International Journal of Plant & Soil Science

Volume 37, Issue 7, Page 500-511, 2025; Article no.IJPSS.134416
ISSN: 2320-7035

A Review of Carbon Neutrality to Climate Resilience Evolving Strategies in Agriculture

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/ijpss/2025/v37i75595

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://pr.sdiarticle5.com/review-history/134416

Review Article

Received: 15/02/2025
Accepted: 18/04/2025
Published: 17/07/2025

ABSTRACT

Current agricultural practices contribute significantly to greenhouse gas emissions. The majority of non-CO_2 emissions of agriculture include methane (54%), nitrous oxide (28%) and carbon dioxide (18%), which collectively account for 12% of the world's yearly greenhouse gas (GHG) emissions (7.1 Gt CO_2 equivalent). GHG emissions contribute to agricultural activity in direct and indirect activities, accounting for 30% of total global anthropogenic GHG emissions. Agriculture serves a

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Cite as: *Zodge, Ranuji B., B. M. Kamble, D. H. Phalke, S. S. Bachhav, Samiksha G. Ahire, Nikita B. Gorde, and Mayuri. M. Jagtap. 2025. "A Review of Carbon Neutrality to Climate Resilience Evolving Strategies in Agriculture". International Journal of Plant & Soil Science 37 (7):500-511. https://doi.org/10.9734/ijpss/2025/v37i75595.*

major role in climate change. Agricultural practices lead to the emission of greenhouse gases. Moreover, conventional farming uses synthetic fertilisers. Deforestation and soil degradation are examples of inappropriate land use practices that lower the amount of organic matter in soil. The inappropriate carbon footprint of agriculture is a result of these activities as well as the wasteful use of inputs like water. carbon-neutral methods that reduce greenhouse gas emissions from the production of crops and livestock, and agricultural rice, enteric fermentation, and manure. Agriculture use the renewable energy irrigation source they help to reduce the GHG emissions. It also help to Sustainable development goal climate change.it is crucial role in the climate resilience.
These include switching to alternative rice farming techniques, using technologies for managing nitrogen fertilisers, decarbonising on-farm energy use, and developing feeding and breeding strategies that lower enteric methane. When taken as a whole, these actions can cut agricultural GHG emissions by as much as 45%. However, to achieve net-zero agriculture, carbon dioxide removal technology offsets will be needed to balance residual emissions of 3.8 Gt CO_2 equivalent per year. Bioenergy with improved carbon collection and storage. Greenhouse Gas emissions profound influence on their effects. Here an overview of inventions and technology was provided with the aim of lowering greenhouse gas emissions from agriculture. The study concluded that the rate and amount of SOC sequestration differ with soil types, depths, land use and land cover and vary from one region to another. Sequestration of carbon in soil can improve soil health, and improvement in soil health will help in improving input use efficiency in agriculture. Thus sequestering carbon in soil and biota can mitigate climate change.

Keywords: Carbon neutrality; carbon sequestration; climate change; greenhouse gas emissions; conservation agriculture.

