Technoarete Transaction on Climate Change and Disaster Management Research
Vol-1 Issue-1, February 2022, PP.7-11

Impact of Climate Change on Agriculture and Need to Focus on Agricultural Sustainability and Climate Change Mitigation of Negative Impact

Hariharan Venkatachalam

M. Sc., Medical Biotechnology, Chettinad Academy of Research and Education, India
hariharanvenkat9810@gmail.com

Abstract **–Introduction: Climate change has a large impact on agriculture in India as there are different types of climate zones in the country. Therefore, there are some positive and some climate change negative impacts on agriculture in India. Furthermore, it is important to start sustainable agriculture in India.**

Purpose: The purpose of this study is to describe the importance of sustainable agriculture for the environment. Therefore, to analyse the positive and negative climate change impacts on agriculture is another purpose of this research study.

Findings: It is found that the level of greenhouse gases is increasing day by day in India and along with that the natural temperature is increasing. Therefore, sustainable farming and other sustainable processes can be helpful for reducing greenhouse gas.

Conclusion: In conclusion, it can be said that the process of climate change can control the agricultural sector of India as there are great climate change impacts on agriculture of the country.

Limitations: The limitation of the research study was budget and time. If the researcher had more budget and time to spend then the researcher can find out more information about the research topic.

Keywords— Climate change, agriculture, sustainable farming, mitigation

Introduction

In India rice and wheat are the main staples of food and India is the second largest producer of rice and wheat in the world. India ranks in the second position for producing various dry fruits. Apart from that, agriculture is a major way of increasing the economy of the country as the economy of India is mainly based on Indian agriculture. Along with that, the food supply chains are based on the agriculture of India. Agriculture is the only sector in India that has identified the growth of nearly ***3.4%*** in the year 2021. In addition to that, agriculture share in GDP has increased nearly ***19.9%*** in the same year (Agriculture, 2021). Thus, it can be said that agriculture is a very important part of the country.

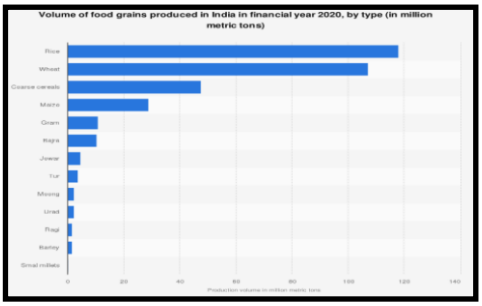

Figure 1: Agricultural development in India
(Source: Agriculture, 2021)

It can be said that; the development of agriculture leads to the development of the economy in India. There are different types of crops and generally different crops are produced in different states of India. Apart from that, climate change is an important part of Indian agriculture as there are major positive impacts of climate change on agriculture (Guntukula, 2020). There are mainly six types of climate zones in India and these all zones have different impacts on agriculture. Therefore, positive, and negative climate change impacts on agriculture of India are described in this research study significantly. The importance of sustainable agriculture is another description in this research study.

Aim and objectives

The aim of this study is to analyse the impacts of climate change on the agricultural sector of India. Thereafter, describing the importance of sustainable agriculture in India is another aim of this research study.

Objectives

- To analyse the positive climate change impacts on agriculture of India
- To investigate the negative climate change impacts on agriculture
- To understand the importance of sustainable agriculture in India

Review of literature

Climate change impact on agriculture

Climate change has a large impact on the agricultural sectors of India as most of the crops that are produced in India are based on different climate zones. There is a total of six types of climate zone and there is a specific climate zone that is good for some specific crops. Therefore, climate change helps enhance carbon fertilization and photosynthetic rate of the soil and that helps in increment of growth in crops producing (Kumar *et al.* 2017). Apart from that, increment of Co2 helps to decrease the rate of transpiration and helps in the development of crop production. Thereafter, high temperature and low temperature have their own positive impacts on agriculture. Along with that, the rainy season is impactful on agriculture as rainfall is essential for the growth of the crops. In addition to that, six climate zones have different types of positive impacts on agriculture. Sometimes high-level temperatures are good for crop production and sometimes high-level temperature became the reason of bad quality crops. Therefore, the importance of climate change for the growth of crops is described in this research study.

