Water footprint assessment: towards sustainable use of freshwater in South Africa

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INTRODUCTION

• South Africa is ranked 30th driest country in the world (DAFF, 2013).

• Rapid growth and increased variability in rainfall caused (DAFF, 2013):
  – Tighter supply;
  – Demand often exceeds supply in different basins in SA.

• Agricultural sector is a major user of scarce freshwater resource in South Africa.
  – Irr agric uses about 40% of exploitable runoff (Backeberg and Reinders, 2009).
  – Direct contribution to Gross Domestic Product of SA is small (<3%) (DAFF, 2014).
  – Currently the agricultural sector may be an inefficient user of freshwater (Nieuwoudt, Backeberg & du Plessis 2004:162)
• Agricultural sector is crucial for food security in SA
  – Produce food;
  – Generate employment along whole value chain.
=> Need to use scarce freshwater resource in a sustainable manner.
  • Environmental; economic; social (Three pillars of sustainable water use (Hoekstra, 2014))

• Water footprint is important sustainability indicator for agri-food sector (Ridoutt et al., 2010).
  – It is believed that water footprint information can guide policy towards sustainable use of freshwater (Hoekstra et al., 2011).
  – Economic growth has to be planned in context of sector specific water footprints (DWA, 2012).

• Aim: Report on some WFA activities in South Africa.
WATER FOOTPRINT ASSESSMENT IN SA

- Eight organisations are involved.
  - Funders
    - Water Research Commission (WRC) (Initiating, funding and managing WF-research).
    - National Research Foundation (NRF) (Funding WF-research)
  - Researchers
    - Four universities
      - University of the Free State
      - University of Pretoria
      - Rhodes University
      - Wits University
    - Research Institute
      - CSIR
    - Consultancy firm
      - Pegasys
WATER FOOTPRINT ASSESSMENT IN SA (CONT…)

- Pegasys
  - Dr Guy Pegram (Project leader)
  - Breede River Catchment in South Africa.
  - WRC project
    - Case studies to assess value of WFA as tool for companies to:
      - assess their water use,
      - Assess impact of their water use on the freshwater resource.

=> They concluded that WFA is useful tool to achieve such an objective.
WATER FOOTPRINT ASSESSMENT IN SA (CONT…)

- WITS University
  - Dr Kevin Harding (project leader)

- Water footprint of:
  - Paper and pulp industry in South Africa
    - 11 different sites across South Africa
  - Three Platinum mines
    - 2 underground; 1 open cast
  - Gold/Coal mine
    - TBC
WATER FOOTPRINT ASSESSMENT IN SA (CONT…)

• Rhodes University (NRF Project)
  – Prof Gavin Fraser (project leader)

  – Water footprint of citrus production in Sundays River Valley of South Africa
    • Calculated the volumetric water footprint indicator
    • Conducted sustainability assessment
      – Considered inter-basin transfer
    • Assessed economic water productivity
WATER FOOTPRINT ASSESSMENT IN SA (CONT…)

• University of Pretoria and CSIR (WRC Project: K5/2273//4)
  – Dr Michael van der Laan (Project leader)

  – Water Footprint of selected vegetable and fruit crops produced in South Africa.
    • Case studies (Irrigated crops)
      – Steenkoppies Aquiffer & Doorn/Olifants Catchment
        » Potatoes; Onions; Tomatoes; Carrots; Beetroot; Broccoli;

=> Research in progress
WATER FOOTPRINT ASSESSMENT IN SA (CONT…)

• University of the Free State (WRC Project K5/2397//4)
  – Dr Henry Jordaan (Project leader)

  – Assessing the water footprints of selected field and forage crops
towards sustainable freshwater use in South Africa

  • Case studies
    – Irrigated crops and their derived crop products:
      » Maize and wheat
      » Alfalfa and irrigated pastures
    – Calculating volumetric water footprint indicators of crops
    – Sustainability assessment (environment; economic; social)
    – Economic water productivity

• Consumer awareness and willingness to pay price premium for
water footprint information.
WATER FOOTPRINT ASSESSMENT IN SA (CONT…)

• Preliminary findings:
  – Total water footprint of milk (4% fat; 3.3% protein) value chain:

<table>
<thead>
<tr>
<th>Total water Footprint</th>
<th>Blue</th>
<th>Green</th>
<th>Grey</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.097</td>
<td>0.862</td>
<td>0.066</td>
<td>1.025</td>
</tr>
<tr>
<td></td>
<td>96.99</td>
<td>862.21</td>
<td>65.76</td>
<td>1024.97</td>
</tr>
</tbody>
</table>

Global average = 1020 l/kg
WATER FOOTPRINT ASSESSMENT IN SA (CONT…)

- Sustainability assessment (Source: Hoekstra and Mekonnen 2011):
WATER FOOTPRINT ASSESSMENT IN SA (CONT…)

- Value added to water:

<table>
<thead>
<tr>
<th></th>
<th>1 Litre</th>
<th>3 Litre</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Value Added</td>
<td>R 1.57</td>
<td>R 1.57</td>
<td>R/kg</td>
</tr>
<tr>
<td>Processing Value Added</td>
<td>R 5.84</td>
<td>R 4.01</td>
<td>R/kg</td>
</tr>
<tr>
<td>Retail Value Added</td>
<td>R 4.70</td>
<td>R 3.46</td>
<td>R/kg</td>
</tr>
<tr>
<td>Total Value Added</td>
<td>R 12.11</td>
<td>R 9.04</td>
<td>R/kg</td>
</tr>
<tr>
<td>Water Used for Production</td>
<td></td>
<td>1.0250</td>
<td>m³/kg</td>
</tr>
<tr>
<td>Value Added to the Water</td>
<td>R 11.81</td>
<td>R 8.82</td>
<td>R/m³</td>
</tr>
</tbody>
</table>
CONCLUSIONS AND RECOMMENDATIONS

• WFA is a relatively new field of research in South Africa.
  – Some industries reacted with distrust.

• Drive is mainly to generate local, context specific information on freshwater use:
  – Case studies.
  – Involve industry partners.

=> to ensure buy-in of everybody for sustainable freshwater use in SA.
CONCLUSIONS AND RECOMMENDATIONS

• Recommendations:
  – Clearly specify
    • The aim and scope of the WFA.
      – Why are you doing WFA?
      – What exactly are you doing (i.e. case study, etc.)?
      – What data was collected and used?
  – Involve industry partners.
    • Get their buy-in.
    • Also increase awareness.
ACKNOWLEDGEMENTS

• WRC
  – initiated, manages and funds my project;
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