Global aspects of fertigation usage

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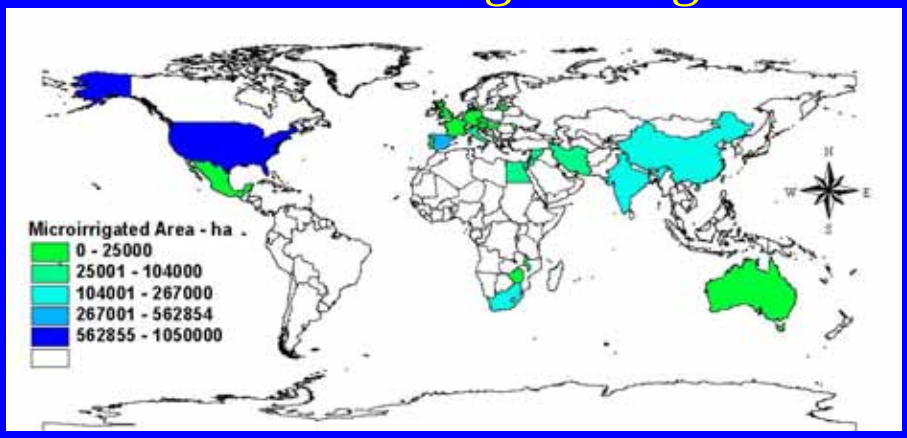
Kafkafi; IPI International Symposium on Fertigation; Optimizing the utilization of water and nutrients; Beijing, September 20-24, 2005

World micro irrigated regions



http://www.oznet.ksu.edu/sdi/News/TMIarea

Available cheap water

enable wasteful flood irrigation

Excess water flow into drainage canals

Malawi, Africa – Soil erosion prevention is a must before irrigation

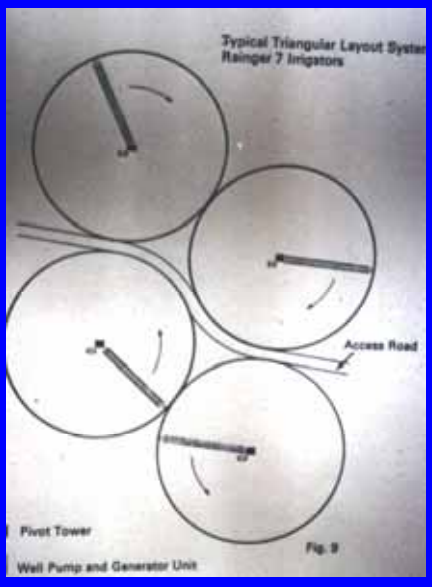
Ethiopia Awash river water supply, Irrigation cotton field, zero cost of water, gravity force

Canal flood - induce salinity

Method of irrigation:

flooding with quality water

High pressure sprinkle irrigation,
energy costs,
ample water supply
equipment maintenance



Center pivot

High pressure, Energy cost
Large volume of water
Field crops
Flat area

Israel map

First site of Fertigation Experiment On sand dunes- 1968

First sites of trickle irrigation

Arava valley
Dry saline desert
The site of first trickle irrigation by Netafim

Dead sea works
Lowest point on earth

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Desert sand dune before and after trickle irrigation installation

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“baby feeding” dates in Arava Desert by fertigation

