

AN ECONOMIC ANALYSIS OF GROWTH AND CHANGES IN CROPPING PATTERN IN KARNATAKA

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Abstract—The study aims at explain the agriculture continues to be an important component of Karnataka's economy and rural livelihood system. However, the cropping pattern of the state has undergone considerable changes because of variations in rainfall, irrigation, market prices, agricultural technology, government policies, changing consumer demand and the increasing commercialization of agriculture. The agricultural sector of the state recorded a 9.1% growth rate at constant prices, marking a significant recovery from the slowdown witnessed as per the Agricultural Department of India report (2025). This strong rebound was primarily supported by favourable monsoon conditions, the adoption of strategic technological interventions, improved agricultural practices, and increased government support and budgetary allocations for farmers. These factors collectively contributed to enhancing agricultural productivity, strengthening farm-sector resilience, and promoting overall growth in the state's agricultural economy. The results indicate that the area under foodgrains increased from 73.38 lakh hectares in 2015–16 to 85.71 lakh hectares in 2024–25, while the area under pulses expanded substantially.

The study reveals that Karnataka's cropping pattern experienced varied changes during 2015–16 to 2024–25. The exponential growth model indicates that cereals recorded a statistically significant positive growth of 1.70% per annum with an R^2 value of 0.667 and a p-value of 0.0039. Pulses showed almost negligible growth of 0.07%, while food grains registered a positive growth of 1.07% per annum. Oilseeds recorded a negative growth of -2.97%, indicating a decline in cultivated area. Cotton and sugarcane showed positive growth rates of 4.50% and 2.99%, respectively, although these trends were statistically insignificant at the 5% level. Overall, the results indicate that changes in Karnataka's cropping pattern have been uneven across crop groups. The hypothesis test confirms that the increase in cereal area is statistically significant, leading to rejection of the null hypothesis for cereals, whereas the null hypothesis is not rejected for pulses, food grains, oilseeds, cotton and sugarcane. The findings highlight a gradual shift in the state's crop composition and emphasize the importance of sustainable crop planning, irrigation management and diversification of agricultural production.

Index Terms—Agriculture, Agricultural Growth, Cropping Pattern, Crop Diversification, Cereals, Pulses, Oilseeds, and Commercial Crops

I. Introduction

Cropping pattern refers to the proportion of cultivated land allocated to different crops during a particular agricultural year. It is an important indicator of the economic and geographical structure of agriculture because changes in crop composition reflect variations in resource availability, climatic conditions, irrigation, technology, market demand and government agricultural policies. Karnataka has considerable agricultural diversity because of its varied soils, rainfall conditions, topography and

agro-climatic characteristics. The state is divided into 10 agro-climatic zones, allowing the cultivation of cereals, pulses, oilseeds, commercial crops, plantation crops and horticultural crops. During the last decade, Karnataka's agricultural economy has experienced both expansion and structural change. The area allocated to pulses has increased significantly, while the relative importance of oilseeds has declined. Maize, ragi, tur, green gram, soybean and some horticultural crops have gained importance in different periods. As per the Karnataka Economic Survey (2025), maize, tur, green gram, soybean and sugarcane among crops showing increasing trends in recent years, while paddy, jowar, bajra, groundnut, sunflower and cotton have shown declining or fluctuating trends in the recent period. The economic significance of agriculture is also evident from state-level GVA. Karnataka's agriculture GVA at constant 2011-12 prices increased from about Rs.48,271 crore in 2015-16 to Rs.65,384 crore in 2024–25, representing an estimated compound annual growth rate of 3.43%.

II. Objectives of the Study

The present study has the following major objectives:

1. To examine the performance and growth of the agriculture sector in Karnataka.
2. To analyse the growth in trends of changing cropping patterns and crop diversification in the state.

