

# Spatio -Temporal Analysis of Crop Diversification in Ghaziabad District

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## Abstract

Agriculture plays an important role in Indian economy. As the population pressure has increasing day by day, we need huge amount of agricultural production to feed huge population. We need crop diversification as a tool to fight with the problem of sustainable use of agricultural practices and increasing agricultural production. I choose Ghaziabad district in Uttar Pradesh as study area because according to 2011 census, it is third most populous district in U.P and it comes under NCR region. The objective of this research work is to analyse magnitude of crop diversification and to know the Spatio temporal variation of changing pattern of crop diversification between 1990-91 to 2016-17. For measuring the magnitude of crop diversification, I used Gibb's and Martin's technique, for spatial distribution Arc GIS have been used. The study reveals that the level of crop diversification has been increased in the study period. The magnitude of crop diversification increased toward more remunerative crops.

## Introduction

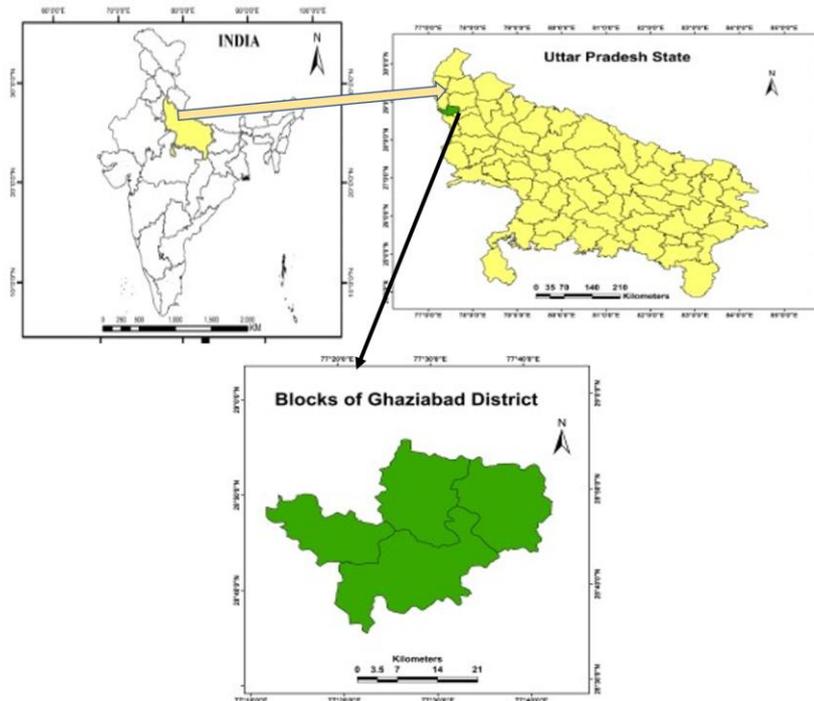
Agriculture is a primary activity which provides fundamental sustainability to all living beings. In Indian economy agriculture is the prime sector which generate employment and livelihood. Though, it has played an important role in poverty reduction, fulfill the food requirements of the existing population and providing raw materials to various industries but its share in gross domestic production of the nation has steady declined over the period. Basically, agriculture is a ratio between input and output. In Indian scenario after the introduction of Green revolution the agricultural production and productivity had remarkably increased due to the use of chemical fertilizers, availability of irrigational facilities and high yielding varieties of seeds. The access use of fertilizers and irrigation effect the health of soil. Crop diversification has introduced as a strategy to enhance the sustainable use of land, water, and other resources. It maximizes the agricultural growth, food security and reducing poverty.

Crop diversification usually refers to the variety of crops grown in a certain area. It is the opposite of the idea of crop specialization, which means changing the mix of crops grown in an agricultural area, which is measured by percentage share of each crop. Crop diversity is also known as the change from farming a single crop to farming multiple crops, or the practice of growing more crops and more types of crops, or the change from subsistence farming to commercial farming. Crop diversity is a farming technique that depends a lot on physical-environmental and socio-economic factors, as well as the region's agriculture, geographical, institutional, and technical structure, and composition. This method helps to reduce unemployment, increase crop yields, increase the diversity of agriculture output, boost farm income, and reduce poverty. It also lessens the bad effects of crop specialization or a single farming system, avoids the risks and doubts of crop failure due to changes in the weather and the environment, and makes it easier to switch crops.

In a simple term, crop diversification is a total number of crops grown in a certain area in a particular time period and it is a strategy to boost the economy with risk aversion and sustainable use of resources. In the study area rural economy is based on the agriculture sector and major portion of the population derived their livelihood through agriculture so for the sustainable use of resources crop diversification is must especially for the small and marginal farmers. To measure the agricultural development, crop diversification is an important indicator.

## Study area

Ghaziabad district is a district in Uttar Pradesh, state in northern India. It is a main part of National Capital Region. It comprises an area about 1273sq km with the population 33,23,241. In 2011, the Hapur tehsil split off from Ghaziabad district and form Hapur district. the four-block split off from mother district so, now Ghaziabad district have 4 block and 3 tehsils.



