GEOGRAPHICAL ANALYSIS

RESEARCH ARTICLE

Dynamics of Crop Concentration in Hassan District: A Comparative Study

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Abstract

This study investigates the spatial and temporal variations in crop concentration patterns across different taluks of Hassan district between 1990-91 and 2004-05. The research focuses on a variety of crops, including rice, ragi, jowar, maize, pulses, groundnut, sugarcane, cotton, high yield varieties (HYV), sunflower, oilseeds, fruits, vegetables, spices, non-food crops, and coffee. The analysis reveals significant shifts in crop concentration, driven by factors such as climate conditions, irrigation availability, and agricultural practices. The findings provide a comprehensive understanding of agricultural transformation in the region and suggest strategies for enhancing crop productivity and sustainability.

Keywords: Crop Concentration; Hassan District; Agricultural Patterns; Crop Distribution; Temporal Analysis; Sustainable Agriculture

1 Introduction

Agriculture is the primary livelihood source for a significant portion of the population in Hassan district, Karnataka, India. Over the years, changes in climate, irrigation, and farming practices have led to noticeable shifts in crop concentration patterns across the district's taluks. Understanding these changes is crucial for developing effective agricultural policies and ensuring sustainable crop production. This study aims to analyze the variations in crop concentration between 1990-91 and 2004-05, providing insights into the factors driving these changes and their implications for the district's agricultural future [1–7].

1.1 Objectives

The primary objectives of this study are:

1. To analyze the crop concentration patterns across different taluks of Hassan district during 1990-91 and 2004-05.
2. To identify the key factors influencing the changes in crop concentration over the study period.
3. To assess the implications of these changes for sustainable agricultural practices in the region.
4. To provide recommendations for enhancing crop productivity and ensuring agricultural sustainability in Hassan district.

2 Methodology

This study employs a comparative analysis approach to examine the changes in crop concentration patterns across Hassan district's taluks between 1990-91 and 2004-05. The methodology includes the following steps:

- **Data Collection:** Secondary data on crop production and area under cultivation for various crops in 1990-91 and 2004-05 were collected from government records, agricultural reports, and relevant literature.
- **Crop Concentration Index (CCI):** The Crop Concentration Index was calculated for each taluk and crop using the formula:

$$CCI = \left(\frac{Area\ under\ Crop\ in\ Taluk}{Total\ Area\ under\ Crop\ in\ District} \right) \times 100$$

- **Analysis:** The CCIs for each taluk and crop were compared between 1990-91 and 2004-05 to identify changes in concentration levels. Crops were categorized into high, medium, and low concentration based on the CCI values.
- **Interpretation:** The results were interpreted to identify patterns of change and the factors influencing these changes, such as irrigation facilities, climate conditions, and changes in agricultural practices.

2.1 Study Area

Hassan district is located in the state of Karnataka, India. It lies between latitudes 12°30' N and 13°33' N and longitudes 75°33' E and 76°38' E. The district covers an area of 6,814 square kilometers and comprises eight taluks: Alur, Arkalgud, Arasikere, Belur, Channarayapatna (C.R. Patna), Hassan, Holenarasipura (H.N. Pura), and Sakleshpur. The district is characterized by a diverse topography, with hilly regions in the west and plains in the east. The climate is predominantly tropical, with a mix of wet and dry seasons, making it suitable for the cultivation of a wide variety of crops.

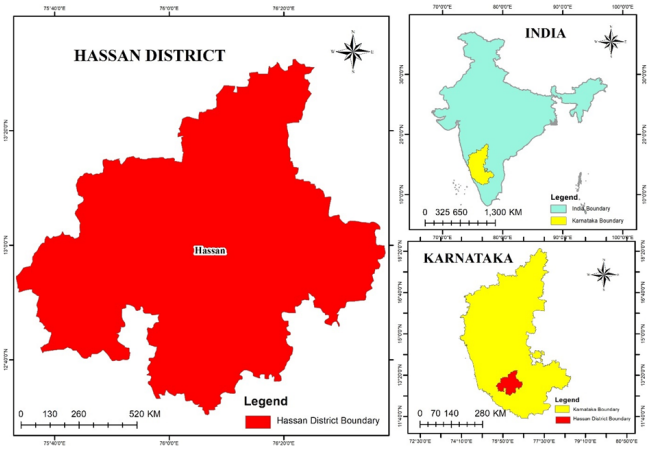

Fig. 1. Location Map of Hassan District

3 Results and Discussion

The crop concentration indices for Hassan District in 1990-91 and 2004-05 reveal significant changes in agricultural practices across its taluks. These indices, derived using the Location Quotient (LQ) method, provide insights into the relative concentration of various crops within each taluk compared to the district as a whole. The following analysis highlights the patterns of crop distribution and the notable shifts that have occurred over the 14-year period.

