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POPULATION GROWTH IN RATNAGIRI DISTRICT OF MAHARASHTRA: A GEOGRAPHICAL STUDY

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ABSTRACT:

Population of a country or other area is the total number of people who live in it. Populations change as a result of migration and a process called natural increase. Natural increase is the difference between births and deaths. Most Countries have more births than deaths, and so their population increases, unless a net loss results from migration. In this paper the present study reveals the tahsil wise growth of population in Ratnagiri district during 1991-2011. The growth of population of Ratnagiri district from 1544057 in 1991 to 1615069 during 2011. It has studied on the basis of India reports, Socio-economic Statistical Abstract and Census Handbook. It occupies area of 8208 sq.km. According to 2011 census Ratnagiri district have shown negative population growth rate which was -4.81 percent so the Ratnagiri districts economically underdeveloped and it is the source area of migration to Mumbai metropolitan area, therefore causes slow growth of populating. The results have been discussed with the help of population growth rate refers to the change in population growth rate over a unit time period, often expressed as a percentage of the number of individuals in the population, at the beginning of that period.

Keywords: Population growth rate, Decadal Variations, Percentage.

Introduction:

Population of a country or other area is the total number of people who live in it. Populations change as a result of migration and a process called natural increase. Natural increase is the difference between births and deaths. Most countries have more births than deaths, and so their population increases, unless a net loss results from migration. The rapid increasing of population is a major problem in the socio-economic development of the region. The population is increasing at a very faster rate than the food grain production and its availability per head per annum. The large population size in area are directly affects resource available there e.g. reducing land-man ratio, shortage of food, water scarisity, shortage in electricity supply etc. From this point of view, the present study of population growth in

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Ratnagiri District has been undertaken.

Study Area:

Ratnagiri a coastal district of Maharashtra state. situated in the western coast of India Maharashtra and lies between 16^0 30'and 18^0 04' north latitudes and $73^0$02' east and $74^0$52' east longitudes It has north- south length of about 180 km and average east-west extension of about 64 km sahyadri hills surround it in the east beyond which there are Satara, Sangli and Kolhapur district Raigad district in the north the Arabian sea in the west and Sindhudurg district in the south. It has an area of 8,208 square km which constitutes 2.7 percent of the total area of the state. As per the 2011 census the total population of Ratnagiri districts was 16, 15,069 the district ranks 22 in the state in term of population.

Objectives:

The major object of this paper is to assess the population growth, decadal and spatial variation in population in Ratnagiri District of Maharashtra.

Database and Methodology:

The present study is entirely based on secondary data and study period for the year 1991 to 2011. The secondary data is collected from socio – economic review and District census hand book. The following formula is used to calculate the growth rate of population:

$$r = \frac{Pn - Po}{Po} \times 100$$

Where, r = Denotes growth rate of population.

Pn = Denotes current year population.

Po = Denotes base year population.

Population Growth in Ratnagiri District:

Table is revealed with percentage of Tahsilwise distribution of population from 1981 – 2011 in Ratnagiri district and it is observed that decadal growth rate of Ratnagiri and Guhagar tahsils were increased during the last two decades (1981 – 2001) But in 2001 –2011 decadal growth rate, Mandangad, Dapoli, Khed, Chiplun, Guhagar, Sangmeshwar, Lanja, Rajapur and in Ratnagiri shows negative population growth but only Ratnagiri Tahsil shows positive decadal growth rate. Ratnagiri is an industrial center as well as a district headquarters of the district were experiencing in migration and were recorded increasing growth rate. Guhagar was given urban status in 2001 that may be the reason for increasing Growth rate.

