A STUDY OF VARIATION IN CROPPING AND IRRIGATION INTENSITY IN IC HYPER ARID PARTIAL IRRIGATED ZONE

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Abstract

Cropping intensity means successive cropping in a particular land during a year. Rajasthan state comprises of 61 percent desert area since climate and irrigation varies in the state, so there is fluctuation in crop intensity over districts. This study present a cropping intensity and irrigation intensity in Ic Hyper Arid Partial Irrigated Zone. The cropping intensity of the study area has increased with the expansion of Indira Gandhi Canal and Tubewell irrigation. The overall cropping intensity was 83 percent in the year 1980-81 which has increased to 95, 104, 113 and 124 in the year 1990-91, 2000-01, 2009-10 and 2014-15 respectively.

Keywords : Cropping intensity, Irrigation intensity, Agriculture.

INTRODUCTION

Indian economy hinges on agriculture. Over 58 percent of Indian population is directly or indirectly dependent on agriculture. Agriculture and allied sectors contribute nearly 15.87 percent of gross domestic product (GDP) of India. Besides, agriculture is an important source of raw material for industrial production and serves as huge market for the industrial product. As per the theory of Gunnar Myrdal in 1956, if agriculture goes wrong, nothing else will have a change to go right in India (M.S. Swaminathan).

There are only two ways to satisfy the increasing food and other demands of the country's rising population either expanding the net area under cultivation or intensifying cropping over the existing data. The net sown area of the country has risen by about 20 percent since independence and had reached a point where it is not possible to make any appreciable increase.

The cropping intensity refers to raising of a number of crops from the same field during one agricultural year. Higher cropping intensity means that a higher proportion of the net sown area is being cropped more than once during one agricultural year. This also implies higher productivity per unit of arable land during one agricultural year. The cropping intensity shows great spatial variation in Rajasthan, with higher level in north-eastern plains. While lower-levels are found in dry, rainfed, western region.

STUDY AREA

The Hyper Arid Partial Irrigated Zone (Zone Ic) lies between the irrigated North-Western (Ib), Ia-Arid Western and IIa-Plain of Inland Drainage. In Rajasthan, it spreads from Rajgarh tehsil in Churu district in the North-East to Sam tehsil in Jaisalmer district in the west. It covers the areas of Bikaner, Jaisalmer and Churu districts. The zone lies between $26^0$24' to $29^0$00' north latitudes and $69^0$29' to $75^0$41' east longitude by covering an area of 82,499 sq km with the altitude ranging from 229 to 292 m above mean sea level. The length of international boarder attached to the zone is 632 km (Fig. 1).

It is characterized by rocky-gravely pediment, flat buried pediment, older and younger alluvial plains and riverbeds produced by the fluvial processes within the desert. The pediment is invariably flat, rocky or slightly veneered surface with sharp interface with the adjoining hill slope.

OBJECTIVES OF THE STUDY

1. To calculate the cropping and irrigation intensity in Ic Hyper Arid Partial Irrigated Zone.
2. To study the spatio-temporal changes in cropping and irrigation intensity in Ic Hyper Aid Partial Irrigated Zone.

REVIEW OF LITERATURE

Prof. P.Y. Mayare & Dr. D.S. Suryawanshi (2010) concluded that irrigation is the major input in the agricultural practices. It improves the cropping intensity and practise. Where there the irrigation intensity is higher there is the higher cropping intensity and lower the net sown area.

