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## SPATIAL CHANGES IN VARIOUS AGRICULTURE CROPS: SPECIAL REFERENCE IN HEMAVATHI WATERSHED

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### ABSTRACT

Agriculture means cultivating soil and producing crops and the science or practice of farming. The study area of Hemavathi river is one of the main tributary of river Cauvery. This study region is divided into three zones. This article is concentrate on seven agriculture crops ie., paddy, ragi, jower, maize, sugarcane, coffee and tobacco. This article is studies cropping area from 2001 to 2012, and divided into two groups from 2001 to 2006 and 2006 to 2012, this is very use full for identifying the trends in cropping area.



**KEYWORDS :** Hemavathi watershed, Cropping area, paddy, ragi, jower, maize, sugarcane etc.

### INTRODUCTION

Cropping pattern define the proportion of various crops in an area of land at specific time period and also indicates the yearly sequence and spatial arrangements of crops and fallows in an area. Rotation of crops is the process of growing different crops in succession, on a piece of land, in a particular period of time. Cultivating the crops is the proportion of area with various crops, inclusive of changes over time and space. Cropping patterns of a area are closely influenced by the climatic, historical and socio economic condition of the farmers, and also terrain, topography, slope, soil condition and availability of water, as well as the pesticides, fertilizers and mechanization.

### OBJECTIVES

In the present article, the overall cropping pattern of the Hemavathi watershed region is outlined, followed by the discussion on the area under individual crops. This also throws light on trends in area of different crops in the study region.

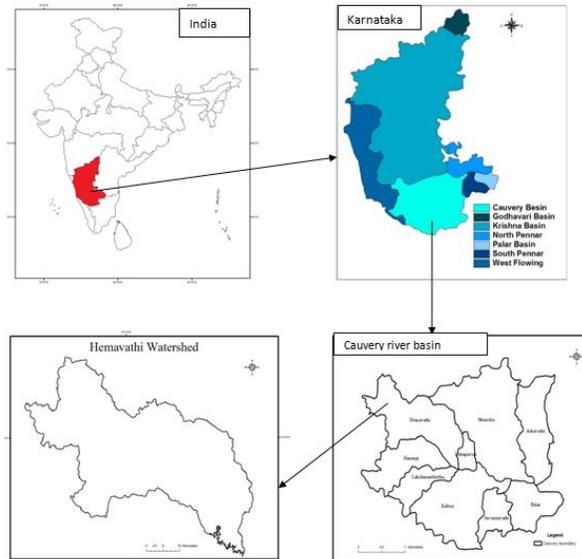
### METHODOLOGY

The present study is based on secondary data collected from 'District statistical office' in Mysore, Mandya, Chikkamagalur, Kodagu and Hassan. This article is concentrate on seven agriculture crops i.e., Paddy, Ragi, Jower, Maize, Sugarcane, Coffee and Tobacco. The study area is divided into three zones for analysis purpose. Zone one is having 8 taluks ie., arsikere, Chennarayapatana, Hassan, Holenarasipura, K.R.Pete, Nagamangala, Pandavapura, S.R.Patna and K.R.Nagar, zone two is having four taluks ie., Alur, Arkalgud, Belur and Chikkamagalur. Zone three taluks are Mudigere, sakaleshpura and

Somvarpet. Total cropping area from 2001 to 2012, is divided into the different span of years i.e, 2001 to 2006 and 2006 to 2012, its very use full for understand the trends the area under different crops.

## STUDY AREA

**Map:1.1 Location map of Hemavathi watershed**



The Hemavathi River is a very important tributary of the Cauvery river. It starts in the Western Ghats at an elevation of about 1,219 meters near Ballala Rayana Durga in the Chikamagalur district of the state of Karnataka and flows through Chikamagalur, Hassan, Mandya and Mysore districts, before joining the Cauvery river near Krishnarajasagara. It is 245 km long and it has a drainage area of about 5,697.65 km<sup>2</sup>. A larger reservoir has been built on the river at Gorur in the Hassan district. In the entire Cauvery basin the Hemavathi watershed is second largest in terms of area.

## Analysis

Table 1, 2, 3 clearly indicate the trends in areas, of various selected crops, within various zones amongst the taluks, during the years, 2001-02 to 2011-12.

