Water charging in irrigated agriculture - lessons from the field

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Water charging in irrigated agriculture

**Background**

Study carried out by HR Wallingford and partners with funding from DFID.

- Review of literature on field experiences of irrigation charging
- Six case studies from 5 countries:
  - Gujarat, Haryana, Macedonia, Morocco, Nepal, Pakistan
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Background - Some ballpark values

Reported water prices - US cents / m³

Countries and regions listed:
- Pakistan - Sindh
- Nepal - Kankai
- Kazakhstan
- Romania
- Haryana, India
- France
- Australia
- Portugal
- Pakistan gw
- Bangladesh STW
- Bangladesh DTW
- Hungary
- Brazil
- Morocco
- UK
- Syria
- Macedonia
- Slovakia
- Algeria
- Jordan
- China
- Bulgaria
- Tunisia
- Gujarat DTW - India
- Greece
Any discussion of irrigation pricing must begin with a clear statement of the objective:

- Demand management (Resource sustainability)
- Cost recovery (Financial sustainability)

These two objectives are distinct and require different forms of intervention.
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Demand management - resource sustainability

- Requires marginal cost pricing
- Requires infrastructure permitting:
  - Measurement of volume delivered to a group or individual
  - Flexibility of water control permitting delivery of different volumes to a group or individual
  - Significant increases over current prices

Volumetric pricing is feasible under demand and closed pipe systems, but is extremely difficult under rotational supply systems and nearly impossible under continuous flow systems.

Sampath (1992)
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*Demand management - resource sustainability*

We must not confuse:

a) Volumetric measurement to ensure delivery of a quota (allocation) based on overall availability.

b) Volumetric measurement and delivery of variable volumes to users free to purchase any volume they wish.
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Demand management - resource sustainability

• There is no evidence of water pricing being used to achieve balance between supply and the demand of competing sectors.

• Volumetric charging means that ‘wasting’ water costs the user.

• However, the value of water to irrigators is generally much higher than its cost, so the influence of price is small. (The price elasticity of demand is low)
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Demand management - resource sustainability

Allocation, rather than price, seems the better way to manage demand.

Allocation requires:

• Political and institutional processes
• Means to check users have received their entitlement:
  - measurement to a block
  - proportional division
  - number of irrigation applications

Entitlement defined

Quasi-volumetric delivery
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Cost recovery - financial sustainability

• Need to define what costs are included - O&M, capital investment, replacement/ modernisation.

• Simpler to apply:
  - No requirement for marginal cost (volumetric) pricing.
  - Charging can be based on farm area, irrigated area or according to crop type and area.

• Still requires political commitment and practical systems for assessment, billing and enforcement.
### Water charging in irrigated agriculture

#### Cost recovery - case studies

**India - Haryana**

- Proportional division (Warabandi)
- Limited management control - low costs
- Billing and fee collection by Revenue Department

**Charge basis:** Area and crop, monitored by ID

**Objective:** Recovery of O&M.

**Required O&M spend:** $2.5 / ha

(Cross subsidised from M&I.)

**Average fee:** $2.5 / ha

**Net income\(^1\):** $500 / ha

**Average holding:** 2.7 ha.

**Fee recovery:** 85 - 95%

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1. Income after deduction of all production costs except water
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Cost recovery - case studies

India - Gujarat

Private tubewells, owned by 3 - 10 farmers
Principal crops wheat and alfalfa

Charge basis: Hours pumping @ 3 cents / kwh,
Objective: Recovery of O&M
Required O&M spend: $ 300 / ha
Average fee: $ 300 / ha
Net income¹: $ 800 / ha
Average holding: 5 ha.
Fee recovery: 100%

1. Income after deduction of all production costs except water
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Cost recovery - case studies

Macedonia
Irrigated agriculture in decline.
Water Management Organisations have large historic debts.
Water law passed in 1998, not uniformly applied.

Charge basis: Area and crop
Objective: Recovery of O&M and capital costs.
Required O&M spend: $ 200 / ha
Average fee: $ 120 / ha
Net income¹: $ 600 - 2,000 / ha
Average holding: 1.3 ha.
Fee recovery: 42%

¹ Income after deduction of all production costs except water
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Cost recovery - case studies

Morocco
Large government schemes
Private wells supplement surface supply

Charge basis: Volumetric
Objective: Recovery of O&M and 40% of capital costs.

<table>
<thead>
<tr>
<th></th>
<th>Tadla</th>
<th>Haouz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required O&amp;M spend:</td>
<td>$ 127 / ha</td>
<td>$ 30 / ha</td>
</tr>
<tr>
<td>Average fee:</td>
<td>$ 148 / ha</td>
<td>$ 125 / ha</td>
</tr>
<tr>
<td>Net income¹:</td>
<td>$ 994 / ha</td>
<td>$ 1,700 / ha</td>
</tr>
<tr>
<td>Average holding:</td>
<td>6 ha</td>
<td>6 ha</td>
</tr>
<tr>
<td>Fee recovery:</td>
<td>70 - 80%</td>
<td>60 - 70%</td>
</tr>
</tbody>
</table>

¹ Income after deduction of all production costs except water
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**Cost recovery - case studies**

Nepal
Government schemes, agency and joint managed
Run of river supplemental monsoon irrigation

Charge basis: Area and crop
Objective: Recovery of O&M
Required O&M spend: $ 10 - 25 / ha
Average fee: $ 0 - 2 / ha
Net income¹: $ 200 - 240 / ha
Average holding: 1 - 2 ha
Fee recovery: 30 - 50%

