

Conservation Agriculture :Scope And Challenges

Amrita Yadav

CT Group of Institutions, Jalandhar

Corresponding author: yamrita152@gmail.com

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Introduction

Conservation agriculture (CA) technologies involve minimum soil disturbance, permanent soil cover through crop residues or cover crops, and crop rotations for achieving higher productivity. In India, efforts to develop, refine and disseminate conservation-based agricultural technologies have been underway for nearly two decades and made significant progress since then even though there are several constraints that affect adoption of CA. Particularly, tremendous efforts have been made on no-till in wheat under a rice-wheat rotation in the Indo-Gangetic plains. Attaining food security for a growing population and alleviating poverty while sustaining agricultural systems under the current scenario of depleting natural resources, negative impacts of climatic variability, spiraling cost of inputs and volatile food prices are the major challenges before most of the Asian countries. In addition to these challenges, the principal indicators of non-sustainability of agricultural systems includes: soil erosion, soil organic matter decline, salinization. These are caused mainly by:

- (i) intensive tillage induced soil organic matter decline, soil structural degradation, water and wind erosion, reduced water infiltration rates, surface sealing and crusting, soil compaction.
- (ii) insufficient return of organic material.
- (iii) monocropping. Therefore, a paradigm shift in farming practices through eliminating unsustainable parts of conventional agriculture (ploughing/tilling the soil, removing all organic material, monoculture) is crucial for future productivity gains while sustaining the natural resources.

Benefits and Scope of Conservation Agriculture

The benefits can be classified into three broad categories:

- I) Agronomic benefits that improve soil productivity.
- II) Economic benefits that improve the production efficiency and profitability.

- III) Environmental and social benefits that protect the soil and make agriculture more sustainable.

Challenges of Conservation Agriculture:

Conservation agriculture as an upcoming paradigm for raising crops will require an innovative system perspective to deal with diverse, flexible and context specific needs of technologies and their management. Conservation agriculture R&D (Research and Development), thus will call for several innovative features to address the challenge. Some of these are:

(a) Understanding The System-

Conservation agriculture systems are much more complex than conventional systems. Site specific knowledge has been the main limitation to the spread of CA system. Managing these systems efficiently will be highly demanding in terms of understanding of basic processes and component interactions, which determine the whole system performance. For example, surface maintained crop residues act as mulch and therefore reduce soil water losses through evaporation and maintain a moderate soil temperature. However, at the same time crop residues offer an easily decomposable source of organic matter and could harbour undesirable pest populations or alter the system ecology in some other way. No-tillage systems will influence depth of penetration and distribution of the root system which, in turn, will influence water and nutrient uptake and mineral cycling. Thus the need is to recognize conservation agriculture as a system and develop management strategies.

(B) Building A System and Farming System Perspective—

A system perspective is built working in partnership with farmers. A core group of scientists, farmers, extension workers and other stakeholders working in partnership mode will therefore be critical in developing and promoting new technologies. This is somewhat different than in conventional agricultural R&D, the system is to set research priorities and allocate resources within a framework, and little attention is given to build relationships and seek linkages with partners working in complementary fields.

(c) Technological Challenges–

While the basic principles which form the foundation of conservation agriculture practices, that is, no tillage and surface managed crop residues are well understood, adoption of these practices under varying farming situations is the key challenge. These challenges relate to development, standardization and adoption of farm machinery for seeding with minimum soil disturbance, developing crop harvesting and management systems.

(D) Site Specificity–

Adapting strategies for conservation agriculture systems will be highly site specific, yet learning across the sites will be a powerful way in understanding why certain technologies or practices are effective in a set of situations and not effective in another set. This learning process will accelerate building a knowledge base for sustainable resource management.

Conclusion:

Conservation agriculture technologies are the future of sustainable agriculture. There are potential benefits of conservation agriculture across different agro-eco regions and farmers groups. The benefits range from nano-level (improving soil properties) to micro-level (saving inputs, reducing cost of production, increasing farm income), and macro-level by reducing poverty, improving food security, alleviating global warming. In view of huge expected benefits, as witnessed during the green revolution period, the conservation agriculture may be aggressively promoted. The advantage of this technology is easy adaptability in heterogeneous agro-ecological and socio-economic environment. The need is aggressive demonstration and information dissemination programs and well complemented by skill development of the farmers. There is a need for a global movement for promoting conservation agriculture. Institutions such as the World Bank, Food and Agriculture Organization of UN. Conservation agriculture offers an opportunity for arresting and reversing the downward spiral of resource degradation, decreasing cultivation costs and making agriculture more resource – use- efficient, competitive and sustainable. “Conserving resources – enhancing productivity” has to be the new mission.