3.1 Crop Concentration in 1990-91

In 1990-91, **Alur Taluk** demonstrated a strong emphasis on rice cultivation, with an LQ of 2.07, indicating that rice was more concentrated in Alur compared to other taluks. Additionally, sugarcane (0.44) and high-yield crops (1.13) were also prominent, suggesting a balanced focus on both food crops and cash crops. The moderate concentration of other pulses (0.28) and groundnut (0.09) indicates some diversification, although these crops were less dominant.

Arkalgud Taluk presented a diversified crop pattern, with notable concentrations in rice (1.42), tur (1.78), and groundnut (1.58). The high LQ for gram (1.33) reflects a local specialization in pulse cultivation. This taluk had a relatively even distribution of crops, balancing food grains and pulses, although jowar and other minor millets were not significant in this region.

In **Arsikere Taluk**, the focus was on dryland farming and cash crops, with high concentrations in jowar (1.85) and cotton (2.36). The presence of ragi (1.36) and tur (1.38) further underscores the emphasis on drought-resistant crops. Maize (0.09) and other pulses (0.66) were cultivated to a lesser extent, indicating a reliance on crops suitable for the region's climatic conditions.

Belur Taluk showed a strong concentration in maize (3.27), cotton (3.00), and sugarcane (1.78), suggesting a mix of food and cash crops. The high concentration of high-yield crops (1.08) points to the taluk's potential for agricultural productivity. However, the low presence of other pulses (0.58) and groundnut (1.08) indicates a lesser focus on these crops.

C.R. Patna Taluk was characterized by a significant concentration in sugarcane (4.88), making it the dominant crop. The presence of tur (1.25) and groundnut (0.92) suggests some diversification, though to a lesser extent. This taluk had low concentrations of ragi (0.09) and maize (0.0), indicating a limited focus on cereal crops.

In **Hassan Taluk**, maize (2.46) and gram (2.33) were the most concentrated crops, reflecting a focus on cereal and pulse cultivation. The taluk also had a moderate concentration of high-yield crops (1.04), but lower values for rice (0.05) and ragi (1.18), suggesting a balanced but somewhat limited diversification.

Table 1. Hassan District Crop Concentration Indices 1990-91 (An Application Of Location Quotient Method)

Sl. No.	Name of the Taluks	Rice	Ragi	Jowar	Maize	Minor Millets	Gram	Tur	Other Pulses	Groundnut	Sugarcane	Cotton	High Yield crops (in hec.)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Alur	2.07	0.82		1.27	-	0.33	0.38	0.28	0.09	0.44	0.71	1.13
2.	Arkalgud	1.42	0.83	0.0	0.09	-	1.33	0.5	1.78	1.58	0.11	0.0	0.86
3.	Arsikere	0.04	1.36	1.85	0.09	0.0	1.33	1.38	0.66	1.5	0.11	2.36	0.08
4.	Belur	1.04	0.79	1.23	3.27	-	0.33	1.63	0.58	1.08	1.78	3.0	1.08
5.	C.R.Patna	0.61	0.09	1.77	0.0	0.0	1.0	1.25	1.34	0.92	4.88	0.07	0.89
6.	Hassan	0.05	1.18	0.92	2.46	0.0	2.33	1.0	0.99	0.67	0.33	0.0	1.04
7.	H.N.Pura	1.27	1.0	0.46	0.09	-	0.33	0.63	1.54	0.08	0.44	0.07	0.88
8.	Sakleshpur	4.69	0.12	-	-	-	-	-	0.05	0.17	0.0	-	1.09