III. Hypothesis

1. There is a significantly cropping pattern changes have increased in Karnataka over the past few periods.

IV. Material and Methods

The present study analyses the growth and structural changes in Karnataka's cropping pattern during 2015–16 to 2024–25. The study is based mainly on secondary data obtained from the Directorate of Economics and Statistics (DES), Government of Karnataka; Karnataka Economic Surveys; NABARD reports; the Directorate of Economics and Statistics; and the Ministry of Agriculture and Farmers Welfare; and, additionally, reputed journals, articles, newspapers, edited books, websites, etc. **Statistical Techniques for Data Analysis:** The collected data were analysed using percentage analysis, crop-share analysis, Compound Annual Growth Rate (CAGR), trend analysis and the Exponential Growth Model, while crop-share analysis was employed to determine the contribution of individual crop groups to the total cropped area. The CAGR was used to measure the average annual rate of growth in the area under different crops.

Exponential Growth Model for Cropping Pattern: It is useful for measuring the rate and direction of changes in the area under different crops in Karnataka over time. It can be applied to annual data on cereals, pulses, oilseeds, commercial crops, fruits and vegetables, or total cropped area.

The model is expressed as:

$$Y_t = ae^{bt}$$

Taking the natural logarithm:

$$\ln(Y_t) = \ln(a) + bt$$

Where:

Y_t = area under a crop in year t

a = constant

b = exponential growth coefficient

t = time period

The annual growth rate is calculated as: $G = (e^b - 1) \times 100$

Performance and Growth of Agricultural Sector in Karnataka

Agriculture has remained an important component of Karnataka's economy, although its relative contribution to the state's overall economy has changed with the expansion of industry and services. The major districts of Karnataka State fall in Zone X (Southern Plateau and Hilly region), and districts like Udupi, Uttara Kannada and Dakshina Kannada come under Zone XII (West Coast Plains and Ghats region). The State is divided into 10 agro-climatic zones on the basis of distribution and percentage of Rainfall, soil quality, height from the sea and based on major crops. On account of these varied agro-climatic features, almost all cereals, pulses, oilseeds and commercial crops are cultivated in different parts of the State. Farmers in Karnataka are very innovative and take the lead in diversification as per the market trends.

Table-1

Agriculture GVA and Annual Growth Rate in Karnataka at Constant 2011–12 Prices

Year	Agriculture GVA (Rs.in lakh)	Growth Rate (%)
2015–16	48,27,055	-
2016–17	49,27,234	2.08
2017–18	63,88,027	29.65
2018–19	57,38,701	-10.16
2019–20	66,69,336	16.22
2020–21	74,85,269	12.23
2021–22	76,09,740	1.66
2022–23	72,35,450	-4.92
2023–24	63,81,831	-11.80

2024–25	65,38,357	2.45
CAGR	3.43%	
Overall Growth	35.45%	

Source: National Statistical Office and RBI Compilation of State GVA data – 2015 to 2024.

The table shows that Karnataka's Agriculture GVA increased from Rs.48,27,055 lakh in 2015–16 to Rs.65,38,357 lakh in 2024–25. Thus, agriculture GVA increased by Rs.17,11,302 lakh, representing an overall increase of about 35.45% during the study period. The CAGR of 3.43% indicates that agriculture GVA grew at an average compounded annual rate of about 3.43% during 2015–16 to 2024–25. However, the annual growth pattern was highly fluctuating. The highest growth rate was 29.65% in 2017–18, followed by 16.22% in 2019–20 and 12.23% in 2020–21. These years indicate relatively strong agricultural performance. In contrast, Agriculture GVA declined by 10.16% in 2018–19, 4.92% in 2022–23, and most notably by 11.80% in 2023–24. The negative growth suggests considerable year-to-year variability in agricultural performance, which can be associated with fluctuations in rainfall, drought conditions, crop production, prices and other agricultural conditions.

V. Results and Discussion

Trends of Cropping Pattern Changes in Karnataka

This study analyse the growth in trends of cropping pattern changes in Karnataka. The average area of crops grown in three seasons, viz. Kharif (82.25 lakh ha.), Rabi (23.64 lakh ha.) and summer (6.09 lakh ha.) is 111.99 lakh ha from 2020 to 2024. Cereals, Pulses, Oilseeds, Cotton, Sugarcane and Tobacco account for 45%, 28%, 10%, 7%, 9% and 1% respectively of the total agricultural cropped area. The major crops like Maize, Tur, Green gram, Soyabean and Sugarcane are witnessing a higher trend, whereas crops like Paddy, Jowar, Bajra, Groundnut, Sunflower and Cotton are witnessing a declining trend in recent years (Economic Survey of Karnataka, 2025).

