

Real-time model predictive control of surface irrigation for cotton: setup of field trial

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Adaptive irrigation control

Adaptive control strategies have been developed for real-time management of irrigation. A closed-loop irrigation control system requires:

- (1) some combination of weather, soil, plant and irrigation data
- (2) control strategy to determine irrigation application and/or timing
- (3) actuator hardware to adjust irrigation application

'VARlwise' simulation software

'VARlwise' framework develops and simulates site-specific irrigation control strategies. VARlwise has been adapted to determine site-specific irrigation requirements of cotton.

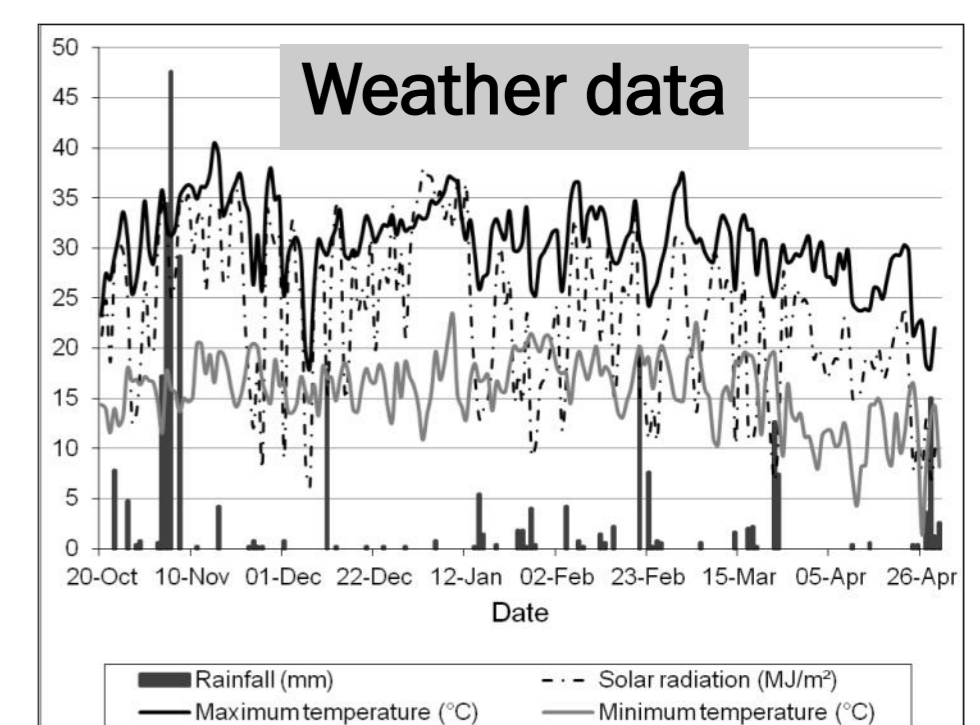
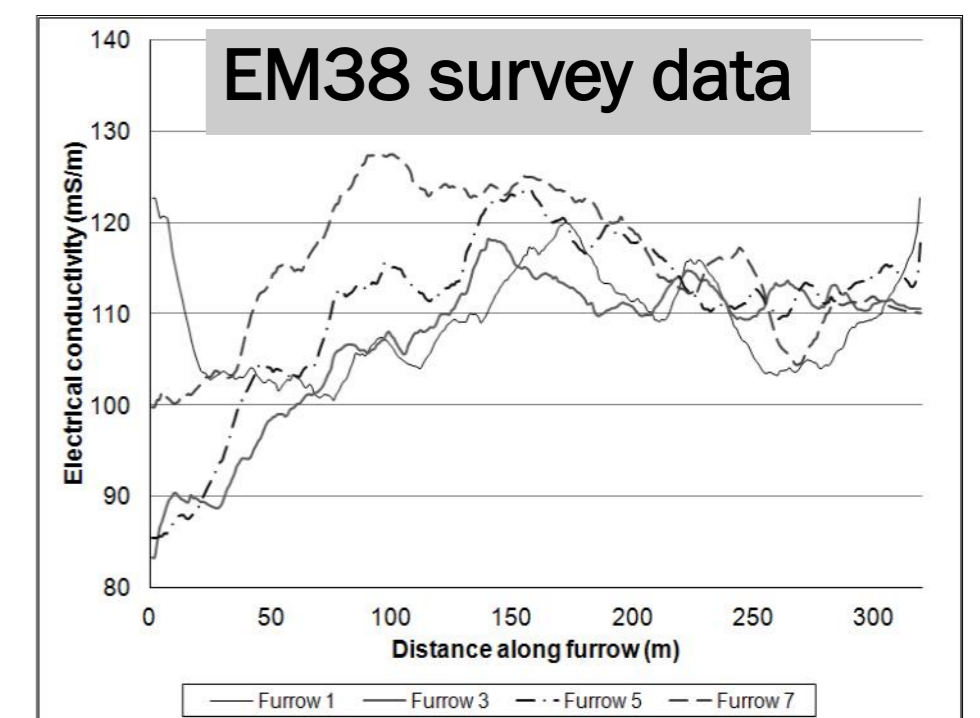
Model-based control of surface irrigation

