can improve soil quality. Nayak *et al.* [104] that the rotating rice-weat system in the Indo-Gangetic Plains is the most effective cultivation system. A few of the intercropping examples include cotton and peanut, wheat and mustard, wheat and chickpea, peanut and sunflower. Thus long term organic agriculture can indeed increase organic carbon in soil compared with conventional agriculture [105]. Taking into account economic factors, choosing optimal rotation of cropping systems accordingly with soil-environmental factors may be helpful in C sequestration that not only increases plant productivity, fertility of soils but often lowers CO_2 emissions into the atmosphere.

6.4 Nutrient management

The sequestration of C in soil requires integrated nutrient management (INM). The lack of N, P, S and other building blocks of humus would severely limit the process for humification [106]. The effectiveness of sequestration is lowered when C and N are not managed properly [107]. The SOC sequestration level is also strengthened with an increase in biomass C application [108]. Chemical fertilizers, particularly N_2O, are a source of GHG emissions. In addition to this, the manufacturing of fertilizer and its transport are both correlated with GHG pollution. Through application doses of 50 percent NPK + 50 percent N through FYM in rice and 100 percent NPK in wheat consequently sequestered 0.39, 0.50, 0.51 and 0.62 Mg C ha^{-1} $Year^{-1}$ [109]. Adopting rice-rice system (RRS) under reduced tillage (RT) or no- till (NT) with INM is recommended for enhancing the productivity, C and N sequestration in paddy soils [110]. Liebig *et al.* [111] found that, relative to unfertilized samples, high N dose treatments improved SOC sequestration concentrations.

6.5 Organic manures and amendments

Another significant SOC sequestration technique is the use of manures and other organic amendments. Long-term studies in Europe revealed that with application of organic manures the intensity of SOC sequestration is larger than chemical fertilizers [112]. The rise of 10 percent over 100 years in Denmark [113], 22 percent over 90 years in Germany [114], 100 percent over 144 years in Rothamsted, UK [115] and 44 percent over 31 years in Sweden [116] in the SOC reservoir through long-term manuring at 0–30 cm depth. Manure application is essential for conserving soil health and it is a basis of C even its usage in various crop fields has an impact on C content. Use of organic amendments as substitution and additional nutrients has a beneficial impact on soil C sequestration and is often used as a C sink. In soils that have paddy cultivation, high clay content has ability to sequester more C [117]. Maltas *et al.* [118] reported that organic amendments viz. green manure, cereal straw , fresh cattle manure in 2 doses 35 and 70 t ha^{-1} and cattle slurry has the potential to supply 25-80 percent more C input to the soil. Uhlen & Tveitnes [119] stated that manure applications could increase the sequestration of SOC at a pace of 70–227 Kg ha^{-1} $Year^{-1}$ over 37–74 years. In contrasted to just NPK application, FYM along with NPK applications improves C sequestration in rice-wheat cropping method, whereas in green manuring, relative to applying FYM along with green manure, sequestered more C in Maize-Wheat crop rotation. In addition to increasing net primary production, composting also enhances the soil C quality. This all means that, along with other inorganic fertilizers, the usage of livestock waste, compost is advantageous for both plant health and climate.

6.6 Biochar

Biochar development is based on a process initiated thousands of years ago in the Amazon

Basin, where the indigenous people produced islands of thick, fertile soils called terra preta ("dark earth"). Anthropologists assume that the intended placement of coal in soil through cooking fires and middles led to a high productivity and C content in soils, sometimes with pieces of broken soil pottery. Biochar is enhancing soils by transforming crop waste into a fertile soil enhancer that preserves carbon and fertilizes fields. It is widely regarded as an effective means of C sequestering. It can successfully be used in concrete constructions as a C sequestering admixture to also help waste recycling [120]. Production of Biochar in association with soil preservation has been proposed as one potential way of decreasing CO_2 amount in the atmosphere [121]. Biochar climate change-mitigation ability derives mainly from its extremely recalcitrant nature that delays the process of return to the atmosphere of photosynthetically-fixed C [122]. Several studies have shown that Biochar use decreases polysaccharide / C co-location by decreasing C metabolism due to C fixation in organic soils. Combining Biochar with manure can decrease CO_2 and N_2O as comparing to manure sandy loam soil but not from the clay loam soil. However, higher amounts of application of Biochar (> 10 Mg ha^{-1}) and long-term monitoring are needed to assess the impact of Biochar on GHG emissions from the soil surface. Transformation of all sustainably produced crops to increase bioenergy, rather than Biochar, output will even mitigate up to 10 percent of global anthropogenic CO_2-Ce emissions. Biochar and bioenergy's relative climate-mitigation capacity depends on productivity changed soil and fuel intensity C being compensated with forms of biomass [123]. Under all other cases, the Biochar's climate-mitigation capacity is greater.

7 Conclusion

In conclusion, industrial revolutionization has caused the climate of the world to change to unexpected levels due to fluxes of greenhouse gases in the atmosphere. Climate change and global warming are a result of increased greenhouse gases in the atmosphere of which carbon dioxide is a major precursor of this changing scenario that all individuals around the world are encountering especially the agricultural sector. Climate and weather patterns have a direct influence on agriculture in terms of food security, sustainability of the soil that having profound effect on human health. With such gradual changes in climatic conditions it can modify the distribution of species and affect beneficial organism interactions in the soil-plant continuum. Temperature, precipitation and increased carbon dioxide levels in the atmosphere are hence considered the three major driving forces that influence soil properties (physical, chemical, biological) and its process which are soil organic matter decomposition, nitrogen mineralization, nitrification and denitrification, nutrient acquisition, erosion, soil salinity and acidity. There are several efficient mitigation measures that can reduce the brunt of climate change with the adoption of sustainable management practices such as following conservative agricultural practices that includes tillage operations, cover cropping and crop rotation, Biochar and through incorporation of organics and amendment that in turn would enhance soil processes and soil health without contributing to climate change.

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