## Objective and methodology

The objective of the present study are as follows:

1. To examine the crop diversification in Ghaziabad district.
2. To analyse the spatial pattern of crop diversification in study Area from 1990-91 to 2016 -17.

The analysis is based on the secondary sources of data from district statistical handbook (sankhiyaki patrika) district Ghaziabad (1990-91, 2000-01, 2010-11 and 2016-17). In order to examine the crop diversification various methods are being used such as index of maximum proportion, herfindal index, ogive index and Simpson index. Every technique has some limitations. As for the requirement of the study area Gibbs and Martin technique has been used which provide a clear diversification.

Gibbs and Martin's technique

$$\text{Index of crop diversification} = 1 - \frac{\sum X^2}{(\sum X)^2}$$

Where, X is the percentage share of total cropped area occupied by each individual crop. If the total cultivated area in a region is dedicated 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 technique helps us to understand the magnitude of diversification on continuous data.

## Results and discussions

For analysis of the present study, 11 different crops such as Rice, Wheat, Barley, Millet, Maize, Pulses, oilseeds, Sugarcane, Potato, Vegetables and Fodder are considered. Wheat is the dominating crop of the area followed by sugarcane and rice. As Ghaziabad district is an NCR region where urbanisation and industrialisation took place at an alarming rate moreover mechanisation and market facilities are there for agricultural development that is why this region is good for agricultural practices. Crop diversification analysing on the block level of Ghaziabad district.

### Pattern of crop diversification

#### Crop diversification in 1990-91

According to Gibbs and Martin's formula, the index value of crop diversification in Ghaziabad district was 0.78 in 1990-91. Table.1 and figure.1 shows that it varies between 0.63 to 0.78. the high diversification has been found in Bhojpur block with index value 0.78 and Murad Nagar block with index value 0.77. the medium level of crop diversification found in block Razapur with index value 0.69. the Loni block record low level of crop diversification with index value 0.63.

#### Crop diversification in 2000-01

Spatial analysis of crop diversification during the year 2000-01 shows significant variation. Table 1.1 shows that the high crop diversification found in Murad Nagar and Bhojpur block with index value above 0.75. the block Razapur records medium level of crop diversification with the index value between 0.65 to 0.75. the low level of crop diversification has been found in block Loni with index value below 0.65.

#### Crop diversification 2010-11

According to the table 1.1, In 2010-11 crop diversification found a decreasing pattern as compare to the other periods. The block Murad Nagar has been found in high level of crop diversification with 0.79 index value while Bhojpur block shift towards medium level of crop diversification with 0.72 index value. Low diversification found in block Loni and Razapur.

