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Status And Growth Performance Of Indian Agriculture- A Spatial And Temporal Analysis.

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Abstract

This paper sheds some light on the status of Indian agriculture over the past two decades (post 2000s). The attempt is to make a state-specific, spatial and temporal analysis of the growth of agricultural outputs and use of inputs in India. A state-specific and zone-wise as well as crop-specific analysis of agriculture sector is made based on secondary data. Further, the study attempts to examine the inter-state disparities (if any) in growth of gross cropped-area and yield of total food-grains in India. Also, we examine if there exists any state-specific or zone-specific disparity in irrigation, credit and fertilizer use in agriculture. On the basis of the observations, the study tries to identify the constraints as well as drivers for future growth in the agricultural sector of India.

Key words: agriculture, irrigation, input, output, growth.

Introduction

In India, agriculture has witnessed an impressive trajectory from a food deficit country, to a food sufficient country and eventually to a food surplus country. Agriculture, along with its allied activities is undoubtedly the backbone of India and the largest livelihood provider (to around 50% of population) in its vast rural areas. The rural areas are more vulnerable to development tailbacks like unemployment, poverty, underemployment etc. Sustainable agriculture, in terms of food security, rural employment, and environmentally sustainable technologies such as soil conservation resource management and use of sustainable technology, are essential for a holistic development of rural India. Thus, despite concerted industrialization in the country, agriculture remains vital for the development of the rural areas as well as development of the economy as a whole.

Agriculture's contribution to GDP of India has also been large. GDP from Agriculture in India averaged 4228.15 INR Billion from 2011 until 2020, reaching an all-time high of 6098.83 INR Billion in the fourth quarter of 2019. Its contribution to GDP of the country has however decreased to 3802.39 INR Billion in the third quarter of 2020 from 4546.58 INR Billion in the second quarter of 2020, (Ministry of Statistics and Programme Implementation, MOSPI). In the long-term, the India GDP from Agriculture is projected to trend around 4292.00 INR Billion in 2022 and 4593.00 INR Billion in 2023. The growth rate of Gross Value Added (GVA) at constant basic prices for Q2 of 2017-18 was6.1 per cent as compared to 6.8 per cent in the corresponding period of previous year. At the sectoral level, GVA of agriculture, industry and services sectors grew at the rate of 1.7 per cent, 5.8 per cent and 7.1 per cent respectively in Q2 of 2017-18.

Review of Literature-

This section of the study attempts to review some of the research done in the area of Indian agriculture, more specifically in the post-green revolution period. Studies on status and growth of Indian agriculture started early in 1960s.

In a study carried out by Chatterjee, Amiyamoy, the growth of production and productivity of some major cereals, pulses and non-food crops was analysed for the time period 1950-51 to 1962-63. The results of his analysis revealed that the output of food-grains increased at the rate of 3.6% per annum during 1950-51. Production of cotton was found to be increasing whereas that of jute was found to be unchanged in the study period.

In a similar study by Dey, A K, growth rates of food-grains production and total agricultural growth was analysed for the period 1949-50 to 1973-74. His study found that since 1950s, there was a common trend which could be interpreted in two ways like-having a diminishing rate or having a constant rate over time.

Singh, C B and Sirohi, A S made a comparative study of the growth rates in the pre-green revolution period and post-green revolution period in India. They examined the growth rates of agriculture in the two periods over time and across different states of India. They calculated the compound annual growth rates of agricultural production and productivity and found that there exists huge disparities in the growth rates across different Indian states.

Singh I J, K N Raj and J C Karwasra examined the spatial and temporal performance of food-grains and non-food grains by calculating the compound annual growth rates of area, production and productivity of the crops. The time period of the study was 1960s to 1990s. The results of their study indicates that there has been an increase in the growth rates of food-grains. In terms of states, Haryana, Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh and Tamil Nadu performed better than others.

