The term "climate change" is often used to refer specifically to anthropogenic climate change (also known as global warming). Anthropogenic climate change is caused by human activity, as opposed to changes in climate that may have resulted as part of Earth's natural processes. In this sense, especially in the context of environmental policy, the term climate change has become synonymous with anthropogenic global warming. Within scientific journals, global warming refers to surface temperature increases while climate change includes global warming and everything else that increasing greenhouse gas levels affect.

Climate change is a reality now and we are already facing the dearth of changing weather patterns. The agriculture sector is highly exposed to climate extremes. Several factors make Indian agriculture particularly vulnerable to increasing climate variability and climate change. Increasingly frequent and intense hydro-meteorological hazards, high dependency on agriculture – with few opportunities for diversifying income sources – rapid population growth, shrinking farm size in the region, and continued unplanned agriculture in areas prone to climate risks are likely to increase the exposure and loss of livelihoods, unless countermeasures are put in place. High exposure and low adaptive capacity pose a major challenge to the agriculture sector, which is expected to suffer livelihood losses and the reduction of crop and livestock production.

The study is an attempt of capturing the effect of climate change with four objectives:

1. To examine the pattern of change of rainfall and temperature in eastern Uttar Pradesh.

2. To examine the agricultural vulnerability to climate change in eastern Uttar Pradesh.
3. To examine the farmers’ perception about climate change in eastern Uttar Pradesh.

4. To examine the climate adaptation and risk mitigation strategies of farmers in eastern Uttar Pradesh.

Although eastern Uttar Pradesh is poor in terms of per capita income, it is the leading state in terms of agriculture production in the country; its comparative advantage in agriculture production stems from a strong agriculture base with the most fertile land masses and a well-connected river network and enables it to play a significant role in the country's food and nutrition security programme. But climate sensitivity to agriculture is very high in the state, and the recent changes observed in climate may be an obstacle (O'Brien et al. 2004). There is therefore an urgent need to make agriculture more resistant to climate change. It will help not only the state economy but also the country.

The study was conducted in the eastern part of Uttar Pradesh. The eastern region is characterised by low education, low per capita income, high population density, and a high number of small and marginal resource-poor farmers, which makes it likely to bear a significant impact of climate change.

From the 9 agro-climatic zones of India, three were selected purposively which contributes to the eastern part of Uttar Pradesh. From the three zones, one district each was selected randomly. From each district, one block was selected randomly and thereafter two villages from each block were chosen. The data for the present study was collected from both primary and secondary sources. Primary information was collected through FGDs, and used individually. In the focus group method, group discussions were organised among selected individuals to explore the information obtained from individuals in more detail and depth. 20 farmers from each village were taken randomly from the three blocks selected (2 villages from the each block), thus making a sum total of 120 farmers.
To examine the pattern of change of rainfall and temperature of eastern Uttar Pradesh, Box plot method was used as a tool to study the change in past years. The box-and-whisker plot is an exploratory graphic, created by John W. Tukey, used to show the distribution of a dataset. (McGill et al. 1978). A box and whisker plot is a type of graphical display that can be used to summarise a set of data based on the five number summary of this data. It is an effective way to investigate the distribution of a set of data.

To examine the agricultural vulnerability to climate change, climate vulnerability index was constructed using Patnaik and Narain method.

To know the farmers perception about climate change, primary data was collected from selected farmers and then garret ranking table was used as a analytical tool to rank them.

To examine the risk adaptation measures/ strategies taken by the Farmers, Primary survey was done with help of pre-structured schedule. Simple descriptive method was used to evaluate the results for possible suggestions.

Rainfall and temperature does not show any significant change in months over the years but due to climate change it becomes more erratic and unpredictable. Long-term changes in temperature and rainfall in eastern districts of Uttar Pradesh were analyzed using observational records of IMD from 1980 to 2015 using the box and whisker plot method. The plot elements and the statistics they represent as the range as shown by the graph lies within range of 20-40°C. December- January months marked out to be coolest months and May-June emerged as the hottest months of years with average max temperature of 40°C. The graphical representation shows that degree of difference in skewness (distribution) over different months. Knowledge of skewness tells the user whether deviations from median are more likely to be positive or negative. Months of January, October, November and April showed small dispersion or zero skewness. Boxes with long tails i.e. March, May, June and July showed negative and positive skewness (outliers). The upward long tail explains positive skewness distribution and downward long tail illustrates the negative
distribution. Open, high, low and close are the standard names given to each quartile range. The average minimum temperature for the months showed that December-January temperature is minimum up to 8°C and maximum to 39°C in months of summer i.e. June-July. It is clearly inferred that over the months from May to September the temperature on an average do not fluctuates much over the years. The Box and Whisker plot for minimum temperature and illustrates the skewness or distribution over the months. January, April, July, August, September months showed the zero or small dispersion as the size of boxes is small whereas February, May, June, October months show high variability in the data set. These months depicts unpredictability in the temperature range over the months in different time periods. The other important variable to study under the climate change pattern is rainfall. Monsoon or rainy season lasts from July to September in India. The season is dominated by the humid southwest summer monsoon, which slowly sweeps across the country beginning in late May or early June. Monsoon rains begin to recede from North India in the beginning of October. The box plot illustrates the average quartile ranges for the rainfall for the time period 1980 to 2015. July-August receive the average maximum rainfall range from 23.73–27.84 mm monthly whereas June-September receives an average maximum rainfall of around 17-18 mm as depicted by the fourth quartile.

