Pushing toward the integration of crop-livestock and conservation agriculture

Reliance on crop residues to feed livestock has hindered the adoption of conservation agriculture. Photo credit: Katrin Park/ICARDA

Tunisia – A modern farming town in northern Tunisia, Siliana is one of the first places in this progressive North African country of 11 million people to adopt conservation agriculture and its use in crop-livestock systems. At a gathering of the town's professional farmers' association, the members were eager to discuss successes and challenges.

The SMSA, as the association is named, started with three farmers working on conservation agriculture during the first phase of the IFAD-funded project for "Crop-Livestock System and Conservation Agriculture," also known as CLCA around here. They minimized the disturbance of the soil, kept crop residues to maintain soil cover, and rotated crops. Often referred to as the three pillars of conservation agriculture, this practice helps mitigate soil nutrient depletion and land degradation, while increasing yields. It brings optimal production at the best cost.

Now with 50-some members, the SMSA has brought together the town's farmers to implement conservation agriculture in their semi-arid climate and mixed-farming systems. The association also functions as a link to national and international agricultural organizations.

"Since adopting conservation agriculture, we have saved 30% in fuel and labor," said Nabil Sahli who acts as the group's treasurer. "And we did this without any subsidies from the government," Sahli added proudly. After three years of conservation farming, the SMSA's

annual sales has reached 127,000 Tunisian dinar (about $50,000), a substantial sum for the district's three villages.

Conservation agriculture uses specialized zero-tillage seeders to plant seeds directly into undisturbed soil, along with the fertilizer. This improves the soil fertility. Less cultivation has meant less fuel used in preparing the land, and more time for farmers for activities. It has reduced seed and fertilizer inputs through precision planting and better placement of fertilizer, cutting production costs and upping efficiency.

In Tunisia, the CLCA package has contributed to increased production at a lower cost compared to conventional agriculture.

With success from the first phase of the project under their belt, the town's farmers now want training, professional demonstrations, and input supplies. They also want to be able to calibrate the width of their Australian seeder plants – to make it narrower than the current 24 cm to fit their farming environment. Even better, they said, it would be nice to acquire a new seeder to serve more villages. Right now, they go from village to village with the Australian seeder they have. The SMSA members plan to double the surface of conservation agriculture to 240 ha in the next planting season.

"We've been doing this for three years, and people who'd moved to Tunis are now coming back to work on the land, and our livestock businesses are improving," said Taoufik ben Amman, chief of SMSA. He added that conservation agriculture is a better alternative in a country like Tunisia, where there's less rainfall. No-tillage farming has also helped boost the soil's ability to retain water, making it available to plants. For this very reason, conservation agriculture has great potential for drylands and marginal lands.

Additionally, keeping crop residues from the past harvest on the soil surface protects farmland from wind, water erosion and heat extremes. It helps soil to absorb rainfall. As the crop residues accumulate in the soil, it increases soil organic matter, improving the soil's structure and positively contributing to the carbon sequestration.

The benefits notwithstanding, farmers' reliance on crop residues to feed livestock during the long summer feeding gap – an important source of income diversification – has been an obstacle to the wider application of conservation agriculture in mixed-farming systems. By developing alternative feeding systems for sheep, ICARDA has been working together with Tunisia's National Institute of Agricultural Research, or INRAT, to change this.

With the second phase of the CLCA project kicking in, ICARDA will work with the International Maize and Wheat Improvement Center (CIMMYT) and INRAT on integrating crop-livestock system and conservation agriculture. With four target countries – Algeria, Tunisia, Bolivia, and Nicaragua – the project aims to sustainably increase production and enhance climate resilience of smallholder farming communities and their crop-livestock

production systems in the drylands of North Africa and Latin America and the Caribbean region. The production systems and socio-cultural context are quite different in the regions. But this is an incentive for inter-regional exchange of knowledge and integrated capacity development of farmers, especially women and young people.

“Educating people on conservation agriculture techniques is the most important element. It’s also the most difficult challenge of the project,” said Mourad Rekik, ICARDA’s senior scientist who leads the project. “We need specialized trainers. We need extension workers who are highly-trained on conservation agriculture packages. We are working together with farmers who have already adopted the conservation agriculture techniques to spread knowledge and scale it up and to maintain satisfactory levels of productivity of their livestock.”

Adnen Abdrabbou, whose mixed-crop farm stretches out as far as the eye can see in Siliana, is one such farmer. As Tunisia’s first conservation agriculture farmer, he has integrated crop-livestock under conservation agriculture since the 1990s. All of his lands are under conservation agriculture, practicing direct seeding under permanent soil cover. He grows five or six crops as part of crop rotation. To avoid feed shortages during summer, he intercrops barley with legumes. Since both are able to grow in harsh and dry conditions, his livestock can feed on them, while he can still leave their residues for soil cover.

“There is science behind conservation agriculture. Conventionally, you’d believe that plowing and burning crop residues can help control pests and all, but I get better results using conservation agriculture and crop rotation,” Abdrabbou explained.

As witnessed from the first phase, farmers switching to conservation farming need chemical help to control weed, which could be economically less profitable for them. But as they learn to manage weeds, pests, and diseases in an integrated way under conservation agriculture, the dependence on chemicals decreases. For instance, growing cereals continuously can lead to high populations of grass weeds, but farmers can control this by using crops like legumes and canola with use of selective herbicides.

Rotation can also boost soil fertility: legumes can fix nitrogen from the atmosphere and make it available for subsequent crops, while green manure crops boost soil organic matter content.

Most farmers in countries like Australia, Brazil, Canada, and the United States use conservation agriculture in a range of rainfall zones, soil-types, and farming systems. Many fields in those countries have not been plowed for more than three decades. And their farmers are getting similar or higher yields with fewer inputs, saving themselves time and money.