



Pattern Of Crop Concentration And Diversification In Upper Ganga Yamuna Doab

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Abstract:

In this paper a detail study has been done to find out pattern of crop concentration and diversification in 2010-11, in upper Ganga Yamuna Doab , which is most fertile land of India. Through this study, authors come to know the dominance of particular crop in particular region and cropping pattern as well as ranking of the crops in the study area, whether it is market oriented or subsistent type. The study is based on secondary sources of data. For calculating the index of crop concentration, location quotient technique is use and for calculating the index of crop diversification, Jasbir Sing's technique in which he take into account only those crop which share more than 5% area of the total cropped area, and Gibs-Martin, who take in account only those crops which share more than 10% area of the total cropped area are use. Authors also tried to highlight the suitable cropping pattern for this income which can enhance the income of the farmers.

Introduction

Knowledge of concentration and diversification pattern in a region may be considered very useful in proper agricultural land use planning. The term crop concentration refers to the variation in the density of crop in a region at a point of time whereas crop diversification means raising of different crops for arable land. In agriculture, diversification implies shift from subsistence farming to commercial farming and from low value food/non food crops to high value food/non food crops and switch over from local to high yielding varieties.

Crop diversification has great relevance in agricultural land use planning. It refers to growing of varieties of crops either in a region or in the same field, the keener the competition the higher the magnitude of diversification. In fact it refers to farming system in which multiplicity of crops characteristics is the agricultural landscape of a real unit. In the diversified farming, there is hardly any scope for specialization, and there is poor magnitude of commercialization. In specialized farming, on the other hand, yields are high and the farming is market oriented.

Diversification has become necessary for developing countries since growing demand of basic staples such as cereals alone cannot support economic development, notwithstanding the need to ensure food security to the people. In essence, diversification to commercial crops becomes an essential strategy that can increase incomes in agriculture, minimize risk due to crop failure and may earn foreign exchange.

Studies on crop concentration and diversification give an idea about the identification of region dominated by particular crop and also have knowledge of diversification to be taken place for proper land use planning for economic development.

Data Base And Methodology

For the present study, the data has been collected from secondary sources. For the study of crop diversification, Jasbir Singh's technique of crop diversification (in which only those crops have been taken into consideration which share more than 5% area of the total cultivated area) and Gibbs- Martin's technique of crop diversification (in which only those crops have been selected for the study which share more than 10% area of the total cultivated area) has been taken for calculating crop diversification index.

$$\text{Index of crop diversification} = \frac{\text{Percentage of total cropped area under 'n' crops}}{\text{Number of 'n' crops}}$$

For calculating crop combination, Location quotient method has been taken into consideration

$$\text{Index of crop concentration} = \begin{aligned} & \text{(a) } \frac{\text{Area of crop 'a' in the component areal unit}}{\text{Area of all crops in the component unit}} \\ & \text{(b) } \frac{\text{Area of 'a' crop in the entire unit}}{\text{Area of all crops in the entire unit}} \end{aligned}$$

Objectives

The crop concentration as well as diversification of crops helps in understanding the cropping pattern adopted by the farmers of a particular region, whether traditional or market oriented and in identification of agricultural region or cropping region in any major region, i.e. which crop dominate in particular region and what should be the new policies regarding that crop in that acquired region. The major objectives of this paper are:

- 0 To find out existing cropping pattern of the region
- 0 To analyze the crop concentration to regionalization of the region for better study and planning
- 0 To show the pattern or the level of crop diversification, whether subsistence or economically viable.

Study Area

Uppar Ganga- Yamuna doab is a part of western Uttar Pradesh. It lies on north western side of Uttar Pradesh, between two main rivers, the Ganga and the Yamuna. It spreads between 28°4' to 30° 34' north latitude and between 72° 2' to 78° 29' east longitudes (Fig.1) covering an area of 2,0055,373 hectares. It is a fertile, well endowed with water resources and conducive climatic conditions that favors the development of agriculture. The total population of the region is about 22187067 (as per 2011 census). The area is dominated by primary activities, especially agriculture in which 68% population of this area is engaged while 21% population is engaged in secondary services while only 11 % people are engaged in tertiary activities (census of India 2011). Here urbanization is quite high i.e. 30% as compared to state. The area comes under the NCR that is why it is highly urbanized.

