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Temporal Variation of Land Use Pattern in Karnataka state: A Geographical Analysis

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Abstract

Abstract: In this paper an attempt has been made to analyse the temporal variation of land use pattern in Karnataka state: A Geographical analysis. This study is based on secondary data collected from Karnataka at a glance. Land use is clearly constrained by environmental factors such as soil characteristics, climate, topography, vegetation. But it also reflects the importance of land as a key and finite resource for most human activities including agriculture, industry, Forestry, energy production, settlement, recreation, and water catchments and storage. For measuring the temporal changes of land use pattern simple statistical equation have been employed. The study covers 30 districts of Karnataka which come under the variation in spatial variation of land use pattern examined for the periods 2003-2004 and 2017-2018.

Keywords: Land use pattern; Forest; Nonagricultural Land; Barren Land; Cultivable Waste; Permanent Pasture; Trees & Groves; Fallow Land and Net Sown Area

Introduction

Land use is the surface utilization of all developed and vacant land on a specific point at a given time and space. For agriculture and its quality and extent largely determine the variety and magnitude of agricultural production. Land use studies are important as they are aimed to explain the occurrence of different uses in different areas. Some land is better than other for specific use depending on physical economic and cultural characteristics of land, to which its suitability for a particular use is related. Therefore, in agricultural geography it is essential to understand the variations in the land use as a

human reaction towards the satisfaction of human wants. The demand for new uses of land may be inspired by a technological change or by a change in the size, composition and requirements of a community; some changes are short lived whereas others represent a more constant. The growth of population may change the forest and pasture land into cropped including residential and industrial land utilization.

Objectives

The aims of the present study to investigate the temporal variations in Land Use Pattern of Karnataka.

Study Area

The Indian State of Karnataka is located 11°30' North and 18°30' North latitudes and 74°East and 78°30' East longitude. In the western part of the Deccan Peninsular region of India. The State is bounded by Maharashtra and Goa States in the north and northwest; by the Arabian Sea in the west; by Kerala and Tamil Nadu States in the South and by the States of Andhra Pradesh and Telangana in the East. Karnataka extends to about 750 km from north to south and about 400 km from east to west. It can be further divided into Four Physiographic regions- the Northern Karnataka plateau, Central Karnataka Plateau, Southern Karnataka Plateau and the Coastal Karnataka plateau. There are Chains of mountains, the highest being the Mullayanagiri (1929 m). There are varied types of soils in Karnataka. Black soils are found in northern Karnataka whereas red and red loamy soils are prominent in southern Karnataka. Laterite soils are found in main land and coastal areas of the state. The forest ecosystem of Karnataka is unique and highly diverse. Vegetation types include tropical evergreen, semi- evergreen, moist deciduous, dry deciduous, thorny scrubs, shoals and coastal mangroves. There are many rivers flowing through the state. The most famous among them are the Krishna, Cauvery, Godavari, Pennar and Palar.