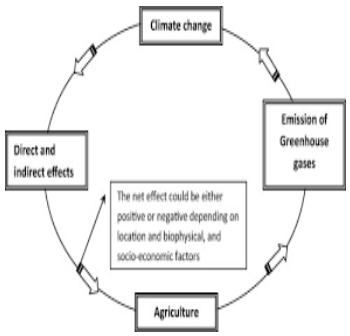

Figure 2: Climate change impact on agriculture
(Source: Kumar *et al.* 2017)

Sustainable agriculture

Sustainable agriculture supports the farming process that is based on some sustainable methods and ecosystem. Therefore, sustainable agriculture helps to get fresh and healthy food by protecting the environment and without using any chemicals. Apart from that, global warming is increasing in India and that reduces the quality of soil, and the sustainable agriculture process is helpful for enhancing the quality of soil. The purpose of sustainable farming is to fulfil the food needs of people without decreasing the ability of next generations to fulfil their basic needs (Yadav *et al.* 2020). Therefore, there are some systems that can be used in sustainable agriculture such as permaculture, hydroponics, and aquaponics farming. Thereafter, using the resources of renewable energy in farming, polycultures, and crop rotation, planting more trees and others are helpful in sustainable agriculture. Thereafter, sustainable agriculture helps to reduce greenhouse gas emissions and that is good for the crops and the environment. These systems are helpful in sustainable agriculture and can be used for the improvement of agriculture sustainably in India. The reasons or importance of sustainable agriculture is analysed in the discussion section of this research study.

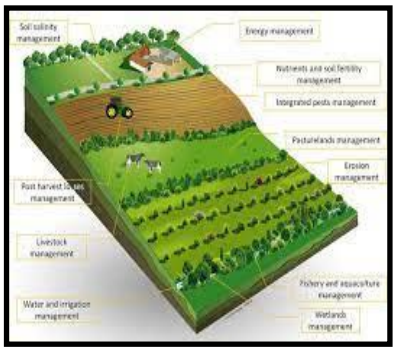

Figure 3: Sustainable agriculture in India
(Source: Yadav *et al*. 2020)

Climate change mitigation negative impact

Climate change has not only the positive impacts but also the negative impacts on agriculture. As there are some positive impacts of increasing Co2 levels in soils similarly there are some negative impacts of increasing Co2 levels. Moreover, rainfall is important for the growth of the crops, but a lot of rainfall is harmful for the crops and over rainfall can destroy the crops. Apart from that, temperature is important for several reasons, but over high temperatures are harmful for the crops (Malhotra, 2017). Therefore, over high temperatures and increasing global warming are similar. There are some major negative impacts of global warming on agriculture as it can reduce the quantity and quality of the crops. In addition to that, high levels of temperatures reduced the ability of storage of crops and because of that the produced crops can be destroyed. All the six seasons have different types of negative impact on agriculture in India. Therefore, greenhouse is considered to have emissions impacts the climate change and increase the heat and that can be the cause of bad crops production. Thus, this is a remarkable negative impact of climate change on agriculture.

Theoretical underpinnings

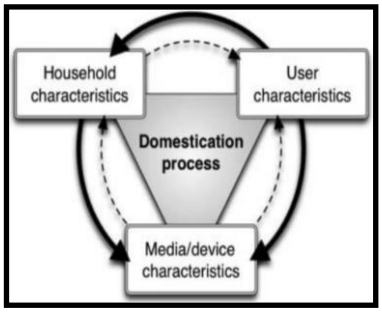

Figure 4: Domestic theory of agriculture
(Source: Abbo, 2017)

In this research ***domestication theory of agriculture*** as it supports in manging domesticated time. Therefore, domestication is a process and according to this process people have to adopt wild plants and animals. Thus, after adopting the pants they have to reproduce it so that the humans can use it. There are some characteristics in this domestication theory and those are important for domestic agriculture (Abbo, 2017). Therefore, the theory was helpful to understand the concept of agriculture. Apart from that, the theory was quite helpful to gain more knowledge about the climate change impacts on agriculture. In addition to that, it was helpful for the researcher to understand the importance of sustainable agriculture in India. Thus, these are the reasons for adopting the domestication theory for this research study.

Research methods

Usage of research philosophy, research design and research approach help the researcher to create a better research study. Therefore, the researcher has adopted the ***positivism research philosophy*** in this research study as it helps to collect some accurate information about research topics (Ryan, 2018). Thereafter, the researcher has used the ***descriptive research design*** in this study as it helps to find out the answers of how, what, when and where questions. The answers to these questions are the basic needs of a research study. Furthermore, the researcher has used the ***inductive research approach*** in this study as it helps to create a presentable research study.

