

Changing trends of crop concentration in Purba Bardhaman district, West Bengal – A comparative analysis

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ABSTRACT

Crop concentration is referred to the best suitability of an area for a specific crop. This crop concentration is more influenced by agro-ecological and other socio-economic environment. This study has been conducted to analyze the spatio-temporal variation of rice crop concentration in between 2005-06 and 2015-16 of Purba Bardhaman district. Purba Bardhaman is an agrarian economy, where 57.76% of population is engaged in agricultural activities. Erstwhile Burdwan district was called '*rice bowl of West Bengal*'. The present study is based on secondary data and recent field survey. The crop concentration index is measured by location quotient technique and compiled data have been processed and computed in tabulated form and finally mapped by QGIS tool. Out of 22 (twenty two) C.D. blocks 9 (nine) C.D. blocks have been showing decreasing tendency due to increasing practices of varying rates of crop diversification.

Key Words : Crop concentration, Rice, Location quotient, Tendency, Diversification

INTRODUCTION

Gandhiji aptly realized India lives in villages. Village continued to be remained as the pillar of society, economy and polity of India where agriculture is the most important economic activities. It is deeply intertwined with social, economic and cultural value system of Indian population. Among crops, rice is the number one staple food of India especially in the Eastern parts. In West Bengal there is no alternative of this crop. Rice covers 16.35 % (2013-14) share in the Indian rice production. It is practiced in about 58 % of the total crop land of West Bengal (2014-15). While for Purba Bardhaman it is found that among total crops, rice covers of 68.48 % (2015-16) where rice is cultivated in the most of the total cultivable lands of the Purba Bardhaman district.

The nature of Indian agriculture is characterized by regional crop concentration *i.e.*, West Bengal in rice, Punjab-Haryana in wheat, Gujarat- Maharashtra in cotton etc. Dias (2017) has described that crop concentration is a particular well crop grown area with minimum agricultural inputs, it is actually density of particular crop in an aerial unit. In the other word, crop concentration is a method where specific crop is cultivated with positive agro-climatic and socio-economic condition

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that there is a concentration of a recognizable level of special component in an area (Singh, 1984). According to Husain (2015) crop concentration is the variation in the density of any crop in a specific area at a given point of time. Many scholars have done on it in the international, national and regional level. Bhatia (1965) has analyzed the cropping pattern of India on a regional basis and fetching out the areal concentration and diversification of crops. Hashmi and Gomatee (2012) have emphasized on the dominance of appropriate crop in an areal unit and crops status in upper Ganga-Yamuna doab region in 2010-11. Singh (1976) said that “The keener competition the greater will be the trend toward specialization or monoculture farming where is one or two crop”. Murugesan *et al.* (2018) worked on crop concentration, diversification and crop combination in Thiruchirappalli in Tamilnadu. Tiwari and Shahdeo (2016) have analyzed intensification and spatio-temporal changes pattern of rice cultivation in Jharkhand state.

