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LEVELS OF AGRICULTURAL DEVELOPMENT IN DAKSHIN DINAJPUR DISTRICT, WEST BENGAL: A BLOCK LEVEL ANALYSIS

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ABSTRACT

In the present paper an attempt has been made to find out the spatial variations in the level of agricultural development in Dakshin Dinajpur district of West Bengal. The study is based on secondary sources of data for the year 2011-12. The data has been obtained from District Statistical Hand Book of Dakshin Dinajpur district. The spatial pattern of agricultural development is determined with the help of thirteen variables. Beside this, the analysis have been carried out by transforming and combining the data related to thirteen variables, using 'Z' score to get the composite score. On the basis of Composite Score, C.D. blocks have been categorized into three categories i.e. high, medium and low. Karl Pearson's Correlation of Coefficient technique has been used to find out the correlation between the variables of agricultural development. The block has been taken as a unit of the study. The study reveals that the high level of agricultural development found in 4 blocks, medium level in 2 blocks and low level in 2 blocks of the study area. Deteriorating irrigation system, faulty water management, Lack of infrastructural facilities, Illiteracy and poor technical know-how are found to be the major causes of agricultural backwardness of the district.

Key Words: ***Agricultural Development, Composite Z score, Correlation, Spatial Variation.***

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INTRODUCTION:

Agriculture has been diffused and developed in various time periods and phases since the last twelve thousand years and still predominates in almost half of the world as the main economy. Being a developing country, Indian economy is largely dependent on agriculture and about 17.4 % of GDP is shared by agriculture

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and allied sectors (Economic Survey 2015-16). About 58 % of rural masses are engaged in this sector serving their livelihood. But the trend of agricultural growth shows that its significance is declining year by year, which is not a good sign for India. It has been seen that there are regional disparity in many parts of the country in terms of agricultural development. As we know the population of the nation is increasing in an alarming rate. Therefore, there is a need to feed all the masses with whatever area for cultivation is available to us. This critical situation could be controlled by proper planning of the agrarian system prevailing in our country. Here on one hand the states like Punjab and Haryana is agriculturally more developed as compared to other states, on the other hand, despite having more productive land the state of West Bengal legs behind due to not having proper planning for agricultural system. About 68 % of rural population is engaged in agricultural activity in West Bengal. Presently the state is sixth largest contributor to India's Net Domestic Production (NDP). But there has been found regional and inter-regional disparity in agricultural development in the state as well as in the districts also.

Many attempts have earlier been also made by the scholars to find out the levels of agricultural development and efficiency in agricultural productivity in India as well as in West Bengal. **Chatterjee and Maitrya** (1964) has calculated the levels of agricultural development and productivity during 1950-51 to 1957-58 in the state of West Bengal, taking into account two crops Rice and Wheat. **Shafi. M.** (1967 & 1969) applied stamp's standard nutrition unit technique for measuring the efficiency of agriculture in India. **Sharma** (1971) pointed out that agricultural development should be assessed not only by levels of productivity or trends in agricultural production but also with reference to various physical inputs like irrigation, fertilizers, improved seeds and extent of cultivated area. **Ghosh, M.** (1998) analysed the Agricultural development, agrarian structure and rural poverty in West Bengal by using Gini-coefficient and least square method and find out that irrigation is the leading input in agricultural production. **Sarkar, S.** (2011) examined the inter-district disparities in rural agricultural sector in West Bengal and its impact on agricultural development through inter-temporal analysis of 18 districts using Kaiser Varimax method and Rotated Factor Matrix. **Raman. R. & Kumari. R.** (2012) by taking into account different variables of agricultural development find out the causes of inter-regional and inter-district disparity in the state of Uttar Pradesh. **Singh, G. and Ashraf, S.W.A** (2012) used nine variables for determining the spatial variation in the levels of agricultural development in Bulandsahar district of Western Uttar Pradesh. They found that the modern technological inputs have reciprocal relationship with agricultural development. **S.H. Siddiqui & et. al** (2015) studied the impact of social disparities on agricultural development in West Bengal. The study reveals that the central plain districts have shown high level of agricultural development whereas the northern and western districts are shown low level of agricultural development in the light of selected variables. **Aktar, N.** (2015) has calculated crop productivity of West Bengal with the help of

Yang's yield index method for the year 2010-11, taking thirteen crops (grouped under cereals, pulses, oilseeds and cash crops) into consideration.

