

## AGRICULTURAL PRODUCTIVITY ANALYSIS OF BIRBHUM DISTRICT: A SPATIO-TEMPORAL CHANGE ASSESSMENT

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### Abstract:

This paper tries to analyze the spatio-temporal variation of agricultural productivity in Birbhum district since 2002-03 to 2007-08. The block wise disparity in agricultural productivity has been calculated using Singh's crop yield and concentration indices ranking coefficient. There is great disparity in the agricultural productivity at block level. The highest level of agricultural productivity has been found in Suri-II and Muraroi-I for both year and lowest productivity has been observed in Rajnagar, Khoyrasole and Dubrajpur in both the years. The immitigable disparities of productivity is because of hydro-physical, economic barriers, lack of cultural motivation and lack of proper implementation of technological supports.

**Keywords:** *Agricultural productivity, crop yield index, crop concentration index.*

### Introduction:

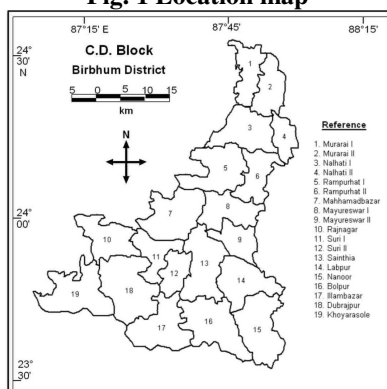
Agriculture has been practised in India since time immemorial. At the present age in spite of technological development and expansion of service sector more than 60% of total population in Birbhum District is dependent on agriculture for their livelihood. So, the fluctuation in agricultural productivity has great impact on socio-economic status of people in Birbhum District. The study of agricultural productivity is a fruitful technique for agricultural planning and showing efficiency of region in comparison to neighboring region. It is necessary to increase the agricultural productivity to combat with increasing food demands which upsurges from the appalling increase in population, because it is not possible to expand land.

The agricultural productivity is a result of complex function of physical, political and socio-economic environment. Productivity of agriculture is defined in agricultural geography means output per unit of input or per unit of area respectively and the improvement in agricultural productivity is generally the result of a more efficient use of the factors of production, viz. environment, arable land, labour, capital and the like (Singh, 1984). The measurement of production and input required for the production of that output is known as agricultural productivity (Hussain, 1996). In simple words, agriculture productivity may be defined as the input output ratio.

### Location of study area:

The Birbhum district is triangular in shape and lies between  $23^{\circ} 32' 30''$  to  $24^{\circ} 35' 00''$  in north latitude and  $87^{\circ} 05' 25''$  to  $88^{\circ} 01' 40''$  in east longitude. The chief town of this district is Suri which is located two miles south of the Mayurakshi River. The Birbhum is bounded on east by Murshidabad and Burdwan Districts, on north by Bihar, on west by Jharkhand and on south by Burdwan district. This district is separated from Burdwan by the Ajoy River which is flowing in the extreme south of this district. The Birbhum district is a part of the tract known as rarb. The entire area of this district is highly undulating in nature and general slope is about <10 meters per kilometer. The entire district is well drained by the rivers like Mayurakshi, Dwarka, Ajoy, Brahmani etc. Various types of soils are found in this district, but most of the area is covered by lateritic nodules and old and younger alluvium soils are found in eastern and southern part of the study area. The Birbhum district falls under the Monsoon climate with average annual rainfall of 1303.7mm where 78% rainfall receives in June to September and with maximum temperature of  $39.7^{\circ}\text{C}$ .

**Fig. 1 Location map**



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**Data base & Methodology:**

The present paper has been completed by using secondary data. The data has been collected from published reports namely District Statistical Hand Book of Birbhum District published by Government of West Bengal.

To show the spatio-temporal change in agriculture productivity, five crops namely rice, wheat, potato, oil seeds, and pulses have been selected. Crop yield and crop concentration indices ranking coefficient technique of Jasbir Singh have been selected to demarcate spatial as well as temporal change in agricultural productivity in Birbhum district since 2002-03 to 2007-08. The crop yield and concentration indices ranking coefficient procedure is as follows-

$$Y_i = Y_{a_c} / Y_{a_r} \times 100 \text{ ----- (I)}$$

Where,  $Y_i$  = The crop yield index.

$Y_{a_c}$  = The average yield per hectare of crop in "a" in the component enumeration unit.

$Y_{a_r}$  = The average yield of the crop "a" in the entire region or country.

$$C_i = P_{a_c} / P_{a_r} \times 100 \text{ ----- (II)}$$

Where,  $C_i$  = The crop concentration index.

$P_{a_c}$  = The percentage strength of crop "a" in the total harvested area in the component enumeration unit.

$P_{a_r}$  = The percentage strength of crop "a" in total harvested area in the entire region.