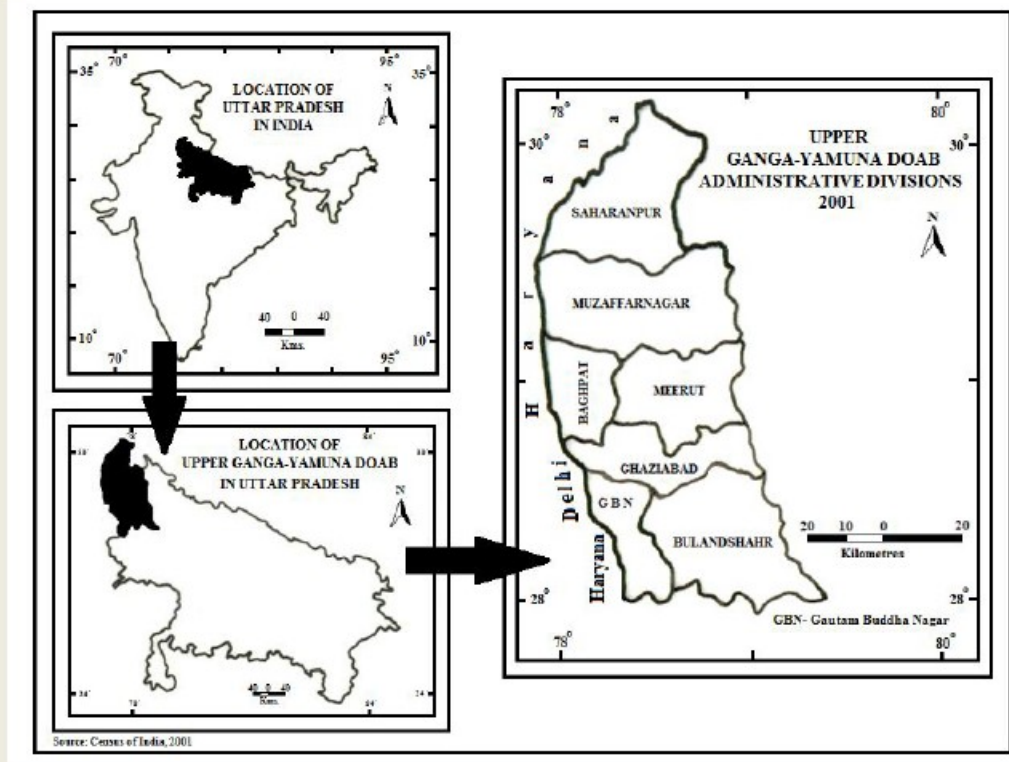


Figure 1: Upper Ganga-Yamuna Doab administrative divisions 2001

Discussion

Crop concentration refers to the density or areal occupancy of a crop in a region. The occupancy (high, medium and low) is determined largely by the terrain and climate including temperature, humidity, transport facilities and demand of the crop.

The study of crop concentration and diversification as a measure of the intensity of crops in a region is considered to be a step ahead in determining the regional character of distribution of crops to highlight the importance of one crop over another.

Ranking Of The Crops

Ranking of the crop depend on geographical reality and cropping structure. It is founded by seeing the percentage of area occupied by a crop to the total cropped area. The ranking of crop show the nature of farmer or cultivator i.e. weather the farmer is traditional or market oriented or partly subsistent and partly market oriented farmer. In this method that crop occupy the highest percentage of the total cultivated area, is chosen as first rank crop and after it crops are taken in decreasing order.

Table 1, is showing the area shared by different crops (in hectares) in upper Ganga Yamuna Doab. Table 2, is showing the variation in ranking of the crops in Uppar Ganga-Yamuna Doab.

Name	rice	wheat	barley	maize	onion	pulses	sugarcane	potato	fodder	vegetables	lahi	fruits
Saharanpur	44584	109509	111	8104	63	6203	143846	516	58640	5284	1116	28760
Muzaffernagar	20969	120003	381	118	114	4089	242430	2019	65123	5667	2616	8830
Meerut	12167	79214	119	327	101	2193	136578	5203	49676	10894	3151	8438
Bagpat	2328	54321	96	34	82	1585	75521	255	32445	3081	1079	1636
Bulandshahr	59674	190466	7988	54519	503	18273	58503	7306	73574	13429	7766	15595
Ghaziabad	20669	72554	641	1977	34	3231	66459	4462	46534	9511	2107	3660
Gautam Buddha Nagar	27228	59759	2143	1456	34	2555	2721	208	24694	567	912	112

