Concentration and Diversification of Crops in Ambedkar Nagar District of UttarPradesh

Abstract

People have relied on agriculture as their primary source of income all over the world. More than half of the population of India depends on agriculture for employment and livelihood. Uttar Pradesh is the largest producer of food grains because of its fertile Gangetic plains, canal irrigation, and government and private tube wells. Social, economic, political, and technological factors also decide crop production in different parts of the state. In this study, calculation and analysis of crop concentration and crop diversification in Ambedkar Nagar district have been done for 2000 and 2018 to investigate the changing relations between land, humans, and the environment. Crop concentrations of crops like rice, wheat, and pulses are increasing, while crop concentrations of sugarcane are decreasing. Crop diversification in Ambedkar Nagar district shows changing trends from 2000 to 2018. The high crop concentration of food crops and high crop diversification index show that agriculture is still the primary occupation and source of income and livelihood in the district.

Keywords: crop concentration, crop diversification, economy, food crops,livelihood.

Comment [IGKA1]: The abstract should briefly describe the purpose of the work, techniques and methods used, major findings with important data and conclusions

1. INTRODUCTION

Agriculture is the backbone of the Indian economy. The people of India heavily depend on agriculture and allied activities. Even today, as secondary and tertiary sectors are growing, the importance of Indian agriculture and the dependency of the population on this sector have been maintained from independence until now. In the initial years of independence, agriculture contributed more than 50% of Indian GDP, but now, agriculture and its allied sectors contribute 17.80% of the GDP/GVA for the year 2019–20 (at current prices) [14]. India's 54.6% workforce is still engaged in agriculture and allied activities [15]. The nature of Indian agriculture is closely related to high crop concentration and a high degree of crop diversification. This is because of the growing population and the continuous decline in size of land holdings, fragmentation of farms, etc., so the farmers' needs are well met by high

Comment [IGKA2]: the Indian..

crop concentration and diversification. Both concentration and diversification are helpful for proper agricultural land use.

Crop diversification simply refers to growing a variety of crops in the agricultural field at a given point in time. In general, crop diversification, a process that takes into account the different returns from value-added crops with competing marketing prospects, is the addition of new crops or growing techniques to agricultural production on a specific field. Pingali and Rosegrant (1995) have defined crop diversification as "change in product choice of input based on market forces and the principle of profit maximization [9].." Diversification means raising a variety of crops. Crops are diversified in the field due to the erratic nature of rainfall and insufficient irrigation [13]. This diversification suits the needs and resource endowments of small landholders [6].It mainly depends on physio-climatic, social, economic, and technological factors. Crop diversification has the opposite effect of crop specialisation. Small landholder farmers try to grow several crops in their fields in an agricultural year. According to Saikia and Bhagyalakhi (2017), agricultural diversification is a process in which farmers change their farm activities or crop patterns from low- to high-value commodities or farm enterprises [11]. The crop diversification formula given by ~~Bhatia, 1965~~ [1], Jasbir Singh 1976 [12], Gibbs, and Martin, 1962[4], and many others. The greater the number of crops, the greater the competition, and the higher the magnitude of diversification [2]. In Indian conditions, crop diversification is a common phenomenon because the farmers try to satisfy most of the family's demands on their own land, resulting in crop diversification [8]. There is obvious competition among crops for space. It is obvious that the larger the number of crops in a combination, the greater the degree of diversification [7].

Comment [IGKA3]: [ ]

Comment [IGKA4]: [ ]

Comment [IGKA5]: [1, 12, 4]

The term "crop concentration" simply refers to the variation in crop density in a given area at a given time. The terrain, temperature, moisture, and soil environment of a region have a significant impact on the concentration of a crop. The concentration of a crop in a geographical area largely depends on regional economic, socio-political, and technological factors [10]. It has a tendency to have a high concentration in areas of ideal agro climatic conditions, and the density declines as the geographical conditions become less conducive [5]. There is an ideal, optimum, and lowest temperature for each crop. It tends to be concentrated heavily in locations with the best agro-climatic conditions, and its density decreases as the terrain becomes less favourable. The crop concentration aids in identifying the region where a specific crop grows well even with the use of few inputs, and as a result, it has substantial planning implications for the growth of agriculture. The concentration of a crop in a given geographical area largely depends on the region's geographical, economic,

political, social, and technological factors [10]. Crop concentration measures the density of individual crops in an area at a given point in time. In the field of crop concentration, pioneering work has been done by Florence, 1948 [3], Bhatia,1965[1], Jasbir Singh, 1976[12], and others. Several scholars have applied the location quotient method to determine the degree of crop concentration in a particular study area, which is the most common method for the analysis of crop concentration. Crop concentration and diversification contributed to high production for the Indian people and economy.

