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## **Agricultural Productivity Regions in Karnataka**

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**Abstract:**

*The productivity variations in each of the twenty-seven (including newly created) districts of the state, the best two methods (out of seven).for the evaluation of productivity have been applied, considering all the major food crops grown in the state, In order to classify districts according to the magnitude of spatial variations a uniform method of regional demarcation was worked out on the basis of the distribution pattern of the average of agricultural productivity indices obtained by all the two methods discussed earlier.*

### **1. Introduction**

Agricultural productivity is a multidimensional concept, which includes technological advancement, effective management of available resources and organizational set-up for the agricultural production. These factors in turn affect the relative production in any region. In order to assess the productivity variations in each of the twenty-seven (including newly created) districts of the state, the best two methods (out of seven).for the evaluation of productivity have been applied, considering all the major food crops grown in the state, namely, Rice, Ragi, Jowar, Bajra, Maize, Wheat, Other Cereals, Tur, Gram, Other Pulses, Groundnut, Sugarcane and Cotton since the beginning of 1993-94 in the state up to 2007-08.

As said above, the following two approaches have been adopted for evaluating productivity, viz;

- Agricultural Productivity Based on Output per hectare of Cropped Land (Price Weighted).
- Agricultural productivity Based on Output per Agricultural Worker (Price Weighted).

In order to identify agricultural productivity regions in Karnataka, the crop productivity indices were computed year-wise for the last fifteen years (i.e., 1993-94 to 2007-08) in accordance with the methodology of two different productivity evaluation methods discussed. The computed values (average of 1993-94 to 2007-08) to productivity indices for the twenty-seven (including newly created)

In order to classify districts according to the magnitude of spatial variations a uniform method of regional demarcation was worked out on the basis of the distribution pattern of the average of agricultural productivity indices obtained by all the two methods discussed earlier.

Productivity Index (Class Interval) Output per hectare (Rs. In 000)	No. of Districts included in the Frequency Class
5 – 10	4
10 – 15	7
15 – 20	4
20 – 25	4
25 – 30	1
30 – 35	4
35 – 40	-
40 – 45	-
45 – 50	-
50 – 55	1
55 - 60	-
60 – 65	-
65 – 70	-
70 – 75	1

75 - 80	1
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*Table 1: Frequency of occurrence of Index Levels  
 Mean value of index=23.61(Rs.in thousand)  
 Standard deviation =21.39(Rs in thousands)*

Table.1 gives the frequency of occurrence of index levels in a certain class interval which helps to formulate the system of regional demarcation used on output per hectare method. A histogram of the frequencies (number of districts falling in each class) is plotted in Fig.1

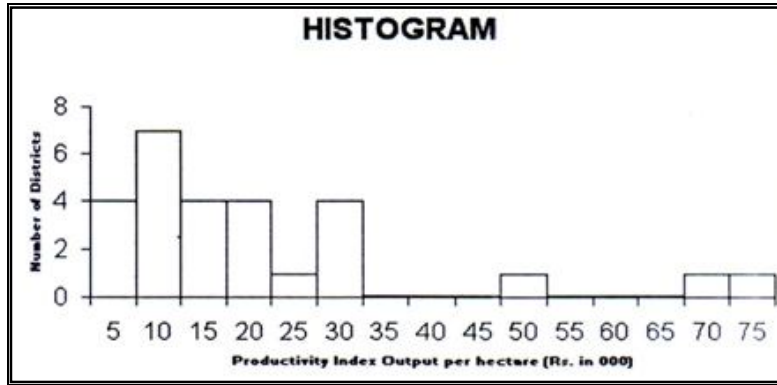


Figure 1

A bell-shaped curve was drawn with a little smoothening which identifies the normal distribution (Fig.2). On the basis of the properties of the normal curve relating to the proportion of area lying at various units of standard deviation from the mean, uniform classes of magnitude of distribution of agricultural productivity were decided.

In a universal following normal distribution pattern 99.973 percent of the individual value of random variables lies within a range of mean value ( $\bar{X}$ )  $\pm$  3 times standard deviation (S.D). In order to classify districts into five classes on the basis of variation of districts around the mean value of the the productivity index, following system was adopted to determine the ranges of classes:

Class	Range of Index
Very High	$\bar{X} + 2.5 SD$
High	$\bar{X} + 0.5 SD$ --- $\bar{X} + 2.5 SD$
Medium	$\bar{X} - 0.5 SD$ --- $\bar{X} + 0.5 SD$
Low	$\bar{X} - 2.5 SD$ --- $\bar{X} - 0.5 SD$
Very Low	$\bar{X} - 2.5 SD$

This system of regional demarcation was applied to the scores of the districts on each of the two indices and thus a uniformity was attained in the regionalization process.

