PRACTICE ABSTRACT

Conservation Agriculture for water conservation and nutrient efficiency

Problem

Intensive tillage-based agriculture is a major cause of soil degradation leading to surface runoff, soil erosion, soil organic matter decline and compaction. Soil management practices need to develop to ensure more sustainable and efficient use of resources.

Solution

Conservation agriculture is based on practices that minimise soil disturbance through no-tillage, maintain permanent soil cover with organic residues, and use a diverse range of crop species to ultimately improve both water conservation and nutrient efficiency in agricultural soils.

Benefits

- Minimum soil disturbance and no-till crop establishment can considerably reduce the need for labour, machinery and fuel.
- Improved trafficability of undisturbed soils allows for the timely performance of field operations and the best timing for the application of agrochemicals thus reducing the amounts necessary to apply.
- Permanent soil cover, increased soil organic matter content (Figure 1), higher aggregate stability and a more favourable pore size distribution under conservation agriculture improve infiltration and available water retention while decreasing water losses through evaporation (Figures 2 and 4).

Applicability box

Theme

Soil management practices for sustainable crop production

Agronomic conditions

Adaption of principles to match climate and soil conditions

Required time

On-going

Period of impact

Implementing practices to conserve soil for future cropping

Equipment

Minimum to zero tillage systems

Best in

Based on annual or perennial crops or crop-livestock farming systems

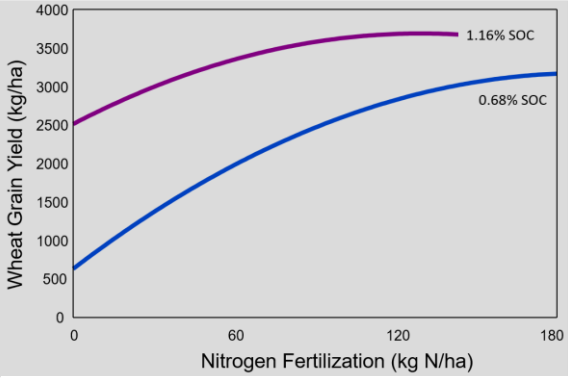

Figure 1: Wheat grain yield as affected by soil organic carbon (SOC) (improved through long-term application of conservation agriculture) and nitrogen fertilization (adapted from Carvalho et al., 2010)

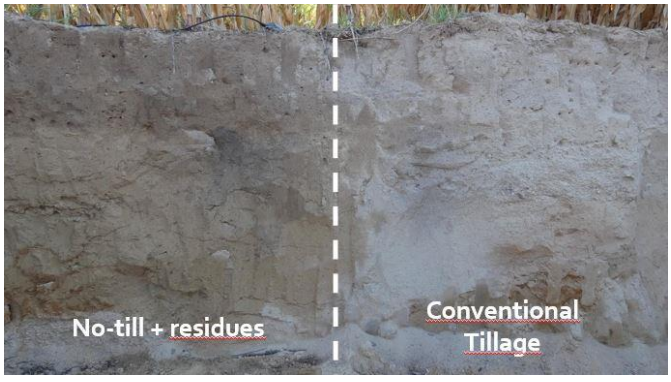

Figure 2: Differences in soil moisture due to evaporation reduction through no-till and residue cover (Basch, 2018)

Practical recommendation

- Using a penetrometer, check your soil profile to evaluate whether tilling is necessary.
- Reduce soil disturbance to the minimum possible to allow for maximum soil cover (Figure 3)
- It may be necessary to change your weed control strategy for low/no till crop establishment; pre-seeding rather than post-emergence herbicide application may become necessary.

ECAF. Conservation Agriculture (CA) for water conservation and nutrient use efficiency.
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- Get advice regarding the most adequate no-till planting equipment for your soil conditions, crops and cropping system, e.g., disc openers deal better with higher amounts of crop residues.
- Consider adapting your fertilization strategies based on soil analyses and crop/soil requirements.
- Plan your crop rotation and crop residue management strategy carefully and consider the inclusion of cover crops to help.

Figure 3: No-till system. Sowing into a thick mulch layer provided by a rolled-down cover crop (Basch, 2018)

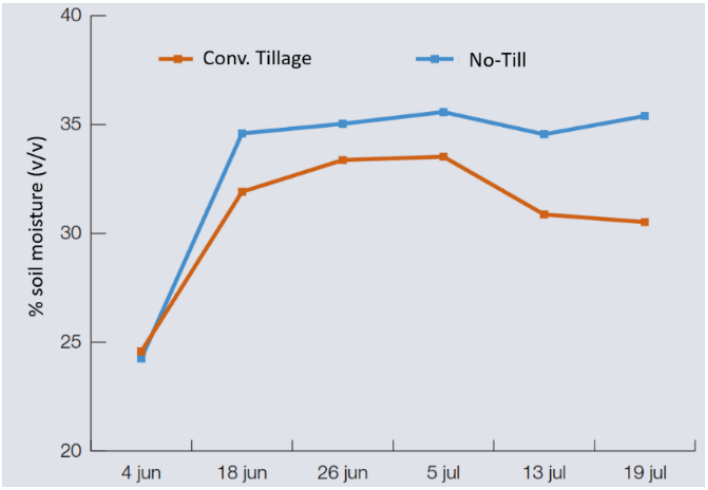

Figure 4: Average soil moisture (0-60cm) of a clay loam in a maize crop established under conventional tillage and no-till with heavy cover crop residues (Basch, 2018)

Further information

Video

- Soil threats & and approaches for their mitigation: https://www.youtube.com/watch?v=rSnKroz5TG8

Further readings

- Kassam, A. (ed.) 2020. Advances in Conservation Agriculture, Volume 2: Practice and Benefits, Cambridge, UK, Burleigh Dodds Science Publishing (ISBN: 978-1-78676-2689).
- Basch, G., Kassam, A., González-Sánchez, E.J. and Streit B. 2012. Making Sustainable Agriculture Real in CAP 2020: The Role of Conservation Agriculture. ECAF, Brussels (ISBN 978-84-615-8106-1), 43pp.
- Jones, C.A., Basch, G., Baylis, A.D., Bazzoni, D., Biggs, J., et al. 2006. Conservation Agriculture in Europe: An approach to sustainable crop production by protecting soil and water? SOWAP, Lealott's Hill, Bracknell, RG42 6EY, UK, 109pp.

Use the comment section on the SolACE discussion forum to share your experiences with other farmers, advisors and scientists! If you have any questions concerning the method, please contact the first author of the practice abstract by e-mail.

About this practice abstract and SolACE

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Project website: www.solace-eu.net

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