1.1 STUDY AREA

Comment [IGKA6]: Please put this study area in the methodology section

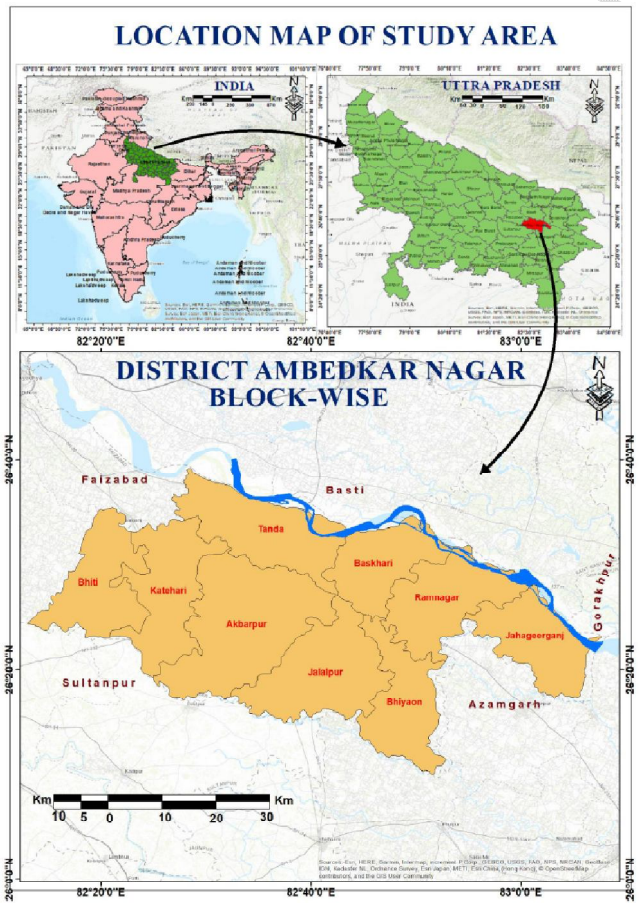

Fig. 1: Location Map of Study Area

Source: NATMO

Ambedkar Nagar district is situated in the eastern part of Uttar Pradesh. The district is located between the latitudes of $26^0$09' and $26^0$40' North and $82^0$12' to $83^0$09' East longitudes (fig.1). The geographical area of the district is 2350 sq. km. Akbarpur, the district headquarter, is also a tehsil and a block. There are 2397888 people living in the district, according to the 2011 census [15].

2. OBJECTIVE:

Comment [IGKA7]: Place in the introduction in a continuous paragraph, not under a separate subsection.

The study's primary goals are to investigate, compute, and analyse the crop concentration and crop diversification of Ambedkar Nagar District and draw conclusions about the changing nature of agriculture, and agricultural constraints.

3. METHODOLOGY

The current study is based primarily on secondary data that was gathered from a variety of sources, including the district statistics magazine, district survey report, and district census guidebook. Crop diversification is calculated using the Gibbs and Martin method, whereas crop concentration is calculated using Jasbir Singh's method.

Formula used are:

A. According to Jasbir Singh Method, 1976

$$Crop\ Concentration\ Index = \frac{Area\ of\ particular\ crop\ in\ the\ unit}{Total\ cropped\ area\ in\ the\ unit\ area} \div \frac{Area\ of\ particular\ crop\ in\ the\ region}{Total\ cropped\ area\ in\ the\ region}$$

(in this “Location Quotient Method of Crop Concentration” high value represent the high concentration and the low value shows the low crop concentration).

B. According to Gibbs and Martin Method, 1962

$$Crop\ Diversification\ Index = 1 - \sum X^2 / (\sum X)^2$$

(in Gibbs and Martin method, crop diversification index value ranges from 0 to 1.
‘1’ shows the higher index value means higher crop diversity and ‘0’ shows the less diversity).

