



Effect of Climate Change on Agricultural Production: Problems and Practices

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Abstract: Since the beginning, nature has nurtured us and helped us survive through millennia of evolution. We also forget what has taken us to the current situation. We try to change nature, try to tame it and it is costing us greatly. The climatic change impacts on our ecosystems are already extreme and widespread, and maintaining food security in the face of climate change is one of humanity's most intimidating issues. The extinction of numerous species has imbalanced the eco-system, the global warming causes sea levels to rise and poses a danger of major flooding. The uncertainty and the loss of farming pattern due to weather change is hampering our agriculture causing food crisis. But the silver lining is that we have realized our mistakes and trying to correct them, mass awareness is increasing to protect nature, and there are courses to make us realize what all we can learn from nature, and stay as a collective group, being calm and patient, learning acceptance and non-resistance and evolving to a better self. We must have to protect nature and we slowly understand this. Fortunately, many countries are already introducing policy and regulatory reforms to reduce their greenhouse gas emissions in certain industries. Several scholarly methods are implemented to reverse the changes. Therefore the paper attempts to show the changing pattern of agriculture with the change of environment and its effect on human life and ecology and different measures taken for the restoration of the environment.

Index Terms: Evolution, Ecosystem, Food security, Global warming, Greenhouse gas.

I. INTRODUCTION

The constant rise of the earth's temperature is frightening. Greenhouse gasses generated by human activities contribute to global warming and climate change. Fossil fuel burning is the major contributor of greenhouse gases as they release a huge amount of CO₂ (Carbon dioxide). It also produces greenhouse gases like methane and nitrous oxides and many more. Other man-made causes include deforestation and pollution. Natural calamities like forest fires, volcanic eruptions, melting of glaciers, and earthquakes are important to look into because they have an impact on the environmental chemistry of the atmosphere. Global warming is a major threat to the environment of the planet that indirectly affects the ecosystem. In recent times the earth is already experiencing the hazardous effects of global warming.

Generally, the sunlight which reaches the earth's surface is reflected to space. Approximately 70% of sunlight is absorbed by the surface, oceans, and Earth's air and 30% is reflected. This absorbed radiation thus heats the planet's surface and atmosphere, making life feasible. As the Earth warms up, this solar energy is scattered out into space allowing it to cool the planet. However, due to the greenhouse gases present in the atmosphere, thermal radiation from the Earth is reabsorbed and eventually radiated back to the Earth. This reabsorption process is beneficial for sustaining life on the Earth because these greenhouse gases increase the temperature of the Earth's surface which was initially very cold. But when the concentrations of greenhouse gases began increasing due to human activities, the issue became problematic. The planet has undergone a significant rise in surface temperature over the last 100 years due to increased CO₂ levels. The average global surface temperature rises between 0.6°C to 0.9°C between 1906 and 2006, but since the mid-20th century, it has nearly doubled. Over the last hundred years, sea levels have risen nearly 0.17 meters. The extent of Arctic sea ice is reducing by approximately 2.7% per year as of the last decade (Shahzad, 2015). Burning fossil fuel produces CO₂ as well as landfills and agrarian biomass decomposition and animal waste produce methane gas, nitrogen-based fertilizers produce nitrous oxide in the atmosphere. As of the 1750 industrial revolution, levels of CO₂ and methane have been up 35% to 148%, according to the Intergovernmental Group on Climate Change (IPCC) (Stocker et al, 2013).

II. EFFECT OF GLOBAL WARMING ON AGRICULTURAL PRODUCTION

Climate change and agriculture are closely related and will have a direct effect on human food security in the future. Climate change is one of the major contributors to farming as well as one of the main culprits of global warming. It is necessary to study climate changes over time to adjust the agricultural management and practices to achieve better production and growth of the agricultural sector.

