Burdekin Bowen Integrated Floodplain Management Advisory Committee Inc.

Water and Energy Assessment Tools

Michael Scobie
Research Engineer (Irrigation and Water Resources)
Discussion topics

- NCEA Background
- Energy Auditing
- Software Tools
  - Whole Farm Water Management
  - Irrigation Scheduling
  - Pump Efficiency Assessments
  - Pressurised System Assessments
  - Surface Irrigation Assessments
  - Storage and Dam losses
NCEA Background

- Largest of 7 USQ research centres
- Two focus areas of research
  - NRM – Irrigation, water resources, soils
  - Biosystems – Livestock, energy, precision agriculture
- Dozens of research projects in the farm energy field
  - Alternate energy
  - Life Cycle Analysis
  - Auditing
Energy Auditing

- Systematic review of operations
  - Used to identify inefficiencies
  - Improve performance

- Australian Standard  AS/NZS 3598:2000
  - Specifies how energy audits should be completed
  - Details of what should be included in the reports and recommendations
Energy Auditing

- **Level 1**
  - Basic look at gross energy usage
  - Overview – Accuracy of savings and costs +/-40%

- **Level 2**
  - More detailed look at individual areas of energy use
  - Energy Use Survey – Accuracy +/-20%

- **Level 3**
  - Detailed investigation into how much energy is being used over time
  - High Level Audit - +/- 10%
Welcome

Welcome to the Burdekin Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC) Level 1 Energy Assessment tool.

This tool has been developed to collect energy use data for the Energy Efficiency Gains For Australian Irrigators (EEGAI) project. The project is funded by the Australian Government’s Energy Efficiency Information Grants Program. The EEGAI project aims to build the capacity of Australian irrigators to adopt energy efficiency practices and technologies. BBIFMAC will use trusted local organisations and consultants to deliver high quality and relevant information, on-farm assessments, benchmarking exercises, and case studies to small and medium enterprises in the Burdekin, Bowen and satellite areas.
Level 1 Energy Auditing

Welcome

Welcome to the Burdekin Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC) Level 1 Energy Assessment tool.

System Type
- Furrow
- Lateral move
- Center pivot
- Trickle
- Sprinkler

Water source
- Ground
- Surface

Number of diesel pumps: 3
Number of electric pumps: 5
List electric meters, separate by comma

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Level 1 Energy Auditing

Welcome

Welcome to the Burdekin Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC) Level 1 Energy Assessment tool.

System Type
- Furrow
- Lateral move
- Center pivot
- Trickle
- Sprinkler

Water source
- Ground
- Surface

Diesel usage per unit and cost per unit

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Level 3 Detailed Assessments

- **Drought - 10 years ago**
  - Water use efficiency was the focus
    - RWUEI
    - NPSI
    - CRCIF
    - SEQIF
- **Focus is now on Energy Use Efficiency**
- **In a pumped system improved WUE can result in improved EUE**
Knowledge Management System for Irrigation

**EconCalc** ([Free Access](#))
EconCalc is a decision support tool used to economically evaluate the costs and benefits associated with a new irrigation system. EconCalc calculates a number of economic performance indicators such as: i) Net Present Value (NPV); ii) annualised costs / benefits (ACBR); iii) the internal rate of return (IRR) and the Benefit Cost Ratio.

**EnergyCalc**
EnergyCalc assesses direct on-farm energy use, costs and the greenhouse gas emissions (GHGs) associated with diesel, petrol, LPG and Electricity consumption. EnergyCalc examines energy use across key processes within a production system and can be used to evaluate farming practices such as tillage, spraying, irrigation etc.

**Gmap**
GMap is a map request and repository tool for irrigators in SEQ. The web portal provides a graphical interface that allows users to identify their particular farm based on a Google Maps environment. GMap facilitates the generation of farm resource maps with the appropriate organisation.

**IPART**
The Irrigation Performance Audit and Reporting Tool (IPART) is designed to assist in the evaluation and collation of irrigation application system performance data. IPART provides a range of functions including standardisation of on-farm data record acquisition, calculation and presentation of on-farm irrigation performance evaluation indices, automated generation of grower recommendations and grower report generation.

**IPART Public Access** ([Free Access](#))
IPART Public Access is part of IPART and is used to view the Application Uniformity of Irrigation Systems. The performance of on-farm application systems is normally reported in terms of the efficiency of application and the uniformity of application. The efficiency of the application system is calculated as the ratio of the water used by the plant relative to the water applied. The efficiency is primarily affected by the management of the irrigation and may vary significantly between irrigation events. However, the uniformity of application is primarily a function of the irrigation system design and maintenance. Low levels of uniformity limit the maximum efficiency achievable.

