

CLIMATE CHANGES EFFECT ON AGRICULTURE

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INTRODUCTION

Climate change and agriculture are two interconnected processes that occur on a global scale. Changes in average temperatures, rainfall, and climate extremes (e.g., heat waves), changes in pests and diseases, changes in atmospheric carbon dioxide and ground-level ozone concentrations, changes in the nutritional quality of some foods, and changes in sea level all have an impact on farming. Climate change is already having an impact on agriculture, with the effects being unevenly distributed around the world. Future climate change will almost certainly have a negative impact on crop production in low-latitude countries, while the effects in higher latitudes may be positive or negative. Food insecurity is likely to increase for some vulnerable groups, such as the poor, as a result of climate change. For example, South America may lose 1–21% of its arable land area, Africa 1–18%, Europe 11–17%, and India 20–40%. Warming will cause rapid many microbial processes in the soil-floodwater system, affecting the C and N cycles. Crop residue decomposition patterns are subject to change. Increased soil temperature may also increase autotrophic CO₂ losses from the soil due to root respiration, exudates, and fine-root turnover. Rising sea levels will have an impact on rice production as a result of climate change. For a temperature increase of 2-3.5°C, most studies predict lower yields in non-irrigated wheat and rice, as well as a loss in farm-level net revenue ranging from 9% to 25%. Aggarwal and Mall (2002) discovered that a 2°C increase resulted in a

15-17% decrease in rice and wheat grain yield. Pathogens such as fungi and bacteria are also expected to worsen.

In areas where precipitation increases, fungal and bacterial pathogens are likely to become more severe. Cereals would be more susceptible to pest and disease outbreaks under warmer and more humid conditions, reducing yield.

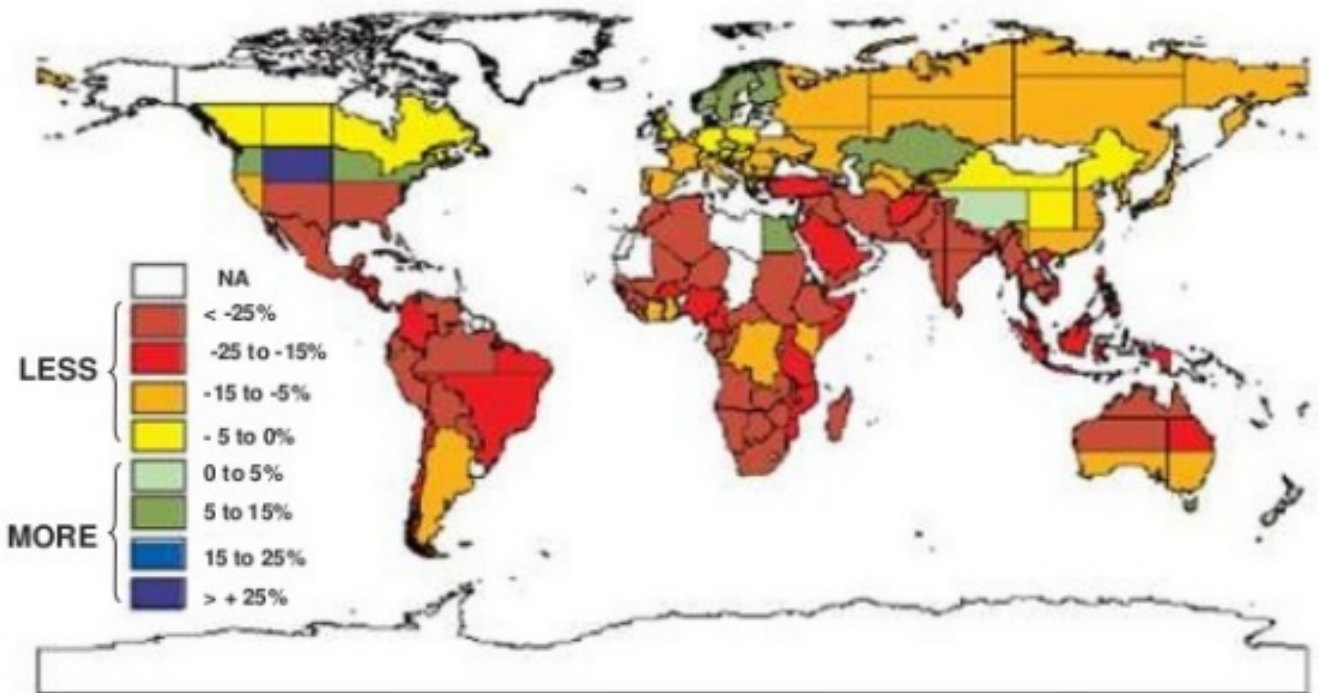
Predicted effect of climate change on Agriculture over the next 50 years			
Climate element	Expected change by 2050	Confidence in prediction	Effect on agriculture
CO ₂	Increase from 360 PPM to 450 – 600 PPM	Very high	<ul style="list-style-type: none"> • Good for crops • Increased photosynthesis • Reduced water use
Sea level rise	Rise by 10-15cm	Very high	<ul style="list-style-type: none"> ❖ Loss of land ❖ Coastal erosion ❖ Flooding ❖ Salinization of ground water.
Temperature	Rise by 1-2 °C Increased frequency of heat waves	High	<ul style="list-style-type: none"> ➤ shorter growing seasons ➤ Heat stress risk ➤ Increased Evapotranspiration
Precipitation	Seasonal changes by + or – 10%	Low	<ul style="list-style-type: none"> • Drought • Soil problem • Water logging
Storminess	Increased wind speeds, more intense rainfall events	Very high	<ul style="list-style-type: none"> ✓ Lodging ✓ Soil erosion ✓ Reduced infiltration of rainfall

