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Changing Patterns of Agricultural Productivity in Uttar Diajpur District, West Bengal

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ABSTRACT

Agricultural productivity is a development index of a region. Block level changing pattern of agricultural productivity highlights in Uttar Dinajpur district has been made in the present study. The aims of the paper is to examine changing pattern of crop productivity in two time period gaps (1990-91 to 2015-16) which is based on the primary and secondary data. It is analysed with the help of Yang's (1965) crop yield index method of calculation for agricultural productivity. Agricultural productivity is calculated on the basis of three basic indices and overlaying method (ArcGIS) is applied to the estimate of changing pattern of productivity. The changing scenario has been hugely transformed in the year 2015-16 from the base year of 1990-91. But overall agricultural productivity is below the standard level i. e. 289.21 (2010-11) compared to the other districts of West Bengal. Not only that, an agricultural productivity index value varies block to block in the district. The remarkable inequality in agricultural productivity is mainly due to lack of proper implementation of technology, variation in use of modern methods and low per-capita income of land holders, etc.

1. Introduction

Agricultural productivity is measured as the ratio of agricultural output to agricultural inputs. Uttar Dinajpur district has witnessed tremendous changes in agriculture and allied sectors since the independence time; it has registered imbalanced agricultural development and spatial variations in productivity. In the district, about 75 per cent of working population is engaged in agricultural sector either as cultivators or as agricultural labours. Agriculture in the district is backward in comparison with that of the other district of West Bengal. Geographical studies on agricultural productivity are largely associated with its regional variations (issues related to environmental condition and productivity pattern), its assessment (methodological aspects of production measurement) and applied aspects (issues related to determination of productivity factors such as biological, techno-economic, demographic and socio-cultural in the specific environment of land). Although agricultural productivity differs from one region to another region, and the factors for such variations are many, the determination of variations in agricultural productivity and there possible reasons help to demarcate the regions of agricultural productivity. Though, the production of cereal crops increased about 20 thousand tonnes in each year to reach 924 thousand tonnes during the year 2015. The main issue in Uttar Dinajpur district is to analyze the productivity pattern in relation to bio-physical factors of land and agricultural intensity in order to understand of agricultural development.

2. Different approaches for the measurement of agricultural productivity

Agricultural productivity measurement is not a simple task as it deals with to establish a relationship between output and input in agricultural production. Agricultural productivity has been assessed and studied by considering physical factors of land (i. e land productivity) and work force engaged in agricultural operation (labour productivity)-(Rehman and Singh 1992). In resent time agricultural productivity has engaged the attention of geographer working in various disciplines subjects like; geography, agricultural science economics and agricultural economics for a long time; many attempts have been made to measure and identify agricultural productivity in India as well as the world. Measuring productivity in agriculture is a substantial literature relating to methodological procedures. The measurement of agricultural productivity which are utmost frequently used are those of partial productivity and refer to the relation of a single input to the total output. There are more than 24 methods to find for the agricultural productivity. Among of these, most important methods are discuss below-

Thompson (1926) measures the relative productivity of British and Danish farming emphasized and expressed of gross output of crops and livestock. Enyedi (1964); Shafi (1972, 1984) determining an index of productivity coefficient. Technique of Enyedi's is applicable for determine productivity index of an area with the reference to national level. Jasbir Singh (1976) has attempted to measure the regional differences in the level of food production and to demarcate the weaker areas from the point of view of agricultural production is enough to focus attention in important food crops in a particular region and it is dominant primary and secondary crops in terms of agricultural land occupancy. Bhatia (1967) standardized yield index where shows the changes and trends of agricultural efficiency in Uttar Pradesh during 1953-1963 adopted Ganguli's method of productivity measurement. Khusro (1965) has linked assessment of productivity with the output per unit of a single input and output per unit of cost of all inputs in the agricultural production. Kendall (1939) has suggested four methods, such as Productivity co-efficient, Ranking co-efficient, Value co-efficient and Energy co-efficient.

