Cooperative Research Centre for
IRRIGATION FUTURES

NCEA

A Scalable Distribution System for the Optimal Application of Evaporation Suppressant Film to Farm Dams

Troy Symes, NCEA, USQ
symes@usq.edu.au

Gavin Brink, NCEA & FOES, USQ
brink@usq.edu.au

A Research Centre of the University of Southern Queensland

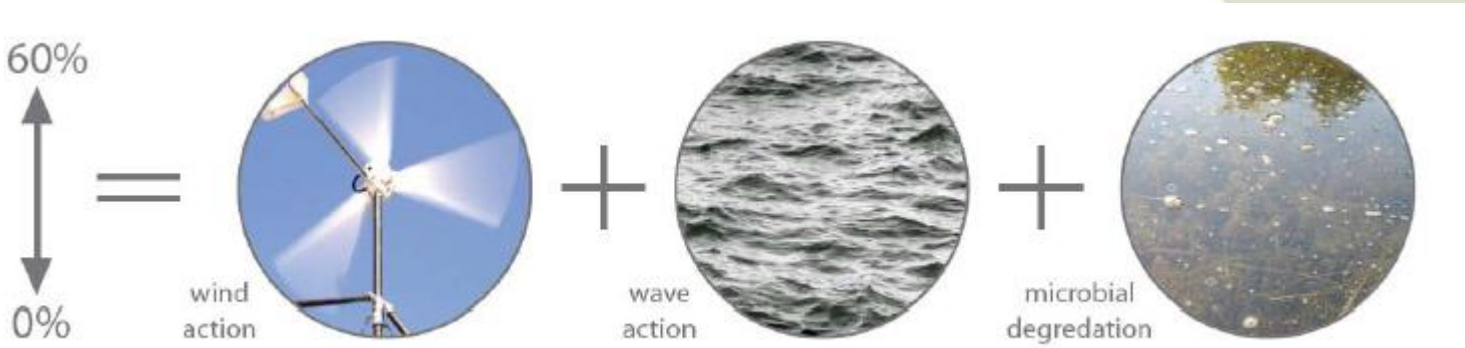
USQ UNIVERSITY OF SOUTHERN QUEENSLAND
fulfilling lives

Introduction

- Automated systems for application of ESFs have not proved overly successful
- Due in small part to the poor performance of available products
- Due in large part to the poor design & management strategies – not capable of adaptive application i.e. Changing on-site conditions

Monolayer Performance

- Monolayer Performance has been shown to be Highly Variable



Available Products

- Monolayers

1. WaterSavr (www.phoslock.com.au)
   - C_{16}/C_{18} mix in hydrated lime

- Surface Films

1. Aquatain (www.aquatain.com.au)
   - Mix of differing Siloxanes

CRCs Collaborate to Reduce Evaporation

Representatives from the three CRCs collaborating on controlling evaporation losses (from left).
Back row: Professor Graeme George (CRC-P, QUT), Dr Geoff Barnes (QUT retired), Dr Ian Dagley (CRC-P),
Professor David Solomon (CRC-P, UniMelb) and Dr Graham Harris (Cotton and Irrigation Futures CRCs).
Front row: Mr Erik Schmidt (Irrigation Futures CRC) and Dr Guy Roth (CEO Cotton Catchment Communities CRC)

http://www.crcp.com.au/publications/Newsletters/Polymer_News_November_2006.pdf

Why Monolayers & Surface Films?

- Easy & Quick to install
- Economical for storages >10ha
- Product costs incurred during application only.
- Low Capital Expenditure (~$10k rather than ~$100k or ~$1M)

What form will monolayers take?

- Powder

- Pellets or Tablets

- Liquid

Previous Application Systems

- Often simple, mechanical and rather crude working prototypes
- Monolayer application was only ever controlled in direct proportion to wind speed or wind direction
- Lack of intelligent decision systems
- As a result, very few application systems were ever commercialised.

