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A Comparative Study of Diversification of Agriculture in Bongaigaon District between Pre-Globalization and Post-Globalization Years

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Abstract

In the context of government annual budget 2016-17, the concept of doubling farm income by 2022, diversification of crops along with advance innovation in the field of agriculture can be one of the main strategies. The present study aims to discuss the nature of extent of diversification of crops during pre-globalization and post globalization years in Bongaigaon district where about 70 % of the population depends on agriculture. The present study also focused on the challenges faced by most of the poor farmer in course of cultivation. With the help of Simpson index of diversification (SID), extent of crop diversification in two blocks of Bongaigaon district, namely Boitamari and Dangtal, has been measured and compared in order to find the nature of crops diversification in the district during pre-globalization and post globalization year. A sample of 200 farmers was collected at random from two blocks of the district in order to come to the conclusion of the study. IBM SPSS and Microsoft Excel were used for the arrangement and calculation of the primary data.

Keywords: crops diversification, Bongaigaon, Boitamari, Dangtal, SID.

Introduction: According to 2011 agricultural Census of India an estimated 61.5% of the total population is rural and dependent on agriculture. So, development of the sector from all directions is urgent need. In particular, structural change is considered to be a major engine in fostering growth of a country, but in the agricultural context, the most commonly used development strategy is crop diversifications that increase the agricultural sector to respond to improving Technologies and market condition. Diversification is basically understood as signifying the shift from the agricultural to the industrial domain. But the intricacies underlying the diversification are many and need threadbare understanding. Though former type of diversification indicates shift from one to another crop or from one

enterprise /sub-sector to another enterprise/ sub-sectors, the other type of diversification may involve income enhancing enterprises in addition to the existing ones. In essence, the diversification to commercial crops/ commodities becomes an essential strategy that can increase in comes in agriculture, minimize risk due to crop failure and above all earn foreign exchange. Plan diversification increases both individual and social gains (Haque,1996). This diversification strategy can be designed to help alleviate poverty, generate employment and conserve environment (Hayami and Otsuka,1995).

Thus, Diversification of agricultural includes changes in crop mix, enterprises mix and activity mix at household level etc. It also considers a shift of resources from monoculture to a large mix of crops and livestock. Factors like low income in agricultural with high risk and uncertainty due to climatic and biological vagaries, long time of harvesting, smallholding, illiteracy of farmers, poverty etc. give rise to diversification of agriculture from stable crops to high value crops like fruits, vegetables, flowers and livestock, fisheries, plantation etc.

There are 33 districts in Assam with different agricultural background. Out of these districts, Bongaigaon possesses immense potential to grow as a leading producer of different crops with developed transport facilities (with New Bongaigaon Railway junction) and increasing presence of plantation crops such as Rubber and small tea gardens.

Background of the problem: The economy of Bongaigaon district is basically agrarian in nature with about 70 per cent of the population depend on agriculture, Comprehensive District Agriculture Plan, (2009). Paddy is the main crop. Other important crops include oil seeds, pulses, cash crop like jute, vegetables etc. along with fruits like banana, orange etc. The agro-climatic conditions of the district are conducive various agricultural activities. Agriculture in the district is characterized by over dependence on rainfall, predominance of seasonal crops and traditional methods of production. Yet the sector contributes about 38 percent of the total income in the Gross District Domestic Product while the secondary sector contributes 19 percent. The territory sector's contribution is estimated to be 43 percent. It should be noted that Bongaigaon Refinery (IOCL) and New Bongaigaon Railway junction have given rise to large number of primary and secondary employment opportunities in this district, both in secondary and tertiary sector. In spite of these, agricultural sector in the district has huge potentiality to generate employment too if it is properly dressed with modern technology along with agriculture diversification.

