LEVELS OF CROP DIVERSIFICATION AND SOCIO-ECONOMIC DEVELOPMENT IN ALIGARH DISTRICT: A BLOCK LEVEL ANALYSIS

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Abstract

The present research work examines the level of crop diversification and spatial variation in the level of socio economic development in twelve blocks of Aligarh District. The study also encompasses the causes of variation in the levels of crop diversification. Block boundry has been chosen as the smallest unit for the study. A secondary source of data has been used for the analysis collected from the District Statistical Bulletin, (Sankyikiya Patrika) Aligarh District for the year 2010.

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Introduction:

The study of crop diversification in relation to socio-economic development has an important significance at the present scenario. At present augmentation of agricultural land is not possible as the rate of urbanization is on high and engulfing the agriculture area steadily day by day. Another problem that is law of inheritance causing the fragmentation of existing land holding day by day and small size of land is not viable to cultivate the land for the economic development for an agriculture based economy (Malik and Singh, 2002).Then the only solution to meet the demand of the day (which is being emerged due to Urbanization, Globalization, Liberalization and increase in per capita income) by intensifying or to diversify the existing cropping system. There is a need to distinguish the commercialization and diversification of agriculture. Commercialization of agriculture is simple means to growing of agricultural produce in order to earn money and maximizing profit characterized by mechanization, monoculture, and use of synthetic inputs such as chemical fertilizers and pesticides (Clark, 2003 and Kasema, 2011). On the other hand diversification has the wider concept including not only the maximization of profit but also aimed to generate employment, poverty alleviation, environmental improvement and overall sustainable development. As far as the determinants are concern, they are debatable, the theory of diffusion of innovation suggest that the social norms and values plays an important role while the economist analyzed that economic factors are more encouraging to adopt the new technology, beside all this the decision also influence by the farmers skill and scientific knowledge, but the poor farmers despite having the knowledge and skills are not able to adopt the improved seeds, fertilizers and access to irrigation to diversify the agriculture (Kasema, 2011).

As far as the benefits of crop diversification is concern it provide food & nutritional security, income growth, poverty alleviation, employment generation, judicious use of land and water resources, sustainable agricultural development and environmental improvement. Contrary to diversification mono cropping affects soil health and creates biotic and abiotic stress to the soil (Velavan and Balaji, 2012).

Though the meaning of diversification is different to the different people, but a common definition may be as growing a variety of crops in an area to maximize the use of land, water and other resources and for the overall development in the country (Acharya, S. P., et. al. 2011).

There is strong evidence that it is not the farm size, but infrastructure, like access to motorable roads, markets and irrigation which determine the extent, success and profitability of diversification through high paying crops like off-season vegetables (Chand, 1995).

Objective of the study

The present study has the following specific objectives:

1. To analyze the spatial variation in the levels of crop diversification.
2. To analyse the relationship between levels of crop diversification and socio economic developments.

Study Area:

District Aligarh is a part of Ganga-Yamuna Doab, (land between two rivers) lies between 27^0 27′ and 28^0 11′ North Latitudes and 77^0 27′, and 78^0 38′ East Longitudes. The district occupies an area of 3650 sq. km. which is 0.13 percent of the total area of the state and 12.55 percent of the total area of Agra Division. Ganga River separates the district from Badaun while river Yamuna constitute the dividing line in the north-west between Aligarh and Gurgaon district of Haryana. The district Aligarh is surrounded by district Bulandshaher in the north, on the west and south west, the district stretches with district Mathura while in the east lies district Hathras. In order to administer the district successfully, the district has been divided into five tehsils namely Khair, Gabhana, Koil, Atrauli and Iglas and these tehsils are further sub-divided into the twelve development blocks namely Tappal, Chandaus, Khair, Jawan Sikandarpur, Lodha, Dhanipur, Gonda, Iglas, Atrauli, Bijauli, Gangiri and Akrabad. There are 1210 revenue villages which includes 30 uninhabited villages. The climate is monsoon and experience two extremes that is severe cold in the winter (January maximum temperature 21^0 C and minimum 7^0 C) and scorching heat during summer (June maximum temperature 43^0 C to 46^0 C). The monsoon starts in late June, continuing till early October with high humidity levels. The rainfall in the district is uneven and scanty ranging between 60-75 centimetres per annum. The rivers and tributaries

which flows the length and width of district are Ganga, Yamuna and Kali. River Ganga covers a distance of 19 Km. in the north-east while the river Yamuna covers 16 Km. in the north-west to south-east. Kali River is the only tributary which traverses through the district for a distance of 60 kilometres. The soil which is found in the district brought by the river Ganga and Yamuna. The soil in the district ranging from sandy loam and silt to heavy clay. The new alluvium is found in the level plain above the flood level of the main river and their tributaries. According to the census 2011 the district has the population of 3,673,849 of which male population constitute the 1,951,996 and female population is 1721893 respectively. Out of the total population 33.13 percent lives in the urban areas. Sex ratio (number of female per thousand of male) in the district is found 876 per thousands of male as against the 912 female per thousands of male in Uttar Pradesh. Average density of population is 1,007 per sq. Km. while the density in the Uttar Pradesh is 829 which is the 1.84 percent of the Uttar Pradesh population. As per the census 2011,

