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Study of farmer's perception on climate change: A case study of Raichur and Bidar districts of Karnataka

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Abstract

This study was performed to examine the perception of farmers towards climate change. Simple random sampling technique was employed to select 120 respondents comprising equal number of respondents from Bidar and Raichur district. The primary data required for the study was obtained using structured interview schedule prepared for the purpose. The pooled data on over all perception of the farmers towards climate change revealed that 41.67 per cent of respondents in Bidar and Raichur district had high favourable perception towards climate change while 31.66 per cent of them had less favourable perception and remaining 26.66 per cent had medium favourable perception towards climate change. Statement wise farmers perception about climate change revealed that in Bidar district 100.00 per cent of the respondents disagreed that there was no change in rainfall pattern, 86.67 per cent respondents disagreed that number of rainy days were more in the recent years, while 100 per cent of them agreed that return to investment is uncertain in agriculture due to climate change, 78.33 per cent of the respondents agreed that there is increase in temperature over the years. Also 68.33 per cent experienced more erratic and extreme temperature during recent years. Regarding ground water, 80.00 per cent of them agreed that there is depletion which affects bore well irrigation. Similar results were found with Raichur district respondents.

Keywords: Farmers perception, climate change

1. Introduction

India is facing unpredictable weather for the last few years. States like Bihar, Assam and parts of Karnataka are experiencing dry spells, where as Southern Gujarat, Maharashtra, parts of Bihar, Andhra Pradesh, Ladakh and Western Karnataka were hit by the flood. Agarwal (2003)^[1] predicted that, due to impact of climate change, average temperature of the air above the earth surface is expected to rise by 1.4 to 5.8⁰C over the next 100 years and CO₂ concentration will rise at the rate of 1.8 ppm and the production of rabi crops is threatened seriously due to increase in temperature and higher uncertainties in rainfall. Some areas in India receive more than normal rainfall while some of the areas receive almost no rainfall. Pandey *et al.* (2012)^[11] in their study in Madhya Pradesh found that majority of farmers perceived that there is delay in onset of monsoon, early withdrawal of monsoons, reduction in number of rainy days and consecutive drought for 3 – 4 years. Sujit and Pandaria (2012)^[12] in coastal ecosystem of West Bengal measured the risk perception of people about climate change and reported that majority of the respondents perceived that there is increase in crop diseases, reduction in agricultural production, increase in salinity and increase in insect and pest attack due to climate change. Kant *et al.* (2015)^[6], found that majority of the farmers in western dry region of India perceived the changes in environmental temperature and timing of precipitation. Even the various studies show the overall loss in the crop production in the country in the last few years due to the anticipated rise in the temperature. It is expected that soon India is going to face the challenges that includes unwanted pressure from the growing population and changing scenario of world trade in agriculture. Thus, the agriculture sector is likely to be more affected by climate change. This poses a challenge to the state due to its dependence on climate-sensitive economic activities and predominantly in practicing rain- sustained agricultural activities. Thus, the human response is critical to understand and accounting of perception and adaptation to climate change is difficult but necessary in order to measure the effect of climate change at farmers' level. Thus, an attempt has been made to document the perception of farmers towards climate by interviewing the sample respondents in the study area. The standardized structure schedule was used to collect the data through personal interview technique.

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2. Methodology

2.1 Study area

The present study was conducted in Zone 1 and Zone 2 of Karnataka during 2015-2016. From Zone 1, Bidar district was purposively selected as it covers maximum area under it. From Zone 2, Raichur was purposively selected from the point of researcher convenience.

2.1.1 Selection of talukas and villages

Bidar district comprises Bidar, Aurad, Bhalki, Basavakalyan and Humnabad. Out of these five talukas, Bidar and Basavakalyana were purposively selected based on highest (998 mm) and lowest (821 mm) annual normal rainfall respectively. Similarly, Raichur district comprises of five talukas viz, Manvi, Lingasugur, Devdurga, Raichur and Sindhanur. Out of these, Raichur and Devadurga are selected based on highest (688mm) and lowest (640mm) annual normal rainfall. From Bidar taluka, Gadagi and Shrimandala, from Basavakalyana taluka, Khanapurwadi and Neelakantawadi were randomly selected. From Raichur taluka Merchatal and Garaldini were randomly selected and from Devadurga taluka, Gabbur and Sunkeshwarahal were randomly selected.