Curtsey, Prof Dan Goldberg

Most tree plantations in Israel are now trickle fertigated

Curtsey, Prof Dan Goldberg

Model 1 trickle
Linear flow

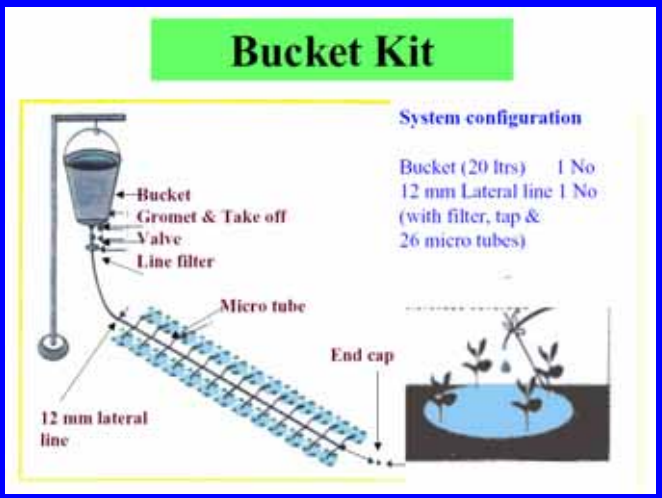
Model 2 trickle
Parallel flow

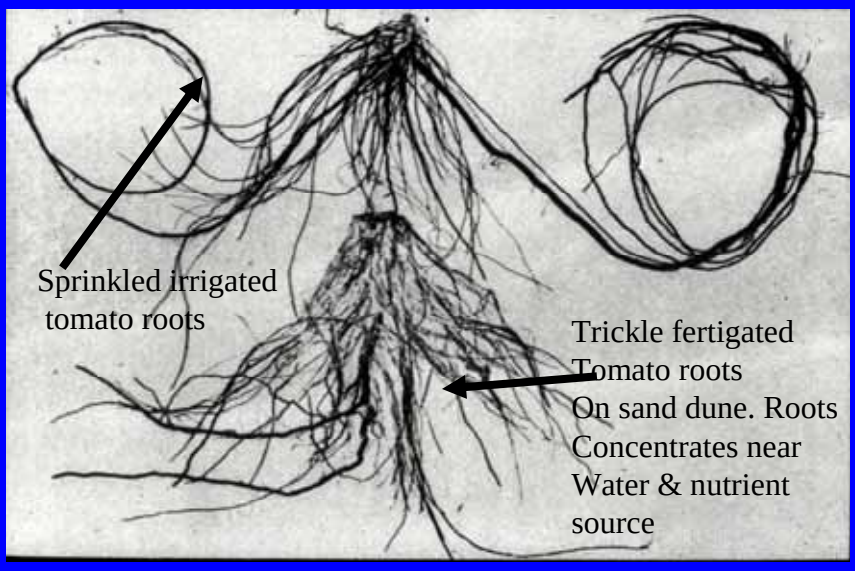
Planting inside
Wet zone

Trickle Fertigation reduces
Wet zone soil surface
Minimize direct
evaporation loss

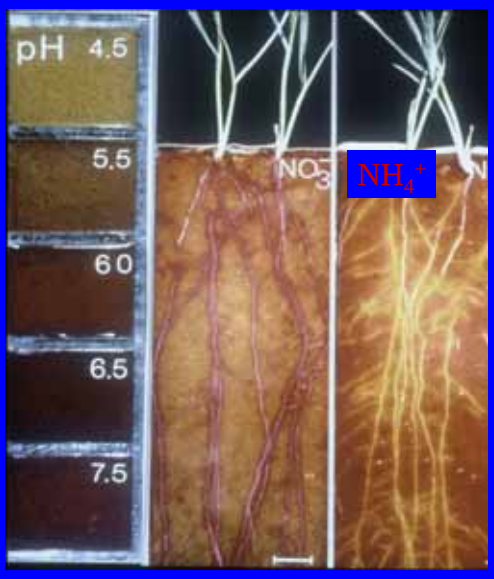
California
Huge field drip area with filters,
fertilization tanks and filters

