Water Economics, Demand & Management

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”Tenth Gulf Water Conference: “Water in the GCC Countries

The Water-Energy-Food Nexus 22-24 April 2012, Doha, Qatar

Political Willingness

- A noticeable change in the discourse of top politicians at GCC level promises a better future of the water sector
  - Speech of H.E. Dr. Abdullatif Al Zayani Secretary General of the GC Council yesterday
    - Phasing out subsidy to bring demand to reasonable levels
  - Speech of H.E. Dr. Abdullah Al-Hussayen, Saudi water and Electricity Minister
    - Low tariffs are the cause of wasteful use of water

Water facts

- At global level, by 2030 the water shortfall will reach 2,800 billion m^3
- Bridging the gap will cost **$50 to $60 billion annually** (least cost options)
- If supply side only is considered the cost will be **$200 billion annually** (Water Resources Group, 2009)
- Saudi Arabia and the United Arab Emirates consume 91% and 83% more water than the global average (Fayed, 2012)
- Seawater Desalination:
  - Costly (US$1)
  - Energy-intensive process: 10%-25% of energy consumption in the GCC
  - Brine disposal jeopardizes marine ecosystems
- GCC countries will likely invest **$20 billion annually** in their water sectors
- If GCC countries do not become actively involved in research, **enforce water policies** and promote sustainability, the consequences will be significant

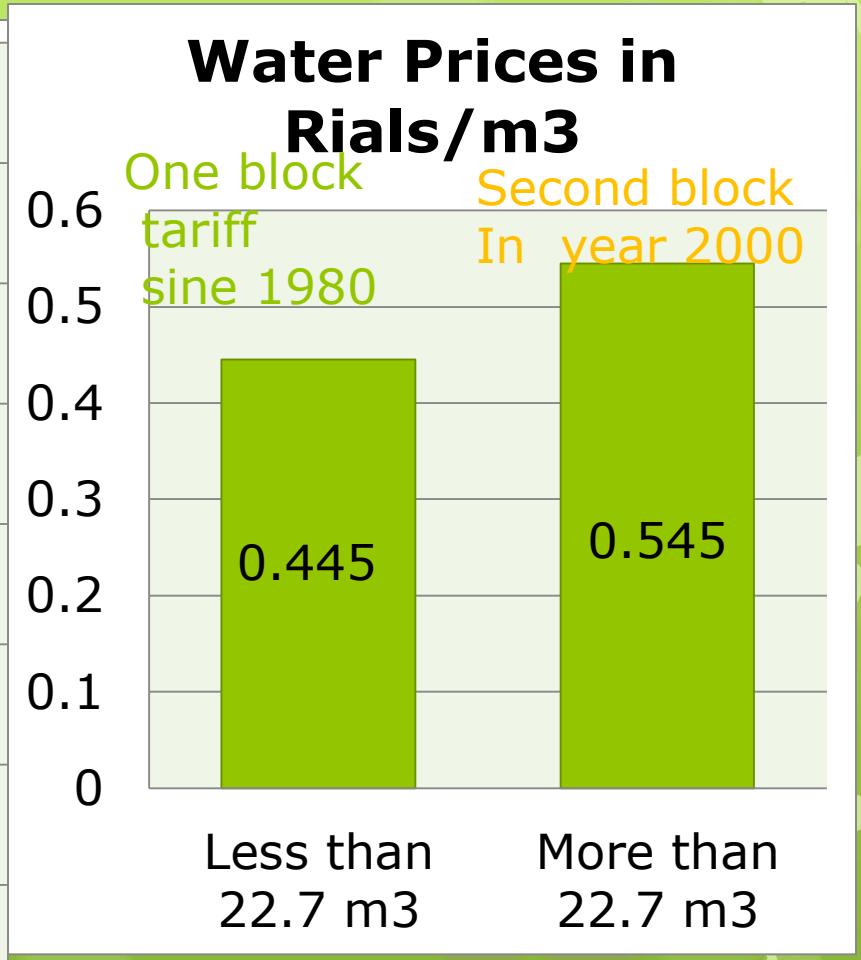
Water cost

- **Total water cost**
  - Desalination cost + Cost of service
    - Capital cost (pipes and equipment)
    - Water utility costs (wages, materials , buildings, consumables…)
    - Amortization
    - Interest on loans
  - Desalination cost is less than 50% of total cost
    - Total cost in the GCC not less than US$ 2/m^3
- Sustainability
  - Cost recovery
  - Self-sustaining water utility
  - Urban water prices are highly subsidized in the GCC

