Adapting agriculture to increasing water scarcity in the dry environments

Theib Oweis
Director, Integrated water and Land Management Program, ICARDA, Aleppo, Syria

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ICARDA

Water scarcity intensifying

- 1/3 of the world's population live in water scarce areas
- Many countries with chronic water scarcity
- Water for agriculture in dry areas is declining
- Climate change adds to the problems
- Energy competes
- Consequences

FOUNDED BY QUAID-I-AZAM MOHAMMAD ALI JINNAH
DAWN
LIX No. 159 Islamabad, Jumadi-ul-Awwal 4, 1426 Sunday, June 12, 2005 66 PAG

He said the CDD wa

Hunger strike against irrigation officials

KHAIRPUR, June 11: Growers of Bhindi Motayo, Sobhodero taluka, held a protest demonstration in Agra and observed a token hunger strike against irrigation officials of the Gambat sub-division.

They accused the officials of creating shortage of water in the Setharja Minor.

They demanded that growers should be provided with their water share.

ACCIDENT: Four passengers were injured in a collision between a wagon and a truck on the National Highway the near Qazi Khoo stop.—**Correspondent**

New water … limited !!!!

- Surface, mostly tapped
- Ground, over exploited
- Marginal-quality, small amounts, environment, health
- Desalination, costly, environment, transport
- Water transfer, cost and politics