1. INTRODUCTION

Indian agriculture has been transformed by the Green revolutions and White revolutions, evolving from a local market to a global market, benefiting consumers worldwide (Bawa & Seidler, 2023). The agricultural productivity of wheat and rice may be increased by 208% and 109%, respectively. The exploitation of nitrogen fertilizer significantly improved agricultural productivity. However, current agricultural practices contribute significantly to greenhouse gas emissions. New estimates of agricultural GHG emissions have shown that these emissions are continually on the increase due to the increase in food demand to feed the world population (Mabicka Obame *et al*., 2025). “GHG emissions contribute to direct and indirect agricultural activities that account for 30% of total global anthropogenic GHG emissions” (Skinner et al., 2019). Nitrous oxide (N_2O) and methane contribute to 60 % and 50%. Soil organic carbon plays a crucial role in reducing the emissions of GHGs and mitigating climate change. Soil organic carbon is an important factor in maintaining soil health and improving the physical, chemical and biological properties. Research suggests that “agriculture has the potential to be both a source and a sink of greenhouse gases. The soil stores a large amount of organic carbon, and about 10% of the CO_2 in the atmosphere passes through terrestrial soils each year. This demonstrates how soil can contribute to the emission of greenhouse gases” (Chataut *et al*., 2023; Qian et al.,2023). “Conventional farming often relies heavily on synthetic fertilizers, leading to substantial nitrous oxide emissions, while livestock farming remains a major source of methane (CH_4). Additionally, unsustainable land-use practices, such as deforestation and soil degradation, further reduce the capacity of agricultural land to act as an effective carbon sink. These practices, combined with inefficient use of inputs like energy and water, contribute to agriculture's unsustainable carbon footprint” (S R et al., 2024). “The main contribution of global agricultural GHG emissions is CH_4 from livestock enteric fermentation and rice cultivation, whereas N_2O is mostly attributed to the application of N-fertilizer. Also, the biomass burning of savannah, forest and crop residues contributes to both CH_4 and N_2O emissions. The excessive use of nitrogen (N) fertilizer led to a significant increase in agricultural productivity, however, the current agricultural activities emit large amounts of GHG. Concerns over climate change have increased globally as a result of the rise in atmospheric GHG levels. Environmental disasters, including widespread flooding, protracted droughts, and destructive wildfires, have been brought on by the significant changes in the global climate brought about by the increase in GHG emissions over the past many years. Humans rely significantly on agriculture for their survival, especially in an agrarian nation like India, where over half of the population works in the field, while 58% Many rural households rely on it to survive. The Intergovernmental Panel on Climate Change (IPCC), as reported by the global mean surface temperature, has risen 0.6 °C since 1861, and a further increase of 1.1 to 6.4°C is expected by 2100. The global carbon cycle soil plays a crucial role in Carbon budget because they contain more carbon than atmosphere and plant (Wang et al. 2010). Terrestrial carbon is 75% in the Earth's top one meter of soil depth. Integrated nutrient management of soil has the potential to sequester more carbon. Efficient use of pesticides, irrigation, fertilizers and farm machinery. Soil and crop management play a significant role in sustainable agriculture development (Lal, 2008).

2. ROLE OF THE GLOBAL CARBON CYCLE AND CARBON POOL

Carbon cycle knowledge is essential for mitigating climate change strategies. The day-by-day increase in the atmospheric CO_2 due to anthropogenic activities is a major issue. The interaction of carbon pools is a biochemical and climate process. The carbon is stored in the following pools: oceanic pools (3800 Pg), geological pools (5000 Pg), pedological pool (2500 Pg), atmospheric pool (760 Pg) and biotic pool (560 Pg).

3. SOIL CARBON STORAGE FACTS

Carbon plays a crucial role on the Earth. It is the building block for life on earth and movements through the atmosphere, oceans, plants and soils. Pool of Carbon is a major storehouse that houses a large amount of carbon. The movement of carbon between these carbon pools is called a flux.

4. CONCEPT OF CARBON NEUTRALITY

Carbon Neutral farming aims to balance the carbon emissions produced by farming activities with equivalent carbon removals or sequestration, resulting in a net–zero carbon footprint (Sneha et al, 2024).

4.1 Carbon Emissions in Agriculture

GHG emissions are significantly influenced by agriculture due to a variety of agricultural activities. GHGs in agriculture are caused by methane emissions from rice crops, enteric fermentation, livestock manure management emissions, burning agricultural residue, changes in land use, emissions from fossil fuels, and nutrient management that lacks scientific knowledge. The emissions from enteric, manure and pasture are 4.2 Gt CO_2-eq year^{-1}, whereas the unbalanced inorganic fertilisers are 3.6 Gt CO_2-eq year^{-1} and the changes in land use are 3.3 Gt CO_2-eq year^{-1}(Poore & Nemecek, 2018).

