Irrigation Water Management in South Carolina – Trends and Needs

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South Carolina Water Resources Conference
October 14 - 15, 2008
Charleston, SC
Outline

- Building a State-wide Irrigation & Water Management Program
- Irrigation in South Carolina - Trends and needs
- Irrigation Research and Extension - Highlights
Stated Purpose of this Water Conference

Provide an integrated forum for discussion of water policies, research and water management among all water players and for the purpose of building productive collaboration among key stakeholders.

The Forgotten Water

Irrigated agriculture and landscape is a major consumer of water and has a large impact on the State’s economy and rural livelihoods.

“Agriculture, Crop, Turf, Evapotranspiration, Crop water or consumptive use, Irrigation systems and scheduling, Demand management or water conservation in irrigated agriculture, Supply management and water harvesting and storage, etc...”
Develop and lead a strong interdisciplinary, externally-funded and nationally-recognized research and extension program in irrigation water and systems management. (75% research and 25% extension)

Questions???
What is the state of irrigation in South Carolina?
What are the irrigation needs?
Who is who in irrigation research?
Where is the integration/collaboration?
What are the water managerial skills of SC irrigators?
What is the level of extension expertise in irrigation?
Where are the irrigation consultants?
When is the next irrigation forum or workshop?
Where is the reference ET?
Where are the crop coefficients?
Rapid Appraisal:

The tradition/culture is rainfed agriculture
Low understanding of the science & engineering of irrigation - rules of thumb
Irrigated agriculture has a low priority among water players
Irrigation literature & data is scarce and incomplete
Limited collaboration between the University and other water players (Fed, State)
No irrigation information system or website (no farmer-friendly site)
No state-wide agro-meteorology networks (ETo, Kc, ET, GDD, scheduling tools)
Lack of irrigation Fact sheets
No irrigation Workshops or Training
**Issues:**

Increasing irrigation  - More pivots and drips and wells are going in.

Water availability  - Drought, conflicts, quality degradation.

Water withdrawal, use, and permitting  - Not many know about!

**Needs:**

In South Carolina, irrigators need up-to-date information and know-how as well as simple and practical methods and technologies to efficiently utilize the advantages of irrigation to remain competitive.
Irrigated Acreage - A National View

South Carolina = 0.26%
Total cropland = 1,673,000 acre
Trend in Irrigated Acreage in South Carolina

USDA-NASS = 95,000 ac
Clemson Extension = 161,000 ac
Irrigated Acreage by Irrigation System

- Sprinkler
- Drip
- Gravity


Acreage: 0, 10,000, 20,000, 40,000, 60,000, 80,000, 100,000, 120,000, 140,000, 160,000, 180,000, 200,000
Irrigated Acreage by Irrigation Type (%)
Irrigated Acreage by Crop (%) in South Carolina

- Alfalfa
- Rice
- Sorghum
- Grapes
- Berries
- Nuts
- Small Fruits
- Grains
- Beans & Peas
- Grass Seeds
- Nursery
- Wheat
- Pasture/Hay
- Tobacco
- Melons
- Soybeans
- Sod
- Vegetables
- Tree Fruits
- Corn
- Cotton
Electric Diesel Gasoline

**SC Pumping Power Source (%)**

- **Diesel to Electric Motors (pays in 1-2 yrs)**
- Suitable for automation, clean, environmentally friendly

- **Irrigation Use Source:**
  - 42% Groundwater
  - 58% Surface water

- **Golf Course Use Source:**
  - 28% Groundwater
  - 72% Surface water

Bar chart showing:
- Electric: 75%
- Diesel: 23%
- Gasoline: 2%
### Yearly Water Use in the State (million gals, DHEC)

