Ecosystem services and water economics

Florida Agricultural Commodity & Policy Outlook Conference
November 15, 2012
Outline

• Part I. Water Issues: an Overview
  Tatiana Borisova, Assistant Professor, Food & Resource Economics Department, University of Florida/IFAS

• Part II. Markets for Ecosystem Services from Agriculture: Outlook
  Laila Racevskis, Assistant Professor, Food & Resource Economics Department, University of Florida/IFAS
Water Issues: an Overview

Tatiana Borisova, Assistant Professor, Food & Resource Economics Department, University of Florida/IFAS

Moonlight Scene in Florida, Showing Orange Grove Across Lake, 1947

http://theoldentimes.com/moonlight_fl-a.html
Irrigated Agriculture

- Irrigated farms account for 40% of the value of U.S. agricultural production
  - On average, value of production for irrigated farms is 3.3 times the value for non-irrigated farms

- Agriculture accounts for ~ 80% of U.S. consumptive water use

State shares of total U.S. irrigated acres, 2007

- California: 14.2%
- Texas: 8.9%
- Arkansas: 7.9%
- Idaho: 5.8%
- Nebraska: 15.1%
- All other States: 22.8%

Florida is among the 12 leading irrigation States that accounted for 77% of all irrigated acres

Source: Schaible and Aillery. 2012; USDA 2012
Irrigated Agriculture

Factors shaping the industry
- Population growth
- Changing food preferences
- Technological changes
- Market competition

Recent:
- Water availability
- Ecosystem service flow

Aggregated global gap between existing accessible, reliable supply\(^1\) and 2030 water withdrawals, assuming no efficiency gains

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<thead>
<tr>
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<th>Billion m(^3) 154 basins/regions</th>
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<tr>
<td>Municipal &amp; Domestic</td>
<td>4,500</td>
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<td></td>
<td>600</td>
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<tr>
<td>Industry</td>
<td>800</td>
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<tr>
<td>Agriculture</td>
<td>3,100</td>
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<td></td>
<td>2,800</td>
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<td>Existing withdrawals(^2)</td>
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<td>2030 withdrawals(^3)</td>
<td>6,900</td>
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<tr>
<td>Basins with deficits</td>
<td>900</td>
</tr>
<tr>
<td>Basins with surplus</td>
<td>4,500</td>
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<tr>
<td>Groundwater</td>
<td>4,200</td>
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<tr>
<td>Surface water</td>
<td>3,500</td>
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</table>

\(^1\) Existing supply which can be provided at 50% reliability, based on historical hydrology and infrastructure investments scheduled through 2010, net of environmental requirements.
\(^2\) Based on 2010 agricultural production analyses from IFPRI.
\(^3\) Based on GDP, population projections and agricultural production projections from IFPRI, considers no water productivity gains between 2005-2030.

Source: Turral, Svendsen, and Faures, 2010

Future Water Demand

- Population increase
- Economic growth
- Changing social values with respect to water quality / availability
- Seasonal weather / climate events

=> Competition for water resources will intensify

Historical freshwater withdrawals in Florida by category, 1975-2005

Source: Marella, 2008
Future Water Demand

- Population increase
- Economic growth
- Changing social values with respect to water quality/availability
- Seasonal weather/climate events

=> Competition for water resources will intensify

Irrigated Agriculture: Future

• Improving water-use efficiency

• Conservation policies that encourage more efficient on-farm water management

• Reallocation of water among competing demands

Sources: Schaible and Aillery, 2012; Turral, Svendsen, and Faures, 2010; Zotarelli, Fraisse, and Dourte, 2012; Biello 2012
Irrigated Agriculture: Future

- Improving water-use efficiency
- Conservation policies that encourage more efficient on-farm water management
- Reallocation of water among competing demands

Subsurface drip irrigation on potatoes in Hastings, Florida

Credits: Lincoln Zotarelli

Sources: Schaible and Aillery, 2012; Turral, Svendsen, and Faures, 2010; Zotarelli, Fraisse, and Dourte, 2012; Biello 2012
Improving water-use efficiency

**Biotechnologies**

- Breeding drought-resistant varieties
- Targeting rapid early growth to shade the soil and reduce evaporation
- Breeding for resistance to disease, pests, and salinity
- Improving the nutritional quality of crops

Source: C. de Fraiture, et al. 2007

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**Top Five Crops in Field Trials of GE Drought-Tolerant Varieties**

- Corn 72%
- Other 12%
- Soybean 4%
- Creeping bentgrass 2%
- Wheat 2%
Improving Water-Use Efficiency

More efficient irrigation systems

- microirrigation
- soil- or plant-moisture sensing devices
- variable-rate irrigation
- computer-based simulation models

Sources: Schaible and Aillery, 2012; Turral, Svendsen, and Faures, 2010; Zotarelli, Fraisse, and Dourte, 2012; Biello 2012


Improving Water-Use Efficiency

More efficient irrigation systems

- microirrigation
- soil- or plant-moisture sensing devices
- variable-rate irrigation
- computer-based simulation models

Source: http://agroclimate.org/tools/water_footprint/

Water footprint is a measure of the consumptive water use required to produce a crop. Green water use represents evapotranspiration (ET) from rainfall, while blue water use represents ET of irrigation from groundwater or surface water.

