Webinar on Practical Benchmarking for Improving Performance of Irrigation and Drainage Schemes

Speaker: Dr. Martin Burton (UK)

7 June 2017, 16:30 – 17:30 Hours IST

Outline of presentation

- Why benchmark?
- Definition
- Processes
- Indicators
- Case studies
- Summary and conclusions
Why benchmark?

Very simply – To improve performance

Benchmarking definition and origins

- “A systematic process for securing continual improvement through comparison with relevant and achievable norms and standards” (Malano and Burton, 2001)

- Benchmarking is about change, moving from one position to a better position

- Based on early work on comparative performance assessment by IWMI (Molden et al, 1998) and others.
Benchmarking identifies gaps in performance

Benchmarking identifies ways to close the performance gap through *diagnostic analysis*

Benchmarking sets achievable standards for which to aim – by identifying “best practice”

Important to identify key processes, and then key indicators

Indicators need to be kept simple, easy to use and understand. An increasingly important indicator is *productivity per unit of water*

Data collection should not be too difficult
Key questions to ask:

- **What are the objectives?**
  - To provide reliable, timely and adequate irrigation supplies to match farmers’ needs.

- **How is success measured (outputs)?**
  - Crop production
  - Crop quality
  - Value of production
  - Productivity of water use

- **What are the processes that contribute to attainment of the objectives?**
  - Planning; Design; Construction; MOM of I&D system
Further questions

- What is the extent of the BM exercise?
- What performance criteria (efficiency, productivity, equity, etc.) should be used?
- What indicators are needed?
- What data are required?
- What are the types and categories of I&D scheme? How can we classify them?
- Who will do the benchmarking?

```
<table>
<thead>
<tr>
<th>Inputs/outputs to each system</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation of irrigation facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply of water to crops</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incomes in rural sector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural economic development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Small and Svendsen, 1992
```
Possible indicators

- **Input indicators**
  - Volume of water abstracted (m$^3$, m$^3$/ha)

- **Process indicators**
  - Conveyance efficiency (%)
  - Application efficiency (%)
  - Overall system efficiency (%)

- **Output indicators**
  - Productivity per unit area (kg/ha, $/ha)
  - Productivity per unit water abstracted (kg/m$^3$, $/m^3$)

- **Impact indicators**
  - Groundwater levels
  - Depth and flow rate in river
  - Wider environmental impacts/mitigations
Key processes and indicators (I)

- **Irrigation service delivery**
  - (i) Operation:
    - Irrigated area
    - Volume of irrigation water abstraction
    - Irrigation water abstracted (total & per unit command or irrigated area)
    - Irrigation water delivered (total & per unit command or irrigated area)
    - Relative irrigation water supply (abstraction/demand)
  - (ii) Maintenance:
    - Maintenance expenditure per unit area (MU/ha)

- **Crop production**
  - MU – Monetary Unit
  - Crop yields (kg/ha) and cropping intensity (%)
  - Value of crop production per unit command area (MU/ha)
  - Value of crop production per unit water abstracted (MU/m³)
  - Output per unit irrigation supply (MU/m³)
  - Output per unit water consumed (MU/m³)

Key processes and indicators (II)

- **Finance**
  - Cost Recovery Ratio
  - Total MOM expenditure per unit command area (MU/ha)

- **WUA Organisation**
  - WUA membership ratio
  - WUA Annual General meeting attendance

- **Environment**
  - Water quality (Biological/chemical content)
  - Minimum flow levels
Indicator definition & terminology

- Important to be consistent in terminology
- Recommend using indicator titles that describe the indicator:
  - Total annual water abstracted per unit command area (m³/ha)
  - Total annual water delivered per unit command area (m³/ha)
  - Total seasonal water delivered per unit irrigated area (m³/ha)
- Distinguish between period, location and extent – annual/seasonal, abstracted/delivered, command/irrigated area, etc.
- May need to adapt indicators to the data feasibly available.

Data collection & analysis

- Stage 2: Collect data to match programme
  - Type of data
  - Frequency
  - Location
  - Who to collect
  - Collection mechanisms (field measurements, remote sensing, SMS, web-based data entry, etc.)

