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Embracing organic farming :

A sustainable approach to conquering climate alter

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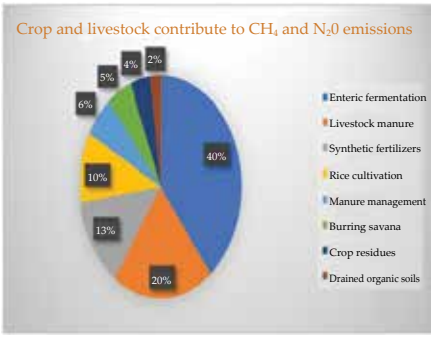
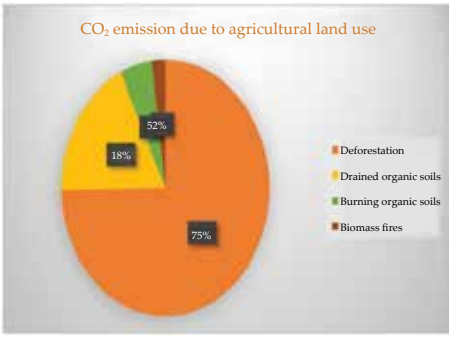
Global ecosystems and human societies are facing enormous challenges because of climate change. Currently, two of the biggest issues which mankind is facing are averting disastrous climate change and providing food to the World's expanding population. Even though Indian agriculture has undergone a huge transformation over the years but agriculture is a cause of climate change as well as a sufferer of it. The best long-term adaptation plan is to switch to organic farming practices. Scientific research has shown that organic farming is a feasible approach which is promising for lowering greenhouse gas (GHG) emissions, improving carbon sequestration, and strengthening ecosystem resilience. Organic agriculture seems to be the most environmentally friendly way to combat climate change while maintaining food security because it uses low external inputs and highoutput techniques.

Key words: Climate change, Carbon sequestration, Organic agriculture

WORLD'S agriculture industry solely produced 5.86 giga tonnes of carbon dioxide emission (GtCO2e) in 2021, accounting to 12.16% of all greenhouse gas (GHG) emissions (Climate watch data). It is imperative to establish adaptation strategies against climate change because agriculture is climate-dependent and thus, vulnerable to it. The agricultural ecosystem is disrupted by climate change, which affects the arable, livestock, and hydrology sectors as well as changes in agricultural climate variables like temperature, precipitation, and sunlight. We must switch to an agriculture that can adapt to climate change, protect biodiversity, maintain soil quality, and enhance farmer's livelihoods to supply sustainable food. By building robust systems, lowering reliance on chemical inputs, and encouraging the growth of natural resources, organic agriculture can be established. It also aids in waste reduction, sustainable diet promotion, distribution improvement, and a decrease in the consumption of animal products.

