



RESEARCH PAPER

Impact of climate change on production aspects of Gram in Khadin area of arid region of Rajasthan

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Abstract : Agriculture is the backbone of Indian economy and climate change significantly affects agriculture productivity. The present study was conducted in jaisalmer district of Rajasthan state. The study sample comprised 160 farmers out of them 80 small and 80 large farmers selected randomly. The results of the study revealed that Majority of the farmer (88.12%) expressed that germination of seeds was good followed by average (11.88%) before the year 2015. About 65.00 per cent of the farmer expressed that germination of seeds was good, followed by average (25.62%) and poor (9.38%) after the year 2015. Majority of the farmers (66.25%) expressed that the growth of the crop was good followed by average (33.75%) before the year 2015. About 55.00 per cent of the farmer agreed that growth of crop was good, followed by average (30.62%) and poor (14.38%) after the year 2015.

Key Words : Climate change, Impact, Gram

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INTRODUCTION

There is need to understand the climatic changes around us and how it affects agricultural productivity. Climate change and global warming is the current global problem which was facing by many countries. Global warming not only causes a change in average temperature and precipitation but also increases the frequency of floods, droughts, heat waves. This extreme climatic event has led to soil degradation which results in low crop yields. Increased temperatures, changed rainfall patterns and more frequent and intense floods and droughts will impact the food production (Lobell *et al.*, 2012; Schellnhuber *et al.*, 2013 and Rosenzweig *et*

al., 2014). The impacts of climate change on crop yields indicate that yield losses may be up to 60 per cent by the end of the century depending on crop, location, and future climate scenario (Rosenzweig *et al.*, 2014; Challinor *et al.*, 2014 and Asseng *et al.*, 2015). Increasing climatic variability may further complicate agricultural production and food security as almost one-third of yield variability is related to climatic variability (Ray *et al.*, 2016). Decline in agricultural productivity discourages the farmers and may lead to change in livelihood especially in the rural settings. Options range from change in crop management, such as sowing time, stress resistance varieties, change in cropping systems and land use, to adjust to new climates

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(Porter *et al.*, 2014). Keeping in view the above facts proposed research work is designed to find out the impacts of climate change on production aspects of Gram crop.

MATERIAL AND METHODS

The present study was conducted in Jaisalmer district of Rajasthan which was selected purposively. The three climatic parameters *viz.*, rainfall, temperature and relative humidity were selected for the study. The Jaisalmer district consists of seven panchyatsamiti, Out of these, three tehsils namely Jaisalmer, Sam and Sankara were selected for present study because of largest area of Gram cultivation in these three panchyatsamiti. For selection of villages, a list of the Gram producing villages of Jaisalmer, Sam and Sankara Panchyatsamiti was prepared with the help of Department of Agriculture. Out of this prepared list, two villages from each selected Panchyatsamiti were selected randomly namely Deda and Jajiya from Jaisalmer, Eklaparand Dablapar from Sam, Lawa and Lambajatan from Merta and Bachwari and Nimbrichandawata from Degana. From all the six selected villages a list of Gram growers as small farmers (a farmer with 1 to 2 hectare of land holding) and large farmers (a farmer with 10 hectare or more land holding) were prepared with the help of patwaris of concerned villages. Out of this list 10 small farmers and 10 large farmers were selected randomly from each village. Thus, the total samples for the study were 120 out of them 60 small farmers and 60 large farmers. An interview schedule was designed and pre tested for collecting the data. The personal interview technique was adopted for the collection of data. Every statement recorded two time intervals as before 2015 and after 2015. The data were scored, tabulated and analyzed with the help of Frequency, Percentage, Arithmetic Mean, Standard Deviation and paired 't' test.

RESULTS AND DISCUSSION

An impact of climate change refers to the degree of severity of climatic parameters like rainfall, temperature and relative humidity and their ill effects on crop production.

Results on impact of climate change on production aspects of Gram are presented in the Table 1. A cursory look at the data reveals that before the year 2015, majority of the farmers (76.25%) did not increase the

area of Gram cultivation but 23.75 per cent of the farmer increases the area of Gram cultivation. After the year 2015, 88.75 per cent of the farmers agreed that they had increased the area of Gram cultivation and 11.25 per cent of them had not increased the area of Gram cultivation.

Majority of the farmers (95.00%) had shown their crop on conserved moisture and 5.00 per cent of them did not use the conserved moisture before the year 2015. After the year 2015, 78.12 per cent of them did not use the conserved moisture for sowing the crop, 21.88 per cent of them stated that they used the conserved moisture for sowing the crop.

Majority of the farmers (57.50%) practiced land preparation in the 2nd fortnight of September followed by 1st fortnight of September (25.62%) and 1st fortnight of October (16.88%) before the year 2015. However after the year 2015, 50.62 per cent of them did land preparation in the 1st fortnight of October followed by 2nd fortnight of September (38.75%) and 2nd fortnight of October (10.63%).

