

# Traditional Crop Diversity and Its Conservation on-farm for Sustainable Agricultural Production in Bhandara District, India

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## ABSTRACT

### Article Info

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The present study includes crop diversity and its conservation on-farm for sustainable agricultural production in the district of Bhandara. Bhandara district is a known rice-producing district having 60 to 75 % area occupied by rice. In 1991 maximum crop diversification in Bhandara and Pauni tehsil and minimum in Tumsar tehsil. Crop diversification in 20 years results that in 1991 crop diversification was much higher than in 2011; because at that time majority of cultivators depend thereon on agriculture on monsoon rainfall. In 2011 area under irrigation was increased by 21.46% to the total cropped area in the district. In this year total cropped was 245607 hector out of which 56.96% area under irrigation. The maximum area under irrigation was in Pauni tehsil (71.56%) and the minimum in Lakhandur tehsil (41.24%). In the district out of the total cropped area 58.52% area under rice out of which 49.11% was under irrigation. In Sakoli tehsil area under rice were maximum in number and 55.53% area under irrigation. From 1999 to 2011 in the number of tehsil area under irrigation increased. The present study to help agriculture planner government policies maker plan the study area.

### Article History

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## I. INTRODUCTION

Agriculture practice and different nature in world; though in all types of food grains rice is the important one. Near about in all the continents rice produces but in Asia continent rice production having 87% of the world (2, 21) China is on number one position in

rice production and India maintaining second position among all continents like Asia, America, Australia and Africa. Other countries in the Asia continent plays important role in rice production (1, 23, 10, 22). In India near about 2/3 population doing direct or indirect practice related to agriculture occupation. India is a developing nation therefore

Indian agriculture feeding family members (4, 5, 9, 20). In such type of agriculture the major crops are food grains and pulses. The major crops in Indian agriculture are rice, wheat, maize, pulses etc. in India near about 80% population uses rice as food (3, 18, 19). The distribution of rice mills and development particular region is depending upon rice production (11, 6, 7, 12). Where the rice production is more than requirement; in such areas density of rice mills is dense (8, 11, 13, 15). Area under rice is not equally distributed among the region but it having geographical disparities. Regional imbalance of per hector production of rice affects distribution of rice mills. Aims of this study to find out the relationship between these two factors and deals the impact of physical, social and political factors (23, 24).

## II. STUDY AREA

The District is located on 20°30' N to 21°38'N and 79°27' E to 80°07'E. Spread over an area of 4087 sq. km. covered 1.3% area of the District. The nearest airport is at Nagpur at a distance of 103 km. The core firm Bhandara district in the rice mill cluster of Bhandara district is spread across the district talukas-Bhandara, The Wainganga river (14, 15,16, 17) is a main river in the study area (Fig. No. 1). The District forms part of Wainganga sub basin and has an undulating terrain with elevations ranging from 263 to 315 m. HSL (Fig. No. 2). Physiographically the district can be broadly divided into two physiographic units viz, the one controlled by structural Features i.e. the denudation origin. The structural hills and ridges are more common in the eastern and southern part of the district, while the denudational features like pediments/pedi plains are seen in north -central, west-central and south – west portions. The soils of the district are varied, arising out of the tropical sub humid weathering of crystalline metamorphic and rocks. They are essentially residual, through along the southern extremes of the wainganga valley downstream of pauni, alluvial soils predominate. Black regur soils derived from the weathering of

basalts are generally rare in the district kanhar or very rich alluvial soils occur widely; these soils crumble readily and are easy to work are clay loams in texture, very deep, sticky and retentive of moisture, they bear double crops. Morand soils are coarser in texture and occur farther away from the rivers, in relatively higher ground in comparison to the Kanhar soil they generally have an admixture of sands or lime or both. The Khardi soils are dark in colour with a considerable admixture of lime; they are generally and shallow. They are poor soils. The sihar, is a reddish yellow soil derived from crystalline rocks as a result of oxidation under tropical humid conditions and cracks very little in the hot weather. It degrades into the Khardi soil (Fig. No. 3). (25, 26, 27).

## OBJECTIVES

- Traditional crop diversity and its conservation on-farm for sustainable agricultural production in Bhandara District.
- To estimate the trend of rice production and rice mills.
- To identify includes crop diversity and its conservation on-farm for sustainable agricultural production in the district of Bhandara.