3. Study Area

For administrative purpose West Bengal has been divided into 20 Districts. Uttar Dinajpur is one of the most important District of West Bengal, comprising an area of about 3140 sq.km and lying between latitudes $25^0$17'10'' N to 26^0 35'15'' N and $87^0$48'37'' E to $88^0$20'10'' E longitudes. The District consists of 9 C.D. Blocks covering 1577 Villages, 3 statutory towns and 3 census towns. Uttar Dinajpur District is situated in the northern tract of Bengal Plain laying North of Ganga River. In general, the area has mostly levelled topography having slope from North to South.

The study area has an average elevation generally does not exceed 30 m above mean sea level and no hill is found in the District. Climatically, this region falls under the subtropical monsoon climatic zone, oppressive hot summer (38^0 C in May) and monsoon rainfall, dry and cold winter season (15^0C in January) are some of the typical characteristics.

The area is drained mainly by the River Mahananda, Nagar, Gamari, Chhiramati (Srimati) and Tangan flowing from North to South.

Thus the study area has a variety of topography having potentials in terms of land utilization. Therefore, the study area is to be studied in detail and evaluated properly.

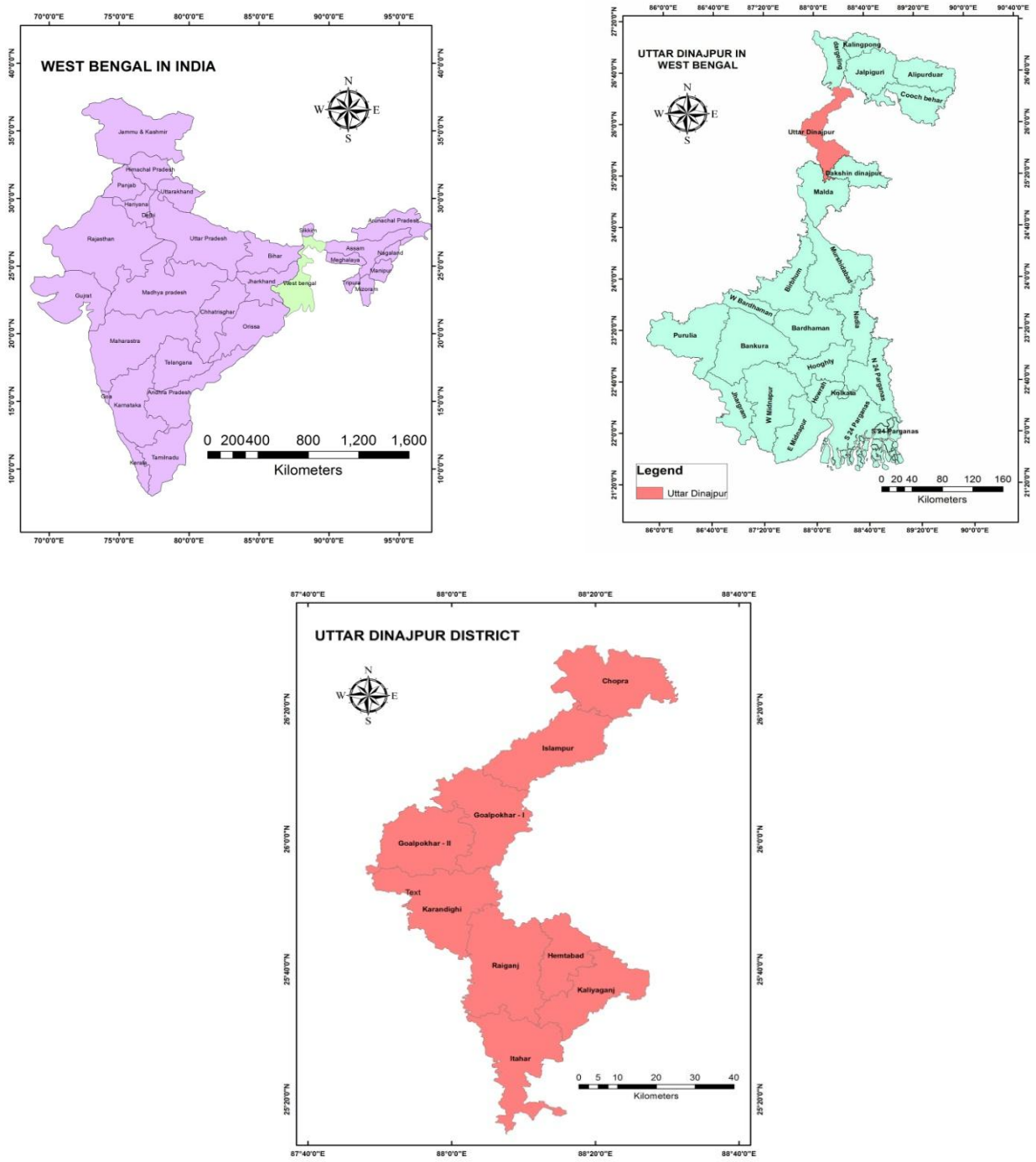

Figure 1 *Location map of the study area.*

4. Objectives

The study will try to fulfil the following objectives

- To find out block level changing pattern of agricultural productivity in Uttar Dinajpur district during 1990-91 to 2015-16.
- To show the per annum change of agricultural productivity from 1990-91 to 2015-16.
- To show the different agricultural productivity zone of cereal crops of Uttar Dinajpur district.
- To identify the high productivity status blocks and to formulate plan to increase their productivity in Uttar Dinajpur District.

5. Data Sources and Methodology

In the present study data has been collected from primary and secondary sources. Block level primary data for the year 1990-91 have been collected by the author from different villages covering different parts of the district. And data the year 2015-16 have been collected from for secondary sources as well as district Statistical Handbook and Principal