**Ipert**
The Irrigation Pump Evaluation and Reporting Tool (Ipert) is designed to assist in the evaluation and collation of on-farm irrigation system performance data. Ipert provides a range of functions including standardisation of on-farm data record acquisition, calculation and presentation of on-farm irrigation system evaluation indices, automated generation of grower recommendations and grower report generation.

**IRUSTIC** ([Free Access](#))
IRUSTIC is a database reference tool used to identify the seasonal irrigation demand for crops in South East Queensland (SEQ). The IRUSTIC database contains simulated seasonal irrigation demands for various crops averaged over a period from 1970 to 2007.

**ISID**
The Irrigation Surface Irrigation Database, known by the acronym ISID, is designed to collate field measurements and simulation results to facilitate benchmarking of surface irrigation performance at the farm, catchment and industry levels. ISID is fully compatible with the Irrimate™ system. It provides the ability to record and store all data necessary to conduct simulation runs, system evaluation and optimisation using Irrimate™ procedures. However, the system is generic and may be applied to a range of field measurement and evaluation techniques.

**Nutrient Balance and Reporting Tool**
Nutrient Balance and Reporting Tool is an online nutrient management calculator designed with an interactive data record management system and tiered reporting capability. It will help with the interpretation of soil test values, and record nutrient requirements, actual fertiliser inputs and subsequent productivity data. The data captured by Nutrient Balance and Reporting Tool can also be used to assist broader-scale interpretation (e.g. district, regional or industry scales) and trend analyses.

**ReadyReckoner** ([Free Access](#))
The ReadyReckoner performs a simple, site-specific economic assessment of the viability of evaporation mitigation systems. The user enters appropriate data to customise the 'Ready Reckoner' to their site.

**RESSTAT**
RESSTAT is an online irrigation survey questionnaire that can be used to report regional irrigation statistics and benchmark performance. The questionnaire covers details of property ownership and location, irrigated land, water availability and cost, annual irrigated production area, water use and irrigation management. Questions on demographics, drivers for change and knowledge of rural water use efficiency programs are also included.

**Scheduling Irrigation Diary**
The Scheduling Irrigation Diary is a tactical decision support tool with simple irrigation recording and scheduling features based on evapotranspiration (ET). The Scheduling Irrigation Diary allows irrigators to record irrigation and rainfall while also calculating daily crop water use. The Scheduling Irrigation Diary assesses crop water needs (i.e. supply vs. demand) based on the actual irrigation amount, irrigation frequency, rainfall and crop water use.

**Water Manager Tool**
The Water Manager Tool is a strategic decision support tool used to assess current irrigation management practices and the interactions between crop and irrigation systems. The Water Manager tool also develops a personalised irrigation schedule and water budget for the grower based on the characteristics of the enterprise.

**Water Resource Info Tool** ([Free Access](#))
The Water Resource Info Tool consolidates information used by irrigators such as rainfall, ET, commercial storage levels, surface water and ground water information in a single location. Information is publicly available via the web and from a range of organisations is presented to irrigators by the Water Resource Info Tool.

KMSI.usq.edu.au

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Water and Energy Assessment Tools
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Water and Energy Assessment Tools
Whole Farm Water Management
Whole Farm Water Management

Water Manager Tool

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# Whole Farm Water Management

## Water Manager Tool

### Irrigated Block / Irrigation System (White Farm)

<table>
<thead>
<tr>
<th>Irrigation System</th>
<th>Micro-spray</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumed Application Efficiency (%)</td>
<td>90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Irrigation System Location</th>
<th>Decimal Degree</th>
<th>Degrees/Minutes/Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude (deg)</td>
<td>-25.078</td>
<td>Latitude (D.M.S)</td>
</tr>
<tr>
<td>Longitude (deg)</td>
<td>152.319</td>
<td>Longitude (D.M.S)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>White Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available Water (ML)</td>
<td>1000</td>
</tr>
<tr>
<td>Water Supply (l/s)</td>
<td>54.7</td>
</tr>
<tr>
<td>Operating Hours/Day</td>
<td>20.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating Cost *per season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumping Cost</td>
</tr>
<tr>
<td>Repair Cost</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labour Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rainfall Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Irrigation Shift</td>
</tr>
<tr>
<td>Total Available Water per ha</td>
</tr>
<tr>
<td>Irrigated Area (ha)</td>
</tr>
</tbody>
</table>
Whole Farm Water Management
Whole Farm Water Management

