ISSN PRINT 2319 1775 Online 2320 7876

Journal Volume 10,Iss 10, 2021

AN ANALYSIS OF TREND AND PATTERN OF FOOD GRAINS PRODUCTION IN SOUTH INDIA

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Abstract

Agriculture sector alone represents 23 per cent of India's Gross National Product (GNP), plays a crucial role in the country's development and shall continue to occupy an important place in the national economy. In India, average food consumption at present is 550 g per capita per day, whereas in China and USA are 980 and 2850 g, respectively. Kharif crops are frequently sown with the commencement of the first rains in July, during the south west monsoon. The Rabi crops are sown around mid-November, after the monsoon rains are over, and harvesting begins in April/May. The crops are grown either with rainwater that has percolated into the ground, or with irrigation. The objective of this study is to examine the trend of food grain production during Kharif and Rabi seasons in South India and find out the problems associated with climate change on food grain production in South India. Climate is the primary determinant of agricultural productivity which directly impact on food production across the globe. Food production systems are extremely sensitive to climate changes like changes in temperature and precipitation, which may lead to outbreaks of pests and diseases thereby reducing harvest ultimately affecting the food security of the country.

Keywords: Agriculture Sustainability, Climate Change, Kharif, Rabi, Food Security.

Introduction

Agriculture production is straightforwardly based on climate change and weather. Feasible changes in warmness, rainfall and CO_2 inclusion are conventional to extensively collision crop augmentation. In common impact of weather change on wide-reaching food manufacture is thorough to be low to well thought-out with victorious changed reproduction and satisfactory irrigation. Universal agricultural production might be enlarged due to the reappearance of CO_2 fertilization outcome. Agriculture will also be impacted due to atmosphere changes obligatory on water resources. India will also start on to familiarity extra seasonal dissimilarity in temperature with more warming in the winters than summers. India has experienced 23 large scale droughts starting from 1891 to 2009 and the frequency of droughts is increasing. Climate change is posing a great threat to agriculture and food security. Water is the most critical agricultural input in India, as 55% of the total cultivated areas do not have irrigation facilities. Climate is the long term pattern of weather conditions for a given area. Climate change

IJFANS International Journal of Food And Nutritional Sciences
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refers to a statistically significant variation in either the mean state of the climate or its variability, persisting for an extended period. India is home to extraordinary variety of climatic regions, ranging from tropical in the south to temperate and alpine in the Himalayan north, where elevated regions receive sustained winter snowfall. The nation's climate is strongly influenced by the Himalayas and the Thar Desert. Four major climatic groupings predominate into which fall seven climatic zones which are defined on the basis of temperature and precipitation. Climate change is the most important global environmental challenge facing humanity with implications for natural ecosystems, agriculture & health. The perusal of general circulation models (GCM s) on climate change indicate that rising levels of greenhouse gases (GHGs) are likely to increase the global average surface temperature by 1.5-4.5°C over the next 100 years. The difference of average temperature between the last ice age and present climate is 6°C. This will raise sea-levels, shift climate zones pole ward, decrease soil moisture and storms. Global warming is predicted to affect agricultural production. Analysis of the food grains production/productivity data for the last few decades reveals a tremendous increase in yield, but it appears that negative impact of vagaries of monsoon has been large throughout the period.

Indian Agriculture and Climate Change

Agriculture sector alone represents 23 per cent of India's Gross National Product (GNP), plays a crucial role in the country's development and shall continue to occupy an important place in the national economy. It sustains the livelihood of nearly 70% of the population. It seems obvious that any significant change in climate on a global scale will impact local agriculture, and therefore affect the world's food supply. The problems of predicting the future course of agriculture in the changing world are compounded by the fundamental complexity of natural agricultural systems, and socio-economic systems governing the world food supply and demand. Climate change will also have an economic impact on agriculture, including changes in farm profitability, prices, supply, demand, trade and regional comparative advantages. The magnitude and geographical distribution of such climate induced changes may affect our ability to expand the food production area as required to feed the burgeoning population of more than 10,000 million people projected for the middle of the next century.