On the account of agricultural vulnerability production of food grains was maximum in Azamgarh (912011 mtonnes) and least was found in Bhadohi (152961 mtonnes). Productivity of food grains was highest in Gorakhpur district followed by Mau. Cropping intensity was highest in Maharajgunj( 182.97%). Livestock population, also a component of agricultural vulnerability was highest in Azamgarh district (2461397) and least in Santkabir Nagar. Sonbhadra reportedly acquires highest forest area comparatively to other districts. Irrigation intensity was highest in Mau (97.07%). Bhadohi was the most agricultural vulnerable district with index 0.753 followed by Basti (0.713) and Sant kabir nagar (0.683) respectively. Azamgarh, Jaunpur and chandauli were ranked as the least vulnerable districts. The age of an individual has a great influence on his/her ability to take part in economic activities and of course chances of benefiting from the ongoing enterprise with more experience
in averting the effects of climate change. It can be inferred that majority of farmers in study area were mature and in middle age group, who generally possesses risk taking attitude and bears family responsibility and more involvement in social activity as compared to other groups. Majority of farmers had small and marginal land holdings. This is due to increased population density, poor resource farmers, etc. Majority of respondents (69.19 per cent) had medium farming experience followed by high farming experience (23.34 per cent). The classification of farmers based on perception of changes in the rainfall and temperature depicts that ‘change in rainfall pattern’, ‘problem in seed quality’ and ‘emergence of new pests and diseases’ ranked the pinnacle effects that farmers’ perceive due to climate change. Change in rainfall pattern with garret score 78 is perceived as the most visible effect of climate change. It is evident that the farmers opined that there was Change in crop cycle, water scarcity in surface water bodies and frequent occurrence of flood / drought due to climate change. The agricultural activities that farmers’ perceive as a cause of climate change were excess use of insecticides and pesticides stood first among the different activities with highest garret score of 67. Majority of respondents had low capacity (77.50 per cent) to adapt followed by medium capacity (11.67 per cent) and no capacity (10.83 per cent) to adapt to cope with the potential impact of climate change.

Majority of respondents were adapting strategies like other income generating activities like fisheries, cottage industries, etc. ranked it first with a garret score of 77. Respondents were also highly adapting crop diversification and ranked it on second with garret mean score of 75. Farmers are also adapting practices like using short growth period crop varieties especially in paddy. They are adopting early maturing varieties or the varieties which can withstand the adverse conditions. They also alter the time of sowing (delay/early) according to the climatic environment and ranked it fourth with garret mean score of 69. Other adaptation strategies adopted by farmers in the study area were judicious use of underground water, use disease resistant / tolerant variety crop, proper application of fertilizers, proper dumping of agricultural wastes, and taking soil and water conservation measures.
Farmers are the most affected group of society due to vagaries of climate change. This is because they are in direct contact with nature and have poor resources to adapt with these changes. With high population density, youth migration from agriculture, decreasing contribution of agriculture in GDP, high cases of farmers’ suicide, etc., climate change impact is comparatively much higher. None of the population thought that mitigation strategies will be helpful in coping with climatic change effect; this may be due to their thinking of majority of them that climate change will affect their farm in long term. So awareness programme regarding affect of climate change on agriculture in long term should be conducted. Adaptation strategies like use of renewable sources of energy, food processing, afforestation and use of crop sheds or greenhouses should be promoted as these were the least adopted adaptation strategies among farmers. Farmers’ awareness and adaptive capacity to climate change needs to be strengthened, for which policy options such as crop insurance and early warning systems would help. The GoI has already taken a few steps in this direction, such as weather-based insurance scheme and agro meteorology services.