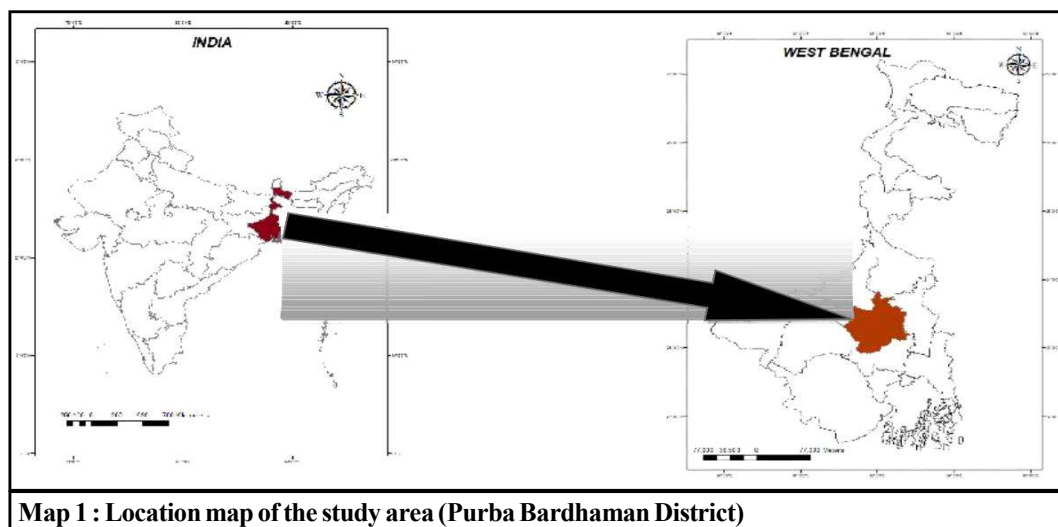
Therefore, Singh (1997) has examined the improper crop cultivation create to soil degradation which is causing loss of nutrients that influencing crop production. Dey and Mistri (2017) have highlighted that crop concentration area has been decreasing due to risk on mono cropping therefore, crop diversification is urgent. Rongsenchiba and *et al.* (2017) have described areal distribution, concentration, production productivity; marketing, processing and consumption etc. are important indicators for determining trends of agriculture. There are many scholars workers on crop concentration like Rafiullah (1956), Bhatia (1965), Husain (1972), Jasbir Singh (1976) etc. Undivided Burdwan district was designated as ‘*rice bowl of West Bengal*’. But now greater portion of this area is covered by the Purba Bardhaman district. 57.76% people have been engaged in agricultural activities (2011). The present study is discussing about the rice crop concentration of Purba Bardhaman district. The concentration of rice depends on favorable geographical and socio-economical condition like terrain, rainfall, temperature, pedological condition, development of rural infrastructure, labors efficiency, technological adoption and use of fertilizer/pesticides etc. Therefore, authors try to find out the spatio-temporal changes of rice crop concentration in-between 2005-06 and 2015-16 cropping year and also take an attempt to measure and chalk out the causes of variations of crop concentration area through blocks level analysis of the district of Purba Bardhaman. It is observed that the crop concentration is significantly changing in the spatio-temporal situation.

Study area:

The study area covers Purba Bardhaman district in West Bengal. It has come into existence on 7th April 2017, after bifurcation of erstwhile Burdwan district and its head quarters is Bardhaman. Purba Bardhaman is an agriculturally prosperous district of West Bengal. This part of the West Bengal is traditionally familiar as the agriculturally developed is known as the ‘*granary of the West Bengal*’. The study area extended from 22°15’08” N to 23°15’17” N latitudes and 87°13’17” E to 88°7’22” E longitudes. It contain an area 5432.69 km² (2097.57 sq miles) as ascertained by the bifurcation, and population (according to 2011 census) is 4835532, density of population is 890/ km². The district lies mainly between the river Ajoy, the Bhagirathi and the Damodar .It is bounded on the north by Birbhum district and Murshidabad district, on the east by Hooghly district, on the south by Hooghly-Bankura district and west by the Paschim Bardhaman district.

Purba Bardhaman district is a flat alluvial plain area that divided into four prominent topographical regions. Ausgram-Ketugram plain lies in the northern part of the district, along the Ajoy river which joins with the Bhagirathi river. Bardhaman plain occupies the central area of the district with the Damodar River on the south and south-east, on the southern part is the Khandoghosh plain. The Bhagirathi flows along the eastern boundary of the district and the Bhagirathi basin lies

on the eastern part of the district. The undulating lateritic topography of Paschim Bardhaman extended up Ausgram area of the district (Map 1).



Objectives:

The study has been conducted to achieve following objectives:

- i. To analyze the C.D. blocks wise variation tendencies in crop concentration of Purba Bardhaman district.
- ii. To glen out a comparative analysis in crop concentration in between 2005-06 and 2015-16 cropping year of the Purba Bardhaman district, West Bengal.

METHODOLOGY

The present work is based on mainly secondary data. The data has been collected from following sources:

- i. Office of the Deputy Director of Agriculture (Administration), Bardhaman.
- ii. Burdwan District Statistical Hand Book 2005 and 2015.
- iii. Census of India 2011.
- iv. Burdwan District Gazetteers, 1997.
- v. District Controller of food supply, Purba Bardhaman.
- vi. Interview of farmers of some selected blocks.
- vii. Field visit in some selected areas.

