IS PRECISION AGRICULTURE READY FOR THE CROP PROTECTION INDUSTRY ?

To date the commercial adoption of GPS (Global Positioning System) technology and variable application systems in Europe has been largely based on the use of fertilisers on combinable crops. A workshop, GPS and Crop Protection, *organised by the Association of Applied Biologists (*www.aab.org*) was recently held at John Deere's UK headquarters. It gave promise that it will not be long before variable agrochemical application will be a serious option and a useful tool to help meet environmental and economic objectives.*

Syngenta is one company that has already shown a commitment to the potential of sensor technology and related electronic systems in agriculture. Dr Bruce Grieve of Syngenta outlined how his company had sponsored a programme of blue sky research at the Syngenta Sensors University Innovation Centre (UIC) based at Manchester University, UK. Initial projects cover the domestic pest control area and post harvest produce tracking. Rob Willey, Household Sprayers in the UK (www.househamsprayers.com), outlined the advances in electronic controls applied to sprayers that have taken place in the recent years. He said that variable rate application, boom height control and boom section control, all based on GPS maps, were now available. Automatic nozzle height adjustment is also possible using optical sensors. Downloading of recorded application maps is also an option.

Jan van de Zande, a sprayer specialist from Wageningen University in the Netherlands, described projects where optical sensors are being evaluated to optimise agrochemical application. Research at the University of Turin is exploring methods of reducing exposure to fungicidal sprays used for apple scab control. Multispectral sensors such as the Green Seeker (www.ntechindustries.com/greenseeker-home.html), mounted on a row sprayer, are being used to measure biomass density and photosynthetic activity, allowing spray rates to be adjusted as the sprayer unit travels along the row. In the Netherlands potato haulm desiccation chemicals have been reduced by 30-60% in trials using the Yara N sensor to measure variability in biomass density.

Cedric Bravo, University of Leuven, Belgium described different sensor technologies being evaluated for fungal disease monitoring. The research included the wheat diseases yellow rust and Septoria. Changes in the development of fungal disease on the growing plant can be detected at four stages - at the spore infection stage, at the first signs of metabolic changes, at early senescence and when the whole plant is under stress. The infection stage brings about stomatal closure but the first signs of metabolic change take about seven days to develop. This can be detected in the laboratory with fluorescence reflection from an ultra violet light source but this is not a practical tool for the field. The first visible detection is through reflectance after 14 to 20 days. The research has shown quite good correlation between the type of disease and the waveband frequency, so identification of the disease present is a possibility. In trials conducted in Leuven a series of fibre optic sensors were mounted on the boom of a sprayer, alongside the nozzles so that data could be channelled to a central computer. In this way it was possible to detect fungal lesions and to create a disease map. A mapping approach with time to input epidemiological models is favoured rather than creating a "real time" spraying programme.

Peter Luttman, formerly of Rothamsted Research, Harpenden, UK and now an independent consultant, reported on a review that he and Professor Paul Miller of Silsoe Spray Applications Unit, part of The Arable Group (TAG) had recently carried out on the feasibility of weed patch spraying. They concluded that for successful weed patch spraying in arable crops a mapping approach is more appropriate than trying to detect weeds and apply herbicides on a real time basis. The problem, however, comes down to the cost of the mapping. Experience has shown that scouting from an ATV is not really favoured by farmers. Nonetheless, Dr Luttman gave theoretical cost models based on scouting three to four hectares per hour which equated to a cost to the farmer of £2.50/hectare ($2/acre). In a theoretical example for blackgrass control where 65% of the field area was sprayed, a saving of £9.80/hectare could be achieved using the principle of switching the sprayer on or off; using fluroxypyr for cleaver control it is possible to save £12 /hectare.. The other option is go from full dose to low dose, rather than switching off. This gives less of an economic benefit, £5 /hectare in both of the examples, but it is perceived to be less of a risk if weed patches are not clearly detected. Dr

Luttman indicated that there is still more to do to improve the reliability of automatic weed patch detection.

Mark James of John Deere described and demonstrated the wide range of GPS systems introduced by his company in recent years. The most prominence is being given to the AutoTrac automatic steering system for tractors. This allows hands off steering between headlands. It raises the question as to whether tramline based cereal crop management could become redundant. The general view is that this is not the case as wheel damage for late season applications would be a problem. John Deere is moving ahead rapidly with its sprayer range and control systems. The latest range of trailed sprayers features a brand new option which automatically switches off individual boom sections and master valve at the headland. Known as Sprayer Pro the system was introduced in October 2006. It can provide automatic recording and documentation of hours sprayed, quantities applied, distance travelled. Future upgrades will make it possible to calculate the quantities of chemical required for each field based on a treatment plan. It will also build into the calculation the effect of field margin shut off.

Bruce Knight prepared this article for Crop Protection Monthly, June 2007 (www.crop-protection-monthly.co.uk)