Climate Change

Climate change is not a new phenomenon in the world and it changing since ancient era. There are many examples that give the clear evidence of climatic change in rising temperature of earth surface, declining ground water, drought, fluctuation in rainfall, flooding, soil erosion, fluctuation in wind speed, rising sea level due to melting of glacier, cyclone, hailstorm, fog, earthquakes and landslide, increasing ocean temperature and acidification of the oceans due to elevated carbon dioxide in atmosphere. Human activities are also responsible for climate change and environmental damage such as growing population, rapid urbanization, higher industrialization, use of modern technologies, innovation, higher economic growth and

ISSN PRINT 2319 1775 Online 2320 7876

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development, transport, building construction, reduction in forest area, burning fossil fuels, increasing development of land for farms, grazing cattle, etc.

Food Consumption in India

In India, average food consumption at present is 550 g per capita per day, whereas in China and USA are 980 and 2850 g, respectively. The country faces major challenges to increase its food production to the tune of 300 mt by 2020 in order to feed its ever growing population which is likely to reach 1.30 billion by the year 2020. To meet the demand for food from this increased population, the country's farmers need to produce 50% more grain by 2020. The total gross irrigated area has more than quadrupled from 22.6 million ha in 1950–51 to 99.1 million ha in 2011-2012. Although, agriculture contributes 14% in the Gross Domestic Product (GDP) in India, 64% of the population depends on agriculture for their livelihood.

India is home to 16% of the world population, but only 4% of the world water resources. Agriculture is directly dependent on climate, since temperature, sunlight and water are the main drivers of crop growth. While some aspects of climate change such as longer growing season and warmer temperatures may bring benefits in crop growth and yield, there will also be a range of adverse impacts due to reduced water availability and more frequent extreme weather conditions. These impacts may put agricultural activities at significant risk. Climate change has already caused significant damage to our present crop profile and threatens to bring even more serious consequences in the future. Wheat yields are predicted to fall by 5-10% with every increase of 1°C and overall crop yields could decrease up to 30% in South Asia by the mid-21st century.

Impact of Climate Change on Crop Productivity

The impact of climate change on water availability will be particularly severe for India because large parts of the country already suffer from water scarcity, to begin with, and largely depend on groundwater for irrigation. Rainfall in India has a direct relationship with the monsoons which originate from the Indian and Arabian Seas. A warmer climate will accelerate the hydrologic cycle, altering rainfall, magnitude and timing of run-off. Warm air holds more moisture and it will result in an increase in evaporation of surface moisture. Climate change has a direct impact on crop evapotranspiration (ET). In arid regions of Rajasthan state an increase of 14.8 per cent in total ET demand has been projected with increase in temperature. The study further indicates that even a marginal increase in ET demand due to global warming would have a larger impact on the fragile water resources of arid zone ecosystem of Rajasthan. Therefore, change in climate will affect the soil moisture, groundwater recharge, and frequency of flood or drought, and finally groundwater level in different areas. Effect of climate change will affect water cycle. In addition, rise in sea level will increase the risk of permanent or seasonal saline intrusion into ground water and rivers which will have an impact on quality of water and its potential use of domestic, agricultural and industrial uses. Climate change will have number of effects on agriculture. Climate change will exacerbate India's existing problems of urban food insecurity. The highest risks related to climate change are likely to be concentrated among the

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low-income groups residing in informal settlements which are often located in areas exposed to floods and landslides and where housing is especially vulnerable to extreme weather events such as wind and water hazards.

Groundwater Resource

Groundwater levels are declining across India. About 54 percent of India's groundwater wells are decreasing, with 16 percent of them decreasing by more than one meter per year. North-western India again stands out as highly vulnerable of the 550 wells studied in the region, 58 percent had decline the groundwater levels. With increased periods of low precipitation and dry spells due to climate change, India's groundwater resources will become even more important for irrigation, leading to greater pressure on water resources. Effect of climate change will affect water cycle. In addition, rise in sea level will increase the risk of permanent or seasonal saline intrusion into ground water and rivers which will have an impact on quality of water and its potential use of domestic, agricultural and industrial uses. Climate change will have number of effects on agriculture. Indian agriculture consumes about 80-85% of the nation's available water. The quantity of water required for agriculture has increased progressively through the years as more and more areas were brought under irrigation. Surface water and groundwater resources have played a significant role in irrigation and also in attaining self-sufficiency in food production during the past three decades.