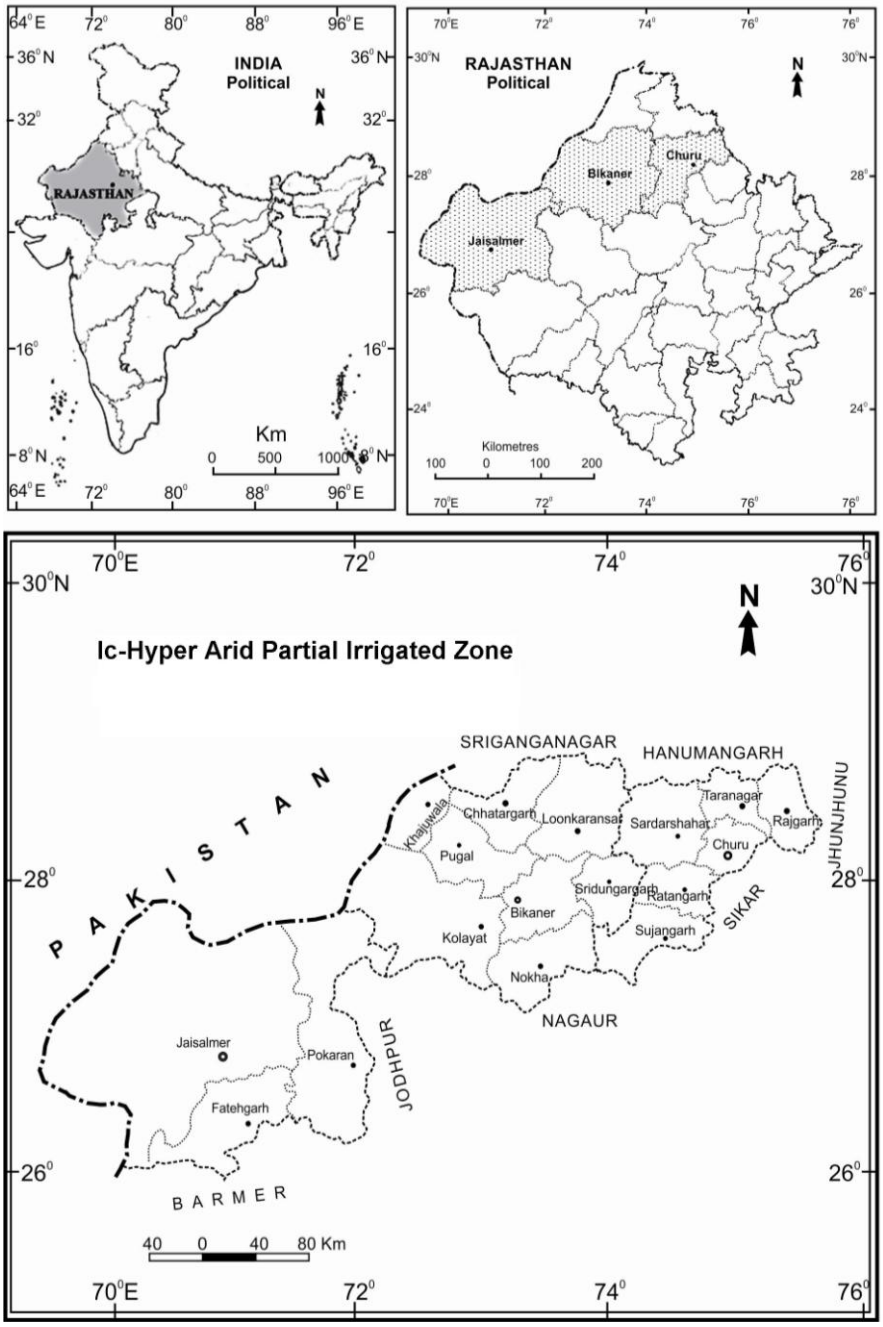

Fig. 1 : Ic-Hyper Arid Partial Irrigated Zone - Location Map

Saka (2011), he has studied the determinants of land use intensity among food crops farmers in south western Nigeria. The study examines the structure of land use intensification in food crop production in towards determining its drivers and concordance with the condition for sustainable intensification. Researcher concludes that evidence of increasing pressure on land that is characterized by increased frequency of cultivation of farmland high cropping intensity and prevalence of high land use intensity in food crop production in the study area. However, the condition under which this took place fell short of what was advanced for sustainable growth through intensification.

Valipoor (2015). He studied what is the tendency of cultivate plants for designing cropping intensity in Irrigated area. The study shows indicate that attention to only commercial goals should

be reduced trial and error policies should be avoided and exert comments be applied to the irrigation system for any crop to achieve sustainable agriculture in future. To identify major and effective variations on land for cropping intensity for investment plans.