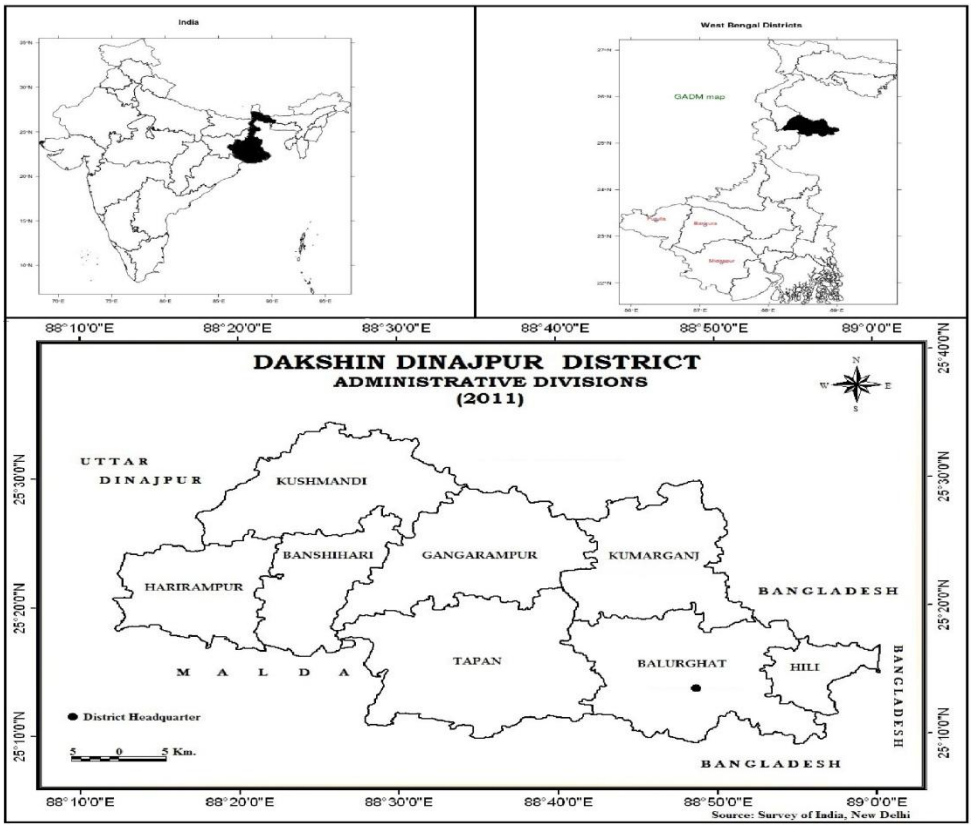

Fig. 1: Locational Map of the study area

STUDY AREA:

Dakshin Dinajpur is located on 26˚ 35' 15" N to 25˚ 10' 55" N latitude, and 89˚ 00' 30" E to 87˚ 48' 37" E longitude. It is situated on north-eastern part of the state of West Bengal and surrounded by Bangladesh on its east and south, Uttar Dinajpur on its north and west, and a part of its southern border lies adjacent to Malda district. The rich alluvium soil has enabled the double as well as multiple cropping in the district. The main crops of the district are rice, jute, potato, wheat, mustard and maskalai. Net shown area is 84 percent of the total reporting area of the district. Cropping intensity in the district is altogether 182%. Total mono-crop area for agriculture is 175.62 thousand hectares and total multi-crop area in the district is 143.29 thousand hectares.

