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Impact of Overpopulation on Land Use Pattern: A Contextual Analysis of Sustainable Natural Resources

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Abstract

Overpopulation and industrialization are laying pressure on land and water resources at a critical level. India is one of the most vulnerable developing countries having the second-largest human agglomeration of the world after China and suffering from the problem of overuse of land and water resources utilizationthat decrease crop production. According to the CIA World Fact Book -Land use (2016) total agricultural land of India is only 60.5% of total land area;out of which arable land is 52.8 percent and only 4.2 percent land is under permanent crops. As per the Report of Statistics Time (2018) India having 26th rank in the world with 455 persons per sq. km area. The average population density in India is 382 persons per sq. km (Census of India, 2011)), while the physiological or nutritional density of India registers 613 persons per sq. km (2011).Analysis of the population and nutritional density indicates that in a small period of time 78 persons were increased that shows how much pressure will be increased on the natural resources in context to satisfythe demand of foodas well as creating social, environmental, ecological and health problems.

Keywords: *Land and water resources, Sustainability, Overpopulation, and Land use.*

Introduction

Overpopulation is the proportion of the population to the available natural resources in a particular area that depends on how land and water resources are managed and

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distributed throughout the whole population in any region (Shiva, 1991). Due to the effect of the green revolution, the production of foodgrains is increased at their plateau level with the highest use of chemical fertilizer and pesticides which were no environmentally sound. Overpopulation is the result of unbalance growth between birth rate and death rate, declining mortality rates due to availability of advanced medical services, and increase in in-migration that creates problems like unsustainable biome, pressure on land and water resources, soil degradation, deforestation, landholding size, depletion of the underground water table.

The human population is continuously growing rapidly worldwide. Presently we are about 7.5 billion andestimates that we will become nearly 10 billion by 2050. This rapid growth of the population is creating pressure on essential natural resources. Soil degradation, soil erosion, monoculture, overgrazing of pasture lands, highly use of chemical fertilizers and pesticides,etc.through various methods and activities that our soils are being degraded and transforming whole land-use patterns across the region in the world.According to UN estimates, approximately 12 million hectares of agricultural lands are being severely degraded annually.Now a day, the cropping pattern in South East Asia is based to fulfill the demand for food that does not keeps soils in good condition.

India is an agriculture-based country and more than 50% of the population is depending on agriculture. India is the seventh-largest country area wise in the world. The Indian subcontinent bounded by Himalayan Mountain from the north, and surrounded by water bodies from three sides i.e. Bay of Bengal from the East, the Indian Ocean from the south and the Arabian Sea from the west. There is a very high climatic variation from one region to another region across the Indian subcontinent. The climate of India varies from very humid to dry and hot tropical in the south to the temperate and cold alpine in the extreme northern part of the country that creates a large diversity of biomass and ecosystems across the country. India is considered as one the most

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fertile land in the world that is supporting one of the largest population after China and densely populated region in the world. In 2016, agricultural land as a share of land area for India was 60.4 percent.Agriculture and agro-based allied sectors constitute the primemeans of livelihoods of the Indian population. More or less 70 percent of the total rural population still depends on agriculture and the allied sector for their means of livelihood; among the 82% farmers belongs to the category of small and marginal farmers in India.

Therefore, if the transformation of land use patternscontinuesatthe same pace due to the rapidly increasing population in next coming decades, the problem of population pressure on our sustainable natural resources will be extremely increased. This will leads to several kinds of problems for the surviving Indian population. Thus, the paper is an attempt to analyze the impact of population growth and crop production, land and water resources and provide the future perspective of land use patterns in the country. The research paper focuses on two major objectives: 1) to investigates the temporal pattern of population growth and cropping pattern, and 2) to investigate the impact of population growth on land and water resources.

Database and Methodology

The present study entitled 'Impact of overpopulation on Land use Pattern in Relation to Sustainability of Land & Water Resources' focuses on Spatio-temporal analysis of cropping pattern in relation to the growth of population. The data for the last six decades 1951,1961,1971,1981, 1991,2001& 2011 for analysis were considered for the present study. It involves basically secondary data. The data were alsoextracted from the Agricultural Statistics, 2015, Ministry of Agriculture & Farmer Welfare, Government of India. Data were arranged, processed and then presented in tables and figures.Statistical techniques, cartographic skills will be applied to present the results obtained from secondary sources.

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Results and Discussion

Cropping pattern refers to the annual cycle/sequence and spatial pattern of crops and practices in any region. The application of a cropping pattern depends on the type of crop as well as the quality of soil and rainfall distribution. On the other hand, Intensive cropping patterns or food grain based cropping patterns produce more and cheaper food per acre which has helped to feed a huge human population. But the reality is that intensive cropping system kills beneficial insects and plants, degrades and depletes the soil, creates polluted runoff and water systems, increases susceptibility to flooding in the practices area.