Several techniques have been applied by different scholars like Florence (1948), Chisholm (1992), Bhatia (1956) and Jasbir Singh (1976). But in this paper the location quotient method has been applied to measure of crop concentration

Formula:

$$\frac{\text{Area of X crop in the component areal unit}}{\text{Area of all crops in the component area unit}} \div \frac{\text{Area of X crop in the entire region}}{\text{Area of the all crops in the entire region}}$$

Here, all 22 (twenty two) C.D. blocks have been taken into consideration to calculate crop concentration in 2005-06 and 2015-16 cropping year. Therefore, on the basis of crop concentration

index, Purba Bardhaman district have been divided into five concentration zones *i.e.* very low, low, medium, high, very high etc. concentration zones.

RESULTS AND DISCUSSION

The results of crop concentration have been discussed for two cropping years are as follows:

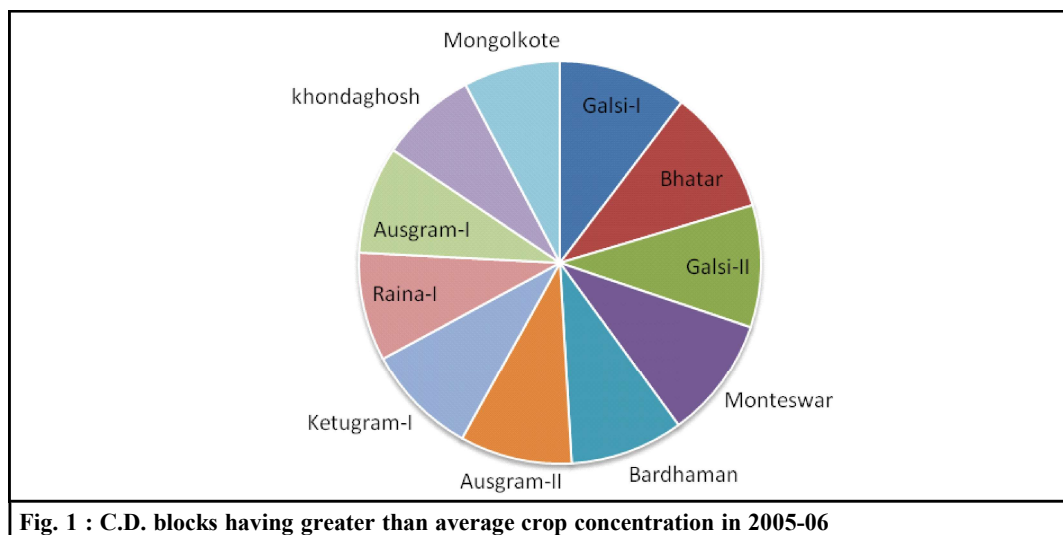
Crop concentration value in 2005-06 databases:

From Table 4, it is clear that the mean crop concentration has been observed about 1.00 (one) and highest concentration value is recorded in Galsi-I (1.33) C.D. block that is greater than average value as below (Table 1 and 4, Fig. 1).

Table 1 : C.D. blocks having greater than average crop concentration value in 2005-06		
Sr. No.	Name of the block	Concentration value
1.	Galsi-I	1.33
2.	Bhatar	1.29
3.	Galsi-II	1.26
4.	Monteswar	1.26
5.	Bardhaman	1.17
6.	Ausgram-II	1.16
7.	Katugram-I	1.16
8.	Raina-II	1.12
9.	Ausgram-I	1.11
10*.	Khandoghosh	1.00
11*.	Mongolkote	1.00

Source: compiled by authors

*= Average crop concentration.



Major causes of this greater than average crop concentration are favorable agro-climatic condition, DVC canal irrigation systems, fertile alluvium, mechanization, development of rural infrastructure, improved rice marketing system mainly *Kisan Mandi*, development of rice milling industries, banking/bima facilities, over all agricultural training and skill development etc.

Besides, remaining of C.D. blocks have recorded average and less than average crop concentration. Lowest crop concentration has recorded in Purbasthali-II (0.34) C.D. block due to very high level of crop diversification (Dey and Mistri, 2017). That is given below (Table 2 and 4).