General topography of the study area is almost flat from north to south. There is found old alluvium soil in most of the blocks such as Kumarganj, Hilli, Balurghat, and Harirampur. The soil is slightly acidic in nature, thus paddy cultivation is up to the mark. Except in Tapan block, where the soil base is lateritic and it is unable to grasp

the rain water at a high level. The district is well drained by three main rivers namely Atryee, Punarbhaba and Tangon, which are rainfed and flood occurs almost every year on the banks of the rivers. The administrative set up of the district consists of two sub-division viz. Balurghat and Gangarampur. There are 8 C.D. blocks, 2 municipalities, 65 Gram panchayats and 929 villages.

STATEMENT OF THE PROBLEM:

Being the most backward district in the state in terms of agricultural output, Dakshin Dinajpur needs a special attention. Because, as compared to the neighbouring districts, Dakshin Dinajpur appears to be good in terms of crop productivity, but at the same time the district is lagging behind so far as the development of agriculture is concerned. The district is predominantly agro-based and majority of the people are engaged in agriculture. But, the small land holdings hampering the growth in agriculture and allied sectors. Also, inadequate management system, low crop diversification, improper crop planning with inadequate irrigation and drainage systems has led to the stagnation in agricultural development. The extent of stagnation in agriculture also varies from one block to another. Thus, a spatial analysis of each block was in need to know the exact causes of this agricultural backwardness. Therefore, the present work has been done to highlight the major problems of agriculture in the district and also to reach at certain solution to overcome this situation.

OBJECTIVES:

The following are the main objectives of the present study:

1. To analyse the spatial pattern of agricultural development in the study area on the basis of selected variables.
2. To find out the possible causes of the variation in agricultural development and suggest some suitable measures to minimise disparities in agricultural performance in each blocks.

DATABASE AND METHODOLOGY:

The Present study entirely based on the secondary data collected from District Statistical hand book of Dakshin Dinajpur for the year 2011-12. Block has been selected as the smallest unit of investigation for the present study. Thirteen variables of agricultural development (Table 1) have been used to show the level of agricultural development. The data of all the variables have been transformed into indices using Z-score technique for determining the overall level of agricultural development and its uneven distribution in the study area. The formula is-

$$Z_i = \frac{xi - \bar{x}}{SD}$$

Where, Z_i = standard score for the observation, x_i = original value of the i^{th} observation, $\bar{x}$ = mean of the observed value of x, SD = Standard deviation of x variable

Based on the value of composite Z-score, the blocks have been classified into groups under the heading of high, medium and low. Further the results of the standard score obtained were aggregated by Composite Standard Score (CSS) so that regional disparity in the levels of agricultural development of blocks can be obtained on a common scale. The formula for CSS may be expressed as:

$$CSS = \frac{\sum Zij}{N}$$

Where, CSS = Composite Standard Score, Z_{ij} = Z-score of variable *j* in block *i*,

N = number of variables.

Karl Pearson's correlation of coefficient technique has been used to show the casual relationship among the variables of agricultural development. The analysis and computation of data is done by SPSS software and Arc View 3.2 version is used for making choropleth maps.

Table 1: List of selected variables of Agricultural Development

Variables	Description
X_1	Agricultural Productivity based on Yang's Yield Index Method
X_2	% of Net Sown Area to Gross Cropped Area
X_3	% of Area Sown More than Once to Gross Cropped Area
X_4	Number of Deep Tube-wells per 1000 Hectares of GCA
X_5	Number of Shallow Tube-wells per 1000 Hectares of GCA
X_6	Number of River Lift Irrigation per 1000 Hectares of GCA
X_7	% of Agricultural Labourers to Total Workers
X_8	Literacy Rate (%)
X_9	Number of Credit Societies per 10000 Population
X_{10}	Number of Fair Price Shops per 10000 Population
X_{11}	Number of Fertilizer Depot per 10000 Population
X_{12}	Rural Electrification
X_{13}	Cropping Intensity (%)

SPATIAL PATTERN OF AGRICULTURAL DEVELOPMENT

The primary focus of the present study is to give an overview of the inter-block variations in level of agricultural development in the district. Hence, the computation of the indices of different variables and their share in each block has been calculated by applying the above said statistical techniques and correlation has been established among the 13 variables of agricultural development. The calculated composite score of the selected variables have been classified into three categories, viz; high, medium and low to show the spatial variations in the level of agricultural development for the year 2011-12 (Table 2).