## III. DATABASE & METHODOLOGY

On the basis of production and import last two decades were selected for the present study. Because during these decades Bhandara district has become self-sufficient in rice production almost. The study will be based on secondary data. Secondary data was collected during the time period between are 1991 to 2011. After data collection the data were edited and coded. Then all the collected data were scrutinized carefully and recorded in master sheets. Finally, a few relevant tables were prepared according to necessity of analysis in order to meet the objectives of the study. Present study completely depended upon primary and secondary data. All required information for present study collected from published and

unpublished information. To collect the primary level information primary level data is collected. Primary information is collected from conduct of interviews, surveys and chat with cultivators and owners of the mills (28, 29).

Present study deals with 20 years changes in rice production in the Bhandara district. This study contains how decrease of rice production affects rice mills. Information regarding area, production and productivity collected from different sources.

### III. RESULT ANALYSIS

Rice is a main food grain in Bhandara district out of total area under crop 62.05% area produce rice in Bhandara district. In 2011 total area under rice was 73.83% in Bhandara district. On the basis of study it results that from 1991 to 2011 area under rice is increased by 7.88%. 1991 out of total area under crops wheat occupied 7.50% in Bhandara district. In 1991 minimum area under wheat is 3.84% in Tumsar taluka and maximum in Bhandara taluka i.e. 10.56% to the total area under crops. In 2011 total area under wheat was 4.14% to the total area under crops. Maximum area under wheat is 4.33% in Mohadi taluka and minimum 2.11% in Lakhani taluka. Other than rice and wheat crops other crops having very much less area occupied in the district.

#### Cropping Pattern:

To find out cropping pattern Jasbir singh method of cropping pattern is used on the basis results it is clear that taluka wise cropping pattern having lot of varieties. In 1991 Tumsar taluka produced rice with other pulses. Mohadi and Sakoli taluka producing four crops i.e. rice, wheat, maize and pulses (Fig. No. 4). In Sakoli taluka rice and wheat are major crops along with pulses and oilseeds. Pauni taluka produced rice, wheat, maize, pulses, mung and oilseeds.

#### Crop Concentration:

Bhandara district is known rice producing district having 60 to 75 percent area occupied by rice. In 2011 maximum crop concentration is in Lakhani taluka followed by Sakoli, Tumsar, Mohadi taluka. Minimum crop concentration is in Lakhandur taluka 0.89. up to 2011 maximum crop concentration of wheat was in Bhandara taluka and minimum in Lakhani & Lakhandur taluka. In pulses category tur is major crop producing as secondary crop in the district. In 1991 crop concentration of tur was medium in Bhandara taluka of the district. In 1991 maximum crop concentration of mung in Lakhandur taluka and minimum in Sakoli taluka. In 2011 taluka was not change in crop concentration of mung; resulting minimum in Sakoli and maximum in Lakhandur taluka. Other than above crops are not so important occupying less than 5% total area (Fig. No. 5).

#### Crop Diversification:

In 1991 maximum crop diversification in Bhandara and Pauni taluka and minimum in Tumsar taluka. Moderate crop diversification in Mohadi and Lakhandur taluka. Up to 2011 there lot of change in crop diversification; the result shows that maximum crop diversification in Mohadi and minimum in Sakoli taluka. Crop diversification in 20 years result that in 1991 crop diversification was much higher than 2011; because at that time majority of cultivators depend there agriculture on mansoon rainfall (Fig No. 6).

#### Crop Combination:

Crop combination in 1991 was four to six crops in the district. These are rice, wheat, pulses and oilseeds included in four crop combinations. In Tumsar taluka other than these four crops fruits and vegetables are another minor crops produced. In Mohadi and Bhandara taluka maize and gram are another minor crops; in pauni taluka mung was another minor crop produced by cultivators. From 1999 to 2011 some of the crops are left by the cultivators. In these talukas

cultivators produced five to six crops they replaced by two to three crops only. Lakhani is a one of the taluka where rice is a major crop having monoculture; because in this taluka availability of tanks and wells are in more number than other taluka. Rice is a latest food crop adopted by man as compared to other crops. More than 50% of population in the world using rice as a principal food. Rice is the symbol of cultural introduction and unity. Rice is most famous crop in the world. Near about 131 countries producing rice in the world. Rice providing 27% of calories and 20% proteins to population of the world. In Asia and Africa continent 10 core families producing rice as main income source. 4/5 production of rice produced by marginal farmers in the world and all the production of rice used for their family requirements of food. Therefore trade of rice is only for 5% population of the world (30).

