

A Spatio-Temporal Analysis of Crop Diversification in Bankura District, West Bengal

Amborish Das

Research Scholar, Dept. of Geography, Visva Bharati, Santiniketan, Birbhum, WB, India

Abstract

For balanced agricultural development, agricultural diversification is necessary in the technologically backward countries like India where 50.2 % of population is directly or indirectly dependent on agriculture for their livelihood. Agricultural and allied sectors contribute nearly 17.8 and 17% of Gross Domestic Product (GDP) of India. Moreover, agriculture fetches substantial amount of valuables foreign exchange. It mostly covers farming practices is one of the potential endowments for some regions .As Indian agriculture is mainly rain-fed in nature, that why farmers had to face risk coming from natural as well as economic factors. The natural factors are difficult to control, but an economic factor related to changes in price commonly occurs and such risks are predictable. So diversification of products is an important way to reduce both natural and economic suspicions. Present study is confined on Bankura District. Such an analysis focuses on the identification of crop diversification regions that provide a clear areal differentiation in case of crop grown and also give avenue to future planners to establish more economically sustained agricultural system.

KEY WORDS: crop diversification, areal differentiation, Monoculture, Economy, Irrigation.

INTRODUCTION:

The concept of crop diversification is a scientific devise to study the existing spatial relationship of crops in association with each other in agricultural geography and land utilization. Crop diversification leads to a progress of low-value agriculture to high-value agriculture and this is an important way to enhance agricultural output.

The cropping pattern in an area depends mostly up on agro climatic, technical and institutional factors (Vaidyanathan, 1992). In the third world country like India where man-land ratio is high enough, agricultural diversification especially in term of crop diversification is very much necessary (Let, 2011). At the same time, Indian agricultural practice is gamble in monsoon i.e., to get rid from helpless dependency on seasonal monsoonal rainfall, irrigation facilities –one of the most efficient infrastructure technological aids are earnestly required so that agricultural economy is established in the strong relative platforms (Let & Bhattacharya,2010). If different High Yielding Verities (HYV) of seeds, proper fertilization, automation in agriculture, information, banking facilities are dully provided according to justified pattern of land use, agricultural diversification is possible to achieve.

In India, through declining over the years, agriculture with a 19.8% contribution to the Gross Domestic Products (GDP) still provides livelihood support to about two thirds of the country's population. (Sau & Pathak, 2007). The sector provides employment to 56.7% of the country's work force and is the single target private sector occupation. So, proper nutrition should be provided to this sector even up to

micro level to dynamically stabilize the agricultural economy. Crop diversification with the aid of proper technological guidance is to be a good approach to sustain the economy.

But due to severe paucity of seasoned harmony of different technological modes, inadequate of different acknowledgement about justified crop chart, lop sided tendency to have involved in rice monoculture collectively have given a miserable decelerating status of crop diversification to W.B. where the picture is too miserable in Murshidabad district(Let, 2011).

OBJECTIVES:

The present study has mainly examined the Spatio-temporal variation of agricultural diversification in different blocks of Bankura District which shows the changes in the total cropped area of the districts. Moreover, it envisages the different levels of diversification at block-level (i.e., High, moderate, low, etc.) in the District. Mainly the spatial pattern of crop diversification would be the tools for future planning in case of crop production.

STUDY AREA:

Bankura district is one of the largest districts in W.B. carrying 6925.01 Sq km or 688100 hectares of geographical area and is located in the western part of West Bengal. It is a part of Bardhaman Division of the State and included in the area known as "Rarh" in Bengal. It ranks 4th according to Population and literacy rate of 2001 Census in the State. The District Bankura is bounded by latitude $22^{\circ}38'$ - $23^{\circ}38'$ N and longitude $86^{\circ}36'$ E to $87^{\circ}47'$ E. River Demodar flows along the northern boundary of the district. The adjacent districts are Bardhaman in the north, Purulia in the west, Paschim Medinapure in the south and Hooghly in the south-east. The Survey of India (SOI) toposheets covering the districts are 73I, 73J, 73M and 73N (Fig.-1).