Materials and Methods

- Our Application System is designed to be modular, scalable and built upon an intelligent decision system
- Scale is related to Dam Size, Shape and site-specific prevailing conditions.
- Current design is for the application of liquid products
- Installation & Product informed by the ‘UDF’ (G Brink – Poster in Hall 1)

Universal Design Framework (UDF)

Need to consider:

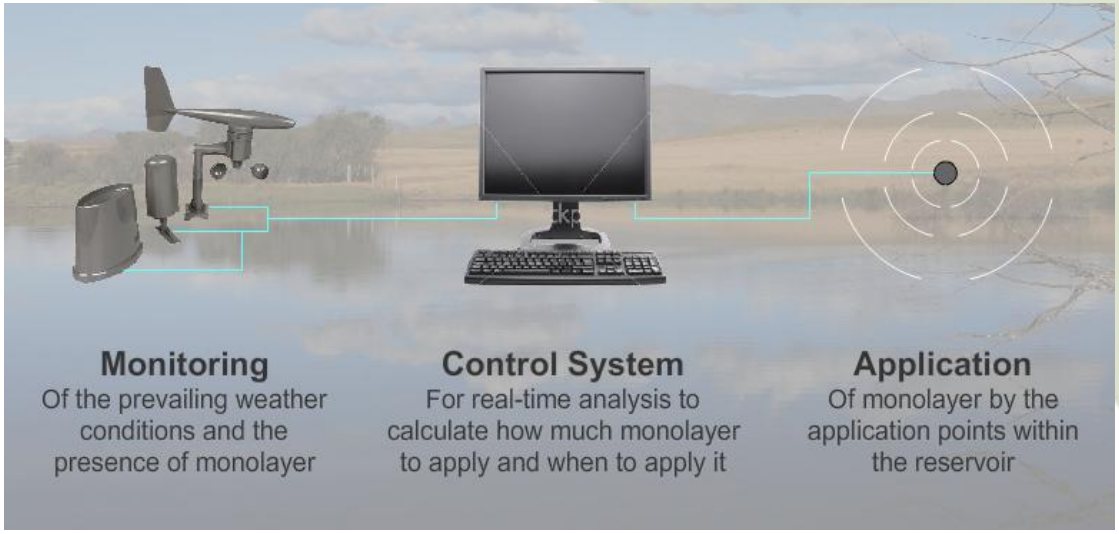
1. **Monolayer** product selection,
2. **Application System Design**

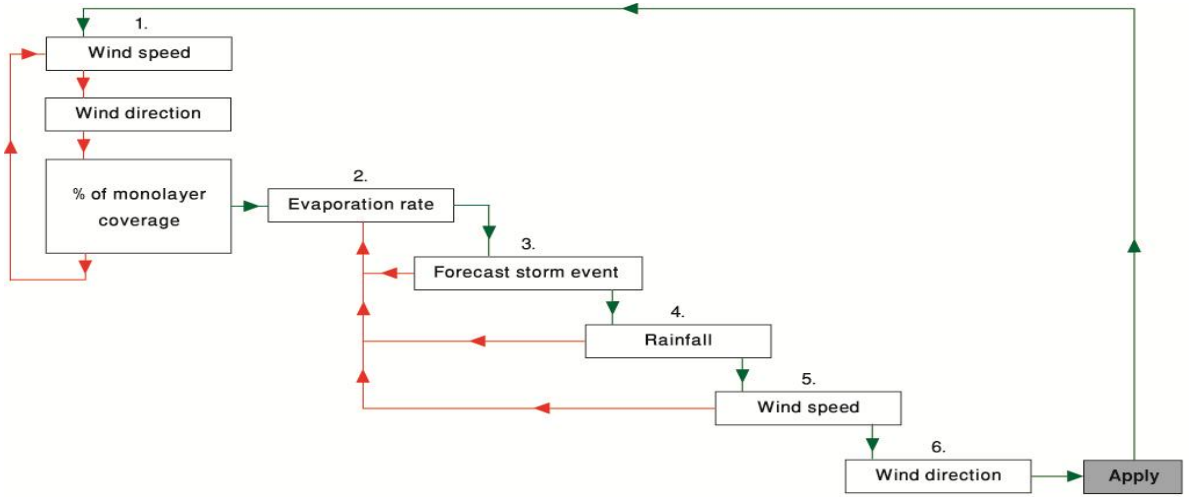
   including no. of applicators types (i.e. shore or floating) and their arrangement on site,
3. **Management Strategy** in response to prevailing conditions and/or user requirements.