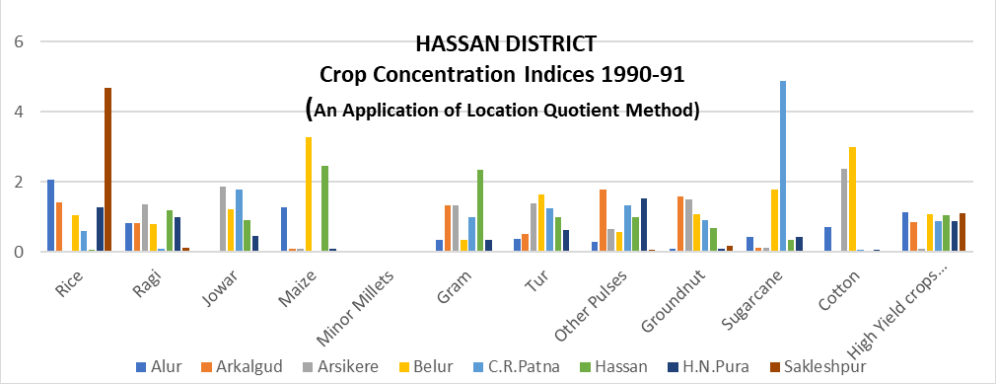

Fig. 2. Hassan District Crop Concentration Indices 1990-91 (An Application of Location Quotient Method)

Table 2. Hassan District Crop Concentration Indices 2004-05 (An Application Of Location Quotient Method)

Sl. No.	Name of the Taluks	Rice	Ragi	Jowar	Maize	Gram	Tur	Other Pulses	Groundnut	Sunflower	Oil seeds	Total Fruits
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Alur	2.15	0.48	1.0	3.75	0.0	0.0	0.33	0.0	0.0	1.0	2.0
2.	Arkalgud	2.36	0.25	0.8	0.84	0.4	1.25	1.70	1.0	-	0.12	1.08
3.	Arsikere	0.00	1.08	1.28	0.26	3.0	1.0	1.51	2.5	3.1	1.92	0.13
4.	Belur	1.55	0.76	0.0	2.21	-	2.0	0.46	0.5	2.4	0.46	0.58
5.	C.R.Patna	0.38	1.02	0.7	0.08	0.4	0.75	0.67	0.0	0.1	0.46	0.67
6.	Hassan	0.13	1.84	0.8	1.62	1.2	1.5	8.99	0.5	0.2	0.75	0.08
7.	H.N.Pura	1.69	1.34	1.4	0.64	0.4	0.75	2.56	0.5	0.0	2.62	0.5
8.	Sakleshpur	2.01	0.00	-	-	-	-	0.05	-	-	-	0.67

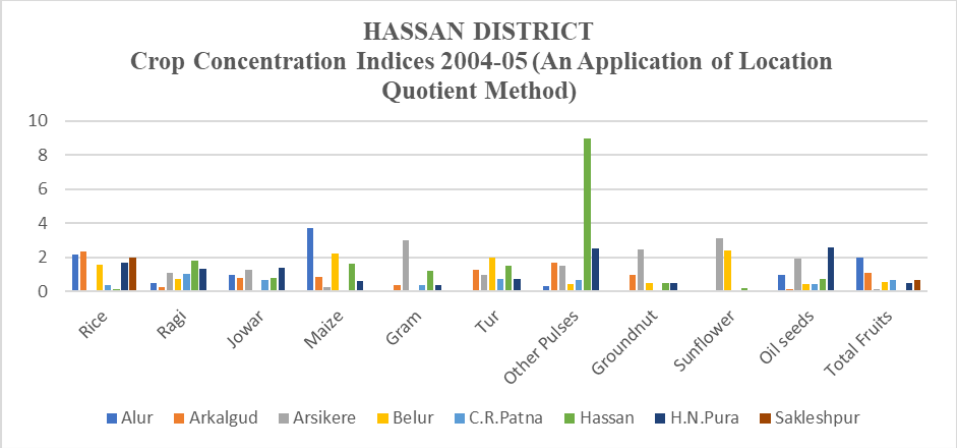

Fig. 3. Hassan District Crop Concentration Indices 2004-05 (An Application of Location Quotient Method)

Table 3. Hassan District Crop Concentration Indices 2004-05 (An Application of Location Quotient Method)