Similarly majority of the farmers (65.63%) took up sowing in the 1st fortnight of October, followed by 2nd fortnight of October (21.25%) and 2nd fortnight of September (13.12%) before the year 2015. After the year 2015, majority of the respondents (61.87%) taken up sowing in 2nd fortnight of October followed by 1st fortnight of November (26.88%) and 1st fortnight of October (11.25%).

Majority of the farmer (88.12%) expressed that germination of seeds was good followed by average (11.88%) before the year 2015. About 65.00 per cent of the farmer expressed that germination of seeds was good, followed by average (25.62%) and poor (9.38%) after the year 2015.

Majority of the farmers (66.25%) expressed that the growth of the crop was good followed by average (33.75%) before the year 2015. About 55.00 per cent of the farmer agreed that growth of crop was good, followed by average (30.62%) and poor (14.38%) after the year 2015.

Majority of the farmers (75.62%) stated that flowering time of fennel was 2nd fortnight of December followed by 1st fortnight of January (15.63%) and 1st fortnight of December (8.75%) before the year 2015. Majority (80.62%) of farmer agreed that flowering time of Gram was 1st fortnight of January followed by 2nd fortnight of January (16.87%) and 2nd fortnight of

Table 1 : Impact of climate change on production aspects of cumin

| Sr. No. | Production aspects of fennel | Responses | | | | |
|---------|---------------------------------|---------------------------------|-----|------------|---------------------------------|-----|
| | | Before 2015 | | After 2015 | | |
| | | Degree of changes | F | % | Degree of changes | F |
| 1. | Area of Gram crop was increased | Agree | 33 | 27.5 | Agree | 98 |
| | | Disagree | 87 | 72.5 | Disagree | 22 |
| | | Disagree | 8 | 5.00 | Disagree | 125 |
| 2. | Month of land preparation | Sep. 1 st fortnight | 05 | 25.62 | Oct. 2 nd fortnight | 62 |
| | | Sep. 2 nd fortnight | 28 | 57.50 | Nov. 1 st fortnight | 81 |
| | | Oct. 1 st fortnight | 87 | 16.88 | Nov. 2 nd fortnight | 17 |
| 4. | Time of sowing | Sept. 2 nd fortnight | 21 | 13.12 | Oct. 1 st fortnight | 18 |
| | | Oct. 1 st fortnight | 105 | 65.63 | Oct. 2 nd fortnight | 99 |
| | | Oct. 2 nd fortnight | 34 | 21.25 | Nov. 1 st fortnight | 43 |
| 5. | Germination of seeds | Good | 141 | 88.12 | Good | 104 |
| | | Average | 19 | 11.88 | Average | 41 |
| | | Poor | 0 | 0.00 | Poor | 15 |
| 6. | Growth of crop | Good | 106 | 66.25 | Good | 88 |
| | | Average | 54 | 33.75 | Average | 49 |
| | | Poor | 0 | 0.00 | Poor | 23 |
| 7. | Flowering time | Dec. 1 st fortnight | 14 | 8.75 | Dec. 2 nd fortnight | 7 |
| | | Dec. 2 nd fortnight | 121 | 75.62 | Jan. 1 st fortnight | 129 |
| | | Jan. 1 st fortnight | 25 | 15.63 | Jan. 2 nd fortnight | 27 |
| 8. | Seed formation | Good | 124 | 77.50 | Good | 98 |
| | | Average | 36 | 22.50 | Average | 54 |
| | | Poor | 0 | 0.00 | Poor | 8 |
| 9. | Number of flowering branches | More | 105 | 65.62 | More | 122 |
| | | Average | 55 | 34.38 | Average | 26 |
| | | Less | 0 | 0.00 | Less | 12 |
| 10. | Incidence of diseases | Severe | 0 | 0.00 | Severe | 0 |
| | | Normal | 4 | 2.50 | Normal | 95 |
| | | Not severe | 156 | 97.50 | Not severe | 65 |
| 11. | Types and number of diseases | More | 0 | 0.00 | More | 0 |
| | | Average | 18 | 11.25 | Average | 52 |
| | | Less | 142 | 88.75 | Less | 108 |
| 12. | Incidence of pests | Severe | 0 | 0.00 | Severe | 0 |
| | | Normal | 24 | 15.00 | Normal | 68 |
| | | Not Severe | 136 | 85.00 | Not Severe | 92 |
| 13. | Types and number of pests | More | 0 | 0.00 | More | 0 |
| | | Average | 29 | 18.13 | Average | 98 |
| | | Less | 131 | 81.87 | Less | 62 |
| 14. | Number of spray | 0-1 | 127 | 79.37 | 0-1 | 89 |
| | | 1-2 | 33 | 20.63 | 1-2 | 53 |
| | | 2-3 | 0 | 0.00 | 2-3 | 18 |
| 15. | Weed infestation | Severe | 0 | 0.00 | Severe | 0 |
| | | Normal | 70 | 43.75 | Normal | 106 |
| | | Not Severe | 90 | 56.25 | Not Severe | 54 |
| 16. | Time of harvesting | Feb. 2 nd fortnight | 48 | 30.00 | Feb. 2 nd fortnight | 14 |
| | | March 1 st fortnight | 90 | 56.25 | March 1 st fortnight | 135 |
| | | March 2 nd fortnight | 22 | 13.75 | March 2 nd fortnight | 11 |
| 17. | Yield (per ha.) | High | 10 | 6.25 | High | 104 |
| | | Normal | 115 | 71.87 | Normal | 48 |
| | | Low | 35 | 21.88 | Low | 8 |