There are 52 numbers of registered MSME units under the Commissionerate of Industries and Commerce, of which 48 are micro and 4 are small. The district has 39 different types of industry of which 5 agro-based, 2 forest based, 7 textile, 2 chemical, 7 engineering, 5 electronics, 3 mineral and rest 8 are miscellaneous. (Krishi Vigyan Kendra, Bongaigaon, Assam Agricultural University, 2015-16).

There are five community development blocks in the district of Bongaigaon. They are: Dangtal, Boitamari, Srijangram, Tapatatri and Manikpur. Out of these five we have chosen two blocks at random: Dangtal and Boitamari. From each chosen block we have

interviewed hundred farmers each with pre tested schedule to study the nature of agricultural diversification.

Rationale of the Study: Diversification of agriculture implies taking the agricultural sector nearer to the market with product diversification and thus increasing income to the farmers. In this study it is being aimed to look at the diversification of the sector in the pre-globalization and post globalization phase viz. between 1991 and 2017 to have a better understanding of the changing pattern of cropping. It is expected that a study based on primary survey will help to decide future course of policy formulation in the study area.

Review of Literature: Various researchers in the field of agriculture and allied sectors had done work on cropping pattern and crop diversification in India and other countries in the world. In this way, an endeavor has been made in the present investigation to review a portion of the significant works in the accompanying sections:

Ayyar, (1969) in his paper entitled "Crop Regions of Madhya Pradesh: A Study in Methodology" has developed another system for estimating crop diversification areas. He has taken every one of the crops which were having 1 percent or more than 1 percent of the complete cropped region. he divided the sum of crops by the number of crops which are having 1 % or more than 1 % of the total cropped area. His strategy is an improvement over Bhatia's and Singh's methods for measuring crop diversification.

Bhatia, (1965) in his investigation on "Patterns of Crop Concentration and Diversification in India" has seen that physical, socio-economic and technological components have influenced the greatness of crop diversification. Variations in the above-mentioned factors are responsible for variations in patterns of crop diversification in India He has likewise developed another strategy for estimating crop diversification in India. He has taken every one of the harvests which are having 10 percent or more than 10 percent of the trimmed territory. He summed up the all out zone under these crops and divided the sum by the number of crops. As indicated by his technique, higher the index, lower is the magnitude of crop diversification and vice-versa.

Hassan, (2000) have evaluated the relationship between canal irrigation and land degradation in Haryana. Their study found that speedy expansion of irrigation, mainly by canals in the state has led to predominant cropping pattern of the state such as wheat and rice or wheat and cotton from diversified to specialized. They further observed that extension in canal irrigation and consequently changes in cropping pattern have resulted in serious amount of ecological destruction through water-logging and accumulation of salts in the soil profile.

Ishtiaq, (2003) have examined the land use pattern and sustainable agricultural development in Nagaland. They found that very recently a section of Naga tribes turned to plantation and horticulture resulting in diversification of agriculture, thus making it sustainable.

Joshi, (2007) have also found in their study that urbanisation is the most important factor behind the growth of high value crop leading to diversification of crops.

Toor, (2007) in their study "Agriculture-led Diversification and Labour Use Enhancement in Punjab: Potentials and Constraints" tried to examine the potential of labour absorption and employment generation in agriculture. They used the Herfindal Index to measure the index of diversification. The paper pointed out major reasons behind casualization of farm labour both male and female in the state which have been the mechanization of major farm operations, inflow of labour from other places; decline of agricultural growth and increase threat of small and marginal holdings. The paper also observed that policy of the state Government infavour of crop diversification has led to the better employment opportunities for agricultural labour, specifically women workforce in the rural areas of their study zones. It was hypothesized that these policy measures will go a long way in generating employment opportunities and improving the economic conditions of the rural economy of the state.

