



# AGRI MAGAZINE

(International E-Magazine for Agricultural Articles)

Volume: 03, Issue: 04 (April, 2026)

Available online at <http://www.agrimagazine.in>

© Agri Magazine, ISSN: 3048-8656

## Organic Farming: An Approach Towards Mitigating Climate Change

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Rising GHG concentrations (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O) spur climate change, with land use, forestry, and agriculture emitting 22% GHG globally; agriculture alone contribute 81% of anthropogenic N<sub>2</sub>O and 70% of CH<sub>4</sub>. Organic farming can mitigate this, yielding 40% less CO<sub>2</sub>-equivalents per hectare than conventional systems while sequestering soil carbon. Organic farming practices including composting/manure management (reduces 38-84% CH<sub>4</sub> emission via aeration/biochar; biogas capture); mulching (>90% erosion reduction); legume rotation (154M tonnes N<sub>2</sub> fixation/year); and synthetic input avoidance (30% less fossil energy). These build soil humus, stabilize nitrogen, and eliminates energy-intensive fertilizer emissions. Organic farming thus reduces GHGs, enhances resilience, and supports sustainable agriculture.

### Introduction

Climate Change is one of the major global problems spurred mainly by rising concentrations of greenhouse gases (GHGs) such as CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. According to the IPCC study, land use, forestry and agriculture account for 22% of the world's greenhouse gas emissions. And mainly agriculture has been recognised as a major contributor of greenhouse gases, releasing around 81 % and 70% of the anthropogenic emissions of nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>), respectively (Paul *et al.*, 2001), but practices like organic farming, which don't use artificial pesticides or fertilizers, can lower GHG emissions and improve soil carbon storage. Compared to conventional farming, organic systems usually produce around 40% less CO<sub>2</sub>-equivalent per hectare (Clark and Tilman 2017). In this regard, organic farming stands out as a viable and environmentally beneficial approach that may lower levels of GHG, and also sequesters carbon in the soil (Panwar *et al.*, 2010).

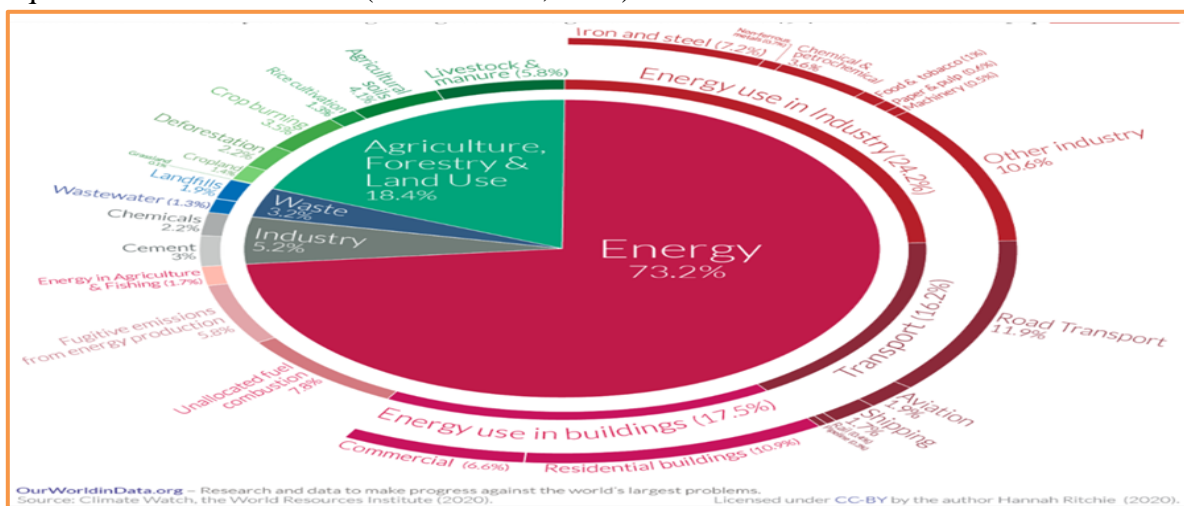
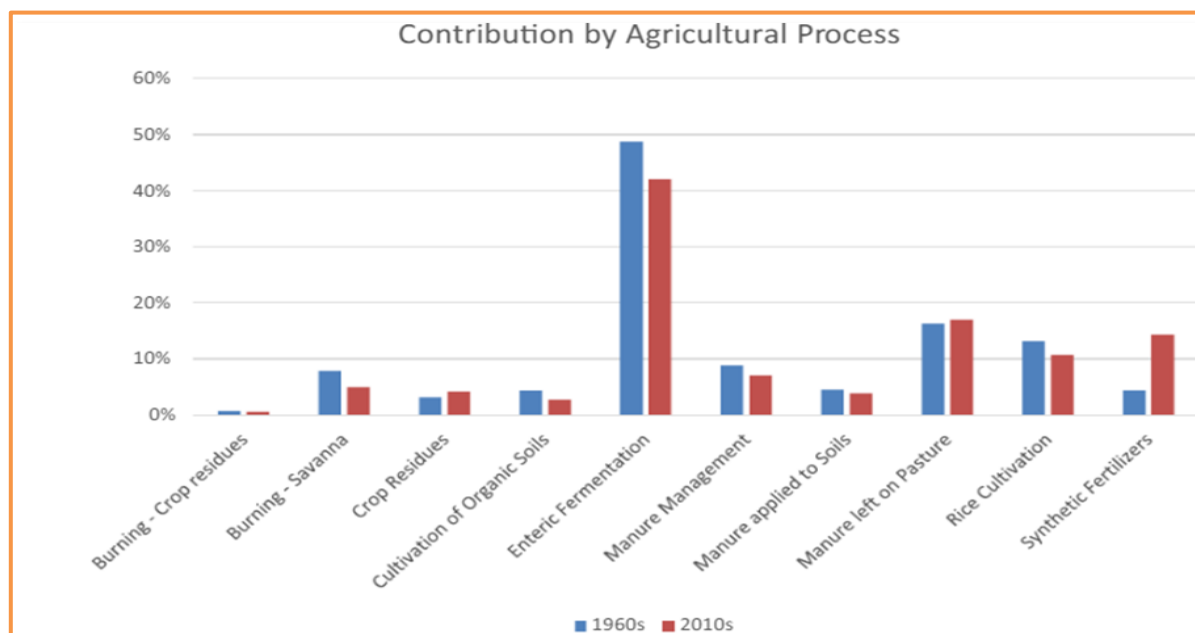


