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It's no longer news that the world's population is ever-increasing. It's no longer news that it's going to be taught to feed the extra mouths. It's no longer news that climate change is turning fresh water into our planet's most scarce resource. When we look at the set of problems around sustainable energy, food and water systems the real issue becomes how people manage the footprint on the landscape. We have two choices: keep talking or start acting.

Humanity needs to find a way to produce fresh water for biomass production. It's necessary to find ways to store renewable energy from solar and wind and other renewable sources into biomass so people can sell it all over the world.

Imagine the difference it would make, if we could turn our deserts green, if we could use seawater and solar power to make this happen to produce enough food, fresh water and energy to sustain local populations. Imagine we could do all this with technologies that are commercially viable with the potential to be scaled up and implemented around the globe. This might sound like a dream but this is a reality nowadays. And it is called the Sahara Forest Project [1].

In 2009 the SFP was presented in Copenhagen. The first SFP pilot facility in Qatar contains 10,000 square meters of environmental technologies that has never been put together before. The SFP Pilot in Qatar includes:

1. Concentrated Solar Power

The Sahara Forest Project launch station

The SFP demonstrates an innovative greenhouse concentrated solar power (CSP) cooling system which enables the low-cost use of saltwater to achieve wet-cooling efficiencies without utilizing precious freshwater resources. The heat from the CSP mirrors is used to drive a multistage evaporative desalination system for producing distilled water for the plants in the greenhouse and outside. The waste heat is used to warm the greenhouses in the winter and to regenerate the desiccant used for dehumidifying the air.

2. Saltwater Greenhouses

Saltwater-cooled greenhouses provide suitable growing conditions that enable year-round cultivation of high-value vegetable crops in the rough Qatar's desert. The greenhouse-structure consists of 3 bays with polythene roof coverings on the horticultural yield. The cooling system is an evaporative cooler at one end of the greenhouse. The cool air is supplied under the plants via polythene ducts to ensure that the cool air is distributed evenly along the greenhouse and at low level. As

the air heats up, it rises and is expelled via high level openings in the end wall. By using saltwater to provide evaporative cooling and humidification, the crops' water requirements are minimized and yields are maximized with minimal carbon emissions.

3. Outside Vegetation and Evaporative Hedges

The water coming from the greenhouse is at a concentration of about 15% salinity. To reduce the water content further, the brine is passed over external vertical evaporators set out in an array to create sheltered and humid environments. These areas are planted to take advantage of the beneficial growing conditions for food and fodder crops and for a wide range of desert species. New candidate species for use as harvested and grazing fodder for livestock, and as bioenergy feedstock, is identified and characterized from among native desert plants. The carbon sequestration benefits of various planting and cropping approaches are measured and compared.

4. Photovoltaic Solar Power

The SFP is supported by state photovoltaic (PV) technology. Dust arresting from the surrounding vegetation and water for cleaning the PV-panels ensure an efficient electricity generation.

The Sahara Forest Project System

5. Salt Production

As the water is evaporated from saltwater the salinity increases to the point that the salts precipitate out from the brine. The last stage of this process is taking place in conventional evaporation ponds.

6. Halophytes

Beyond traditional horticulture and agriculture, halophytes (salt-loving plant species) are cultivated in saltwater. These hardy plants, often already well adapted to desert conditions, are highly promising sources of fodder and bioenergy feedstocks. Irrigating with saltwater directly into the soil can cause significant environmental harm. So, the SFP implements a variety of up-to-date cultivation techniques.

7. Algae Production

Marine algae are one of the most promising future sources of bioenergy. Nutrients with the SFP saltwater-greenhouse infrastructure, mariculture operations, and soil remediation methods are developed. This will not be important for Qatar but for all the region with the same climate. The SHP is really innovative example of tying together all of the aspects of sustainability. The SFP will provides people with a unique opportunity to optimize our technological system and to be large-scale in future.

The SHP shows what can be done when great minds think alike and work together without boundaries. It proves that we can take the things we have too much of and use them to produce the things we need more of. Turning the desert green can be done. See it. Believe it.

References:

1. Sahara Forest Project [Electronic resource]. – Mode of access: http://www.saharaforestproject.com. – Date of access: 23.01.2018.