In 1991 total cropped area was 257278 hector in the district; there is variation in distribution of area under crop among all talukas. Out of total cropped area maximum area used for Kharif crop. In net Kharif season 68 to 78 percent area occupied by rice cropped in the district. In the district less percentage of area under second crop which is produced in Rabbi Season i.e. 23.17% only. In Rabbi Season maximum area cultivated by cultivators 34.30% in Lakhandur taluka and less amount of area is 11.49% in Mohadi taluka. As per the data of 2011 it is clear that after 20 years area under crops is increased by 13680 hector. In 20 years Rabbi cropped area reduced by 17.37%. In 1991 net sown area was 197677 hector and out of which 17.64% area under irrigated. Maximum area under irrigated was in Sakoli taluka 32.97%. Where as in 2011 net sown area and area under irrigation increased in maximum number. In this year net sown area was 202511 hector out of which irrigated area was 15.89%. Minimum irrigated area was in 42.72% and maximum in Mohadi taluka was 64.92%. 1991 was the year when total crop area was 257287 hectors in the district. Out of which only 35.56% area was under irrigated; these amount is only 35.56%.

Maximum area is depending on monsoon rainfall therefore total irrigated area in the district is very less. Bhandara is the district of tanks; even though lack of monsoon rainfall amount of water stored in tanks is in less quantity than its capacity. It results that in the district agriculture productivity counted less number. Maximum area under irrigation was in Mohadi taluka i.e. 51.51% to the total cropped area. In other taluka area under irrigation was in 22 to 45 percent. It indicates that accept Mohadi taluka less than 50% area was under irrigation.

In 2011 area under irrigation was increased by 21.46% to the total cropped area in the district. In this year total cropped was 245607 hector out of which 56.96% area under irrigation. Maximum area under irrigation was in Pauni taluka (71.56%) and minimum in Lakhandur taluka (41.24%). In the district out of total cropped area 58.52% area under rice out of which 49.11% was under irrigation. In Sakoli taluka area under rice was maximum in number and 55.53% area under irrigation. From 1999 to 2011 in number of taluka area under irrigation in increased. In 1991 percentage of total area under rice to total cropped area was 58.53%. in this year maximum area under cropped was in Tumsar taluka which is 69.49% and minimum in Pauni taluka i.e. 50.19 percent. In 2011 percentage of area under rice crop to total cropped area 76.35% and in this year maximum percent of area under rise was 98.51% and minimum in Lakhandur taluka i.e. 65.86% only. From production of Paddy to ready to consumption as rice it go through number of different procedures. For production of paddy 90 to 110 days period is required. Processing of paddy to rice is most important procedure; because 96% paddy used in the form of rice. In Bhandara district first rice mill established at 1905; from 1905 to till the year lot of changes in the rice mills processing units. Presently Bhandara district owns 243 rice mills. Out of which 213 mills newly formed and 30 mills are upgraded their production capacity and modern technology. In the study area out of total 243 mills; 09 mills owned by

SC category, 26 mills owned by Open category, 206 mills owned by OBC and 16 mills owner are females. From beginning of first rice mill in the district to the present year there is lot of change in processing technique, quality of rice, transportation, market etc.

### **Rice mills and capacity:**

Bhandara district divided in 7 talukas for administration purpose; in these talukas distribution of rice mills studied deeply. In tumsar taluka 14 villages had 26 rice mills. In Mohadi taluka 24 villages having maximum number of rice mills in the district i.e. 58. Bhandara taluka is the district place even though the number of rice mills is only 45 in 21 villages. Sakoli taluka having 19 rice mills in 12 villages. Less number of rice mills situated in Sakoli taluka and capacity of rice mills is only 0.82 Tone per hour. In Lakhani taluka 14 rice mills operating in 14 villages; maximum number of 6 rice mills situated in taluka place and there capacity of rice mills 1 tone per hour. In Lakhandur taluka 34 rice mills established in 24 villages. In these taluka maximum number of rice mills in chinchad villages i.e. 4. In Lakhandur taluka capacity of rice mills is 0.81 tone per hour. Pauni taluka operational rice mills are 37 distributed in 21 villages. Milling capacity of rice mills in pauni taluka maximum in bhandara district is 1.23 tone per hour. Maximum number of rice mills situated in adyal village i.e. 7 in pauni taluka. After study of rice mills distributed in number of villages in different talukas; it indicates that distance between rice mill and surrounding villages is not more than 4 km. average distance between rice mill and surrounding villages of tumsar taluka is 3.99 km, Mohadi taluka 3.61 km, Bhandara taluka 4.09 km, Sakoli taluka 3.11 km. Lakhani taluka, 2.90 km, Lakhandur taluka 3.19 km and pauni taluka 2.99 km. maximum average distance acquiring in bhandara taluka because it is district place and therefore farmers prefer market place for selling of paddy and purchasing their needs. In the district 243 mills are operational situated in 126 villages. Out of which 24 villages in Mohadi taluka