2.1.2 Selection of respondents

List of farmers from each of the eight selected villages was obtained. From each village, fifteen farmers were selected randomly. Thus, the total sample size constitutes 120 respondents for the study.

The required information was obtained from sample respondents by personal interview method with the help of structured interview schedule. The tabular analysis was made to document the perception of farmers towards climate change by computing averages and percentages.

3. Results

3.1 Over all perception of farmers towards climate change

It was observed from the Table 1 that 43.34 per cent of the Bidar respondents had more favorable perception towards climate change as they observed changes in rainfall seasons and pattern, change in the onset and off set of rainfall, increasing temperature over the years, followed by 38.33 per cent of the respondents belonged to less favorable perception category as they had better irrigation facilities and improved farming practices which influenced them to have less favorable perception towards changing climate. Table 2 depicts that 40.00 per cent of the Raichur respondents belonged to high favorable perception category followed by 35.00 per cent with medium favorable perception towards climate change because farmers witnessed changes in climate over a period of time which had adverse effect on crop and livestock.

The results in Table 3 showed that major portion (41.67 %) of the respondents had high favorable perception towards climate change. This is because of the reason that farmers are aware of changing climate which may be derived through their own personal experience and also via mass media such as radio and television which was the main source of information on climate change. Farmers indicated that they have observed changes in rainfall seasons and pattern, change in the onset and off set of rainfall, increasing temperature over the years. Farmers have also indicated that they are experiencing frequent and severe droughts for the past ten years. The above findings of the results were similar to the

findings of Maddison (2006)^[7] and Ugwoke *et al.* (2012)^[13].

Table 1: Distribution of respondents based on their overall perception (Bidar) (n₁=60)

Sl. No.	Categories	Frequency	Percentage
1	Low (mean - 0.425*SD)	23	38.33
2	Medium (mean ± 0.425*SD)	11	18.33
3	High (mean + 0.425*SD)	26	43.34
		Mean=46.3	SD= 3.88

Table 2: Distribution of respondents based on their overall perception (Raichur) (n₂=60)

Sl. No.	Categories	Frequency	Percentage
1	Low (mean - 0.425*SD)	15	25.00
2	Medium (mean ± 0.425*SD)	21	35.00
3	High (mean + 0.425*SD)	24	40.00
		Mean= 50.2	SD= 3.06

Table 3: Distribution of respondents based on their overall perception (Pooled) (n=120)

Sl. No.	Categories	Frequency	Percentage
1	Low (mean - 0.425*SD)	38	31.66
2	Medium (mean ± 0.425*SD)	32	26.66
3	High (mean + 0.425*SD)	50	41.67

3.2 Individual statement wise perception of farmers towards climate change.

3.2.1 Individual statement wise perception of farmers towards climate change (Bidar district)

An appraisal of table 4 revealed statement wise perception of Bidar respondents towards climate change. Majority (86.66 %) of the respondents disagreed that number of rainy days were more in the recent years, even 83.33 per cent of them disagreed that over the years amount of rainfall was more. The respondents eluded that, the number of rainy days have reduced to a greater extent than last decade. Rainfall was more regular and predictable in seasons during the early days but currently, rains have become more unpredictable. Farmers explained that rainfall had reduced in both quantity (amounts per rainfall) and quality (ability of the rains to sustain the crops for a reasonable period to crops maturity). Also majority (81.66 %) of the farmers agreed that change in the onset of rainfall was observed in the recent years. Farmers expressed that onset of rainfall was late than expected date which delayed their agricultural activities to a greater extent. Proper timing of precipitation plays important role in productivity of crops. Change in timing of precipitation is creating problems like disturbance in flowering, reduction in biomass production, decrease in grain size, shortening of maturity period resulting in lowering of productivity in major crops. In the same tune 75.00 per cent of the respondents agreed that rainy season off set occurs earlier than schedule period in both *kharif* and *rabi* season which in turn lead to reduced number of rainy days and rainfall amount. The table also showed that 66.67 per cent of the respondents agreed that there was more dry spell than compared to past as they observed sequence of days without rain during rainy season and also days with very less amount of rainfall. In the same way 75.00 per cent agreed that the probability of occurrence of droughts was more frequent compared to last decade. Farmers reported that they have observed long period of dry weather than before that caused serious problems like crop damage, shortage of water etc. Similarly, 88.34 percent agreed that there was uneven distribution of rainfall during