- Stage 3: Data processing, analysis & reporting
  - Process data (spreadsheets useful)
  - Analyse – use graphics, GIS
  - Report – use graphics
Locations for data collection

Common locations for collection of data related to water management include:

- **Drains**
- **Fields**
- **Groundwater**
- **Canals**

Useful tools - Remote sensing

Source: ADB, 2015
**Stage 4: Integration**

- **Usually the most difficult part.**
- Based on the findings an Action Plan needs to be prepared, costed and agreed with key stakeholders.
- To implement changes agreement needs to be reached with the key stakeholders:
  - Water users
  - WUAs
  - I&D agency staff
  - Politicians
  - Etc.
Stage 5: Action

- Once agreement is reached the Action Plan can be implemented
- Leadership by senior management and key stakeholders is an important factor in the success of the Action Plan

Stage 6: Monitoring and evaluation

- The implementation of the action plan needs to be monitored and evaluated
- The key indicators are used to monitor and evaluate progress
- Senior managers and key stakeholders need to be kept informed of progress
Case Studies

- Egypt
- Turkey
- Australia
- Albania
- Kyrgyz Republic
- India
  - Maharashtra (Dr Sanjay Belsare to present)
  - Madhya Pradesh
  - WUAs
- IWMI on-line irrigation benchmarking service
- UK

Case Study: Egypt

- Studied performance on six branch canals
- Studied irrigation and drainage systems
- Field measurements and farmer interviews
- Final report and guidelines produced
Sanhour and Nesheel have high water productivity due to relatively low irrigation water supply.
Egypt: Data presentation: “Traffic light” system

<table>
<thead>
<tr>
<th>Description</th>
<th>Units</th>
<th>Basentway</th>
<th>Zawiet Naim</th>
<th>El- Baidda</th>
<th>Daqalt</th>
<th>Sanhour El- Kadeema</th>
<th>Nesheel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater level (depth to)</td>
<td>m</td>
<td>0.80</td>
<td>0.58</td>
<td>0.82</td>
<td>0.75</td>
<td>0.58</td>
<td>0.95</td>
</tr>
<tr>
<td>Groundwater salinity</td>
<td>Mmhos/cm</td>
<td>2.2</td>
<td>3.0</td>
<td>2.1</td>
<td>2.0</td>
<td>3.2</td>
<td>6.1</td>
</tr>
<tr>
<td>Soil salinity</td>
<td>Mmhos/cm</td>
<td>0.8</td>
<td>0.7</td>
<td>1.1</td>
<td>2.8</td>
<td>3.9</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Farmer questionnaire

Irrigation problems:

- Very severe
- Severe
- Mild

Counts

- Little

Legend

Best value
Critical value
Area of concern

Egypt: Analysis of I&D performance

- Total seasonal value of crop production per unit command area (LE/ha)
- Seasonal value of crop production per unit water supply (LE/m²)
- Main system water delivery efficiency (%)
- Seasonal relative irrigation water supply
- Equity of water distribution between head & tail mesqas
- Groundwater levels (m)
- Groundwater salinity (mmhos/cm)

El-Baidda

- Nesheel, Basentway, Zawiyat Naem (vegetables)

Nesheel

- Sanhour (low water supply)

Besentway

- Daqalt (>55%)

Zawiyat Naim & Daqalt

Besentway & Zawiyat Naem

- Sanhour (adeq.), Daqalt (poor)

Nesheel (shortage of irrig water)

Zawiyat Naem (critical)

El-Baiada & Besentway

Nesheel (critical)

Zawiyat Naim

Sanhour (critical)
Egypt: Summary of performance

- In overall terms Besentway is the best performer:
  - The production levels per unit area were reasonable.
  - The conveyance efficiency was high.
  - The groundwater level was relatively low.
  - There were very few complaints from farmers.
- Daqalt also performed reasonably, though problems voiced by farmers with the drainage needed to be resolved.
- Lesson 1: “Traffic light” coding can be useful
- Lesson 2: Not usually one “best performer” on all indicators

Turkey

- Data analysed for 5 irrigation schemes (Camak et al, 2004).
- Used the IPTRID/FAO Guidelines indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual irrigation water delivery per unit command area (m³/ha)</td>
<td>WDCA</td>
</tr>
<tr>
<td>Annual irrigation water delivery per unit irrigated area (m³/ha)</td>
<td>WDIA</td>
</tr>
<tr>
<td>Annual relative water supply</td>
<td>RWS</td>
</tr>
<tr>
<td>Total MOM cost per unit area ($)</td>
<td></td>
</tr>
<tr>
<td>Water fee collection performance</td>
<td></td>
</tr>
<tr>
<td>Staffing number per unit area (person/ha)</td>
<td></td>
</tr>
<tr>
<td>Output per unit serviced area (US$/ha)</td>
<td>GVPISA</td>
</tr>
<tr>
<td>Output per unit irrigated area (US$/ha)</td>
<td>GVPIA</td>
</tr>
<tr>
<td>Output per unit irrigation supply (US$/m³)</td>
<td>GVPIS</td>
</tr>
<tr>
<td>Output per unit water consumed (US$/m³)</td>
<td>GVPWC</td>
</tr>
</tbody>
</table>
# Turkey: Which is the benchmark?

