

APPROACHES FOR IMPROVING WATER PRODUCTIVITY TOWARDS GLOBAL FOOD SECURITY

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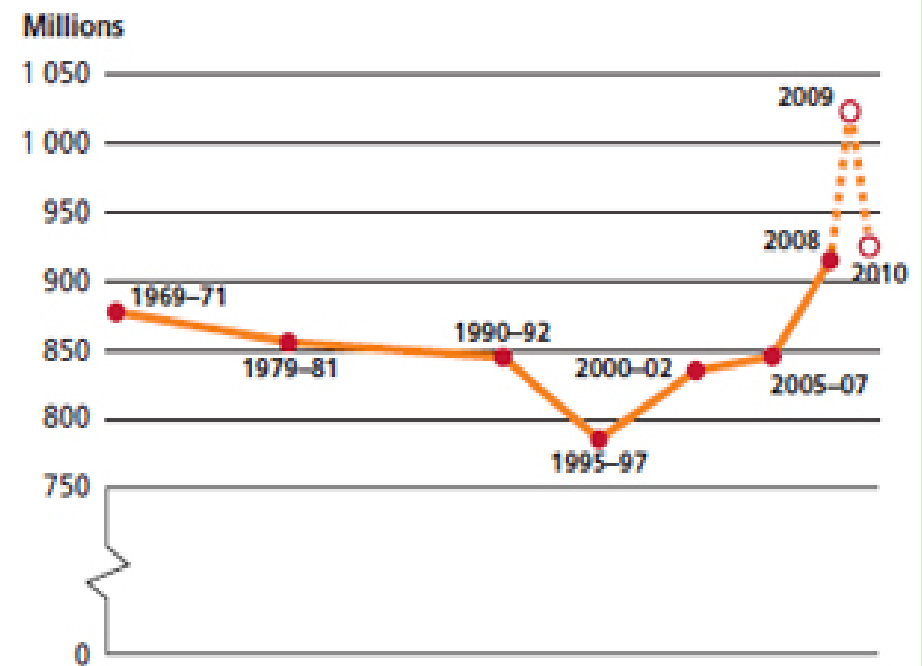
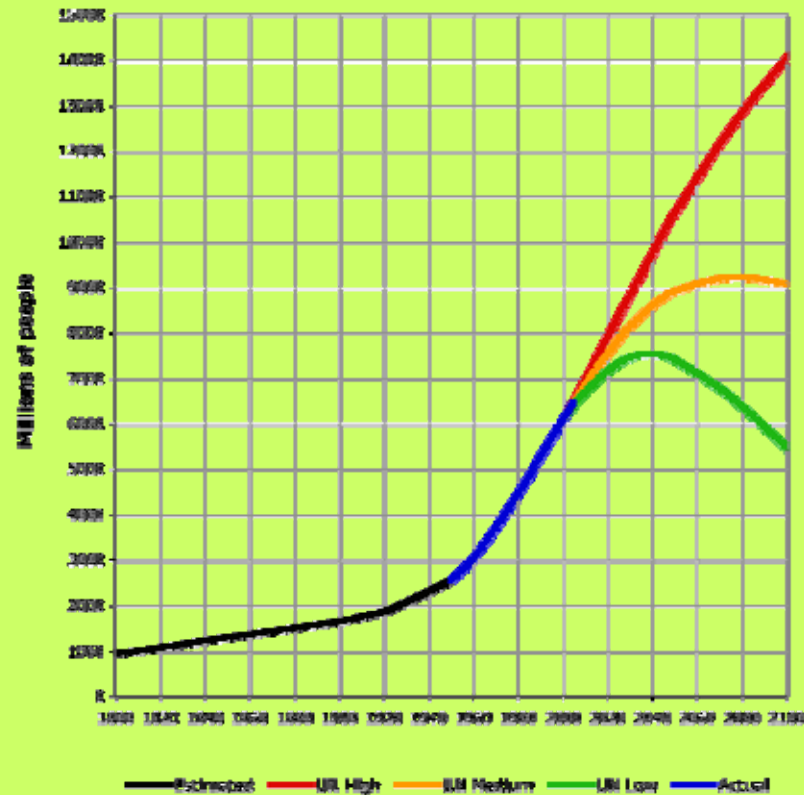
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POPULATION & FOOD PRODUCTION



Diets and Water

Between 2,000 and 5,000 liters per person per day – depending on type and amount of food eaten and how it is produced.