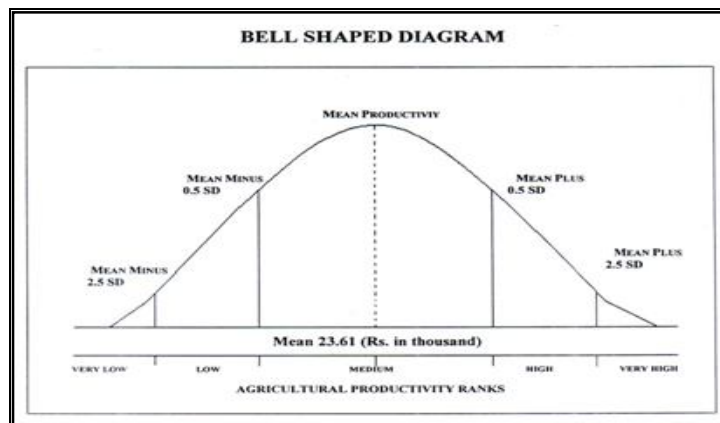


Figure 2: Bell Shaped Diagram

Sl. No.	Name of the district	Growth rate in agricultural productivity indices – based on	
		Output per hectare	Output per agrl. Worker
1	2	3	4
1	Bangalore (U)	09.50	07.50
2	Bangalore (R) *	10.90	08.60
3	Chitradugra	12.50	10.30
4	Davangere	12.50	10.30
5	Kolar	00.57	07.40
6	Shimoga	17.50	15.20
7	Tumkur	02.30	01.30
8	Belgaum	20.40	18.00
9	Bijapur	18.60	16.10
10	Bagalkot	18.60	16.10
11	Dharwad	08.10	06.00
12	Gadag	08.10	06.00
13	Haveri	08.10	06.00
14	Uttar Kannada	07.60	03.60
15	Bellary	13.50	11.30
16	Bidar	27.00	25.40
17	Gulbarga *	12.60	09.10
18	Raichur	10.20	08.10
19	Koppal	10.20	08.10
20	Chikamangalur	14.30	12.10
21	Dakshina Kannada	12.60	10.40
22	Udupi	12.60	10.40
23	Hassan	11.50	09.40
24	Kodagu	17.90	15.50
25	Mandya	27.35	24.80
26	Mysore	12.40	10.40
27	Chamrajnagar	12.40	10.40

Table 2: District Wise Linear Growth Rate in Productivity Indices in Karnataka – Percent Per Annum – 1993-94 to 2007-08

Source: Computed by the resource based in data available

\* including Yadagiri District, \* including Raichur District

Application of this method to the regional classification of the districts and analysis of trends in the productivity has yielded interesting results. Though, it is found that each productivity index reveals a common underlying temporal regional pattern, yet there is considerable divergence in the details. These regional and temporal specificities of each index are briefly described in the following.

## 2. Productivity Regions, Based on Output per Hectare

This index is based on the value of selected food crops in terms of rupees per hectare. The total production of each crop in each district for each year was multiplied by the money value of the crop and the money value of all the selected food crops in each district for each year was thus obtained. The process was repeated for all the years from 1993 to 2008. The summation of all the money values in each district was divided by the area of all the crops considered in hectare. The result thus obtained was divided by the number of years considered to obtain the average money value per hectare in each district which was grouped into four classes of Very High, High, Medium and Low productivity levels (Table.3). The regional demarcation based on the respective levels of productivity of districts on this index is shown in Fig.3.

It is seen from Fig.3 that the highest growth rate recorded based on this index is 27.35 percent per annum in the district of Mandya, followed by Bidar where the growth rate is 27.00 percent. The lowest growth rate is recorded as 0.57 percent in the district of Kolar. The growth rates in the district of Tumkur and Uttar Kannada are slightly higher than that of Kolar, being 2.27

and 7.60 percent per annum respectively. Though there is no strong association between spatial level of productivity and growth rate, the two variables are positively related. This association is an indication of the fact that all the districts based on this index have rapid growth rate.