Fig.1: Global greenhouse gas emissions by different sectors



**Fig. 2: Contributions from agriculture sub-sector to total GHG emissions at global level**  
 Source: FAOSTAT database (FAO, 2018)

## Climate change mitigation through organic farming practices

Organic farming leads to climate change mitigation via different practices as mentioned below:

### Composting and manure management

Composting process has the potential to reduce GHG emissions, including nitrous oxide ( $N_2O$ ) and methane ( $CH_4$ ) emissions from livestock waste. Higher emissions from outdoor windrow composting systems than from controlled aerated systems.

- **Reduction in  $CH_4$  emissions**

Organic wastes (crop residues, manure, food waste) in landfills decompose anaerobically, causing higher methane emissions. While composting through aerobic process significantly reduces methane formation compared to landfilling by 38–84% (Paul *et al.*, 2001).

- **Reduction in nitrous oxide ( $N_2O$ ) emissions**

Poor storage of manure releases  $N_2O$  (highly potent greenhouse gas) while controlled composting stabilises nitrogen, reducing  $N_2O$  emissions.

- **Proper manure management**

Biogas ( $CH_4$ ) produced from the anaerobic composting method is captured and used in place of fossil fuels, resulting in reduced GHG emissions.

- **Improved approaches for composting**

It includes two methods: process modification (PM) and additive strategies (AS).

- **Process modification:** It involves improving aeration and optimising turning regimes that suppress  $CH_4$  by maintaining aerobic conditions.
- **Additive strategies:** Biochar and mineral amendments like zeolites reduces GHG emissions through improved porosity and microbial habitat enhancement.

### Mulching

Mulching is a sustainable practice for reducing GHGs emissions as it increases carbon sequestration through reduced soil erosion and reduced soil temperature. Mulching reduces erosion by more than 90% compared to bare agricultural soil (Mostaghini *et al.*, 1994).

### Crop Rotation with legumes

Legumes fix atmospheric nitrogen into the soil thus reducing dependence on fertilizers. Potentially legume fix 154 million tonnes nitrogen annually (Badgley *et al.*, 2007).