## Paddy

Paddy is the most dominant food crop in this region. More than 60 percent of the gross cropped area is paddy areas in S.R.Patna, while 50 percent to 60 percent are paddy areas in K.R.Pete and K.R.Nagara taluks, during 2006-12. Less than 50 percent of the gross cropped area was registered as paddy, in Arsikere, Chennarayapatna, Hassan, Holenarasipura and Nagamangala taluks during the same period. There was less than 5 percent increase in paddy areas in K.R.Pete, Nagamangala, S.R.Patna and Pandavapura taluks, from 2001-02 to 2011-12. Less than 5 percent decreases in areas covered by paddy were observed in Arsikere, Chennarayapatna and Holenarasipura taluks. There were decreases of more than 5 percent in the paddy areas of K.R.Nagara taluk, during the study period and there were increases of more than 5 percent in the paddy areas of taluk of Hassan. In zone two and zone three, all the taluks registered paddy lands as occupying less than 50 percent of the gross cropped areas, in the years 2006-12. The highest negative change of more than 5 percent paddy area, was recorded in Belur taluk. (Zone two).

## Ragi

In zone one, the total area growing ragi was 59.54 percent in 2001-06 and 38.03 percent in the years, 2006-12. The highest negative change was recorded in the taluk of Hassan i.e., 43.18 percent. Out

of the total cropped area, there was a less than 1 percent ragi crop, recorded in Nagamagala taluk. The remaining taluks recorded negative changes, during the study period. In zone two and zone three, the change was negative. The highest negative change occurred in Arkalgud taluk and the lowest negative change was observed in the taluk of Chikkamagalur. The total cropped area decreased from 31.74 percent to 15.01 percent. In zone two and in zone three, it decreased from 0.39 percent to 0.23percent,during the study period.

### Jowar

1.19 percent of the gross cropped area grew jowar, in the years, 2001-06 and 0.49 percent of the gross cropped area grew jowar in the years, 2006-12. In zone one and in zone two 0.07 percent of the area had jowar crops and in zone three, 0.58 percent of the area had jowar crops. In zone one, it is observed that Chennarayapata, Hassan, Holenarasipura, K.R.Pete, Nagamangala, Pandavapura, S.R.Patna and K.R.Nagara had less than 1 percent of the area in jowar crops, during the years, 2006-12; whereas, 1.49 percent positive change occurred in the taluk of Arsikere. In zone two, the total cropped area under jowar decreased 0.19 percent, during the study period. In Belur taluk, a positive increase was recorded, in the total cropped area. The remaining taluks recorded negative changes.

### Maize

In zone one, the total percentage of cropped area of maize was 6.09 percent in 2001-06 and 21.01 percent in 2006-12. Less than 2 percent was observed in the taluks of K.R.Pete, Nagamangala, S.R.Patna, Pandavapura and K.R.Nagara. The highest cropped area of maize was grown in Hassan taluk i.e., 52.15 percent during the period of 2006-12. In zone two, Chikkamagalur taluk had recorded that less than 5 percent of the cropped area was in maize and the remaining taluks recorded that more than 30 percent of the total cropped area was in maize, from 2006-07 to 2011-12. The highest positive change was recorded in the taluk of Arkalgud, during the period of study.

In zone three, only the Somvarpet taluk cultivated maize crops. Within the total area, there's an increase of 6.21 percent to 7.57 percent, from 2001-06 to 2006-12 (table 3). However, in zone one, the Pandavapura taluk had recorded a negative change i.e., 0.015 percent, less than 1percent. A positive change occurred with the taluks of K.R.Pete, Nagamangala, S.R.Patna and K.R.Nagara. In zone two, the recorded change revealed a 'less than 2 percent' positive change in Chikkamagalur taluk, during the study period (table 2).

### Sugarcane

Sugarcane has occupied 41,963 hectares of the total cropped area in 2001-06 and 66,827.05 hectares in 2006-12, in zone one.The highest negative change was found with the Chennarayapatna taluk i.e., 3.49 percent. Positive change of less than 5 percent occurred with the taluks of K.R.Nagara and Hassan. Pandavapura taluk recorded the highest positive change i.e., 18.06 percent during the study period. In zone two, Alur and Belur taluks recorded negative changes i.e., 0.12 percent and 1.44 percent, respectively. The remaining taluks of Arkalgud and Chikkamaglaur recorded positive changes, during the study period. In zone three, only the Sakleshpura taluk have cultivated sugarcane, during 2006-2012. Zero percent of the area was cultivated in sugarcane crops, by the other taluks, from 2001-2006. In the years, 2006 - 2012, the total cropped area had increased in volume i.e., 2.19 hectares (0.0019 percent).