Monolayer Management Issues

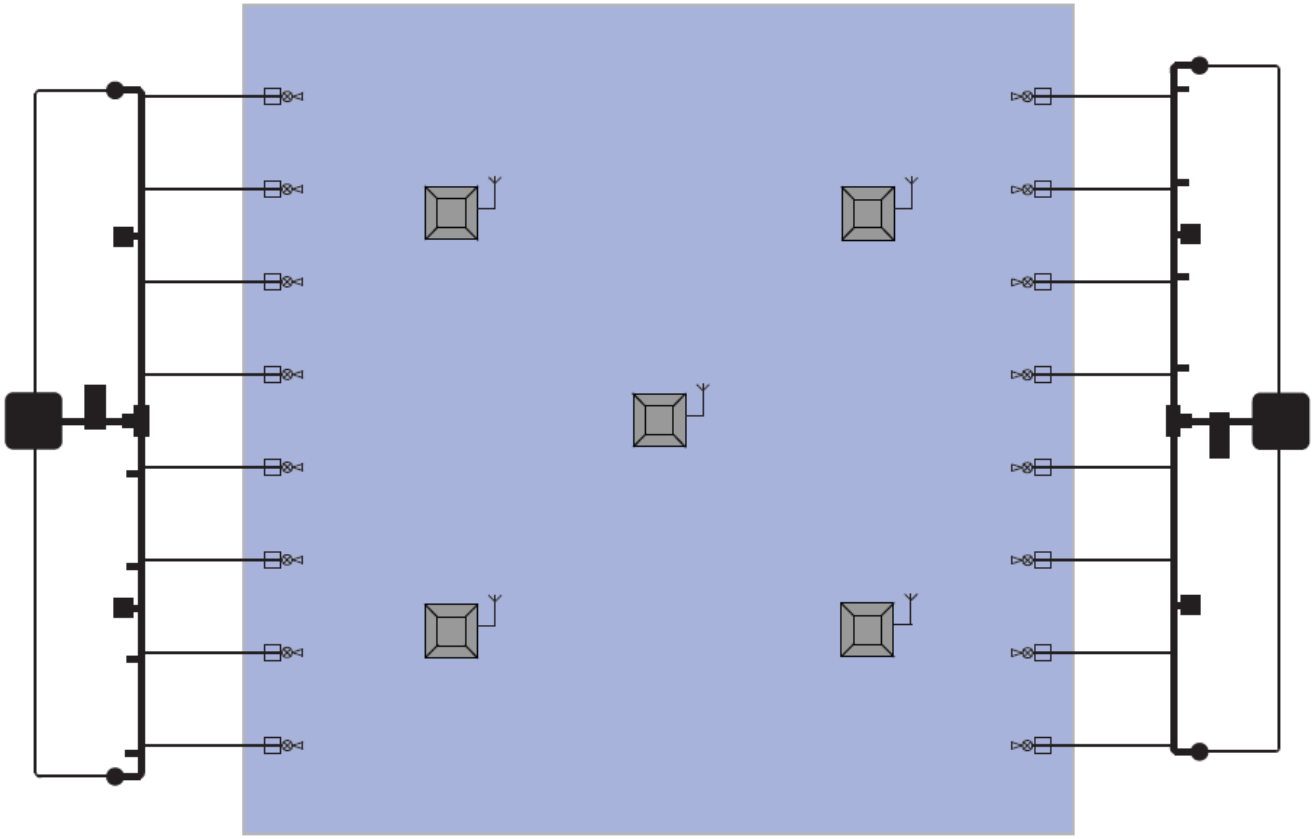
- Half-life of ~2 days
- Application during periods of highest evaporation?
- Continuous or no application during high wind periods?
- Containment grids?
- Monolayer Detection System (P Coop)
- Specific Issues for Channel Systems