Large cotton field
drip lines every second row

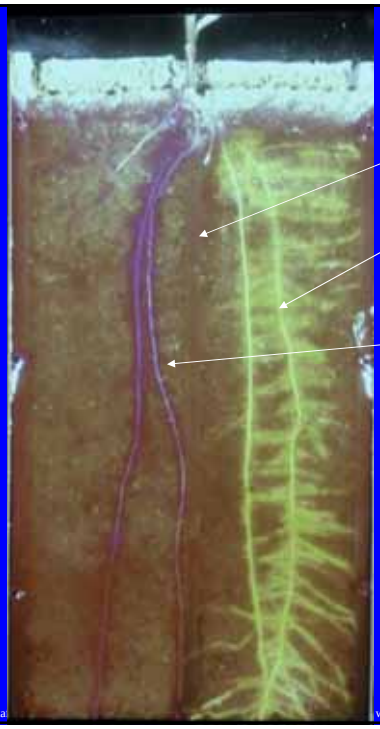




The type of N fertilizer
Affects the resulted pH
Near plant roots



(Marschner's group)



Split root system

NH_4 on right side- acidic

NO_3 on left side - basic

(Marschner's group)

Nitrate only

Nitrate and ammonium supply

Resulted Tomato root System due to N form and Nitrate to ammonium ratio

1/3 7/14 | K/N in solution Mol NH_4/ mol NO_3 | **1/4** 10/18

1/1 0/7 | **1/2** 3.5/10.5

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Tomato on calcareous soil 95% $CaCO_3$

fertilizer - Urea

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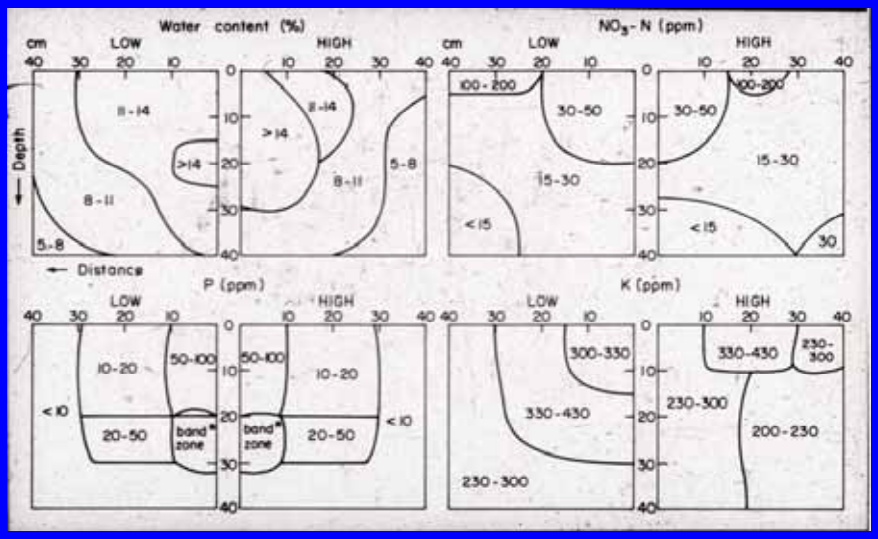
Soil containing 95% lime, Arava desert 1974, Tomatoes fertigation KNO3 source
(picture taken by Prof. K. Mengel)

Soil containing 95% $CaCO_3$, Arava desert 1974,
Tomatoes fertigation KNO_3 source

Arava 1974, water and nutrients distribution from a point source
Low and high refer to irrigation levels



P is concentrated around the trickle point

The use of fertilizer dilution tank restrict the Irrigated area

Devices for fertigation

Solid Fertilizer source Liquid fertilizer source

Redistribution of salts
In wet zone boundary
around the emitter

Fertigation under plastic reduce salt accumulation on soil surface

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Fertigation under plastic reduce salt and accumulation and reduce weed infestation

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Fertigation allow plant cover avoiding cold spells and allow early season fruit production

All greenhouse industry has completely moved to fertigation in all parts of the world

Fertigation in the USA

- California, Florida, Texas, Georgia and Hawaii, account for over 90% of the of the total USA area under MIS,
- California and Florida account for more than 80%,
- In Florida, over 200,000 ha are micro irrigated, the majority of this area is for the irrigation of citrus,
- More than 95 % of Florida strawberry growers use drip irrigation, and most of those fertigated,
- Among citrus growers in Florida, most have converted to MIS, but a smaller percentage fertigated

