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Spatial Analysis Of Crop Combination: An Empirical Study Of Dhule District, Maharashtra (2013–2016).

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Abstract

Crop combination and diversification are fundamental concepts in agricultural geography that help in understanding spatial patterns of land use and regional agricultural development. This study examines crop combination and diversification patterns in Dhule district, Maharashtra, for the period 2013–2016 using Doi's modified minimum deviation method. The analysis is carried out at both tahsil and circle levels to identify dominant crop associations and regional variations. The findings indicate significant spatial heterogeneity in cropping patterns, with cotton dominating monoculture regions and diversified cropping systems prevalent in tribal and high rainfall areas. The study highlights the influence of physical and socio-economic factors such as rainfall, soil fertility, irrigation, and market accessibility on crop distribution. It also emphasizes the importance of crop diversification as a strategy for risk mitigation, resource optimization, and sustainable agricultural development.

Keywords: Crop combination, crop diversification, agricultural regionalization, Doi's method, Dhule district

1. Introduction

Agriculture is a dynamic activity influenced by a complex interplay of natural and human factors. The study of agricultural land use patterns provides valuable insights into regional development, resource utilization, and economic sustainability. Among the various approaches used in agricultural geography, the concepts of crop concentration, crop diversification, and crop combination hold significant importance.

Crop concentration focuses on the dominance of specific crops in a region, whereas crop diversification involves cultivating a variety of crops to maximize productivity and minimize risks. Crop combination, on the other hand, reflects the spatial association of multiple crops grown within a given area and provides a scientific basis for identifying agricultural regions.

In recent years, the importance of crop diversification has increased due to growing concerns over climate variability, soil degradation, and economic instability in agriculture. Farmers increasingly adopt diversified cropping systems to ensure stable income and efficient utilization of resources. Therefore, the study of crop combination and diversification is essential for effective agricultural planning and policy formulation.

2. Objectives of the Study

The present study is undertaken with the following objectives:

To examine the spatial pattern of crop combinations in Dhule district

To analyze the extent and nature of crop diversification

To identify crop combination regions at tahsil and circle levels

To assess the applicability of Doi's method in agricultural regionalization

To understand the factors influencing crop distribution and combinations

3. Conceptual Framework

3.1 Crop Combination

Crop combination is defined as the practice of growing more than one crop within the same agricultural unit. It represents the spatial relationship among crops and provides insights into cropping patterns and land-use efficiency.

The advantages of crop combination include:

Reduction of pest and disease risks due to crop diversity

Maintenance of soil fertility through crop rotation (e.g., inclusion of legumes)

Efficient utilization of land and water resources

Availability of multiple agricultural outputs

The concept of crop combination is widely used in agricultural geography to delineate crop regions and understand spatial agricultural structures.

4. Methodology

4.1 Data and Study Area

The study is based on secondary data related to crop distribution in Dhule district, Maharashtra, for the triennium period 2013–2016. The analysis is conducted at two spatial levels: Tahsil level, Circle level

4.2 Methods of Crop Combination Analysis

Various methods have been developed to identify crop combination regions. These methods can be broadly classified into qualitative and quantitative approaches. While qualitative methods rely on ranking crops, quantitative methods provide more precise and objective results.

- Important quantitative methods include:
- Standard deviation method
- Quartile method
- Least square deviation method
- Maximum positive deviation method

4.3 Doi's Modified Minimum Deviation Method

This study adopts Doi's (1959) method due to its simplicity and accuracy. The method utilizes a one-sheet table of critical values and focuses on cumulative crop percentages.

The procedure involves:

Arranging crops in descending order of their area

Calculating cumulative percentages

Comparing these values with critical values

Including crops that exceed the threshold

A region is classified as monoculture if a single crop occupies more than 70.5% of the cultivated area.

5. Results and Discussion

5.1 Crop Combination at Tahsil Level

The analysis reveals distinct crop combination patterns across different tahsils. Sakri tahsil is characterized by a five-crop combination consisting of Bajara, Maize, Cotton, Pulses, and Oilseeds. Bajara occupies the first position, followed by Maize.