Management Strategies





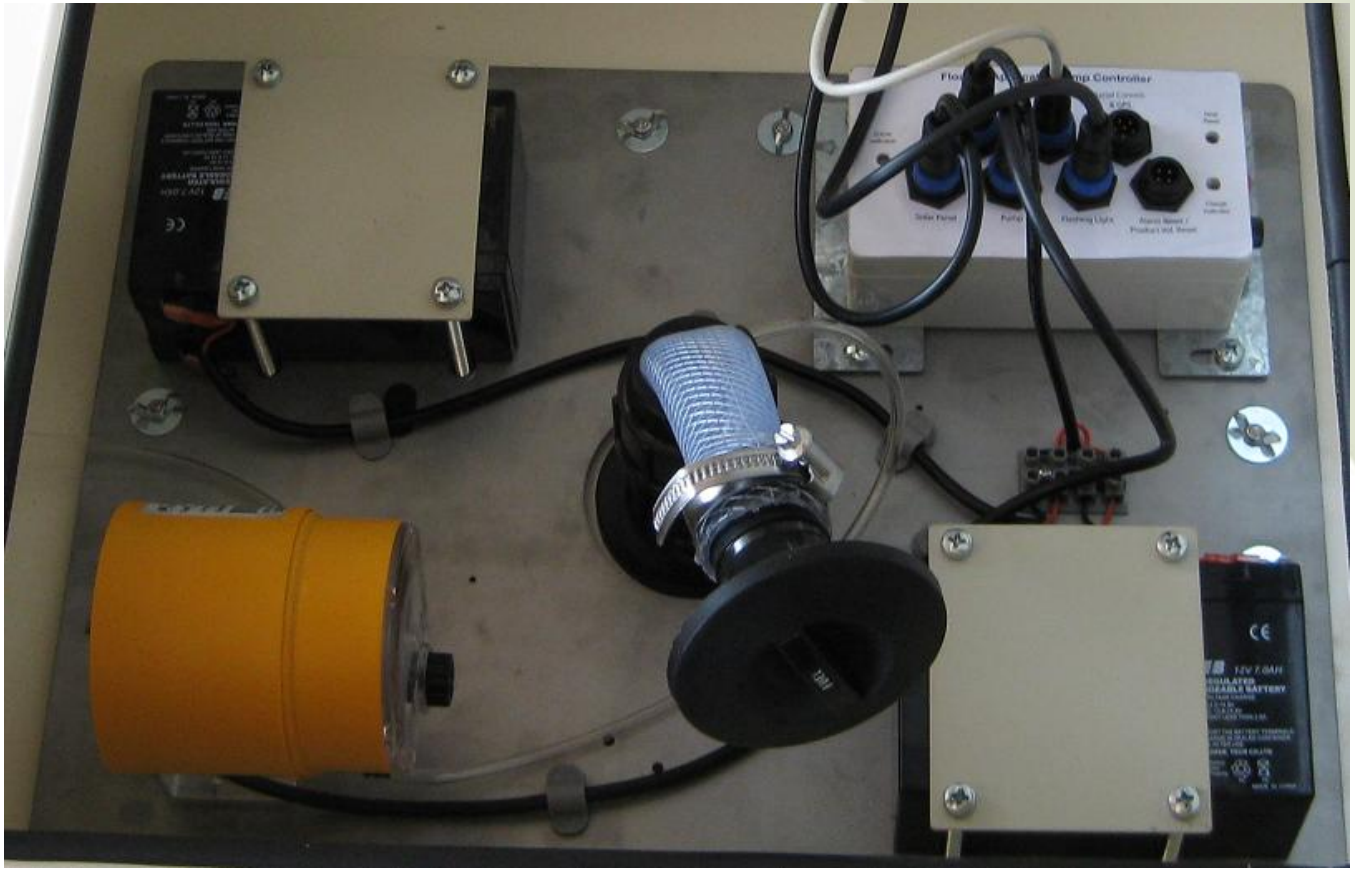
Shore or Floating Applicators?



Applicator System: Key Features

- Wireless Communications
- Central Coordination & Control
- Decentralised Application & Failsafe
- Simple Timed/Volume Dosing Strategy, or
- Dynamic Application via on-site Data from AWS and inputs from ‘UDF’
- Input for Monolayer Detector (P Coop)