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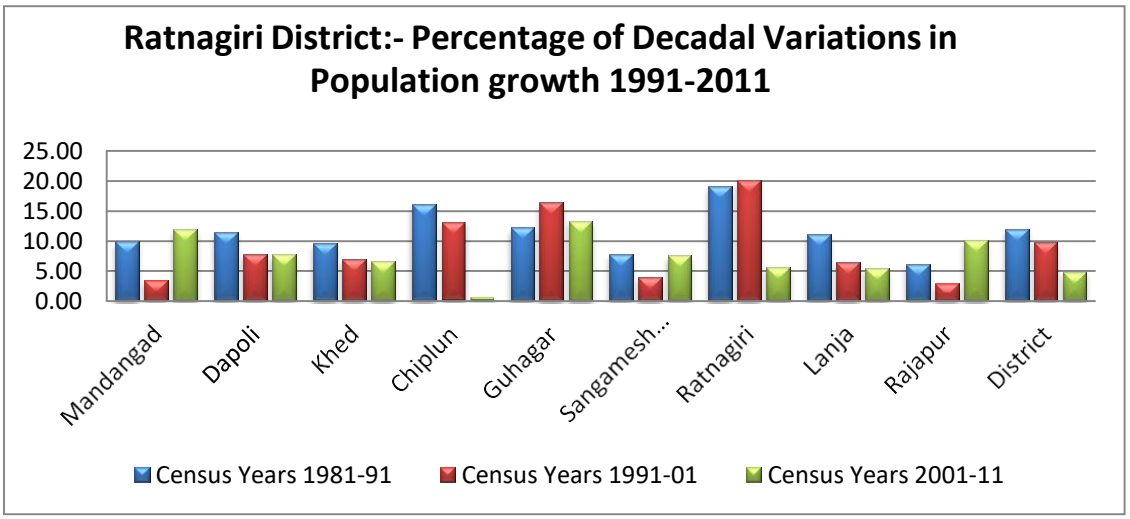
Table

Ratnagiri Distict: Percentage of Decadal Variations In Population Growth 1991 – 2011

Sr. No.	Tahsil	Census Years		
		1981 – 91	1991 – 2001	2001 – 2011
1	Mandangad	9.92	3.50	-11.99
2	Dapoli	11.48	7.90	-7.80
3	Khed	9.57	6.91	-6.63
4	Chiplun	16.10	12.99	-0.69
5	Guhagar	12.28	16.47	-13.39
6	Sangmeshwar	7.78	3.95	-7.66
7	Ratnagiri	19.14	20.10	5.68
8	Lanja	11.20	6.53	-5.45
9	Rajapur	6.13	2.90	-10.19
10	District	11.92	9.87	-4.81

(***Source:*** *Socio – Economic Report of Ratnagiri District)*

Graph



The Growth rate of all Tahsil is shows Negative Growth rate only Ratnagiri Tahsil shows positive Growth rate. The growth rate of population was low and Negative all tahsils due to lack of employment opportunities; people might have migration to nearby prospering areas.

Ratnagiri has the district with lowest rate of decadal growth during 1981 – 2011, but in 2011 the district were having negative growth rate of population and it is due to economically backwardness in the district hence people were entailed under such circumstances to me grate to prosperous areas like Mumbai, Suburban Mumbai, Thane, etc.

Conclusion:

The population of Ratnagiri district is constantly changing. These population changes represent peoples' adjustment to economic development, opportunities of employment,

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development of educational facilities, immigration and outmigration sources. According to 2011 census Ratnagiri district have shown negative population growth rate which was -4.81percent so the Ratnagiri districts economically underdeveloped and it is the source area of migration to Mumbai metropolitan area, therefore causes slow growth of populating. The Growth rate of all Tahsil is shows Negative Growth rate only Ratnagiri Tahsil shows positive Growth rate during last decade.

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2.0 Objectives

- To study the status of Indian agricultural sector and its trends.
- To elaborate the concept of sustainable agriculture.
- To examine the current situation of India agriculture at various dimension.
- To identify areas of intervention that could achieve sustainable agricultural growth.
- To find the future prospects and solution for India.