Productivity Index Range	No. of Districts Included
More than --- 77,000	1
34,300 --- 77,000	2
12,900 --- 34,300	14
Less than --- 12,900	10*

*Table 3: Agricultural Productivity Class Interval, Based on Output Per Hectare of Cropped Land, 1993-94 to 2007-08 (Price Weighted in Rupees)*

*Mean Value of Index = 23.61 (Rs. in Thousand)*

*Standard deviation = 21.39 (Rs in Thousand)*

*\* includes newly created districts also*

### 2.1. Very High Productivity Level

The only one district i.e., Mandya district constituting this region shows an output of more than rupees 77,000 per hectare (Fig.3)

### 2.2. High Productivity Level

There are two districts namely, Shimoga and Belgaum which fall in this region. These districts show an output between Rs.34,300 and Rs.77,000 per hectare.

### 2.3. Productivity Trends

The district of Mandya in the region of very high productivity level shows the highest growth rate in productivity where the output per hectare shows an average annual increase of 27.35 percent. Similarly, in the region of high level productivity, Shimoga and Belgaum districts show a rate of growth more than 15.00 percent (Fig.4). The maximum rate of growth is observed as 23.43 percent in the district of Belgaum.

### 2.4. Medium Productivity Level

This is the largest region extending from south to north and includes fourteen districts, which is about nearly 50.00 percent of all the districts of the state considered.

These districts show variations in their level of productivity ranging from Rs.12,900 to Rs.34,300 per hectare. Apart from the isolated pocket of Bidar, these districts form two distinct blocks. The first block (north-region) includes the districts of Bijapur, Bagalkot and Uttar Kannada. The second block (South-Region) includes the districts of Chitradurga, Davangere, Chikamagalur, Hassan, Kolar, Kodagu, Mysore and Chamarajnaragar. The districts of Udipi and Dakshina Kannada also form a part of the second block of medium productivity.

### 2.5. Productivity Trends

The maximum growth rate in this region is 27.00 percent in the district of Bidar which is followed by Bijapur and Bagalkot districts each having a rate of growth of 18.57 percent per annum. But the majority of the districts show a rate of increase less than 13.00 percent except Kodagu which has the growth rate of 17.86 percent per annum. The minimum rate of growth is 0.57 (0.6) percent in the district of Kolar (Fig 4)

### 2.6. Low Productivity Level

The low productivity level prevails in ten districts of the state. In all the ten districts which fall in this category show an output per hectare below Rs.12,900. There are four districts in the north-eastern region of Karnataka namely, Gulbarga, Raichur, Koppal and Bellary. There are three districts in the northeastern region of Karnataka namely, Dharwad, Gadag and Haveri. In the South Karnataka region there are three districts namely, Bangalore (U), Bangalore (R) and Tumkur.

### 2.7. Productivity Trends

It is quite interesting to note, that the highest growth rate of 13.50 percent is recorded in the district of Bellary and the second highest rate of 12.60 percent is observed in Gulbarga. The remaining districts show a rate of growth which is lower than 10 percent except the district Bangalore (R) which has 10.90 percent per annum. The minimum growth rate is 2.3 (2.27) percent as noticed in the case of Tumkur district.

## 3. Productivity Regions, Based on Output per Worker

This index is based on the money value output per worker in terms of rupees at 1990 – 91 prices. The outturn of all the selected crops of each year for the period 1993-2008, for every district was converted into money value. The population of agriculture workers was interpolated for each year with the help of following exponential growth formula:

$$ALB (I) = P_{91} [(1 + R)X T]$$

Where

ALB (I) = Population of the agricultural workers in each district in the 1<sup>st</sup> Year.

$P_{91}$  = Population of the agricultural workers as per (1991 Census).

R = Rate of Growth during the decade,

i.e.,

$$\left[ \left( \frac{P_{2008}}{P_{91}} \right) - 1 \right] \frac{1}{10}$$

P 2008 is population of agricultural workers for 2008 (2008 Projected figures)

T = Number of years onward from 1991

The money value of the produce of the selected crops of each district was divided by the agricultural population of the district concerned for each of the respective years 1993-2008, and the average value of output of fifteen years for each worker of the district was subsequently obtained. This index thus takes the form of input and output ratio where output is compared with input of the labour.

