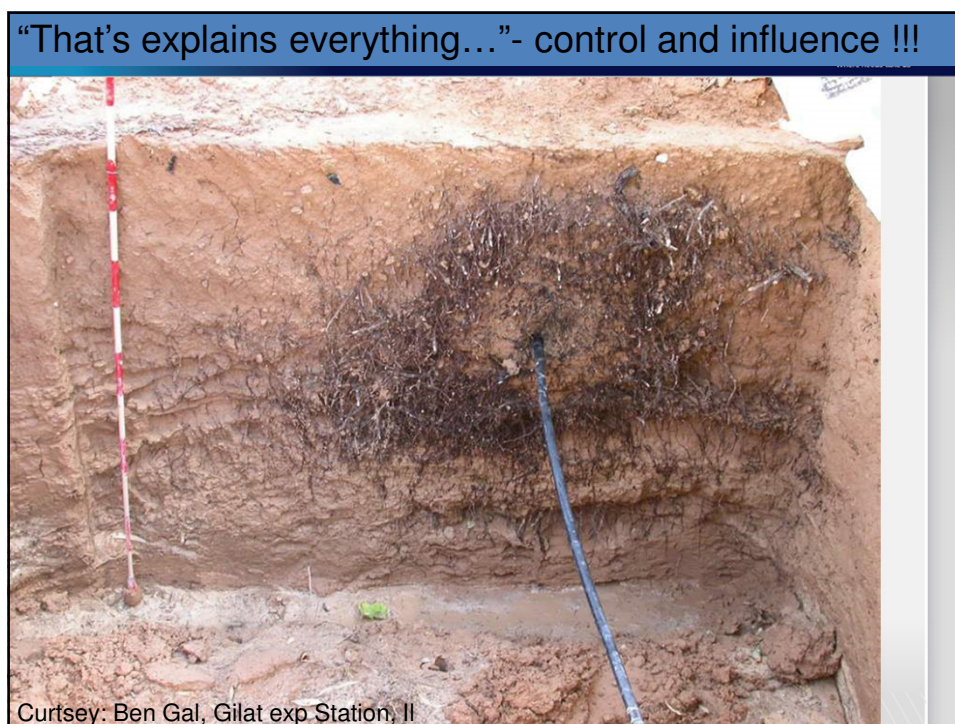



ICL

Fertigation- the right way!


Gershon Kalyan - ICL Israel
16-3-15 IFA Delhi



What is fertigation?




Fert ilization




+


Irr igation




=



Fertigation




What is fertigation?






Fertigation is the application of plant nutrients through the irrigation system

We take the fertilizers and dissolve them into the irrigation system

The plant roots receive water + nutrients at the same time and location






Advantages of fertigation

- 
 ✦ **Maximizing crop and soil productivity:**
 - ✦ Higher yields and top quality of produce
 - ✦ Marginal lands (sandy, rocky, shallow and salt affected soils) can be successfully put into cultivation
- 
 ✦ **Maximizing fertilizer efficiency:**
 - ✦ Accurate and uniform application of fertilizers
 - ✦ The amounts and concentrations of nutrients are adapted to the plant needs and climatic conditions
 - ✦ Increases availability and uptake of nutrients
 - ✦ Reduces nutrients losses by leaching and/or volatilization
- 
 ✦ **Minimizing production costs:**
 - ✦ Large savings on time, traffic, labor and fuel costs

Fertigation – “Spoon feeding”

- ✦ **Fertigation allows nutrients application to plants in the correct dosage and at the time appropriate for a specific stage of plant growth:**
- ✦ **This gives plants the needed amounts of fertilizer throughout the growth cycle**