Developed ← → *Developing*



FOOD SECURITY ISSUE

- POPULATION IN 2010 WAS 6.91 BILLION.
- PROJECTED POPULATION BY 2050 IS 9 BILLION.
- TODAY ENOUGH FOOD IS PRODUCED, BUT THE PROBLEM IS WITH DISTRIBUTION. MORE THAN 1 BILLION PEOPLE ARE UNDERNOURISHED.
- EATING HABITS OF MIDDLE-INCOME PEOPLE IN DEVELOPING COUNTRIES ARE CHANGING TO MORE MEAT, MILK, AND FISH.
- CLIMATE CHANGE EXPECTED TO DECREASE CROP YIELDS BY ABOUT 15%.
- TO FEED THE GROWING POPULATION, TO IMPROVE THE NUTRITIONAL STATUS OF UNDERNOURISHED PEOPLE, AND TO MEET THE DEMAND FOR HIGH CALORIE FOOD, FOOD PRODUCTION MUST INCREASE BY 70 TO 100 PERCENT BY 2050.

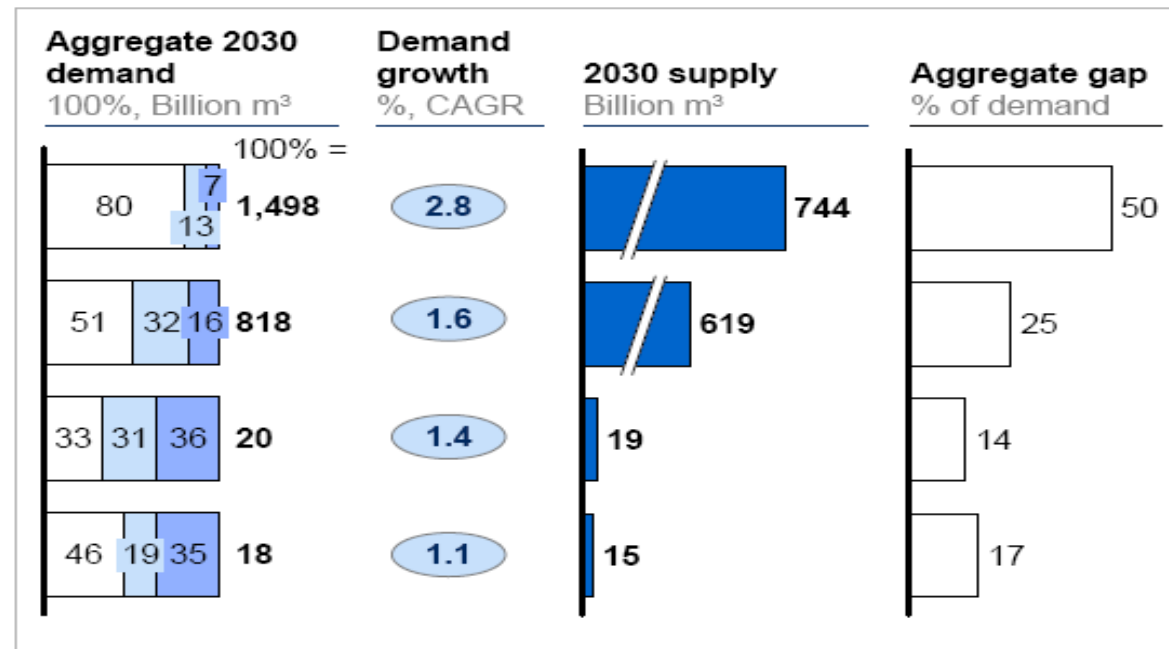
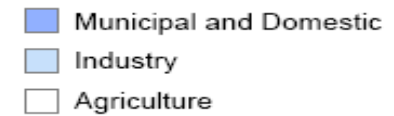
OPTIONS TO INCREASE FOOD PRODUCTION

OPTION I: INCREASE AREA UNDER RAINFED AND IRRIGATED AGRICULTURE?