3.0 Role of Agriculture in Economic Development

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Agriculture plays an important role in economic development as well as it contributes to economic growth of a country (Ahuja, 2016). Agriculture's contribution to economic development has been classified into four categories: (a) product contribution; (b) factor contribution; (c) market contribution and (d) Foreign Exchange contribution.

(a) Product Contribution: Most of the developing countries depend on their own agriculture to provide food to be consumed by their population. However, there are few exceptions. Some countries such as Malaysia, Saudi Arabia have large exports based on natural resources which enable them to earn enough foreign exchange to import their food requirements for their people. Farmers in developing countries have to produce food over and above their subsistence needs so as to provide necessary food to their urban population. If the industrial and services sectors have to grow, the food requirements of the workforce employed in them have to be met by the marketable surplus of the farmers. As the industrial and services sectors develop further, the agricultural productivity and production must also rise to sustain the industrial development by feeding the industrial workforce. The marketable surplus must be extracted from the agricultural population to be used for the expansion of the industrial sector. Besides this, the significant increase in agricultural productivity will enabled agriculture to provide enough food to feed its increasing industrial workforce.

(b) Factor Contribution: Another contribution of agriculture to economic development is that it provides two important factors- labour and capital- for industrial growth (Mishra and Puri, 2015).The size of agricultural sector in developing countries is quite large as around 60 percent of their population is engaged in agriculture. Therefore, it can release a significant amount of labour to be employed in the industrial and other non-farm sectors. However, agriculture can release labour for industrial development if its productivity rises. In Lewis *"Model of Development with Unlimited Supplies of Labour"*, mobilization of surplus labour in agriculture for expansion of modern industrial sector and capital accumulation has to make for employment in expanding industries. The smaller the wages of labour, the lower will be the cost of industrial sector which will bring large profits to the industrialist which can be ploughed back for further industrial development and capital formation.

(c) Market Contribution: According to Ahuja (2016), the rapidly growing agricultural sector is a precondition for rapid industrial growth. The market contribution of agriculture means the demand for industrial products. In the earlier stages of development when urban sector is very small and markets for exports have yet been found, agricultural sector of the developing countries is a major source of demand or market for industrial products. The farmers often produce cash crops such as sugar, jute, cotton and from their sales they obtain money incomes which they can spend on industrial goods. Besides, farmers who have marketable surplus of food grains(cereals and pulses) sell them in the market from which they get money incomes which also become a source of demand for industrial goods. Unless the market or demand for industrial products expands, rate of industrial growth cannot be high. *According to World development Report (1979), "a stagnant rural economy with low purchasing power holds back industrial growth in many developing countries."*

(d) Foreign Exchange Contribution: The exports of agricultural products can also be a source of foreign exchange earnings. In the initial stages of economic development when industrial sector has not yet developed much, agriculture is a source of foreign exchange

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earnings from its exports of primary goods. The developing countries in the early stages of economic development often experiences shortage of foreign exchange or what has been called *'foreign exchange gap'* to meet the requirements of imports for industrial development. By contributing to foreign exchange earnings, it enables the developing countries to have access to imported goods needed for industrial growth which cannot be produced at home or can be produced at a higher opportunity cost. Thus agriculture can make significant contribution to economic development by earning foreign exchange required for importing industrial raw materials and capital goods required for expanding industries.

4.0 Review of Literature

Praduman Kumar and Surabhi Mittal (2006) in their paper "Agricultural Productivity Trends in India: Sustainability Issues" have examined various issues related to the trends in the agricultural productivity, particularly with reference to individual crops grown in the major states of India. They also examined the temporal and spatial variations of total factor productivity growth for major crops of India. The paper uses secondary data covering the period 1971-2000. The study suggested that an increase in agricultural investments, especially in research and development is urgently needed to stimulate growth in TFP.