## Effects of organic farming practices on Climate

The different organic practices ultimately result in reduction of GHGs through various ways:

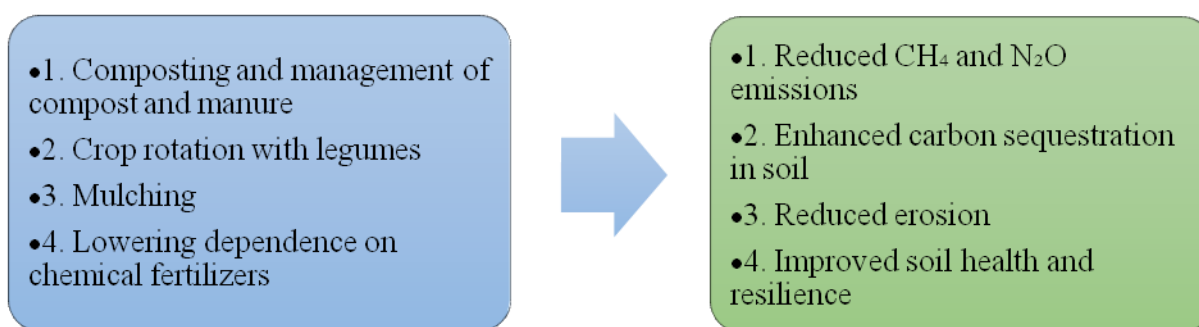
### Enhancing carbon sequestration in soil

As compost adds humus (stable organic matter) to soil, this helps in the retention of carbon in soil instead of getting released as CO<sub>2</sub>.

### Reduced Energy Use and Fossil Fuel Dependency

Organic agriculture plays a significant role in reducing fossil fuel consumption. Studies indicate that organic corn production uses about 30% less fossil energy (Pimentel *et al.*, 2005). This reduction is largely attributed to the avoidance of energy-intensive synthetic fertilizers. And use of compost and manure as a nutrient substitute reduces the need for synthetic fertilizers. Reduced use of fertilizers on soil ultimately minimises N<sub>2</sub>O emissions from fertilizer. Also, elimination of fertilizer in organic farming curbs GHG emissions since fertiliser production is a highly energy-intensive process.

| Organic farming practice         | Effects on GHG emissions  |
|----------------------------------|---|
| Composting and Manure Management | Reduces emissions of CH <sub>4</sub> and N <sub>2</sub> O by 38–84% ; captures biogas for energy. |
| Mulching                         | Cuts erosion by >90%; boosts soil C sequestration.  |
| Legume Crop Rotation             | Fixes N <sub>2</sub> (154M tonnes/year); lowers fertilizer needs.                                 |
| Reduced Synthetic Inputs         | 30-40% less CO <sub>2</sub> -eq.; less energy or fossil fuels.                                    |



**Practices and effects of organic farming resulting in climate change mitigation**

### Conclusion

Organic farming practices like composting and management of compost and manure, crop rotation and legume incorporation, mulching, and lowering dependence on chemical fertilisers enhance soil carbon sequestration and reduce greenhouse gas emissions, representing a sustainable pathway toward climate change mitigation.

### References

- Goh, K. M. (2011). Greater mitigation of climate change by organic than conventional agriculture: A review. *Biol Agric Hort* **27**(2): 205–229.
- Holka, M., Kowalska, J. and Jakubowska, M. (2022). Reducing carbon footprint of agriculture - can organic farming help to mitigate climate change? *Agriculture* **12**(9): 1383.
- Panwar, A.S., Ansari, M.A., Ravisankar, N., Babu, S., Prusty, A.K., Ghasal, P.C. and Sharma, P.B. (2022). Effect of organic farming on the restoration of soil quality, ecosystem services and productivity in rice–wheat agro-ecosystems. *Front Environ Sci* **10**: 972394.
- Paul, J.W., Wagner-Riddle, C., Thompson, A., Fleming, R. and MacAlpine, M. (2001). Composting as a strategy to reduce greenhouse gas emissions. *Proc Can Nucl Soc*.
- Pimentel, D., Hepperly, P., Hanson, J., Seidel, R. and Douds, D. (2005). Organic and conventional farming systems: Environmental and economic issues.
- Tubiello, F.N. (2019). Greenhouse gas emissions due to agriculture. *Ency Food Sec Sustain*. 11: Pp. 196–205.