- Irrigated agriculture has already expanded into marginal land. Increasing cultivable area by a significant amount is not a feasibility.
- Today, irrigated area occupies about 18% of total cultivable area, but contributes 40% of food production. Increase irrigated area to 45 % of total cultivable area.
- Irrigated agriculture already diverts 70% . With competition from other sectors, water storage capacity must be more than doubled!!
- In 2009 - 300 M ha. By 2030 to 345 M ha.

Issue identification: Water supply vs demand gaps

Base-case demand, supply, and gaps for the regional case studies



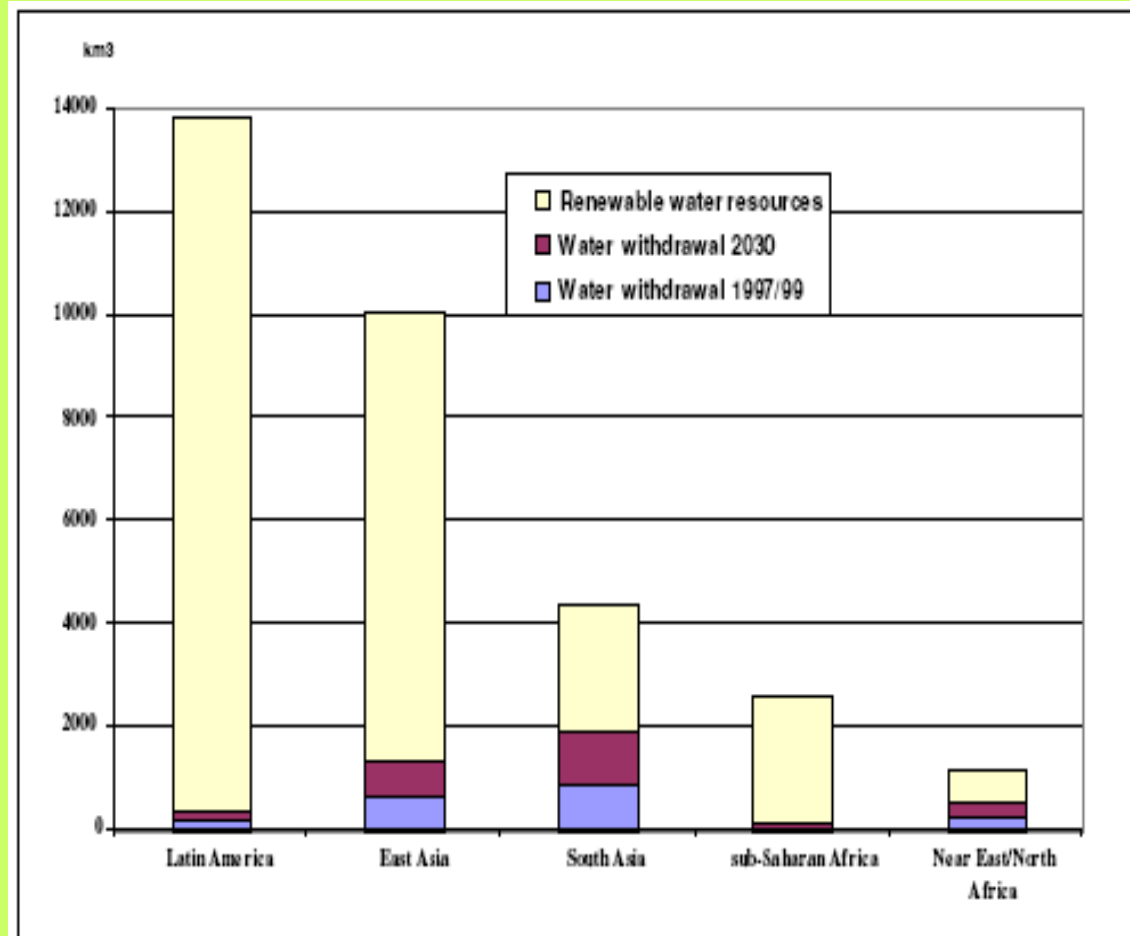
¹ Gap greater than demand-supply difference due to mismatch between supply and demand at basin level