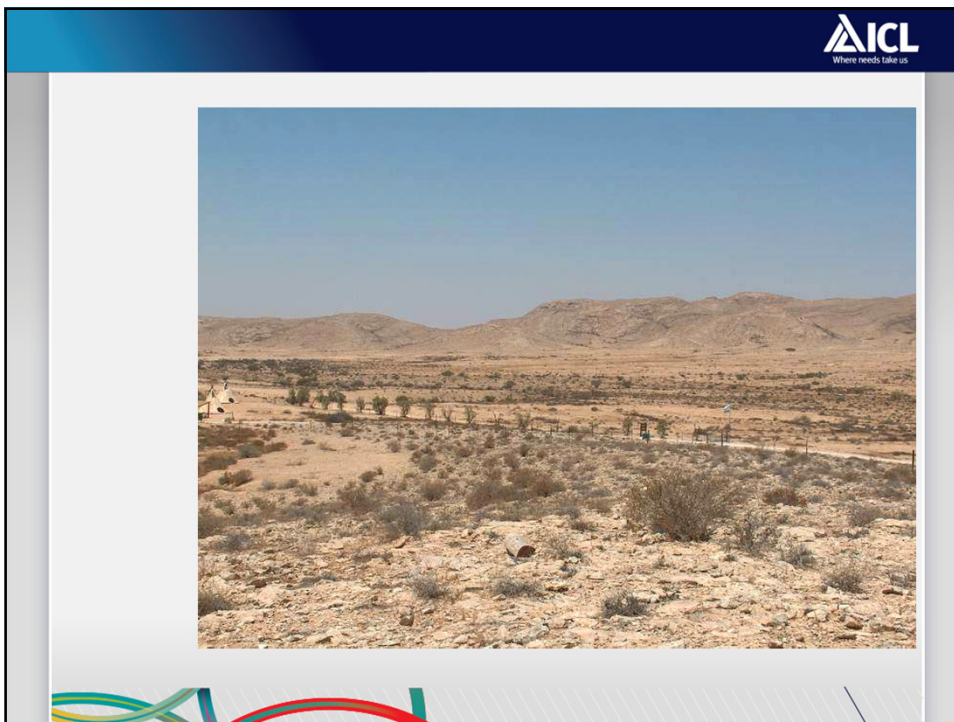
Israel Map

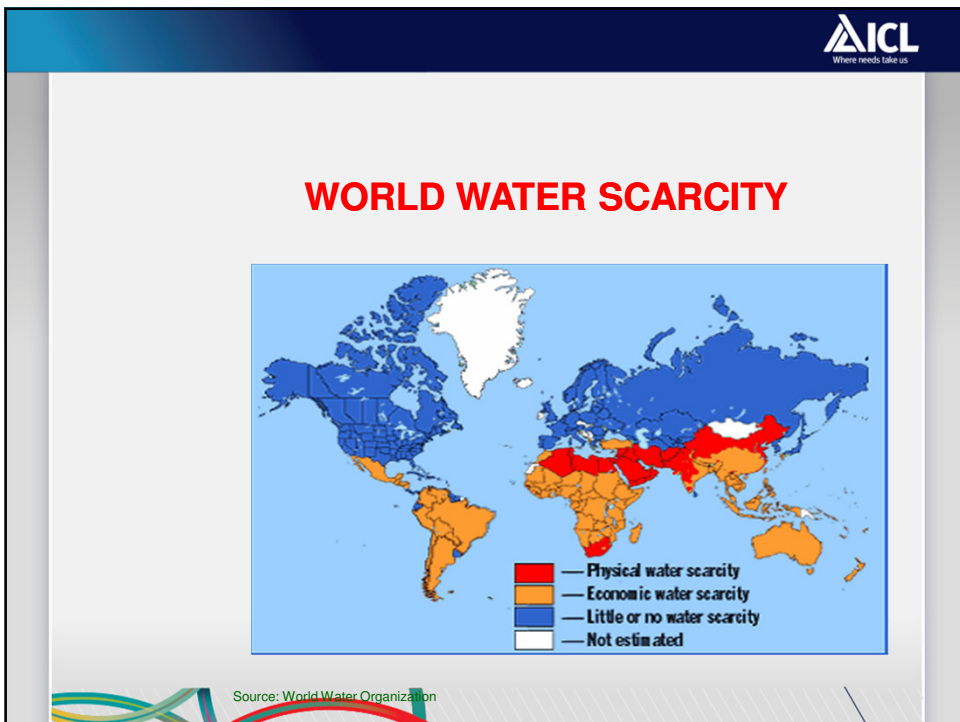
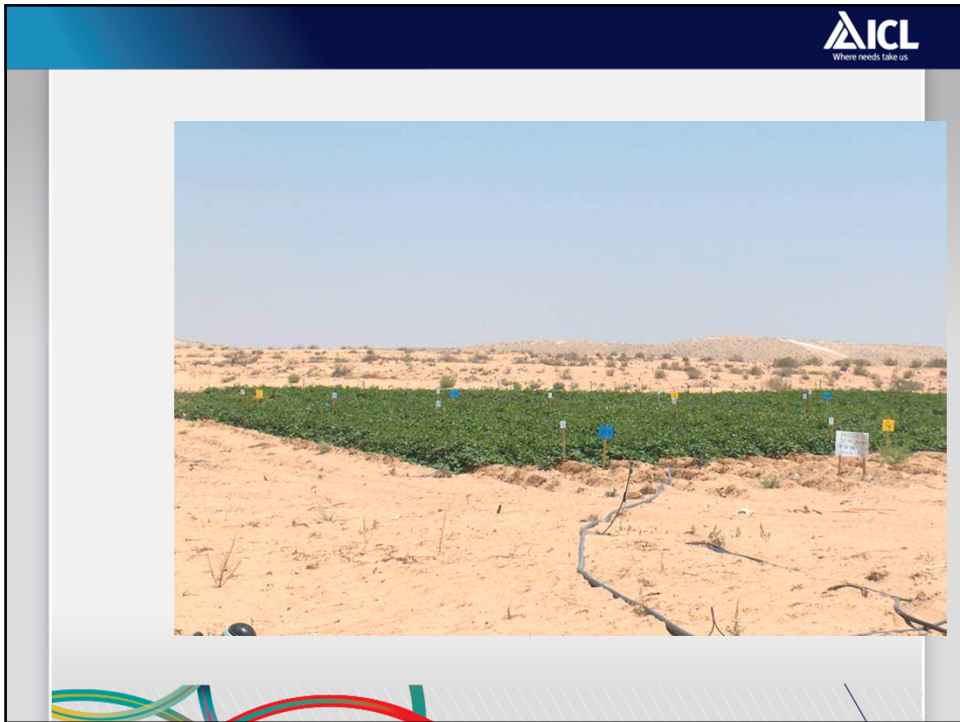
Arava Valley
Dry saline desert
The site of first trickle irrigation by Netafim


Dead sea works
Lowest point on earth

First site of Fertigation Experiment
On sand dunes-1968

First sites of trickle Irrigation









1. SHORTAGE IN ARABLE LAND

2. SHORTAGE IN WATER

1. Techniques that will increase the efficiency of food production
2. Techniques that will add marginal soils and water for food production use




World Arable Land

Total: 1 billion hectares

- 280 million hectares, irrigated arable land
- 28 million hectares by pressurized irrigation
- 6 million hectares by micro-irrigation (Feb 2007)