The crop yield and concentration indices are thus derived for all the crops and ranked separately. Yield and concentration ranks are added and thereafter divided by two.

Crop yield and concentration indices ranking coefficient for crop "a" = Crop yield index ranking of crop a + Crop concentration index ranking of crop a / 2 ----- (III)

Lastly, for drawing of choropleth maps of two different year ranks of crop yield and concentration indices of five crops of particular year are added and then divided by five. And average ranks of crop yield and concentration of five crops are grouped into four categories namely (I) Highly Productive Zone (II) Moderately productive Zone (III) Low Productive Zone (IV) Very Low Productive Zone.

**Objectives:**

The main objectives of this study are-

- To examine the spatial pattern of agricultural productivity in Birbhum district at block level.
- To examine the temporal change in agricultural productivity from 2002-03 to 2007-08.
- To examine the inter block disparity in agricultural productivity in Birbhum district.
- To identify the blocks which have different agricultural productivity levels.
- To identify the factors which are responsible for spatio-temporal change in agricultural productivity in Birbhum district.

**Agricultural Scenario:**

Variation in natural, socio-economic factors and orthodox method of farming stand in the way of equal agricultural productivity in Birbhum district. Here, the variation of areal coverage of different crops is significant at block level. All the blocks are characterized by rice dominance because areal proportion is more than 60%. After rice, the devotion of area for wheat and productivity is relatively higher than other crops.

**Result and Discussion:**

The spatial variation in physical output from the land is the result of combination of natural environment and human activities. Due to variation in such factors, level of productivity of different crops is different at block level in Birbhum district. Table-2 represents the spatial pattern of agricultural productivity at block level based on crop yield and concentration indices of rank coefficient of 2002-03.

High productivity zone consist of Nalhati-I, Nalhati-II, Murarai-I, Suri-II, Bolpur-Sriniketan, Illambazar, Rampurhat-II. Irrigation (canal as well as tube well) and other infrastructural facilities help a lot for high rate of agricultural productivity. Five blocks namely Rampurhat-II, Md. Bazar, Sainthia, Labpur, and Nanoor are defined as moderate productivity blocks. Only one block Suri-I is found to be low agriculture productivity block. Six blocks, Murarai-II, Mayureswar-I, Mayureswar-II, Dubrajpur, Rajnagar, Khoyrasole are identified as very low productivity blocks. Unfavorable soil and climate in Dubrajpur, Rajnagar, Khoyrasole, absent of canal system and other irrigation system are the main culprits for such low productivity.

**Table-1: Crop yield and concentration indices of 2002-03**

Blocks	Rice		Wheat		Potato		Pulses		Oil Seeds	
	Yi	Ci	Yi	Ci	Yi	Ci	Yi	Ci	Yi	Ci
Nalhati-I	110.08	77.18	114.62	16.79	113.92	100.00	97.13	446.05	81.70	172.05
Nalhati-II	105.74	87.60	109.53	182.45	103.17	5.19	102.67	38.49	129.46	232.47
Muraroi-I	9.79	88.30	91.01	91.96	74.80	87.01	109.78	416.15	45.64	115.75
Muraroi-II	86.63	77.82	93.09	308.04	84.26	15.58	86.10	222.34	77.91	171.37
Mayureswar-I	102.75	103.35	86.57	104.75	87.83	72.73	86.10	1.00	88.12	67.67
Mayureswar-II	97.98	96.37	81.90	26.33	105.84	629.87	75.20	87.29	82.60	33.56
Rampurhat-I	106.69	96.52	99.64	134.55	104.72	49.35	102.67	120.96	109.01	120.96
Rampurhat-II	120.96	83.45	117.38	295.61	103.17	31.17	91.04	1.72	90.64	220.41
Md. Bazar	95.04	118.10	112.61	113.35	112.63	64.94	107.34	6.53	105.05	10.14
Sainthia	91.81	107.47	101.65	23.95	123.38	220.78	78.37	10.65	108.65	70.41
Dubrajpur	91.05	115.41	94.93	35.65	93.54	32.00	99.35	41.24	104.93	20.14
Rajnaragar	94.19	116.60	97.90	72.76	78.97	12.12	119.90	1.03	102.33	1.36
Suri-I	72.39	113.26	103.60	30.35	97.58	43.72	100.53	9.62	114.15	57.26
Suri-II	104.45	115.40	110.93	32.18	111.34	39.39	104.94	20.27	122.08	28.90
Khoyrasole	89.04	107.28	92.27	108.41	91.14	95.67	78.11	7.22	108.65	50.27
Bolpur-Sriniketan	99.48	105.90	92.57	31.99	124.67	106.06	111.07	29.55	106.23	110.96
Labhpur	109.72	99.10	103.36	21.76	98.19	192.64	91.11	207.56	99.02	96.71
Nanoor	108.93	97.88	86.77	129.25	84.26	87.88	138.56	0.69	105.40	145.48
Illambazar	113.29	112.70	109.67	21.02	106.61	28.14	120.69	43.64	118.46	61.78

