

Agricultural Regionalization: Spatial Analysis of Crop Combination Regions

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Abstract - Crop combination regions refer to the number or diversity of crops grown in a particular area during a specific interval of time [1]. These regions provide strong basis for agricultural regionalization. Developmental policies and other planning measures can be taken on the basis of these regions. This research paper is a case study and it is based on Land Record Circles. The method used for delineation of regions is Rafiullah's maximum positive deviation method. Out of 11 LRC's 10 are mono crop regions and the prominent crop is Bajra. The results of the paper are analyzed according to the climatic conditions of the study area. This is a semi-arid region and major part of it is a dark zone. So, the rain fed agriculture is done in the study area. The Bajra crop is produced on south west-monsoon.

Keywords: Agricultural Regionalization, Crop Combination Regions, Maximum Positive Deviation, Dark Zone

I. INTRODUCTION

India being an agrarian country, research in the field of agriculture is very important. Agriculture in India mainly depends on Monsoon. Monsoon has characteristics of both un-certainty and ire-regularity [2]. The selection of crops and their combinations help to fight in diverse conditions. So, the study of crop combination regions is essential to make development policy of a particular region, and it is also important for introduction of any crop in that region. To ensure soil fertility and maximum production, study of crop combination regions is essential. Crop combination is concerned with the number or diversity of crops grown in a particular area during a specific interval of time. It presents a true picture of crop distribution. It provides a solid base

for agricultural regionalization. For understanding geography of crops and basic regional planning, crop combination regions provide a comprehensive basis [3]. For identifying the significant crops of a region, it is essential to adopt a statistical base.

Statistics is another science that has been used effectively by the agricultural geographers as well agricultural economists. It has helped them in their study of agricultural phenomena by supplying them with techniques to collect, analyze and interpret data regarding specific farm problems. In delineation of agricultural boundaries, the best effort was made by Weaver (1954). Who tried to apply the least deviation Model for crop combination regions. Jasbir Singh (1976) has shown that the least deviation model can be modified to overcome its limitations. Other agricultural geographers who have studied the crop combination regions of different parts of the world and India, Scott (1957), Doi (1959,1970), Coppock (1964), Hong (1969), Husain (1982), Singh and Dhillon (2006), applied their own methods for the calculations of the crop combination regions.

II. STUDY AREA

The study was conducted in Jamwaramgarh tehsil of Jaipur district in Rajasthan State with total geographical area of 103370 hectares. It is located between 26°50'10" to 27°16'33, North latitude and 75°56'11" to 79°19'54" East longitude. Total population of this tehsil is 3,03,236 (census 2011) and Literacy rate is 65.22%.

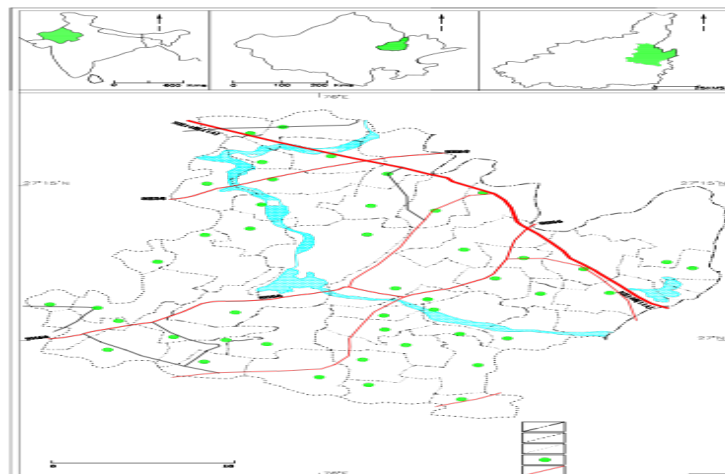


Fig. 1 Study area

Climatic conditions in this area fall in semi-arid category. Basically it gets rainfall by south west monsoon and some by Mawatha (western disturbances).

III. OBJECTIVES OF THE STUDY

This research paper is written for agricultural regionalization of the study area. The prime objective of this paper is to find out crop combination regions so the development policies can be formed. Crop combination regions provide a strong basis agricultural regionalization.