4.2 Share in Emissions of GHG in India

In 2020, India's GHG emissions energy sector reached 75.66% and agriculture 13.75%, industries 8.08%, and waste 2.56%. Electricity plays a major role in the emissions of GHG. Half of the on-farm energy is the electricity (0.46 Gt CO_2-eq per year), and the remaining half is used

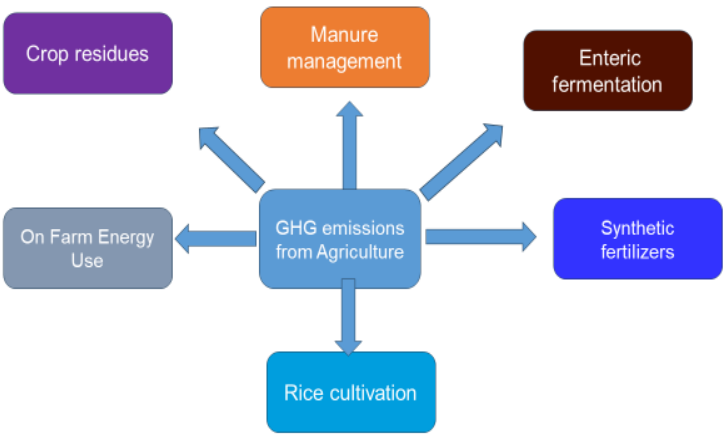

Fig. 1. GHG emissions from agriculture
Sneha et al.*, (2024)*

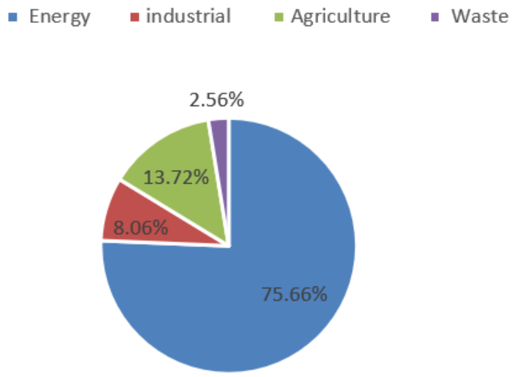

Fig. 2. Distribution of GHG emissions (Gtco$_2$e) by sector, 2020
(Source: India fourth biennial report)

as fuel in farm operation combustion (0.53 Gt CO_2 -eq per year) FAOSTAT (2023) and Flammini et al. (2022). Energy is a required non-renewable source of coal emission of GHG, the second emission of agriculture is due to the injudicious use of fertilizers, rice production, enteric fermentation and manure management. Use of the renewable source such as solar energy, wind power, ocean energy is regarded most important and efficient to achieve C neutrality (Wang *et.al*., 2021). C neutrality helps to reduce the emissions of GHG in the atmosphere and climate change. Conservation agriculture practices promote the sequestration of atmospheric carbon into the soil. Global anthropogenic (GHG) emissions of food production systems contribute 16.5 Gt CO_2 e year^{-1} from a total of 54 Gt CO_2 a year (Crippa et al., 2021) and FAO (2022). Synthetic nitrogen fertilizer contributes 8.3% of farm gate emissions (FAO, 2019).

4.3 Impact of Agrochemicals on Carbon Emissions

Agriculture's use of agrochemicals has increased since the green revolution. Various agrochemicals are used, like fertilizers, pesticides, fungicides, and herbicides. The transportation and packaging of agrochemicals required energy and GHG emissions (Bhat et al., 1994). Fertilizer is one of the crucial factors impacting the Carbon footprint (Iriarte, 2010) and (Gasol et al., 2012).

4.4 Crop Residue Burning

India generates a large quantity of crop residue, 500-550 million tonnes after harvest. Each year, approximately 90-140 million tonnes of these residues are burned on farms, primarily to clear fields for the next planting season. This practice significantly contributes to carbon dioxide emissions from agriculture (Sharma et.al., 2011).

4.5 Carbon Dioxide Emissions

In agriculture, CO_2 is released due to the soil microorganism respirations or crop residue burning (Bairwa et al., 2020; Janzen 2004).

4.6 Mitigating GHGs Emissions from Indian Agriculture

Agriculture can significantly reduce greenhouse gas emissions by implementing low-carbon technologies and sustainable practices. The following three approaches are for mitigating GHGs.