² South Africa agricultural demand includes a 3% contribution from afforestation

SOURCE: 2030 Water Resources Group

POTENTIAL FOR WATER RESOURCES DEVELOPMENT

- **Good potential in AFRICA. Possibility for Green Revolution in Africa. But, not enough.**
- **Development of additional water resources is expensive economically as well as environmentally.**
- **Technologies for use of wastewater and low quality drainage water for irrigation**



OPTIONS TO INCREASE FOOD PRODUCTION

OPTION II: PLANT BREEDING FOR

- HIGH YIELDING CROP VARIETIES
- DROUGHT TOLERANT VARIETIES
- SALT TOLERANT VARIETIES

Technologies for storage of agricultural produce

OPTIONS TO INCREASE FOOD PRODUCTION

OPTION III: TO INCREASE WATER PRODUCTIVITY OF EXISTING IRRIGATION PROJECTS.

- Actual irrigated area is less than (about 75 %) potential irrigated area of 300 M ha. Take measures to decrease gap between potential and actual irrigated area.
 - FAO data (from 93 countries) indicates that the average irrigation efficiency of irrigation projects is 38% !!
- Increase crop yield per drop of water.

PERFORMANCE OF IRRIGATION PROJECTS

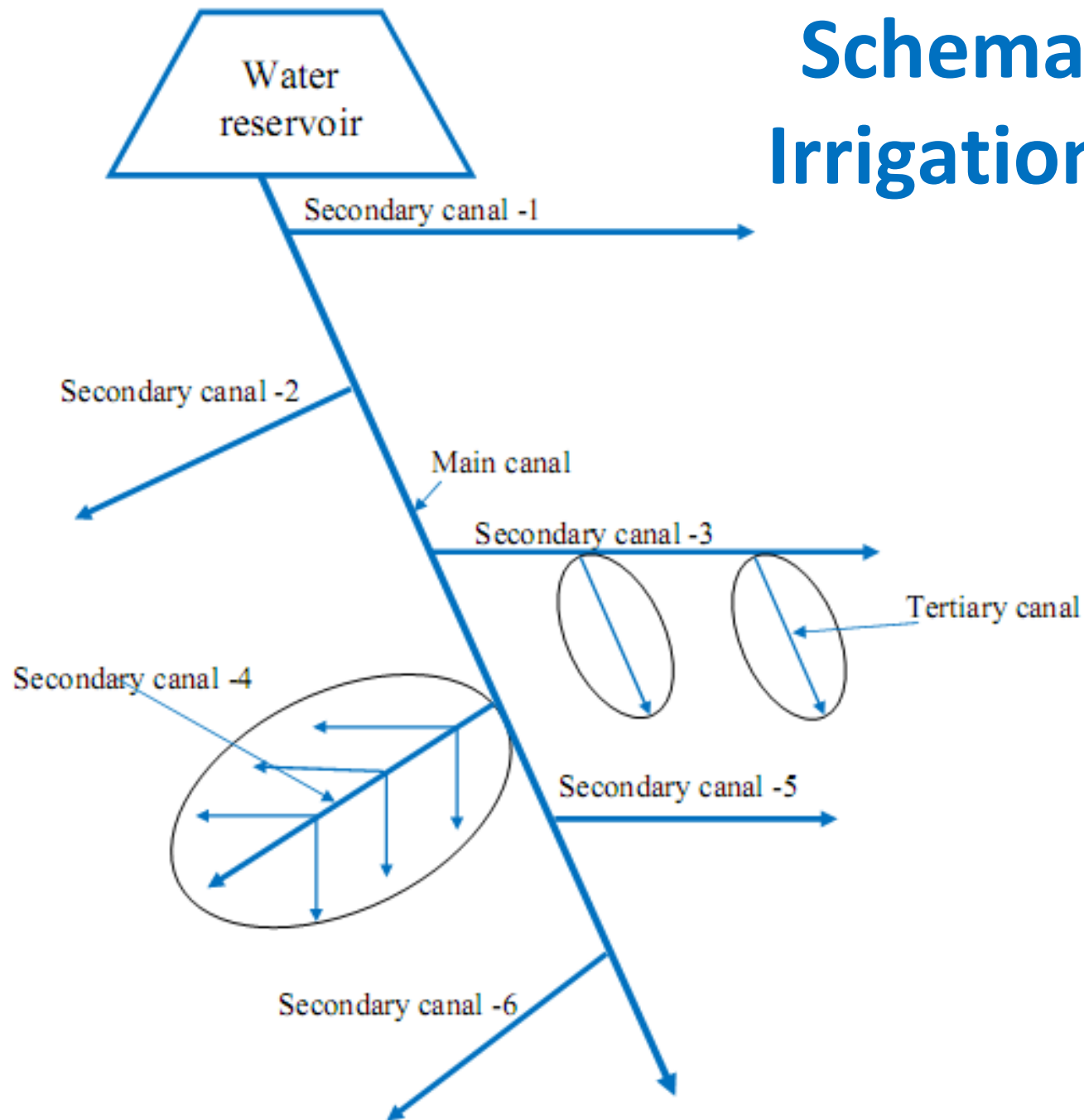
- **Low Crop Yields**

- Undependability of water supply
- Inequity in water supply
- Waterlogging and salinity
- Lack of appropriate on-farm irrigation and agronomic practices

DUE TO

- Inadequate structural control
- Inadequate communication
- No monitoring
- Inadequate/lack of maintenance
- Ad hoc operational plans
- Lack of credit and economic incentives
- Lack of appropriate irrigation extension services

