

PRACTICE FACT SHEET

ROLE IN THE USE OF GPS AND CONTROLLED TRAFFIC FARMING SYSTEMS



Project Catalyst is a grower-led innovation project in sugar cane that was formed to explore and validate farm management practice change leading to improved water quality for the Great Barrier Reef.

BACKGROUND

Global Satellite Navigation Systems (GSNS), more commonly referred to as Global Positioning Systems (GPS) has been one of the major contributors towards the development of improved farming systems and technologies. The NAVSTAR GPS, which was developed by the US Department of Defense, is the most widely used GPS system but other systems such as GLONASS (Russian), Galileo (European) are operational and accessible.

Basically, a standard GPS receiver calculates its position by measuring the distance between itself and at least three or more GPS satellites by measuring the time delay between transmission and reception of each GPS microwave signal transmitted by the satellites. The accuracy of the basic GPS receivers can be affected by a multitude of factors; however, the unimproved positional accuracy for most receivers is nominally about five metres. Improving the accuracy via technologies such Differential GPS (DGPS) and Real Time Kinematic (RTK) has allowed GPS to accelerate at an even greater rate into mainstream PA technologies.

Real-Time Kinematics (RTK)

navigation is required for precision guidance applications. Put simply, RTK is a technique used to reduce and remove common positioning errors. RTK GPS comprises three components, a local base station (also known as a reference station), a rover or mobile unit and a communication device common to both the base station and rover (normally a radio). The local base station can be either fixed to a known location or is transportable between locations where it is "surveyed in" to find its correct location. The base station receives signals from the satellite, calculates the inaccuracies in the position signal and then sends the correction information to the rover unit via the communication channel in near real time.

More recently, Satellite Based Augmentation System (SBAS) has the capability of providing wide area coverage of augmented GNSS services. There are several commercial providers of SBAS signal and dependent on the service selected, the signal received by the rover unit from the SBAS provider can eliminate the need to use a localised base station while maintaining the required positional accuracy. Access to the SBAS systems greatly enhances the successful adoption of

PA into a farming operation.

The advancement and subsequent cost reduction of RTK GPS and SBAS systems has paved the way for precision guidance systems (auto-steer) to be introduced into sugar cane farming operations and is a pre-requisite for a controlled traffic system. The use of these systems can improve positional accuracies of the rover units to approximately 2cm in the horizontal plane and 4cm in the vertical plane. Precision guidance systems offer opportunities to minimise the impact of large machinery under a controlled traffic system. A controlled traffic system allows for a farming operation to have defined sections within the paddock dedicated to the wheels of the machinery and the other section dedicated for plant growth. One of the first and most beneficial impacts of a well instigated controlled traffic system is to reduce the impact that large farm machinery (such as harvesters) has on soil compaction within the plant growth zone.

Compacted soils can severely reduce water infiltration thereby causing an increase in water run-off from cane paddocks that may contain nutrients and chemicals harmful to the health of the Great Barrier Reef.