4.6.1 Avoiding emissions

Use crop residues from agricultural lands as fuel directly or after they are converted to fuels like diesel or ethanol. Upon combustion, these bioenergy feedstocks will also release carbon dioxide (CO_2), but this carbon will now come from recent atmospheric processes (photosynthesis) rather than fossil fuels. These bioenergy sources' net contribution to the atmosphere is equal to the emissions of fossil fuels that are eliminated, less any emissions that occur during processing, transportation, or manufacturing. By using agricultural management techniques that prevent the cultivation of new lands that are currently covered by forest, grassland, or other non-agricultural vegetation, greenhouse gas emissions, particularly CO_2, can also be prevented.

Enhancement of removals: Agricultural soil stores significant carbon reserves, primarily in soil organic matter. However, these systems have lost a substantial amount of carbon over time, though some can be restored through better management practices. The approach that enhances photosynthesis carbon input contributes to carbon sequestration.

Reduction in emissions: The efficient management of carbon and nitrogen flows in agriculture can reduce the flux of CO_2, CH_4 and N_2O. Optimum use of nitrogen fertilizers reduces the emissions of N_2O. It helps to increase the nitrogen use efficiency. The nitrogen fertilizers can be available in both cation and anion form; the anion form of fertilizer leaching loss is more than the cation form because the anion exchange capacity of soil is less. The emission of nitrogen fertilizer also depends on climatic factors, a humid climate high leaching losses.

Reducing greenhouse gas emissions from agriculture can be accomplished by storing carbon in the soil and reducing nitrous oxide emissions through improved land use management. Incorporating more perennial plants or those with deep root systems into crop rotations enhances carbon storage in the soil.

4.7 Mitigation of Methane Emissions from Rice Fields

Rice cultivation emissions of methane occur from the rice crop due to anaerobic conditions. The global emissions of methane from rice range from 31 to 280 Tg $y^{-1.}$ India's rice farming contributes methane emissions of 97 Mt CO_2-eq (FAO, 2017). Methane emissions from rice cultivation can be reduced through various strategies. For instance, organic matter management by aerobic degradation through composting. The System of Rice Intensification (SRI) and direct seeding of rice have the potential to reduce methane emissions. The DSR and SRI use alternate irrigations that do not require continuous soil submergence, which helps reduce the methane emission.

4.8 Mitigation of Nitrous Oxide Emissions

Nitrous oxide emissions reduce nitrogen use efficiency (Pathak, 1999). Leaching of nitrate is the main source of emissions of nitrous oxide. Site-specific nutrient management and the use of nitrification inhibitors help to reduce the emission of nitrous oxide.

Tillage is defined as the mechanical manipulation of soil with tools and its implement results in good tilth. Tillage operations require fossil fuel consumption, which leads to CO_2 emissions. Tillage has various operation *viz.* primary tillage and secondary. Primary tillage includes preparations of land in ploughing and secondary harrowing, seedbed preparation. The Mouldboard ploughing CO_2 emissions is highest followed by subsoiler (Table 1). Ploughing requirement varies with depth of ploughing, operation, type of soil, (Schrock et al.,1985; Bowers; 1989; Rautray, 2003).

Table 1. Tillage operations and average C emission

Tillage operation	Equivalent carbon emission (kg CE/ ha)	
	Range	Mean SD
Mouldboard ploughing	13.4- 20.1	15.2±4.1
Chisel ploughing	4.5-11.1	17.9±2.3
Heavy tandem disking	4.6-11.2	8.3±2.5
Standard tandem disking	4.0- 7.1	5.8±1.7
Sub-soiler	8.5- 14.1	11.3±2.8
Field cultivation	3.02-8.6	4.0±1.8
Rotary hoeing	1.2- 2.9	2.0±0.9

Source: Lal, 2004b

Table 2. Different Conservation methods for carbon sequestration

Conservation method	Characteristics
Plant selection	Species cultivar variety, Growth habits Rotation sequence Biomass energy crops
Tillage	Types and frequency
Fertilizer	Rate, timing, placement Organic amendments
Integrated management	Pest control Crop/ livestock systems

Source: Franzluebbers (2008)

Table 3. Average net carbon flux with changes in tillage practices

	Conventional tillage (kg C/ha/year)	No tillage (kg C/ha/year)
C emission from soil	0	-337
C emission from farm machinery	+69	+23
C emission from Agril. Inputs	+99	+114
Net C flux	+168	-200
Relative C flux	0	-368

Source: (West & Marland, 2002)

4.9 Conservation Agriculture

Conservation agriculture is the optimal utilization of resources and efficient use of technologies to save and conserve natural resources and the environment. Principle of conservation agriculture can be stated by three main processes as described by FAO.