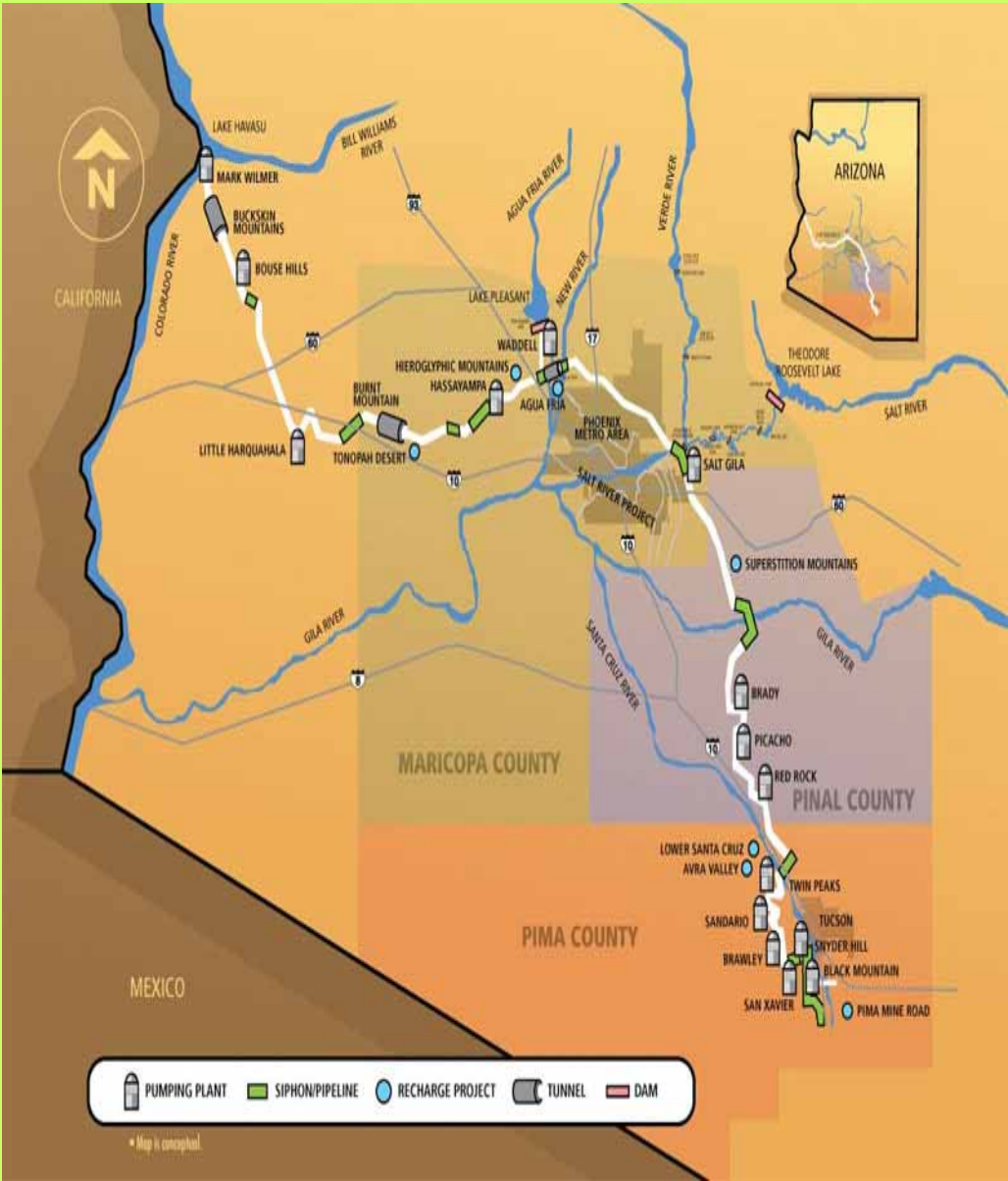
Schematic of an Irrigation Scheme

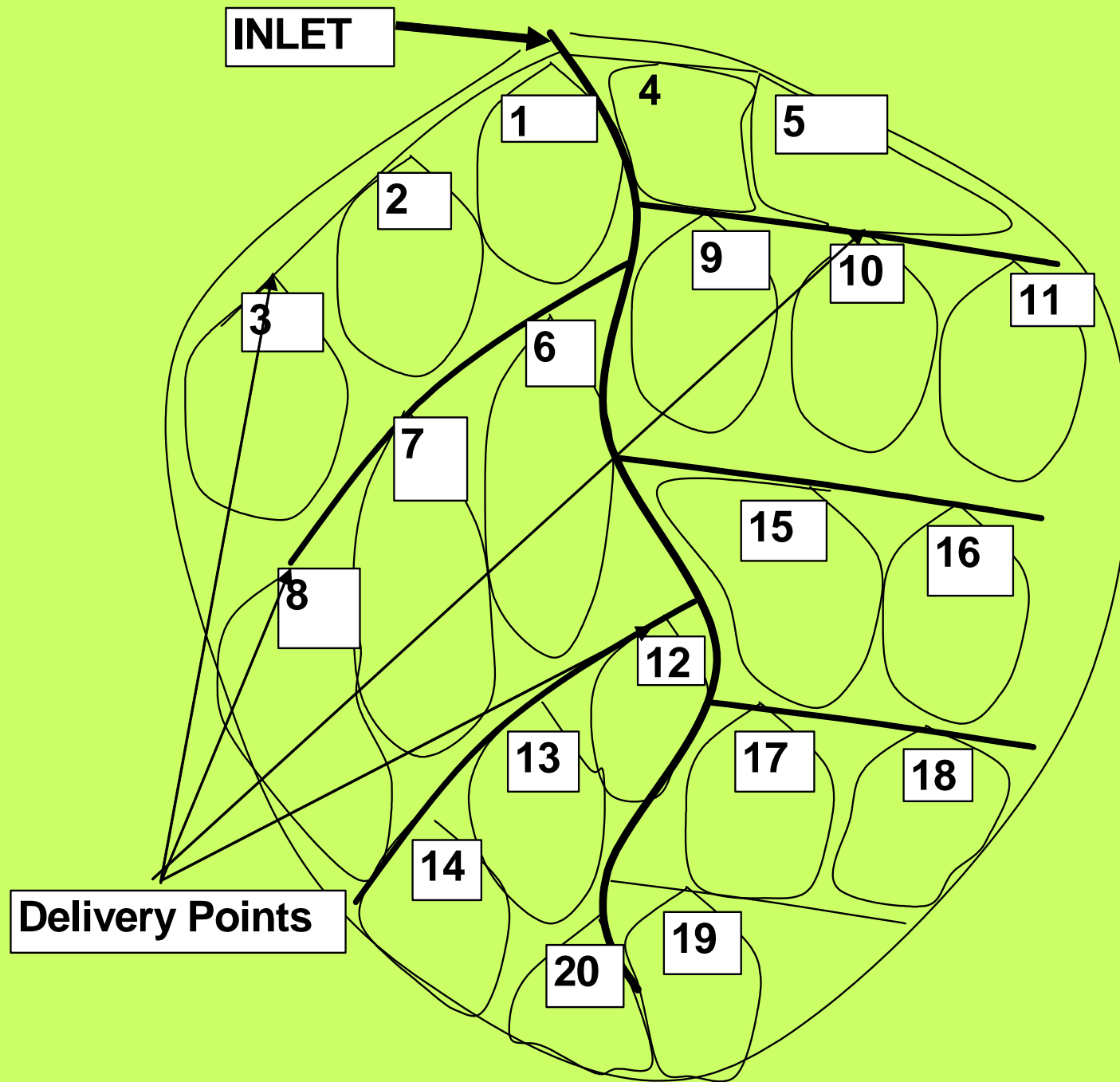


APPROACHES TO IMPROVE WATER DISTRIBUTION

- Stakeholder participation in decision making.
- Technical, Institutional, Legal and Policy interventions to improve equity and reliability in water supply.
- Hierarchical Decision Making/Control
- Government Water Agency-> WUA-> Water Users
