FACT SHEET
NO: 27
Date: September 2014

Turf Queensland
Grow Green

Benefits of On-Farm Soil Mapping

INTRODUCTION

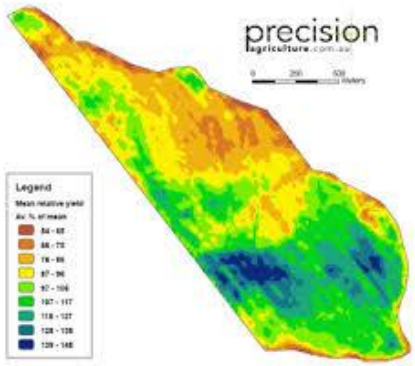
Precision farming (PA) or **satellite farming** or **site specific crop management** (SSCM) is a farming management concept based on observing, measuring and responding to inter and intra-field variability in crops.

The holy grail of **precision agriculture** research will be the ability to define a Decision Support System (DSS) for whole of farm management with the goal of optimizing returns on inputs while preserving resources. The reality today is that seemingly simple concepts such the ability to define management zones, areas where different management practices will apply, for a single crop type on a single field over time is difficult to define.

The spatial and temporal behaviours of farm variability are key to defining amendment strategies that could be defined for farm use within a farm management plan. Precision agriculture (PA) has also been enabled by technologies like crop yield monitors mounted on GPS equipped machinery that assists in productivity improvement (see fact sheet 28).

One of the early reasons for low adoption of PA is the reluctance of farmers to invest many thousands of dollars in PA without knowing if the technology will return a profit. Soil mapping costs and precision agriculture has reduced in cost to a point where the benefits far outweigh any investment.

Many studies have been undertaken globally, including Australia, on precision agriculture that indicate benefits to the turf farmer in soil improvement; fertiliser use, labour reductions, increased yield, increased turf quality, less waste, improved water and energy efficiency as well as improving profitability.



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DIGITAL FARM MAPS

A key item in today's farming business is a farm map showing the location of features, paddocks and assets of the property. Precision agriculture starts with an accurate digital farm map, then other information is built around this map.

Whole farm contour map is essential for designing farm layouts and managing surface water. Extra features can also be added to farm maps to achieve your desired output:

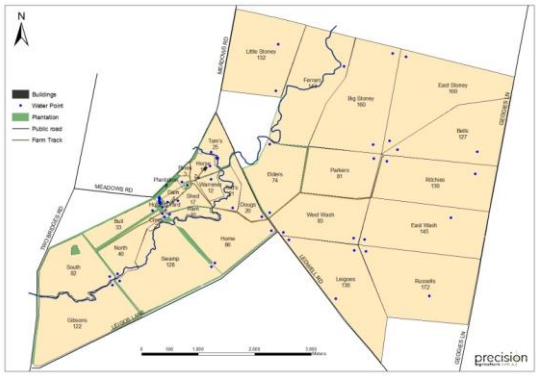
- legislative compliance maps (e.g. land and water management plans, vegetation management plans, OH&S, and environmental plans)
- property plans including infrastructure (fences, roads, paddocks, etc) and natural features (soils, vegetation, water, etc)

The data format of the maps can be used in many farm mapping programs. Common data formats are used to ensure easy data transfer to your own software.

BENEFITS:

- Areas and names of all paddocks, as well as the location of roads, access tracks, and other features.
- **A4 hardcopy tear paddock.**
- Electronic pdf copy for email.
- Position of key assets for planning and insurance purposes (sheds, pumps, houses, power lines, etc).
- Real-world coordinates of anywhere in the map.
- Location of any hazards for workplace health and safety, especially for staff and contractors on the property.
- A scale that is accurate and in a user friendly format.

We can also source an image background, especially suitable for the large office wall map.



