Agriculture Intensity of Cropping Pattern in Haveri District of Karnataka State: A Geographical Analysis

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Abstract: In order to know agricultural Intensity of cropping pattern in the Haveri district all the indicators mentioned above have been used for the present analysis, these indicators differ not only in their basic unit, but also in their relative importance. Therefore, to get the combined effects of these, the composite index has been proposed by applying Kendal's (1936) rank-score method. Ranks are given to all the 30 indicators and then are summed up for each revenue circle. The total rank score of each taluka wise is divided by 30, which gives a composite index of agricultural efficiency. Thus the results obtained with regard to agricultural Intensity of cropping pattern in the present study have been categories in to three groups i.e. high, medium and low agricultural intensity regions and are cartographically represented with the help of choropleth map.

Key words: Agriculture, Cropping intensity, Kendal’s rank score method

I. INTRODUCTION

The study of crop intensity is of utmost importance because of the fact that the land resources are finite and extracting the maximum returns from the available land has become imperative. Of late it has become more a necessary so as to feed the rapidly growing population, it is more so in all the third world agrarian countries. Since the early days of 'Green Revolution' there are signs of imbalance in cropping pattern. Technological changes of mid-sixties caused significant shifts, in land utilisation, in favour of crops like wheat and rice at the cost of area under coarse cereals, pulses and oil seeds. Distortions in cropping pattern were reflected in relatively abundant supply of the same crops (like wheat of which the Government had surplus stocks) and acute shortage of others (like pulses and edible oils which had to be imported at huge cost in terms of foreign exchange). Change in cropping pattern is determined by factors like agro-climatic conditions, technological, infrastructural and institutional environment and profitability signals. The single most important element in crop production strategy in the post-green revolution period is improved agricultural technology. This technology is in the form of high yielding plant varieties, intensive cultivation, greater use of fertilizers, increased irrigation and better techniques for ploughing, harvesting and plant protection. High yielding varieties have been developed for a number of crops but their impact on production, productivity and costs varies across crops and regions. Thus there are only two ways to satisfy the increasing food and other agricultural demands of the country's rising population: either expanding the net area under cultivation or intensifying cropping over the existing area. The net sown area of the country has risen by about 20 per cent since independence and has reached a point where it is not possible to make any appreciable increase. Thus; raising the cropping intensity is the only viable option left.

Cropping intensity is defined as a ratio between net sown area (NSA) and gross cropped area (GCA). It thus indicates the additional percentage share of the area sown more than once to NSA. The index of cropping for the country as a whole was 130 per cent. It shows great spatial variations with higher levels in northern plains. Punjab has the highest cropping intensity of 176 per cent, followed by Himachal Pradesh (169 per cent), West Bengal (157 per cent), Haryana (145 per cent) and Uttar Pradesh (143 per cent). The intensity is low in dry, rainfed regions of Rajasthan, Gujarat, Maharashtra and Karnataka (110-125 per cent).

Objective and Methodology

The objective of the present study is to know the land use pattern of the Belgaum district and to investigate the spatio-temporal variations of cropping intensity in district at taluka level for the period 1970 - 71 and 2010 -11. The cropping intensity is the ratio between net sown area (NSA) and gross cropped area (GCA) and it is the index of multiple cropping, which expressed Statistically as fallows;

\[ IC = \frac{TCA}{NSA} \times 100 \]

Whereas,

IC = Intensity of cropping or index of intensity.

TCA = Total cropped area.

NSA = Net sown area.

Thus intensity of cropping, therefore, refers to raising a number of crops from the same field during one agricultural year. The index of cropping intensity is 100 if one crop has been grown in a year and it is 200 if two crops are raised. Higher the index, greater is the efficiency of land use. Thus, higher cropping intensity means that a higher portion of the net area is
being cropped more than once during one agricultural year. This also implies higher productivity per unit of arable land during one agricultural year.

The assessment of cropping intensity has direct correlation with assured irrigation which enables farmers to go for multiple cropping and use higher dose of fertilizers and HYV seeds. Hence, besides irrigation fertilisers, early maturing high yielding variety of seeds, selective mechanization and as such as tractors, pumping sets and seed drills, etc., plant, protection measures through the use of insecticides, pesticides etc. do have role in affecting the intensity of cropping.

**Introduction:**

It is quite obvious from the land use pattern that the study region that it experiences high density of crop population and large area brought under cultivation. The intensification of farming is one of the effective means of increasing the agricultural production in the region. It will help in maintaining a balance between demand and supply of food and cash crop.

The land use efficiency is defined as “the extent to which the net-sown area is re-sown”. The total cropped area as percentage of net sown area (net cropped area) gives a measure of land use efficiency, which really means the intensity of cropping.