Population Growth and Land Resources

India possesses only 2.4% of the total land surface in the world that is providing a livelihood to 17.5% population of the world(Census of India, 2011). After the United States, India has 2nd largest arable land in the world also have more water area except for Canada and the United States. 68.84% population of India lives in rural area and their life therefore revolves mostly around agriculture and allied activities (Mishra, et al. 2015). Table 1 shows selected land use categories from 1950-51. Table 1 shows that the population was increased 235% during the period of 1950-51 to 2010-11 but the net area sown was increased only 19.20% during the same time period. On the other hand physiological density shows that it was 274 persons per square kilometers in 1950-51 and in 2010-11 it was increased to 613 persons per square kilometers.

Table 1
Land Use Categories from 1950-51 to 2010-11 (Area in Million Hectares), India

Years	Total Population	Net Sown	Gross SownArea	Gross Irrigated	Physiological Density of	Cropping Intensity	Share of Agricultureto

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		Area		Area	persons per sq. km.		GDP (%)
1950-51	361088090	118.75	131.89	22.56	274	111	54.66
1960-61	439234771	133.20	152.77	27.98	288	115	49.14
1970-71	548159652	140.86	165.79	38.20	331	118	43
1980-81	683329097	140.29	172.63	49.78	396	123	37.5
1990-91	846421039	143.00	185.74	63.20	456	130	30.32
2000-01	1028737436	141.34	185.34	76.19	555	131	24.00
2010-11	1210193422	141.56	197.56	88.89	613	142	17.32

Source: Agricultural Statistics, 2015, Ministry of Agriculture & Farmer Welfare, Government of India.

The increasing values for physiological density prove that the pressure of increasing population on land resources is over its limit. The percentage of the agriculture sector in GDP was also decreasing which was 54.66% in 1950-51 and 17.32% was 2010-11. Cropping intensity also proves that how much pressure was created on the agriculture land to provide food and feed to peoples during the period of 1950-51 to 2010-11. Figure 1 shows a decadal growth rate of population in comparison to the decadal growth in net area sown.

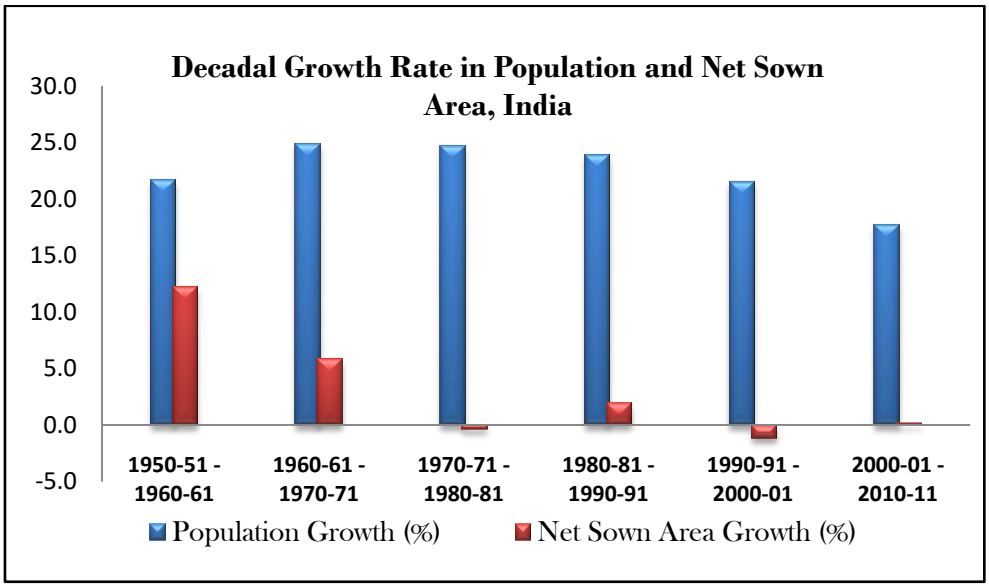

Figure-1

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Source: Computed from Agricultural Statistics at Glance, 2015, Ministry of Agriculture & Farmer Welfare, Government of India.

Population Growth and Cropping Pattern

Agriculture is an important means of the Indian population. A rapid increase in the population of the country is causing the increase of great pressure on the limited land area that is harmfully affecting the ecological footprint of agriculture or man-land ratio for surviving the population. Table 2 shows that area under rice and wheat crops are increasing 13.38 and 20.85 million hectare respectively during 1950-51 to 2016-17. The area under pulse, maize, cotton and oilseed crops was also increased. On the other hand, jowar and bajra crops area are decreased (Ministry of Agriculture & Farmers Welfare, 2015) and (Ministry of Agriculture and Irrigation, 2015).

