigation: the impact of climate change on farmers in Africa. CEEPA Discussion Paper No. 18. Centre for Environmental Economics and Policy in Africa. Pretoria, South Africa: Univ. of Pretoria.

KOWSALYA, K. S., 2017, impact of integrated farming system demonstration (ifsd) programme on livelihood and nutritional security of Farmers of mandya district. Ph.D *(Agri) Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

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

LAKSHMINARAYAN M.T., 1997, Adoption of sustainable sugarcane farming practices by farmers-An analysis. *Ph.D. Thesis, (Unpub.),* Univ. Agri. Sci.,Bengaluru

LAKSHMI NARAYANI, S., 2009, A study on livelihood security of farmers in Virudhnagar district of Tamil Nadu. *M.Sc. (Agri) Thesis (Unpub.),* Univ. Agric. Sci., Bangalore

LAVANYA, B. T., 2010, Assessment of farming system efficiently in Theni district of Tamil Nadu, *M.Sc. (Agri) Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

LISA PALMER, 2015, Learning from India's climate smart farming villages, Yale climate connections organisation.

LOEDE, R. R., KREUTZWISER AND MORARU, L., 2001, Adaptation options for the near term: climate change and the Canadian water sector. *Global Environ. Change* **11**:231-245.

LOREN TAUER, 1995, Review of Agricultural Economics, **17**(1): 63-69.

LYAMA, KENYAMIYUKIL, PATRICK, KUMARA I., PATTI, KRIST JANSONN, AND SIEMON (2008) Livelihood diversification strategies income and soil management strategies. Journal of International Development J. Int. Dev. 20, 380–397.

MADDISON, D., 2006, The perception and adaptation to climate change in Africa. (CEEPA) Centre for Environmental Economics and Policy in Africa. Pretoria, South Africa: Univ. of Pretoria. Discussion Paper No. **10**.

MAHATAB ALI, K.M., 2010, A Study On Knowledge And Adoption Of Aerobic Rice Growers In Eastern Dry Zone Of Karnataka State. *M.Sc. (Agri.) Thesis*, (Unpub.), Univ. Agric. Sci., Bengaluru.

MAHENTESHSIRUR, 2015, A study on Mushroom entrepreneurship and consumer behavior in Karnataka, *Ph.D. (Agri) Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

MAMATHALAKSHMI, N., 2009, Performance Evaluation of Chrysanthemum Growers in Mandya District of Karnataka *M.Sc. (Agri.) Thesis,* (Unpub.), Univ. Agric. Sci., Bengaluru.

MAMATHALAKSHMI, N., 2013, An analysis of livelihood security among agricultural labourers in Karnataka, *Ph.D. (Agri) Thesis (Unpub.),* Univ. Agric. Sci., Bangalore. *M.Sc. (Agri.) Thesis,* (Unpub.), Univ. Agric. Sci., Bengaluru.

MANDAVI MISHRA, 2013, Role of eco-friendly agricultural practices in Indian agriculture development. *Inter. J. Agric. Food Sci. Techn.,***4**(2): 2249-3050.

MANI, V., 2016, Impact analysis of Sujala watershed project in Kolar district of Karnataka, *M.Sc. (Agri.) Thesis*, (Unpub.), Univ. Agric. Sci., Bengaluru.

MANSINGH PAUL, J., 1993, Construction and Standardization of Socio-Economic Status Scale. *Ph.D. Thesis*, (Unpublished), TNAU, Coimbatore.

MEEHL, G. A, STOCKER, T. F, COLLINS, W. D, FRIEDLINGSTEIN, P, GAYE, A. T, GREGORY, J. M, KITOH, A, KNUTTI R, MURPHY, J. M, NODA, A, RAPER, S. C. B, WATTERSON, I. G, WEAVER, A. J. AND ZHAO, Z. C., 2007, Global climate projections. In Climate change 2007: The physical science basis. Contribution of working group to the fourth assessment report of the intergovernmental panel on climate change [Solomon, S, Qin, D, Manning, M, Chen, Z, Marquis, M, Averyt, K. B, Tignor, M. and Miller, H. L. (eds)]. Cambridge Univ. Press. Cambridge, United Kingdom and New York, NY, USA.

MEENA, H. R. AND FULZELE, R. M., 2008, Scale for measuring economic motivation. *Indian Res. J. Extn. Edu.,* **8** (2 & 3): 22–25.

MELISSA HARVEY AND SATHIS WIJEWADANE, 2008, Cultivation gresilience: lesson from the 2004 tsunami in Srilanka**.** *LIESA INDIA, AME foundation*: **10**(4):33-34.

MENDELSOHN, R.AND DINAR, A.,1999,Climatechange,agriculture, and developing countries: Does adaption mater? The world bank research observer **14**:277-293.

MUTTANNA, 2013, A study on perception of climate change among farm women and its impact on production of red gram. *M. Sc. (Agri.) Thesis*, *(Unpub.*), Univ. Agric. Sci., Bangalore.

NAGARAJ, N., BANTILAN, M.C.A., KUMAR, A.A., ANUSUSHA, R. AND HALDAR, S., 2013, Technological and institutional intervensions in enhancing livelihood of farmers in semi-Arid tropics (SAT) areas: experience of ICRISAT-HOPE project. *Indian J. Agric. Econ.,***68**(3).

NAGARAJA B, C, SOMASHEKAR R, K, KAVITHA, A, 2011, Impact of drought on agriculture: challenges facing poor farmers of Karnataka, south India. In: Paper presented at the climate change and security, Norway. **12**:1–18.

NAGENDRA KUMAR NARESH, 2017, An study on the status of agricultural mechanization and its needs in the Bundelkhad region of Uttar Pradesh. *Ph.D. (Agri) Thesis (Unpub.),Samhigginbottom,* Univ. Agric. Techn. Sci.,

NAGESH, 2006, Study on entrepreneurial behaviour of pomegranate growers in Bagalkot district of Karnataka, *M.Sc. (Agri.) Thesis*, *(Unpub.),* Univ. Agric. Sci., Dharwad.

NARAYAN MOORTHI, 2011, Climate change inputs on ground water extraction cost: who are the gainers and losers? *Indian J. Agric.,* 415-416.

NARMATHA, N., 1994, Involvement of Women in Poultry Farming Activities.*J. Extn.Edu.*, **3**(2): 1188-1190.

NEELAM JAISWAL, 2016, Assessment of training needs of farm women with reference to rice production technology in Korba district of Chhattisgarh. *M.Sc. (Agri.) Thesis*, *(Unpublished),* Indira Gandhi krishi vishwavidayalaya, Raipur.

NEELAVENI, S., RAMBABU AND PUNNA RAO, 2002, Developmental priorities of farm women in agribusiness management – a case of an adopted village K. B. Palm. *MANAGE Extn. Res. Revi.*, **6**(3): 74-83.

NHEMACHENA, C. AND R. HASSAN., 2007, Micro-level analysis of farmers' adaptation to climate change in Southern Africa. IFPRI Discussion Paper No. 00714. *Int. Food Policy Res. Inst.,* Washington, D.C.

NILES, M. T., MARK, L. AND MARGARET, B., 2015, How limiting factors drive agricultural adoption to climate change. *Agric., Ecosys. Environ*., **200**:178-185.

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.

NORRIS, E. AND BATIE, S.,1987, Virginia farmers' soil conservation decisions: An application of tobit analysis. *Southern J. Econ.,***19**(1): 89–97.

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.

OGUNLADE, I., ADERINOYE-ABDULWAHAB, S. A., AND MENSAH, A. O., 2014, Knowledge Levels of Extension Agents and their Perceived Impact of Climate Change on Extension Service Provision in Ghana. Ethiopian Journal of Environmental Studies & Management **7**(1): 96 – 103.

ONYENEKE, R.U. AND MADUKWE, D.K., 2010, Adaptation measures by crop farmers in the southeast rainforest zone of Nigeria to climate change. *Sci. World J.,* **5**(1).

ORINDI, V.A.AND ERIKSEN,2005, Mainstreaming adaptation to climate change in the development process in Uganda. *Eco policySeries*15.Nairobi, Kenya: African Centre for Technology Studies (ACTS).

PALANISAMI, K. AND RANGANATHAN, C. R., 2014, Climate change and agriculture in India studies from selected river basins.

PALANISWAMY, A., 1984, A study on modernization characteristics and training needs of sugarcane growers. *Ph.D Thesis,* (unpub.), Univ. Agric. Sci., Bangalore.

PALLAVI. G, 2011, Perception of students and teachers about usefulness of under – graduate curriculum at UAS, Banglore. *M.Sc. (Agri) Thesis, (Unpub.*), Univ. Agric. Sci., Bangalore.