1. Minimal soil disturbance: the disturbed area must be less than 15 cm wide or 25% of the cropped area. No periodic tillage that disturbs an area greater than the aforementioned limits.
2. Soil cover: Ground cover must be more than 30%.
3. Crop Rotation: Rotations should involve at least three different crops.

4.10 Forms of Conservation Agriculture

Major forms of conservation agriculture include

- Minimum, reduced or no tillage
- Crop rotation
- Strip cropping
- Green manuring
- Erosion control
- Stubble mulching
- Integrated nutrient management
- Integrated pest management
- Irrigation management
- Cover cropping

Conservation agriculture is a crucial management practice in agriculture because it plays an important role in maintaining carbon in the soil. SOC is essential to regulate the physical, chemical and biological properties of soil. CA helps to reduce the loss of organic carbon. Various management approaches to sequester carbon from the atmosphere to the biosphere are suggested by Frazlubbers, (2008) (Table 2).

Land preparation involves various operations. The primary sources of carbon emissions are mobile tillage operations such as tillage, sowing, intercultural activities, harvesting, and transportation. Stationary operations like water pumping and grain drying also contribute to emissions. Secondary sources include packaging, storage, and the production of fertilizers and pesticides. The tertiary source of C emission is farm buildings. Transportation requires significant energy due to high fuel usage, which leads to increased greenhouse gas (GHG) emissions (Vlek et al., 2003; Chauhan et al., 2005; Maraseni et al., 2010a,b; Maraseni & Cockfield, 2011).

4.11 Cultivation of Climate-Resilient Crops

Use the climate-resilient and low-carbon-footprint crop, such as millets and tubers, wheat and rice, which have a low carbon footprint of 3218 kg CO_2 equivalent ha^{-1}, as against 3968 kg and 3401 kg for wheat and rice, respectively (Tiwari, 2022). Cassava plants have the potential for C sequestration and mitigation of GHG (Jonh *et al.,* 2014). Crop has the ability to sustain and yield without application of manure and fertiliser in a long-term fertiliser experiment for 20 years, such crops attribute the climate resilience and C sequestration.

Amid the current climate crisis, the global community is urgently seeking solutions to achieve net zero greenhouse gas (GHG) emissions. Agriculture, forestry and other land use sectors contribute roughly 24% of total GHG emissions. This is largely due to intensified agricultural practices, which involve increased use of machinery, fossil fuels and fertilizers, all of which further elevate GHG emissions. Therefore, developing systems that rely on fewer inputs and prioritize sustainability is essential for enhancing soil carbon stocks, offsetting emitted GHGs and reducing the overall carbon footprint of ecosystems. Table 4 presents data on GHG emissions associated with various inputs used in guava cultivation in semi-arid regions. In the first year of guava cultivation, electricity use resulted

Table 4. Green house gas emissions from various activities in guava

Sr. No.	Inputs	Green house gas emissions (Kg CO_2 eq./ha)					Total	GHG emission (t CO_2 eq./ha)
		1 (Age of plant yr)	2	3	4	5		
1	Diesel	271	242	272	330	378	1495	1.5
2	Herbicides	20.81	28.01	24.12	26.26	24.9	124.1	0.12
3	FYM	101.86	130.4	167.61	245.09	230.7	875	0.88
4	N	172.32	152.47	161.83	192.42	206	885.53	0.89
5	P	740.63	935	1206.66	1041.84	1104.81	5028.93	5.03
6	K	128.97	113.05	124.22	152.08	147.53	665.85	0.67
7	Electricity	912.17	1140.86	1465.37	1557.03	2231.83	7307.27	7.31
8	Pesticides	24.31	37.67	39.73	40.3	71.71	213.71	0.21
	Total	2372.28	2779.9	3462.26	3585.17	4396.62	16596.32	16.60

