

An Empirical Study On Crop Diversification In West Bengal

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Introduction:

The term 'diversification' has been derived from the word 'diverge' meaning 'to move or extend' to the direction, different from a common point. Agricultural diversification can well be explained in terms of the shift from the regional dominance of one crop towards the production of a large number of crops to meet the increasing demand of those crops. Diversification can also be conceived, as the economic development of non-agricultural activities. Diversification can also be conceived as the economic development of non-agricultural activities. Farming is a risk-prone livelihood practice and farmers adopt numerous ways either to reduce part of risk or shift its incidence. Crop diversification reduces the risk of putting all their eggs in a single basket (McCloskey, 1972; Jones, 1984). The process of diversification can be typified as horizontal and vertical diversification. Horizontal diversification is that form wherein farmers diversify their agricultural activities either to stabilize or increase their income or both. It can take the form of shift from subsistence farming either to commercial farming or to the shift from low value food crops to high value crops. Vertical Diversification refers to the farmers' access to non-farm income, i.e., the income from non-agricultural sources (Haque, 1996).

At a given point of time, the extent of crop diversification can be measured by using several Indices namely: 1. Herfindhal Index (HI) 2. Simpson Index (SI) 3. Ogive Index (OI) 4. Entropy Index (EI) 5. Modified Entropy Index (MEI) 6. Composite Entropy Index (CEI) etc. All these indices are computed on the basis of proportion of gross area under different crops cultivated in particular geographical locations. Among these indices HI, EI and MEI are most widely used to measure the extent of crop diversification.

In this study Herfindahl Index has been used to measure the extent of crop concentration both at aggregate level i.e., for the state of West of Bengal as well as at disaggregated level or at

district level. It is to be mentioned that the Herfindahl index is the index of concentration and higher value of it indicates crop specialisation. Therefore, to obtain the index of diversification, it is subtracted from one, which is simplified form of Simpson index of diversification.

Brief Review of Literature:

Agricultural diversification has been perceived as a strategy that augments growth, stabilizes farm income especially of the small and marginal farmers, generates employment and attains the goal of food security. There is substantial evidence on crop area shifts from coarse cereals and pulses to rice, wheat, sugarcane and oilseeds during the seventies and eighties and in the subsequent period from crop sector to high value fruits, vegetables crops, forestry, livestock and fishery activities (Sawant and Achuthan, 1995; Joshi, Gulati, BIRTHAL and Tiwari, 2004). While area changes within the cropping sector are stated to have induced by favourable price structure, adoption of high yielding varieties, changes in technology, a move towards horticultural crops and allied activities received impetus by liberal external trade policies under the structural adjustment programme.

Cropping pattern connotes spatio-temporal sequence of crops or proportion of area under different crops at a point of time. Crop Diversification or a change in cropping pattern signifies a change in the proportion of area under different crops. To realise sustained growth in agricultural output four important inter-related factors may be considered: institutional changes in the agrarian sector, rise in cropping intensity of land, switching over from low priced crops with low productivity to more productive and remunerative crops and techno-biological improvements. Among institutional factors equitable distribution of lands and pro-peasant tenurial arrangements, access to credit and other inputs may enhance agricultural production and productivity. However, to achieve sustained agricultural growth along with institutional changes, techniques of cultivation need to be improved. In a situation of constraints in cultivable land, increase in cropping intensity may enhance the agricultural production. The existing discourse suggests that cropping pattern gets influenced by various agro-climatic, technical and institutional factors. Various price and non-price factors are identified in various studies which influence cropping pattern. Narain (1965), Boyce (1987), Narayanmoorthy (1997), Bhalla and Singh (1997), Ashok and Bulsubramania (2006) are few among many who examined the role of infrastructural factors like irrigation, road, market, institutions, technology etc., to bring in changes in the cropping pattern in different parts of India. Narain (1965), Sarkar (1988), Nayyar and Sen (1994) observed that changes in the relative

prices do have considerable impact on cropping pattern. Chand and Chauhan (2002) considered land holdings of small and marginal farmers which did have considerable impact on crop diversification in India.