### Water Manager Tool

#### Crop 1

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area</th>
<th>Planting Date</th>
<th>Harvesting Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>52 (ha)</td>
<td>20-10-2010</td>
<td>5-05-2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Irrigation Water Applied</th>
<th>Operating Hours/Day</th>
<th>Soil Moisture at Planting</th>
<th>Soil Moisture at Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>65 ML</td>
<td></td>
<td>0</td>
<td>-50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional info</th>
<th></th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Potential System Capacity (mm/day)</th>
<th>System Operating Capacity (mm/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Indices

<table>
<thead>
<tr>
<th>Indices (WUUI)</th>
<th>Gross Production Water Use Index (GPWUI) (bales/ML)</th>
<th>Gross Production Water Use Index (Effective) (GPWUI) (bales/ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation Water Use Index (WUUI) (bales/ML)</td>
<td>5.5</td>
<td>0.95</td>
</tr>
<tr>
<td>Irrigation Water Use Index (WUUI) (bales/ML)</td>
<td>4.82</td>
<td>0.98</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indices (Catchment)</th>
<th>Gross Production Water Use Index (GPWUI) (bales/ML)</th>
<th>Gross Production Water Use Index (Effective) (GPWUI) (bales/ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation Water Use Index (WUUI) (bales/ML)</td>
<td>1.22</td>
<td>1.28</td>
</tr>
</tbody>
</table>
Irrigation Scheduling
# Irrigation Scheduling

## Scheduling Irrigation Diary

<table>
<thead>
<tr>
<th>Field</th>
<th>Crop</th>
<th>MON 20 JAN</th>
<th>TUE 21 JAN</th>
<th>WED 22 JAN</th>
<th>THU 23 JAN</th>
<th>FRI 24 JAN</th>
<th>SAT 25 JAN</th>
<th>SUN 26 JAN</th>
<th>Total in-season rain (mm)</th>
<th>Total irrig. (mm)</th>
<th>Irrig. due in (days)</th>
<th>Actual harvest date</th>
<th>Graphs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brockstead</td>
<td>Home Reingauge</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6.8</td>
<td>1.2</td>
<td>1950.6</td>
<td>&gt;14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field 4</td>
<td>Cotton</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1990.6</td>
<td>300</td>
<td>&gt;14</td>
<td></td>
</tr>
<tr>
<td>Field 5</td>
<td>Cotton</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1990.6</td>
<td>270</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Field 6</td>
<td>Cotton</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1990.6</td>
<td>170</td>
<td>overdue</td>
<td></td>
</tr>
<tr>
<td>River Reingauge</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8.8</td>
<td>1.2</td>
<td>1975.6</td>
<td>380</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>River North</td>
<td>Forage Sorghum</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1975.6</td>
<td>150</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>River South</td>
<td>Forage Sorghum</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1975.6</td>
<td>150</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Evapo-transpiration</td>
<td>8.6</td>
<td>10.8</td>
<td>7.9</td>
<td>8.42</td>
<td>8.64</td>
<td>3.9</td>
<td>6.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Irrigation Scheduling
Whole Farm Water Management
Pump Energy Efficiency
Pump Energy Efficiency
Pump Energy Efficiency
### Pump Energy Efficiency

**Calculated Performance Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Rate</td>
<td>26.78 ML/Day (310 l/sec)</td>
</tr>
<tr>
<td>Flow Rate (target)</td>
<td>25.06 ML/Day (290 l/sec)</td>
</tr>
<tr>
<td>Total Dynamic Head</td>
<td>33.66 (m)</td>
</tr>
<tr>
<td>Total Dynamic Head (target)</td>
<td>27.96 (m)</td>
</tr>
<tr>
<td>Energy/Volume</td>
<td>104.44 (kW.h/ML)</td>
</tr>
<tr>
<td>Engine Derating Factor</td>
<td>98%</td>
</tr>
</tbody>
</table>

**Performance**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined / Overall Performance</td>
<td>28.04%</td>
</tr>
</tbody>
</table>

**Specific Speed**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Specific Speed</td>
<td>Insufficient input to calculate Target Specific Speed</td>
</tr>
<tr>
<td>Nominal Specific Speed</td>
<td>Insufficient input to calculate Nominal Specific Speed</td>
</tr>
<tr>
<td>Measured Specific Speed</td>
<td>71.92</td>
</tr>
</tbody>
</table>