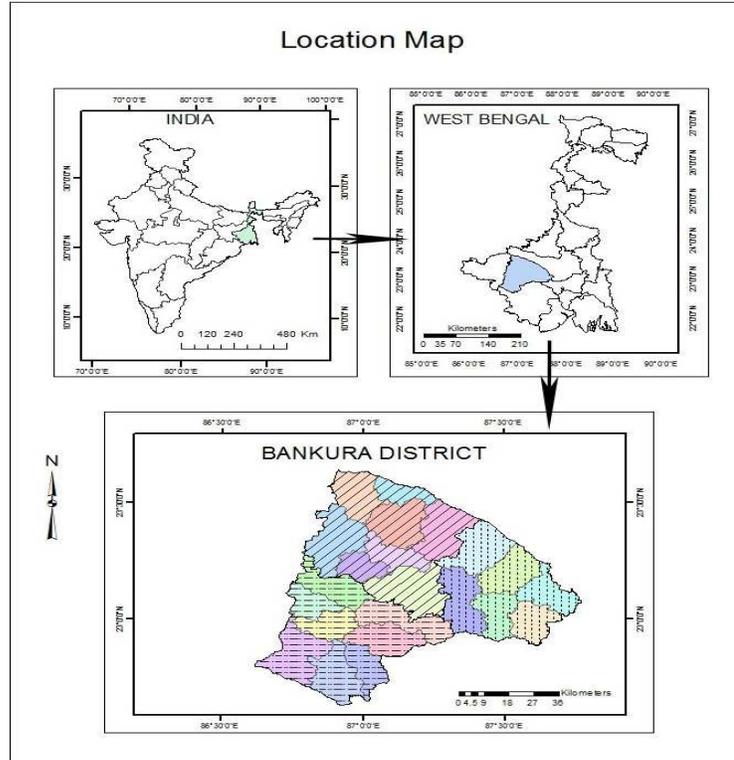


Fig. 1: location map of Study Area

GEOGRAPHICAL CHARACTERISTICS OF STUDY AREA:

Bankura district has been described as the “connecting link between the plains of Bengal on the east and Chotanagpur plateau on the west.” The area to the east and north-east are low lying alluvial plains, similar to predominating rice lands of Bengal. To the west the surface gradually rises, giving way to undulating country, interspersed with rocky hillocks. Much of the country is covered with jungles, having main concentration of *Sal*, *Teak* and *Mahua*. Bankura has a great historical as well as cultural background; it was ruled under the Gupta period by local Hindu kings who paid tribute to Samudra Gupta. The land was also called Mallabhum after the Malla rulers of this place who built the famous terracotta temples during the 17th and 18th century at this place. The terracotta temples here are the best specimen of the classical style of Bengal architecture (Wikipedia). The important rivers are Dwarakeswar, the Kasai, Silai, Sali, Damodar etc.

Table 1: Some important information in Bankura district

Total Area	6925.01sq. km.
Total Population	3596292
Population Density	523 per Sq. Km.
Percentages of Cultivators	30.82
Percentages of Agricultural Labourers	35.26
Net Sown Area	264.09 (' 000 Hectares)
Percentage of Irrigated area to Cultivated area	43.62 %
Yield Rate of Rice	2563 Kg. per Hec.

Source: District Statistical Handbook of Bankura, 2011

DATABASE AND METHODS:

The work is mainly based on secondary data i.e., collected from District statistical Handbook of Bankura District (2006 and 2011), District Gazetteer of Bankura District and many others literature and research papers. To undertake the scientific investigation for crop diversification, first method was formulated by Jasbir Singh in 1984. It suggests the following formula:-

Index of Crop Diversification = (Percentage of total cropped area under 'n' crop ÷ Number of 'n' crops)

Where 'n' denotes those crops which individually occupied at least 5 % or more of total cropped area in the Tahsil.

For the measurement of diversification of crops Bhatia (1965) also developed a formula based on the gross cropped area. The formula stands as:

Index of crop diversification= (Percent of sown area under x crops ÷ number of x crops)

There are some limitations to adopt this formula since, in this purpose, the quantitative techniques proposed by Gibbs and Martin to measure crop diversification provide a useful index for measuring the degree of diversification in the cropping pattern of an area (Singh & Dhillon, 1984). The formula developed for calculating the Crop Diversification Index (CDI) is as follows:

Crop Diversification Index (CDI) = 1- $\{\sum X^2 / (\sum X)^2\}$

Where, X is the percentages of the total cropped area occupied by each crop or hectare under individual crop. If the total cultivated area in a region is devoted wholly to one

crop (i.e., specialization) the index value will be zero (0) and if it is evenly distributed among all crops (i.e., maximum diversification) the index value approaches one (1).