Objective of the Study:

This paper attempts to study intends to explore crop diversification in West Bengal as a whole and also disaggregated at district level. To compute the indices used to measure Crop diversification by taking into account a select food-grains as well as non-food-grains for the State of West Bengal as well as for the districts and to have a disaggregated picture of crop Concentration or diversification in different districts of West Bengal.

Data and Methodology

This study is based on secondary data and information collected from various volumes of District Statistical Handbook, Government of West Bengal To maintain temporal continuity of data, the districts of 24 Parganas, West Dinajpur Midnapore, Jalpaiguri, Darjeeling and Burdwan have been taken as an undivided unit and the empirical analysis evolved around 15 districts over time. Here, to compute the indices for the state of West Bengal as well as for the districts, seven major crops - a mix of food-grains as well as non-food-grains have been considered. They are rice, wheat, other cereals, pulses, jute, potato, Rapeseeds and mustard respectively.

To understand the temporal changes, nine points of time have been taken into account and these points are respectively 1970-71, 1975-76, 1980-81, 1985-86, 1990-91, 1995-96, 2000-01 and 2008-09 (five year interval has been maintained except for the last period)

In this study Herfindahl Index has been used to measure the extent of crop concentration both at aggregate level i.e., for the state of West of Bengal as well as at disaggregated level or at district level. It is to be mentioned that the Herfindahl index is the index of concentration and higher value of it indicates crop specialisation. Therefore, to obtain the index of diversification, it is subtracted from one, which is simplified form of Simpson index of diversification. Herfindahl index is defined as:

$$HI = \sum_{i=1}^n p_i^2$$

Where:

p_i = Proportion of area under ith crop

And

$$p_i = \frac{A_i}{\sum_{i=1}^n A_i}$$

Where, A_i = Area under I th crop and $\sum A_i$ = Total Cropped area

Therefore, Simpson Index of Diversification or

$$SI = 1 - \sum_{i=1}^n p_i^2$$

Results and Findings

Based on the values of Herfindahl indices (Table-1), four observations can be made. In districts like Burdwan, Midnapore, Purulia, Bankura and 24-Parganas, crop concentration is strongly pronounced. On the contrary, in Nadia, Murshidabad, Malda and Darjeeling, crop diversification is strongly pronounced. Therefore, in these four districts, diversification of crop combinations was maintained. Hoogly and Birbhum have gradually been moving from a situation of diversified crop combinations to specialisation or production of one or two crops. However a reverse trend is observed in Cooch Behar and Jalpaiguri, where crop mix has gradually been reduced and crop concentration has become more prominent.

The extent of crop diversification can also be explained with the help of Simpson Index (table-2). Since the Simpson index is calculated by deducting the value of Herfindahl index from unity, therefore, value closer to zero indicates crop concentration and value closer to one indicates crop diversification. For the districts of Burdwan, Midnapore, Purulia, Bankura and 24-Parganas, it has been observed that least diversification has taken place in these districts between 1970-71 and 2008-09.

Conversely, for Nadia, Murshidabad, Malda and Darjeeling crop mix has remained diversified all along. During the same period, crop-mix has hardly changed in Hoogly and crop diversification has slightly increased in Birbhum. Finally, in Cooch Behar and Jalpaiguri, crop concentration has increased in these two districts.

Indices for the state for all these time periods remain fairly constant and hover around 0.56 in 1970-71 to 0.57 in 2008-09, barring 2000-01 when the Herfindahl index for the state assumed a value of 0.49

Table -1: District wise Herfindhal Indices of Crop Diversification in West Bengal (1970-71 to 2008-09)