RESEARCH METHODOLOGY

The research work comprises of primary and secondary data. The primary data have been collected containing landuse, cropping pattern, irrigation facilities, use of machineries and equipments, crop combination, crop rotation, crop diversity, crop ranking etc.; whereas the secondary data have been gathered from various census records, journals and government publications. The literature survey on the various aspect of the Ic-Hyper Arid Partial Irrigated Zone has been undertaken in the libraries and internet searching. It also includes the study of respective issues from different governmental and non-governmental organization, and various academic and non-academic people have been consulted.

After that compilation, calculation and computation of both primary and secondary data; the analysis is done. The final presentation of the same is done using cartographic techniques e.g. bar diagram, wheel diagram, line graph, choropleth and isopleth maps along with cropping intensity and irrigation intensity have been computed by the following formulas -

$$\text{Irrigation Intensity} = \frac{\text{Gross cropped area}}{\text{Net irrigated area}} \times 100$$

$$\text{Cropping Intensity} = \frac{\text{Total cropped area}}{\text{Net sown area}} \times 100$$

FINDINGS AND RESULTS

Thus, higher cropping intensity means that a higher proportion of the net sown area is being cropped more than once during one agricultural year. This also implies higher productivity per unit of arable land during one agricultural year. The cropping intensity shows great spatial variation in Rajasthan, with higher level in north-eastern plains while lower levels are found in dry, rainfed western regions.

According to the Directorate of Economics and Statistics (2011) the cropping intensity for the country as a whole has increased to 132 per cent in 2010-11 from 130 per cent, in 1990-91 and 111 per cent in 1950-51 with great spatial variations with 'higher level' in northern states such as Punjab (176 per cent), followed by Himachal Pradesh (169 per cent), West Bengal (176 per cent), Haryana (145 per cent) and Uttar Pradesh (143 per cent). The intensity is low in dry, rainfed regions of Rajasthan, Gujarat, Maharashtra and Karnataka (100-125 per cent). In Rajasthan the cropping intensity during the period has increased from 113 in 1980-81 to 147 in 2008-09. The state average during the period under consideration is 126, much lower than the India average of 165. The cropping intensity is lower in desert districts where there is no assured source of irrigation and it varies from 105 in Barmer and Jodhpur to 147 in Alwar and Jhalawar.

In the study area, rainfall is most important factor limiting crop production and sustenance of life. A number of studies have indicated that there was significant rise in cropping intensity due to the use of tractors and irrigation as a consequence of mechanization. The obtained cropping intensity in the Ic-Hyper Arid Partial Irrigated Zone has been displayed in table 1.

Table 1: Ic-Hyper Arid Partial Irrigated Zone-Crop Intensity

District	Year-wise Cropping Intensity (per cent)								
	1980-81	1990-91	2000-01	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Bikaner	84	93	102	111	114	116	117	120	122
Churu	79	96	105	114	134	131	117	138	126
Jaisalmer	86	97	107	115	121	121	127	129	126

Total	83	95	104	113	123	122	120	129	124
Rajasthan State	97	110	118	128	142	142	137	143	138