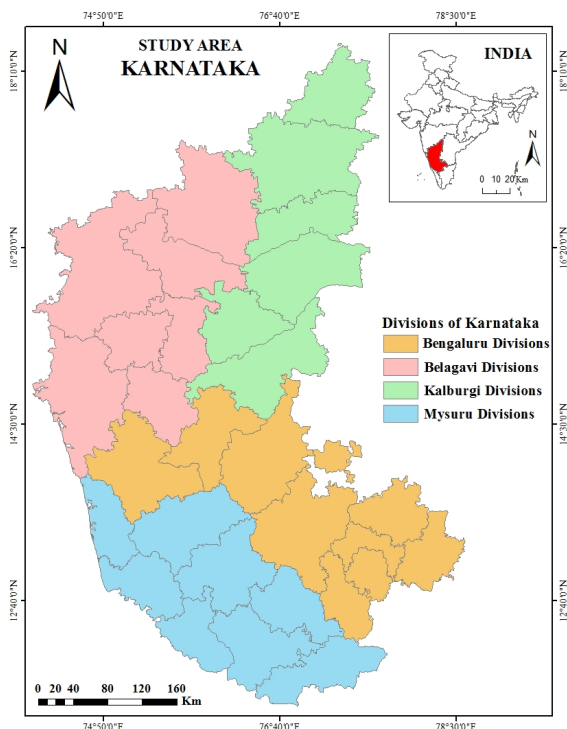


Fig. 1. Location Map of Karnataka

Methodology

The present study based on the secondary sources data. Land use data have been collected from Agricultural Development and Rural Transformation Centre, Institute for Social and Economic Change, Bengaluru and Karnataka at a Glance. The whole Karnataka state is divided into following four administrative divisions, covering all 30 districts. In this study, land use data for the periods 2003-2004 and 2017-2018 was collected and analyzed, for different categories of land use include Forest, Non-agricultural Land, Barren Land, Cultivable Waste, Permanent Pasture, Trees & Groves, Fallow Land and Net Sown Area. Further, divisional wise changes in area under individual category also compared for the same periods with their interpretation.

Table 1. Administrative Divisions of Karnataka State

Bengaluru Divisions		Mysuru Divisions		Kalburgi Divisions		Belagavi Divisions	
S	District	S	District	S	District	S	District
N	N	N	N	N	N	N	N
1	Bengaluru (u)	1	Udupi	1	Bellary	1	Belagavi
2	Bengaluru	2	Chikkama	2	Kalburgi	2	Bagalkot
3	Chitradurga	3	Mandya	3	Bidar	3	Vijayapura
4	Chikkaba	4	Hassan	4	Raichur	4	Gadag
5	Davanagere	5	Dakshin Kan-nada	5	Koppal	5	Dharwad
6	Kolara	6	Kodagu	6	Yadgir	6	Uttara Kannada
7	Ramana gara	7	Mysuru			7	Haveri
8	Shivamogga	8	Chamarajanagara				
9	Tumakuru						

Results and Discussions

Changes in Land Use Pattern

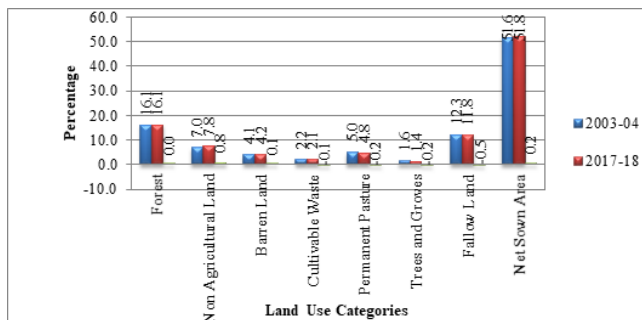
Land is a finite resource and its demand for diverse purposes is increasing day by day. There are large areas of utilizable but wasteland resources. Moreover, the pressure of commercialization is increasingly forcing out productive land resources for nonagricultural uses. Considering the importance of land use and policy, the Government of Karnataka brought out a document on land use policy recently (GoK, 2003).

The Table 2 and Figure 2 shows the Changes of Land use pattern in 2003-04 and 2017- 18 in the state of Karnataka.

Table 2. Changes in Land Use Pattern 2003-2004 and 2017-2018 in Karnataka

S No	Categories	2003-2004		2017-18		Change (%)
		Area (Hectare)	Area (%)	Area (Hectare)	Area (%)	
1	Forest	3070330	16.1	3073376	16.1	0.0
2	Non-agricultural Land	1331643	7.0	1479580	7.8	0.8
3	Barren Land	788017	4.1	791698	4.2	0.1
4	Cultivable Waste	421263	2.2	399315	2.1	-0.1
5	Permanent Pasture	952204	5.0	905072	4.8	-0.2
6	Trees and Groves	304718	1.6	271142	1.4	-0.2
7	Fallow Land	2344041	12.3	2254125	11.8	-0.5
8	Net Sown Area	9837620	51.6	9874158	51.8	0.2
9	Total Geo-graphical Area	19049836	100.0	19048466	100.0	

Source: Karnataka at a Glance – 2003-04 and 2017-18.