**Pumping Cost**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grower Cost</td>
<td>32.93 (S/ML)</td>
</tr>
<tr>
<td>Comparison Cost at $1.20/l</td>
<td>37.63 (S/ML)</td>
</tr>
<tr>
<td>Grower Cost ($/ML/m)</td>
<td>0.98 (S/ML/m)</td>
</tr>
<tr>
<td>Comparison Cost at $1.20/l</td>
<td>1.12 (S/ML/m)</td>
</tr>
</tbody>
</table>
Pump Energy Efficiency

Involvement in BBIFMAC

Energy Auditing Assessment Tools

River pump
Bore pump

Pump Energy Efficiency

IPERT: Irrigation Pump Evaluation and Reporting Tool

Overall Efficiency (%)

Evaluation Type

BORE_DIESEL  CENTRIFUGAL_DIESEL  BORE_ELECTRIC  CENTRIFUGAL_ELECTRIC

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Pressurised System Assessments
Pressurised System Assessments

River pump

Bore pump

River pump

Travelling irrigator

Burnett River
Pressurised System Assessments

River pump

Burnett River

Travelling irrigator

IPART
Irrigation Performance Audit Reporting Tool
Pressurised System Assessments

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Pressurised System Assessments

![Diagram showing depth applied vs distance with labels for Travelling irrigator and IPART Irrigation Performance Audit Reporting Tool.]
Pressurised System Assessments

IPART
Irrigation Performance Audit Reporting Tool

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Uniformity (%)</td>
<td>84.97</td>
</tr>
<tr>
<td>Coefficient of Uniformity (%)</td>
<td>89.72</td>
</tr>
<tr>
<td>Minimum Depth Applied (mm)</td>
<td>21.52</td>
</tr>
<tr>
<td>Maximum Depth Applied (mm)</td>
<td>37.04</td>
</tr>
<tr>
<td>Average Depth Applied (mm)</td>
<td>27.38</td>
</tr>
<tr>
<td>Average Depth Applied in Lowest Quarter (mm)</td>
<td>23.27</td>
</tr>
<tr>
<td>Sprinkler Wetted Diameter (m)</td>
<td>40.00</td>
</tr>
</tbody>
</table>
Pressurised System Assessments
Surface Irrigation Assessments
Surface Irrigation Assessments
Surface Irrigation Assessments

**SISCO**

*Surface Irrigation Simulation, Calibration and Optimisation*

V 1.5.1

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Surface Irrigation Assessments

NCEA Energy Efficiency

NCEA involvement in BBIFMAC

Energy Auditing

Assessment Tools

River pump
Bore pump
Surface Irrigation
Surface Irrigation Assessments

SISCO

Surface Irrigation Simulation, Calibration and Optimisation

V 1.5.1

Input - SISCO - DownsTest

Field Details
- Field Length: 565.0 m
- Manning's n: 0.04000
- Spacing (wetted): 2.000 m

Downstream Condition:
- Free Draining
- Blocked

Recycling Eff.: 90.00 %

Runoff Meas Dist: 565.0 m

Upstream Condition:
- Drainback
- Draw Down: 60.00 min.

Field Details
- Field Length: 565.0 m
- Manning's n: 0.04000
- Spacing (wetted): 2.000 m

Downstream Condition:
- Free Draining
- Blocked

Recycling Eff.: 90.00 %

Runoff Meas Dist: 565.0 m

Upstream Condition:
- Drainback
- Draw Down: 60.00 min.

Field Slope
- Variable
- Constant slope: 0.001000

Field Slope
- Variable
- Constant slope: 0.001000

Bore pump

Surface Irrigation

Surface Irrigation Assessments

Assessment Tools

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fulfilling lives
Surface Irrigation Assessments

Assessment Tools

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Surface Irrigation Assessments

NCEA involvement in BBIFMAC

Energy Auditing

Assessment Tools

River pump
Bore pump
Surface Irrigation
Travelling irrigator

SISCO

Surface Irrigation Simulation, Calibration and Optimisation

V 1.5.1

Simulated Results - SISCO - DownsTest

<table>
<thead>
<tr>
<th>ResultsTab</th>
<th>AnimationPage</th>
<th>Animation with Slope</th>
<th>Advance</th>
<th>Runoff</th>
<th>Infiltration</th>
<th>Inflow</th>
<th>Inlet Depth</th>
<th>Depths</th>
<th>ErrorLog</th>
</tr>
</thead>
</table>

| Efficiency | Application Efficiency | 85.30 % | | | | | | | |
| Requirement Efficiency | 93.39 % | | | | | | | |
| Distribution Uniformity | 82.47 % | | | | | | | |
| Coefficient of Uniformity | 89.88 % | | | | | | | |
| Abs DU | 72.02 | | | | | | | |
| DU of Root Zone | 84.99 % | | | | | | | |
| AE of Low 1/4 | 72.50 % | | | | | | | |
| AE with Recyling | 95.63 % | | | | | | | |
| Completion Time | 424.01 minutes | | | | | | | |

