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# Industrial Growth And Its Imapct On Agriculture And Cropping Patterns In Bagalkot District, Karnataka: A Spatial Analysis

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***Abstract:***

*The area under study is one of the districts of Karnataka and is predominantly agrarian, with over 70 per cent of the population dependent on farming. The impact of the industrial sector on primary activities, particularly agriculture and forests, is a multifaceted issue, involving both positive impacts (such as agro-based industries) and negative impacts (such as resource competition). This study aims to examine the impact of industrialization on agriculture and forests in Bagalkot district over three periods (2000, 2010, and 2020).*

*In the year 2000, the district recorded 4,500 industrial units, utilizing 1,838 hectares of agricultural land for industrial purposes. This period marked the initial phase of industrial expansion, characterized by moderate growth. Within a span of a decade, the number of industries nearly doubled to 10,991 in 2010, accounting for a 144 per cent increase. However, land acquisition during this period sharply declined to 98.99 hectares, owing to a shift toward small-scale industries that required less physical space. The period from 2010 to 2020 shows an explosive industrial expansion, with the number of industries surging to 38,442, marking nearly a 250 per cent increase. Land acquisition also rose steeply to 1,188.72 hectares, indicating renewed large-scale industrial development. This expansion has had a notable influence on crop production and cultivated areas, as industrialization and market demands have driven a clear shift from traditional crops toward commercial crops and industrial inputs.*

*The growth of industries has not only impacted agricultural land but has also led to significant changes in cropping patterns. Sugarcane, a key industrial crop, exhibited massive growth, with production soaring from 13,157,984 tons in 2000 to over 104,801,751 tons in 2020, registering a net increase of 91,643,767 tons. This substantial rise was supported by a corresponding expansion in the cultivated area, which increased from 115,938 hectares to 1,203,297 hectares. This trend clearly signifies the impact of industrialization, where crops are cultivated on an industrial scale to supply processing factories such as sugar mills and ethanol production units.*

*In contrast, banana production recorded negative growth, declining from 3,862,800 tons in 2010 to about 3,172,800 tons in 2020. Although production decreased slightly, the cultivated area nearly doubled, expanding from 1,578 hectares to 2,645 hectares. Overall, the period from 2000 to 2020 witnessed a decisive shift away from traditional agriculture toward highly commercialized farming. The industrial sector's impact on agriculture in Bagalkot district is primarily centered on agro-processing industries particularly sugar factories and presents both opportunities for economic growth and significant challenges, especially with regard to water resource management and crop diversification.*

***Keywords**: Acquisition, Hectares, Impact, Increase, Production, Tons.*

**Introduction:**

Industrial growth in Bagalkot District of Northern Karnataka has brought significant economic, spatial, and environmental changes, directly affecting agriculture and cropping patterns. Geographically, industrial growth can be defined **as "the expansion and concentration of productive activities in a region that utilize local resources, generate employment, and modify the economic landscape,"** as noted by **Michael Storper**, highlighting its role in shifting labor and land from subsistence farming to market oriented systems. In Bagalkot, industrial growth is closely linked to agro based and mineral based industries, particularly sugar, cement, and limestone, which depend on local agricultural and mineral resources.

This relationship reflects **Hirschman's** idea of **backward and forward linkages**, where industrial growth encourages agricultural production, and agriculture provides raw materials for industries. Historically, Bagalkot agriculture was dominated by dryland crops like jowar, bajra, pulses, and oilseeds, which **Sauer** described as **"human adaptation to environmental constraints, shaped over generations to optimize resource use in marginal climates."** The development of irrigation through the Upper Krishna Project and Almatti Dam shifted cultivation from traditional crops to water intensive sugarcane to meet industrial demand from sugar mills.