**Fig. 2.** Changes of Land Use Pattern 2003-2004 and 2017-2018 Karnataka

The divisions are categorized as Forest, Nonagricultural land, Barren land, Cultivable waste, permanent pasture, Trees and Groves, Fallow land and Net sown area. The total geographical area covered in 2003-04 is 19049836 hectares which decreased to 19048466 hectares in 2017-18. There are various positive and negative changes seen in the overall land use pattern and the highest change is seen in Non-agricultural land i.e. 0.8% (increased from 7.0% in 2003-04 to 7.8% in 2017-18) followed by Net sown area i.e. 0.2% (increased from 51.6% in 2003-04 to 51.8% in 2017-18) and Barren land i.e. 0.1% (increased from 4.1% in 2003-04 to 4.2% in 2017-18). Negative changes are seen in Fallow land i.e. -0.5% (decreased from 12.3% in

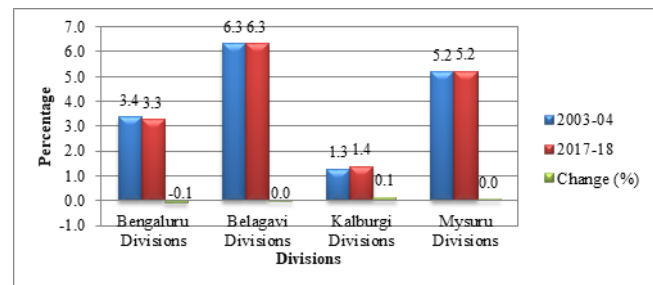
2003-04 to 11.8 % in 2017-18) followed by Trees and Groves i.e. -0.2% (decreased from 1.6% in 2003-04 to 1.4% in 2017-18), Permanent pasture i.e. -0.2% (decreased from 5.0% to 4.8) and Cultivable waste i.e. -0.1% (decreased from 2.2% in 2003-04 to 2.1% in 2017-18). There is no change in case of Forest. The reasons behind these changes are urban growth, lack of irrigation facilities, converting the forest area into settlement areas and industries, excessive use of fertilizers etc.

Forest

Table 3. Divisions wise Changes in Area Under Forest 2003-2004 and 2017-2018 in Karnataka

S. No	Divisions	2003-2004		2017-2018		Change (%)
		Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	
1	Bengaluru	640565	3.4	620086	3.3	-0.1
2	Belagavi	1203285	6.3	1202425	6.3	0.0
3	Kalburgi	241431	1.3	263661	1.4	0.1
4	Mysuru	985049	5.2	987204	5.2	0.0
	Karnataka	3070330	16.1	3073376	16.1	0.0

Source: Karnataka at a Glance – 2003-04 and 2017-18.

**Fig. 3.** Divisions wise Changes in Area Under Forest 2003-2004 and 2017-2018 in Karnataka

Forest is a piece of land with many trees. These are very important and grow in many places around the world. They are an ecosystem which includes many plants and animals. Temperature and rainfall are the two most important things of forests.

The Table 3 and Figure 3 represent the Changes in area under Forest in 2003-04 and 2017-18 in the state of Karnataka. The state is categorized into 4 divisions- Bengaluru, Belagavi, Kalburgi and Mysuru. The entire state covered a total geographical area of 3070330 hectares i.e. 16.1% in 2003-04 and it increased to 3073376 hectares in 2017-18. A positive change is seen in Kalburgi division i.e. 0.1% (increased from 1.3% in 2003-04 to 1.4% in 2017-18). A negative change is seen in Bengaluru division i.e. -0.1% (decreased from 3.4% in 2003-04 to 3.3% in 2017-18), because of urbanization. There are no changes in forest cover in Belagavi and Mysuru

divisions i.e. 0.0%.

Non-agricultural Land

Table 4. Divisions wise Changes in Area Under Non-Agricultural Land 2003-2004 and 2017-2018 in Karnataka

S No	Divisions	2003-2004		2017-2018		Change (%)
		Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	
1	Bengaluru	486008	2.6	523234	2.7	0.1
2	Belagavi	231408	1.2	241261	1.3	0.1
3	Kalburgi	217732	1.1	288804	1.5	0.4
4	Mysuru	396495	2.1	426281	2.2	0.1
	Karnataka	1331643	7.0	1479580	7.8	0.8

