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REGIONAL IMBALANCES IN OILSEEDS PRODUCTIVITY IN RAJASTHAN DURING 1990-91 TO 2014-15: A GEOGRAPHICAL PERSPECTIVE

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Abstract: *The principal objective of the present study is to reveal the changes in regional Imbalances of oilseeds productivity in Rajasthan, because oilseeds is major crop of the state. The present study is divided into three folds. First deals with regional disparities in oilseeds productivity during 1990-91 and found that magnitude of oilseeds productivity was high in eastern parts as compare to western parts, owing to favorable geo-climatic conditions in east as compare to west. The second parts describe the regional inequalities in oilseeds productivity of 2014-15 have revealed that oilseeds productivity generally decreases from south-east to west and its index value ranges from 49.55 in Jaisalmer district to 194.44 in Baran district. Changes in oilseeds productivity in Rajasthan are explained in third part. The study has observed that in 1990-91 magnitude of oilseeds productivity was high in eastern parts, moderate in central part and low in western part. But in 2014-15, its magnitude has decreased from south-east to west. Basically, in both years of the study, the spatial patterns of oilseeds productivity have remained same. But the highest index value has increased from 190.04 in Kota district to 192.44 in Baran district , while the lowest index value of 32.25 was recorded in Jaisalmer district which has increased to 49.55 in Jaisalmer district during study period which shows that the gap between regional disparities in oilseeds productivity has narrowed down in Rajasthan. It is also noted that the state average productivity of oilseeds has increased from 105.54 to 115.58 during 1990-91 to 2014-15 which is indicative of positive trends for the oilseed's crops. The study in hand is based on secondary sources of data. The unit of study is district. Modified formula of Singh (1976) technique is used for deriving the results and cartographic method is applied for mapping the results.*

Key words: Dynamics, Imbalances, Productivity, Oilseeds, Spatial-pattern.

Introduction

Oilseeds have been grown all over the world and are considered important crops due to their economic value. Oilseeds are well nutritious food to human beings and animals. About 15 million people work in oilseeds-based industries in India *(Sharma, 1999).*Owing to their high oil content, moderate fiber content, several vitamins, minerals, and saturated and unsaturated fatty acids, oilseeds are high-energy foods. Fats and oils are vital for human nutrition and also have industrial value because these are needed to produce a wide range of goods, including hair oils, soaps, goods like paints, varnishes, fabrics, medications, etc. Oilcakes obtain after extraction of oils from these crops are important source of animal feed and manure. Accounting about 19 percent of global area with around 2.7 percent of global production, these field crops hold the second most important determinant of Indian agricultural economy next to cereals*(Thapa, et. al., 2019).* The consumption demand for edible oil has been growing faster year over year due to enhancement of the population and economic prosperity in the country. It is estimated that consumption of oilseeds is about 5 million tons in 1990-91 and 14 million tons in 2009-10 *(Kulshrestha, et. al, 2015*). India is one of the largest producers of oilseeds in the world and this sector occupies an important position in the agricultural economy. Traditionally, Oilseeds crops are the mainstay of agricultural economy of India. For this purpose, a wide variety of oilseeds crops are grown in country namely mustard, soybeans, sesame, groundnut, linseed, sunflower, etc. which are grown in different agro-climatic regions *(Swain, 2013).*

Rajasthan has rich agro-ecologically diversity and is ideally suitable for growing oilseeds crops*(Jha, et al, 2012).* Rajasthan is the largest oilseed producer state only next to Gujarat. It has first place in term of rape seeds production while Gujarat in term of castor production. Being a largest state in India there is much potential of oilseed production. Time series data over the past five decades indicate significant structural shifts in oilseed production. The analysis of data reveals that the production of oilseeds in Rajasthan has experienced significant changes over last five decades. Rajasthan occupies a prominent place in the oilseeds production of India. The important oilseed crops of Rajasthan are groundnut, soybean, rapeseed & mustard, sesamum and taramira *(Jain, 2005*). In Rajasthan oilseeds are grown throughout the year. Such as soybean and ground nut are the main kharif crops and rapeseeds and mustard are significant rabi crops (*Kumar and Kumar, 2018).*