and minimum 12 villages in Sakoli taluka. Talukawise an even distribution of rice mills determined and affected by land use, transportation and size of villages. Distribution of rice mills studied through some of the analytical techniques; Rn value it is one of the most important methods to know distribution of rice mills and surrounding villages. Maximum Rn value 3.39 counted in Mohadi taluka and minimum 2.30 in Pauni taluka. In total average Rn value of the district is 2.52. Relationship between total number of villages and rice mills centers having positive in the district. Comparative study has been done on the basis of these values it indicates that location of rice mills and distribution of villages are more systematic.

### **Correlation coefficients of Population and number of mills:**

Location of rice mills and population of that particular center it is very important two factors to know the capacity of rice mills per hour to provide required rice to the population. Here location of rice mills and population of the center these two factors considered for correlation. To find out correlation temporary hypothesis formed as "Maximum population of the center resulting maximum capacity of rice mills". To find out correlation between Mills capacity and area under rice "Spearman" method adopted. After calculation correlation coefficient is 0.89 and it accepted on 99.99% level of "t test". It means in which areas maximum area covered by rice resulted maximum rice mills capacity. In total Mohadi and Bhandara taluka having maximum capacity of rice mills in the district. The surrounding villages supplying paddy to different rice mills studied with graphically relationship on the basis of area under rice and capacity of mills. Regression line formed for area under rice of surrounding villages and capacity of rice mills shows the situation is not normal; different factors participated in location of rice mills. Out of total rice mills number of rice mills location affected by means of transport and trade. Adyal, Bhuyar these

two centers situated on highways therefore capacity of these centers is much higher than average capacity of district rice mills.