Tariff structure reforms

- Arguments against price increase and cost recovery
  - Public
    - Cost of living already high
    - water is a basic necessity or "right to life" and should be free
    - Government using oil to desalinate, oil is God’s gift
  - Political arguments
    - Protect the low income class
    - Avoid social unrest: protests, demonstrations…
- Irrational arguments
  - Low income groups not a reason to subsidize all users
  - Politicians should know the cost and alternative to subsidies
    - Who benefits the more from subsidies to water

Prices up….Except Water!



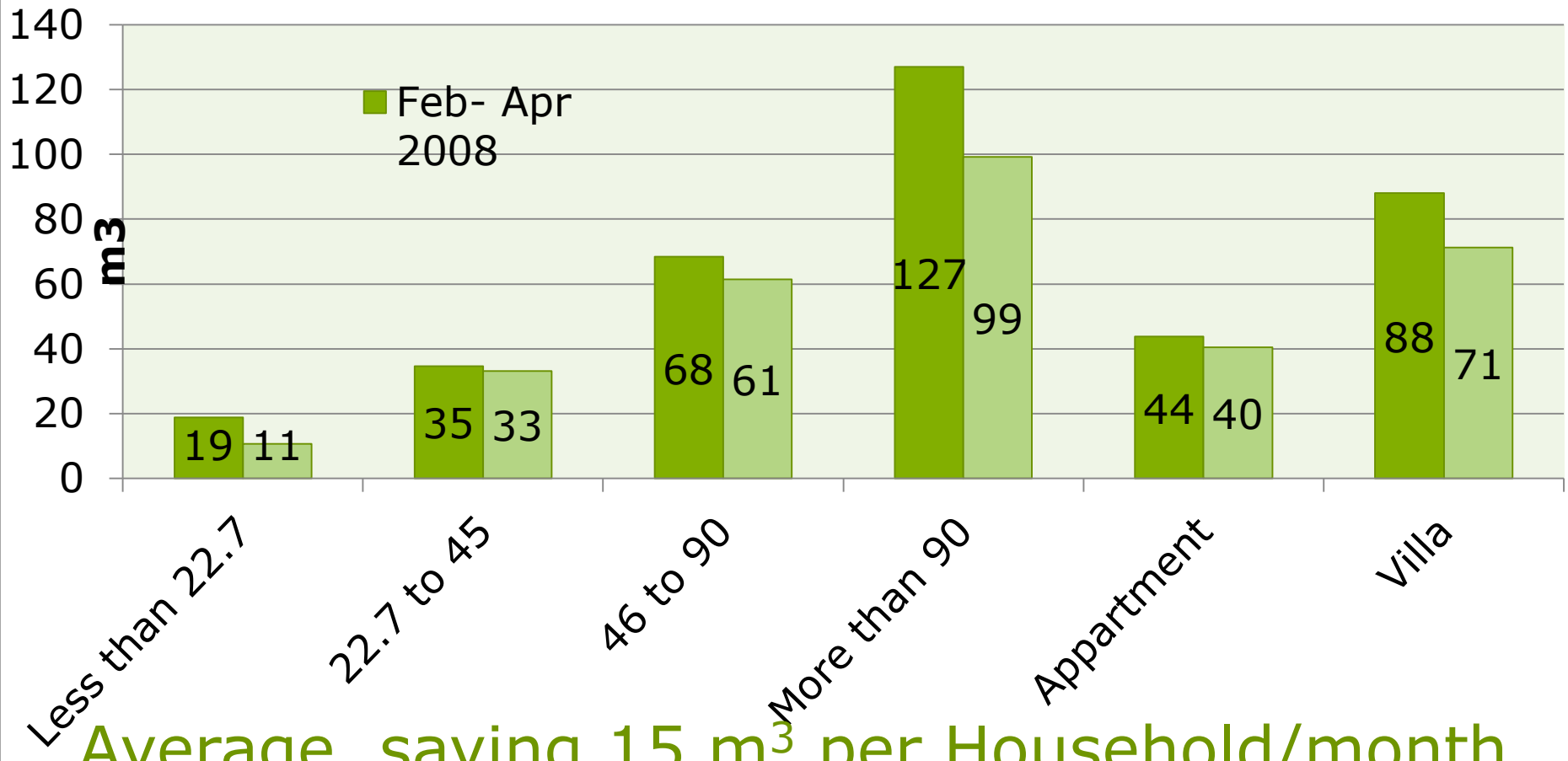
Charging households for treated wastewater reduces domestic water consumption:

Evidence from Muscat, Oman

2009 introducing Sewage charges, Rials 0.154 per m^3

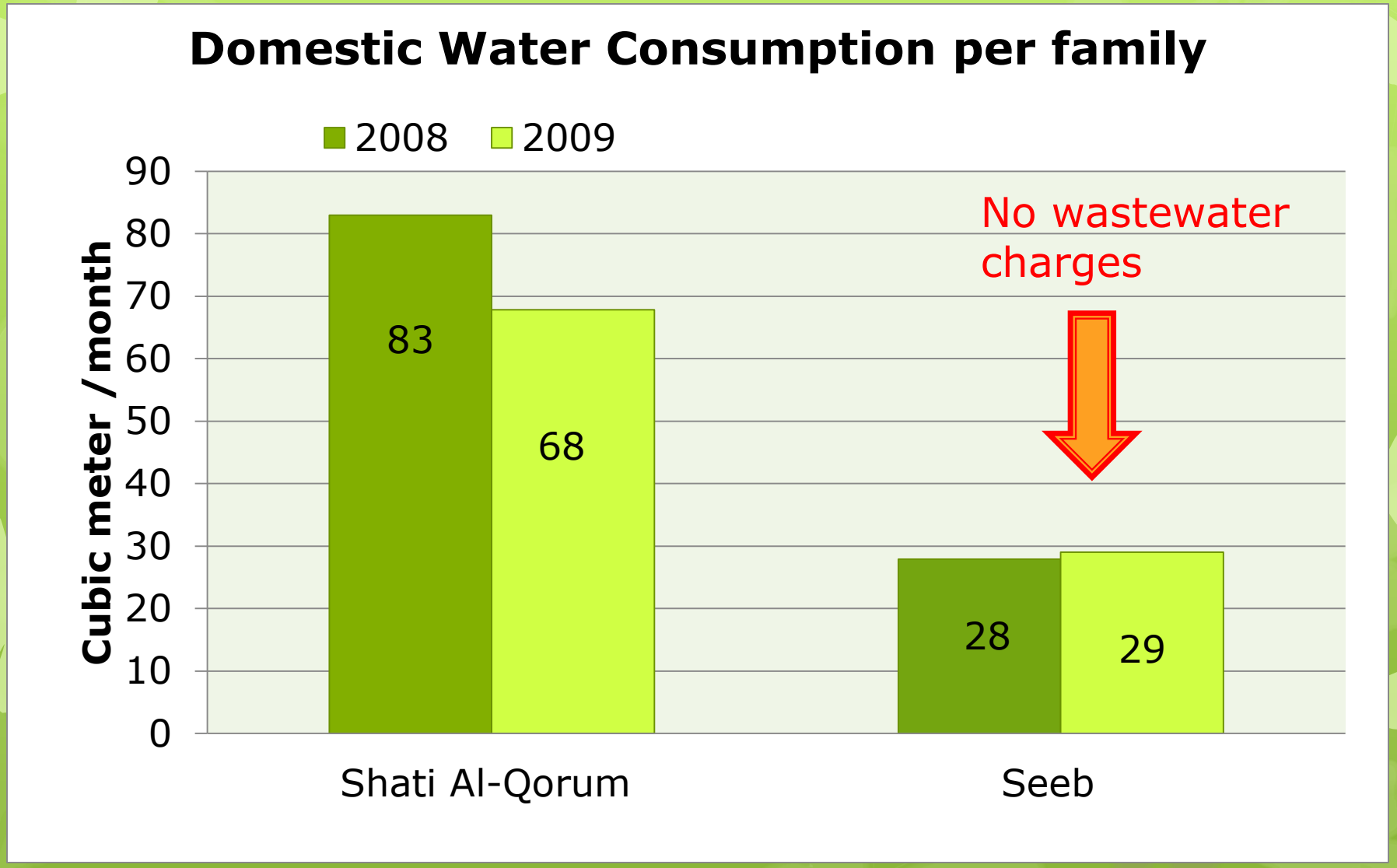
Monthly water Consumption in m^3 before (2008) and after inclusion of sewage charges (2009)