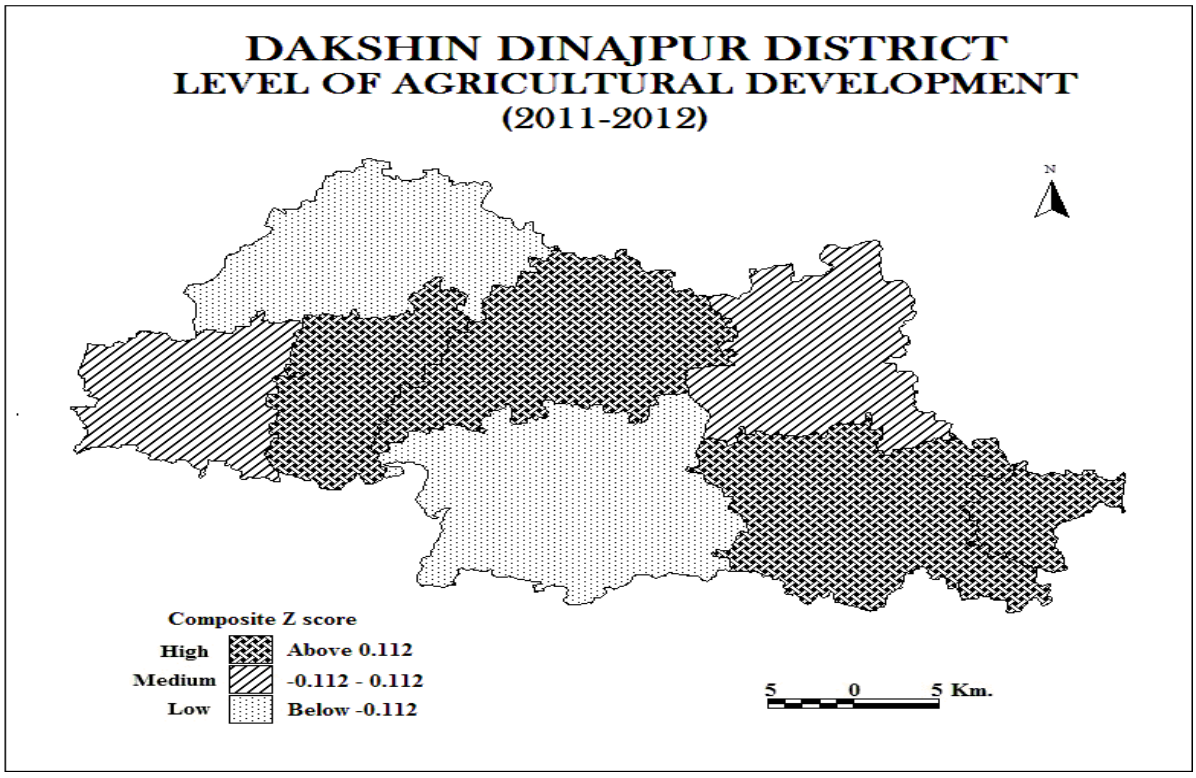

Fig. 2

High level of agricultural development:

About 43.33 percent area of the district comes under high level of agricultural development. There are four blocks where agriculture is highly developed; namely Bansihari (0.232), Gangarampur (0.133), Balurghat (0.194), and Hilli (0.156) (See Fig. 2). Among the four blocks Bansihari is at top position. This is due to advantage in physiographic location, fertile soil, high cropping intensity, use of HYV seeds, and better farm equipments, high percentage of area under net sown area, and a well developed irrigation facilities. Besides this, the farmers of all these blocks are using chemical fertilizers to increase the production and also use pesticides to protect crops from various types of diseases. The agriculture in these blocks is highly developed also due to high

literacy rate among the farmers, use of modern farm technology, better infrastructure and a good transportation facility.