Source: Computed by researcher

**Table-2: Agricultural productivity status of 2002-03**

Productivity Zone	Range Value	Name of Blocks	Actual Area	% of Area to Total
High	<9.0	Nalhati-I, Nalhati-II, Muraroi-I, Suri-II, Bolpur-Sriniketan, Illambazar, Rampurhat-I	1553.93 Sq.km.	34.57
Moderate	9.0-10.0	Rampurhat-II, Md. Bazar, Sainthia, Labhpur, Nanoor	1381.39 Sq.km.	30.73
Low	10.0-11.0	Suri-I	154.65 Sq.km.	3.44
Very Low	>11	Muraroi-II, Mayureswar-I, Mayureswar-II, Dubrajpur, Rajnaragar, Khoyrasole	1405.27 Sq.km.	31.26

Source: Computed by researcher

The table-4 for 2007-08 shows that five blocks, Muraroi-I, Md.Bazar, Sainthia, Suri-I, Suri-II are identified as highly agricultural productivity blocks. Moderate agriculture productivity region consists of five blocks namely Nalhati-I, Muraroi-II, Rampurhat-II, Illambazar, Mayureswar-I. Six blocks, Nalhati-II, Mayureswar-II, Rampur hat-I, Bolpur-Sriniketan, Labpur, Nanoor are found to be low agriculture productivity blocks. Dubrajpur, Rajnaragar, Khoyrasole comprise the very low productivity zone.

**Table-3: Crop yield and concentration indices of 2007-08**

SL. NO	Name of Block	Rice		Wheat		Potato		Pulses		Oil Seeds	
		Yi	Ci	Yi	Ci	Yi	Ci	Yi	Ci	Yi	Ci
1	Nalhathi-I	97.42	90.13	96.35	152.40	111.09	123.74	110.21	212.76	75.94	97.12
2	Nalhathi-II	105.37	82.88	80.12	285.94	63.47	21.79	82.48	83.38	115.49	167.26
3	Muraroi-I	106.72	80.43	112.83	163.52	117.13	61.73	112.49	321.66	54.51	172.88
4	Muraroi-II	95.10	86.78	126.24	207.74	74.76	20.39	109.12	220.77	54.66	131.78
5	Mayureswar-I	107.02	103.42	118.55	56.57	139.37	68.72	65.02	110.39	79.40	112.19
6	Mayureswar-II	94.43	88.02	116.63	73.72	109.98	423.46	73.24	131.16	83.51	80.41
7	Rampurhat-I	105.05	106.86	96.41	104.64	50.36	5.03	143.57	58.16	98.92	87.26
8	Rampurhat-II	93.61	88.65	103.83	153.01	99.24	62.29	101.18	164.69	134.63	164.79
9	Md. Bazar	96.11	103.25	107.72	93.66	141.19	62.57	87.92	71.81	126.58	101.64
10	Sainthia	110.29	104.07	114.57	74.65	99.87	196.37	111.93	60.64	124.91	60.68
11	Dubrajpur	88.32	108.57	110.09	82.84	52.04	75.42	112.46	30.27	113.97	66.58
12	Rajnagar	91.72	120.80	92.89	25.19	60.48	16.20	102.55	3.86	97.96	26.03
13	Suri-I	104.14	102.12	121.00	62.13	101.04	133.24	125.12	7.42	105.21	105.89
14	Suri-II	116.18	110.50	122.43	19.01	57.03	63.69	118.82	66.17	110.92	91.37
15	Khoyrasole	102.83	97.26	106.54	174.34	53.79	91.62	82.02	56.08	108.44	88.36
16	Bolpur-Sriniketan	93.10	106.12	100.00	52.55	136.29	127.88	128.75	73.29	82.51	74.79
17	Labhpur	93.51	104.53	78.17	49.15	132.51	167.88	137.84	58.4	104.54	81.92
18	Nanoor	96.24	102.38	95.62	57.65	133.23	75.14	95.17	56.16	108.70	143.15
19	Illambazar	102.84	113.89	105.56	32.46	167.12	54.19	134.66	56.16	119.20	39.45

Source: District statistical handbook, 2007-08

**Table-4: Agricultural productivity status of 2007-08**

Productivity Zone	Range Value	Name of Blocks	Actual Area	% of Area to Total
High	<9.0	Muraroi-I, Md.Bazar, Sainthia, Suri-I, Suri-II	1086 Sq.km.	24.16
Moderate	9.0-10.0	Nalhathi-I, Muraroi-II, Rampurhat-II, Illambazar, Mayureswar-I	1102.96 Sq.km.	24.54
Low	10.0-11.0	Nalhathi-II, Mayureswar-II, Rampur hat-I, Bolpur-Sriniketan, Labhpur, Nanoor	1467.74 Sq.km.	32.65
Very Low	>11	Dubrajpur, Rajnagar, Khoyrasole	838.54 Sq.km.	18.65

