GLOBAL TRENDS IN IRRIGATION

Challenges of Water Management due to Climate Change

Farminar 2: Precíziós gazdálkodás Magyarországon

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Climate related risks to water resources and potential adaptation actions

PRIMARY Climate Risks	Knowledge	Governance (policies and institutions)	Infrastructure	Planning/ management	Communications / Education / Participation
a) Changes in Precipitation	Research; weather monitoring	Coordination between meteorological, water and agriculture agencies	**Dams, Reservoirs; inter-basin transfers; groundwater recharge (including artificial options)**	**Flexible irrigation management systems**; inter-sector responses to assist adaptation	Water User Associations (WUAs) and **Farmer Organizations (FOs)** involvement; Capacity development; Communication to farmers and other stakeholders
b) Sea-level rise					
c) Temperature extremes	Research; monitoring	Coordination between water, energy and productive sectors	Soil and water conservation; **improved water supply infrastructure**	Mapping trends and designing for peak demands	Prevention of risk through public information and information sharing

Source: adapted from *Rafik Hirji, Alan Nicol, and Richard Davis. 2017. South Asia Climate Change Risks in Water Management. Washington, DC:* ***World Bank****. Colombo, Sri Lanka:* ***International Water Management Institute (IWMI)****.*

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SECONDARY Climate Risks	Knowledge	Governance (policies and institutions)	Infrastructure	Planning/ management	Communications / Education / Participation
a) Floods	Monitoring and early warning systems	Coordination (interagency, government- public)	Embankments; Dams; retention areas	Flood management plans; restrict development on floodplains; flood mapping	Public awareness of flood risk areas; capacity strengthening
b) Droughts	Weather prediction & early warning Communication; Research; monitoring	Allocation priorities & planning; **Coord. Beetw. Ag/Power/ W Resources/W Supply**	**Dams, reservoirs; inter-basin transf.; groundwater development**	Water allocation plans; Conjunctive use; demand management (pricing, efficiency); **irrigation management**; urban w management; recycl. & reuse	Involvement and sharing **local solutions;** capacity development
c) Reduction in groundwater recharge	Monit.; Aquifer charecterization; database dev.	Coord. Beetw. Ag/ domestic/industrial W use/W Resources; public ownership of gr. W	**Check dams; Recharge ponds; managed aquifer recharge development**	Groundwater use plans; control over groundwater use; artificial recharge; conjunctive use	Awareness of groundwater limitations; Capacity dev.
d) Incr. erosion, landslides and sedimentation	Research: soil management & protection; early warning syst.em	**Coordination between land, water, energy and other agencies**	Sedimentation dams	**Land management**; riparian management; soil conservation	Awareness of soil loss; participation and **local solutions**
e) Reduced water quality (surface and groundwater)	Monitoring; Research into water quality treatment	Coordination between water, energy and productive sectors	Soil and water conservation; improved water supply infrastr.	Mapping trends and designing for peak demands	Prevention of risk through public information and inf. sharing

Water Scarcity

- Water scarcity is the lack of sufficient available water resources to meet water needs within a region (Wikipedia).
- Effects every continent
- 2.8 billion people around the world at least one month out of every year
- More than 1.2 billion people lack access to clean drinking water
- Agriculture accounts for 70% of global freshwater withdrawals
- Agriculture accounts for about 90% of global consumptive use
- Agriculture is constantly competing for a scarce water supply
- Need effective methods of water management
- By 2050 - 1 billion more metric tons of cereal

Options (FAO)

Reduce water losses

Increase water productivity

Water re-allocation

Image courtesy of IWA

Precision Irrigation

- Precision agriculture
  - Effectively manage on an area, square meter - ha level
- **Precision irrigation**
  - **Precisely irrigate individual plants**
- Two categories
  - Equipment to gather environmental, soils, or weather data
  - Equipment used to automatically control the irrigation system

Image courtesy of Lockheed Martin

Image courtesy of University of Minnesota

Precision Irrigation

- No commonly accepted definition
  - Drip irrigation
  - Irrigation scheduling based on collected data

Image courtesy of Wikipedia

Surface Irrigation Improvements

- Surface irrigation has the reputation for low irrigation efficiencies
- Can have high efficiencies
  - Design
  - Management
- Some poor efficiencies are from poor operating decisions
- Simple operations that are less subject to error
- Training is important
- Low surface irrigation efficiencies are not always bad
- If return flow is reusable downstream, low efficiencies have little impact on water supplies
- May be an economic choice

Image courtesy of USDA

Irrigation typologies (FAO)

- large-scale public irrigation systems in dry areas.
- large-scale public paddy irrigation systems in humid areas.
- **small- to medium-scale community-managed (<u>and-built</u>) systems**.
- Commercial privately managed systems, producing for local and export markets

Are all types of irrigated areas included in the statistics?

