



## Agriculture and Changing Climate

The article is based on [‘Climate Change and Agriculture: Way Ahead for Low-Emission Growth’](#) published in Down To Earth on 25/09/20. It focuses upon how the Agriculture and Changing Climate are affecting each other and what steps can be taken to curb the worse.

As the climate continues to heat up and the impacts of global warming grow more frequent and severe, farmers and farm communities around the world have been increasingly challenged.

While the agriculture sector is responsible for climate change due to [Greenhouse Gas \(GHG\)](#) emissions, it is also severely impacted by the effects of changing climate.

Climate change is also threatening India’s agricultural growth with frequent dry spells, heat waves and erratic rainfall. Besides, the changing rainfall patterns in the form of delayed onset or early withdrawal has adversely affected the cropping cycle and farm operations.

With increasing population and the need to enhance food production, one has to address the challenge of meeting the growing demand for food production while controlling and reducing the GHG emissions from agriculture.

### Agriculture Affecting Climate

- **Greenhouse Gases:** Farming in particular releases significant amounts of methane and nitrous oxide, two powerful greenhouse gases.
  - Methane is produced by livestock during digestion due to enteric fermentation and is released via belches.
    - It can also escape from stored manure and organic waste in landfills.
    - Livestock is alone responsible for 44% of methane emissions.
  - 53% of Nitrous oxide emissions are an indirect product of organic and mineral nitrogen fertilisers.
- Fertilisers rich in nitrogen pollute water and threaten the aquatic ecosystem.
- **Monocultural Practices:** Monocultures along with pesticides and herbicides lead to the loss of biodiversity.
  - Monoculture cropping systems leave soil bare for much of the year, rely on synthetic fertilizer, and plow fields regularly.
  - These practices leave soils low in organic matter and prevent formation of deep, complex root systems leading to reduced water holding capacity.
- Clearing uncultivated land for farming can lead to the destruction of natural ecosystems, which may have a devastating effect on the local wildlife and biodiversity and the micro-climate.
- Many agricultural sectors need large amounts of water, which may cause water scarcity and drought.

## Changing Climate Affecting Agriculture

- **Extreme heat:** Crops need suitable soil, water, sunlight, and heat to grow. However, extreme heat events and reductions in precipitation and water availability have hampered the crop productivity.
- **Changing Rainfall Patterns:** Rainfall patterns have already begun shifting across the country, and such changes are expected to intensify over the coming years.
  - This is likely to mean more intense periods of heavy rain and longer dry periods, even within the same regions.
- **Floods:** Flooding in many agricultural regions of the country have been witnessed and these floods have devastated crops and livestock, accelerated soil erosion and have polluted water.

## The Scenario of India

- India is the third-largest emitter of greenhouse gases after China and the United States.
- According to a report by the [International Energy Agency](#), India emitted 2,299 million tonnes of Carbon Dioxide (CO<sub>2</sub>) in 2018.
  - This accounts for 7% of global GHG emissions.
- Agriculture and livestock account for 18% of gross national emissions.
- A study by the **International Maize and Wheat Improvement Centre (CIMMYT)** pointed out that India has the potential to cut 18% of its annual greenhouse gas emissions from the agriculture and livestock sector.
  - The study estimated that 50 per cent of this reduction could be achieved by implementing these three measures:
    - Efficient use of fertiliser
    - Adoption of zero-tillage
    - Management of water used to irrigate paddy.

**Zero Tillage** also called **No-till Agriculture**, is a cultivation technique in which the soil is disturbed only along the slit or in the hole into which the seeds are planted, the reserved detritus from previous crops covers and protects the seedbed.

## Challenges

- Convincing the farmers for switching to the alternate package of practices; changing their socio-economic perspective.
- Pursuing people to change their mindsets for agricultural areas; treating them as whole of an ecosystem rather than treating them as a crop producing factory.
- Ensuring that all the farmers are provided with better market linkages so that they are able to get higher returns for their produce.

## Measures That Can Be Taken

- A combination of tools and techniques covering capacity building, field demonstration, extension and outreach will enable faster adoption.
- **Low External Input Systems:** Moving our current agricultural production systems from an input-intensive regime to low external input systems requires engaging with farmers to first demonstrate alternate practices and then convincing them to change their practices.
  - Concepts such as **Low External Input Sustainable Agriculture (LEISA)** are receiving increased attention as a sustainable alternative to chemical farming.

- **Zero Budget Natural Farming (ZBNF):** It encourages farmers to use low-cost locally sourced input and should be promoted to minimise the use of chemical fertilisers and pesticides.
- **Small and Marginal Farmers:** They should be persuaded to shift to alternate packages of practices, demonstrated the effectiveness of these practices and encouraged to work in collaboration with the [Krishi Vigyan Kendras](#) to increase the outreach.
  - For example, Cotton farmers in Maharashtra's Yavatmal district are making the shift to a package of practices that lower the use of water (through in-situ soil moisture conservation and other demand management measures), promote the use of biofertilizers and biopesticides as a means to reduce the cost of cultivation and lower the environmental footprint of cotton cultivation.

### **Low External Input Sustainable Agriculture (LEISA)**

- The term low-input agriculture has been defined as a production activity that uses synthetic fertilizers or pesticides below rates commonly recommended by the Extension Service. However, it does not mean elimination of these materials.
- Yields are maintained through greater emphasis on cultural practices, [Integrated Pest Management](#), and utilization of on-farm resources and management.
- The **LEISA** concept seeks to optimize the use of locally available resources by maximizing the complementary and synergistic effects of different components of the farming systems. External inputs are used in a complementary way.

### **Conclusion**

- The efforts to combat climate change will have to focus on mitigation and adaptation efforts across all sectors.
- For agrarian countries, the task will be to ensure increased production without increasing the environmental footprint of agriculture by enhancing the knowledge and skills of our farmers.

#### ***Drishti Mains Question***

"Agriculture and climate change are deeply intertwined. It's time to change the way agriculture affects the environment, and vice versa." Discuss.

This editorial is based on '[China drives QUAD](#)' published in 'The Indian Express' on October 10, 2020. Now watch this on our youtube channel.

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