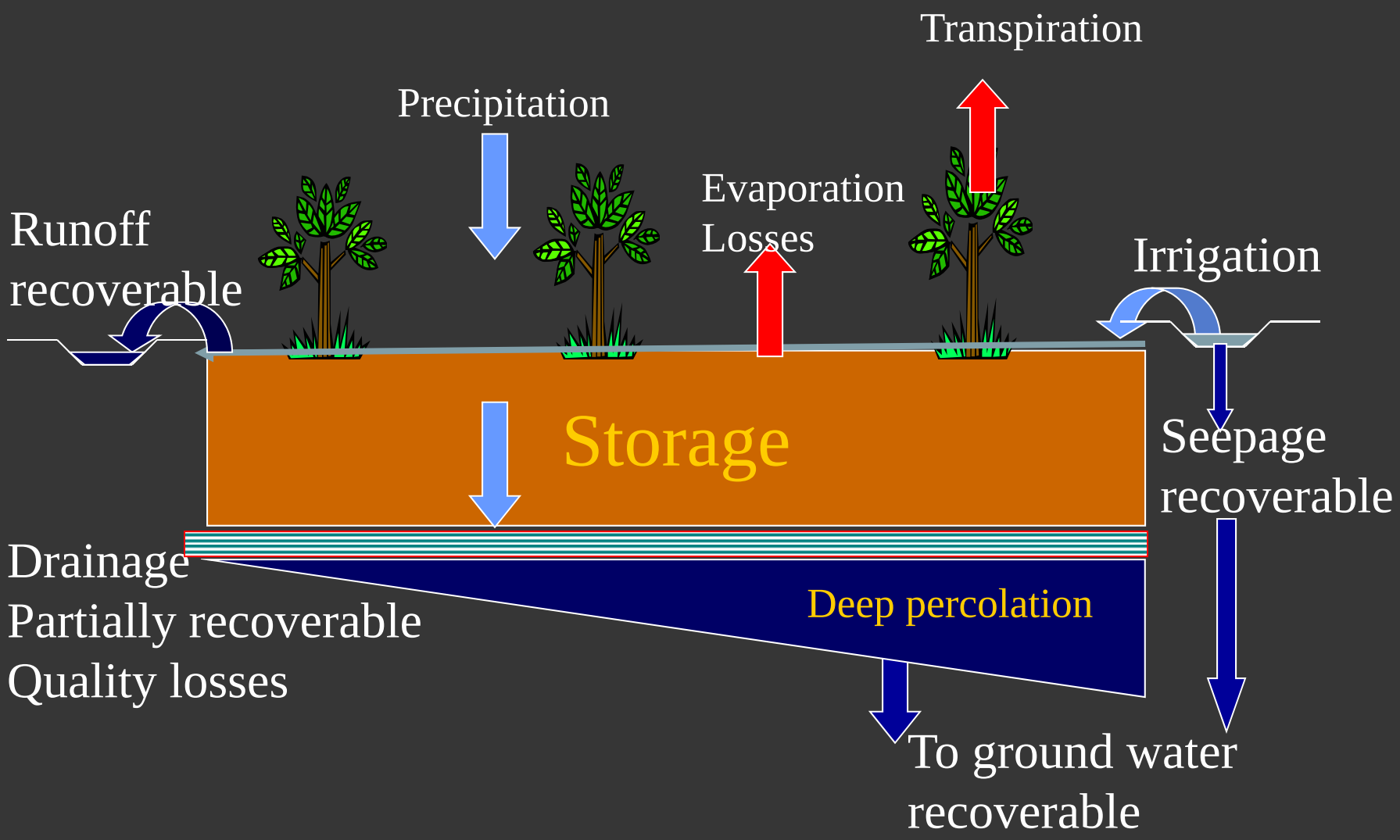
Managing with less water

Increasing Efficiency / productivity

Conventional strategies

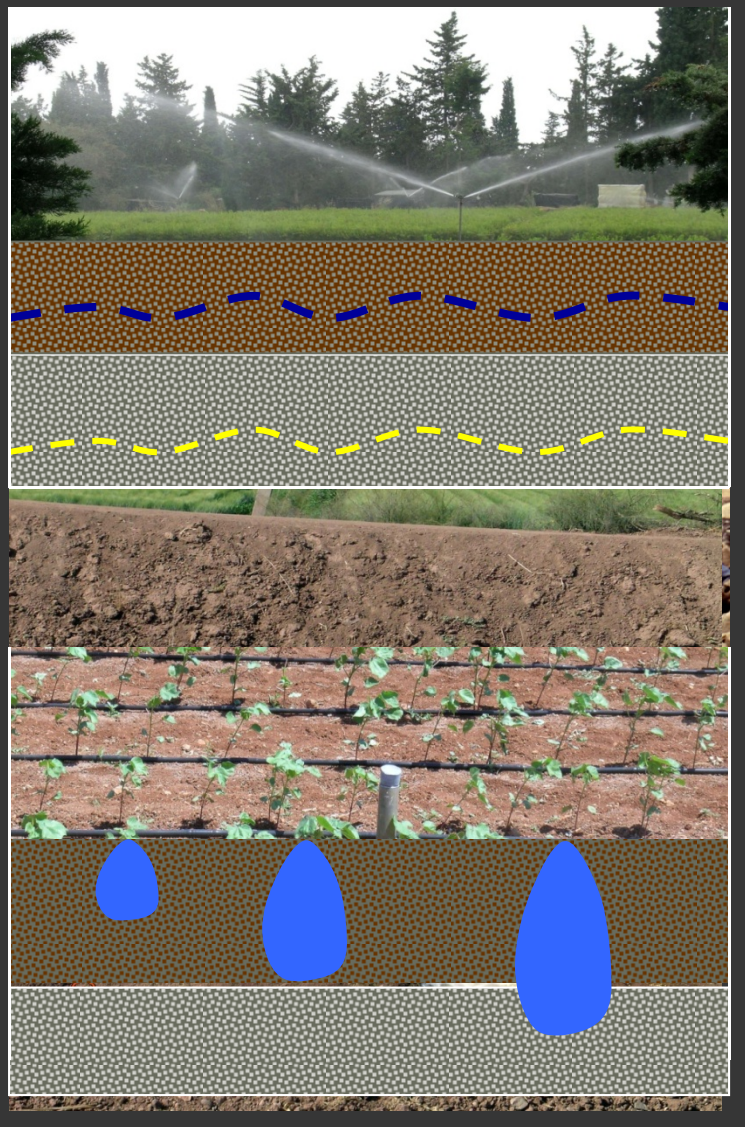
- Increasing yields
- Improving irrigation efficiency
- Modernizing irrigation systems
- Demand management / pricing water

Real vs paper losses



Irrigation efficiencies; not enough

- Irrigation system performance
- Ignore recoverable losses
- Does not reflect productivity
- Investment should target real losses



Modernizing irrigation: water savings !