The cropping intensity is the index of multiple cropping. Statistically it can be expressed in percentage and as follows:

\[ \text{IC} = \frac{\text{TCA}}{\text{NAS}} \times 100 \]

Whereas,

- **IC** = Intensity of cropping or index of intensity.
- **TCA** = Total cropped area.
- **NAS** = Net sown area.

In case where only one crop is grown in one agricultural year then the degree of intensity index will be 1, and the index number of crop intensity will be 100 percent while in the second case the degree of intensity will be 1:2 and the index number of crop intensity will be 120 percent. In this way the index number of crop intensity increases with the increase in the area sown more than once. Therefore the higher the index of intensity of cropping the highest is the land use efficiency and the lower the index the lower is the land use efficiency.

That the intensity of cropping in the district. The study reveals the fact that, the cropping intensity has been increased during the study period i.e. from 1997-98 to 2012-13. The region as a whole it was recorded 131.16 percent of intensity during the year 1997-98 and it decreased to 126.61 percent in 2002-03, where as in third decade 2007-08, it was decreased tremendously to 116.91 percent in found decdecade 2012-13, it was decreased to 114.69 in the district. The intensity of land use in Haveri district is extremely complex in some talukas and nearer to specialization in some talukas. The extension of irrigation from canals, wells bore wells and other sources, and the district has improved the rate of agricultural land. The improved farming system, multiple cropping and area sown more than once gained more importance and there is an imperative change in the agriculture of the district during the study period.

**II. STUDY AREA**

The present study of Haveri district is one of the taluka was placed in Dharwad district earlier, with re-organization of the districts in 1997 by the Government of Karnataka State, the new Haveri district has came into existence as an independent District, in the northern part of Karnataka State after 50th year of India’s independence.

Haveri district is located in between 14°-28’ to 14°-39’ and 75°07’ to 75°38’ East longitude covering area about is 4823 squire kms and consists of seven talukas namely, Byadagi, Ranebennur, Haveri, Hirekerur, Savanur, Shiggaon and Hanagal talukas.

The total population of the district was about 1598506 persons, out of which 819295 (52%) males and 779211 (48%) female population. The district is drained by four major rivers like Tungabhadra, Varada, Dharma and Kumadvati which supplies water for drinking and agriculture. The soil groups found in the district are red sandy soil followed by the medium black soil deep black soil, the red loamy soil and lateritic soil are seen in very small parts particularly in the southern border of the district.

The district enjoys sub tropical climate and temperatures varies 18°C to 40°C. The district relieves most of the rainfall from the South-west monsoon and the maximum rainfall (903) occurs in Hanagal taluka and minimum rainfall falls in Ranebennur taluka (592 mms). The natural vegetation found in district and semi-evergreen. The total forest, covers an area about 47454 hectares in the district, which contributes 9.78 percent of the total geographical area of the district.

**III. METHODOLOGY**

The data used for the present study are collected from various sources like published and unpublished. The major sources of extensive data for the present study have been collected from the census hand book District statistical office of Haveri District. Population and Socio-Economics data have been collected from International population Research center at J.S.S. and College Dharwad.

The taluka wise rural-urban, male-female total population data has been collected from the District statistical office Haveri. Climate, rainfall, land use, soil, natural vegetation has been collected from statistical of Haveri District.
Data relating to Land use area under Principal crops, irrigation and different sources of irrigation, chemical fertilizer and other related data collected from the district statistical office Haveri district and Bureau of Economics and Statistical, Bangalore. The data pertains to different variables selected for the studies have been collected from the agricultural office, zilla panchayat office in the district head quarter.

The data collected have been classified, tabulated and various tables have been prepared, and the same have been represented with the help of, charts, graphs and maps by the applying statistical and quantitative methods and also by used appropriate cartographic GIS technology for the preparation of the maps and graphs in the study area.

IV. REVIEW OF LITERATURE

The geographical studies on land use and cropping pattern are many in India and abroad, but the studies with a spatial emphasis on irrigation and agriculture comparatively few in India. It must be mentioned that irrigation is studied by geographers, Economists, Irrigation Engineers, Agronomists and Administrators from the different points of view.

The crop culture varies in the area; through the types of agricultural produce happen to vary under local conditions. The physiography of the area has an impact on the association of crops and diversification, as revealed by Bhatia (1965), Gibbs (1962), Harpal Singh (1963), and John Parr (1965). The crop association regions display a relationship between physiography, soil, climate, irrigational facilities, availability of transport and market. Roy B. K (1967) explained the crop association regions and changing pattern in Gangs, Ghaghara Doab.