<table>
<thead>
<tr>
<th>Name of irrigation scheme</th>
<th>Performance benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cropping intensity</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
</tr>
<tr>
<td>Batman-Silvan</td>
<td>7590 ha</td>
</tr>
<tr>
<td>Devegecidi 6900 ha</td>
<td>○</td>
</tr>
<tr>
<td>Derik-Kumluca 1860 ha</td>
<td>○</td>
</tr>
<tr>
<td>Nusaybin Cagdas 6695 ha</td>
<td>○</td>
</tr>
<tr>
<td>Cınar-Goksu 3852 ha</td>
<td>○</td>
</tr>
</tbody>
</table>

**Notes:**
1. No benchmark set for Total MOM costs per unit area as data not available on the relevant target values for each scheme.

---

# Turkey: Best performers

- Each of the 5 schemes gave the best result for at least one indicator.
- One scheme was identified as the better performer based on production per unit of land and water.
- Highlights the difficulty of identifying the “better” performers.
- **Lesson 2:** Not usually one “best performer” on all indicators.
ICID Webinar  ICID Webinar  ICID Webinar  ICID Webinar  ICID Webinar

Case Study: Australia

- Started in 1998 by ANCID.
- Covered 1.2 million ha, ~47 schemes with 37,000 irrigation farmers.
- Crops include rice, maize, vines, cotton, sugar cane, pasture, citrus, vegetables.
- Total gross revenue to service providers in 1999/2000 was A$ 228 million (US$171 million).
- Used 47 performance indicators:
  - System operation (7 No.)
  - Environmental management (5 No.)
  - Business processes (22 No.)
  - Financial management (13 No.)

Australia – BM Results

- Water delivered per unit area
- Depth delivered (in)
- Same types of system?

Lesson 3: Take care to compare “like with like”.

ICID Webinar  ICID Webinar  ICID Webinar  ICID Webinar  ICID Webinar
Case Study: Albania

- Second Irrigation and Drainage Rehabilitation Project started in 21 Districts in May 2000
- Physical rehabilitation with institutional strengthening
- Improved standards of service programme (ISOSP) introduced. Key elements:
  - Improved water management
  - Improved fee collection
  - Improved maintenance
  - Improved user participation and ownership
- Used a limited set of IPTRID/FAO indicators

Albania: Simplified BM results (2001)

<table>
<thead>
<tr>
<th>Federation</th>
<th>Total command area (ha)</th>
<th>Area irrigated during the season</th>
<th>Irrigation Service Fees collected (Lek)</th>
<th>Irrigation Service Fee collected per unit area (Lek/ha)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albulena</td>
<td>5313</td>
<td>27%</td>
<td>948,000</td>
<td>178</td>
<td>7</td>
</tr>
<tr>
<td>Erzeni</td>
<td>4450</td>
<td>24%</td>
<td>847,000</td>
<td>190</td>
<td>5</td>
</tr>
<tr>
<td>Peqin-Kavaje</td>
<td>7872</td>
<td>54%</td>
<td>3,028,000</td>
<td>384</td>
<td>2</td>
</tr>
<tr>
<td>Naum Panxhi</td>
<td>2128</td>
<td>61%</td>
<td>1,228,000</td>
<td>577</td>
<td>1</td>
</tr>
<tr>
<td>Cukas</td>
<td>6022</td>
<td>34%</td>
<td>1,110,000</td>
<td>184</td>
<td>6</td>
</tr>
<tr>
<td>Krutje</td>
<td>6577</td>
<td>54%</td>
<td>2,353,000</td>
<td>357</td>
<td>3</td>
</tr>
<tr>
<td>Lushnje</td>
<td>3588</td>
<td>55%</td>
<td>855,000</td>
<td>238</td>
<td>4</td>
</tr>
<tr>
<td>Myzeqeja</td>
<td>1980</td>
<td>0%</td>
<td>66,000</td>
<td>34</td>
<td>9</td>
</tr>
<tr>
<td>Gjanci</td>
<td>55377</td>
<td>44%</td>
<td>757,000</td>
<td>137</td>
<td>8</td>
</tr>
</tbody>
</table>

- Lesson 4: Keep it simple: limit the number of key performance indicators.
Lesson 5: Reward good performance!