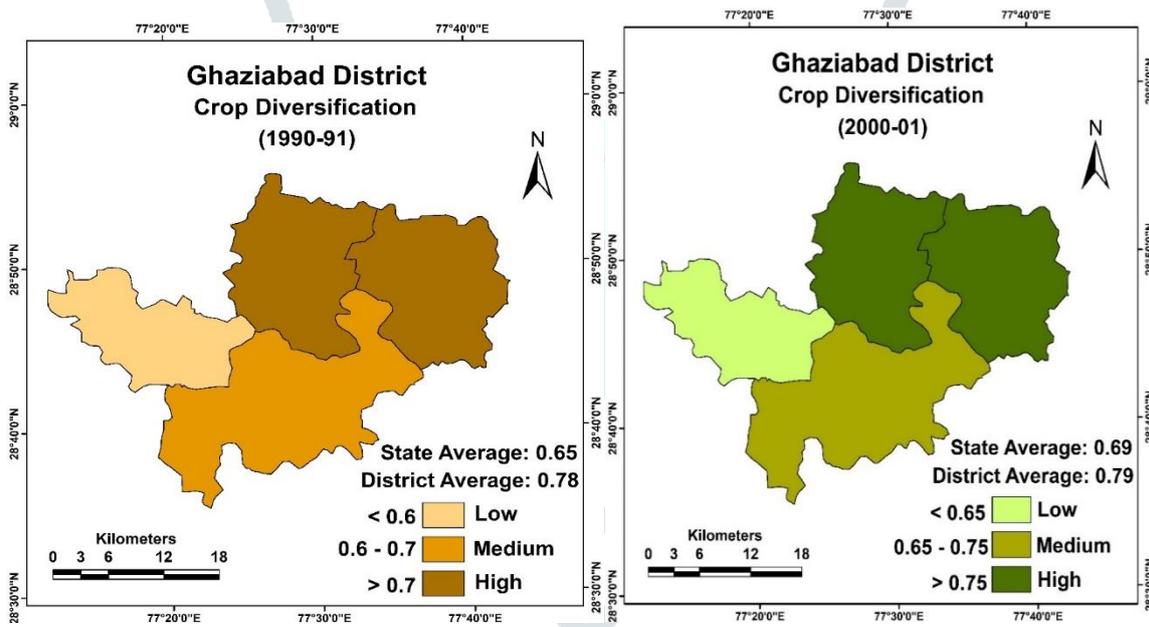
#### Crop diversification 2016-17

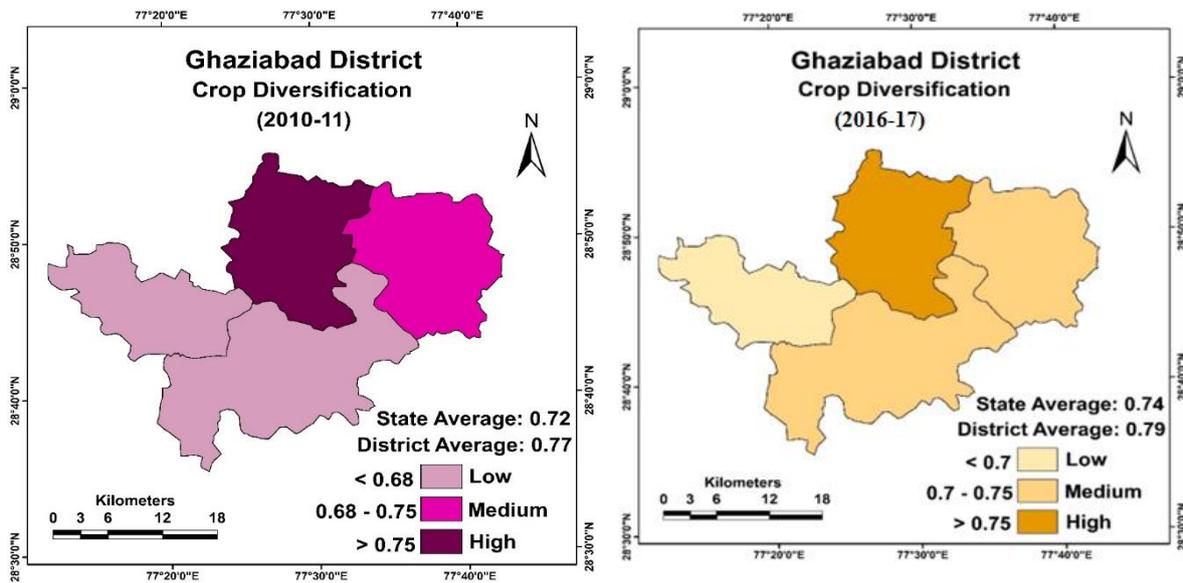
It is seen from the table 1.1 that there is an increasing pattern of crop diversification has been recording in the year 2016-17 as Murad Nagar block remains found under high crop diversification with the index value 0.80. Bhojpur and Razapur block comes under medium category with the range between 0.70 to 0.75. Razapur block increases crop diversification in decadal year. Loni block falls under low category with the increasing value that is 0.69.

**Table 1.1: Ghaziabad district: crop diversification based on Gibbs-Martin technique  
(1990-91 to 2016-17)**

Blocks	Gibbs-Martin Crop Diversification Index			
	1990-91	2000-01	2010-11	2016-17
1.Bhojpur	0.78	0.80	0.72	0.71
2.Loni	0.63	0.64	0.68	0.69
3.Muradnagar	0.77	0.78	0.79	0.80
4.Razapur	0.69	0.73	0.68	0.71
<b>District</b>	<b>0.78</b>	<b>0.79</b>	<b>0.77</b>	<b>0.79</b>

Source: Computed by Researcher based on district statistical handbook, Ghaziabad (1990-01 to 2016-17)





## Conclusion

Results of the present study reveals that the level of crop diversification in Ghaziabad district has fluctuations during the study periods. The crop diversification shows an increasing trend in first period and in last period so, crop diversification existing in Ghaziabad district and it is increasing year by year due to certain reasons. Murad Nagar block remains found in the high category of crop diversification. Loni is the only block which found in the low category through out the study period but the index value of Loni block gradually increasing towards the diversification. Crop diversification has existing in Loni block as well. Bhojpur blocks records decreasing trend of crop diversification as index value increase in the period of 2000-01 but because of the certain reasons the crop diversification decreasing in 2010-11 and 2016-17 periods. Razapur block records increasing trend of crop diversification as it falls under low level of crop diversification in 1990-91 but in 2016-17, it has found in medium level of crop diversification. According to the Gibbs and Martin technique, Ghaziabad district has been recording an increasing trend and the northern and western part of Ghaziabad record more remunerative crops because of the increasing urbanisation as it is an NCR region where agricultural development took place at an alarming rate. It is found that innovation and price fluctuation are the main reasons for crop diversification in Ghaziabad district. It can be stated that there is a much requirement of farmers interest in southern part of Ghaziabad district to support crop diversification. So that Ghaziabad district achieve a sustainability in agricultural practices.

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