Agricultural

High frequency intermittent drip irrigation

Ica, Peru

water scarcity impact

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

volumetric impact

1 172 500 m^3/yr

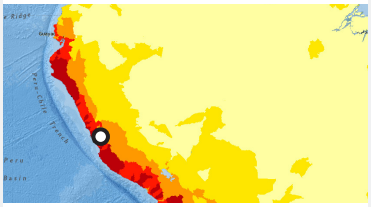
capital cost

$ 949 000

estimated unit cost of water

10 ¢/m^3

Water Stress
Ica, Peru



Arid & low water use
Low (<10%)
Low to med (10-20%)
Med to high (20-40%)
High (40-80%)
Extremely high (>80%)
No data available

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 Miguel Bentin of Valle y Pampa in the preparation of this case study.

Project Overview

The Ica region of Peru has experienced a boom in asparagus production since 1990's and is now responsible for 95% of Peru's fresh asparagus exports. The region is facing major issues around increasing water scarcity. Groundwater abstraction significantly outstrips recharge rates causing the water table to fall by 8-10 metres annually in some parts.

Valle y Pampa is a 217 hectare entrepreneurial agricultural venture producing and exporting pomegranate, asparagus and blueberry crops to international markets across twenty countries. The farm has demonstrated a new High Frequency Intermittent Drip Irrigation System (HFDI) technology, which combines an automatic fertigation system with drip irrigation methodology that doses in short 4-9 minute shifts. The automated system monitors chemical and physical conditions in the upper levels of the root zone in real time and fertigates accordingly.

When benchmarked against industry standards based on the utilisation of conventional drip irrigation, the system provides an increase in yield of 65% and 126% for asparagus and pomegranate respectively per m^3 of water applied.

Key Elements

- Three high value, high water consuming products produced for international export: asparagus, blueberries and pomegranates.
- The automatic monitoring system measures soil moisture tension, oxygen, pH, conductivity and nitrate levels.
- Irrigation shifts are 4-6 minutes, compared to 3-hour shifts of conventional drip irrigation systems.
- The frequency of irrigation shifts varies between 5-30 bursts per day depending on climate conditions, and the stage of crop cycle.

Key Outcomes

- When benchmarked against industry standards, the HFDI system demonstrated the following reduction in water applied and energy and fertiliser consumed:
  Water - Asparagus: 45%; Pomegranate: 60%
  Energy - Asparagus: 45%; Pomegranate: 60%
  Fertiliser - Asparagus: 44%; Pomegranate: 56%
- The system does not demonstrate any reduction in consumptive use per unit of crop produced.

Ica, Peru

Intervention Features

- Irrigation scheduling
- Soil moisture content monitoring
- Remote monitoring and sensing
- Fertigation systems
- Drip irrigation systems

Project Levers

(1) Precise maintenance of optimal growing conditions

Valle y Pampa has established the ideal soil humidity conditions for their crops. Comprehensive real time monitoring of soil conditions informs the automated system, which doses in short shifts in order to maintain these optimal conditions.

(2) Financial approach

The commercial risk of adopting the unconventional HFDI system was held by the individual agro-entrepreneurs who undertook the business venture as an opportunity to demonstrate the benefits of HFDI in the Peruvian context. Initial financing came from personal investment by the founders and from loans provided by local banks.

(3) Technology adaptation

The farm adopted the principles and equipment developed by Eitan Israeli and developed this to the context of asparagus cultivation in desert conditions. Valle y Pampa was able to adapt the system to work effectively across wide expanses of open air plots.

(4) Replicability

In order to replicate the efficiency of the HFDI approach through precise hydraulic design for simultaneous fertigation of field drippers, the farm had to balance the topography, energy requirements, soil conditions, pressure and flow of their context.

Outcomes and Challenges

Given the risk levels applied to agricultural developments by financial institutions, securing seed capital for the farm under favourable terms proved difficult. Companies that are able to demonstrate environmental and social performance can apply for attractive hybrid equity-debt schemes from European development institutions. Having achieved various social and environmental certifications, the farm is in a position to apply for such financing as it looks to expand.

Major agricultural users in the Ica region compete with the local population for access to dwindling water resources. This has led to indigenous communities seeking litigation through the Latin American Water Tribunal. If Ica's asparagus industry could reduce its water abstraction by 45% this would amount to a total reduction of 160 000 000 m^3/yr. Inevitably, the challenge is to balance productivity with withdrawal rates. Often, agricultural water users will counter any reductions in withdrawal by increasing their rate of productivity through farm expansion or otherwise. Although there are no incentives currently being offered by the Peruvian Government to mitigate this, a 'water ban' has been declared in the Ica region to prevent further exploitation of groundwater and a census of wells has begun to facilitate better monitoring and control in the future.

The presence of the large scale agro-export industry in the Ica Valley is causing elevated nitrate levels in drinking water. Using HFDI, the precise application of fertilizer coupled with an overall reduction in the volume of fertiliser used, reduces leaching and pollution of groundwater from the farm.

Above: Valle y Pampa farm in the Pampas California desert (© Valle y Pampa)