Research Gap in existing literature-

The review of existing literature makes it clear that there are very few studies in India carried out to analyse the instability and growth performance of Indian agriculture. Most of the existing studies are concentrated around the green revolution period or a decade or two before the onset of green revolution. The status of Indian agriculture in the recent years is yet to be analysed in many studies. Thus, the present study aims at bridging the gap in existing literature by analysing the present status and growth performance of agriculture (input as well as output) in the more recent years i.e. in the 2000s. We also attempt to make a spatial and crop-specific analysis across the states of India to get a clear view at the disaggregate level.

Objectives- The specific objectives of this paper are to examine the growth of area and productivity of total food-grains in India since the 2000s and to analyse the use of agricultural inputs in India. The major objective is to make a crop-specific, spatial and temporal analysis of the present status and growth of Indian agriculture and to identify the underlying constraints as well as prospect for future growth of the agricultural sector of India

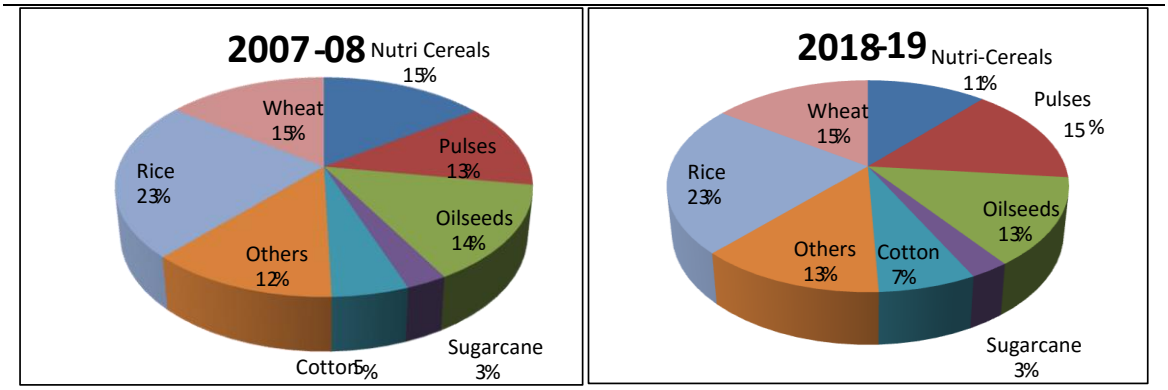
Data and Methodology- Secondary data for the time period 2001-02 to 2019-20 is taken from various government sources like*:* Directorate of Economics & Statistics Department of Agriculture, Cooperation & Farmers Welfare, Reserve bank of India's database on Indian economy and various government reports, publications and empirical studies**.** The study is descriptive in nature. Simple growth rates and percentages are calculated and graphs and tables are used to analyse the objectives.

