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Conservation Agriculture in the UK: A visit to a no-till farm in Lincolnshire

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On 8 March 2011 IAgrE and the Tropical Agriculture Association (TAA) joined forces to host a wide ranging seminar on Conservation Cropping at Cranfield University (www.iagre.org/conservecrop.shtml). At the seminar it appeared that there was a disquieting lack of appreciation of the benefits of conservation agriculture (CA) in the UK environment. At the same time there was a very useful attempt to identify some of the potential areas of difficulty for would-be UK farmer adopters.

There were (at least) three main areas of concern: These included the high levels of crop residue and potentially high weed populations in temperate-zone agriculture. Both of which, some delegates erroneously argued, 'require' ploughing to solve.

Another issue was the tendency of soils with a high clay content to smear, and so reduce seed germination with direct drilling. This actually could be more of a reason to abandon ploughing and so eliminate the danger of forming plough pans which require energy-expensive tillage to remove.

Finally there was the vexed question of grass weed control in cereal crops. The chief villain is black grass (*Alopecurus myosuroides*) and it seems that the one herbicide capable of controlling it –Atlantis – may not retain its efficacy for very much longer. There is an ongoing debate about this, correct application (nozzle selection, forward speed, boom height) and applying the herbicide to plants no bigger than the three-leaf stage are likely to play a major role in ensuring good control. Poor quality spraying of mature black grass will, of course, result in unsatisfactory control.

It was also suggested that *reduced* tillage may hold the key as it can cut fuel costs and increase operating speeds. However this half measures approach still destroys soil structure and fauna; and spreads weeds like black grass.

Against this backdrop it was a pleasure to accompany the TAA farm visit to Tony Reynolds' farm (Thurlby Grange, Thurlby, Bourne, Lincolnshire) on 4 June[2]. Tony had been at the Cranfield meeting and has been a 100% no-till farmer since 2006 after a 3-year period of trial and assessment. Thurlby Grange farm is 243ha and is predominantly devoted to annual crops (first and second wheat, oil seed rape and spring crops like peas, beans, linseed, oats and canary grass – *Phalaris canariensis).* All crop residues are retained and the soil is never tilled. In fact it would now be difficult to wreak mechanical damage on the soils as all tillage equipment was auctioned off in 2006 (to the bemusement of neighbours who suspected financial or mental ruin). Crucially the arable crops are complemented with two livestock production enterprises: store cattle for fattening and a 16 000 bird poultry unit for egg production which also produces 10 tonnes/week of high P and K manure, all of which is returned to the farm's soils. The beef enterprise means that cereal crops are

[1] www.engineering4development.co.uk

[2] A fuller, differently nuanced, account of the visit can be seen at: www.taa.org.uk

undersown with grass when pasture is required; the poultry enterprise has helped the farm to reduce its overall inorganic fertilizer use by 80%. The target for N fertilization reduction is 50% which will be achieved principally as a result of the increased soil fertility provided by residue mulch.

Equipment

The equipment needed to run the farm comprises a no-till drill (an Argentinean Bertini 22000 – www.bertini.com.ar/imod22.htm), a Claas Lexion 460 combine with Shelbourne Reynolds stripper header, a 24 metre Knight trailed sprayer, a fertilizer spreader, and tractors for general farm work. An important addition to the stripper header is the pneumatic Autocast seed and slug pellet distributor which broadcasts oil seed rape seed at the time of stripping to then be covered by the chaff and straw emerging from the rear of the combine. This really is no-till as the rape seed is 'sown' at harvest and is left alone, except for phytosanitary spray applications and fertilization, until harvest the following year.

Benefits

The benefits to the farm must, of course, start with the economics. Tony calculates that his soils needed 5 years to regain their structure and fertility after ploughing was stopped. So, for example, wheat yields dropped from 8.75 t/ha under conventional tillage, to a low of 7.5 t/ha at year 3 before recovering to 8.5 t/ha in year 5 and reaching 10 t/ha in year 6. Crop establishment costs have fallen from £245/ha to £36/ha with no-till, and annual fuel use over the whole farm has dropped from 96 litres/ha to 43 l/ha. So there is no doubt about the profitability of the switch. But what about the environmental benefits?

Soil is no longer lost to wind erosion. The soils on the farm range from highly erodible organic fen soils to silt and clay loams and, with plough-based tillage wind erosion is a serious problem. The farm now benefits from wind blown deposits from the neighbouring farms and so, in the long term is actually accumulating soil! Soil structure is markedly improved due to the addition of organic matter via the crop residues and to the biological tillage provided by the vastly increased earthworm population. The soils are now stable, well structured and healthy and, although the farm has only received 11mm of rain since February, the soils are moist and there is no sign of moisture stress in the crops.

The black grass problem has been all but eliminated (I didn't see a single plant during the visit). Tony explained that 80% of black grass seeds buried in the soil lose their viability each year, so that if the soil is not moved and no new seeds are brought to the surface layers to germinate, the herbicide only has to eliminate 20% of the initial population in year 2. Thereafter the weed seed bank declines rapidly to practically zero. Although he still applies Atlantis, he maintains that this is a precautionary measure and dose rates are kept as low as possible.

Beans direct sown into wheat residue

Autocast oil seed rape seed and slug pellet broadcaster

Tony Reynolds in a broadcast oil seed rape crop

Bertini 4m no-till seed drill

Bertini planting line which comprises a fluted roller for residue cutting, off-set twin disc openers for seed and inclined seed covering wheels. The machine has an additional hopper for slug pellet application