

Farmers' Perception about Climate Change and Strategies to Cope-up with Climate Change in Uttar Pradesh

Thesis

Submitted to the



**Govind Ballabh Pant University of Agriculture & Technology,
PANTNAGAR-263145 (U.S. Nagar), Uttarakhand, INDIA**

By

**SHARAD JOSHI
(47030)**

**IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF**

Master of Science
(AGRICULTURAL EXTENSION AND COMMUNICATION)

DECEMBER, 2016

ACKNOWLEDGEMENT

In expressing my innate feelings and thoughts, first of all I would like to bow my head with adoration before the “Omniscient Almighty” for it is his grace that allowed me to drive forward through the entire impediments and acquired me to this juncture of immense pleasure.

First and foremost, I would like to extend my sincere gratitude to my research guide Dr. M.A, Ansari for introducing me to this exciting field of research and for his dedicated help, advice and continuous support, throughout my M.Sc. period. His enthusiasm and his mission to produce high-quality research work made a quality impression on me. During our course of interaction during the last one and half years, I have learnt extensively from him, including how to raise new possibilities, how to approach a problem by systematic thinking, data-driven decision making and exploiting serendipity. I owe him lots of gratitude for having me shown this way of research. I am really glad to be associated with a person like him in my life.

My special words of thanks should go to the esteemed members of my advisory committee Dr. Gyanenedra Sharma and V. L. V. Kameswari, for their valuable suggestions and guidance during the course of investigation.

I am thankful to Dean, College of Post Graduate studies; Dean, College of Agriculture; University Librarian and Department Librarian for providing necessary facilities.

I am grateful to Dr. S.K.Kashyap, Professor and Head; Department of Agricultural Communication for giving me moral support during my studies. My heartfelt thanks to Dr. B. Kumar, Dr. Neelam Bharadwaj, and Dr.Amardeep for giving me constant support and encouragement regarding the research work.

I owe my deepest gratitude towards my parents who have been source of my strengths and guided me during my studies. Their patience and sacrifice will remain my inspiration throughout my life. Without their help, I would not have been able to complete much of what I have done and become who I am.

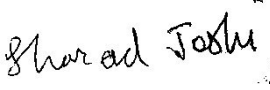
A special thanks to my brother Deepak and sister Preeti for their love and affection. Thanks to the supporting hand by them whenever I needed their help.

My special thanks to fellow mates Priyanka, Arpit, Debashis, Abhinav, Sumit, Mall, Jyoti and Himanshu for always standing by my side and sharing a great relationship as compassionate friends. I will always cherish the warmth shown by them.

A special mention of thanks to my loving seniors in the department, Neelam Basera, Anjali Chunera, Renu Gangwar, Amita Yadav, Neha Arya , Deepti Kothari, Rifat Haneef, Arjun Verma, Rupesh Ranjan, Archana Bhatt, G.K. Arpana, Tanuja Verma, Pooja Kohli, Neelam Yadav, Geeta Negi, and many more for their constant support and cooperation during my stay. Their timely help and friendship shall always be remembered.

Thank are also due to Sabhanand ji and other office staff of the department of Agricultural Communication for facilitating office support whenever needed. Their constant cooperation and personal help always kept me going ahead during my course of M.Sc.

Pantnagar
December,2016


(Sharad Joshi)
Author

CERTIFICATE

This is to certify that the thesis entitled “**Farmers’ Perception about Climate Change and Strategies to Cope-up with Climate Change in Uttar Pradesh**”, submitted in partial fulfilment of the requirements for the degree of **Master of Science** with major in **Agricultural Extension and Communication** of the College of Post Graduate Studies, G.B. Pant University of Agriculture and Technology, Pantnagar, is a record of *bonafide* research carried out by **Mr. Sharad Joshi, Id.No. 47030**, under my supervision, and no part of the thesis has been submitted for any other degree or diploma. The assistance and help received during the course of this investigation have been duly acknowledged.

Pantnagar
December, 2016



(M.A. Ansari)
Chairman
Advisory Committee

CERTIFICATE

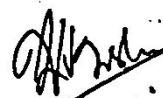
We, the undersigned, members of the Advisory Committee of **Mr. Sharad Joshi**, **Id.No. 47030**, a candidate for the degree of **Master of Science** with major in **Agricultural Extension and Communication**, agree that the thesis entitled **“Farmers’ Perception about Climate Change and Strategies to Cope-up with Climate Change in Uttar Pradesh ”** may be submitted in partial fulfilment of the requirements for the degree.



(M.A. Ansari)
Chairman
Advisory Committee



(Gyanendra Sharma)
Member



(V.L.V Kameswari)
Member

CONTENT

S. No.	CHAPTERS	PAGE
1.	INTRODUCTION	
2.	REVIEW OF LITERATURE	
3.	RESEARCH METHODOLOGY	
4.	RESULTS AND DISCUSSION	
5.	SUMMARY AND CONCLUSION	
	LITERATURE CITED	
	ANNEXURE	
	VITA	

LIST OF TABLES

Table No.	Title	Page No.
1	Sample of Farmers from the selected Blocks and Villages	
2	Selected Variables and their Measurement	
3	Distribution of farmers according to age	
4	Distribution of farmers according to educational level	
5	Distribution of farmers according to gender	
6	Distribution of farmers according to family size	
7	Distribution of farmers according to Occupation	
8	Distribution of farmers according to farming experience	
9	Distribution of farmers according to land holding	
10	Distribution of farmers according to annual income	
11	Distribution of farmers according to decision making ability	
12	Distribution of farmers according to economic motivation	
13	Distribution of respondents according to scientific orientation	
14	Distribution of respondents according to mass media exposure	
15	Distribution of farmers according to frequency of use of mass media	
16	Distribution of respondents according to information seeking behaviour	
17	Distribution of respondents according to their knowledge level on coping strategies with regard to climate change	
18	Distribution of respondents according to their knowledge about coping strategies	
19	Distribution of respondents according to perception of farmers about climate change	
20	Distribution of the farmers according to perception on each statement on farmers' perception about climate change	
21	Relationship between farmer's socio-personal, economic, psychological and communication characteristics and their perceptions about climate change	
22	Results of hypothesis on relationship between independent variables and farmers' perception about climate change	
23	Partial regression analysis	
24	Multiple regression equation for independent variables with dependent variable (Perception of farmers about climate change)	

LIST OF FIGURES

Figure No.	Title	Page No.
1	Map of Uttar Pradesh	
2	Map of Lucknow district	
3	Map of Hardoi district	
4	Distribution of farmers on the basis of age	
5	Distribution of farmers on the basis education level	
6	Distribution of farmers on the basis of gender	
7	Distribution of farmers on the basis of family size	
8	Distribution of farmers on the basis of occupation	
9	Distribution of farmers on the basis of farming experience	
10	Distribution of farmers on the basis of land holding	
11	Distribution of farmers on the basis of annual income	
12	Distribution of farmers on the basis of decision making ability	
13	Distribution of farmers on the basis of economic motivation	
14	Distribution of farmers on the basis of scientific orientation	
15	Distribution of farmers on the basis of mass media exposure	
16	Distribution of farmers on the basis of information seeking behaviour	
17	Distribution of farmers on the basis of knowledge about coping strategies	
18	Distribution of farmers on the basis of perception of farmers about climate change	

INTRODUCTION

Climate change has been considered as the most vital issue affecting the survival of the human race in the 21st century. There has been a continuous global debate, putting the blame on each other's head for being more responsible for the climate change. Scientists have clearly said that it is the high time for the adoption of preventive and corrective measures to save the planet earth from the upcoming catastrophe. Climate change with expected long-term changes in rainfall pattern and shifting temperature cycles are expected to have significant negative effects on agriculture, food and water security and economic growth of the country (**DFID, 2004**). Climate change is expected to have a serious and lasting impact on agriculture sector in India. The most important impact of the climate change can be observed in obvious terms of global temperature increase popularly known as global warming. There was a worldwide increase (0.4-0.7 °C) in temperature (**Singh, 2008**). In ecological terms, this is a very rapid change. Due to this increasing temperature, various problems occur like- melting of the glaciers, increase in the sea level which may lead to complete inundation of coastal areas, change in the patterns of the rainfall leading to frequent droughts and floods and effects on human health and livelihood. Climate change has adverse impact on agriculture leading to economic slowdown of the country.

Climate Change and Agriculture

Agriculture is the backbone of economy in most of the developing countries. In addition to food and raw material, agriculture also provides employment opportunities to large population. Climate change directly affects agriculture production as this sector is inherently sensitive to climatic conditions and is one of the most vulnerable sectors at the risk and impact of global climate change (**Parry *et al.* 2005**).

In Asia, agricultural crop yield are expected to decline by 5-30 percent by 2050s due to rise in temperature in the Himalayas and this decline in yields will have negative impact on food security in, which poses a serious problems for the survival human beings. Fourth Assessment Report of Intergovernmental Panel on Climate Change (IPCC) also describes the impact of climate change on food security. Projections suggested that there could be large increase in hunger globally by 2080. Reductions in hunger were driven by

projected social and economic development. For the references, The FAO has estimated that in 2006, the number of people undernourished globally was 820 million(**CIA, Factbook, 2014-15**).

Any short term or long term fluctuation of climate can have dramatic effects on the agricultural productivity. Thus, the climate has a direct impact on the food safety. The risk associated with climate change lie in the interaction of several systems with many variables that must be collectively considered. It is evident that human activities can affect climate that is one of the component of the environment. Climate in turn affects agriculture, the source of all food consumed by human beings and domestic animals.

Agriculture and Climate Change in India

India is an agriculture dependent country as more than two third of its population depends on agriculture for their survival. Agriculture contributes approximately 18 percent (**CIA, Factbook, 2014-15**) of India's GDP. India is a large country with a diverse climate, diverse seasons, diverse crops and diverse farming systems. There is a high dependency of agriculture on monsoon rains and a close link exists between climate and water resources. The impacts of climate change are multidimensional and global. Countries like India are more vulnerable in view of the high population depending on agriculture. Climate change, it is predicted will reduce yields by 4.5-9 percent, depending on the magnitude and distribution of global warming. Since, agriculture makes up roughly 18 percent (**CIA, Factbook, 2014-15**) of India's GDP, a 4.5-9 percent negative impact on agricultural production on agriculture implies the cost of climate to be roughly 1.5 percent GDP per year (**NICRA 2011**).

People's livelihoods, especially in rural areas, are directly or indirectly affected by climate change. Climate change poses a direct and serious threat to the livelihoods of millions of people in India. They depend pre-dominantly on agriculture and natural resources (**Kates *et al.* 2011**).

Negative impacts of climatic change are such as cereal productivity to decrease by 10-40 percent by 2100, greater loss expected in Rabi crops. Every 1°C increase in temperature will reduce wheat production by 4-5 million tones, and with increase in 2°C temperature the yield of rice and wheat will decrease i.e. 8.5 and 12.2 quintal per hectare, respectively. Further increase in melting of glaciers in Himalayas will affect availability of irrigation in the Indo- Gangetic plains (**Aggarwal, 2008**).

Climate Change in Uttar Pradesh

During the last one decade, Indian state of Uttar Pradesh has suffered due to many climatic changes. Eastern Uttar Pradesh has faced severe floods, while Bundelkhand region has faced one of the worst famines of the last decade. Thus, the impact of climate change has negatively affected agricultural production that gave a huge loss of paddy and corn crops in eastern districts and regional crops in Bundelkhand (www.geagindia.org). Climate-related disasters have brought widespread gloom and huge economic losses to Uttar Pradesh, adversely affecting public health, food security, agriculture, water resources and biodiversity in the state. Floods are the most general annual occurrences in Uttar Pradesh, affecting one or the other part of the state; the most affected being the districts of the eastern U.P. and terai region. A large majority of farming in India very much dependent on weather. It is ironic, then, that a large percentage of greenhouse-gas emission-come from agriculture. Fossil-fuel intensive agriculture is contributing to the formation of the unpredictable weather conditions which all farmers will require to battle in the not so distant future.

Scientists believe that the changing weather conditions in a state suggest that the state is reeling under climatic anarchy. For more than a decade now, the state has been experiencing contrasting severe weather conditions. Agriculture has been most horribly affected in Uttar Pradesh by these climatic changes. A little decrease in temperatures can diminish the production of wheat crops, but may help out in the growth of paddy. Such changes may have often angled the farmers towards growing one crop at the expenditure of the other. This would lead to imbalances in crop production.

According to the census conducted in the year 2001, out of the total worker population of U.P. the population of agriculture workers is 62.12 percent. Uttar Pradesh contributes 21 percent to the food grain production of India contributing about of 42.7 million tons and the per capita production of 234 kg. U.P. is at the third rank in the food grain production in major states, and is known as a food grain surplus state. Yet the condition of farmers is not at all of satisfactory level. Government and development organizations have tried to deal with the situation, but their initiatives have been more relief oriented than solution oriented. Local people have devised their own peculiar ways and means to deal with the situation. Their methods are inherently scientific and require no

external help or support. These region specific techniques have shaped people's lifestyles in these regions and strengthened their adaptive capacities," said Prof. (Dr) Shiraj A Wajih, President, Gorakhpur Environmental Action Group. According to a 'Gorakhpur Environmental Action Group, survey "agriculture in Uttar Pradesh is characterized by very small size of land holdings; approx 90 percent of the farmers in the state are small and marginal farmers (www.geagindia.org). Some 73.8 percent of the total operational holdings in the state are marginal (below 1.0 ha) and another 15.5 percent holdings are small (1-2 ha). Due to the preponderance of the small holdings cropping pattern, U.P. agriculture is still largely subsistence oriented." He further said that, "We need to strengthen our capacities and capabilities to deal with climatic changes, civil society should be more responsible and sensitive towards nature. Government should make interdepartmental integration and farmer friendly policies. It should not jeopardize agricultural growth in favour of corporate interests. Being one of the most populous and geographically diverse state of India, U.P. is more prone to climatic changes."

In Bundelkhand, various small and marginal farmers are indebted to small banks and private money lenders. As the weather gets hotter, the probability of paying back loans become difficult, leading to stress and in some cases, farmers committing suicides. The growing water scarcity poses further troubles of survival to people and animals alike. Already there have been reports of cattle deaths due to water scarcity in the district. In recent years, the ground water level has gone down. The ill effects of climate change can also be seen on women farmers, especially poor women farmers because of their low social and economic status. They also have less accessibility to livelihood resources and land holdings. There is a serious danger of climatic changes (in the form of severe droughts, floods, intense rainfall, and storms) undermining development programmes and millennium development goals aimed at reducing poverty.

Currently India is spending 2.5 percent of its total GDP on measures to control the adverse impact of climate change, which is a big amount for any developing nation. The zeal of rapid industrialization, deforestation and willful consumption of natural resources is likely to make the situation worse. Policy makers at the state, regional and national level should take a serious view of the economic, agricultural, health-related and environmental impacts of climate changes.

Coping Strategies and Agriculture

Coping strategies, both behavioral and psychological efforts, that helps to cope up with climate change. Variety of options exists for adaptation. There are improved crop and grassland management practices like improved organic practices, fertilizer use, tillage and residues management and restoration of degraded lands and improved water use efficiency. Thus the changing climate force farmers to take appropriate step to mitigate or cope with climate change as their production is reducing continuously. Farmers follow different strategies to solve their problems.

The farmers have made some strategies in their choice of technology, production and consumption decision regarding climate change risks and vulnerability. These coping strategies are categorised into three categories.

- A) Ex ante risk management strategies (choice in tolerant varieties, water management)
- B) Seasonal adjustment of crop and resource management in response to climate change
- C) Ex post risk management (reduce livelihoods negative impacts of climate change).

Strategies followed by farmers to cope up with climate change are:

A number of researchers as well as policy planners have recommended to farmers to follow the below mentioned strategies to cope up with climate change.

- Implementing water harvesting practices- It implies such activities in which minimum use of water give the maximum output yield for example drip irrigation, sprinkler irrigation.
- Shift in sowing dates and time - According to changes in climate we shift our sowing date and time.
- Use of tolerant varieties- Use of such varieties which can tolerate water stress conditions or heat stress period.
- Building water harvesting structures- Rain water harvesting needs to be promoted to get required water in lean season.
- Less water consuming crop varieties- Growing those crops whose water requirement is less.
- Crop insurance to minimize the economic losses.

- Conservation agriculture.
- Change in cropping pattern.
- Micro (farm level) and macro (National level) adaptation strategies with the help of government officials.

Perception of Farmers about Climate Change

Perception refers to the process concerned with the acquisition and interpretation of information from one's environment (**Maddox, 1995**). Perception of the farmers is also changing as the climate is changing day by day. As the temperature is increasing, rainfall is shifting and heavy climatic disaster is occurring. The farmers have more concerns about the climate and pattern of climate change as it has serious impact on crop production. The perception of the farmers is changing. The following studies revealed the extent of farmers perception about climate change.

Maddison (2006 a) discovered that adaptation to climate change requires that farmers first notice that the climate has changed, and then identify useful adaptations and implement them. Another important issue related to adaptation in agriculture as pointed out by Bryant et al.(2000) is how perceptions of climate change are translated into agricultural decisions.

Maddison (2006 b) argued that if farmers learn gradually about the change in climate, they will also learn gradually about the best adaptation options towards it. According to him, farmers learn about the best adaptation options through the followings three ways:

1. Learning by doing.
2. Learning by copying.
3. Learning from instruction.

Akanda and Howlader (2015) stated that adaptation towards climate change is affected mostly by the same factors which affect farmers perception, Thus perception is the preliminary stage of adaptation towards climate change.

This demonstrates how the farmers' perception is changing and how they are preparing themselves for a better response to climate change. Thus we can say that the

present study will have a significant importance to reveal farmers perception towards climate change.

Government initiatives

1. National Action Plan on Climate Change (NAPCC)

On June 30, 2008, the then Prime Minister Manmohan Singh initiated India's first National Action Plan on Climate Change (NAPCC) delineating the existing and future policies and programs addressing climate mitigation and adaptation. The plan recognized eight core "national missions" in a row through 2017 and directed the ministries to submit detailed implementation plans to the Prime Minister's Council on Climate Change by December 2008. Focusing on the overriding priority of maintaining high economic growth rates to raise living standards, the plan "identifies measures that encourage our development objectives while also yielding co-benefits for addressing climate change effectively" It indicates these national measures would be more successful by assistance from developed countries, and pledges that India's per capita greenhouse gas emissions will at no point exceed that of developed countries even as we pursue our development objective. The main principles of the programme are as follows:

- Protecting the deprived and the vulnerable sections of society through a comprehensive and sustainable development strategy, sensitive to climate change.
- Achieving national growth objectives by a qualitative change in direction that enhance ecological sustainability, leading to more mitigation of green house gas emission.
- Devising efficient and cost effective strategies for end user demand side management.
- Deploying suitable technologies for both adaptation and mitigation for green house gases emissions widely as well as at an accelerated pace.
- Engineering new and innovative form of markets regulatory and voluntary mechanisms to endorse sustainable development.

National Missions

a) National Mission for Sustainable Agriculture: The plan aims to support climate adaptation in agriculture through the development of climate-resilient crops, growth of weather insurance mechanisms, and agricultural practices.

b) National Mission on Strategic Knowledge for Climate Change: To add a better understanding of climate science, impacts and challenges, the plan envisions a new Climate Science Research Fund (CSRF), better climate modeling, and increased international collaboration. It also encourages private division initiatives to develop adaptation and mitigation technologies through venture capital funds.

2. National Initiative on Crop Resilient Agriculture (NICRA)

ICAR launched a project on climate change, namely National Initiative on Climate Resilient Agriculture (NICRA) in February, 2011. The aim of NICRA is to bring flexibility to the Indian agriculture for the climate change and the variability in the long term with the help of research and technology. The research on adaptation and mitigation focuses on crops, livestock, fisheries and natural resource management. The project has four components:-

- Strategic Research on adaptation and mitigation.
- Demonstration of the new technology available to check the vulnerability due to climate change in 100 prone districts.
- Capacity building.
- Sponsored competitive research to fill critical gaps.