Table-2 Area under Cropping Pattern in Karnataka (2015–16 to 2024–25)

(Area: Lakh Ha)

Year	Cereals	Pulses	Food Grains	Oilseeds	Cotton	Sugarcane
2015–16	45.07	28.31	73.38	12.86	6.42	4.50
2016–17	44.95	30.79	75.73	13.74	4.48	4.66
2017–18	45.27	31.60	76.87	12.71	5.31	4.40
2018–19	45.28	35.70	80.98	9.99	7.18	7.94
2019–20	48.96	32.77	81.73	10.66	8.17	4.28
2020–21	53.02	31.90	84.93	12.35	8.37	4.52
2021–22	50.80	32.54	83.34	12.22	6.88	6.50

2022–23	50.17	28.91	79.08	12.83	9.69	7.08
2023–24	50.09	26.66	76.75	8.97	7.59	5.54
2024–25	50.84	34.87	85.71	9.44	6.91	5.51
Change (%)	12.80	23.17	16.80	–26.59	7.63	22.44

Sources: Government of Karnataka (2025), Karnataka Economic Surveys and Directorate of Economics and Statistics– 2015 to 2024.

The table clearly demonstrates that Karnataka's cropping pattern underwent considerable structural changes during 2015–16 to 2024–25. Although cereals continued to occupy the largest share among the major crop groups, pulses and sugarcane recorded substantial increases, while oilseeds experienced a significant decline. The area under cereals increased from 45.07 lakh ha in 2015-16 to 50.84 lakh ha in 2024-25, representing an increase of 12.80%. The cereal area remained relatively stable during 2015-16 to 2018-19 but increased considerably to 53.02 lakh ha in 2020-21. Thereafter, it declined slightly and recovered to 50.84 lakh ha in 2024-25. This indicates that cereals continue to be the principal component of Karnataka's cropping system, although their relative importance has fluctuated. Pulses recorded a strong long-term increase. The area increased from 28.31 lakh hectares in 2015–16 to 34.87 lakh ha in 2024–25, representing an increase of 23.17%. The area reached a peak of 35.70 lakh hectares in 2018-19, declined to 26.66 lakh ha in 2023–24 and subsequently recovered sharply to 34.87 lakh hectares in 2024–25.

The increasing importance of pulses indicates greater diversification within Karnataka's food-grain sector. Pulses are particularly important for rainfed agriculture because of their relatively lower water requirement and their contribution to soil fertility. The area under total food grains increased from 73.38 lakh ha in 2015–16 to 85.71 lakh ha in 2024–25, representing an overall increase of 16.80%. The area increased consistently up to 81.73 lakh ha in 2019–20 and reached 84.93 lakh ha in 2020–21. It subsequently declined to 76.75 lakh ha in 2023–24 before recovering strongly in 2024–25. The most significant negative change occurred in oilseeds. The area declined from 12.86 lakh ha in 2015–16 to 9.44 lakh has in 2024–25, representing a decline of 26.59%. Although oilseed area increased to 13.74 lakh ha in 2016–17, it subsequently fluctuated and fell sharply to 8.97 lakh ha in 2023–24.

Cotton cultivation showed considerable fluctuations rather than a consistent upward or downward trend. Its area increased from 6.42 lakh ha in 2015–16 to 6.91 lakh ha in 2024–25, representing an overall increase of 7.63%. The area reached its highest level of 9.69 lakh ha in 2022–23 but subsequently declined to 6.91 lakh hectares in 2024–25. The fluctuations may reflect changes in rainfall, market prices, input costs, pest incidence and farmers' responses to alternative crop profitability. Sugarcane showed a substantial increase of 22.44%, with its area rising from 4.50 lakh ha in 2015–16 to 5.51 lakh ha in 2024–25. The area reached 7.94 lakh ha in 2018–19 and 7.08 lakh ha in 2022–23.

