



Precision Agriculture Technologies for the Australian Nut Industries

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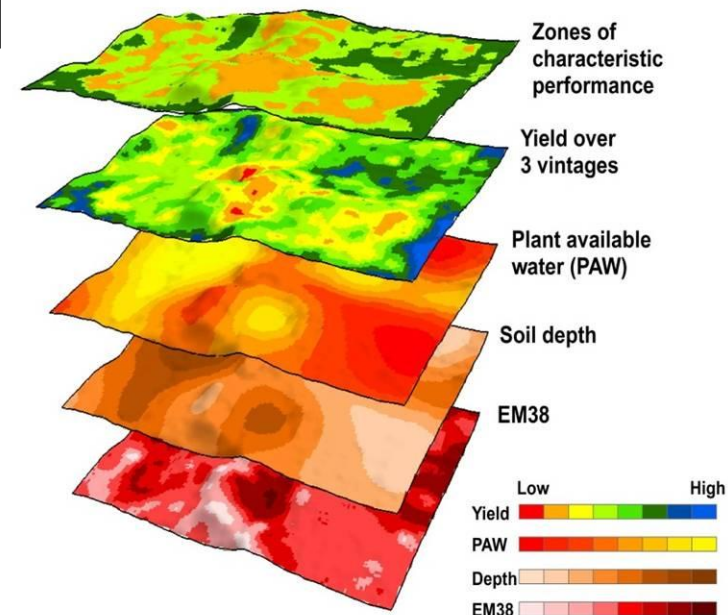
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Precision agriculture

- In-field conditions often vary with time and location
- Precision management can manage variability through spatial monitoring and control of irrigation, herbicide, nutrients
- Potential collaborators

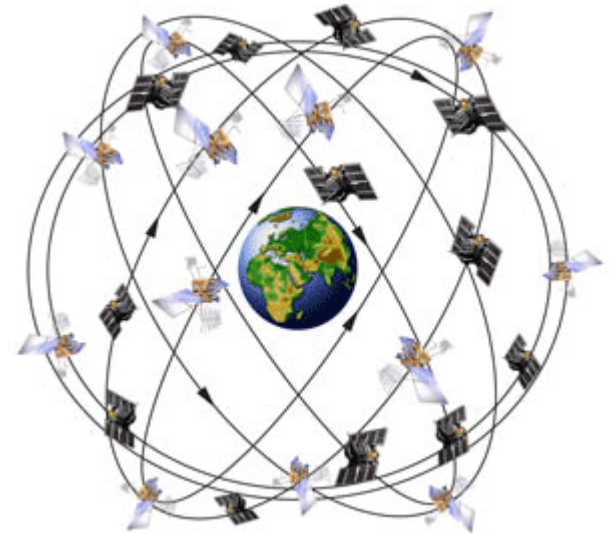


Precision technology research at NCEA

- NCEA has projects in a range of agricultural industries to deal with:
 - In-field position for tracking and monitoring
 - Sensors for crop growth and yield monitoring
 - Automating irrigation
 - Site-specific herbicide application
 - Equipment monitoring and evaluation
- Precision technologies can be applied to all nuts

Things we can do when we have spatial referencing

- Mapping (yield, soil parameters, elevation,) at much less than a block level enabling
- Variable application, machine control
- Guidance (concentrate on other things, constrain compaction...)
- Data logging and traceability
- Zonal management (matching inputs to potential yield)
- Canopy management