### Coffee

Coffee is one of the dominant crops in zone two and zone three. The total area growing coffee crops had not decreased in both the zones, during the study period. In zone two, there was an increase of more than 60 percent of the coffee cultivation in the total cropped area, as recorded with the taluk of Chikkamaglaur. 1 percent of the positive change occurred with the taluk of Arkalgud, from 2001-12. In zone three, the total cropped area growing coffee, was 67.74 percent in 2001-06 and 70.11 percent in 2006-12. A lesser positive change was noticed with the Somvarpet taluk i.e., 0.41 percent (table 3),

whereas the Mudigere and Sakleshpura taluks recorded a positive volume of change slightly more than 2 percent during the study period.

**Table No: 1: HEMAVATHI WATERSHED  
TRENDS IN AREA UNDER DIFFERENT CROPS IN ZONE ONE-2001 to 2012 (AREA IN HECTARES)**

Zone	Taluku/ Crops	Years	Arsikere	Chenna rayapatna	Hassan	Hole narasipura	K.R.Pete	Naga mangala	Pandava pura	S.R. Patna	K.R. Nagar	Total
1	Paddy	2001-06	122.7	14221.32	12875.74	26397.29	55779.6	921.32	14022.6	313.02	6694.62	131348.29
		%	2.76	15.24	6.72	30.86	51.51	12.93	39.15	63.68	72.55	24.52
		2006-12	93.93	16028.2	21757.73	29343.33	86294.4	1108.99	20407.8	438.79	2950.24	178423.47
		%	2.16	12.76	12.11	29.03	54.46	13.75	39.41	68.34	59.42	28.12
		<b>Vol. Of Change</b>	<b>-0.59</b>	<b>-2.48</b>	<b>5.38</b>	<b>-1.82</b>	<b>2.94</b>	<b>0.82</b>	<b>0.26</b>	<b>4.65</b>	<b>-13.13</b>	<b>3.59</b>
	Ragi	2001-06	3924.6	62665.44	147559.34	48681.91	33253.7	6013.75	15388.1	80.22	1310.9	31887.88
		%	88.30	67.19	77.10	56.91	30.71	84.39	42.96	16.32	14.20	59.54
		2006-12	3341.75	72513.21	60932.72	37598.18	45386.5	6872.44	13900.2	86.75	674.22	241305.95
		%	77.06	57.73	33.92	37.2	28.64	85.25	26.84	13.51	13.58	38.03
		<b>Vol. Of Change</b>	<b>-11.23</b>	<b>-9.45</b>	<b>-43.18</b>	<b>-19.71</b>	<b>-2.06</b>	<b>0.85</b>	<b>-16.12</b>	<b>-2.81</b>	<b>-0.62</b>	<b>-21.51</b>
	Jowar	2001-06	248.85	1239.08	2537.13	1230.2	64.759	116.64	889.89	11.31	39.29	6377.149
		%	5.59	1.32	1.32	1.43	0.059	1.63	2.48	2.3	0.42	1.19
		2006-12	307.73	971.72	1500.65	128.78	0	49.24	153.9	3.37	9.86	3125.25
		%	7.09	0.77	0.83	0.12	0	0.61	0.29	0.52	0.19	0.49
		<b>Vol. Of Change</b>	<b>1.49</b>	<b>-0.55</b>	<b>-0.49</b>	<b>-1.31</b>	<b>-0.059</b>	<b>-1.02</b>	<b>-2.18</b>	<b>-1.77</b>	<b>-0.22</b>	<b>-0.69</b>
	Maize	2001-06	142.07	2066.74	27354.78	2703.89	336.81	4.6	17.52	0.092	26.56	32653.06
%		3.19	2.21	14.29	3.16	0.31	0.06	0.048	0.018	0.28	6.09	
2006-12		590.18	22873.25	93687.87	14656.68	1444.05	7.073	17.56	0.47	63.34	133340.473	
%		13.61	18.21	52.15	14.50	0.91	0.087	0.033	0.0732	1.27	21.01	
	<b>Vol. Of Change</b>	<b>10.41</b>	<b>15.99</b>	<b>37.86</b>	<b>11.34</b>	<b>0.60</b>	<b>0.023</b>	<b>-0.015</b>	<b>0.054</b>	<b>0.98</b>	<b>14.91</b>	