SATELLITE IMAGERY

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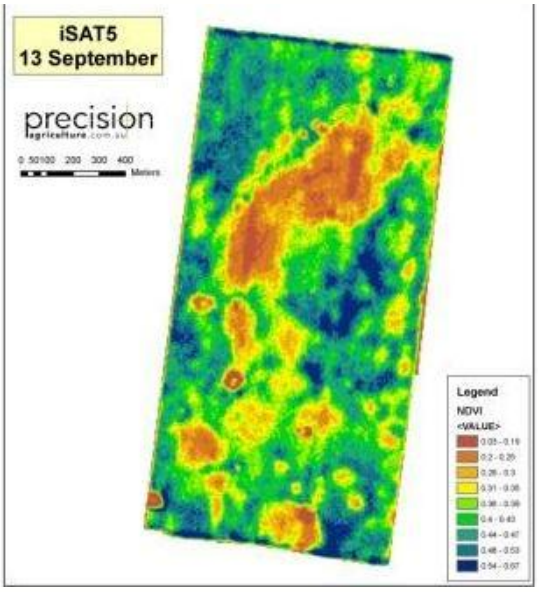
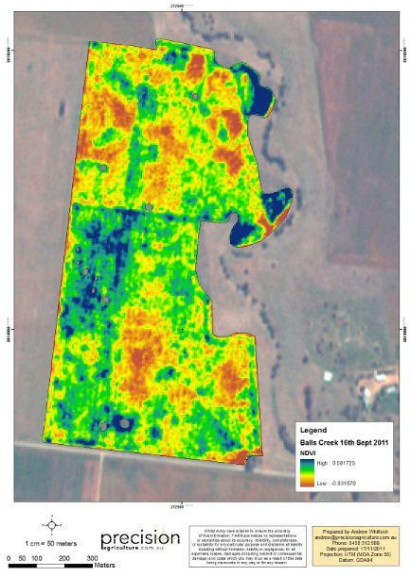
One of the most valuable PA tools on the market today is satellite imagery. With new satellites seemingly being launched almost on a weekly basis, satellite imagery will only get better, cheaper, and more accessible.

iSAT5 – this is a new satellite which is primarily designed for the Precision Agriculture market, and has a pixel size of 5m x 5m. It has the red-edge included, which may give us new insights into soil and crop health. This imagery is useful for zoning and in-crop applications of crop protectants, nutrients, and even desiccation where appropriate.





EM38 SOIL MAPPING

Electromagnetic (EM38) soil mapping:

- EM38 soil mapping is used by Precision Agriculture as a reliable option for zoning paddocks according to soil type and potential yields. It is a fast and cost effective way of measuring soil moisture content, salt levels, and soil texture, i.e. clay content.

- This technology on all types of crops and across all types of terrain. It is suitable for use on any ground and we have found good results on grain, pasture, cotton, turf and olive paddocks.

The EM38 measures the apparent electrical conductivity of soil through the use of sensors. The electromagnetic sensors are applied across the soil surface by towing the EM38 by quad bike, which is fitted with RTK GPS, around the paddock. It sits on a rubber mat and is enclosed in a protective plastic box.

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Data is transmitted and stored via Bluetooth to a Trimble Yuma screen that is also fitted to the front of the quad. The EM38 is approximately 1m long, can be easily carried, and is battery powered.
It works through the use of a transmitting coil that induces a magnetic field that varies in strength according to soil depth. The strength of the magnetic field is illustrated by the diameter of the circles. The magnetic field is strongest about 30-40cm below the soil surface and has an ability to sense to a depth of about 1.5m in vertical mode. A receiving coil reads primary and secondary induced currents in the soil. It is the relationship between these primary and secondary currents that measures soil conductivity.

EM38mapping provides an understanding through conductivity of electrical current. Clay soils are better conductors than coarse textured soils, so when a clay horizon is nearer the surface, the EM sensor reading is higher. Deeper topsoils with clay further below the surface are less conductive to electrical current and, therefore, have lower EM readings.

BENEFITS:

- Determine soil types boundaries non-invasively
- Determine location of soil moisture monitoring equipment
- Identify soil/water problem areas (such as salinity, waterlogging)
- Help identify the need for Variable rate irrigation, and define irrigation zones

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