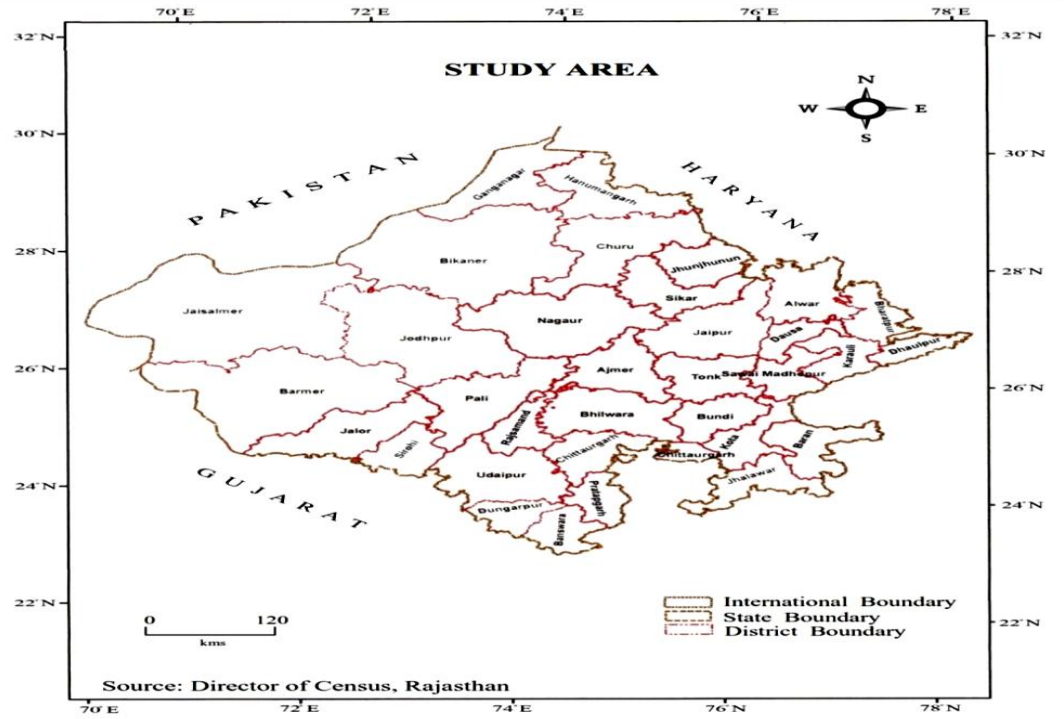
Study Area

Rajasthan is the largest state of India, covering 3,42,274 sq. km. area. Its latitudinal and longitudinal extent lies between 23˚3' N to 30˚12' N and 69˚30' E and 78˚17' E respectively. Its neighboring states are Punjab, Haryana, Uttar Pradesh, Madhya Pradesh and Gujarat. It forms international boundary with Pakistan in the west. Its topography varies from sandy to rocky semi-arid to arid climatic conditions and varieties of soils are found. According to 2011 census, the average density of population is 200 persons per sq km. For administrative purposes, there are 33 districts.

Objectives

1. To know the spatial patterns of oilseeds productivity in Rajasthan.
2. Find out the changes in oilseeds productivity during 1990-91 to 204-15.
3. To identify factors responsible for changes in regional imbalances of oilseeds productivity.

Figure 01: Key Map



Methodology and Sources of Data

The study is empirical in nature and based on secondary data which is collected from various sources like Lal kitabs, Directorate of Agriculture, Rajasthan, various libraries, etc. Unit of study is district. Singh (1976) technique is used for deriving the results and cartographic method is applied for mapping the results.