A good number of studies on similar line were made by Indian Geographers to examine the regional characters of agriculture. The notable works on this theme have come from Geographers such as Singh Surendra (1982), Parimala (1983), Daitiya and Gupta (1984), Swaminathan (1984), Chatarjee N. (1986), Punnalar Das Biswas (1990), and Sindhe S. D., Noor Mohammad, Mandal R. B. Sharma and Cootino, Ram Mohan Rao, Jayachandran, Subramanyam V.P., Singh Jasbir, Majid Husain, K. V. Tiwari, C. T. Powar and Dixit, V. S. Bhadrapur, dealt with regional study of agriculture recently.

V. AGRICULTURE INTENSITY OF CROPPING PATTERN:

Current Pattern (2012-13):

The taluka wise distribution of cropping intensity in the district also explains that almost all the decades Number of talukas remain the same and shifted its position from one taluka to another. During 1997-98 the high (>136%) percentage of cropping intensity was observed in Haveri (137.39%), Savanur (149.75%) and Ranebennur (134.84%) talukas. It is because of more area under cultivation during the first decade of 1997-98.

The medium (122% to 134%) percentage of intensity of cropping was observed in two talukas, viz- Byadagi, (131.20%), Shiggaon (129.33%), talukas. The low (< 121%) of intensity of cropping was confined to two talukas of the district. Viz- Hanagal (120.18%) and Hirekerur (116.16%) talukas. This was mainly due to fluctuation in the amount of rainfall and rugged topography.

During 2002-03, there were four talukas namely, Byadagi (127.14%), Savanur (125.87%) and Shiggaon (126.61%) Hirekerur (125.96%) talukas fall under the category of high (>125.51%), percentage of intensity of cropping in the district. The medium (113% to 126.50%) percentage of intensity was found in three talukas namely, Haveri, (124.89%) Ranebennur (124.41%) The low (<112%) percentage was seen only in one taluka of the district, viz-Hanagal (111.04%) taluka.

During the decade of 2007-08, the high (>119.51%) percentage of intensity of cropping was experienced by two talukas, viz-Ranebennur (119.79%), Savanur(129.19%) and This was mainly due to large area beside irrigation Whereas, the medium (111 to 119.50 %) percentage of intensity of cropping was seen in three talukas namely, Haveri (118.72%), Hirekerur(114.62%) and Shiggaon (117.78%) talukas. It is because of irrigation, these talukas experienced more area under sown more than once. (Table No.4.31)

\[ IC = \frac{TCA}{NSA} \times 100 \]

Note:
Intensity of Cropping is Calculated by
NSA=Net shown area.
TCA=Total Cropped area.
IC= Intensity of Cropping

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### Table -1: Taluka wise Intensity of Cropping Pattern in Haveri District (1997-98 to 2012-13)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TCA</td>
<td>NSA</td>
<td>IC</td>
<td>TCA</td>
</tr>
<tr>
<td>1</td>
<td>Byadagi</td>
<td>4173</td>
<td>3</td>
<td>3180</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Hanagal</td>
<td>6179</td>
<td>5</td>
<td>5141</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>Haveri</td>
<td>8953</td>
<td>1</td>
<td>6516</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Hirekerur</td>
<td>6935</td>
<td>3</td>
<td>5970</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Ranebennur</td>
<td>8153</td>
<td>3</td>
<td>6046</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Savanur</td>
<td>7317</td>
<td>2</td>
<td>4886</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Shiggaon</td>
<td>5493</td>
<td>5</td>
<td>4247</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>Total</td>
<td>4720</td>
<td>52</td>
<td>3598</td>
<td>87</td>
</tr>
</tbody>
</table>

### Table -2: Taluka wise Intensity of Cropping in Haveri District (1997-98 to 2012-13)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Talukas</th>
<th>Intensity of Cropping 1997-98</th>
<th>Volume of Change 2012-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Byadagi</td>
<td>131.20</td>
<td>127.14</td>
</tr>
<tr>
<td>2</td>
<td>Hanagal</td>
<td>120.18</td>
<td>111.04</td>
</tr>
<tr>
<td>3</td>
<td>Haveri</td>
<td>137.39</td>
<td>124.89</td>
</tr>
<tr>
<td>4</td>
<td>Hirekerur</td>
<td>116.16</td>
<td>125.96</td>
</tr>
<tr>
<td>5</td>
<td>Ranebennur</td>
<td>134.84</td>
<td>124.41</td>
</tr>
<tr>
<td>6</td>
<td>Savanur</td>
<td>149.75</td>
<td>129.16</td>
</tr>
<tr>
<td>7</td>
<td>Shiggaon</td>
<td>129.33</td>
<td>125.87</td>
</tr>
<tr>
<td>8</td>
<td>Total</td>
<td>131.16</td>
<td>126.61</td>
</tr>
</tbody>
</table>

