

Development of Agriculture & Their Spatial Pattern: A Case Study of Purba Medinipur District, West Bengal, India.

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ABSTRACT: India is a country of villages and villagers who, for obvious reasons depend, mainly on agriculture as their principal occupation. Agriculture, by and large, constitutes one of the most important sectors of our economy and contributes 14.4% of GDP to the national income. The pressure of demands and necessities on agriculture is increasing very rapidly due to growing population. Unless the agricultural sector is properly managed and the effective measures of population control are adopted, particularly in developing countries the population-agriculture relationship which is already disbalanced, will for their deteriorate to an alarming extent. But the experience of the more than five decades shows that agricultural sector, in terms of its contribution to the national economy, has not performed up to the expectations (Mishra and Shukla, 1996). The present micro-level study is a modest attempt towards accelerating and streamlining the process of agricultural development of Purba Medinipur district of West Bengal in this respect. The research paper study aims at assessing the condition of agricultural sector in terms of different variables like net sown area, irrigated area, cropping intensity, use of fertilizers and use of ploughing tractors lastly measuring and determining the spatial patterns and level of agricultural development of district Purba Medinipur .

The spatial pattern and general level of agricultural development of 25 blocks in Purba Medinipur district have been measured by transforming & combining the data related to five variables using 'Z' score. On the basis of composite score the 25 development blocks have been again categorised into the classes (high > + 5, medium 0 to 5 and low -5 to 0) which clearly shows the spatial pattern and level of agricultural development in the district Purba Medinipur. High level of agricultural development shows in Patashpur-II block (6.17) & low level of agricultural development shows Khejuri-I block (-4.99).

Key Words: Agricultural development, Cropping intensity, Composite Score.

INTRODUCTION

Agricultural development is an integral part of overall economic development of a region. Agriculture is the most important constituent of mans primary, occupations and forms the first vital link of human interaction with his environment (Mishra, 1992). The beginning of agriculture marked a significant landmark in the annals of human civilization, as it revolutionised the entire human existence by sparking off a chain of developments like social, economic, political, scientific and technological (Zimolzak and Stansfield, 1975). It also observed that the conscious production through the investment of human energy and care in raising the plants and animals was a major step in human control over environment. Even today its contribution to the growth and development of human society and economy is an important as it used to be in the early years of human history (Mishra & Tripathi, 1989). The rural economic sector is termed as primary and natural resource sector in which agriculture plays a dominant role. It is primary because it supplies the basic necessities of human life, provides basic inputs for industries and also purveys good of expert (Mishra & Singh, 1992). Right from the inception of planned development India embarked on an era

of rural development and removal of rural poverty by placing the agricultural sector on top of the, priority list of the first five year plan (Mishra & Shukla, 1995). Agricultural development is important to know the aggregate picture of development based on all the indicators already chosen to understand the nature & spatial pattern of agricultural development.

Study Area

Purba Medinipur district came into existence after bifurcation of erstwhile Medinipur on and from January 1, 2002. This district is situated on the southern side of the state of West Bengal. The total area of the district is 4151.64 square kilometres. It exists between 21°38' N to 22°31' N and 87°27' E to 88°12' E. The District is surrounded by Ghatal sub-division of Paschim Medinipur district in the north, Bay of Bengal in the south, Paschim Medinipur district in the west and Hoogly-Rupnarayan river in the east (Rupnarayan river separates this district from Howrah). Tamluk, Haldia, Contai and Egra are its 4 subdivisions. The district comprises of 25 blocks and 5 municipalities, namely Panskura, Tamluk, Egra, Contai and Haldia.