4. RESULTS AND DISCUSSION

Comment [IGKA8]: Tables & figures should be placed inside the text. Tables and figures should be presented as per their appearance in the text. It is suggested that the discussion about the tables and figures should appear in the text before the appearance of the respective tables and figures

In Result and discussion section, the authors must provide not only results but also discussion (data interpretation)

Table 1.Crop Concentration Index in Ambedkar Nagar District, 2000 (in%)

Blocks	Rice	Wheat	Pulses	Sugarcane
Bhiti	0.98	0.92	1.19	1.26
Katehari	1.08	0.99	0.92	0.68
Akbarpur	1.07	0.97	0.97	0.74
Tanda	1.03	0.96	1.08	0.58
Baskhari	0.97	1.02	0.99	0.81
Ramnagar	1.02	1.03	0.81	1.06
Jahageerganj	0.80	1.12	1.06	1.44
Jalalpur	0.97	1.05	0.98	1.19
Bhiyaon	0.94	1.00	1.06	1.72
District	**40.47**	**41.34**	**5.52**	**3.92**

Source: Computed by the author

Table 2. Crop Concentration Index in Ambedkar Nagar district, 2018(in%)

Block	Rice	Wheat	Pulses	Sugarcane
Bhiti	0.93	0.92	1.75	1.48
Katehari	0.99	1.00	1.28	0.75
Akbarpur	0.99	1.03	1.17	1.03
Tanda	1.03	1.00	1.33	0.95
Baskhari	1.04	1.03	1.07	0.57
Ramnagar	1.02	1.00	0.76	0.90
Jahageerganj	1.03	1.01	0.73	0.99
Jalalpur	1.02	0.99	0.90	1.17
Bhiyaon	0.85	1.03	1.31	1.97
District	42.23	41.78	3.69	3.88

Source: Computed by the author

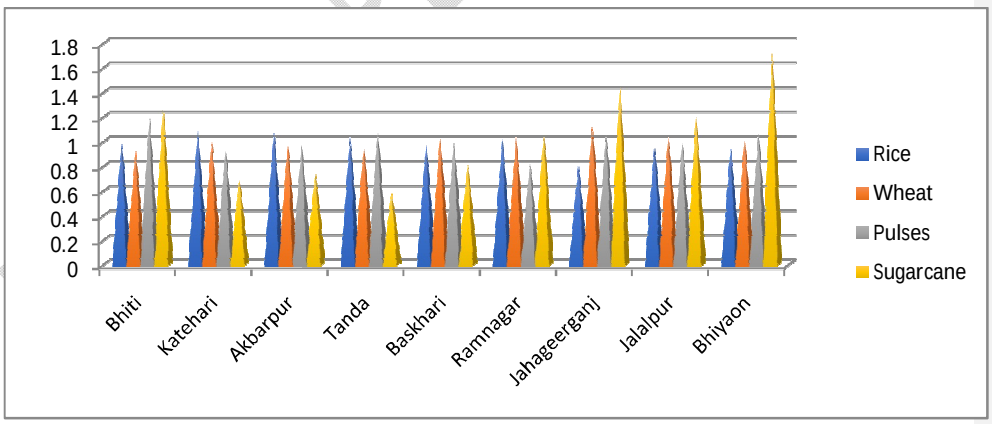

Fig. 2. Trends of crop concentration, 2000

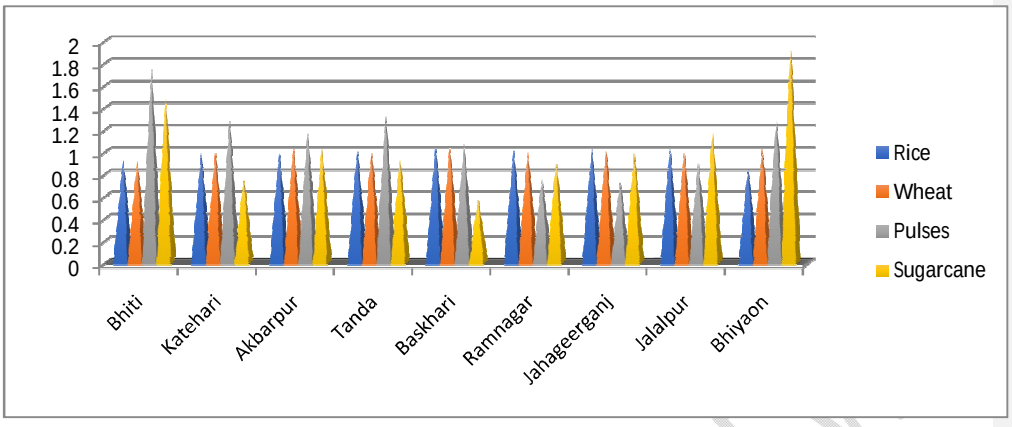

Fig. 3. Trends of crop concentration, 2018

4.1 Crop Concentration:

4.1.1Concentration of Rice:

The crop concentration is calculated blockwise for the main crops like rice, wheat, pulses, and sugarcane. Table 1 and fig.2shows the high concentration of rice in four blocks, more than one of which was in Katehari, Akbarpur, Tanda, and Ramnagar in the year 2000. In the same year, Jahaheerganj had the lowest rice crop concentration. Bhiyaon, Jalalpur, Bhaskhari, and Bhiti, also have crop concentrations less than one. In the year 2018, Bhaskhari showed the highest rice crop concentration, which is more than one; Tanda, Jahageerganj, and Jalalpur performed well and had more than one rice crop concentration, respectively. The Bhiyaon block has the lowest crop concentration, with other blocks performing Bhiti, Katehari, and Akbarpur less than one, respectively (Table 2 and fig. 3).

4.1.2 Concentration of Wheat:

In the year 2000, five blocks performed better in wheat crop concentration, which was more than one, in blocks Jahageerganj, Jalalpur, Ramnagar, Baskhari, and Bhiyaon. The four blocks that perform less than 1 wheat crop concentration are Bhiti, Tanda, Akbarpur, and Katehari. In 2018, 7 blocks had more than one wheat crop concentration: Akbarpur, Bashkari, Bhiyaon, Jahageerganj, Ramnagar, Katehari, and Tanda. Only two blocks performed less than one crop concentration, i.e., Bhiti and Jalalpur blocks (Table1 & 2 and fig.2&3).

4.1.3 Concentration of Pulses:

According to the table 1 in the year 2000, four blocks had pulse production more than one crop concentration, which are Bhiti, Tanda, Jahageerganj, and Bhiyaon blocks. The crop concentration of pulses lower than one was found in six blocks, namely, Bhiti, Ramnagar, Katehari, Akbarpur, Jalalpur, and Baskhari. In 2018, the crop concentration of pulses was more than one in six blocks, namely, Bhiti, Tanda, Bhiyaon, Katehari, Akbarpur, and Baskhari. In 2018, the crop concentration was less than one in Jahageerganj, Ramnagar, and Jalalpur blocks (Table 2 & fig. 3).

4.1.4 Concentration of Sugarcane:

A high sugarcane crop concentration of more than one was found in five blocks in 2000. Bhiyaon had the highest crop concentration, followed by Jahageerganj, Bhiti, Jalalpur, and Ramnagar, respectively. Four blocks had low crops, i.e., less than one in Baskhari, Tanda, Katehari, and Akbarpur blocks, respectively, in 2000. In 2018, the highest sugarcane crop concentration was found in three blocks, namely, Bhiyaon, followed by Bhiti, Jalalpur, and Akbarpur. But low crop concentration, i.e., lower than one, was in five blocks in the year 2018, namely Baskhari, Katehari, Ramnagar, Tanda, and Jahageerganj. Table and fig show that the concentration of sugarcane is reducing while rice, wheat, and pulses, i.e., food crops, are increasing in 2018 (Table1 & 2 and fig.2 & 3).

4.2 Crop Diversification

The given table shows the higher crop diversification in the Ambedkar Nagar district, covering all 9 blocks. All nine blocks of the Ambedkar Nagar district between 2000 and 2018 show the same trend. It simply means the farmer in Ambedkar Nagar district tries to grow several crops in his fields. Generally, higher diversification shows the poor development of agricultural technology and various other components like erratic weather, a lack of labour, fertilisers, etc (Table 4 & 5).