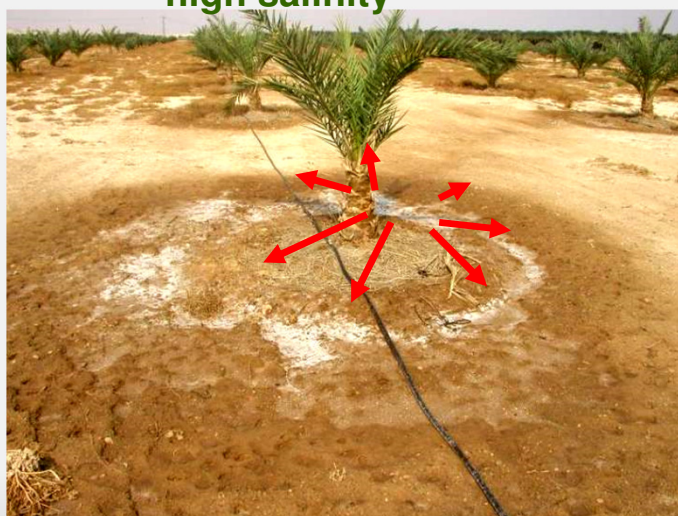
Source: FAO

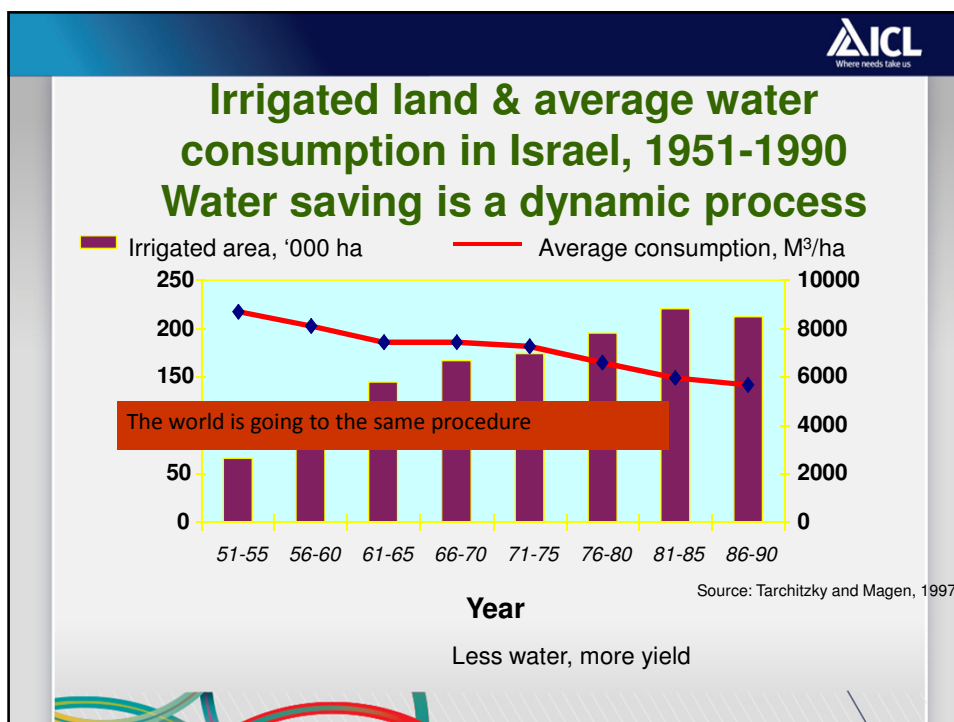


Advantages of Micro-irrigation

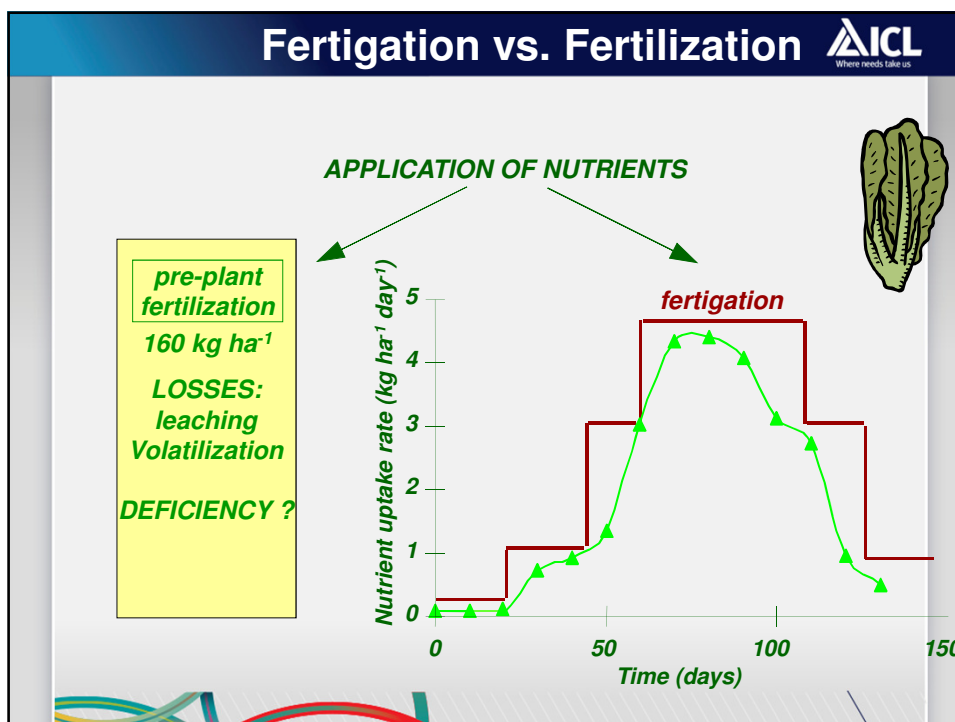
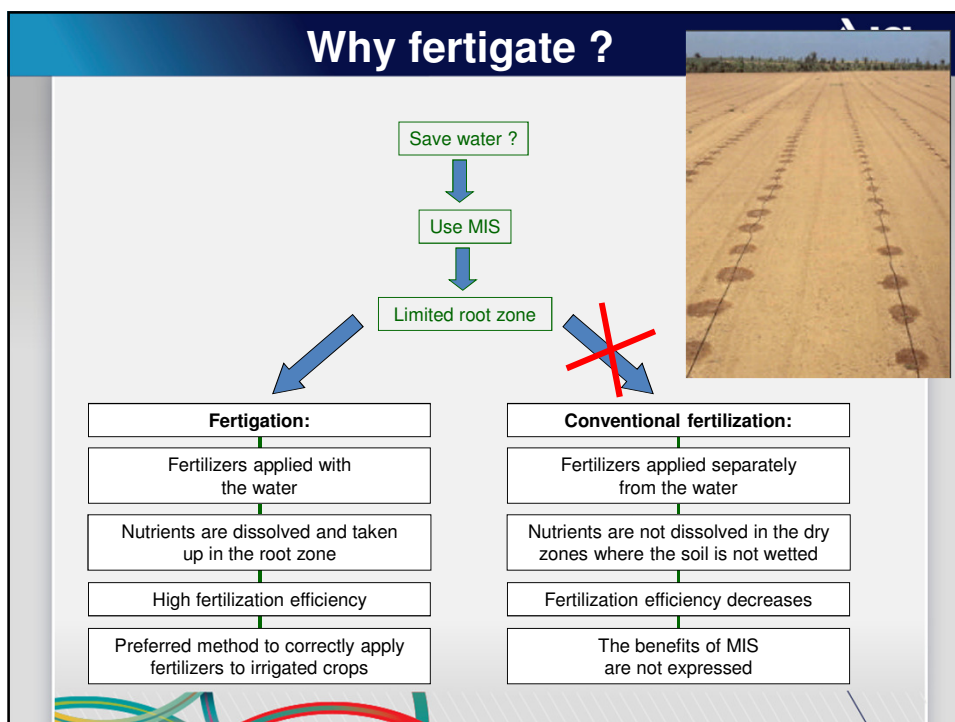
1. Increasing yields
2. Saving water
3. Allows growing in marginal soils
4. Water in due time (crop cycle)
5. Uniformity watering
6. Enables fertigation