Source: Agricultural Statistics Rajasthan, DoES, GoR, Jaipur

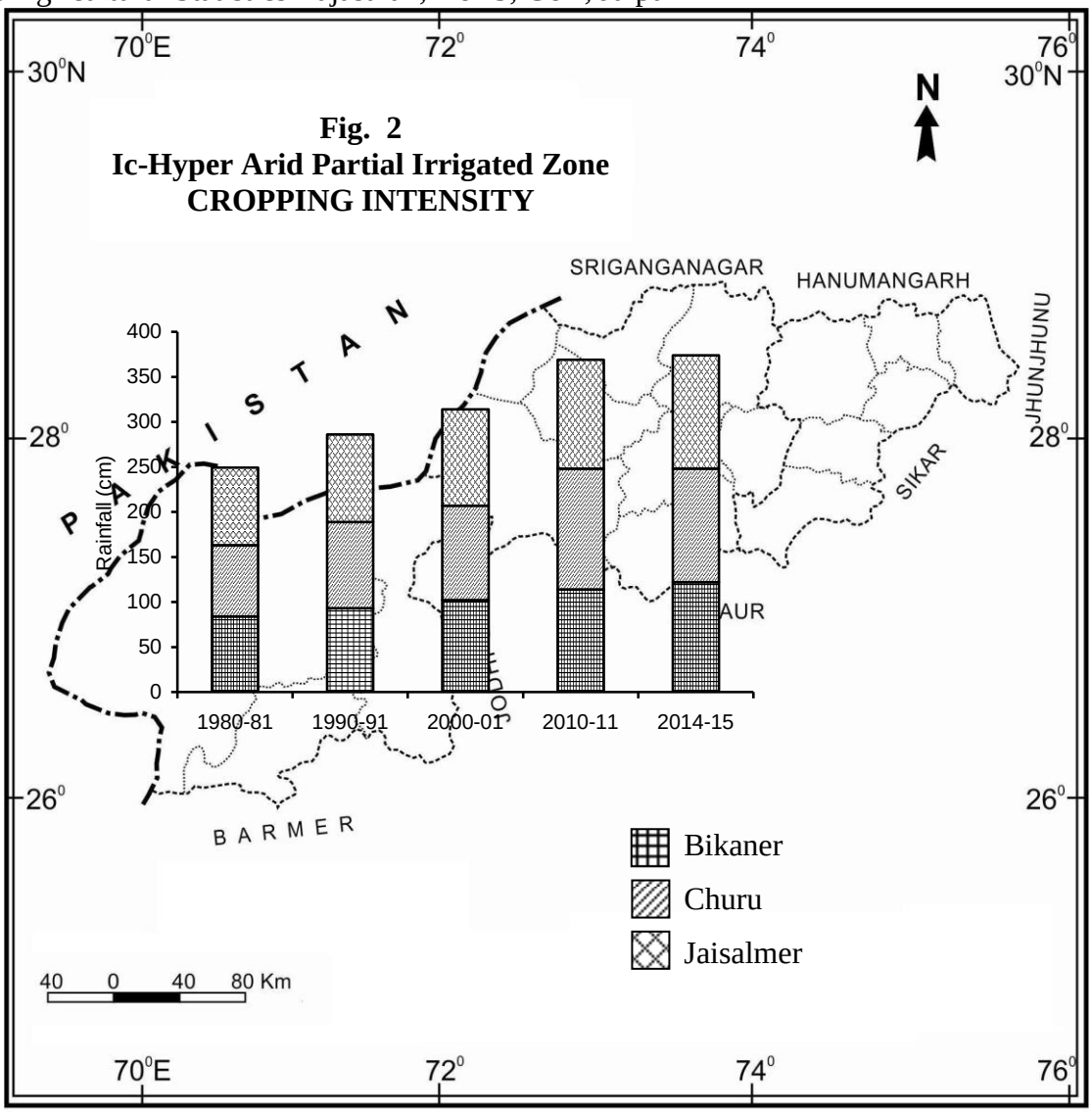

Fig. 2
Ic-Hyper Arid Partial Irrigated Zone
CROPPING INTENSITY

The gross irrigated area is positively related to cropping intensity. The facilities of tube-well irrigation and mechanical power helped the farmers in raising the cropping intensity of their farms (Patil and Sirohi, 1987). Cropping intensity is the phenomena that show affect of many factors for enhancement of agriculture productivity. The enhancement of cropping intensity is a good indicator about awareness of farmers and ratifies government policy in right way.

CROPPING INTENSITY

The irrigation of the study area has increased with the expansion of Indira Gandhi Canal and tubewell irrigation. The overall cropping intensity was 83 per cent in the year 1980-81which has increased to 95, 104, 113 and 129 in the year 1990-91, 2000-01, 2009-10 and 2013-14 respectively. It has slightly decreased (124) in the following year 2014-15. It is also noticed that the irrigation intensity has been lesser than that of Rajasthan State during the whole period.