Location Map: District Aligarh

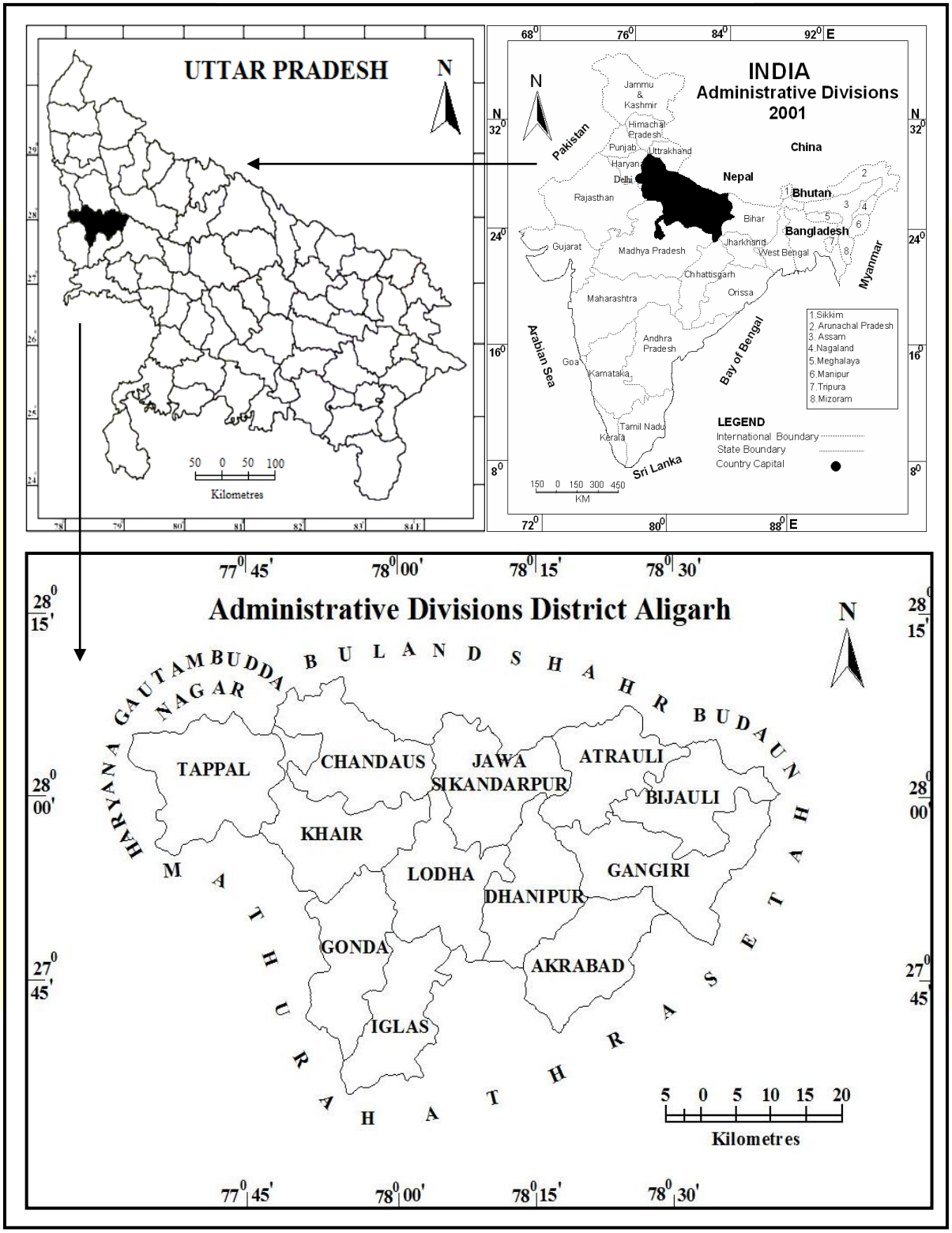


Fig: 1

69.61 percent population was found literate which is lower than the state literacy rate that is 67.68 percent. Gender wise literacy rate work out as 77.97 and 55.68 for the male and female respectively.

