# Resource Conservation Technologies for Enhancing Productivity of Oilseeds

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**ABSTRACT**

Oilseed crops are important for making sure edible oil security and that farming can continue, but their productivity is still limited because of inefficient resource or input use, soil degradation, and changes in the climatic conditions. Resource Conservation Technologies such as conservation tillage, crop residue cover, crop diversification, SSNM, cover crop etc., play an important role in initiating changes in physical, chemical and biological properties of soil and consequentially improving soil fertility. RCTs can be seen as a new way forward for conserving resources and enhancing oilseed productivity to achieve goals of sustainable agriculture and nutritional security in India. However, it demands development of location specific RCTs and combination of institutional and policy support.

## INTRODUCTION

The Green Revolution transformed agricultural production in India from food scarcity to food security. As per recent statistics our food gain production has reached to 357.73 MT in 2024-25 (Economic survey of India 2025-26), but the productivity of the major oilseed crops viz., soyabean, groundnut, mustard and sunflower remained low. Low productivity of oilseed crops in India is due to their majority cultivation under rainfed condition in low soil fertility and prone to erosion. (Suresh *et al*. 2020). Traditional farming practices are unsustainable and have a detrimental effect on the environment in the

modern era. Resource conservation technologies are very important for solving the growing global problems of resource scarcity, environmental degradation, and sustainable development. The yield of oilseed crops is still comparatively low despite technical developments because of poor water management, uneven fertilization, and degraded soil. Resource Conservation Technologies (RCTs) are becoming more and more significant as sustainable, climate-smart solutions that increase productivity while preserving natural resources. RCTs concentrate on lowering environmental deterioration, preserving soil health, and increasing resource-use efficiency. These methods are especially important for systems based on oilseeds, which are frequently farmed in marginal circumstances with little input.

**Resource Conservation Technologies for oilseed crops: Concept and Components:**

Resource Conservation Technologies refer to any management approach that increases factor productivity including land, labour and capital. The agricultural resources domain covers capital, land, labour, machinery and agricultural inputs such as fertilizers and pesticides etc.

Major components include:

- **Water management technologies:** Drip irrigation, sprinkler systems, and laser land levelling reduce water wastage and ensure efficient water application.
- **Soil conservation techniques:** Practices like conservation tillage, mulching, and cover cropping improve soil moisture retention and reduce water loss.
- **Crop management practices:** Crop rotation, intercropping.
- **Nutrient management:** Site-specific nutrient management improve nutrient use efficiency.

These components collectively improve resource-use efficiency and system sustainability. Resource Conservation Technology in Oilseed-Based Cropping Systems.

**Conservation Agriculture:**

According to FAO, Conservation Agriculture (CA) is an approach to manage agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment. CA is characterized by three linked principles, namely:

- Continuous minimum mechanical soil disturbance,
- Permanent organic soil cover, and
- Diversification of crop species grown in sequences and/or associations.

**Zero Tillage:** Zero tillage, also known as no-till farming, involves completely eliminating physical soil disturbance in the planting and cultivation process. In zero tillage systems, crops are planted directly into untilled soil, often through the residue left from the earlier crop. This method helps to maintain soil structure, preserve soil organic content, and considerably reduce soil erosion.

**Precision land levelling (Laser land leveller):** Laser levelling is a process of smoothening the land surface (± 2 cm) from its average elevation using laser equipped drag buckets to achieve precision in land levelling. Precision land levelling facilitated application efficiency through even distribution of water and increased water-use efficiency that resulted in uniform seed germination, better crop growth and higher crop yield (Jat *et al*. 2006).

**Crop Residue Cover:**

Crop residues are the portion of a plant or crop that is left in the field after harvest, or the portion of the product that is not used locally, sold commercially, or thrown away during processing. Fixed or permanent crop cover with crop residue recycling is a necessary and essential component of conservation agriculture. Sowing a crop with leftovers from a previous crop is problematic, though. However, innovative zero-till seed-cum-fertilizer drill variations, such the Turbo Seeder, Happy Seeder, and rotary-disc drill, have been developed allowing direct seed sowing by drilling into the soil even while surface leftovers are present. RCTs in residue management have the potential to lower greenhouse gas emissions, increase soil organic carbon, and lessen straw burning (Pathak *et al*. 2011).

**Cover crops:** Cover crops are crops grown basically for protecting and improving the soil health rather than for profitability. In order to avoid soil erosion, suppress weeds, improve soil fertility, and improve general soil health, they are usually sown during the off-season or in between major crops. These crops can include a variety of grasses, legumes, or other plants with dense foliage or deep roots that support soil structure, nutrient retention, and moisture conservation. Common cover crops include clover, rye, vetch, and buckwheat. Maintaining soil coverage stands as a fundamental tenet of conservation agriculture (CA). These cover crops serve various agronomic, ecological, and economic roles within CA systems, complementing the functions performed by primary commercial crops.

**Site-Specific Nutrient Management (SSNM):** Site-Specific Management of Nutrients In order to give plants nutrients that are best suited to their unique geographical and temporal requirements for additional nutrients, SSPNM uses a variety of SSNM techniques, including remote sensing, GPS, GIS systems, VRT, and yields monitoring. When using prescription fertilizers, the SSNM technology has made it possible to control soil nutrient changes across an area. A key element of precision agriculture is site-specific nutrient management. It provides an approach for need based feeding of crops with nutrients while recognizing the inherent spatial variability. The growing concern about impaired soil health, declining productivity growth and decreasing factor productivity or nutrient use efficiency (NUE) are compelling the farmers to use higher level of fertilizers during last two decades. As such, it is high time to develop site-specific nutrient management (SSNM) technologies which are able to synergic crop-soil nutrient dynamics (Kaur *et al*. 2022).

## CONCLUSION

The RCTs, is less labour-intensive, energy-efficient, and input-responsive, lowers greenhouse gas emissions, and provides farmers with sustainable yields without endangering the environment or the foundation of natural resources, it offers a new path for sustainable agricultural research and development. There are several advantages and downsides to using resource conservation technologies alone. However, the drawbacks of any one method can be removed by combining multiple RCTs. In conclusion, the application of resource conservation technologies in cropping systems based on oilseeds has the potential to considerably increase crop productivity and sustainability.

## REFERENCES:

Jat, M. L., Chandna, P., Gupta, R. K., Sharma, S. K., & Gill, M. A. (2006). Laser land levelling: A precursor technology for resource conservation (Technical Bulletin Series No. 7). Rice-Wheat

Consortium for the Indo-Gangetic Plains, New Delhi. P 48.

Kaur, N., Singh, J., & Shilpa. (2022). Effect of site-specific nutrient management on growth indices of soybean(Glycine max (L.) Merrill) under mid hill conditions of Himachal Pradesh Journal of Food Legumes, 35(3), 189-192.

Pathak, H., Saharawat, Y. S., Gathala, M., & Ladha, J. K. (2011). Impact of resource-conserving technologies in the rice–wheat system. Greenhouse Gas Science and Technology, 1(3), 261–277.

Suresh, G., Sudhakara Babu, S. N., & Qureshi, A. A. (2020). Conservation agriculture—An ideal resource management strategy for sustainable oilseed production in India. Modern Concepts & Developments in Agronomy, 8(1).