Sl. No.	Name of the Taluks	Total Vegeta-bles	Total Spice	Sugar cane	Other non food crops	Coffee	Yallachi	Banana	Mango	Supari	Coconut
1	2	14	15	16	17	18	19	20	21	22	23
1.	Alur	0.86	1.33	-	1.0	2.57	-	0.31	1.33	0.67	0.21
2.	Arkalgud	1.38	1.61	-	0.65	0.04	-	0.67	2.0	4.0	0.25
3.	Arsikere	0.46	0.25	0.08	1.19	-	-	2.33	1.0	1.0	1.88
4.	Belur	0.22	0.5	1.5	0.99	2.18	0.08	0.5	0.67	1.17	0.29
5.	C.R.Patna	0.26	0.25	4.75	1.35	0.0	-	0.83	0.5	0.33	2.58
6.	Hassan	3.08	0.25	0.17	0.31	-	-	0.33	0.67	0.67	0.49
7.	H.N.Pura	0.44	0.25	1.67	0.78	-	-	0.83	0.33	0.33	0.77
8.	Sakleshpur	0.04	4.04	-	1.49	4.57	7.15	0.83	0.0	0.17	0.01

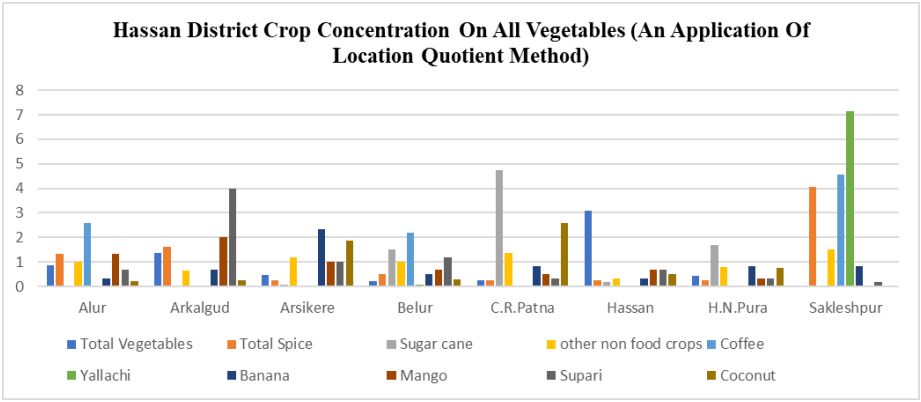

Fig. 4. Hassan District Crop Concentration On All Vegetables (An Application of Location Quotient Method)

H.N. Pura Taluk exhibited a strong emphasis on rice (1.27) and tur (1.54), with moderate concentrations in other pulses (1.54) and ragi (1.0). The presence of high-yield crops (0.88) indicates a potential for increased productivity, but the taluk had lower concentrations of maize (0.09) and groundnut (0.08).

Finally, **Sakleshpur Taluk** had an extremely high concentration in rice (4.69), showing a dominant focus on this crop. The taluk had very low diversity in other crops, with little to no concentration in categories such as maize, minor millets, and pulses. This suggests a highly specialized agricultural practice centered around rice cultivation.

3.2 Crop Concentration in 2004-05

By 2004-05, **Alur Taluk** had shifted its focus significantly towards maize (3.75) and coffee (2.57), reflecting a move towards more commercial and high-value crops. While rice (2.15) remained important, the taluk diversified by introducing vegetables (0.86) and spices (1.33). The reduction in minor pulses and groundnut concentration suggests a transition away from traditional food crops towards crops with greater market demand.

Arkalgud Taluk continued to diversify, with increased concentrations in rice (2.36), tur (1.25), and groundnut (1.0). The introduction of sunflower (3.1) and oil seeds (1.92) highlights a shift towards cash crops. The high concentration in supari (4.0) and spices (1.61) suggests a strategic focus on high-value crops, reducing the emphasis on traditional cereals like jowar (0.8) and ragi (0.25).

In **Arsikere Taluk**, there was a marked increase in the cultivation of sunflower (3.1) and oil seeds (1.92), indicating a strategic shift towards commercial crops. While jowar (1.28) and gram (3.0) remained significant, the taluk introduced new crops such as vegetables (0.46) and spices (0.25), further diversifying its agricultural output.

Belur Taluk saw a shift towards maize (2.21) and coffee (2.18), with a continued focus on sugarcane (1.5). The taluk also diversified into vegetables (0.22) and spices (0.5), although the concentration of traditional food grains like ragi (0.76) and pulses remained moderate. The introduction of coffee as a significant crop highlights a shift towards plantation crops with higher economic returns.

C.R. Patna Taluk maintained a strong focus on sugarcane (4.75) and coconut (2.58), with a lesser emphasis on traditional crops like ragi (1.02) and jowar (0.7). The introduction of oil seeds (0.46) and spices (0.25) suggests some diversification, but the taluk remained focused on a few key high-value crops, reducing its reliance on food grains.

