Feeding hungry and thirsty soils increases yield and protects the environment: some results of WFD experiments in LIVES

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IRRIGATION IN ETHIOPIA

- Fast development
- On-farm water management:
  - Individual farmers = f(depends on water lifting & labor)
  - Schemes = f(irrigation interval, gravity/pumping, WUA)
- Consequences:
  - Over-irrigation in schemes has led to periodic water scarcity issues in large schemes
  - Low yield and water productivity
  - Fertilizer leaching and increased groundwater tables

The graph shows the yield response of crops to water availability. High yielding varieties produce more than rainfed varieties only when provided with adequate amount of water.

Source: Smith et al., 2001

Simple technical advisory units on water application to high value crops will lead to a reduction in water demand
WETTING FRONT DETECTORS

- A mechanical device to monitor the wetting front
- 2004©CSIRO (http://www.agriplas.co.za/)
- Installation depth depends on the application, soil & crop type
STUDY SITES, CROPS & MANAGEMENT

• Water lifting and irrigation:
  – Motorized lifting & furrow
  – Gravitational & furrow

• Crops:
  – Onion, tomato, cabbage, green pepper
  – Wheat, Potato

• Measurements:
  – Irrigation quantity
  – Crop performance & yield
  – Soil moisture and management
Installation at the same depth:

⇒ Effect depends on:
- Water availability
- Length of furrow
- Method of irrigation (1, 2, 3 furrows at a time)
- Soil type
- Land size/experience?
• Farmers practice (FP) used 12% > WFD and 50% > CWR
• Yield FP < 15% for WFD and 24% for CWR
• Fuel saving between 50 -150$/ha
• Motorized pump in SSA could benefit 185 million people; 29,661 thousand ha generating revenues of US$22 billion a year across the continent BUT needs CLIMATE SMART MANAGEMENT:
  ✓ US $1.5 to 4.4 billion saving of fuel
  ✓ 3 – 29 billion m³/yr water saved

⇒ Farmers preferred the CWR and WFD yield as fruits were bigger and fields had a higher marketable yield
Simple technical advisory on water application will lead to a reduction in water demand and efficient use of inputs

- Similar effect of WFD as for motorized lifting
- Water management improves yield by 7%
- Reduction of fertilizer: 20% N and 50% P
- 1,153 USD/ha profit (90% water, 10 % fert.)

Onion

OPTIMIZING RESOURCES BEYOND WATER

Irrigation water productivity (kg m⁻³)

Yield ( t ha⁻¹)

y = 0.095x; R² = 0.83
y = 0.093x; R² = 0.82
y = 0.081x; R² = 0.88
y = 0.080x; R² = 0.86
Experiment was repeated using full farmer fields with WUA (1 WFD for 0.5 ha)

Three blocks: Chihona, Tagel, Adibera

Is water saving achieved?

Does it impact yield?

Can land be increased?
When WUA distribute the information and manage water accordingly

=> increased irrigable land by 37% (onion) & 85% (potato)
CONCLUSION AND FURTHER OUTLOOK

• The **impact on water and crop** productivity depends strongly on water lifting technology and management.

• **Impact goes beyond** the hypothesis- reduction in costs through reduced fertilizer; positive impact on quality of produce (bigger and better); compliments existing indigenous knowledge.

• Efficiency gains in both water and fertilizer **contribute** to move towards **sustainability** (reducing water demand, reduction in loss of nutrients etc.) and meeting the **SDG on water** (e.g 6.4).

• Influences farmers’ thinking about water use to **compliment their existing indigenous** skills (build trust in research for development) => well liked by farmers.

• **Interest by National key stakeholders** to conduct National Research on irrigation scheduling using WFD.
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