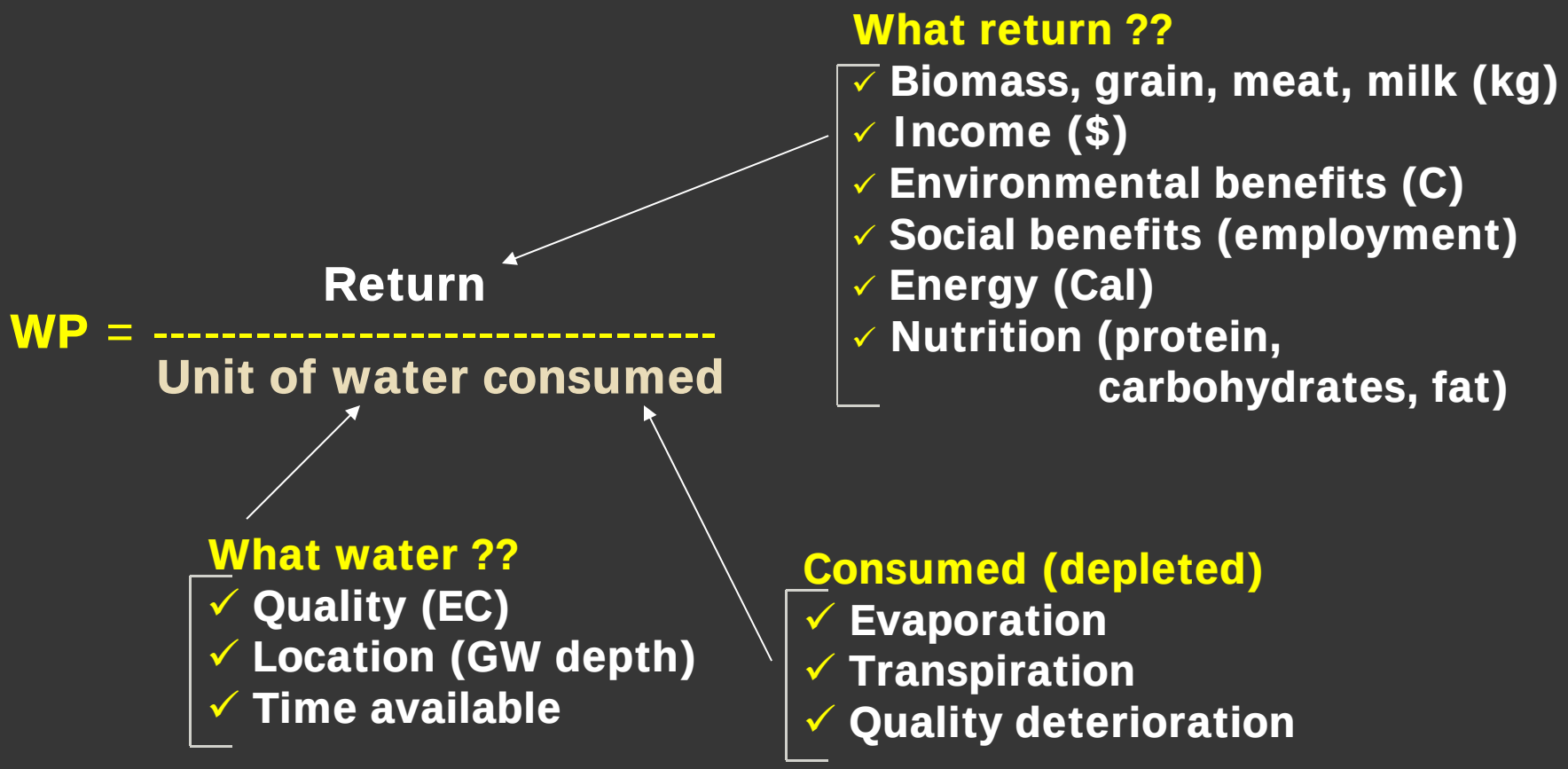
- Does irrigation modernization save water ?
  - YES
- Does increasing Irrigation Efficiency from 50% to 80% save 30% water?
  - NO
- How much real saving? Depends on local conditions
- Is it worth the cost? Not necessarily

Modern systems: productivity

- Higher productivity is not only associated with water savings. Drip irrigation does:
  - Provide better soil water due to frequent irrigation
  - Fertigation more frequent and uniform
  - Weed control
- The cost:
  - Investment, Maintenance, Skill
  - Salt accumulation needs periodical flushing
- Modernizing surface irrigation, ignored option