PANDETI, C.M., 2005, A Study on Entrepreneurial behaviour of farmers in Raichur district of Karnataka, *M. Sc. (Agri.) Thesis, (Unpub.),* Univ. Agric. Sci., Dharwad.

PANDYA, R.D. AND VEKARIA, R.S., 1994, Knowledge and adoption behaviour of banana growers. *Maha. J. Extn. Edu*, **13**: 289-290.

PARVEZ, R., DUBEY, M. K., SINGH,S. R. K. AND KHAN, M. A., 2013, Factors affecting knowledge of fish farmers regarding fish production technology. *Indian Res. J. Extn. Edu.*,**13**(2): 33-35.

PATEL DARVINKUMAR, J., 2017, Strategic convergence between KVK and ATMA in Gujarath. *M. Sc. (Agri.) Thesis,* (*Unpub.*)*,* Navasari agric. univ.

PATHAK, H., AGGARWAL, P.K., AND SINGH. S.D., 2012, Climate change impact, adaption and mitigation in agricultural research institue, New Delhi.

PATIL, S. S., 2018, A study on leadership behaviour of heads of panchayat raj institutions for agricultural development in south saurashtra agro-climatic zone of Gujarat . *Ph. D. Thesis (Unpub.),* Navasari agric. Univ.

PATRICK GWIMBI, 2009, Cotton farmers' vulnerability to climate change in Gokwe district (Zimbabwe): impact and influencing factors. *J.Disaster Risk Studies*.

PHILIP ANTWI-AGYEI, ANDREW, J., FOUGILL AND LINDSAY C. STRINGER., 2013, Barriers to climate change adaptation in sub-saharan Africa: evidence from north east Ghana and systematic literature review. Centre for climate change Economics and Policy. *Working paper no. 154*. Sustainability research Institute. Paper No. 52.

POMP, M. AND BURGER. K., 1995, Innovation and Imitation: Adoption of cocoa by Indonesian smallholders. *World Development,***23**: 423–31.

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.

PRADEEP RATHORE,2016, “Impact of integrated watershed management programme on sustainable rural livelihood of beneficiary farmers in district Sidhi (M.P.) *M.Sc. (Agri) Thesis, (Unpub.),* Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

PRAMEELAMMA, U., 1990, A study on knowledge and participation of rural women in agricultural operation in paddy, *M.Sc. (Agri.) Thesis*, Univ. *(Unpub.),* Agric. Sci., Bangalore.

PRASAD, R. M., 1983 Comparative analysis of achievement motivation of rice growers in three states in India. *Ph.D. Thesis, (Unpub.),* Univ. Agri. Sci Bengaluru.

PREETHI, 2012, A comparative study on knowledge and perception of agro-met advisory (AAS) service farmers and other farmers towards climate change in Chickballapur District. *M.Sc.(Agri) Thesis, (Unpub.),* Univ. Agric. Sci., Bangalore.

PREETHI, 2015, A study on Perception, aspiration and participation of farm youth in agriculture *Ph.D. (Agri) Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

RAGHAVENDRA, H.N., 1997, A study on knowledge and adoption behaviour of arecanut farmers of south Canara district, Karnataka state. *M.Sc. (Agri) Thesis,* (Unpub.), Univ. Agric. Sci., Bangalore.

RAGHUPATHI, D., 1994, Agricultural modernization among farmers in upper Krishna Project area of Karnataka. *Ph.D. Thesis, (Unpub.),* Univ. Agric. Sci, Bangalore (India).

RAI SURENDER KUMAR, 2015, Agricultural diversification for livelyhood security of rural people of South Gujrath. *Ph.D Thesis,* (Unpub.), Navasari agric. Univ.

RAJ AND PRAKASH,2008, Making an opportunity in changing climate scenario, A case of Kullu and Lahaul Valley. *LIESA INDIA, AME foundation*: **10**(4):31-32.

RAJEGOWDA M.B., RAVINRABABU B.T., JANARDHANAGOWDA N.A. AND MURLIDHARA K.S., 2009, Impact of climate change on agriculture in Karnataka. Journal of Agrometeorology, **11**(2):125-131.

RAJPUT, R. P. 2016**.** Impact of training imparted by KVK on the knowledge and adoption of the beneficiaries about IPM in cumin. M.Sc. (Agri.) Thesis *(Unpub.)*, Junagadh Agricultural University, Junagadh.

RAKSHA, RITA GOEL. AND LALI YADAV., 2012, Constraints faced by rural women in procurement and utilization of credit facilities in Hissar district. *J. Res.*, ANGRAU, **40**(4): 29-35.

RAO, D.G. and S.K. SINHA (1994), "Impact of Climate Change on Simulated Wheat Production in India",In: Rosenzweig C, Iglesias A (Eds.), 1994, Implications of Climate Change for International Agriculture: Crop Modelling Study, US Environmental Protection Agency, Washington

RAVINDRA, (2016), An economic study of farmers preference of rice varital traits and impact of improved rice varieties in North Eastern Plain Zone of Uttar Pradesh. *M.Sc. Thesis (Unpub.),*Indian Agric. Res. Inst., New Delhi.

RAVINDRA JAMADAR, (2012), Farmers Awareness of Climate change and Their Adaptations. *M. Sc. (Agri.) Thesis, (Unpub.),* Univ. Agric. Sci., Dharwad.

RAVIYA, P. B.2017. Knowledge and adoption of farmers about cotton production practices recommended by GAU AND JAU IN Junagadh district. M.Sc. (Agri.) Thesis (Unpublished), Junagadh Agricultural University, Junagadh

REDDY, S.M.V., 1995, A study on knowledge and adoption of improved practices of mango growers of Kolar district. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci. Bangalore (India).

REILLY, J. M. AND SCHIMMELPFENNING, D., 1999, Agricultural impact assessment, vulnerability, the scope for adoption. *Climate Change*, 43:745-788.

ROBINSON, P.W., 1976, Fundamentals of experimental psychology – A comparative approach, Prentice Hall Inc., Englewood cliffs, New Jersey: **64**.

ROKONUZZAMAN, M., 2013, Training needs of tribal people regarding incomegenerating activities. *Indian Res. J. Extn. Edn*.,**13**(2): 10-16.

RONAK SHAH NIRANJAN AMETA, 2008, Adopting to change with a blend of traditional and improved practices. *LIESA INDIA*, AME foundation: **10**(4):13-15.

ROSENZWEIG, C. AND M.L. PARRY, 1994, Potential impact of climate change on world food supply. *Nature*, **367**:133-138.

SAHA, B. and BAHAL, R.(2010). Livelihood diversification pursued by farmers in West Bengal. *Indian Res. J. Ext. Edu.* **10**(2):1-9

SAHANA, S., 2013, A study on contract farming in Karnataka. *Ph.D. Thesis*, (Unpub.), Univ. Agric. Sci., Bengaluru.

SAMAL, P. AND PANDEY, S., 2005, Climatic risks, rice production losses and risk coping strategies: A case study of a rain fed village in coastal Orissa. *Agric. Econ. Res. Rev.,* **18** (conference issue): 61-72.

SANDESH, H.M., 2004, A profile study of Kannada farm magazine readers in Karnataka, *M.Sc. (Agri.) Thesis*, *(Unpub.),* Univ. Agric. Sci. Dharwad (India).

SANDEEP KUMAR. R., 2013, A critical analysis of joint forest planning andmanagement in improving livelihood status of village forest committee members in Chickmaglur district of Karnataka state. *Ph.D. Thesis, (Unpub.),* Univ. Agric. Sci., Bengaluru.

SANGEETHA, S. 2013, Assessment of perceived impact of climate change on agriculture and developing suitable strategies for sustainable development. *Ph.D. Thesis*, *(Unpub.*), Tamilnadu Agric. Univ.

SANGHI, A., MENDELSOHN, R. AND DINAR, A.,1998, The climate sensitivity of Indian agriculture in measuring the impact of climate change on indian agriculture, edited by Dinar, R., Mendelsohn, Everson, J., Parika, A., Sanghi, K., Kumar, J., Mckinsey and S Lonergan. Washington, DC: The World Bank [World Bank Technical Paper No **402**].

SANJIT MAITI, 2013, Vulnerability and adoption strategies on climate change among livestock reares in costal and alpine region of India. *Ph. D. Thesis*, (Unpub.), National dairy Inst.Haryana.

SARKAR SUJIT, 2014, Assessment of climate change led vulnerability and simulating adaptive behaviour of farmers in Himalayan and Arid-ecosystem.*Ph. D. Thesis*, (Unpub.), Indian Agric. Res. Inst., New Delhi.

SATINDRA KUMAR VERMA , 2017, A study on awareness and adoption strategies of climate smart agriculture in Sultanpur district of Uttar Pradesh. *Ph.D. Thesis*, *(Unpub.),* Banaras Hindu Univ., Varnasi.