Unique features of the projects are:

- Critical assessment of different crops / zones in the country for vulnerability to climatic stresses and extreme events, in particular the intra seasonal variability of rainfall. Installation of state of the art equipments.
- Instant and huge scale screening of crop germplasm, including wild relatives for drought and heat tolerance through phenomics platforms for quick identification of promising lines and early development and release of drought/ heat tolerant varieties.
- Comprehensive field evaluation of new and emerging approaches of paddy cultivation like aerobic rice and SRI for their contribution to reduce the GHG (green house gases) emissions and enhance water savings.
- Special attention to livestock and fishery sectors including aquaculture which have not received enough attention in climate change research in the past. In particular,

the documentation of adaptive traits in indigenous breeds will be the most useful step.

- Thorough understanding of crop-pest / pathogen relationship and emergence of new biotypes due to climate change.
- Simultaneous up-scaling of the outputs, both through KVKs and the National mission on Sustainable Agriculture for wider adoption by the farmers.

Objectives of NICRA are:

- To enhance the resilience of Indian agriculture covering crops, livestock and fisheries to climate variability and climate change through development and application of improved production and risk management technologies.
- To demonstrate site-specific technology packages on farmers' fields for adapting to current climate risks.
- To enhance the capacity of scientists and other stake holders in climate resilient agricultural research and its application.

1.1 Problem Statement

Indian situation is predominantly agrarian and the climatic conditions vary from time to time. In recent years, low agricultural production in India is associated with changes and variability in climatic condition. Raising fossil fuel burning and land use changes have emitted and continuing to emit, increasing quantities of green house gases into earth's atmosphere. Many studies discovered that climate change has more negative impact than positive impact. "In case of rainfed agriculture, droughts always results in crop failure, decreases the yield of food grains (cereals and pulses), horticultural and livestock production which weakens the income of agrarian households" (**Udmale *et al.* 2014**).

According to the report of FAO, due to climate change India lost 18% of its rainfed cereal production. Global warming is causing all the trouble in the present context of agrarian situations. Climate related hazards affect poor peoples' lives through impact on livelihoods, reduction in crop yields, or destruction of homes although indirectly. The development objectives in the field of agriculture get lopsided because of climate change.

Indian agriculture is predominantly dependent upon monsoon and up to 80 percent variability in crop yields is caused by weather in India. It has been projected that under the

range of 2.5-4.9°C temperature, rice yield will drop by 32-41 percent and wheat yield by 41-52 percent (NICRA 2011). As a result, GDP would fall by 1.8-3.4 percent in the coming years (NICRA 2011).

Farming is the leading occupation in Uttar Pradesh. It contributed 20 percent of country's total food grains production of 235.88 mt in 2010-11. It has first rank in wheat production all over India. It also contributed 35 percent of the total wheat production, 13 percent of the pulses output and 8 percent of the coarse cereals yield in the country in 2010-11. Uttar Pradesh comprises of many small and marginal farmers who own a meager amount of land holding and due to repetitive change in weather and climate conditions they are in severe trouble. They have various perceptions regarding the climatic hazards before and now. They are lacking proper information before hand regarding the changes in the weather and climate which counts towards their losses in agricultural sector. Severe losses in this sector make them forcefully sell their land and get engaged in non-agricultural operations. In several states, situation has compelled the poor farmers to commit suicide. To overcome agricultural risk associated with climate change such as heat stress and uneven rainfall, farmers have adopted different coping strategies e.g. practicing conservation agriculture, drip irrigation, building water harvesting structure and crop insurance scheme.

Hence, this study typically aims at studying the perception of farmers about climate change and to develop more efficient coping strategies for tackling the adverse situation beforehand. In this context, the study **“Farmers’ Perception about Climate Change and Strategies to Cope-up with Climate Change in Uttar Pradesh”** was undertaken with the following objectives:

1.2 Objectives

- To study socio-personal, economic, psychological & communication characteristics of farmers.
- To determine farmers’ knowledge of various coping strategies related to climate change adaptation.
- To find out farmers’ perception about climate change.
- To find out relationship between farmers’ socio-personal, economic, psychological and communication characteristics and their perceptions about climate change.

1.3 Scope of the study

The study shall reveal the diverse and varied perception of farmers' towards climate change and knowledge of farmers about coping strategy to cope-up with climate change.

- The findings of the study will highlight the clear understanding of perception of farmers about climate change.
- The study will also reveal the knowledge of farmers about various coping strategy to cope up with climate change.
- The study is expected to serve as a helpful guide for scientists and policy makers to develop specific plans regarding the change in climate in agriculture.

1.4 Limitation of the study

- The present study focuses on the farmers of Uttar Pradesh. Therefore findings cannot be generalized on large scale to other areas.
- The study will also suffer from all the limitations associated with studies conducted by single researcher and limited time available to take the study.

1.5 Organization of the Thesis

This study has been presented in five chapters and each chapter has been devoted to a clear cut exposition of various aspects of the main theme. Chapter 1 (Introduction) gives a brief account of need, specific objectives as well as scope and limitations. This is followed by Chapter 2 (Review of literature), which deals with past studies relevant to the present study. The Chapter 3 (Research Methodology) described the locale of the study with reference to the selection of State, Districts, Blocks, Villages and respondents, selection and measure of variables, data collection and statistical tools used. Chapter 4 covers the Results and Discussion and the Chapter 5 gives the brief Summary and Conclusion of the present study. The literature consulted and cited in this study has been enlisted in the section under reference. Relevant appendices have also been adequately included.

REVIEW OF LITERATURE

A literature review gives an overview of the field of inquiry that has already been done on the topic. The review helps to design the objectives and methodologies which are appropriate and relevant for the study. On the basis of objectives, the review of literature has been classified into four sub-heads:

- 2.1 Socio-personal, economic, psychological and communication characteristics of farmers.
- 2.2 Farmers' knowledge of various coping strategies related to climate change adaptation.
- 2.3 Farmers' perception about climate change
- 2.4 Relationship between farmers' socio-personal, economic, psychological and communication characteristics and their perceptions about climate change.

2.1 Characteristics of the Farmers

Raghunandan (2004) in a study on "A study on knowledge and adoption level of soil and water conservation by farmers in northern Karnataka" reported that majority (23.38 percent) of respondents were illiterate, 22.50 percent studied up to primary, 20 percent middle school, 15 percent up-to high school, 11.25 percent of respondents up to pre university, whereas 5 percent respondents had graduation.

Kumar *et al.* (2011) reported that majority (70 percent) of farmers had medium level information seeking behaviour. As regard to scientific orientation, it was found that majority of them had medium scientific orientation and displayed moderately favourable attitude towards use of information sources.

Yadav (2011) revealed that more than half (55.42 percent) were in the middle age group (20-48 years). Almost all farmers were literates and about half (49.39 percent) were educated up to intermediate level. Three fourth of the farmers had medium family income followed by nearly one fourth (22.98 percent) farmers with low family income and only 13.25 percent had high family income. It was also revealed that maximum farmers had a medium level of social participation followed by high (39.75 percent) and low (15.66

percent) level of social participation. Majority (96.38 percent) of farmers were contacting fellow farmers to get agricultural information. This was followed by friends and about 96.36 percent farmers contacted them for information followed by family members or relatives (83.13 percent), neighbors 68.67 percent and progressive farmers (59.03 percent).

Yadav and Rani (2011) in their paper on “Role of communication in climate change and sustainable development” revealed that indigenous communication channels are used for creating awareness among people in disaster prone areas and motivating them to adopt life saving styles.

Roy *et al.* (2013) in a study on “Socio-economic status of hill farmers in Almora district in Uttarakhand” revealed that 26.67 percent farmers belonged to low SES (socio-economic status) category, 55 percent farmers belonged to medium SES category and 18.33 percent farmers belonged to high SES category.

Jha and Bisht (2014) while studying “Addressing the information needs of farmers to enable climate change adaptation: A study of Bundelkhand region in Central India” found that 41 percent of the farmers preferred ‘other farmers and elders’ as primary source of information related to agriculture and 39 percent farmers preferred ‘government officials’ such as Pradhan and Gram Sevak.

Rastogi and Hasan (2014) reported in a study on “Communication behavior of agricultural input users of Udham Singh Nagar” that 73.75 percent farmers were in the middle age group followed by young (13.75 percent) and old (12.5 percent) Majority of respondents were literate (78.75 percent). Majority (48.75 percent) of respondents were having medium level of income (0.8-1.2 lac) followed by high (33.75 percent) and low (17.5 percent) income. The majority (56.25 percent) were having small size land holding followed by medium (36.25 percent) and large (7.5 percent) size land holding.

Adelani and Oyesali (2014) conducted a study on “Information sources and awareness about climate change by citrus farmers in Benue state, Nigeria” reported that 15.4 percent had primary education, 53.7 percent had secondary school education whereas 22 percent had higher education.

Raghuvanshi (2014) in a thesis on “Awareness about Climate Change and Adaptation of Agricultural Practices by Farmers in Uttarakhand” found that 76.38 percent

of farmers had low level of information seeking behaviour from mass media sources and only 1.81 percent had high level of information seeking behaviour from mass media sources.

2.2 Farmers' Knowledge about Coping Strategies of Climate Change on Agriculture

Narain (2003) reported that households engaged in agriculture can employ a range of strategies like by improving their access to available water in responding to water scarcity (e.g. make shift storages, digging deeper tubewells, exchanging irrigation timeshares), reducing their demand for water (e.g. switching to less water consumptive crops, adopting more efficient irrigation practices, and altering dates for agricultural operations), coping with the adverse impacts of periodic droughts (e.g. credit, sales of valuables and livestock, use of stored seeds and food grains) and diversifying their sources of livelihood (e.g. alternative employment opportunities , migration).

Bradshaw *et al.* (2004) in a study on “Farm-level adaptation to climatic variability and change: Crop diversification in the Canadian Prairies” revealed that important adaptation options in the agricultural sector includes crop diversification, mixed crop livestock farming systems, using different crop varieties, changing planting and harvesting dates, and mixing less-productive and drought-resistant varieties and high yielding water sensitive crops.

Selvaraju *et al.* (2006) while studying “Livelihood adaptation to climate variability change in drought-prone areas of Bangladesh” found that the main coping strategies practiced by the small scale farmers were in the form of change in the agronomic practices and in the choice of crop varieties that tolerate the new conditions.

Nhemachena and Hassan (2007) in a study on “Micro-level analysis of farmers' adaptation to climate change in southern Africa” reported that the adaptation options being used by farmers can be classified into two main categories: (a) increased diversification and (b) escaping sensitive growth stages through crop management practices which ensures that critical crop growth stages do not coincide with very harsh climatic conditions in the season such as mid-season droughts.

Kelkar *et al.* (2008) found in a study on “Vulnerability and adaptation to climatic variability and water stress in Uttarakhand” that majority of households reported that in

poor rainfall years they shift to less water-intensive crops or look for other employment. Other options include obtaining loans or selling assets or taking loans from traditional money-lenders, during low income periods.

Gbetibouo (2009) in a paper on “Understanding farmers’ perception and adaptations to climate change and variability” stated that the main strategies followed by the farmers were building water harvesting structure and storage tanks to cope with rise in temperature.

Dhaka *et al.* (2010) while studying “Analysis of farmers’ perception adaptation strategies to climate change” concluded that the chief coping measures followed by farmers were change in planting time, cropping pattern, soil and water conservation and planting drought tolerant crops.

Sogani (2011) in a study on “Climate change perceptions and adaptation practices in Uttarakhand” reported that the sowing season of some crops has been shifted because of warmer climate. In earlier times, Rabi crops would be sown and harvested between first week of October and second week of May, almost eight months. Today, crops are being sown after first fortnight of October and harvested after first fortnight of May. To address the unpredictability of weather, people have also resorted to intercropping with vegetables, spices and fruit trees.

Latha *et al.* (2012) revealed in a study on “Impact of climate change on rainfed agriculture in India: A case study of Dharwad” that mixed and intercropping was the major coping mechanism which was adopted by 75.66 per cent followed by integrated and mixed farming which was adopted by 71.11 per cent and change in cropping pattern to the extent of 42.22 percent.

Codjoe *et al.* (2013) while studying “Climate change awareness and coping strategies of cocoa farmers in rural Ghana” concluded that adaptation options used by cocoa farmers to sustain adverse effect imposed on cocoa production by climate change can be categorized into shade strategy, land preparation, soil preparation strategy and farm size strategy.

Shankar *et al.* (2013) in a study on ‘Farmers’ perception and adaptation measures towards changing climate in South India and role of extension in adaptation changing

climate' observed that early sowing, salt water spray for harvested paddy stalks, strengthening of rivers banks and improved drainage are the major adaptation strategies followed by the farmers.

2.3 Farmers' Perception about Climate Change

Lautze *et al.* (2003) in a report on "Risk and vulnerability in Ethiopia" stated that analysis of trends in precipitation in long cycle crop-producing regions indicates a strong and consistent drying trend of (negative) 23 mm per year. Thus, the appearance of climate change in Ethiopia is a factor much commented on by urban and farming populations alike.

Maddison (2006) reported in a study on "Perception and climate change in Africa" that a significant number of farmers believe that temperature has already increased and that precipitation has declined for eleven African countries.

Bhusal (2009) in a study on 'Local people's perception on climate change, its impact and adaptation measures in mid-mountain region of Nepal' observed that 50 percent of the respondents said that temperature is increasing, rainfall pattern is unpredictable, seasons are changing and incidents of droughts are increasing.

Mertz *et al.* (2009) analysed "Farmers' perceptions of climate change and adaptations in the savanna zone of Senegal" the results of the study showed that farmers in this zone are aware of climate variability, and identified intensive wind and occasional excess rainfall as indicators of climate change.

Mandleni and Anim (2011) while working on "Perceptions of cattle and sheep framers on climate change and adaptations in the Eastern Cape Province of South Africa" concluded that. about 86 percent of the farmers were aware of increase in temperature, and that weather conditions in the province was dominated by drought. About 83 percent of the respondents reported that harsh weather conditions led to the reduction in cattles.

Nyanga *et al.* (2011) interviewed farmers in Zambia to elicit information on their perceptions of climate change impacts in the country. Most farmers reported that they have perceived increase in the duration of the cold season, no change in the duration of the hot season and a reduction in the rainy season's duration. Further, farmers perceived an increase in the frequency of droughts and floods.

Sofoluwe *et al.* (2011) surveyed farmers in Osun State, Nigeria to gather information on their perceptions about changes in temperature and precipitation. The results revealed that more than 75 percent of the respondents were aware of increase in temperature and precipitation in the region.

Shashidahra and Reddy (2012) while studying “Farmers’ perception and adaptations about climate change and its variability in UKP area of Karnataka” observed that a large majority of respondents (90 percent) perceived, increase in temperature and only 2 percent perceived decrease in temperature.

Shankara *et al.* (2013) in a study on “Farmers’ perception on climate change and its impact on agriculture in eastern dry zone of Karnataka” found that about 73.00 percent of farmers had high level of perception followed by medium (20.83 percent) and low (5.83 percent) level of perception about changes in the rainfall. In case of changes in the temperature, about 76.66 per cent of farmers had high level of perception followed by medium (19.17 percent) and low (4.17 percent) level. Majority of farmers (99.16 percent) had high, 0.84 percent had medium and none of them had low level of perception about changes in the temperature.

Tripathi and Singh (2013) observed in their study on “Perception, anticipation and responses of people to changing climate in Gangetic plains of India” that only 76 percent had positive perception about the effects of climate change.

Akanda and Howlader (2015) while studying “Coastal farmers’ perception about climate change effects in Patuakhali District of Bangladesh” found that less than three-fifth (55.45 percent) of the farmers had medium perception compared to 24.75 percent of them having low and 19.80 percent high perception in this area. Thus, majority (80.20 percent) of the farmers had low to medium perception about climate change.

Fadlullah (2015) in a paper on “Farmers’ perception of climate change and coping strategies across gender in two agro-ecological Zones of Nigeria” reported that general perception by both females and males was that climate change reduces the yield of crops, increase the cost of crop production and reduces the productivity of livestock.

2.4 Relationship between Farmers' characteristics and their perception about climate change

Maddison (2006) while working on "Perception and adaptation to climate change in Africa" stated that farmers with the greatest farming experience, access to free extension services and markets were more likely to notice changes in climatic conditions.

Nhemachena and Hassan (2007) examined "Farmers' perception about climate change and adaptation strategies in South Africa, Zambia and Zimbabwe" revealed that gender, years of farming experience, access to extension services, access to credit facilities and markets of the farmers were related to their perception about climate change in the region.

Temesgen *et al.* (2008) while analyzing the "Determinants of farmers' choice of adaptation methods and perceptions of climate change in the Nile Basin of Ethiopia" found that age of the household head, wealth, information on climate change, social capital, and agro-ecological settings have significant effects on farmers' perceptions of climate change.

Gbetibouo (2009) while working on "Farmers' perception and adaptations to climate change in South Africa" concluded that farmers with access to extension services were more likely to perceive changes in the climate because extension services provide information about climate and weather.

Mensah *et al.* (2010) conducted a survey in Ghana to investigate how they perceive long-term changes in temperature, rainfall and vegetation cover over the past twenty years. The explanatory variables included household characteristics, years of farming experience, farm size, access to markets, access to extension services, access to credit/loans, land tenure and soil fertility.

Graft and Onumah (2011) analyzed "Farmers' perceptions and adaptations to climate change: An estimation of willingness to pay in western Ghana" revealed age, gender, years of education, years of farming experience, own farm land and other income generating activities were found to be significantly related with the perception of farmers about climate change.

Sofoluwe *et al.* (2011) surveyed farmers in Osun State, Nigeria to gather information on their perceptions about changes in temperature and precipitation. The

regression results showed that livestock ownership, access to loans, off farm income generation, gender and household size were significantly related with the perception of farmers about climate change.

Ndambiri *et al.* (2012) in a study on “Evaluation of ‘farmers’ perceptions and adaptation to the effects of climate change in Kenya” reported that age of the household head, gender, education, farm experience, household size, distance to the nearest market, access to irrigation water, local agro-ecology, on and off farm income, access to information on climate change through extension services, access to credit, changes in temperature and precipitation were found to have significant influence on the probability of farmers to perceive and/or adapt to climate change.

Ogalleh *et al.* (2012) found in a study on “Local perceptions and responses to climate change and variability in Laikipia district of Kenya” found that household size had significant impact on the perception that amount of water flow in streams is decreasing. By interpretation, it can be said that a larger family’s perception of the amount of water flow in streams would be different from that of a smaller family.

Akanda and Howlader (2015) while studying “Coastal farmers’ perception about climate change effects in Patuakhali District of Bangladesh” concluded that education, farm size, annual family income, communication exposure, agricultural knowledge and fatalism exposure had significant relationship with perception of farmers about climate.

RESEARCH METHODOLOGY

Research methodology is a detailed plan of investigation and the blue print of procedure for carrying out the research. The methodology designed and adopted for conducting present study has been presented under following sections;

- 3.1 Description of the Study Area.
- 3.2 Locales of the Study.
- 3.3 Selection of Blocks.
- 3.4 Selection of Villages.
- 3.5 Selection of Respondents.
- 3.6 Research Design.
- 3.7 Hypothesis.
- 3.8 Operationalisation of the Variables and Measurement.
- 3.9 Data Collection Tools and Procedures.
- 3.10 Statistical Methods used for Analysis of Data.

3.1 Description of the Study Area

3.1.1 Universe of study

Uttar Pradesh is a northern part of India. In 1947, when India gained independence, the state of United province was renamed as Uttar Pradesh. It is situated on the northern spout of India and shares an international boundary with Nepal. The Himalayas border the state on the north, but the plains that covers most of the state are distinctly different from those high mountains. The larger gangetic plain region is in the north, it includes the Ganges-Yamuna Doab, the Ghaghra plains and the terai, the smaller vindhya range plateau region is in the south. It is characterized by erujhard rock strata and a varied topography of hills, plains, valleys and plateaus. The bhabhar area which is covered with tall elephant grass and thick forests interspersed with marshes and swamps. The sluggish rivers of the bhabhar deepen in this area, their course running through a tangled mass of thick under growth. The terai sub-region is the first in the Eastern tract consisting of fourteen district which are subject to periodical floods and droughts and have been classified as scarcity areas. These districts have the highest density of population which gives the lowest per

capita land. The other two regions, the central and the western are comparatively better with a well-developed irrigation system. They suffer from water logging and large -scale user tracts. In addition, the area is fairly arid. The state has more than 32 large and small rivers. The Ganges, Yamuna, Saraswati. Sarayu, Betwa and Ghagra are larger and also of religious importance in Hinduism.