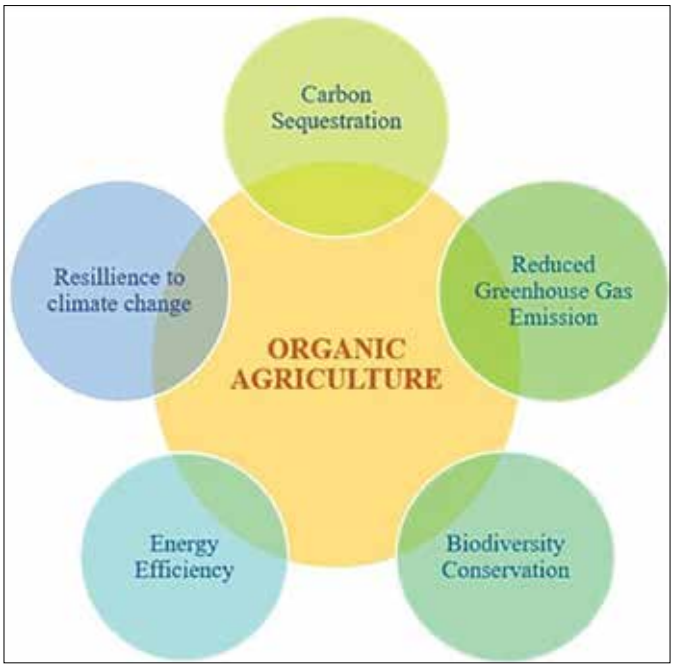


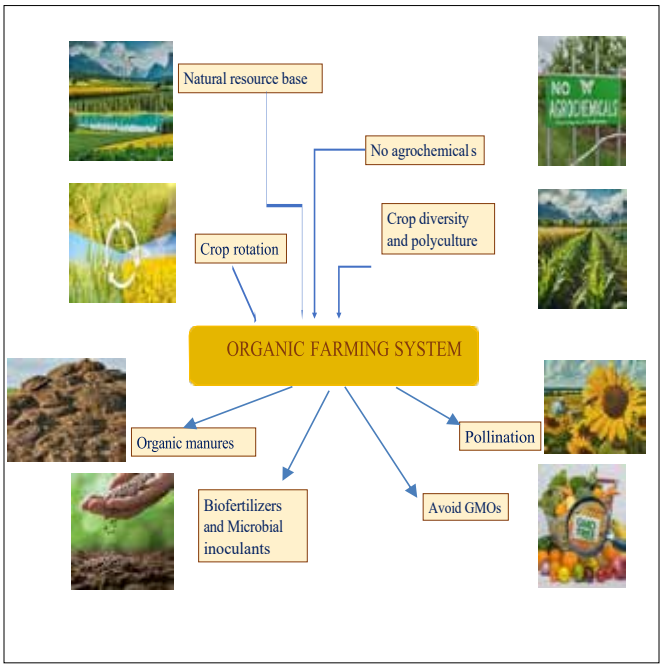


Organic agriculture is a promising approach

In essence, agriculture is both a generator and a sink of greenhouse gases. The two ways by which agricultural systems contribute to carbon emissions are direct use of fossil fuels in farming operations and indirect use of embodied energy in inputs that need a lot of energy to manufacture inputs. Agricultural practices, on the other hand, accumulate carbon in the form of biomass above ground or organic matter in the soil. However, due to its capacity to reduce GHG through carbon sequestration, agriculture has played a special role in mitigating the climate change. Organic farming has demonstrated the ability to lower GHG emissions by storing carbon and requiring less input.

The term "organic farming" describes food and fiber production methods that are based on ecological principles. The proactive, ecological management techniques that preserve and improve soil fertility, stop soil erosion, foster, and increase biological diversity, and reduce risks to the health of people and animals as well as the environment are what constitute organic farming. The return of carbon to the soil is enhanced by several management techniques used in organic agriculture, such as minimum tillage, reintroducing crop residues to the soil, using cover crops and rotations, and integrating





Scientifically driven potency of organic farming methods

nitrogen fixing legumes more deeply. This increases productivity and promotes carbon storage. The main goal of organic farming should not be to mitigate climate change; however, a greater conversion to organic agriculture can help reduce greenhouse gas emissions while also offering some significant advantages, like enhanced system resilience to climate change effects, preserved or enhanced farmland biodiversity, preserved soil fertility, decreased eutrophication, and water pollution, and enhanced food security and farmer sovereignty.

Carbon sequestration

Organic farming significantly reduces climate change through carbon sequestration. Carbon dioxide (CO_2) can be taken up and stored from the atmosphere by healthy soils that are high in organic matter. By improving soil structure and increasing its capacity to store carbon, organic farming techniques like the use of compost and cover crops help to successfully lower CO_2 levels in the atmosphere. Organic farming techniques absorb much more carbon than conventional farming systems, with an average gain of 0.45 tonnes of carbon per hectare per year.

Diminished emissions of GHG

The total greenhouse gas footprint of agriculture is reduced by organic farming because it avoids the use of synthetic fertilizers, which are a major source of N_2O, and fosters better soils. N_2O emissions from organic farming systems were 40–60% lower than those from conventional farming systems. Methane emissions from organic farming can be decreased by integrated animal management. Organic farms can reduce methane emissions by using techniques like composting and better management of their waste. Furthermore, compared to constant flooding, organic rice farming methods such as intermittent wetting and drying have been demonstrated to dramatically lower methane emissions. Also, organic farming requires 20–50% less energy per unit of crop yield, which lowers CO_2 emissions.