District/Yr	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2008-09
Burdwan	0.7185	0.7011	0.7423	0.7047	0.7093	0.5381	0.7092	0.7825	0.7676
Birbhum	0.5571	0.5720	0.7105	0.6815	0.6950	0.7504	0.6043	0.7251	0.6856
Bankura	0.8597	0.7568	0.8459	0.8196	0.7984	0.8294	0.8022	0.7426	0.7179
Midnapore	0.8186	0.7694	0.8047	0.8140	0.8418	0.8008	0.8052	0.7921	0.8395
Howrah	0.6826	0.6587	0.6394	0.6666	0.8189	0.8430	0.7400	0.7963	0.8188
Hoogly	0.5324	0.5906	0.5775	0.5285	0.5615	0.5663	0.4459	0.5136	0.5283
24Parganas	0.7077	0.6895	0.7808	0.5481	0.6005	0.6340	0.5128	0.6904	0.6964
Nadia	0.3138	0.3059	0.2863	0.2732	0.3197	0.3368	0.2625	0.3109	0.3321
Murshidabad	0.2969	0.3297	0.3073	0.2751	0.3374	0.3243	0.2382	0.3474	0.3212
West Dinajpur	0.5650	0.4981	0.5186	0.4603	0.5919	0.5841	0.4053	0.5614	0.4915
Malda	0.3432	0.3580	0.3768	0.3763	0.4109	0.4901	0.3894	0.4377	0.4200
Jalpaiguri	0.6734	0.6252	0.5998	0.5292	0.6422	0.5830	0.5374	0.5418	0.4796
Darjeeling	0.4144	0.3990	0.3828	0.3834	0.3001	0.2933	0.2834	0.3517	0.3488
Cooch Behar	0.5993	0.5841	0.5573	0.5611	0.5978	0.5356	0.4980	0.5178	0.4945
Purulia	0.7615	0.7061	0.8067	0.7715	0.7697	0.7925	0.7693	0.7571	0.8449
West Bengal	0.5647	0.5563	0.5787	0.5287	0.5818	0.5643	0.4980	0.5824	0.5718

Source:

Calculation based on data collected from various volume
of District Statistical Handbook, Government of West
Bengal

**Table-2: Simpson Indices of Crop
Diversification in the Districts of West Bengal
(1970-71 to 2008-09)**

District/Year	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2008-09
Burdwan	0.2815	0.2989	0.2577	0.2953	0.2907	0.4619	0.2908	0.2175	0.2324
Birbhum	0.4429	0.4280	0.2895	0.3185	0.3050	0.2496	0.3957	0.2749	0.3144
Bankura	0.1403	0.2432	0.1541	0.1804	0.2016	0.1706	0.1978	0.2574	0.2821
Midnapore	0.1814	0.2306	0.1953	0.1860	0.1582	0.1992	0.1948	0.2079	0.1605
Howrah	0.3174	0.3413	0.3606	0.3334	0.1811	0.1570	0.2600	0.2037	0.1812
Hoogly	0.4676	0.4094	0.4225	0.4715	0.4385	0.4337	0.5541	0.4864	0.4717
24 Parganas	0.2923	0.3105	0.2192	0.4519	0.3995	0.3660	0.4872	0.3096	0.3036
Nadia	0.6862	0.6941	0.7137	0.7268	0.6803	0.6632	0.7375	0.6891	0.6679
Murshidabad	0.7031	0.6703	0.6927	0.7249	0.6626	0.6757	0.7618	0.6526	0.6788
West Dinajpur	0.4350	0.5019	0.4814	0.5397	0.4081	0.4159	0.5947	0.4386	0.5085
Malda	0.6568	0.6420	0.6232	0.6237	0.5891	0.5099	0.6106	0.5623	0.5800
Jalpaiguri	0.3266	0.3748	0.4002	0.4708	0.3578	0.4170	0.4626	0.4582	0.5204
Darjeeling	0.5856	0.6010	0.6172	0.6166	0.6999	0.7067	0.7166	0.6483	0.6512
Cooch Behar	0.4007	0.4159	0.4427	0.4389	0.4022	0.4644	0.5020	0.4822	0.5055
Purulia	0.2385	0.2939	0.1933	0.2285	0.2303	0.2075	0.2307	0.2429	0.1551

West Bengal	0.435 3	0.443 7	0.421 3	0.471 3	0.418 2	0.435 7	0.502 0	0.417 6	0.428 2
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Source: Calculation based on data collected from various volumes of District Statistical Handbook, Government of West Bengal

Conclusion

These results suggest that crop concentration is more pronounced than crop diversification. This is based on the fact that majority of the total cropped area in the State is used for food-grain production and more precisely rice production. However, present study yet to consider the area allocated for the cultivation of fruits and vegetables.

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