different stages of the crop growth as they observed irregular rainfall affecting crop growth and production. Also cent per cent of the respondents disagreed that there was no change in the rainfall pattern as farmers had noticed considerable amount of changes in rainfall pattern, amount of rainfall and number of rainy days which varied to greater extent. This is consistent with findings from studies done by Gwimbi (2009) [4], Gbetibouo (2009) [5] and Mengistu (2011) [8]. They also reported the changes in rainfall patterns.

More than half (58.33 %) of the respondents agreed that climate change restricts the farmers for selection of crop enterprise in different season because farmers felt that with the varying climate, they do not have alternate choices for selection of the crops. Cropping is highly sensitive to climate

and has limited environment in which they are productive and profitable, hence climate change restricts the m in selection of crops. Also 65.00 per cent of the respondents agreed that due to change in climate there is reduction in risk bearing ability of the farmers to take new crops in addition to traditional crop as farmers were assured of certain income from traditional crops. But uncertainty about the income expecting from new crops which reduces risk bearing ability. Majority (80.00 %) of the farmers opined that there is depletion of ground water level, which affects the bore well irrigation. They reported that this is mainly due less rainfall and recharge followed by excessive pumping of ground water to buffer against surface water scarcity.

Table 4: Distribution of the respondents according to their statement wise perception about climate change (Bidar district) (n₁=60)

Sl. No.	Perception Statements	Response of farmers			Sl. No.	Perception Statements	Response of farmers		
		Agree	Undecided	Disagree			Agree	Undecided	Disagree
1	Number of rainy days were more in the recent years	8 (13.33)	0 (0.00)	52 (86.66)	10	Experienced more erratic and extreme temperature during recent years	41 (68.34)	8 (13.33)	11 (18.33)
2	Over the years amount of rainfall was more	10 (16.67)	0 (0.00)	50 (83.33)	11	Summer is getting warmer in addition to winter as well	42 (70.00)	0 (0.00)	18 (30.00)
3	Change in the onset of rainfall was observed in the recent years	49 (81.66)	4 (6.66)	7 (11.67)	12	Climate change restricts the farmers for selection of crop enterprise in different season	35 (58.33)	6 (10.00)	19 (31.66)
4	Rainy season off set occurs earlier than schedule period in both <i>kharif</i> and <i>rabi</i> season	45 (75.00)	8 (13.33)	7 (11.67)	13	Due to change in climate there is reduction in risk bearing ability of the farmers to take new crops in addition to traditional crop	39 (65.00)	4 (6.67)	17 (28.33)
5	Occurrence of more dry spell than compared to the past	40 (66.67)	5 (8.33)	15 (25.00)	14	There is depletion of ground water level, which affects the bore well irrigation	48 (80.00)	8 (13.33)	4 (6.67)
6	Probability of occurrence of droughts were more frequent compared to last decade	45 (75.00)	3 (5.00)	12 (20.00)	15	Urban migration trend of farmers from rural areas is being increased	31 (51.67)	0 (0.00)	29 (48.33)
7	There was uneven distribution of rainfall during different stages of the crop growth	53 (88.34)	2 (3.33)	5 (8.33)	16	Increase in trend of farmers towards non farmer activities for their livelihood	36 (60.00)	0 (0.00)	24 (40.00)
8	There was no change in rainfall pattern	0 (0.00)	0 (0.00)	60 (100.00)	17	Return to investment is uncertain in agriculture due to climate change	60 (100.00)	0 (0.00)	0 (0.00)
9	There is increase in temperature over the years	47 (78.33)	7 (11.67)	6 (10.00)	18	There is increase in thunder storm and hail storm in the recent years	51 (85.00)	0 (0.00)	9 (15.00)

*Parenthesis indicates percentiles

Table 5: Distribution of the respondents according to their statement wise perception about climate change (Raichur district) (n₂= 60)

