

Feasibility of Nano-filtration for desalinization of saline/seawater used for irrigating vegetable crops in greenhouse under Qatar conditions

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Background

Freshwater is gaining same importance in 21st century as oil in the 20th century. There is a severe water deficiency for drinking, domestic use and agricultural purposes in GCC countries including Qatar. However, a number of seawater desalination technologies are developed during the last decades to augment the supply of water in arid regions. These technologies and continuous research work suggest that seawater is the only freshwater of future.

The increasing usage of desalinized seawater has demonstrated it as a feasible water resource despite high costs. Seawater desalination process separates saline seawater into two streams: a fresh water stream (with low quantity of dissolved salts) and a concentrated brine stream. The most widely used technologies at present are Reverse Osmosis (RO) and Multi-stage Flash (MSF) distillation. These processes require a lot of energy and attached costs.

There is problem of disposing brine as well. Innovative technologies are emerging through consistent research and subsequent development for removing present deficiencies. Nano technology of water desalinization is one of these. This water purification process is claimed just as effective as current methods but more energy efficient and potentially much less expensive. However, this needs research under Qatar and UAE conditions prior to recommend for adoption in the country's agriculture for irrigation. Present project will address this aim through collaborated efforts of Ministry of Environment of Qatar and funds provided by QNRF.

Objectives

- Explore feasibility of innovative technologies of water desalinization in Qatar and UAE
- Determine energy use efficiency by conventional RO and nano-filtration membranes
- Investigate on sustainable handling of brine to end up with zero liquid discharge and helping the environment protection
- Make cost-benefit analysis of the nano-filtration technique and compare with traditional RO technology



Installation of RO and Nano units at ICBA

Two units (RO and Nano) were tested in the factory and installed at ICBA station. Soil and water samples were collected and analyzed at Central Analytical Laboratory at ICBA before starting experiments.



Field preparation to grow salt tolerant crops irrigated with brine

The field was leveled and prepared to grow salt tolerant crops using brine and groundwater to offset irrigation water requirement. Three salt tolerant species (Salicornia, Atriplex, Acacia) were planted using three different saline waters (ground water, brines from RO and Nanofiltration systems).



Sowing of salicornia seeds

Monitoring and Evaluation

- Water samples are being collected from the units and tanks twice a month and analyzed at CAL
- Energy consumption is being recorded and economical



Fruits are being collected and yield recorded.



Transplantation of vegetables seedlings in the greenhouse

The Greenhouse plots are prepared for cultivation of vegetables. Three vegetables (Cucumber, Capsicum and Tomato) were grown using three different waters (DEWA fresh water, fresh water produced by RO and Nano-filtration system).