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New insight on the water management in Ica Valley-Peru

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The Andes divide Peru into three natural drainage basins: Pacific basin, Atlantic basin and Lake Titicaca basin. According to the National Water Authority (ANA), the Pacific basin is the driest basin. The bulk of water that feed the local aquifers in the coastal Pacific region is coming from rivers that flow west from the Andes. One of them is the Ica River- source of the Ica Aquifer and the Pampas de Villacuri Aquifer.
The Ica River flows in a graben that was created by a series of faults. The graben is filled with sand and gravel with interbeded and lenses of clay. The aquifer thickness varies between 25 meters to more than 200 meters.
The Ica Valley has an extension of 7700 km2 and belongs to the Province of Ica, the second larger economic center in Peru. The Valley is located in the hyperarid region of the Southern Coastal area of Peru with a few millimeters of precipitation per year. The direct recharge is almost zero. The recharge into the Ica Valley aquifer is comes indirectly by infiltration of storm water through the riverbed generates in the Andes, through irrigation canals and by irrigation return flow.
In this hyperarid region, local aquifers like the Ica Valley are extremely valuable resources to local populations and are the key sources of groundwater for agriculture and population needs. Therefore, these aquifers play a crucial role in providing people with water and intense attention should be given to manage the water sector properly and to keep the aquifer sustainable for future generations.
The total pumping (from rough estimations) is much greater than the direct and indirect recharge. The deficit in the water balance is reflected in large water level decline, out of operation of shallow wells and the ascending of saline water from deeper layers. The change from flood irrigation that contributes about 35-40% of the water to the aquifer, to drip irrigation dramatically reduces the amount of water that infiltrates into the sub-surface from the irrigation canals and returns flow and increases the water balance deficit.
In principal there are two ways to improve the hydrological conditions of the aquifers. One is to reduce dramatically the pumping from the aquifers to a level close to the calculated recharge. This will reduce the rate of decline of the water level and bring the aquifer to a new equilibrium. As there is no alternative source to bridge the gap in demand, this would lead to the collapse of local agriculture and thus is impractical.
The second way is to improve (indirectly) the hydrological situation of the aquifers by artificially increasing the recharge into the aquifers together with encouraging sustainable water-based policies and restrictions on the drilling of new wells. Our recommendation is the second way to treat municipal effluents to a tertiary level and to recharge them along with excess runoff from the Ica River into the subsurface.