Medium level of agricultural development:

There are only two blocks which comes under medium category; namely Harirampur (-0.019) and Kumarganj (-0.041), covering about 22.59 percent area of the district. The analysis of the data pertaining to the variables indicates that there are some advances and some weaknesses found in both the blocks. It is found that the crop productivity is quite good and there is high percentage of agricultural labourers in Harirampur block, while the irrigation facility is poor and farmers are not using sufficient amount of fertilizers in their fields. On the other hand in Kumarganj block the irrigation facilities and cropping intensity is very good, but the crop productivity is very low. This is because the gross cropped area is very less here, and there is lack of adequate credit facilities in Kumarganj block. Hence, all these factors incorporate with the medium level agricultural development in these two blocks.

Low level of agricultural development:

About 34.07 percent area of the district comes under low level of agricultural development. There are two blocks namely, Kushmandi (-0.325) and Tapan (-0.332) (See Fig. 2), where agriculture is in very poor condition. The cause for this situation can be attributed to a number of factors which are not in favour for agricultural development in these two blocks. Firstly, the lateritic soil present in Tapan block, which does not support agricultural activity at all. Secondly, the crop productivity is very low in Kushmandi block, which ultimately led to low cropping intensity here. Thus, physiographic disadvantage, infertile soil, poor infrastructural facility are the root cause of low agricultural development in these two blocks. Apart from this, there is less number of agricultural labourers, there is lack of credit facilities, less use of modern farm inputs and very poor irrigation system found in these blocks. The blocks are also located at far distance from the sub-divisional towns and therefore, due to poor transport facility the farmers are inaccessible to various facilities and subsidies that the governmental bodies are offering to them. Hence, all these negative factors resulting to low level of agricultural development in these two blocks.

Table 2: The spatial pattern of agricultural development in Dakshin Dinajpur district

Category	Index Value	No of Blocks	Name of the Blocks
High	> 0.112	4	Banshihari, Balurghat, Hilli, Gangarampur
Medium	-0.112 – 0.112	2	Harirampur, Kumarganj
Low	< -0.112	2	Kushmandi, Tapan

Source: Calculated by Authors

Table 4: Block-wise agricultural productivity and cropping intensity

Blocks	Productivity	Cropping intensity
1. Kushmandi	110.86	125.7
2. Bansihari	40.54	130.6
3. Harirampur	131.68	138.6
4. Gangarampur	124.27	142.1
5. Kumarganj	90.19	119.1
6. Tapan	113.7	102.6
7. Balurghat	97.05	134.6
8. Hilli	101.9	148.5

Source: Calculated by author

Table 3: Correlation Matrix between the Variables of Agricultural Development

Variables	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}
X_1	1												
X_2	0.227	1											
X_3	-0.227	-.999**	1										
X_4	0.032	0.622	-0.622	1									
X_5	-0.088	-0.125	0.125	0.323	1								
X_6	-0.352	0.001	0.001	0.360	-0.255	1							
X_7	0.344	0.581	-0.581	0.042	-0.648	0.127	1						
X_8	-0.666	-.766*	.766*	-0.253	0.137	0.232	-0.657	1					
X_9	-	0.043	-	0.368	0.191	0.388	-	0.165	1				

	0.434		0.043				0.467						
X_{10}	0.516	0.33	-0.330	-0.082	0.012	-.744*	0.451	-0.567	-0.572	1			
X_{11}	-0.641	-0.554	0.554	-0.157	0.182	0.002	-.795*	.864**	0.417	-0.507	1		
X_{12}	-0.144	-0.234	0.234	0.518	0.342	0.190	-0.464	0.502	0.259	-0.166	0.482	1	
X_{13}	-0.242	-.999**	.999**	-0.598	0.135	0.019	-0.598	.779*	-0.013	-0.351	0.570	0.259	1