SAVITHA, S. S., 2004, Role of rural women in Animal husbandry. *M. Sc. (Agri.) Thesis*, *(Unpub.),* Univ. Agric. Sci., Dharwad, Karnataka (India).

SAVITHA, M. G., MUNIDINAMANI, S. M., DOLLI, S. S., NAIK, B. K., PATIL, B. L. AND MEGERI, S. N., 2011, Livelihood systems for rural community in Chitradurga district of Karnataka state. *Karnataka J. Agric. Sci.*,**24**(3): 325-330.

SAWANTH, P.A., 1999, An experiment study on the effectiveness of different modes of presentation of information on mushroom cultivation through television. *Ph.D. Thesis (Unpub.)* Univ. Agric. Sci., Dharwad.

SAXENA, N.,1992, Adoption of a long-gestation crop: Eucalyptus growers in North-West India. *J. Agric. Econ.*,**43**: 257–67.

SEEMA TENDEKAR, 2014. Assessment of stress management by the farmers in western vidarbha region. M.Sc thesis (unpub). Dr. PDKV, Akola (MS)

SCHUCK, E., NGANJE W. AND YANTIO, D.,2002, The role of land tenure and extension education in the adoption of slash and burn agriculture. *Ecological Econ.,***43**: 61–70.

SEO, N. AND R. MENDELSOHN., 2006, Climate change adaptation in Africa: a microeconomic analysis of livestock choice. CEEPA Discussion Paper No. **19**. Centre for Environmental Economics and Policy in Africa. Pretoria, South Africa: Univ. Pretoria.

SHAKUNTALA MANAY AND CHAMAN FARZANA, 2000, Socio-economic characteristics of rural families. *Maharashtra J. Extn. Edu.,***19** : 325-328.

SHALINI, D. M., 2017,A study on Adoption and Economic Performance of hybrid paddy cultivation among farmers of Mandya district. *M. Sc. (Agri.) Thesis, (Unpub.),* Univ. Agric. Sci., Bangalore.

SHAMNA, A., 2009, Performance analysis of village resource centres (VRCs) on farming activities in Karnataka. *Ph.D. Thesis, (Unpub.),* Univ. Agric. Sci., Bengaluru.

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

SHARADA, K., 2016, Gender and climate change adoptions in Guntur District of Andra Pradesh. *M. Sc. (Agri.) Thesis, (Unpub.).,* Acharya N. G. Ranga Agric. Univ, Hyderabad (Andhra Pradesh).

SHASHIDHAR, D. N., 2004, A study on influencing factors and constraints in drip irrigation by horticulture farmers of Bijapur district of Karnataka. *M.Sc. (Agri.) Thesis, (Unpub.),* Univ. Agric. Sci. Dharwad (India).

SHASHIDHARA, K. K., 2006, A study on management of eco-friendly practice by vegetable growers of north Karnataka. *Ph.D. Thesis, (Unpub.),* Univ. Agric. Sci., Dharwad.

SHIFERAW, B. AND S. HOLDEN., 1998, Resource degradation and adoption of land conservation technologies in the Ethiopian highlands: Case study in andit tid , North Shewa. *Agric. Econ.,* **27**(4): 739–752.

SHILPA, C. N., 2010, A study on knowledge and adoption of potato growers in Hassan Karnataka state**.** *M.Sc.(Agri.) Thesis (Unpub).* Univ. Agric. Sci., Bangalore.

SHILPA KANNAN, 2014, India's farmers neating climate change with technology. BBC news, Haryana.

SHINDE, R.A. 1997. Study of regulated markets in Raigad district. *M.Sc. (Agri.) Thesis, (Unpub.),* KK V, Dapoli. pp. 28-80.

SIMONSEN, S. H., BIGGS, R, SCHLÜTER, M., SCHOON, M., BOHENSKY, E., CUNDILL, G. AND MOBERG, F., 2014, Applying resilience thinking: Seven principles for building resilience in social-ecological systems, 1–20. Retrieved from http://www.stockholmresilience.org/download/18.10119fc11455d3c557d6928/139815079979 0/SRC+Applying+Resilience+final.pdf

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.

SOMASHEKARA, D.S.,2010, Irrigation Water Crisis Management In Cauvery Command Area – A Critical Analysis. *M.Sc.(Agri.) Thesis (Unpub).* Univ. Agric. Sci., Bangalore

SOWMYA, T.M., 2009, A study on Entrepreneurial Behaviour of Rural women in Mandya district of Karnataka**.** *M. Sc. (Agri.) Thesis, (Unpub*.), Univ. Agric. Sci., Bangalore.

SOUNAM UPADHYA, 2017, Effectiveness of DD Kisan among farmers of Panagar block of Jabalpur district (M.P). *M. Sc. (Agri.) Thesis, (Unpub*.)., Jawaharlal Nehru Krishi Vishwavidayalaya, Jabalpur.

SMITH, B., BLAIN, R., AND KEDDIE., P., 1997, Corn hybrid selection and climaticvariabality: Gambling with nature? Canadian geographer,**41**:429-438.

SPERANZA, C. I., 2010, Resilient adaptation to climate change in African agriculture. Bonn: Deutsches Institutfür Entwicklungspolitikg GmbH. Retrieved from 181 http: //www.adaptationlearning.net/sites/default/files/Studies%2054.pdf

STERN, N., 2006, Review: The economics of climate change. U.K.: H.M. Treasury.

SRINIVASAN, N, 1997. Organizational and management effectiveness of market committees and regulated markets. Ind. Jour. Agril. Mklg**. 11**(1 & 2) : 103-107.

SRINIVASA REDDY, M. V., 1995, A study on knowledge and adoption of recommended mango cultivation practices among farmers of Kolar district. *M.Sc. (Agri.) Thesis*, *(Unpub.)*, Univ. Agric. Sci. Dharwad (India).

STEFANIE ASCHMANN, 2016, Bio diversity project. Bio diversity is important because. Economic benefits: Kyvia. Ukraine-24.

SUDHA, C. K., 2016, An analysis of the impact of bore well irrigation on farmers in eastern dry zone of Karnataka. *Ph.D. (Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

SUPE, S. V., 1969, Factors related to different degrees of rationality indecision-making among farmers in Buldana district. *Ph.D. Thesis, (Unpub*.)., Indian Agric. Res. Inst., New Delhi.

SUPE, S. V. AND SINGH, S. N., 1969, Dynamics of rational behavior, new weights, New Delhi.

SURESH, 2004, Entrepreneurial behaviour of milk producers in Chittoor district of Andhra Pradesh – A critical study.*M. V. Sc. Thesis, (Unpub.),* Acharya N. G. Ranga Agric. Univ, Hyderabad (Andhra Pradesh).

SURESH, S., 2011, Studying climate change pattern through farmers participatory approach. M.Sc. (Agri.*)*, *(Unpub.)*, Tamilnadu Agric. Univ.

SWATHILAKSHMI, P.S., CHANDRAKANDAN, K. AND BALASUBRAMANI, N., 2014, Dept. Agric. Extn. Rural Socio., Tamilnadu Agric. Univ.

THANGAVEL, N.R., SUBRAMANIAN, R AND KARTIKEYAN, C., 1996, Characteristics of buffalo farmers. *J. Extn. Edu.*,**7(**1**)**:1307-1309.

TENGE, J., DE GRAAFF AND HELLA, 2004, Social and economic factors affecting the adoption of soil and water conservation in West Usambara highlands, Tanzania. *L and Degradation and Development.* **15**(2):99 –114.

THURSTONE, L.L AND CHAVE, E.J., 1929, The measurement of attitude. Chicago University Press, USA. pp 39-40.

TOL, R.S.J., 2002, New estimates of the damage costs of climate change, part I: Benchmark estimates, *Environ. Res. Econ.*, **21**(1): 47-73.

TRIVEDI, G.,1963, Measurement analysis of socio-economic status in rural families, Ph.D. *Thesis*, (Unpub.), Indian Agricultural Research Institute, New Delhi.

UNFCCC, 2007, Climate change: Impacts, vulnerabilities and adaptation in developing countries. Bonn, Germany: United Nations framework convention on climate change.

VARA PRASAD, 2016, Study on knowledge and adoption of no till technologies by the farmers in Guntur district of Andra Pradesh. *M.Sc. (Agri.) Thesis, (Unpub.)*, Acharya N. G. Ranga Agric. Univ, Hyderabad (Andhra Pradesh).

VENKATESWARLU, B., MAHESWARI, M., SRINIVASA RAO, M., RAO, V.U.M., SRINIVASA RAO, CH., REDDY, K.S., RAMANA, D.B.V., RAMA RAO, C.A., VIJAY KUMAR, P., DIXIT, S. AND SIKKA, A.K., 2013, National Initiative on Climate Resilient Agriculture (NICRA), Research Highlights (2012-13). Central Res. Inst. Dryland Agric., Hyderabad.