FERTIGATION: Dripped date palms, high salinity






- ICL**
Where needs take us
1. MICRO-IRRIGATION ALLOWS US TO GROW ON MARGINAL SOILS AND TO USE MARGINAL WATER
 2. MICRO-IRRIGATION SAVES WATER AND INCREASES YIELDS
 3. FERTILIZERS INCREASE YIELDS
 - 4. FERTIGATION INCREASES YIELDS**






APPLICATION OF NUTRIENTS
FERTIGATION vs. FERTILIZATION




Conventional preplant fertilizer:
Plants get a larger dosage of fertilizer than they require at the time it is applied. Losses occur.

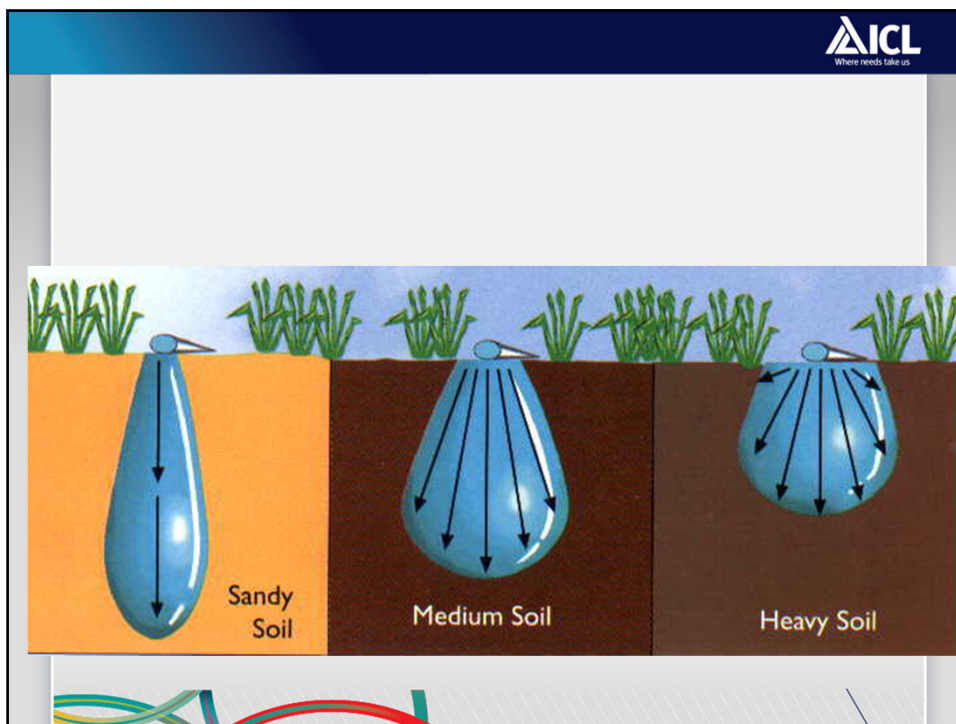
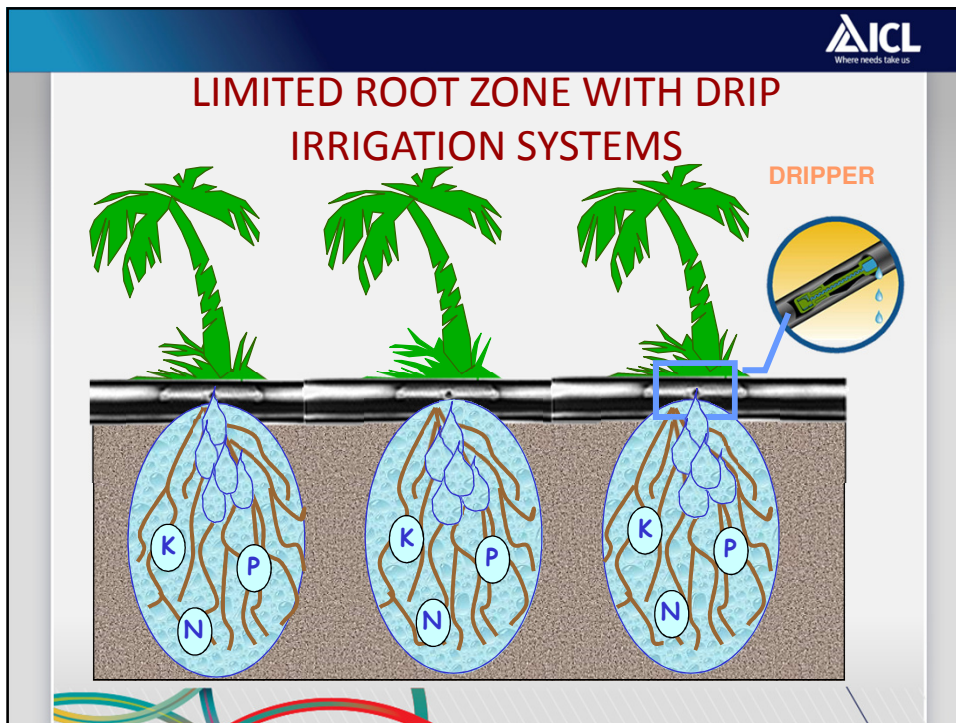