Due to global warming, the Earth's temperature is gradually increasing. The effect of global warming can be observed all over the world. Impact of the climate change can be seen on the ecosystem. Increasing global temperature is not only causing climate change but also changes the agricultural pattern.

Temperature and rainfall:

Global warming contributes to irregular or uneven rainfall, increased temperature, elevated greenhouse gases in the atmosphere which are vital climatic parameters affecting crop production. Weather plays an important role in the cropping season along with soil and nutrients. For agricultural manufacture, high temperatures, increased heat waves, warm nights, and lower winter dates have been disastrous. Any fluctuations and uncertainties in the pattern of long-range rainfall can affect the farming industry and increase regional flood and drought rates (Jain et al, 2012). Therefore the crops which require high rainfall do not give satisfactory production. On the other hand, many crops that are generally grown in the winter are destroyed due to variation in the weather. All these changes are caused due to climatic transformation all over the world. Extreme weather conditions like floods or drought, scanty or heavy rainfall, a hot spell, or cold snaps at the wrong time can have a substantial impact on local agricultural as well as and livestock production.

Biodiversity of crops:

The variation of relatives of the wild crops which are the significant genetic sources for the breeding of crops are extremely affected.

Future consequences on the economy:

Since crop production will be affected, there will be a rise in the price of staple crops like rice, wheat, corn or soybean, etc. A decrease in crop production, in turn, increase the price of livestock feed and therefore expense on the meat. As a result, climate change will cause people to consume less meat and cereals causing a rise in food prices and this may lead to food insecurity.

While global food production is adequate to meet the people's needs, there is also proof of the devastating effects of climate change on the quality and quantity of food production globally. It is not simple to differentiate between climate change and other patterns, but one study recently by Stanford University showed that rises in global maize and wheat production since 1980 would have been around five percent higher unless climate change had occurred. A study on the global production of vegetables and legumes shows that if greenhouse gas emissions continue on their current course, crop outputs will drop by 35% by 2100 as a result of inadequate water and increased salinity and ozone. A warm climate also increases the chance of insect or microbial infestation of crops as a very short period of winter is not enough to kill them. Again very high temperature during the summer increases the incidence of forest fire and drought frequently.

Similarly, very cold climates or excess moisture in the environment is not suitable for the production of some crops. The IPCC report also showed that rain-fed agriculture could decline by 50% by 2020 across Africa

III. SOME EXAMPLES OF AGRICULTURAL LOSS DUE TO CLIMATE CHANGE

- In Maharashtra (India), the seasonal and low rainfall distribution in 1997 to 98 caused major losses in the crop.
- In 2003, a massive heat-wave in summer in Europe and cold waves in India during winter causes agricultural loss varying from 10-100% in the case of seasonal and horticultural crops.
- Beijing in China experienced the snowy winter in 2007-2008 which caused damaged to the farmland and economic loss of around \$7.5 billion.
- The effects of night-time high temperatures on corn yields vary across the U.S Corn Belt in 2010 and 2012. The premature blossoming of cherries in 2012 triggered the loss of \$220 million in Michigan cherries due to a warm winter (Ahmed et al, 2018).

IV. FUTURE STEPS

However, people are wary of the devastating consequences of global warming and climate change and their effect on the agricultural field. So they are taking various steps to combat these changes. They are:

1. Rainwater harvesting and efficient irrigation management:

Water is for agriculture. But farmers generally depend on groundwater pumping which consumes electric power since a regular supply of water is necessary for the supply of crops all-round the year.

But now planters in many areas have started to conserve rainwater during the monsoon and using the water in the field. Low consumption of electricity will automatically reduce the burning of fossil fuel for electricity production and thus greenhouse gas emission. For reducing energy consumption and to save water farmers can use drip irrigation, dry farming, planting cover crops, etc.

2. Use of renewable source of energy:

Shifting away from fossil fuel and efficient use of energy is very important steps by which farms can battle against climatic change. These can be produced using solar panels or wind turbines on the field, reducing the use of petroleum-based fertilizers, and the reduction of the reliance on fossil fuel for irrigation, warehousing, and transport.