Sources: Schaible and Aillery, 2012; Turral, Svendsen, and Faures, 2010; Zotarelli, Fraisse, and Dourte, 2012; Biello 2012
Improving water-use efficiency

Other strategies

• Lessening nonproductive evaporation
  o mulching, enhancing soil infiltration and storage properties, decreasing areas of exposed water surface

• Reusing return flows
  o irrigation tailwater recovery and reuse

• Alternative freeze protection

• Minimizing nonproductive depletion of water flows
  o canal lining

• Adding water storage facilities

Source: based on C. de Fraiture, et al. 2007

Credit: Lincoln Zotarelli
Copied from Zotarelli, Fraisse, and Dourte, 2012
Adoption of Water Productivity—Enhancing Practices

- Cost and affordability
- Price and profitability
- Risks
- Markets
- Availability of a reliable supply of water
- Information / education
- Incentives and institutional structures

Source: C. de Fraiture, et al. 2007

**DRY-BY-WIRE:** Soil sensors, software and variable-rate technology will help cut down on unnecessary irrigation, saving water for rivers, streams and wildlife. Image: Calvin Perry / U.G.A. Copied from Biello, 2012
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Conservation Policies / Incentives

- Cost-share opportunities
  - **State:**
    - Florida Mobile Irrigation Laboratories (MILs)
      [http://www.floridaagwaterpolicy.com/MobileIrrigationLabs.html](http://www.floridaagwaterpolicy.com/MobileIrrigationLabs.html)
    - SJRWMD: Cost-share opportunities for growers; Tri-County Agricultural Area (TCAA) resources;
    - SWFWMD: Facilitating Agricultural Resource Management Systems (FARMS);
      [http://www.swfwmd.state.fl.us/agriculture/farms/](http://www.swfwmd.state.fl.us/agriculture/farms/)
    - SFWMD: Dispersed Water Management program; [www.sfwmd.gov](http://www.sfwmd.gov)
  - **Federal: USDA / NRCS**
    - Environmental Quality Incentives Program
      - Agricultural Water Enhancement Program (AWEP);
      - USDA / NRCS Conservation Innovation Grants;
Conservation Policies / Incentives

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    - SJRWMD: Cost-share opportunities for growers; Tri-County Agricultural Area (TCAA) resources;
      http://www.sjrwmd.com/agriculture/costshare.html
    - SWFWMD: Facilitating Agricultural Resource Management Systems (FARMS);
      http://www.swfwmd.state.fl.us/agriculture/farms/
    - SRWMD: District-Wide Cost-Share Program;
    - SFWMD: Dispersed Water Management program; www.sfwmd.gov
  - **Federal: USDA / NRCS**
    - Environmental Quality Incentives Program
      - Agricultural Water Enhancement Program (AWEP);
      - USDA / NRCS Conservation Innovation Grants;

Zac Thaggard uses USDA / NRCS Agricultural Water Enhancement Program (AWEP) to **install irrigation retrofits and remote soil moisture monitors** during a drought in Georgia.

See:
Future Policies

Consumptive Use Permitting Consistency

The Department of Environmental Protection is leading a statewide effort to improve consistency in the Consumptive/Water Use Permitting Programs implemented by the Water Management Districts. The individual water management district consumptive use permitting rules, while all developed under the authority of Ch. 373, F.S., are inconsistent among the districts. While some of the differences may be based on differing physical and natural characteristics, others are the result of development of separate rules and procedures developed over time. This results in confusion for the regulated public, particularly along the border areas of the districts, and inequitable treatment of similar applicants in different districts. Additionally, the development of separate procedures and rules is costly and inefficient.

The Department’s goals include:

» Make programs less confusing for applicants, particularly those who work in more than one District;
» Treat applicants equitably statewide;
» Provide consistent protection of the environment;
» Streamline the process; and
» Incentivize behavior that protects water resources, including conservation.
The purpose of the workshops is to discuss draft rule language under development by the Department to include criteria for reuse offsets and credits, other recommendations of the Reclaimed Water Policy Workgroup and recommendations resulting from the Consumptive Use Permitting Consistency Initiative.

