Teaspoon Feeding™ concept for large and sophisticated as well as small and simple farms in Asia

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Teaspoon Feeding™:

Nutrients availability follows plant's requirements

Ideal 4R for both NUE & WUE

Teaspoon Feeding™ =

Precise **timing**

Teaspoon Feeding™ =

Precise **location**

Teaspoon Feeding™ =

Precise **dosing**

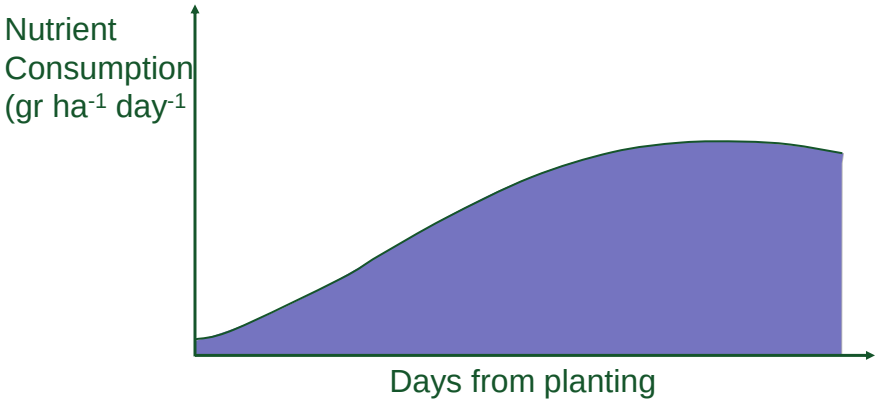
Teaspoon Feeding™ =

Photo by A. Lowengart

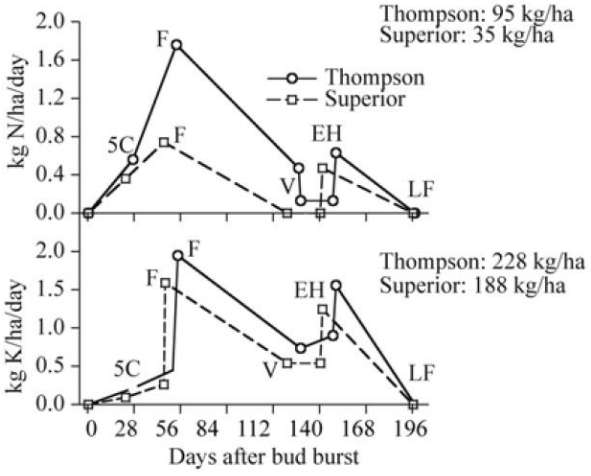
Selected **nutrient**

N, P & K source

Teaspoon Feeding™: crop specific uptake curve



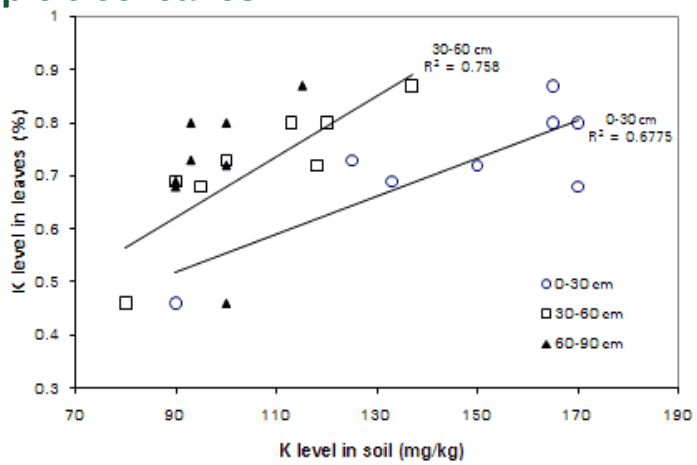
Australia: Basic N & K fertigation program for two table grape varieties



F = flowering
V = verasion
EH = end of harvest
LF = leaf fall

Source: Treeby, 2005. http://www.ipipotash.org/udocs/7_Treeby_Manipulating_Grapevine_Annual_Shoot_Growth_p89-102.pdf

China: Correlation between soil K in three horizons (0-30, 30-60 and 60-90 cm) and K in apple tree leaves.