Table 1: Area shared by different crops (in hectares) in upper Ganga Yamuna Doab (2010-11)

Source: District Statistical Hand Book of U.P, 2010-11

Name of the Districts	First rank	Second rank	Third rank	Fourth rank	Fifth rank	Sixth rank
Saharanpur	sugarcane	wheat	fodder	rice	fruits	maize
Muzaffarnagar	sugarcane	wheat	fodder	rice	fruits	vegetables
Meerut	sugarcane	wheat	fodder	rice	vegetables	fruits
Bagpat	sugarcane	wheat	fodder	vegetables	rice	fruits
Bulandshahr	wheat	fodder	rice	sugarcane	maize	fruits
Ghaziabad	wheat	sugarcane	fodder	rice	vegetables	fruits
Gautam Buddha Nagar	wheat	rice	fodder	sugarcane	pulses	Bajra

Table 2 : Ranking of the crops in upper Ganga Yamuna Doab

First Ranking Crop

Sugarcane is the first ranking crop in major districts of the study area. In the four districts, namely Saharanpur, Muzaffernagar, Meerut and Bagpat, it is first ranking crop, while in rest of the district, i.e. the districts of southern part of upper Ganga Yamuna Doab, it is overtaken by wheat.

Second Rank

Except Ghaziabad (Sugarcane), Bulandshahr(fodder) and Gautam Buddha Nagar(rice), in all the states wheat is on second rank in the study region. It is because; wheat is the traditional diet of the people of the region so they prefer to grow wheat for their own consumption as well as for the market.