Uttar Pradesh lies between latitude 24° - 31° N and longitude 77° - 84° E According to census, Uttar Pradesh has a population of 199,581,477 (19.9 crore) making it most populous state in the country. For administrative purposes, the state is divided into 18 division and 75 districts. There are 303 sub division, 313 tehsils, 11 municipal corporation, 689 cities, 820 community development blocks, 52,000 Gram Sabha, and 1,07,452 revenue villages out of which 97,941 are inhabitant and 9.511 uninhabitant in the state. The gender ratio is 908 females per 1000 males as per the census 2011 with 65 percent of the population living in rural area. Total geographical area of the state is 24,170 thousand hectare out of which 16,573 hectare is under cultivation. Gross cropped area is 25,414 thousand hectare, with the cropping intensity of 153 percent. In Uttar Pradesh the average size of land holding is around 0.83 ha and per capita land area is 0.14ha, which is less than a half of national average of 0.32 ha (<http://www.uttarpradeshindia.com/>).

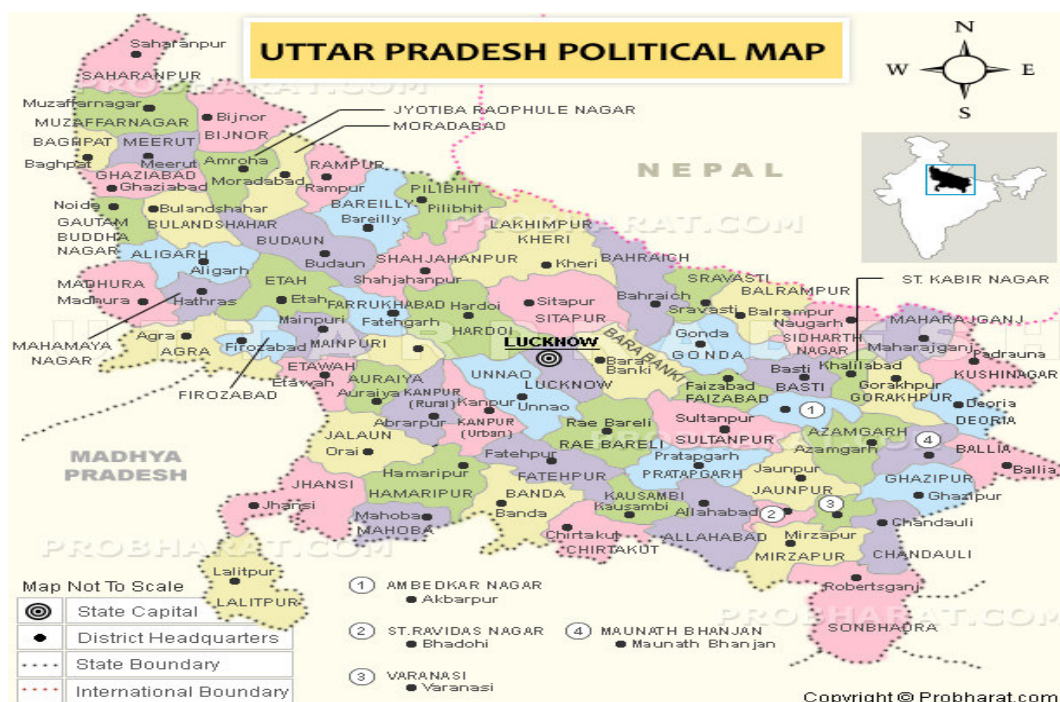


Figure 1 Map of Uttar Pradesh

3.2 Locales of the Study

Out of 75 districts, two districts, i.e. Lucknow and Hardoi were selected purposively. The purpose was the lack of rainfall for last three years (2013, 2014 and 2015). Due to this, heat stress has increased comprehensively leading to changes in cropping pattern as well as farming practices by the farmers of area under study. The area (i.e. selected districts) also does not have irrigation facilities. Hence, farmers were feeling the adverse impact of climate change. Lucknow formed the central part of the province of *Oudh* and capital of Uttar Pradesh as it occupies central position of the state. It is situated along both side of the river Gomti- a tributary of the river Ganga. It lies in between 26°30' to 27° 10' North latitude and 80°30' to 81° 13' East longitude. It covers an area of 2544 sq. km and the area of city is 310.104 sq km excluding cantonment area. It has 2.207 million populations with the density of 7120.25 persons per sq. km. It is surrounded by the districts Sitapur in the North, Barabanki in the East, Raibareli in the South, Hardoi in the North West and Unnao in the South West. The climate of the region is tropical monsoon. It experiences dry and hot summer and very cold winter every year. Dust storm in summer and cold North wind in winter are common. Some time the temperature in summers may go as high as 48.3°C and may drop as below as -1.0° C in winter. Lucknow districts receives most of the annual rain fall (85.5per cent) in the months of June, July, August and September and rest of the amount comes during winter season through North East and retreating monsoon. The annual rainfall is 953 mm.

The second district which is selected purposively was Hardoi which lies between 26°53' to 27°47' N and 79°41' to 80°49' E. It is bounded on the North by district Shahjahanpur and Kheri. On the East the Gomti river separates it from district Kheri and Sitapur. On the South lie the district of Unnao and Lucknow, while to the west are the districts of Shahjahanpur and Farrukhabad and, for a very short distance in the south-western corner, the Kanpur district. Hardoi had an area of 6012 Sq. Kms. The main rivers running through the district are Ganga, Ramganga, Garra and Gomati. The Ganga along with Garra and Ramganga drains the lowland and the Gomati flows along the eastern boundary of the district.

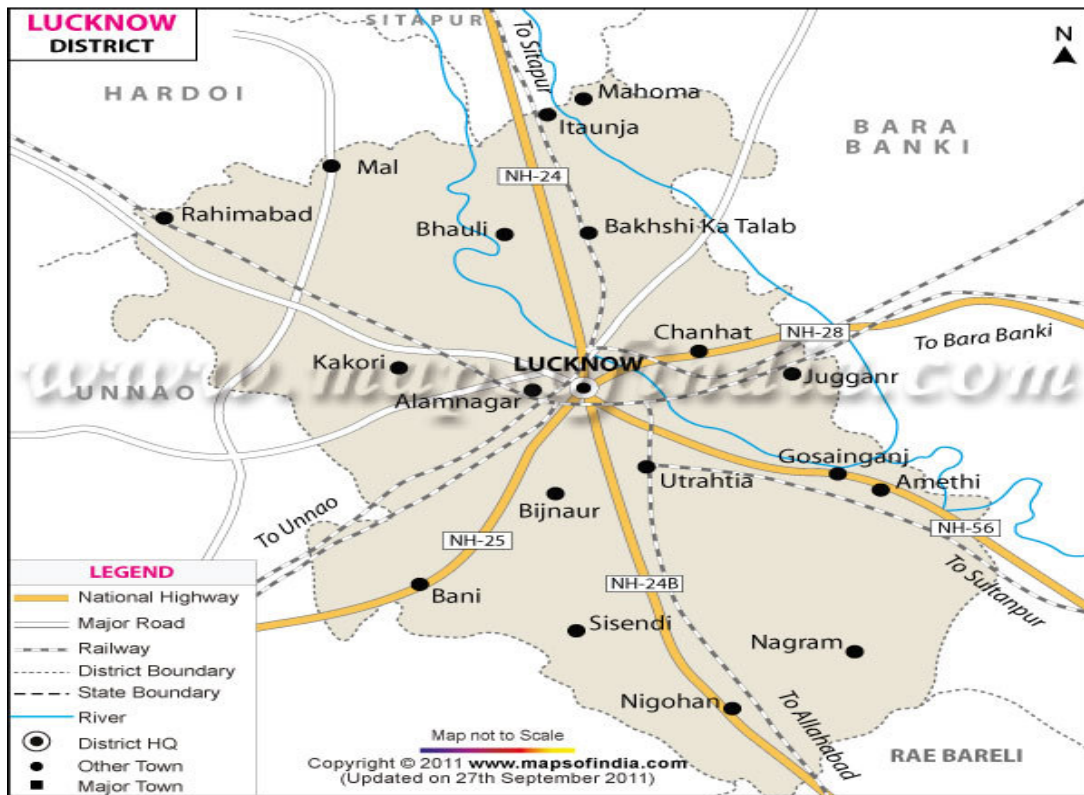


Figure 2 Map of Lucknow district



Figure 3 Map of Hardoi District

3.2 Selection of blocks

One block from each selected district (Lucknow and Hardoi) was selected purposively. Therefore, from Lucknow district (which has eight blocks), Bakshi Ka Talab block and from Hardoi district (which has thirteen blocks), Kothawa block were selected purposively.

3.3 Selection of villages

Two villages from each block were selected purposively where agriculture is the primary source of income and is followed as the major occupation. From Hardoi district (Kothawa block), Sair Bahadurpur and Jankipur villages were selected, and from Lucknow (Bakshi Ka Talab block) district, Bhauli and Dhinauri villages were selected purposively.

3.4 Selection of respondents

The study sample comprised of one hundred twenty respondents (farmers) selected randomly, i.e. thirty respondents from each village.

Sample of respondents

Table 1: Sample of Farmers from the selected Blocks and Villages

S.No.	Districts	Blocks	Villages	Sample Size
1	Lucknow	Bakshi Ka Talab	Bhauli	30
			Dhinauri	30
2	Hardoi	Kothawa	Sair Bahadur pur	30
			Janki Nagar	30
Total			120	

3.5 Research Design

A research design enables the investigator to answer the research questions as objectivity, accurately, and economically as possible. It sets up a theoretical framework for testing relationship among variables, and helps to keep the research in proper direction. Appropriate research design is critical for any research investigation. Depending upon the

nature of the study and to meet the study objective set forth, analytical research design was adopted for this study.

3.6 Hypothesis of investigation

Null hypothesis

- **H_{0A}**- Age of farmers is not related to perception of farmers about climate change.
- **H_{0B}**- Gender of farmers is not related to perception of farmers about climate change.
- **H_{0C}**- Education of farmers is not related to perception of farmers about climate change.
- **H_{0D}**- Family size of farmers is not related to perception of farmers about climate change.
- **H_{0E}**- Occupation of farmers is not related to perception of farmers about climate change.
- **H_{0F}**- Farming experience of farmers is not related to perception of farmers about climate change.
- **H_{0G}**- Land holding of farmers is not related to perception of farmers about climate change.
- **H_{0H}**- Annual income of farmers is not related to perception of farmers about climate change.
- **H_{0I}**- Knowledge about coping strategy of farmers is not related to perception of farmers about climate change.
- **H_{0J}**- Decision making ability of farmers is not related to perception of farmers about climate change.
- **H_{0K}**- Economic motivation of farmers is not related to perception of farmers about climate change.
- **H_{0L}**- Scientific Orientation of farmers is not related to perception of farmers about climate change.
- **H_{0M}**- Mass media exposure and ownership is not related to perception of farmers about climate change.
- **H_{0N}**- Information seeking behavior is not related to perception of farmers about climate change.

3.8 Operationalization of Variables and their Measurement

Independent variables

Table 2: Selected Variables and their Measurement

S. NO.	Variables	Measurements
1	Age	Structured schedule
2	Gender	Category
3	Education	Structured schedule
4	Family size	Structured schedule
5	Occupation	Structured schedule
6	Farming experience	Structured schedule
7	Land holding	NSSO classification
8	Annual income	Structured schedule
9	Knowledge about coping strategies	Structured schedule
10	Decision making ability	Nandapurkar (1981)
11	Economic motivation	Supe (2007)
12	Scientific Orientation	Supe (2007)
13	Mass media exposure and ownership	Modified scale of Reddy (1976)
14	Information seeking behavior	Modified scale of Gogoi (1984)

Dependent Variable

S.No.	Variable	Measurements
15	Perception of farmers about Climate change	Modified scale of Koshti, Salame and Lahariya (2013)

Independent Variables

1. **Age-** It referred to the chronological age of the respondent at the time of investigation. The age of the respondents was recorded as told by them in number of completed years. The respondents were categorized into three groups on the basis of Mean value (44.16) and SD (14.14).

Categories	Range
Young	less than 30 years
Middle	30 -58 years
Old	more than 58 years

- 2. Gender-** It refers to the differences in man and woman in terms of role and status in society, values and attitude. It was categorised as follows;

Categories	Score
Male	1
Female	2

- 3. Education** – It refers to highest level of formal schooling completed by respondent at the time of investigation. Education plays an important role in shaping the behavior and outlook of an individual. It provides knowledge and skills to negotiate the dynamics of social life and grant his or her a unique status in the society. The data pertaining to education was collected by asking the respondents to mention their highest educational qualification attained. It was further categorized as follow;

Categories	Score
Illiterate	1
Primary level	2
Secondary level	3
Intermediate level	4
Graduate and above	5

- 4. Family size:** It refers to the number of family members in a single family unit. It was categorized into small, medium and large. It was categorised on the basis of Mean (7) and SD (2.62)

Categories	Range
Small	up to 4 members
Medium	4-10 members
Large	more than 10 members

- 5. Occupation-**It is defined as the state of livelihood or source of income of an individual respondent's for the sustenance of their family. The data was collected by asking respondents to mention their occupation for their livelihood. As farmers were the respondents of study, their occupation was summarised into following two categories.

Categories	Score
Agriculture	1
Agriculture with other subsidiary occupation	2

- 6. Farming experience-** The respondents were asked to mention the length of their experience in farming. They were categorised in three groups and scores were assigned on the basis of Mean value (21.35) and SD (11.5).

Categories	Range
Low	Less than 11 years
Medium	11-34 years
High	More than 34 years

- 7. Land holding-** It is the operational size of the land that a farmers has actually put into cultivation. The data was categorized according to NSSO classification as follows;

Categories	Size of landholding
Marginal	Up to 1 hectare
Small	1-2 hectare
Medium	2-10 hectare
Large	more than 10 hectares

- 8. Annual income-** It refers to the total household earnings of the respondent's family per year through farm and non-farm sources at the time of investigation. The following categories were made on the basis of Mean value (83950) and SD (30000).

Categories	Range
Low	Up to Rs 53,950
Medium	Rs 53,950-1,13,950
High	More than Rs 1,13,950

9. Knowledge about coping strategies– It is defined as the respondent's understanding about the strategies to cope up with climate change and its impact on agriculture. A set of questions were made for this investigation; for each right answer the respondent got one marks and zero for wrong answer. The categorised were made on the basis of Mean value (6.09) and SD (1.09).

Categories	Range
Low	Less than 5
Medium	5-7
High	More than 7

10. Decision making ability- It is the degree to which an individual justifies his selection of the most efficient means from among the available alternatives on the basis of scientific criteria for achieving maximum economic profit. This was measured with the help of scale developed by Nandapurkar (1981).

Each with 3 point item was scored on continuum, namely, 'not considered', 'considered after consultation with others' and 'decision taken independently' with scores of 0, 1, 2, respectively. The sums of scores were categorized under three categories as depending upon Mean value (28.02) and SD (1.93).

Categories	Range
Low	Less than 26
Medium	26-30
High	More than 30

11. Economic motivation- It is defined as the occupational success in terms of profit maximization and the relative value placed by farmers on economic ends. Supe (2007) scale was used to measure this variable. The scale consisted of 6 statements, out of which, first five are positive and statement number six was negative. The responses are recorded on a five point continuum ranging from 'strongly agree' to 'strongly disagree'. The scoring was 5,4,3,2,1, for positive statements and 1,2,3,4,5 points for negative statement, respectively. The sum of score was categorized under three categories as depending upon Mean value (23.81) and SD (1.37).

Categories	Range
Low	Less than 23
Medium	23-25
High	More than 25

12. Scientific orientation- It refers to the frequency of contact or exposure of the respondent to different sources for obtaining information on climate change. Supre (2007) scale was used to measure this variable. This scale consisted of 6 statements in which first five are positive and six is negative. The responses were recorded on five point continuum ranging from 'strongly agree' to 'strongly disagree'. The scoring procedure as followed for positive statements 1,2,3,4 and 5 points assigned and for negative statement 5, 4, 3, 2 and 1 the categories were made on the basis of Mean value (25.08) and SD (1.04).

Categories	Range
Low	Less than 24
Medium	24-26
High	More than 26

13. Mass media exposure and ownership: It is operationalised as the degree to which respondent utilizes various mass media sources for information. This variable was measured by the scale developed by Reddy (1976) with some contextual modification. The user of each medium was assigned with one mark. The regular users got one score for use of each medium. According, mass media exposure score for each respondent was computed by summing up the scores for all media used by the respondents. The categories were made on the basis of Mean value (9.88) and SD (3.03).

Categories	Range
Low	Less than 7
Medium	7-13
High	More than 13

14. Information seeking behavior- It was operationalised as the frequency with which respondent approaches different sources of information. Information seeking behavior was measured for formal and informal sources separately. It was measured by the modified schedule of Gogoi (1984) and in which frequency was studied on a

three point continuum that is regularly, sometimes, never and the numerical values 3, 2 and 1 were assigned respectively, Finally following categories were made on the basis of Mean (6.91) and SD (2.23).

Categories	Range
Low	Less than 5
Medium	5-9
High	More than 9

Dependent Variables

15. Perception of farmers' about climate change- It refers to the opinion of farmers towards climate change (expressed that the time of interview) and its impact perceived on agriculture. Modified scale of Koshti, Salame and Lahariya (2013) was used to measure the variable. The scale consisted of sixteen statements. A five point continuum ranging from 'strongly agree' to 'strongly disagree' was used and the score was assigned as 5, 4, 3, 2, 1 for each statements.

Modification has been done according to study area. The scale constituted 15 statements for which maximum score was 75 and lowest 15 and then perception index of each individual farmer was measured the sum of score of all the statements climate change inquired from the farmers was computed which indicated the perceived climate change score for the selected individual farmers the raw score further converted into **Perception Index** with the formula:

$$\text{Perception index} = \frac{\text{Obtained perceived climate change score}}{\text{Obtainable perceived climate change score}} \times 100$$

Then further it categories into following categories

Categories	Range
Low	Up to 33.33 percent
Medium	33.34-66.66 percent
High	More than 66.67 percent

3.9 Data Collection Tools and Procedure

Tool is a device which is used to collect the data. The tool was developed on various aspect of study objectives. The data was collected with the help of a structured interview schedule during March- April, 2016. The farmers were personally interviewed by the researcher in the study and Data were collected in a series of stages and details are as follows.

Interview Schedule

Interview schedule was used by many researchers as a convenient tool. 'It may be defined as a formal list (points of enquiry), a category or inventory and it may be added that it is a counting device used in formal and standardised inquiries, the sole purpose of which is aiding the collection of quantitative cross sectional data, comprehensive and detailed interview schedule consisting of structured close and open ended questions were developed for collecting the relevant information from the respondents.

Pre-testing of Interview Schedule

The structured interview schedule was pre-tested on a non-sampled area and necessary corrections were made. The interview schedule was finalized after making necessary modifications, deletion and addition based on pre-testing recommendations.

3.10 Statistical Methods used for analysis of data

Statistical analysis of quantitative data is an important aspect of research work, as it facilitates the condensation and interpretation of collected data in simple form and helps in predicting future trends, helps in establishing relationship between different variables and provides sound base for policy formulation. After data collection, the data was presented in 'data matrix' for further analysis. The data was analysed in the light of objectives set forth for the study. The statistical techniques used for data analysis were as follows;

1 Frequency

It was calculated to find out the number of respondent in a particular cell.