Source: Computed by researcher

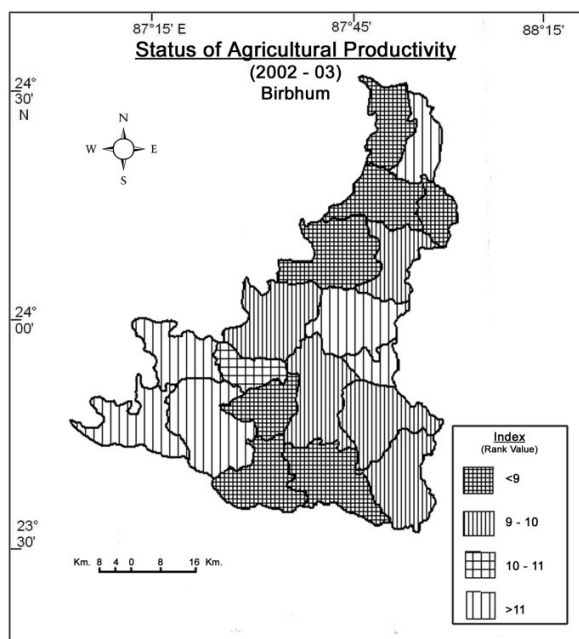


Fig. 2

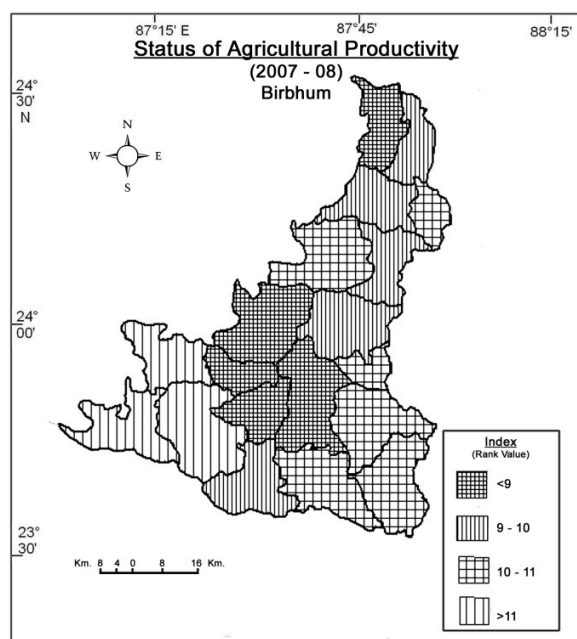


Fig. 3

The C.D. Block, Murarai-I has maintained its position as high productivity region in both the period i.e. 2002-03 and 2007-08. Four blocks, Md.Bazar, Sainthia, Suri-I and Suri-II have been raised their position to high productivity region. The main causes which have accelerated the productivity of these blocks are favorable agro-ecological condition as well as increase in the infrastructural and technological factors such as irrigation source, high yielding variety seeds, pesticides and chemical fertilizer etc.

Two blocks namely Nalhati-I and Illambazar are identified as high productivity blocks in the former period (2002-03), but have deteriorated their position to moderate productivity region in the later period. Rampurhat-II block is bound to the same category in both the period. In 2002-03 Muraroi-II and Mayureswar-I blocks were in the very low productivity region but in 2007-08 these two blocks have improved to moderate productivity region. Within this very short period irrigated area in these two blocks has increased significantly.

Bolpur-Sriniketan, Nalhati-II and Rampurhat-I blocks were in high productivity region in 2002-03 but these three blocks have fallen down to low productivity region. Labpur and Nanoor are in the moderate productivity region but in the former period these two blocks have come under the low productivity region.

Mayureswar-II was in the very low productivity region but due to increase of irrigated area as well as technological inputs it has entered into low productivity region.

Three blocks, Dubrajpur, Rajnagar and Khoyrasole are continuing as very low productivity region because of unfavorable soil, climate, less use of infrastructural facilities as well as absent of canal network system.

#### Conclusion:

Effort should be made for the greater degree of agricultural productivity in Birbhum district because in many cases, declining and low agricultural productivity force people to encroach on forests, grasslands and wetlands, creating a downward spiral of further environmental degradation and poverty. This spatio-temporal variation may be controlled by changing orthodox method of cultivation and implementing the modern technologies and inputs. Important measures i.e. extension of irrigation facilities and introduction of HYV seeds will be valuable steps for the increase of agriculture productivity. Hence, it can be concluded that, improving agricultural productivity is essential for sustainable economic development and reduction of stress on the environment.

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