Agriculture Officer, Karnojora, Uttar Dinajpur District. Yang (1965) devised a 'crop yield index' method was applied for the agricultural productivity. The agricultural productivity indices of crops were calculated. His method represents the yield rate of various crops in a blocks compared with the average crop yield of the district. The procedure for calculating 'crop yield index' is-

Firstly, the average yield of each crop grown in the whole region is determined. And secondly, the value of each crop is divided by the yield of the whole region then multiplied by 100 and get the value in per cent (shown in column 5, table 1). By considering the area devoted to each crop as a weight and multiplying it with the percentage value, a product is obtained (shown in col. 6, table 1). By adding the total products and dividing the sum of the products by the total crop area (in hectares). The computed values of productivity index for nine blocks of Uttar Dinajpur are given in the table 2.

6. Yang's Crop Yield Index Method of Agricultural Productivity (1965)

For the study of agricultural productivity of Uttar Dinajpur District, Yang's crop productivity index method has been applied. In this method some major crops grown in the district were considered for the productivity analysis. The area and average yield of different crops have been taken into account to calculate the agricultural productivity and results shown in the table 1.

Table 1 Method of Calculating Crops Productivity Index of Chopra Block, Uttar Dinajpur District for the Year of 1990-91

Name of the crops	Average yield rates (Quintal/Hectare)		Area of each crops in Block (Hectares)	Crop yield in the block as % of the District (col.3/col.2)x100	Percentage multiplied by area under crops (col.4xcol.5)
	Yield in District	Yield in Blocks			
1	2	3	4	5	6
Paddy	23.40	25.45	13,580	108.76	1,476,960.80
Wheat	16.75	18.10	2,015	108.05	2,17,720.75
Potato	72.00	67.75	3,140	94.09	2,95,442.60
Gram	5.60	4.78	570	85.35	48,649.50
Maize	41.90	44.50	890	106.20	94,518.00
Mustard	9.35	10.20	285	108.85	31,022.25
Total			20,480	-	2,164,313.90

Source: Office of the Principal Agricultural Officer, Directorate of Agriculture, Government of West Bengal, Karnojora, Uttar Dinajpur.

