

Leading Edge, supported by the Society for Engineering in Agriculture and the Australian Centre for Precision Agriculture, provides a local and worldwide window on engineering and PA research.

## Soil moisture gets a better image

By Gary Alcorn

The first crop of two dimensional (2D) images which record soil moisture movement under Centre Pivot & Lateral Move (CP&LM) machines in cotton growing on a cracking black clay soil near Moree, is giving agricultural engineers real encouragement to expand their research.

Team leader David Wigginton at the National Centre for Engineering in Agriculture in Toowoomba stresses the images in this story are 'guinea pigs' in the quest for a practical visual tool to help extension officers and consultants determine optimum CP&LM design and management combinations for various soils.

"It's early days but these first images are very promising. They show soil water movement across the profile by analysing data from 25 points.

"Our capacitance probes are tracking moisture movement every 200 mm down to a metre," he said.

The scope of this two-year trial is chal-

lenging when the list of variable combinations is considered.

Apart from a family of soils ranging from red loams to heavy black clays, this project will encompass the effects of lateral move and centre pivot machines, whether sprinkler and low energy precision application (LEPA) socks are fitted and if furrow dykes are used.

Other inputs include soil surface roughness, cracking patterns, stubble levels and surface cultivation techniques.

As reported in a previous edition of *The Australian Cottongrower*, this research project, funded by the Cotton Research and Development Corporation, aims to further improve the profitability and sustainability of CP&LM irrigation practices across the industry.

According to David Wigginton this will be achieved by:

- Gaining an understanding of placement, movement and infiltration of irrigation water for a range of CP&LM characteristics under various field conditions;
- Encouraging adoption by creating visual tools that enable growers and consultants to understand soil water movement under these machines;
- Increasing awareness of management issues for CP&LM machines through development of decision support sys-

tems to demonstrate different management scenarios and the effect these decisions can have on performance, rainfall capture and water use efficiency (WUE).

Back in the lab, team members are interpreting the raw data, making adjustments and preparing to animate the single slides into a moving picture show available for distribution on CD or from a web site.

The show will be the electronic equivalent of the old cartoon technique of riffling a stack of slightly different images rapidly so movement is simulated and detected by the eye and brain.

So far data is captured every 10 minutes for analysis and converted to an image which shows moisture in blue and drier soil as light patches.

"Our aim is to provide extension officers and consultants with useful information to help them advise on optimum irrigation techniques for various signature soil types.

"Next year we want to establish five to 10 sites and collect a lot more data by extending the recording time to include several wetting and drying cycles," David said.

Within two years growers will be able to see how soil moisture moves after various application techniques by dialling up a 2D movie made in their region for their soils.

Findings from this two-year project

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The society contributes to the development of a strong engineering involvement in agriculture to aid economic growth and environmental sustainability for the entire Australian community.

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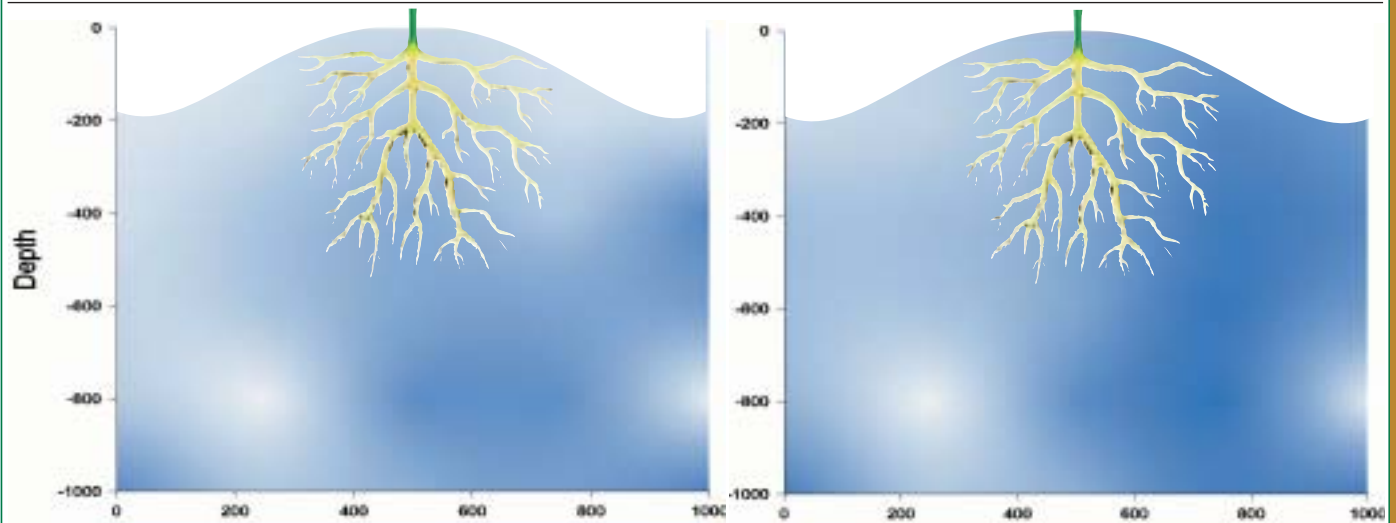
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The visual tool will help extension officers and consultants determine optimum CP&LM design and management combinations for various soils.

**FIGURE 1: Images of soil moisture movement under a lateral move machine in cotton**



This soil is a black cracking clay near Moree NSW. Cotton plants are located on a raised hill in the centre of one metre irrigation furrows. Only the right hand furrow is irrigated. The left-hand slide shows 2D soil moisture levels immediately prior to a lateral move irrigation using LEPA socks. The second slide shows changes in soil moisture 30 minutes later, following the LEPA irrigation. The white areas contain the least amount of soil moisture while the strong blue zone indicates higher soil moisture.

should enable growers to fine tune their CP&LM management and assist potential CP&LM adopters to understand what combination of management options best suit their soil types.

Another benefit for the irrigation and

cotton industries will be the reduction of their environmental footprint.

This will be achieved by:

- Increasing WUE through increased application efficiency;
- Eliminating deep drainage, except

where limited deep drainage is necessary for salt leaching purposes;

- Reducing fertiliser losses through leaching; and,
- Eliminating irrigation tail water runoff and reducing rainfall runoff.