Crop Diversification and Recent Cropping Changes Pattern in Karnataka

The study explains the crop diversification and recent cropping pattern changes in Karnataka during from 2015 to 2024. Crop diversification refers to the shift from dependence on a limited number of crops towards the cultivation of a wider range of crops. It is an important indicator of structural changes in the agricultural economy and is influenced by irrigation, rainfall, market prices, government policies, technology, soil conditions and farmers' economic decisions. The recent cropping pattern indicates a gradual shift from traditional cereal-based cultivation towards commercial crops, pulses and selected high-value crops. According to the Karnataka Economic Survey (2025), Karnataka has experienced significant changes in its cropping pattern. The changes are reflected in the area allocated to cereals, pulses, food grains, oilseeds and major commercial crops. Variations in rainfall, irrigation, market prices, government support, input costs and crop profitability have influenced farmers' decisions regarding crop selection. The Karnataka Economic Survey 2025–26 reports that the total area under major crops in 2024–25 was 112.09 lakh ha, of which 85.71 lakh ha was under food grains. This indicates a gradual process of crop diversification and adjustment to market demand and agro-climatic conditions.

Table-3 Result of Growth of Crop Diversification and Recent Cropping Changes Pattern in Karnataka (2015 to 2024)

(Area in lakh ha)

Crops	2015–16 Area	2024–25 Area	Absolute Change	% Change	CAGR (%)
Cereals	45.07	50.84	5.77	12.80	1.35
Pulses	28.31	34.87	6.56	23.17	2.34
Food grains	73.38	85.71	12.33	16.80	1.74
Oilseeds	12.86	9.44	–3.42	–26.59	–3.38
Cotton	6.42	6.91	0.49	7.63	0.82
Sugarcane	4.50	5.51	1.01	22.44	2.28

Source: Compiled Data by the Researcher

Table 4 presents the growth and structural changes in the area under major crop groups in Karnataka between 2015–16 and 2024–25. The results indicate considerable variation among different crop groups, reflecting changes in farmers' crop choices, rainfall conditions, irrigation availability, market prices, government policies and relative profitability. Cereals increased from 45.07 lakh hectares in 2015–16 to 50.84 lakh hectares in 2024–25, showing an absolute increase of 5.77 lakh ha and an overall growth of 12.80 per cent. The CAGR of 1.35 per cent indicates moderate long-term growth. Despite fluctuations during the study period, cereals continued to occupy an important position in Karnataka's cropping structure. Pulses recorded the highest growth among the major food crops. The area increased from 28.31 lakh ha to 34.87 lakh ha, resulting in an absolute increase of 6.56 lakh ha and a 23.17 per cent increase.

The CAGR of 2.34% indicates relatively strong expansion. This trend suggests the increasing importance of pulses in Karnataka's agricultural economy; particularly because several pulse crops are suitable for rainfed and relatively low-water agricultural conditions. Food grains increased from 73.38 lakh ha in 2015–16 to 85.71 lakh ha in 2024–25, representing an absolute increase of 12.33 lakh ha and a 16.80% growth. The CAGR of 1.74 per cent indicates a positive but moderate long-term expansion. The increase demonstrates the continued importance of food-grain cultivation for food security and rural livelihoods. In contrast, oilseeds experienced a significant decline. Their area decreased from 12.86 lakh ha to 9.44 lakh ha, resulting in a reduction of 3.42 lakh ha or 26.59 per cent. The CAGR was –3.38 per cent, the only negative CAGR among the crop groups presented in the table. This decline indicates a structural shift away from oilseed cultivation towards other crops, particularly pulses, cereals and commercial crops. The trend has important implications for edible-oil production and agricultural diversification.

Cotton showed relatively modest long-term growth. Its area increased from 6.42 lakh ha to 6.91 lakh ha, an absolute increase of 0.49 lakh ha, or 7.63%, with a CAGR of 0.82%. However, cotton cultivation experienced considerable fluctuations during the intervening years, indicating the influence of market prices, rainfall, input costs and crop profitability on farmers' decisions. Sugarcane recorded strong positive growth, increasing from 4.50 lakh ha in 2015–16 to 5.51 lakh ha in 2024–25. The absolute increase was 1.01 lakh ha, corresponding to 22.44% growth, with a CAGR of 2.28 per cent. The expansion of sugarcane reflects its economic importance in irrigated regions and its close linkage with the sugar-processing industry. However, because sugarcane is relatively water-intensive, its expansion also raises concerns regarding sustainable water management in drought-prone areas.