¹. Income after deduction of all production costs except water
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Cost recovery - case studies

Pakistan - Sindh province

Proportional division (Warabandi). Infrastructure and management discipline, poor

Undergoing major reform - Sindh Irrigation Development Authority

Charge basis: Area and crop

Objective: Recovery of O&M

Required O&M spend: $10 / ha

Average fee: $2 - 8 / ha

Net income\(^1\): $236 / ha

Average holding: 6 ha

Fee recovery: 30%\(^2\)

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1. Income after deduction of all production costs except water

\(^2\)DFID - Department for International Development
## Water charging in irrigated agriculture

### Cost recovery - can farmers afford it?

<table>
<thead>
<tr>
<th>Country/site</th>
<th>Net water value US cents / m³</th>
<th>Present fee US cents / m³</th>
<th>Present fee recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>India Haryana</td>
<td>7.1</td>
<td>0.04 (0.6%)</td>
<td>85 - 95%</td>
</tr>
<tr>
<td>India Gujarat</td>
<td>13.3</td>
<td>5.0 (37%)</td>
<td>100%</td>
</tr>
<tr>
<td>Macedonia</td>
<td>20.0</td>
<td>2.4 (12%)</td>
<td>42%</td>
</tr>
<tr>
<td>Morocco Tadla</td>
<td>13.4</td>
<td>2.0 (17%)</td>
<td>70 - 80%</td>
</tr>
<tr>
<td>Morocco Haouz</td>
<td>27.3</td>
<td>2.0 (7%)</td>
<td>60 - 70%</td>
</tr>
<tr>
<td>Nepal</td>
<td>12.5</td>
<td>0.1 (0.8%)</td>
<td>30 - 50%</td>
</tr>
<tr>
<td>Pakistan Sindh</td>
<td>3.0</td>
<td>0.06 (2%)</td>
<td>&lt; 30%</td>
</tr>
</tbody>
</table>

**Net water value =** \( \frac{\text{net income / ha (\$)}}{\text{volume used / ha (m}^3)\)}
## Water charging in irrigated agriculture

*Cost recovery - can farmers afford it?*

<table>
<thead>
<tr>
<th>Country/site</th>
<th>Present fee US cents / m³</th>
<th>Fee required to cover O&amp;M US cents / m³</th>
<th>As a % of net income</th>
<th>Net income US$ / ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>India Haryana</td>
<td>0.04 (0.6%)</td>
<td>0.11 (1)</td>
<td>1.5%</td>
<td>500</td>
</tr>
<tr>
<td>India Gujarat</td>
<td>5.0 (37%)</td>
<td>5.0</td>
<td>37%</td>
<td>800</td>
</tr>
<tr>
<td>Macedonia</td>
<td>2.4 (12%)</td>
<td>4.2</td>
<td>21%</td>
<td>1,000</td>
</tr>
<tr>
<td>Morocco Tadla</td>
<td>2.0 (17%)</td>
<td>1.72</td>
<td>12.8%</td>
<td>994</td>
</tr>
<tr>
<td>Morocco Haouz</td>
<td>2.0 (7%)</td>
<td>0.86</td>
<td>3.2%</td>
<td>1,706</td>
</tr>
<tr>
<td>Nepal</td>
<td>0.1 (0.8%)</td>
<td>0.55 - 1.25</td>
<td>4.5 - 11%</td>
<td>225</td>
</tr>
<tr>
<td>Pakistan Sindh</td>
<td>0.06 (2%)</td>
<td>0.13</td>
<td>4.5%</td>
<td>236</td>
</tr>
</tbody>
</table>

1. If cross subsidy from other sectors were removed
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Cost recovery - findings

• Case studies and wider literature indicate it is financially feasible to recover annual O&M costs on most gravity irrigated schemes.

• Schemes where supplementary irrigation supports basic grain production on small holdings are an exception.

• High-cost pump-lift schemes may also be “financially unsustainable” without subsidy.

• In general, willingness, rather than ability, to pay is the major constraint.
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Cost recovery - unwillingness to pay

Factors leading to unwillingness to pay:

- Absence of a well-defined water entitlement
- Poor service delivery
- No linkage between fees paid and service received
- Water is perceived as a free good
- Lack of political will and mixed messages
- Reluctance to reduce establishment costs
- Little motivation for those collecting fees

- User
- Agency/politician
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There are no magic bullets

- IMT frequently leads to increases in levels of cost recovery but revenues are still routinely below the cost of O&M.

- “Volumetric charging” is not required to address the problem of cost recovery and prices needed to recover O&M costs have little effect on demand.

- % of net income paid for irrigation varies greatly. Moroccan farmers now pay as much as 17% but 5% may be unrealistic in other countries.
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What to do?

• Agree the objective of water pricing. Agree what costs will be recovered, how they are calculated and how they are linked to price.

• Secure political commitment to cost recovery.

• Define water rights or entitlements so users know what to expect.

• Examine means of improving service delivery (flexibility of supply) but understand the cost implications.

• Provide adequate resources for assessment and billing. Keep mechanisms simple and transparent.

• Accept a phased approach to increasing charges and improving service.
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Further information in:

OD 145 (2002). Water charging in irrigated agriculture - lessons from the literature.

OD 150 (2003). Water charging in irrigated agriculture - lessons from the field.

Available at:

http://www.hrwallingford.co.uk/publications/overseas.html