Going Green: Alleviating Global Water Shortage

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INTRODUCTION

- Water scarcity is increasing with growing global populations
- The addition of green water to ecological flows is often overlooked
- Many areas benefit from including green water into their water budget
- To capture water, regions can also improve their green water technology
- Green water utilization is especially helpful in arid regions

DEFINITION

Virtual water **is** used for production and is comprised of white, green, blue and gray water

- **Green water** is the soil moisture from precipitation, used by plants via transpiration. It is part of the evapotranspiration flux in the hydrologic cycle
- **Blue water** is the freshwater: surface and groundwater. It is stored in lakes, streams, groundwater, glaciers and snow

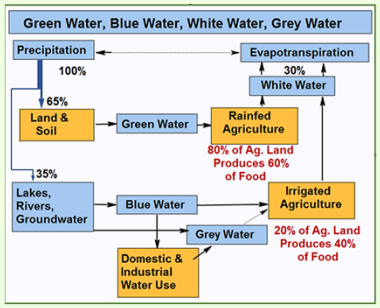

Figure 1. Virtual Water Cycle (Schreier, 2014)

IMPACTS

- Preserving blue water for ecosystem functions and vulnerable species
- Reducing water scarcity and resulting conflict
- Creating climate resiliency for vulnerable areas
- Decreasing the amount of blue water needed for agriculture
- Less infrastructure and resources are needed to distribute green water, creating economic savings

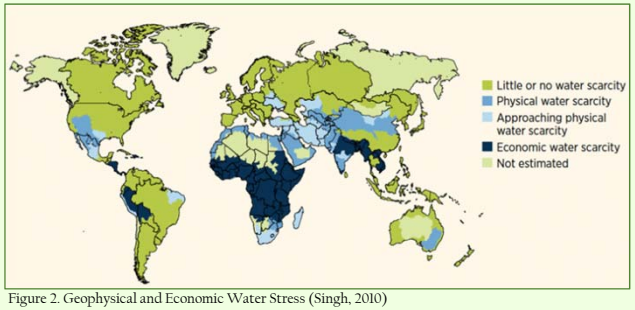

Figure 2. Geophysical and Economic Water Stress (Singh, 2010)

TECHNOLOGY

- Constructing storage reservoirs to accumulate and store rainwater
- Small scale rainwater harvesting technologies: green rooftops, porous pavements, green lands, dry system, wet system
- Irrigation methods: sewage irrigation, impulse sprinkling, subsurface watering, low-capacity irrigation (drip, mist and combined)
- Conservation practices : mulching, low tillage, zai pits, ripper furrows, perimeter runoff control
- Crop selection: low-water crops, date of sowing
- Conservation agriculture and the direct rice sowing (DRS) technology (Akhter, 2016)
  - The rice is sown in dry soil

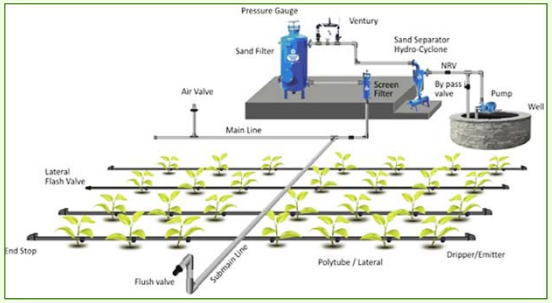

Figure 3. Drip Irrigation System (Asia Farming, 2018)

MAGNITUDE

- Middle East and North Africa are the most water stressed regions
  - >50% consumptive use of blue water for agriculture (Hoff, 2010)
  - Blue models: most African countries in intermediate (below 1300 m³/capita) to high (below 1000m³/capita) water shortage by 2025 (Falkenmark, 1989)
  - Blue-green models: most African countries above the 1300 m³/capita threshold by 2050 (Rockstrom, 2009)
- Rainwater harvesting for irrigation: 15-25% increase in potential global food production (Hoff, 2010)
- Vapor shifts: 6% potential increase in global food production (Hoff, 2010)

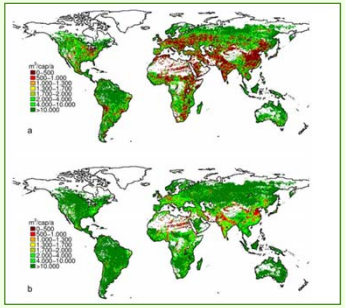

Figure 4. a) Water availability accounting for blue water only b) Water availability accounting for blue and green water (Rockstrom, 2009)

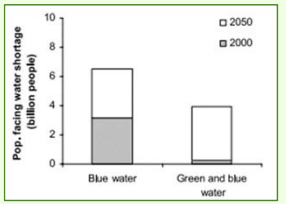

Figure 5. Population facing water shortage when considering models of blue water sources vs green and blue sources in 2000 and 2050 (Rockstrom, 2009)

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