Table 2 : Level of less than average crop concentration in 2005-06 cropping year		
Sr. No. and Name of the block	Crop concentration value	Probable causes
Purbasthali-II	0.34	High crop diversification due to alluvial soil ,irrigation facilities
Purbasthali-I	0.63	High crop diversification due to alluvial soil ,irrigation facilities
Jamalpur	0.74	High crop diversification due to alluvial soil ,irrigation facilities
Katwa-I	0.87	High crop diversification due to alluvial soil ,irrigation facilities
Memari-II	0.89	Medium crop diversification due to alluvial soil, irrigation facilities
Raina-I	0.90	Medium crop diversification, acquisition of land for non agricultural purposes
Katwa-II	0.90	Medium crop diversification due to alluvial soil, irrigation facilities
Kalna-I	0.92	Medium crop diversification due to alluvial soil, irrigation facilities
Memari-I	0.96	Medium crop diversification acquisition of land for non agricultural purposes
Kalna-II	0.96	Medium crop diversification due to alluvial soil, irrigation facilities
Ketugram-II	0.99	Medium crop diversification due to alluvial soil, irrigation facilities

Sources:-i. Office of the DDA, Bardhaman. ii. (Dey and Mistri, 2017). Compiled by authors

Main causes of this less than average crop concentration are high crop diversification practices due to alluvial soil, river bank location which provides periodic irrigation system, suitable positive attitude of farmers, availability of skilled labour, agricultural marketing system and well transport connectivity (Dey and Mistri, 2018).

On the basis of crop concentration in Purba Bardhaman district can be classified into five concentration zones as below:

Very low crop concentration zone (0.78 and below):

This scenario is seen only three C.D. blocks. These are Jamalpur, Purbasthali-I & II.

Low crop concentration zone (0.79-0.93):

It is found only in five C.D. blocks which are Memari-II, Raina-I, Kalna-I, Katwa-I & II etc. C.D. blocks.

Medium crop concentration zone (0.94-1.08):

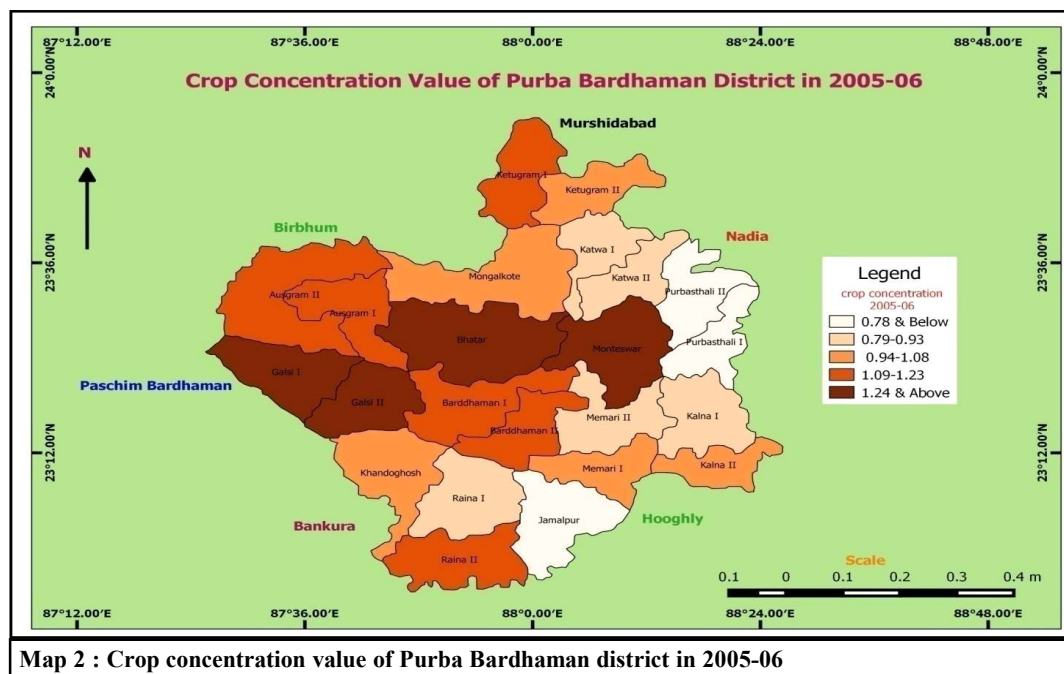
It is also observed in only five C.D. blocks. These are Khandoghosh, Memari-I, Kalna-II, Ketugram-II and Mongolkote etc. C.D. blocks.

High crop concentration (1.09-1.23):

This scenario is found only in five C.D. blocks which are Bardhaman, Aushgram-I & II, Raina- II and Ketugram-I etc C.D. blocks.