VERNON RUTTAN, 1994, *Agric. Enviorn. climate and health: sustainable development in 21st century*. Univ. Minnoesota Press, Minneapolis.

VIDYADHARA, B. 2015, A Study on Agricultural Risk Management Strategies Adopted By The Farmers of Eastern Dry Zone Of Karnataka. *M.Sc. (Agri.) Thesis (Unpub.),* Univ. of Agric. Sci., Bangalore.

VIDHYANAND., 2004, A study on extent of participation and Decision making by farm women in agriculture and homestead gardening in selected districts of Karnataka. *M.Sc. (Agri.) Thesis (Unpub.),* Univ. of Agric. Sci., Bangalore.

VIJAYA KUMAR, K., 2001, Entrepreneurship behaviour of floriculture farmers in Ranga Reddy district of Andhra Pradesh. *M. Sc. (Agri.) Thesis, (Unpub*.), Acharya N. G. Ranga Agric. Univ., Hyderabad.

VIJAYA KUMAR, K., 2011, Study on entrepreneurial behaviour of silkworm seed producers, *M. Sc. (Agri.) Thesis, (Unpub*.), Univ. Agric. Sci., Bangalore.

VINAYA KUMAR, H. M., 2015, Management of climate induced crisis by the farmers of coastal region. *Ph. D. Thesis (Unpub.),* Dept. Agric. Extn, U. A. S., Bangalore.

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.

VIPIN KUMAR AND RAMPHAL, 2012, Risk orientation of the farmers and their reactions towards contract farming, *Adv. Res. J. Soc. Sci*., **3**(2):216-219.

VIVEKANANDAN, 1993, Approaches in documentation traditional technologies process and out come in Tamil Nadu. *paper presented at National Seminar on Indigenous technologies for sustainable agriculture*, held at IARI, New Delhi.

WANI S,P. YIN DIXIN LI ZHONG DAR W,D and CHANDER G.(2012) Enhancing agricultural productivity and rural income through systainable use of natural resources in semi arid tropics *.journal of the science of FOOD AND AGRICULTURE.**92**(5) 1054-1063*

WARDEKKER, A., 2018, Resilience principles as a tool for exploring options for urban resilience. Solutions,**9**(1). PhD dissertation. Utrecht University, Utrecht.

WILLIM E EASTERING., 1999, Adapting North American agriculture to climate change in Review.

WORLD BANK, 2013,*Warming Climate in India to Pose Significant Risk to Agriculture, Water Resources, Health, says World Bank* (New Delhi: The World Bank); as available at: http://www.worldbank.org/en/news/press-release/2013/06/19/warming-climate-india-pose-significant-risk-agriculture-water-resources-health-says-world-bank-report.

YASHASHWINI, M. A., 2013, Effectiveness of front line demonstrations of Krishi Vigyana Kendra on FLD Farmers of Mandya district. *M.Sc. (Agri.) Thesis, (Unpub.),* Univ. Agric. Sci., Bengaluru

YASHODHARA, B., 2015, A Comparative Analysis of Livelihood Status in Irrigated and Rainfed Farming Situation in Central Dry Zone of Karnataka. *Ph.D. (Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

YEAR BOOK OF GLOBAL CLIMATE ACTION, 2017, Climate Change 2017: Mitigation of climate change contribution. Intergovernmental Panel on Climate Change. IPCC:https://www.ipcc.ch/pdf/assessmenteport/ar5/wg3/ipcc_wg3_ar5_chapter10. pdf

YIRGA, C. T., 2007, The dynamics of soil degradation and incentives for optimal management in Central Highlands of Ethiopia. *Ph.D, Thesis*. Dept. Agric. Econ., Extn, Rural Development. Univ. Pretoria, South Africa.

ANNEXEURE-I

UNIVERSITY OF AGRICULTURAL SCIENCES, BENGALURU
DEPARTMENT OF AGRICULTURAL EXTENSION
GKVK, BENGALURU-560 065

“Climate Resilience Management level Among Farmers In Agriculture In Eastern Dry Zone Of Karnataka”

INTERVIEW SCHEDULE **Schedule No. :**

I. General information

1. Name of the farmer : __________________
2. Father name : __________________
3. Village : __________________
4. Taluk :__________________
5. District : __________________

PART – II

Personal and socio-psychological characteristics of farmers

1. **Age of the respondent** (completed years): _______________

2. **Education:** Illiterate / Literate

   a. Primary school (1st – 4th std): ______ b. Middle school (5th – 7th std): ________

   c. High school (8th – 10th std): ______ d. Pre-University (10th + 12th std)/Diploma: ___

   e. Graduate and above: ________

3. **Dependency ratio:** Give the following information about the members of the family.

Sl. No.	Name	Age	Gender	Relation with respondent	Occupation	Education	Monthly earnings (Rs.)
1							
2							
3							
4							
5							
6							

4. Farm size: Indicate the land details owned by you.

Type of Land **Area (acres)**

Dry land : __________

Irrigation : __________

Garden Land : __________

Waste land : __________

Total **:** __________

5. Farming experience_____________ years

6. Annual income : Give details on the income of the family

Sl. No.	Source of Income	Net Income (Rs.)
1	Agriculture	
2	Subsidiary activities (Dairy/Sheep/Goat/Poultry)	
3	Business	
4	Salary	
5	Wages	
6	Others (specify)	
	Total	

7. Economic motivation:

Please, indicate your level of response to following statements

Sl. No.	Statements	Responses				
		SA	A	UD	DA	SDA
1.	A farmer should work towards larger yields and economic profits					
2.	The most successful farmer is one who makes the best profits					
3.	A farmer should try any new farming idea which may earn more money					
4.	A farmer should grow cash crops to increase monetary profits in comparison to growing of food crops for home consumption					

5.	It is difficult for the farmer's children to make a good start unless he provides them with economic assistance					
6.	A farmer must earn his living, but the most important thing in life cannot be defined in economic terms					

SA=Strongly agree; A=Agree; UD= Undecided; D= Disagree; SD= Strongly disagree

8. Mass media exposure:

Please provide the information about how your use the following media.

Sl. No.	Medium	Subscriber/owner Yes/no	Listening/viewing/reading behaviour		
			Regularly	Occasionally	Never
1	Radio				
2	Television				
3	News paper				
4	Farm magazines				
5	Journals				
6	Mobile SMS				
7	Video (CD)				
8	Internet				
9	Others If any				

9. Risk orientation:

Please indicate your extent of **Agree and Disagreeness** to the following statements.

Sl. No.	Statements	Response		
		A	UD	DA
1	A farmer should grow more number of crops to avoid greater risk involved in growing one or two crops			
2	A farmer should rather take more of a chance in making a bigger profit than to be content with smaller but less risk financially			
3	A farmer who is willing to take greater risk than the average farmer usually does it better financially			
4	It is better for farmers to take risk than the average usually does better financially.			

5	Trying an entirely new practice by a farmer involves risk but it is worth.			
6	It is better for grower not to try new cultivation methods, unless other growers have used them with success.			
7	Trying an entirely new cultivation practice by a farmers is risky, but it is worth			

SA=Strongly agree;A=Agree; UD= Undecided

10. Scientific orientation:

Please indicate your degree of agreement or disagreement to the following statements

Sl. No.	Statements	Response				
		SA	A	UD	DA	SDA
1.	New methods of farming give better results to beneficiaries than the old methods.					
2.	Even beneficiaries with lot of experience should use new method of farming.					
3.	Though it takes time for beneficiaries to learn new method in farming it's worth the efforts.					
4.	A good farmer experiments with new ideas in farming.					
5.	Traditional methods of farming have to be changed.					

SA=Strongly agree;A=Agree; UD= Undecided; D= Disagree;SD= Strongly disagree

11. Extension contact

Please indicate the extent of participation in extension activities

Sl. No.	Extension activities	Extent of participation		
		Regularly	Occasionally	Never
1	Krishimela			
2	Demonstrations			
3	Training programmes			
4	Field visits			
5	Educational tours/ exposure visits			
6	Campaign			
7	Exhibitions			

8	Group meetings			
9	Field day			
10	FFS/Farm school			
11	Videoconferencing			
	Others			

12. Cosmo politeness

a. Please indicate the number of times you have visited the nearest town.

(Two or more times per week/ once in 15 days/ once in a month/seldom/ never)

b. What generally would be the main purpose of your visit?