It is clear from the data that in the year 2006-07, the gross area under cultivation of Bikaner, Churu and Jaisalmer districts was 12.99 lakh ha, 14.21 lakh ha and 6.21 lakh ha respectively having an average 116.33 per cent of cropping intensity in the Ic-Hyper Arid Partial Irrigated Zone. In the year 2010-11; the gross cropped area has increased to 18.80 lakh ha, 15.75 lakh ha and 8.77 lakh ha respectively having an intensity of 123 per cent.

Table 2 : Ic-Hyper Arid Partial Irrigated Zone-Cropping Intensity

Year	District	Net Area (Ha)	Gross Area (Ha)	Cropping Intensity (%)	Average (%)
2006-07	Bikaner	1160186	1299558	112	116.33
	Churu	1163648	1421549	122	
	Jaisalmer	539559	621605	115	
2010-11	Bikaner	1646822	1880272	114	123.00
	Churu	1172489	1575078	134	
	Jaisalmer	725685	877585	121	
2014-15	Bikaner	1586130	1928363	122	124.70
	Churu	1149990	1452323	126	
	Jaisalmer	691661	870760	126	

Source: Agricultural Statistics Rajasthan, DoES, Jaipur

As per the year 2014-15; the gross irrigated area of study region is 42.51 lakh ha while average value of cropping intensity is 124.7. It indicates that both the cropped area and cropping intensity have increased simultaneously. At the same time, it is clear that increasing irrigation intensity has also increased the cropping intensity as well and there is a positive correlation in both.