The researcher has used the secondary data collection method in this research study as there are a lot of resources for the ***secondary data collection method***. The resources are books, journals, newspapers, magazines, government records, public records, and other published records (Johnston, 2017). Therefore, the secondary data collection method was helpful for the researcher to collect some proper and accurate data about agriculture in India.

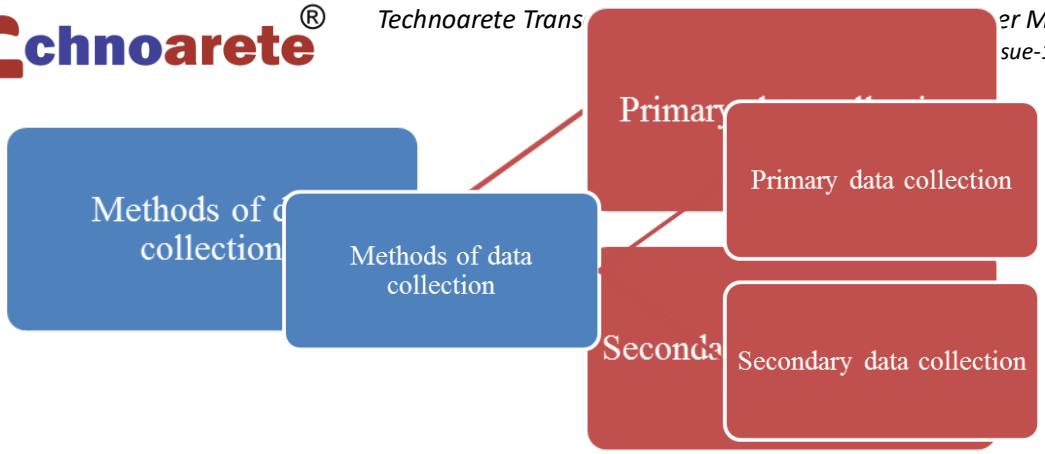

Figure 5: Methods of data collection
(Source: Johnston, 2017)

Discussion

Theme 1: Climate change on agriculture in India

Climate change has a great impact on agriculture as mostly the agriculture of India is based on several climate zones. There are some positive impacts as well as some negative impacts. Therefore, climate change impacts agriculture nearly ***4-9%*** in a year and this is a positive impact. As a negative impact, climate change is one of the causes for about ***1.5%*** loss in GDP yearly (Agriculture, 2017). Apart from that, high temperatures help in the growth of the crops and along with that, it helps to reduce the time of crop production. Furthermore, there is another important positive climate change impact and that is it helps to increase the possibility of producing two or more cycles of crops in one season. Sometimes air pollution damages the growth of the crops and therefore climate change helps to reduce that damage. Thus, these are the positive climate change impacts on agriculture of India.

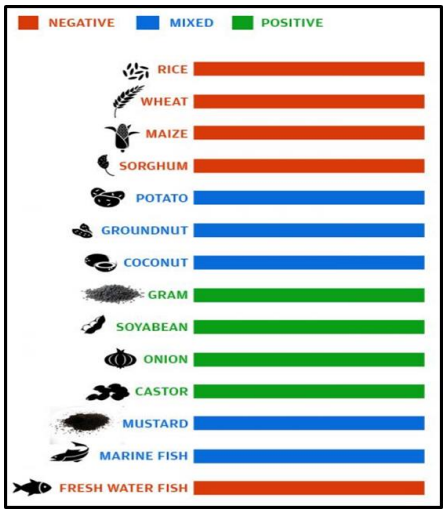

Figure 6: Impact of climate change on crops
(Source: Agriculture, 2017)

On the other hand, there are some negative climate change impacts on agriculture such as change of climate can simulate biomass and that is harmful for the soil. Therefore, perfect level of PH in soil is important for good quality crops production. Apart from that, climate change accelerates the rate of respiration and there is a good and bad impact such as the over rate of respiration is not good for the soil and crop (Sapkota *et al.* 2019). Therefore, a low rate of respiration is important for better crop production. Along with that, a high level of temperature can increase the rate of evaporation and reduce the availability of moisture in soil. Thereafter, these are harmful for the soil as it can be the cause of bad quality crops. Hence, these are the negative climate change impacts on agriculture of India.

