TOWARDS A MORE SUSTAINABLE USE OF WATER FOR FOOD AND NATURE UNDER SCARCITY IN ANDALUCÍA, SOUTHERN SPAIN
Towards a More Sustainable Use of Water for Food and Nature Under Scarcity in Andalucía, Southern Spain

Water Supply and Use in Andalucía

- Brief description of the region
- Water in Andalucía
- Irrigation in Andalucía
- Economic and social value of water in Andalucía

Problems and Changes

- Water Scarcity
- Food production vs. Nature

Proposal for the Future

Policy Instruments to Effect Changes in Water Management:

- Common Agricultural Policy of European Union (CAP)
- Water Directive of the EU (WFD)
- Water Markets (Spanish Water Law)
Situation

WATER SUPPLY AND USE IN ANDALUCÍA

BRIEF DESCRIPTION OF THE REGION

Mediterranean climate

Winter temperature: 2 – 15 º C
Summer temperature: 16 – 35 º C
High evaporation: (>1,200 mm/yr)
Precipitation: 200 – 600 mm/yr

Rainfall in Sevilla

Annual rainfall
Average rainfall
(1940-2003)

Rainfall (mm)
300 400 500 600 700 800 900 1000 1100
Year

143 Nature Protected Areas
(1,600,000 ha)
WATER RESOURCES: SUPPLY AND DEMAND

Imbalance of - 235 hm³/yr

WATER IN ANDALUCÍA

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WATER SUPPLY AND USE IN ANDALUCÍA
During the 1970-1998 period:
- Surface storage capacity has increased 83%
- Groundwater supply has increased 20% in the last 20 years
- 11 hydrological units are overexploited

1986-1998:
Water demand has increased in 21%
- Agriculture: 23%
- Urban: 26%
- Industry: 6%

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IRRIGATION IN ANDALUCÍA

Area
- Irrigated: 19%
- Rainfed: 892 M ha

Production
- Irrigated: 53%
- Rainfed: 4,570 M €

Employment
- Irrigated: 55%
- Rainfed: 540 M €

Subsidies (CAP)
- Irrigated: 40%
- Rainfed: 540 M €

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• Irrigated area has increased 68% in the last 25 years
• Prospects for 5% increase in the next 5 years (costal areas)
IRRIGATION IN ANDALUCÍA

Field crops
282,372 ha
404 M€

Olives
355,820 ha
3,261 M€

Horticultural crops

IRRIGATED CROPS

STRAWBERRY AND CITRUS

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WATER SUPPLY AND USE IN ANDALUCÍA

IRRIGATION IN ANDALUCÍA

Area

Production

3.261 M€
15%
9%
32%
672 M€
Less than 1.5% of irrigation supply originated from waste water reuse.

28% of the distribution networks in need of rehabilitation and 53% in satisfactory conditions.
• Water economy is a complex problem with political and social implications.

• Water is a ecological asset (Water Act 46/1999)

“...water is a natural resource of first priority requiring maximum protection”

• Lack of economic information on water use
ECONOMIC AND SOCIAL VALUE OF WATER IN ANDALUCÍA

WATER PRODUCTIVITY

Productivity (€/m³)

- < 2
- 2 - 5
- 5 - 10
- 10 - 15
- 15 - 25
- >25

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WATER SUPPLY AND USE IN ANDALUCÍA

ECONOMIC AND SOCIAL VALUE OF WATER IN ANDALUCÍA

WATER PRODUCTIVITY

Water use in the Genil-Cabra Irrigation Scheme
Economic efficiency is related to employment generation in a region of high chronic unemployment.
### WATER COST

<table>
<thead>
<tr>
<th>Economic sector</th>
<th>Cost (cent euro/m³)</th>
<th>Productivity (euro/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>1 - 30</td>
<td>0.2 -15</td>
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<tr>
<td>Industry</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Building and service</td>
<td>27</td>
<td>31</td>
</tr>
<tr>
<td>Supply</td>
<td>23</td>
<td>-</td>
</tr>
</tbody>
</table>

- WATER TARIFF (for collective systems: operation & maintenance costs + investment recovery cost)
- ON-FARM: operation & maintenance costs + investment cost

WATER COST ARE A SMALL FRACTION OF TOTAL PRODUCTION COSTS, EVEN IN HORTICULTURAL, HIGH WATER COST AREAS
Water demand is inelastic against water price (consumption determined by cropping patterns and irrigation efficiency).

