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Abstract

Climate change adversely affects human health due to fluctuations in temperature, rainfall pattern and natural hazards etc. The impact of climate change is also on agriculture where food security is greatly affected by climate change. The present paper deals with change in cropping and irrigation intensity in western part of Rajasthan due to climate change. The study includes comparison of cropping intensity and irrigation intensity of 12 districts of Rajasthan and found that Jhunjhunu have the highest cropping intensity from 2006 to 2016 which means a higher portion of the net area is being cropped more than once during one agricultural year. While, Barmer recorded the lowest cropping intensity for both years 2006 and 2016. Sikar did not show change in cropping intensity in this duration while Churu had a decline in cropping intensity from 2006 to 2016. Further, Sri Ganganagar district have an increase in cropping intensity in 2015-2016 as compared to 2006-2007. Jaisalmer and Hanumangarh recorded the highest irrigation intensity which increased from 2006 to 2016 and the lowest irrigation intensity was recorded in Pali and Jhunjhunu. Pali and Jalore district had not shown change in irrigation intensity from 2006 to 2016. While Barmer, Jhunjhunu and Sikar districts showed a decrease in irrigation intensity from 2006 to 2016. Henceforth, the study shows the scenario of cropping and irrigation intensity as well as variation due to climate change in western part of Rajasthan.

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Introduction

Rajasthan is the largest state of the country, its agricultural area depends on the irrigation facility, availability of fertilizers and pesticides etc. In Rajasthan rainfall can determine the future of farming over an area (Haque 2015). The western part of Rajasthan state (211867 Km²), which encircle a major

part of Thar Desert, which is dominated by sand dunes, sandy plains of variable thickness, as well as some barren hills, uplands and gravelly walkway (Amalkar 2014). In the western part of Rajasthan such as Barmer, Bikaner, Churu, Sri Ganganagar, Jaisalmer and Jodhpur lie in the arid zone, while some percentage of area such as Nagaur (96%),

Jalore (88%), Jhunjhunu (69%), Sikar (65%) and Pali (48%) are found arid zone (Kulshrestha and Sinha, 2009). In western part of Rajasthan large areas are cultivated but the yield of the crops are low in comparison to districts of eastern part of Rajasthan. In Rajasthan some area receive normal rainfall while another area faces drought condition so, due to low rainfall farmers are reliable on irrigation for farming (Gogoi 2016). The study shows the scenario of cropping and irrigation farming in Rajasthan.

Study area

Rajasthan is situated in the north-western part of India. It covers 342,329 square kilometers (132,139 square miles). Rajasthan lies between latitudes 23° 3' to 30° 12', north and longitudes 69° 30' to 78° 17', east. In Rajasthan Aravalli Range divides the Rajasthan into two parts. The Eastern part of Rajasthan receives good amount of rainfall with humid condition and the western part of Rajasthan is drought prone area receives low rainfall. So, both have different characteristics from each other. The objective of study is to carry out the analysis of cropping and irrigation intensity of western part of Rajasthan. The hypothesis of the study is to change in cropping intensity follows the change in irrigation intensity.

Materials and Methods

The study is carried by the secondary data which is collected from the website of Agriculture department, Government of Rajasthan. The data is presented by maps. The cropping and irrigation intensity is calculated by using following formulas:

$$(1) \text{ Cropping Intensity} = \frac{\text{Gross Area}}{\text{Net Area}} \times 100$$

$$(2) \text{ Irrigation Intensity} = \frac{\text{Gross Irrigated Area}}{\text{Net Irrigated Area}} \times 100$$

Results and Discussion

Cropping intensity refers to rising of a number of crops from the same field during one agriculture year. Thus, higher cropping intensity means that a higher cropping intensity means that a higher portion of the net area is being cropped more than once during one agricultural year. In year 2006-2007, the highest cropping intensity was recorded in Jhunjhunu (157%) followed by Sikar (142%), Hanumangarh (141%) and the lowest cropping intensity were recorded in Barmer (106%), Jodhpur (110%) and Bikaner (112%). In 2015-2016, the highest cropping intensity was recorded in Sri Ganganagar (167%) followed by Jhunjhunu (158%), Hanumangarh (153%) and the lowest cropping intensity were recorded in Barmer (112%), Churu (119%), and Nagaur (119%). According to Pagar (2016), this study shows that if cropping intensity is low then the productivity of soil will also become poor, this condition is found in district such as Barmer, Churu and Nagaur.