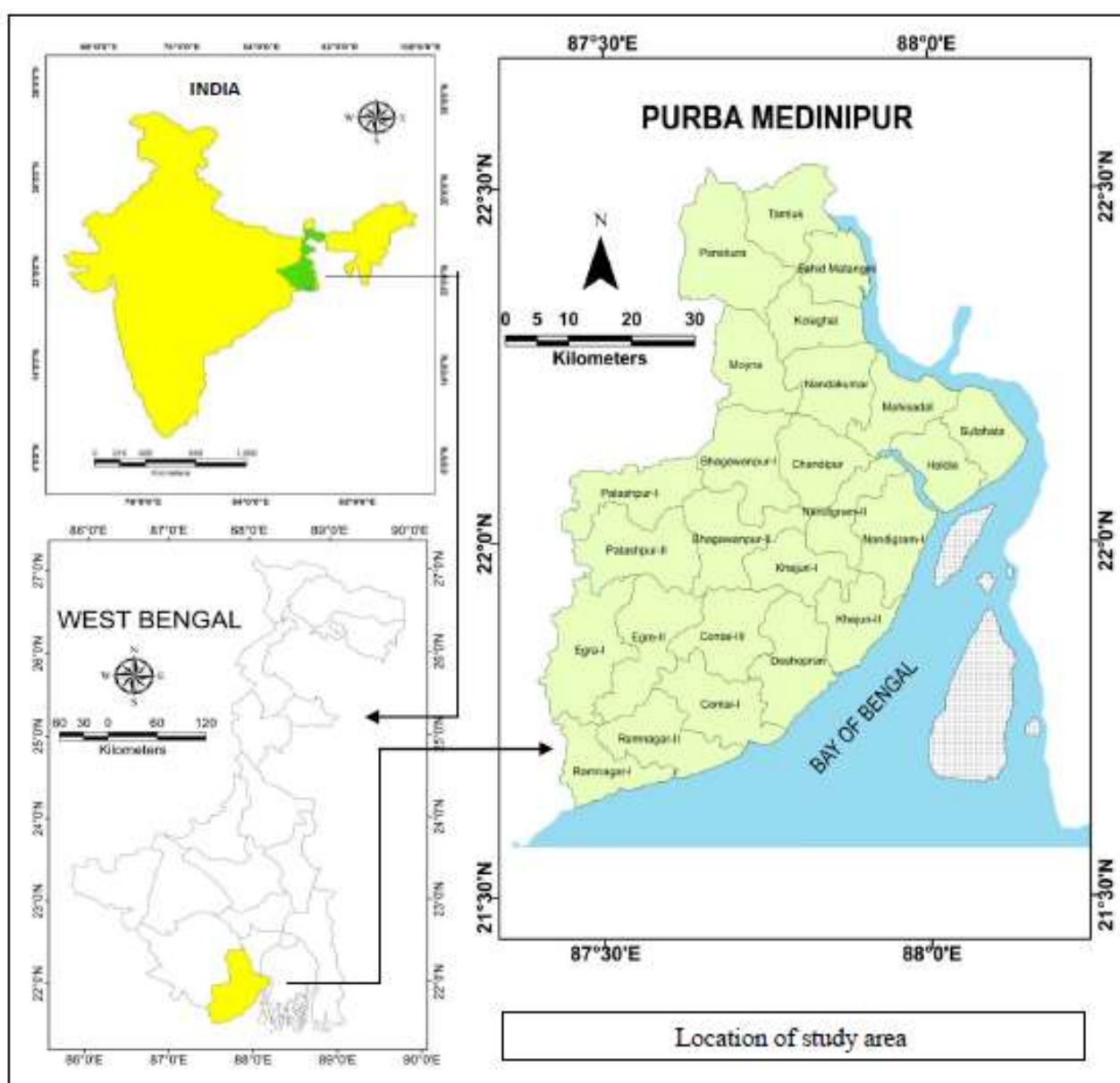


Fig.No.1: Location of study area

Objectives

The major objectives of this study are as follows.

1. To understand the nature & spatial pattern of agricultural development in Purba Medinipur district.
2. To provide locational and spatial input for the agricultural development planning of Purba Mednipur district.

DATA BASE & METHODOLOGY

The present study has been entirely based on secondary data and sources are Directorate of Agriculture, Govt. of W.B. relevant issue, 2013-14; B.A.E.S., Govt. of W.B. & District Statistical Hand book- 2014 of Purba Medinipur. The tabulated data have been represented by cartographic methods (maps & graphs).