Crop yield index for Chopra Block is = 2164313.90/20480
= 105.68

7. Agricultural Productivity Region-Based on Cereal Crops

Cereal crops in the district occupy an important position in agricultural sector. The major cereal crops like; paddy, wheat, maize, bajra and barly which occupy an important position. Area of very high, high, medium, low and very low productivity categories are shown in the table-2 and its zone shows in figure- 2 and 3.

Table 2 Agricultural productivity index for cereal crops

Name of the CD blocks	Yield index (1990-91)	Yield index (2015-16)	Growth per annum
Chopra	102.12	141.32	1.57
Islampur	98.45	129.48	1.24
Goalpokher-I	97.65	122.35	0.99
Goalpokher-II	100.15	143.90	1.75
Karandighi	103.34	139.65	1.45
Raiganj	106.18	137.02	1.23
Hemtabad	95.14	129.30	1.37
Kaliyaganj	90.76	119.26	1.14
Itahar	109.42	160.25	2.03

Source: i. District Statistical Handbook, Uttar Dinajpur District, Bureau of Applied Economics and Statistics, Govt. of West Bengal.
ii. Office of the Principal Agricultural Officer, Directorate of Agriculture, Government of West Bengal, Uttar Dinajpur.
iii. Author's calculation.

7.1 Very Low Productivity Zone

In the study area, very low productivity cereal crops is limited in one block namely Kaliaganj (90.76) with an index value of below 94.49 in the year 1990-91 and in the year 2015-16 it is also covered two blocks namely Kaliaganj (119.26 per cent) and Goalpokher-I (122.35 per cent) with an index value of below 127.46 per cent (shown in table 2).

7.2 Low Productivity Zone

Low productivity cereal is limited in two blocks namely Goalpokher-I and Hemtabad Block with the agricultural productivity index 97.65 and 95.14 per cent in the year 1990-91 respectively. But in the year 2015-16, it is confined to two blocks with an index value namely Islampur (129.48 per cent) and Hemtabad (129.30 per cent).

Table 2a Productivity region based on cereal crops of yield index in Uttar Dinajpur District (1990-91 and 2015-16).

1990-91				2015-16			
Productivity Category	**Crop index**	**No. of CD Blocks**	**Name of CD Blocks**	**Productivity Category**	**Crop index**	**No. of CD Blocks**	**Name of CD Blocks**
V. Low	<94.49	1	Kaliaganj	V. Low	<127.46	2	Kaliaganj, Goalpokher-I
Low	94.49-98.22	2	Goalpokher-I, Hemtabad	Low	127.46-135.66	2	Islampur, Hemtabad
Medium	98.22-101.95	2	Islampur, Goalpokher-II	Medium	135.66-143.86	3	Chopra, Karandighi & Riganj
High	101.95-105.68	2	Chopra, Karandighi	High	143.86-152.06	1	Goalpokher-II
V. High	>105.68	2	Raiganj, Itahar	V. High	>152.06	1	Itahar

Source: Computed by the author.

7.3 Medium Productivity Zone

The medium productivity zone in cereal crops (shown in figure 1) lies in Northern part of the district with an index value ranges between 98.22 to 101.55 per cent in 1990-91. In the study area, blocks having the medium productivity are namely Islampur (98.45 per cent) and Goalpokher-II Block (101.15 per cent). This zone lies in Northern part of the district (shown in figure 2). But in the year 2015-16, medium productivity zone is confined to three blocks with an index value ranges between 135.66 to 143.86 per cent. Block having the medium productivity is namely Chopra (141.32 per cent), Karandighi (139.65 per cent) and Raiganj (137.02 per cent). This zone lies in Northern-middle part of the district (shown in figure 3).