Kharif Season

Kharif crops are frequently sown with the commencement of the first rains in July, during the south west monsoon. In India the Kharif season varies by crop and state, with Kharif starting at the earliest in May and ending at the latest in January, but is popularly considered to start in June and to end in October. Kharif stand in contrast with the Rabi crops, cultivated during the dry season. Both words come with the arrival of Mughals in the India subcontinent and are widely used ever since. Kharif means "autumn" in Arabic. Since this period coincides with the beginning of autumn/ winter in the Indian sub-continent, it is called "Kharif period".

Kharif crops are usually sown with the beginning of the first rains towards the end of May in the southern state of Kerala during the advent of south-west monsoon season rains advance towards the north India, the sowing dates vary accordingly and reach July in north Indian states.

These crops are dependent on the quantity of rain water as well its timing. Too much, too little or at wrong time may lay waste the whole year's efforts.

Common kharif crops are Rice, Millet, Jowar, Maize, Soyabean, Turmeric, groundnut and Sugarcane.

Rabi Season

Rabi Crops or Rabi harvest are agriculture crops sown in winter and harvested in the spring in the South Asia. The term is derived from the Arabic word for "spring", which is used in the Indian Subcontinent, where it is the spring harvest (also know as the "winter crop").

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The Rabi crops are sown around mid-November, after the monsoon rains are over, and harvesting begins in April/May. The crops are grown either with rainwater that has percolated into the ground, or with irrigation. A good rain in winter spoils the rabi crops but is good for Kharif crops.

The major rabi crops in India is Wheat, followed by barley, mustard, sesame and peas.

Many crops are cultivated in both Kharif and Rabi seasons. The agriculture crops produced in India are seasonal in nature and highly dependent on these two monsoons.

Objectives of the Study

1. To study the trend of food grain production during Kharif and Rabi seasons in South India.
2. To find out the problems associated with climate change on food grain production in South India.

Analysis and Interpretation

Table 1: Food grain production in Kharif Season

Sl. No	Years	Food grains							
		Andhra Pradesh	Index No	Kerala	Index No	Karnataka	Index No	Tamil Nadu	Index No
1	2005-06	2167	100	2214	100	1934	100	2025	100
2	2006-07	2073	95.7	2329	105.2	1470	76.0	2805	138.5
3	2007-08	2630	129.1	2227	95.6	1670	113.6	2347	83.7
4	2008-09	2466	93.8	2348	105.4	1682	100.7	2344	99.9
5	2009-10	1978	80.2	2456	104.6	1526	90.7	2671	113.9
6	2010-11	2143	108.3	2329	94.8	1940	127.1	2598	97.3
7	2011-12	2449	114.3	2588	111.1	1882	97.0	3440	132.4
8	2012-13	2569	104.9	2475	95.6	1732	92.0	2336	67.9
9	2013-14	2299	89.5	2498	100.9	1814	104.7	2765	118.4
10	2014-15	2387	103.8	2712	103.5	1933	104.7	2920	102.1

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11	2015-16	2387	101.5	2681	98.8	1735	89.8	3415	116.9
12	2016-17	2558	107.2	2447	91.3	1534	88.4	1715	50.2
13	2017-18	2785	108.9	2663	108.8	1817	118.5	3397	198.1
14	2018-19	2758	99.0	2818	105.8	1662	91.5	3331	98.1

Source: Directorate of Economics & Statistics

It is inferred from the table production of food grain in Kharif season 129.1 percent of high production in Andhra Pradesh the year of 2007-08, 111.1 percent of high production in the state of Kerala the year of 2011-12, 127.1 percent of high production in the state of Karnataka the year of 2010-11 and 198.1 percent of high production in the state of Tamil Nadu the year of 2017-18.