For deciding the spatial pattern and level of agricultural development of Purba Medinipur district five important agricultural indicator (Table No.1) have been selected (i) net sown area as percent of total area, $X_1 = (\text{net sown area} / \text{total area}) \times 100$ (ii) irrigated area as percent of total sown area, $X_2 = (\text{irrigated area} / \text{total sown area}) \times 100$ (iii) cropping intensity of major crops, $X_3 = (\text{G.C.A.} / \text{N.C.A.}) \times 100$ (iv) use of fertilizers Kg./ Hectare, X_4 and (v) use of registered ploughing tractors X_5 . These data were tabulated and classified in to low, medium and high and the development blocks were arranged in the respective classes as per their score on the five variables (Table No.2). This gave the spatial patterns and level of development of twenty five blocks in terms of the five variables separately. To determine the overall spatial pattern and the level of agricultural development, the data related to the five variable were transformed and combined using 'Z' score technique (Table No.3) and the twenty five development blocks were classified in to three development levels viz. low, medium and high on the basis of their composite scores (Table No.4). 'Z' score can be calculated by the following methods.

$$Z = \frac{X_i - \bar{X}}{\sigma}$$

Where, Z denote z-score of variable, X_i denote original value of the variable of ith variable.

$$C.S. = \frac{\sum Z_{ij}}{N}$$

Where, C.S. denotes Z score of an indicator in block j.

RESULT & DISCUSSION

Agricultural development is a multidimensional concept. To measure the agricultural development of Purba Medinipur district following variable has been selected and results are discussed in the following manner.

Net Sown Area (X_1)

According to the (Table No.1), the first position is occupied by Panskura-I development block (87.6%) followed by Nandigram-II (85.2%) and Mahisadal (84.6%) while the lowest place goes to Contai-I development block (72.9%). According to the (Table No.2), Contai-I, Ramnagar-II & Moyna is the only three blocks which is classified in the low category while nine blocks are in the medium category and remaining thirteen blocks are in the high category. This situation clearly shows that the amount of net sown

area is fairly high in most of the blocks due to the fact that the area flat and fertile and constitutes an integral part of the coastal plain.

Irrigated Area (X₂)

The Necessity for extra and artificial water supply is always felt in successful farming operation and this in fact, places irrigation in a commanding position in the entire agricultural sector. Therefore, farmers portray dynamic attempts to overcome environmental limitations in the transformation of the physical attributes of the area in to agricultural resources (Singh, 1974). The total irrigated area has been, calculated as percent of the total sown area (Table No.1). The table shows the highest percentage of total irrigated area in Moyna (77.62%) followed by Kolaghat (62.59%) and Patashpur-I (61.71%) while the lowest place is occupied by Haldia (13.87%). The (Table No.2) shows that only one block Moyna rank high, due to the large number of tube wells, pumping sets and canals in there. While Sahid Matangini, Panskura-I, Nandakumar, Chandipur, Mahisadal, Nandigram-I, Nandigram-II, Sutahata, Haldia, Egra-II, Khejuri-I, Deshapran, Contai-III, Khejuri-II, Bhagawanpur-II, Ramnagar-I, Ramnagar-II, & Contai-I ranks low in terms of the total irrigated area. The remaining six blocks are in the medium category.

Cropping Intensity (X₃)

The concept and-practice of the multiple cropping signifies the cultivation of more than one crop in the same field in one cropping year. The cropping intensity refers to the use of a field several times during a cropping year. It is a measure of land use efficiency, which is defined as the extent to which the net area sown is cropped or resown. The gross cropped area as percent of net sown area gives a measure of land use efficiency, which really means the efficiency of cropping. The value of cropping intensity (15.96) lowest in Haldia and (209.86) highest in Patashpur-II block.