2. Percentage

Percentage values were calculated to make simple comparisons. These were calculated by dividing the frequency of a particular cell by the total number of respondents and multiplying by 100.

$$P = \frac{n}{N} \times 100$$

Where,

P= Percentage

n= Frequency of a particular cell

N= Total number of respondent

3. Arithmetic mean

Mean score for each category were worked out separately by the following formula.

$$\bar{X} = \frac{\sum X_{ij}}{N}$$

Where,

X_{ij} = Sum of each of the individual comparisons

I = 1, 2, 3.....N

N = Number of observations

$\bar{X}$ = Mean

4. Standard deviation

It is a measure of variability in a set of scores, found by summing up the squared differences from the mean, dividing by the number of cases and extracting the square root. Standard deviation was computed for the purpose of analysis and further categorization. The formula used for calculating standard deviation was as follows;

$$\sigma = \frac{\sqrt{\sum x - \bar{x}}}{N - 1}$$

Where,

σ = Standard Deviation

x = Value of individual Variable

$\bar{x}$ = Assumed mean

N = Total number of items

5. Co-efficient of Correlation

It tells us the degree to which variables have been observed together. More specially, a correlation coefficient is ‘statistic value’ computed from a set of data and which summarised the extent to which variations in one measure go together with variation in other measure. It was used to find out the relationship between independent and dependent variables. The formula used to compute the correlation was as follows;

$$r = \frac{\text{Cov.}(x_1 x_2)}{\sqrt{\text{Var}(x_1) \text{var}(x_2)}}$$

Where,

r = Correlation coefficient

X_1 and X_2 are the two variables

$$\text{Var } X_1 = \sum (x_1 - \bar{x}_1)^2 / n$$

$$\text{Var } X_2 = \sum (x_2 - \bar{x}_2)^2 / n$$

$$\text{Covar. } (X_1 X_2) = \sum (x_1 - \bar{x}_1) (x_2 - \bar{x}_2) / n$$

6. Significance Co-efficient of Correlation

The ‘t’ test was used to test the significance of correlation. This test depicts whether calculated ‘r’ value between two variables was high so as to be considered significant or not. The formula used for this purpose is as follows;

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Where,

r = Correlation coefficient

n = Number of respondent

This calculated value of 't' was compared with table value of 't' at n-2 degree of freedom if the calculated value of 't' was higher than its table value, observed correlation coefficient between two variables was significant, other was non-significant.

7. Multiple regression analysis

When there are two or more independent variables, multiple regression analysis is used, multiple regression analysis equation assumes the form;

$$\hat{Y} = a + b_1X_1 + b_2X_2 + \dots + b_kX_k$$

Where $\hat{Y}$ denotes the estimated value of Y for given values of $X_1, X_2, \dots, X_k$. a is the constant or intercept and $b_1, b_2, \dots, b_k$ are the slope of predictors $X_1, X_2, \dots, X_k$ respectively.

$\hat{Y}$ = perception of farmers about climate change

X_1 = Age

X_2 = Gender

X_3 = Education

X_4 = Family size

X_5 = Occupation

X_6 = Farming experience

X_7 = Landholding

X_8 = Annual income

X_9 = Knowledge about coping strategies

X₁₀= Decision making ability

X₁₁= Economic motivation

X₁₂= Mass media exposure and ownership

X₁₄= Information seeking behavior

Testing of significance of multiple regression

The t-test was used to test the significance of multiple regression. This test depicts whether the calculated multiple regression between the two variables is high enough to be considered as significant or not if the values were found significant due to actual relation between the two variables otherwise. It was attributed to chance or errors. The formula used for this is as follows;

$$t = \frac{r}{1-r^2} \sqrt{N-2}$$

Where,

r= correlation coefficient

N= Number of respondents

The calculated value was compared with the table value of 't' at N-2 degree of freedom. If the calculated value of was higher than the observed value then correlation between two variables was significant otherwise not.

RESULTS AND DISCUSSION

This chapter presents the research findings of the study along with interpretation of empirical data collected on the basis of objectives. The findings of the study are presented under the following sub heads:

- 4.1 Socio-personal, economic, psychological and communication characteristics of farmers.
- 4.2 Farmers' knowledge of various coping strategies related to climate change adaptation.
- 4.3 Farmers' perception about climate change.
- 4.4 Relationship between farmers' socio-personal, economic, psychological and communication characteristics and their perceptions about climate change.

4.1 Socio-personal, economic, psychological and communication characteristics of farmers

4.1.1 Age

Age is said to be a determining factor of individual's thinking, attitude and role perception in the society. Keeping this in view, age of the respondents was studied and results obtained are presented in table-3.

Table 3: Distribution of respondents according to age (N=120)

S. No.	Category	Frequency	Percentage (%)
1	Young	75	62.50
2	Middle	42	35.00
3	Old	3	2.50

It is evident from the above table-3 that maximum number (62.50 percent) of respondents in the study sample were in 'young age' category followed by 35.00 percent respondents 'middle age' category. Only 2.50 percent respondents were found in 'old' category.

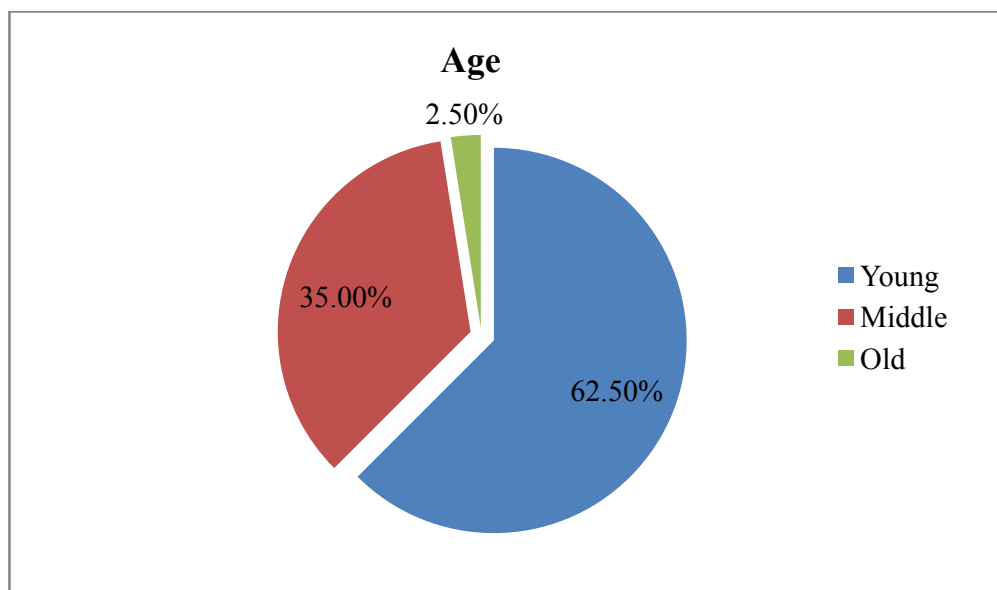


Figure 4: Distribution of farmers on the basis of age

The result indicated that majority of respondents were ‘young’ and this was followed by the middle aged. The data revealed that the higher number of young farmers were engaged in the farming.

The findings of the present study are in contradiction with the observation of **Martin (2013)** who reported that majority of respondents were in the middle age.

4.1.2 Education

Education provides an exposure to the outside world and also helps in shaping one’s opinion and thinking towards many things in life. Besides, education broadens the attitude, outlook and lifestyle perceptions of an individual towards in the society. The distribution of respondents according to their level of education is presented in table-4.

Table 4: Distribution of farmers according to educational level (N=120)

S. No.	Category	Frequency	Percentage (%)
1	Illiterate	37	30.83
2	Primary level	13	10.83
3	Middle level	17	14.16
4	High school level	12	10.00
5	Intermediate	26	21.67
6	Graduate and above	15	12.50

It is clear from the table-4 that most of respondents in the study sample were illiterate (30.83 percent) whereas 21.67 percent were educated up-to ‘intermediate’ followed by 14.16 percent up-to ‘middle’ level, 12.50 percent up-to ‘graduate and above’, 10.83 percent up-to ‘primary level’ and about 10.00 percent were educated up-to high school.

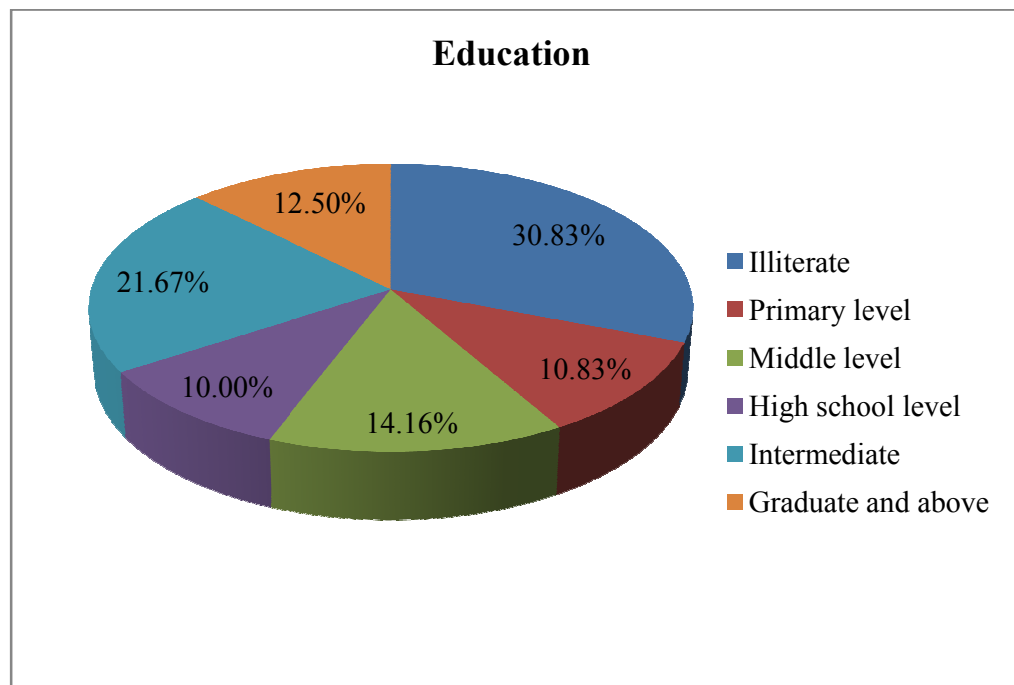


Figure 5: Distribution of farmers on the basis of educational level

Thus, we conclude that the majority of farmers in the study sample were illiterate and a substantial number educated up-to ‘intermediate’. The probable reason could be the prevailing literacy rate in the Uttar Pradesh.

The results of the presented study are, however, different with the study of **Akanda and Howladar (2015)** who reported that majority (29.50 percent) were educated up-to primary level.

4.1.3 Gender

It refers to the difference in man and woman in terms of role and status in society. The result in respect of gender-wise composition of respondents in the study sample is given in table-5 below.

Table 5: Distribution of farmers according to gender (N=120)

S. No.	Category	Frequency	Percentage (%)
1	Male	118	98.33
2	Female	2	1.67

The findings given in table-5 shows that a large majority of the respondents (98.33 percent) were male and only 1.67 percent respondents are female. Thus, it can be concluded most of respondents were male and very few were female. Probable reason for this could be that the males are more engaged in farming in Uttar Pradesh.

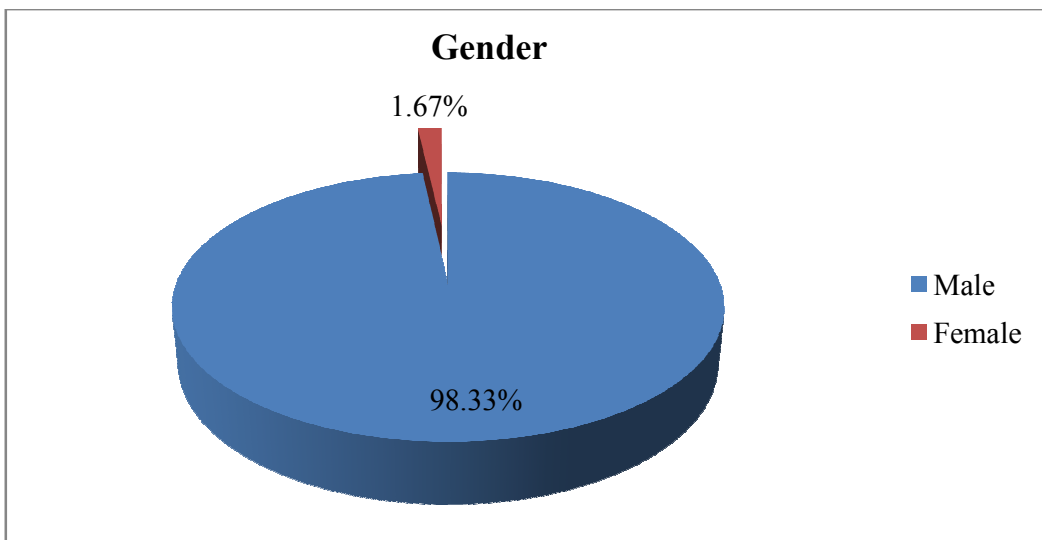


Figure 6: Distribution of farmers on the basis of gender

The findings regarding gender were found to be similar to the findings of **Nyanga (2011)** who reported that most of the respondents were male.

4.1.4 Family size

It refers to the total number of family members living together under one roof. The results obtained are presented in table-6.

Table 6: Distribution of farmers according to family size (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	21	17.50
2	Medium	94	78.34
3	Low	5	4.16

It is evident from table-6 from that most of the respondents (78.34 percent) were found to have ‘medium’ sized family followed by high family size (17.50 percent) and very few respondents (4.16 per cent) had low family size. Thus, it may be concluded that majority of respondents in the study sample had ‘medium’ family size.

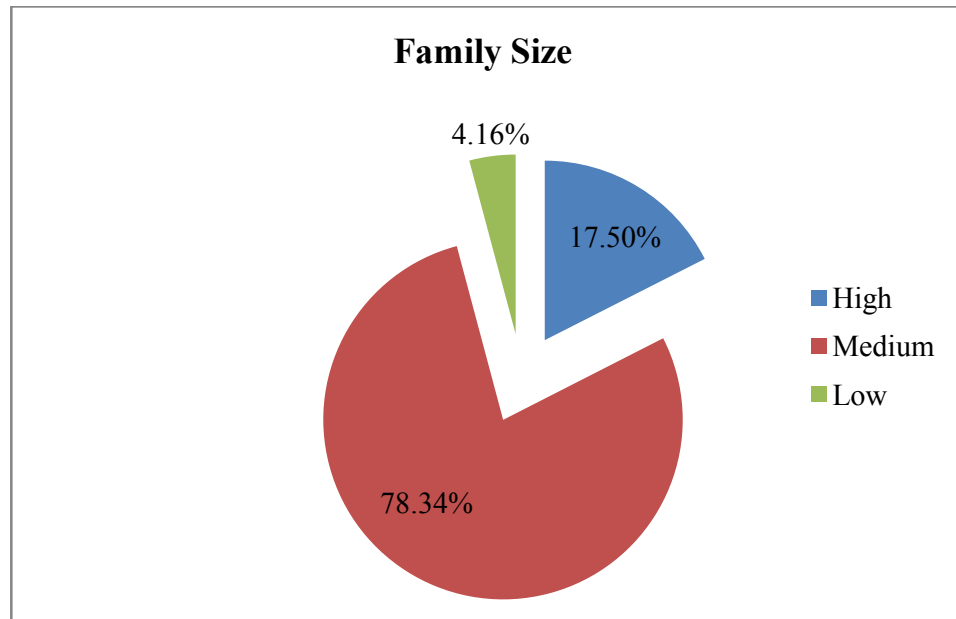


Figure 7: Distribution of farmers on the basis of family size

The findings are similar to **Ndambiri *et al.* (2012)** who observed that majority of farmers have ‘medium’ sized family.

4.1.5 Occupation

The occupation in the present study referred to means of livelihood adopted by the respondents included in the study sample. The results obtained are given in table-7.

Table 7: Distribution of farmers according to occupation (N=120)

S. No.	Category	Frequency	Percentage (%)
1	Farming	106	88.33
2	Farming with others	14	11.67

The findings presented in the above table-7 shows that a large majority (88.33 percent) of the respondents were found to have adopted ‘farming’ as their primary occupation whereas only 11.67 percent of the respondents had ‘other’ occupation along with farming.

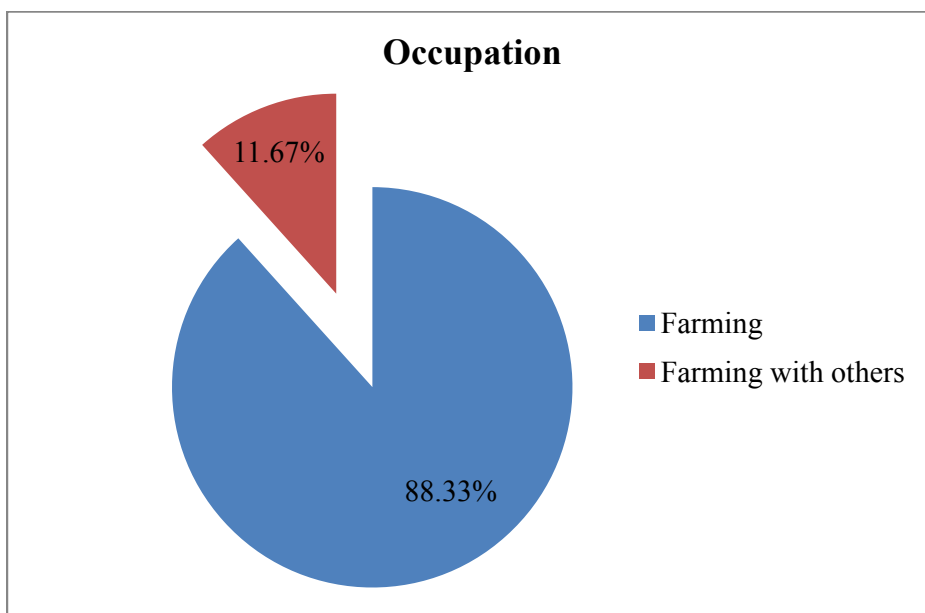


Figure 8: Distribution of farmers on the basis of occupation

Thus, we can conclude that in the study area most of the people were engaged in farming. Besides, few were found to be following others occupation such as shop/business, labour, etc. as subsidiary/secondary occupation.

The results of the present study are similar to the observations of **Daulagala *et al.* (2013)** who reported that majority of respondents were engage in agriculture.

4.1.6 Farming experience

It refers to the number of years of experience in doing the farming as a major source of livelihood. The findings regarding farming experience of the respondents have been presented in the table-7.

Table 8: Distribution of farmers according to Farming experience (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	15	12.50
2	Medium	2	1.67
3	Low	103	85.83

It is clear from the table-8 that majority of the respondents (85.83 percent) had 'low' farming experience and followed by 'high' level of farming experience (12.50 percent) and only 1.67 percent of respondents were found to be having 'medium' level of farming experience.

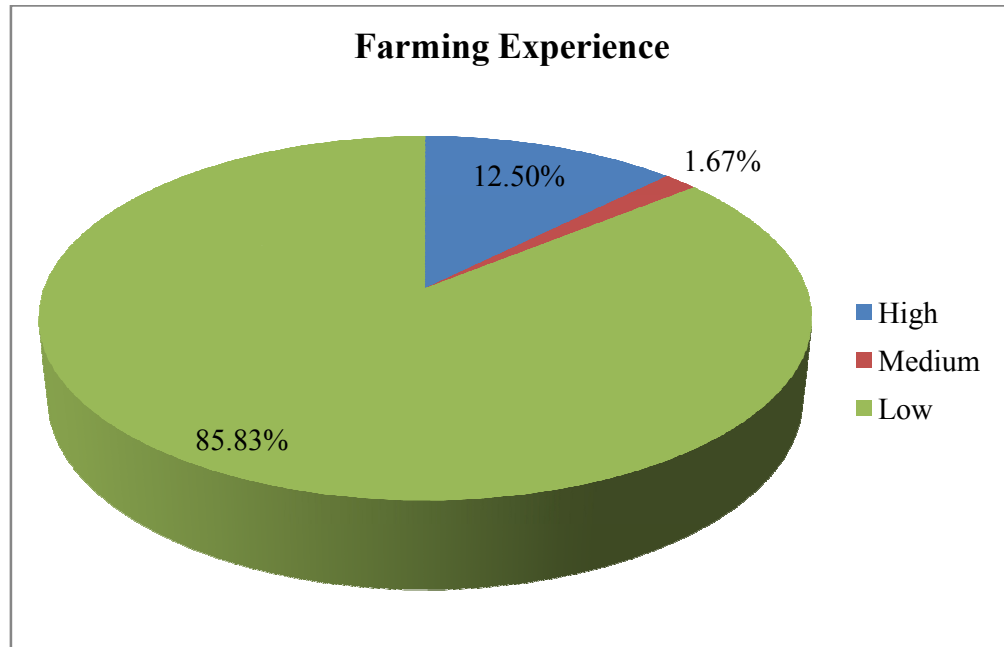


Figure 9: Distribution of farmers on the basis of farming experience

Thus, we can conclude that majority of the respondents in the study area were found to be having ‘low’ farming experience, and very less number of farmers were ‘high’ in respect of farming experience. This could be because of the fact that most of the farmers included in the study sample were young.