The traditional cropping patterns cannot afford water prices any higher.
PROBLEMS AND CHANGES
WATER SCARCITY

IRRIGATION EXPANSION FASTER THAN PREDICTED

1983

Field crops: 320,971 ha
Olives: 80,549 ha
Horticultural crops: 228,970 ha

2004

Field crops: 254,817 ha
Olives: 282,372 ha
Horticultural crops: 355,820 ha

REASONS:

- Employment creation
- Wealth creation
- Control from water authorities

PROBLEMS AND CHANGES

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PROBLEMS AND CHANGES

WATER SCARCITY

DROUGHT

PROBLEM: unreliability of water supply

Rainfall in Sevilla

- During the drought periods there was an increase in horticulture (plastic greenhouse) along the costal line (5%)
- The area of irrigated field crops decreased to 60% of the irrigable area
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Food Production vs Nature

Evolution of fertilizer consumption

Areas vulnerable to nitrate pollution

Problems and changes
Contamination of water supply by pesticides used in the past in olive growing areas
• The 30,000 ha of plastic houses in Almeria generate 1.5 million tn/year of various residues that must be disposed off or recycled.

• Sea water intrusion: A PROBLEM IN COASTAL AQUIFERS
Water quality: over half of network stations have levels below minimum standards (over 400 control stations)

- 36 hydrological units related to natural areas
- 50% of the water resources and 40% of the water extractions related to natural areas
POLICY INSTRUMENTS TO EFFECT CHANGES IN WATER MANAGEMENT
Water productivity is inversely related to subsidies level.

The shift from field crops (subsidized) to horticultural crops (non subsidized) occurred despite the cap policies, mostly due to private initiative of a new generation of entrepreneurs.
WATER DIRECTIVE OF THE EU (WFD)

Water White Paper:
“...to achieve the best satisfaction of the water demands, to balance regional and sectorial development, increasing water availability, conserving its quality and rationalising its use in armony with the demands from natural systems” (art. 38, Libro Blanco del Agua)

Plan Hidrológico Nacional:
It does not include the impact of human activity
It does not include an economic analysis.

Modification of the Water Act (1999):
Towards conserving water and water quality improving water use efficiency and taxing water missuse
Aspects of the EU Water Framework Directive relevant to Andalucia:

- Protection of aquatic ecosystems
- Participation of water users and stakeholders
- Transference to the users of all water costs. Introduction of water measurement at all levels
- Readibility and transparency in the use of available hydrological information
The modified Water Act considers “water markets”

Voluntary
Agreed duration
Free negotiation of prices

Successful experience:
During the 1995 drought Seville bought water to nearby farmers

Disadvantage:
Indirect negative effects to third parties, particularly in the areas that sell the water. It is generally agreed that water markets work best for drought, emergency type situations
PROPOSAL FOR THE FUTURE
PROPOSAL FOR THE FUTURE

INSTITUCIONAL BACKGROUND

Decentralise and democratise water management

Reconsider the structure of the water administration

Elaboration and dynamic maintenance of a water database

More flexible water rights

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Adopt an Adaptive Management framework where all stakeholders are actively involved (learning by doing)

Revise the concepts of water use and water accounting

Analyse and solve problems at crossing scales

Integrate water planning with land use planning
PROPOSAL FOR THE FUTURE

WATER MANAGEMENT

- Measure and control ground water extraction
- Conjunctive management of surface, ground and non-conventional water
- Reclaim water quality
- Protect aquatic ecosystems
- Protocols for best management practices
- Consider water productivity for water allocation

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THE RECENT EXPANSION OF IRRIGATION IN ANDALUCÍA IS A SUCCESS STORY, **BUT**...
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