Table No.1: Variables for Agricultural Development of Purba Medinipur, 2014

Sl. No.	Development Blocks	Net sown as % of total area (X ₁)	Irrigated area as % of total sown area (X ₂)	Cropping intensity (%) (X ₃)	Use of fertilizers (Kg./hec.) (X ₄)	Use of registered ploughing tractors (X ₅)
1	Tamluk	82.6	56.15	51.52	145	253
2	Sahid Matangini	78.3	54.64	75.26	120	189
3	Panskura-I	87.6	49.05	70.57	137	259
4	Kolaghat	80.2	62.59	77.53	126	223
5	Moyna	74.6	77.62	75.46	103	248
6	Nandakumar	82.1	47.28	71.79	98	175
7	Chandipur	75.8	39.18	64.54	109	211
8	Mahisadal	84.6	48.20	113.54	95	193
9	Nandigram-I	81.2	16.42	158.73	138	202
10	Nandigram-II	85.2	26.81	123.35	123	245
11	Sutahata	80.3	44.00	75.99	107	132
12	Haldia	80.5	13.87	15.96	129	154
13	Patashpur-I	78.7	61.71	190.18	136	231
14	Patashpur-II	81.7	56.93	209.86	139	219
15	Bhagawanpur-I	82.2	56.88	130.80	124	186
16	Egra-I	79.5	61.05	125.08	126	206
17	Egra-II	78.7	52.41	187.02	115	178

18	Khejuri-I	80.4	30.36	78.15	102	125
19	Khejuri-II	82.7	34.40	73.08	97	119
20	Bhagawanpur-II	78.6	51.14	80.65	136	183
21	Ramnagar-I	75.2	39.02	57.10	125	195
22	Ramnagar-II	73.8	28.39	107.44	102	193
23	Contai-I	72.9	23.98	77.60	140	209
24	Deshapran	78.9	16.41	79.69	139	129
25	Contai-III	79.6	30.86	96.77	137	205

Source: Computed by Author(s), based on District Statistical Hand Book, 2014.

Use of Fertilizers (X₄)

The fertilizers play an important role relation to the soil as food in relation to the crop health. Just as a well nourished body is capable of the maximum effort well nourished soil will have the-best fertility (Dubey & Negi, 1968). For improving the yield rate, timely and adequate provisions of input like fertilizers high yielding variety seeds and insecticides is of prime importance. In the use of fertilizers Tamluk with 145 Kg./hec. stood first of the list, while Mahisadal with 95 Kg/hec. ranks last in the list (Table No.1). It has been noticed that the use of the fertilizers follows the intensity of irrigation. The (Table No.2) shows that nine blocks of the district ranks high, thirteen blocks of the district ranks medium & while remaining three blocks ranks low in terms of use of fertilizers in the district.

Use of Ploughing Tractor (X₅)

Modern ploughing machine like tractors also play an important role in accelerating the pace and level of agricultural development in a region. The greater use of tractors informing operation is a significant indicator of the level of agricultural development. As is evident from (Table No.1) the use of tractors ranges from mere 119 in Khejuri-II block to 259 in Panskura-I block. Twelve blocks ranks high, nine blocks ranks medium while four blocks ranks low in terms of the use of the tractors in agricultural operations (Table No.2). Number and size of landholding, economic status and the progressive attitude of the farmers attracts the use of tractors.

Class	Net sown area as % of total area (value) blocks	Irrigated area as % of total sown area (value) blocks	Cropping intensity (%) of major crop (value) blocks	Fertilizer used Kg./hec. (value) blocks	Use of registered ploughing tractor (value) blocks
Low	(<75) Moyna, Ramnagar-II, Contai-I	(<55) Sahid Matangini, Panskura-I, Nandakumar, Chandipur, Mahisadal, Nandigram-I, Nandigram-II, Sutahata, Haldia, Egra-II, Khejuri-I, Khejuri-II, Bhagawanpur-II, Ramnagar-I, Ramnagar-II, Contai-I, Deshapran, Contai-III	(<100) Tamluk, Sahid Matangini, Panskura-I, Kolaghat, Moyna, Nandakumar, Chandipur, Sutahata, Haldia, Khejuri-I, Khejuri-II, Bhagawanpur-II, Ramnagar-I, Contai-I, Deshapran, Contai-III	(<100) Nandakumar, Khejuri-II, Mahisadal	(<150) Sutahata, Khejuri-I, Khejuri-II, Deshapran