A model predictive control strategy has been applied to surface irrigation by:

- calibrating a crop production model using the available weather, soil and plant data
- using the crop model to predict the irrigation timing and/or volume that produces the desired performance
- using the surface irrigation model SISCO to determine the irrigation flow rate and advance trajectory that best corresponds to the optimal irrigation distribution

1. Soil moisture, cotton growth and weather measurement

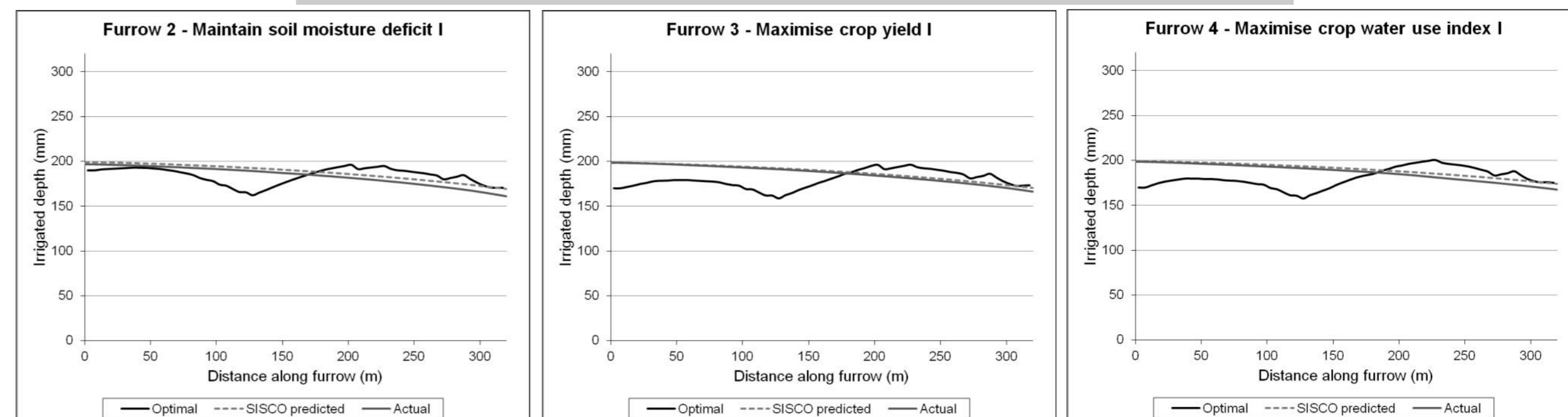
Field data from a weather station, EM38 surveys, soil moisture probes in each furrow and on-the-go plant sensing apparatus are collected.



2. VARlwise model-based irrigation control strategy

The field data and irrigation control strategy determine the optimal site-specific irrigation volumes, and the hydraulic model predicts the closest achievable surface irrigation distribution and advance trajectory.

Optimal, predicted and actual irrigation distributions



3. Real-time surface irrigation control

The flow rate is measured and adjusted using controllable valves during the irrigation event to minimise the difference between the measured and optimised advance trajectories.