Growth Analysis of Major Crops

The growth analysis demonstrates that Karnataka's agricultural structure is undergoing a gradual transformation. The strongest expansion occurred in pulses and sugarcane, while food grains and cereals recorded moderate growth. Cotton showed relatively limited expansion, whereas oilseeds experienced a substantial contraction. The results therefore suggest a movement towards greater crop diversification, with farmers increasingly allocating land to crops that offer favourable economic returns or are better suited to prevailing agro-climatic conditions. At the same time, the decline in oilseeds and expansion of water-intensive crops highlight the need for crop-specific policies, efficient irrigation, climate-resilient agriculture and sustainable water management.

Table-4 Changes in Different Cropping Pattern in Karnataka (2020 to 2024)

(Area: Lakh Ha)

Sl. No.	Crops	2020–21	2021–22	2022–23	2023–24	2024–25
Cereals						
1	Rice	15.14	14.87	13.55	9.72	12.05

2	Jowar	7.65	6.28	5.67	8.28	6.66
3	Ragi	8.01	8.64	8.28	8.44	8.97
4	Maize	17.62	17.52	19.52	20.13	19.54
5	Bajra	2.07	1.68	1.49	1.48	1.66
6	Wheat	2.26	1.51	1.31	1.71	1.41
7	Minor Millets	0.27	0.30	0.35	0.32	0.55
	Total Cereals	53.02	50.80	50.17	50.08	50.84
Pulses						
1	Tur	16.64	17.54	12.45	13.93	17.80
2	Bengal Gram	7.28	7.26	8.39	6.51	6.92
3	Horse Gram	1.50	1.38	1.11	1.34	1.57
4	Black Gram	0.91	0.81	0.73	0.50	1.06
5	Green Gram	4.62	4.28	5.09	3.03	5.80
6	Avare	0.32	0.38	0.28	0.32	0.36
7	Cowpea	0.54	0.80	0.79	0.99	1.30
8	Other Pulses	0.09	0.08	0.07	0.04	0.06
	Total Pulses	31.90	32.53	28.91	26.65	34.87
	Total Food Grains	84.93	83.33	79.08	76.73	85.71
Oilseeds						
1	Groundnut	7.35	5.88	4.74	3.80	4.06
2	Sesamum	0.22	0.32	0.20	0.18	0.28
3	Sunflower	1.23	1.66	2.51	0.76	1.04
4	Castor	0.04	0.02	0.04	0.04	0.03
5	Niger	0.01	0.004	0.001	0.002	0.003
6	Mustard	0.004	0.004	0.002	0.04	0.004
7	Soyabean	3.17	3.89	4.69	3.97	3.81
8	Safflower	0.30	0.43	0.64	0.18	0.19
9	Linseed	0.01	0.01	0.01	0.01	0.01
	Total Oilseeds	12.34	12.22	12.83	8.98	9.44
Commercial Crops						
1	Cotton	8.37	6.87	9.69	7.58	6.91
2	Sugarcane	4.52	6.50	7.08	5.54	5.51
3	Tobacco	0.72	0.82	0.78	0.79	0.81
	Total Area	115.41	114.30	114.09	104.05	112.09

Source: Government of Karnataka (2025), Directorate of Economics and Statistics (2024) and Karnataka Economic Survey – 2020 to 2025.

As shown in the table, food grains consistently command the vast majority of cultivated land, accounting for 76.47% of the total cropped area in 2024–25. Maize is the single largest cereal crop, remaining steadily high at 17.5–20.1 (19.54 in 2024–25). In contrast, rice coverage contracted by 20.41% from 15.14 in 2020–21 down to 12.05 in 2024–25, following a sharp low of 9.72 in 2023–24. Pulses experienced a notable 30.84% single-year rebound from 26.65 (2023–24) to a five year peak of 34.87 in 2024–25. Tur (17.80) and Green Gram (5.80) drove this gain, with Tur constituting over half of all pulse acreage. Total oilseed area shrank from 12.34 to 9.44 over the five year period. This was primarily driven by Groundnut, which dropped 44.76% from 7.35 (2020–21) to 4.06 (2024–25). Soyabean remains the second-largest oilseed anchor at 3.81. Cotton and Sugarcane both hit peak acreage in 2022–23 (9.69 and 7.08 respectively) before stabilizing

at lower levels in 2024–25 (Cotton at 6.91 and Sugarcane at 5.51). Total cultivated area suffered a widespread drop to 104.05 in 2023–24 before recovering to 112.09 in 2024–25.