1. All visits are related to agriculture.
2. Some visits are relating to agriculture.
3. Personal/ domestic.
4. Entertainment.
5. Others
6. No Response

13. Distance to Market

How much distance from your place to market __________Kms

14. Awareness about diversification

Sl. No.	Weather parameters	Seasonal variation as compared to last 2 decades (before 1980's)						
1	**Rain fall**	***Kharif***	**Extent (in%)**	***Rabi***	**Extent (in%)**	**Summer**	**Extent (in%)**	**Total**
1	**a. Over all receipt of rains**							
	i. Increasing							
	ii. Decreasing							
	iii. Don't know							
	b. Quantity							
	i. Increasing							
	ii. Decreasing							
	iii. Don't know							

	c. Distribution Pattern							
	i. Predictable/uniform							
	ii. Unpredictable/ erratic							
	iii. Constant							
2.	**Temperature**							
	i. Increasing							
	ii. Decreasing							
	iii. Don't know							
3.	**Relative humidity**							
	i. Increasing							
	ii. Decreasing							
	iii. Don't know							
4.	**Relative humidity**							
	i. Increasing							
	ii. Decreasing							
	iii. Don't know							
5.	**Sunshine**							
	i. Increasing							
	ii. Decreasing							
	iii. Don't know							

15. Extent of natural capital

a) How Land is utilised for

Sl. No		Before Area (acres)	Now Area (acres)
1	Agriculture		
2	Horticulture		
3	Forest land		
4	Fallow land		
5	Domestic purpose		

b) Land productivity

i. Increased
ii. Decreased
iii. No change

c) Water Availability

Availability of water for irrigation					
Before			Now		
Shortage	Excess	Optimum	Shortage	Excess	Optimum

d) Water quality

i. Increased

ii. Decreased

iii. No change

16.Innovative proneness:

Give your response as the following statements

Sl. No.	Statement	Response	
		Yes	No
1	Do you want to learn new ways of climate resilience management		
2	If the extension worker gives a talk climate resilience management, would you attend?		
3	If the Government would help you to establish a climate resilience management farm elsewhere, would you move?		
4	Do you want a change in your way of life?		
5	Farmer should try to farm the way his parents did		
6	Do you want your sons to be venturesome in farming?		
7	It is better to enjoy today and let tomorrow take care of itself		
8	A man’s fortune is in the hands of god		

17. Farm financial literacy

Provide how you spend your money as the following terms

Sl. No.	Items	% of investment
1.	Consumption of money	
2.	Ceremonies ; a) Religious b) Social c) Others	
3.	Investment ; a) Land b) Implements c) Mechanization d) House e) Savings f) Others	
4.	Health	
5.	Educational	
6.	Miscellaneous a) b) c)	

18.Irrigation Potential

(Please indicate the source of irrigation and extent of area covered under irrigation)

Sl. No.	Sources of irrigation	Area covered(acres)		
		Kharif	Rabi	Summer
1	Well			
2	Bore well			
3	Canal			
4	Tank			
5	Others			

19. organizational participation

Are you in contact with any extension agents (Yes/ No). If yes, specify.

Sl. No.	Designation	Frequency of contact		
		Regularly	Occasionally	Never
1	Agriculture Officer/AAO			
2	Assistant Dir. of Agri.			
3	Deputy Dir. of Agri.			
4	University scientists/ KVK staff/university extension staff			
5	Private companies			
6	Private companies scientist/extension staff			
7	NGO’s			
8	Private consultants			
9	Agril. input dealers			
10	Others (Specify)			

20. Farm mechanization level:

How many of the following on used by you

Sl. No	Particulars	Yes	No
1	Wooden plough		
2	Iron plough		
3	Bullock cart		
4	Seed drill		
5	Leveller		
6	Tractor / power tiller		
7	Pump set / oil engine		
8	Sprayers / dusters / weeders		

PART – II

1. Climate resilience management level of the farmers

Please, indicate your response towards the extent of existence in the present situations at your own farm with respect to the following statement

Sl. No.	Statement	Measurement				
I	**Natural resource degradation management**	**Fully in Vogue**	**In Vogue**	**Undecided**	**Partially in vogue**	**Not in Vogue**
1.	Sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment					
2.	Non-adoption of soil-conservation management practices leads to desertification of the agricultural land					
3.	Steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements					
4.	Cost effective and efficient methods of water conservation and use					
5.	Encouraging crop rotation patterns					
6.	Environmental consciousness through education and mass awareness programmes which can reduces the natural resource degradation					
7.	Prevent and control the future deterioration in land, water and air which constitute our life-support systems					
8.	Ensure that development projects are correctly sited so as to minimize their adverse environmental consequences					
9.	Ensuring land for different uses based upon land capability and land productivity					
10.	Encouragement for improvement in traditional methods of rain water harvesting and storage					

11.	Developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases					
12.	Development and promotion of methods of sustainable farming, especially organic and natural farming					
13.	Raising of green belts with pollution tolerant species can protect the natural resources					
14.	Efficient use of inputs including agro-chemicals with minimal degradation of environment					
15.	Inorganic fertilizer, insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment					
II	**Agricultural resource / Non agricultural resource management**					
1.	Organic farming is effective in increasing the texture and fertility of soil					
2.	Integrated pest management is a boon to reduce the chemical use for plant protection					
3.	Integrated farming system is one of the best method to use the agricultural resource management					
4.	Measures for increasing the efficiency of water-use, water conservation and recycling					
5.	Setting up of biogas plants based on cow-dung and vegetable wastes					
6.	Restoration and protection of grazing lands					
7.	A movement toward greater efficiency in resource use including recycling					
8.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices					
9.	Development of integrated pest management and nutrient supply system					

10.	Afforestration on common lands by the local communities through government schemes					
11.	Improvement in genetic variability of indigenous population					
12.	Incentives for environmentally clean technologies, recycling and conservation of natural resources					
13.	Concerted efforts for development and propagation of non-conventional renewable energy generation systems					
14.	Improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems					
15.	Encouraging efficient utilization of forest produces					
III	**Environmental protection**					
1.	Environmental change causes negative effect on people health and animals					
2.	Organic farming can improve soil fertility and soil structure					
3.	Willing to give up part of my profit for environmental conservation					
4.	Create environmental consciousness through education and mass awareness programmes					
5.	Climate resilience reduces environmental degradation					
6.	Environmental factors play an important role in climate change					
7.	Crop cover may protect the soil climate					
8.	Climate resilience efficient in mitigating climate change effects					
9.	Less risk of pollution in climate resilience practices					
10.	Raising of green belts with pollution tolerant species					

11.	Increasing temperature and variation in rain fall are the main indicators of environmental change and modify the cropping pattern					
12.	Inorganic fertilizers and pesticides cause long term harmful effects to the environment					
13.	Pesticides and chemical fertilizers will reduce the number of soil micro organisms					
14.	Practicing the afforestration activities helps in increasing environmental conditions					
15.	Climate change reduces mineral output to the environment					
IV	**Ecological security management**					
1.	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					
2.	Protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity					
3.	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					
4.	Concentrating on Common Property Resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation					
5.	Development and promotion of methods of sustainable farming, especially organic and natural farming					

6.	Development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology					
7.	Encouraging private individuals and institutions to regenerate and develop their wastelands					
8.	Support for protecting traditional skills and knowledge for conservation of resources					
9.	Conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land					
10.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices					
11.	Restriction on introduction of exotic species of animals without adequate investigations					
12.	Discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation					
13.	Taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand					
14.	Reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority					
15.	Development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation					

PART-III

1. Document the Climate Resilient management Practices in Response to climate change

(Have you taken any practices in response to climate change, please indicate your response to the following)

Sl. No.	Statement	Measures				
		Fully fallowed	Fallowed	Undecided	Partially not followed	Not followed
1	Pest and disease resistant varieties					
2	Drought tolerant varieties					
3	Intercropping					
4	Crop substitution					
5	Alteration in sowing/ planting dates					
6	Integrated farming system approach					
7	Organic farming practices					
8	Establishing wind breaks					
9	Alteration in fertilizer/pesticide usage					
10	Establishing soil& water conservation structures					
11	Micro irrigation systems					
12	Soil moisture conservation measures					
13	Use of organic manures					
14	Integrated nutrient management practices					
15	Crop rotation					
16	Soil test based fertilizer application					
17	Integrated weed management practices					
18	Measures towards disease resistance in animals					
19	Use of suitable breeds/ varieties for climate					
20	High yielding & drought resistant forage crops/ varieties					
21	Mulching					
22	Farm pond					

PART-IV

1. Constraints Faced by the Farmers due to climate change

(Have you come across any constraints, if yes please indicate your response)