The study contradicts with the findings of **Ayanwuyi *et al.* (2010)** who found that most of the respondents had high farming experience.

4.1.7 Land holding

It refers to the land possessed by an individual at the time of study and it reflects the socio-economic status of an individual in the society. The results in respect of land holding are given in table-9 below.

Table 9: Distribution of farmers according to land holding (N=120)

S. No.	Category	Frequency	Percentage (%)
1	Marginal (less than 1 hectare)	24	20.00
2	Small (1-2 hectare)	35	29.17
3	Medium (2-10 hectare)	57	47.50
5	Large (more than 10 hectare)	4	3.33

Findings in above table-9 shows that about half of respondents included in the study sample (47.50 percent) have ‘medium’ land holding followed by ‘small’ (29.17 percent) and ‘marginal’ (20.00 percent) land holding.

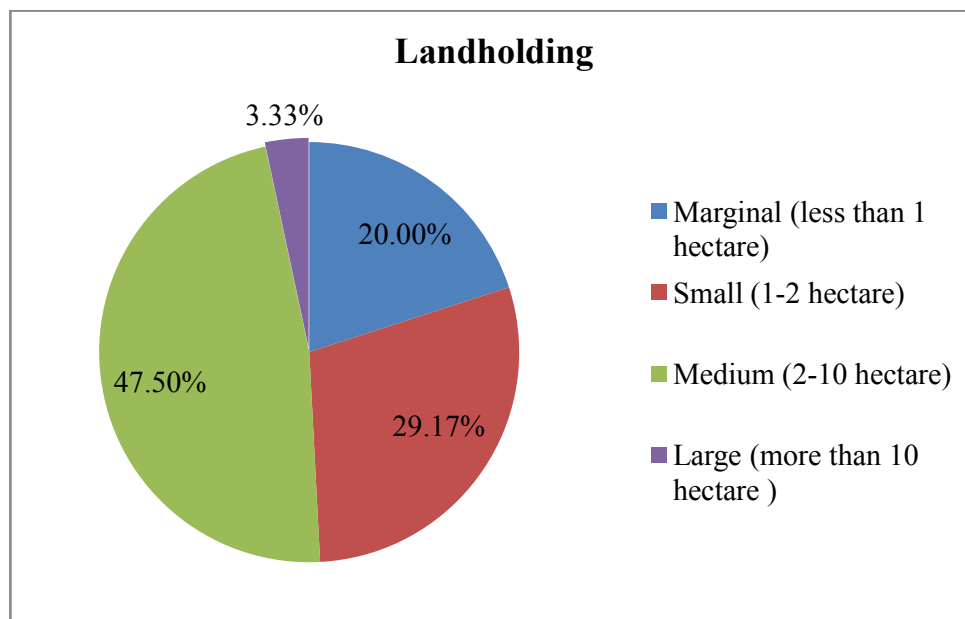


Figure 10: Distribution of farmers on the basis of landholding

According to Government of Uttar Pradesh, 2014-2015, about 90 percent of agricultural landholdings in the state are marginal and small (1-2 hectare) in size hence, the findings are similar to the state figures.

The findings of the study were different to **Dolli (2006)** in which majority of respondents were reported to have large size of landholding.

4.1.8 Annual income

Money that an individual or business receive in exchange for providing a good service or through investing capital is referred as income of an individual. Data regarding annual income of the respondents is given in the table-10.

Table 10: Distribution of farmers according to annual income (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	23	19.16
2	Medium	29	24.17
3	Low	68	56.67

It is evident from table-10 that majority of respondents (56.67 percent) comes under 'low annual income' category followed by 24.17 percent under 'medium' category and only 19.16 percent comes under 'high' income category.

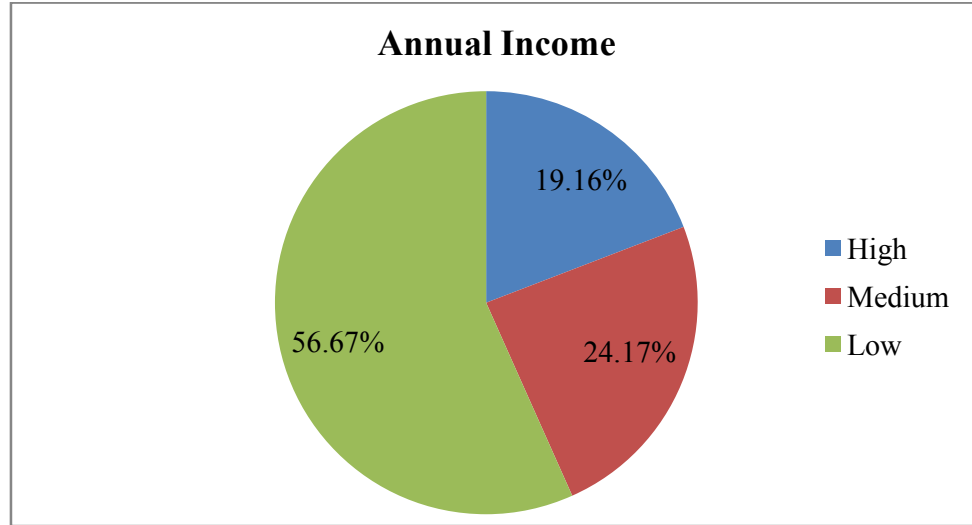


Figure 11: Distribution of farmers on the basis of landholding

The findings revealed that the high proportion of the respondents come under the low income category (i.e. annual earnings up to Rs 53,950.00) this was followed by medium (Rs 53,950 - 1, 13,950) and very few in under the high income category (more than Rs 1,13,950). The probable reason for this could be that per capita income in Uttar Pradesh is Rs 40,373.

The findings of the present study are different than the findings of **Yadav (2011)** who found that the majority (22.98 percent) of respondents had low annual income.

4.1.9 Decision making ability

It is the degree to which an individual justifies his selection of most efficient means from among the alternatives on the basis of scientific criteria for achieving maximum profit. The findings were given in table-11.

Table 11: Distribution of farmers according to decision making ability (N=120)

S. No.	Category	Frequency	Index range
1	High	40	33.33
2	Medium	53	44.17
3	Low	27	22.5

It is observed from table-11 that the decision making ability of maximum respondents (44.17 percent) found to be ‘medium’ followed by high (33.33 percent) and low (22.5 percent).

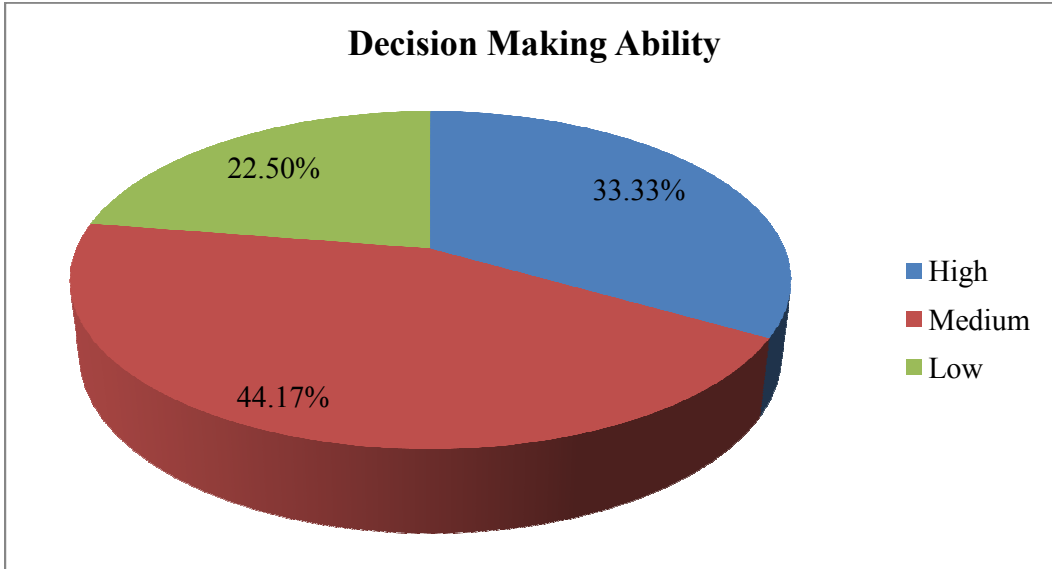


Figure 12: Distribution of farmers on the basis of decision making ability

Thus, we can conclude that farmers displayed ‘medium’ decision making ability. In view of the several options available, farmers are not able to decide about which option is best for them, they require suggestion/help of experts. This indicates the need for extension advisory services from extension officials and /or scientists/experts.

4.1.10 Economic motivation

It refers to the occupational success in terms of profit maximization and relative value placed by a farmer on economic end. The results regarding economic motivation given in table-12.

Table 12: Distribution of farmers according to economic motivation (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	75	62.50
2	Medium	43	35.83
3	Low	2	1.67

The study findings given in table-12 shows that majority of respondents (62.5 percent) come under ‘high’ economic motivation, 35.83 percent of respondents under

‘medium’ and only 1.67 percent of respondents come under ‘low’ economic motivation. Thus, we conclude that farmers in study area have a mindset of profit earnings.

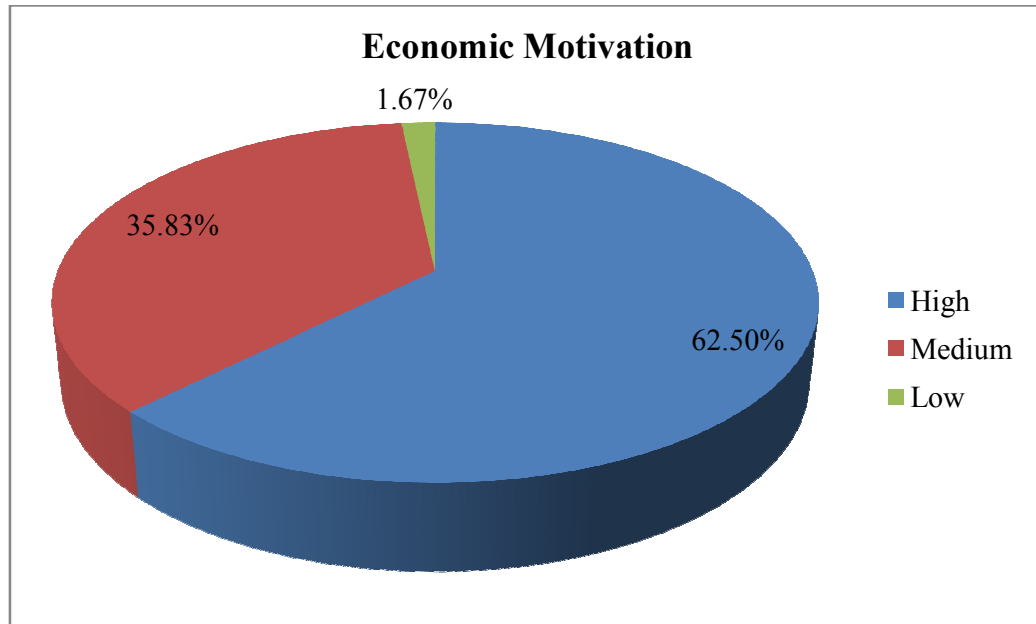


Figure 13: Distribution of farmers on the basis of economic motivation

The findings are contradictory to that **Singh *et al.* (2013)** who reported that majority of respondents have medium level of economic motivation.

4.1.11 Scientific orientation

It refers to the degree to which a farmer is oriented to be scientific in decision making and issues related to farming. The findings are given in table-13.

Table 13: Distribution of respondents according to scientific orientation (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	9	7.50
2	Medium	86	71.67
3	Low	25	20.83

The findings given in table-13 reveals that majority of respondents (71.67 percent) had ‘medium’ scientific orientation followed by 20.83 percent having ‘low’ and only 7.50 percent with ‘high’ scientific orientation. Thus, we may conclude that farmers are having a scientific outlook as regards farming.

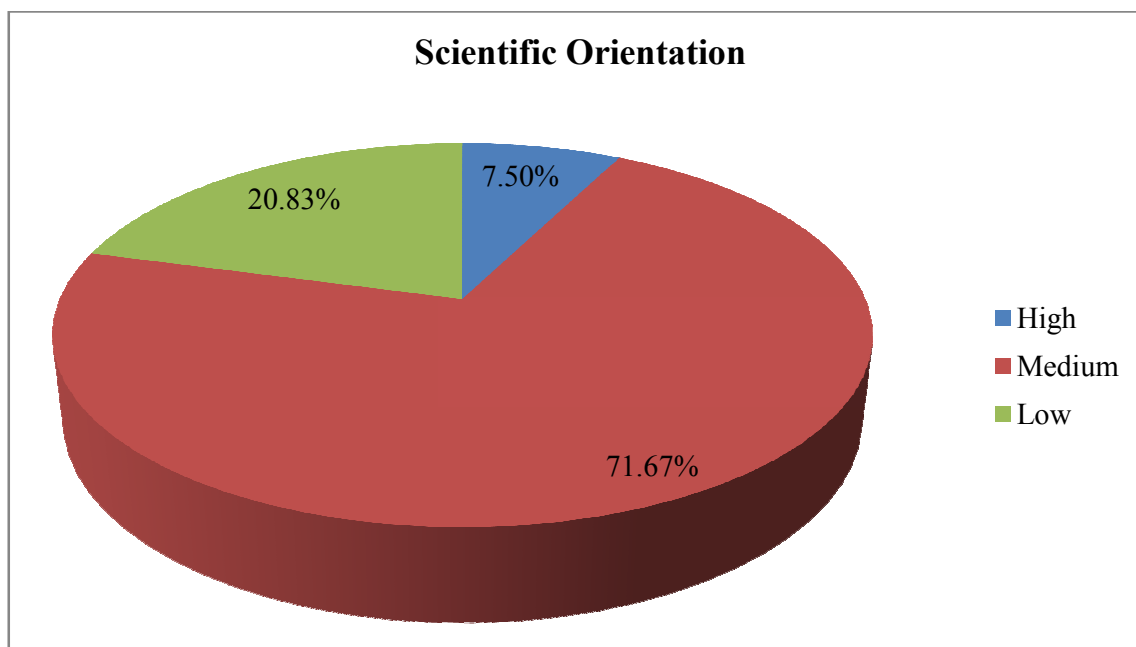


Figure 14: Distribution of farmers on the basis of scientific orientation

The results of the study are found to be different than **Kumar *et al.* (2011)** who observed that majority of respondents have medium scientific orientation.

4.1.12 Mass media exposure and ownership

It refers to the ownership and actual use of different media for a variety of purpose. Mass media exposure of respondents was measured in terms of frequency of use of different mass media sources for information, education or entertainment purposes by respondents. Results regarding mass media exposure and ownership are given in table-14 and table-15.

Table 14: Distribution of respondents according to mass media exposure (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	20	16.67
2	Medium	28	23.33
3	Low	72	60.00

It can be inferred from table-14 that majority of respondents (60.00 percent) had 'low' mass media exposure followed by 'medium' (23.33 percent) and 'high' (16.67 percent). This indicated that farmers use different mass media for a variety of purposes – for information, education, and entertainment

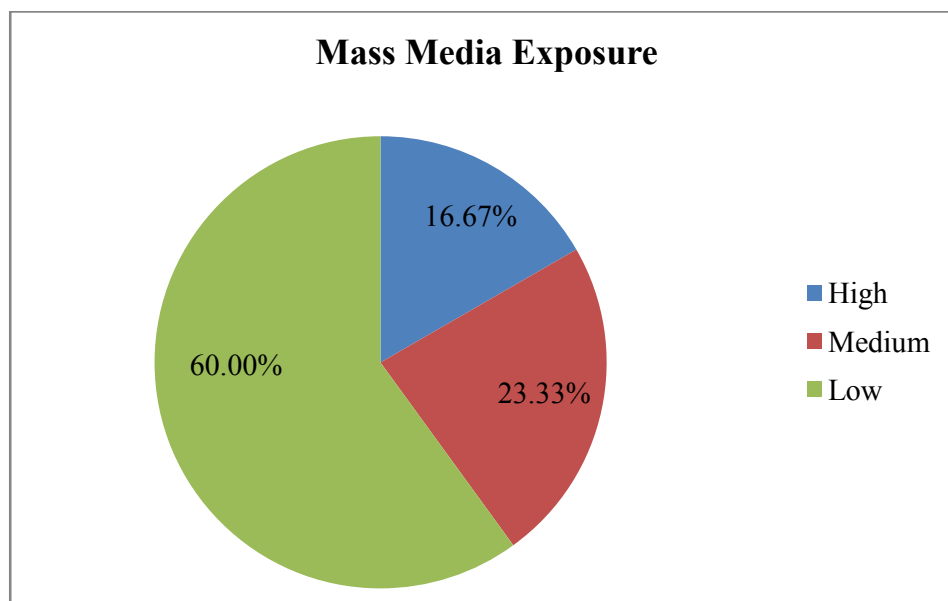


Figure 15: Distribution of farmers on the basis of mass media exposure.

Further, the results regarding the frequency of mass media use is given in the table-15 below.

Table 15: Distribution of farmers according to frequency of use of mass media

S. No.	Sources	Frequency	Percentage (%)
1	Radio	62	51.67
2	Television	69	57.50
3	Newspaper	30	25.00
4	Mobile	112	93.33

(Multiple choices were allowed)

It is evident from the findings given in table-15 above that mobile was the most preferred mass media followed by television and radio; and newspaper was the least preferred mass media. It is to be noted that mobile telephone has become the choice of masses as a very large majority (93.33 percent) of farmers prefers it. This is also reflected in the ever-increasing subscriber base of mobile phone users in India as well as globally.

4.1.13 Information seeking behavior

Information is required by farmers at all the stages of farming. The information may be communicated by mass media or inter-personal sources. The findings in respect of information seeking behaviour are given in table-16.

Table 16: Distribution of respondents according to information seeking behavior (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	8	6.66
2	Medium	110	91.66
3	Low	2	1.67

The finding in table-15 revealed that maximum respondents (91.66 percent) have 'medium' information seeking behaviour and only 6.66 percent had 'high' whereas very few (1.67 percent) respondents had low.

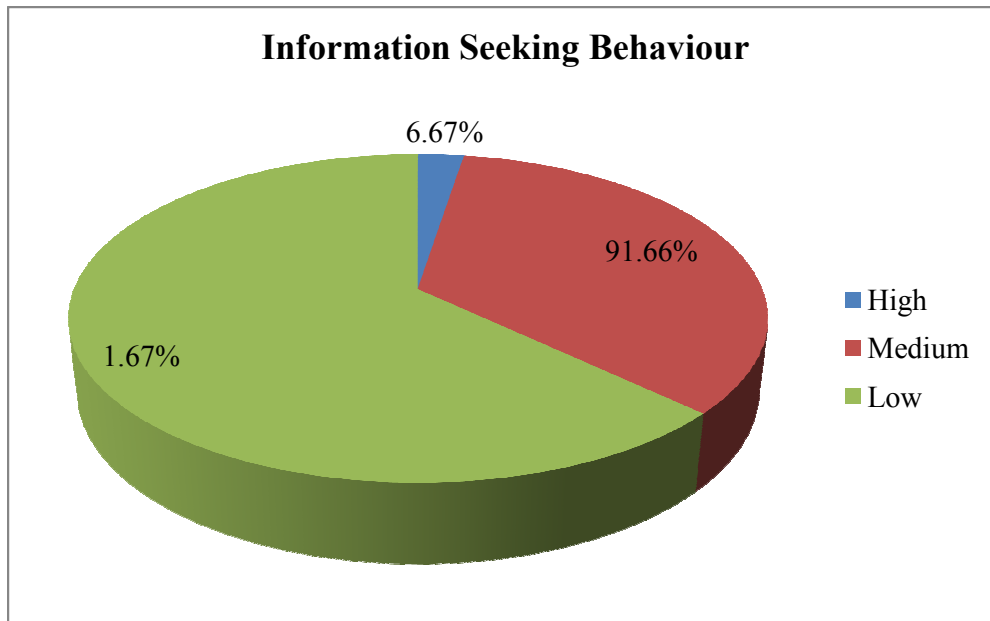


Figure 16: Distribution of farmers on the basis of information seeking behaviour

The findings are however, different to **Raghuvanshi (2015)** who reported that majority of respondents exhibit medium level of information seeking behavior.