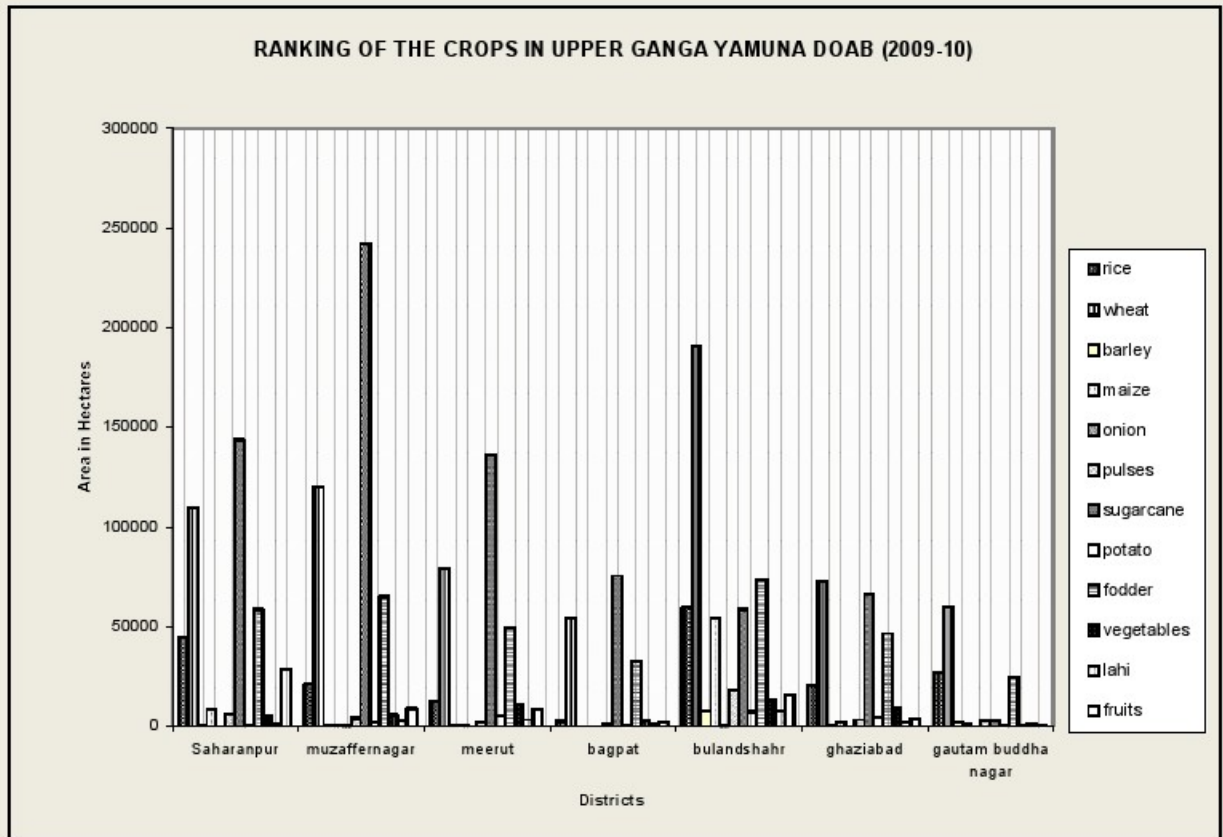


Figure 2: Ranking of the crops in upper Ganga Yamuna Doab.

Third Rank

except Bulandshahr where rice is on third rank, all the districts of upper Ganga Yamuna Doab have fodder crops on third rank. In this region, live stock rearing is main occupation that is why a large proportion of agricultural land is devoted to fodder crops in the entire district.

Fourth Rank

In northern part of the study region, rice ranked fourth, while in southern part i.e. Gautam Buddha Nagar and Bulandshahr, it is taken over by sugarcane and in Ghaziabad by vegetables. In this region rice is not the traditional crop or traditional diet of the people. After developing irrigation facilities, its area expand up to a large scale. Here good quality of rice is grown mainly for market purpose. While in Bagpat, vegetables are on third rank, here they are grown for the market purpose.

Fifth Rank

there are numbers of crops stands fifth in rank in the study region such as, fruits in Saharanpur and Muzaffarnagar, vegetables in Meerut and Ghaziabad, rice in Bagpat, maize in Bulandshahr and pulses in Gautam Buddha Nagar.

Sixth Rank

In majority of the districts, fruits are on the sixth rank in the study area. In Saharanpur maize, in Muzaffarnagar, vegetables and in Gautam Buddha Nagar, is overtaken by Bajara.

The ranking of crops shows that the entire area of the upper Ganga – Yamuna Doab, is dominated by value added crops, which covers the largest area, while the inferior quality of the cereals are grown on the marginal scale.

Crop Concentration In Upper Ganga Yamuna Doab

The relationship between density of individual crop and the corresponding density for the study area as a whole has been studied. Table 1 is showing the district wise crop concentration index in Upper Ganga Yamuna Doab. The pattern of crop concentration in the region is as follows-

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Paddy

Upper Ganga Yamuna Doab come under the impact of summer monsoon. Here though the rainfall is enough to meet the requirement, even then area is enjoying fairly good irrigation facilities to facilitate paddy cultivation without risk. The concentration of paddy has been shown in three categories i.e. high, medium and low. High concentration of paddy is found in Gautam Buddha Nagar (2.63), and Bulandshahr (1.39), Medium concentration of rice is found in Saharanpur (1.29), Ghaziabad (1.05) and Muzaffarnagar(0.52) while its low concentration is found in Meerut(0.46) and Baghpat(0.15).