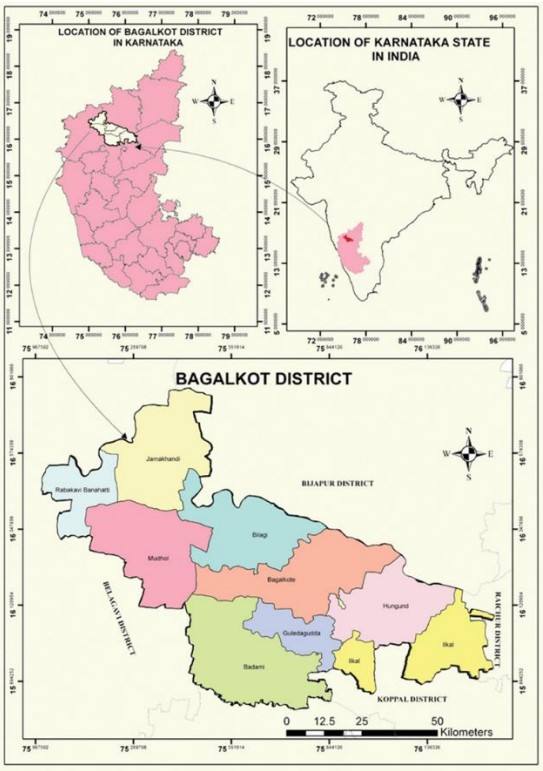
**Von Thunen's** model explains this change, as high value crops tend to grow closer to markets and industries, making taluks with better connectivity adopt sugarcane faster. Industrialization has increased mechanization, improved farm productivity, and assured income through the Fair and Remunerative Price system, but it has also reduced crop diversity, stressed water resources, and affected soil fertility. **Gregory** noted that **"industrial expansion leaves a lasting imprint on the landscape, often reshaping ecological and social systems in ways that persist across generations,"** which is visible in Bagalkot as sugarcane replaces millet fields. Socially, seasonal labor migration linked to industrial cycles blurs the roles of farmers and industrial workers, while dependence on factory demand and global commodity prices creates economic vulnerability.

Mineral based industries, especially cement production using limestone, have also transformed land use and added environmental pressure, demonstrating **Losch's** point that **"economic activities arrange themselves in space to maximize profitability, often generating conflicts for scarce land and resources."** These changes have produced a dual economy, where irrigated, industrially connected taluks thrive with commercial crops and mechanization, while rainfed areas rely on traditional farming, reflecting Myrdal's theory of cumulative causation, which states that regional inequalities grow without policy intervention. Overall, industrial growth in Bagalkot has driven modernization, technology adoption, and market integration, but it has also reshaped cropping patterns, increased environmental vulnerability, and created socio economic dependencies, showing that careful management of land, resources, crops, and industries is essential for sustainable and balanced growth. Bagalkot experience highlights the complex link between industrialization and agriculture, where development brings both opportunities and challenges that must be managed thoughtfully to ensure long term resilience

**Study Area:**

Bagalkot District is located in the northern part of Karnataka, covering an area of

about 6,577 square kilometers. It lies between 15°49′ and 16°56′ North latitude and 74°42′ to 76°18′ East longitude. The district is bordered by Belagavi to the west, Gadag to the south, Vijayapura to the north, and Raichur to the east. Its terrain mainly consists of gently rolling plains, low hills, and plateau regions. The Krishna river, along with its major tributaries, the Ghataprabha and Malaprabha rivers, traverses the district, providing a crucial source of water for irrigation and domestic use, Krishna river basin forms the backbone of the region's irrigation system, supporting extensive canal networks that supply water to agricultural lands, Bagalkot has a semi-arid climate with three distinct seasons: hot summers, monsoon, and mild winters. The average annual rainfall is about 600 millimeters, the district is predominantly covered by black cotton soils, which are fertile and ideal for a variety of crops, major crops include sugarcane, groundnut, maize, cotton, and sunflower, while horticultural crops such as grapes, bananas, and pomegranates are also cultivated. Irrigation is largely dependent on the Krishna River and its reservoirs, including Almatti and Ghataprabha, supplemented by canal systems to support multiple cropping.




**Objectives:**

The main objectives of the present study which provide clear direction and focus for thstrenthen the quality e research.

1. To examine the growth and spatial pattern of industries in Bagalkot District from 2000 to 2020.
2. To assess **taluka-wise variations** in the types, scale, and concentration of industries across the district.
3. To analyze the impact of industrial development on agricultural land use and cropping patterns.
4. To evaluate the relationship between industrial expansion and agricultural productivity.
5. To evaluate changes in cropping patterns in relation to the expansion from agro-based industries to commercial industries.

**Data Base and Methodology:**

The present study is based on secondary data obtained from various government and institutional sources, including the *District*

*Gazetteer of Bagalkot*, *Census of India*, *Department of Industries and Commerce*, *Department of Agriculture*, and municipal records of Bagalkot District (2000–2020), as well as relevant journals and articles. The data include indicators of industrial development such as the number of registered industries, industrial employment, and pollution, along with agricultural performance indicators such as cropping intensity, crop yield, and gross sown area. To examine the relationship between industrial growth and agricultural development, quantitative statistical techniques have been employed. The Location Quotient (LQ) technique is applied to measure the strength and direction of the relationship between industrial and agricultural activities. Choropleth maps were generated to visualize the distribution and intensity of industrial concentration, agricultural performance, and environmental impact across talukas, enabling clear identification of high-impact areas and spatial disparities.