Sl. No.	Statement	Response		
		More severe	Severe	Less severe
1	Difficult to work in the field due to severe temperature			
2	Higher cost of the agricultural inputs			
3	Non availability of timely inputs (seeds, plant protection chemicals, fertilizers)			
4	Low price for the produce in the market			
5	Non availability of labour			
6	Higher labour wage rate			
7	Poor supply of uniform electricity			
8	Lack of information about long term climate change			
9	Non availability of irrigation facility			
10	Lack of knowledge regarding appropriate adaptations			
11	Lack of credit /loan from the banks			
12	Lack of storage facility in the village			
13	Absence of processing units in the village			
14	Long distance of the regulated market from the village			
15	Lack of knowledge about post-harvest technology			
16	Poor transport facility and high cost			

2.Your Suggestions to face climate resilience management

(Please indicate your suggestions to face climate resilience management)

Sl. No.	Farmer's Suggestion	More important	Important	Less important	Ignored
1	Early warning has to be given to the farmers about environmental changes				
2	Creating awareness to the farmers about appropriate adoption measures against climate change				
3	Non availability of timely inputs (seeds, plant protection chemicals, fertilizers)				
4	Subsidies/compensation has to be given for the crops to make up the cost of cultivation due to weather aberrations				
5	Insurance has to be extended to all crops				
6	Providing financial support for soil nutrient enrichment				
7	Incentives/support for increasing the green manuring				
8	Support price has to be given to all the crop produce based on cost of cultivation				
9	Creating awareness/ Support for adoption of organic farming technologies				
	Any other Specify				

ANNEXURE-II

UNIVERSITY OF AGRICULTURAL SCIENCES, GKVK, BENGALURU -65
DEPT. OF AGRIL. EXTENSION
UAS, GKVK, BANGALORE – 560065

Dr. K. Nagabhushanam
Associate Director of Extension
Directorate of Extension
UAS, Hebbal, Bangalore-24

Dear Sir/Madam,

I am glad to inform that one of my Ph.D scholar Mr. Murthy M.A, ID No. PALB-3015, is working on research topic entitled "Climate resilience management among farmers in Agriculture in Eastern dry zone of Karnataka." under my guidance. As part of the study, the student researcher is trying to develop a scale to measure the climate resilience level. In this direction, he has selected climate resilience management aspects on the basis of available literature as well as the discussion had with the experts in the field. The list of statements is herewith appended.

You are requested to rate the relevance of each statement on five point continuum viz., Most Relevant (MR), Relevant (R), Some What Relevant (SWR), Least Relevant (LR), Not Relevant (NR) in the schedule by putting a tick mark (√) at the appropriate column.

We appeal to you sir, kindly spare some of your valuable time for this, as your judgment help in the conduct of student's research. The filled in Performa may please be returned as your convenience and earliest to the researcher in the enclosed self addressed and stamped envelope.

With kind regards,

Yours sincerely,

(K.Nagabhushanam)
Chairperson (Advisory Committee)

Climate resilience management among farmers in Agriculture in Eastern dry zone of Karnataka

Operational definition: It is operationally defined as the capacity for a socio-ecological system to absorb stresses and maintain function in the face of external stresses imposed by climate change and adopt, reorganize, and evolve into more desirable management practices that improve the sustainability of the system and better prepared for future climate change impacts.

Following are the components to measure the Climate resilience management please indicate your opinion as Most Relevant(MR), Relevant (R), Some What Relevant (SWR), Least Relevant (LR), Not Relevant (NR) in the schedule by putting a tick mark (√) at the appropriate column

Sl. No.	Indicators	MR	R	SWR	LR	NR	Rank
1	Behavioral attributes						
2	Economical status						
3	Natural resource degradation						
4	Agricultural resources/ Non agricultural resources management						
5	Knowledge on climate resilient management practices						
6	Coping strategies						
7	*Planning skills*						
8	Crisis management						
9	Environmental aspects						
10	Ecological security						
11	Livelihood security						

ANNEXURE-III

Statement Wise Values For Measure the Climate Resilience Management Level in Eastern Dry Zone

Sl. No.	Statements	Measurement		
I	**Natural Resource Degradation Management**	**R.W**	**M.R.S**	**'t' value**
1.	Non-adoption of soil-conservation management practices leads to desertification of the agricultural land	0.91	4.57	1.99*
2.	Prevent and control the future deterioration in land, water and air which constitute our life-support systems	0.89	4.45	2.50*
3.	Ensure sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment	0.92	4.62	2.88*
4.	Ensure that development projects are correctly sited so as to minimize their adverse environmental consequences	0.87	4.37	2.00*
5.	Create environmental consciousness through education and mass awareness programmes can reduces the natural resource degradation	0.90	4.50	3.71**
6.	Encouragement for improvement in traditional methods of rain water harvesting and storage	0.86	4.34	1.96*
7.	Raising of green belts with pollution tolerant species can protect the natural resources	0.78	3.93	2.00*
8.	Developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases	0.83	4.18	4.33**
9.	Evolving cost effective and efficient methods of water conservation and use	0.91	4.57	2.58*
10.	Ensuring land for different uses based upon land capability and land productivity	0.86	4.31	2.51*
11.	Encouraging crop rotation patterns	0.90	4.54	3.21**
12.	Efficient use of inputs including agro-chemicals with minimal degradation of environment	0.76	3.83	3.87**
13.	Development and promotion of methods of sustainable farming, especially organic and natural farming	0.82	4.14	3.90**
14.	Take steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements	0.91	4.57	1.96*

15.	Extension of cultivation onto lands of longer potential and/or high natural hazards causes high ill effect	0.75	3.73	2.72*
II	**Agricultural Resource / Non Agricultural resource Management**			
1.	Measures for increasing the efficiency of water-use, water conservation and recycling	0.91	4.59	1.74 ^{NS}
2.	Development of integrated pest management and nutrient supply system	0.88	4.40	2.43*
3.	Development of technologies for enhancing the productivity and efficiency of use of all biomass resources	0.79	3.96	1.87 ^{NS}
4.	Integrated pest management is a boon to reduce the chemical use for plant protection	0.92	4.60	3.58**
5.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices	0.88	4.44	2.95*
6.	Improvement in genetic variability of indigenous population	0.86	4.31	2.15*
7.	Restoration and protection of grazing lands	0.88	4.42	3.05**
8.	Incentive for growing fodder crops and establishment of fodder banks	0.83	4.19	1.41 ^{NS}
9.	Creation of land banks for compensatory afforestration	0.83	4.19	2.30*
10.	Afforestration on common lands by the local communities through government schemes	0.87	4.39	2.11*
11.	Setting up of biogas plants based on cow-dung and vegetable wastes	0.90	4.54	2.27*
12.	Improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems	0.84	4.22	2.04*
13.	Incentives for environmentally clean technologies, recycling and conservation of natural resources	0.86	4.34	2.81*
14.	Concerted efforts for development and propagation of non-conventional renewable energy generation systems	0.85	4.29	2.37*
15.	Encouraging efficient utilization of forest produces	0.83	4.19	5.31**
16.	A movement toward greater efficiency in resource use including recycling	0.88	4.40	3.09**
17.	Organic farming is effective in increasing the texture and fertility of soil	0.93	4.65	3.63**
18	Integrated farming system is one of the best method to use the agricultural resource management	0.92	4.63	2.81 **
III	**Environmental Protection**			
1	Climate change reduces mineral output to the environment	0.76	3.81	3.92**

2	Healthy environment and sustainable development in agriculture possible through climate resilience	0.89	4.49	2.58*
3.	Willing to give up part of my profit for environmental conservation	0.75	3.73	2.04*
4.	Inorganic fertilizers and pesticides cause long term harmful effects to the environment	0.83	4.18	3.35**
5.	Environmental factors play an important role in climate change	0.87	4.39	1.93 NS
6.	Chemical fertilizers has seriously polluted groundwater	0.76	3.81	1.05 NS
7.	Climate resilience efficient in mitigating climate change effects	0.85	4.26	2.66*
8	Organic farming can improve soil fertility and soil structure	0.91	4.59	2.05*
9	Climate resilience reduces environmental degradation	0.89	4.45	2.23*
10.	Less risk of pollution in climate resilience practices	0.84	4.22	3.28**
11.	Pesticides and chemical fertilizers will reduce the number of soil micro organisms	0.75	3.65	5.07**
12.	Greater bio diversity found in climate resilience	0.81	4.06	3.55**
13.	Create environmental consciousness through education and mass awareness programmes	0.89	4.45	2.20*
15.	Practicing the afforestration activities helps in increasing environmental conditions	0.80	4.01	2.16*
16.	Raising of green belts with pollution tolerant species	0.84	4.22	1.71 NS
17.	Increasing temperature and variation in rain fall are the main indicators of environmental change	0.84	4.24	5.05**
18.	Environmental change causes negative effect on people health and animals	0.911	4.55	5.24**
19.	Crop cover may protect the soil climate	0.86	4.34	4.64**
IV	**Ecological security management**			
1.	Conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land	0.83	4.18	2.33*
2.	Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices	0.82	4.14	1.7 2 NS
3.	Protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity	0.88	4.40	2.72*
4.	Emulation and support for protecting traditional skills and knowledge for conservation	0.84	4.21	2.80*

