Impact of Climate Change on Agriculture in Vellore District an Overview

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Introduction

Agriculture the mainstay of Indian economy, has been and will continue to be the lifeline of the Indian economy at least in the foreseeable future. Climate change is now recognized as one of the most serious challenges facing the world. The agricultural sector holds significant climate change mitigation potential through reduction of GHG Emissions and enhancement of agricultural sequestration .in addition, it also has significant role to adapt climate change. Adaptation alone is not enough to offset the effects of climate changes, and thus still need to be supplemented by concerted mitigation efforts. Mostly, when we implement adaptation measure, we enhance mitigation capacity of particular area such as practicing different land use management (soil and water conservation measure, manure and fertilizer management) in the agricultural field will help us to sequester substantial amount of carbon in the field and reduce emission of methane and nitrous oxide which are the main GHG emission means. Therefore, the management activities are already readily available. Climate change is the most serious environmental threat that adversely affects agricultural productivity. It is any significant long-term change in the expected patterns of average weather of region over a significant period of time. It is about no-normal variations to the climate, and the effects of these variations on other parts of the Earth. These change in may take tens, hundreds or perhaps millions of year. But increased in anthropogenic activities such as industrialization, urbanization, deforestation, agriculture, and change in land use pattern etc.leada to emission of green house gases due to which the rate of climate change is much faster. Climate change scenarios include higher temperatures, changes in precipitation, and higher atmospheric CO_2 concentrations.(YohannesHet.al.,2016)

Impact of climate change on world's agriculture

Climate change is likely to directly impact on food production across the globe. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce final yield. In areas where temperatures are already close to the physiological maxima for crops warming will impact yield s more immediately (IPCC, 2007). World agricultural faces a serious decline within this century due to global warming. Overall, agricultural productivity for the entire world is projected to decline between 3 and 16% by 2080. Developing countries, many of which have average temperatures that are already near or above crop tolerance levels, are predicted to suffer an average 10 to 25% decline in agricultural productivity the 2080s. Rich countries, which have typically lower average temperatures, will experience a much milder or even positive average effect, ranging from 8%incerase in production to a 6%decline individual developing countries face even larger declines. Developed countries lower rainfall levels can be overcome through irrigation but these technological solutions are not necessarily possible in less developed countries. Climate Change and Its Consequential Change in Water regimes ground and air temperature patterns are projected to severely dent production in varying intensities. Crop improvement for conservation agricultural practices the increased emphasis on improving soils can be achieved to a large extent by adopting conservation agriculture practices which uses a combination of minimum tillage residues incorporation and its management over a period of time multi- crop facilitation with modified planting systems alternate water-nutrient –chemicals management, etc. development of climate-smart crop varieties: Unraveling the molecular basis and pyramiding of the component physiological traits such as radiation use efficiency, water use efficiency, nutrient use efficiency, and tolerance to biotic and a biotic stresses may help in developing high yielding, resource efficient and climate resilient crops.

Change in temperature and rainfall due to Global Warming in different Crop Seasons South Asia.

The Inter-Governmental Panel on Climatic Change (!pCe) of the United Nations in its report for 2001 has projected using different models that the globally averaged temperature of the air above the earth's surface might rise by 1.4-5.8°C over the next 100 years (Fig. 1) (!pCC, 2001). The CO2 levels are projected to increase to 388-399 478-1099 by 2100 using different model. For India, the area-averaged annual mean warming by 2020 is projected to be between 1.0 and 1.4°C and between 2.2 to 2.9°C by 2050. Relatively, the increase in temperature would be less in *khari!* (Monsoon season) than in *rabi* (winter season). The *khari!* Rainfall is expected to increase in most places whereas *rabi* rainfall may decrease in some areas. The *rabi* rainfall will, however, have larger uncertainty

Year	Season	Increase in temperature, °C		Change in rainfall, %	
		Lowest	Highest	Lowest	Highest
2020	Rabi	1.08	1.54	-1.95	4.36
	Khari	0.87	1.12	1.81	5.10
2050	Rabi	2.54	3.18	-9.22	3.82
	Khari	1.81	2.37	7.18	10.52
2080	Rabi	4.14	6.31	-24.83	4.50
	Khari	2.91	4.62	10.10	15.18