Crop Name	Index Value	Level of Concentration	Districts Under Zone
Rice/Paddy	1.39- 2.63	High	Gautam Buddha Nagar, Bulandshahr, Saharanpur, Ghaziabad
	0.52- 1.39	Medium	Muzaffernagar
	0.15- 0.52	Low	Meerut, Bagpat
Wheat	>1	High	Bulandshahr, Bagpat, Ghaziabad
	0.5 to 1	Medium	Saharanpur, Muzaffernagar
	<0.5	Low	Meerut
Barley	>1	High	Gautam Buddha Nagar, Bulandshahr
	0.5 to 1	Medium	Ghaziabad
	<0.5	Low	Muzaffarnagar, Bagpat, Meerut Saharanpur
Maize	0.66- 3.58	High	Bulandshahr
	0.03- 0.66	Medium	Saharanpur
	0.01- 0.03	Low	Gautam Buddha Nagar, Ghaziabad, Meerut, Muzaffarnagar, Saharanpur
Onion	>1	High	Bulandshahr, Bagpat
	0.5 to 1	Medium	Meerut, Gautam Buddha Nagar, Muzaffarnagar
	<0.5	Low	Saharanpur
Pulses	>1	High	Bulandshahr, Gautam Buddha Nagar
	0.5 to 1	Medium	Saharanpur, Ghaziabad, Bagpat, Muzaffarnagar
	<0.5	Low	Meerut
Sugarcane	1.08- 1.57	High	Muzaffarnagar, Meerut, Bagpat, Saharanpur
	0.35- 1.08	Medium	Ghaziabad
	0.06- 0.32	Low	Bulandshahr, Gautam Buddha Nagar
Potato	>1	High	Ghaziabad, Meerut, Bulandshahr
	0.5 to 1	Medium	Muzaffarnagar
	<0.5	Low	Gautam Buddha Nagar, Bagpat, Saharanpur
Fodder	>1	High	Gautam Buddha Nagar, Ghaziabad, Bagpat, Meerut
	0.5 to 1	Medium	Saharanpur, Bulandshahr
	<0.5	Low	Muzaffarnagar
Vegetables	>1	High	Ghaziabad, Meerut, Bulandshahr
	0.5 to 1	Medium	Bagpat, Saharanpur, Muzaffernagar
	<0.5	Low	Gautam Buddha Nagar
Lahi/Mustard	>1	High	Bulandshahr, Meerut, Ghaziabad
	0.5 to 1	Medium	Gautam Buddha Nagar, Muzaffarnagar
	<0.5	Low	Saharanpur, Bagpat
Fruits	1.01- 2.34	High	Saharanpur, Bulandshahr
	0.31- 1.01	Medium	Meerut, Muzaffarnagar
	0.02- 0.31	Low	Bagpat, Ghaziabad, Gautam Buddha Nagar

Table 3: Crop concentration index in upper ganga yamuna doab

Source: District Statistical Handbook

Data is calculated by Author.

Wheat

Wheat is the main diet of the people in this region and the physical conditions are well endowed for wheat cultivation. Wheat is highly concentrated in southern upper Ganga Yamuna doab. Concentration of wheat is high in seven districts, i.e. Bagpat(1.02), Bulandshahr(1.21), medium concentration is found in Ghaziabad(1.01), Gautam Buddha Nagar(1.58) Saharanpur(0.87) and Meerut(0.83). While low concentration is found in Muzaffarnagar(0.82).

Barley

Barley is mainly grown for fodder for the cattle's. High concentration of barley is found in Gautam Buddha Nagar (3.38), and Bulandshahr(3.04) it has a medium concentration in Ghaziabad(0.53) while low concentration in Muzaffarnagar (0.15), Bagpat(0.10), Meerut(0.07) and Saharanpur(0.052).

Maize

Maize is another important diet in winter season for the people of the study region. Like wheat, having high concentration in southern part of the study region. Here maize is grown for domestic demand as well as for market purposes. Maize has its high concentration in Bulandshahr(3.58) and Saharanpur(0.66). Medium concentration in Gautam Buddha Nagar (0.39), and Ghaziabad (0.28) and low concentration in Muzaffarnagar(0.15), Meerut (0.03), and Bagpat(0.006).

Onion

High concentration of onion is found in Bulandshahr and Bagpat, medium concentration is found in Muzaffarnagar, Meerut and Gautam Buddha Nagar, while its low concentration has been recorded in Ghaziabad and Saharanpur.

Pulses

Pulses cover very small or negligible area of the total cultivated area in the study region. But the concentration of pulses is high in Bulandshahr(2.09) and Gautam Buddha Nagar (1.25) and medium in Saharanpur (0.88), Ghaziabad(0.80), Bagpat(0.53) and Muzaffarnagar(0.50), and low concentration is in Meerut(0.41) district.

Sugarcane

The Upper Ganga Yamuna Doab come under the western Uttar Pradesh, it is highly developed in sugarcane cultivation from several decades. Here, many small and large scale sugar mills support sugarcane cultivation on large scale. Sugarcane has it high concentration in northern and north western part of upper Ganga Yamuna Doab, which covers, Muzaffarnaga(1.57), Meerut(1.35), Bagpat(1.33) and Saharanpur (1.08), its medium concentration is found in Ghaziabad(0.87) and Bulandshahr(0.35) , it low concentration has been recorded in Gautam Buddha Nagar(0.06).

Potato

The concentration of potato is found in Ghaziabad (2.14) Meerut (1.87), and Bulandshahr(1.60). Medium concentration is found in Muzaffarnagar(0.57) and low concentration is found in Gautam Buddha Nagar(0.18)), Bagpat(0.16) and Saharanpur(0.14).