4.2 Knowledge about coping strategies

It refers to the understanding of various strategies by the farmers' to cope-up with climate change. A number of (close ended) statements about climate change were developed; and respondent's knowledge about it (in terms of Yes or No) was tested. The findings regarding farmer's knowledge about coping strategies are given in table-17 and table-18 below.

Table 17: Distribution of respondents according to overall knowledge about coping strategies (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	10	8.33
2	Medium	83	69.17
3	Low	27	22.50

Table-17 revealed findings in respect of overall knowledge of respondents about various coping up strategies. Majority of the respondents (69.17 percent) had ‘medium’ level of knowledge about coping strategies followed by 22.50 percent having ‘low’ and only 8.33 percent having ‘high’ level of knowledge.

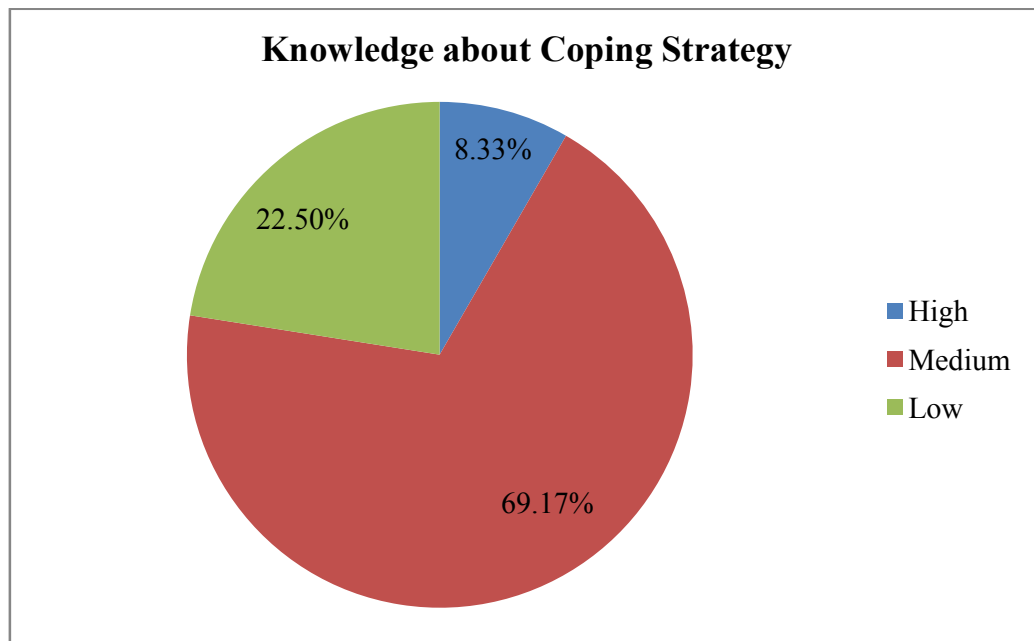


Figure 17: Distribution of farmers on the basis of their knowledge about coping strategy

The findings are similar to the observation of **Mangistu (2013)** who concluded that the majority of respondents had ‘medium’ level of knowledge about coping strategies.

However, the results regarding respondents’ knowledge about individual coping strategies’ are presented in the following table-18.

Table 18: Distribution of respondent's knowledge about coping strategy

S. No.	Various coping strategies	Frequency (Yes)	Percentage (%)
1	Do you shift sowing time and date of your crops according to change in climate	120	100
2	Do you use drought tolerant varieties in adverse condition	78	65.00
3	Do you have any water harvesting structure to conserve water	12	10.00
4	Are you implementing water harvesting practices in field	34	28.33
5	Do cropping pattern help to cope with climate change effect	112	98.33
6	Do you know about any crop insurance scheme	54	45.00
7	Is mulching helpful in water conservation	98	81.67
8	Are you practicing zero tillage	95	79.17
9	Do you know any micro and macro level adaptation strategies being followed by progressive farmers	21	17.50
10	Do you use any short duration crop to avoid loss of previous crop	86	71.67
11	Do you follow INM and IPM	20	16.67

The findings given in the above table-18 brings interesting results. All the farmers (100 percent) responded in the affirmative when asked ‘Do you shift sowing time and date of your crops according to change in climate’? This indicate that farmers know about it comprehensively, i.e. climate change has led to change their crop sowing strategy. When asked “Do cropping pattern help to cope with climate change effect”, a large majority of farmers (98.33 percent) said yes. Further, 81.67 percent farmers said yes when asked “Is mulching helpful in water conservation”; and 79.17 percent farmers said yes when asked “Are you practicing zero tillage”. Additionally, a large number of farmers (71.67 percent) responded positively when asked “Do you use any short duration crop to avoid loss of previous crop”; and 65.00 percent farmers answered affirmatively when asked “Do you use drought tolerant varieties in adverse condition”. Thus, we can concluded that most of the

farmers have good knowledge about these six practices as coping –up strategies to avoid the adverse effects of climate change.

However, farmers displayed a varying degree of knowledge about the remaining coping up strategies, i.e. only 10.00 percent responded positively to the query “Do you have any water harvesting structure to conserve water”; and 28.33 percent said yes to a query “Are you implementing water harvesting practices in field”? A reasonably good number of farmers (45.00 percent) answered yes to a question “Do you know about any crop insurance scheme”, and 17.50 percent said yes to the query “Do you know any micro and macro level adaptation strategies being followed by progressive farmers”; and an equal number also said yes to the query “Do you follow INM and IPM”.

Dependent variable

4.3 Perception of farmers about climate change

It refers to the opinion of farmers towards climate change and its impact on agriculture. The findings regarding farmers’ perception about climate change’ are given in table-19.

Table 19: Distribution of respondents according to Perception of farmers towards climate change (N=120)

S. No.	Category	Frequency	Percentage (%)
1	High	65	54.17
2	Medium	25	20.83
3	Low	30	25

The findings given in table-18 revealed that majority of the farmers (54.17 percent) have high level of perception towards climate change followed by medium (25.00 percent) and low (20.83 percent). The findings of the study are similar to **Shankara *et al.* (2011)** wherein it was found that the majority of the farmers had high level of perception about climate change (Temperature, Rainfall and Dry spells).

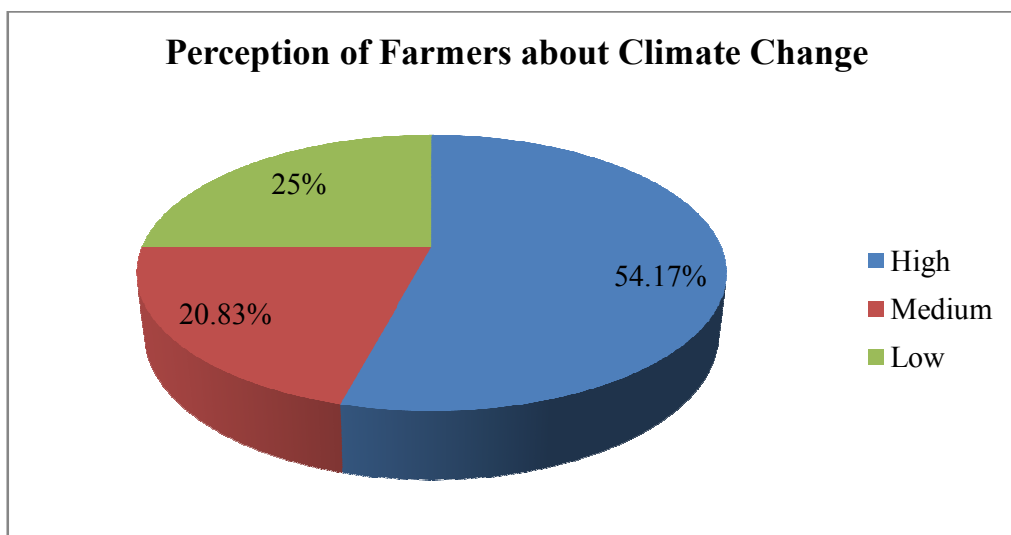


Figure 18: Distribution of the farmers on the basis their perception about climate change

Further, farmers' response to individual statements about climate change was also analysed and the results are given in the following table-20

Table 20: Distribution of the farmers according to perception about climate change

S. No.	Statements	Responses				
		SA	A	UD	DA	SDA
		N	N	N	N	N
		%	%	%	%	%
1	Do you agree that temperature as compared to previous years has increased?	88	12	4	10	6
		73.33%	10.00%	3.33%	8.33%	5%
2	Do you agree that amount of rainfall as compared to previous year has decreased?	65	22	10	8	12
		54.17%	18.33%	8.33%	6.66%	10%
3	Do you agree that frequency of heavy rains have decreased?	72	25	3	14	6
		60%	20.83%	2.50%	11.67%	5%
4	Do you agree that the rains are occurring either earlier or later than the expected rainy season?	72	25	5	10	8
		60%	20.83%	4.17%	8.33%	6.67%
5	Do you agree that total rainy days as compared to previous years have decreased?	64	26	16	5	9
		53.33%	31.67%	13.33%	4.17%	0.50%
6	Do you agree that duration of dry spell during rainy season has increased?	69	33	5	8	5
		57.50%	27.50%	4.17%	6.67%	4.17%

7	Do you agree that the number of sunshine hours during rainy season have decreased as compared to previous years?	73	22	12	7	6
		60.83%	18.33%	10%	5.83%	5%
8	Do you agree that intensity of heat during summer has increased?	77	14	8	12	9
		64.17%	11.67%	6.67%	10%	7.50%
9	Do you agree that bitterness of cold during winter has increased?	54	24	7	17	18
		45%	20%	5.83%	14.17%	15%
10	Do you agree that chances of high temperature and heat wave occurrence have increased?	78	21	2	12	8
		65%	17.50%	1.67%	10%	6.67%
11	Do you agree that the intensity of fog compared to previous years has increased?	27	13	3	35	42
		47.50%	10.83%	2.50%	29.17%	35%
12	Are you experiencing shorter winter as compared to previous years?	75	17	2	12	14
		62.50%	14.16%	1.67%	10%	11.67%
13	Do you agree that the dew drops occurrence compared to previous years has increased?	22	11	12	40	35
		43.33%	9.17%	10%	23.33%	18.33%
14	Do you agree that night temperature compared to previous years has increased?	73	20	8	11	8
		60.83%	16.67%	6.67%	9.17%	6.67%
15	Do you agree that ground water table compared to previous years has decreased?	71	20	5	16	8
		59.17%	16.67%	4.17%	13.33%	6.67%

It is evident from the above table-20 that a large majority of farmers (83 percent) agreed (SA+A) that “temperature has increased as compared to previous years” whereas 13 (SDA+DA) percent disagreed with this; and 3 percent were ‘undecided’. In response to a statement whether ‘they agree that amount of rainfall as compared to previous year has decreased’, majority of farmers (72 percent) agreed (SA+A) with this statement. When asked “do you agree that frequency of heavy rains have decreased” more than 80 percent of farmers agreed (SA+A) with this statement; and when asked “do you agree that the rains are occurring either earlier or later than the expected rainy season”, 80 percent (SA+A) respondents replied in the affirmative.

Further, It was revealed that 85 percent (SA+A) farmers agree to the statement that “total rainy days as compared to previous years have decreased”; and when asked “do you agree that duration of dry spell during rainy season has increased”, 85 percent agreed (SA+A) with it, which reflects a shift in rainfall over the years. About 80 percent agreed

(SA+A) with the statement that “number of sunshine hours during rainy season have decreased as compared to previous years”; and 76 percent agree (SA+A) with the statement that “intensity of heat during summer has increased”.

Additionally, when farmers were asked whether “bitterness of cold during winter has increased”, 65 percent agreed (SA+A) with the statement whereas about 30 percent disagreed (SDA+DA) with it. When probed further whether “chances of high temperature and heat wave occurrence have increased”, 82.5 percent agreed (SA+A) with the statement. Upon enquiring “do you agree that the intensity of fog compared to previous years has increased”, majority (75 percent) farmers disagreed (SDA+DA) with this statement while only 40 percent agreed (SA+A). About 76 percent farmers agree (SA+A) to the statement “Are you experiencing shorter winter as compared to previous years” whereas 20 percent disagreed (SDA+DA).

As regards the statement, “experiencing more dew drops than previous years” 76 percent disagreed whereas a little more than 20 percent disagreed (SDA+DA) with regarding the question “Do you agree that night temperature compared to previous years has increased” 76 percent disagreed (SDA+DA) whereas about 20 percent disagreed (SA+A). And finally, when asked “do you agree that ground water table compared to previous years has decreased” about 76 percent agreed (SA+A) with it but about 20 percent disagree with it (SDA+DA).

Thus, we can conclude that majority of the farmers agreed with most of the statements regarding perception about climate change except the statements number 11 and 13 wherein majority of them disagreed.

These results are similar with IMD (Indian Meteorological Department) report released in 2013 that the temperatures have increased as compared to previous years, the rainfall amount has decreased as compared to previous years, dry spells during rainy season have increased, total number of rainy days has decreased and the rainfall has become unexpected and irregular.

4.4 Relationship between farmers’ Socio-personal, economic, psychological & communication characteristics and their Perceptions about climate change.

Correlation coefficient was calculated to find out the relationship between selected

independent variables with dependent variable. Further, t-test was used to check the significance of the relationship between the two variables. Results obtained are presented in the table-21.

Table 21: Relationship between farmer's socio-personal, economic, psychological and communication characteristics and their perceptions about climate change

S. No.	Independent Variable	Karl Pearson's 'r' value
1	Age	0.191*
2	Gender	0.114
3	Education	0.232*
4	Family size	0.092
5	Occupation	0.322**
6	Farming Experience	0.204*
7	Land holding	0.028
8	Annual income	0.013
9	Knowledge about coping strategies	0.188*
10	Decision making ability	0.072
11	Economic motivation	-0.012
12	Scientific Orientation	0.053
13	Mass media exposure and ownership	0.198*
14	Information seeking behavior	0.167

**Significant at 5 % level of significance and **Significant at 1 % level of significance*

Findings presented in table-21 reveals that out of fourteen independent variables, age, gender, education, family size occupation, farming experience, landholding, annual income, knowledge about coping strategy, decision making ability, scientific orientation, mass media exposure & ownership, and information seeking behavior were found to be positively related. Further, it was found that, except economic motivation, all other variables were positively related; these two variables, i.e. annual income and economic motivation were negatively related.

4.4.1 Age

The value of coefficient of correlation at 5% level of significance was 0.191; and t_{cal} ($t=2.112$) was greater than t_{tab} value. This confirms a **significant positive relationship** between age and perceptions about climate change. Hence, null hypothesis H_{0A} was rejected. Thus we may conclude that age of the farmers significantly affect farmer's perceptions about climate change. **Akanda and Howladar (2015)** also found that age has a significant positive effect on perception of farmers about climate change

4.4.2 Gender

The value of coefficient of correlation at 5% level of significance was 0.114; and t_{cal} ($t=1.248$) was less than t_{tab} value. This indicates a **non significant positive relationship** between gender and perception of farmers about climate change. Hence, the null hypothesis H_{0B} was accepted. This positive relationship may be due to the fact that male are more engaged in farming in the study area rather than female.

The results are different to the observation of **Falaki *et al.*(2013)** who concluded that there was a significant relationship between gender and perception of farmers about climate change (drought incidence).

4.4.3 Education

The value of coefficient of correlation at 5% level of significance was 0.232; and t_{cal} ($t=2.589$) was greater than t_{tab} value. This confirms a **significant positive relationship** between education and perception of farmers about climate change. Hence, null hypothesis H_{0C} was rejected. The relationship between the two variables could be due to the fact that most of the farmers in the study sample were illiterate.

The findings are similar to **Graft and Onumah (2011)** who reported that education has a significant positive effect on perception of farmers about climate change.

4.4.4 Family size

The value of coefficient of correlation at 5% level of significance was 0.092; and t_{cal} ($t=1.003$) was less than t_{tab} value. This indicates a **non significant positive relationship** between Family size and Perception of farmers about climate change. Hence, the null hypothesis H_{0C} was accepted.

However, **Ndambiri *et al.* (2016)** reported that family size has a highly significant negative effect on perception of farmers about climate change

4.4.5 Occupation

The value of coefficient of correlation at 5% level of significance was 0.322; and t_{cal} ($t=3.693$) was less than t_{tab} value. This indicates a **significant positive relationship** between Occupation and perception of farmers about climate change. Hence, null hypothesis H_{0D} was rejected.

This is may be due to that the most of the respondents in the study sample have farming as their primary occupation. However, **Umeh and Chukwu (2014)** reported that

occupation has a significant positive relation with perception of farmers' about climate change.

4.4.6 Farming experience

The value of coefficient of correlation at 5% level of significance was 0.095; and t_{cal} ($t=2.058$) was greater than t_{tab} value. This indicates a **significant positive relationship** between farming experience and perception of farmers about climate change. Hence, null hypothesis H_{OE} was rejected.

The positive relationship between the two variables may be due to that the study area had a very high number of farmers in low farming experience. The study findings are similar to **Mensah *et al.* (2010)** who reported that farming experience was found to have a significant positive relation with perception of farmers about climate change.

4.4.7 Land holding

The value of coefficient of correlation at 5% level of significance was 0.028; and t_{cal} ($t=0.299$) was less than t_{tab} value. This indicates a **non significant positive relationship** between land holding and perception of farmers about climate change. Hence, null hypothesis H_{OF} was accepted. The reported relationship between two variables may be due to fact most of the farmers had small landholdings.

The study findings do not match with **Akanda and Hawlader (2015)** who reported that farm size have a significant positive relation with perception of farmers about climate change.

4.4.8 Annual income

The value of coefficient of correlation at 5% level of significance was 0.013; and t_{cal} ($t=0.013$) was less than t_{tab} value. This indicates a **non significant negative relationship** between annual income and perception of farmers about climate change. Hence, null hypothesis H_{OG} was accepted. The probable reason for the negative relationship may be that the most of the farmers in the study sample were in the low annual income category

However, **Sofuluwe *et al.* (2011)** reported that annual family income has a significant positive effect on perception of farmer about climate change.

4.4.9 Knowledge about coping strategies

The value of coefficient of correlation at 5% level of significance was 0.188; and t_{cal} ($t=2.079$) was greater than t_{tab} value. This indicates a **significant positive**

relationship between knowledge about coping strategies and perception of farmers about climate change. Therefore, null hypothesis H_{OH} was rejected. The probable reason for this relationship could be that most of the farmers were illiterate in study area, and lack adequate exposure to the environment related issues.

The finding contradicted to **Fadlullah (2015)** who observed that knowledge about coping strategies has a non significant positive relation with farmers' perception about climate change.

4.4.10 Decision making ability

The value of coefficient of correlation at 5% level of significance was 0.072; and t_{cal} ($t=0.779$) was less than t_{tab} value. This confirms that there exists a **non significant positive relationship** between decision making ability and perception of farmers about climate change. We therefore accept the null hypothesis H_{OI} .

4.4.11 Economic motivation

The value of coefficient of correlation at 5% level of significance was -0.012; and t_{cal} ($t=-0.130$) was less than t_{tab} value. This indicates a **non significant negative relationship** between economic motivation and perception of farmers about climate change. Hence, the null hypothesis H_{OJ} was accepted.