Singh (1976) method for determining agricultural productivity index value is as follow:

Crop Productivity = $\frac{C_i+Y_i}{2}$

Where C_i is the crop concentration index and Y_i is the crop yield index

Crop Concentration Index = $C_i = \frac{P_{a_e}}{P_{a_r}} \times 100$

Where C_i is the crop concentration index

Pa_e is the percentage strength of crop 'a' of total cropped area in the component enumeration unit and Pa_r is the percentage strength of crop 'a' of total cropped area in the entire region.

Crop Yield Index = $Y_i = \frac{Ya_e}{Ya_r} \times 100$

Where Y_i is the crop yield index.

Ya_e is the average yield per hectare of crop 'a' in the component enumeration unit.

Ya_r is the average yield of crop 'a' in the entire region.

Discussion

Changes in regional imbalances of oilseeds productivity in Rajasthan: 1990-91 to 2014-15 are discussed under the following heads;

- **A.** Spatial Patterns of oilseeds productivity in Rajasthan :1990-91
- **B.** Spatial patterns of oilseeds productivity in Rajasthan :2014-15
- **C.** Changes in oilseeds productivity in Rajasthan 1990-91 to 2014-15
- **D.** Conclusions.
- **E.** Suggestions.

A. Patterns of Oilseeds Productivity in Rajasthan: 1990-91

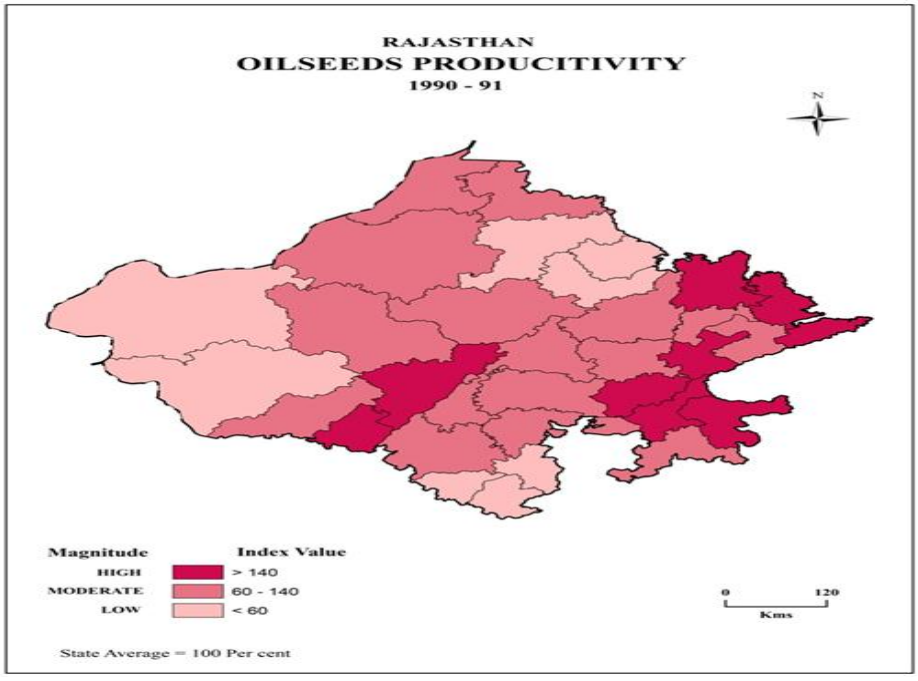
In 1990-91, the index value of oilseeds was noted lowest of 32.25 in Jaisalmer district

and highest of 190.04 percent in Kota district in Rajasthan. It shows that the magnitude of oilseeds was highly variable in its spatial distribution. Oilseeds were important crop in the study region with 16.90 percent of the total cropped area and 3rd rank crop in overall cropping pattern. Oilseeds were grown throughout the study region. Fig. 2 is mapped which shows 3 categories in levels of their productivity. These categories explain blow:

1. **High category of Oilseeds Productivity (Over 140 Index Value)**:
   It had nine districts and 27.27 percent of total occurrences. Districts included in this category were Sirohi, Pali, Bundi, Kota, Baran, Sawai-Madhopur, Alwar, Bharatpur and Dhaulpur. It had three belts which were largely confined to eastern half of the study region. First belt comprised three districts namely Alwar, Dhaulpur and Bharatpur. Reasons for high index value of productivity were high concentration index as well as high yield index, because these areas were highly suitable for oilseeds especially for rape and mustards. Similar were the reasons for second belt which had districts of Bundi, Kota, Baran and Sawai-Madhopur. Third belt had districts of Sirohi and Pali where concentration index was very high followed by high yield index. It was a major crop of Rabi season in this category. Thus, owing to all these reasons, the index value of oilseeds was noted high.

2. **Moderate Category of Oilseeds Productivity (60 to 140 index value):**
   This category was the largest in size and largely comprised of central parts in the study region with certain exceptions. It contained one belt and two patches. The belt included 14 districts namely Ganganagar, Hanumangarh, Bikaner, Jodhpur, Nagaur, Jaipur, Ajmer, Tonk, Dausa, Karauli, Bhilwara, Rajasmand, Udaipur and Chittaurgarh. The concentration index value decreased from east to west but yield index was high in western parts as compare to eastern parts, because of geo-climatic conditions. The patches of this category had Jhalawar and Jalor districts. In Jhalawar district, the concentration index was low, because of high share of spices, maize and jowar in the cropping pattern but yield index noted high, thus, consequently productivity level was noted moderate. In respect of Jalor district, the magnitude of oilseeds was moderate because of hot and dry climatic conditions followed by nearly absence of irrigation facilities which were unfavorable for oilseeds cultivation. Thus, oilseeds had noted moderate level of productivity.

Figure 02: Oilseeds Productivity in Rajasthan, 1990-91



Sources: Directorate of Agricultural, Rajasthan, Jaipur.

Table 01: Oilseeds Productivity in Rajasthan: 1990-91

#	Districts	Index Value
1.	Ajmer	76.77
2.	Jaipur	110.30
3.	Dausa	124.61
4.	Tonk	139.59
5.	Sikar	56.29
6.	Jhunjhunu	59.29
7.	Nagaur	101.57
8.	Alwar	155.86
9.	Bharatpur	218.90
10.	Dhaulpur	168.11
11.	Sawai-Madhopur	180.60
12.	Karauli	111.69
13.	Bikaner	64.98
14.	Churu	49.10
15.	Jaisalmer	32.25
16.	Ganganagar	108.38
17.	Hanumangarh	77.37
18.	Jodhpur	85.79
19.	Barmer	42.50
20.	Jalor	92.45
21.	Pali	160.84
22.	Sirohi	157.89
23.	Kota	190.04
24.	Baran	168.32
25.	Bundi	157.49
26.	Jhalawar	99.71
27.	Banswara	51.95
28.	Dungarpur	56.79
29.	Udaipur	71.12
30.	Pratapgarh	43.37
31.	Bhilwara	100.30
32.	Chittaurgarh	72.21
33.	Rajasmand	96.44
34.	**State Average**	**105.54**