(Lambate, 2023)

Table 5. Adaptation options for climate change in Indian agriculture and their co-benefits for mitigation

Option	Description	Adaptation Benefits	Mitigation Co-benefits
Climate-resilient crop varieties	Crop varieties tolerant to drought, flood and heat, of shorter duration with high yield	•Increased and stable production •Saving of water and energy •Increased income	•Reduce GHG due to shorter duration •Reduced CO_2 emissions with less energy used for irrigation
Water-saving technologies	Drip and sprinkler, Laser-aided land leveling, Fertigation	•Saving of water •Increased nutrient use efficiency •Increased production income	•Reduced CO_2 due to less water-use •Reduced N_2O with increased N-efficiency •Reduced CH4 with no submergence in rice cultivation
Changing planting date	Adjusting planting dates to avoid heat stress during flowering and maturity	•Reduced yield loss •Less water-use and energy-use	Reduced CO_2 with less energy-use for irrigation
Integrated farming system	Inclusion of crop, livestock and fishery to improve livelihood	•Increased farm income •Livelihood security	Reduced GHGs because efficient use of agriculture inputs
Crop diversification	Growing suitable crops to adjust the adverse climate	•Less water and energy use Increased stable production	Reduced CO_2 with less energy-use for irrigation
Integrated pest management	Combining physical, chemical and biological methods of pest	Increased yield with reduced loss due to pest infestations	Reduced CO_2 with less energy-use for pesticide manufacturing

Option	Description	Adaptation Benefits	Mitigation Co-benefits
	management		
Organic farming	Use of organic sources of nutrients, Avoiding use of chemical pesticides	Less energy requirement Improved soil health	Reduced CO_2 with less energy-use for pesticide and fertilizer manufacturing C sequestration
Conservation agriculture	Zero tillage Crop rotation Residue cover of soil	Less energy and water requirements Improved soil health	Reduced GHGs because of conservation and efficient use of agri inputs C sequestration
Precision farming	Precise and site-specific management of agri inputs	Increased input use efficiency Increased yield	Reduced GHGs because of efficient use of agri inputs
Use of efficient microbes	Use of microbes for enhancing soil fertility and crop productivity	Improved soil health Increased yields	Reduced CH_4 and N_2O C sequestration
Waste land management	Developing wastelands for forestry, agroforestry, grassland and crop production with improved water and nutrient management	Increased production Livelihood security Improved soil health increased income	Carbon sequestration
Improved weather-based agro-advisory	Forecasting of weather, particularly extreme events for crop management planning	•Reduced risk • Increased and stable production	________
Intercropping/mixed cropping	Growing more than one crop to increase productivity and avoid crop failure	Increased nutrient use efficiency Increased farm income	Reduced N_2O and CO_2 per unit production
Use of non-conventional energy	Use of solar and wind energy to substitute fossil fuel-based conventional energy sources	Reduced dependence on imports Increased farm income	Reduced CO_2 with the lesser use of fossil fuel
Use of biofuel	Use of biofuel from non-edible crops and crop residues in conjunction with fossil fuel	Reduced dependence on fossil fuel Increased farm income	Reduced CO_2 with the lesser use of fossil fuel C sequestration with growing of perennial non-edible crops

Source: Pathak et al., *(2014)*

in the highest GHG emissions (912.17 kg CO_2 eq. ha^{-1}), followed by phosphorus fertilizer (740.63 kg CO_2 eq. ha^{-1}) and diesel (271.20 kg CO_2 eq. ha^{-1}). The lowest emissions were from herbicides (20.81 kg CO_2 eq. ha^{-1}) closely followed by pesticides (24.31 kg CO_2 eq. ha^{-1}). This emission pattern remained consistent throughout the first four years of orchard growth. By the fifth year, electricity consumption continued to be the largest source of emissions (2,231.83 kg CO_2 eq. ha^{-1}), followed by phosphorus fertilizer (1,104.81 kg CO_2 eq. ha^{-1}) and diesel (378.64 kg CO_2 eq. ha^{-1}). Herbicides (24.90 kg CO_2 eq. ha^{-1}) and pesticides (71.71 kg CO_2 eq. ha^{-1}) remained the lowest contributors. Overall, GHG emissions from guava orchards ranged from 2,372.28 kg CO_2 eq. ha^{-1} in one-year-old orchards to 4,396.62 kg CO_2 eq. ha^{-1} in five-year-old orchards. The findings also indicate that GHG emissions increased as the orchard aged. The total GHG emissions from guava orchards aged one to five years amounted to 16.60 tons CO_2 eq. ha^{-1}.