CRC IF / NCEA Monolayer Applicator



CRC IF / NCEA Monolayer Applicator

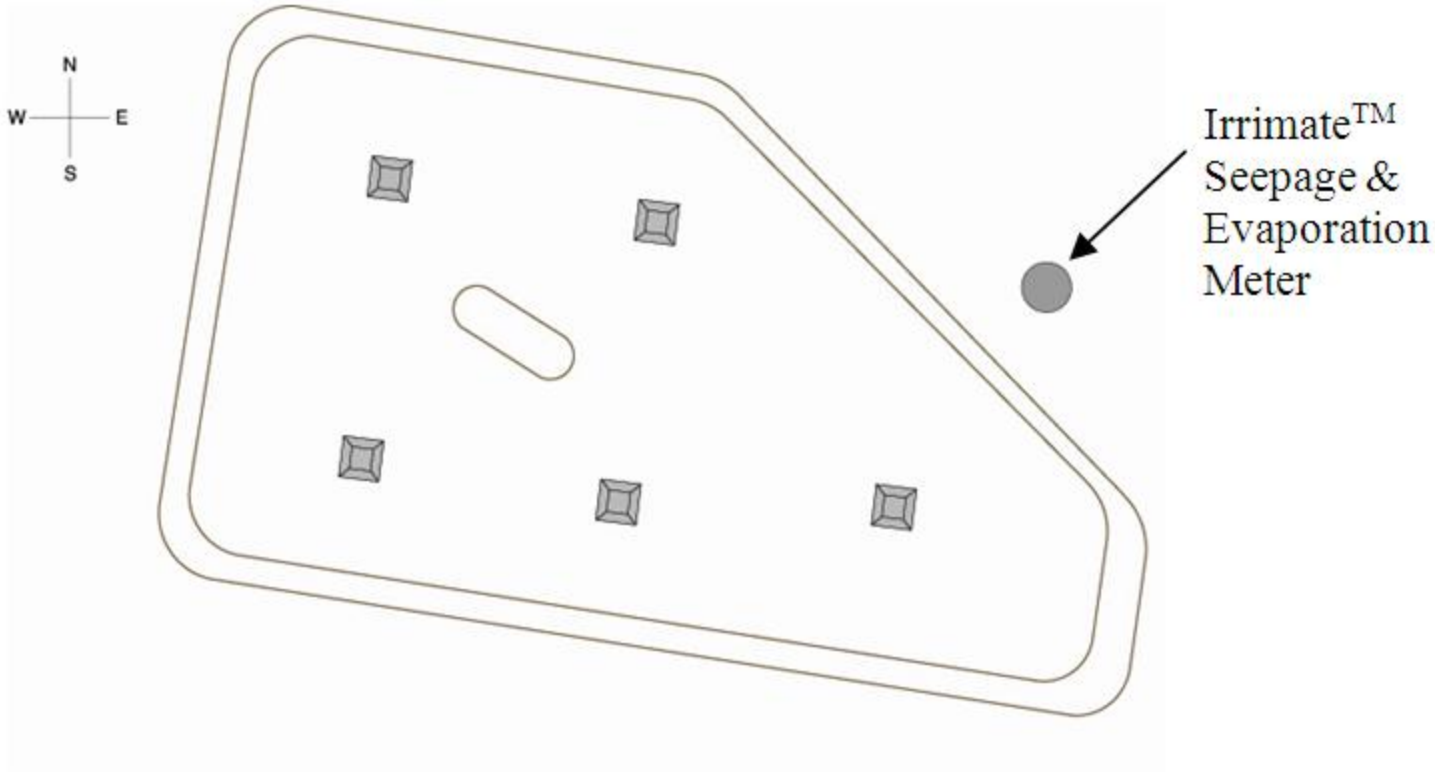
Application Installation / Trial

- **NSW Sustaining the Basin: Border Rivers – Gwydir Pilot Project**

- **Site: Yamba, 30km west of Moree**
  - Cotton and Cattle Property
  - 9 Ha Water Storage (Trial Site)
  - 70 Ha Water Storage (No Water)

Yamba, Gwydir Valley, NSW

Yamba: Trial Layout



Product Application

Product Coverage

Results & Discussion

- Five Monolayer Applicators deployed
- Aquatain was used as a model for the application of a monolayer
- Time/Volume Application Strategy
- Product affected by wind/wave action
- System Operated very well
- Evaporation Savings achieved < 10% (Related to simple application strategy?)

Results & Discussion cont.

- Wave Calming Structures

A floating structure may help to:

- Calm the water surface, and
- Contain the monolayer within smaller more manageable cells.
- Improve overall product performance

Yamba: Acknowledgements

- Lyndon Mulligan (Yamba Manager)
- Bill Williamson (I&I NSW / CRC IF)
- Janelle Montgomery (DPI Moree, NSW)
- David Wigginton (DW Cons. / NCEA)

Future Large-Scale Trials

Orica / CRC Polymers Product and CRCIF / NCEA Applicators

1. 1 ha Horticulture Storage @ Caffey
2. 16 ha Horticulture Storage @ Forrest Hill
3. 10,800 ha Wivenhoe Dam? (SEQUWA)

Cooperative Research Centre for
IRRIGATION FUTURES

NCEA

A Scalable Distribution System for the Optimal Application of Evaporation Suppressant Film to Farm Dams

Troy Symes, NCEA, USQ
symes@usq.edu.au

Gavin Brink, NCEA & FOES, USQ
brink@usq.edu.au

A Research Centre of the University of Southern Queensland

USQ UNIVERSITY OF SOUTHERN QUEENSLAND
fulfilling lives