Source: Karnataka at a Glance – 2003-04 and 2017-18

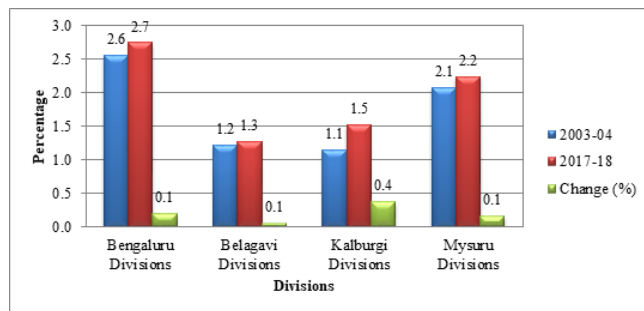


Fig. 4. Divisions wise Changes in Area Under Non-Agricultural Land 2003-2004 and 2017-2018 in Karnataka

Non-agricultural land means land upon which no agricultural activities are conducted and from which no agricultural products are derived. These lands are never eligible to receive an agricultural assessment.

The Table 4 and Figure 4 shows Division Wise Changes in Non-Agricultural land in 2003-04 and 2017-18 in the state of Karnataka. The state is categorized into 4 divisions- Bengaluru, Belagavi, Kalburgi and Mysuru. The entire state covered a total geographical area of 1331643 hectares i.e. 7.0% in 2003-04 which got increased to 1479580 hectares i.e. 7.8% in 2017-18 accompanied by a total change of 0.8%. The highest change is seen in the Kalburgi division i.e. 0.4% (increased from 1.1% in 2003-04 to 1.5% in 2017-18) followed by Bengaluru divisions i.e. 0.1% (increased from 2.6% in 2003-04 to 2.7% in 2017-18), Mysuru divisions i.e. 0.1% (increased from 2.1% in 2003-04 to 2.2% in 2017-18) and Belagavi divisions i.e. 0.1% (increased from 1.2% in 2003-04 to 1.3% in 2017-18). The reasons behind these changes are urbanization, lack of irrigation facilities, use of excessive fertilizers which again deteriorated the quality of land for use of agriculture, etc.

Barren Land

Table 5. Divisions wise Changes in Area Under Barren Land 2003-2004 and 2017-2018 in Karnataka

S.No Divisions		2003-2004		2017-2018		Change (%)
		Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	
1	Bengaluru Divisions	230567	1.2	223219	1.2	0.0
2	Belagavi	135854	0.7	136209	0.7	0.0
3	Kalburgi	172437	0.9	184226	1.0	0.1
4	Mysuru	249159	1.3	248044	1.3	0.0
	Karnataka	788017	4.1	791698	4.2	0.1

Source: Karnataka at a Glance – 2003-04 and 2017-18.

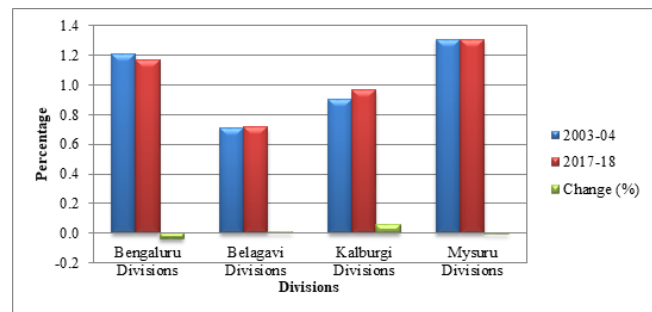


Fig. 5. Divisions wise Changes in Area Under Barren Land 2003-2004 and 2017-2018 in Karnataka

Barren land is defined as those ecosystems in which less than one third of the area has vegetation or other cover. In general, Barren land has thin soil, sand, or rocks. Barren lands include deserts, dry salt flats, beaches, sand dunes, exposed rocks, strip mines, quarries, and gravel pits.

The Table 5 and Figure 5 shows Division Wise Changes in Area under Barren Land in 2003-04 and 2017-18 in the state of Karnataka. The state is categorized into 4 divisions- Bengaluru, Belagavi, Kalburgi and Mysuru. The entire state covered a total geographical area of 788017 hectares i.e. 4.1% in 2003-04 which increased to 791698 hectares i.e. 4.2% in 2017-18. A positive change is seen in the Kalburgi divisions i.e. 0.1% (increased from 0.9% in 2003-04 to 1.0% in 2017-18). There are no changes seen in Bengaluru, Belagavi and Mysuru divisions' i.e. 0.0%.

