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Farmers perception on climate change and its impact on agriculture in eastern dry zone of Karnataka

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ABSTRACT

To understand the farmers perception of climate change (rainfall and temperature) and adaptation measures initiated to overcome its ill effects the study was conducted by interviewing 120 farmers in eastern dry zone (Zone 4) of Karnataka. The results of the study revealed that 73.34 per cent of farmers had high perception of changes in rainfall before 2000 and 98.34 per cent of them after 2000. Though the actual documentation of climatic data indicated that there was increase in the rainfall after 2000 farmers perceived that there was a decrease in the rainfall. This trend of perception was due to increased area under water intensive crops and short period of rainy days. However 76.66 per cent farmers were having high level of perception about changes in temperature before 2000 which has increased to 99.16 per cent after the year 2000. All the farmers perceived that there was decrease in yield, income, soil nutrients and increase in cost of cultivation, pests, diseases and weed infestation due to climate change. There was no change in varieties, replacement of crops, early planting, spacing, quantity of seeds and number of irrigations before 2000. However substantial changes occurred in all of the practices after 2000. Noteworthy measures taken up by the farmers include early planting, drip irrigation, farm ponds and increase in number of irrigations for mulberry and rice crops.

Keywords: Climate change; farmers; perception; adaptation

INTRODUCTION

Climate change is one of the biggest challenges facing the world today. The problem of human induced climate change first came into force and drew the attention of the scientists and policy makers when Inter Governmental Panel on Climate Change (IPCC) was established. Agriculture and climate are mutually dependent. There is a need to understand the effect of climate change on agricultural sector both at global as well as at regional level especially from the point of view of providing food to vulnerable sections of the population. Changing climatic conditions can have the big effect on our life and environment.

It seems clear that vulnerability to climate change is closely related to poverty as the poor are least able to respond to climatic stimuli. Furthermore certain regions of the world are more severely affected by the effects of climate change than others. Generally speaking vulnerability and adaptation to climate change are urgent issues among many developing countries. Agriculture and food security are among the major casualties of climate change in India. The pace and extent of warming across India is wide spread and undisputed. Climate change is affecting India in a big way and its impacts are many and serious such as erratic monsoon, changes in agricultural zones, spread of tropical diseases, sea level rise, change in availability of fresh water, floods, droughts, heat waves, storms, hurricanes etc. The rise in average annual temperature by 1.3^0C in the state of Karnataka during 1950 to 1990 has been observed. The mean annual rainfall trend from 1901 to 2000 has been reported as declining. There is a definite declining trend in rainfall in Kodagu, Chikmaglure and South Canara districts from 1950 to 2006 and Bangalore, Tumkur and Kolar destricts of Karnataka have shown considerable increasing trend in the annual rainfall (Rajegowda et al 2009).

With unpredictable weather farmers keep changing crop management practices by growing resistant varieties and are prepared for constant change in the farming practices. Mendelsohn and Dinar (1999) reported that adaptation was estimated to reduce the potential damages from climate change from 25 to 15-23 per cent in Indian agriculture. Impacts of climate change are diversified and need to be understood so as to workout pragmatic strategies to mitigate ill-effects of climate change. With this background this study has been designed to understand farmers perception about the changes in climate and adaptation measures initiated due to climate change.

METHODOLOGY

The study was conducted in the eastern dry zone (Zone 5) of Karnataka, India. The two climatic parameters viz rainfall and temperature were selected for the study based on the existence of high range of variability (since 20 years) in three Taluks viz Ramanagar (Kasaba), Chickballapur (Kasaba) and Tumkur (Kasaba). From each of the so selected Taluks four villages were selected randomly. Thus 12 villages were considered for the study. From each of the selected villages ten respondents were selected by applying proportionate random sampling. Thus the data were collected from 120 respondents with the help of a pre-tested schedule. For the purpose of data collection respondents were selected between the age group of 25 to 60 years with farming experience of 10 -40 years in

order to elicit the accurate information regarding perception of climate change and adaptation measures taken by the farmers due to climate change. The data were scored, tabulated and analyzed using suitable statistical tools.