Very high crop concentration zone (1.24 and above):

These are observed in Bhatar, Galsi-I & II, Monteswar etc C.D. blocks (Table 4 and 6 and Map 2).

**Table 3 : Level of high crop concentration in 2015-16 cropping year**

Sr. No. and name of the block	Crop concentration value	Probable causes
1. Galsi-I	1.38	Very low crop diversification, suitable rice growing agro- climatic condition etc.
2. Bhatar	1.34	Very low crop diversification, suitable rice growing agro- climatic condition etc.
3. Monteswar	1.28	low crop diversification, suitable rice growing agro- climatic condition etc.
4. Bardhaman	1.21	Low crop diversification, rice growing agro- climatic condition, urbanization
5. Ketugram-I	1.21	Low crop diversification, suitable rice growing agro- climatic condition
6. Ausgram-II	1.14	Low crop diversification, rice growing agro- climatic condition etc.
7. Katwa-I	1.14	Low crop diversification, suitable rice growing agro- climatic condition etc.
8. Galsi-II	1.13	Low crop diversification, rice growing agro- climatic condition, well irrigation
9. Raina-II	1.10	Medium crop diversification, rice growing agro-ecological environment
10. Ketugram-II	1.08	Medium crop diversification, rice growing agro-ecological environment
11. Mongolkote	1.08	Medium crop diversification, rice growing agro-ecological environment
12. Katwa-II	1.03	Medium crop diversification, rice growing agro-ecological environment
13. Ausgram-I	1.00	Medium crop diversification, rice growing agro-ecological environment etc.

Sources: - i. DDA, Bardhaman. ii. Dey and Mistri (2017)

(Compiled by authors)

Crop concentration value in 2015-16 databases:

From Table 5, it is found that the average crop concentration value is 0.99 and highest value is observed in Galsi-I (1.38) C.D. blocks and followed by given below C.D. blocks (Table 3 and 5).

Causes of this rice crop concentration are favorable condition of rice growing, suitable agro-climatic condition, improvement of R & D infrastructure, implementation of NAS good irrigation systems etc. (Table 3).

Therefore, rests of the C.D. blocks have noticed that less than average crop concentration. The lowest crop concentration is found in Purbasthali-II (0.38) C.D. block and followed by Purbasthali-

I (0.63), Khandoghosh (0.81), Kalna-I (0.74), Jamalpur (0.72), Memari-I (0.83), Kalna-II (0.85), Memari-II (0.90), Raina-I (0.90) etc. C.D. blocks (Table 5).

On the basis of crop concentration of Purba Bardhaman district can be classified into five concentration zones. These are as follows:

Very Low crop concentration zone (0.78 and below):

It is observed in Jamalpur, Purbasthali-I & II, Kalna-I etc C.D. blocks due to very high crop diversification (Dey and Mistri, 2017).

Low crop concentration zone (0.79-0.93):

This scenario is found in only five C.D. blocks. These are Khandoghosh, Memari-I & II, Raina-I, Kalna-II which are located in the both sides the Damodar and the Bhagirathi rivers. Main causes of low crop concentration are irrigation improvement, implementation of modern agricultural technologies and infrastructure. It is suggested that farmers should cultivate minor crops that can restore soil fertility with overall developed marketing system in the area.

Medium crop concentration zone (0.94-1.08):

It is seen in Ausgram-I, Katwa-II, Ketugram-II and Mongolkote etc., C.D. blocks where crop diversification is medium (Dey and Mistri, 2017).