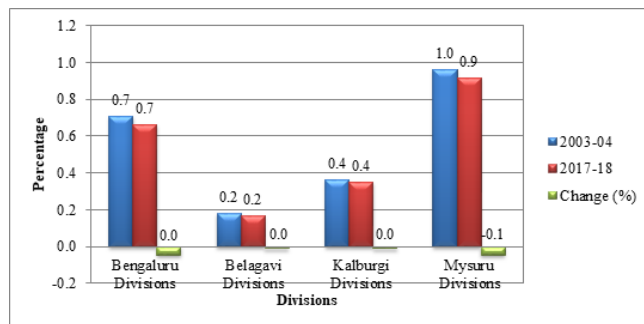
Cultivable Waste

Cultivable waste land includes all land available for cultivation or taken up for cultivation once, but not cultivated during the current year and the preceding five years or more in succession.

Table 6. Divisions wise Changes in Area Under Cultivable Waste 2003-2004 and 2017-2018 in Karnataka

S.No	Divisions	2003-2004		2017-2018		Change (%)
		Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	
1	Bengaluru	134611	0.7	125924	0.7	0.0
2	Belagavi	34322	0.2	32120	0.2	0.0
3	Kalburgi	69185	0.4	66881	0.4	0.0
4	Mysuru	183145	1.0	174390	0.9	-0.1
	Karnataka	421263	2.2	399315	2.1	-0.1

Source: Karnataka at a Glance – 2003-04 and 2017-18.

**Fig. 6.** Divisions wise Changes in Area Under Cultivable Waste 2003-2004 and 2017-2018 in Karnataka

The Table 6 and Figure 6 shows Division Wise Changes in Area under Cultivable waste in 2003-04 and 2017-18 in the state of Karnataka. The state is categorized into 4 divisions- Bengaluru, Belagavi, Kalburgi and Mysuru. The entire state covered a total geographical area of 421263 hectares i.e. 2.2% in 2003-04 which decreased to 399315 hectares i.e. 2.1% in 2017-18 accompanied by a total change of -0.1%. The graph shows a negative change in Mysuru divisions i.e. -0.1% (decreased from 1.0% in 2003-04 to 0.9% in 2017-18). There are no such changes in the areas under cultivable waste in Bengaluru, Belagavi, Kalburgi divisions i.e. 0.0%. The reason behind this reduction is less agricultural activities which reduced the increment of cultivable waste in Mysuru divisions.

Permanent Pasture

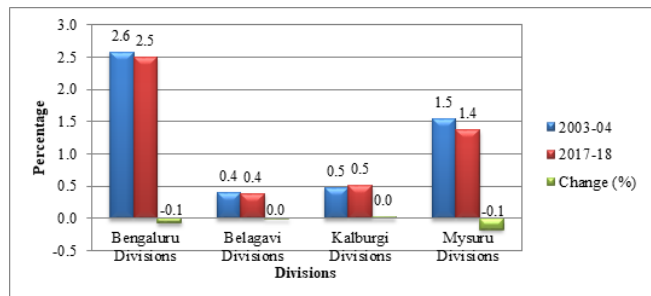
Permanent pasture means non rotational land used for grass production (sown or natural) on a permanent basis (five years or longer).

The Table 7 and Figure 7 shows Division Wise Changes in Area under Permanent Pasture in 2003-04 and 2017-18 in the state of Karnataka. The state is categorized into 4 divisions- Bengaluru, Belagavi, Kalburgi and Mysuru. The entire state covered a total geographical area of 952204 hectares i.e. 5.0% in 2003-04 which decreased to 905072 hectares i.e. 4.8% in 2017-18 accompanied by a total change of -0.2%. There are

Table 7. Divisions wise Changes in Area Under Permanent Pasture 2003-2004 and 2017-2018 in Karnataka

S.No	Divisions	2003-2004		2017-2018		Change (%)
		Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	
1	Bengaluru	491071	2.6	475774	2.5	-0.1
2	Belagavi	75815	0.4	72884	0.4	0.0
3	Kalburgi	91336	0.5	96107	0.5	0.0
4	Mysuru	293982	1.5	260307	1.4	-0.1
	Karnataka	952204	5.0	905072	4.8	-0.2

Source: Karnataka at a Glance – 2003-04 and 2017-18

**Fig. 7.** Divisions wise Changes in Area Under Permanent Pasture 2003-04 and 2017-2018 in Karnataka

negative changes seen in the Bengaluru divisions i.e. -0.1% (decreased from 2.6% in 2003-04 to 2.5% in 2017-18) followed by Mysuru divisions i.e. -0.1% (decreased from 1.5% in 2003-04 to 1.4% in 2017-18). There are no changes seen in Belagavi and Kalburgi divisions i.e. 0.0% during the year 2003-04 and 2017-18. The reason behind this decrement is converting the lands into settlements and rapid growth of urbanization.