IV. DATABASE

The present study is based on both primary and secondary data. The data mainly have been obtained from Census of India (2011), Primary Census Abstract, Rajasthan, 2011 and collected from Land record from Tehsildar office, Jamwaramgarh No./L.R./15/7244 dated 2/05/2019 and Land record from collectorate, Jaipur. At the first point weaver’s method also used for crop combinations but at the final point after reviewing the shortcomings, Rafiullah’s method of Maximum positive deviation is used. In the field of agricultural geography Weaver was the first to use statistical technique to establish the crop combination of the Middle West (USA) [4].

V. RESEARCH METHODOLOGY

This Research Paper is based on Rafiullah’s Maximum Positive Deviation Method. It was developed in 1956[5]. The technique may be expressed as follows:

$$D = \sqrt{\frac{\sum D_p^2 - D_n^2}{N^2}}$$

Later, The formula was modified to avoid laborious calculations:

$$D = \frac{\sum D_p^2 - D_n^2}{N^2}$$

Where

- D =Deviation.
- Dp =The Positive difference from the hypothetical value or median value.
- Dn =Negative difference from the median value.
- N =Number of functions in the combination.

In this method at grass root level 50 percent of land occupied by less than one crop while the remaining 50 percent of land might have been shared by other crops.

VI. RESULTS AND INTERPRETATIONS

This study area is divided into 11 Land record circles named Jamwaramgarh L.R.C., Andhi L.R.C., Bhavni L.R.C., Neemla L.R.C., Nayala L.R.C, Booj L.R.C., Khawaraniji L.R.C, Raisar L.R.C., Tala L.R.C and Gathwari L.R.C. only one L.R.C Bhanpur Kala is a double crop region/ LRC. It is clear that statistical technique is a significant device to assess domination position of the crops in different LRCs [6]. The two examples one from monocrop and another from double crop region are presented here with calculations.

A. Jamwaramgadh L.R.C.

Calculations for Jamwaramgadh LRC for crop combinations Total cropped area in this LRC is 4196 h. When we calculate percentage of each one of crop in terms of total cropped area and arrange the data in descending order. The calculations are given below:

$$\text{Mono Crop} = (34.485-50)^2 / 1^2 = 240.8704$$

$$\text{Double Crop} = \{(34.485-25)^2 - (34.461-25)^2\} / 2^2 = 0.1136$$

$$\text{Three Crop} = \{(34.485-16.7)^2 - (34.461-16.7)^2 - (9.485-16.7)^2\} / 3^2 = -5.6892$$

The group with Maximum value will be suitable combination. In this LRC the maximum value is 240.8704 so according to Rafiullah Jamwaramgadh LRC will be a Mono crop region.

B. Bhanpur Kalan LRC

Calculations for Bhanpur Kalan LRC for crop combinations

$$\text{Mono Crop combination} = (46.225-50)^2 / 1^2 = 14.250$$

$$\text{Double Crop combination} = \{(46.225-25)^2 - (25.074-25)^2\} / 2^2 = 450.495/4 = 112.624$$

$$\text{Three Crop combination} = \{(46.225-16.7)^2 - (25.074-16.7)^2 - (8.549-16.7)^2\} / 3^2 = 81.685$$

$$\text{Four Crop combination} = \{(46.225-12.5)^2 - (25.074-12.5)^2 - (8.549-12.5)^2 - (7.216-12.5)^2\} / 4^2 = 58.483$$

The Group of Maximum value will be the best suitable combination [7]. In this LRC of Bhanpur Kalan first two crops make suitable combination. Crop combination will be Bajra and Wheat crops (Table I).

TABLE I SHOWING AREA UNDER VARIOUS CROPS IN JAMWARAMGARH AND BHANPURKALAN LRC

1. Jamwaramgarh LRC				2. Bhanpur Kala LRC		
Sl. No.	Crops	Total area under crop (hect.)	% of total cropped area (4196hect.) in L.R.C. `	Crops	Total area under crop (hect.)	% of total cropped area (5404hect.) in L.R.C. `
1	Bajra	1447	34.485	Bajra	2498	46.225
2	Wheat	1446	34.461	Wheat	1355	25.074
3	Flowers	398	9.485	Mustard	462	8.549
4	Mustard	275	6.553	Barley	390	7.216
5	Barley	185	4.409	Jowar	205	3.793
6	Jowar	175	4.171	Taramira	160	2.960
7	Taramira	96	2.288	Gram	115	2.128
8	Gram	70	1.668			
9	Carrot	46	1.096			
10	Maize	24	0.572			