EFFECTS

Climate change will impair farm production in many poor countries and regions

Climate change, combined with global population and income growth, poses a global threat to food security. Climate change poses a significant threat to agriculture. Higher temperatures eventually reduce crop yields while encouraging weed and pest growth. Pest management becomes less effective, requiring higher pesticide rates to achieve the same levels of control. Heat waves can cause extreme heat stress in crops, limiting yields if they occur at specific times in the plant's life cycle (pollination, pod or fruit set). Furthermore, heat waves can cause wilted plants (due to increased transpiration rates),

Modelled % change in agricultural production due to climate change, 2080



Source: Cline WR, 2007: *Global warming and agriculture: Impact estimates by country*. Washington, D.C.: Center for Global Development, Peterson Institute for International Economics (cited in von Braun J (IFPRI), 2007)

which can lead to yield loss if not mitigated by irrigation. Heavy rains, which frequently cause flooding, can also be harmful to crops and soil structure. Most plants cannot survive in prolonged waterlogging because their roots require oxygen. The overall effects of climate change on farming are anticipated to be detrimental, endangering the security of the world's food supply.

A number of African nations already struggle with semi-arid conditions that make agriculture difficult, and climate change is likely to shorten the growing season and put large areas of marginal agriculture out of business. By 2020, yields in some nations could be reduced by up to 50%, and crop net revenues could decline by up to 90% by 2100, with small-scale farmers being the most adversely affected.

Climate changes may also affect the availability of water and the amount of water required for agriculture. The need for irrigation may rise in the future if temperatures rise and there are more sporadic rainfall events as a result of global warming.

Plant breeders are currently working to create new crop varieties that are thought to be drought tolerant and more adaptable to varying levels of temperature and moisture in anticipation of these changes.

Effects of global warming on agriculture

By emitting greenhouse gases (GHGs) and converting non-farm land (like forests) into farmland, agriculture contributes to climate change. In 2010, the combined effects of agriculture, forestry, and land use change accounted for 20 to 25% of global annual emissions.

However, investments in the right agricultural innovations are required right away because some of the best strategies to combat climate change, such as more resilient crop varieties and livestock breeds, can take up to 20 years to develop. Food production in vulnerable areas can still be profitable. Even though it is urgent, our efforts to lessen the effects of climate change will not have much of an impact over the next 50 years.

Past greenhouse gas emissions have already started the changes that will take place during this time.

Limiting greenhouse gas emissions will only affect climate change in the long-term (beyond 50 years). So we must learn to adapt to the changes in climate that will occur over the next 50 years.

CLIMATE CHANGE – MITIGATION AND ADAPTATION IN AGRICULTURE

1. Assist farmers in coping with current climatic risks by providing value-added weather services to farmers.

Farmers can adapt to climate changes to some degree by shifting planting dates, choosing varieties with different growth duration, or changing crop rotations.

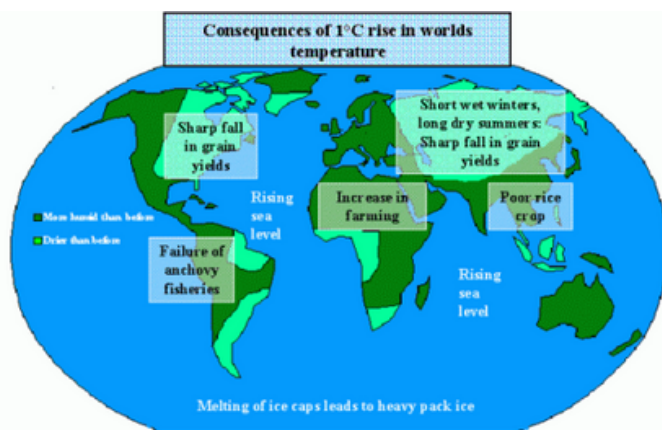
2. An Early warning system should be put in place to monitor changes in pest and disease outbreaks. The overall pest control strategy should be based on integrated pest management because it takes care of multiple pests in a given climatic scenario.

3. Participatory and formal plant breeding to develop climate-resilient crop varieties that can tolerate higher temperatures, drought and salinity.

4. Developing short-duration crop varieties that can mature before the peak heat phase sets in.

5. Selecting genotype in crops that have a higher per day yield potential to counter yield loss from heat-induced reduction in growing periods.

6. Preventive measures for drought that include on-farm reservoirs in medium lands, growing of pulses and oilseeds instead of rice in uplands, ridges and furrow system in cotton crops, growing of intercrops in place of pure crops in uplands, land grading and leveling stabilization of field bunds by stone and grasses, graded line bunds, contour trenching for runoff collection, conservation furrows, mulching and more application of Farm yard manure (FYM).



CONCLUSION

The result of "Global Warming," climate change, has begun to have an impact everywhere. The main factor affecting agricultural productivity, which has a direct impact on food production all over the world, is climate. As a result of the fact that the world's population is ageing, the world's population is becoming more and more reliant on technology. A rise in the average seasonal temperature can shorten the growing season for many crops, lowering their final yield.

Climate change, including variations in temperature and precipitation, has a significant impact on food production systems because it can cause pest and disease outbreaks, reduce harvests, and ultimately jeopardise the nation's ability to eat.

The exposure to global environmental factors will determine the overall impact of food security. The exposure to global environmental change and the ability to adapt to and recover from global environmental change will determine the overall impact of food security. Careful resource management, including the management of soil, water, and biodiversity, will be necessary to deal with the effects of climate change on agriculture. India will need to take action at the international, regional, national, and local levels to address the effects of climate change on agriculture and food production.