Decanting acid mine drainage is presenting a major problem in the economic heartland of South Africa. Reverse osmosis (RO) proposed as solution but very expensive and energy intensive. Irrigation represents an attractive alternative to RO as it removes significant salt loads and can use the water productively to produce crops in a food insecure region.
Quality of water decanting from mine voids in South Africa varies, but often acidic and saline, dominated by CaSO$_4$, Na$_2$SO$_4$, MgSO$_4$ or NaHCO$_3$.

Results in a salinity problem as there is not enough clean water available to dilute the salts and still achieve water quality objectives.

**Technology principle:**

Irrigation with CaSO$_4$ rich mine water

Roots take up water and concentrate the salt – precipitation of gypsum in the soil profile

Salts therefore removed from the water
### Managing poor quality mine water in the Vaal Basin, South Africa

<table>
<thead>
<tr>
<th>Project's name</th>
<th>Country</th>
<th>City</th>
<th>Start Date-End Date</th>
<th>Water Sources</th>
<th>Uses</th>
</tr>
</thead>
</table>

#### Sources

<table>
<thead>
<tr>
<th>Origin</th>
<th>Industrial - mining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water reused (m³/Y)</td>
<td>Potential: 54 000 000</td>
</tr>
</tbody>
</table>

#### Uses

<table>
<thead>
<tr>
<th>Crops</th>
<th>Soybean, wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated Area (Ha)</td>
<td>Potential: 12 000</td>
</tr>
<tr>
<td>Cost of the Cubic meter (€/m³)</td>
<td>0.35</td>
</tr>
</tbody>
</table>

#### Water Reuse Chain

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Neutralisation using lime in a high density sludge plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disinfection</td>
<td>None</td>
</tr>
<tr>
<td>Storage Capacity (m³)</td>
<td>Mine void – capacity unknown</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Sprinkler (pivot)</td>
</tr>
</tbody>
</table>
MANAGING POOR QUALITY MINE WATER: IS IRRIGATION PART OF THE SOLUTION?

### Irrigation with neutralised acid mine drainage

- **Salts added with irrigation or leached // gypsum precip (t/ha)**
- **Year**: 1950 to 1998
- **Percentage salts precip (%)**
- **Total salt added**
- **SO4 leached**
- **Na leached**
- **Cl leached**
- **Mg leached**
- **Ca leached**
- **K leached**
- **Gypsum precip (t/ha)**
- **% salts removed**

69% salts removed from water

Irrigation with neutralised acid mine drainage

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- **K leached**
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- **% salts removed**

69% salts removed from water
• Yes, but only certain water qualities (must be high in calcium and sulfate)
• Potentially cheaper with a lower environmental impact compared to reverse osmosis
• A 40 ha farm could realise a profit of approximately 15,000 euros/yr
• Salt tolerant crops such as soybean and wheat recommended
• Hydrogeological setting should be carefully planned