

**Impact of Change Climate on agriculture and livelihoods:  
a pilot study in the eastern dry zone of Karnataka**

**MINOR RESEARCH PROJECT**

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## **Executive summary**

Climatic changes has brought about rampant variation in the weather pattern be it increase in temperature, precipitation levels and humidity. This has drastically affected the various sectors worldwide. Agriculture being the worst affected. Higher temperature on the one hand reduces yields of desirable crops while encouraging weed and pest on the other. Changes in precipitation patterns increase the likelihood of short run crop failures and long run fall in production levels. Climatic variation changes the cropping pattern and reduces vol of output which inturn reduces the income of farm households leading to multiple adverse affects. The research study conducted in the Eastern Dry Zone of Karnataka analyses the cropping pattern changes and the dependent livelihoods of people involved in it.

The study aimed to answer the trends of climate change, its impact on the livelihood who is vulnerable to the impact and why, what are other constraints that exacerbate social vulnerability and what are the existing local and institutional coping mechanisms and how they can be viewed from sustainability point of view.

The research work was initiated having the below objectives which formed the background of the study. The study has taken three districts namely Bangalore rural, Tumkur and Kolar which presently constitutes the Eastern Dry Zone of Karnataka. An yield function was estimated with yield per hectare as the dependent variable.

Several independent variables were considered and based on the results a final list of variables comprising of proportion of irrigated area, annual rainfall, proportion of HYV area a double log regression was estimated by the method of Ordinary least squares. The coefficients of the regression were checked for their significance by using the student t test.

## **Objectives**

1. To document the nature and magnitude of climate change occurring in the various agro-climatic regions of south India.
2. To assess the impact of climate induced changes on agriculture production, livestock output and livelihoods of the various regions.
3. To analyse the effectiveness of the coping strategies adopted by the stakeholders to mitigate adverse climatic conditions.
4. To derive policy options for long term solutions of the problem of climate change.

The population in the study area is equally spread between the urban areas and the rural areas in the eastern dry zone, showing a consistent growth in the level of literacy. The no of cultivators and agricultural labourers have been growing only at a moderate level. Bangalore urban district obtained an average of 842 mm of rainfall with slight fluctuations witnessed in some years.

September is seen as the wettest month obtaining the highest average rainfall. The rainfall declined gradually in the decade 2000-10. The average in tumkur district though oscillating between the good and the bad years with an average of 774 mm rainfall has not witnessed a particular trend in rainfall over the years. There has been an overall increase in the rainfall pattern in the 1991-2000. The mean rainfall for kolar district at 766 mm showed an increasing pattern. The average rainfall of kolar is seen to be higher than tumkur. Another similarity is that September is one month which has obtained remarkably high rainfall followed by the month of May where the monsoon season begins. Rainfall pattern among the districts shows that though there is a slight decrease in the average rainfall, the last five decades have not witnessed a drought like situation. The quantum of rain per day in the eastern dry zone has decreased at the rate of 1.13mm per ear. This goes to show that the distribution of rainfall is not intense and is thinly spread over a long duration rather than a heavy downpour. This leads to a quick drying rather than leading to ground water seepage which helps in replenishing the water table.

The temperature of Bangalore has been constant in the last 3 decades where as that of tumkur and kolar has shown an increasing trend. The projected temperature for next thirty years for kolar and tumkur is projected to be steady whereas for Bangalore it is going to increase. The water usage per lakh hectare has declined indicating more lands turning fallow.

#### Cropping Pattern

The crops taken up for the study are mostly finger millet, rice maize sorghum, pearl millet pigeon pea, ground nut, sunflower fruits, flowers and vegetables. Kolar has a high retention for fruits, finger millet and pearl millet held large cultivable land in kolar. The percentage of land for fruits and other crops have consistently shown an increase due to climatic changes which have benefitted the farmers to shift to commercial crops which also demand less water. farmers are also not keen on continuing with a particular crop. The transition matrix reveals that except for Bangalore district which has a strong retention for finger millet and rice, the other two districts show weak retention implying a shift to other crops of value.

Tank irrigation was prominent in the 1960's and 70's have given way to tube and well irrigation through which more than 75% of lands are cultivated. Annual rainfall, productivity per hectare and the proportion of area under high yielding varieties were the variables in the model which had significantly influenced the productivity of crops. The use of irrigational facilities have benefitted the productivity but efforts be made at the micro and macro should level to recharge ground water and also to use alternative irrigation like drip which would bring down the percentage of water use. The farmers have over the years made slow moves in shifting their cultivation to value based crops. This indicates their adaptation to climatic changes. This has benefitted them in maintaining their livelihoods. Various govt schemes during production and marketing of varied crops can benefit to a larger scale. Crops like oilseed, finger millet are adversely affected and crops like rice, groundnut and tur dhal are less receptive to the changes in

the rainfall. Livestock production in the study have showed consistent increase. The income of the population in the last deciles remained constant in all the rounds.

#### Policy recommendation:

Global warming has altered the climatic changes world over. Being at the cross roads only decisive and immediate action will make it possible to influence the future consequences of climate change and stall global warming. There is need to carry out more research and development programs on the issues and facets of climate change.

A good source through which rain water recharge can take place is through rain water harvesting. Drip irrigation can be practiced when farmers cultivate fruits and vegetables which prevents excess wastage of water.

Support system from various agriboards can be provided to the farmers in using hybrid seed, new technology. Public agencies with strong science and technology and engineering capabilities need to play a major role in constructing and managing large recharge structures the role of extension to advice farmers on climatic issues and the need to conserve water should be an integral part of the watershed programme.

Extension programmes should help farmers to diversify into new techniques of cultivation as well as cultivating crops of value.