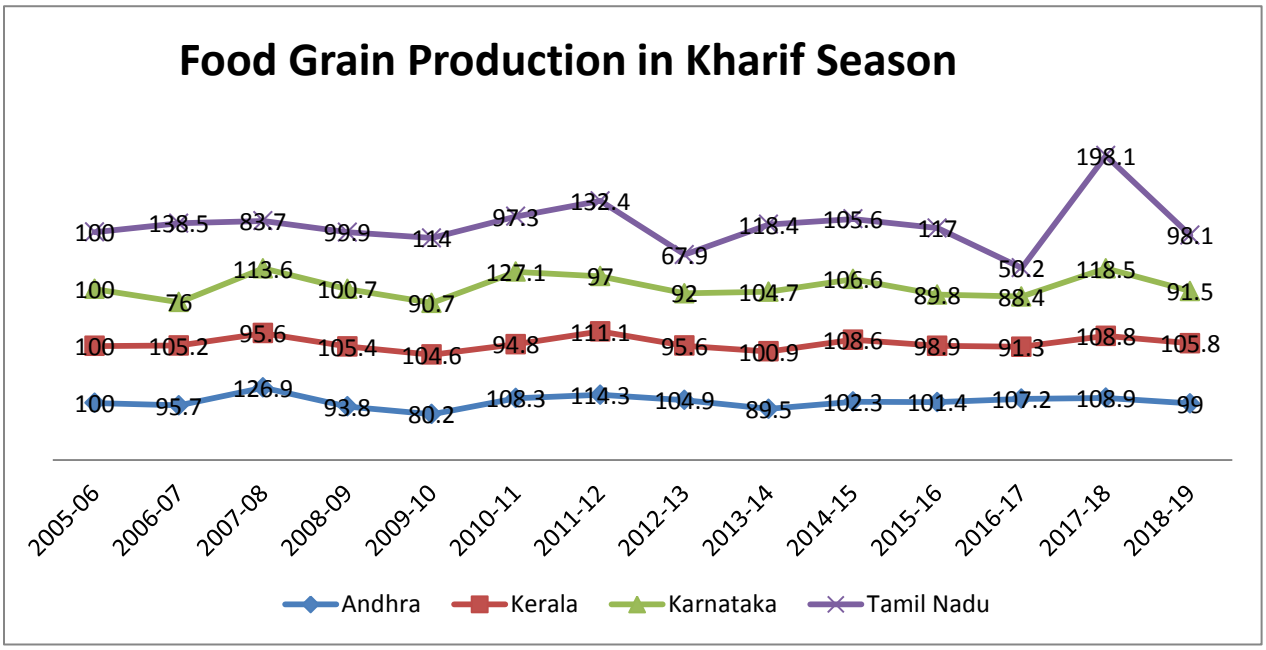

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Table 2 Food Grain Production in Rabi Season

Sl. No	Years	Food grains							
		Andhra Pradesh	Index No	Kerala	Index No	Karnataka	Index No	Tamil Nadu	Index No
1	2005-06	2669	100	2268	100	1464	100	1203	100
2	2006-07	2452	91.9	2338	103.1	980	66.9	2304	191.5
3	2007-08	2590	105.6	2197	94.0	1301	132.7	1437	62.4
4	2008-09	3123	120.9	2754	125.4	1231	94.6	1817	126.4
5	2009-10	2677	85.7	2517	91.4	1139	92.5	1827	100.5
6	2010-11	3052	114.0	2625	104.3	1236	108.5	1759	96.3
7	2011-12	2622	85.9	3052	116.3	1154	93.4	2317	131.7
8	2012-13	2805	107.0	2769	90.8	1111	96.3	1499	64.7
9	2013-14	3108	110.8	2634	95.1	1270	114.3	2032	135.6
10	2014-15	2966	95.4	3190	121.1	1278	100.6	2264	111.4
11	2015-16	2744	92.5	2995	93.9	808	63.2	2229	98.5
12	2016-17	2675	97.5	2808	93.8	897	111.0	782	35.08
13	2017-18	3086	115.4	2967	105.7	1114	124.2	2167	277.1
14	2018-19	2623	85.1	3118	105.1	931	83.6	2313	106.7

Source: Directorate of Economics & Statistics

It is inferred from the table production of food grain in Rabi season 120.9 percent of high production in Andhra Pradesh the year of 2008-09, 125.4 percent of high production in the state of Kerala the year of 2008-09, 132.7 percent of high production in the state of Karnataka the year of 2007-08 and 277.1 percent of high production in the state of Tamil Nadu the year of 2017-18.