Sl. No.	Perception Statements	Response of farmers			Sl. No.	Perception Statements	Response of farmers		
		Agree	Undecided	Disagree			Agree	Undecided	Disagree
1	Number of rainy days were more in the recent years	4 (6.67)	0 (0.00)	56 (93.33)	10	Experienced more erratic and extreme temperature during recent years	60 (100.00)	0 (0.00)	0 (0.00)
2	Over the years amount of rainfall was more	5 (8.33)	0 (0.00)	55 (91.66)	11	Summer is getting warmer in addition to winter as well	53 (88.33)	4 (6.67)	3 (5.00)
3	Change in the onset of rainfall was observed in the recent years	60 (100.00)	0 (0.00)	0 (0.00)	12	Climate change restricts the farmers for selection of crop enterprise in different season	48 (80.00)	8 (13.33)	4 (6.67)
4	Rainy season off set occurs earlier than schedule period in both <i>kharif</i> and <i>rabi</i> season	49 (81.66)	4 (6.67)	7 (11.66)	13	Due to change in climate there is reduction in risk bearing ability of the farmers to take new crops in addition to traditional crop	54 (90.00)	2 (3.33)	4 (6.67)

5	Occurrence of more dry spell than compared to the past	55 (91.66)	1 (1.66)	4 (4.67)	14	There is depletion of ground water level, which affects the bore well irrigation	50 (83.33)	2 (3.34)	8 (13.33)
6	Probability of occurrence of droughts were more frequent compared to last decade	60 (100.00)	0 (0.00)	0 (0.00)	15	Urban migration trend of farmers from rural areas is being increased	28 (46.66)	0 (0.00)	32 (53.33)
7	There was uneven distribution of rainfall during different stages of the crop growth	56 (93.33)	0 (0.00)	4 (6.67)	16	Increase in trend of farmers towards non farmer activities for their livelihood	39 (65.00)	0 (0.00)	21 (35.00)
8	There was no change in rainfall pattern	5 (8.33)	3 (5.00)	52 (86.67)	17	Return to investment is uncertain in agriculture due to climate change	60 (100.00)	0 (0.00)	0 (0.00)
9	There is increase in temperature over the years	60 (100.00)	0 (0.00)	0 (0.00)	18	There is increase in thunder storm and hail storm in the recent years	60 (100.00)	0 (0.00)	0 (0.00)

*Parenthesis indicates percentiles

More than half (51.67 %) of the respondents agreed that there is increase in urban migration trend in rural areas and also 60.00 per cent of the respondents agreed that there is increase in trend of farmers towards nonfarm activities for their livelihood. Respondents cited the reason that many of the farmers tend to engage in diverse livelihood activity and many went to do the job in industrial sectors like as garments and textile. Others move from village to town for seeking work as day labour, rickshaw polar etc. Cent per cent of the farmers agreed that return to investment is uncertain in agriculture due to climate change as farmers reported that due to the extreme adverse on agriculture which induce considerable reduction in crop yield, which caused reduction in farm income. Majority (85.00 %) of the farmers agreed that there is increase in thunder storm and hail storm in the recent years as the farmers reported that there were frequent thundering even during non occurrence of rainfall which were not usually found in last decades. This was in line with the report of Kant *et al.* (2015) [6].

3.2.2 Individual statement wise perception of farmers towards climate change (Raichur district)

Table 5 revealed statement wise perception of Raichur respondents towards climate change. Majority (93.33 %) of the respondents disagreed that number of rainy days were more in the recent years and also majority (91.67 %) of them disagreed that over the years amount of rainfall was more. They reported that number of rainy days has reduced especially in last two – three years and are experiencing uncertain and erratic rainfall in the recent years which has reduced the amount of rainfall which was adversely affected on farming. Cent per cent of the respondents observed the change in the onset of rainfall. Farmers expressed that they experienced delay in onset of rainfall than last decades which disturbed their calendar of agricultural activities. Most (81.66 %) of the respondents agreed that rainy season off set occurs earlier than schedule period in both *kharif* and *rabi* season. Farmers reported that due to early with drawl of rainfall there is reduction in moisture availability to crops sown which adversely affects their productivity. Even 91.66 per cent of the respondents observed occurrence of more dry spell compared to past as farmers reported that, presently farmers are experiencing shorter rain seasons than in the past and most of the times, there were only dry spells with no rains. It is in line with findings of Ogalleh *et al.* (2012) [10]. Cent per cent agreed that probability of occurrence of droughts were more