Table-2
Changes in Cropping Pattern in India

Year	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2010-11	2016-17
Rice	30.81	34.13	37.59	40.18	42.69	44.71	42.96	43.19
Wheat	9.75	12.93	18.24	22.28	24.17	25.73	29.07	30.60
Pulses	19.09	23.56	22.54	22.46	24.66	20.35	26.40	29.46
Jowar	15.57	18.41	17.37	15.81	14.36	9.86	7.38	5.14
Oilseeds	10.73	13.77	16.64	17.60	24.15	22.77	27.22	26.21
Bajra	9.02	11.47	12.91	11.66	10.48	9.83	9.61	7.47
Maize	3.16	4.41	5.85	6.01	5.90	6.61	8.55	9.86
Gram	7.57	9.28	7.84	6.58	7.52	5.19	9.19	9.58
Cotton	5.88	7.61	7.61	7.82	7.44	8.53	11.22	10.85
Sugarcane	1.71	2.42	2.62	2.67	3.69	4.32	4.88	4.39
Tobacco	0.36	0.40	0.45	0.45	0.41	0.26	0.49	0.45

Source: Agricultural Statistics, 2015, Ministry of Agriculture & Farmer Welfare, Government of India.

The land and environmental degradation and its sustainability is the result of intensive cultivation over the land surface and increasing population pressure on it. It was also

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proved that the introduction of the green revolution was successful due to the availability of fresh groundwater and a well-developed canal system in the area has made farmers dependent on groundwater for irrigation. The problem of groundwater depletion, contamination of water and land degradation was arrived due to excessive of use fresh groundwater and use of chemical fertilizers and pesticides during green revolution However, strategy for crop production applied during post green revolution period has substantially facilitated to enlarge cereal food output and heavy stocks in the country (Singh, 2009). Intensive use of innovative and new technology during the green revolution has led to the transform in the cropping pattern and intensity (Sarkar and Kumar, 2017). Moreover, unsustainableagricultural development leads to a higher level of environmental degradation and a decrease in soil quality.Table 2 presents changes in the cropping pattern of different crops during the periods of 1950-51 to 2016-17.

Population Growth and Degradation of Land and Water Resources

Proper crop rotation is the best means of managing soil productivity, crop yield and managing crop pests. The overall choice of crop rotation should be aimed at sustaining soil fertility or nutrients balance, meeting farmer's dietary needs. The problem of land degradation is needed to be effectively addressed, so its significance spread awareness among the people so that future policy on land management can facilitate a more sustainable and strong agricultural sector (NRSA, 1990).According to NBSS & LUP (2004), an estimate of 147 million hectares (Mha) of land has been affected from soil degradation in India, including 9 Mha from wind erosion, 14 Mha from flooding, 94 Mha from water erosion, 6 Mha from salinity , 16 Mha from acidification, and 7 Mha from a combination of different factors (NBSS & LUP, 2004).Now, the problem of soil degradation has considered one of the concernsin both rainfed and irrigated regions of the country due to the faulty cropping system, deforestation, industrialization, urbanization and pressure of increasing population to food and feed them. India is suffering from losing a huge amount of money on degraded lands.Groundwater is also

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one of the most important sources of water in India using 63% of total irrigation water and more than 80% of water for domestic use in the rural and urban areas (Das, et al., 2014). According to the UNESCO World Water Development Report, India is the largest groundwater extractor and user in the world. Nearly 54% of groundwater wells in India have recorded water depletion over the past decades, and more the 21 major cities are likely to drain out of groundwater by 2020 (Economic Survey, 2003). Therefore, India is facing the dual challenge, of satisfying the rising demand for groundwater on one hand and recharging water sourceson the other (Hira, et al., 2004). The underground water table is not only going down but the quality of freshwater is also changing into the saline water.

Conclusion

The land and waterresources of India have been exploited intensively without a proper strategy and take care of it. Presently, it is needed to a strategyof population control policy caring individual rights, and policies for sustainable use of the resource. There is a need to increase energy supplies with eco-friendly clean energy generated from innovative science and technology in order to protect the carrying capacity of the land and water resources. This is possible only if all individuals came forward to work together for achieving the goal of sustainable development through sustainable agriculture and by sustainable use of natural resources. There is a rapidincrease in an imbalance between availability and demand for land and water resources at the local level across the world. Many regions across the world are reaching the highest limits of their production capacity. Only a healthy ecosystem can mitigate change to solve that problem. Finally, only population growth is not responsible for the crisis of land and water resources. It is an aspect of the crisis and both of them are correlated to the irrational and unfriendly use of natural resources and destruction of livelihoods on it. Providing individual rights and reasonable access to resources in order to

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generatesustainable means of livelihood is the only solution to check the environmental degradation and the synchronized process of population control.

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