Benchmarked the performance of 486 WUAs to identify the better and less well performing schemes. Support then provided to less well performing schemes.

Data taken from the WUA database. All WUAs required to submit an annual report to government.

Key indicators used: (weighted, W):
- Cropping intensity (%) $W=2$
- Collected ISF per unit command area (KGS/ha) $W=3$
- ISF collection ratio (%) $W=1$
- Maintenance expenditure per unit command area (KGS/ha) $W=3$
- O&M expenditure as percentage of total ISF collected (%) $W=1$
Lesson 6: Consider “weighting” KPIs if values of indicators are summed together.

- A number of benchmarking initiatives in India:
  - Maharashtra
  - Madhya Pradesh
  - World Bank/INPIM WUA benchmarking web site
India: Maharashtra

- Ongoing since 2001-2. Championed by Mr S.V.Sodal, Secretary (CAD), Irrigation Department (Sodal, 2004; MWRD, 2008)
- Started with selected IPTRID/FAO indicators (10 No.) for 84 schemes (minor, medium and major). Increased to 262 schemes by 2005-6.
- Categorized I&D systems – size, water source, type of control; method of water distribution; water availability.
- Lesson 7: Performance assessment and benchmarking often needs champions to promote it.

India: Madhya Pradesh

- Used web-based MIS to monitor and compare performance of over 150 reservoir-based I&D schemes.
- Benchmarking analysis: 1 MCM stored water is sufficient to irrigate 200 ha.
- This target was set for all schemes.
- Irrigated area increased from 0.85 million ha in 2009-10 to 2.91 million ha in 2015-16
- Maintenance expenditure increased from Rs112/ha in 2009-10 to Rs820/ha in 2015-16
Lesson 8: Use the KPIs to drive performance improvement.

Web link: [http://wua.aquiferindia.org](http://wua.aquiferindia.org)
- Open platform for data sharing for WUAs.
- Publications, regulations, training resources.
- Benchmarking data entry and analysis

Lesson 9: National benchmarking programmes need a secure hosting site and technical support
ICID Webinar  ICID Webinar  ICID Webinar  ICID Webinar  ICID Webinar

IWMI On-line benchmarking service

International Water Management Institute (IWMI) On-line Irrigation Benchmarking Service

Benchmarking of Irrigation Systems

This initiative by the World bank, ITPRD, ICID and IWMI puts state-of-the-art system performance monitoring in the hands of practising irrigation system managers.

User Name: [Input field]
Password: [Input field]

IWMI OIBS: Data entry

Basic Scheme Information - Location Details

- Scheme Name: [Input field]
- Country: [Input field]
- Latitude: [Input field]
- Longitude: [Input field]
IWMI OIBS: Data entry
Lesson 10: International benchmarking can be problematic; variations may be too great.

Programme to identify key performance indicators (KPIs) for UK irrigation and develop an on-line benchmarking tool (Knox et al, 2013).

Benchmarked potato and strawberry growers.

Identified 11 KPIs: system operation (3); agricultural productivity (2); financial performance (3); and environmental performance (3).

UK Benchmarking

Using the benchmarking tool...

Learn more about benchmarking and how to use the webtool to assess your performance on video at www.ukia.org

Benchmarking, 7 June 2017

http://79.170.40.182/iukdirectory.com/benchmarking

UK Benchmarking Scorecard

----

08/06/2017
Lesson 11: Benchmarking can identify significant differences in performance between schemes/users.
**Lesson 12:** Simple presentations can get the message across.

**Summary and conclusions**

- Benchmarking is a valuable tool to compare performance.
- Important to identify key processes and be selective about indicators.
- Identify and analyse outputs then use diagnostic analysis to analyse gaps in performance.
- Important to categorize schemes and compare “like with like”.
- The integration phase is the most difficult, putting the analysis into action is not easy.
- Issuing performance scorecards for individual schemes may be a useful way forward.
- Remote sensing, GIS and IT have a valuable role to play.
References


Julaniya, R.S., Manish Singh, M.G. Choubey and Shubhankar Biswas. A management approach to increased irrigated agriculture and production in Madhya Pradesh, India. Paper presented at the Second World Irrigation Forum (WWF2), Chiang Mai, Thailand, 6-8th November.

References