The index ranges of productivity (output per worker) obtained by this method is shown in table 6.4; and figure 6.5 shows the regional demarcation of productivity. This index of productivity is characterized with a high rate of growth. The lowest positive growth rate of 1.35 percent is observed in the district of Tumkur. Excluding Tumkur and Uttar Kannada,

Productivity Index Range		No. of Districts Included
More than	5904.5	1
2,610.5	5904.5	5
963.5	2610.5	13
Less than	963.5	8

*Table 4: Agricultural Productivity Class Interval, Based on Output per Agricultural Worker, 1993-94 to 2007-08 (Price weight in Rupee)*

*Mean Value of Index ( $\bar{X}$ ) = 1787*

*Standard deviation (S.D) = 1647*

no other districts show a rate less than 5 percent. The highest growth rate in productivity is found in the district of Bidar, where output per worker in monetary terms has increased at a rate of 25.40 percent. It is interesting to note, that not a single district shows a decline in the growth rate in productivity. There is no correlation between the spatial distribution of productivity based on output per agricultural worker and the productivity trend. The spatial distribution shows productivity regions of Very High, High, Medium and Low as defecated in (Fig 6.5), but the trend of productivity is high in the level of the four regions as defecated (Fig 6.5). However, districts with a high average level of productivity show a moderately high growth rate, while districts with low level of productivity show a relatively low growth rate.

### 3.1. Very High Productivity Level

The region includes only one district of Belgaum which shows an output more than of Rs.5904.50 per worker i.e., Rs.6017.4

### 3.2. High Productivity Level

In this region five districts are falling with high level of productivity. This region which includes the districts of Shimoga, Bijapur, Bagalkot and Bidar shows a variation of agricultural output per worker between Rs.2610.50 and Rs.5904.50 (Table .4). There is an isolated pocket in the form of district Mandya showing high productivity level with the high growth rate of 24.80 percent per annum.

### 3.3. Productivity Trends

The district of Bidar, marked for very high level of productivity, shows a relatively low rate of increase in productivity per agricultural worker, A similar trend is also found in the districts attaining high level of productivity (Fig .6). With the exception of Bidar (25.40 percent) and Mandya (24.80 percent) all other districts show a rate of growth less than 18.00 percent. This region contains some of the districts (Shimoga, Bijapur and Bagalkot) which have a growth rate as a low as 16.00 percent per annum.

### 3.4. Medium Productivity Level

The whole of central Karnataka, including districts, namely, Dharwad, Gadag, Haveri, Davangere and Chikkamagalur; Eastern part of Karnataka including districts namely, Bellary, Raichur, Koppal, Chitradurga; and the Southern part of Karnataka including Hassan, Kodagu, Mysore and Chamarajnagar districts are included in this region. This region exhibits a level of agricultural output ranging between Rs.963.50 and Rs.2610.50 per worker. It comprises 13 districts which accounts for more than 45 percent of total number of the districts considered of the state.

### 3.5. Productivity Trends

A majority of districts in this region is noted for moderate growth in productivity. The maximum growth rate in this region is found in the district of Kodagu where output per worker has increased at a rate of 15.50 percent. However, it is noted, that the district next to the maximum growth rate is only 12.1 percent, as seen in Chikkamagalur which is followed by the district of Bellary where the growth rate is 11.30 percent. The minimum rate of growth in the descending order is recorded in the districts of Raichur (including Koppal) and Dharwad (including Gadag and Haveri) respectively as 8.1 and 6.0 percent per year. Thus in contrast to the region of high level of productivity the range of variation is much lower in this region and may be termed as moderate.

### 3.6. Low Productivity Level

This region consists of 6 districts of southern Karnataka and two districts of northern Karnataka where the output per worker is less than Rs.963.50. The districts constituting the region of low productivity are, Bangalore (U), Bnagalore (R), Kolar, Tumkur, Dakshina Kannada and Udupi and also Uttar Kannada and Gulbarga.

### 3.7. Productivity Trends

The group of districts constituting this region is characterized by a relatively moderate high growth rate on an average. The maximum growth found in the district of Dakshina Kannada (including Udupi) is 10.4 percent, while the minimum is 1.35 percent in the district of Tumkur. However, if extreme values of the growth rate are excluded the range of variation in this group is in between 7.50 and 9.0 percent in Bangalore (U) and Gulbarga respectively.

## 4. Conclusion

From the above, it is clear that regional variation is existing in Karnataka in respect of agricultural development. Regional imbalance in agricultural productivity caused the underdevelopment of agriculture in Karnataka state. Regional imbalances in agricultural productivity are due to special variations in the availability of important agricultural inputs. Provision of agricultural input along with the development of basic infrastructure will help to develop agriculture. Further diverting of human labour pressure from agriculture sectors to some non –agricultural sector will increase the productivity of agricultural sector and contributes positively towards the agricultural development in the state.

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