Fertigation in Spain

- MIS size is 563,000 ha (17% of total irrigated land),
- about 8% (40,000 ha) are greenhouses,
- Spain is the 2nd largest market in the world for MIS, and has a great potential for development,

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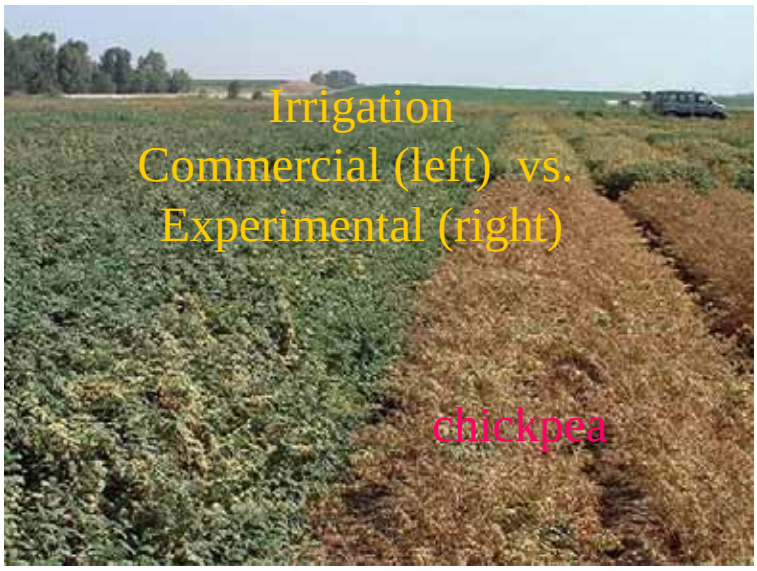
Fertigation in Spain - Almeria case

- Driving force: marginal soils, water shortage
- Problems: lack of water, unfavourable climate conditions
- Poor rocky soils were replaced by imported soil, consisting of:layer of 10 cm beach sand overlaying a 2 cm deep manure layer resting over a heavy clay textured soil mined in the vicinity of the region.
- Fertigation now is 100% of area.

Summary

- The constant demand for higher yields and quality – under restrictive usage of water is now a common issue around the globe
- More and more farmers are shifting to MIS with fertigation, overcoming water shortage and marginal soils
- Adoption of MIS and fertigation depends on incentives,
- Private or country
- Wide range of soluble fertilizers for optimal economical production are available
- Education packages, and agronomic advise promote the
- Use of fertigation



Salt movement from dripper

microdrip

Revadim - recycled water reservoir 2002

Cotton irrigation with RCW

Sap flow and root temp.