Trees and Groves

Table 8. Divisions wise Changes in Area Under Trees and Groves 2003-2004 and 2017-2018 in Karnataka

S.No	Divisions	2003-2004		2017-2018		Change (%)
		Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	
1	Bengaluru	109897	0.6	101439	0.5	-0.1
2	Belagavi	9621	0.1	12233	0.1	0.0
3	Kalburgi	29966	0.2	30383	0.2	0.0
4	Mysuru	155234	0.8	127087	0.7	-0.1
	Karnataka	304718	1.6	271142	1.4	-0.2

Source: Karnataka at a Glance – 2003-04 and 2017-18.

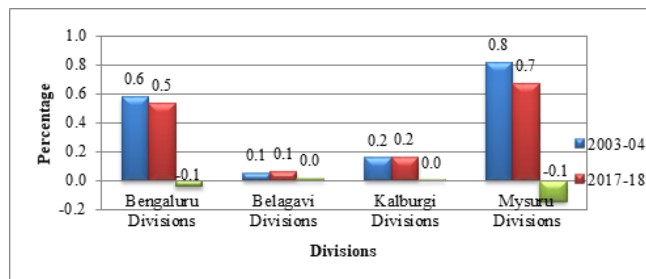


Fig. 8. Divisions wise Changes in Area Under Trees and Groves 2003-2004 and 2017-2018 in Karnataka

Grove is a group of trees that grow close together, generally without many bushes or other plants underneath.

The Table 8 and Figure 8 shows Division Wise Changes in Area under Trees and Groves in 2003-04 and 2017-18 in the state of Karnataka. The state is categorized into 4 divisions-Bengaluru, Belagavi, Kalburgi and Mysuru. The entire state covered a total geographical area of 304718 hectares i.e. 1.6% which decreased to 271142 hectares i.e. 1.4% accompanied by a total change of -0.2%. There are negative changes seen in Bengaluru divisions i.e. -0.1% (decreased from 0.6% in 2003-04 to 0.5% in 2017-18) followed by Mysuru divisions i.e. -0.1% (decreased from 0.8% in 2003-04 to 0.7% in 2017-18). There are no changes seen in Trees and Groves in Belagavi and Kalburgi divisions i.e. 0.0%. The reason behind this change is urbanization, conversion of forest areas into settlements, rapid urban growth etc.

Fallow Land

Table 9. Divisions wise Changes in Area Under Fallow Land 2003-2004 and 2017-2018 in Karnataka

S. No	Division	2003-2004		2017-2018		Change (%)
		Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	
1	Bengaluru	628416	3.3	648093	3.4	0.1
2	Belagavi	595497	3.1	490463	2.6	-0.5
3	Kalburgi	735778	3.9	687929	3.6	-0.3
4	Mysuru	384350	2.0	427640	2.2	0.2
Karnataka		2344041	12.3	2254125	11.8	-0.5

Source: Karnataka at a Glance - 2003-04 and 2017-18.

Fallow land is all arable land either included in the crop rotation system or maintained in good agricultural and environmental condition, whether worked or not, but will not be harvested for the duration of a crop year.

The Table 9 and Figure 9 shows Division wise Changes in Area under Fallow Land in 2003-04 and 2017-18 in the state of Karnataka. The state is categorized into 4 divisions-Bengaluru, Belagavi, Kalburgi and Mysuru. The entire state covered a total geographical area of 2344041 hectares i.e.