18% Decrease in volume of water demanded



Average saving 15 m^3 per Household/month

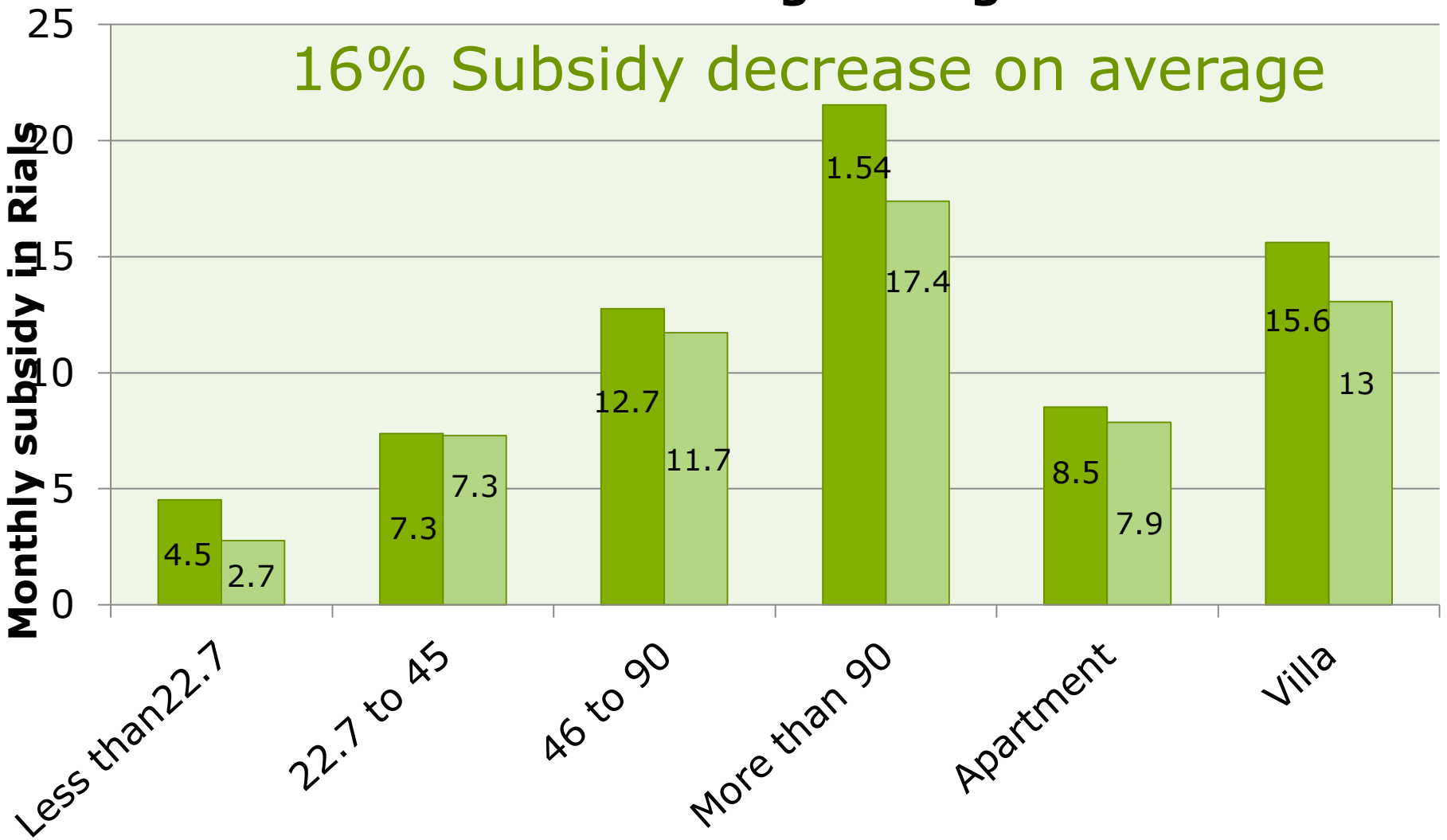
Price effect: …empirical evidence



Water price elasticity

- The price elasticity is the change in quantity demanded due a 1% change in price. It is negative.
- The average water price elasticity is **-0.58**
- An increase of water price of 10% results in a reduction in water use of 5.8%
- Most GCC countries have no estimation of the elasticity
- Planning is done without taking into consideration of water price/cost and income of households

Monthly subsidy in Rials before and after inclusion of sewage charges



2.3 RO/month less subsidy per household (US$6)

Water Bill in RO/month

Groups	Before 2008	After 2009	Difference in (R.O)	Difference in %
Low consumption group	8.6	6.4	-2.2	-26%
22.7 to 45	16.9	21.1	4.2	25%
46 to 90	35.1	40.8	5.7	16%
More than 90	67.3	67.4	0.1	0%
Apartment	22.1	26.6	4.5	20%
Villa	45	47.9	1.9	4%
Full sample	43.3	45.5	2.2	5%

Who Benefits the more from Subsidy?

- Fresh water Subsidy per family
  - Shati Al-Qorum (**wealthy**) = Omani Rials 20/month
  - Seeb (**low income**) = Rials 8/month
- Wastewater subsidy
  - Shati Al-Qorum (wealthy) = Rials 35/month
  - Seeb (low income) = Rials 11/month

- Subsidy (Cost to the government) per family per year
  - Wealth family= Rials 656 **(US$ 1,700)**
  - Low Income Family = Rials 231 **(US$ 600)**

Where to from here?

- Increasing domestic water prices is not as bad as thought of
  - Only the second block tariff should be increased to protect the low income class
  - An increase in salary is recommended to speed up reform, while increasing water price
- Price increase results in
  - Self-sustaining water utilities
  - Lower demand
  - Less pollution
  - More recycling
  - Less subsidy & more funds available to face future demand

Conclusions

- As currently designed the low water prices benefit the wealthy more than the poor
  - Subsidy should be targeted to low income groups exclusively
    - UAE is doing the opposite: Expatriates pay the highest price
