Agricultural

Adapting to water scarcity at farm level

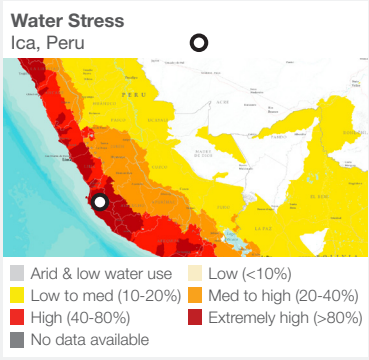
Ica, Peru

water scarcity impact	
Reduced withdrawal	●
Reduced consumption	
Improved water quality	
Increased productivity	●
Net basin benefit	

volumetric impact
298 265 m^3/yr

capital cost
$2 770 000

estimated unit cost of water
135 ¢/m^3



Water Stress Map:
F. Gassert, P. Reig, T. Shiao, M. Luck and M. Landis, 2015. "Aqueduct Global Maps 2.1."

Confidence level
Low Medium High

Water Scarcity Impact Key
Main Minor

Credits
We would like to acknowledge Isabella Gazzo of Monsanto for her input in the preparation of this case study.

Project Overview

The Ica Home Farm is Monsanto`s largest vegetable seed manufacturing site in Peru. It produces more than half of firm`s global production of melon seeds, but also growing tomato, watermelon, cucumber and cauliflower seeds. The farm covers an area of 200ha and employs over 1 500 people.

Located on the Pacific coast in the Ica Valley desert, it has ideal, sunny weather conditions for growing crops all-year-round, but is impacted by water scarcity. With an annual rainfall of only 3mm per year, the main water source for the farm has been the underground aquifer. However, with agriculture farms booming and more farmers drilling for water, the aquifer levels have dropped from 35m to 50m between 2000 and 2012, and salinity levels have increased. In 2011 the Government issued a regulation prohibiting any new wells to be drilled in the area, forcing local farmers to relocate or adapt to new conditions.

The Ica Home Farm commenced a programme to adapt to the new circumstances. In 2011 it installed a Reverse Osmosis (RO) plant that treats 200 000m^3/yr of saline groundwater. Between 2012 – 2014, the farm implemented a series of measures to reduce its water withdrawals including the introduction of a new conduction and pruning system for melon seeds, a new grafting technique for watermelons, the installation of moisture sensors and transitioning from soil to soilless cultivation

Key Elements

- Governmental regulation which prohibit drilling of new wells in the Ica Valley.
- Installation of 200 000m^3/yr reverse osmosis plant to improve water quality but resulting in a significant increase in the unit cost of water.
- Implementation of various irrigation management and systems techniques to increase yield and offset increased water costs.
- Development of an in-house water footprint tool in order to guide interventions for minimising water use and maximising yield.

Key Outcomes

- Water withdrawals of the farm decreased by 298 265m^3/yr following the implementation of the interventions.
- Crop yield increased as follows
  (a) 20% due to supply of better water quality.
  (b)19% in melons yield due to the installation of a new conduction and pruning system.
  (c) between 24 and 50% for watermelons due to the introduction of new grafting techniques.

Ica, Peru

Intervention Features

- Irrigation management
- Irrigation systems
- Evapotranspiration reduction
- Improvement in water quality
- Education, technical training and capacity building

Project Levers

(1) Installation of a Reverse Osmosis plant

Production yield of crops was decreasing due to the saline, brackish groundwater (salinity of 2.84 dS/m in 2009) pumped from the depleting aquifer. The farm installed a Reverse Osmosis (RO) plant (200 000m^3/yr) which treats brackish water to usable quality (1.0dS/m). As a result, the productivity of tomatoes and other crops increased by 20%. The treatment train includes microfiltration and double-pass RO. The RO brine reject is diverted into an outside natural pit holes with concrete and a geo-membrane placed at the bottom, where brine evaporates and salts are sold off to a waste management company.

(2) Irrigation management and systems

Several interventions were implemented to increase yield and reduce water withdrawals from the aquifer. These included:

- A new conduction and pruning system for melons which reduced water use from 19.8m^3 per kg of melon produced to 16.7m^3 per kg. This involved changing the growth of melon from three stems to one.
- Installation of 5 moisture sensors allowed for more precise millimetre-based irrigation regime based on monitoring of evapotranspiration.
- Relocation of melon crops inside net houses reduced evaporative losses by 20%.
- Implementation of soilless cultivation of tomatoes to keep water available for longer periods and reduce infiltration.
- A new grafting technique which results in stronger roots that are disease resistant and have improved water-nutrient efficiency.

(3) Tool for measuring water footprint

In 2013 the farm developed an in-house tool for measuring water footprint linked to crop production yields. It included a precise measurement and recording of the amount of water used for irrigation per crop per hectare (in m^3) and for a single plant (in litres), the average crop yield (in kg) and the amount of water used per kg of seed. It also calculated the total volume of reduced water use (in m^3/yr).

Outcomes and Challenges

The Ica Home Farm project was born as a response to water scarcity and the changing water withdrawal regulations. However, the applied interventions go far beyond regulatory requirements. Inspired by a workshop delivered by the World Business Council for Sustainable Development (WBCSD), local staff built the business case for reducing water use to the senior management.

While the Ica Home Farm had a general commitment to good water stewardship, it did not have specific targets. Improvements based on the productivity benefits and the direct impact on the bottom line enabled financing of the interventions. The project had positive social and environmental outcomes as it improved relationships with the local population of Ica who share the underground aquifer and ensured the environmental sustainability of the water supply of the farm and community, at large.

The greatest challenge was the education of the 1 500 staff members who work on the farm about the importance of water conservation and its impact on their local community. To get everyone on board, the implementation team organised a Water Day, where the cycle of water and benefits of interventions were explained. There are currently about twenty trained employees who have the direct responsibility of recording and managing the water stewardship initiatives. Following the success of the project, the Ica Home Farm is planning a series of interventions that will reduce water use even further.

Above: Irrigation techniques at Ica Home Farm (© Monsanto)