Table 3. Calculation of Gibbs and Martin Index for Crop Diversification

Blocks	Rice	Wheat	Pulses	Sugarcane	Vegetable	Potato	Total	Percentage $1-\sum X^2/(\sum X)^2$
Bhiti	1585.632	1446.281	43.033	24.304	13.690	2.433	3115.375	0.688
Katehari	1917.564	1687.566	25.806	7.128	5.198	1.537	3644.802	0.636
Akbarpur	1877.489	1598.400	28.515	8.352	5.760	3.385	3521.903	0.648

Tanda	1735.556	1580.858	35.640	5.107	11.155	4.708	3373.026	0.663
Baskhari	1545.276	1774.094	29.593	10.176	4.840	7.236	3371.216	0.663
Ramnagar	1709.823	1800.305	20.160	17.222	1.440	3.276	3552.226	0.645
Jahageerganj	1051.056	2126.132	34.105	31.696	6.002	1.822	3250.816	0.675
Jalalpur	1542.918	1867.968	29.376	21.808	3.385	4.622	3470.080	0.653
Bhiyaon	1621.673	1701.563	34.222	41.860	3.062	3.496	3405.878	0.659

Source: Computed by the author

Table 4. Value of Gibbs and Martin Index in Ambedkar Nagar

Blocks	Year (2000)	Year (2018)
Bhiti	0.688	0.687
Katehari	0.635	0.644
Akbarpur	0.647	0.636
Tanda	0.662	0.630
Baskhari	0.662	0.619
Ramnagar	0.644	0.637
Jahageerganj	0.674	0.629
Jalalpur	0.652	0.640
Bhiyaon	0.659	0.679

Source: Computed by the author

Table5. Range of Gibbs and Martin Index

Categories	Range of Gibbs and Martin Index	No. of Blocks
Low	<0.40	0
Medium	0.40-0.60	0
High	>0.60	9

Source: Based on Gibbs and Martin Index (GMI), 1962

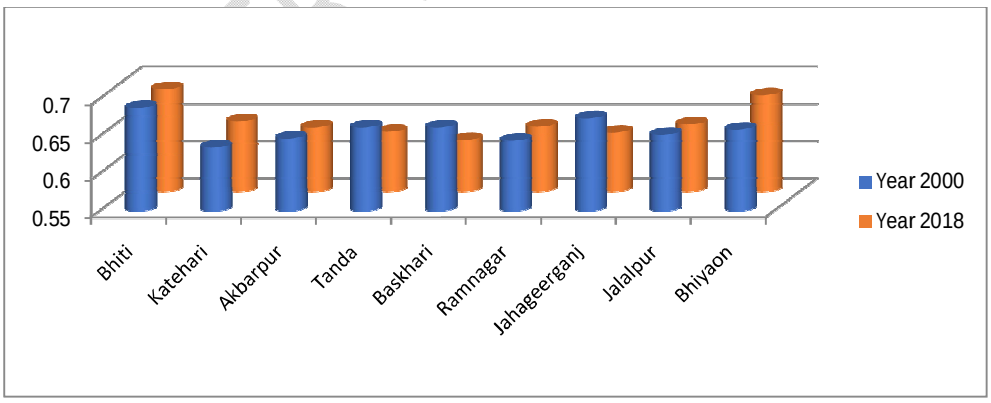

Fig. 4. Values of Gibbs and Martin Index (GMI)