In year 2006-2007, the highest irrigation intensity was recorded in Jaisalmer (177%) followed by Hanumangarh (175%) and Barmer (161%). The lowest irrigation intensity was recorded in Pali (108%), Jalore (114%) and Jhunjhunu (119%) and in 2015-2016; the highest irrigation intensity was recorded in Jaisalmer (285%), Hanumangarh (188%), and Sri Ganganagar (184%) and lowest irrigation intensity was recorded in Pali (108%), Jhunjhunu (109%) and Jalore (115%). In both year highest irrigation intensity were recorded in Jaisalmer and Hanumangarh. The Jaisalmer is a desert prone area with low

rainfall so, farming is totally depends on intensity were recorded in Pali and Jhunjhunu. irrigation facility and the lowest irrigation

Table 1. Cropping intensity of Rajasthan for the year (2006-2007 and 2015-2016)

S. No.	Districts/ State	2006-2007			2015-2016		
		Net area (hectare)	Gross area (ha)	Cropping Intensity (%)	Net area (hectare)	Gross area (ha)	Cropping Intensity (%)
1	Barmer	1690814	1791772	106	1647600	1846104	112
2	Bikaner	1160186	1299558	112	1652358	2050904	124
3	Churu	1163648	1421549	122	1154924	1375702	119
4	Sri Ganganagar	703002	926832	132	811979	1358389	167
5	Hanumangarh	792846	1121264	141	847603	1295703	153
6	Jaisalmer	539559	621605	115	802386	1027862	128
7	Jalore	661732	834676	126	668186	921716	138
8	Jhunjhunu	422765	664329	157	403483	635494	158
9	Jodhpur	1159643	1270424	110	1387136	1716695	124
10	Nagaur	1232877	1421392	115	1241057	1472570	119
11	Pali	609185	698887	115	604694	726045	120
12	Sikar	526834	745871	142	509653	722330	142

Table 2. Irrigation Intensity of Rajasthan for the year (2006-2007 and 2015-2016)

S. No.	Districts/ State	2006-2007			2015-2016		
		Net irrigated area (hectare)	Gross irrigated area (Ha)	Irrigated Intensity (%)	Net irrigated area (hectare)	Gross irrigated area (Ha)	Irrigation Intensity (%)
1	Barmer	104185	167512	161	246074	354990	144
2	Bikaner	221442	341109	154	441886	776230	176
3	Churu	65125	84206	129	145491	225587	155
4	Sri Ganganagar	586113	805352	137	626580	1150415	184
5	Hanumangarh	362828	633913	175	417321	782487	188
6	Jaisalmer	96710	171257	177	120111	342262	285
7	Jalore	251177	286329	114	347971	398971	115
8	Jhunjhunu	232411	275526	119	227515	248476	109
9	Jodhpur	184060	276278	150	437314	728989	167
10	Nagaur	274426	362601	132	273320	374010	137
11	Pali	151225	163802	108	162686	175822	108
12	Sikar	245546	318859	130	236292	294877	125

Source:

http://www.agriculture.rajasthan.gov.in/content/dam/agriculture/Agriculture%20Department/ecitizen/agriculture-statistics/Agri_Statistics_2007_08.pdf

http://www.agriculture.rajasthan.gov.in/content/dam/agriculture/Agriculture%20Department/ecitizen/agriculture-statistics/agriculture_statistics_2015-16.pdf

Conclusion

The present study showed the changes in cropping intensity and irrigation intensity in twelve districts of Western Rajasthan. Climate change could be a reason for these variations in western part of Rajasthan.

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