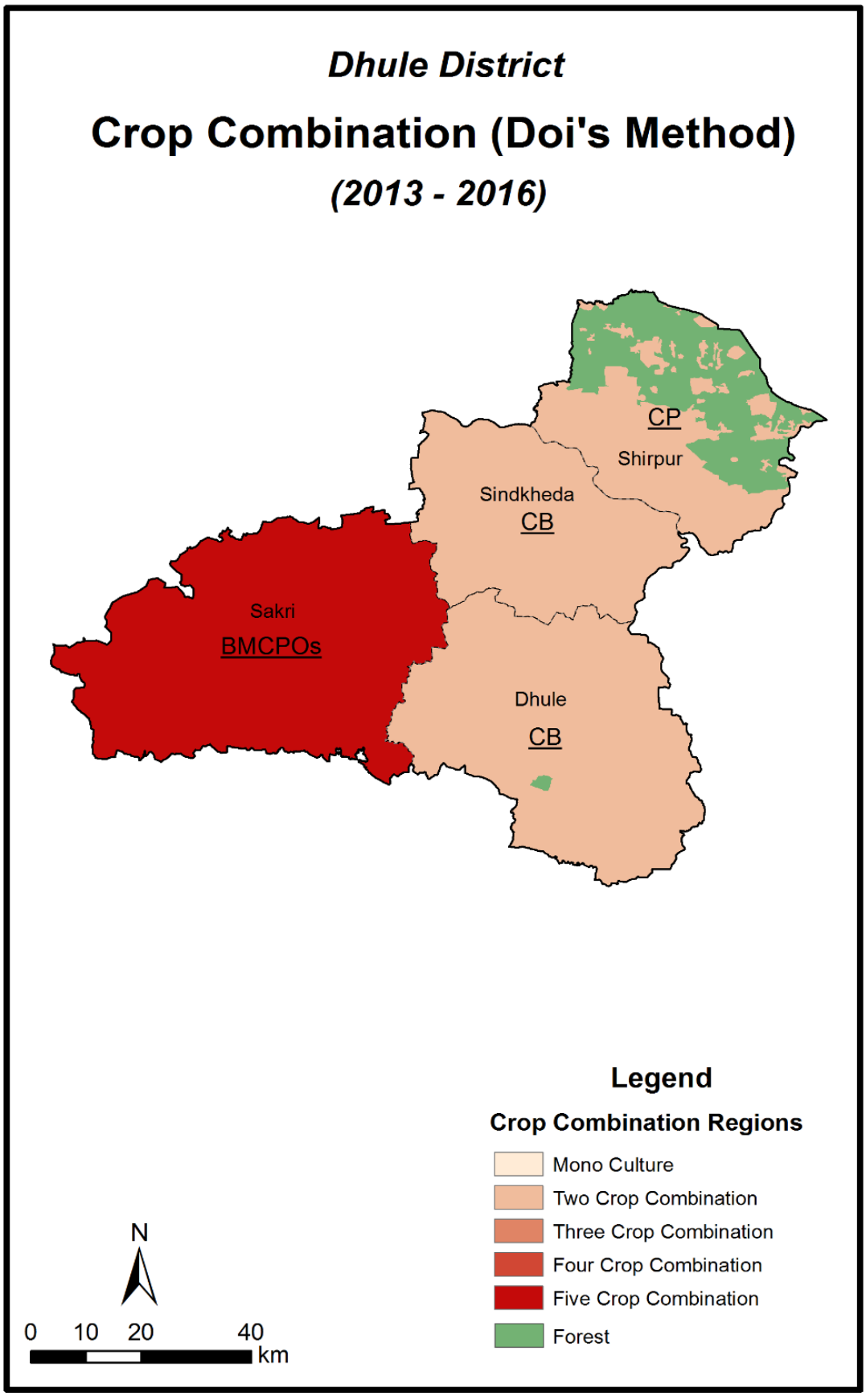
In contrast, Dhule, Shindkheda, and Shirpur tahsils exhibit two-crop combinations, with Cotton as the dominant crop. Cotton is typically combined with Bajara in Dhule and Shindkheda, while in Shirpur it is associated with Pulses.

At the district level, Bajara emerges as the leading crop, followed by Cotton, Pulses, and Maize, indicating a mixed cropping system with moderate diversification.