  - Benefits the private companies producing desalinated water through higher demand
- Decrease in demand delays the need to build new desalination plants and allows servicing more households
- Subsidy reduction Rials US$ 600-1700/family/year
  - Finance new water projects
- Lower volumes of wastewater to be treated
- More recycling is expected as fresh water prices go up
- Lower Environmental impacts (brine, sludge…)
- **Tariff reform is more efficient than increasing supply or water saving awareness programs**

Groundwater monitoring & food Security

- "…Special attention is needed to the governance of groundwater"

6th World Water Forum. Theme 2.2. Contribute to Food Security by Optimal Use of Water. Jan (2012)

Excess water use is the prime cause of salinization of agricultural soils

In many areas water demand exceeds supply and this draws saline water into aquifers

Groundwater around the world
Study by NASA & US. Geological Survey (2012)

- Groundwater levels have dropped in many places across the globe over the past nine years
- Water has been disappearing beneath southern Argentina, western Australia and stretches of the United States.
  - The decline is especially pronounced in parts of California, India, the Middle East and China, where expanding agriculture has increased water demand.
- "Groundwater is being depleted at a rapid clip in virtually of all of the major aquifers in the world's arid and semiarid regions" says Jay Famiglietti, a hydrologist at the University of California
- In some areas, short-term climate variability may be to blame. But there's little doubt as to what's behind the biggest drops: **farming**.
- "People are **using groundwater faster than it can be naturally recharged**" says Matthew Rodell, a hydrologist at NASA
- "There are too many areas in the world where groundwater development far exceeds a sustainable level" says Konikowa hydrogeologist at the U.S. Geological Survey, "**Something will have to change**"
- Source: http://www.orsam.org.tr/tr/trUploads/OrtadoguBulteni/201212_orsamwater26december1january2012f.pdf