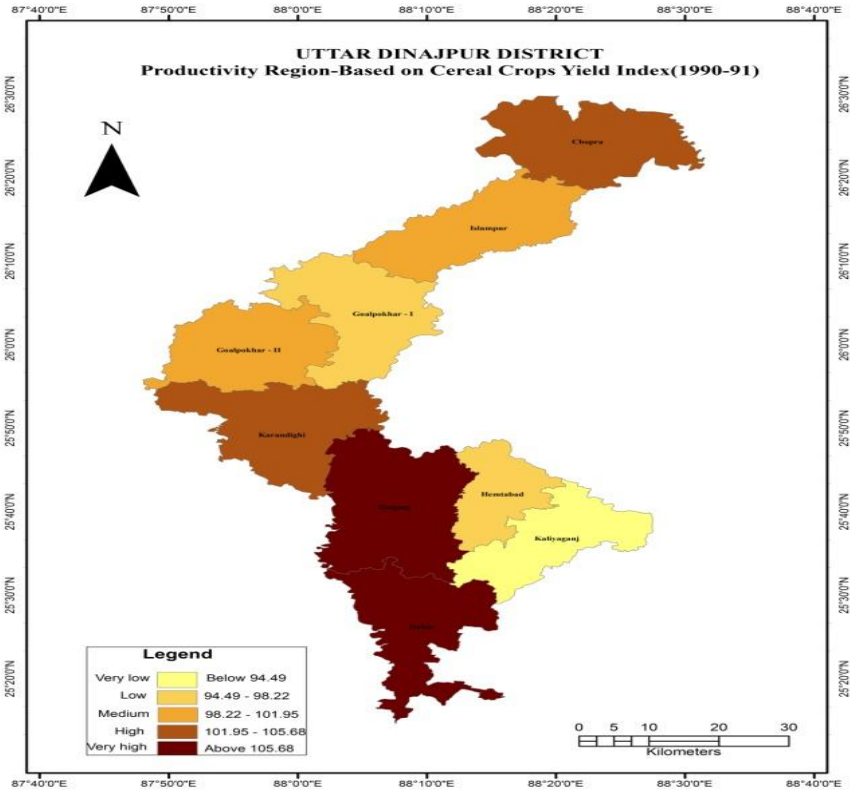

Figure 2 *Status of agricultural productivity of cereal crops 1990-91*

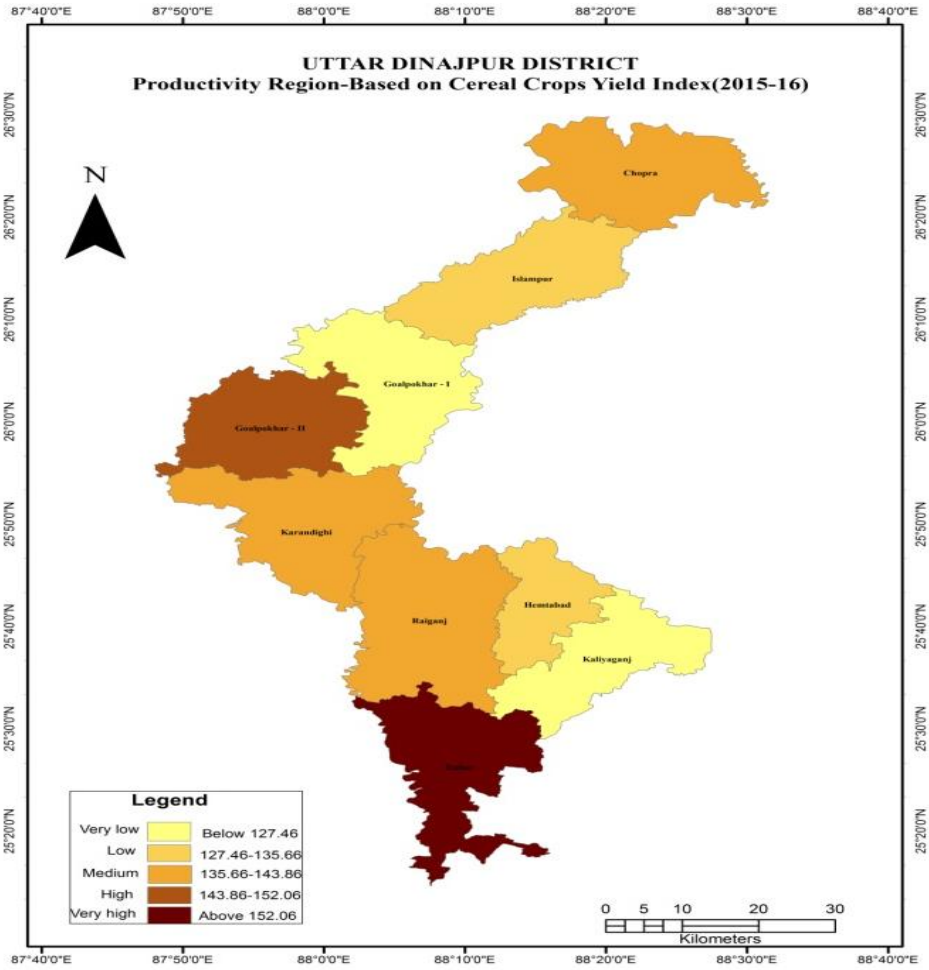

Figure 3 Status of agricultural productivity of cereal crops 2015-16

7.4 High Productivity Zone

In the study area, high productivity zone index value ranges between 101.95 and 105.68 per cent in 1990-91 and it increased 143.86 and 152.06 per cent in the year 2015-16. High productivity cereal crops confined two blocks namely Chopra (102.12 per cent) and Karandighi (103.34 per cent) in the year 1990-91. This zone lies in Northern and South-Western part of the district. But in the year 2015-16, it confined in only one block namely Goalpokher-II Block with an index value (143.90 per cent). This zone lies in Middle-Western part of the district. The productivity is high because, variation in soil fertility, availability of irrigation, use of HYV seeds and other favourable conditions are prevailing in this Block (shown in figure 3).

7.5 Very High Productivity Zone

In the year 1990-91, the highest agricultural productivity confined in two blocks namely Raiganj (106.18 per cent) and Itahar (109.42 per cent). The very high productivity zone of cereal crops (shown in figure 2) lies