Sources: Indian Agricultural Research Institute

Soil organic carbon change and crop productivity: Under balanced fertilization in soybean and wheat, change in soil organic C in soil depth of 0-15 cm and 15-30 cm was non-significant in all RCPs and time slices. This result agreed well with the change in grain yield of soybean and wheat. In 2050, soybean yield will increase by 12, 17, 15 and 22% in RCPs 2.6, 4.5, 6.0 and 8.5, respectively. Similar trend in soybean grain yield was also observed for year 2080 in RCPs under investigation. The yield of soybean increased by 14, 19, 25 and 37% over base in RCPs 2.6, 4.5, 6.0 and 8.5, respectively. The result showed that soybean yield increase will be more in year 2080 than 2050. The increased temperature effects in all RCPs and time slices are masked by increase CO2 concentration, positive effects of which are reflected in increase in soybean yield and minor change in wheat yield. However, increase in wheat yield would be 2-4% over in year 2050 whereas 1- 6% in year 2080.

Climate change and Indian agriculture

Mounting evidence suggest that climate change impact would fall more disproportionately on developing countries .climate change poses itself as a significant problem due to many of its direct and indirect consequences, especially from the standpoint of developing countries. Its direct effects on agricultural production system will have consequences for the global food system as a whole, thereby challenging its sustainability and posing threat towards the food security situation in many developing countries like Indian (porter et al., 2014). It is likely that efforts made by India towards meeting developmental goals such as reducing malnutrition would be seriously undermined due to climate change. Similarly, direct effects of climate change on health could potentially threaten the existence of many living organisms. Moreover, since any shock to human health could also lead to significant reduction in economic productivity thereby decreasing aggregate human welfare. According to AK Singh, deputy director-general (natural resource management) of the Indian council of agricultural research (ICAR), medium-term climate change predictions have projected the

likely reduction in crop yield due to climate change at between 4.5and 9per cents by 2039. The long run predictions paint a scarier picture with the crop yields anticipated to fall by 25 per or more by 2099. With 27.5% of the population still below the poverty line, reducing vulnerability to the impacts of climate change is essential. Indian food production must increase by 5 million metric tons per year to keep pace with population increase and ensure food security.

Objectives

1. To study the growth rates in area, production and yield of Agriculture in Tamil Nadu and Vellore district.
2. Development and identification of appropriate crop production protection and value addition technologies

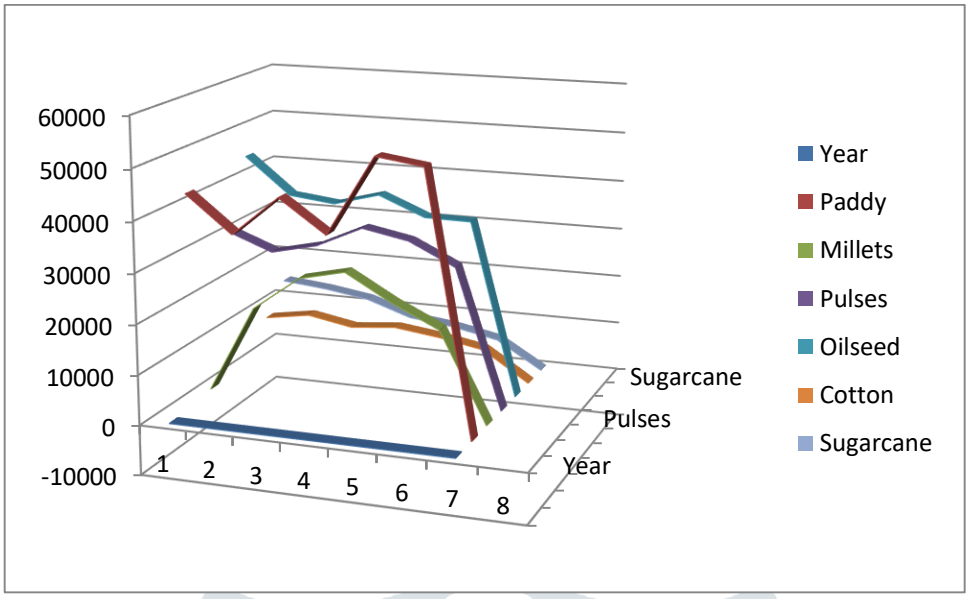
Climate change and agriculture in Vellore

Vellore district is located in northern part of Tamil Nadu and it falls under the north eastern agro climatic zone of Tamil Nadu. The district is bound on the north by Karnataka State and Chithoor district of Andhra Pradesh State, on the east by Thiruvallur and Kancheepuram districts, on the south by Thiruvannamalai district and on the west by Krishnagiri district. There were eight taluks and 20 blocks. Also, there were seven agriculture divisions in the district Vellore district is a drought prone district with erratic and less than normal rainfall recorded during the past several years. Most of the rivers in this district are dry for years together, and the major irrigation tanks which are mostly system tanks which are also dry for the most part of the year.