Allocation of Water Rights and Quotas

- World wide experiences included: raising farmers awareness, stakeholders' participation, introduction of modern irrigation technologies and remote sensing with very limited impact on groundwater depletion
- USA, Australia and Jordan introduced groundwater flow metering and allocated groundwater quotas to farmers
- Flow water metering is highly expensive in Oman Zekri (2008)
- Introduction of Smart Energy & Water Meters
  - Allocate GW quota and ensure sustainability of farming
    - Control/monitor GW pumping: Major goal
    - Increase productivity
    - Ensure sustainability

Introducing Cost-efficient Cheating-Proof Technology

Electricity Grid

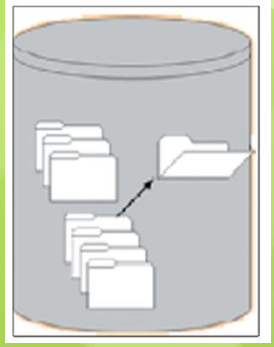
Smart Energy Water Meter

1

2

Data-base

MAF



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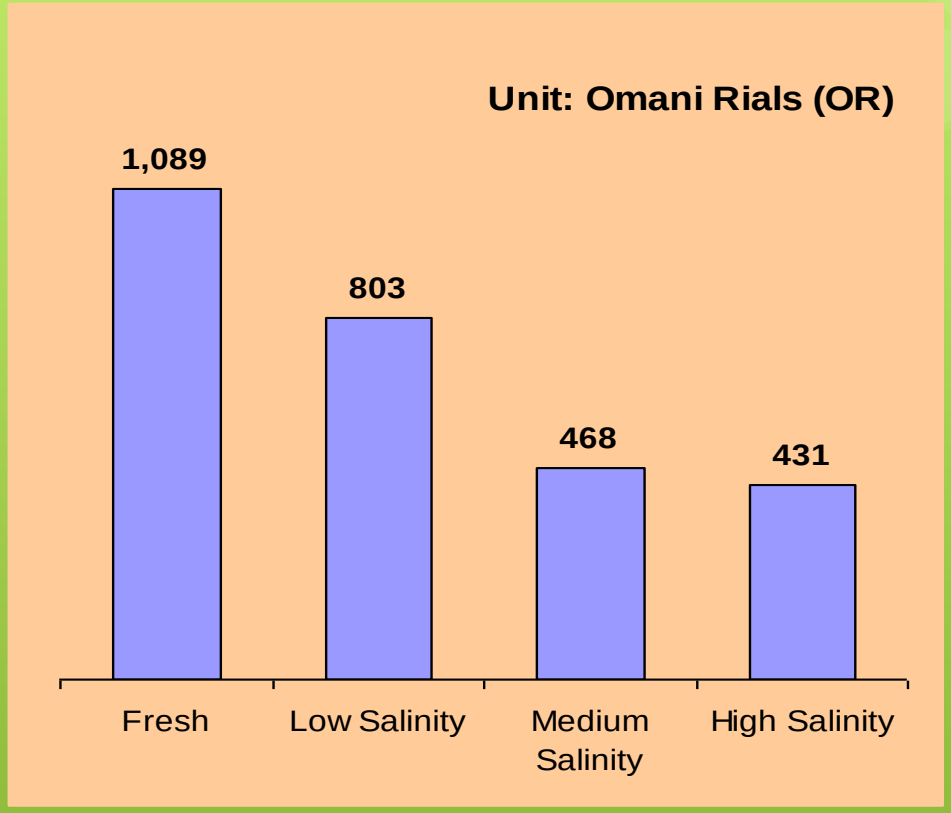
Well