Sources: Directorate of Agriculture, Rajasthan, Jaipur

3. Low Category of Oilseeds Productivity (less than 60 index value)

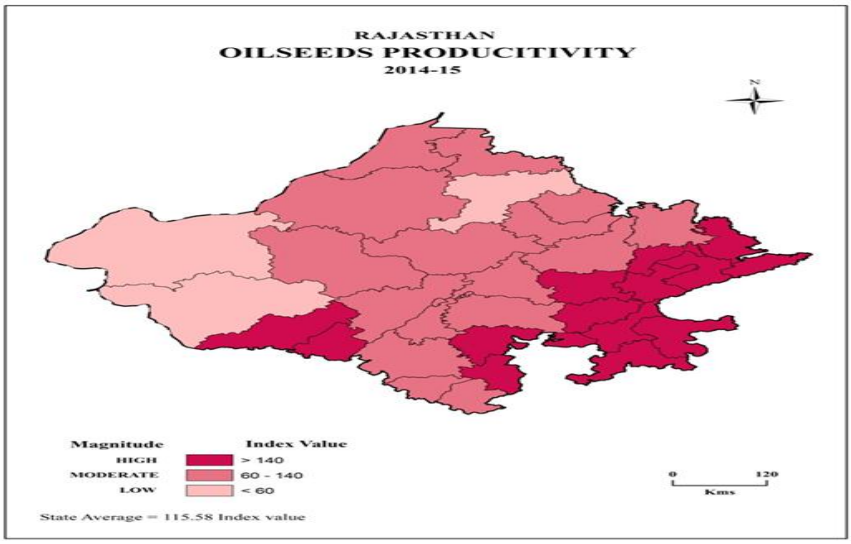
Eight districts formed low category which covered 24.24 percent of total occurrences. It had three belts; one in the south, second in south-west and third in the north. The productivity level was low in the southern belt comprising districts of Dungarpur, Banswara and Chittaurgarh, where owing to high rainfall; more area was under jowar, rice and maize. In case of south-western belt which had two districts namely Jaisalmer and Barmer, reasons responsible for low productivity index value were sand dunes, infertile soil, very low rainfall, inadequate irrigation facilities etc. In such conditions, farmers devoted their lands to guar which was highly responsive to hot-dry climatic conditions as compare to oilseeds and consequently area under oilseeds was noted negligible which led to low productivity index value. The third belt had districts of Churu, Jhunjhunu and Sikar. These three districts had also guar as major crop, because of low rainfall and insufficient irrigation facilities which were mainly responsible for low share of oilseeds in the cropping pattern. Here concentration index and yield index were noted low and moderate respectively which ultimately resulted into low productivity index value of oilseeds. It is concluded that, the magnitude of oilseeds productivity was normally high in eastern parts. It decreased from east to west with certain exceptions. Nine districts had high productivity, sixteen moderate and eight low oilseeds productivity. Generally central parts of the study region had moderate magnitude of oilseeds productivity.

B. Patterns of Oil Seeds Productivity in Rajasthan: 2014-15

It enjoys first rank with 19.53 per cent of total cropped area in the cropping pattern of Rajasthan in 2014-15. The index value of oilseeds productivity varies from 49.55 percent in Jaisalmer to 192.44 percent in Baran district which shows its uneven distributional pattern. Fig. 3 is mapped to show the oilseeds productivity and a synoptic view of this figure reveals that generally the patterns of oilseeds productivity decrease from east to west with certain exceptions.

