Integrated Water Resources Management advances in Ica aquifer (I-V-L), Peru. Improvement actions based on Managed Aquifer Recharge technique

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ICA RIVER BASIN, ICA, PERU

- Main agroindustrial sector in Peru
- Exports Pisco, grapes, asparagus, avocado...
- Produces over **5,000 M$ / year**, most of it in the external market... *at what price?*
ICA-VILLACURÍ, LANCHAS (I-V-L) AQUIFER
I-V-L Aquifer behavior

BIFURCATION
I-V-L aquifer’s diagnoses.
Water balance for 2018. FACTS and Figures:

- Exploitable volumes exceeded since decades ago
- Renewable water resources below extractions. Over-exploited
- Growing demand
- Rapidly outdated information
- Increasing development of infrastructures for the reservation, storage and retention of intermittent events
- Confidence in future external water transfers
- Problems of quality deterioration
- Disconnected Actions.
I-V-L aquifer’s diagnoses.
Water balance for 2018. Facts and FIGURES:

- Resources of the aquifer: 1,861 hm³/año
- Ica aquifer extractions: 232 hm³/año (2017)
- GW extractions: 68.7% of total use
- 898 wells in exploitation
- Natural recharge: 179,4 MCM/year
- OVEREXPLOITATION: 52.17 hm³/year
- Groundwater table decrease about 41 cm/year
- Outflow to the Ocean: 95,8 MCM/year (2017, Samaca Station)
- **MAR in I-V-L Aquifer:**
  - 17 hm³ (2018)
  - 26 hm³ (2019).
SUPPORT TO I-V-L AQUIFER MANAGEMENT

PUBLIC initiative:

1-Mission of Experts BM August 2015.

PRIVATE or stakeholders’ initiative:

- Consult to external experts
Detailed and up-to-date knowledge of the aquifer:

1. Updating the inventory of water points
2. Geophysical prospecting
3. New groundwater monitoring network
4. Perforate piezometers "a la carte"
5. Instrumentation that allows to know the evolution in real time (interoperability)
6. Thorough control of extractions (flowmeters)
7. DyTT and awareness campaigns
Detailed and up-to-date knowledge of the aquifer:

1. Updating the inventory of wells

898 inventoried wells in intense exploitation
2. Geophysical prospecting

Several campaigns of SEV and TDEM soundings. Different institutions > different interpretations
Holes or gaps in the knowledge, generally in the transition between irrigator associations (Juntas)
3. New groundwater monitoring networks (96 points)
4. Piezometers made "a la carte"
5. Instrumentation to know the evolution in real time
6. Control of extractions (flowmeters)
7. DyTT and awareness campaigns
MAR characteristics in the I-V-L aquifer 1/2

- Management and actions to capture, conduct, store and recharge ponds for MAR.
- Structures to retain and store flood waters minimizing the volume of water to the sea.
- Knowledge of the aquifer and its behaviour improves permanently.
- Location of new storage areas and suitable places.
MAR characteristics in the I-V-L aquifer (2/2)

• Water is **collected from the Ica River** mostly by means of La Achirana channel during the rainy season.

• Specific constructions for **stagnation and decantation + diversion to infiltration ponds.**

• **Passive and intermittent** system requiring an integrated and interconnected approach.

• **Real-time monitoring** network.

• **Annual cleaning and maintenance works.**
MAR volumes per year and e.g. response in GW levels

MAR system in Ica - Peru
Physical clogging impacts
846 infiltration ponds constructed in the I-V-L aquifer

Inventory – Database 660 ponds (2017): goo.gl/SbBGpG

- **MAR:** 27 MCM (2019)
- **Overexploitation:** 53 MCM
  - Mean area per inf. pond: **0.35 hectares**
  - Mean Volume per inf. pond: **216,600 m³**

Would be necessary **2,497** ponds more to balance the overexploitation
IWRM in I-V-L aquifer “bets” for MAR technique…
…but it is not enough…

Villacurí, 2019 August 21st
IWRM proposal

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IWRM in Ica Valley

Canals are Key
IWRM in Ica Valley (2)

Request of political support

D.S. 007/2015

Veda: no new perforations
No extension of the agricultural frontier

New water management constructions

Water transferences (win-win scheme)

Key importance of canals (necessary cleaning and maintenance)
IWRM in Ica Aquifer. Conclusions

- Ica aquifer has an overexploitation due to GW extractions of about 53 MCM/year whilst 27 MCM/year are supplied from MAR (as maximum)
- 5,000 M$ / year productions relies on GW
- Thus, IWRM relies importantly on MAR, but other water resources are required as there is an absolute dependence on rainwater for MAR
- Options are:
  - a smart and highly efficient IWRM approach (internal)
  - water transferences from three different origins (external)
- Additional elements:
  - surface reservoirs,
  - high efficiency irrigation improvements,
  - “curtains” and drainages in the subalveum of Ica River...
  - keeping attention on desalination
- The debate is more social than technical. E.g. the increase of the resources presents the disadvantage of "benefiting" both, formal and "informal" users
- Shared responsibility: Support from authorities, private sector, users, "people"...