* Correlation is significant at 5 %
** Correlation is significant at 1 %

Relationship between the Variables of Agricultural Development

The inter correlation matrix below discloses the causal relationship among the variables of agricultural development (i.e. X_1 to X_{13}). From the significance test it is evident that variable X_1 i.e; agricultural productivity is positively correlated with number of agricultural labourer (X_7) and number of fair price shops (X_{10}), while it is negatively correlated with literacy rate (X_8), credit societies (X_9) and number of fertilizer depots (X_{11}).

On the other hand variable X_2 i.e; Net shown area is significantly correlated with number of deep tube-wells (X_4) and agricultural labourers (X_7), while it has a strongly negative relation with area shown more than once (X_3), literacy rate (X_8), fertilizer depots (X_{11}) and cropping intensity (X_{13}). The next variable X_3 i.e; area shown more than once is strongly and positively correlated with literacy rate (X_8), number of fertilizer depots (X_{11}), and cropping intensity (X_{13}), while it is negatively correlated with net shown area (X_2), number of deep tube-wells (X_4), and percentage of agricultural labourers (X_7).

The number of deep tube-wells (X_4) is positively correlated with net shown area (X_2), rural electrification (X_{12}) and negatively correlated with area shown more than once (X_3) and cropping intensity (X_{13}). The number of shallow tube wells (X_5) is strongly negatively correlated with only variable X_7 i.e; agricultural labourers and its correlation with other variables is very negligible. The variable X_6 i.e; river lift irrigation has a strong negative correlation with number of fair price shops (X_{10})

Again the agricultural labourers (X_7) is positively correlated with net shown area (X_2), and number of fair price shops (X_{10}), while it has strongly negative correlation with fertilizer depots (X_{11}), area shown more than once (X_3), number of shallow tube-wells (X_5), literacy rate (X_8), credit societies (X_9), rural electrification (X_{12}),

and cropping intensity (X_{13}). The variable literacy rate (X_8) is strongly and positively correlated with area shown more than once (X_3), fertilizer depots (X_{11}), rural electrification (X_{12}) and cropping intensity (X_{13}), while it has strongly negative relation with agricultural productivity (X_1), net shown area (X_2), agricultural labourers (X_7), and number of fair price shops (X_{10}).

Number of credit societies (X_9) is positively correlated with number of fertilizer depots (X_{11}), while it is negatively related with agricultural productivity (X_1), agricultural labourers (X_7), and number of fair price shops (X_{10}) The number of fair price shops (X_{10}) has a positive relationship with agricultural productivity (X_1), and agricultural labourers (X_7), but it is negatively related with river lift irrigation (X_6), literacy rate (X_8), number of credit societies (X_9), and number of fertilizer depots (X_{11}).

The number of fertilizer depots (X_{11}) is strongly and positively correlated with literacy rate (X_8), area shown more than once (X_3), number of credit societies (X_9), rural electrification (X_{12}), and cropping intensity (X_{13}) while it has a strongly negative relation with agricultural labourers (X_7), agricultural productivity (X_1), net shown area (X_2), and number of fair price shops (X_{10}). The variable X_{12} i.e; Rural electrification is positively related with deep tube-wells (X_4), literacy rate (X_8), and fertilizer depots (X_{11}), but it is negatively related with agricultural labourers (X_7). The cropping intensity (X_{13}) is strongly and positively correlated with area shown more than once (X_3), literacy rate (X_8), and number of fertilizer depots (X_{11}), while it has a strong negative relation with net shown area (X_2), deep tube-wells (X_4), and agricultural labourers (X_7).