Fertigation:
Fertilizers are applied according to the need for nutrients, following the uptake rate of the crop.

Sub Surface Drip irrigation vineyard 8 years negev IL



Curtsey: Ben Gal, Gilat exp Station, Il



Fertigation in Israel

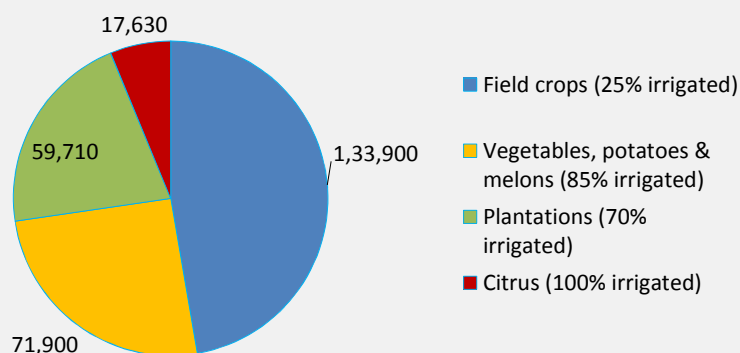


- Israel is a small but long country with high crops diversity
- More than half of Israel has an arid to semi-arid climate.
- Approximately half of the cultivated area (200,000 hectares) has to\can be irrigated due to lack of rainfall and other water resources.
- Approximately 80% of the irrigated land uses the fertigation method.
- Most of Israel agriculture use acid fertilizers-mainly liquids
- Most common K source for Israel agriculture is KCl
- The above related mainly to open fields which are the large areas of agriculture in Israel and the world!

Agricultural crop area in Israel (2010)




Total 280,960 ha; ~50% irrigated, with pressurized irrigation only



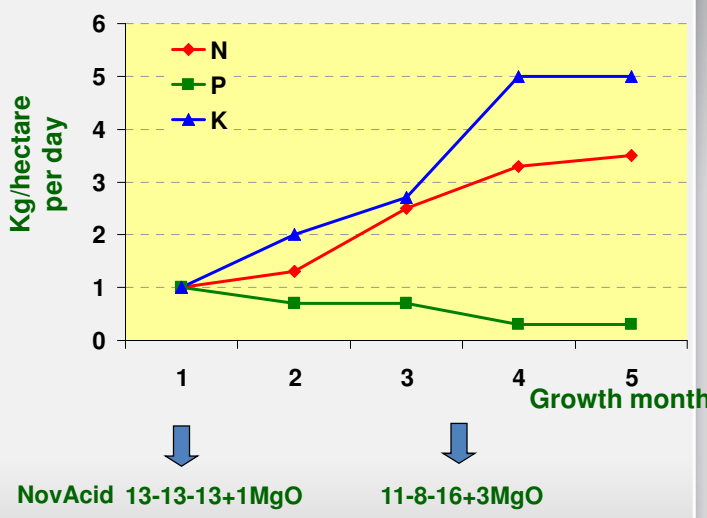
Fertigation by irrigation- fertigation plan **ICL**
Where needs take us

- Analyzes of the water type : acidic, hard water, restored water
- Compatibility of the fertilizer to the irrigation water
- Simulation and Fertigation Plans as per crop and local conditions
- Bicarbonate/Carbonate reduction in irrigation water
- Disinfection of water in irrigation systems
- Reacting to soil \ leaves \ water analysis



25


Fertigation program: nutrient ratio
Fertigation plan for open field tomatoes **ICL**
Where needs take us



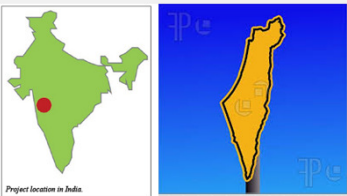
Growth month	N (Kg/hectare per day)	P (Kg/hectare per day)	K (Kg/hectare per day)
1	1.0	1.0	1.0
2	1.3	0.7	2.0
3	2.5	0.7	2.8
4	3.3	0.3	5.0
5	3.5	0.3	5.0