Kumar, (2007) in his paper entitled "Trend in Rural Diversification and its Determinants in Uttar Pradesh" tried to examine the process of economic transformation of workers from agricultural segment to rural non-farm segment (RNFS) in Uttar Pradesh. He also attempted to guesstimate the determinants of RNFE (Rural Nonfarm Employment) and to evaluate region specific constraints in the growth of RNFE and draw related policy implication. The author used the statistical techniques of correlation coefficient and multiple regressions to identify the determinants which are closely associated with RNFE. He acknowledged a sharp deterioration in proportion of agricultural workers during nineties as compared to eighties. Yet, among the agricultural workers, agricultural labourer has sharply declined as compared to cultivators. The study highlights the fact that there has occurred a definite but moderate transformation in favour of non-agricultural rural workers in Uttar Pradesh.

Sharma, (2007) in his paper entitled "Crop Diversification in Himachal Pradesh: Extent, Impact, Determinants and Challenges" has attempted to uncover that the procedure of crop diversification in the territory of Himachal Pradesh was begun with the introduction of apple during sixties and vegetable crops during eighties. All the categories of households, including small and marginal ones, have adopted the cultivation of high-value cash crops like garlic, ginger, cabbage, cauliflower, peas and tomato. The development of these crops made a significant impact on the dimensions of family income and employment. Factor analysis demonstrates that the formation of essential infrastructural offices, accessibility of gigantic market in the neighboring states, high level of price reaction among farmers and the rise of self-help institutions triggered the process of crop diversification. The consequences of regression analysis in the investigation demonstrate that the road length and number of bank branches were significant determinants of area under non-food grain.

Bhaumik, (2007) in his study "Occupational Diversification Among Rural Workers: Results from Field Surveys in West Bengal" made an analytical study in west Bengal to observe the pattern and determinants of occupational diversification by rural workers by using the Probit Regression Model. The study showed that the majority of the rural workers in both the advanced and backward regions worked in the farm sector. He found that about

54 per cent of the rural worker working in the advanced region and about 62 per cent working in the backward region in the farm sector. Apart from this, about one eighth of the workers have been 'multi-active' as they participated in both the farm and non-farm sectors. The study further showed that in both the advanced and backward regions, nearly three-fourths of all workers have been self-employed while the remaining workers served as agricultural wage labour.

Barghouti, (2003) in their study "Poverty and agricultural diversification in developing countries" have observed that per capita income is hypothesized to influence the diversification as estimated with the presence of non-food grain in either way. More specifically, fruits and vegetables among non- food grain are increasingly recognized as a new source of growth of income in the agricultural sector. Conversely, increment in per capita income is the reason for move in consumer's inclination from staple food to the items like fruits and vegetables, plantation, fishery, animal husbandry etc.

In the policy maker context, (Mehta, 2009) in his study "Role of crop diversification in output Growth in India: A state level analysis" has observed that crop diversification is one of the major tools of policy, which drew widespread attention in India in the recent past in the face of stagnant growth; incomplete agricultural transformation and low productivity.

Objectives of the Study: The broad objective of the study is to analyze crop diversification in Bongaigaon district of Assam in comparative light between pre-globalization and post-globalization phase between the years 1991 and 2017.

The specific objectives are:

1. To study the nature of crop diversification in Bongaigaon district between the years 1991 and 2017.
2. To examine the challenges to the process of crop diversification from conventional crops to cash crops in Bongaigaon district.

Methodology: This study is empirical in nature based on both primary and secondary data analyzed by different statistical instruments/ tools.

The primary data have been collected from two agricultural blocks of Bongaigaon district of Assam selected at random out of total 5 Community development blocks. These blocks are namely- (a) Dangtal and (b) Boitamari. From these 2 blocks 100 samples of farmers from each have been selected at random totally 200 samples. With the help of pre-tested schedules the data have been collected. The main objective of the schedule is to find out the comparative extend of crop diversification in the district during 1990-910 and 2017-18. Also it was intended to find out that the effect of crop diversification on annual income of the sample unit. The primary data have been collected during June- August 2018.

The secondary data have been collected from different sources such as books, journals, earlier research works, Govt. report and census etc.

The data thus collected have been analyzed with various statistical tools and findings/ conclusion have been reached at.