Analysis: Section 1-

Status of Agricultural output in India-

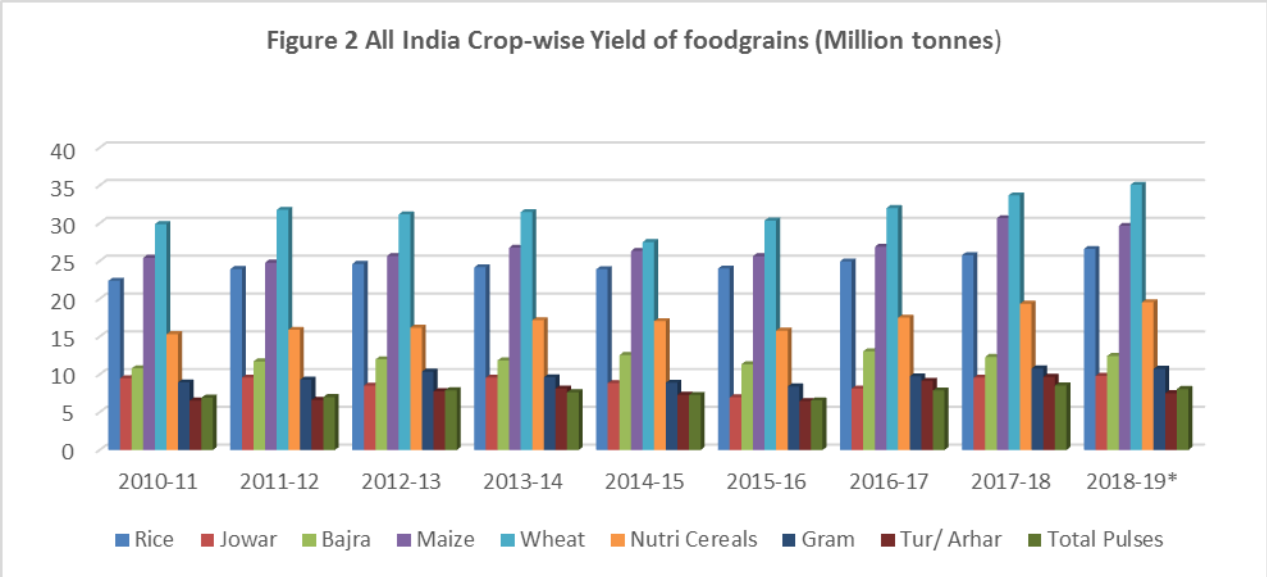
In this section of the study we try to analyse the status of gross cropped area and yield per hectare (termed together as agricultural output), of major crops in India post 2000s. Figure 1 reflects the changes in percentage share of area under major during the time period 2007-08 to 2018-19. It is seen that there has not been any significant changes in the percentage share of area under major crops except for a few crops. There has been a decrease in the area under nutri-cereals from 15% to 11% during the two periods. Area under oilseeds also decreased from 14% to 13%. In case of cotton and pulses there has been a slight increase in percentages share of area, 5% to 7% for cotton and 13% to 15% for pulses during the study period.