NovAcid 13-13-13+1MgO 11-8-16+3MgO

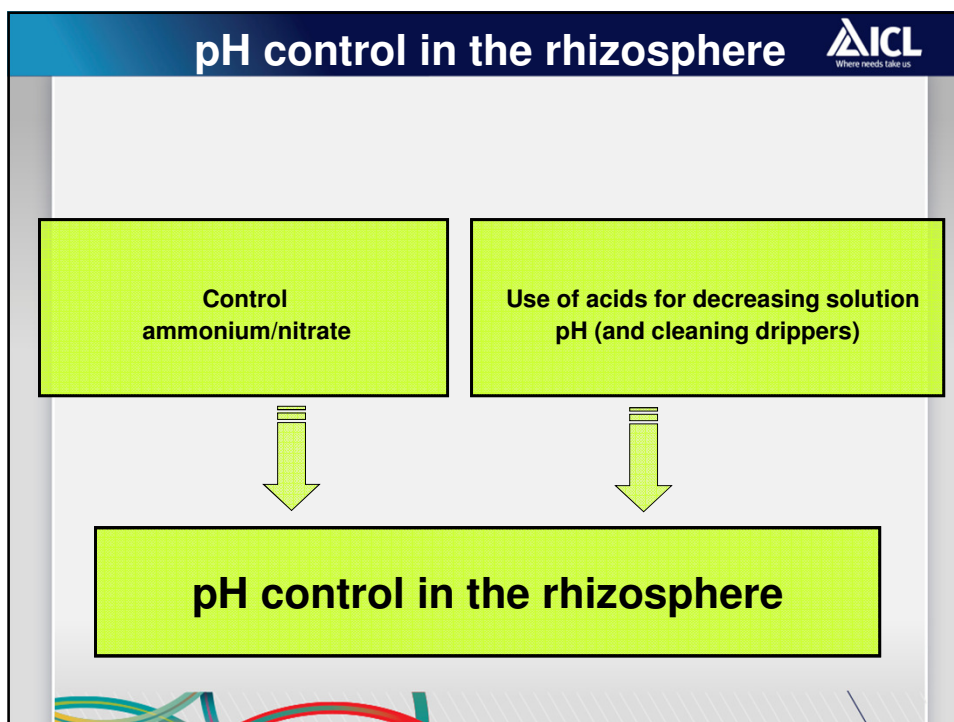
Israel- India similarities:




- Both democracies...
- Water shortages
- Need to use marginal soils
- High pH soils
- High pH water
- Same shape... different size...



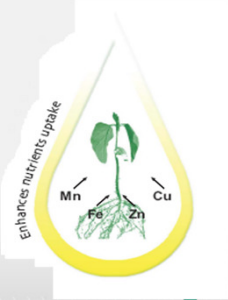
27




Why acid?



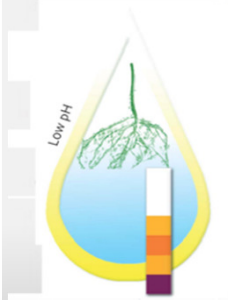
- Hard water
- Blockage-free irrigation
- Optimal nutrients availability
- Adding Ca + Mg to the formula



enhances nutrients uptake




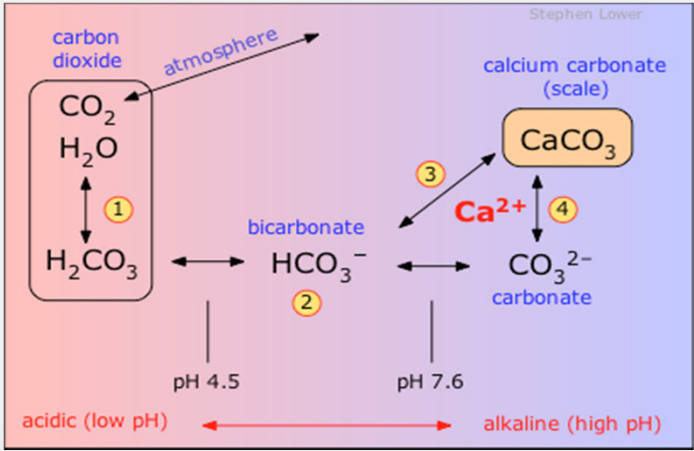
Anti clogging action



Low pH

NO 1 blocker-caco₃

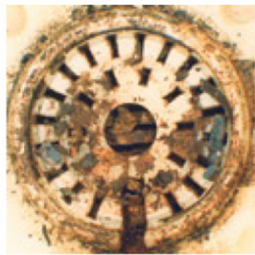
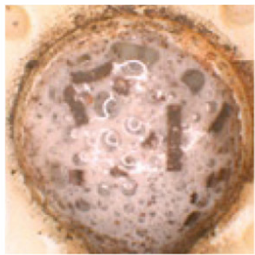
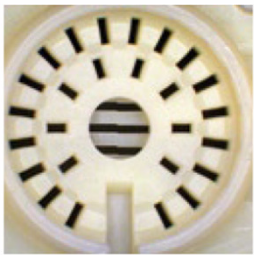