Testing Hypothesis

H₀: There is no significant change in the area under different crops in Karnataka during the study period.

H₁: There is a significant change in the area under different crops in Karnataka during the study period.

Table- 6 Exponential Growth Model Result of Cropping Pattern in Karnataka (2015 to 2024)

Crop	Growth Coefficient (b)	Growth Rate (%)	R ²	p-value	Trend	Decision on H ₀
Cereals	0.01685	1.70	0.667	0.0039	Increasing	Reject H₀
Pulses	0.00071	0.07	0.001	0.9484	Increasing, very weak	Accept H₀
Food Grains	0.01065	1.07	0.383	0.0563	Increasing	Accept H₀
Oilseeds	-0.03011	-2.97	0.372	0.0611	Decreasing	Accept H₀
Cotton	0.04398	4.50	0.353	0.0700	Increasing	Accept H₀
Sugarcane	0.02949	2.99	0.163	0.2470	Increasing	Accept H₀

Source: Compiled Data by the Researcher

Note: H₀ = No significant change in the area under the respective crop; H₁ = Significant change. At 5% significance, $p < 0.05$ = reject H₀.

The exponential growth model indicates that the cropping pattern in Karnataka has undergone differential changes during 2015–16 to 2024–25. Cereals experienced a statistically significant increase in cultivated area at an annual rate of about 1.70%, leading to rejection of the null hypothesis for cereals. For pulses, food grains, oilseeds, cotton and sugarcane, the estimated trends were statistically insignificant at the 5% level. Therefore, the null hypothesis is rejected only for cereals and is not rejected for the other crop categories. The results suggest that changes in Karnataka's cropping pattern have been uneven across crop groups rather than representing a uniform state-wide increase.

VI. Conclusion

The present study, “An Economic Analysis of Growth and Changes in Cropping Pattern in Karnataka,” examined the trends, growth and structural changes in the area under major crops during 2015–16 to 2024–25. The analysis demonstrates that Karnataka's agricultural sector has experienced noticeable changes in the allocation of cultivated land among different crop groups. The area under food grains increased from 73.38 lakh hectares in 2015–16 to 85.71 lakh hectares in 2024–25, indicating the continued importance of

food-grain production in the state's agricultural economy. The study found that the changes in cropping patterns were not uniform across crop groups. Cereals increased from 45.07 lakh hectares to 50.84 lakh hectares, while pulses increased substantially from 28.31 lakh hectares to 34.87 lakh hectares. Sugarcane and cotton also recorded increases in cultivated area. In contrast, the area under oilseeds declined from 12.86 lakh hectares to 9.44 lakh hectares. These changes indicate a gradual restructuring and diversification of the cropping pattern, reflecting farmers' responses to market demand, profitability, irrigation availability, climatic conditions, government policies and technological changes.

The exponential growth analysis further revealed that cereals recorded a statistically significant annual growth rate of about 1.70%, while the trends in pulses, food grains, oilseeds, cotton and sugarcane were statistically insignificant at the 5% level. The findings therefore indicate that the transformation of Karnataka's cropping pattern has been selective and crop-specific rather than uniform. From an economic perspective, crop diversification can improve farm income and reduce dependence on a limited number of crops; however, excessive concentration on water-intensive crops may create pressure on water and other natural resources. Therefore, Karnataka requires a balanced and regionally suitable cropping strategy that considers agro-climatic conditions, water availability, market opportunities and resource sustainability. In conclusion, the study establishes that Karnataka's cropping pattern has undergone significant structural changes during 2015–16 to 2024–25. Strengthening crop diversification, promoting pulses and oilseeds, improving irrigation efficiency, encouraging climate-resilient agriculture, providing appropriate price and market support, and promoting modern agricultural technologies can contribute to sustainable agricultural growth. A scientifically planned and economically viable cropping pattern will be essential for enhancing farmers' income, food security, resource conservation and the long-term sustainability of Karnataka's agricultural economy.

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