Medium	(75-80) Sahid Matangini, Chandipur, Patashpur-I, Egra-I, Egra-II, Bhagawanpur-II, Ramnagar-I, Deshapran, Contai-III	(55-65) Tamluk, Kolaghat, Patashpur-I, Patashpur-II, Bhagawanpur-I, Egra-I	(100-150) Mahisadal, Nandigram-II, Ramnagar-II, Egra-I, Bhagawanpur-I	(100-130) Sahid Matangini, Kolaghat, Moyna, Chandipur, Nandigram-II, Sutahata, Haldia, Bhagawanpur-I, Egra-I, Egra-II, Khejuri-I, Ramnagar-I, Ramnagar-II	(150-200) Sahid Matangini, Nandakumar, Mahisadal, Haldia, Bhagawanpur-I, Egra-II, Bhagawanpur-II, Ramnagar-I, Ramnagar-II
High	(>80) Tamluk, Panskura-I, Kolaghat, Nandakumar, Mahisadal, Nandigram-I, Nandigram-II, Sutahata, Haldia, Patashpur-II, Bhagawanpur-I, Khejuri-I, Khejuri-II	(>65) Moyna	(>150) Nandigram-I, Patashpur-I, Patashpur-II, Egra-II	(>130) Tamluk, Panskura-I, Nandigram-I, Patashpur-I, Patashpur-II, Bhagawanpur-II, Contai-I, Deshapran, Contai-III	(>200) Tamluk, Panskura-I, Kolaghat, Moyna, Chandipur, Nandigram-I, Nandigram-II, Patashpur-I, Patashpur-II, Egra-I, Contai-I, Contai-III

Table No.2: Classification of Blocks of Purba Medinipur District by Selected Variables

Source: Compiled by Author(s)

Sl. No.	Development Blocks	X ₁	X ₂	X ₃	X ₄	X ₅	Composite Score
1	Tamluk	0.86	0.79	-1.03	1.56	2.55	4.73
2	Sahid Matangini	-0.39	0.70	-0.51	-0.01	-0.14	-0.35
3	Panskura-I	2.30	0.36	-0.61	1.06	2.81	5.91
4	Kolaghat	0.16	1.19	-0.46	0.36	1.29	2.54
5	Moyna	-1.46	2.10	-0.51	-1.08	2.34	1.40
6	Nandakumar	0.71	0.25	-0.59	-1.40	-0.73	-1.75
7	Chandipur	-1.11	-0.24	-0.75	-0.70	0.79	-2.02
8	Mahisadal	1.43	0.31	0.32	-1.58	0.03	0.51
9	Nandigram-I	0.45	-1.63	1.31	1.12	0.41	1.65
10	Nandigram-II	1.61	-1.00	0.54	0.18	2.22	3.54
11	Sutahata	0.19	0.05	-0.50	-0.83	-2.54	-3.62
12	Haldia	0.25	-1.79	-1.81	0.55	-1.61	-4.41
13	Patashpur-I	-0.27	1.13	2.00	0.99	1.63	5.48
14	Patashpur-II	0.60	0.84	2.43	1.18	1.12	6.17
15	Bhagawanpur-I	0.74	0.84	0.70	0.24	-0.27	2.25
16	Egra-I	-0.04	1.09	0.58	0.36	0.58	2.57
17	Egra-II	-0.27	0.56	1.93	-0.33	-0.60	1.29
18	Khejuri-I	0.22	-0.78	-0.45	-1.14	-2.83	-4.99
19	Khejuri-II	0.88	-0.54	-0.56	-1.46	-3.09	-4.75
20	Bhagawanpur-II	-0.30	0.49	-0.39	0.99	-0.39	0.39