4.4.12 Scientific orientation

The value of coefficient of correlation at 5% level of significance was 0.053 ($r=0.0527$) and t_{cal} ($t=0.513$) was less than t_{tab} value. This indicates a **non significant positive relationship** between scientific orientation and perception of farmers about climate change. Therefore, the null hypothesis H_{OK} was accepted

The finding are different with the study of **Parganiha (2016)** who concluded that scientific orientation had a significant positive relationship with farmers' perception about climate change.

4.4.13 Mass media exposure and ownership

The value of coefficient of correlation at 5% level of significance was 0.198; and t_{cal} ($t=2.116$) was greater than t_{tab} value. This indicates a **non significant positive relationship** between mass media exposure & ownership and perception of farmers about climate change. Hence, the null hypothesis H_{OL} was accepted.

4.4.14 Information seeking behavior

The value of coefficient of correlation at 5% level of significance 0.167; and t_{cal} ($t=1.844$) was less than t_{tab} value. This indicates a **non significant positive relationship** between information seeking behavior and perception of farmers about climate change. Therefore, the null hypothesis H_{0L} was accepted

The findings are found to be different with **Temesgen (2008)** who observed that information on climate had a significant relationship with farmers' perception about climate.

Table-22 Results of hypothesis on relationship between independent variables and farmers' perception about climate change

Hypothesis	Statement	Conclusion
H_{0A}	H_{0A} - Age of farmers is not related to perception of farmers about climate change.	Rejected
H_{0B}	H_{0B} - Gender of farmers is not related to perception of farmers about climate change.	Accepted
H_{0C}	H_{0C} - Education of farmers is not related to perception of farmers about climate change.	Rejected
H_{0D}	H_{0D} - Family size of farmers is not related to perception of farmers about climate change.	Accepted
H_{0E}	H_{0E} -Occupation of farmers is not related to perception of farmers about climate change.	Rejected
H_{0F}	H_{0F} -Farming experience of farmers is not related to perception of farmers about climate change.	Rejected
H_{0G}	H_{0G} -Land holding of farmers is not related to perception of farmers about climate change.	Accepted
H_{0H}	H_{0H} - Annual income of farmers is not related to perception of farmers about climate change	Accepted
H_{0I}	H_{0I} -Knowledge about coping strategy of farmers is not related to perception of farmers about climate change.	Rejected
H_{0J}	H_{0J} - Decision making ability of farmers is not related to perception of farmers about climate change.	Accepted
H_{0K}	H_{0K} - Scientific Orientation of farmers is not related to perception of farmers about climate change.	Accepted
H_{0L}	H_{0L} -Mass media exposure and ownership is not related to perception of farmers about climate change.	Rejected
H_{0M}	H_{0M} -Information seeking behavior of farmers is not related to perception of farmers about climate change.	Accepted

4.5 Regression Analysis: Impact of independent variables on dependent variable

An attempt was made to find out the impact of independent variables on the dependent variable. Multiple Regression analysis was done to predict the dependent variable on the basis of independent variables.

First partial regression analysis was done to find out how the fourteen independent (age, gender, education, family size, occupation, farming experience, landholding, annual income, knowledge about coping strategies, decision making ability, economic motivation, scientific orientation, mass media exposure and information seeking behaviour) variables are related with the dependent variable (Farmers' perception towards climate change). Then, regression equations were developed between independent variables and dependent variable (perception of farmers about climate change) along with the values of coefficient of determination. The results obtained are given in table - 23 and table-24.

Table- 23: Partial regression analysis

Independent variables	Partial regression coefficient (b)	't' value
1. Age	-0.831 ^{**}	3.95
2. Gender	-0.500	1.33
3. Education	-1.314 [*]	2.41
4. Family size	0.187	1.39
5. Occupation	-0.360	1.86
6. Farming Experience	0.222	1.19
7. Land holding	-0.172	0.97
8. Annual income	1.053	1.18
9. Knowledge about coping strategies	0.712 ^{**}	2.95
10. Decision making ability	0.829	2.50
11. Economic motivation	-0.111	1.38
12. Scientific Orientation	0.122	0.52
13. Mass media exposure & Ownership	-0.829 [*]	3.19
14. Information seeking behavior	0.213	1.12

**Significant at 5 % level of significance and **Significant at 1 % level of significance*

The above table reveals that partial regression coefficients for seven independent variables – i.e. age, gender, education, occupation, land holding, economic motivation and

mass media exposure & ownership – were inversely related with farmer’s perception towards climate change. This indicate that a unit increase in the value of independent variables will lead to corresponding decrease in the dependent variable. Further, the remaining seven variables (family size, farming experience, annual income, knowledge about coping strategies, annual income, scientific orientation, and information seeking behaviour) were found to be positively related with farmer’s perception about climate change. However, relationship of only four variables age, education, knowledge about coping strategies and mass media exposure and ownership was found to be significant.

Further, multiple regression analysis was done and Coefficient of determination (R^2) was calculated to find out the contribution of all the independent variables on the dependent variable. The results are given in table-24.

Table-24 Multiple regression equation for independent variables with dependent variable (Perception of farmers about climate change)

Dependent variable	Regression Equation	R^2
Perception of farmers about climate change	$32.68 - 0.8313x_1 - 0.50x_2 - 1.31x_3 + 0.18x_4 - 0.36x_5 + 0.22x_6 - 0.17x_7 + 1.05x_8 + 0.71x_9 - 0.82x_{10} - 0.11x_{11} + 0.12x_{12} - 0.82x_{13} + 0.15x_{14}$	0.43

It can thus be inferred from the results given in table- 24 that Coefficient of determination (R^2) is 0.43, which means that only 43 percent of the variation in the dependent variable (i.e. farmers’ perception about climate change) could be attributed to all the independent variables included under the present study. The remaining 57 percent variation in the dependent variable under study could be attributed to other factors/ variables not included in the study. There may be some intervening and/ or extraneous factors which need to be studied in order to arrive at a factual and valid conclusion.

SUMMARY AND CONCLUSION

Climate change has been considered as the most vital issue affecting the survival of the human race in the 21st century. There has been a continuous global debate, putting the blame on each other's head for being more responsible for the climate change. Scientists have clearly said that it is the high time for the adoption of preventive and corrective measures to save the planet earth from the upcoming catastrophe. Climate change with expected long-term changes in rainfall pattern and shifting temperature cycles are expected to have significant negative effects on agriculture, food and water security and economic growth of the country (DFID, 2004). Climate change is expected to have a serious and lasting impact on agriculture sector in India. The most important impact of the climate change can be observed in obvious terms of global temperature increase popularly known as global warming. There was a worldwide increase (0.4-0.7°C) in temperature (Singh, 2008). In ecological terms, this is a very rapid change.

Agriculture is the backbone of economy in most of the developing countries. In addition to food and raw material, agriculture also provides employment and opportunities to large population. Climate change directly affects agriculture production as this sector is inherently sensitive to climatic conditions and is one of the most vulnerable sectors at the risk and impact of global climate change (Parry *et al.* 2005).

To overcome these negative effects of climate change farmers followed some coping strategies (*Coping strategies*, both behavioral and psychological particular efforts, that help to cope up with climate change). Variety of options exist for adaptation, there are improved crop and grassland management practices like improved organic practices, fertilizer use, tillage and residues management and restoration of degraded lands and improved water use efficiency.

Perception of the farmers influenced by increasing temperature, shifting in rainfall and heavy climatic disaster is occurring the farmers have more concern about the climate and they are directly and indirectly to crop production. As the concern with the change in climate and the perception of farmers delivered that adaptation to climate change requires that farmers first notice that the climate has changed, and then identify useful coping

strategies and implement them. Adaptation to climate change requires that farmers first notice that climate has changed, and then identify useful adaptations and implement them (Maddison,2006).

Considering all these above facts a research study entitled **“Farmers’ Perception about Climate Change and Strategies to Cope-up with Climate Change in Uttar Pradesh State”** has been taken with specific objectives were as follows:-

- To study socio-personal, economic, psychological & communication characteristics of farmers.
- To determine farmers’ knowledge of various coping strategies related to climate change adaptation.
- To find out farmers’ perception about climate change.
- To find out relationship between farmers’ socio-personal, economic, psychological and communication characteristics and their perceptions about climate change.

The study was conducted in Uttar Pradesh. Two districts – out of total 75 districts – were selected purposively. Further, Kothawa block of Hardoi district and Bakshi Ka Talab block of Lucknow district of Uttar Pradesh state were selected purposively. Four villages – two each from the selected block - were selected purposively. Further, thirty respondents from each of the selected villages were selected randomly. Thus, the study sample comprised of 120 respondents.

The analytical design was used to meet the objectives of the study. For this study age, gender education, family size, occupation, farming experience, landholding, annual income, knowledge about coping strategies, decision making ability, economic motivation, scientific orientation, mass media exposure and ownership and information seeking behavior were selected as independent variables. Perception of farmers about climate change was the dependent variable. Data was collected with the help of pre tested structured interview schedule. Appropriate statistical tools and techniques such as frequency, mean, percentage, standard deviation, correlation of coefficient, t-test and multiple regression analysis were used for analysis.

5.1 Major Findings

- The findings revealed that maximum number (62.5 percent) of respondents were found in young age category followed by 35 percent respondents found in middle age category. Only 2.5 percent respondents were found in old category.

- Majority of the respondents (30.83 percent) were illiterate whereas 21.67 percent were intermediate followed by 14.16 percent educated up-to middle level, 12.50 percent educated up to graduate and above, 10.83 percent were educated up-to primary and 10.00 percent are educated up-to high school.
- Most of the respondents (98.33 percent) were male and only 1.67 percent respondents were female.
- The findings also revealed that majority (78.34 percent) of the respondents had medium sized family followed by large (17.5 percent) and very few respondents had small (4.16 percent).
- Nearly 90 percent of the respondents (88.33percent) had farming as main occupation where as only 11.60 percent of the respondents had other occupation along with farming.
- Majority of the respondents (85.83percent) had low farming experience, 12.50 percent high and only 1.67 percent of respondents were having medium farming experience.
- The findings revealed that maximum number of respondents (47.50) had medium size of land followed by small (29.17 percent) about 20.00 percent of respondents had marginal, where as only 3.33 percent of respondents had large land holding.
- Majority of respondents (56.67 percent) had low annual income, 24.17 percent had medium and only 19.16 percent had high.
- The findings also revealed that maximum number of respondents had medium decision making ability (44.17 percent) followed by high (33.33 percent) and low (22.50 percent).
- More than half of the respondents had (62.50 percent) had high economic motivation followed by medium level (35.83 percent) and only 1.67 percent of respondents had low level of economic motivation.
- The results revealed that majority of respondents (71.65 percent) had medium scientific orientation followed by low (20.83 percent) and 7.50 percent of respondents had high scientific orientation.
- Majority of respondents (60.00 percent) had low mass media exposure followed by medium 23.33 percent and high 16.67 percent, where as mobile (93.33 percent) and television (57.5) was the most preferred media.
- The results revealed that majority of respondents (91.66 percent) had medium

information seeking behaviour followed by high (6.66 percent) and only 1.67 percent had low level of information seeking behaviour.

- Majority of respondents (56.67 percent) had low knowledge about coping strategies followed by 24.17 percent had medium and 19.16 percent had high.
- Findings revealed that majority of the farmers (54.17 percent) had high perception about climate change followed by low (25 percent) and medium (20.83 percent).
- Findings revealed that occupation had high positive significant relationship with perception of farmers about climate change and other variables like age, education, farming experience, knowledge about coping strategies and mass media exposure and ownership were positively and significantly (except economic motivation negatively non- significantly related) correlated with perception of farmers about climate change
- Findings revealed that there was 43.00 percent variation in the dependent variable (farmers perception about climate change) due to all the independent variables
- It was also found in the study (by partial regression coefficient) that independent variables age and knowledge about coping strategies were highly significantly related with farmers perception about climate change and education and mass media exposure were significantly related with dependent variable (farmers perception about climate change).

5.2 Conclusion

Findings of the study concluded that majority of farmers were young aged, illiterate, males, had medium sized family, having main occupation farming with low farming experience in small landholding, low annual income had medium decision making ability with high economic motivation, had medium scientific orientation. Majority of the respondents had low mass media exposure maximum farmers use mobile, most of them had medium level of information seeking behavior, overall it was concluded that they had medium level of knowledge about coping strategies to cope up with climate change and highest knowledge about shift in dates and time for sowing crop according to climate change.

With regards to farmers perception about climate change it was revealed that majority of the farmers were having high perception index range. Most of them perceived that the temperature has increased as compared to previous years.

With regard to relationship between socio-economic, psychological and communication characteristics of farmers with perception of farmers about climate change, it was found that occupation had highly significant and positive relationship with perception of farmers about climate change and other variables like age, education, farming experience, knowledge about coping strategies and mass media exposure and ownership except economic motivation which was negatively and non- significantly related) correlated with perception of farmers about climate change. About 43 percent variation in the dependent variable (farmers perception about climate change) was due to all the independent variables. Independent variables age and knowledge about coping strategies were found to be highly significantly related with farmers perception about climate change and education and mass media exposure were significantly related with dependent variable (farmers perception about climate change).

5.3 Implication and recommendations of the study

- The study has identified factors affecting farmers' perception towards climate change. It will help concerned agencies to initiate sustained campaigns for mitigating negative impact of climate change on agriculture productivity.
- The coping-up strategies adopted by farmers can be helpful for policy makers in developing suitable measures for climate change mitigation.

LITERATURE CITED

- Adelani, O. and Oyesali, B. 2014. Information sources and Awareness of Climatic Change by Citrus Farmers in Benue State, Nigeria. *Journal of Agricultural Extension*, 18(2):1-9.
- Aggarwal, P.K. 2008. Global Climate Change and Indian Agriculture: Impacts Adaptation and Mitigation. *Indian Journal of Agricultural Sciences*, 78(10): 11 -19.
- Akanda, M. G. R. and Howlader, M. S. 2015. Coastal Farmers' Perception about Climate Change Effects at Galachipa .Upazila under Patuakhali District of Bangladesh. *Global Journal Science Frontier Research: Agriculture and Veterinary*, 15(4):56-66.
- Ayanwuyi, E. Kuponiyi, F. A. Ogunlade, A. and Oyetoro, J. O. 2010. Farmers Perception of Impact of Climate Changes on Food Crop Production in Ogbomosho Agricultural Zone of Oyo State, Nigeria. *Global Journal of Human Science*, 10(7): 33-38.
- Bhusal, Y. 2009. Local people's perception on climate change, its impacts and adaptation measures in mid-mountain region of Nepal. Unpublished Thesis, B.Sc. Tribhuvan University, Nepal. 10-11.
- Bradshaw, B., Dolan, H. and Smit, B. 2004. Farm-level adaptation to climatic variability and change: Crop diversification in the Canadian Prairies. *Climatic Change*, 6(7): 119–141.
- Bryant, R.C., Smit, M. Brklacich, R.T. Johnston, J. Smithers, Q. Chiotti, R. and Singh, B. 2000. Adaptation in Canadian agriculture to climatic variability and change. *Climatic Change*, 4(5):181–201.
- Codjoe, F. N. Y., Ocansey, C. K. and Ofari, J. 2013. Climate change awareness and coping strategies of cocoa farmers in rural Ghana. *Journal of Biology, Agriculture and Healthcare*, 1(6): 388-390.
- Daulagala, C., Weerahewa, J., Miah, G. and Jana, S. 2013. Socio – Economic Characteristics of Farmers Influencing Adaptation to Climate Change: Empirical Results from Selected Homegardens in South Asia with Emphasis on Commercial Orientation. *Sri Lanka Journal of Advanced Social Studies*, 2(2):71-86.

- Dhaka, B. L., Chayal, K. and Poonia, M. K. 2010. Analysis of farmers' perception and adaptation strategies to climate change. *Agriculture Research Centre Journal International*, 1(6); 388-390.
- Dolli, S. S. 2006 Sustainability of natural resources management in watershed development project. Unpublished Ph.D. Thesis, University of Agricultural Sciences, Dharwad, Karnataka, India.
- Fadlullah, C. S. 2015. Farmers' Perception of Climate Change and Coping Strategies across Gender in two Agro-Ecological Zones of Nigeria. *Journal of Agricultural Extension*, 19 (1): 35-48.
- Falaki, A. A., Akogbe, J. A. and Ayinde, O.E. (2013). Analysis of climate change and rural farmers' perception in north central Nigeria. *Journal of Human Ecology*, 43(2): 133-140.
- Gbetibouo, G. A. 2009. Understanding farmers' perception and adaptations to climate change and variability. International Food Policy Research Institute (IFPRI) Discussion Paper 00849.
- Graft, H. and Onumah, E. (2011). Farmers' perceptions and adaptations to climate change: An estimation of willingness to pay in western Ghana. *Agris*, 3(4): 31-39.
- IPCC.2007. Impacts, Adaptations and Vulnerability. Cambridge: Contribution of Working Group II to the Fourth Assessment Report of IPCC on Climate Change, 2007. Intergovernmental Panel on Climate Change (IPCC).
- Jha, A. and Bisht, H. 2014. Addressing the information and knowledge needs of farmers to enable climate change adaptation: A study of Bundelkhand region in Central India. 12p. Available online <http://cdkn.org/project/shubh-kal-a-better-future-from-to-knowledge-and-action-2/> accessed on 25/09/2015.
- Kates, R. 2011. 'Cautionary tales: Adaptation and the Global poor' *Climate Change*, 45(1): 5-7.
- Kelkar, U., Narula, K. K., Sharma, V. P. and Chandna, U. 2008. Vulnerability and adaptation to climate variability and water stress in Uttarakhand State. India. *Global Environmental Change*. 18(2): 564-574.

- Kumar, S.N., Tiwari, R. L., and Kanojia, S. K. 2011 Perception of climate change and livelihood of a farming community in Faizabad district of Uttar Pradesh. *Climate change*, 105:84-87.
- Latha, K. V., Munisamy, G. and Bhatt, A. R. S. 2012. Impact of Climate Change on Rainfed Agriculture in India: A Case Study of Dharwad. *International Journal of Environmental Science and Development*, 4(3): 367-371.
- Lautze, S.Y., Aklilu, A., Roberts, H., Young, G., Kebede, B. and Learning, J. 2003. Risk and vulnerability in Ethiopia: Learning from the past, responding to the present, preparing for the future. Report prepared for the US Agency for International Development, Addis Ababa, Ethiopia.
- Maddison, D. 2006. Perception and adaptation to climate change in Africa. CEEPA. Discussion paper No.10. Centre for Environmental Economics and Policy in Africa. Pretoria, South Africa, University of Pretoria.
- Maddox, G. L. 1995. The Encyclopedia of Aginy. (Second edition). New York: Springer Publishing Company.
- Mandleni, B. and Anim, F. (2011). Perceptions of Cattle and Sheep Framers on Climate Change and Adaptations in the Eastern Cape Province of South Africa. *Journal of Human Ecology*, 34(2): 107-112.
- Mangistu, D. K. (2011). Farmers' perception and knowledge of climate change and their coping strategies to the related hazards: Case study from Adiha, central Tigray, Ethiopia. *Agricultural Science*, 2(2): 138-145.
- Martin, N. M. 2013. Use of seasonal forecast information in farm level decision making in Bundelkhand, India. *Indian Research Journal of Extension Education*, 13 (2): 93-103.
- Mensah, B., Vlek, P., and Manschadi, M. (2010). Farmers' Perceptions and Adaptations to Climate Change: A Case Study of Sekyedumase District in Ghana. A contributed paper presented at World Food Systems Conference in Tropentag, Zurich: 14-16 September, 2010.