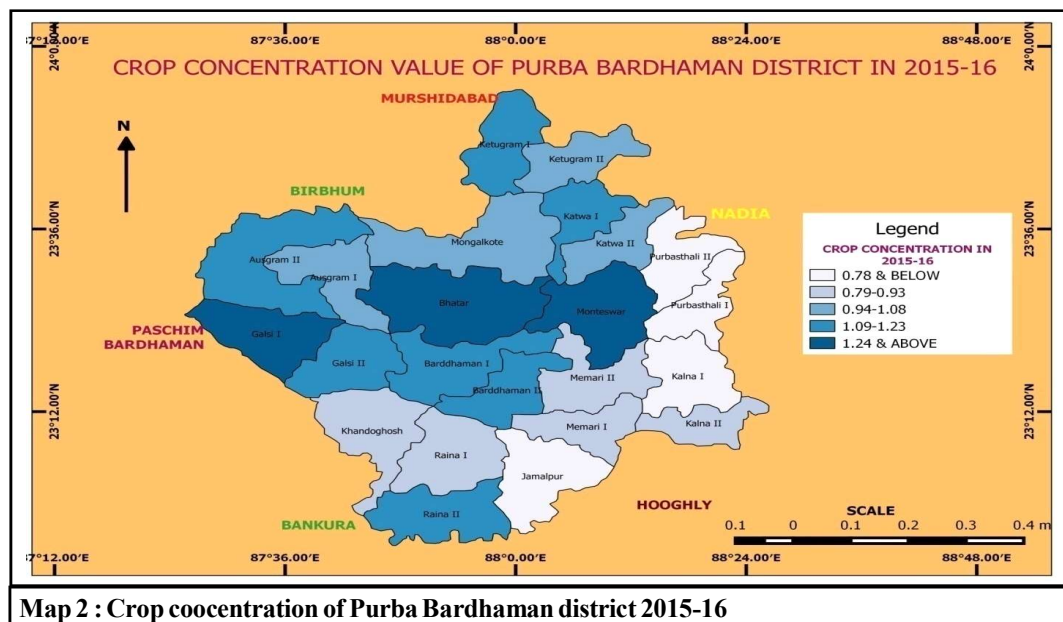
Comparative analysis of crop concentration in between 2005-06 and 2015-16 cropping year:

Comparative study of Table 3 and 4 reveal some changes in the position of concentration area

Table 4 : Crop concentration value of Purba Bardhaman district in 2005-06				
Sr. No.	Name of the block	Area of rice crop in hectares	Area of the all crops in hectares	Crop concentration value
1.	Bardhaman	55700	69173	1.17
2.	Ausgram-I	19400	25408	1.11
3.	Ausgram-II	19490	24408	1.16
4.	Bhatar	48150	54271	1.29
5.	Galsi-I	29960	32550	1.33
6.	Galsi-II	35655	40979	1.26
7.	Jamalpur	25740	50045	0.74
8.	Khandoghosh	23200	33461	1.00
9.	Memari-I	21985	33355	0.96
10.	Memari-II	20780	33781	0.89
11.	Raina-I	25965	41935	0.90
12.	Raina-II	22300	28788	1.12
13.	Kalna-I	16430	25954	0.92
14.	Kalna-II	18900	28605	0.96
15.	Purbasthali-I	14500	33331	0.63
16.	Purbasthali-II	10850	45751	0.34
17.	Monteswar	35750	41099	1.26
18.	Katwa-I	15730	26124	0.87
19.	Katwa-II	15390	24662	0.90
20.	Ketugram-I	18515	23162	1.16
21.	Ketugram-II	17608	25680	0.99
22.	Mongolkote	35300	51176	1.00

Source: Deputy Director of Agriculture (Administrative), Bardhaman

(Compiled by authors)

**Table 5 : Crop concentration of Purba Bardhaman district in 2015-16**

Sr. No	Name of the block	Area of rice crop in hectares	Area of all crop in hectares	Crop concentration value
1.	Bardhaman	42215	50862	1.21
2.	Ausgram-I	19600	28474	1.00
3.	Ausgram-II	20700	26474	1.14
4.	Bhatar	44000	48072	1.34
5.	Galsi-I	20480	21723	1.38
6.	Galsi-II	21535	27721	1.13
7.	Jamalpur	21275	43155	0.72
8.	Khandoghosh	17950	32363	0.81
9.	Memari-I	17583	30760	0.83
10.	Memari-II	19000	30962	0.90
11.	Raina-I	15850	25573	0.90
12.	Raina-II	14850	19655	1.10
13.	Kalna-I	12995	25758	0.74
14.	Kalna-II	15375	26554	0.85
15.	Purbasthali-I	11783	27129	0.63
16.	Purbasthali-II	9210	35509	0.38
17.	Monteswar	40340	46027	1.28
18.	Katwa-I	16695	21379	1.14
19.	Katwa-II	15270	21593	1.03
20.	Ketugram-I	17755	21404	1.21
21.	Ketugram-II	18850	25431	1.08
22.	Mongolkote	34150	45989	1.08

Source: Deputy Director of Agriculture (Administration), Bardhaman

(Compiled by authors)

in between 2005-06 and 2015-16. From above analysis it can be said that overall crop concentration have decreased. Although, in very high categories numbers of blocks have decreased in 2005-06 and 2015-16 but high and very low categories numbers has increased nominally. Therefore, low categories of blocks have in more or less unchanged position.

