THE USE OF GPS GUIDANCE SYSTEMS AND CONTROLLED TRAFFIC IN MECHANISED CANE FARMING

By

M.A. SMITH
Bundaberg Sugar Ltd., Bundaberg, Australia

Abstract

Enhanced differential global positioning systems such as the BEELINE Navigator offer mechanised cane farmers an accurate (2 cm precision) method of vehicle control. This paper lists the ways that Bundaberg Sugar is incorporating this technology in its farming operations and, in particular, its attempts to commercialise high density farming and the necessary controlled traffic concepts at its intensive farming systems pilot farm.

Introduction

Precision agriculture is a rather loose term that covers many different uses of the Global Positioning System (GPS) technology to produce a more efficient farming system. Other papers at this workshop will deal with systems such as yield mapping and differential application of inputs across blocks. In many ways, precision agriculture attempts to reclaim for today’s large farming operations, some of the detailed knowledge that small farmers in the past had of variation across their fields.

This paper deals with some early experiences with GPS based machine guidance in the Australian industry. At the time of writing, an Australian company, Agsystems Pty Ltd, had sold more than 200 BEELINE Navigator (BN) machine (usually tractors) guidance systems into Australia and USA. These units are considered to be the leading technology at the present time. Three of their row crop units have been sold to cane farmers while the majority of sales have gone into the cotton industry.

Cost is the obvious constraint on greater adoption of the technology but it is reasonable to assume that the cost will be reduced as market competition develops.

The beeline system of machine guidance

The BN uses a process called differential global positioning system (DGPS) to automatically control the vehicle’s position. In essence, the onboard computer in the tractor uses the position provided by the DGPS to control the hydraulic steering system to keep it in a straight line with an accuracy of 2 cm. The rowcrop version of BN also uses an inertial sensory input sub-system to fine tune the position information coming from the GPS satellites, resulting in smoother tracking where precision is paramount.

Using beeline on Australian cane farms

Bundaberg Sugar Ltd (BSL) has two BN row crop guidance systems. The first of these was installed about 12 months ago to provide the accuracy of tractor guidance required to plant the first section of the company’s Intensive Farming Systems (IFS) pilot farm. The aim of the 60 ha pilot farm is to commercialise a number of new concepts that are being promoted by our researchers: high density planting (HDP), controlled traffic, trafficking a lower proportion of the field, matching bed or row widths to maximum legal road vehicle wheel track widths, harvesting of better quality planting material, better billet planter performance, irrigation scheduling using soil water monitoring and more efficient irrigation systems. In keeping with the controlled traffic concept and the low power requirements when operating on compacted wheel tracks, the BN was fitted to a relatively small 100 HP FWA tractor equipped with 300 mm tyres at 2100 mm centres. The second system was recently installed on a modified tracked harvester to complete the pilot farm’s harvesting unit. The aim of this pilot farm is to combine these concepts in a practical farming system and determine the costs and benefits associated with these over at least a crop cycle.

While BSL was aware of the BN technology, the price prevented BSL farm management from seriously considering its use in the company’s commercial farming operations. The BSL units were originally purchased specifically for the IFS pilot farm. Many other uses are now being investigated.

The BSL units have been used for marking out for conventional planting. BN offers much faster and more accurate marking out and allows the operation to continue outside daylight hours. These advantages give more uniform row spacings and generate benefits which propagate through the whole crop cycle especially when multi-row equipment is used. The company is investigating the benefits that may accrue if some or all planter tractors were equipped instead of the marker tractor.

BSL has a significant area of sub-surface trickle irrigated cane. Experience has shown that the tape retains its efficiency for at least two crop cycles. Replanting cane over the tape is possible but locating the new rows over the tape is a difficult task. BN would make this a very simple task.

A fallow preparation method based on sprayout and rotary hoe cultivation of the row was developed for the trickle replanting task. Experience has shown that there were no yield penalties with this system on red volcanic soils. The system is now used on most
red soil blocks. Once again locating the rows at a uniform spacing is difficult. Planning is underway to add the BN to overcome this limitation.

The BN can be used to survey heights used to produce laser-levelling designs. BSL has yet to test whether the vertical accuracy based on GPS is acceptable when compared to the normal levels based on the use of the laser beacon. However, the BN has been used to mark grids for surveying. This is much quicker than the previous method based on using markers.

Conclusion
After some initial teething problems associated with setting up the equipment for tasks that it had not undertaken previously, the BN has performed very effectively for every task asked of it. BN is ideally suited to the HDP concept as it is currently packaged. The author believes that as time and imagination allow the development of more uses, the BN will come into general use by contractors and larger corporate farms where increased utilisation will spread the cost down to acceptable levels.

UTILISATION DES SYSTEMES DE GUIDAGE GPS ET DU TRAFIC CONTROLE DANS LA CULTURE MECANISEE DE LA CANNE

M.A. SMITH
Bundaberg Sugar Ltd., Bundaberg, Australia

Résumé
Les GPS à différentiels accrus tels que le Navigateur BEELINE donnent aux planteurs de cannes mécanisées une méthode précise (à 2 cm près) pour le contrôle de leurs véhicules. Cette communication énumère les façons par lesquelles la Bundaberg Sugar est en train d’incorporer cette technologie dans ses opérations agricoles. Elle décrit en particulier les essais commerciaux dans sa ferme-pilote sur la plantation à forte densité et les concepts de trafic contrôlé requis dans les systèmes agricoles intensifs.

USO DEL GPS COMO SISTEMA GUÍA Y PARA EL CONTROL DEL TRÁFICO DE LAS LABORES AGRÍCOLAS

M.A. SMITH
Bundaberg Sugar Ltd., Bundaberg, Australia

Resumen
Los sistemas mejorados de posicionamiento global diferencial tal como el navegador BEELINE ofrece a los agricultores que usan mecanización, una precisión de 2 cm para el control de los vehículos. Este artículo lista la manera como Bundaberg Sugar está incorporando esta tecnología en sus operaciones agrícolas y, en particular, su intento por comercializar el sistema de siembra de alta densidad y el requerido sistema de control de tráfico en su finca piloto de agricultura intensiva.