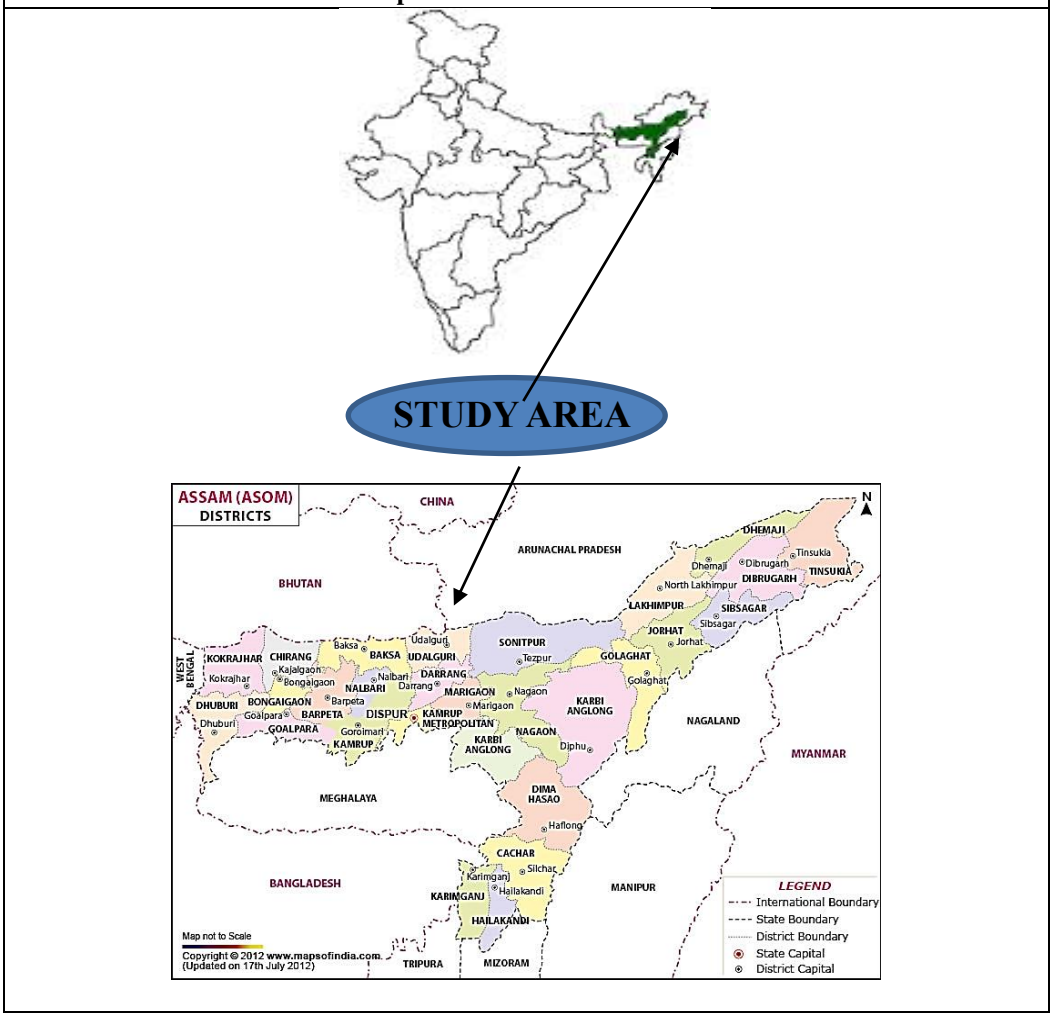
There are several methods to study diversification such as Herfindal Index, Simpson Diversity Index, Ogive Index, Entropy and Modified Entropy Index to assess the extent of diversification. The method of Simpson's index of diversification (SID) has been used to calculate the extent of diversification in this study. The Simpson's Index of Diversification is calculated as:

$$SID = 1 - \sum_{i=1}^{n} P_i^2$$

Where Pi = Ai/ $\sum_{i=1}^{n} A_i$; Pi is the proportion of area under the i[th] crop and Ai is the actual area under i[th] crop and n is the total number of crops grown.

