

Precision in physical weed management

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Summary Field guidance is an integral part of cropping operations, particularly row cropping, but this has been largely a function of the operator's steering ability. The past decade has seen the development of automatic guidance systems that claim to provide much greater precision than human operators. These are almost always based on Global Positioning Systems (GPS), and greater precision is achieved with Real Time Kinematic (RTK) systems.

The accuracy of one such system (Beeline®) was assessed using a fixed string line surveyed in between the start and end coordinates of a run, using a video camera mounted at various points on the tractor and an implement to record deviation. This was sampled at set intervals to produce a composite image and measurements.

Mean deviation of the tractor was well within the claimed ± 20 mm. Runs appeared consistent along most of their length but slightly greater deviation at some points suggested the possibility of external

interference—mechanical or electronic. The precision achieved with automatic guidance was always significantly better and more repeatable than that of a human operator.

Application of the system to physical weed control was assessed using linkage mounted mechanical interrow tools, with a range of guidance and equipment variables (distance from plants, speed, depth), in comparison with a human operator. GPS always provided significant benefits over operator guidance. In these tests the precision guidance system allowed mechanical treatments to achieve a similar level of weed control to herbicide, without crop damage.

The poster will provide data from both experiments, and some speculation about the potential of precision guidance to improve the performance of both physical and herbicide weed management systems.

Keywords Precision, field guidance, GPS, row cropping, physical weed control.

Energy use in physical and herbicide weed control

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Summary Energy consumption is becoming increasingly important as a measure of efficient practice and as a way of measuring sustainability. On-farm energy use is a direct input to soil structural damage, and energy inefficiency – on and off-farm – usually implies greater use of fossil fuels. Accurate guidance can improve the targeting of crop inputs, and reduce energy requirements.

This poster will report on an experiment to assess energy requirements of mechanical weed control in which ground-tool draft was measured at three speeds and two depths in five soil treatments – ploughed, crusted, crusted with residue, and single and multiple-wheeled soil, to simulate field conditions in a tilled soil, in-crop, in fallow, after normal field traffic and headland traffic respectively.

The results indicate that significantly smaller energy requirements can be achieved when precision guidance is used to avoid unnecessary soil disturbance. Control of ground-tool position (in both horizontal and vertical planes) may be an important tool in the substitution or incorporation of physical weed management into herbicide dominated systems.

The poster will question current thinking on the relative energy efficiency of herbicide and physical measures in weed management. It will also note potential applications, and their effects in terms of residue protection of the soil surface.

Keywords Energy, precision, field guidance, herbicide, physical weed control.