**Result And Discussion:**

**Table.1 Spatio-Temporal Analysis of Industrial Growth (2000-2020)**

| SI.NO | TALUKA | 2000 | 2010 | 2020 | TOTAL |
|---|---|---|---|---|---|
| 1 | JAMKHANDI | 740 | 2074 | 3762 | 6576 |
| 2 | MUDHOL | 698 | 1601 | 2987 | 5286 |
| 3 | BILAGI | 398 | 858 | 1937 | 3193 |
| 4 | R-BANAHATTI | 430 | 1186 | 3307 | 4923 |
| 5 | BADAMI | 483 | 910 | 2042 | 3435 |
| 6 | BAGALKOT | 911 | 2196 | 4265 | 7375 |
| 7 | GULLEDAGUDDA | 211 | 421 | 691 | 2028 |
| 8 | HUNGUNDA | 343 | 988 | 2194 | 3525 |
| 9 | ILKAL | 286 | 757 | 1058 | 2101 |
| **TOTAL** | | **4500** | **10991** | **22243** | **38442** |

**Source:** Karnataka State Small Industries Development Corporation (KSSIDC).

The table presents taluka-wise distribution of industrial in r Bagalkot District for the years 2000, 2010, and 2020, highlighting both temporal growth and spatial variation across talukas.

**Temporal Analysis:**

Temporally, Table 1 and Fig.1 reveal a consistent and substantial increase in the total number of industries across all talukas over the study period. The total number of industries in the district increased from **4,500 in 2000** to **10,991 in 2010**, and further to **22,243 in 2020**, indicating rapid industrial growth over two decades. This growth reflects accelerated industrialization, particularly after 2010, as the number of industries more than doubled between 2010 and 2020. The trend suggests improved infrastructure, policy support, and expanding market opportunities within the district.

**Spatial Analysis:**

Spatially, industrial development shows significant variation among talukas. **Bagalkot taluka** consistently recorded the highest number of industries throughout the study period, increasing from **911 in 2000** to **4,265 in 2020**, with a cumulative total of **7,375**, indicating its role as the primary industrial hub of the district. **Jamkhandi** and **Mudhol** also exhibit strong industrial concentration, with total values of **6,576** and **5,286** respectively, suggesting their importance as secondary industrial centers. Talukas such as **Banahatti** and **Hungund** show notable growth, particularly between 2010 and 2020, indicating emerging industrial regions. In

contrast, **Gulledagudda** and **Ilkal** recorded comparatively lower industrial numbers throughout the period,
reflecting slower industrial expansion and limited industrial concentration in these areas. Overall, the spatial pattern indicates a clear concentration of industrial activities in a few major talukas, while others lag behind, leading to spatial disparities in industrial development. Temporally, the uniform upward trend across all talukas suggests district-wide industrial growth, though at varying rates, reinforcing the need for balanced regional development strategies.

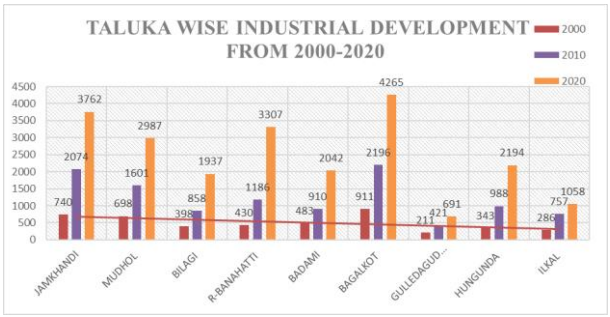



Fig.1

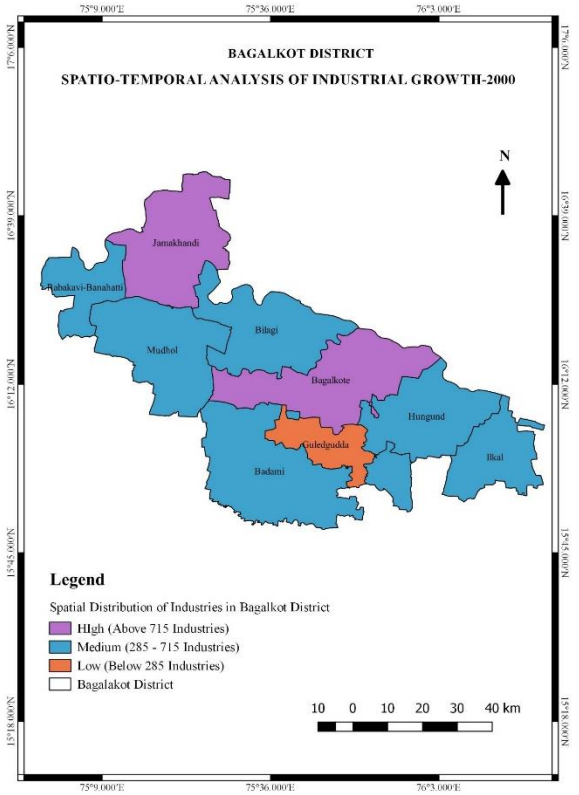
**Table 1 and Fig. 1 show that there was a continuous growth of industries in the study area during the period from 2000 to 2020, with clear spatial variations among the talukas of the district.** In 2000, the total number of industries across all talukas was **4,500**, reflecting a relatively low initial base. **Bagalkot taluka** recorded the highest value (**911**), indicating early dominance due to its administrative importance, better infrastructure, and higher levels of economic activity. This was followed by **Jamkhandi (740)** and **Mudhol (698)**, which also showed relatively strong initial positions. In contrast, **Gulledagudda (211)** and **Ilkal (286)** reflected limited development and a weaker economic base, while **Bilagi, Badami, Hungund, and Rabakavi-Banahatti** occupied a middle position with moderate levels of industrial activity.

