

Appendix 1 – Case Studies

Case Study 5:

Conservation agriculture: the future of smallholder farming

There is little new arable land in Asia and Africa and degradation is advanced and worsening. Smallholder farmers in Brazil and Paraguay, faced with falling crop yields and soil degradation, have concluded that practices must change to stabilise and increase production sustainably: their agriculture must protect natural resources, especially against unnecessary and extremely destructive tillage. We also know that poor practices cause 15% of global emissions of greenhouse gases, as carbon dioxide, methane and nitrous oxide. Conservation agriculture (CA) can play an important role.

Conservation agriculture (CA) is a suite of practices developed to provide sustainable cropping intensification whilst protecting natural resources. It builds on our understanding of soil quality, the importance of organic matter, and the impact of inappropriate tillage for the farmer and the environment and involves site-specific adaptation of three basic principles: keeping soil covered with organic matter, retaining crop residues and augmenting with specially sown cover crops; not disturbing the soil more than absolutely necessary to get seed into the soil at the required depth (no-till agriculture); and applying the well-understood concept of crop and cover-crop rotations and associations, to manage fertility and reduce the build-up of pests, diseases and weeds.

Great steps are being taken in sub-Saharan Africa, Asia and Central America. A major thrust by FAO and others has provided a sound platform for the practice to take off. We know what needs to be done to the soil and the crop. But a major obstacle to greater success is often the immature state of indigenous manufacturing capabilities and sustainable approaches to mechanisation²⁴. Local manufacture can respond rapidly to the demands of the agricultural sector, but equipment is not available on the market. Imports tend to be expensive, slow to initiate and unable to adapt easily to local circumstances. Local manufacturers say farmers don't know what they want and anyway they have limited purchasing capacity.

The agricultural engineering challenge is to take our knowledge of soils and implements, and the effects of management and water, and then promote local agricultural engineering industries in developing countries. Guidelines for success in developing the CA equipment industry will include:

- *The need for manufacturers to carry out market studies* working with researchers, farmers, farming organisations, input and credit suppliers and others.
- *The importance of thorough testing of equipment before commercial batch production.* Manufacturers need to incorporate user feedback into the next generation design.
- *The provision of technical training for manufacturers, operators, dealers and extension staff,* including training in business skills and business diversification.
- *Support for hire service providers;* there are increasing efforts to support hire services for tractor or animal traction owners, as high investment costs can often be a disincentive for individual farmers.
- *Active promotion of products,* through on-farm demonstrations, field days and agricultural shows.
- *The formation of CA practitioners mutual support groups.*

There is a major opportunity for international aid organisations, with national governments to support the development of indigenous agricultural industries and expand the current 120m hectares of CA not subjecting the soil to damaging tillage. In the long term, cheaper equipment tailored to local needs will be required, and now is the time to intervene with appropriate technical support.

²⁴ <http://blog.cimmyt.org/?p=8198>. "Mechanization, entrepreneurship, and conservation agriculture to leverage sustainable intensification in eastern and southern Africa" (MELISA), CIMMYT workshop 2012



Appropriate Technology

Conservation Tillage

The Challenge

Conservation agriculture requires the soil to be kept covered and for seed and fertilizer to be placed with a minimum of soil disturbance.

The conventional plough remains popular but continues to wreak immense damage on agricultural soils.

The Solution

“No-Till” planters cutting through the surface vegetation and deposit the seed and fertilizer at the depth and placement required.

Here, a Brazilian animal drawn planter is being evaluated by farmers in Tanzania