- Technical interventions include: improving structural control, flow measurement structures, flow monitoring, improved communication, Conjunctive use, integrated operation of I & D systems, and improved operational procedures for canals including canal automation.
- South Fergana Canal, Aravan-Akbura Canal and Khodja-Bakirgan Canal were automated in Fergana Valley with support from SDC. They have been working satisfactorily, and potential exists for further improvement.

CANAL AUTOMATION





Water Users Associations

- **For equitable distribution of irrigation water.**
- **Maintenance of irrigation infrastructure.**
- **Capacity building for**
 - **Proper water distribution**
 - **Water accounting**
 - **Maintenance**
 - **Accounting & Financial management**

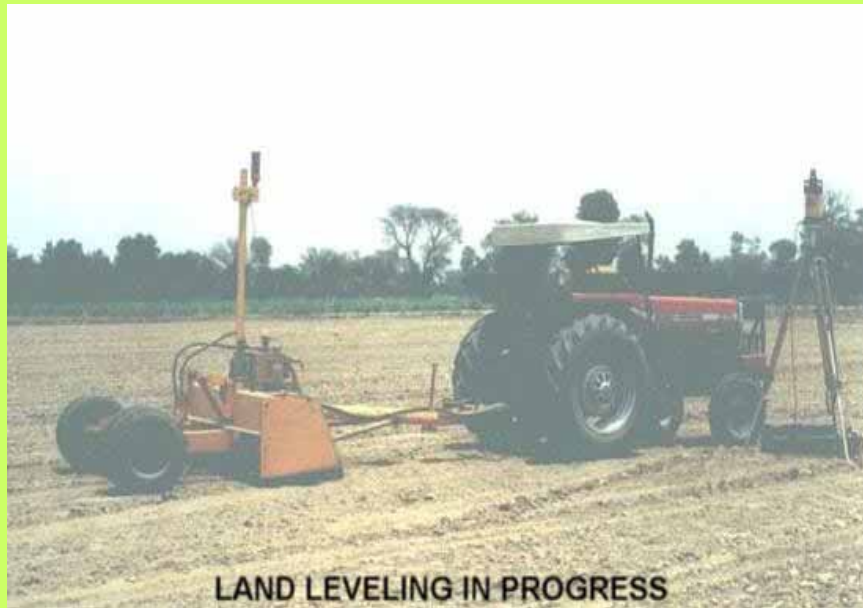
IMPROVE WATER PRODUCTIVITY @ FIELD LEVEL