This direct and calculation- precise method has taken into consideration both the number of factors (number of crops) and the evenness factor (relative strength of crops) perfectly for proper measurement of diversity. On the other hand, the figures can be adjusted into hundreds, thousands, millions etc. which will not alter the results. Because of all the advantages, this method of crop diversification has been adopted in this study.

ANALYSIS OF DATA:

Total area of Bankura District is 6925.01 sq. km. Out of this total land, only 2640.90 Sq.km. i.e. 38.14% is under agricultural uses in 2011. The tendency of total cultivated area is rather fluctuating during the period of 2006 to 2011 (Fig. No. 2), where as irrigated area under different sources of irrigation is also fluctuating during same time span (Fig. 3).

TABLE: 2 Areas Under principal crops

Year	Gross Crops Area in '000 Hectares	Irrigated Area in '000 Hectares
2006-07	494.3	276.94
2007-08	505.8	301.04
2008-09	454.6	297.52
2009-10	454	267.03
2010-11	260.5	115.20

Source: District Statistical Handbook, Bankura District (2011)

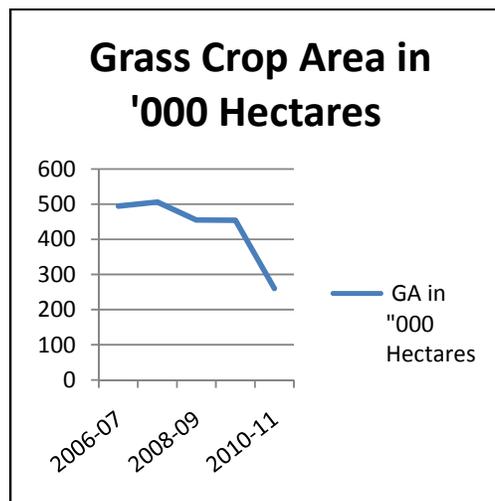


Fig. 2

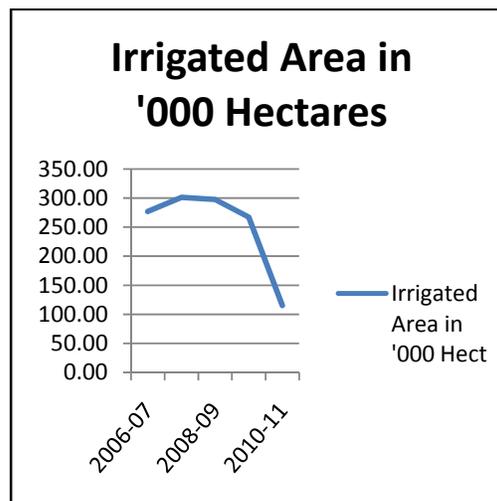


Fig.3

Table: 3 (A) & (B) Crop Diversification Categories, Bankura district, 2011

TABLE: 3 (A)

Sl. No.	Name of the CD Block	Crop Diversification Index (CDI)
1	Bankura-I	0.1
2	Bankura-II	0.12
3	Chhatna	0 (Minimum)
4	Saltora	0 (Minimum)
5	Mejia	0.20
6	Gangajal Ghati	0.09
7	Barjora	0.3
8	Onda	0.38
9	Indpur	0.27
10	Khatra	0.26
11	Hirbandh	0.01
12	Ranibandh	0.2
13	Taldangra	0.38
14	Simlapal	0.23
15	Raipur	0.36
16	Sarenga	0.45
17	Bishnupur	0.32
18	Joypur	0.43
19	Kotulpur	0.50 (Maximum)
20	Sonamukhi	0.36
21	Patrasayer	0.31
22	Indus	0.18

TABLE: 3 (B)

Diversification Categories	Range of Crop Diversification Index	Block Sl. No.	Number of Blocks
VERYLOW	<0.11	1,3,4,6,11	5
LOW	0.11-0.20	2,12,22,5	4
MODERATE	0.21-0.30	7,9,10,14	4
HIGH	0.31-0.40	8,13,15,17,20,21	6
VERY HIGH	>0.40	16,18,19	3

Source: District Statistical Handbook, Bankura District, 2011 and Calculated by author.