1. **Areas of High Oilseeds Productivity (Over 140 index value):**
   It includes 14 districts and 42.42 percent of total occurrences. Districts fall in this category are Jalor, Sirohi, Pratapgarh, Chittaurgarh, Jhalawar, Baran, Kota, Bundi, Tonk, Sawai-Madopur, Karauli, Dausa, Bharatpur and Dhaulpur. It had one belt and one patch. The belt of this category confines to eastern parts. These are predominant oilseeds growing areas because of comfortable rainfall during Rabi season, suitable soils for their cultivation, traditionally oilseeds growing areas, low area under pulses due to more rainfall and consequently farmers devote most of these areas either to oilseeds or wheat etc. Hence all these factors become responsible for high productivity index value of oilseeds in this belt. The patch of this category contains two districts namely Jalor and Sirohi. Here geo-climatic conditions are suitable for oilseeds cultivation followed by farmers interest in oilseeds cultivation, because of ensured higher economic returns than from pluses, which leads to high productivity index value of oilseeds cultivation.
2. **Areas of Moderate Oilseeds Productivity (60 to 140 index value):**
   Out of33 districts, sixteen districts and 48.48 percent of the total occurrences fall in this category which is a compact belt. Districts in this category are Ganganagar, Hanumangarh, Bikaner, Jodhpur, Nagaur, Sikar, Jhunjhunu, Pali, Ajmer, Jaipur, Alwar, Rajasmand, Bhilwara, Udaipur, Dungarpur, and Banswara. These are areas of secondary importance from oilseeds crop point of view, because of geo-climatic conditions. In southern parts, districts of Udaipur, Rajasmand, Bhilwara etc. have comparatively high rainfall which is not highly suitable for oilseeds, thus, farmers on high lands grow oilseeds and wheat on low lands. The yield index is also moderate which is resulted into moderate proportion of oilseeds productivity. But in the remaining districts, the share is moderate owing to predominance of bajra and guar crops, because districts which fall in Thar Desert have quite low rainfall and poor irrigation facilities (Jhunjhunu, Sikar, Nagaur, Jodhpur and Bikaner). While in Alwar, Jaipur, Ajmer and Pali districts, owing to moderate rainfall there is tough competition from pulses and wheat which consequently lead to moderate index value of oilseeds productivity.
3. **Areas of Low Oilseeds Productivity (Less than 60 index value):**
   Districts of Churu, Jaisalmer and Barmer form low category of oilseeds productivity. Among these districts Jaisalmer and Bikaner have frequent occurrence of sand dunes, hardly any irrigation facilities, predominance of guar crop etc. which are responsible for low productivity of oilseeds. Same are the reasons in Churu district also. In these three districts, there is predominance of bajra, guar and pulses crops. It is observed that the magnitude of oilseeds productivity generally decreases from south-east to west. It is recorded high in south-eastern parts, moderate in central parts and low in western parts. Its index value varies from 49.55 in Jaisalmer district to 194.44 in Baran district. Moreover, patterns of oilseeds productivity coincide with patterns of rainfall and soils.

Figure 03: Oilseeds Productivity in Rajasthan, 2014-15



Sources: Directorate of Agriculture, Rajasthan, Jaipur

C. Changes in Oilseeds Productivity in Rajasthan: 1990-91 to 2014-15

Oilseeds have improved their rank in the overall cropping pattern of Rajasthan from third to first during 1990-91 to 2014-15, which shows the significance of oilseeds in Rajasthan. The average value of oilseeds productivity index value in Rajasthan has increased from 105.54 to 115.58 index values and experienced 10.04 positive volume of change during study period. The highest productivity index value of 190.00 was noted in Kota district which has increased to 192.44 in Baran district during 1990-91 to 2014-15. But in respect of lowest index value of oilseeds productivity, it has increased from 32.25 in 1990-91 to 49.55 in Jaisalmer district in 2014-15. These figures show that the levels of productivity of oilseeds have increased over time in Rajasthan. A study of table 3 and figs 2 & 3 highlight the below mentioned points;

1. There were 9 districts and 27.27 percent of total occurrences in high category of oilseeds productivity in 1990-91, but has increased to 14 districts and 42.42 percent of total occurrences in 2014-15. Some districts have lost their position from high productivity to either moderate or low, while others have experienced increased in their productivity index value in the study period. High category of oilseeds productivity was largely confined to eastern parts of the study region in 1990-91, as well as in 2014-15 with certain exceptions. The district of Pali has lost its high oilseeds productivity position to moderate category, but Jalor district has increased its oilseeds productivity level from moderate to high, while Sirohi remained as high productivity district of oilseeds in both years. Alwar district has also lost its position from high to moderate category, because concentration index has declined. The district of Pratapgarh has improved its position from low category to high category, whereas the districts of Chittaurgarh, Jhalawar, Tonk, Dausa and Karauli have joined the high category from moderate category, while districts of Dhaulpur, Bharatpur, Sawai Madhopur, Baran, Kota and Bundi have able to maintained their high productivity level of oilseeds. In 2014-15, there was one belt and one patch of high category. The belt is confined to eastern parts with exceptions of Jalor and Sirohi districts. The reasons, for high productivity level of oilseeds in these districts are increase in concentration index as well as yield index owing to improvements in socio-economic factors. Moreover, these are major oilseeds producing areas, where geo-climatic conditions are highly suitable for oilseeds cultivation.
2. The number of districts was 16 in 1990-91 as well as in 2014-15 in moderate category of oilseeds productivity. The districts of Dausa, Karauli, Tonk, Jhalawar, and Jalor have shifted to high category, whereas Banswara Dungarpur, Jhunjhunu and Sikar have