Smart Electricity Water Meters

Farm size
Crop mix
Crop-water requirement
Water quota
Well depth
Pump HP

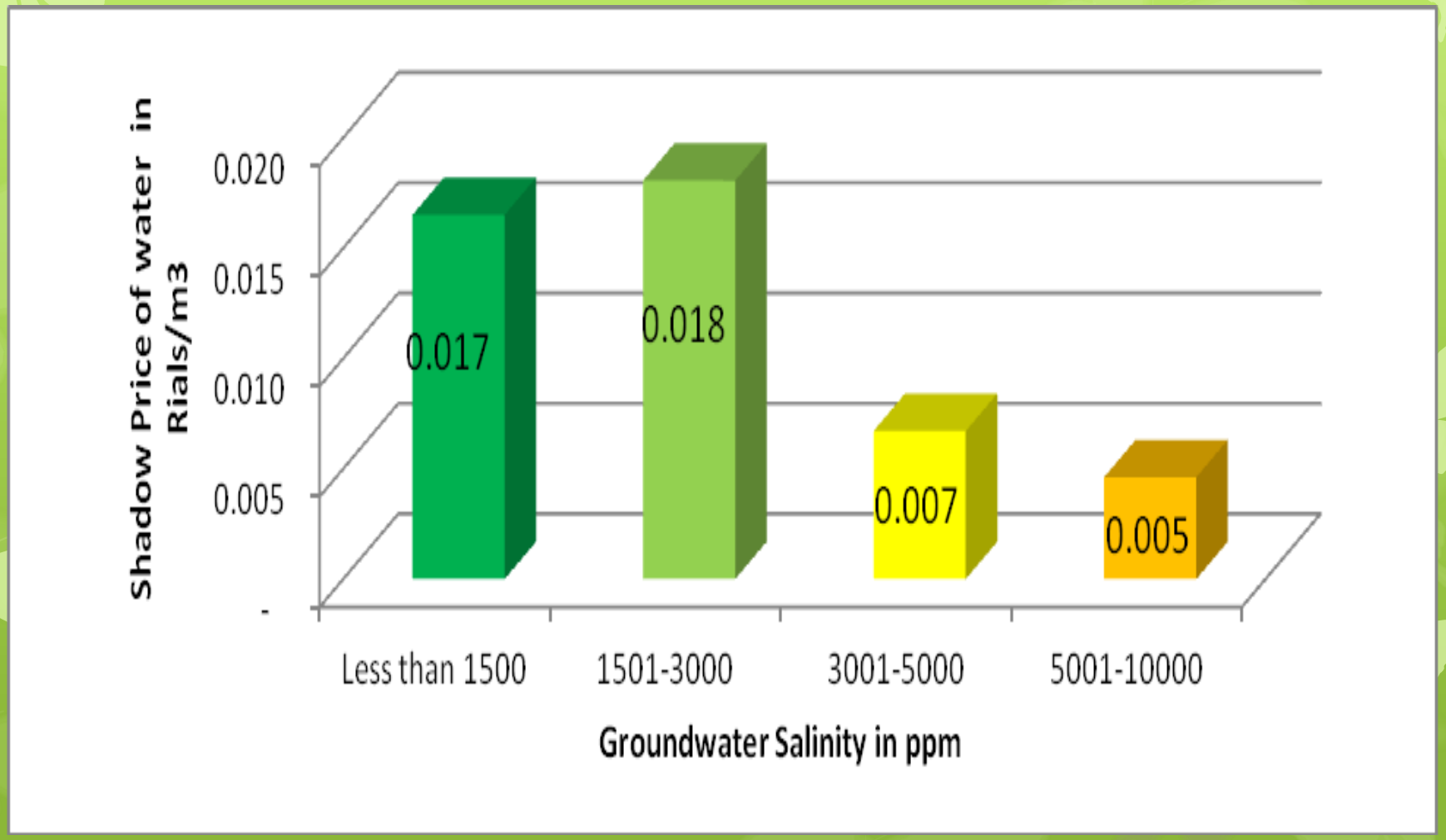
Figure 1: On-Line Quota monitoring

Salinity reduces farmer's profits

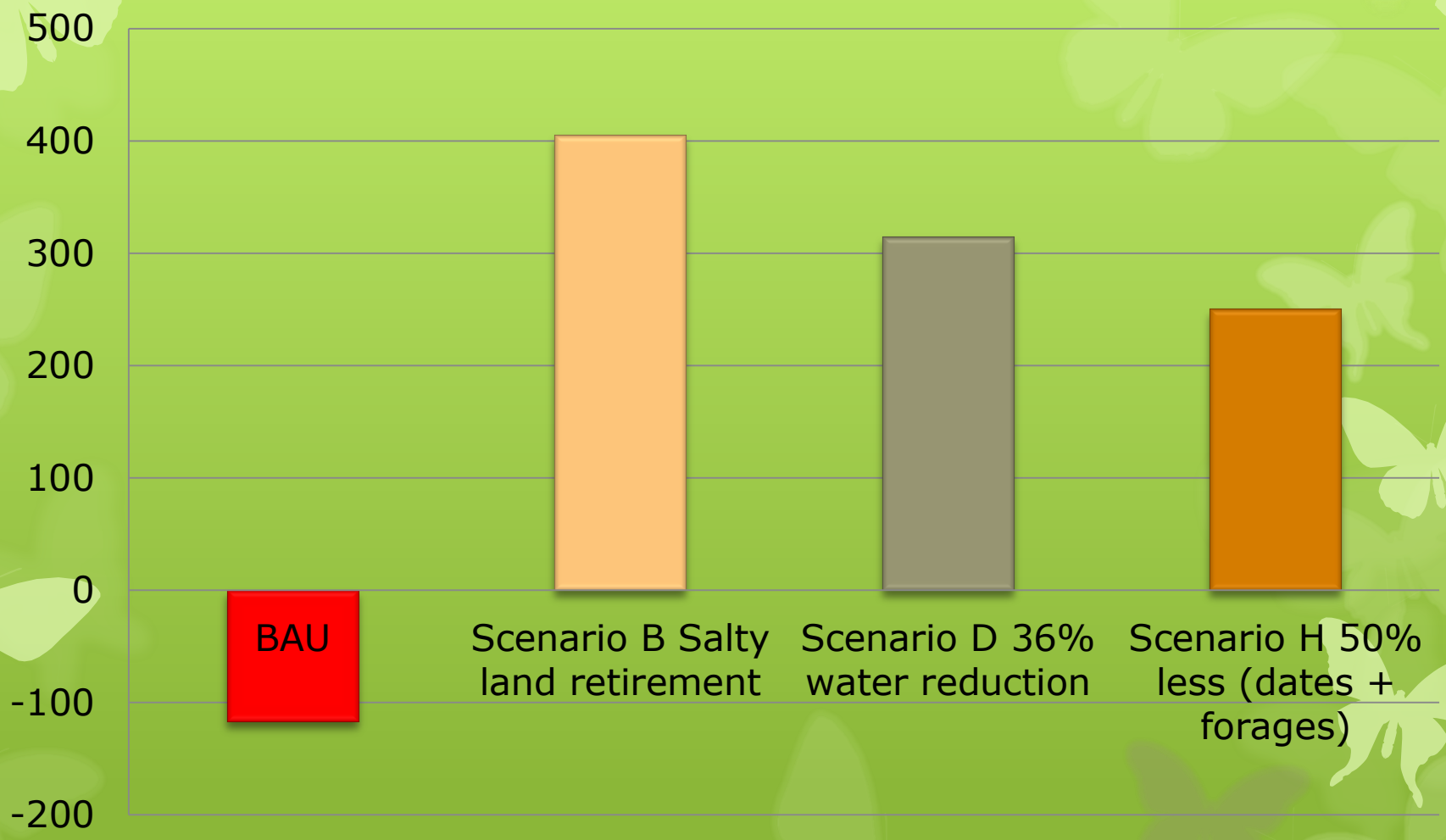


Farm Profitability Declines with Salinity OR/Feddan

Water Productivity and policy options



Net Present Value: efficiency vs equity



Conclusions

- Groundwater pumping control is
  - Possible
  - Cost effective
  - Easy to monitor
  - Profitable
  - Ensures sustainability
- But it requires
  - Farmers' involvement
  - Participatory approach
  - Political will
  - Government investment in Smart Electricity & water Meters


Water Food-nexus
Thank you

Higher price of water will

- Encourage recycling of treated wastewater, thus increase the supply
- will make large R&D investments in water technology profitable., thus increase efficiency

Impediments to recycling the TWW

- Legal
  - Water is private property by the treating company
  - Obligation to have an outlet to the sea!
- Price
  - Fresh water prices are lower than costs
    - Environmental costs not included in the desalination cost
  - Treated wastewater charges lower than costs
  -