Saroj Kumar Singh and Ankita Parihar (2015) in their paper "Challenges of Sustainable Agriculture Development in India" attempts to tackle and explore the issue of sustainable development in agriculture in India. The study aims to compare the sustainable agriculture system with the traditional system and the current system in practice. It also focuses on various dimensions of ecological, economic, and social sustainability. It tries to give long-term solutions to solve the problems plaguing the system so that sustainable practices can be promoted and practiced.

Bethu Sudhakar (2016) in his paper "Sustainable Agriculture Development in India: Issues & Challenges" aims to study the significance of the sustainable development in the field of agriculture byusing the secondary data. According to him, sustainable development in the areas of agriculture, forestry and fisheries sector willconserve the land, water, plant and animal genetic resources, isenvironmentally non-degrading, technically appropriate, economically viable and socially acceptable. Therefore, to achieve sustainable agriculture development the optimum use of natural resources, human resources, capital resources and technical resources are required.

P. Kareemulla et.al.in their paper "An Analysis on Agricultural Sustainability in India" tried to understand the regional and temporal dynamics of three dimensions of sustainability, using a state-level analysis for two time-periods i.e. 2001 and 2011. The sustainability index estimation was based on the human development index methodology. The results revealed that in general, sustainability did not deteriorate over the reference period, although some states gained and some others lost in terms of change in the level of sustainability.

Prakash kamble and Chavan Dipak (2018) in their paper "Sustainability of Indian Agriculture: Challenges and Opportunities" highlights the major challenges to secure sustainability of agriculture in India. Global warming and climate change have adversely affected the overall agriculture productivity and production in India. According to them, larger private sector participation in the entire value chain is needed for the food processing

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and distribution sector. Also there is an urgent need for agricultural diversification by identifying the key crops/ commodities which can help small farm holders to raise their income. The paper also suggests that the workforce which dependent on agriculture should be reduced. The Indian agriculture may be developing into a vibrant sector contributing substantially to the growth of New Age Indian economy and for its sustainable development.

According to V. Basil Hans (2019) it is necessary, to execute policies and programmes that are not only financially viable and technically feasible, but also ecologically sustainable. On the basis of the findings of study, an integrated farming system (micro, innovative and inclusive) approach for the state's agricultural sector is necessary.

5.0 Sustainable Agricultural Development

While starving for faster agricultural growth to meet the food requirements of growing population one must pay attention to the sustainability of agricultural growth. *Economists use the term sustainable development that ensures the balance between economic growth on the one hand and conservation of natural resources and protection of environment on the other (Ahuja 2016).* Therefore various measures should be adopted to prevent damages to the agricultural ecology and environment. This will ensure sustainable soil health, to prevent land degradation and to raise agricultural productivity.

*Sustainable agricultural development thus refers to meeting the needs of the present generation without compromising the needs of the future generation.*The adoption of a technology to generate higher agricultural growth and to ensure food security to the people will be unsustainable if it leads to the degradation of land and depletion of other natural resources. There is a need to devise a strategy of agricultural growth which effectively reconciles the objective of rapid growth of agriculture with the conservation of land and forests and protection of environment. It is worth mentioning that capacity to produce and quality of life of future generations depend on the natural resource base and quality of environment that is quality of land, water and air. Therefore, degradation of land and over-exploitation of other natural resources such as water and forests and pollution of the environment will though raise the short-term agricultural growth and provide food security to the present generation. But this will have adverse effects on future growth and quality of life of future generations. Such a process of agricultural growth will therefore be unsustainable.

Sustainability in agriculture means the land and resources that use for agriculture today should be handed over to the future generations in a sustainable form so that they can continue to practice agriculture and have food security. This means that we have to use lands, water resources, etc in such a manner that the future generations are also will be able to have sustainable development (Selvam, 015).

According to Hans Basil (2013), "Sustainable agricultural development seeks not only to preserve and maintain natural resources, butalso to develop them, as future generations would have much more demand quantity-wise and quality-wise for agricultural and food products. Such goals should ensure a balance with the development of livelihoods enjoyed by the individuals concerned. Livelihood should not be restricted to an indicator of sufficient income levels but should also include public health concerns and education standards".

