Defining Precision Irrigation

Rod Smith

National Centre for Engineering in Agriculture &
Cooperative Research Centre for Irrigation Futures
University of Southern Queensland
Goal
to provide guidance to the irrigation industry on the application of Precision Irrigation (PI) and associated technologies.

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Project outcomes

• an agreed conceptualisation and definition of precision irrigation,

• an indication of the opportunities and likely success of adapting current application systems to precision irrigation,

• case studies where PI is being implemented in whole or part, and

• an evaluation of the likely or potential benefits from precision irrigation, and

• a clear direction for future research in precision irrigation.
‘ Precision irrigation is: the accurate and precise application of water to meet the specific requirements of individual plants or management units and minimize adverse environmental impact. ‘

Precision irrigation is:

- is the optimal management of irrigation spatially and temporally;
- is holistic, combining seamlessly the optimal performance of the application system with the crop, water and solute management;
- is not a specific technology, it’s a way of thinking;
- is adaptive, it’s a learning system; and
- is applicable to all irrigation application methods.
Precision irrigation cycle

Precision irrigation is adaptive control
Components of PI

**Essential**
- measurement & simulation tools for evaluation & optimisation of the application system;
- sensing & decision support tools for irrigation management (i.e., irrigation scheduling); and
- an effective control & response mechanism.

**Optional**
- Spatially & temporally varied applications (flexible) or management zones (fixed)
- Automation
- Informatics (information & communication technologies)
- Machine based &/or real-time control

Wireless infield and whole farm networking
Traditional surface irrigation (automated or manual)
Smart automated surface irrigation
Surface irrigation as PI
Surface irrigation as PI
Spatial scales are a function of the scales associated with:

- the application system;
- the control system;
- sensing; and
- decision support simulation.

These scales are not equal and no requirement for any one to be greater or smaller than any other.
# Minimum spatial scales of common irrigation systems

<table>
<thead>
<tr>
<th>System</th>
<th>Spatial Unit</th>
<th>Order of magnitude of spatial scale (m^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface - furrow</td>
<td>single furrow</td>
<td>1000</td>
</tr>
<tr>
<td>Surface - furrow</td>
<td>set of furrows</td>
<td>50000</td>
</tr>
<tr>
<td>Surface - bay</td>
<td>bay</td>
<td>10000 to 50000</td>
</tr>
<tr>
<td>Sprinkler - solid set</td>
<td>wetted area of single sprinkler</td>
<td>100</td>
</tr>
<tr>
<td>Centre pivot, lateral move</td>
<td>wetted area of single sprinkler</td>
<td>100</td>
</tr>
<tr>
<td>LEPA - bubbler</td>
<td>furrow dyke</td>
<td>1</td>
</tr>
<tr>
<td>Travelling irrigator</td>
<td>wetted area of sprinkler</td>
<td>5000</td>
</tr>
<tr>
<td>Drip</td>
<td>wetted area of an emitter</td>
<td>1 to 10</td>
</tr>
<tr>
<td>Micro-spray</td>
<td>wetted area of single spray</td>
<td>20</td>
</tr>
</tbody>
</table>
Key Conclusion

• No PI systems operational
• Many of the component systems, practices, tools and technologies available
• Integration is the research imperative