5. CONSERVATION TILLAGE AND CARBON SEQUESTRATION

The reduction of on-farm emissions through zero tillage is important compared to the conventional method. Vanden Bygaart *et al.,* (2003) found that reduced tillage increases the amount of carbon sequestered by an average of 320-150 kg C/ha in 35 studies of western Canada and that the removal of fallow enhanced soil carbon storage by 150-60 kg C/ha based on 19 studies. West & Marland (2002) reported that carbon emission from conventional tillage (CT), reduced tillage (RT) and no tillage (NT) were respectively 72.02, 45.27, 23.26 kg C/ha in case of corn cultivation and 67.45, 40.70, 23.26 kg C/ha for soybean cultivation based on annual fossil fuel consumption and CO2 emission from agricultural machinery. Thus, there was a 67.70% and 65.41% reduction in CO2 emission as compared to conventional tillage for corn and soybean cultivation, respectively.

5.1 Advantages of Carbon Neutral Agriculture

Lower environmental impact: Adopting carbon-neutral methods in farming can greatly reduce greenhouse gas emissions, helping to protect the environment.

Enhanced soil quality: Techniques like regenerative farming, which support carbon neutrality, boost soil fertility, prevent erosion, and improve moisture retention.

Support for biodiversity: Carbon-neutral strategies often include practices such as cover cropping and agroforestry, which foster wildlife habitats and strengthen ecosystems.

Reduced input costs: Using fewer synthetic chemicals and conserving water can help farmers cut costs over time.

Additional income opportunities: Farmers may be able to earn extra money by selling carbon credits to industries looking to offset their emissions.

Long-term land stewardship: Practices focused on carbon neutrality promote sustainable land use, preserving its productivity for future generations.

Minimizing fossil fuel dependence: Implementing renewable energy solutions like solar and wind power on farms can greatly decrease the need for fossil fuels, resulting in reduced emissions from agricultural activities.

Enhancing input efficiency: Utilizing precision agriculture methods allows for more efficient use of resources such as water, fertilizers, and pesticides, which helps cut down waste and diminishes the carbon footprint of farming operations.

5.2 Disadvantages of Carbon Neutral Agriculture

Possible rise in pesticide use: No-till methods, often part of carbon-neutral approaches, might increase reliance on chemical pesticides to manage pests and weeds.

Risk of habitat loss: Initiatives like afforestation can lead to deforestation elsewhere or the establishment of single-species plantations, harming biodiversity.

Monitoring difficulties: Tracking and verifying emissions reductions on farms can be technically complicated and resource-intensive.

High costs and limited resources: Implementing carbon-neutral farming systems can be costly and challenging, especially for small-scale farmers with limited means.

Complicated supply chains: Achieving carbon neutrality throughout the entire agricultural supply chain can be particularly difficult for large producers.

6. CONCLUSION

Carbon-neutral agriculture presents valuable environmental and economic opportunities and supports a more sustainable food system. However, to ensure its success, it's essential to address associated risks and strive for fair, effective implementation. Agriculture significantly impacts the environment, and practising conservation agriculture and other resource conservation technologies can play a significant role in SOC sequestration by increasing soil carbon sinks, reducing GHG emissions, and sustaining agricultural productivity at a higher level. Rate and amount of SOC sequestration differ with soil types, depths, land use and land cover and vary from one region to another. Sequestration of carbon in soil can improve soil health, and improvement in soil health will help in improving input use efficiency in agriculture. Thus, sequestering carbon in soil and biota can mitigate climate change. Use of renewable source of energy it helps to reduce GHGs emissions.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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