Theme 2: Importance of sustainable agriculture

Sustainable agriculture is important as it is based on the ecosystem and that is good for the future generation. Therefore, there are other reasons that claim that sustainable agriculture is essential in India. First of all, sustainable agriculture helps to nourish the soil and make the soil perfect for another crop production. Thereafter, perfect soil and nourished soil is helpful for the development of the quality of the crops. Thus, it can be said that sustainable agriculture is important for healthy and good

quality plants or crops (Selvaraj, 2021). Apart from that, the process of industrial farming needs good quality machines and those machines are one of the important reasons for increasing greenhouse gas. Moreover, the sustainable farming process does not need any machine and that means it helps to save money and energy. Along with that, sustainable agriculture is good for the environment as it does not create greenhouse gas.

On the other hand, sustainable agriculture values diversity and helps to provide resilient crops to the people. As the food security of the people of India is based on agriculture then it is important to be more focused on sustainable agriculture (Patidar *et al.* 2018). This has several advantages along with it helps to secure the environment for the future generations.

Conclusion

In conclusion, it can be said that climate change is important for good quality crops. Apart from that, climate change can be harmful too for agriculture as there are some negative impacts of climate change. Along with that, it is high time now to be focused on sustainable agriculture as the increment of greenhouse gas is harmful for the environment. Therefore, global warming and greenhouse gas is increasing day by day in India because of the usage of industrial farming processes. Thus, a sustainable farming process can control greenhouse gases and global warming that is important to protect the environment for the future generations. Thus, it can be said that change of climate has a large impact on agriculture and the sustainable farming process can be helpful for the development of agriculture in India.

Reference

1. Abbo, S. and Gopher, A., 2017. Near Eastern plant domestication: a history of thought. Trends in Plant Science, 22(6), pp.491-511.
2. Agriculture, 2017. Latest findings [Online]. Available at: https://www.downtoearth.org.in/news/agriculture/climate-change-causes-about-1-5-per-cent-loss-in-india-s-gdp-57883 [Accessed on: 19th June]
3. Agriculture, 2021. Latest findings [Online]. Available at: https://www.downtoearth.org.in/news/agriculture/agri-share-in-gdp-hit-20-after-17-years-economic-survey-75271 [Accessed on: 20th june]
4. Guntukula, R., 2020. Assessing the impact of climate change on Indian agriculture: Evidence from major crop yields. Journal of Public Affairs, 20(1), p.e2040.
5. Johnston, M.P., 2017. Secondary data analysis: A method of which the time has come. Qualitative and quantitative methods in libraries, 3(3), pp.619-626.
6. Kumar, N., Tischbein, B., Kusche, J., Laux, P., Beg, M.K. and Bogardi, J.J., 2017. Impact of climate change on water resources of upper Kharun catchment in Chhattisgarh, India. Journal of Hydrology: Regional Studies, 13, pp.189-207.
7. Malhotra, S.K., 2017. Horticultural crops and climate change: A review. Indian Journal of Agricultural Sciences, 87(1), pp.12-22.
8. Patidar, J., Kumhar, B., Mhaske, S. and Jat, S., 2018. Importance of Sustainable Agriculture in Tribal Community of India. International Journal of Bio-resource and Stress Management, 9(2), pp.253-256.
9. Ryan, G., 2018. Introduction to positivism, interpretivism and critical theory. Nurse researcher, 25(4), pp.41-49.
10. Sapkota, T.B., Vetter, S.H., Jat, M.L., Sirohi, S., Shirsath, P.B., Singh, R., Jat, H.S., Smith, P., Hillier, J. and Stirling, C.M., 2019. Cost-effective opportunities for climate change mitigation in Indian agriculture. Science of the Total Environment, 655, pp.1342-1354.
11. Selvaraj, A. and Thangavel, K., 2021. Arbuscular Mycorrhizal Fungi: Potential Plant Protective Agent Against Herbivorous Insect and Its Importance in Sustainable Agriculture. In Symbiotic Soil Microorganisms (pp. 319-337). Springer, Cham.
12. Yadav, A.N., Rastegari, A.A., Yadav, N. and Kour, D., 2020. Advances in Plant Microbiome and Sustainable Agriculture. Springer Singapore.