improved their position from low productivity index value to moderate productivity index value in 2014-15 and in these districts areas as well as yield both have increased which resulted into increase in concentration index and yield index of oilseeds. Farmers of these districts have been attracted by higher economic returns of oilseeds. Pali and Alwar districts have lost their high productivity index value to moderate category during 1990-91 to 2014-15, owing to decline in area under oilseeds and increase in areas under pulses.

3. The number of districts of low category in oilseeds productivity has declined from eight to three during study period. Among these three districts, Barmer, Churu and Jaisalmer which have experienced low productivity magnitude of oilseeds in 1990-91 as well as 2014-15, because these could not bring more areas under oilseeds cultivation. Owing to low rainfall, lack of irrigation and more area under guar cultivation. Pratapgarh district which had low productivity of oilseeds in 1990-91 has joined high productivity index value in 2014-15, because of increase in concentration index as well as yield index. While Banswara, Dungarpur, Jhunjhunu and Sikar districts have shifted from low to moderate category of productivity, owing to increase in concentration index due to more area under its cultivation in 2014-15 as compare to 1990-91. Thus, owing to these reasons, low category has lost its districts either to moderate or high category during study period.
4. Thus, study has concluded that in 1990-91 the magnitude of oilseeds productivity was high in eastern parts and moderate in central parts of the study region. While in 2014-15, it is observed that the magnitude of oilseeds productivity generally decreases from south-east to west. It is recorded high in eastern parts, moderate in central parts and low in western parts.

Table 02: Oilseeds Productivity in Rajasthan: 2014-15

#	Districts	Index value
1.	Ajmer	87.80
2.	Jaipur	92.71
3.	Dausa	142.00
4.	Tonk	159.72
5.	Sikar	73.71
6.	Jhunjhunu	75.03
7.	Nagaur	85.84
8.	Alwar	118.61
9.	Bharatpur	157.73
10.	Dhaulpur	145.42
11.	Sawai-Madhopur	188.21
12.	Karauli	145.09
13.	Bikaner	74.83
14.	Churu	57.30
15.	Jaisalmer	49.55
16.	Ganganagar	119.52
17.	Hanumangarh	92.61
18.	Jodhpur	93.21
19.	Barmer	53.71
20.	Jalor	155.83
21.	Pali	114.62
22.	Sirohi	156.23
23.	Kota	183.52
24.	Baran	192.44
25.	Bundi	141.09
26.	Jhalawar	179.31
27.	Banswara	80.05
28.	Dungarpur	76.31
29.	Udaipur	66.43
30.	Pratapgarh	171.83
31.	Bhilwara	75.72
32.	Chittaurgarh	142.61
33.	Rajasmand	65.22
34.	**State average**	**115.58**

