

Conservation farming

Conservation farming is a sustainable and profitable farming system that provides soil health benefits and increased efficiency of use of farm labour and machinery.

Conservation farming systems should ultimately be based on full stubble retention, with zero-tillage and sound agronomy. Over time, this system will lead to improved soil condition and an increased ability to breakdown crop residue, increase water infiltration and improve soil water holding capacity.

The two basic elements of conservation farming are stubble retention and reduced tillage.



Stubble retention

Stubble retention is implementing farming practices that maximise the amount of stubble retained on the soil surface for soil and water conservation.

Some benefits are immediate, while others will take several years to become evident.

Immediate benefits are:

Erosion control. Stubble traps soil particles and reduces the speed of water travelling over the soil surface, which aids infiltration. Stubble also helps to prevent soil loss due to wind erosion by reducing wind velocities at the soil surface and trapping soil particles being transported by the wind.

Helps prevent the formation of crusts. Stubble reduces the impact of raindrops on the soil surface. Soil left bare after cultivation or burning often crusts after rainfall. Surface crusts decrease infiltration rate, increase runoff and cause water logging (on flat surfaces). Surface crusts also reduce seedling emergence.

Improves soil water storage. With reduced runoff and evaporation, more water is stored by the soil. In addition, retaining moisture close to the surface allows the crop to be sown at the optimum time.

Creation and maintenance of biopores. Stubble retention encourages biological activity which creates new pores in the soil. These pores are called biopores. Cultivation tends to destroy biopores but infiltration rates will remain high in soil with biopores left intact.

Buffers extreme soil temperatures. Stubble reduces soil temperatures, particularly during summer, which helps reduce evaporation and encourages soil organisms.

Stubble also increases soil temperature during winter, which helps seed germination and faster plant establishment.

Longer term benefits are:

Increased soil organic matter. When incorporated (through natural breakdown or physical incorporation at sowing) stubble adds organic matter to the soil. This results in raising carbon and nitrogen levels which enhances the stability of the soil. Furthermore, soil structure and infiltration improves, thus reducing runoff.

Encouragement of soil organisms. Stubble retention allows populations of soil organisms to multiply due to increased food sources. The biological activity that creates biopores benefits the soil by recycling nutrients and increasing infiltration.

Nutrient recycling. As stubble breaks down it releases nutrients back to the soil. If the stubble is burnt these nutrients (particularly nitrogen and phosphorus) are lost from the system and must be replaced using fertilisers.

Reduced tillage

There has been an increase interest in the adoption of conservation farming machinery by farmers in the Western Catchment.

The benefits of reduced tillage

Fertility. Reduced tillage increases accumulated soil nitrogen over time

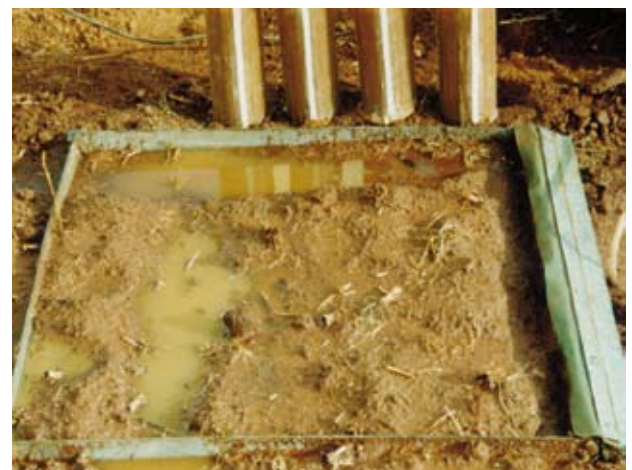
Soil Structure. Tillage operations destroy the biopores in the soil, reducing water infiltration and nutrient storage.

Economics. Only one implement is required for tillage and planting operations. The reduced use of tillage implements results in decreasing wear, fuel and labour



Benefits of stubble. Keeping stubble (top) protects the soil surface and improves water infiltration.

Removing stubble (below) allows the soil to disperse, reducing water infiltration and resulting in runoff and erosion. (Photos: Ian Packer)



requirements, which lowers production costs. Yields are increased due to better soil condition and fertility, ensuring additional income.