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
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<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
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<tbody>
<tr>
<td>Hydroelectric</td>
<td>12,160,642.62</td>
<td>10,281,681.91</td>
<td>9,796,267.91</td>
<td>11,415,081.44</td>
<td>18,958,207.77</td>
<td>15,203,000.52</td>
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<td>Thermoelectric</td>
<td>2,326,627.77</td>
<td>2,240,508.37</td>
<td>1,624,984.88</td>
<td>2,467,042.32</td>
<td>3,558,474.88</td>
<td>3,232,104.07</td>
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<tr>
<td>Water Supply</td>
<td>221,911.79</td>
<td>148,265.21</td>
<td>193,525.29</td>
<td>212,402.79</td>
<td>197,088.27</td>
<td>209,464.30</td>
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<tr>
<td>Industrial</td>
<td>172,314.14</td>
<td>157,463.33</td>
<td>180,579.90</td>
<td>167,051.34</td>
<td>168,334.76</td>
<td>157,309.02</td>
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<tr>
<td>Irrigation</td>
<td>9,470.97</td>
<td>3,182.73</td>
<td>27,121.14</td>
<td>29,668.39</td>
<td>12,172.86</td>
<td>24,119.87</td>
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<tr>
<td>Golf Course</td>
<td>6,323.77</td>
<td>6,806.35</td>
<td>13,302.54</td>
<td>14,022.92</td>
<td>10,373.47</td>
<td>13,230.46</td>
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<tr>
<td>Mining</td>
<td>2,546.92</td>
<td>3,056.08</td>
<td>2,691.75</td>
<td>3,159.88</td>
<td>4,935.07</td>
<td>3,241.62</td>
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<tr>
<td>Aquaculture</td>
<td>35.97</td>
<td>13.67</td>
<td>865.17</td>
<td>2,283.95</td>
<td>1,451.98</td>
<td>1,355.63</td>
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<tr>
<td>Other</td>
<td>367.06</td>
<td>223.61</td>
<td>204.84</td>
<td>106.22</td>
<td>59.033</td>
<td>85.505</td>
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<tr>
<td>Total</td>
<td>14,900,241.01</td>
<td>12,841,201.26</td>
<td>11,839,543.42</td>
<td>14,310,819.25</td>
<td>22,911,098.09</td>
<td>18,843,911.01</td>
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</tbody>
</table>

How much of each use is consumptive?
Irrigation of cropland and golf courses are mostly consumptive (ET).
Hydro and Thermoelectric and Industry uses are mostly returned.
Yearly Variations in Water Use (million gallons)

- **Irrigation**
- **Golf**
2004 Yearly Water Use (%)
Where do these numbers come from?

SC Water Use Reporting Act of 1982 - Withdrawals of 100,000 gals/day or more.

Center pivot pumping at 500 gal/min, will pump 30,000 in an hour, and 720,000 in a day. For 10 irrigations, that’s 10 million gallon per year.
2004 Yearly Water Use (%)

Acreage = 66,000 ac (assuming 12”)

Our estimate = 170,000 ac
yearly water use = 60,000 to 70,000 million gals

Water Supply: 51%
Industrial: 38%
Irrigation: 6%
Golf Course: 3%
Mining: 1%
Aquaculture: 0%
Other: 0%
Do we even need to irrigate?

Rainfall at Edisto REC (1930-2002) - 46 inches
Need for Irrigation at Edisto REC

- Rain: 15
- Effect. Rain: 11
- ET: 25
- Irrig (85% Eff): 16
Corn could use 0.3 in/day in July = 2.0" in a week
Probability of getting 2" in one week in July is 20%
Probability of getting 2" in two weeks in July is 50%
Irrigation and Water Management Research & Extension

State-wide Initiatives in Irrigation Research and Outreach

- State-wide survey (baseline data)
- SC Irrigation Society (& Customer Focus Group)
  A forum to discuss problems, constraints, and solutions
- Update Extension/Irrigation Information Resources
  Pubs, on-line irrigation scheduling guides (Kc major crops)
- Workshops and Training (IA Certification)
- Mobile Irrigation Lab (NRCS, and other RECS)
- Irrigation & soil-plant water relations lab (production functions)
- Cropping systems modeling (Yield response to water)
- SCAgMet - South Carolina Agricultural Meteorology Network
What do my checking account and the farmers’ soil water storage have in common?  

Nothing...

Irrigated farmers need their own online irrigation checkbook

When to irrigate? How much to apply? and for what purpose?
What was the reference ET in my area yesterday? Not in GA, FL, or NC
How much water corn or cotton or turf used yesterday?
How many GDD has the crop accumulated so far?
What is the forecast for next few days?
How much water do I have in the bank, the rootzone?

A Network of Agricultural Meteorology Stations in South Carolina can help develop an Irrigation and Water Management Information Website
US Networks of Agricultural Meteorological Stations
South Carolina Agricultural Meteorology Network (SCAgMet)

96 per State (2 per County)
ET, temperature, wind, ... maps

**Concluding Remarks**

SCAgMet is a need, yet a huge task.

Clemson, Experiment Station, Cooperative Extension, DNR, State Climate Office, DHEC, the State & Fed Depts of Ag, Irrigation dealers, and ...are needed to get it accomplished.

$8-10K per station
$500-700 per yr for maintenance
Sponsors are welcome!