On-Farm Recharge: Acceptance and Use by Farmers and Water Managers in the San Joaquin Valley, California

Daniel Mountjoy
Director of Resource Stewardship

June 29, 2016 | International Groundwater Conference

Terranova Ranch
Helm, CA

Accelerated Groundwater Recharge Strategy Area

January/February 2011

May/June 2011

SGMA Supply Side Options:
Recharge Basins
**SGMA Supply Side Options:**

- **Farmland Recharge**
- **Fallow Land Recharge**

---

**Cost Comparison of Recharge Options**

- **on-farm**
  - $40 - 107/AF
  - (Capital and operating costs amortized over 20 years)

- **dedicated basin**
  - $124/AF

---

**Available Flood Water Resources**

- **Kings River Winter Flows**
  - November – March

- **Merced River Winter Flows**
  - November – March

---

**McMullin Survey** Summary of Findings

1. Control of amount and timing of water received
Control of amount, timing, and location of flood water use

<table>
<thead>
<tr>
<th>MORE LIKELY TO PARTICIPATE IF YOU COULD:</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify maximum amount of floodwater grower is willing to use per flood event?</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Specify certain fields for recharge any time floodwater is available?</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Specify the number of acres for recharge any time floodwater is available but retain choice of which fields?</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Dedicate land as permanent recharge basin rather than flooding cropland?</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

Growers interviewed are willing to divert floodwater to their crops well into the summer.

McMullin Survey Summary of Findings

1. Control of amount and timing of water received
2. Larger diversified farms have more flexibility to accept floodwater
3. Flood water delivery costs vary by District and source
4. Uncertain risk to crop yield and plant health
5. Lack of irrigation infrastructure

Most crops grown, and acreage represented, have existing irrigation infrastructure compatible for off-farm recharge but may require expanded capacity.
McMullin Survey Summary of Findings

1. Control of amount and timing of water received
2. Larger diversified farms have more flexibility to accept floodwater
3. Flood water delivery costs
4. Uncertain risk to crop yield and plant health
5. Lack of irrigation infrastructure
6. Ground water quality

Groundwater quality concerns

67% of farmers interviewed have water quality concerns

Outreach to recruit growers interested in Testing and Demonstrating on-farm recharge in the San Joaquin Valley

Demonstration Sites 2015-16

- 131 sites
- 10 crops
- 14,723 acres

Purpose: Assess constraints and measure water that can be applied in excess of crop demand
Growers with on-farm recharge experience:

- On-farm recharge has been used on 27 of 131 fields (21%)
- Method of application: flood irrigation (3 sites used drip)
- Amount applied: 6" and repeat
- Fertilizer Management:
  - Most apply post harvest in October
  - Typically apply again in February – March
  - All agreed they could delay by 1 or 2 months

Recharge water application

Latest month farmer is willing to over-irrigate for recharge

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Feb-Mar</th>
<th>April-May</th>
<th>June-July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almonds</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Grapes</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Pistachios</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Walnuts</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Figs</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Row crops</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
</tbody>
</table>

Willing to try on-farm recharge ■ Has used on-farm recharge

Fertilizer application

Typical first spring application month

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almonds</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Grapes</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Pistachios</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Walnuts</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
</tbody>
</table>
Fertilizer application
Typical first spring application month and willingness to delay

<table>
<thead>
<tr>
<th></th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almonds</td>
<td></td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Grapes</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Pistachios</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Walnuts</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
</tbody>
</table>

*Typical first fertilizer application*  
*Willing to delay application*

Site Recharge Suitability
Comparison of grower site offering with suitability indices

<table>
<thead>
<tr>
<th>SAGBI</th>
<th>Soil Agricultural Groundwater Banking (SAGBI) avg.</th>
<th>Subsurface avg.</th>
<th>Combined index avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sites offered</td>
<td>3.8</td>
<td>4.6</td>
<td>4.0</td>
</tr>
<tr>
<td>Sites with prior on-farm recharge</td>
<td>3.4</td>
<td>4.9</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Scale: 1 = poor; 5 = excellent

Challenges to accelerated use of on-farm recharge:

1. Concerns about nitrate leaching and crop suitability
2. Lack of clarity about water rights to flood water and recharged groundwater
3. Lack of incentives to reward farmers for the benefit they provide to all
4. Irrigation district preference for centralized water projects

Leveraging Knowledge and Partnerships for Groundwater Recharge

**Short-Term Actions** (2015-2017)  
**Long-Term Actions** (2018-2020)