| Depth | Average Depth | 96.25 mm | | | | | | |
| Average Depth | 93.39 mm | | | | | | | |
| Applied Depth | 109.49 mm | | | | | | | |
| Drainage Depth | 2.86 mm | | | | | | | |
| Runoff as Depth | 13.13 mm | | | | | | | |
| Maximum Depth | 108.92 mm | | | | | | | |
| Minimum Depth | 69.05 mm | | | | | | | |

| Volumetric Proportion | Runoff Percentage | 12.00 % | | | | | | |
| Drainage Percentage | 2.61 % | | | | | | | |
| Storage Percentage | 85.30 % | | | | | | | |

| Volume | Inflow Volume | 123.72 m³ | | | | | | |
| Infiltration Volume | 108.75 m³ | | | | | | | |
| Runoff Volume | 14.84 m³ | | | | | | | |
| Drainage Volume | 3.23 m³ | | | | | | | |
| Storage Volume | 105.54 m³ | | | | | | | |
| US Runoff Volume | 0.00 L | | | | | | | |
| DS Runoff Volume | 14840.69 L | | | | | | | |

Model Stability

Error % | 0.095 % |
Error Volume | 0.12 m³ |

Assessment tools
Water Storage Loss Calculations
Water Storage Loss Calculations

- River pump
- Bore pump
- Travelling irrigator
- Recycle Pit

Surface irrigation

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Water Storage Loss Calculations

- River pump
- Bore pump
- Surface irrigation
- Travelling irrigator
- Recycle Pit

Economic Ready Reckoner - Evaporation Mitigation Systems

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Water Storage Loss Calculations

**ReadyReckoner**

Economic Ready Reckoner - Evaporation Mitigation Systems

**Monthly Evaporation Calculator**

- **Location:** Bourke, North-Western New South Wales.
- **Description:** Cotton Production,

1. **Select Storage Type**
   - Circular Ring Tank
2. **Enter / Import Monthly Evaporation Data**
3. **Enter the Average Amount of Water Stored Per Month (as a % of Total Storage Volume)**
4. **Enter the Average Percentage of Years that the Storage Contains Water (per month)**
5. **Select your Most Applicable Seepage Option**
   - I Have Measured the Seepage Loss
6. **Initial evaluation for various Evaporation Mitigation System (EMS)**

**Initial Evaluation**

- **Modify selected Evaporation Mitigation System (EMS)**
  - Increase Wall Height
- **Modify selected Seepage Mitigation System (SMS)**
  - No Seepage Mitigation Required

**Evaluate**

**Calculate**
## Water Storage Loss Calculations

### Result - Circular Ring Tank

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated Storage Volume at Full Supply Level</td>
<td>4,243.2 ML</td>
</tr>
<tr>
<td>Surface Area at Full Supply Level</td>
<td>109.7 ha</td>
</tr>
<tr>
<td>Annual Seepage Loss</td>
<td>99.1 ML</td>
</tr>
<tr>
<td>Annual Evaporation Loss</td>
<td>877.8 ML</td>
</tr>
</tbody>
</table>

### Evaporation Mitigation System: Increase Wall Height

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Water Saved From Evaporation</td>
<td>363.3 ML each year</td>
</tr>
<tr>
<td>Cost to Save this Water</td>
<td>$178.7 per ML per year</td>
</tr>
<tr>
<td>Total Cost of Evaporation Mitigation System at Installation</td>
<td>$1,210,141.5</td>
</tr>
<tr>
<td>Annual Operating and Maintenance Cost</td>
<td>$1,000</td>
</tr>
<tr>
<td>Total Extra Earthworks to Increase Wall Height</td>
<td>605,070.7 m³</td>
</tr>
<tr>
<td>Storage Volume at Full Supply Level after Increasing Wall Height</td>
<td>7,239.7 ML</td>
</tr>
</tbody>
</table>
KMSI tools for Water and Energy
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- Water Manager Tool
- Scheduling Irrigation Diary
- IPERT (Irrigation Pump Evaluation and Reporting Tool)
- SISCO (Surface Irrigation Simulation, Calibration, and Optimization)
KMSI tools for Water and Energy
Burdekin Bowen Integrated Floodplain Management Advisory Committee Inc.

Water and Energy Assessment Tools

Michael Scobie
Research Engineer (Irrigation and Water Resources)