Florida Statewide Agricultural Irrigation Demand (FSAID)

Modelling future irrigation demand from the ground-up (2015-2035): lessons from Florida USA

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Florida Statewide Agricultural Irrigation Demand (FSAID) Modelling future irrigation demand from the ground-up (2015-2035): lessons from Florida USA
**Study area**
Florida USA (think: Miami, Orlando, Gatorade, NASA)

**Goal**
Improve planning, reduce risk of litigation

**Project**
Develop statewide estimates of agricultural water use at the property level, and forecast to 2035
## Obvious differences: Florida and Australia

- Size: less than 1/5 of NSW
- Pop: more than 2 x NSW
- Gross Value of Irrigated Ag Production: 1/10 of NSW

<table>
<thead>
<tr>
<th>Approximate scale</th>
<th>Florida</th>
<th>NSW</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (million)</td>
<td>19.8</td>
<td>7.52</td>
<td>23.5</td>
</tr>
<tr>
<td>Area (million ha)</td>
<td>13.8</td>
<td>80.9</td>
<td>769.2</td>
</tr>
<tr>
<td>Agricultural land (million ha)</td>
<td>3.8</td>
<td>58.3</td>
<td>406.2</td>
</tr>
<tr>
<td>Irrigated Agricultural land (million ha)</td>
<td>0.693</td>
<td>0.674</td>
<td>~ 2</td>
</tr>
<tr>
<td>GVIAP ($b)</td>
<td>0.4</td>
<td>3.5</td>
<td>14.6</td>
</tr>
<tr>
<td>Ag Water use (GL)</td>
<td>3,484</td>
<td>4,506</td>
<td>11,561</td>
</tr>
<tr>
<td>Average annual rainfall (mm)</td>
<td>1,518</td>
<td>919*</td>
<td>443</td>
</tr>
</tbody>
</table>

*average annual rainfall for Orange*
Problem
• Water supply conflicts: authorities getting caught in litigation among themselves and with other states

Charge
• Florida Department of Agriculture and Consumer Services legislated requirement to project water supply for its 5 Water Management Districts over next 20 years, and to locate irrigated Ag spatially (GIS)

Problem
• Each District used its own methodology (same crop 1km away using 70% more water/acre), plus inconsistent data (content, coverage, missing years, spatial gaps)
FSAID

Approach

• Collated existing data and GIS layers: landuse, soil type, irrigation type, rainfall, evapotranspiration
  ⇒ consistent statewide map of irrigated agriculture (1st FL)
• Fed water meter data (2,300 farms) into an bio-economic to model water demand for each farm given crop price, soil type, rainfall, evapotranspiration, chemical costs, location ...
  ⇒ base-year estimates of agricultural water demand
• Forecast crop prices, chemical costs, combined with long-term average rainfall & ET
  ⇒ future changes in Ag water demand and landuse
Outputs

1) Irrigated Lands Geodatabase (spatial dataset, 2015-2035)
2) Agricultural water use: by crop, by irrigation type, by county (irrigation, livestock, cold protection)
3) Water use projections
4) Soils Geodatabase
5) Conservation potential
## Outputs

1) **Irrigated Lands Geodatabase** (spatial dataset, 2015-2035)

2) **Agricultural water use**: by crop, by irrigation type, by county (irrigation, livestock, frost protection)

3) **Water use projections**

4) **Soils Geodatabase**

5) **Conservation potential**

### Irrigated Acreage Comparison by County, RWSP, and Crop Category

<table>
<thead>
<tr>
<th>COUNTY</th>
<th>Citrus</th>
<th>Sugar Cane</th>
<th>Vegetables/Melons/Berries</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SFWMD – Lower West Coast RWSP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broward</td>
<td>0</td>
<td>0</td>
<td>1,006</td>
<td>1,187</td>
</tr>
<tr>
<td>Collier</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hendry</td>
<td>12,457</td>
<td>43,572</td>
<td>22,362</td>
<td>511</td>
</tr>
<tr>
<td>MiamiDade</td>
<td>657</td>
<td>0</td>
<td>20,172</td>
<td>118</td>
</tr>
<tr>
<td>PalmBeach</td>
<td>1,031</td>
<td>387,012</td>
<td>5,230</td>
<td>432</td>
</tr>
<tr>
<td>Monroe</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>SFWMD – LEC Total</strong></td>
<td><strong>14,145</strong></td>
<td><strong>430,585</strong></td>
<td><strong>48,770</strong></td>
<td><strong>2,248</strong></td>
</tr>
<tr>
<td><strong>SFWMD – Lower East Coast RWSP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charlotte</td>
<td>4,330</td>
<td>0</td>
<td>4,843</td>
<td>2,708</td>
</tr>
<tr>
<td>Collier</td>
<td>33,077</td>
<td>0</td>
<td>43,939</td>
<td>553</td>
</tr>
<tr>
<td>Glades</td>
<td>7,985</td>
<td>14,874</td>
<td>465</td>
<td>0</td>
</tr>
<tr>
<td>Hendry</td>
<td>49,248</td>
<td>56,007</td>
<td>7,806</td>
<td>740</td>
</tr>
<tr>
<td>Lee</td>
<td>11,710</td>
<td>0</td>
<td>7,701</td>
<td>566</td>
</tr>
<tr>
<td><strong>SFWMD – LWC Total</strong></td>
<td><strong>106,350</strong></td>
<td><strong>70,881</strong></td>
<td><strong>64,754</strong></td>
<td><strong>4,567</strong></td>
</tr>
</tbody>
</table>

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Agricultural Irrigation: 2,132 MGD

Agricultural Water Use: Florida 2015

Projections:
5% increase in irrigated acreage, but 17% increase in water use
**Costs of irrigation water conservation**

<table>
<thead>
<tr>
<th>Data source</th>
<th>Total project cost</th>
<th>Water savings (MGD)</th>
<th>$/kgal (5 years)</th>
<th>$/kgal (10 years)</th>
<th>$/kgal (15 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRIS data, Florida; 2003,2008,2013</td>
<td>$7,901,227</td>
<td>20.1</td>
<td>0.23</td>
<td>0.13</td>
<td>0.09</td>
</tr>
<tr>
<td>FRIS data, U.S.; 2003,2008,2013</td>
<td>$339,027,408</td>
<td>400.0</td>
<td>0.51</td>
<td>0.27</td>
<td>0.20</td>
</tr>
</tbody>
</table>

**Outputs**

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Improvements
• User interface: FSAID2.com
Differences in Australia

• Physical: less rainfall, fewer lakes, dryer rivers
• Drought: no crops sown in a bad year
• Data: property-level landuse data
• Institutional: water trading, response to world prices
Potential outcomes

- Potential scale of future Ag water demand
- Identify supply constraints
- Identify landuse conflicts
- Geodatabase: landuse, Irr Ag, soil
- Values: GVIAP, opp. cost of water (MDBP)
- Conservation: water quality, excess runoff vs. recharge vs. re-use
Questions...