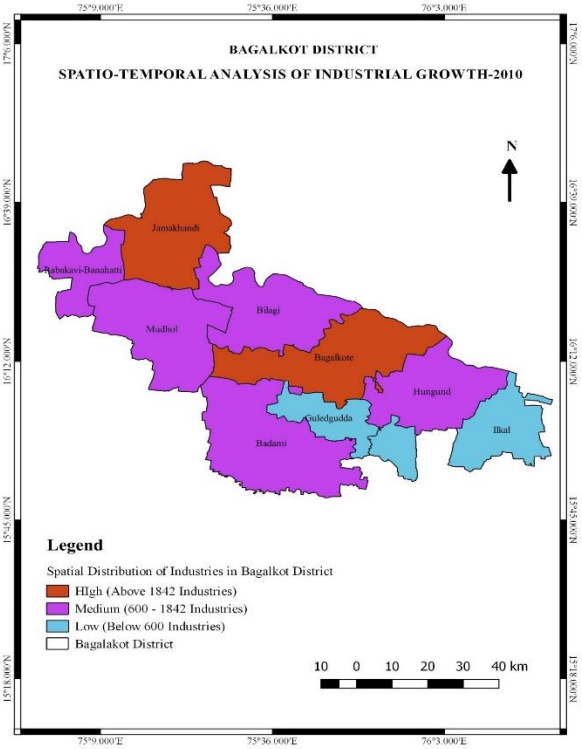
By **2010**, the district total increased sharply to **10,991**, more than double the 2000 figure, indicating accelerated industrial growth across the district. **Bagalkot** maintained its lead with **2,196**, showing more than a two-fold increase. **Jamkhandi (2,074)** and **Mudhol (1,601)** also registered substantial growth, reflecting improved connectivity and expanding economic opportunities. **Rabakavi-Banahatti** increased to **1,186**, suggesting that industrial development was spreading beyond the main urban centers. However, **Gulledagudda (421)** and **Ilkal (757)** remained comparatively low, indicating slower growth in less developed areas. Overall, the period from **2000 to 2010** represented rapid expansion accompanied by emerging spatial imbalances, as more developed talukas grew faster than others.

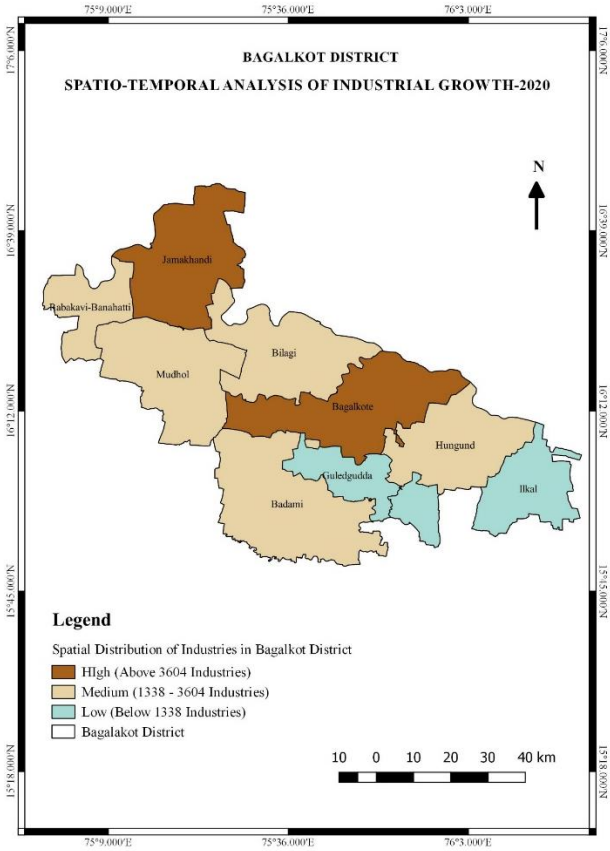
In **2020**, industrial growth intensified further, with the district total rising to **22,243**, nearly double the 2010 level. **Bagalkot** strengthened its dominance with **4,265**, confirming its role as the principal growth center. **Jamkhandi (3,762)** emerged as a strong secondary center, while **Rabakavi-Banahatti (3,307)** showed a sharp increase. **Mudhol** continued its upward trend, reaching **2,987**, and **Hungund** and **Badami** also recorded notable increases, indicating a wider spatial spread of industrial growth. Despite this overall improvement, **Gulledagudda (691)** and **Ilkal (1,058)** remained at the lower end, reflecting persistent structural and developmental constraints.