21	Ramnagar-I	-1.28	-0.25	-0.91	0.30	0.11	-2.03
22	Ramnagar-II	-1.69	-0.90	0.19	-1.14	0.03	-3.52
23	Contai-I	-1.95	-1.17	-0.46	1.24	0.70	-1.63
24	Deshapran	-0.21	-1.63	-0.42	1.18	-2.66	-3.75
25	Contai-III	-0.01	-0.75	-0.04	1.06	0.53	0.78

Table No.3: Variables Transformed and Combined by 'Z' Score

Calculated by Researcher(s)

Table No.4: Levels of Agricultural Development of Purba Medinipur, 2014

Z' Score	Levels of Agricultural Development	Name of Blocks	Total No. of Blocks
(-5 to 0)	Low	Sahid Matangini, Nandakumar, Chandipur, Sutahata, Haldia, Khejuri-I, Khejuri-II, Ramnagar-I, Ramnagar-II, Contai-I & Deshapran	11
(0 to 5)	Medium	Tamluk, Kolaghat, Moyna, Mahisadal, Nandigram-I, Nandigram-II, Bhagawanpur-I, Egra-I, Egra-II, Bhagawanpur-II & Contai-III	11
(> + 5)	High	Panskura-I, Patashpur-I & Patashpur-II	3

Calculated by Researcher(s)