RESULT AND DISCUSSIONS:

The picture is quite clear from the analysis (table no. 3-A & B) that crop diversification is not so much promising rather it is moderate in character. Within the whole district, only three blocks i.e. Sarenga, Joypur, and Kotalpur where crop diversification is very high (CDI>0.40). The region has many depressions which receive water from the surrounding lands during the rainy season and discharge the water through small channels. As a result, agriculturally this region is made of fertile alluvial soil as well as the irrigation facilities play an important role for this result. (Fig.4).

High level crop diversification (CDI=0.31-0.40) is found within six blocks namely Patrasayar, Taldangra, Sonamukhi, Bihsnupur, Raipur, Onda. In this blocks rivers (Ajoy. Sali, Dwakeswar, Kasai and silai) plays significant role and also maximum area is under irrigation facilities.

Crop diversification index lies below 0.30 in rest of the blocks of the district, whereas it is very low (<0.11) in Bankura-I, Chatna, Saltor, Hirabandh & Gangajalghati block.

Actually the condition is not so suitable for agricultural practice apart from it, irrigation facilities is also unavailable here which makes this situation. Bankura town that is HQ of the district located in Bankura-I block which act importantly in case of this block.

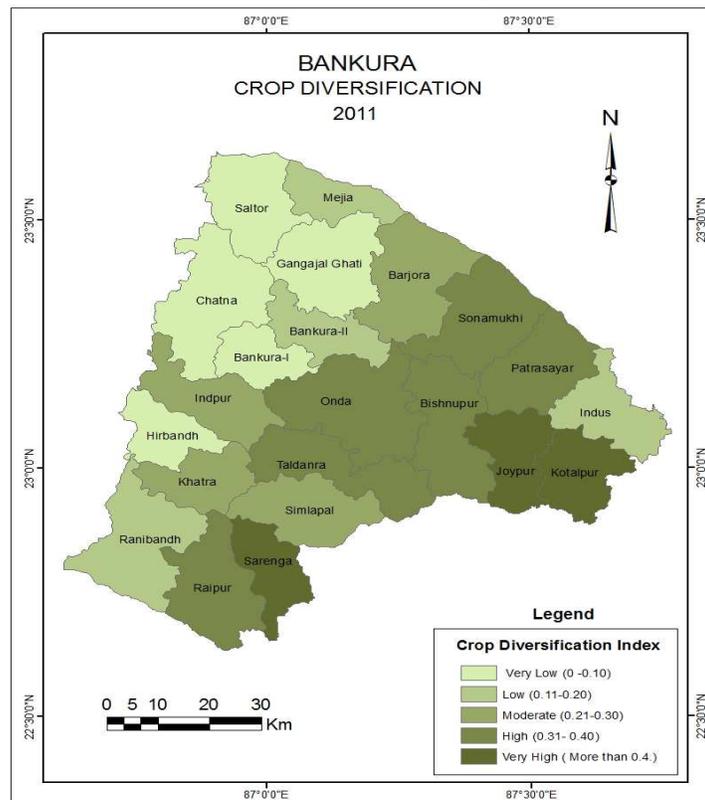


Fig. 4: Crop Diversification Map of Bankura

CONCLUSION:

The picture is quite clear from the above analysis that physical environment play vital role besides cultural as well as technological hands are playing significant role on agro-environmental situation of this district. As the district paying connecting role between Chotanagpur plateau in the west and Gangetic Plain in the east so physiographically the district is divers in character where alluvial soil of plain covered the eastern part and low fertile soil belongs to Chotanagpur plateau covered the western part of the district. Rainfall is quite low in the west (below 1400mm/year) whereas eastern part receive more rainfall (1400-1600mm/year even more than that in some place) so naturally agricultural practice is supported by nature in the east side whereas in the west part experience opposite situation. Apart from this irrigational facilities are also available in the eastern portion whereas it almost absent in the western portion of the district. Above said situation combinely create present picture i.e. high crop diversification in eastern part and low to very low in the western part of Bankura. In this situation as we know it is not possible to overcome the physical barrier fully but with the help of technology the picture may be quite gainful in near future.

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