The value of the Simpson's Index of Diversification ranges between 0 and 1. The larger the value larger is the diversification and vice-versa.

Map 1 : STUDY AREA MAP



Data Analysis and Findings: From the survey undertaken in the study area, it was found that the total cropping pattern can be divided into four types. They are: (a) Food grain

covering Rice; (b) Non Food Grain includes Mustard, vegetables, jute, sugarcane, corn; (c) Plantation includes Beetle nut, Bamboo, Tea, Rubber, Timber and lastly (d) Fishery.

Table 1
Land Holdings (in Bigha)

Concerned Study Area	Average Landholding		SD of Landholding	
	1990-91	2017-18	1990-91	2017-18
Boitamari (N=100)	26.40	17.51	13.66	9.63
Dangtal (N=100)	39.94	23.6275	27.41	15.60
Total (N=200)	33.17	20.57	22.64	13.29

Source: Primary data

The landholding data reveals (Table: 1) that the average land holdings over the study period has decreased in Bongaigaon district. Also the standard deviation of land holding records have shown sharp decrease in both two sample blocks. It is worth mentioning that decrease in both average and standard deviation values imply fragmentation of earlier comparatively bigger land holdings.

Now, in order to calculate the extent of diversification in the study area, the SID values have been calculated (Table: 2).

Table No: 2
SID value

Blocks	1990-91	2017-18
Boitamari	0.51	0.50
Dangtal	0.54	0.54
Total	0.53	0.53

Source: Primary Data Calculation (Appendices 1, 2 and 3))

A simple glance at the values tells that there has been no diversification at all and as a matter of fact, diversification value reduces marginally in Boitamari block. Therefore, it is necessary to look into other statistical dimensions of the data collected in order to have a better understanding of the change in cropping pattern (Table:3). In simple statistical context the nature of diversification in Bongaigaon district during 1990-91 and 2017-18 is depicted in table 3.

Findings:

1. Food grain production, which is the leading component of agriculture in Assam, is leading in the entire table (Table No.3) among all.
2. Non-Food grain component shows drastic reduction over the years. Primary survey reflects that sugarcane and jute cultivation have reduced tremendously. Increasing use of plastic and synthetic products has reduced the local demand for jute. This, in turn, has affected the cultivation of jute.

3. Plantation crops, with lowest coefficient of variation, shows marginal increase in small tea and rubber production. But the area under beetle nut production has reduced due to increase in inhabited land requirements.
4. The area under fishery cultivation has increased for all instances.

Table 3
Comparative Co-efficient of Variation of Land proportion under Different Crops During 1990-91 & 2017-18

Block	Crops	Food Grain		Non-Food Grain		Plantation		Fishery		Gross Land holdings	
		1990-91	2017-18	1990-91	2017-18	1990-91	2017-18	1990-91	2017-18	1990-91	2017-18
Boitamari N= 100 (Values in Bigha)	Mean	16.88	7.10	2.35	0.12	26.40	11.74	2.56	3.12	26.40	17.51
	SD	9.04	4.50	1.53	0.36	13.66	7.54	2.41	2.43	13.66	9.63
	CV	53.56	63.45	65.25	296.82	51.73	64.22	93.95	77.88	51.73	54.98
Dangtal N= 100 (Values in Bigha)	Mean	24.83	9.58	5.40	0.16	39.94	14.65	3.32	5.42	39.94	23.63
	SD	18.13	6.74	5.65	0.51	27.41	10.87	3.14	6.15	27.41	15.60
	CV	73.00	70.38	104.69	316.83	68.62	74.22	94.66	113.56	68.62	66.03
Total Two Blocks N=200 (Values in Bigha)	Mean	20.86	8.34	3.88	0.14	33.17	13.20	2.94	4.27	33.17	20.57
	SD	14.83	5.85	4.41	0.44	22.64	9.45	2.82	4.81	22.64	13.29
	CV	71.12	70.18	113.68	312.46	68.25	71.59	95.82	112.59	68.25	64.60