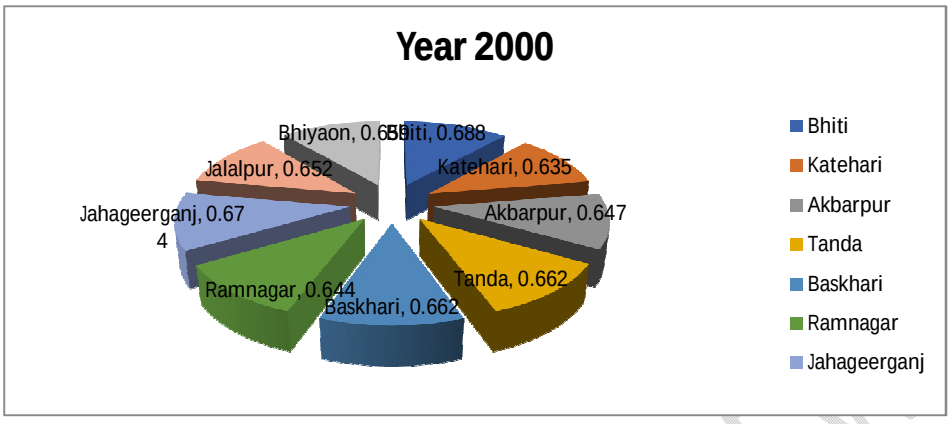

Fig. 5. Crops Diversification Value (GMI) of the Year 2000

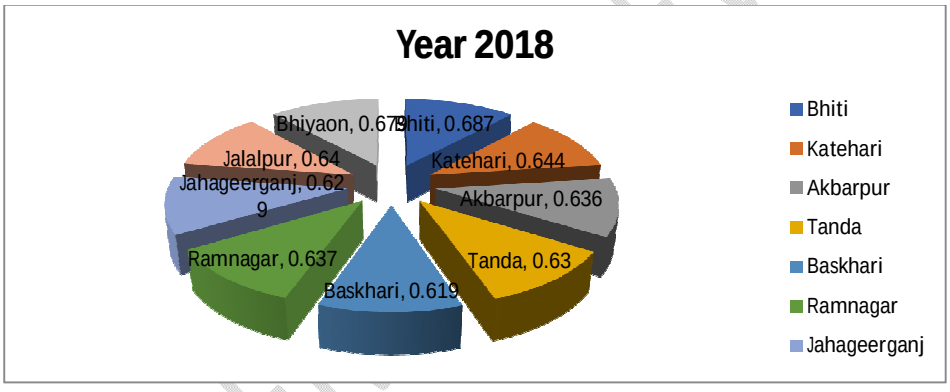

Fig. 6. Crops Diversification Value (GMI) of the Year 2018

5. Conclusion

The analysis of crop concentration in Ambedkar Nagar district reflects the result that rice, wheat, and pulses were the most concentrated crops in the district in 2018, while crop concentration of sugarcane decreased. The economy of the population revolves around these crops. The high level of crop diversification in both 2000 and 2018 shows very little crop specialisation in the study area, which means that livelihood farming is dominant in the Ambedkar Nagar district and that people practise agriculture mainly to sustain their lives and fulfil their daily food needs.

Huge crop diversification in the district is happening due to the insufficient and erratic nature of rainfall, the changing nature of agro-climatic conditions, the lack of finance for the farmers, poor agricultural tools, technology, and infrastructure, etc.

7. References:

1. Bhatia SS, Patterns of Crop Concentration & Diversification in India. Economic Geography, 1965;41: 40-56.
2. Bhatia SS. An index of crop Diversification, Professional Geographer. 1960; 12(2): 3-4.
3. Florence PS. “Investment Location and size ofplant”. (Quoted from, Agricultural Geography of Jasbir Singh and S. S. Dhillon). 1948; p. 217.
4. Gibbs J & Martin W. Index of Diversification. In R Hammond & PS McGullagh (eds.). Quantitative Techniques in Geography: An Introduction. 1962; (pp. 386). Oxford: Clarendon Press.
5. Husain M. Agricultural Geography, Rawat Pub. Jaipur. 1996.
6. Joshi PK, Gulati A, and Cummings, RW. (eds). Agricultural Diversification and Smallholders in South Asia.Academic Foundation, New Delhi, India. 2007.
7. Mehta PK. Role of Crop Diversification in Output Growth in India: A State Level Analysis. Journal of Agricultural Economics. 2010; 6(2):24-42.
8. Murugesan J, Gangai P, Selvam K. Patterns of Crop Concentration, Crop Diversification and Crop Combination in Thiruchirappalli District, Tamil Nadu. 2018.
9. Pingali PL, and Rosegrant, MW. Agricultural Commercialization and Diversification: Processes and Policies. Food Policy. 1995 20(3): 171-186.
10. Punithavathi JS, Tamilenthi and RBaskaran. Agricultural concentration and crop wise changes in Thanjavur District, Tamil Nadu, UsingGeographical Information System, International Multidisciplinary Research Journal. 2012; 2(7):44-48.
11. Saikia S, and Bhagyalakhi G. Why is Agricultural Diversification? - A Theoretical Framework, Social Science Journal of Gargaon College. 2017; 5.
12. Singh J. An Agricultural Geography of Haryana. Kurukshetra: Vishal Publication. 1976.
13. Singh J and Dhillon S. Agricultural Geography, Tata McGraw Hill Publishing Company Ltd. New Delhi. 1984; 112-115.
14. www.MoSPI.gov.in
15. Census, 2011