Some *(guesstimated)* numbers

- Nigeria – 75% of irrigated area under small private irrigation; Niger – 55%; Kenya - 15%
- Tanzania 600,000 farmers involved

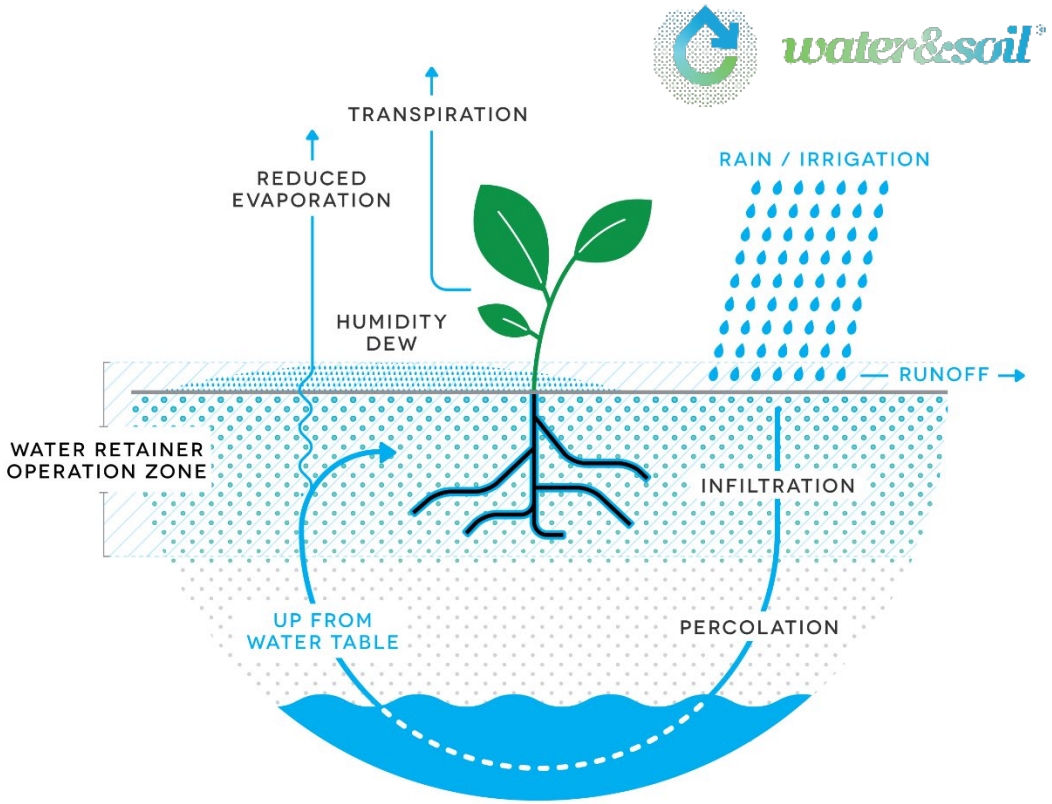
Comparison of Ghana's Formal and Smallholder Irrigation Sectors

Type – technology	No. of farmers	Area under irrigation	Investment costs USD per ha	Main crop
Public irrigation schemes	11,000	7,185 ha	10,000 – 15,000	Rice
Small reservoirs	25,000	6,000 ha	6,000 – 15,000	Rice/vegetables
Motorized pumps	160,000	120,000 ha	500-1000	Vegetables
Buckets, watering cans	335,000	66,000 ha	<25	Vegetables
Treadle pumps	< 100	< 20 ha	500	Vegetables

Innovative Solutions - Reducing Evaporation

Options (FAO)

- **Reduce water losses**
- **Increase water productivity**
- **Water re-allocation**



WATER RETAINER

- is a water soluble liquid, which we spray onto the surface of the soil;
- locks to the soil particles and the roots as well;
- is organic based and degrades without any remedies within three months;
- can be used with repeated treatment;
- allows rain and irrigation water infiltration into water table;
- reduces evaporation losses by keeping upcoming moisture around roots' level. It also takes humidity from the air to the soil;

TAKAWAY MESSAGES

- **Great Challenges**
  - Primary Climate Risks
  - Secondary Climate Risks
- **Adaptation Required**
- **Climate resilient measures**

- **Small scale LOCAL measures are possible**
- **Water harvesting**
- **Local storage facilities**
  - rainwater infiltration into the soil
  - water-storing greenhouse roofs
- **Innovative solutions, etc.**

THANK YOU FOR YOUR ATTENTION!

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