

Role of Agriculture in Climate Change

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Introduction:

Agriculture and livestock account for 18% of gross national emissions in India, making them the third-highest sector after energy and industry. India is the third-highest emitter of greenhouse gases after China and the United States. According to a report by the International Energy Agency, India released 2,299 million tonnes of carbon dioxide (CO₂) in 2018. This is responsible for 7% of the world's Greenhouse Gas (GHG) emissions. The primary source of greenhouse gases is methane, which is released via agricultural processes and food systems. Agriculture and the food system's crucial function is frequently disregarded. The Compassion in World Farming charity submitted a paper to the Conference of the Parties 26 (COP26), a United Nation climate change conference, stating that the food system "receives significantly less attention, although producing 26–37% of Greenhouse Gas (GHG) emissions." With frequent dry spells, heat waves, and variable monsoonal rains, climate change is endangering India's food security and aggravating farmers' problems.

Major greenhouse gas emitting states

Uttar Pradesh appeared as the top agricultural and livestock GHG emitter, followed by former undivided Andhra Pradesh and Madhya Pradesh. Since Andhra Pradesh, West Bengal, and Assam states have more land dedicated to rice farming, these states had the maximum paddy rice emissions.

Emissions of Greenhouse gases

S.No.	Domains	N ₂ O (kt)	CH ₄ (kt)	CO ₂ (kt)
1.	Rice	-	4750.2	-
2.	Food systems wastage disposal	28.43	5283.89	814.77

3.	Crop residues (All crops)	88.76	-	-
4.	Burning crop residue	3.52	135.73	-
5.	Synthetic fertilizers	424.84	-	-

(Source: FAO STAT, 2020)

Note: Kilotonnes is denoted as kt

Greenhouse gases such as N₂O, CH₄ and CO₂ are emitting from agriculture. From Rice production, 4750.2 kt of Methane (CH₄) was emitting. Food systems wastage disposal was contributing the 28.43 kt of Nitrous Oxide (N₂O), 5283.89 kt of Methane (CH₄) and 814.77 kt of Carbon dioxide (CO₂) into the environment which were adversely affecting the climate. From different types of crop residues, 88.76 kt of Nitrous Oxide (N₂O) got emitted. By burning the crop residues, 3.52 kt of Nitrous Oxide (N₂O) and 135.73 kt of Methane (CH₄) were emitting. Due to the utilization of Synthetic fertilizers, 424.84 kt of Nitrous Oxide (N₂O) got emitted.

Crop residues

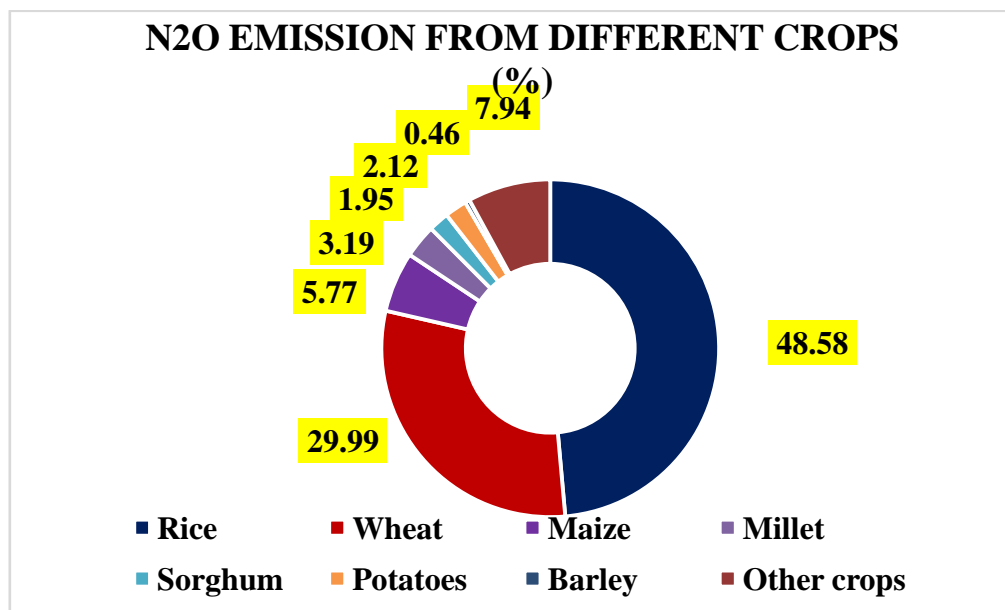
Crop residues are plant materials that remain on cultivated land after a crop is harvested including leaves, stubble, seed pods and stalks.

S. No.	Crops	N ₂ O (kt)
1.	Rice	43.12
2.	Wheat	26.62
3.	Maize	5.12
4.	Millet	2.83
5.	Sorghum	1.73
6.	Potatoes	1.88
7.	Barley	0.41
8.	Others	7.05
Crop residues (All crops)		88.76

(Source: FAO STAT, 2020)

From the crop residues, rice is emitting the highest amount of Nitrous Oxide (N₂O) i.e., 43.12 kt followed by wheat (26.62 kt), maize (5.12 kt), millet (2.83 kt), potatoes (1.88 kt), sorghum (1.73 kt) and barley (0.41 kt).

Figure 1. Percentage contribution of N₂O emission from different crops for total crop residues



Burning crop residues

Crop burning is widely considered as an effective way to clear land, fertilize soil and prepare it for the next crop. However, the frequent burning pollutes the environment by emitting Greenhouse Gases such as methane (CH₄) and nitrous oxide (N₂O).

S. No.	Crops	CH ₄ (Kilotonnes)	N ₂ O (Kilotonnes)
1.	Maize	26.63	0.69
2.	Rice	66.82	1.73
3.	Wheat	33.86	0.87
4.	Sugarcane	8.41	0.22

(Source: FAO STAT, 2020)

From burning crop residue, rice is emitting the uppermost amount of methane (CH₄) and Nitrous Oxide (N₂O) i.e., 66.82 kt and 1.73 kt respectively followed by wheat (33.86 kt) of CH₄ & (0.87 kt) of N₂O, maize (26.63 kt) of CH₄ & 0.69 kt of N₂O and sugarcane (8.41 kt) of CH₄ & 0.22 kt of N₂O.

Climate-friendly mitigation measures:



- ✓ India can encourage a site-specific approach to nutrient management, exchange the urea for other sources of nitrogen, inhibit broadcast application, encourage drill application, encourage fertigation (applying fertilizer with irrigation), etc. to increase the efficiency of fertilizer N [nitrogen] use.
- ✓ Zero tillage, commonly referred to as no-till farming, is a method where farmers try to disturb the soil as little as possible while reducing the amount of fuel used in tillage operations. It is applicable to the growth of rice, maize, cotton, and sugarcane.
- ✓ Methane emissions can be decreased without sacrificing output by managing rice water by letting the field dry after irrigation as opposed to continuously flooding it.
- ✓ Low-carbon emission crops can be encouraged to minimize the release of GHGs
- ✓ It is high time for India to establish a thriving carbon market and declare indicative carbon pricing in order to promote sustainable development.

Conclusion:

India is the third-highest emitter of greenhouse gases after China and the United States. Greenhouse gases (GHGs) emissions are increasing day by day as a result of various agricultural activities. To combat the GHGs emissions, different measures such as efficient use of fertilizers, zero tillage, management of water in rice production, encouraging low carbon emission crops to be followed.

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