Figure 1- Changes in Percentage Share of Area under Major Crops in India

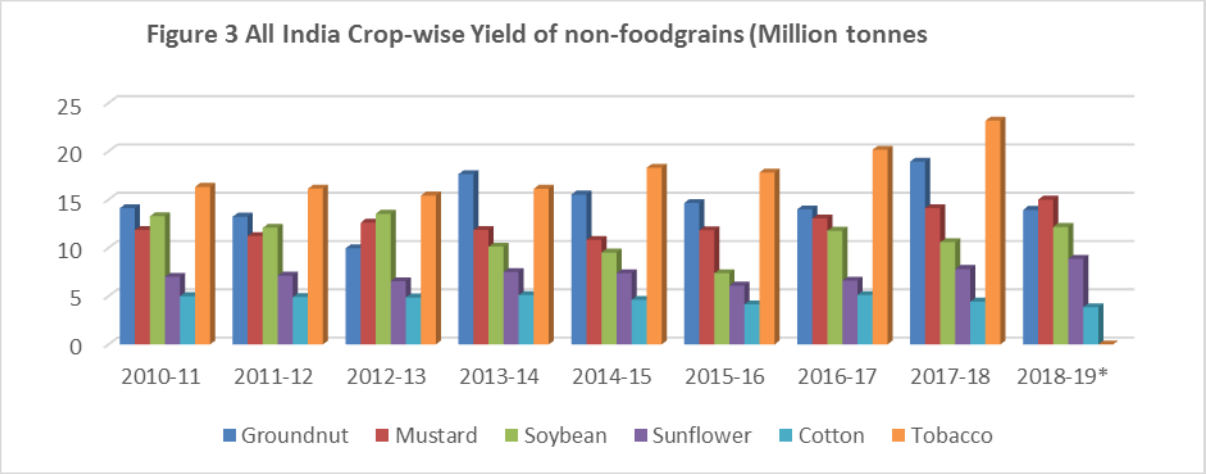


Source: Directorate of Economics & Statistics

Figure 2 and 3 shows all India crop wise yield (in million tonnes) of food-grains and non-food-grains respectively from the year 2010-11 to 2018-19. In case of food-grains, the highest yield is seen in wheat, followed by rice and maize. The lowest yield in million tonnes are seen in crops like pulses like tur, arhar and crops like jowar etc. In case of non-food-grains (figure 3), highest yield is seen in crops like tobacco, groundnut and mustard, whereas lowest yielding crops are cotton sunflower. Over the study period, however, there is little change in the average yield of both food-grains and non-food-grains in India.



Source- Author's based on data from Directorate of Economics and Statistics



Source- Author's based on data from Directorate of Economics and Statistics

Growth of agricultural output in India-

As mentioned in the previous section, by agricultural output, we denote gross cropped area and yield of food-grains (and or non-good grains) of India. In this section, we calculated the Compound Annual Growth Rates (CAGR) state-wise for Gross cropped area (thousand hectares) and yield (kg per hectare) of total food grains. For calculating CAGR we considered the time period 2007 to 2015 for gross cropped area and from 2011 to 2019 for yield (based on availability of data). Table 1 shows the results of the growth rate across the states of India. In case of Gross cropped area, the highest growth is seen in case of states like Andhra Pradesh, Chhattisgarh, Kerala, Maharashtra, Madhya Pradesh etc. In case of yield, positive CAGR was seen in states of Arunachal Pradesh, Madhya Pradesh, Puducherry, Jammu and Bihar. The factors behind growth and disparity in agricultural output is discussed in the later part of the study.

TABLE 1- STATE-WISE CAGR OF GROSS CROPPED AREA AND YEILD OF TOTAL FOODGRAINS

STATES/UNION TERRITORIES	**GROSS CROPPED AREA (THOUSAND HECTARES)**		**CAGR**	**YEILD (KG PER HECTARE)**		**CAGR**
	2007	**2015**	**2007-2015**	**2011**	**2019**	**2011-2019**
Andhra Pradesh	12811	7690	157%	2530	1945	-3%
Arunachal Pradesh	271	299	92%	1663	2694	6%
Assam	3763	4083	93%	1763	1600	-1%
Bihar	7719	7673	101%	1479	2078	4%
Chhattisgarh	5732	5728	100%	1424	2402	7%
Delhi	43	35	120%	3896	3567	-1%
Goa	172	158	108%	2264	2469	1%
Gujarat	11807	12773	93%	1843	2134	2%
Haryana	6394	6536	98%	3526	3981	2%
Himachal Pradesh	944	918	103%	1787	2049	2%
Jammu and Kashmir	1126	1178	96%	1639	2178	4%
Jharkhand	1649	1554	105%	1257	1623	3%
Karnataka	12438	12247	101%	1684	1422	-2%

Kerala	2918	2625	110%	2400	2890	2%
Madhya Pradesh	20113	23810	86%	1162	1970	7%
Maharashtra	22571	23474	97%	1184	1071	-1%
Manipur	225	383	62%	2244	1688	-3%
Meghalaya	246	343	74%	1803	1835	0%
Mizoram	91	145	66%	1246	1691	4%
Nagaland	406			1902	1664	-2%
Odisha	8960	500	130%	1432	1766	3%
Puducherry	36	5173	1%	2351	3345	5%
Punjab	7861	27	100%	4280	4658	1%
Rajasthan	21534	7857	245%	1250	1437	2%
Sikkim	123	24235	11%	1448	1669	2%
Tamil Nadu	5843	136	229%	2393	2972	3%
Tripura	.	5995		2587	2673	
Uttar Pradesh	276	5315	11%	2386	2803	0%
Uttarakhand	25415	483	338%	1841	2247	2%
West Bengal	1210	26147	7%	2601	2938	3%

