Importance of Treated Waste Water for Forage Irrigation in Kuwait Dr. Ashok Alva **Senior Research Scientist Environment & Life Sciences Research** Centre

<u>UK Based Risk Assessment Firm (Maplecroft)</u> <u>Severely Water Stressed Countries</u>

- Mauritania
 Kuwait
- 3. Jordan
- 4. Egypt
- 5. Israel
- 7. Iraq
- 8. Oman
- **9. UAE**
- <u>10.</u> Syria
- 11. Saudi Arabia
- 14. Libya
- 16. Djibouti
- . 17. Tunisia
- 18. Algeria

World Resource Institute: Among the top 33 most water-stressed countries - 14 are from the Middle East and **North Africa region** (MENA), including all **GCC** countries





Figure 3 Drought severities, 1901–2008

Source: graphical elaboration from Gassert et al. (2013), data from Sheffield and Wood (2007).

Critical Water Issues

 Problems will be dire in the Middle East, northern India, northern China, and the western US
 Factors affecting Water & Food Security:

- Climate change
 - Increasing demand for meat consumption, which requires significantly more water & energy to produce than plant based diet, due to increasing middle class with greater disposable income & affordability in emerging economy countries
 - World's population continues to grow, which is expected to reach 9+ billion by 2040

Climate change projections for for Middle East – Case Study by ICARDA

GCMs aggregated Sommer, Hussein & Oweis 2011



Critical Water & Food Security Global population will increase to: 9+ billion **Global freshwater: 40%** shortfall **Global water demand:** increase by 55% **Global food demand: will** increase by 70%

Sustainability vs. Food Security

- **Rothamsted Research (reported by Reuters): By 2050 Population will increase to: 9+ Billion** Soil Productivity will decrease by: 30% 70% of earth surface area needs to be cultivated (as compared to 40% now) FAO:
- 25% agricultural soils severely degraded8% moderately degraded

Limitations for Open Field Agriculture in the Gulf Cooperation Council (GCC) Countries Extremely arid hot desert climate Low irregular rainfall (<100</p> mm/year) > High evapotranspiration (ET) rates (3000-4000 mm/year) Scarce to non-existent surface water

Water Demand will continue to increase in all GCC countries to keep phase with increasing population & High Standard of living



Water demand forecast for GCC countries (adapted from Trieb et al. 2008)



Water Consumption and Renewable Water Resources, m³ Pcpa (Source: AQUASTAT 2013)

Exploring use of TWW in Agriculture FAO Global Forum for Food and Agriculture (Jan, 2017) 'Agriculture and Water - Key to Feeding the World' "Properly managed, treated wastewater can

be used safely to support crop production – directly through irrigation or indirectly by recharging aquifers – but doing so requires diligent management of health risks through adequate treatment or appropriate use" **Exploring use of TWW in Agriculture Global Forum for Food and** Agriculture (Jan, 2017) 'Agriculture and Water - Key to Feeding the World' **Convened by FAO; United Nations** University, Institute for Water, **Environment and Health (UNU-INWEH);** the UN's Educational, Scientific and **Cultural Organization; and the Leibniz Research Alliance Food and Nutrition**

Exploring use of TWW in Agriculture (FAO)

"Properly managed, wastewater can be used safely to support crop production – directly through irrigation or indirectly by recharging aquifers – but doing so requires diligent management of health risks through adequate treatment or appropriate use"

Exploring use of TWW in Agriculture (FAO, Jan 2017 Global Forum) **Globally, only a small proportion** of TWW is being used for Agriculture Egypt, Jordan, Mexico, Spain and the US: exploring TWW use for Agriculture on a larger scale

<u>GCC WASTEWATER STAT (billion m³/yr)</u>



C)	0.5	1		1.5	2	
	UAE	Bahrain	KSA	Kuwait	Oman	Qatar	
Reused wastewaters	0.1804386	0.0146316	0.657532	0.151177892	0.0253472	0.0375936	
Treated wastewaters	0.289	0.076	1.063	0.219	0.037	0.117	
Total wastewaters	0.5	0.151	1.546	0.292	0.09	0.274	

WATER REUSE IN THE ARAB WORLD: **PRINCIPLE TO PRACTICE, 2011 "One of the most important** lessons learned is that, to enable local end-users to feel confident with TWW for irrigation, it is imperative to establish trusted institutions to ensure the highest standards of health and safety"

To the best of our knowledge Treated Waste Water (TWW) produced in Kuwait is: 870,000 cubic meters per day About 29% of this is unaccounted. Therefore could be available for agricultural irrigation





TWW POTENTIALLY Available for Agricultural Irrigation **TWW production estimated to increase to: 1.4 million cubic meters per day** 29% of the current production plus new production when the total quantity increase: 255000 + 530 000= 785000 cubic meters per day could be available for agricultural irrigation

WASTEWATER PROD (billion m³/yr, AQUASTAT 2009)



<u>WASTEWATER PER CAPITA (AQUASTAT, 2009)</u>



<u>**Critical Needs for Way Forward**</u>

- **1.** Adequate infrastructure for delivery of TWW from production site to major agricultural production regions
- 2. Research based recommendations for optimal use of TWW for:
 - *i.* Improved water use efficiency & water productivity
 - *ii.* Ensure no negative impacts on desert environment, ecosystem & food safety & quality