Name	rice	wheat	barley	maize	onion	pulses	sugarcane	potato	fodder	vegetables	lahi	fruits
Saharanpur	1.29	0.87	0.05	0.66	0.36	0.88	1.08	0.14	0.91	0.59	0.32	2.34
Muzaffernagar	0.52	0.82	0.15	0.02	0.57	0.50	1.57	0.47	0.87	0.55	0.65	0.61
Meerut	0.46	0.83	0.07	0.03	0.78	0.41	1.35	1.87	1.02	1.62	1.21	0.90
Bagpat	0.15	1.0	0.10	0.006	1.13	0.53	1.33	0.16	1.19	0.81	0.008	0.34
Bulandshahr	1.39	1.2	3.04	3.58	2.36	2.09	0.35	1.60	0.91	1.21	1.81	1.01
Ghaziabad	1.05	1.01	0.53	0.28	0.35	0.80	0.87	2.14	1.27	1.88	1.07	0.52
Gautam Buddha nagar	2.63	1.58	3.38	0.39	0.66	1.25	0.06	0.18	1.27	0.21	0.88	0.03

Table 4: INDEX of crop concentration in Upper Ganga Yamuna Doab

Source: Data is calculated by author through Location quotient method

Fodder

The high concentration of fodder is found in Ghaziabad (1.27), Gautam Buddha Nagar (1.27) Meerut (1.02), and Bagpat(1.19), while medium concentration is found in Saharanpur(0.91) and Bulandshahr(0.91) and low concentration is found in Muzaffernagar(0.47).

Vegetables

The region comes under the national capital region because of this; vegetable cultivation is well developed in this area. High concentration of vegetables is found in, Ghaziabad (1.88), Meerut (1.62) Bulandshahr(1.21), and Bagpat(0.82) medium concentration is

found in Muzaffarnagar (0.59) and Saharanpur (0.55), and low concentration is found in Gautam Buddha Nagar (0.21).