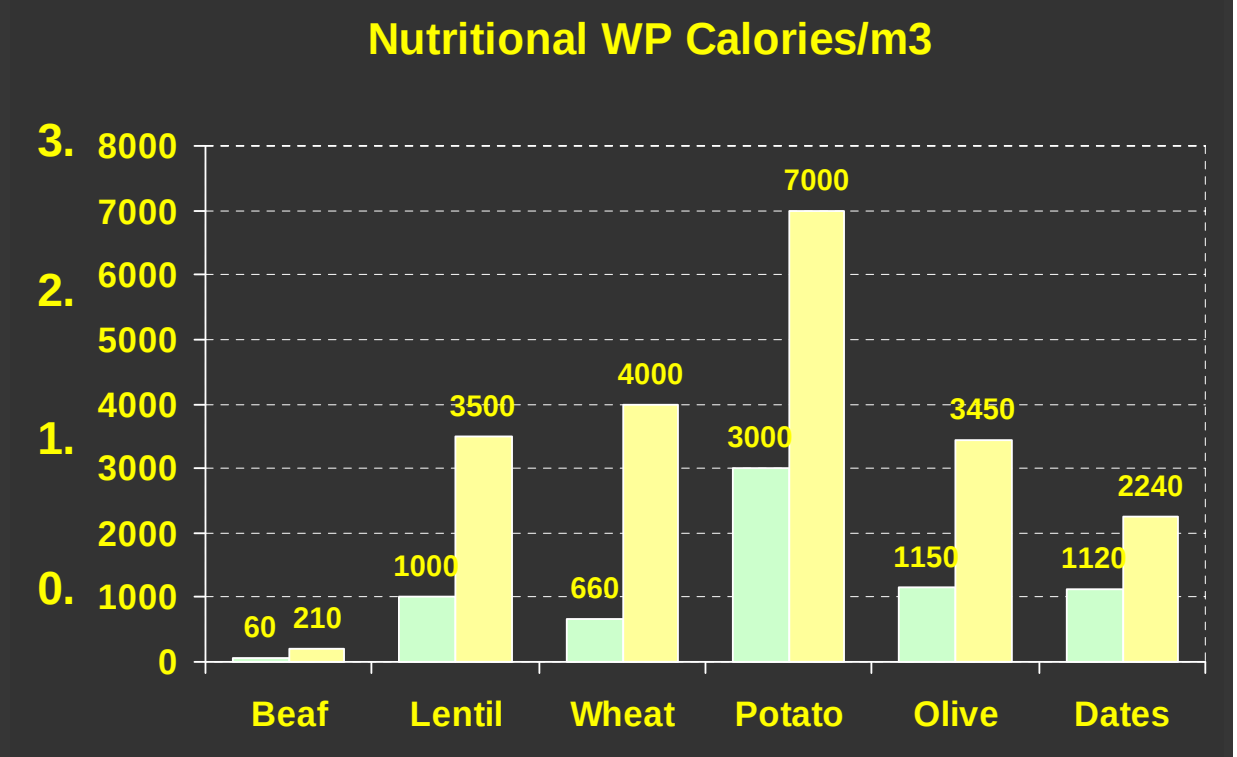
from
efficiency
to
productivity

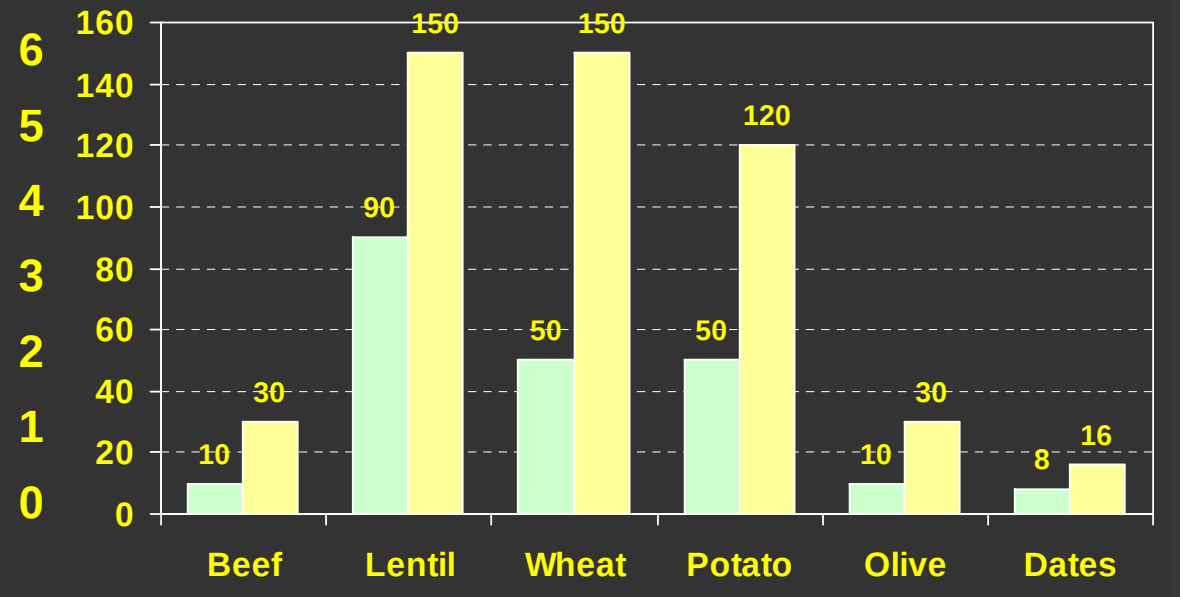
Water productivity: a broader framework



Comprehensive assessment of water management in agriculture

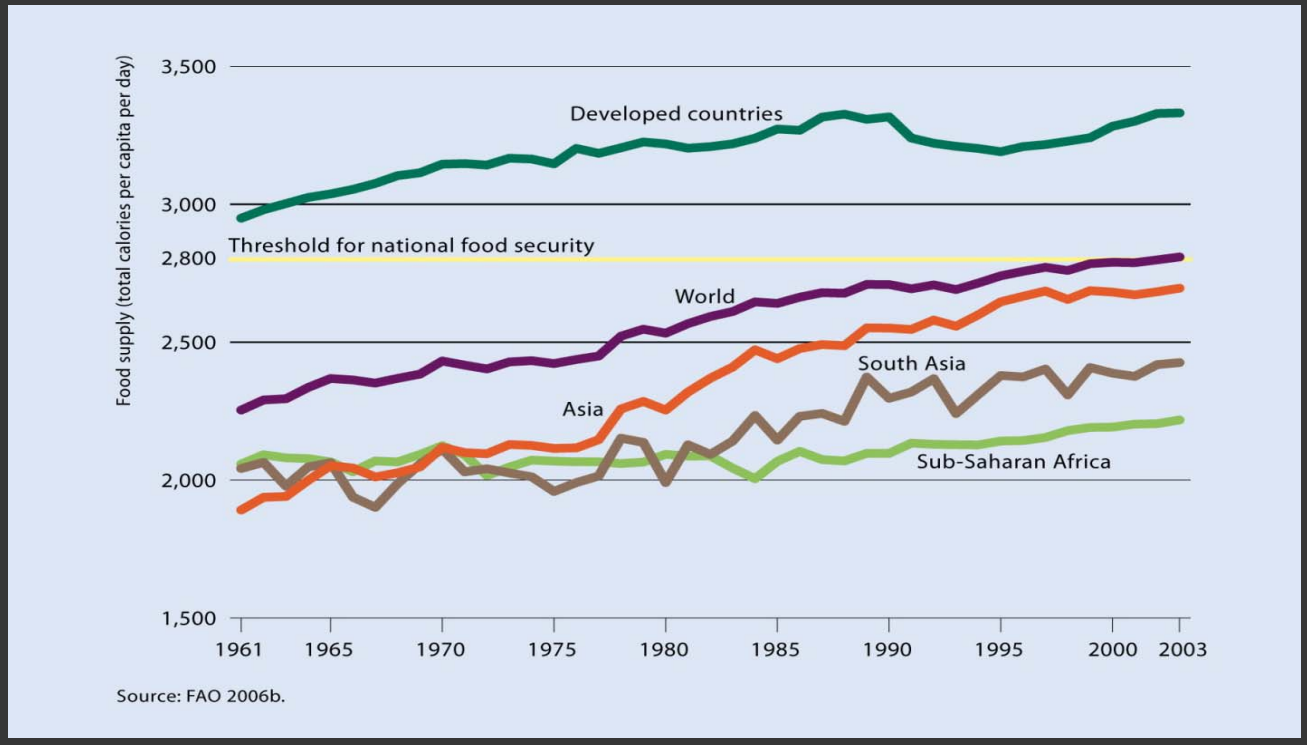
Potential water productivity improvement