frequent compared to last decade as they reported in the recent years there was less or no rain over the season resulting in water scarcity for various uses mainly for drinking and agriculture, lack of water and fodder for livestock etc. Majority (93.33 %) of the respondents agreed that there was uneven distribution of rainfall during different stages of the crop growth. The farmers reported that most of the times there was no rain during critical growth stages which resulted in reduced yield of the crops. 86.67 per cent of respondents disagreed that there was no change in the rainfall pattern as they reported that, farmers experienced the erratic and varied rainfall pattern over the years. Above findings were similar to the studies done by Gwimbi (2009) [4], Gbetibouo (2009) [5], Mengistu (2011) [8]. They also reported the changes in rainfall patterns. With respect to temperature table revealed that cent per cent of the respondents agreed that there is increase in temperature over the years and experienced more erratic and extreme temperature during recent years. Most of the farmers reported that temperature and its intensity is increasing day by day. They experienced more erratic and extreme temperature during especially during drought years. Majority (88.33 %) of the respondents agreed that summer is getting warmer in addition to winter as well. They believe that temperature is steadily grown to be worsening intensity with long length of summer days and less number of cold days during winter. The findings were similar to studies done by Nhemachen and Hassan (2007) [9], Apata *et al.* (2009) [2], Gwimbi (2009) [4], Gbetibouo (2009) [5] and Dhaka *et al.* (2010) [3]. They concluded that large proportion of the respondents perceived significant changes in temperature.

It was reported that most (80.00 %) of the respondents agreed that climate change restricts the farmers for selection of crop enterprise in different season. Farmers expressed that when there is low rainfall they cannot go for high water intensive crops. Even when onset of rainfall is late, they cannot take up long duration varieties. 90 per cent of the respondents agreed that due to change in climate there is reduction in risk bearing ability of the farmers to take new crops in addition to traditional crop. Farmers were assured of certain income from traditional crops. But uncertainty about the income expecting from new crops which reduces risk bearing ability Hence they prefer to grow traditional crops like Cotton, Chili, Tur etc. Majority (83.33 %) of them agreed that there is depletion of ground water level, which affects the bore well irrigation. Farmers expressed that this might be due to the continued groundwater utilization and less recharge owing to erratic and

less rainfall. More than half (53.33 %) of them did not agree that urban migration trend of farmers from rural areas is being increased. As they expressed that agriculture is their main source of livelihood and look after their own farm in a profitable way rather than migrating to urban areas. While 46.66 per cent agreed that urban migration trend of farmers from rural areas is being increased as they expressed that many went to do the job in industrial sectors like as garments and textile. Others move from village to town for seeking source of income. Also 65.00 per cent of them agreed that there increase in trend of farmers towards nonfarm activities for their livelihood. They pointed out that nonfarm activities are additional source of income and opting it during non-agricultural seasons. It is also evident from the table that cent per cent of the respondents agree that return to investment is uncertain in agriculture due to climate change. Farmers reported that there is more crop failure and crop damage in the recent years due to varying climate resulting in less productivity of crops and realized low income from agriculture. 100 per cent of the respondents agreed that there is increase in thunder storm and hail storm in the recent years. They expressed that they witnessed more thunder and hail storm then last decades. The above results were similar to the report of Kant *et al.*, (2015) ^[6].

4. Conclusion

It is revealed from this study that farmers both the district were aware of climate change and its impacts on crop production which may be derived through their own personal experience and also via mass media such as radio and television which was the main source of information on climate change. Farmers indicated that they have observed changes in rainfall seasons and pattern, change in the onset and off set of rainfall, occurrence of more dry spell, increasing temperature over the years, Farmers have also indicated that they are experiencing frequent and severe droughts for the past ten years, depletion in ground water level and opined that climate change has restricted in selection of crops, reduced their risk bearing ability to take up new crops, return to investment is uncertain in agriculture which has lead to increase in trend of framers towards urban migration and nonfarm activity.

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