Written comments can be submitted by December 3, 2012 to CUPCON@dep.state.fl.us
Consumptive Use Permitting Consistency

• draft Chapter 62-40 F.A.C.
  o No water allocation reductions for decreased water use due to:
    • Changes in growth/economic conditions
      o unless the allocation will not be needed during the permit term
    • Growing different crop
      o as the use for each crop remains efficient
  • Water conservation

Source: based on handouts for August 2012 Workshop Materials;  
http://www.dep.state.fl.us/water/waterpolicy/rule.htm#wm
Proposed Form: Supplemental Application Form A - Agricultural Use (August 2012)

- SECTION A1 – SITE INFORMATION

- SECTION A2 – WATER USE INFORMATION
  - 1. CULTIVATED CROPS
  - 2. LIVESTOCK
  - 3. NURSERY, FERN AND CUT FOLIAGE
  - 4. AQUACULTURE
  - 5. SUPPLEMENTAL WATER USE

- SECTION A3 – REQUESTED WATER USE

- SECTION A4 – WATER CONSERVATION

Source: based on handouts for August 2012 Workshop; http://www.dep.state.fl.us/water/waterpolicy/rule.htm#wm
Proposed Form: Annual Crop Summary (August 2012)

XXX Water Management District
Annual Crop Summary
Water Use Permit Report Form

PERMIT INFORMATION

WATER USE PERMIT NUMBER: ______________ PERMITTEE NAME: ______________
PROJECT NAME: _______________________________________________________________________________________

CROP INFORMATION
(attach additional sheets if necessary)

<table>
<thead>
<tr>
<th>Year: ______________</th>
<th>Months in Production (check all that apply)</th>
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<tbody>
<tr>
<td>Crop Name</td>
<td>Irrigation System</td>
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<tr>
<td>Drip</td>
<td>overhead</td>
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SUBMITTER INFORMATION

NAME OF PERSON SUBMITTING DATA: ______________________________ DATE: ______________

PHONE NUMBER: ______________________________ EMAIL ADDRESS: ______________________________

Please mail form to:
Department/Section Name
XXX Water Management District
Address
City, Florida Zip Code

For assistance, please contact:
## August 2012 Workshop Materials:

**Proposed Form:**

**Crop Protection (August 2012)**

Source: handouts for August 2012 Workshop; http://www.dep.state.fl.us/water/waterpolicy/rule.htm#wm

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### XXX Water Management District

**Crop Protection**

**Water Use Permit Report Form**

<table>
<thead>
<tr>
<th>PERMIT INFORMATION</th>
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<tbody>
<tr>
<td>WATER USE PERMIT NUMBER: ___________ PERMITTEE NAME: ____________________</td>
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<td>PROJECT NAME: ____________________</td>
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<table>
<thead>
<tr>
<th>CROP PROTECTION INFORMATION</th>
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<td>(attach additional sheets if necessary)</td>
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**REPORTING MONTH/YEAR:**

Please enter the beginning and ending meter readings or the starting and ending time water was pumped for crop protection (i.e. freeze or heat stress), as specified by condition in your permit. Use one form for each month that the withdrawal point(s) were used for crop protection.

<table>
<thead>
<tr>
<th>Date</th>
<th>District Well/Pump/Station ID Number</th>
<th>Well/Pump/Station Capacity (gpm)</th>
<th>Start Time or Begin Meter Reading</th>
<th>End Time or End Meter Reading</th>
<th>Gallons Pumped</th>
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<tr>
<th>Total Gallons Used:</th>
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</thead>
</table>

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| NAME OF PERSON SUBMITTING DATA: ____________________ | DATE: ___________ |
| PHONE NUMBER: ____________________ | EMAIL ADDRESS: ____________________ |

Please mail form to:
Department/Section Name
XXX Water Management District
Address
City, Florida Zip Code

For assistance, please contact:
Consumptive Use Permitting Consistency

- Potential Ag Conservation Incentives (August 2012 Workshop Materials)
  - Provide longer term permits for the most efficient irrigation systems?
  - Provide permit extensions for system improvements (saved water could be maintained if needed, for such cases as increased planting or intensity of use)?
  - Reduce reporting requirements for efficient systems?
  - Allow certified, highly efficient systems to be exempt from irrigation restrictions?

Florida's Agricultural Heritage in Paintings by Robert Butler
Strawberry Patch


Source: Based on PUBLIC WATER SUPPLY CONSERVATION
http://www.dep.state.fl.us/water/waterpolicy/docs/cupcon/ppt/II_f_conservation.pdf
The purpose of the workshops is to discuss draft rule language under development by the Department to include criteria for reuse offsets and credits, other recommendations of the Reclaimed Water Policy Workgroup and recommendations resulting from the Consumptive Use Permitting Consistency Initiative.

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Economic Analysis of Adaptation Options

• Innovative production systems that simultaneously reduce crop consumptive water use while maintaining farm profits
  o balancing crop choice, yield target, water application rates, and adopting efficient irrigation technology and water management practices
  o adjusting to changing water-supply conditions over time

• Performance of alternative policy options

Source: based on Schaible and Aillery. 2012; USDA 2012

FDACS, Agricultural Commerce, Business Development and Marketing

http://florida-agriculture.com/business/commerce/agprices/
References