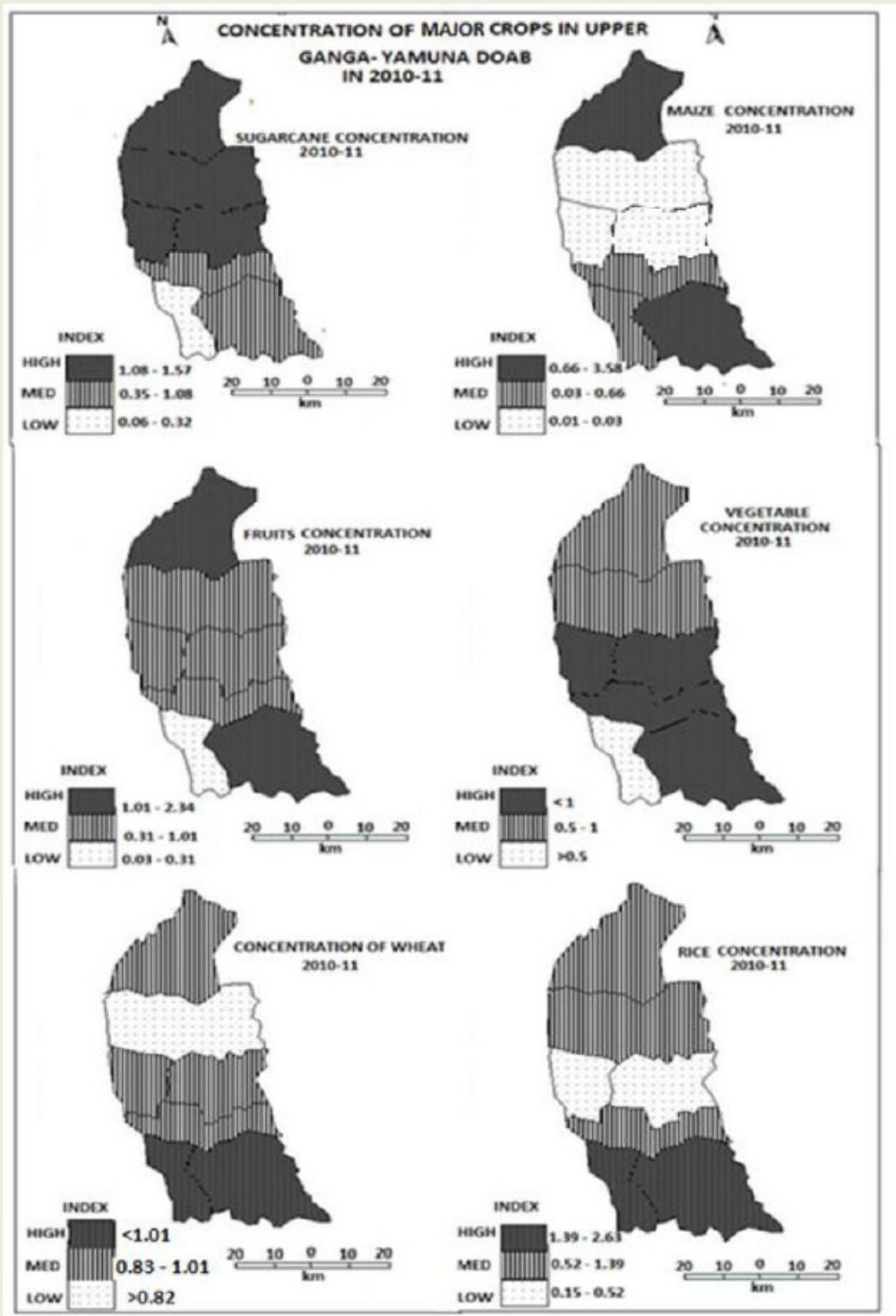


Figure 3: Concentration of major crops in upper Ganga Yamuna Doab in 2010-2011

Lahi

Lahi has its higher concentration in Bulandshahr and Ghaziabad, its medium concentration is found Muzaffarnagar, Meerut and Gautam Buddha Nagar and low concentration is found in Saharanpur and Bagpat.

Fruits

Fruits are highly concerned in Saharanpur (2.34) and Bulandshahr(1.01) while their medium concentration is found in Meerut(0.90), Muzaffarnagar (0.61), Ghaziabad(0.52), and Bagpat(0.34), its low concentration is recorded in Gautam Buddha Nagar(0.03).

Pattern Of Crop Diversification

The study of crop concentration and diversification as a measure of the intensity of crops in a region is considered to be a step ahead in determining the regional character of distribution of crops to highlight the importance of one crop over another.

A close examination of index value reveals, in the areal units as a whole do not exhibit marked variations in spatial distribution of the cultivated area. Upper Ganga Yamuna Doab, has fairly moderate degree of crop diversification index in 2010-11 (table-5). In spatial context, there is a range of crop diversification value among the districts. To study the pattern of crop diversification three categories viz., high, medium and low have been considered.

Name	Jasbir singh	Gibs -martin
Saharanpur	8.192	0.76
Muzaffernagar	7.91	0.65
Meerut	8.03	0.70
Bagpat	7.84	0.67
bulandshahr	8.32	0.79
Ghaziabad	7.87	0.76
gautam Buddha nagar	7.59	0.67

Table5: Index of crop diversification in 2010-11

Source: The Data is Calculated by the Author.

The index of crop diversification in the study area has been calculated by two methods both from Jasbir Singh's and from Gibs- Martin. Both, the techniques show different results but not a large variation. The three categories of diversification are discussed below:

High Crop Diversification

According to Jasbir Singh's technique, the districts under high crop diversification are, Bulandshahr(8.32), Saharanpur(8.19),and Meerut(8.03), where the number of crops are eight, while according to Gibs-Martin technique the districts under high crop diversification are, Bulandshahr(0.79), Meerut(0.70), and Saharanpur(0.76) and Ghaziabad(0.76), where the number of crops are seven. In these districts number of crops shares a large proportion of area to the total cultivated area.