3. Maintaining green agriculture:

Reforestation, restoration of riparian zones, plantation of perennial plants, and other land management practices can deliver multiple advantages such as providing wildlife shelter, attracting beneficial insects for natural pest control, and pollination purpose. Reforestation with plants can beautify the farm, reduce the concentration of CO₂ in the atmosphere, prevent soil erosion and conserve water.

4. Practice organic farming:

Farmers rely on petroleum-based pesticides, herbicides, and fertilizers in conventional farming up to the middle of the twentieth century. But now most of them are using organic farming practices that reduce the production of greenhouse gases as well as cleaner water, soil, and food. Additional benefits of organic farming include good soil health and fertility good for friendly insects in the agricultural field.

5. Increasing Soil Health:

There is tremendous potential for the reduction and even reversal of climate changes in a wide variety of sustainable activities like carbon farming. Plants are used as carbon sinks and absorb CO₂ from the atmosphere during photosynthesis. Around 40% of the CO₂ is then stored in the soil and feeds bacteria, fungi, protozoa, nematodes, etc. In exchange, these creatures give the plants a natural fertilizer with mineral nutrients. By increased crop material and by developing soil fertility through practices such as application of compost, planting covers, and reduced or no-farm cultivating, farmers can support this carbon sequestration phase.

6. Reducing Livestock Methane Emissions:

More than half of greenhouse gas emissions are accountable to the agriculture sector. The main sources of methane emissions are beef and dairy cattle. Manure lagoons in industrial dairy and livestock farms produce toxic emissions through anaerobic decomposition and pollute water. Total pasture management by rotational grazing will minimize this impact because grass provides a high-quality feed, which is better for the digestion of cattle, as their hooves break up soil and manure, as they pass across rangelands, contribute to soil fertilization.

7. Protecting Farmland:

Expanding the population reduces the farmland which is also a great threat to agriculture. The increasing population is responsible for more greenhouse gas production. On the other hand farmland conservation also preserve the local foods, promotes biodiversity by protecting plants and wildlife which have a climate-friendly impact.

8. Supporting the farmers by using local foods:

Another way of reducing greenhouse gas emissions by promoting the use of local foods among people. Food shipping includes fossil fuels and other greenhouse gas-producing natural resources. If the farmers sell their products directly from their farms or through local markets, the food is transported to a small distance preserving the resources. Therefore promoting market support for local farmers encourages them to stay in their land and produce food is a good way for sustainable development.

9. Supporting climate-friendly policies:

There are many ways to avoid the emission of greenhouse gases and support eco-friendly practices in the agricultural sector which require major policy changes and implementing policies at the legislative level. Awareness of the people regarding the environment is also necessary. If the general mass and government work hand in hand then definitely the problem of global warming can be defeated (Ranger, 2012)

IV. CONCLUSION

The impact of climate change has a far-reaching effect. It affects global, regional, and local food security. Climate change due to global warming can influence the availability of food; reduce food production and access to food and its quality. Extreme weather and water shortages can all lead to a reduction in agricultural production. It also increases the cost of the products. High temperature and moisture also increase the chance of spoilage, contamination, and infestation of the agricultural products. Reducing crop production because of climate change can also significantly increase the number of undernourished people, hampering progress on poverty alleviation and food security. Researches aiming at improving agricultural adaptation to prevent climate change in the agricultural field. Both developed and developing countries need a determined effort to reduce greenhouse gas emissions from greenhouse gases. Mass consciousness about climate change and its impact on different sectors, the role of the human in reversing the climate change and strict government legislation are necessary to reduce the emission of greenhouse gases and global warming. Also, farmers are needed to be guided on the harmful effect of climate change and their probable mitigation and adaptation option to minimize the risk in the agricultural sector.

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