5.	Development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology	0.85	4.29	2.05*
6.	Discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation	0.81	4.06	3.90**
7.	Restriction on introduction of exotic species of animals without adequate investigations	0.82	4.14	3.55**
8.	Encouraging private individuals and institutions to regenerate and develop their wastelands	0.85	4.27	2.44*
9.	Taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand	0.79	3.98	2.54*
10.	Development and promotion of methods of sustainable farming, especially organic and natural farming	0.85	4.27	2.25*
11.	Development and strengthening of formal education efforts for awareness of biodiversity, and promoting action for sustainable use and biodiversity conservation	0.76	3.81	3.00**
12.	Reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority	0.78	3.93	3.59**
13.	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	0.90	4.50	2.06*
14.	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	0.88	4.44	2.38*
15.	Concentrating on Common Property Resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation	0.87	4.36	2.05*
16.	Recognition and integration of the full range of intrinsic as well as direct values of biodiversity into human activities	0.78	3.73	1.05 NS
17.	Raising of fuel-wood species and provision of alternatives to reduce dependence on fuel-wood	0.76	3.96	0.87 NS
18.	Restriction on diversion of prime agricultural land for other purpose	0.75	3.47	1.18 NS

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

R.W: Relevancy weightage, M.R.S: Relevancy score,

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A Scale to Measure Climate Resilience Management Level among Farmers and Its Application

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ABSTRACT

An attempt is made in the study to construct a scale to measure climate resilience management level among farmers. The method of summated rating procedure was followed in the construction of climate resilience management scale. All those items with the relevancy weightage of 0.75 and above were selected for the inclusion in the climate resilience management level scale. Sixty items retained in the scale to measure the climate resilience management level. The scale developed was found reliable (0.9223) and valid (0.9603). The results revealed that 43.33 per cent of farmers belonged to medium level of climate resilience management followed by 38.34 and 18.33 per cent had low and high level of climate resilience management level, respectively.

Keywords: Climate change, resilience management level, item analysis, reliability, validity

CLIMATE change is posing biggest challenges facing the world today. The problems of human induced climate change first came into force and drew the attention of the scientist and policy makers when Inter Governmental Panel on Climate change was established. Agriculture in entire world and particularly in India mostly depend on the persisting weather conditions. The alteration in global warming has dramatically affected on agriculture and it's productivity, through serious-erratic monsoon, micro level changes in agricultural zones, spread of tropical diseases, sea level rise, change in availability of fresh water, floods, droughts, heat waves and storms, etc. Analysis of different metrological data from weather stations in the country shows that there is an upward trend in mean temperature and downward trend in relative humidity (RH), annual rainfall and number of wet days in a year. With unpredictable weather, farmers keep changing crop management practices by growing suitable crops, varieties and be prepared for constant change in the farming practices.

Impacts of climate change are diversified and need to be understood, so as to workout pragmatic strategies to mitigate ill-effects of climate change. There is no scale available to measure climate resilience management level; hence, the present study was taken up with following objectives :

1) Developing a scale to measure the climate resilience management level among the farmers.
2) To measure the climate resilience management level among the farmers in eastern dry zone.
3) To document the climate resilience management practices followed by farmers to mitigate climate change.
4) To know the association between Climate resilience management and farmers profile characteristics and.
5) To enlist the constraints faced by farmers due to climate change and their suggestions.

METHODOLOGY

The study was conducted in Chikkamagalur district of Karnataka state during 2016-17. Study area was purposively selected because it represents both rainfed and irrigated conditions. Randomly 60 farmers were personally interviewed using the scale developed to measure the Climate resilience management level among the farmers. The collected data was scored and analyzed using frequency and percentage.

Development of scale to measure the Climate Resilience Management level among farmers

Climate Resilience Management level is operationally defined as the capacity for a socio-ecological system to absorb stresses and maintain functional in the face of external stresses imposed by climate change and adopt, reorganize and evolve into more desirable management practices that improve the sustainability of the system and better prepared for future climate change impacts. The method suggested by Likert (1932) and Edward (1969) in developing scale was followed in construction of climate resilience management level among farmers. The procedure followed in construction of the scale is depicted in the following steps.

Table I revealed that 21 dimensions were identified from the literature and discussion with experts in the selected fields. It is apparent that, all

TABLE I

Steps to develop and standardize a scale to measure the climate resilience management level among farmers

Steps	Management level	
	Considered	Retained
Collections of Dimensions	21	4
Collection of items	110	110
Editing of items	110	81
Relevancy Analysis	81	70
Item Analysis	70	60
Reliability and Validity	60	60
Administrating the scale	60	60

the 21 dimensions will not contribute equally towards the climate resilience management level among farmers. Hence, the variation in contribution of each dimension for the resilience management must be represented by assigning different weightage to each of the dimension. Judgment ratings for all the 21 dimensions were obtained and the relevancy weightage were worked out. Based on relevancy weightage more than 0.90 is considered, accordingly four dimensions, namely natural resource degradation management, agriculture resource /non agriculture resource management, environmental protection and ecological security management were identified and included to develop the scale. 130 statements pertaining to Climate Resilience Management level was prepared based on the available literature and discussion with experts from selected areas.

Further, the statements were edited as per the 14 criteria suggested by Edwards (1969), Thurstone and Chave (1929). As a consequence 29 statements were eliminated and the remaining 81 statements were included for the study. Eighty one statements were mailed to experts in the Agricultural Extension and other related fields working in SAUs, ICAR institutions in Karnataka State Department of Agriculture to critically evaluate the relevancy of each component viz., Most Relevant (MR), Relevant (R), Somewhat Relevant (SWR), Less Relevant (LR) and Not Relevant (NR) with the score of 5, 4, 3, 2 and 1, respectively. The 'relevancy weightage' and 'mean relevancy score' were worked out for 81 statements. The statements were analyzed for their relevancy using the following formulae.

$$\text{Relevancy Weightage} = \frac{(MR\times5)+(R\times4)+(SWR\times3)+(LR\times2)+(NR\times1)}{\text{Maximum Possible score}}$$

$$\text{Mean Relevancy Score} = \frac{(MR\times5)+(R\times4)+(SWR\times3)+(LR\times2)+(NR\times1)}{\text{Number of Judges responded}}$$

The results on the relevancy weightage and mean relevancy weightage score obtained after analysis. Accordingly statements having 'relevancy weightage' of more than 0.75 and above and 'mean relevancy score' of 3.65 and above were considered for final selection. Sixty statements were retained after relevancy test and these statements were suitably modified and written as per the comments of the judges wherever applicable.

$$t = \frac{\overline{X}_H - \overline{X}_L}{\sqrt{\dfrac{\left[\Sigma x^2_H - \dfrac{(X_H)^2}{n}\right] \left[\Sigma x^2_L - \dfrac{(X_L)^2}{n}\right]}{n\,(n-1)}}}$$

where

Σx^2_H= sum of the square of the individual scores (high group)

Σx^2_L= sum of the square of the individual scores (Low group)

x_H=mean score for the given item for high group

x_L=mean score for the given item for low group

Item analysis

To delineate the statements based on the extent to which they can differentiate the Climate Resilience

Management level as lower or lower management level, item analysis was carried on the statements selected in the first stage. For item analysis, statements were arranged in ascending order based on relevancy score. The 't' value of the statements were calculated by using following formula.

Based on the item analysis (t value), 60 statements which were statistically significant at 5 per cent and 1 per cent were finally retained in the scale to Climate Resilience Management level.

Reliability and validity of the scale

The value of correlation coefficient was 0.8595 and this was further calculated by using Spearman brown formula and obtained the reliability coefficient of the whole test. The value of the scale was 0.9223 which was highly significant at 1 per cent level indicating high reliability of the scale. The validity of coefficient of the scale was 0.9603 which was also statistically significant at 1 per cent level of probability indicates the higher validity of the developed scale. Hence, the scale is said to be valid. Thus the developed scale to measure the Climate Resilience Management level was feasible and appropriate.

