Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 02, Issue: 03 (MAY-JUNE, 2022)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Conservation Agriculture: Introduction

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Conservation agriculture is normally based on soil tillage as the main operation. The most widely known tool for this operation is the plough (a tool used in farming for initial cultivation of soil in preparation for sowing seed or planting), which has become a symbol of agriculture. Soil tillage has in the past been associated with increased fertility, which originated from the mineralization of soil nutrients as a consequence of soil tillage. This process leads in the long term to a reduction of soil organic matter. Soil organic matter not only provides nutrients for the crop, but it is also, above all else, a crucial element for the stabilization of soil structure. Therefore, most soils degrade under prolonged intensive arable agriculture. This structural degradation of the soils results in the formation of crusts and compaction and leads in the end to soil erosion The process is dramatic under tropical climatic situations but can be noticed all over the world. Mechanization of soil tillage, allowing higher working depths and speeds the use of certain implements like ploughs, disk harrows (iron or steel discs which have slight concavity and are arranged into two or four sections) and rotary cultivators have particularly detrimental effects on soil structure. The excessive tillage of agricultural soils may result in short term increases in fertility, but will degrade soils in the medium term. Structural degradation, loss of organic matter, erosion and falling biodiversity are all to be expected. Soil erosion resulting from soil tillage has forced us to look for alternatives and to reverse the process of soil degradation. The logical approach to this has been to reduce tillage. This led finally to movements promoting conservation tillage, and especially zero-tillage, particularly in southern Brazil, North America, New Zealand and Australia. Over the last two decades the technologies have been improved and adapted for nearly all farm sizes; soils; crop types; and climatic zones. Experience is still being gained with this new approach to agriculture and FAO has supported for many years.

The Principles of Conservation Agriculture

Conservation agriculture is based on ecological principles and is utilised in many places around the globe to make land use more sustainable. Adoption of CA for improving Resource Use Efficiency and crop productivity is urgently needed as a powerful tool for natural resource management and agricultural sustainability. CA is based on three concepts; these are the following:

1. **Minimum soil disturbance:** Direct planting involves growing crops with minimum soil disturbance since the harvest of previous crops. Direct planting can be used with all annual and perennial crops and vegetables. Direct planting can done manually or mechanically.

2. **Permanent soil cover**: The permanent soil cover, especially by crop residues and cover crops, is important to protect the soil against the deleterious effects of exposure to rain and sun. To provide the micro and macro organisms in the soil with a constant supply of "food"; and alter the microclimate in the soil for optimal growth and development of soil organisms, including plant roots.
3. **Crop rotation and inter cropping**: Crop rotation means the alteration of different crops of fields and by years, for example the alteration of cereals (maize and wheat) followed by legumes (for example beans).

Advantages of Conservation Agriculture

- Reduction of workload due to tillage.
- Preserving and enhancing soil fertility.
- Enhancing soil water retention capacity.
- Reducing evaporation.
- Adaptation to and mitigation of climate change.
- Reducing pests and disease

Disadvantages of Conservation Agriculture

- Disadvantages in the short term might be the high initial costs of specialized planting equipment and the completely new dynamics of a conservation farming system, requiring high management skills and a learning process by the farmer.
- Long term experience with conservation farming all over the world has shown that conservation farming does not present more or less but different problems to a farmer, all of them capable of being resolved.
- Particularly in Brazil the area under conservation farming is now growing exponentially having already reached the 10 million hectare mark. Also in North America the concept is widely adopted.