



CONSERVATION AGRICULTURE | PFUMVUDZA

A MNANDIAFRICA PUBLICATION



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A Mnandi Africa Publication (2023)



Acknowledgements

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Dissertation on The adoption of conservation agriculture by women farmers: A case study of Mnandi Africa's, Marondera District, Zimbabwe)

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what is conservation agriculture?

Conservation Agriculture (CA) is a farming system that aims to prevent arable land loss and regenerate degraded lands by maintaining permanent soil cover, minimizing soil disturbance, and diversifying plant species. This enhances biodiversity and natural biological processes, leading to increased water and nutrient use efficiency and improved, sustained crop production. CA principles can be applied universally with locally adapted practices, reducing soil disturbance and optimizing external inputs. CA promotes good agronomy and land husbandry for both rainfed and irrigated production, serving as a foundation for sustainable agricultural production intensification and allowing for increased integration of production sectors.

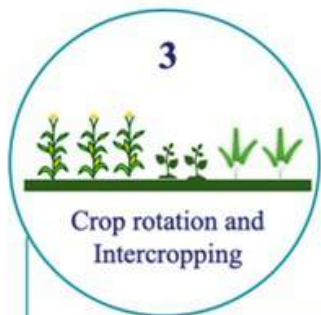
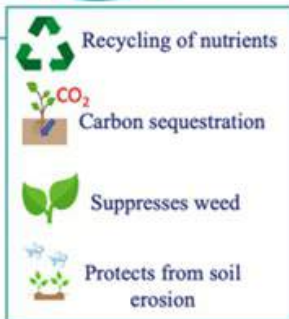
To be widely adopted, all new technology needs to have benefits and advantages that attract a broad group of farmers who understand the differences between what they are doing and what they need. In the case of conservation agriculture these benefits can be grouped as:

- + Time saving and thus reduction in labour requirement.
- + Reduction of costs, e.g. fuel, machinery operating costs and maintenance, as well as a reduced labour cost.
- + Higher efficiency in the sense of more output for a lower input.



benefits of conservation agriculture

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benefits of conservation agriculture

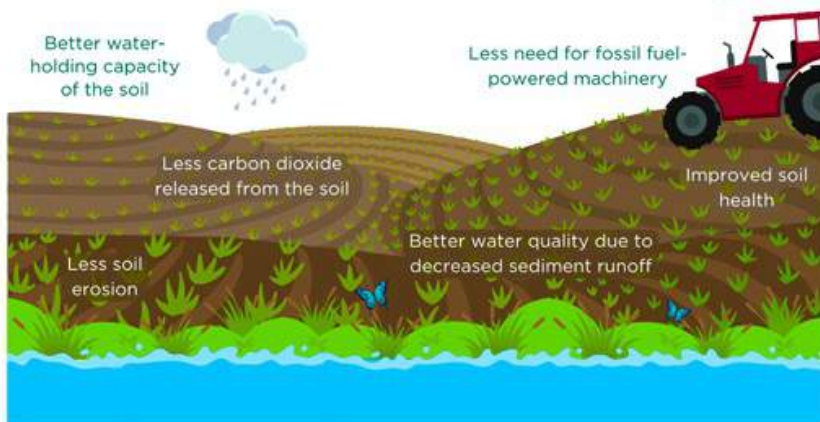
Agronomic benefits

improves soil productivity by increasing organic matter, conserving in-soil water, and enhancing soil structure. The addition of crop residues raises the soil's organic matter content, which in turn improves fertilizer use efficiency, water holding capacity, soil aggregation, rooting environment, and nutrient retention.

Environmental benefits

reduced soil erosion, improved water and air quality, increased biodiversity, and carbon sequestration. Soil surface residues protect the soil from raindrops and wind, reducing erosion and evaporation. Conservation agriculture also promotes a better habitat for organisms and helps maintain genetic biodiversity through crop rotation.

Benefits of No-Till Farming





no-till farming (pfumvudza)

Advantages of No-till Farming

Conservation agriculture (CA) helps improve soil quality over time, as the rate of soil build-up exceeds degradation and erosion. Initially, the focus will be on weed control, crop residue management, and pest and disease monitoring. Farmers new to CA should consult with experienced practitioners and be prepared for a conversion period to establish the system and restore natural balances. They will need information on field equipment and tools, as well as guidance on the time needed for conversion, crop yields, and labor requirements. Planter clinics and Farmer Field Schools can provide support and knowledge-sharing for new CA farmers.



no-till farming (pfumvudza)



No-till farming (also known as zero tillage or direct drilling) is an agricultural technique for growing crops or pasture without disturbing the soil through tillage. No-till farming decreases the amount of soil erosion tillage causes in certain soils, especially in sandy and dry soils on sloping terrain. No-till farming (also known as zero tillage or direct drilling) is an agricultural technique for growing crops or pasture without disturbing the soil through tillage. No-till farming decreases the amount of soil erosion tillage causes in certain soils, especially in sandy and dry soils on sloping terrain.





conservation agriculture principles



1 MINIMAL MECHANICAL SOIL DISTURBANCE

Minimum soil disturbance refers to low disturbance no-tillage and direct seeding. The disturbed area must be less than 15 cm wide or less than 25% of the cropped area (whichever is lower). There should be no periodic tillage that disturbs a greater area than the aforementioned limits. Strip tillage is allowed if



2 PERMANENT SOIL ORGANIC COVER

Three categories are distinguished: 30-60%, >60-90% and >90% ground cover, measured immediately after the direct seeding operation. Area with less than 30% cover is not considered as CA.