Considering the **cumulative totals from 2000 to 2020**, the district recorded **38,442**, demonstrating long-term industrial growth across all talukas. **Bagalkot** contributed the highest total (**7,375**), followed by **Jamkhandi (6,576)**, **Mudhol (5,286)**, and **Rabakavi-Banahatti (4,923)**, together accounting for a major share of the district total. **Bilagi, Badami, and Hungund**

exhibited steady but moderate growth, while **Gulledagudda** and **Ilkal** recorded the lowest cumulative values (**2,028** and **2,101** respectively). This clearly indicates that although industrial growth increased steadilyover time, it remained **spatially uneven and concentrated in a few talukas**.




**Concentration of industries: Based on Locational Quotient:**

The taluka-wise overall **Location Quotient (LQ)** table, based on cumulative totals for the period **2000–2020**, clearly brings out the spatial pattern of industrial concentration and specialization across the district. The district recorded a total of **38,442 industries**. Talukas with a location quotient value greater than **1** indicate a higher-than-average concentration of industries, while values below **1** suggest a relatively lower share compared to the district average.

**Table .2 Concentration of industries based on Locational Quotient Based on Cumulative (2000-2020)**

| Si. No | Taluka | Total (2000-2020) | Location quotient |
|---|---|---|---|
| 1 | Jamkhandi | 6576 | 1.54 |
| 2 | Mudhol | 5286 | 1.24 |
| 3 | Bilagi | 3193 | 0.75 |
| 4 | R-Banahatti | 4923 | 1.15 |
| 5 | Badami | 3435 | 0.8 |
| 6 | Bagalkot | 7375 | 1.73 |
| 7 | Gulledagudda | 2028 | 0.47 |
| 8 | Hungund | 3525 | 0.83 |
| 9 | Ilkal | 2101 | 0.49 |
| | **District Total** | 38,442 | |

**Source:** Karnataka State Small Industries Development Corporation (KSSIDC).

On this basis, **Bagalkot taluka** emerges as the most dominant unit, with a cumulative total of **7,375 industries** and a location quotient of **1.73**. This reflects a strong concentration of industrial activities and confirms its role as the principal growth center, supported by administrative importance, better infrastructure, market accessibility, and diversified economic opportunities. **Jamkhandi** follows with a cumulative total of **6,576** and a location quotient of **1.54**, indicating a high level of specialization and reinforcing its position as a major secondary growth center within the district. **Mudhol**, with a cumulative total of **5,286** and a location quotient of **1.24**, also exhibits an above-average concentration, suggesting steady growth supported by improving connectivity and expanding economic activities. Similarly, **Rabakavi-Banahatti**, with a total of **4,923** and a location quotient of **1.15**, reflects emerging importance and gradual integration into the district's development framework (Table. 2 &Fig.2).

In contrast, talukas such as **Bilagi, Badami, Hungund, Ilkal, and Gulledagudda** record location quotient values below **1**, indicating a comparatively lower concentration of industrial activities. **Bilagi**, with a cumulative total of **3,193** and a location quotient of **0.75**, represents a moderately developed taluka that has experienced growth, but not at a pace sufficient to match the district average. **Badami**, with a total of **3,435** and a location quotient of **0.80**, shows a similar pattern of steady but restrained development, possibly influenced by physical constraints and limited industrial expansion. **Hungund** records a cumulative value of **3,525** with a location quotient of **0.83**, reflecting gradual improvement but continued dependence on traditional economic activities. **Ilkal** and **Gulledagudda** occupy the lowest positions, with location quotient values of **0.49** and **0.47** respectively, clearly indicating weak industrial concentration and limited growth over the study period. These conditions may be attributed to factors such as remoteness, inadequate infrastructure, and a narrow economic base.