Data base and Methodology:

To analyze the crop diversification and socio-economic development in the district secondary sources of data has been collected from District Statistical Bulletin Aligarh for the year 2010-11. Keeping in mind the requirements and goal of the present study to assess the extent of diversity in crops, Simpson Diversity Index has been used (Joshi 2004) the formula is used as:

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

Where, SID is the Simpson diversity index P is the proportionate area or value of *i*th crop in the gross cropped area of output. The index value runs from 0 to 1, in case of complete specialization the index value will be 0, while index value 1 shows the complete diversification. This method has an advantage over other indices, that it is easy to process.

Z-score

. In the first step, the raw data for each variable has been computed into standard score. It is generally known as *Z* value or *Z*-score. The score quantify the departure of individual observations, expressed in a comparable form. This means it becomes a linear transformation of the original data (Smith, 1973). It may be expressed as:

$$Z_{ij} = \frac{X_{ij} - \overline{X_i}}{\sigma_i}$$

Where, Z_{ij} indicates Standardized value of the variable *i* in block *j;*

X_{ij} for Actual value of variable *i* in block *j*;

$\overline{Xi}$ for Mean value of variable *i* in all blocks;

and σ_i for Standard deviation of variable *i* in all blocks.

In the second step, the Z-scores of all variables have been added block wise and the average have been taken out for these variables which may be called as composite score (SC) for each block and may be algebraically expressed as:

$$CS = \frac{\sum Z_{ij}}{N}$$

Where, *CS* is composite score,

N refers to the number of variables;

$\sum Z_{ij}$ indicates z-scores of all variables *i* in block *j*.

Besides, these statistical techniques, GIS Arc view programme (Version 3.2a) has been used for preparing the maps to show the regional pattern of crop diversification and socio-economic development in the study area, Microsoft excel has been used to calculate the data on crop diversification and socio-economic development.

Result and Discussion

Cropping pattern in any region is not the hundred percent specialized or diversified due to the demand, erratic nature of rainfall, insufficient irrigation or the other geographical conditions in the region. As the table 1 and 2, shows the Blockwise computed value of the crop diversification index in Aligarh district. The index of diversification in the district ranges from 0.81 to 0.69. On the basis of the index value the whole region may be divided in to three categories i.e. high, medium and low. The index value of medium diversification ranges from 0.77 to 0.73, high diversification index ranges above the 0.77 and low diversification level are below the 0.73 index

value. The analysis confirms that there are three blocks which comes under the high category of diversification namely Lodha, Gonda and Iglas beside these blocks Chandaus, Khair, Jawa, Dhanipur and Atrouli comes under the medium category of crop diversification. Low level of crop diversification has been observed in Tappal, Bijouli, Gangiri and Akrabad.

Table 1: Blockwise index of Diversification in Aligarh District

S. No.	Blocks	Index Value of Crop Diversity
1	Tappal	0.69
2	Chandaus	0.76
3	Khair	0.75
4	Jawa	0.75
5	Lodha	0.78
6	Dhanipur	0.76
7	Gonda	0.79
8	Iglas	0.81
9	Atrouli	0.77
10	Bijouli	0.72
11	Gangiri	0.72
12	Akrabad	0.72

Source: Computed by Researcher based on District Statistical Bulletin, (Sankyikiya Patrika) District Aligarh 2010.

Spatial Pattern of Crop Diversification:

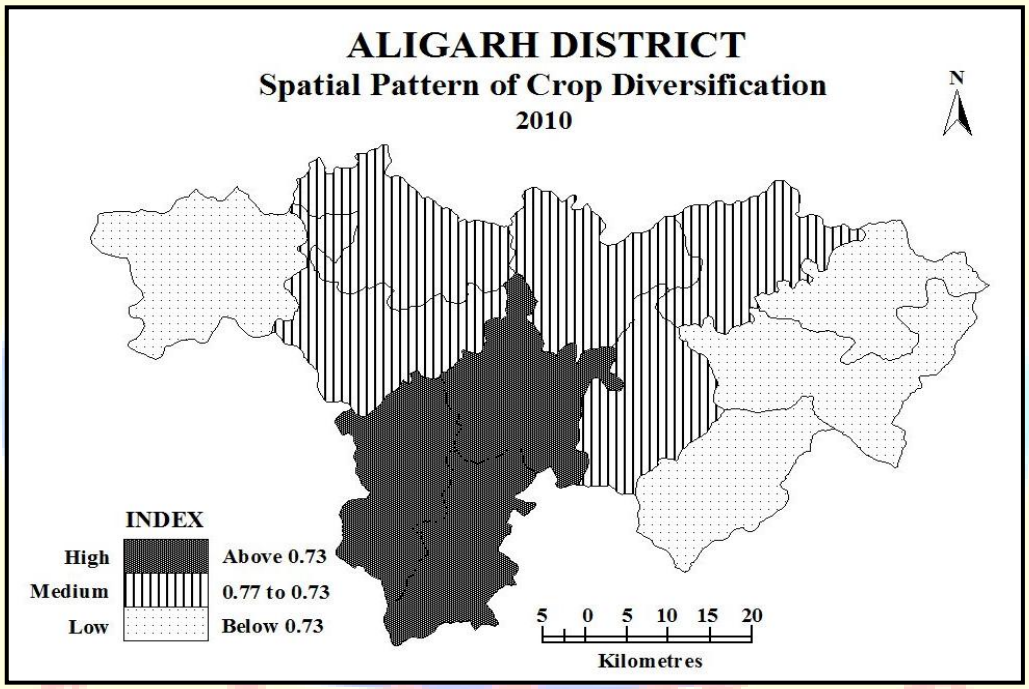
Fig. 2 shows the spatial pattern of crop diversification for the year 2010 in the district. The high level of crop diversification is concentrated in the southern most blocks of the district that is Gonda, Iglas and Lodha. Lodha block with the advantage of having highest urban population has the great potential of crop diversification to full fill the demand of the urban population.

Table 2: Blockwise Status of Crop Diversification

Category	Index	Name of the Block
High Diversification	Above 0.77	Lodha, Gonda and Iglas
Medium Diversification	0.77 to 0.73	Chandaus, Khair, Jawa, Dhanipur and Atrouli
Low Diversification	Below 0.73	Tappal, Bijouli, Gangiri and Akrabad

Source: Based on the table 1.

Among these three Blocks of high crop diversification Iglas Block (0.81) has the maximum value of diversity. Five Blocks observe the moderate diversification which spread all over the district. Chandaus, Jawan and Atrauli in the extreme north while Khair in the south west and Dhanipur in the south. Among the moderately diversified blocks Atrauli has the (0.81) maximum diversity index.



Source: Based on Table 2. **Fig: 2**

Four Blocks Namely Tappal, Bijouli, Gangiri and Akrabad come under the low diversification in the district. The blocks having the lowest level of diversification Tappal stand the lowest with the diversity index (0.69). After all these analysis it is quite clear that a major part of the district is moderately diversified while the blocks cover the low level diversification stand second in aerial expansion.

Level of Socio-economic Development:

In order to access the level of socio-economic development total 43 indicators from agriculture sector and social sector and infrastructure indicators have been selected for the analysis.

Table: 3 shows the composite mean Z-score value of the socio-economic development and table 4, visualized the status of Socio-economic Development in Aligarh district. The analysis of Table 3 reveals that there is a wide range of variations in the level of development in the blocks of the Aligarh district. It varies from -0.458 in Gonda to 0.524 in Gangiri block of the district. On the basis of the Z- score value of the socio-economic development the whole range of spatial variation in socio-economic development may be arrange into three category such as high

Table 3: Blockwise Z-score Value of Socio-economic Development

S. No.	Blocks	Score of Socio-economic Development
1	Tappal	-0.072
2	Chandaus	0.033
3	Khair	-0.048
4	Jawa	0.081
5	Lodha	0.163
6	Dhanipur	-0.012
7	Gonda	-0.458
8	Iglas	-0.120
9	Atrouli	0.231
10	Bijouli	-0.280
11	Gangiri	0.524
12	Akrabad	-0.042

Source: Computed by Researcher based on District Statistical Bulletin, (Sankyikiya Patrika) District Aligarh 2010.

(above 0.124) medium (0.124 to -0.124) and low (Below 0.124) for the year 2010 (see the figure 3). The table 4 exhibits that three blocks in the district fall under the high level of socio economic development (Above 0.124) namely Lodha, Atrauli and Gangiri. Spatially these three