Source: Primary data

Challenges to the process of crop diversification:

The main problems to the process of diversification as appeared in the primary survey are:

1. Poverty, which is closely related to the lives of small farmers, demands survival cropping pattern skewed in favour of food grain production.
2. Illiteracy and lack of knowledge of the modern technology reduces the productivity. Also, lack of modern irrigation facilities affects timely and available water requirements.
3. Fear of unknown gives rise to default bias in agriculture. As a result new profitable crops get ignored.
4. Increasing and available use of plastic materials has reduced the demand of jute in the local market and also homemade products made from jute.
5. Availability of timely credit system is still missing in the sector.
6. The distribution of agricultural tools through different government schemes seems to have been politicized and the actual farmers in need somehow get deprived.
7. Longer gestation period of the plantation crops and lack of ready market facilities for the profitable cash crops has hindered the diversification process.
8. Among other reasons, increase in population has led to land fragmentation and increasing demand for inhabitable land.

Suggestions:

The following suggestions can be underlined:

1. Incentives for alternative/cash crops should be provided so that it appears profitable.
2. Initiative to provide proper information about the changing innovation in the field of modern farming.
3. Arrangement of adequate market with absence of intermediaries so that the farmers be able to get exact value of their product.
4. Cold storage facility can be provided for the excess products.
5. Facility/ tools distribution among farmers from Government should not be politicized so that needy farmers are not deprived.
6. Homemade products can be linked with tourism sector in order to increase the production of jute, bate, bamboo etc.

Conclusion: From the above analysis and findings, it can be concluded that crop diversification in Bongaigaon district has not been visible in spite of some new crops gaining popularity such as rubber and small tea production. It may also be added that the agricultural sector has many problems as discussed which deserve immediate attention

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APPENDICES

Appendix 1
Calculation of Diversification Index (SID) in Boitamati Block

Name of Block	**Boitamari**			
	1990-91		2017-18	
Crops	P	P^2	P	P^2
Food grains (in Bigha)	0.64	0.41	0.67	0.45
Non-food grains (in Bigha)	0.27	0.07	0.14	0.02
Plantation (in Bigha)	0.09	0.01	0.17	0.03
Fishery (in Bigha)	0.00	0.00	0.01	0.00
Sample size: N= 100		$\sum P^2$= 0.49		$\sum P^2$= 0.50
SID=(1-$\sum P^2$)		**SID= .51**		**SID= .50**
Source: Primary data				

Appendix 2
Calculation of Diversification Index (SID) in Dangtal Block

Name of Block	**Dangtal**			
	1990-91		2017-18	
Crops (in Bigha)	P	P^2	P	P^2
Food grains	0.62	0.39	0.62	0.38
Non-food grains	0.24	0.06	0.14	0.02
Plantation	0.13	0.02	0.23	0.05
Fishery	0.00	0.00	0.01	0.00
Sample size: N= 100		$\sum P^2$ = 0.46		$\sum P^2$= 0.46
SID=(1-$\sum P^2$)		**SID= .54**		**SID= .54**
Source: Primary data				

Appendix 3
Calculation of Diversification Index (SID) in both Blocks together

Name of Block	**Total**			
	1990-91		**2017-18**	
Crops (in Bigha)	P	P2	P	P2
Food grains	0.63	0.40	0.64	0.41
Non-food grains	0.25	0.06	0.14	0.02
Plantation	0.12	0.01	0.21	0.04
Fishery	0.00	0.00	0.01	0.00
Sample size: N= 200		**$\sum P^2$** = 0.47		**$\sum P^2$** =0.47
SID=1-$\sum P^2$	**SID= .53**		**SID= .53**	
Source: Primary data				