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The issues of sustainable development can be discussed under three broad types of farming systems viz. traditional production system, modern agriculture system and sustainable agriculture system. Further, we can compare them across three dimensions, ecological, economic, and social sustainability.

5.1. Ecological Sustainability

Most of the traditional and conventional farm practices are not ecologically sustainable.According to B. Sudhakar (2016), they misuse natural resources, reducing soil fertility causing soil erosion and contributing to global climatic change. But sustainable agriculture has some major advantages over traditional practices:

5.1.1. Soil Fertility

Continuous fall in soil fertility is one of the major problems in many parts of India. Sustainable agriculture improves fertility and soil structure.

5.1.2. Water

Irrigation is the biggest consumer of fresh water, and fertilizer and pesticides contaminate both surface and ground water. Sustainable agriculture increase the organic matter content of the top soil, thus raising its ability to retain and store water that falls as rain.

5.1.3. Biodiversity

Sustainable agriculture practices involve mixed cropping, thus increasing the diversity of crops produced and raising the diversity of insects and other animals and plants in and around the fields.

5.1.4. Health & Pollution

Chemicals, pesticides, and fertilizers badly affect the local ecology as well as the population. Indiscriminate use of pesticides, improper storage etc. may lead to health problems. Sustainable agriculture reduces the use of hazardous chemical and control pests.

5.1.5. Land use Pattern

Over-exploitation of land causes erosion, landslides, and flooding clogs irrigation channels and reduces the arability of the land. Sustainable agriculture avoids these problems by improving productivity, conserving the soil etc.

5.2. Economic Sustainability

For agriculture to be sustainable, it should be economically viable over the long term (B. Sudhakar, 2016). Conventional agriculture involves more economic risk than sustainable agriculture in the long term. Sometimes governments are inclined to view export-oriented production systems as more important than supply domestic demands. This is not right. Focusing on exports alone involves hidden costs: in transport, in assuring local food security, etc. Policies should treat domestic demand and in particular food security as equally important to the visible trade balance.

It is a popular misconception that specific commodities promise high economic returns. But market production implies certain risks as markets are fickle and change quickly. Cheap foreign food may sweep into the national market, leaving Indian farmers without a market. As a World Trade Organization signatory, the Indian government is under pressure to

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deregulate and open its economy to the world market so it cannot protect its farmers behind tariff walls.

5.3. Social Sustainability

Social sustainability in farming techniques is related to the ideas of social acceptability and justice (B. Sudhakar,2016). Development cannot be sustainable unless it reduces poverty. The government must find ways to enable the rural poor to benefit from agriculture development. Social injustice is where some section of the society is neglected from development opportunities. Many new technologies fail to become applicable in agriculture sector due to lack of acceptability by the local society. Sustainable agriculture practices are useful because it is based on local social customs, traditions, etc. Because of being familiar, the local people are more likely to accept and adopt them.Moreover, sustainable agriculture practices are based on traditional know-how and local innovation. Local people have the knowledge about their environment crops and livestock.

Traditional agriculture is more gender oriented, where woman bear the heaviest burden in terms of labor. Sustainable agriculture ensures that the burden and benefits are shared equitably between man and woman. While conventional farming focuses on a few commodities, sustainable agriculture improves food security by improving quality and nutritional value of food, and by producing bigger range of products throughout the years. Traditional farming was also driven by the caste and wealth oriented people. The rich and higher castes benefitted more, while the poor and lower castes are left out. Sustainable agriculture attempts to ensure equal participation, which recognizes the voice and speech of every people.

6.0 Indian Agriculture Sector

As it can clear from the Table 1.1 that, there has been a slow and steady rise in productivity during 2000-01 to 2018-19 for most of the crops. The CAGR technique is used to find out the growth of various crops during the study period. However, as compared with other countries and as compared with the potential, actual productivity levels in agriculture continue to be very low.