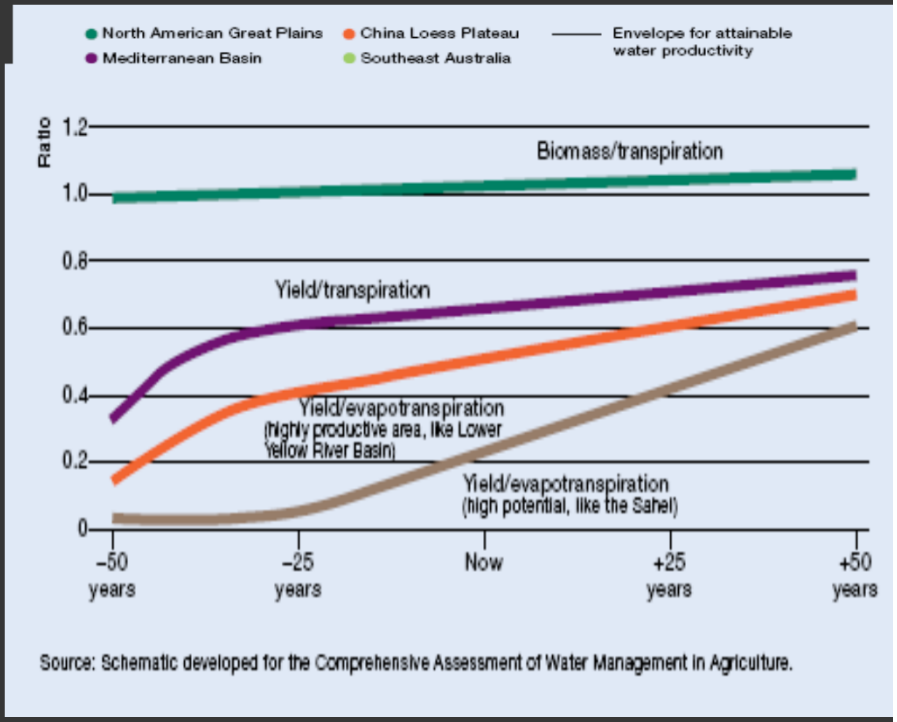
More food with less water

It takes a litre of water to produce every calorie, on average



Potential WP improvements

- Reducing evaporation
- Improving management
- Enhancing genetic resources
- Great potential in developing countries