in middle part and southern part of the district with a index value of above 105.68 per cent. On the other side, in the year 2015-16, only one block namely Itahar (160.25 per cent) and it lies in southern part of the district (shown in figure 3). The very high productivity zone with an index values above 152.06 in 2015-16 found in Itahar CD Block.

8. Growth of Agricultural Productivity in Uttar Dinajpur District (1990-91 To 2015-16)

The growth of very high agricultural productivity index per annum is 2.03 (shown in table 2) in between 1990-91 to 2015-16 recorded in Itahar Block. But very low growth index per annum found in Goalpokher-I (0.99 per cent). The growth of agricultural productivity for the period of the study blocks in Uttar Dinajpur district between in 1990-91 to 2015-16 has been shown in the table 2b. Per annum growth zone distribution are shown in the figure 4.

Table 2b Per annum productivity growth of cereal crops (1990-91 to 2015-16)

Productivity Category	Crop index	No. of CD Blocks	Name of CD Blocks
V. Low	< 1.20	2	Goalpokher-I, Kaliaganj.
Low	1.20-1.41	3	Islampur, Raiganj & Hemtabad.
Medium	1.41-1.62	2	Chopra, Karandighi.
High	1.62-1.83	1	Goalpokher-II
V. High	> 1.83	1	Itahar.

Source: Computed by the author.