3 SPECIES DIVERSIFICATION

Rotation/association should involve at least 3 different crop species.



TO PRACTISE CONSERVATION AGRICULTURE FARMERS SHOULD;

1. Assess their current practices.
2. Adopt minimum tillage and use cover crops,
3. Rotate crops,
4. Practice integrated pest management
5. Manage water wisely.

These steps help improve soil health, reduce erosion, conserve water, and increase crop yields while protecting the environment.



Mnandi Africa is promoting the adoption of Conservation Agriculture principles (minimal soil disturbance, permanent soil cover and crop rotations) that are universally applicable in all agricultural landscapes and cropping systems.

mnandi africa's commitment



Mnandi Africa' support to small-holder farmers includes:

- ✔ Designing, formulating and planning strategies that provide encourages farmers to adopt Conservation Agriculture practices. This allows farmers – especially smallholders – to move away from inefficient agronomic management practices and manual labour to appropriate levels of mechanization that offer higher returns.
- ✔ Training farmers, service providers and extension agents on Conservation Agriculture practices and sustainable mechanization. Developing and disseminating training materials and guides to raise awareness.
- ✔ Implementing location-specific practices and identifying suitable crops to improve production systems that are resilient to the effects of climate change, as well as identifying existing or potential markets for inputs and/or outputs.
- ✔ Increasing agricultural production by implementing Conservation Agriculture practices in support of national priorities linked to food and nutrition security.



why do we do it?

Approximately one-third of the world's soils are degraded due to intensive crop production, negatively impacting soil quality and future production. Healthy soils are essential for sustainable and climate-resilient crop systems as they support diverse organisms and various essential functions. Conservation Agriculture (CA) is a solution that is less labor-intensive and reduces greenhouse gas emissions while protecting soil from releasing carbon. CA offers multiple benefits, including conserving natural resources, increasing biodiversity, and maintaining high production levels. It also promotes carbon sequestration, potentially earning farmers carbon credits.

Furthermore, CA results in healthier soils, decreased soil erosion, improved water quality, and increased yields over time, while reducing production costs, labor demands, and machinery maintenance.





environmental conditions

A number of environmental conditions might speed up the successful promotion of conservation agriculture. Generally the following conditions lead to a sub-optimal crop yield, farm income or environmental problems resulting from agricultural activities in these areas:

- ◆ Hilly topography.
- ◆ Erosive rainfall.
- ◆ Arid climate, with very hot and dry periods.
- ◆ Degraded and eroded soils High production costs.
- ◆ Diminishing labour capacity.
- ◆ Diminishing agricultural subsidies.

“A shift to conservation agriculture could rapidly gain momentum and improve social and economic conditions, as its benefits are evident to farmers.

Early adopters of conservation agriculture are likely to be innovative farmers seeking to save money, enhance productivity, and improve soil quality, while also promoting the practice within their communities.”

Ruramiso Mashumba

Farming Equipment in Conservation farming practices:



Disc harrow, Off-set/in-line:

Disc harrows are used for clearing land, levelling, fireguard incorporating residue and necessary for crops such as potato and tobacco. For general row cropping, the use of an off-set harrow should be minimized as it is very aggressive and damages soil aggregates.



Chisel Plough/ Sub-soiler/Ripper:

Chisel plough and rippers are used for soil disturbance and aeration of soil. Standard rippers are not recommended because, to achieve the similar results a chisel plough, one must rip then cross rip and this is costly and slow. Chisel plough and subsoiler are better as they shatter the soil across the width of the machine and reduce side wall compaction and underfoot smearing.



Fixed knife/ Flail mower:

These are used for residue management to chop up the residue, therefore it will breakdown faster, avoiding a layer of compost. (if fire is an issue, one can use a disc harrow, set shallow to incorporate the residue).

Farming Equipment in Conservation farming practices:

Seed Drill:

Heavy duty, zero till capable seed drills are required to place seed into the soil through the residue much like the planters. These are used for crops that would traditionally be broadcasted and the in-row spacing is not a concern such as wheat, barley, soya and grass seed. Row spacing is between 17cm-34cm.



Top Dressing Spreader:

Mounted or trailed (with clearance to avoid pushing over the crops) must be selected to match the boom sprayers working width to reduce wheel track compaction.



Grain Tankers:

Purpose built grain tankers/chaser bins are used during harvest. They are designed to spread the weight of the loaded trailer in the field to reduce the effects of compaction from traditional trailers. If fitted with multi-use augers, the tanker can be used in filling planters with fertilizer increasing efficiency of the planter therefore one can plant more hectares in a shorter time frame.



Farming Equipment in Conservation farming practices:



Trailed spreader:

They are recommended for application of lime, gypsum and dry manure. These have higher capacity wide spreader width therefore more efficient and one can then practice controlled trafficking/tram lines infield minimizing compaction in the wheel tracks.



Planters:

Heavy zero till capable planter are required to plant through residue and into unprepared soil. Planters are used for crops that require precision spacing between the plants and wider rows.



Boom sprayers:

Selection of the boom sprayer is important to match the boom width, with the spreading width of the trailed spreader/mounted spreader as well as wheel tracks when using a trailed sprayer.



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