Source: Schematic developed for the Comprehensive Assessment of Water Management in Agriculture.

Scales and drivers to increase WP

- At the basin level:
  - ✓ competition among uses (Env., Ag., Dom.)
  - ✓ conflicts between countries
  - ✓ Equity issues
- At the national level:
  - ✓ food security
  - ✓ hard currency
  - ✓ sociopolitics
- At the farm level:
  - ✓ maximizing economic return
  - ✓ Nutrition in subsistence farming
- At the field level:
  - ✓ maximizing biological output

Major agroecosystems

Irrigated systems

Low WP
Salinization
Marginal water

Rainfed systems

Improve WP
Sustainable use of marginal water

Rangelands systems

300-500mm annual
100 – 300 annual

Low and erratic rainwater

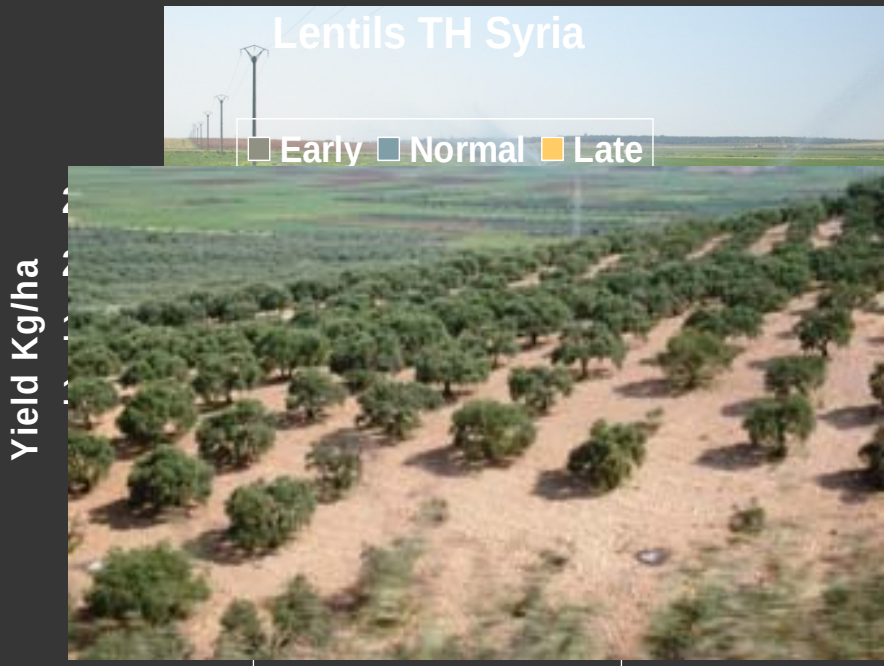
Degraded rangelands
Desertification

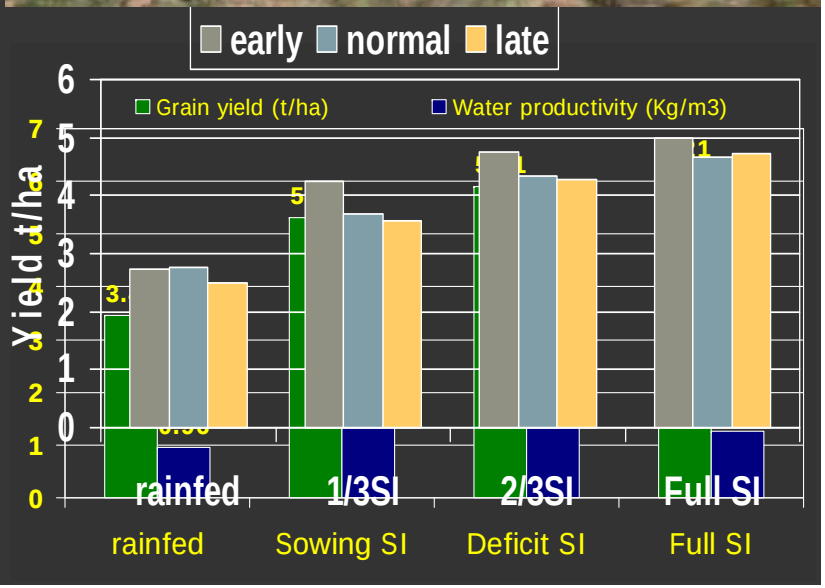
Dry spells
Low yields
Rainwater mostly lost in evaporation
GW depletion