Zone	Taluku/ Crops	Years	Arsikere	Chenna rayapatna	Hassan	Hole narasipura	K.R. Pet	Naga mangala	Panda vapura	S.R. Patna	K.R. Nagar	Total
1	Sugarcane	2001-06	6.37	13062.93	1042.68	3031.75	18845.8	69.16	5496.14	86.85	321.29	41963
		%	0.14	14	0.54	3.54	17.4	0.97	15.3462	17.67	3.48	7.83
		2006-12	1.5	13198.35	1732.3	8765.89	25320.2	23.73	17297.1	112.66	375.37	66827.05
		%	0.034	10.50	0.96	8.67	15.98	0.29	33.4071	17.54	7.56	10.53
		<b>Vol. Of Change</b>	<b>-0.108</b>	<b>-3.49</b>	<b>0.41</b>	<b>5.12</b>	<b>-1.42</b>	<b>-0.67</b>	<b>18.0609</b>	<b>-0.12</b>	<b>4.07</b>	<b>2.69</b>
	Tobacco	2001-06	0	0	0	3483.43	0	0	0	0	834.2	4317.63
		%	0	0	0	4.072	0	0	0	0	9.041	0.80
		2006-12	1.17	2.6	13.73	10567.53	0	0	0	0	891.62	11476.65
		%	0.026	0.002	0.0076	10.45	0	0	0	0	17.95	1.80
		<b>Vol. Of Change</b>	<b>0.026</b>	<b>0.002</b>	<b>0.0076</b>	<b>6.38</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8.91</b>	<b>1</b>
Total cropped area	2001-06	4444.59	93255.51	191369.67	85528.47	108281	7125.47	35814.2	491.49	9226.86	535537.011	
	%	100	100	100	100	100	100	100	100	100	100	
	2006-12	4336.26	125587.33	179625	101060.39	158445	8061.47	51776.5	642.04	4964.65	634498.843	
	%	100	100	100	100	100	100	100	100	100	100	

Source: District Statistical Glance, Computed by the author.

**Table No: 2: HEMAVATHI WATERSHED  
TRENDS IN AREA UNDER DIFFERENT CROPS IN ZONE TWO 2001-2012  
(AREA IN HECTARES)**

Zone	Taluks/ Crops	Years	Alur	Arkalgud	Belur	Chikkamagalur	Total
2	Paddy	2001-06	30281.37	17575.48	22911.34	13000.26	83768.5
		%	35.40	37.22	19.77	24.07	27.66
		2006-12	34775.78	16443.65	18794.8	14071.97	84086.2
		%	32.86	37.32	13.57	21.26	23.72
		<b>Vol. Of Change</b>	<b>-2.53</b>	<b>0.10</b>	<b>-6.19</b>	<b>-2.80</b>	<b>-3.945</b>
	Ragi	2001-06	23992.93	23822.75	40497.98	7786.86	96100.5
		%	28.05	50.45	34.95	14.41	31.74
		2006-12	9412.11	12885.21	25170.33	5761.58	53229.2
		%	8.89	29.24	18.18	8.70	15.01
		<b>Vol. Of Change</b>	<b>-19.15</b>	<b>-21.20</b>	<b>-16.76</b>	<b>-5.71</b>	<b>-16.724</b>
	Jowar	2001-06	203.18	405.24	308.99	1453.04	2370.45
		%	0.23	0.85	0.26	2.69	0.78
		2006-12	4.87	136.54	565.3	1377.46	2084.17
		%	0.004	0.30	0.40	2.08	0.58
		<b>Vol. Of Change</b>	<b>-0.23</b>	<b>-0.54</b>	<b>0.14</b>	<b>-0.60</b>	<b>-0.19</b>
	Maize	2001-06	10702.52	5161.88	20670.81	382.03	36917.2
		%	12.51	10.93	17.841	0.70	12.19
		2006-12	33046.73	13342.57	49480.82	2093.73	97963.9
		%	31.23	30.28	35.75	3.16	27.63
		<b>Vol. Of Change</b>	<b>18.72</b>	<b>19.35</b>	<b>17.90</b>	<b>2.45</b>	<b>15.44</b>
	Sugarcane	2001-06	138.28	72.97	2622.48	424.2	3257.93
		%	0.16	0.15	2.26	0.78	1.07
		2006-12	37.02	79.1	1137.66	530.8	1784.58
		%	0.034	0.17	0.82	0.80	0.50
		<b>Vol. Of Change</b>	<b>-0.12</b>	<b>0.025</b>	<b>-1.44</b>	<b>0.016</b>	<b>-0.57</b>
	Coffee	2001-06	20191.94	181.64	28845.87	30959.81	80179.3
		%	23.60	0.38	24.89	57.32	26.48
		2006-12	28526.76	239.6	43257.37	42335.79	114360
		%	26.96	0.54	31.25	63.97	32.26
		<b>Vol. Of Change</b>	<b>3.35</b>	<b>0.15</b>	<b>6.35</b>	<b>6.65</b>	<b>5.78</b>
Tobacco	2001-06	14.61	151.49	0	0	166.1	
	%	0.017	0.32	0	0	0.05	
	2006-12	9.74	928.13	0	0	937.87	
	%	0.009	2.10	0	0	0.26	
	<b>Vol. Of Change</b>	<b>-0.0078</b>	<b>1.78</b>	<b>0</b>	<b>0</b>	<b>0.20</b>	
Total cropped area	2001-06	85524.83	47219.96	115857.47	54006.2	302760	
		100	100	100	100	100	
	2006-12	105803.27	44054.8	138406.28	66171.33	354445	
		100	100	100	100	100	

Source: District Statistical Glance, Computed by the author.

