Society for ENGINEERING in AGRICULTURE
Ph: 02 6270 6562, Fax: 02 6273 4825
Australian Centre for Precision Agriculture
Ph: 02 9351 2947 Fax: 02 9351 3706
www.usyd.edu.au/su/agric/acpa/

LEADING EDGE

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.

Movie role for CP and LM machines

By Gary Alcorn

Cotton growers are under constant pressure to become more water efficient without threatening potential fibre yield. Around 100 producers now use centre pivot and lateral move (CP&LM) machines in their quest for more dollars return per megalitre.

These impressive machines equipped with a range of low energy precision application (LEPA) devices will be part of the cast in a movie series which will show growers how their precious water moves around in various soil profiles.

A current 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 project leader, agricultural engineer 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; and,
- Increasing awareness of management issues for CP&LM machines through development of decision support systems to demonstrate different management scenarios and the effect these decisions can have on performance, rainfall capture and water use efficiency (WUE).

"This project is expected to have significant commercial impacts within our industry. A 2001 scoping study by Joseph Foley and Steven Raine found average water use efficiencies under CP&LM was 1.9 bales per ML," says David.

"If this WUE can be achieved on the probable 30 per cent of the industry that will convert to CP&LM machines by 2015, we would see more than 480,000 bales of additional production," he said.

"At $450 per bale that's an additional industry revenue of more than $216 million a year."

The former DPI Rural Water Use Efficiency officer is now working at the National Centre for Engineering in Agriculture in Toowoomba to manage this two-year project. He realises that the visual medium is a very effective learning channel as people are exposed each day to dynamic television and computer screen images.

This project aims to set up the monitoring equipment under selected CP&LM machines across a range of soil types from Narrabri to Theodore. Video cameras will capture how various LEPA devices apply water and how that surface water moves under different conditions.

"We will record what happens when water is applied to soil surfaces ranging from hard-setting red to deep-cracking black earths using various devices including the LEPA sock and spray heads.

"The data will include what happens to any runoff and how far water moves from the point of application right across the bed profile. This will give us a two-dimensional picture of the wetting and drying of the crop root zone under different machines and field conditions," he said.

Agricultural engineering processes are being applied to the challenge of recording variation in wetting down through the soil profile and presenting that data in a farmer friendly form other than charts and

The project aims to explain the behaviour of water applied through CP and LM machines.

CP and LM machines could be used on 30 per cent of the cotton crop in 10 years time.

Growers need to understand the LEPA technology that best suits their soil types.

bar graphs. Enter three dimensional mapping.

Although historical research uses coloured food dye mixed in irrigation water to map the distribution of irrigation water through soil structures such as cracks, David doesn't see that technology working across all soil types in Australia's cotton growing regions.

"That technique requires large soil pits to be dug in the cultivation to reveal the dye's distribution. That approach would be too disruptive in mid-season crop areas and I can't see the dye being visible in a heavy black earth pit wall."

Current planning at NCEA is focusing on using a fluorescent tracer dye in the irrigation water which can be detected by ultraviolet sensors or a UV sensitive camera mounted in a soil probe. Smart software would interpret the concentration of dye at various points and display the data as available water volumes.

The research team aims to have all the data converted to a video format which can be displayed and explained at grower and consultant meetings.

Findings from this two-year project should enable growers to fine tune their CP&LM management and assist potential CP&LM adopters to understand what combination of LEPA technology best suits 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.

So keep watching the media for the travelling picture show that's coming your way starring local soils and a bunch of CP&LM machines.