Water harvesting
Supplemental irrigation

Rainfed agroecosystem

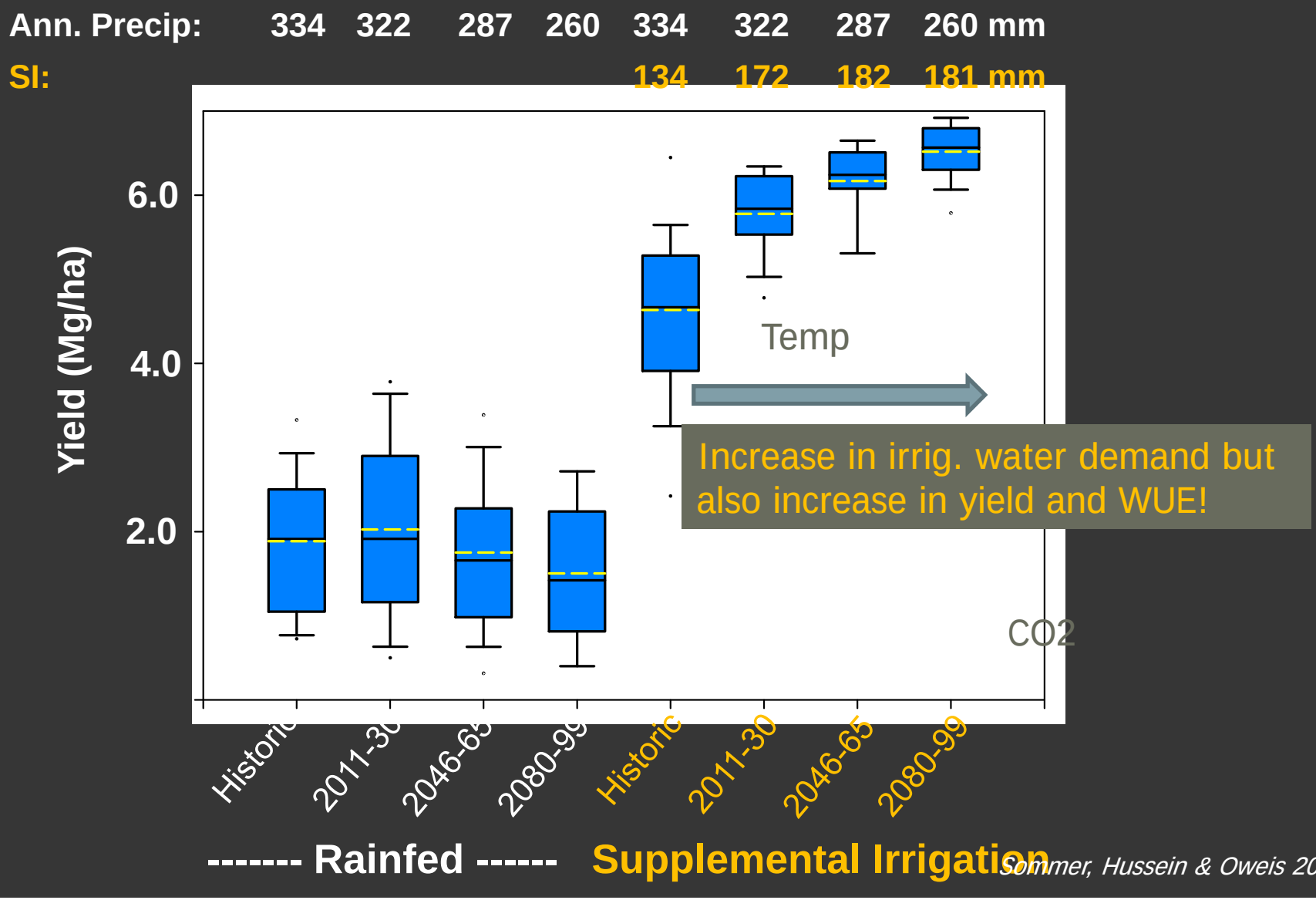
- Supplemental irrigation
  - Cereals
  - legumes
  - Early sowing
  - Orchards