**Table No: 3: HEMAVATHI WATERSHED  
TRENDS IN AREA UNDER DIFFERENT CROPS IN ZONE THREE  
2001-2012 (AREA IN HECTARES)**

Zone	Taluks/ Crops	Years	Mudigere	Sakleshpura	Somvarpet	Total
3	Paddy	2001-06	16037.21	30141.12	12069.71	58248.04
		%	28.72	31.96	29.68	30.53
		2006-12	18656.64	32782.2	13946.7	65385.54
		%	26.47	28.80	28.03	27.94
		<b>Vol. Of Change</b>	<b>-2.24</b>	<b>-3.16</b>	<b>-1.64</b>	<b>-2.59</b>
	Ragi	2001-06	5.54	108.17	645.15	758.86
		%	0.009	0.11	1.58	0.39
		2006-12	0	44.36	508.2	552.56
		%	0	0.038	1.02	0.23
		<b>Vol. Of Change</b>	<b>-0.009</b>	<b>-0.075</b>	<b>-0.56</b>	<b>-0.16</b>
	Maize	2001-06	0	0	2526.19	2526.19
		%	0	0	6.21	1.32
		2006-12	0	0	3766.1	3766.1
		%	0	0	7.57	1.60
		<b>Vol. Of Change</b>	<b>0</b>	<b>0</b>	<b>1.35</b>	<b>0.28</b>
	Sugarcane	2001-06	0	0	0	0
		%	0	0	0	0
		2006-12	0	2.19	0	2.19
		%	0	0.0019	0	0.0009
		<b>Vol. Of Change</b>	<b>0</b>	<b>0.0019</b>	<b>0</b>	<b>0.0009</b>
	Coffee	2001-06	39781.93	64037.99	25423.25	129243.17
		%	71.26	67.91	62.51	67.74
		2006-12	51803.83	80973.68	31308.88	164086.39
		%	73.52	71.15	62.93	70.11
		<b>Vol. Of Change</b>	<b>2.25</b>	<b>3.23</b>	<b>0.41</b>	<b>2.37</b>
	Tobacco	2001-06	0	0	0	0
		%	0	0	0	0
		2006-12	0	0	218.28	218.28
		%	0	0	0.43	0.093
		<b>Vol. Of Change</b>	<b>0</b>	<b>0</b>	<b>0.43</b>	<b>0.093</b>
Total cropped area	2001-06	55824.68	94287.28	40664.3	190776.26	
		100	100	100	100	
	2006-12	70460.47	113802.43	49748.16	234011.06	
		100	100	100	100	

Source: District Statistical Glance, Computed by the author.

## Tobacco

The total cropped tobacco was less during the study period, in all the zones. In zone one, the total volume of change was only 1 percent from 2001-02 to 2011-12. In the years 2001-06 only the Holenarasipura and K.R.Nagara taluks had recorded growth of tobacco cultivated areas. However, in 2006-12, other taluks such as the Arsikere, Chennarayapatna and Hassan, recorded tobacco crops as being less than 1 percent of the total cropped areas. More than 5 percent of positive change had occurred with the taluks of Holenarasipura i.e., 6.38 percent and K.R.Nagara i.e., 8.91 percent, during the study period. In zone two, only two taluks had cultivated tobacco crops. Total volumes of negative changes were recorded with the taluk of Alur i.e., 0.0078 percent, whereas total volume of positive changes was recorded with the Arkalgud taluk i.e., 1.78 percent. In zone three, from 2006-2012, the Somvarpet taluk cultivated tobacco and the total cropped area amounted to 0.43 percent.

## CONCLUSION

There has been remarkable variation in areas and different crops. All cropped areas indicate increases and decreases in their areas from 2001-02 to 2011-12. In all the zones, the greatest negative change can be observed in ragi crops, from 2001-02 to 2011-12 and the greatest positive change occurred in the maize crop. In zone two coffee cropping area is increase and ragi cropping area is decrease, in zone three volume of changes in crops can find in the coffee cropping area and decreasing area is in paddy crop. Changing of cultivating area is depend on the chemical and physical parameters of soil, climate and also socio and economic condition of the famers.

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