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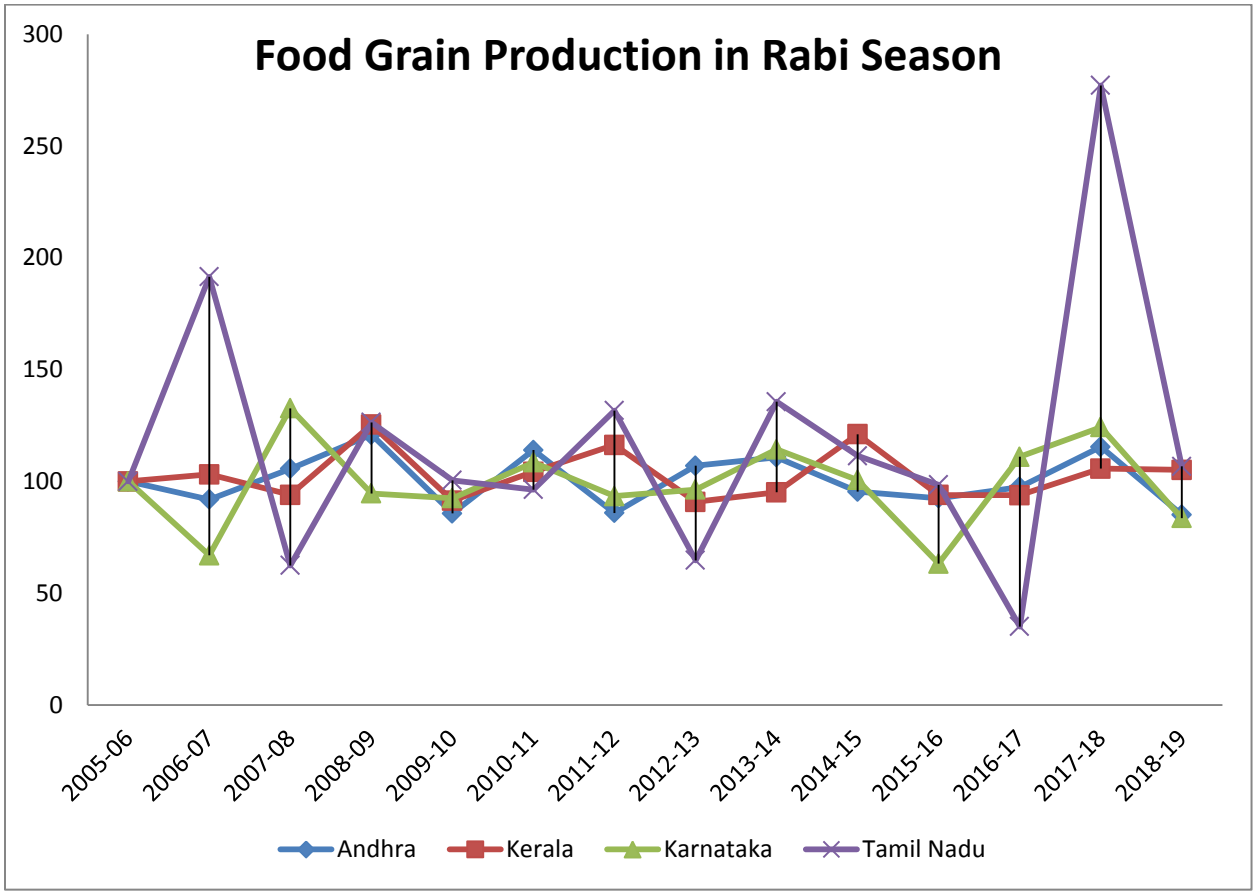

Table 3 Total food grains in south states

Sl. No	Years	Southern states of Food grains							
		Andhra Pradesh	Index No	Kerala	Index No	Karnataka	Index No	Tamil Nadu	Index No
1	2005-06	2365	100	2219	100	1776	100	1847	100
2	2006-07	2231	94.3	2331	105.0	1289	72.6	1354	73.3
3	2007-08	2613	117.1	2221	95.3	1548	120.1	2125	156.9
4	2008-09	2744	105.0	2440	109.7	1511	97.6	2225	104.7
5	2009-10	2294	83.6	2470	101.2	1377	91.1	2477	111.3

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6	2010-11	2530	110.3	2399	97.1	1684	122.3	2393	96.6
7	2011-12	2519	99.6	2695	112.3	1629	96.7	3162	132.1
8	2012-13	2670	106.0	2547	94.5	1488	91.3	2131	67.4
9	2013-14	2661	99.7	2530	99.3	1620	108.9	2554	119.8
10	2014-15	2648	99.5	2823	111.6	1689	104.3	2720	106.5
11	2015-16	2571	97.1	2756	97.6	1354	80.2	3063	112.6
12	2016-17	2611	101.6	2532	91.9	1333	98.4	1406	45.9
13	2017-18	2934	112.4	2736	108.1	1542	115.7	3028	215.4
14	2018-19	2894	98.6	2890	105.6	1422	92.2	2972	98.2

Source: Directorate of Economics & Statistics

It is inferred from the table total production of food grain 117.1 percent of high production in Andhra Pradesh the year of 2007-08, 112.3 percent of high production in the state of Kerala the year of 2011-12, 122.3 percent of high production in the state of Karnataka the year of 2010-11 and 215.4 percent of high production in the state of Tamil Nadu the year of 2017-18.