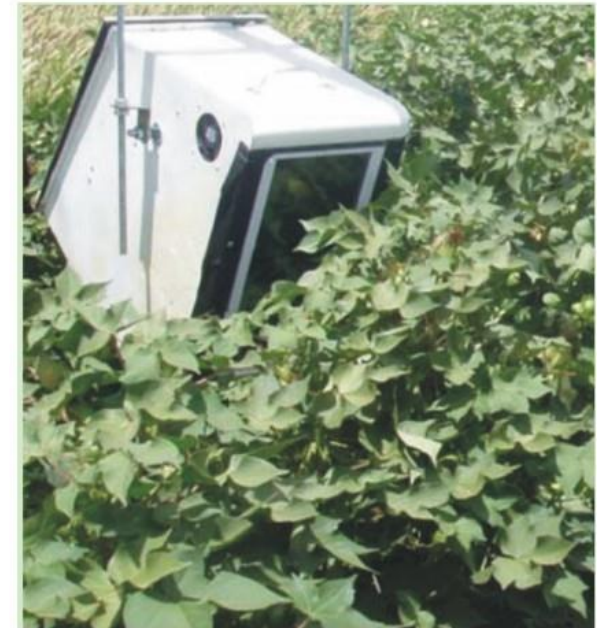
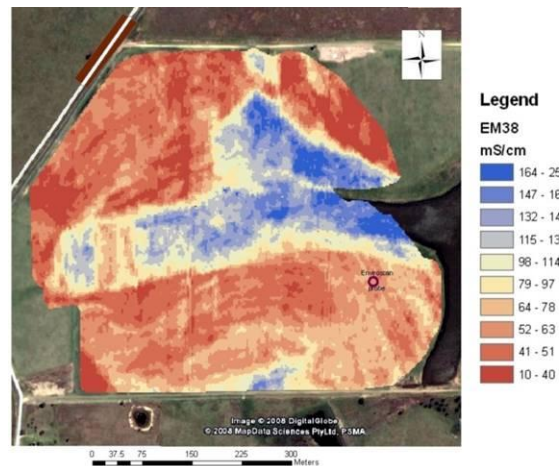


Spatial referencing issues



Irrigation control and automation

- Sensors for measuring in-field crop/soil variability
- Control systems for determining irrigation
- Site-specific irrigation application hardware



On-the-go crop monitoring

- Camera-based sensors:
 - Macadamia nut yield monitor
 - Weed monitoring for spot spraying



Importance of the project/research to the industry


- Improved sustainability of nut industry by ensuring that only minimum necessary inputs are applied
- Improved profitability of farms by increasing crop yield and reducing labour
- Reduced input costs
- Enhances grower understanding and influences management decisions



How are nut growers/others going to find out about the project?

- Industry magazines, events
- Field days
- Demonstration trials
- Industry extension teams
- Commercialisation through commercial partners
- Newspapers, radio and television

Implementation of Precision Agriculture in the Macadamia Industry.



Development of yield mapping technologies for the Macadamia Industry based on machine vision.

Funding Body:
Horticulture Australia Ltd. Collaborators Hidden Valley Plantations and NSW DPI.

Objectives:
Accurate yield maps would be of great value to Macadamia breeding programs as well as commercial growers and harvesters.
The primary purpose of this project is to design and develop a vision based yield monitoring device that relates quantity of nuts collected to location with sufficient accuracy to determine the yield from individual trees.
The project is testing the systems on a number of field and commercial scale trials. Based on the success of the system developed a commercial unit will be developed in conjunction with a harvesting contractor.



Summary:

This project has developed image analysis techniques to count nuts collected on a Pin Wheel Macadamia Nut harvester. A prototype system for use within the Macadamia industry plant breeding program has been completed and a number of field trials have been conducted to evaluate performance.

A number of techniques have been developed to accurately record the location of the nuts picked up by the harvester. The project has developed a system which provides great precision through the fusion of multiple low cost sensors which include vision sensors, ground speed radar, radio frequency identity tags, and GPS.

Incorporation of the information into freely available Google Earth/Maps allows easy information transfer to the end user (eg yield map colour overlay).

The accuracy of the complete system is still under trial, but as a showcase for the application of technology in agriculture, this project has already succeeded.

Future work:

Ongoing testing is still required to test the commercial viability of the prototype system. Algorithms for nut identification need to be improved to better distinguish trash. A number of commercial scale trials are planned, which if successful, will lead to development of a

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