Area Coverage 2011-17 (Unit .Ha)

Year	**Paddy**	**Millets**	**Pulses**	**Oilseed**	**Cotton**	**Sugarcane**
2011-12	43100	1145	31487	45042	8395	14150
2012-13	35839	18786	27979	37671	9869	13234
2013-14	43720	25691	30096	36595	8164	11808
2014-15	37286	27822	34399	39104	9058	8676
2015-16	52899	22548	32620	35264	7856	7561
2016-17	51597	18119	28154	35122	6128	5649
Total	**264441**	**114111**	**184735**	**228798**	**49470**	**61078**
CGR	**5.60**	**51.04**	**0.09**	**-3.85**	**-5.96**	**-17.13**

Sources: Department of Agriculture in Vellore District



Change crop variety

It involves switching from one crop variety to another in response to climatic stresses and changes. In Vellore explained that Vellore‘s farmers try to adapt climate change by using drought resistance Crops. Introducing highbred Crop and through time it replace the dominant stable crop.

Change in cropping pattern

Application of changes of changes in how crops are cycled within a season. Farmers in the drought prone semi-arid areas of Vellore have realized that several varieties of a single crop species can occupy a common land area, incorporating several crop varieties, cotton, maize and sorghum, among others, to increase harvest potential arid climate stresses.

Change in cropping calendar

It is another common adaptation to climate change at the farm level, which largely involves altering the timing of farm activities to suit climate variations or changes. In Vellore, farmers adapt to the early onset of rainy season through early cultivation of upland farms, which results in high agricultural production for the season and higher household income from farm activities.

Farm management practices

Change in current farm management practices such as maintaining diverse farming systems (i.e. planting different crop species) also helps diversify potential sources of income for farmers, making the farming household more resilient to adverse impacts of climate on agricultural production . According to Rhodes et al., also crop residue management practice is considered one of the best climate smart actions. In addition, smallholder farmers in sub-humid southwestern Cameroon have been adapting to variations in rainfall through different soil and water conservation practices.

Impact of climate change on agriculture

Vellore's district agriculture is more dependent on monsoon from the ancient periods. Any change in monsoon tend drastically affects agriculture, even the increasing temperature is affecting the district agriculture. In the Indo-Gangetic plan, these premonsoon changes will primarily affect the food grain. Increase in CO_2 to 600pmm increases yields of food grains and oilseeds by 15-30%. A 1^0 C increase in temperature may reduce yields of food grain s by 3-5%. Much higher losses at higher temperature. Productivity of most crops to decrease only marginally by 2020 but by 15-60%by 2100 due to increases in temperature, rainfall variability, and decreases in irrigation water. The major impacts of climate change will be on rain fed or un-irrigated crops, which is cultivated in nearly 23.58 Hect of crop land. A temperature rise by 67%-86% in winter temperature is projected to reduce rain fed crop yield by 1.0 tons per hectare in Vellore. Possibly some improvement in yields Paddy, Sugarcane, Groundnut, Sorghum and Millets. Less loss in Vegetables, Turmeric and Cotton in North –Western Vellore due to reduced frost damage. Increased droughts and floods are likely to increase production variability.

Conclusion

Climate change, the outcome of the "Global Warming" has now started showing its impact worldwide. Climate is primary determinant of agricultural productivity which directly impact on food production across the globe. Agriculture sector is the most sensitive sector to the climate changes because the climate of a region/country determines the nature and characteristics of vegetation and crops. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce final yield. Food production systems are extremely sensitive to climate change like changes in temperature and precipitation, which may lead to outbreaks of pest and diseases thereby reducing harvest ultimately affecting the food security of the country. Coping with the impact of climate change on agriculture will require careful management of resources like soil, water and biodiversity. To cope with the impact of climate change on agriculture and food production, Vellore will need to act at the global, regional national and local levels. Agriculture has significant contrition for climate change disruption but the attention given for this situation is low. So, there should be more research and awareness creation on this is important.

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