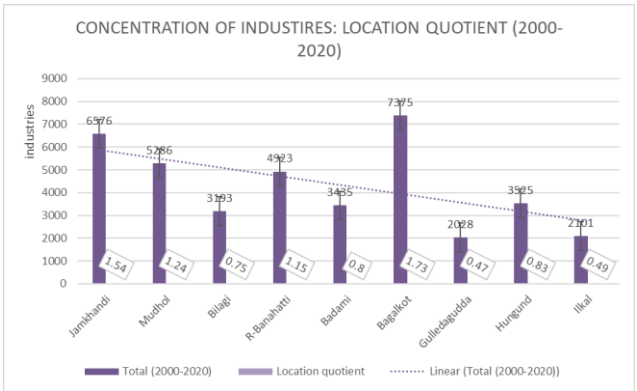
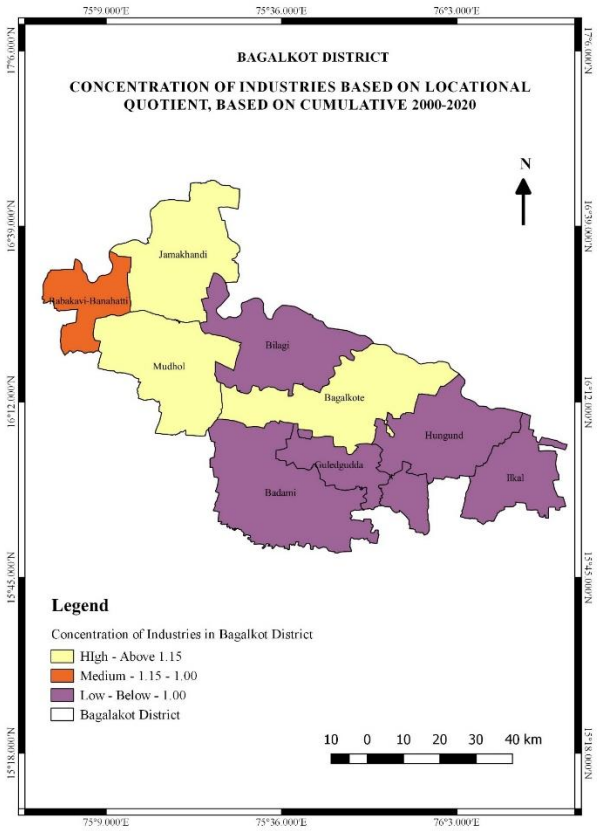



Fig.2




Overall, the locational quotient analysis reveals a clear spatial imbalance within the district, where development and economic activities are heavily concentrated in a few dominant talukas, particularly Bagalkot and Jamkhandi, while several others lag behind.

**Spatio- temporal analysis of Area under cultivation and production:**

The year-wise statistical analysis of crop area and production reveals a clear numerical transformation in the agricultural structure of the study area between **2000 and 2020**, marked by strong growth, increasing specialization, and selective diversification. In **2000**, agricultural production was highly concentrated in **sugarcane, coconut, and banana**. Sugarcane recorded a production of **13.16 million tons** from **115,938 ha**, coconut produced **12.39 million tons** from **2,601 ha**, and banana yielded **3.86 million tons** from **954 ha**. In contrast, **turmeric** and **sweet potato** remained marginal, with productions of **3,160 tons from 611 ha** and **324 tons from 102 ha** respectively, indicating low levels of diversification and the dominance of traditional irrigated crops(Table 3).

By **2010**, both total output and cultivated area expanded substantially. Sugarcane production increased to **38.85 million tons** with an area of **305,876 ha**, registering an absolute area growth of **189,938 ha** compared to 2000. Coconut production more than doubled to **26.29 million tons**, with the area expanding to **5,008 ha**. Turmeric showed a sharp rise to **68,134 tons** from **5,197 ha**, reflecting more than a sevenfold expansion in area. In contrast, banana production declined to **66,368 tons** despite an increase in area to **1,578 ha**, indicating reduced productivity. The emergence of **cotton (29,140 tons from 16,556 ha)**, **grapes (94,898 tons from 2,437 ha)**, **mango (2,073 tons from 888 ha)**, and **other fruits (1,755 tons from 835 ha)** statistically confirms diversification during this decade.

Overall, between **2000 and** in**2020**, agricultural growth intensified further. Sugarcane production rose sharply to **104.80 million tons** from **1,203,297 ha**, showing a nearly threefold increase in area over 2010. Coconut production increased to **55.09 million tons** with **6,376 ha**, reflecting sustained plantation expansion. Turmeric recorded exceptional growth, with production reaching **249,999 tons** from **38,263 ha**, indicating large-scale adoption of this high-value crop. Banana production further declined to **31,728 tons**, despite an increase in area to **2,645 ha**, highlighting a continued fall in yield. The introduction of **ginger (8,129.5 tons from 346 ha)**, **tomato (1,492 tons from 435 ha)**, and **tobacco (14 tons from 17 ha)** reflects continued, though limited, diversification.