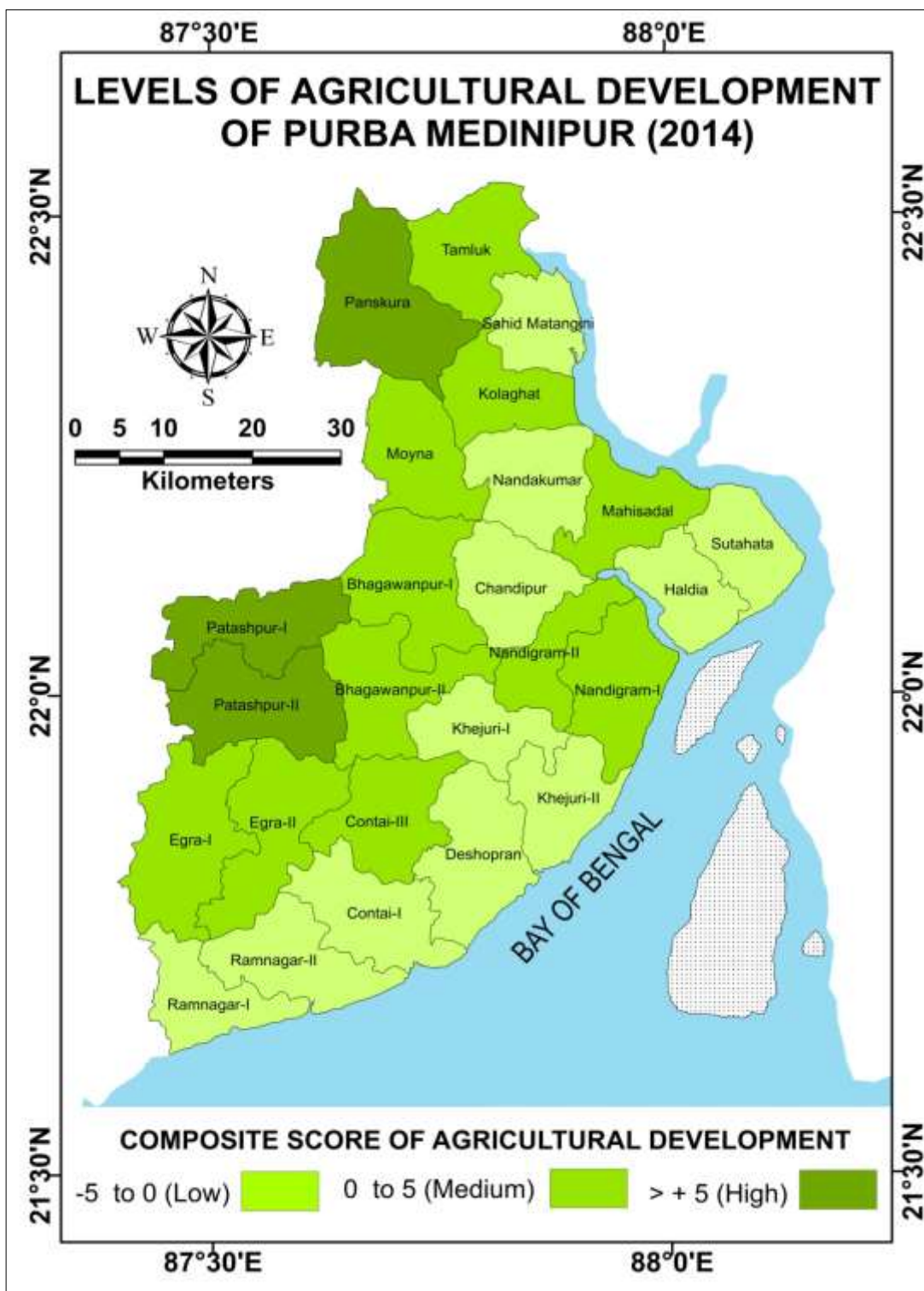


Fig.No.2: Spatial Pattern of Agricultural Development of Purba Medinipur, 2014

Spatial Pattern of Agricultural Development in District Purba Medinipur

A variety of agricultural development programmes launched by the government are operating in the district. They are basically aimed at increasing the production and productivity of various crops, ensuring the availability input facilities to the farmers, creation of infrastructural facilities development of animal husbandry, dairying, fisheries, forestry etc. For measuring the general level of agricultural development in Purba Mednipur district, all the five indicators have been taken in to account collectively as the five

variables are measured in different ways and in different units, hence it was difficult to combine them to evolve a Composite indicator of general levels of agricultural development. It was therefore, though pertinent to transform and combine the data related to the five variables using 'Z' score method. Thus the values of all the five variables were transformed and combined with the help of 'Z' score and a composite score were prepared (Table No.3). The composite score ranges from '- 4.99' is lowest in Khejuri-I block to '+ 6.17' highest in Patashpur-II block leading to the conclusion that the former is the least development block of Purba Medinipur district in terms of the five variables considered together. On the basis of the composite scores, the development blocks have been categorised in the three classes viz low, medium and high (Table No. 4) which clearly shows the spatial as well as the level of agricultural development in district Purba Medinipur. On the basis of composite score Panskura-I, Patashpur-I & Patashpur-II are highly developed blocks according to the many variables comparison while eleven blocks viz. Sahid Matangini, Nandakumar, Chandipur, Sutahata, Haldia, Khejuri-I, Khejuri-II, Ramnagar-I, Ramnagar-II, Contai-I & Deshapran are less developed blocks of district Purba Medinipur in terms of the five variables considered together. The remaining eleven blocks are at the medium level of agricultural development. The blocks ranking medium and low in the general level of agricultural development occupy, more or less same category.

CONCLUSION

If there are many problems in agricultural development in the district like soil, irrigation, electricity, fertilizers and many more developed new machines which are used in agriculture by farmers. There is great need of technical training and scientific knowledge to farmers by seminars & 'Agricultural Fair'. The present study has yielded very significant information about the spatial pattern and level of agricultural development in district Purba Medinipur in addition to providing the position of different blocks in terms of five variables; it also highlights their collective impact on the general agricultural development of the district Purba Medinipur. The study also provides locational and spatial input for the agricultural development planning of Purba Medinipur district. If the results are adopted in the right spirit, they can contribute considerably to accelerating and strengthening the pace of agricultural development in district Purba Medinipur. The Government sponsored programmes of agricultural development are helpful in the agricultural development of the district. The temporal and spatial analysis of various aspects of agriculture in Purba Medinipur district reveals that this sector is gradually picking up, but in view of the growing demands of a growing population, the pace of agricultural development is not up to the mark. There are various problems and constraints which hinder the growth of agriculture sector spatial plan for agricultural development improve the level of district in agricultural field.

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