



Role of efficient management of non-conventional and brackish water resources in sustaining agricultural production and achieving food security in the United Arab Emirates

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ABSTRACT

Water scarcity is the main limiting factor to food production in the United Arab Emirates. The country is located in an arid to hyper-arid zone with limited renewable natural freshwater resources due to limited rainfall. Other considerable limiting factors include low agricultural water productivity, salinization of farmed areas, and low soil suitability for agricultural production.

The agricultural sector is the highest water consumer, with more than 56% of total water use, while its contribution to the GDP is less than 1%. The total agricultural area is about 1.1 million dunums. Only 51% of the agricultural area is cultivated with crops, including (1) fruit trees of more than 400,000 dunums (mainly date palm trees); (2) field crops and fodders of about 109,000 dunums; (3) vegetables of about 66,000 dunums. Although most farmers are using modern irrigation systems in their farmed areas, mainly drip irrigation, the agricultural water productivity is still low. Many farmers are not aware of the practical irrigation scheduling based on the actual crop water needs according to the growing stages of the crops and therefore over-irrigate their crops.

Groundwater is the main source of agricultural water in farming areas where the annual water use exceeds 2,500 million m³. Usable groundwater is mostly non-renewable and brackish, with different levels of salinity ranging from low salinity of 2 ds/m to more than 15 ds/m. Groundwater quality degradation and declining groundwater levels are well-known problems in many farmed areas.

The soil is generally poor and lacks necessary natural soil elements and nutrients. Only about 13% of the UAE's existing farmed areas are located on suitable soil for agricultural production. The arable land is degrading in many locations mainly in the cultivated areas due to salinization.

In parallel, the demand for food is steadily growing. Ninety percent of food in the UAE is imported as the local agricultural production cannot meet the current domestic demand, which is anticipated to increase substantially. However, UAE's economic and political stability and its geographic location with high accessibility to trade centers and markets have created a stable environment for food security.

This paper presents the optimal use of alternative and natural water resources through improving water use efficiency. It entails the best practices to use water based on crop water needs, most profitable crops, best match of water and soil, and when crops to be grown, hence reducing the use of water resources significantly and boosting agricultural water productivity.

The paper will also highlight the importance of using these alternative water resources, particularly treated sewage effluent (TSE), in controlled-environment agriculture (CEA) and the expected benefits to farmers such as: saving freshwater resources, reducing water consumption, reducing crop loss, improving water productivity, and using less land. TSE is a reliable water supply source, particularly in water scarcity countries. The seasonal TSE supply can help bridge the seasonal gap of freshwater supply and reduce the use of fertilizers as it is rich with nutrients that are needed for plant growth. As such, the use of TSE in CEA could potentially increase agricultural productivity and economic return for farmers while reducing environmental pollution.

Keywords: Water resources; Agriculture; Sustainability