Table II indicates that 60 statements which determines the Climate Resilience Management level consist of both positive and negative statements. The

TABLE II

Statement consisted to measure the climate resilience management level among the farmers

Statement	Measurement				
	Fully in Vogue	In Vogue	Un decided	Partially in vogue	Not in Vogue
1	2	3	4	5	6
I Natural resource degradation management					
1. Sustainable and equitable use of resources for meeting the basic needs of the present and future generations without causing damage to the environment					
2. Non-adoption of soil-conservation management practices leads to desertification of the agricultural land					
3. Steps for restoration of ecologically degraded areas and for environmental improvement in our rural settlements					
4. Cost effective and efficient methods of water conservation and use					
5. Encouraging crop rotation patterns					
6. Environmental consciousness through education and mass awareness programs which can reduces the natural resource degradation.					
7. Prevent and control the future deterioration in land, water and air which constitute our life-support systems					
8. Ensure that development projects are correctly sited so as to minimize their adverse environmental consequences					
9. Ensuring land for different uses based upon land capability and land productivity					
10. Encouragement for improvement in traditional methods of rain water harvesting and storage					
11. Developing coping mechanisms for future climatic changes as a result of increased emission of carbon dioxide and greenhouse gases					

1	2	3	4	5	6
12. Development and promotion of methods of sustainable farming, especially organic and natural farming					
13. Raising of green belts with pollution tolerant species can protect the natural resources.					
14. Efficient use of inputs including agro-chemicals with minimal degradation of environment					
15. Inorganic fertilizer ,insecticides and other chemicals used in non-organic farming cause long term harmful effects to the environment					
II Agricultural resource / Non agricultural resource management					
1. Organic farming is effective in increasing the texture and fertility of soil.					
2. Integrated pest management is a boon to reduce the chemical use for plant protection.					
3. Integrated farming system is one of the best method to use the agricultural resource management.					
4. Measures for increasing the efficiency of water-use, water conservation and recycling					
5. Setting up of biogas plants based on cow-dung and vegetable wastes					
6. Restoration and protection of grazing lands					
7. A movement toward greater efficiency in resource use including recycling					
8. Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices					
9. Development of integrated pest management and nutrient supply system					
10. Afforestration on common lands by the local communities through government schemes					
11. Improvement in genetic variability of indigenous population					
12. Incentives for environmentally clean technologies, recycling and conservation of natural resources					
13. Concerted efforts for development and propagation of non-conventional renewable energy generation systems					
14. Improvement of infra-structural facilities such as water supply, sewerage, solid waste disposal, energy recovery systems					
15. Encouraging efficient utilization of forest produces					

1	2	3	4	5	6
III Environmental protection					
1. Environmental change causes negative effect on people health and animals					
2. Organic farming can improve soil fertility and soil structure					
3. Willing to give up part of my profit for environmental conservation					
4. Create environmental consciousness through education and mass awareness programs					
5. Climate resilience reduces environmental degradation					
6. Environmental factors play an important role in climate change					
7. Crop cover may protect the soil climate					
8. Climate resilience efficient in mitigating climate change effects					
9. Less risk of pollution in climate resilience practices					
10. Raising of green belts with pollution tolerant species					
11. Increasing temperature and variation in rain fall are the main indicators of environmental change and modify the cropping pattern					
12. Inorganic fertilizers and pesticides cause long term harmful effects to the environment					
13. Pesticides and chemical fertilizers will reduce the number of soil micro organisms					
14. Practicing the afforestration activities helps in increasing environmental conditions					
15. Climate change reduces mineral output to the environment					
IV Ecological security management					
1. 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					
2. Protection of domesticated species/varieties of plants and animals in order to conserve indigenous genetic diversity					
3. 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					

1	2	3	4	5	6
4. Concentrating on Common Property Resources as these offer a single platform to collectively address issues of social justice, ecological restoration and poverty alleviation					
5. Development and promotion of methods of sustainable farming, especially organic and natural farming					
6. Development of methodologies to multiply, breed and conserve the threatened and endangered species through modern techniques of tissue culture and biotechnology					
7. Encouraging private individuals and institutions to regenerate and develop their wastelands					
8. Support for protecting traditional skills and knowledge for conservation of resources					
9. Conservation of micro-fauna and micro-flora which help in reclamation of wastelands and revival of biological potential of the land					
10. Protection and sustainable use of plant and animal genetic resources through appropriate laws and practices					
11. Restriction on introduction of exotic species of animals without adequate investigations					
12. Discouragement of monoculture and plantation of dominating and exotic species, in areas unsuited for them and without sufficient experimentation					
13. Taking measures to increase the production of fodder and grasses to bridge the wide gap between supply and demand					
14. Reorientation of the development process, ensuring that ecological and livelihood security become central concerns and that the conservation of biodiversity receives the highest priority					
15. Development and strengthening of formal education efforts for awareness of biodiversity promoting action for sustainable use and biodiversity conservation					

response collected on a five point continuum, namely, fully in vogue, in vogue, undecided, partially in vogue, and not in vogue with assigned score of 5, 4, 3, 2 and 1, respectively for positive statements and vice versa for negative statements. Thus, the minimum and maximum score one could get is 60 and 300, respectively. Higher the score indicates the high management level of farmers towards Climate Resilience Management level and lesser the score indicates low management level.

Results and Discussion

Dimension wise analysis climate resilience management level among farmers in Eastern Dry Zone

The results in Table III revealed that the irrigated situation, natural resource degradation management (62.00%) and Agriculture / non agricultural resource management (60.00%) were ranked I and II, respectively. Where in rainfed situation, environmental

TABLE III

Dimension wise analysis climate resilience management level among farmers in eastern dry zone

Dimensions	Scores	Per cent	Rank
Irrigated (n=30)			
Natural resource degradation management	93.43	62.00	I
Agriculture / non agricultural resource management	90	60.00	II
Environmental protection	88.25	58.84	III
Ecological security management	87.85	58.56	IV
Rainfed (n=30)			
Environmental protection	128	85.34	I
Ecological security management	84	56.00	II
Agriculture / non agricultural resource management	71.22	47.48	III
Natural resource degradation management	62.14	41.42	IV
Pooled (n=60)			
Environmental protection	216.25	72.00	I
Ecological security management	171	57.00	II
Agriculture / non agricultural resource management	161	53.67	III
Natural resource degradation management	155	51.66	IV

TABLE IV

Climate resilience management level of the farmers different situations in eastern dry zone

Management level	Irrigated		Rainfed	
	No.	%	No.	%
High	8	26.67	5	16.67
Medium	15	50.00	11	36.67
Low	7	23.33	14	46.66
Total	**30**	**100**	**30**	**100**

TABLE V

Distribution of farmers according to their climate resilience management level in eastern dry zone

Management level	No.	%	Mean	SD
High	13	18.33		
Medium	26	43.33	249.56	9.49
Low	21	38.34		
Total	**60**	**100**		

protection (85.34%) ecological security management (56.00%), were ranked I and II, respectively. In pooled situation, environmental protection (72.00 %) and ecological security management (57.00 %) were ranked I and II, respectively. The probable reason for above findings might be environmental protection is the prime factor which determine climate change. Ecological security management determine the life of all creatures on this earth and ecological resource supports the living beings. The findings are conformity with the findings with Mamathalakshmi *et al.* (2013).

Climate resilience management level among the farmers in Eastern Dry Zone

An examination of Table IV indicates the levels of climate resilience management of farmers in different situations. In irrigated situation, half of the respondents (50.00 %) belongs to medium climate resilience management subsequently 26.67 and 23.33 per cent under high and low climate resilience management, respectively. Due to irrigation facilities, the irrigated farmers harvests two to three crops in a year leading to increased opportunities. In the rainfed situation, 46.66 per cent respondents had low level of climate resilience management followed by 36.67 and 16.67 per cent of them fall under medium and low climate resilience management level, respectively. As it is rainfed situation only one crop can be harvested per year was the possible reason for this type of results. The findings are conformity with the findings of Vinay Kumar *et al.* (2010).

Distribution of farmers according to their climate resilience management level in Eastern Dry Zone

A critical look at the Table V shows that 43.33 per cent of farmers belonged to medium level of climate resilience management followed by 38.34 and 18.33 per cent of them belong to low and high climate resilience management level, respectively. It can be inferred that majority (62 %) of farmers had medium level to high level of climate resilience management level. Most of the respondents have availed the benefits of government initiated programmes and also majority of the respondents depends on-farm and off-farm activities for their livelihood security. The results are in close agreement with findings of Shankar (2010).

It can be concluded that the scale developed is useful to measure the climate resilience management level beyond the study area with suitable modifications. The reliability and validity of the developed scale indicated the precision and consistency of results. The study revealed that majority (62 %) of farmers had medium to high level climate resilience management practices.

References

Edwards, A. L., 1969, Techniques of Attitude scale construction. *Vikils, Feger and Simons Pvt. Ltd.,* Bombay.

Likert, R., 1932, A technique for the management of attitude. *Psych. Stud.,* **5** : 106-107.

Mamathalakshmi, N., 2013, An analysis of Livelihood security among Agricultural labourers in Karnataka. *Ph.D. Thesis*, (Unpub.), Univ. Agri. Sci., Bengaluru.

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

Thurstone, L. L. and Chave, E. J., 1992, The measurement of attitude. *Chicago University Press,* USA, p. 39-40.

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

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