In **Hassan Taluk**, there was an increased focus on ragi (1.84) and other pulses (8.99), reflecting a shift towards cereal and pulse cultivation. However, the taluk diversified its crop portfolio by introducing vegetables (3.08) and oil seeds (0.75), while reducing its focus on traditional cash crops. This suggests a strategic move towards crops with higher nutritional and economic value.

H.N. Pura Taluk demonstrated significant changes, with a focus on other pulses (2.56), oil seeds (2.62), and ragi (1.34). The introduction of new crops such as vegetables (0.44) and spices (0.25) indicates a broader diversification strategy. The taluk reduced its reliance on traditional food grains and focused more on crops with higher market demand and resilience.

Sakleshpur Taluk continued its specialization in rice (2.01) and coffee (4.57), but also introduced spices (4.04), indicating a strategic focus on high-value plantation crops. The taluk had very low diversity in other crops, maintaining its traditional focus on a few key agricultural products.

3.2.1 ***Rice***

In 1990-91, rice was a dominant crop in all taluks of Hassan district, with Sakleshpur taluk showing very high concentration. By 2004-05, while rice remained concentrated in Alur, Arkalgud, and Sakleshpur, its cultivation declined in other taluks. The reduction in rice concentration in certain taluks may be attributed to changes in irrigation availability and the introduction of alternative crops better suited to local conditions.

3.2.2 ***Ragi***

Ragi concentration remained relatively stable between 1990-91 and 2004-05, with medium concentration in Arasikere, C.R. Patna, Hassan, and H.N. Pura taluks. However, slight reductions in ragi concentration were observed in some taluks, possibly due to the adoption of other cash crops.

3.2.3 ***Jowar***

Jowar showed a decline in concentration in several taluks from 1990-91 to 2004-05, with the crop disappearing entirely from Belur and Sakleshpur taluks by 2004-05. The shift could be due to changing market demand and the introduction of more profitable crops.

3.2.4 ***Maize***

Maize concentration shifted from Belur and Hassan taluks in 1990-91 to Alur and Belur taluks in 2004-05. The rise in maize cultivation in Alur and Belur suggests a strategic shift by farmers towards crops with higher market value.

3.2.5 ***Pulses***

The concentration of pulses, particularly gram, increased in Arasikere taluk by 2004-05, while declining in other taluks. The introduction of new seed varieties and improved irrigation could have contributed to this trend.

3.2.6 ***Groundnut, Sugarcane, and Cotton***

Groundnut, sugarcane, and cotton saw varying levels of concentration changes. Notably, cotton cultivation disappeared entirely from Hassan district by 2004-05 due to crop failures and a shift towards more resilient crops like fruits and vegetables.

3.2.7 ***High Yield Varieties (HYV) and Sunflower***

HYV crops and sunflower, which were either absent or had low concentrations in 1990-91, saw an increase in cultivation by 2004-05. This shift reflects the adoption of modern agricultural practices and the growing demand for high-value crops.

3.2.8 ***Coffee and Spices***

The introduction of coffee and spices in Sakleshpur, Alur, and Belur taluks by 2004-05 highlights the district's transition towards plantation crops, driven by favorable climatic conditions and market demand.

3.3 Comparison of these two periods

The crop concentration indices for Hassan District in the years 1990-91 and 2004-05 reveal a significant shift in the agricultural focus of the region. The comparison of these two periods provides insights into how the district's agricultural landscape has evolved over 14 years, reflecting broader economic, environmental, and market trends.

3.4 Shift Towards Commercial Crops

One of the most prominent changes between 1990-91 and 2004-05 is the district's shift towards more commercial and high-value crops. In 1990-91, crops such as **rice** and **sugarcane** dominated in several taluks. For instance, **Sakleshpur Taluk** had an exceptionally high concentration in rice (LQ of 4.69), and **C.R. Patna Taluk** was heavily focused on sugarcane (LQ of 4.88). However, by 2004-05, there was a noticeable shift towards crops like **maize**, **coffee**, **sunflower**, and **oil seeds**. For example, **Alur Taluk** increased its concentration in maize (LQ of 3.75) and introduced coffee as a significant crop (LQ of 2.57). Similarly, **Arsikere Taluk** saw a strong rise in sunflower cultivation (LQ of 3.1) and oil seeds (LQ of 1.92).