Sources: Directorate of Agriculture, Rajasthan, Jaipur

Table 03: **Changes in Oilseeds Productivity in Rajasthan: 1990-91 to 2014-15**

#	Districts	1990-91	2014-15	Changes
1	Ajmer	76.77	87.80	11.03
2	Jaipur	110.30	92.71	-17.59
3	Dausa	124.61	142.00	17.39
4	Tonk	139.59	159.72	20.13
5	Sikar	56.29	73.71	17.42
6	Jhunjhunu	59.29	75.03	15.74
7	Nagaur	101.57	85.84	-15.73
8	Alwar	155.86	118.61	-37.25
9	Bharatpur	218.90	157.73	-61.17
10	Dhaulpur	168.11	145.42	-22.69
11	Sawai-Madhopur	180.60	188.21	7.61
12	Karauli	111.69	145.42	33.73
13	Bikaner	64.98	74.83	9.85
14	Churu	49.01	57.30	8.29
15	Jaisalmer'	32.25	49.55	17.30
16	Ganganagar	108.38	119.52	11.14
17	Hanumangarh	77.37	92.61	15.24
18	Jodhpur	85.79	93.21	7.42
19	Barmer	42.50	53.71	11.21
20	Jalor	92.45	155.83	63.38
21	Pali	160.84	114.62	-46.22
22	Sirohi	157.89	156.23	-1.66
23	Kota	190.04	183.52	-6.52
24	Baran	168.32	192.44	24.11
25	Bundi	157.49	141.09	-16.40
26	Jhalawar	99.71	179.31	79.60
27	Banswara	51.95	80.05	28.10
28	Dungarpur	56.79	76.31	19.52
29	Udaipur	71.12	66.43	-4.69
30	Pratapgarh	43.37	171.83	128.46
31	Bhilwara	100.30	75.72	-24.58
32	Chittaurgarh	72.21	142.61	70.40
33	Rajasmand	96.44	65.22	-31.22
34	**State average**	**105.54**	**115.58**	**10.04**

Sources: Directorate of Agriculture, Rajasthan, Jaipur.

Conclusion

The study has observed that in 1990-91, the magnitude of oilseeds productivity was normally high in eastern parts as compare to western parts. It decreased from east to west with certain exceptions because of geo-climatic conditions. 9 districts had high oilseeds productivity, 16 moderate oilseeds productivity and 8 low oilseeds productivity. Central parts of the study region had moderate magnitude of oilseeds productivity. In 2014-15, the magnitude of oilseeds productivity in Rajasthan generally decreases from east to west. It is recorded high in eastern parts and patches in Sirohi and Jalor districts, moderate in central parts and low in western parts. Its index value varies from 49.55 percent in Jaisalmer district to 194.44 percent in Baran district. It is deduced that patterns of oilseeds productivity coincide with patterns of rainfall and soils because oilseeds require less moisture as compare to wheat. It is concluded that in 1990-91, the magnitude of oilseeds productivity was high in eastern parts and moderate in central parts of the study region. While in 2014-15, the magnitude of oilseeds productivity decreases from south-east to west. It is recorded high in eastern parts, moderate in central parts and low in western parts. All this is the result of more area come under wheat in 2014-15. The southern and eastern parts have more area under oilseeds owing to suitable geo-climatic conditions. Western Rajasthan has recorded negative change in oilseeds productivity, because of low rainfall, sandy soils and low extent of irrigation except Ganganagar and Hanumangarh districts. Out of 33 districts, 12 districts have recorded negative change and 21 districts have noted positive change in oilseeds productivity during 1990-91 to 2014-15. The study has observed

that the magnitude in regional imbalances of oilseeds productivity has narrowed down during period under present study.

Suggestions

For increasing oilseeds productivity and minimizing regional disparities in Rajasthan, recommended suggestions are; to enthuse sprinkle irrigation, reclamation of kallar soils, introduction of improved seeds of crops of oilseeds, to strengthen village road network, open more agricultural markets, impart training to farmers about new technology in agriculture by agricultural research institutes and government departments, remunerative prices of oilseeds and their ensured marketing, liberal loan facilities to farmers, favourable government policy etc. If these suggestions are implemented than oilseeds productivity of the state will increase in future**.**

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