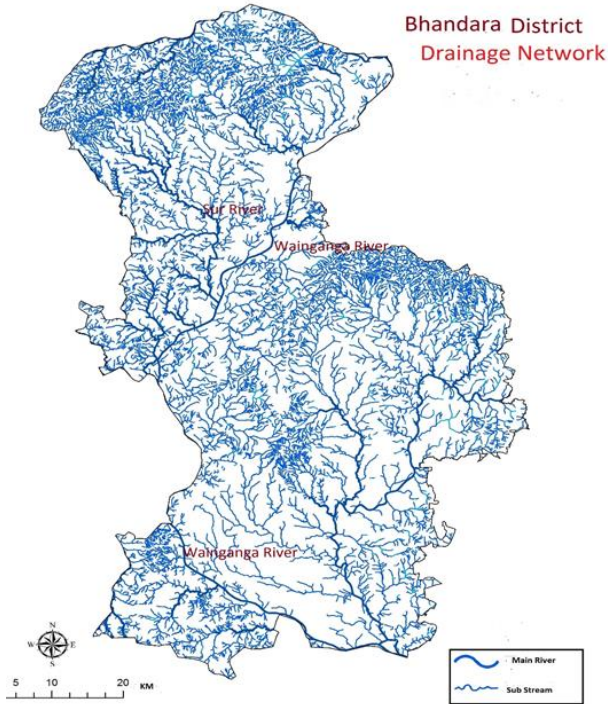


Fig No. 1

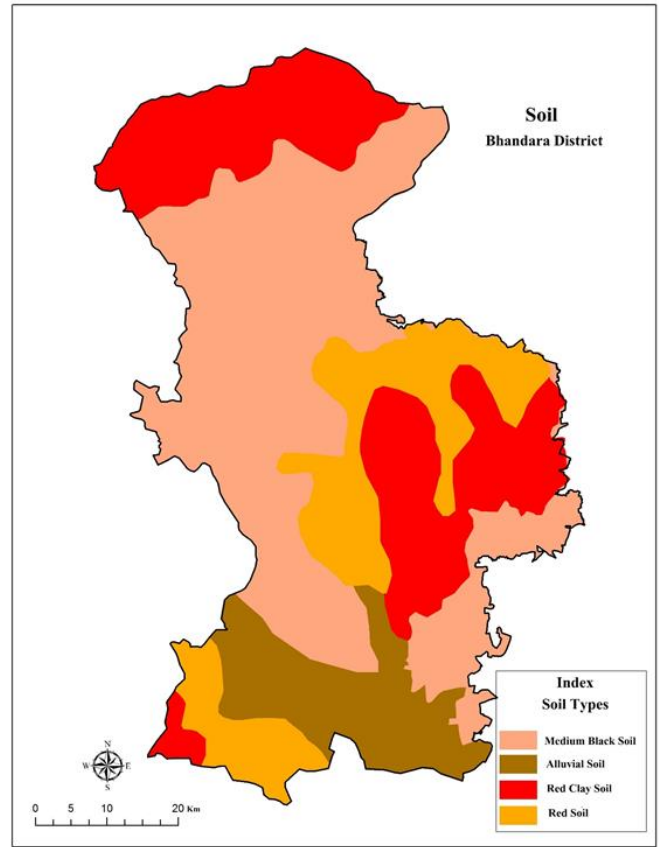


Fig No. 3

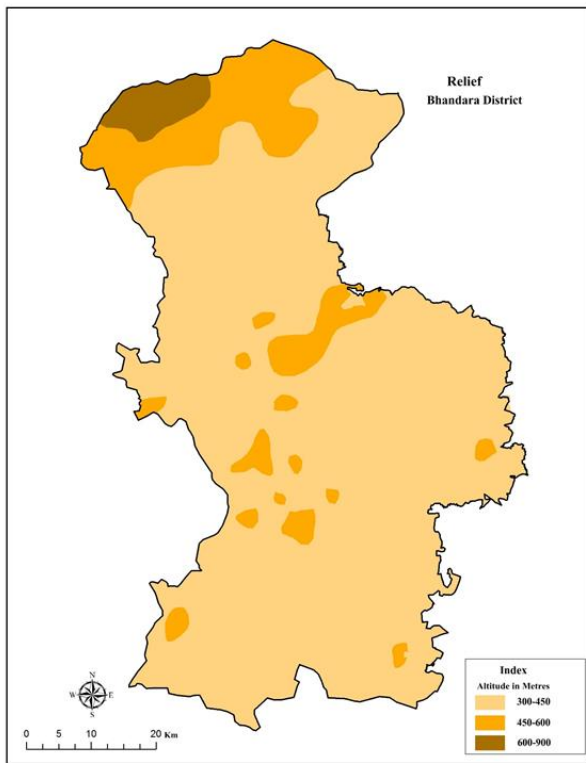


Fig No. 2

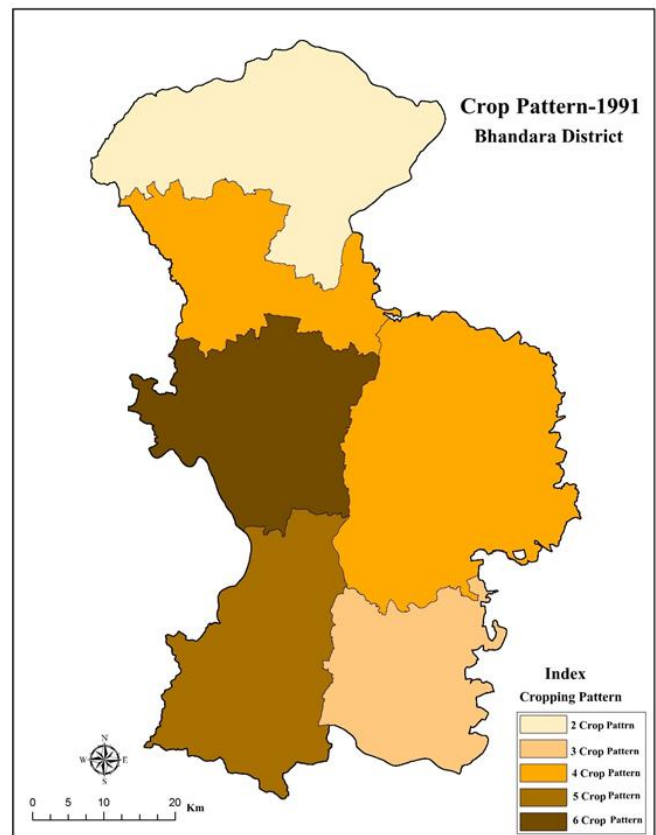


Fig No. 4

#### IV. CONCLUSION

Rice production can largely be sustained in Bhandara District if land and water on which it is primarily based are not degraded. District needs to exploit the benefits of rice science more than anything else. If the successful discoveries of high breed rice can be fully exploited and integrated, District fortune may change positively. Maintaining a favorable demand-supply balance of rice in District will depend on the exploitation of the productive capacity mainly in