Machinery selection

The assumption of many farmers starting their conservation farming program is that they have to purchase a new planter, header, spray rig or guidance system.

However, this is not so. Farmers are able to modify most farm machinery currently in use.

The basics of crop production are:

- Timing of operations
- Seed placement and seed-soil contact
- Appropriate levels of fertiliser
- Weed control
- Good rotation.

Planter

When buying or modifying a planter for reduced tillage systems a number of considerations need to be addressed:

- Soil condition
- Expected stubble loads
- Expected weed spectrum
- Crop types and rotations
- Area to be sown annually
- Type of operation (e.g. mixed farming vs continuous cropping).

This will help determine:

Disc planter vs tyne planter: Disc planters provide a number of advantages over tyne seeders:

- Stubble handling
- Higher operation speeds
- Lower draft.

Disadvantage of disc planter:

- Lack of penetration in hard soils.

Tyne spacing: One of the main factors limiting how well stubble flows through a tyned planter is the length of the straw compared to the gap between tynes. As a guide, the distance between any two tynes should be at least twice the length of the straw on the ground.



Disc arrangement for a disc planter

The spacing between the tynes and the ranks depends on row spacing and the number of bars the tynes are spread over. As a guide, aim for a least 600 mm between tynes on each rank, and 600 mm between the ranks.

Tyne breakout pressure: You need to choose a tyne with sufficient break-out force to hold the sowing point in the soil at the correct angle of operation.

Tyne shape: Tynes with good vertical clearance height and straight shanks have the best stubble handling characteristics.

Point type: The type of point and operation speed will determine the force on each planter tyne and the power required to pull it at that speed. Increasing speed and depth can dramatically change the forces and their direction. The rake angle at which the point operates to the ground is also very important.

Presswheel: Presswheels could be considered the best-value-for-money planter component. If set-up and used correctly they can:

- Improve seed-soil contact
- Reduce seeding depth, which allows faster crop emergence
- Provide more even seeding depth

- Improve seedling emergence
- Extend sowing time in dry conditions
- Avoid stubble residue blocking due to the rolling action.

Harvest

'Paddock preparation starts at harvest' is a saying well used by conservation farmers. The reason is clear: stubble management. There are options growers can use at harvest that will make planting the following crop easier. Reducing stubble length by changing harvest height or spreading straw and chaff evenly the full width of the header comb are considerations at harvest. Straw and chaff spreaders are available as standard or add-on fittings.

Other considerations

Controlled traffic:

Controlled traffic means all machinery travels on the same wheel tracks (tramlines) in the paddock. This can be achieved by using satellite navigation tracking or steering systems/programs to ensure the tramlines are completely straight and traffic on them does not overlap the crop area.

The advantages of controlled traffic include reduced soil compaction and increased machinery efficiency with little overlap when applying chemicals or fertilisers.

Precision agriculture

Precision agriculture requires the use of new technologies, such as global positioning systems (GPS), sensors, satellites or aerial images, and information management tools such as Geographic Information Systems (GIS) to assess and manage soil and crop variations in a paddock.

Components of precision farming include:

- Yield monitoring
- Yield mapping
- Variable fertiliser rate
- Weed mapping

- Variable spraying
- Topography and boundaries
- Guidance systems
- Records and analyses.

References and further reading

The effects of cropping on the Western CMA red soils

The effects of cropping on the Western CMA grey soils

SOILpak for dryland farmers on the red soil of Central Western NSW

Northern Wheat-Belt SOILpak

Manual on-ground implementation of conservation farming

Dryland cropping guidelines for the Western Farming Systems Zone

For more information

The Complete Guide to Tine – Kondinin Group

Gear'd Up – NSW Department of Primary Industries

www.western.cma.nsw.gov.au

or

www.dpi.nsw.gov.au

Acknowledgements

Compiled by Ian Toole, NSW Department of Primary Industries, Trangie

Dr David Mitchell, NSW Department of Primary Industries, Orange

Dr Alison Bowman, NSW Department of Primary Industries, Wagga Wagga

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