Source-Author's calculations based on data from Reserve Bank of India database

Section 2-Status of agricultural input use in India-

In this section, we attempt to make a spatial and temporal analysis of the status of use of agricultural inputs in India. Here, we consider three significant variables for representing agricultural inputs-

- Gross Irrigated Area (thousand hectares.),
- Agricultural Credit disbursement by commercial banks (Per hectare)
- Consumption of Fertilisers in terms of Nutrients (N, P & K), Kgs per hectare

Table 2 represents state wise gross irrigated area (thousand hectares) for the time periods 2005 and 2015, and agricultural credit disbursement by commercial banks (per hectare) for the time period 2004 to 2016. Gross irrigated area has increased from 2005 to 2015 for many states like Bihar, Gujarat, Madhya Pradesh, Maharashtra, Rajasthan etc. while it has slightly decreased for other states like Delhi, Mizoram, Puducherry. In case of credit disbursement, the highest credit receiving states are Delhi, Kerala, Tamil Nadu and Uttar Pradesh.

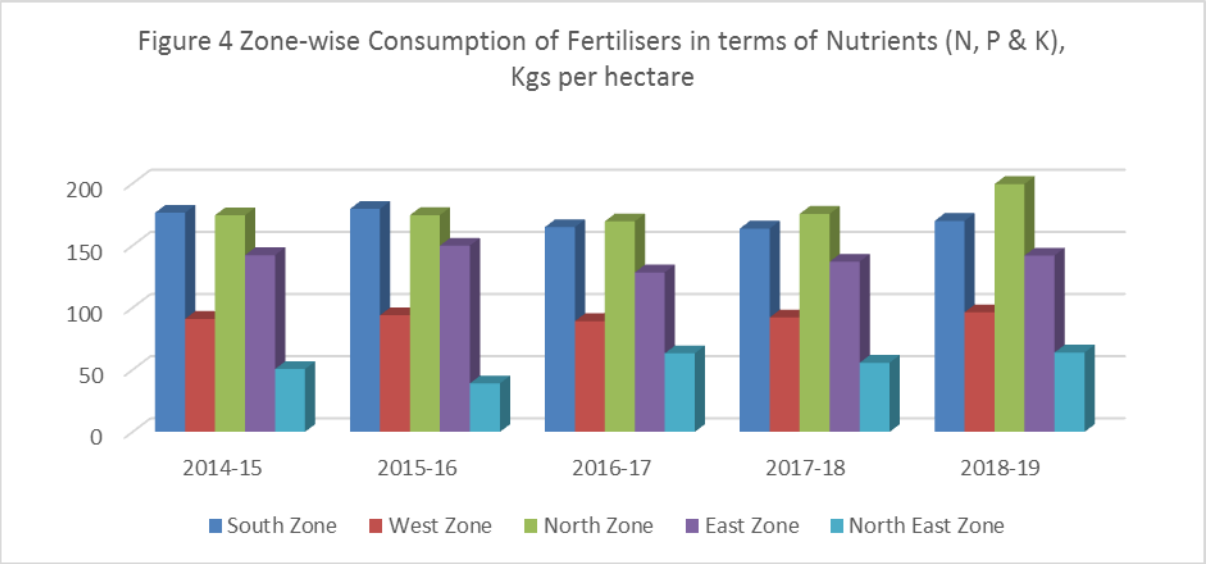
TABLE-2 STATE WISE GROSS IRRIGATED AREA AND AGRICULTURAL CREDIT

YEAR / STATES	**2005**	**2015**	**2004**	**2016**
	Gross Irrigated Area (thousand hectares.)		**Per hectare. Credit disbursement (commercial banks)**	
Andhra Pradesh	4987	3886	8733.6	109001.5
Arunachal Pradesh	49	56	-	3322.2
Assam	171	374	1283.3	23152.7
Bihar	4197	5268	2567.9	39751.7
Chhattisgarh	1312	1787	1399.5	19148.9
Delhi	34	29	1086956.6	4241379.3
Goa	40	39	5917.1	44585.9
Gujarat	4280	6014	3997.5	38882.1
Haryana	5434	5824	6225.6	60675.8
Himachal Pradesh	183	193	4197.2	63236.8