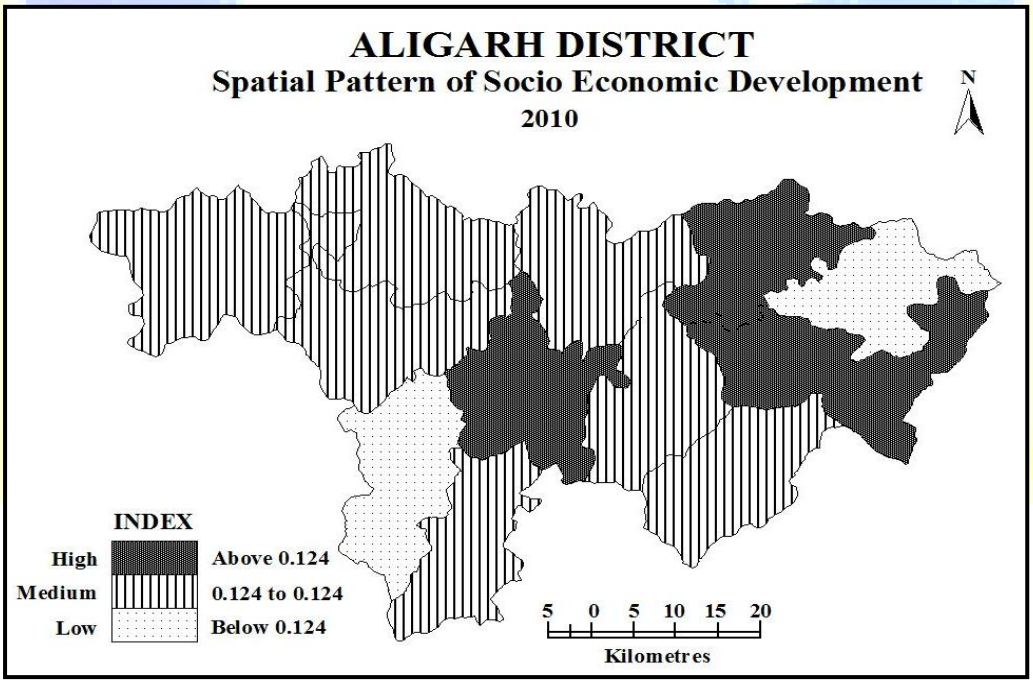
blocks does not show any pattern. Two blocks that is Atrauli and Gangiri situated in the western part of the district while the Lodha block situated in the middle of the district.

Table 4: Blockwise Status of Socio-economic Development

Category	Z-score	Name of the Blocks
High	Above 0.124	Lodha, Atrauli and Gangiri
Medium	0.124 to -0.124	Tappal, Chandaus, Khair, Jawa, Dhanipur, Iglas and Akrabad
Low	Below -0.124	Gonda and Bijouli

Source: Based on the table 3.

The seven blocks experience the medium level (0.124 to -0.124 score) of socio-economic development, in which three blocks (Tappal, Chandaus and Khair) in the north and north western side are in the continuous position, while Jawan Dhanipur and Akrabad from north to south are in continuous line, one more block that is Iglas situated in the extreme south.



Source: Based on Table 4. **Fig: 3**

Remaining two blocks that is Gonda and Bijouli recorded the lowest level (Below -0.124score) of socio-economic development in the district. Among them Bijouli block lies in the extreme north east and the Gonda block lies in the south west part of the district.

Level of Crop Diversification Vis-a -Vis Socio-Economic Development:

In order to understand the relationship between the crop diversification and socio-economic development a comparative analysis is essential. Figure 2 and 3 shows clear picture about this relationship. Figure 2 shows that three blocks comes under the high crop diversification namely (Lodha, Gonda and Iglas) while the figure 3 shows that three blocks namely (Lodha, Atrauli and Gangiri) comes under the high socio-economic development. Among these three blocks Lodha is the only block which experience both high diversification and high socio-economic development. Other two blocks comes under high crop diversification Gonda exhibit low and Iglas medium socio-economic development.

Five blocks namely (Chandaus, Khair, Jawa, Dhanipur and Atrouli) fall under the medium category of crop diversification. Atrouli is the only exception which experience high level of development. Beside this Tappal and Iglas also fall under the medium category of socio-economic development.

Four blocks Tappal, Bijouli, Gangiri and Akrabad experience low level of crop diversification. Bijouli is the only block which experience low diversification and low development. Gangiri experience low diversification fall under high socio-economic development. Tappal and Akrabad with low diversification comes under the medium category of social-development.

Conclusion

It may be concluded from the above analysis that there is a large scale variation may be noticed in the spatial patterns of crop diversification and socio-economic development among the blocks of the district. It may be summarized that one block that is lodha experience the high level of crop diversification and socio-economic development. Five blocks namely Chandaus, Khair, Jawa, Dhanipur and Atrouli experience medium level of diversification and medium level of socio-economic development. One block that is Bijouli experience low level diversification and low level development. After all this analysis it can be said that it is not necessary that high level of crop diversification leads to the high development.

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