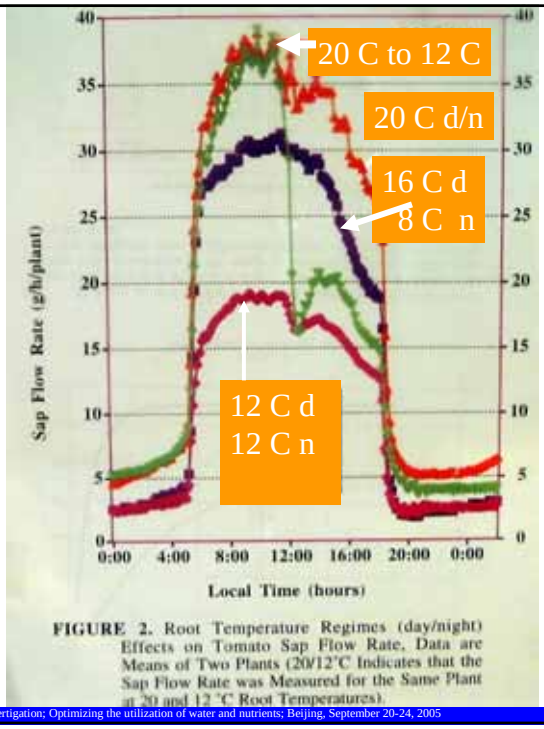
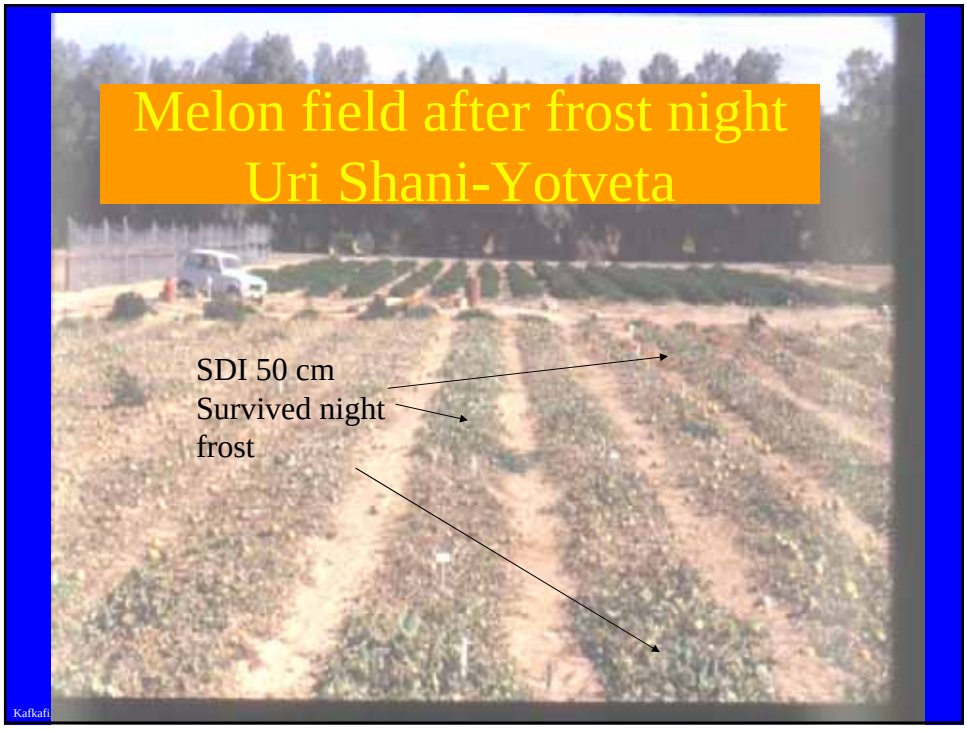
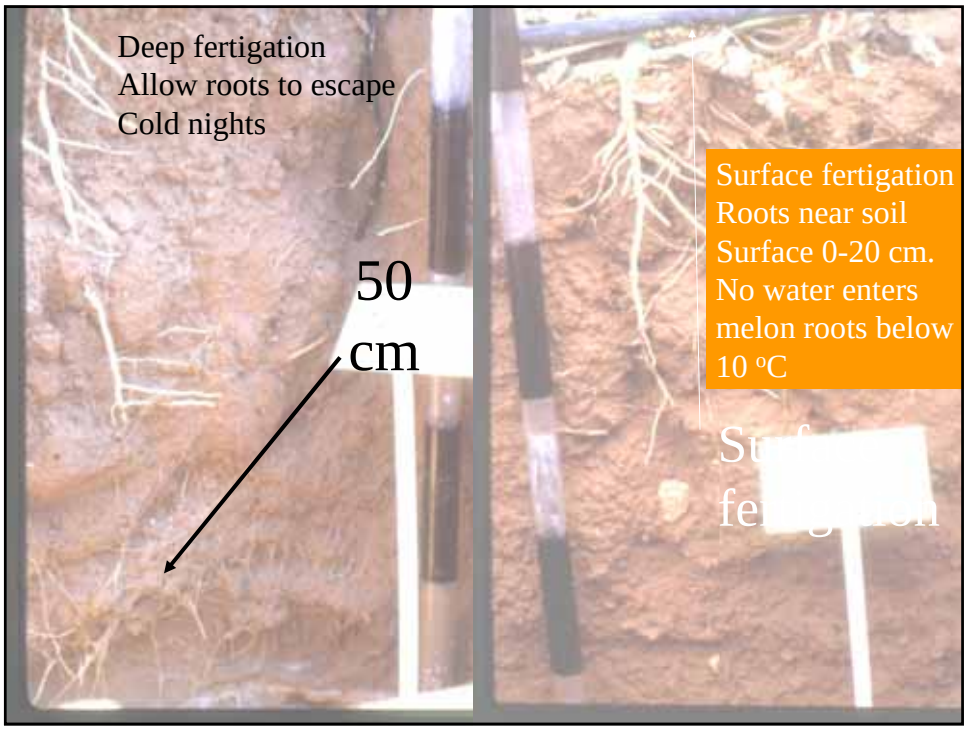
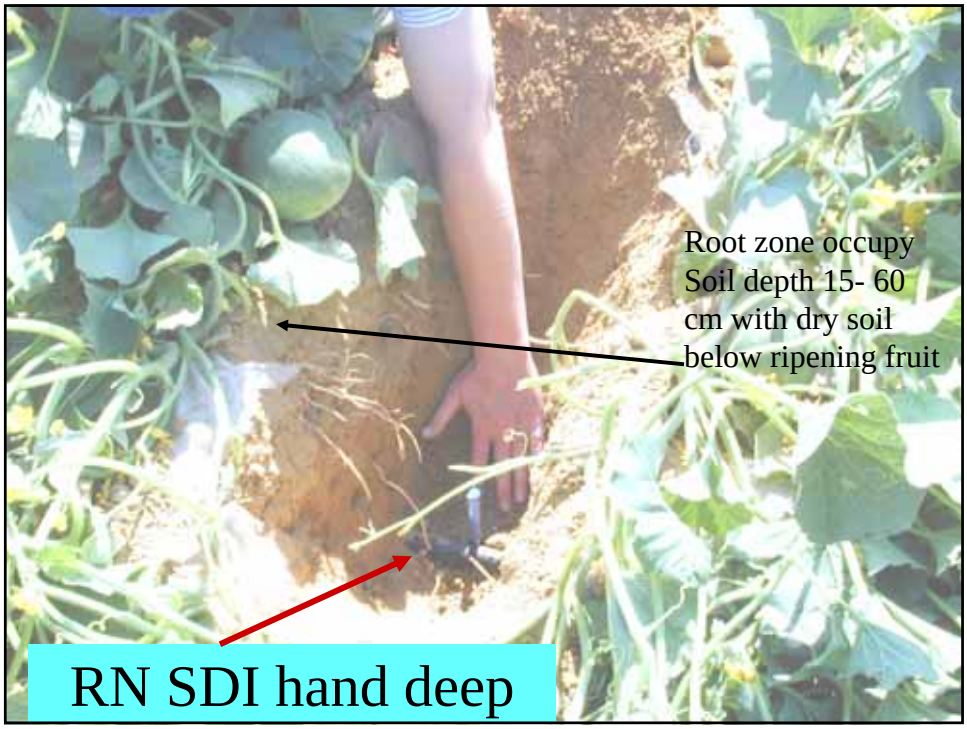


FIGURE 2. Root Temperature Regimes (day/night) Effects on Tomato Sap Flow Rate. Data are Means of Two Plants (20/12°C Indicates that the Sap Flow Rate was Measured for the Same Plant at 20 and 12 °C Root Temperatures).


Melon field after frost night
Uri Shani-Yotveta
SDI 50 cm
Survived night
frost
Kafkafi


Deep fertigation
Allow roots to escape
Cold nights
50
cm
Surface fertigation
Roots near soil
Surface 0-20 cm.
No water enters
melon roots below
10 °C



Conclusions

A global acceptance of trickle irrigation

Possibility to grow crops in deserts

Future expansion in small farmer fields

Fertigation need attention by industry
And training of field advisers
To match plant physiology to daily feeding