Jasbir Singh' Technique*			
Index Value	Category	Number of Crops	Name of the Districts
Above 8	High	8	Bulandshahr, Saharanpur, Meerut,
7.8 to 8	Medium	6	Muzaffarnagar, Ghaziabad, Bagpat
Below 7.8	Low	4	Gautam Buddha Nagar
Gibs- Martin,s Technique**			
Index Value	Category	Number of Crops	Name of the District
Above 0.75	High	7	Bulandshahr, Meerut, Saharanpur, Ghaziabad
0.70 to 0.75	Medium	4	Gautam Buddha Nagar, Bagpat
Below 0.70	Low	2	Muzaffarnagar

Table 6: Level of crop diversification

*In Jasbir Singh's technique only those crops have been included which share more than five percent area of the total cultivated area

**In Gibs-Martin technique, only those crops have been included which share more than ten percent area of the total cultivated land

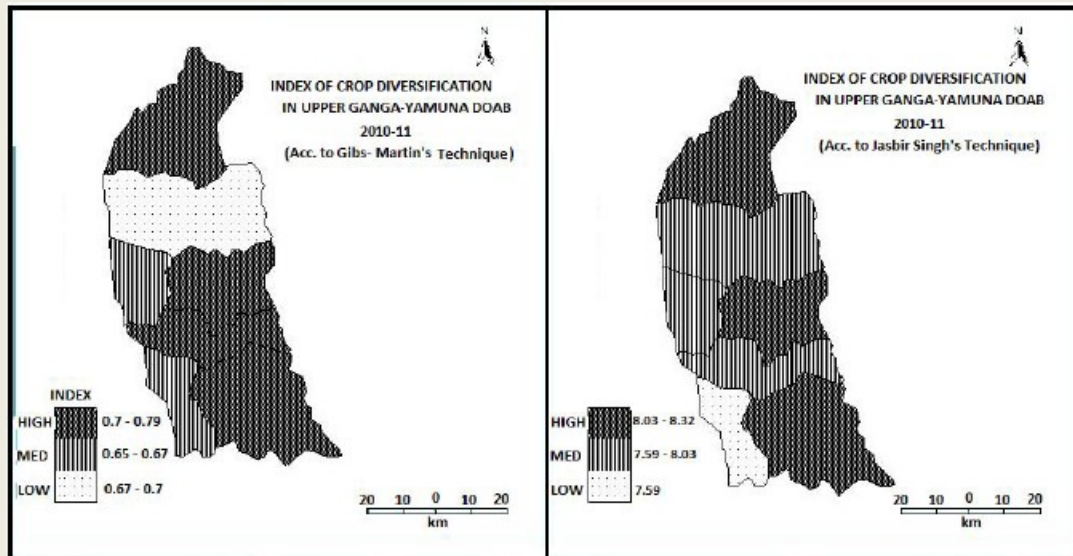


Figure 4: Index of crop Diversification in upper Ganga Yamuna Doab 2010-11

Medium Crop Diversification

Medium crop diversification is recorded in the three districts according to Jasbir Singh's technique namely, Muzaffarnagar(7.91), Ghaziabad(7.87), and Bagpat(7.84), where the number of crops are six, two district are recorded according to Gibbs-Martin technique, namely, Gautam Buddha Nagar(0.67), and Bagpat(0.67), where the number of crops are four only.

Low Crop Diversification

Gautam Buddha Nagar (7.59), is only district recorded low crop diversification according to Jasbir Singh where the number of crops are four, and Muzaffarnagar(0.65), is the only district according to Gibbs-Martin where the number of crops are two.

Conclusion And Suggestion

The techniques for measuring crop concentration and crop diversification seems to be useful tool for regionalization of cropping regions. Cropping pattern generally means that the proportion of area under different crop at a point of time. The pattern of crop concentration and diversification is the part of cropping pattern. As the above study shows that largest proportion of the area is covered by grain crop, especially wheat and rice, in non food grain by sugarcane. In the entire region these crops are on the first,

second and third rank and have their dominance over the entire region, while the other crops have their low density in the region. It is clear from the above study that in the cereals sectors, concentration of rice and wheat has overtaken all the crops, all the inferior quality of food grains are overtaken by the rice and wheat, and among the non food grains, concentration of sugarcane has its strong grip over the entire region. The pattern of diversification varies according the Jasbir Singh's technique and Gibs-Martin's technique. It is because, Jasbir Singh selected those crops which share more than five percent area of the total cultivated area while Gibs-Martin selected only those crops which cover more than ten percent area of the total cultivated area but in spite of this both the techniques almost (except Muzaffarnagar(low) in Gibs-Martin and G.B.N(low) in Jasbir Singh's technique) give the same result.

So the study of crop diversification may be utilize to find out its contribution to the changing income and also to examine its long term impact on the resources viz., productivity of land, use of other resources etc. the study of crop concentration and diversification can be also important in proper planning of area and cropping choice for the utilization of resource in best possible way.

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