Biodiversity and resilience

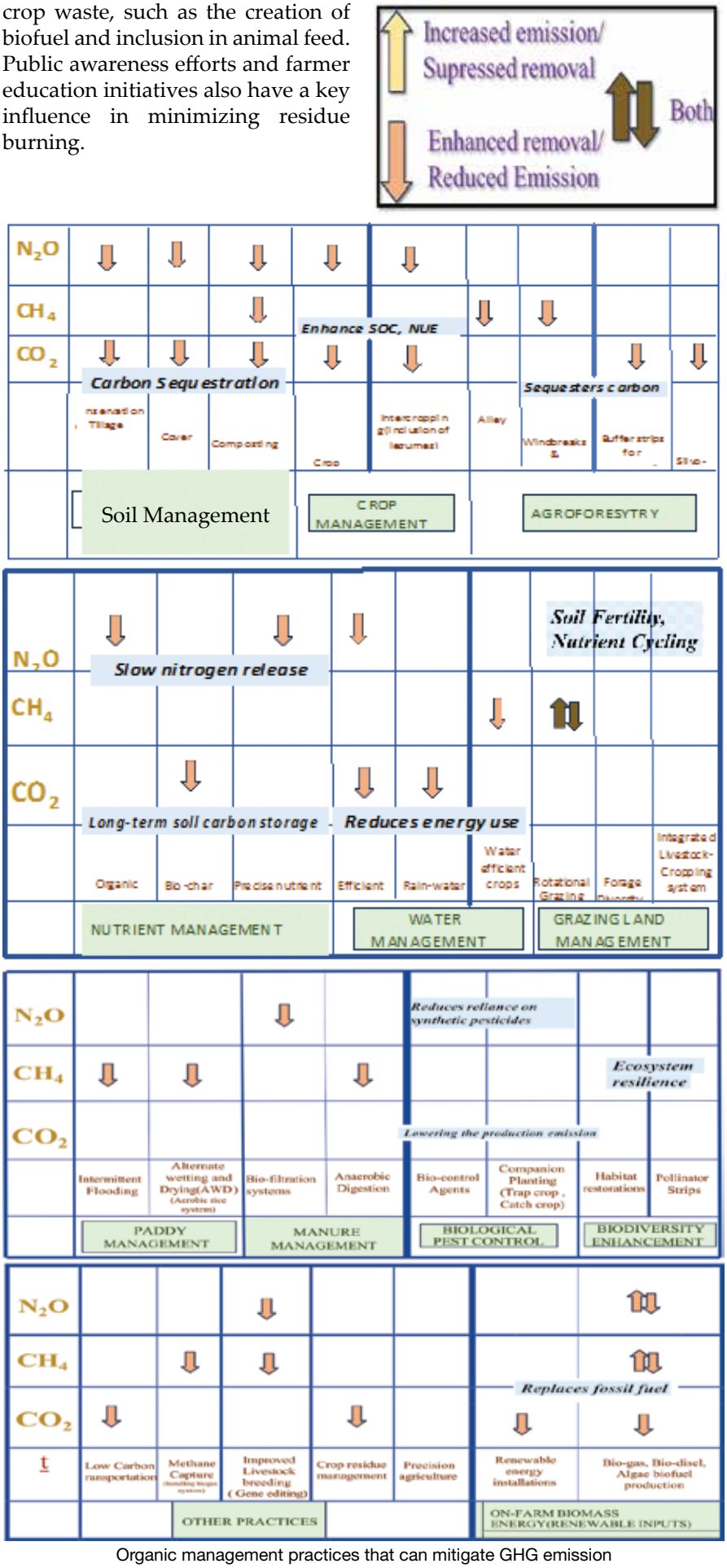
Diverse ecosystems are more resilient to diseases, pests, and periods of extreme weather. This resilience lowers the chance of crop failure and helps to provide stable food supply in a changing climate. Organic farming increases habitat diversity, biodiversity, and abundance while lowering synthetic input use and encouraging sustainable food production.

Case study

Studies worldwide showcase the impact of organic farming practices on climate change mitigation, highlighting their significant impact on carbon sequestration, emission reduction, and biodiversity conservation. The Rodale Institute's Trial of farming system research compared conventional and organic farming practices over an extended period. Their research suggested that organic systems improve soil carbon sequestration while requiring less energy. The potential of organic systems to lower atmospheric CO_2 levels was highlighted by a 30-year study that found them to sequester more carbon than conventional systems.

An integrated strategy is being employed to tackle the environmental problem of agricultural residue burning-induced air pollution in New Delhi. As evidenced by the assessment of mitigation strategies, promoting *in situ* residue management techniques, such as Happy seeder machine, which enables direct sowing without burning the stubble from the previous crop, is one of the key measures. Crop residues naturally break down more quickly when microbial decomposers like *Trichoderma* and *Pseudomonas* species are used. Furthermore, research is being done on other applications for

crop waste, such as the creation of biofuel and inclusion in animal feed. Public awareness efforts and farmer education initiatives also have a key influence in minimizing residue burning.



Organic management practices that can mitigate GHG emission

Prospects and difficulties

Organic farming offers advantages, but it also has drawbacks. These include reduced yields during the transition period, higher labour costs, and the requirement for management expertise. Fostering policy, funding for research, and farmer education are necessary to address these issues. Through financial incentives, technical support, and instructional programmes, governments and institutions can ease the transition to organic farming. Future research is necessary to develop cutting-edge organic farming techniques that maximize productivity and improve the environment.

SUMMARY

Despite some drawbacks, organic agriculture is so far the most promising strategy for survival and adaptation to climate change. Promoting and supporting organic farming practices is crucial in building a more resilient and sustainable agricultural system as the world faces more pressing concerns connected to food security and climate change. Establishing green governance is very important, as it requires the cooperation of all farmers, pertinent organizations, and policymakers, as well as a strong will to achieve green growth and an efficient system of execution to make it happen. To guarantee a smooth transition to a low-carbon agricultural system, however, reorganizing the agricultural sector as a whole is required; while promoting environmentally friendly agriculture will not be enough. To fully realize organic farming's potential in solving the dual concerns for food supply and climate change mitigation, further research, legislative assistance, and public awareness is essential. In order to create a robust and ecologically conscious food system for future generations, this article emphasizes how vital it is to give priority to sustainable agricultural methods like organic farming.

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