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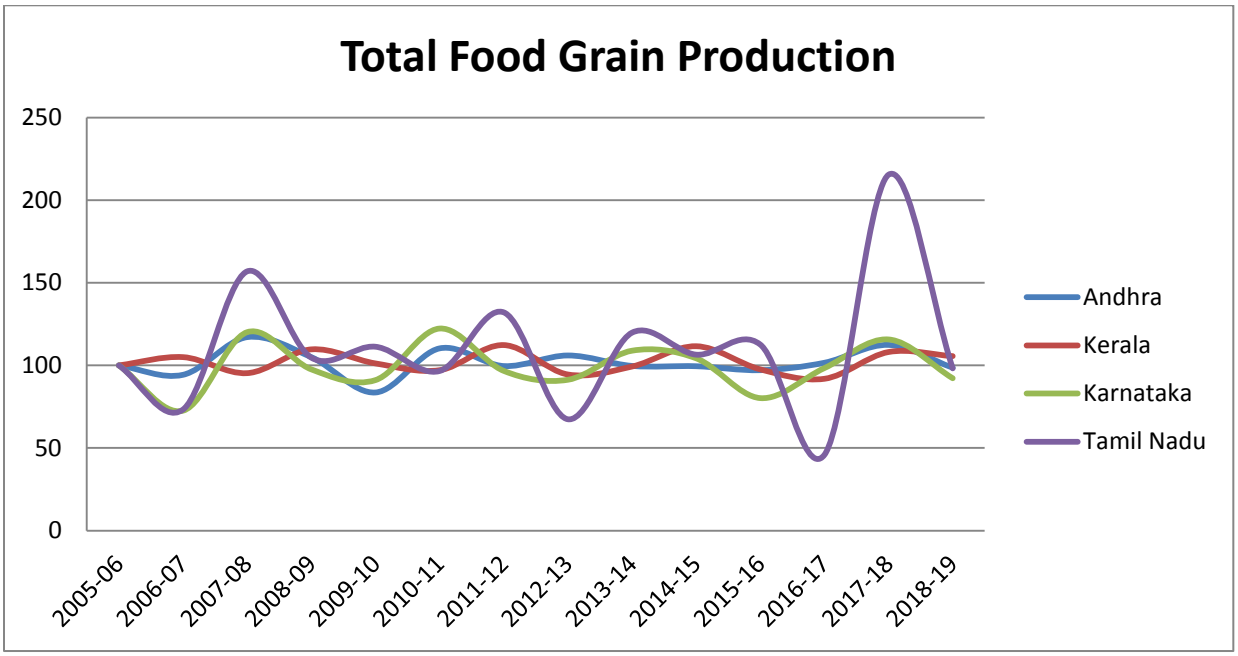
 Journal Volume 10,Iss 10, 2021



Conclusion

Global climate change is not a new phenomenon. The effect of climate change poses many threats; one of the important consequences is bringing about changes in the quality and quantity water resources and crop productivity. Socio-economic aspects of climate change are relatively weak, and future scenarios are to be generated for various agro-ecological regions for subsequently linking with other relational layers to work out the impact. Climate is the primary determinant of agricultural productivity which directly impact on food production across the globe. Food production systems are extremely sensitive to climate changes like changes in temperature and precipitation, which may lead to outbreaks of pests and diseases thereby reducing harvest ultimately affecting the food security of the country. We can concluded that climate change, through an increase in actual average maximum temperature, actual average minimum temperature and changing rainfall pattern has a resulted to a decline in productivity of most of food grain crops. Farm harvest price for all the crops are very crucial to improve the productivity of food grain crops and there may be one important reason that farmers give preference to those crops which will provide more financial benefits and it will also increase the decision of farmers to select more financially beneficial crop for cultivation.

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