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Chapter 19

Conservation Agriculture and Soil Carbon Sequestration

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Abstract Changes to agricultural practices in response to climate change and widespread soil degradation are being investigated to improve food security, enhance environmental conservation, and achieve sustainability. Since soil organic carbon (SOC) concentration is a strong determinant of soil physicochemical and biological activities, carbon (C) sequestration in agricultural soils requires changes to management practices. Conservation agriculture (CA)—based on minimum soil disturbance, adequate surface cover, and complex crop rotations—has been proposed as an alternative system to conventional agriculture. This chapter reviews potential impacts of CA mainly on C sequestration, collates information on the influence of tillage, integrated nutrient management (INM), fertilizers, residue management and cover crops on SOC stocks, and deliberates on the mitigation of greenhouse gas (GHG) emissions, economics, etc. by CA from existing case studies. Whether conversion to a CA system can increase C sequestration is not yet clear. More research is needed, particularly long-term research, to delineate ecological conditions suitable for adaptation in a CA system. Harshness of arid and semiarid climate exacerbates the risk of soil degradation by depleting SOC stock and increasing risks of erosion and salinization. Widespread adoption of CA can reduce the cost of farm operations including fuel consumption, while conserving soil water, improving soil functions, controlling erosion, and sustaining productivity.

Keywords Conservation tillage · Carbon management · Carbon credit · Organic matter · System productivity · Zero tillage · Sustainability · India

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