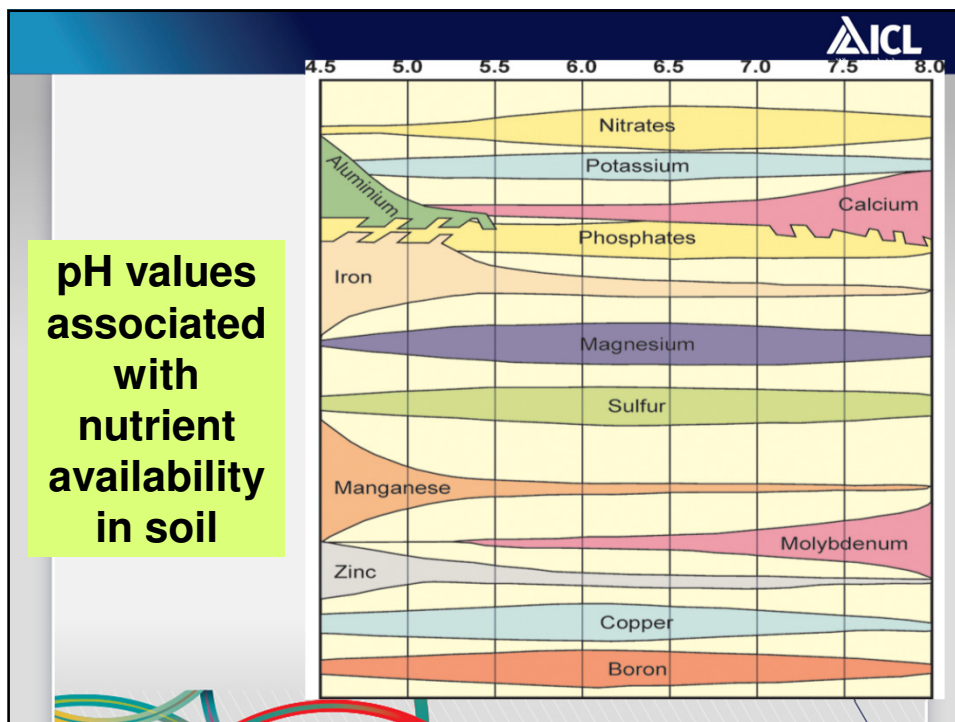


Stephen Lower


ICL
Where needs fall us

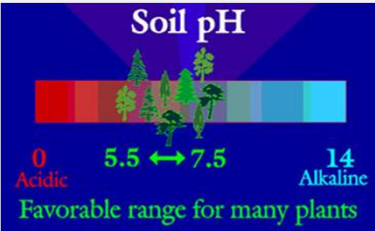
NovAcidNPK™ - antiblocking

BLOCKED	CLEANING	UNBLOCKED
		
<p>Blocked drippers due to precipitates formed while using hard irrigation water</p>	<p>Drippers being cleaned while using NovAcidNPK™ (precipitates are dissolved)</p>	<p>Cleaned, unblocked drippers after using NovAcidNPK™</p>



pH

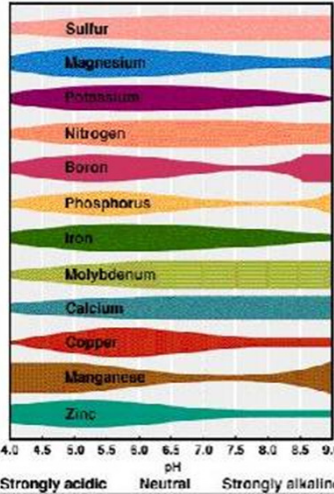




Soil pH

0 Acidic 5.5 ↔ 7.5 14 Alkaline

Favorable range for many plants




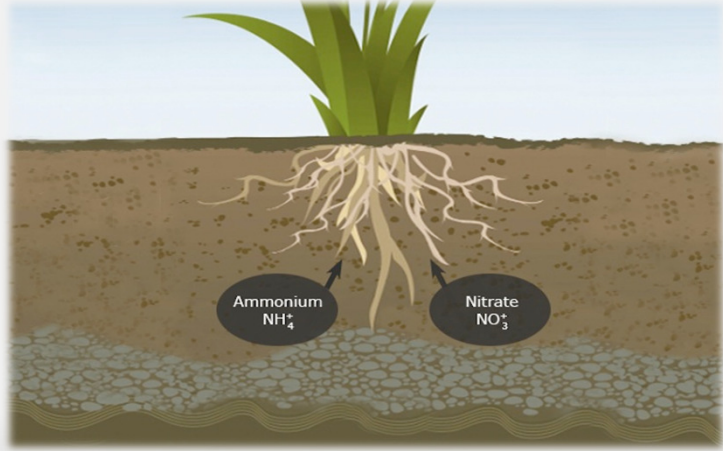
4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Strongly acidic Neutral Strongly alkaline

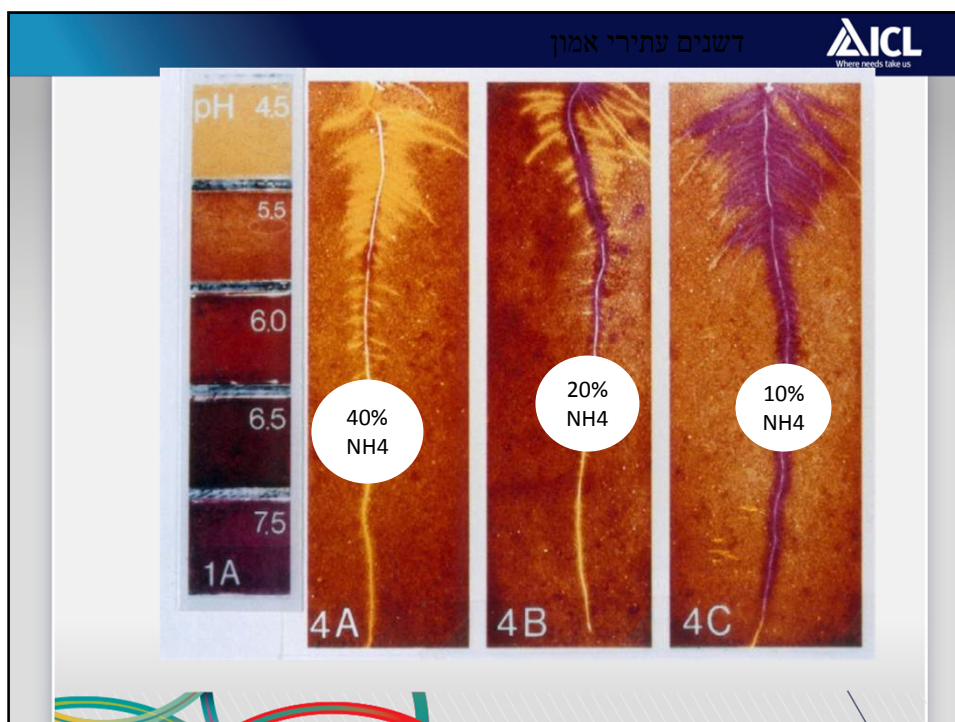
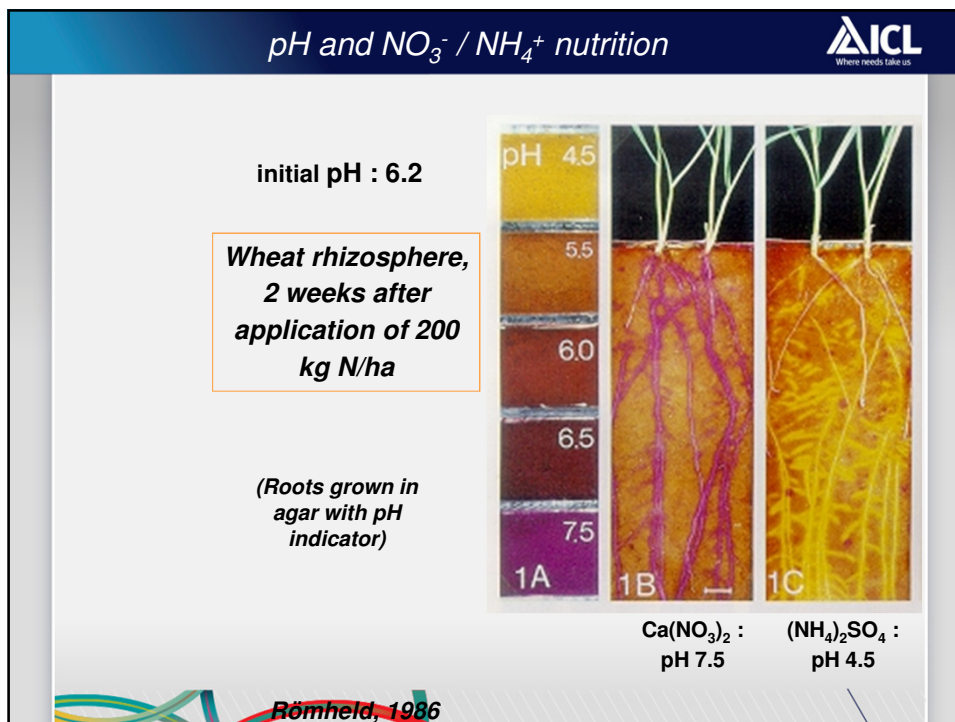
- Optimal pH value: 5 – 6
 - Maximal nutrient availability
- High pH values:
 - Reduced nutrient availability
- Low pH values:
 - Reduced nutrient availability
 - Toxic levels of Al, Mn