3.5 Diversification of Crop Patterns

The data from 2004-05 shows a greater diversification of crop patterns across the district compared to 1990-91. In 1990-91, several taluks had a narrow focus on a few key crops, such as rice, jowar, and sugarcane. **Arkalgud Taluk**, for instance, was primarily concentrated on rice, tur, and groundnut. By 2004-05, this taluk had diversified significantly, introducing crops like **sunflower**, **oil seeds**, and **supari** (LQ of 4.0). This trend towards diversification is also evident in **Hassan Taluk**, where the concentration of **other pulses** rose dramatically (LQ of 8.99) alongside the introduction of **vegetables** (LQ of 3.08) and **oil seeds** (LQ of 0.75).

3.6 Decrease in Traditional Crop Concentration

There is a clear decline in the concentration of traditional crops like **rice**, **ragi**, and **jowar** in several taluks. In 1990-91, rice had a high concentration in taluks such as Alur (LQ of 2.07) and Sakleshpur (LQ of 4.69). By 2004-05, although rice remained important, its relative concentration had decreased, with other crops gaining prominence. **Belur Taluk**, for instance, saw a reduction in ragi (LQ of 0.76) and a shift towards **maize** (LQ of 2.21) and **coffee** (LQ of 2.18). Similarly, **Hassan Taluk** showed a decrease in the concentration of rice and an increased focus on pulses and vegetables.

3.7 Introduction of New Crop Categories

The 2004-05 data also reveals the introduction of new crop categories that were either absent or less significant in 1990-91. For instance, **vegetables** and **spices** emerged as important crop categories in several taluks. **Arkalgud Taluk** introduced spices (LQ of 1.61) and increased its concentration in **vegetables** (LQ of 1.38). In contrast, these crops were not prominent in the 1990-91 data, indicating a strategic shift towards more diversified and potentially more profitable agricultural practices.

3.8 Continued Specialization in Certain Crops

Despite the overall trend towards diversification, some taluks maintained their specialization in specific crops. **Sakleshpur Taluk** continued its strong focus on **rice** (LQ of 2.01) and **coffee** (LQ of 4.57) in 2004-05, similar to its earlier concentration on rice in 1990-91. This suggests that certain regions within the district have remained consistent in their agricultural focus, likely due to favorable environmental conditions or established market channels for these crops.

4 Suggestions

Based on the findings of this study, the following suggestions are made to improve agricultural sustainability and crop productivity in Hassan district:

- **Diversification of Crops**: Encourage farmers to diversify their crops to reduce dependency on a single crop and mitigate risks associated with crop failures.
- **Irrigation Infrastructure**: Enhance irrigation facilities, particularly in taluks with declining crop concentration, to support the cultivation of water-intensive crops like rice and sugarcane.

- **Market Access**: Improve access to markets for high-value crops like spices, fruits, and coffee, which have shown increasing concentration in recent years.
- **Training and Support**: Provide training and support to farmers on modern agricultural practices, including the use of high-yielding and climate-resilient crop varieties.
- **Research and Development**: Invest in research to develop new crop varieties that are better suited to the changing climate and soil conditions in Hassan district.

5 Conclusion

This study demonstrates the dynamic shifts in crop concentration patterns in Hassan District between 1990-91 and 2004-05. The observed changes are indicative of the district's adaptive response to various influencing factors, including alterations in climate, the availability of irrigation, and evolving agricultural practices. Over this period, there has been a notable transition towards more diversified and commercially viable farming systems, with an increased emphasis on high-value crops such as coffee, sunflower, and oil seeds. While traditional staples like rice and ragi continue to hold significance, their relative concentration has diminished in favor of crops with higher market demand and economic return.

The analysis of crop concentration indices reveals a clear trend towards the diversification of agricultural practices and the introduction of new crop categories across the district. Despite this diversification, certain taluks have maintained their specialization in specific crops, reflecting localized agricultural strategies that align with regional environmental conditions and market opportunities. The findings of this study highlight the necessity for adaptive and sustainable agricultural strategies to enhance productivity and economic viability in the district. By addressing the identified challenges and implementing targeted measures, Hassan District can optimize its agricultural potential, contributing significantly to regional economic development.

Overall, the evolution of Hassan District's agricultural landscape underscores the importance of strategic planning in agricultural practices, informed by economic, environmental, and market-driven considerations. These insights are crucial for policymakers, agricultural planners, and stakeholders in developing sustainable and profitable farming systems that are resilient to changing conditions.

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