Table : Crop combination regions at tahsil Level

Sr.No.	Tahsil / District	Crop Combination
1	Sakri	5 (BMCPOs)
2	Dhule	2 (CB)
3	Shindkheda	2 (CB)
4	Shirpur	2 (CP)
5	Dhule district	4(BCPM)

Source: Computed by Researcher



(Source: Computed by Researcher)

Fig: Crop Combination Regions at Tahsil Level

Table :Crop Combination Regions at Circle Level By Doi's Method (2013-16)

Tahsil / Revenue Circle		Crop Combination
Sakri Tahsil		
1	Sakri	3 (BMOs)
2	Dusane	3 (CBOs)
3	Pimplner	3 (MBO)
4	Kudashi	4 (RMBN)
5	Nijampur	2 (BC)
6	Dahivel	5 (MBPOsR)
7	Mhasadi	3 (BCV)
8	Umarpata	5 (RMPNB)
9	Kasare	3 (BMP)
10	Brahmanvel	3 (BMO)
Dhule Tahsil		
1	Fagane	2 (CB)
2	Lamkani	2 (CB)
3	Borkund	2 (CB)
4	Aarvi	2 (CB)
5	Dhule (Rural)	3 (CBP)
6	Nagaon	5 (CPMBO)
7	Kusumba	3 (CMB)
8	Shirud	Monoculture (C)
9	Songir	Monoculture (C)
10	Mukati	2 (CB)
11	Ner	3 (BCM)
12	Dhule (Urban)	3 (CBO)
Shindkheda Tahsil		
1	Shindkheda	2 (CD)
2	Chimthane	Mono culture (C)
3	Shewade	2 (CB)
4	Varshi	2 (CB)
5	Khalane	Mono culture (C)
6	Nardane	2 (CD)
7	Betawad	2 (CD)
8	Virdel	2 (CD)
9	Vikharan	2 (CB)
10	Donaicha	2 (CB)
Shirpur Tahsil		
1	Sangavi	2 (COS)
2	Thalner	2 (CP)
3	Jawkeda	2 (CB)
4	Shirpur	2 (CW)
5	Boradi	2 (CP)
6	Arthe	Mono culture (C)
7	Holnathe	2 (CP)

5.2 Crop Combination at Circle Level

5.2.1 Monoculture Region

Monoculture regions are identified in five circles where Cotton occupies more than 70.5% of the cultivated area. These regions are primarily located in the eastern part of the district and account for 11% of the total cultivated area. Favorable climatic conditions, fertile soils, and adequate irrigation facilities contribute to the dominance of Cotton.

5.2.2 Two-Crop Combination Region

Two-crop combination regions cover the largest share (51.10%) of the cultivated area and are found in 20 circles. Cotton remains the dominant crop and is commonly combined with Bajara, Pulses, Oilseeds, or Wheat.

These regions are mainly located in the fertile Tapi valley and drought-prone areas, where irrigation facilities and soil conditions support such combinations.

5.2.3 Three-Crop Combination Region

Three-crop combinations are observed in 10 circles, covering 26.19% of the cultivated area. The major crops include Bajara, Maize, Cotton, Pulses, and Onion.

These regions are concentrated in the west-central part of the district and are characterized by moderate irrigation, coarse soils, and tribal population.

5.2.4 Four-Crop Combination Region

A four-crop combination is identified in Kudashi circle, where Rice, Maize, Bajara, and Nagali are cultivated. This region represents subsistence agriculture and is influenced by moderate to high rainfall conditions.