- Mertz, O., Mbow, C., Reenberg, A., and Diouf, A. 2009. Farmers' perceptions of climate change and agricultural adaptation strategies in rural sahel. *Environ. Manag.*, 4(3): 804-816.
- Moyo, M., Mvumi, M.B., Kunzukeguta, M. and Dorward, P. 2012. Farmer perceptions on climate change and variability in semi-arid Zimbabwe in relation to climatology evidence. *African Crop Science Journal*, 20(7): 317-335.
- Narain, V. 2003. Institutions, technology, and water control: water user associations and irrigation management reform in two large-scale systems in India. Orient Longman, Hyderabad. 244p.
- Ndambiri, H.K., Ritho, C.N. and Mbogoh, S. G. 2012. An evaluation of farmers' perceptions of and adaptation to the effects of climate change in Kenya. *International Journal of Food and Agricultural Economics*, 1(1): 75-96.
- Nhemachena, C., and Hassan, R. (2007). Micro-level analysis of Farmers' Adaptations to Climate Change in Southern Africa. IFPRI, Environment and Production Technology Division. Washington, DC: International Food Policy Research Institute.
- Nyanga, P., Johnsen, F., Aune, J., and Kahinda, T. (2011). Smallholder Farmers' Perceptions of Climate Change and Conservation Agriculture: Evidence from Zambia. *Journal of Sustainable Development*, 4(4): 73-85.
- Ogalleh S. A., Vogl, C. R. and Hauser, M. 2012. Local Perceptions and Responses to Climate Change and Variability: The Case of Laikipia District, Kenya. *Sustainability*, 4:3302-3325.
- Parganiha, O. 2016. Farmers' perception about climate change and its impact on agriculture and allied activities in Chhattisgarh plains. Unpublished Thesis, Ph.D. Indira Gandhi Krishi Vishwavidyalaya, Raipur. Jharkhand.
- Parry, M., Rnzwoseeig, C. and Livermore, M. 2005. Climate change, global food supply chain and risk of hunger. *Philosophical Transaction of the Royal Society B*, 360:2125-2136

- Raghunandan, H.C. 2004. A study on knowledge and adoption level of soil and water conservation practices by farmers in northern Karnataka. Unpublished Thesis, M.Sc. University of Agriculture Sciences, Dharwad, Karnataka, India.
- Raghuvanshi, R. 2014. A study on Awareness about Climate Change and Adaptation of Agricultural Practices by Farmers in Uttarakhand. Unpublished Thesis, M.Sc. Govind Ballabh Pant University of Agriculture and Technology. Pantnagar.
- Rao, K.P.C., Ndegwa, W.G., Kizito, K., and Oyoo, A. 2011. Climate variability and change: Farmer perceptions and understanding of intra-seasonal variability in rainfall and associated risk in semi-arid Kenya. *Exp. Agri.*, 47, 267–291.
- Rastogi, S. and Hasan, S. 2014. A study on communication behavior of agricultural input users of Udham Singh Nagar district of Uttarakhand, India. *Journal of Applied and Natural Science*, 6(1): 193-196.
- Roy, M. N., Chandra, N., Kharbikar, H. L., Joshi, P. and Jethi, R. 2013. Socio- economic status of hill farmers: An exploration from Almora district, Uttarakhand. *International Journal of Agriculture and Food Science Technology*. 4(4): 353-358.
- Sarkar, S. and Padaria, R.N. 2010. Farmers' awareness and risk perception about climate change in Coastal Ecosystem of West Bengal. *Indian Research Journal of Extension Education*, 10(2): 32-38.
- Selvaraju, R., Subbiah, A.R., Baas, S. and Juergens, I. 2006. Livelihood adaptation to climate variability change in drought-prone areas of Bangladesh. *Global Journal of Science*, 8(2): 125-132.
- Shankar, K. R., Nagasree, K., Prasad, M. S. and Raju, M.S. 2013. Farmers' perception and adaptation measures towards changing climate in South India and role of extension in adaptation to changing climate. Central Research Institute for Dryland Agriculture. Extension Bulletin No. 03/201.
- Shankara, M. H., Shivamurthy, M. and Kumar K.T.V. 2013. Farmers perception on climate change and its impact on agriculture in eastern dry zone of Karnataka. *International Journal of Farm Sciences*, 3(2):100-107.

- Shashidahra, K. K. and Reddy, B. S. 2012. Farmers Perceptions and Adaptation about Changing Climate and Its Variability in UKP Area of Karnataka. *Indian Research Journal of Extension Education*, 1(5):196-201.
- Singh, G. Kumar, L., and Prakash, D. 2013. Challenges of climate change and options to overcome them. *Intensive Agriculture*, 6(2): 9-16.
- Sofoluwe, N., Tijani, A., and Baruwa, O. 2011. Farmers' Perception and Adaptations to Climate Change in Osun State, Nigeria. *African Journal of Agricultural Research*, 6(20): 36-45.
- Sogani, R. 2011. Beej bachao Andolan save seed campaign. 2011. Documentation of Climate change perception and adaptation practices in Uttarakhand. Northern India. 33p. Available on [http:// www.panap net/sites/default/files/06-CC-Phase1-BBA.pdf](http://www.panap.net/sites/default/files/06-CC-Phase1-BBA.pdf) assessed on 26-02-15.
- Temesgen, D., Hassan, R., and Ringler, C. 2008. Measuring Ethiopian farmers' vulnerability to climate change across regional states. IFPRI Discussion Paper No. 806, USA.
- Tripathi, A. and Singh, G. S. 2013. Perception, anticipation and responses of people to changing climate in the Gangetic plain of India. *Current Science*, 105(12): 25p.
- Umeh, G.N. and Chukwu, V.A. 2013. Farmers' perception and adaptative initiative to the effect of climate change on food production in Abakaliki local government area of Ebonyi state, Nigeria, *International Journal of Science and Research*. 4(2): 417-422.
- Venkatesan, R. 2000. Farmers' Awareness and Adoption Level of Recommended Tomato Cultivation Practices. Unpublished Thesis, M.Sc. Agriculture College and Research Institute Tamil Nadu Agriculture University, Coimbatore, Tamil Nadu.
- Yadav, K. 2011. Impact assessment of ICT- enabled knowledge sharing Agri-portals in Uttarakhand. *Indian Research Journal of Extension Education*. 3(2): 154-159.
- Yadav, Y. P. and Rani, R. J. 2011 Role of communication in climate change and sustainable development. *Global Media Journal-India Edition*, 2(2): 1-17.

APPENDIX

INTERVIEW SCHEDULE

General Information:

1. Name of the Block:
2. Name of the Village:
3. Name of the respondent:

Socio-personal, economic, psychological & communication characteristics of farmers'. characteristics

4. Age: in years
5. Education

S. No.	Category	
1.	Illiterate	
2.	Primary level	
3.	Middle level	
4.	High school level	
5.	Intermediate	
6.	Graduate and above	

6. Occupation; a) farming b) other with farming as subsidiary
7. Annual income:
8. Gender: Male ☐ Female ☐
9. Family size (in numbers): ☐
10. Farming experiences (in years) :
11. Total area (in acre):
12. Mass media ownership and exposure

S. No.	Mass media use	Y/N	Frequency of use		
			frequently	Sometimes	Never
1	Radio				
2	Television				
3	Newspaper				
4	Mobile				
	Any other (specify)				

13. Information seeking behaviour:

S. No	Information Source	Seeking Behaviour		
		Regular	Occasional	Never
1	Friends & relatives			
2	Neighbours			
3	Progressive farmers			
4	Local leaders			
5	Block Dev. Officer			
	Any other (specify)			

14. Economic Motivation

S. No.	STATEMENTS	Response				
		SA	A	UD	DA	SDA
1	A farmer should work towards higher yields and economic profits.					
2	A most successful farmer is the one who makes the most profit.					
3	A farmer should try any new farming idea which may earn him 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 good start unless he provides them with economic assistance.					
6	A farmer must earn for his living but the most important thing in life cannot be defined in economic terms.					

15. Decision Making ability

S.No.	Statement	Frequency of orientation				
		V O	O	ST	SL	N
1	Participation in the decision concerning household problem					
2	Participation in the decision adoption of new idea/ technology etc.					
3	Participation in the decision over the financial matters					
4	Participation in the decision concerning the implementation of the community development programme					
5	Participation in the decision about farm related matters					
6	Participation in the decision regarding litigation matters					

16. Scientific Orientation

S. No.	Statements	Response				
		SA	A	UD	DA	SDA
1	New methods (Modern) of farming give better results to a farmer than the old methods (Traditional)					
2	Even a farmer with lots of experience should use new methods of farming					
3	Though it takes time for farmer to learn new methods in farming, it is worth the efforts					
4	A good farmer experiments with new ideas in farming					
5	Traditional method of farming have to be changed in order to raise farmer's level of living					
6	The way farmers' forefathers farmed is the still best way to farm					

17. Knowledge about various coping strategies

S. No.	Various coping strategies	Yes	No
1	Do you shift sowing time and date of your crops according to change in climate		
2	Do you use drought tolerant varieties in adverse condition		
3	Do you have any water harvesting structure to conserve water		
4	Are you implementing water harvesting practices in field		
5	Do cropping pattern help to cope with climate change effect		
6	Do you know about any crop insurance scheme		
7	Is mulching helpful in water conservation		
8	Are you practising zero tillage		
9	Do you know any micro and macro level adaptation strategies being followed by progressive farmers		
10	Do you use any short duration crop to avoid loss of previous crop		
11	Do you follow INM and IPM		

18. Perception of Farmers' about climate change

S. No.	Statements	Responses				
		SA	A	UD	DA	SDA
1	Do you agree that temperature as compared to previous years has increased?					
2	Do you agree that amount of rainfall as compared to previous year has decreased?					
3	Do you agree that frequency of heavy rains have decreased?					
4	Do you agree that the rains are occurring either earlier or later than the expected rainy season?					
5	Do you agree that total rainy days as compared to previous years have decreased?					
6	Do you agree that duration of dry spell during rainy season has increased?					
7	Do you agree that the number of sunshine hours during rainy season have decreased as compared to previous years?					
8	Do you agree that intensity of heat during summer has increased?					
9	Do you agree that bitterness of cold during winter has increased?					
10	Do you agree that chances of high temperature and heat wave occurrence have increased?					
11	Do you agree that the intensity of fog compared to previous years has increased?					
12	Are you experiencing shorter winter as compared to previous years?					
13	Do you agree that the dew drops occurrence compared to previous years has increased?					
14	Do you agree that night temperature compared to previous years has increased?					
15	Do you agree that ground water table compared to previous years has decreased?					

 **Name** Sharad Joshi

 **Date of Birth** October 10, 1992

 **Place of Birth** Lucknow, U.P.

Academic Qualifications

 **2008** High School examination, C.B.S.E, Kendriya Vidyalaya .
A.F.S. Station, Bakshi Ka Talab, Lucknow

 **2010** Intermediate examination, U.P Board, Bakshi Ka Talab
Intercollege Bakshi Ka Talab, Lucknow

 **2014** B.Sc. (Agriculture.) C.B.G College, Lucknow

 **2016** M.Sc. Agricultural Extension and
Communication, G.B.P.U.A. & T., Pantnagar

Permanent Address:

Village: Hazipur

Post Office: Bakshi Ka Talab

District : Lucknow

State: Uttar Pradesh

Pin: 226201

ABSTRACT

Name : Sharad Joshi **Id. No.** : 47030
Semester and Year of admission: I, 2014-15 **Degree** : M.Sc.
Major : Agricultural Extension & Communication **Department** : Agricultural Communication
Thesis title : “Farmers’ Perception about Climate Change and Strategies to Cope-up with Climate Change in Uttar Pradesh”
Advisor : Dr. M.A. Ansari

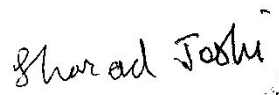
Climate change has been recognized globally as the most pressing critical issue affecting the mankind survival. It is expected to have serious environmental, economic and social impacts on Indian agriculture. Perception of the farmers is also changing with the change in climate. They are more concerned about the climate change as it is directly or indirectly affecting the crop production. Many studies discovered that climate change has more negative impact than positive impact. In several states of India, situation has compelled the poor farmers to commit suicide. To overcome agricultural risk, farmers have adopted different coping strategies. Hence, a study entitled “Farmers’ Perception about Climate Change and Strategies to Cope-up with Climate Change in Uttar Pradesh State” was designed to study the perception of farmers about climate change and to develop more efficient coping strategies for tackling the adverse situation beforehand.

The state of Uttar Pradesh state was the universe of the study. Out of 75 districts, two districts, viz. Hardoi and Lucknow were selected purposively. One block from each of the districts was selected purposively; namely, Kothawa and Bakshi ka Talab from Hardoi and Lucknow, respectively. Two villages were purposively selected from the selected blocks, viz. Janakinagar and Sair Bahadurpur from Kothawa block and Bhauli and Dhinauri from Bakshi ka Talab block. 30 farmers were randomly selected from each village, thus forming a total of 120 respondents. A structured interview schedule was designed and pre-tested by the researcher to collect the data. Analytical research design was adopted and statistical techniques like mean, frequency, percentage, standard deviation, t-test and multiple regression were applied to carry out the purposeful interpretation of the collected data and fulfill the objectives of the study.

The findings of the study revealed that maximum number of respondents were young-aged (62.5 percent), illiterate (30.83 percent), males (98.33 percent), had medium family size (78.34 percent) and farming as occupation (88.33 percent). Majority of the respondents had low farming experience (85.83 percent), medium land holding (47.50 percent), low annual income (56.67 percent), high level of economic motivation (62.5 percent), medium level of scientific orientation (71.65 percent), low level of mass media exposure (60 percent), medium level of information seeking behavior (91.66 percent), low level knowledge about coping strategies (56.67 percent) and high perception about climate change (54.17 percent). Occupation had highly positive significant relationship with perception whereas age, education, mass media exposure and ownership, knowledge about coping strategies and farming experience had a positive significant relationship. Gender, family size, landholding, annual income, decision making ability, scientific orientation, information seeking behavior and only economic motivation had negative non-significant relationship. Coefficient of determination value (R^2) was 0.43 that means there was 43 percent variation in the dependent variable due all independent variable. Whereas age and knowledge about coping strategies were highly significantly related with farmers perception about climate change and education and mass media exposure were significantly related with perception about climate change.



(M.A Ansari)
Advisor



(Sharad Joshi)
Author

सारांश

नाम	: शरदजोशी	परिचयांक : 47030
षटमास एवंवर्ष	: प्रथम, 2014-15	उपाधि : स्नातकोत्तर
प्रमुख विषय	: कृषि प्रसार एवं संचार	विभाग : कृषि संचार
शोध शीर्षक	: "उत्तर प्रदेश राज्य में किसानों के जलवायु परिवर्तन के बारे में धारणा तथा जलवायु परिवर्तन के साथ सामंजस्य करने की रणनीतियाँ"	
सलाहकार	: डॉ० एम० ए० अंसारी	

विश्वस्तर पर जलवायु परिवर्तन अहम मुद्दा है जो मानवजाति पर महत्वपूर्ण रूप से प्रभाव डाल रहा है। यह भारतीय कृषि पर संभवतः गंभीर रूप से पर्यावरणीय आर्थिक और समाजिक प्रभाव डाल रहा है। जलवायु परिवर्तन के साथ किसानों की धारणा में भी परिवर्तन आया है। किसान जलवायु परिवर्तन से अधिक चिंतित हैं क्योंकि ये प्रत्यक्ष या अप्रत्यक्ष रूप से फसल उत्पादन को प्रभावित कर रहा है। कई अध्ययनों से पता चला है कि जलवायु परिवर्तन सकारात्मक की तुलना में अधिक नकारात्मक प्रभाव डाल रहा है एवम् कृषि में निहित जोखिमों को बढ़ा रहा है। इन कृषि जोखिमों को कम करने के लिए किसानों ने कई तरह की रणनीतियाँ अपनायी हैं। इसीलिए "उत्तर प्रदेश राज्य में किसानों के जलवायु परिवर्तन के बारे में धारणा तथा जलवायु परिवर्तन के साथ सामंजस्य करने की रणनीतियाँ" नामित अध्ययन जो कि किसानों की जलवायु परिवर्तन के बारे में धारणा का अध्ययन करने के लिए और प्रतिकूल स्थिति के बाने से पूर्वउन से मुकाबला करने के लिये कुशल रणनीतियाँ विकसित करने के लिये डिजाइन किया गया था।

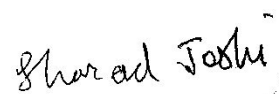
उत्तर प्रदेश राज्य का चयन उद्देश्यपूर्ण किया गया था। प्रदेश के 75 जिलों में से दो जिले—लखनऊ और हरदोई को उद्देश्यपूर्ण से चयनित किया गया था। एक खण्ड प्रत्येक चुने हुए जिलों से उद्देश्यपूर्ण से चयनित किया गया था। कोटावा ब्लाक हरदोई जिले से तथा बख्शी का तालाब ब्लाक लखनऊ जिले से चुने गये थे। दो गाँव प्रत्येक चुने हुये ब्लाक से उद्देश्यपूर्ण चयनित किये गये थे, जानकीपुर और सैरबहादुरपुर गाँव कोटावा ब्लाक से और भौली और धिनौरीगाँव बख्शी का तालाब खण्ड से, प्रत्येक चुने हुए गाँवों से 30 किसानों को क्रम रहित नमूना विधि से चयनित किया गये। इस प्रकार उत्तरदाताओं की कुल संख्या 120 थी। आवश्यक सूचनाओं को एकत्र करने के लिए एक साक्षात्कार अनुसूची को बनाया गया था। अध्ययन के उद्देश्यों को पूरा करने के लिए विश्लेषणात्मक अनुसंधान डिजाइन को लिया गया था। अध्ययन हेतु विश्लेषण एवं व्याख्या करने के लिए आवश्यक एवं महत्वपूर्ण सांख्यिकी तकनीकों की मदद ली गयी है।

अध्ययन के निष्कर्षों से पता चला है कि उत्तरदाताओं की अधिकतम संख्या मध्यम आयु (62.50 प्रतिशत), अनपढ़ (30.83 प्रतिशत), पुरुष (98.33 प्रतिशत), व्यवसाय (88.33 प्रतिशत) के रूप में खेती तथा मध्यम (73.34 प्रतिशत) आकार का परिवार था। अधिकतम उत्तरदाताओं की निम्न (85.83 प्रतिशत) खेती का अनुभव, निम्न (56.67 प्रतिशत) वार्षिक आय, उच्च (62.50 प्रतिशत) आर्थिक प्रेरणा, मध्यम (71.65 प्रतिशत) वैज्ञानिक उन्मुखीकरण, निम्न (60 प्रतिशत) मासमीडिया एक्सपोजर एवं आपरशिप, निम्न (91.66 प्रतिशत) सूचना की माँग का व्यवहार, निम्न (56.67 प्रतिशत) जलवायु परिवर्तन से सामंजस्य के लिए रणनीतियों के बारे में ज्ञान तथा किसानों की जलवायु परिवर्तन के बारे में धारणा उच्च (54.17 प्रतिशत) थी। जबकि व्यवसाय का किसानों की जलवायु परिवर्तन के बारे में धारणा के साथ बेहद सकारात्मक संबंध थे अतः आयु, शिक्षा, मासमीडिया एक्सपोजर एवंस्वामित्व तथा खेती का अनुभव के साथ सकारात्मक महत्वपूर्ण संबंध थे। जबकि लिंग, परिवार का आकार, जमीन की जोत, वार्षिक आय, निर्णय लेने की क्षमता, वैज्ञानिक उन्मुखीकरण, जानकारी का माँग का व्यवहार के साथ सकारात्मक गैर-महत्वपूर्ण संबंध थे जबकि केवल आर्थिक प्रेरणा के साथ नकारात्मक गैरमहत्वपूर्ण संबंध थे।

दृढ़ संकल्पमूल्य (t^2) के गुणांक का मान (0.43) था जिसका तात्पर्य है कि 43 प्रतिशत भिन्नता स्वतंत्र चर में सारे निर्भर चरों के कारण थी, जबकि आयु तथा सामंजस्य रणनीतियों के बारे में ज्ञान तथा किसानों की जलवायु परिवर्तन के बारे में ज्ञान तथा किसानों की जलवायु परिवर्तन के बारे में धारणा के साथ बेहद महत्वपूर्ण संबंध थे। शिक्षा और मासमीडिया एक्सपोजर एवं स्वामित्व का किसानों की जलवायु परिवर्तन के बारे में धारणा के साथ महत्वपूर्ण संबंध थे।



(एम० ए० अंसारी)
सलाहकार



(शरद जोशी)
लेखक