### Table -3: Categories of Intensity of Cropping in Haveri District (1997-98 to 2012-13)

<table>
<thead>
<tr>
<th>SL.N</th>
<th>Category</th>
<th>1997-98</th>
<th>2002-03</th>
<th>2007-08</th>
<th>2012-13</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ranking of Intensity of Cropping</td>
<td>No of the Talukas</td>
<td>Ranking of Intensity of Cropping</td>
<td>No of the Talukas</td>
<td>Ranking of Intensity of Cropping</td>
</tr>
<tr>
<td>1</td>
<td>Low</td>
<td>&lt;121</td>
<td>02</td>
<td>Hanagal, Hirekerur</td>
<td>&lt;112</td>
</tr>
<tr>
<td>2</td>
<td>Medium</td>
<td>122 to 134</td>
<td>02</td>
<td>Byadagi, Shiggaon</td>
<td>113 to 125.5</td>
</tr>
<tr>
<td>3</td>
<td>High</td>
<td>&gt;134 .01</td>
<td>03</td>
<td>Haveri, Savanur, Ranebennur</td>
<td>&gt;125.51</td>
</tr>
</tbody>
</table>
The low (<110%) percentage was confined to two talukas, viz- Byadagi (104.40%) Hanagal (109.49%), taluks this fluctuation of intensity of irrigation was due to large area under cultivation, more area sown more than once and irrigation and socio-economic facilities.

During 2012-13, the high (>120%) percentage of intensity of cropping was experienced by two talukas, viz- Hirekerur (120.36%) and Hanagal (122.69%). This was mainly due to large area beside irrigation whereas, the medium (113% to 119%) percentage of intensity of cropping was seen in two talukas namely, Byadagi (113.21%), Ranebennur (114.37%) and Savanur (116.40%) taluks. It is because of irrigation, these taluks experienced more area under sown more than once. (Table No.3)

The low (<112%) percentage was confined to two taluks, viz- Haveri (105.01%) Shiggaon (111.52%) taluks. This fluctuation of intensity of irrigation was due to large area under cultivation, more area sown more than once and irrigation and socio-economic facilities. (Table No.3)


After comparing the intensity of cropping for three points of time (1997-98, 2002-03 and 2007-08 and 2012-13), the study reveals that, the intensity of cropping varies from one decade to another. This was mainly due to extension of irrigation facilities by different sources of irrigation the area under sown more than once in the district, the cropping intensity has changed significantly. During 1997-98, the area under sown more than once was 112165 (18.78%) hectares and it has decreased to 95752 hectares (16.48%) during the second decade of 2002-03. But it has steeply decreased to 61918 hectares (11.32%) during the decade of 2007-08 fourth decades to 53534 hectares (9.94%) during the year 2012-13.

It is clear from the district shows a negative change in the intensity of cropping during the study period. The taluka wise distribution of negative change of the intensity of cropping in the district. The high (>2.50%) percentage of positive change was observed in two taluks viz-Hirekerur (+4.20%), Hanagal (+2.51%) it is because these taluks have experienced canal irrigation from Varada and Darma. Haveri (-32.38%) Hirekerur (-20.47%) and Ranebennur (-33.35%) taluka have confined to medium (-20.01 to +2.50%) percentage degree of negative change in the intensity of cropping in the district. The low (<20.00%) percentage of negative change in intensity of cropping was observed in Byadagi (-17.99%) Savanur (-17.81%), Shiggaon (-16.47%), taluks. This variation was mainly due to the variation in the amount of rainfall, irrigation facilities, topography and socio-economic facilities in the district. (Table No3).

VI. CONCLUSION

In view of partly contrasting and partly complementary roles of the crop Intensity in the agriculture study of Haveri district. The crop intensity is an index of socio Economic and agricultural conditions prevailing in an area and is a useful tools for regional analysis. The present study reveals the imbalance between the crop intensity during the period from 1997-98 to 2012-13. During the period 1997-98 98 to 2012-13, the Haveri district crop intensity was varied between one taluka to another taluka.

The cropping intensity has direct correlation with assured irrigation which enables farmers to go for multiple cropping and use higher dose of fertilizers and HYV seeds. Hence, besides irrigation fertilisers, early maturing high yielding variety of seeds, selective mechanization such as the use of tractors, pumping sets and seed drills, etc., plant, protection measures through the use of insecticides, pesticides etc. do have role in affecting the intensity of cropping. It is clear indication that, the taluks which have tremendous development in agriculture scene were showing relatively higher intensity than compared with agriculturally less developed taluks. Cropping intensity was showed fluctuations over a period of time, due to unfavourable rainfall and drastic decline in irrigated area.

VII. REFERENCES


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