Jammu and Kashmir	453	504	2722.3	47454.7
Jharkhand	163	221	2857.1	33664.4
Karnataka	3328	4186	8471.6	72945.2
Kerala	455	470	14895.0	195205.4
Madhya Pradesh	6193	10301	2728.9	21295.4
Maharashtra	3990	4282	4506.5	3720.1
Manipur	54	69	-	9153.3
Meghalaya	74	128	3676.4	29702.9
Mizoram	19	21	-	15957.4
Nagaland	104	106	-	3968.2
Odisha	2691	1485	1620.9	37476.5
Puducherry	32	22	-	653846.1
Punjab	7702	7757	7082.3	78760.1
Rajasthan	7093	10171	2538.7	26385.2
Sikkim	11	12	-	7299.2
Tamil Nadu	3087	3394	17118.1	192295.0
Tripura	108	2529	3533.5	3474.3
Uttar Pradesh	18939	116	4051.1	2216049.3
Uttarakhand	549	20965	4909.9	2785.9
West Bengal	5339	542	3933.3	272391.505

Source: irrigation data-Department of Agriculture, Cooperation & Farmers Welfare
Credit data-Reserve Bank of India Database.

In figure 4, the zone wise consumption of fetilizers (N, P, K) are shown. In India, the states are categorized into five different zones which are given in table-3 for reference.



In consumption of fertilizers, the south zone and the north zone are the leading zones followed by east zone. West Zone and North east zone are among the lowest consumers of fertilizers in India. It is evident from figure 4 that over the years i.e. from 2014-15 to 2018-19, there has been little change in average consumption of fertilizers in India.

TABLE 3 ZONE WISE DISTRIBUTION OF INDIAN STATES

SOUTH ZONE	Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Puducherry Andaman and

	Nicobar Islands, Lakshadweep
WEST ZONE	Gujarat, Madhya Pradesh, Chhattisgarh, Maharashtra, Rajasthan, Goa, Daman & Diu, Dadra & Nagar Haveli
NORTH ZONE	Haryana, Punjab, Uttar Pradesh, Uttaranchal, Himachal Pradesh, Jammu and Kashmir, Delhi, Chandigarh
EAST ZONE	Bihar, Jharkhand, Odisha, West Bengal
NORTH EAST ZONE	Assam, Tripura, Manipur, Meghalaya, Nagaland, Arunachal Pradesh, Mizoram, Sikkim

Results and Observation-Spatial disparity in Indian agriculture-

From the analysis, it is evident that there is considerable spatial disparity in growth of agricultural output and use of inputs in different regions/states in India. Such disparity exists due to the differences in the agro-climatic conditions, infrastructure and socio-economic factors, resource endowment and level of development of these regions. As stated earlier, India is divided into the eastern, northern, southern, north-eastern and western regions.

The Northern region, including the states of Punjab, Haryana, Uttar Pradesh etc. specializes in intensive grain production. In terms of both area and value, wheat is the most important crop, followed by rice. Together they account for 62 percent of the cropped area and 56 percent of the value of crop output. Almost three-quarters of the cropped area is irrigated, compared to less than 40 percent in the other regions. Also use of fertilizer in the Northern region (Figure-4), is highest and only slightly less than in the Southern region.

The Eastern region comprises of the states- Bihar, Jharkhand, Odisha, West Bengal. The major characteristic of this region is relatively high rainfall, widespread rice production, and a population density that is almost twice the national average. Rice accounts for almost 60 percent of the cropped area and 41 percent of the value of crop. Fruits and vegetables are the second most important crop in this region.