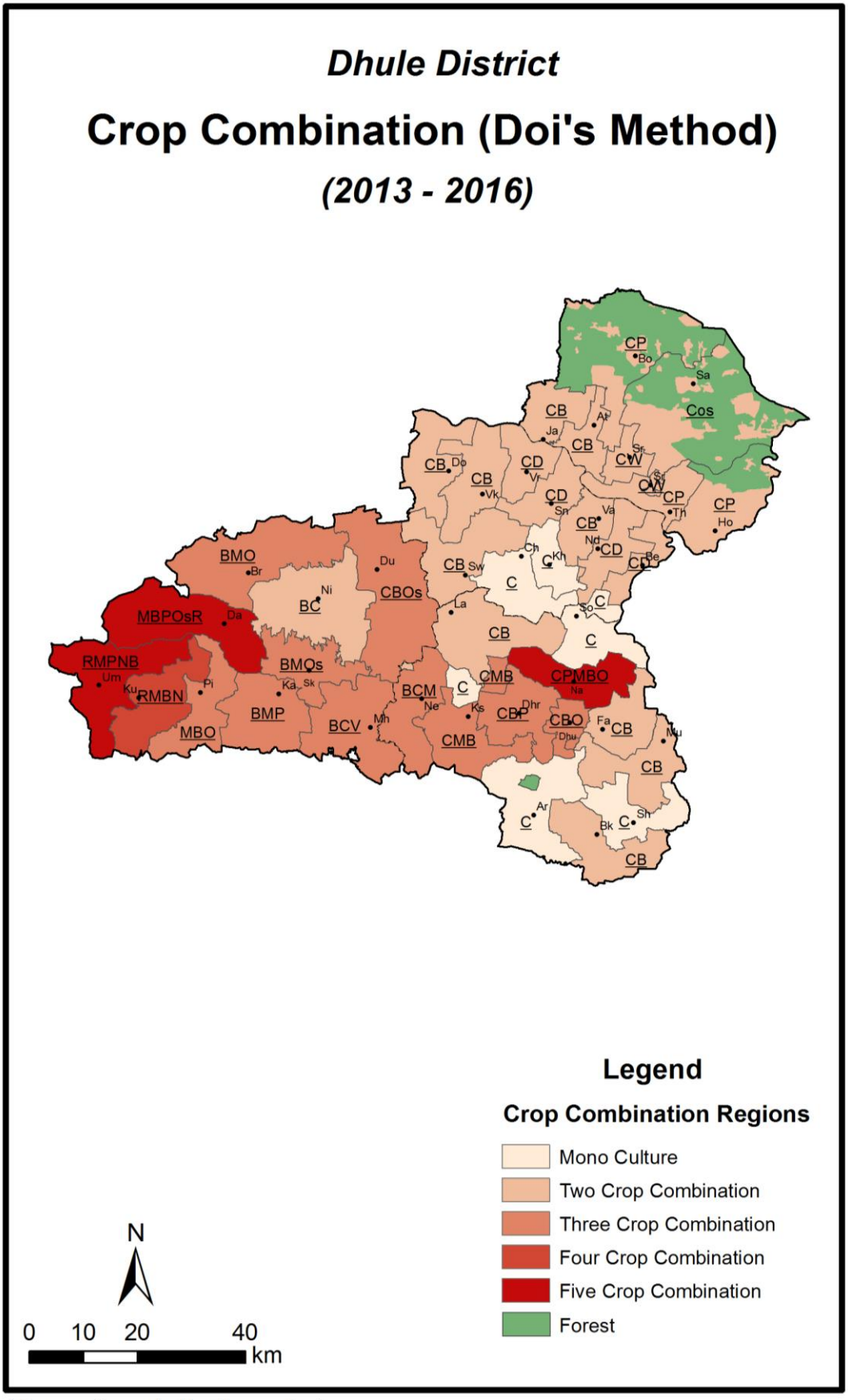
5.2.5 Five-Crop Combination Region

Five-crop combinations are observed in three circles—Dahiwel, Umarpata, and Nagaon. These regions exhibit high crop diversification. Dahiwel and Umarpata are located in high rainfall tribal areas with small landholdings and limited irrigation, while Nagaon lies in a drought-prone region but still exhibits diversified cropping due to adaptive farming strategies.

Table :Crop Combination Regions in Dhule District

Sr. No.	Types of Crop Combination	No.of Revenue Circles	No.of villages	Cultivated Area in Hectares	Percentage of Cultivated Area
1	Mono culture	5	67	44038.95	11.00
2	Two Crop Combination	20	352	204524.84	51.10
3	Three Crop Combination	10	174	104836.55	26.19
4	Four Crop Combination	01	22	10169.61	2.54
5	Five Crop Combination	03	71	36722.05	9.17
	Dhule District	39	686	400292.00	100%

Source: Computed by researcher



(Source: Computed by Researcher)

Fig : Crop Combination Regions at Circle Level

6. Factors Influencing Crop Combination and Diversification

The variation in crop combinations across the district is influenced by multiple factors:

Physical factors: rainfall, soil type, topography

Economic factors: farmer income, market demand

Technological factors: irrigation systems, HYV seeds

Social factors: traditional practices, landholding size

Institutional factors: government policies and support

7. Significance of the Study

The study of crop combination and diversification is significant for:

Agricultural regionalization

Efficient land-use planning

Risk reduction in farming systems

Enhancing agricultural productivity

Supporting policy formulation and rural development

8. Conclusion

The study demonstrates that crop combination patterns in Dhule district are highly diverse and influenced by both environmental and socio-economic conditions. Cotton dominates monoculture regions, whereas diversified cropping systems are more prevalent in tribal and high rainfall areas. Doi's method proves to be an effective and reliable tool for identifying crop combination regions. The findings emphasize that crop diversification is essential for sustainable agriculture, as it enhances resilience, improves resource utilization, and stabilizes farmer income.

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