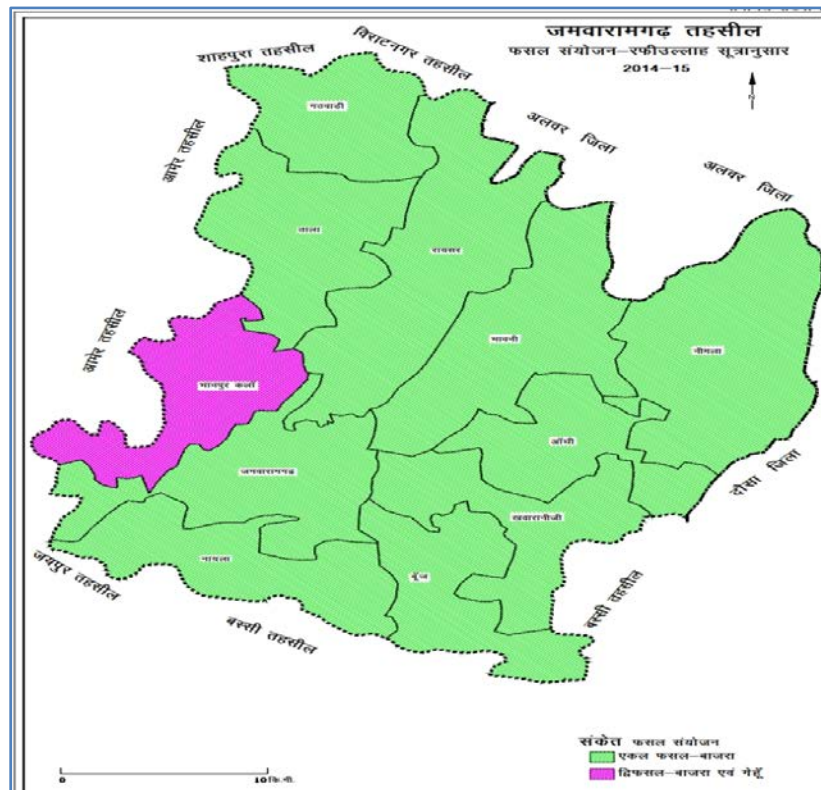


Fig. 2 Crop combination regions in the Study area

The results of this study show that the study area is mainly a monocrop region. The crop is Bajra crop. Only Bhanpur kalan land record circle is a double crop combination region and the crops are bajra and wheat.

VII. SUGGESTIONS

The whole study area is going to become a dark zone. So now it becomes more important to study crop geography. The introduction of new crops which need less water and can be grown in diverse climatic conditions is the need of

hour in this tehsil. The intensity of irrigation encourages the farmers to cultivate a greater number of crops in a year [10], so irrigation facilities especially micro-irrigation methods should be developed in this tehsil. Other crops which can be produced in semi-arid region should be introduced here. Water harvesting and management techniques like-cemented farm-ponds, check-dams and anicuts should be made. With the help of govt. cemented ponds can be made because this area has sand soil so porosity of soil is greater. The river basins of this area like river Ban-ganga should be regenerated to sustain the ecological balance in the area.

The way of dealing with the method will be really helpful for other researchers also to calculate crop combinations in the particular areas of their need and interest.

VIII. CONCLUSION

This tehsil has a famous dam Jamwaramgarh. Once it was fully filled to its capacity but present scenario is too pessimistic. Now it has no water or very less water even in times of monsoon. River basins has been destroyed in agricultural land use, rainfall distribution is both uneven and less. The realization of agro climatic regions plays a significant role in development of agriculture in any area [8]. So the results of the study are analyzed in terms of climatic conditions. This study falls under Rajasthan state of India which has 61.11 % area as desert [9]. Water is a scarce resource in the study area. This area is a semi-arid region and in terms of ground water availability it is a dark zone. The main Irrigation source is tube wells but Ground water level is decreasing rapidly. There is no ponds and canals for irrigation. The crop Bajra needs less water, so Bajra crop can be grown only on rainfall so it is a major crop in the area of study.

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