

# From zero tillage to conservation agriculture

## An unexpected success

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Conventional farming systems based on intensive and continuous use of the plough are difficult to sustain in several climatic zones as they cause degradation of the soil. Tillage-induced erosion in developing countries can exceed 150 t/ha annually and soil erosion is responsible for 40% of land degradation worldwide (FAO, 2001). Moreover, yields are beginning to stagnate or even decrease whilst inputs are increasing. In the early 1970s, farmers in Santa Catarina (Brazil) tried conventional terracing as a solution to the problems of continuous erosion and declining yields. The inconsistent results led farmers and researchers to tackle the problems at their source, trying to find solutions to avoid the direct impact of rainfall on the bare soil and to improve water infiltration. What began as green manuring has now evolved to residue-based zero tillage for maintaining a per-



Zero-tillage, entry point technology for conservation agriculture.  
Photo: FAO

manent soil cover (FAO, 2000; ILEIA Newsletter 1995, no.3, pp16-17). In 2000, the global area under zero tillage was estimated at 57 million ha, including 9.2 million ha in Argentina and 13.5 million ha in Brazil (FAO, 2001).

### Principles of conservation agriculture

Zero tillage (or direct seeding), crop rotation and green manure cover crops (GMCC's) are essential elements in the successful expansion of conservation agriculture in Latin America. Farmers have realised that zero tillage alone is an imperfect and incomplete system in which disease, weeds and pests tend to increase and profits tend to decrease. Research conducted in southern Brazil also shows that zero tillage practices in combination with suitable crop rotations consistently reduce weed infestations (Derpsch, 1999). Based on this observation, a more integrated approach to zero tillage evolved which FAO now calls "conservation agriculture".

This approach implies conformity with the following principles (Benites and Ashburner, 2001):

- No mechanical soil disturbance – direct seeding or planting
- Permanent soil cover – making particular use of crop residues and cover crops
- Judicious choice of crop rotations

Implementation may vary according to the local conditions, problems and means, but zero tillage (direct seeding) is the key technique in the system. Direct seeding implements and tools are often adapted by the farmers themselves or, like in Brazil, by means of collaboration between farmers, technicians, researchers

and the private sector (FAO, 2000). Crops are sown directly into a permanent soil cover which can be either residues from a previous crop (or imported straw) or a live cover crop. The permanent soil cover reduces the damaging impact of rain drops on the bare soil, retains soil moisture, regulates temperature, provides organic matter and is a potential source of nutrients.

Zero tillage applied within a conservation agriculture framework has proven to be a feasible farming practice applicable under a wide range of climatic, soil and social conditions, both for large and small-scale farmers.

### The farmers-driven adoption process

Conservation agriculture is attractive to farmers for several reasons: it saves time and money, it makes available a longer period for planting, it leads to greater drought tolerance and generally higher yields. Despite these major advantages, farmers are still wary in adopting such radical changes. But in Brazil, the main reason for the rapid expansion of this system is that the farmers themselves are extremely active in promoting them. From the beginning, they have been involved in creating associations and networks, which also involve technicians and researchers from the Brazilian Zero Tillage Association for the Tropics (ZTAT) or the Clubes Amigos da Terra (CAT). These groups and networks provide support to members and have become very effective in farmer-to-farmer spread and acceptance of the ideas and the technologies. They have also begun to develop into significant local pressure-groups pushing for improvements in the policy and institutional environment as well as for political and legal support for their initiatives (FAO, 2001).

### Supports to farmers' and NGOs' actions

Since 1995, the Brazilian government has been strongly involved in the process. Several ministries and research institutions are now collaborating with NGOs such as ZTAT and CAT and provide financial support, training of technicians, research support, integration of training sessions in universities, etc. Further support for zero tillage promotion was generated by collaborating with ABEAS (Brazilian Association for Higher Agricultural Education) and the University of Brasilia in the first graduate-level correspondence course in zero tillage in Brazil, in 1999 (Landers, 2000).

However, most agricultural policies still focus solely on increasing production, usually associated with packages of external inputs and technical interventions. In many cases, these policy frameworks are the principal barriers to the spread of more integrated, sustainable and productive agricultural systems (FAO, 2001).

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