TRIAL RESULTS

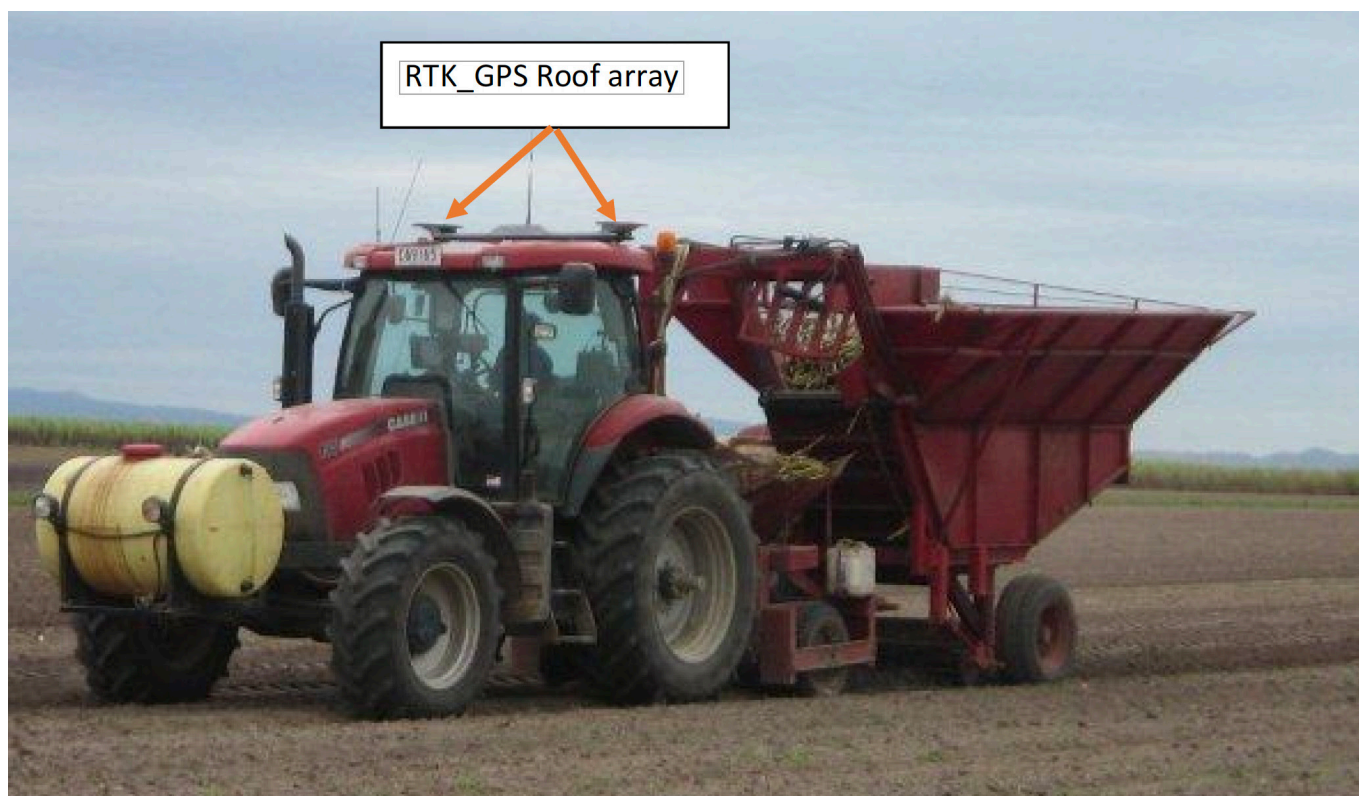


Figure 1 - Planting using controlled traffic guidance

Most foundation Project Catalyst growers were pioneers in the development and use of controlled traffic farming systems. Early pioneers included Gerry Deguara, Joe Muscat, Tony Bugeja, John and Phil Deguara, Blackburn Brothers, Brian and John Stevens, Tony Jeppersen, Mark Blair, Serge Berardi, Robert Sluggett and many more. These pioneer growers were greatly assisted in the implementation of their systems by project Catalyst agronomist Tony Crowley. Not only were these growers some of the first to introduce guidance systems into tractors used for farming operations, they were also some of the first to implement guidance systems into their harvesting operations.

Project catalyst growers successfully trialed and implemented a number of techniques designed to improve soil compaction and tillage operations. Soil compaction had been seen to have a major effect on the yield of sugarcane through limiting the availability of soil water. Intensive tillage between cane cycles can remove the compaction accumulated during the previous cane growing cycle (up to 6 years) but such intensive tillage is known to break down soil structure and soil biota thereby affecting the soil health of the farming operation. Therefore, the benefit gained by Project Catalyst

growers from the introduction of a controlled traffic system allowed them to move to a minimal tillage (zonal) operations. Zonal tillage in sugarcane farming refers to when only the row area is cultivated and not the entire field in preparation for planting. Zonal tillage operations are known to conserve organic matter, improve soil health, and reduce runoff and erosion as well as reducing the impact of water logging. Zonal tillage operations can also significantly reduce the number of passes required to prepare land for planting.

Trial results indicate water runoff from locations utilising a well-developed controlled traffic system can be reduced by up to 30% when compared to non-controlled traffic sites. Water quality is also shown to be improved with sediment load as well as nutrient and chemical losses reduced by 25-30%.

Further trial conducted were aimed at introducing operations that complemented zonal tillage such as the use of direct drill planting. Direct drill planting is the use of



Figure 2 - Bed renovator

specialised planter design such as a double disc opener planter to plant cane billets directly into soil that has not been extensively cultivated. Often, this method of planting is used in conjunction with raised beds which are cane beds that have

been pre-formed using bed forming cultivators with GPS guidance. Equipment required for improved land preparation includes; direct drill planters (Figure 1), bed renovators (Figure 2), zonal rippers, zonal rotary hoe (Figure 3).

Ideally the furrow width (cane row spacing) should match that of the wheel spacing of the high impact vehicles such as harvesters, haul-outs and larger tractors which in most cases is approximately 1.83m or wider.



Figure 3 - Zonal rotary hoe

EXPANSION

Project Catalyst has played a leading role in the rapid uptake of GPS technologies and the subsequent expansion of controlled traffic farming systems in the sugar industry. It is estimated that more than 50% of farms in the industry now have access to guidance technology suitable for controlled traffic operations.

Further to this, several regions have introduced community RTK base stations that freely transmit RTK correction signals that are accessed by multiple rover units. This initiative greatly reduced the cost for a grower to implement a guidance system and has been one of the key drivers in the expansion of GPS technologies. Many of the base stations utilised in this initiative are located within the properties of project catalyst growers.

The ABCD framework of farming practices for sugar cane identifies controlled traffic where permanent wheel tracks are matched to harvesting machinery wheel centres with GPS guidance on planting, zonal tillage, harvesting and

haulout machinery as an A class practice. Strategic or zonal tillage of fallow crops and plant cane including bed renovation is also classed as an A class management practice.

The success of practises undertaken as part of the Catalyst project has been an important component in the rapid expansion of using GPS guidance and controlled traffic in the sugar industry. This has led to the rapid uptake of an A class practice for many growers across all cane growing regions and has been instrumental in improving soil management and soil health while reducing the impact that soil compaction has on water quality leaving the farm.

