Conservation agriculture

Farmers like it because it gives them a means of conserving, improving and making more efficient use of their natural resources

"Conservation agriculture" sounds too good to be true. Instead of burning crop residues after the harvest, or ploughing biomass into the ground, you leave them in place, as soil cover. At the start of the next cropping season, you don't plough the field at all - instead, you use special equipment to drill the seeds directly into the soil. Besides reducing mineralization, erosion and water loss, the surface cover inhibits the germination of weeds, protects soil microorganisms and helps build up organic matter. Result: less time and labour spent on land preparation, lower fuel consumption and less air pollution, reduced need for chemical inputs, and increasing yields and farm income.

Of course, it is not that simple. Conservation agriculture also requires careful planning of crop rotations, new approaches to weed control and pest management, and range of other "precision farming" skills. But around the world - from the humid tropics almost to the Arctic Circle - conservation agriculture (or CA) is being adopted by increasing numbers of farmers. Recent studies estimate that CA is practised on about 100 million ha of farm land, mainly in North and South America, but also increasingly in Africa and Asia.

"Farmers like it because it gives them a means of conserving, improving and making more efficient use of their natural resources," says **Theodor Friedrich**, a CA specialist at FAO. "It's resource-efficient/resource effective agriculture..."

No shortcomings at all? "Conservation agriculture is generally a 'win-win' situation. That does not mean that there are no problems. For example, CA may require the application of herbicides where there is heavy weed infestation. During the transition phase from conventional to conservation agriculture, certain soil-borne pests or pathogens might create new problems due to the change in the biological equilibrium. But once the CA environment has stabilized, it tends to be more manageable and productive than conventional agriculture. So far there has been no pest problem that could not be overcome in Conservation agriculture."

No-tillage in selected countries 2004/2005 (in hectares)	
USA	25 000 000
Brazil	24 000 000
Argentina	18 000 000
Australia	9 000 000
Canada	13 000 000
Paraguay	1 700 000
South Africa	300 000

Spain Africa	300 000
Indo-Gangetic plains	4 000 000
Bolivia	500 000
Chile	100 000
Colombia	100 000
Uruguay	300 000
Venezuela	300 000
China	1 000 000
Others	1 000 000

What distinguishes Conservation agriculture from organic farming? "Although both are based on natural processes, CA doesn't prohibit the use of chemical inputs. For example, herbicides are an important component in CA, particularly in the transition phase until a new balance in the weed population is achieved. Also, in view of the importance of soil life in the system, farm chemicals, including fertilizer, are applied very carefully. In general, CA farmers use fewer chemical inputs than comparable conventional farmers and, over the years, quantities of chemical inputs tend to decline"

Is Conservation agriculture compatible with Integrated pest management (IPM)? "Not only is it compatible, but CA actually works on the same principles. Like IPM, it enhances biological processes, and expands IPM practices from crop and pest management to overall land husbandry. Without the use of IPM practices, the build up of soil biota would not be possible."

Do disease problems increase due to the residues left in the field? "Not in the long term, if sound crop rotations are adopted. Monocropping under zero-tillage is possible, but not recommended, because - just as in conventional farming - it creates pest problems."

Will CA only work with grain crops? "No, the system has been adapted for vegetables and root crops. Now, not only grain crops and pulses but also a wide range of other crops - such as sugar cane, vegetables, potatoes, beets and cassava - can be grown. Perennial crops like fruit and vines can also be grown using CA techniques."

Will it only work in certain climates or on certain soils? "So far the only area where the concept has not been successfully adapted is arid areas with extreme water shortages and low production of organic matter."

Machinery and equipment

On most farms where conservation agriculture is practised, fewer field operations are needed. For this reason, farmers need less equipment and the costs of both labour and fuel are reduced. In addition, the number of implements can be reduced - ploughs

What is the role of livestock in Conservation agriculture? "Livestock can be fully integrated into conservation agriculture, by exploiting the recycling of nutrients. This reduces the environmental problems caused by concentrated, intensive livestock production. The farmer can introduce forage crops into the crop rotation, thus broadening it and reducing pest problems. Forage crops can often be used as dual-purpose crops for fodder and soil cover. However, conflicts between the use of organic matter to feed the animals or to cover the soil has to be resolved, particularly in arid areas with low production of biomass."

and harrows are no longer required. In the case of tractor-powered farming, the size of the tractor can also be reduced. Likewise, in animal draught systems, fewer animals are needed, or different types of animals can be used: instead of one pair of oxen, a pair of donkeys might be sufficient.

Despite its advantages, CA has so far spread rather slowly. Why? "There are a number of reasons. Firstly, there is greater pressure to adopt Conservation agriculture in tropical, rather than temperate climates. In Latin America it is catching on at an increasing rate but it has taken a long time. Europe is slowly getting there - generally, farmers still don't feel sufficient pressure to adopt CA and environmental indicators are not yet taken seriously enough. But ECAF [the European Conservation Agriculture Federation] is working hard to change that."

And in other developing regions? "CA has great potential in sub-Saharan Africa because it can control erosion, gives more stable yields and reduces labour. There are a number of ongoing initiatives promoting different practices, from conservation tillage up to integrated systems of Conservation agriculture. Another vast area where the adoption of CA would be extremely beneficial is Central Asia - in many countries, conventional agriculture has become problematic because of environmental degradation and the use of unsuitable and obsolete farm machinery. In the South Asian rice-wheat area, there have been 50% increases in net benefits through the direct seeding of wheat in the rice crop or stubble, compared with conventional tillage before seeding. About half of the benefit achieved was from reduced costs, and the other half from increased yields due to water saving and better use efficiency."

CA requires management skills and equipment that might not be available, especially to small-scale farmers "Yes, and the first years of CA can be very difficult for the farmer. Support, both technical and financial, is often needed. To get started with CA, the minimum a farmer needs is a zero tillage planter, which might not be available in the neighbourhood. Buying one without knowing the system or even having seen it, is a risk that few farmers are prepared to take. And, of course, machinery manufacturers and their dealers might not be enthusiastic promoters of CA - less equipment is required and the need for large, expensive tractors and tillage equipment is reduced."

- Visit FAO's new site on Conservation agriculture
- See related **Spotlights** on Zero tillage, "Cover crops" save soil in Brazil and The life in soil