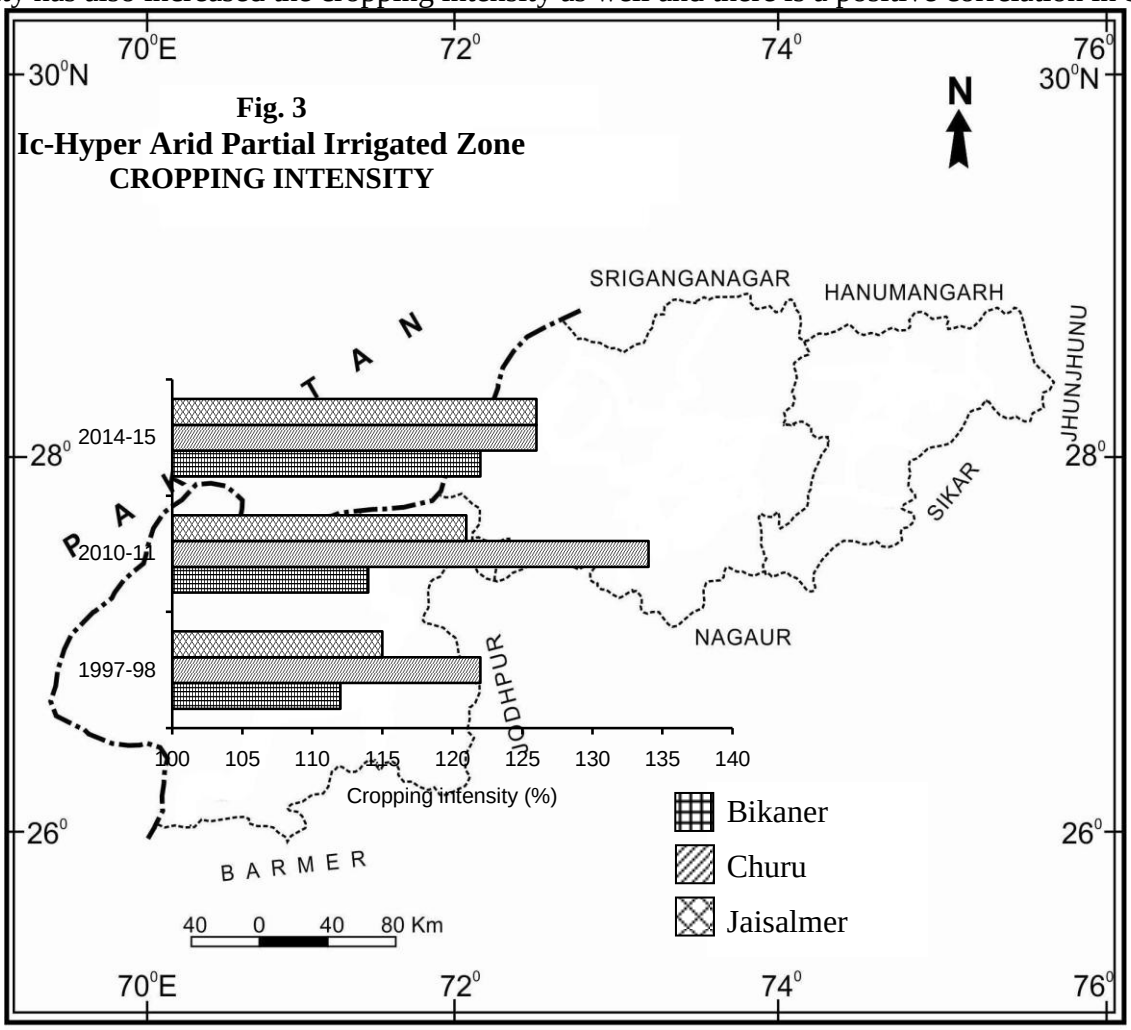

Fig. 3
Ic-Hyper Arid Partial Irrigated Zone
CROPPING INTENSITY

IRRIGATION INTENSITY

The data exhibits the irrigation intensity under different districts in Ic-Hyper Arid Partial Irrigated Zone during the period under study. In 2006-07, the gross irrigated area of Bikaner, Churu and Jaisalmer districts was 3.41 lakh ha (154 per cent), 0.84 lakh ha (129 per cent) and 1.71 lakh ha (177 per cent) respectively with an average of 153.33 per cent for the whole study area; which increased by 172, 141 and 229 per cent respectively in the year 2010-11. As per the data of the year

2014-15, the gross irrigated area of Bikaner, Churu, Jaisalmer districts are 7.08 lakh ha (171 per cent), 1.98 lakh ha (152 per cent) and 3.05 lakh ha (238 per cent) respectively while its average value 187 per cent. It is clear from the above description that the irrigation intensity has increased with the expansion of irrigation facilities in the study area (table 3).

Table 3 : Ic-Hyper Arid Partial Irrigated Zone-Irrigation Intensity

(Ha)

Year	District	Net Irrigated Area	Gross Irrigated Area	Irrigation Intensity (%)	Average (%)
2006-07	Bikaner	221442	341109	154	153.33
	Churu	65125	84206	129	
	Jaisalmer	96710	171257	177	
2010-11	Bikaner	274050	470324	172	180.67
	Churu	85230	119898	141	
	Jaisalmer	101329	232488	229	
2014-15	Bikaner	413654	708859	171	187.00
	Churu	180656	198567	152	
	Jaisalmer	128329	305436	238	