Nitrogen uptake/Fertilization Plan





34



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Where needs takes us

pH AND NO₃⁻ / NH₄⁺ NUTRITION

The plant absorbs: CATIONS ⁺ and ANIONS ⁻

ELECTRONEUTRALITY: Σ CATIONS = Σ ANIONS

NO₃⁻ anionic nutrition	A > C	OH⁻ out	pH ↑
---	-----------------	---------------------------	-------------

NO₃⁻ OH⁻ pH ↑

NH₄⁺ cationic nutrition	C > A	H⁺ out	pH ↓
--	-----------------	--------------------------	-------------

NH₄⁺ H⁺ pH ↓

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Where needs takes us

Urea hydrolysis causes pH increase

Ammonification by heterotrophic bacteria

H2O + H2N-CO-NH2 -> NH4+ + CO2

H₂O Urea Ammonium Ammonia

Hydroxyl

Stable and absorbed to soil particles


leaching

38


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Where needs talk us

High pH increase nutrients deficiencies


Mn



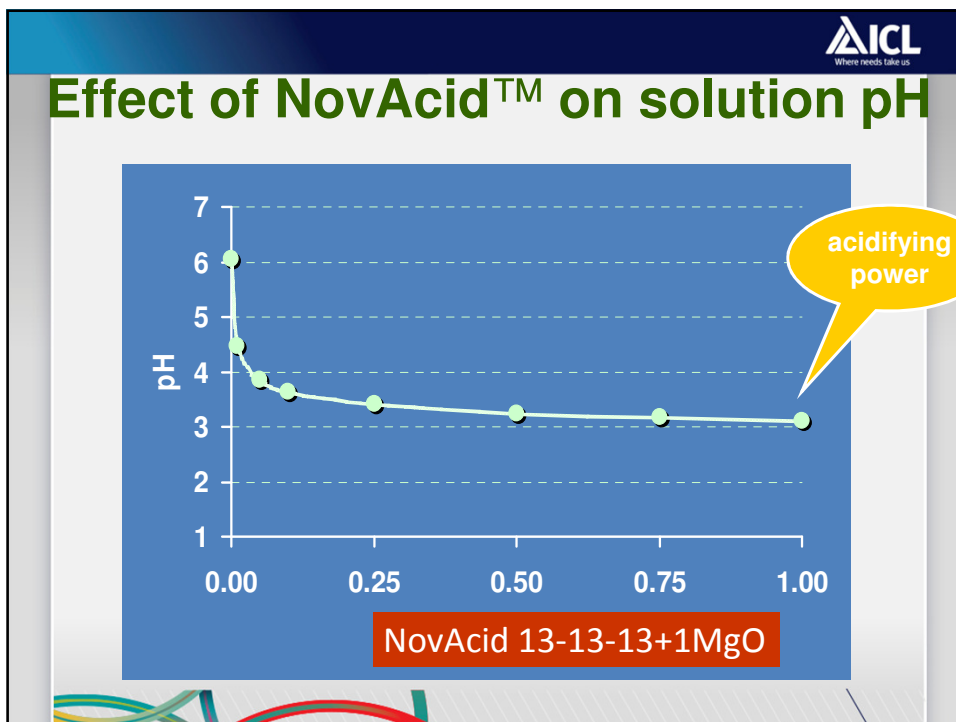
Zn



Fe



39



Summary- fertigation for soil culture in open fields



- Always use WSF- water soluble fertilizers
- Always use low pH fertilizers
- Prefer high Ammonium ratio fertilizers
- Proportional fertigation for better results

41