CC alleviation potential of supplemental irrigation

Crop yield based on GCM *IPSL-CM4:*



Sommer, Hussein & Oweis 2011

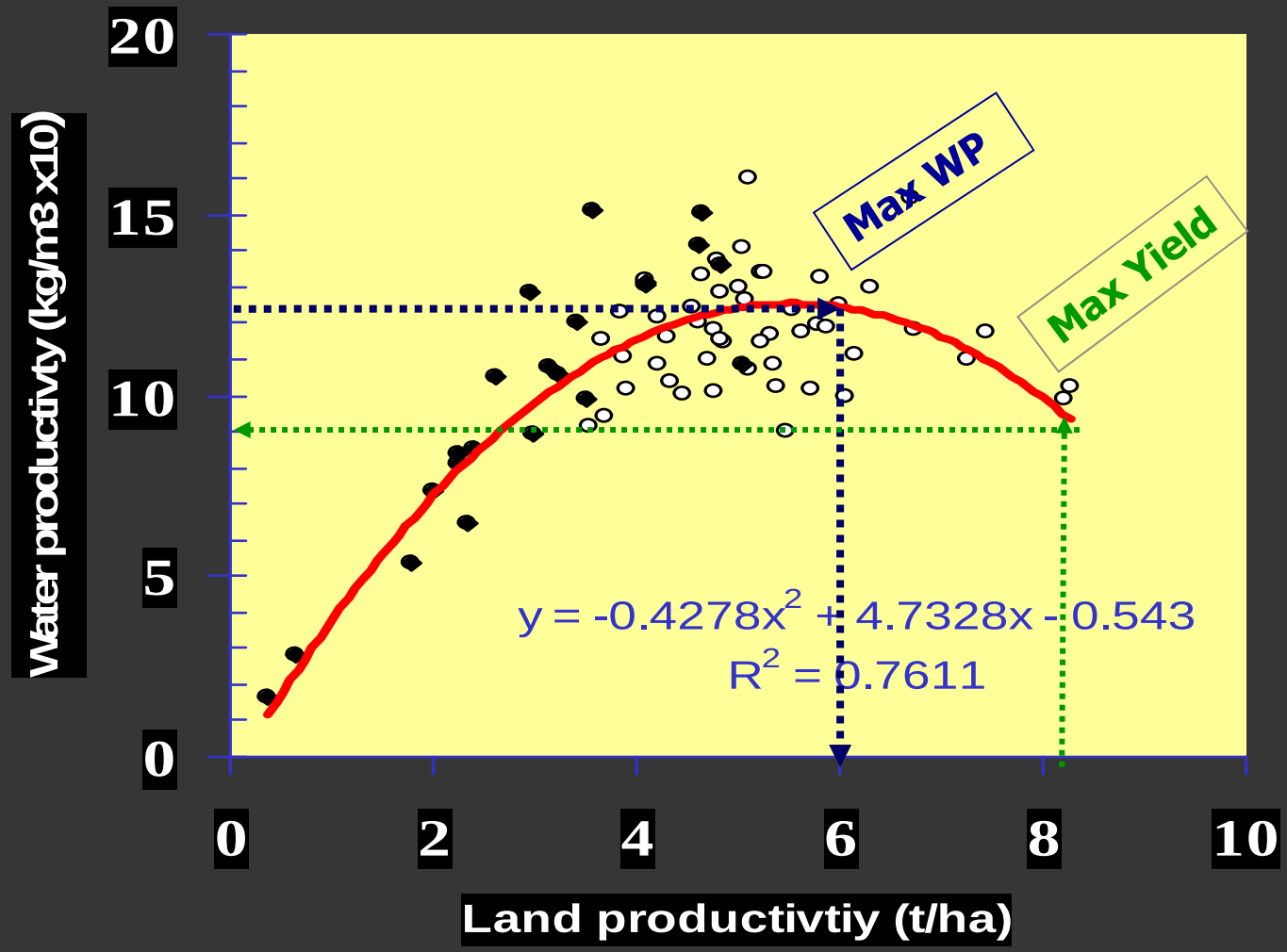
Rangelands (badia) agroecosystem

- WH technologies integrated
- Mechanization, laser guide contouring, direct seedling planting
- Soil and water conservation
- Grazing management
- Increase rainwater productivity
- Combating desertification

Irrigated agroecosystem

- Increasing water productivity
  - Improving surface irrigation
  - Deficit irrigation
  - Modifying cropping patterns
  - Cultural practices
- Management of marginal water and soil
  - Reuse of Treated Wastewater
  - Reuse of drainage water

Tradeoffs between water & land productivity



Adaptation needs change

- Land use / cropping patterns
- Guidelines for irrigation
- Water allocation to more water-efficient practices
- Water-use efficient germplasm
- Water valuation–sociopolitical issues
- Utilization of marginal-quality water
- Policies from reactive to proactive

It is a prime time for change !!!!

Thank you