

Impact of Climate Change on Agriculture and Food Security

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Impact on Ecosystems

Semi-arid regions

- ↑↑ Frequency of extreme weather climates.
- By 2050 winter rainfall will ↓↓ by 10-20 %.
- N.India: ↑↑ temperature could rise by 3.5oC to 5oC.
- Water Shortages at all levels.



Impact....

Arid regions

- Fresh water decreases.
- Water salinity ↑↑ due to excess rainfall & flooding





Impact....

Tropical wet and dry regions

- Drought prone regions experience frequent flooding.
- High incidence of extreme weather events.



Impact....

River deltas and coastal areas

- Krishna, Cauvery and Narmada rivers expected to experience water shortage.
- Sea incursion threatens coastal regions.
- Expected $\uparrow\uparrow$ in temperature from 1°C to 7°C by 2070 in coastal regions.
- Sea level rise: 3-16 cm by 2030, 50 cm by 2070 and 60 cm by 2100.

Impact....

Mangroves

- Temperature above 35°C will affect mangrove root structure.
- ↑↑ in sea level and extreme water events will destroy mangrove ecosystem.
- ↓↓ in rainfall will affect mangrove geographical distribution and biodiversity.



Impact of Climate Change on Agriculture

- Melting Himalayan glaciers reduce water for agriculture
- N.India: water levels ↓↓ by 40.5 mm per year
- Uttarakhand: 34% water streams dried/become seasonal
- High temperature → dry soil → reduced root growth → less N₂ fixation → low yield





Impact on Agriculture...

- Rise in number of invasive alien species pose threat to agriculture.
- Rise in the spread of disease and pests will reduce yields.
- ↑↑ temperature will negatively impact pollination.



Impact on Crops

Cereal Crops

- **Wheat:** 1°C rise in temperature will decrease wheat production by 6 million tonnes.
- **Rice:** 1°C increase in night time temperature led to a 10 percent reduction in yield.
- **Maize:** Yield reduction by 18 % by 2080.



Vegetables and Legumes

- **Chickpeas:** ↑↑CO₂ can increase yield
- **Onion:** ↑↑ CO₂ enhanced accumulation of dry matter = big size bulbs.
- **Tomato:** ↑↑CO₂ increases yield, higher no. of fruits.
- **Coconut:** Temperature sensitive. Likely to decline on east coast, increase in west coast.
- **Apples:** Reduction in yield in current locations.





Impact on Livestock

- Indigenous breeds have better tolerance to heat, pests & disease
- Hybrid cattle highly vulnerable
- Current milk production based on hybrid cattle will decline



Impact on Fisheries

Marine Fish:

- Increased mortality, changed geographic distribution; affect availability.
- Rise in sea surface temperature affects spawning activity.





Fresh water fish:

- ↓↓ in rainfall alters flow of water affect breeding patterns.
- Changes in rainfall and ↑↑ temperature affects shift in distribution of species in rivers.
- Quality & quantity of water in ponds/tanks affects fresh water fish.



Adaptation

- Adaptation based on Sustainable Agriculture
- Global-India must negotiate that global temperature rise is capped at 2⁰C.
- Regional cooperation at SAARC level necessary to protect the Himalayan ecosystem



Adaptation...

National-

- Multiple food and livelihood strategies
- Food inflation must be contained at all costs
- Strategic research, along with dedicated funding to develop solutions
- Mitigating emissions to reduce input costs
- Reduce vulnerabilities, strengthen resilience



Adaptation...

- Sustainability rather than maximising outputs
- Ecosystem approach with crop rotations, bioorganic fertilizers and biological pest controls.
- Diverse agro ecosystems, have more efficient network of insects & microorganisms that control pests and disease.





Adaptation...

- Conserve Agriculture biodiversity
- Special package for rianfed areas
- Diversify production to include crops, livestock, fisheries, poultry and agro forestry
- Farm ponds, fertilizers trees and biogas plants
- Knowledge-intensive, rather than input-intensive approach.