Source: Agricultural Statistics Rajasthan, DoES, Jaipur

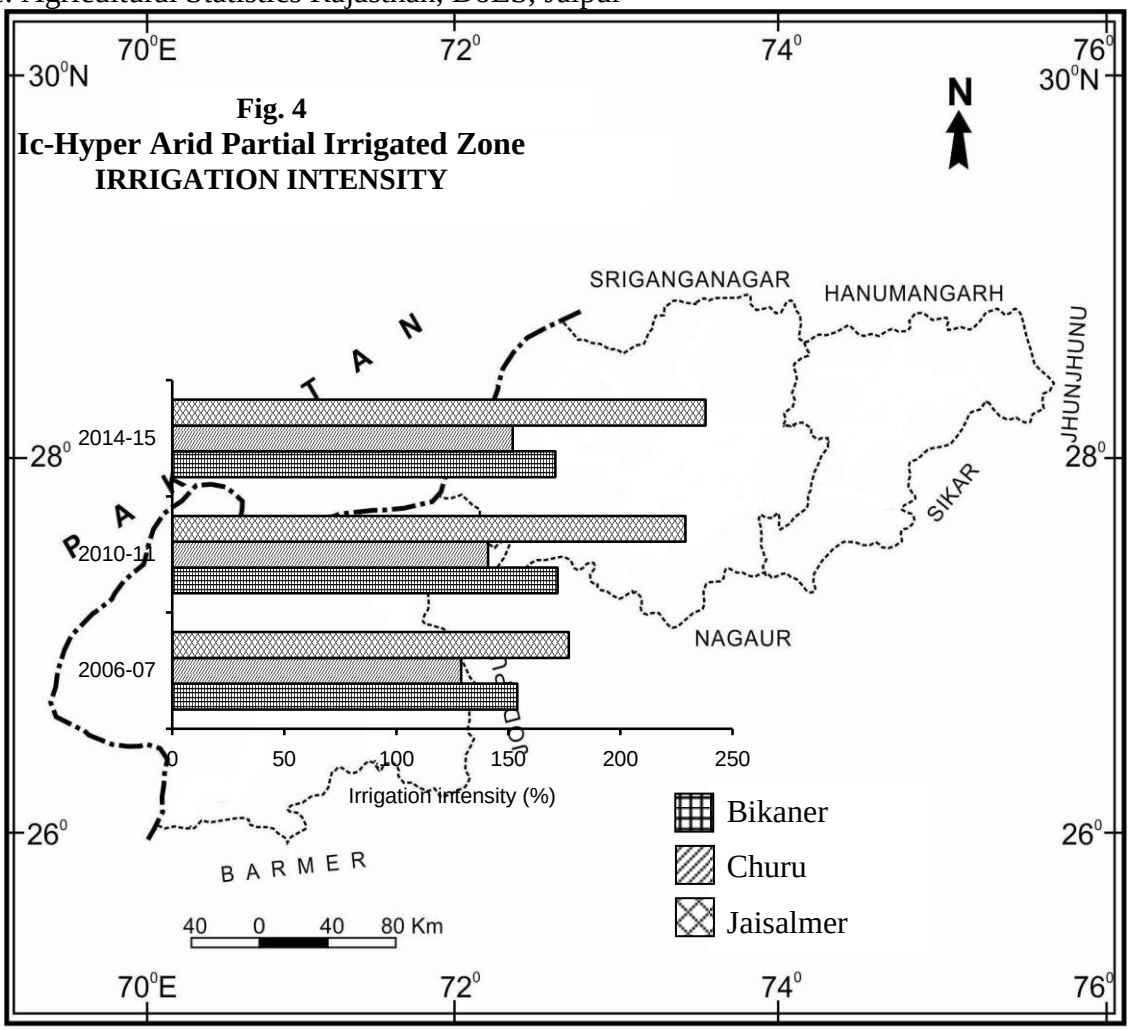

Fig. 4
Ic-Hyper Arid Partial Irrigated Zone
IRRIGATION INTENSITY

When the data of field survey have been analysed, it is concluded that Jaisalmer district has the highest irrigation intensity (188.96 per cent) followed by Churu (165.78 per cent) and Bikaner (140.38 per cent) with mean irrigation intensity of 165.04 per cent of the whole study area (table 4).

Table 4 : Ic-Hyper Arid Partial Irrigated Zone-Irrigation Intensity

District	Net Irrigated Area (Ha)	Gross Irrigated Area (Ha)	Irrigation Intensity (%)	Average (%)
Bikaner	4876	6845	140.38	165.04
Churu	1365	2263	165.78	
Jaisalmer	4314	8152	188.96	

Source: Field survey conducted during 2014-16.

CONCLUSION :

Irrigation has made significant impact on the growth of agriculture and contributed by expanding the area under cultivation. Tubewell and IGNP canal are the most prevalent mode of irrigation & over 65 percent of irrigated area has been served by tubewell and IGNP canal in the study region. The intensity of cropping has increased from 116.35 percent in 2006-07 to 124.70 percent in 2014-15. The intensity of irrigation has increased from 153.33 percent in 2006-2007 to 187.00 percent in 2014-15. It is clear that increasing irrigation intensity has also increased the cropping intensity as well and there is a positive correlation in both.

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