Table 6 : Level of crop concentration value of Purba Bardhaman district in between 2005-06 and 2015-16					
Degree of crop concentration	Concentration value	Sr. No. of block for crop concentration in 2005-06	Total	Sr. No. of block for crop concentration in 2015-16	Total
Very low	0.78 and below	7,15,16	3	7,13,15,16	4
Low	0.79-0.93	10,11,13,18,19	5	8,9,10,11,14	5
Medium	0.94-1.08	8,9,14,21,22	5	2,19,21,22	4
High	1.09-1.23	1,2,3,12,20	5	1,3,6,12,18,20	6
Very high	1.24 and above	4,5,6,17	4	4,5,17	3

Source: Deputy Director of Agriculture (Administration), Bardhaman (Compiled by authors)

C.D. blocks with increased crop concentration value are as follows:

Six (06) C.D. blocks have improved their crop concentration value. These are Ausgram-I (0.11), Galsi-II (0.13), Khandoghosh (0.19), Memari-I (0.13), Kalna-I (0.18) and Kalna-II (0.11) due to agricultural infrastructural development, uses of NAS (New Agricultural Systems), positive attitude of farmers, development of rice milling industries, improved rice marketing system etc.

C.D. blocks with intact position of crop concentration:

Only 7 (seven) blocks have unchanged position. These are Raina-I, Purbasthali-I, Monteswar, Ausgram-II, Jamalpur, Raina-II and Memari-II etc C.D. blocks.

High crop concentration zone (1.09-1.23):

This scenario is observed in Bardhaman, Aushgram-II, Galsi-II, Raina-II, Katwa-I and Ketugram-I etc C.D. blocks due to low crop diversification practices, traditional attitude, good rice marketing and high concentration of rice mills etc.

Very high crop concentration (1.24 and above):

It is found in Bhatar, Galsi-I and Monteswar blocks *aus*, *aman* and *boro* paddy is main crops are cultivated in whole year due to better DVC irrigation systems, traditional attitude, increasing demand of rice, well marketing system etc. There are new types of rice mainly aromatic rice is cultivated. But very low level of agricultural development is found which can be measured on the basis of area under crop cultivation, cropping intensity, diversification and area under cash crops. (Dey and Mistri, 2018), (Table 5 and 6 and Map 3).

C.D. blocks having less crop concentration are as follows:

Only 9 (nine) C.D. blocks have decreased their concentration value. These are Bardhaman, Bhatar, Galsi-I, Purbasthali-II, Katwa-I & II, Ketugram-I & II and Mongolkote C.D. blocks due to crop diversification practices, acquisition of land for non agricultural purposes etc. (Table 6).

Conclusion:

Erstwhile Burdwan district was known as rice bowl of the West Bengal. Now bulk of that part what is now Purba Bardhaman district. Low and very low crop concentration indicates high to very high crop diversification for this district (Dey and Mistri, 2017).

From above analysis and comparative study of 22 (twenty two) C.D. blocks of Purba Bardhaman district of two cropping year, it is clear that six blocks have improved their position, seven C.D. blocks are lagging in term of crop concentration and nine blocks have recorded decreased tendencies of their concentration value in one decade. The probable causes of these decreasing

tendencies are improved crop diversification, development of infrastructural facilities, changing trends of positive attitude of farmers, governmental initiative to cultivate minor crops, motivation programme of electronic media and the agricultural department, improvement in food processing industries, the development of agro-based industries etc. It is clear that agriculturally developed blocks have been observing low crop concentration and agriculturally under developed blocks have found high crop concentration *i.e.* agricultural development is measured by area under crop cultivation, diversification, cropping intensity and area under cash crops etc. based (Dey and Mistri, 2018).

Last of all, it can be said that India is a country of tropical monsoon climate where agriculture is highly dependent on good monsoon rainfall but the monsoonal rain is highly uncertain and erratic in nature and its distribution is also highly irregular. Therefore, farmers should to think about the diversification of crops production with crop rotation that would help to minimize their losses and simultaneously ensure their income sustainability.

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