Table 1.1 Yield Per Hectare of Major Crops (Kgs. per hectare)

Crop	Rice	Wheat	Jowar	Bajra	Maize	Pulses	Foodgrains	Oilseeds	Cotton	Jute
2000-01	1901	2708	764	688	1822	544	1626	810	190	2026
2010-11	2239	2989	949	1079	2540	691	1930	1193	499	2329
2011-12	2393	3178	957	1171	2478	699	2078	1133	491	2389
2012-13	2462	3117	850	1198	2566	789	2079	1168	486	2396
2013-14	2416	3145	957	1184	2676	764	2120	1168	510	2639
2014-15	2391	2750	884	1255	2632	728	2028	1075	462	2549
2015-16	2400	3034	697	1132	2563	656	2042	968	415	2457
2016-17	2416	3145	957	1184	2676	764	2120	1168	510	2639
2017-18	2576	3368	960	1231	3065	853	2235	1284	443	2517

2018-19	2659	3507	979	1242	2966	806	2299	1265	386	2467
CAGR	**3.93**	**3.98**	**1.69**	**5.94**	**6.27**	**3.06**	**4.74**	**4.61**	**5.02**	**2.73**

Source: Government of India, Economic Survey, 2019-20, volume II, Statistical Appendix, Table 1.17, p. A 36.

Agricultural Productivity in Comparison with other countries

A comparison of productivity levels in Indian agriculture with the levels of other countries shows how the productivity in Indian agriculture is. Table 1.2 compares the productivity of some crops in India with their productivity in some other countries.

Table 1.2 Productivity of Land is some countries, 2016 (kgs/hectare)

Rice/Paddy		Wheat		Maize	
Indonesia	5236 (10.49)	China	5396 (17.79)	USA	10960 (34.97)
India	**3790 (21.65)**	**India**	**3034 (12.32)**	China	5967 (23.96)
Bangladesh	4586 (6.67)	Russia	2684 (9.79)	Brazil	4288 (5.83)
Myanmar	3818 (3.40)	USA	3531 (8.39)	Argentina	7443 (3.62)
China	6866 (27.92)	Canada	3470 (4.29)	Mexico	3718 (2.57)
Thailand	2854 (3.52)	France	5304 (3.94)	**India**	**2616 (2.35)**
Brazil	5464 (1.40)	Germany	7641 (3.27)	Indonesia	5306 (2.14)
World	**4577 (100.0)**	**World**	**3401 (100.0)**	**World**	**5632 (100.0)**

Pulses		Sugarcane		Groundnut (in Shell)	
India	**588 (21.75)**	Brazil	75180 (41.29)	China	3678 (36.43)
Canada	2011 (9.75)	**India**	**70394 (18.72)**	USA	4073 (5.64)
Myanmar	1508 (7.88)	China	73620 (5.55)	**India 1287 (16.62)**	
China	1732 (5.41)	USA	80033 (1.57)	Myanmar	1590 (3.50)
USA	2034 (4.09)	Mexico	72270 (3.03)	Argentina	2929 (2.23)
Russia	1750 (3.53)	Australia	76929 (1.85)	Cameroon	1647 (1.66)
Australia	1197 (2.89)	Colombia	86399 (1.87)	Sudan	789 (4.07)
World	**958 (100.0)**	**World**	**70134 (100.0)**	**World**	**1606 (100.0)**

Source: Government of India, Agricultural Statistics at a glance, 2018 (New Delhi, 2019), New Delhi, Table 7.1, pp 218-220. Figures in parentless are percentage of world production.

As it can clear that from the above table that, productivity of wheat in India is 48 percent of the productivity in UK and 64 percent of the productivity of China. As far as rice is concerned, productivity in India is 55 percent that is half of the productivity in China and 45 percent of the productivity in USA. The productivity of maize in India is around 44 percent of the productivity in China and Argentina and just one-third as compared with USA. Similar conclusions holdfor most of other crops not included in the table.