the rainfed areas. Recent advances in molecular biology, genetic engineering, bio-technology, systems models, remote sensing and Geographic Information Systems (GIS) will hopefully encourage scientists to put more effort in addressing the complex problems of rice cultivation in the rainfed ecosystem. Current situation of cluster firm on profit margin is 1.8% but after advanced intervention it could be 9.1%. At present turnover growth rate is 11-12%; which could be better by 20% per annum.

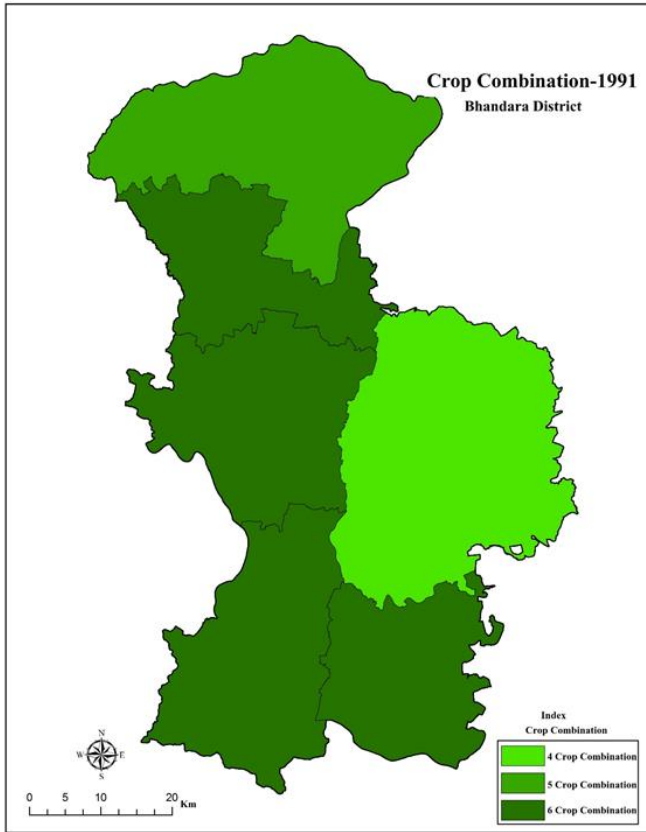


Fig No. 5

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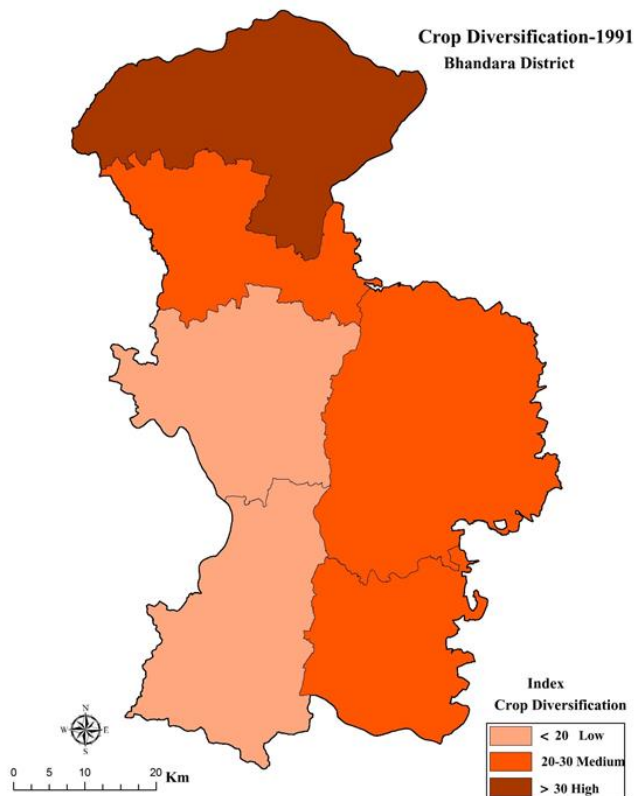


Fig No. 6

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