RESULTS AND DISCUSSION

Perception of farmers about climate change (rainfall and temperature)

An overview of the Table 1 shows classification of farmers based on perception of changes in the rainfall and temperature in two time intervals before and after 2000. About 73.00 per cent of farmers had high level of perception followed by medium (20.83%) and low (5.83%) level of perception about changes in the rainfall before 2000. Majority of farmers (98.34 %) had high and only 1.64 per cent had medium level of perception about changes in the rainfall after 2000. In overall it could be concluded that majority of the farmers were having higher perceiving ability about changes in rainfall. The reason may be that they had more recalling ability as rainfall affects on production aspects of crops than other inputs. These results are in conformity with studies of Lautze et al (2003) and Maddison (2006). They reported that farmers perceived changes in climate and opined that there was severe changes in rainfall patterns over the years.

Along with rainfall temperature also plays an important role in the crop production. But the direct impact of temperature on crop yield is hidden factor on the farmers' perception and they are in the position to judge impact in terms of evapo-transpiration and dehydration in human beings other than physiological process in the plant system. In cases of changes in the temperature before 2000 about 76.66 per cent of farmers had high level of perception followed by medium (19.17%) and low (4.17%) level. Majority of farmers (99.16%) had high, 0.84 per cent had medium and none of them had low level of perception about changes in the temperature after 2000. These results are in conformity with studies of Sinha et al (1998). They opined that average annual minimum and maximum temperatures had been increasing in every decade.

Perception of farmers about impact of climate change on agriculture

It is evident from the Table 2 that all the farmers opined that there was increase in the cost of cultivation, decrease in the crop yield, decreasing income from agriculture, loss in the soil nutrients, more weed infestation (leading to competition with crops for space and nutrients) and more pest and disease incidence due to climate change (100 %). It implies that agriculture is one where it is contributing to the overall economy in a higher proportion.

Table 1. Classification of farmers based on perception of rainfall and temperature change before and after 2000 (n=120)

Period	Level of perception	Perception of farmers about climate change	
		Rainfall	Temperature
Before 2000	High	88.00	92.00
		(73.34)	(76.66)
	Medium	25.00	23.00
		(20.83)	(19.17)
	Low	7.00	5.00
		(05.83)	(04.17)
After 2000	High	118.00	119.00
		(98.34)	(99.16)
	Medium	2.00	1.00
		(1.64)	(0.84)
	Low	-	-

Figures in parentheses are per cent values

Table 2. Response of farmers to affects of climate change wrt agriculture (n=120)

Statement	No of farmers		
	Agree	Undecided	Disagree
There is decrease in the crop yield due to climate change	120.00 (100.00)	-	-
Income from agriculture is adversely affected due to climate change	120.00 (100.00)	-	-
There is soil nutrient loss due to climate change	120.00 (100.00)	-	-
Cost of cultivation has increased due to changes in the climate	120.00 (100.00)	-	-
There is more weed infestation due to climate change (leads to competition with crops for space, nutrients etc)	120.00 (100.00)	-	-
There is more pest and disease incidence due to climate change (cost of cultivation increased due more expenditure on control of pests and diseases)	120.00 (100.00)	-	-

Figures in parentheses are per cent values

This sector is challenged by many factors of which climate-related disasters are the major ones and farmers can easily perceive the impacts on agriculture from any external factors like climate change.