The Western region, comprising of states like Gujarat, Madhya Pradesh, Chhattisgarh, Maharashtra, Rajasthan etc. is the most urbanized and characterized by relatively low rainfall, low population density in which oilseeds (particularly groundnuts and rapeseed), wheat, and fruits and vegetables are the most important crop categories in terms of value. Production tends to be less intensive, with less irrigation and lower fertilizer use per hectare than any other region, (Table-2, Figure-4).

Rice is the most important crop in the South Zone, followed by oilseeds, fruits and vegetables, and spices. The states in the South Zone are- Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Puducherry Andaman and Nicobar Islands, Lakshadweep. Production is relatively intensive, with the highest fertilizer use (see Figure 4) and the second-highest share of irrigated land (Table-2) among the four regions.

Agriculture is an important sector in the economy of the North Eastern zone. It comprises of states Assam, Tripura, Manipur, Meghalaya, Nagaland, Arunachal Pradesh, Mizoram, Sikkim. The population dependent on agriculture remains very high, as a result, agriculture in the region has not been able to generate surpluses. Moreover, the region is most vulnerable to climatic factors like natural calamities, large number of smallholders, low intensity agri-inputs.

What are the drivers of growth in India's agriculture-?

Based on the observations and analysis made in this study and from review of many theoretical and empirical studies, we identify the drivers of agricultural growth in India. We also try to throw some light on the

deficiencies and constraints faced by the agricultural sector which leads to disparities in production, yield and use of inputs across the states of India.

1. *Adoption of advanced technology*-. From being a food deficit to a food surplus country, (Food-grain production rose from 74 million tons in 1966-67 to 213 million tons in 2001-02, Government of India 2004), India has passed through many revolutions in agriculture like the green revolution, white revolution, blue revolution etc. These revolution brought into picture, the adoption of advanced technology like use of HYV seeds, irrigations, fertilizer consumption, pesticides and mechanisation in agriculture. Technology was the prime mover of growth in yield during the 1980s. Lack of availability and access to advanced technologies in many parts of India has been contributing to stagnant agricultural growth and decline in productivity in the sector.

2. *Massive investment*-Increase in investment in the agriculture sector has the power to ensure food security and nutrition goals and combat social evils like poverty, unemployment. Investment in agriculture generates wide variety of benefits like technology transfer, increase in yield, access to capital, access to markets and so on and so forth. Insufficient investment thus leads to deceleration in the pace of agricultural growth.

3. *Appropriate institutions*- Appropriate institutions in agriculture implies provision of agricultural credit, extension services etc. Provision of timely credit, subsidies and extension services and training to farmers forms the basis of agricultural growth and development.

4. *Policy support*- Leftover and non-implemented policies since the period of food deficit in India has been blocking potential growth opportunities in the country's agriculture sector which is under significant adjustment pressure related to market liberalization and globalization. Policies like the National Agricultural Policy (NAP), 2000 targeted a growth rate exceeding 4 percent per annum in agriculture sector (Government of India 2002). It envisaged a technology-led and demand-driven growth to benefit widespread rural population and sustain soil and water resource. But, unfortunately, targets like this are rarely achieved.

Concluding remarks-

The paper made an attempt to analyse and describe the status of agriculture in India post 2000s. For the purpose, both agricultural input as well as output is considered. A spatial and temporal analysis has been carried out to provide a comprehensive as well as disaggregate picture of the agricultural status. Also, crop-specific analysis has been made in certain sections. Using simple graphs, tables, percentages and growth rates, we arrived at the conclusion that there exists disparity in agricultural yield and input use across the states of India. The reason behind this is identified as inherent diversities in the characteristics of the states as well as deficiency in investment, lack of access to advanced technology, inadequate institutional support and left-over policies. For development of the agriculture sector, all these constraints needs to be taken care of while keeping in mind the region-specific differences that exists in India

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