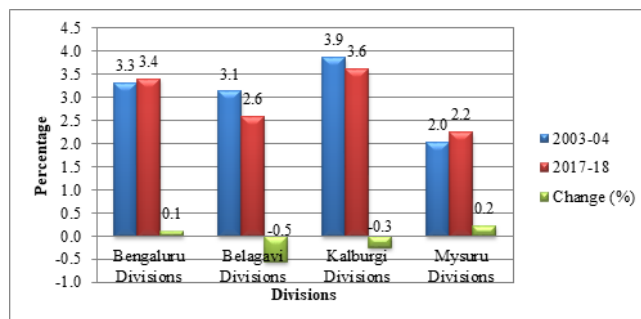


Fig. 9. Divisions wise Changes in Area Under Fallow Land 2003-2004 and 2017-2018 in Karnataka

12.3% in 2003-04 which decreased to 2254125 hectares i.e. 11.8% in 2017-18 accompanied by a total change of -0.5%. The highest change is seen in Mysuru divisions i.e. 0.2% (increased from 2.0% in 2003-04 to 2.2% in 2017-18) followed by Bengaluru divisions i.e. 0.1% (increased from 3.3% in 2003-04 to 3.4% in 2017-18). Negative changes are seen in Belagavi divisions i.e. -0.5% (decreased from 3.1% in 2003-04 to 2.6% in 2017-18) and Kalburgi divisions i.e. -0.3% (decreased from 3.9% in 2003-04 to 3.6% in 2017-18).

Net Sown Area

Table 10. Divisions wise Changes in Area Under Net Sown Area 2003-2004 and 2017-2018 in Karnataka

S.No	Divisions	2003-2004		2017-2018		Change (%)
		Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	
1	Bengaluru	2142012	11.2	1983155	10.4	-0.8
2	Belagavi	3173807	16.7	3272014	17.2	0.5
3	Kalburgi	2795642	14.7	2898484	15.2	0.5
4	Mysuru	1726159	9.1	1720505	9.0	-0.1
Karnataka		9837620	51.6	9874158	51.8	0.2

Source: Karnataka at a Glance - 2003-04 and 2017-18.

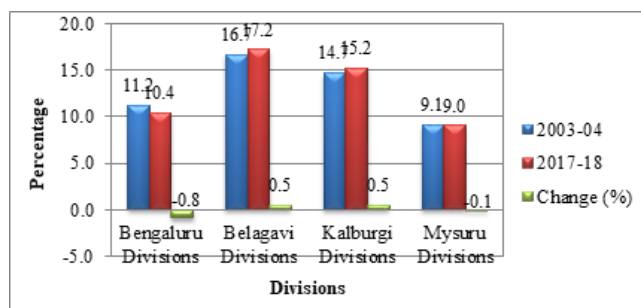


Fig. 10. Divisions wise Changes in Area Under Net Sown Area 2003-2004 and 2017-2018 in Karnataka

Net sown area is the total area sown with crops and orchards. It represents an area in which total crops are grown only once in a year.

The Table 10 and Figure 10 shows Division Wise Changes in Area under Net Sown Area in 2003-04 and 2017-18 in the state of Karnataka. The state is categorized into 4 divisions- Bengaluru, Belagavi, Kalburgi and Mysuru. The entire state covered a total geographical area of 9837620 hectares i.e. 51.6% in 2003-04 which increased to 9874158 hectares i.e. 51.8% in 2017-18 accompanied by a total change of 0.2%. The highest change is seen in Belagavi divisions i.e. 0.5% (increased from 16.7% in 2003-04 to 17.2% in 2017-18) followed by Kalburgi division i.e. 0.5% (increased from 14.7% in 2003-04 to 15.2% in 2017-18). A negative change is seen in Bengaluru divisions i.e. -0.8% (decreased from 11.2% in 2003-04 to 10.4% in 2017-18) and Mysuru divisions i.e. -0.1% (decreased from 9.1% in 2003-04 to 9.0% in 2017-18).

Conclusion

In the study region the land use pattern was classified in to eight categories. i.e. Area under forest, non-agricultural land, barren land, cultivable waste, permanent, pasture, trees and groves, fallow land and net sown area. In the study region forest and net sown area is the most important type of land use except the other entire land use category. Proportion of such land is higher in both years. A noticeable decreased is indicated in other categories i.e. area under Fallow Land -

0.5 percent. Increase is observed in the categories of Non Agricultural Land which is +0.8 percent to the area of the study region.

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