- Encourage use of drip irrigation for growing fruit and vegetable crops.
- Provide training on O&M of drip irrigation systems.
- For surface irrigation systems, land grading/leveling is a must for higher crop yields and efficiency of water use.
- Proper layout of field irrigation systems and tools for efficient application of irrigation water.
- Irrigation scheduling for proper timing and application of right quantity of water.
- Improved Agronomic Practices
- Credit and economic incentives for efficient use of water.
- *Irrigation Extension (a missing element)*

IMPROVED ON-FARM PRACTICES



University of Arizona. Credit: John C. Palumbo



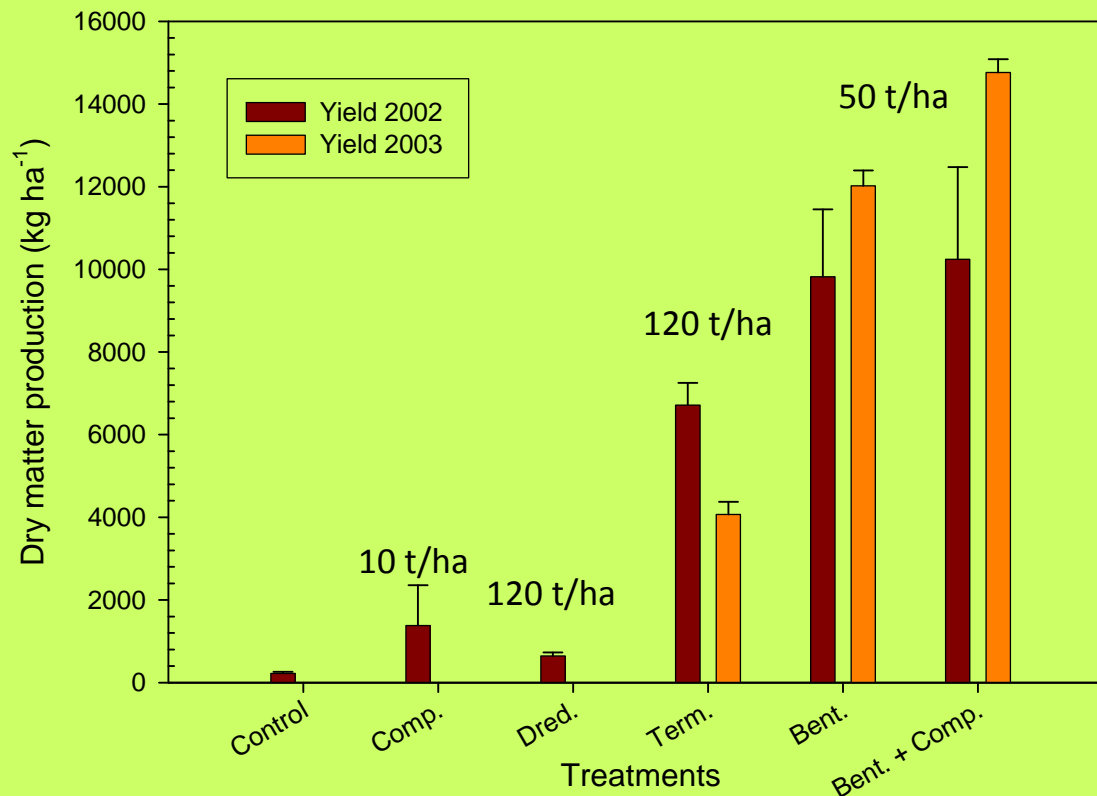
LAND LEVELING IN PROGRESS



Bentonite responses



Yield response of forage sorghum



- Extreme degradation evident.
- Significant increase in productivity over 2 years to clay based amendments.
- Responses have **persisted** and **increased** in bentonite treatments.

HOW TO ACCOMPLISH

- In many developing countries, Agricultural Extension, particularly Irrigation Extension is weak or does not exist.
- There is a shortage of On-Farm Irrigation/Drainage Specialists particularly with knowledge on modern technologies.
- Irrigation Curriculum must be strengthened
- Irrigation Improvement is an Evolutionary process. Hence, a Management Improvement Process (MIP) must be in place-

Monitoring and Problem Identification
Search for Solutions