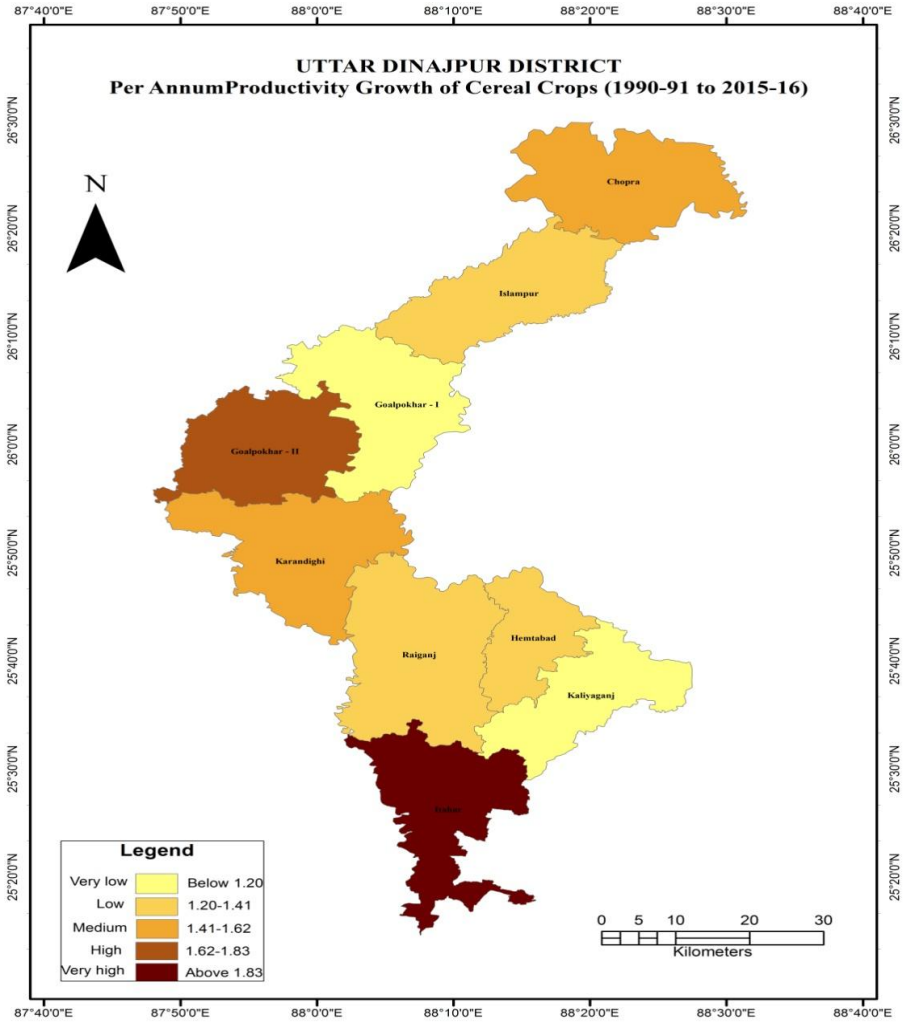

Figure 4 *Status of agricultural productivity of cereal crops 1990-91 to 2015-16*

From the table 2b, per annum medium agricultural productivity index confined in two blocks namely Chopra (1.57 per cent) and Karandighi Block (1.45 per cent). Low productivity growth per annum confined to three blocks with an yield index value namely Islampur (1.24 per cent), Raiganj (1.23 per cent) and Hemtabad (1.37 per cent). Per annum low growth of productivity causes is low capacity of soil fertility for cereal crops, low water retention capacity of soil, non-availability of irrigation system and many others.

9. Conclusion

Agricultural productivity studies most essential for the measurement of productivity of different crops in a region. During the study period (1990-91to 2015-16) levels of agricultural productivity has been increased in all blocks of Uttar Dinajpur District. Therefore, farmers are literates, implementing the modern technology, crop rotation, expansion of irrigation facilities, introduction of HYV seeds and high amount of fertilizers and organic manures used in agricultural sectors. Improvement of agricultural productivity in the district is a good sign for future generation as well as establishes the sustainable economic development.

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