

A pragmatic approach to Conservation Agriculture in the Mediterranean region

Scientific evidence and policy recommendations



Conservation Agriculture: An alternative for dryland agriculture to tackle water-scarcity

Mediterranean farming systems are currently challenged by periods of drought, erratic and heavy rainfall and rising temperatures. Combined with extensive tillage and monoculture, there is a high risk of soil and water erosion, adversely affecting yields. Conservation agriculture (CA), with its three principles of no-tillage, permanent soil cover and diverse crop rotations, has been promoted as a promising alternative for dryland farming systems to cope with climate-induced water scarcity and to regenerate soils. By improving soil stability and structure, the resilience of farms can be increased to maintain future crop productivity and stabilize yields.

Barriers to adoption

Despite the benefits, the uptake of CA in the Mediterranean remains negligible. Key constraints are

- ✔ Limited inclusion of legumes in rotations due to limited access to seeds and marketing opportunities.
- ✔ Livestock grazing, which limits the ability to leave biomass on the ground as soil cover.
- ✔ Weed pressure due to no-tillage and limited access to affordable herbicides.
- ✔ Limited access to direct seeding machinery.
- ✔ Limited knowledge of soil processes and soil as a living entity.
- ✔ Insufficient promotion of CA for the Mediterranean context.








Key messages

- ✔ CA is an alternative dryland farming system to cope with water scarcity.
- ✔ To increase adoption, a more pragmatic approach to CA is needed that reflects the reality of Mediterranean farmers.
- ✔ Support policies for farmers must be strengthened.
- ✔ Collaborative efforts between different stakeholders needs to be improved.

Scope

This factsheet is based on interviews, on-field and on-station research in Morocco, Spain, Tunisia and Türkiye carried out as part of the ConServeTerra project between 2020 and 2024. The project aimed to facilitate wider acceptance and adoption of CA principles in the Mediterranean area by understanding constraints and developing best management strategies under local conditions.

Results: A pragmatic approach to CA

Standard CA		Pragmatic CA	
No-tillage through direct seeding		Occasional and strategic tillage	
At least 30 % permanent soil cover with crop residues and cover crops		Optimum stubble grazing	
Diverse crop rotations with at least three different crops		Diverse crop rotations with forage and pulse legumes	
		Soil literacy	

For CA in practice, have a look at the factsheet for practitioners



FAO (2024). Conservation Agriculture.
<https://www.fao.org/conservation-agriculture/en/>.
Accessed: 11.06.2024

CA is often promoted as a package based on the principles of no-tillage, permanent soil cover and diversified crop rotations. The solution to overcoming barriers is a pragmatic and flexible approach to CA, which considers site conditions and socio-cultural aspects:

- 1. Occasional and strategic tillage:** A strict no-till approach contradicts the reality of Mediterranean farmers, as tillage is a common tool for weed control, especially when affordable herbicides are limited. Occasional, strategic and reduced tillage can be an alternative to the strict no-tillage principle and motivate farmers to adopt CA. Benefits include the reduction of animal driven soil compaction, disrupting pest cycles, incorporating organic matter, controlling herbicide-resistant weeds and encouraging weed seed germination before planting. The type of machinery, timing and number of tillage operations will depend on the application objective, soil type, tillage costs and erosion risk.
- 2. Optimum stubble grazing:** In CA, it is advised to leave crop stubbles on the field, which is difficult to implement due to the traditional grazing of crop residues. Intensive grazing with high stocking rates can have a negative effect on soil structure, leading to soil compaction and reduced water infiltration, resulting in more weeds and lower yields. However, these negative consequences are only seen in wetter areas on the globe. There is no scientific data from the Mediterranean region. Although excessive grazing is contrary to

the principles of CA, farmers should not be discouraged from using CA if their fields are being grazed beyond their control. An optimal approach would be a moderate grazing at lower stocking rates or grazing only immediately after harvest, when the nutritional value of crop residues is highest.

- 3. Diverse crop rotations with forage and pulse legumes:** Legumes are important for biodiversity, soil fertility, soil structure and economic diversification. In particular, the inclusion of forages in the farming system can increase the adoption rate of CA due to their ability to suppress weeds and reduce the trade-off between the use of crop residues for biomass or as soil mulch. Farmers should be encouraged to start CA conversion with mixed forages. Limited availability and high cost of forage seeds are major obstacle to forage cultivation. A concerted effort should be made by the government and seed companies to make forage seeds available and affordable. For pulse production under CA, in-row cultivation for weed control should be promoted, especially in areas where selective herbicides are expensive and/or unavailable.
- 4. Soil literacy:** Next to agronomic principles, a basic understanding of soil processes is key to increasing farmers' appreciation of soil and their ability to practice CA. Farmer Field Schools (FFS) introduce farmers to soil processes using interactive tools such as a rainfall simulator and can act as a platform for co-learning and sharing experiences.

Benefits of Conservation Agriculture

Improved water infiltration

Water accumulation in the soil layer between 100 and 180 cm is 46 mm higher in CA



Increased yields

In a wheat-lentil rotation wheat yield can be 60 % higher in CA



Higher profit and reduced production costs

Production costs are on average 13,4 % lower in CA



Reduced soil erosion

Through reduced exposure to water run-off and wind



Improved soil fertility and structure; more soil organic matter

Through the addition of crop residues



Policy example: Morocco to convert 1 million ha to Conservation Agriculture

Morocco is the largest practitioner of CA in the region. As part of the national Green Generation 2020-2030 strategy, the country targets one million hectares of cereals under CA by 2030. To achieve this, strategies have been formulated in a national program. The initiatives are largely the result of long-term research by ICARDA and INRA, which have identified CA as an alternative for dryland farming systems. Research has focused on crop rotation systems and alternating cereals with fodder crops and legumes to increase soil organic matter, improve soil fertility and reduce the widespread monocultures of cereals, which play a major role in soil degradation.

Policy recommendations

Farmers have different preferences and motivations when it comes to their choice of agricultural practices. Not all farmers will adopt CA practices in the same way and to the

same extent. Policies need to provide a range of options to cater for farmers with different interests and to encourage wider adoption.

Offer supportive policies for farmers

- ✔ Offer subsidies to farmers who adopt CA practices such as crop rotations, minimum tillage, cover crops and the inclusion of certain crops like legumes.
- ✔ Subsidize specialist machinery at regional level.
- ✔ Offer training to educate farmers on soil management and soil processes.
- ✔ Strengthen advisory services and training for advisors through e.g. offering field days.

Strengthen collaborative efforts between stakeholders across all sectors

- ✔ Set up state-owned demonstration farms to demonstrate CA practices and its benefits. Encourage collaboration between government agencies, advisory services, NGO's and farmer cooperatives.
- ✔ Support further research on legume cultivation under no-till and technical knowledge in the context of low-input smallholder farmers.

Monitor and evaluate policies

- ✔ Avoid contradicting policies as farmers will choose the more attractive ones.
- ✔ Adjust policies based on farmer feedback and developments.
- ✔ Track adoption rates of CA.

References

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