Information on India's global rank in major agricultural crops is still more revealing. India happen to be one of the largest growers and produces of the moist of the agricultural crops but ranks very low in terms of yield. For instance, it has the largest area under rice and wheat

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in the world and is the second largest producer of these crops. However, in terms of productivity, its rank is only 52nd in the world in rice and 38th in wheat. It has the largest area under pulses in the world and is also the world's largest producer of pulses, but in terms of productivity is a lowly 138th in the world.

Potential and Actual Productivity

Not only is productivity in Indian agriculture lower than that in other countries, it is much lower than potential. This would be clear from Table 1.3.

Table 1.3 Potential and Actual Productivity (kgs per hectare)

Crop	Potential	Actual (2018-19)
Rice	4000/5810	2659
Wheat	6000/6800	3507
Jowar	3000/4200	979
Maize	6000/8000	2966
Cotton	700/850	386
Jute	2500/3000	2467
Sugarcane	96000/112000	78000

Source: Government of India, Economic Survey, 2019-20, volume II, Statistical Appendix, Table 1.17, p. A 36.

Even in case of wheat, the actual productivity in 2018-19 was only 3507 kgs per hectare as against the potential of 6000/6800 kgs per hectare. In case of rice, the actual productivity in 2018-19 was only 2659 kgs per hectare as against the potential of 4000/5810 kgs per hectare. The same story holds for all other crops.

Per Capita Net Availability of Foodgrains (per day) in India:

The sufficient and timely availability of food grains is one of the agenda of the government policy. But it has been observed that there is a huge difference between the food grain production and its availability to masses. The foodgrain availability during 2000 to 2018 has given in the following table. The food grain availability in kilo gramper year and gram per day has given as follows.

Table 1.4 Per Capita Net Availability of Foodgrainsin India

Year	Foodgrains (Kgs per year)	Year-on-year Growth rate	Foodgrains (Grams per day)	Year-on-year Growth rate
2000	165.9	---	454.4	---
2001	151.9	-0.09	416.2	-0.09
2002	180.4	0.16	494.1	0.16
2003	159.7	-0.13	437.6	-0.13
2004	168.9	0.05	462.7	0.05
2005	154.2	-0.10	422.4	-0.10
2006	162.5	0.05	445.3	0.05
2007	161.6	-0.01	442.8	-0.01

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2008	159.2	-0.02	436.0	-0.02
2009	162.1	0.02	444.0	0.02
2010	159.5	-0.02	437.1	-0.02
2011	170.9	0.07	468.2	0.07
2012	169.3	-0.01	463.8	-0.01
2013	179.5	0.06	491.9	0.06
2014	178.6	-0.01	489.3	-0.01
2015	169.8	-0.05	465.1	-0.05
2016	177.7	0.04	486.8	0.04
2017	178.4	0.00	488.7	0.00
2018	180.3	0.01	494.1	0.01
CAGR	**0.003541**		**0.003547**	

Source: Government of India, Agricultural Statistics at a glance, 2018 (New Delhi, 2019), New Delhi, Table 10.2, pp 250-251.

The table no.1.4 reveals food grain availability in India has grown by 6.16 % during the period 2000 to 2018. The highest availability of kg. Per year existed in year 2002 and lowest inthe year 2001. The considered period shows less increase in food grain availability in India. The food grain availability gram per day also increases 8.11% during the study period. Thus both indicators suggest that the real task that the production targets should be expanded and there should be sustainable increase in availability of food grain to masses of India.

8.0 Challenges before Indian agriculture

Land Degradation

Nature takes about 300 years to form 1 cm of top soil. It is a matter of concern that 5.3 billion tons of soil gets degraded annually in India. Soil loss is about 16.4 tons per ha, annually. ICAR reported that out of the total geographical area of 328.73 million hectares, about 120.40 million hectares (37 per cent) were affected by various kinds of land degradation.