**2020**, sugarcane production increased nearly **sevenfold**, coconut production by more than **four times**, and turmeric production by several thousand percent. Area expansion was most pronounced for **sugarcane and turmeric**,

statistically indicating a strong shift toward **irrigated, commercial, and high-output agriculture**, accompanied by increasing crop concentration and widening inter-crop disparities

**Table.3 Crop-wise Production and Area under Cultivation of Bagalkot District (2000- 2020)**

| YEAR | 2000 | AREA (ha) | 2010 | AREA (ha) | 2020 | AREA (ha) |
|---|---|---|---|---|---|---|
| **Crops** | **Production** | | **Production** | | **Production** | |
| BANANA | 3862800 | 954 | 66368 | 1578 | 31728 | 2645 |
| COCONUT | 12398000 | 2601 | 26293000 | 5008 | 55085000 | 6376 |
| SUGARCANE | 13157984 | 115938 | 38847963 | 305876 | 104801751 | 1203297 |
| TURMURIC | 3160 | 611 | 68134 | 5197 | 249999 | 38263 |
| COTTON | | | 29140 | 16556 | | |
| GINGER | | | | | 8129.5 | 346 |
| SWEET POTATO | 324 | 102 | 1071 | 278 | 1193 | 83 |
| TOBACO | | | 1 | 1 | 14 | 17 |
| TOMATO | | | | | 1492 | 435 |
| MANGO | | | 2073 | 888 | | |
| GRAPHES | | | 94898 | 2437 | | |
| OTH FRUITS | | | 1755 | 835 | | |

**Source:** National Bank for Agriculture and Rural Development, Bagalkot, Karnataka

**Change in Land use and cropping pattern:**

**Table 4** illustrates the decadal changes in land use and cropping patterns in **Bagalkot District** from **2000 to 2020**, showing notable shifts in agricultural utilization and intensity. The geographical area remained constant at **658,877 hectares** throughout the study period, indicating that the observed changes are the result of internal land-use adjustments rather than spatial expansion.

The **net sown area** increased from **434,749 ha in 2000** to **469,783 ha in 2010**, reflecting the conversion of fallow and unused land into cultivated land, supported by improved farming practices and favorable economic incentives. However, it slightly declined to **467,000 ha by 2020**, suggesting a stabilization of cultivable land in the district. In contrast, the **net irrigated area** declined from **243,007 ha in 2000** to **212,872 ha in 2010**, possibly due to groundwater depletion, rainfall variability, and constraints in canal water supply. This trend reversed by **2020**, when the irrigated area increased sharply to **267,757 ha**, indicating the expansion of irrigation infrastructure through canals, lift irrigation systems, and bore wells.

The **gross cropped area** showed a consistent and significant increase, rising from **477,756 ha in 2000** to **571,622 ha in 2010**, and further to **610,000 ha in 2020**. This clearly demonstrates an increase in **cropping intensity** and more efficient utilization of agricultural land through multiple cropping, improved crop management practices, and technological adoption.

Overall, these trends highlight a transition in Bagalkot District from **extensive agriculture toward intensification**, driven by improved irrigation facilities, technological advancements, and growing demand for agricultural production.

**Table.4 Decadal Changes in Land Use and Cropping Pattern of Bagalkot District (2000-2020)**

| Year | Geofraphical Area (Ha) | Net Sown (Ha) | Net Irrigated Area (Ha) | Gross Cropped Area (Ha) |
|---|---|---|---|---|
| 2000 | 658,877 | 434,749 | 243,007 | 477,756 |
| 2010 | 658,877 | 469,783 | 212,872 | 571622 |
| 2020 | 658,877 | 467,000 | 267,757 | 610,000 |

**Source:** Karnataka State Industrial Policy 2011,2020.

**Table.5 Decadal Changes in Land Use / Land Cover (LULC) Classes in Bagalkot District (2000-2020)**

| LULC Class | 2000 (ha) | 2010 (ha) | 2020 (ha) | Net Change (2000–2020) |
|---|---|---|---|---|
| Agricultural Land | 4,82,000 | 4,80,750 | 4,73,650 | –8,350 ha |
| Industrial Land | 5,800 | 7,900 | 14,600 | +8,800 ha |
| Built-up area | 12,400 | 18,300 | 24,900 | +12,500 ha |

**Source**: Karnataka State Industrial Policy 2011.

**Table 5** shows the changes in **Land Use and Land Cover (LULC)** in Bagalkot District between **2000 and 2020**, indicating a gradual transformation of the district's landscape due to industrialization and urban expansion. **Agricultural land**, which remained the dominant land use category, declined from **482,000 ha in 2000** to **473,650 ha in 2020**, recording a net loss of **8,350 ha** over two decades. This reduction reflects the steady conversion of cultivable land into non-agricultural uses, particularly in areas influenced by industrial growth, infrastructure development, and urban expansion.