Adaptation measures initiated by farmers to overcome ill effects of climate change

Data presented in the Table 3 reveal that out of 120 respondents considered for the study only 49 and 62 farmers were growing rice and mulberry respectively. The data were collected with respect to adaptation measures initiated by the rice growers. It could be observed that all farmers (100%) had not taken any adaptation measures like changing of the long duration varieties to short duration, from short to long duration, changing of rice crop to other alternative crops, changing in the planting dates, spacing between rows and plants, quantity of fertilizer application, quantities of seeds and irrigation due to changes in the climate before 2000 in the rice production. The probable reason might be that in the past farmers were more interested in sustainable yield besides higher production and productivity based on the demand for rice that made the farmers to grow rice on traditional ways rather than adoption of new technologies.

After 2000 in case of rice production all the farmers (100%) changed the planting dates of rice, increased the quantity of fertilizer application, seeds, number of irrigations. 51 per cent of rice growers and 88.70 per cent of mulberry growers increased the spacing between plants and rows while 59.18 per cent of rice growers changed varieties from long to short duration and only 16.32 per cent changed short to long duration varieties. Majority of mulberry growers changed from long duration to short duration varieties. A remarkable percentage of farmers replaced rice and mulberry crops with low water requirement crops like Ragi, red-gram and considerable number of farmers constructed farm ponds and installed drip irrigation at their farms for protective irrigation. There was also increase in the quantity of seeds/cuttings, spacing and number of irrigations after 2000. The probable reasons might be that farmers were more interested in higher production and productivity than sustainable yield. Based on the demand and higher price for the rice in the market made the farmers to grow rice by adapting new technologies suiting to their situation.

CONCLUSION

Based on the findings it can be concluded that the farmers were initiating adaptation measures as suggested in the package of practices provided by University of Agricultural Sciences, Bangalore. Much remains to be done to create awareness and knowledge about the adverse effects of climate change.

Table 3. Adaptation measures taken by farmers in rice and mulberry crops in response to climate change

Adaptation measure	Major changes in farming							
	Rice crop (n=49)				Mulberry crop (n=62)			
	Before 2000		After 2000		Before 2000		After 2000	
	S	NS	S	NS	S	NS	S	NS
Shifted from long duration to short duration varieties	-	49 (100.00)	29 (59.18)	20 (40.82)	-	62 (100.00)	25 (40.42)	37 (59.68)
Shifted from short duration to long duration varieties	- -	49 (100.00)	8 (16.32)	41 (83.68)	- -	62 (100.00)	5 (8.06)	57 (91.94)
Changes in crops (crop diversification)	- -	49 (100.00)	20 (40.81)	29 (59.19)	- -	62 (100.00)	19 (30.65)	43 (69.35)
Changes in planting dates	-	49 (100.00)	49 (100.00)	- -	6 (9.67)	56 (90.33)	62 (100.00)	-
Use of drip irrigation	-	-	-	-	5 (8.10)	57 (91.90)	24 (38.70)	38 (61.30)
Construction of farm pond	5 (10.20)	44 (89.80)	13 (26.53)	36 (73.47)	18 (29.00)	44 (71.00)	23 (37.10)	39 (62.90)

Changes in cultivation practices												
	Before 2000			After 2000			Before 2000			After 2000		
	I	D	NC	I	D	NC	I	D	NC	I	D	NC
Spacing between the rows/plants	-	-	49 (100.00)	25 (51.00)	-	24 (49.00)	-	-	62 (100.00)	55 (88.70)	-	7 (11.30)
Quantity of seeds/cuttings used	-	-	49 (100.00)	49 (100.00)	-	-	-	-	62 (100.00)	62 (100.00)	-	-
Quantity of fertilizer application	-	-	49 (100.00)	49 (100.00)	-	-	-	-	62 (100.00)	62 (100.00)	-	-
Number of irrigations given	-	-	49 (100.00)	49 (100.00)	-	-	-	-	62 (100.00)	62 (100.00)	-	-

S= Started; NS= Not started; I= Increased; D= Decreased; NC= No Change

Figures in parentheses are per cent values

Systematic development and delivery of extension programs on climate change are needed. Further a need exists for examining cost-effectiveness of the measures taken by the farmers. An integrated approach to address many issues of climate change is also required.

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