CONCLUSION AND SUSGGESTIONS

From the foregoing analysis it is evident that, although the district stands at a better position in terms of agricultural development in the state of West Bengal, there prevails substantial inter-block variation in terms of level of agricultural development. As much as four out of eight blocks is agriculturally well developed, two blocks are moderately developed and only two blocks are agriculturally very less developed. The blocks of high and medium agricultural development are concentrated in the eastern and central part of the district, while the blocks of low agricultural development are found in the northern and southern part. Thus, there exists spatial variation in agricultural development in the district. The reason for this spatial variation in agricultural development can be attributed to-

- Deteriorating irrigation system and faulty water management.
- Inadequate use of chemical fertilizers, insecticides and pesticides.
- Lack of infrastructural facilities, specially rural road and electrification.

- Inequitable use of public funds and poor composition of public expenditure.
- Inadequate services and lack of financial support by the local Government.
- Poor access to rural credits and less number of fair price shops.
- Illiteracy and poor technical know-how of the farmers.

This district is backward in almost every aspect of socio-economic parameter because the economy is totally dependent on agriculture. However, the district is blessed with genetic crop materials and there is a need to explore the other bio-resources. Based on this perspective, Regional Research Station (Old Alluvial Zone) has been established here to find out the ways for sustainable agricultural development through research and extension in existing agro-climatic and socio-economic conditions of the farmers.

Following are some suggestions for better planning and development of agriculture in the district-

1. Improving irrigation system by providing minor irrigation facilities, as the district gets the benefit of agricultural irrigation mostly by minor RLI, DTW, LDTW, and diesel/electrically operated shallow tube wells.
2. Providing electricity facility to rural areas, especially in the backward blocks of Tapan and Kushmandi, and enhancing investment in rural infrastructure particularly in rural roads.
3. Farmers must have to use NPK fertilizers and HYV seeds to their fields and for this purpose number of fair price shops must be increased by the local government especially in the backward blocks.
4. Intensification of agricultural activities by adoption of crop diversification and practice of multiple cropping (growing more than one crop in the same field in a year) so that the hectare per yield could be increased.
5. Adoption of new farm technologies like, tractor, harvester, and tiller in the field, because multi-cropping also needs application of new technologies.
6. Strengthening local agricultural markets and smooth processing of agricultural commodities.
7. Ensuring smooth co-operation of nationalized banks and government financial institutions in providing loans to the farmers.
8. Strengthening public distribution system and social safety needs and linking them to employment generation in rural areas.
9. Ensuring greater coordination and collaboration between the farmers, governmental agencies, agricultural universities, agriculture research institutes and industries.

10. The inter-block variation can only be minimised if the government will take necessary steps and form equilateral policies for the agricultural development of the district.

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Appendix 1: Block wise standard scores of selected variables of Agricultural Development in Dakshin Dinajpur District

Block	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	CZS
Kushmandi	0.144	0.664	-0.664	-0.328	0.754	-0.399	0.163	-1.189	0.138	0.082	-1.024	-1.867	-0.693	-0.325
Banshihar	-0.555	1.649	-1.649	2.284	0.232	1.217	0.220	-0.394	1.267	-0.632	-0.027	0.993	-1.585	0.232
Harirampur	1.624	0.626	-0.626	0.298	0.228	-1.361	0.983	-1.342	-1.198	2.287	-1.383	0.274	-0.657	-0.019
Gangarampur	1.097	-0.884	0.884	0.025	-0.175	1.140	-0.203	0.237	-0.222	-1.107	-0.357	0.399	0.894	0.133
Kumarganj	-1.326	-0.605	0.605	-0.604	-0.543	0.870	0.767	0.975	-0.928	-0.176	-0.010	-0.150	0.589	-0.041
Tapan	0.346	0.535	-0.535	-0.944	-2.015	-0.405	0.962	-0.435	-0.429	0.207	0.052	-1.083	-0.569	-0.332
Balurghat	-0.839	-1.147	1.147	-0.557	0.135	0.093	-1.114	0.831	1.664	-0.539	1.119	0.540	1.188	0.194
Hilli	-0.494	-0.828	0.828	-0.174	1.385	-1.175	-1.779	1.324	-0.301	-0.110	1.628	0.896	0.832	0.156