December (4.37%) after the year 2015.

Majority of farmers (77.50%) opined that seed formation of Gram was good followed by average (22.50%) before the year 2015. However, 61.25 per cent of them expressed that the seed formation of Gram was good followed by average (33.75%) and poor (5.00%) after the year 2015.

Majority of the farmers (65.62%) agreed that the number of flowering branches was more followed by average (34.38%) before the year 2015. Whereas, 76.25 per cent of them they agreed that the number of flowering branches was more followed by average (16.25%) and less (7.50%) after the year 2015.

Considerable percentage of the farmers (97.50%) opined that incidence of disease was not severe followed by normal (2.50%) before the year 2015. However 59.37 per cent of them agreed that incidence of disease was normal followed by not severe (40.63%) after the year 2015. Farmers agreed that incidence of disease and pest increased after the year 2015.

Majority of farmers (88.75%) stated that types and number of disease was less followed by average (11.25%) before the year 2015. However 67.50 per cent of them agreed that types and number of disease was less followed by average (32.50%) after the year 2015.

More than half of the farmers (85.00%) expressed that the incidence of pest was not severe followed by normal (15.00%) before the year 2015. Similarly 57.50 per cent of the farmers observed that the incidence of pest was not severe followed by normal (42.50%) after the year 2015.

Majority of farmers (81.87%) stated that types and number of pest was less followed by average (18.13%) before the year 2015. However, 61.25 per cent of them agreed that types and number of disease was average followed by less (38.75%) after the year 2015.

Majority of the farmers (79.37%) opined that the 0 to 1 number spray was given followed by 1 to 2 number of spray (20.63%) before the year 2015. Whereas, after the year 2015 majority of the farmers (55.62%) expressed that the number of spray given was 0 to 1 followed by 1 to 2 (33.13%) and up to 2 to 3 (11.25%).

Majority of the farmers (56.25%) agreed that weed infestation was not severe followed by normal (43.75%) before the year 2015. 66.25 per cent of them opined that weed infestation was normal followed by not severe (33.75%) after the year 2015.

Majority of the farmers (56.25%) expressed that

time of Gram crop harvest was in 1st fortnight of March followed by 2nd fortnight of February (30.00%) and 2nd fortnight of March (13.75%) before the year 2015. After the year 2015, 84.37 per cent of them expressed that time of Gram crop harvest was in 1st fortnight of March followed by 2nd fortnight of February (8.75%) and 2nd fortnight of March (6.88%).

Majority of the farmers (71.87%) expressed that the yield of Gram was normal followed by low (21.88%) and high (6.25%) before the year 2015. Whereas, 65.00 per cent of the farmers expressed that the yield of Gram crop was high followed by normal (30.00%) and low (5.00%) after the year 2015.

The probable reasons behind these findings might be that the majority of farmers did not use the conserved soil moisture because termination of rainfall was early and duration of summer season also increased so there was not enough moisture in the soil after the year 2015. Findings also indicate that the winter season started late so they shifted the sowing time of Gram from 15 to 20 days approximately as compared to the before the year 2015. Farmers shifted sowing time of Gram so flowering time also shifted after the year 2015. Farmers perceived that, germination of seeds, crop growth, seed formation were good before the year 2015 as compared to after the year 2015 due to the impact of climate change on Gram. After the year 2015 germination of seeds, crop growth and seed formation were affected due to the impact of variation in the parameters of climate change on Gram. The farmers perceived that the attack of disease and pests also increased after the year 2015 and they used more quantity and concentration of pesticides to control them and also increased the frequency and number of spray. Farmers also told that the resistance in pests also increased. These findings are supported by Ofuoku (2011), Jha *et al.* (2013), Khan and Arya (2016) and Chand and Kumar (2018).

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