Irrigation Potential

Out of the total geographical area of 329 million hectares of the country, the total cropped area is about 194 million hectares, out of which net sown area is only about 140 million hectares. Only about 66 million hectares, i.e., 47.6 per cent of the net sown area, is reported as irrigated. There is a need to bring more cropped area under assured irrigation to increase agriculture productivity and production.

Excessive & distortive use of Chemical Fertilizers

Chemical fertilizer use has seen rapid expansion and intensification in India. The average consumption of fertilizers in India rose from 105.5 kg per ha in 2005-06 to 128.34 kg per ha in 2012-13.A common belief is that the ideal balance among N, P and K in India is 4: 2: 1. In 2012-13, the proportions stood at 8.2:3.2:1.

Excessive Use of Pesticides

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Although in per hectare terms pesticide use in India is much lower than in other countries, especially developed ones, pesticide residues in produce in India have been found to be high.

Wasteful use of ground water

Groundwater accounts for about 60% of the irrigated area. Heavy subsidies in electricity consumed for agriculture have tended to encourage wasteful use of energy and water. This has also encouraged farmers to overdraw water from deep aquifers, causing substantial depletion of the water table and deterioration of water quality in many cases.

9.0 Measures for sustainable agriculture:

In the word of Swaminathan (2003), "Agriculture in most developing countries is not just a food producing machines but is the backbone of the livelihood security system." We explain below the measures that should be adopted to prevent damages to the agricultural ecology and environment and therefore to ***ensure sustainable soil health, to preventland degradation and to raise agricultural productivity.***

Soil is one of the basic natural resources that support life on earth and this resource is under threat in India from soil erosion due to natural factors compounded by excessive use of fertilizers and deforestation which causes floods. The soil ecosystem is a living self-balancing system and excessive use of chemical fertilizers disturbs the balance often causing long-term damage to soil. Thus ***chemical fertilizers*** should be used with great care and in combination with other means of using organic sources to replenish the soil.

For sustainable agriculture the ***best practices of soil fertility management*** need to be adopted which include generation of biomass for bulk addition of organic matter in the soil to maintain proper soil health through degeneration of biomass through sole cropping/intercropping/ bund cropping of green manure crops. There is a need for the adoption of biodynamic farming methods and crop rotation to enrich the soil.

Land is a fixed resource and its availability in India on per capita basis is relatively low compared with most countries. It is therefore of paramount importance that for sustainable agricultural growth, rational and proper use of land is made. Besides, India's population is likely to continue to grow till at least 2040 whereas the landmass may actually shrink with the increased coastal erosion and flooding due to climate change. In these circumstances, ***rational and planned use of landmass*** must be an issue that needs the highest priority in our strategy of agricultural development.

There is a large scope for improving water use in our economy. Agriculture consumes around 50 percent of our available water resources at present and its water use efficiency is among the lowest in the world, expressing concern over this inefficiency of water use, the Planning Commission writes, "Absence of rational pricing for canal water, combined with free or very cheap power for agricultural practices which are extremely wasteful, cheap power has encouraged excess drawal of ground water leading to falling of water tables in large part of the country". Thus there is urgent need for the ***optimum use of available water***for sustainable agricultural development.

10.0 Conclusion

Sustainable agriculture in most developing countries is not just a food producing machine but is the backbone of livelihood security system. Degradation, diversion of arable land and the

depletion and pollutions of water resources result in the loss of rural households. Sustained agricultural development represents best safety net against poverty, hunger and unemployment. Unsustainable land and water use and forests will lead not only to the food insecurity of the people but also adversely affect the rural people. The principle of food security focuses on availability of food which depends on the production of food in turn depends on agricultural productivity.So it follows from the above that sustainable agriculture is a guarantee for ensuring food security to the people of a country.

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