**Industrial land** increased significantly from **5,800 ha in 2000** to **14,600 ha in 2020**, registering a net gain of **8,800 ha**, highlighting the growing importance of industrial activities such as cement manufacturing, agro-based industries, and small-scale industrial units in the district's economic structure. The **built-up area** exhibited the highest growth, expanding from **12,400 ha in 2000** to **24,900 ha in 2020**, with a net increase of **12,500 ha**, reflecting rapid urbanization driven by population growth, expansion of towns and residential areas, development of transport networks, and establishment of public infrastructure.

Overall, these changes indicate a clear shift from an **agriculture-dominated land use pattern** toward a more **diversified landscape**, increasingly characterized by industrial and urban land uses.

**Findings:**

The analysis of industrial growth, agricultural cropping pattern changes, and land-use dynamics in Bagalkot District from 2000 to 2020 reveals a profound structural and spatial transformation of the district's economy and landscape. Over the two-decade period, the total number of industries increased sharply from **4,500** in 2000 to **10,991** in 2010 and further to **22,243** in 2020, indicating rapid and sustained industrial growth, particularly after 2010 when industrial units more than doubled within a single decade, reflecting improved infrastructure, policy support, expanding markets, and increased investment in manufacturing and agro based industries. Despite this overall growth, industrial development remained spatially uneven, with Bagalkot taluka consistently emerging as the dominant industrial hub, increasing from 911 industries in 2000 to **4,265** in 2020 and recording the highest cumulative total of **7,375** industries, a dominance attributable to its administrative

importance, superior infrastructure, accessibility, and diversified economic base. Jamkhandi and Mudhol also maintained strong industrial concentrations throughout the study period, functioning as important secondary growth centers with cumulative totals of **6,576** and **5,286** respectively, while Rabakavi-Banahatti, and Hungund showed notable growth after 2010, indicating the gradual outward diffusion of industrial activities into emerging areas. In contrast, Gulledagudda and Ilkal consistently recorded the lowest number of industries across all years, reflecting persistent structural constraints such as remoteness, limited infrastructure, weaker market linkages, and a narrow economic base, thereby reinforcing intra district spatial disparities.

The location quotient analysis further confirms this imbalance, with Bagalkot, Jamkhandi, Mudhol, and Rabakavi Banahatti exhibiting values greater than one, signifying higher than average industrial concentration and specialization, while the remaining talukas recorded values below one, indicating relative under representation of industrial activities. Parallel to industrial expansion, the district experienced significant transformation in its agricultural structure, with production in 2000 heavily concentrated in traditional irrigated crops such as sugarcane, coconut, and banana, reflecting limited diversification, while subsequent years witnessed substantial expansion in both cultivated area and output, particularly for sugarcane and turmeric, the latter showing exceptional growth by 2020 and indicating a shift toward high value **commercial cropping**. Although crop diversification increased with the introduction of cotton, grapes, mango, ginger, tomato, and tobacco, it remained selective, and declining banana productivity despite area expansion highlighted emerging challenges related to resource stress and yield sustainability.

Land-use dynamics indicate a shift toward agricultural intensification rather than spatial expansion, as net sown area increased up to 2010 and then stabilized, while gross cropped area rose continuously, reflecting higher cropping intensity supported by improved irrigation and technology. Irrigation declined between 2000 and 2010 due to groundwater stress and rainfall variability but increased sharply by 2020 with renewed investments in canals, lift irrigation, and bore wells, reinforcing the dominance of water intensive commercial crops. Concurrently, the district experienced notable land use and land cover change, with agricultural land declining by **8,350 hectares** between 2000 and 2020, alongside substantial expansion of industrial and built up areas. These trends reveal intensifying competition between agricultural and non-agricultural land uses, especially around major industrial talukas, and growing pressure on land and water resources.

Overall, the influence of industrial activities on agriculture in **Bagalkot District** necessitates an **integrated and strategic approach** that balances economic progress with environmental protection. While industrial development has supported local employment and infrastructural growth, its adverse impacts on **soil health, water availability, air quality, and overall agricultural productivity** remain significant challenges. Recommended interventions including**stricter regulatory oversight, adoption of modern pollution control systems, scientific land-use planning, sustainable groundwater management, soil restoration measures, farmer capacity building, and stronger institutional collaboration**offer a viable roadmap to mitigate these negative effects.

The effective implementation of these strategies will safeguard the agricultural sector while promoting **long-term ecological balance**

**and socio-economic stability**. Ultimately, responsible industrial growth, guided by forward-looking **environmental and agricultural policies**, will be essential to achieving a **sustainable and prosperous future** for Bagalkot District.

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