

Reply to Parliament Question

Impact of Global Warming on Agriculture

1. The projected temperature increase by the end of this century is *likely* to be in the range 2 to 4.5°C with a best estimate of about 3°C, and is *very unlikely* to be less than 1.5°C. Values substantially higher than 4.5°C cannot be excluded.
2. For the next two decades a warming of about 0.2°C per decade is projected. Even if all future emissions were stopped now, a further warming of about 0.1°C per decade would be expected.
3. It is *very likely* that hot extremes, heat waves, and heavy precipitation events will continue to become more frequent.

Indian scenario of climatic change (Based on NATCOM report, MOEF)

1. Surface air temperature for the period 1901-2000 indicated a significant warming of 0.4°C for 100 years. The spatial distribution of temperature changes indicated a significant warming trend has been observed along the west coast, central India, and interior Peninsula and over northeast India. However, cooling trend has been observed in northwest and some parts in southern India.
2. Instrumental records over the past 130 years do not show any significant long-term trend in the frequencies of large-scale droughts or floods in the summer monsoon season.

Probable Impacts of Climate Change on Indian agriculture

1. There is preliminary evidence to indicate that rice yields in Indo-Gangetic plains may have decreased in recent past due to a slight rise in minimum temperatures.
2. Wheat yields and hence production has shown losses of 4-6 million tons in recent years due to increased heat in February-March.
3. Increasing temperatures in Himachal Pradesh has resulted in a decrease in apple productivity and the apple belt is gradually shifting upwards (higher elevation).
4. Although increase in CO₂ is beneficial to several crops, associated increase in temperatures, and increased variability of rainfall would considerably impact food production. It is projected that production of most food crops would decrease; the magnitude of that remains uncertain at present.
5. Small changes in temperature, CO₂ and rainfall can have significant effect on quality of fruits, vegetables, tea, coffee, aromatic, and medicinal plants.
6. Changes in precipitation patterns and amount, and temperature can influence soil water content, runoff and erosion, workability, salinisation, biodiversity, and organic carbon and nitrogen content.
7. Increasing glacier melt would affect irrigation resources especially in the Indo-Gangetic plains.
8. Increasing temperature reduces fertilizer use efficiency, which may result in increased fertilizer requirement for meeting future food production demands and at the same time higher emissions of greenhouse gases.

9. Global warming in short-term is likely to favour agricultural production in temperate regions (largely Europe, north America) and negatively impact tropical crop production (South Asia, Africa) affecting trade.
10. Global warming could increase water, shelter, and energy requirement for meeting projected milk demands.
11. Increasing sea and river water temperature is likely to affect fish breeding, migration, and harvests.

Adaptation strategies in agriculture to climate change

1. Altered agronomy of crops: Small changes in climatic parameters can often be managed reasonably well by altering dates of planting, spacing and input management. Development of alternate crops or cultivars more adapted to changed environment can further ease the pressure.
2. Development of resource conserving technologies: Recent researches have shown that surface seeding or zero-tillage establishment of upland crops after rice gives similar yields to when planted under normal conventional tillage over a diverse set of soil conditions. In addition, such resource conserving technologies restrict release of soil carbon thus mitigating increase of CO₂ in the atmosphere. Greater emphasis on water harvesting and improving the efficiency of regional as well as farm water use efficiency could help to face uncertain rainfall.
3. Improved land use and natural resource management policies and institutions: Adaptation to environmental change could be in the form of social aspects such as crop insurance, subsidies, and pricing policies related to water and energy. Necessary provisions need to be included in the development plans to address these issues of attaining twin objectives of containing environmental changes and improving resource use productivity. Policies should be evolved that would encourage farmers to enrich organic matter in the soil and thus improve soil health such as financial compensation/incentive for green manuring.
4. Improved risk management through early warning system and crop insurance: The increasing probability of floods and droughts and other uncertainties in climate may seriously increase the vulnerability resource-poor farmers to global climate change. Policies that encourage crop insurance can provide protection to the farmers in the event their farm production is reduced due to natural calamities.