Source: e-ifc 18, 2008. http://www.ipipotash.org/eifc/2008/18/2

Teaspoon Feeding™:

Nutrient supply **follows** plant's requirements

Teaspoon Feeding™

Benefit: Optimal plant development = getting closer to achieving genetic potential

Teaspoon Feeding™

Benefit:

Economical use of fertilizers = direct savings

South China: Fertilizer input, water consumption and labor cost in fertigated and non-fertigated plots (2 seasons)

	2000/ 2001			2001 / 2002		
	Fertilizer cost (USD$/ha)	Water used (m3/ha)	Labor cost (USD$/ha)	Fertilizer cost (USD$/ha)	Water used (m3/ha)	Labor cost (USD$/ha)
No fertigation	229.6	3,260	44.86	229.6	3,120	45.47
With fertigation	59.2	1,780	1.4	64.2	1,950	1.48

1/1/1999

Source: Z. Chenglin and Y. Xie, IPI Fertigation symposium, Beijing 9-2005

Teaspoon Feeding™

Benefit:

Minimized spill off to the environment = indirect (and not yet paid for) savings

Teaspoon Feeding™ Methods

- ***Nutrigation***™ - **based on water application**

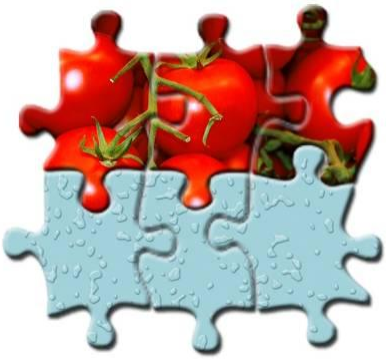
- **Controlled-release nutrition – based on specific coating and slow release patter**

- **Foliar nutrition – based on specific timely application**

Nutrigation™ *(fertigation)*

Nutrigation is Haifa and Netafim Trade Mark for fertigation.

Proportional *Nutrigation*™



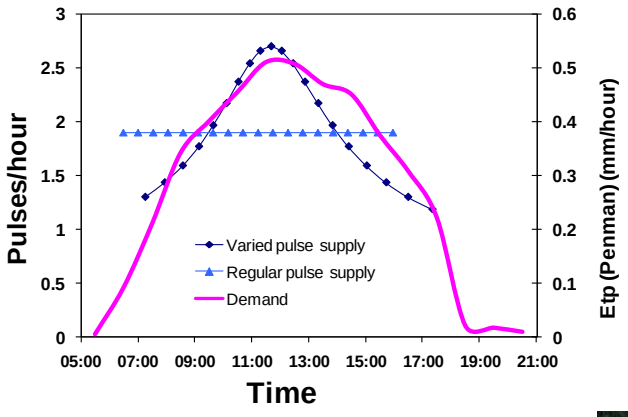
Irrigation and **nutrition**

match

plant requirements

Atmosphere

Meteorological station to provide actual ET



Soil

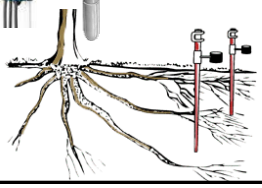
Soil moisture measurements

Tensiometers

Soil water content probes

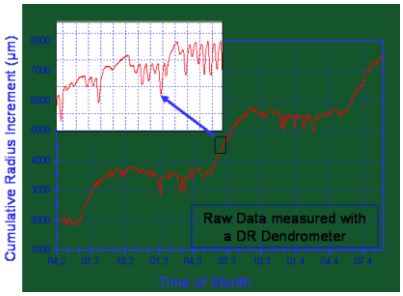
Soil salinity probes

Potential - tensiometers



Capacitance - conductance

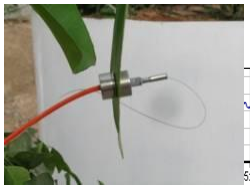
Plant

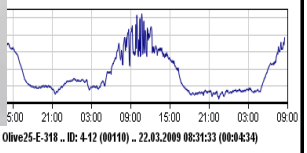


Dendrometers

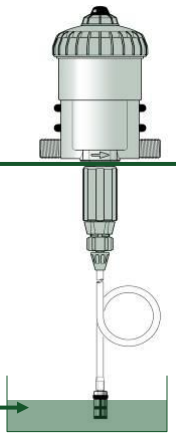
Canopy temperature

Plant water status (sap flow, turgor, stem water)





Proportional *Nutrigation*™

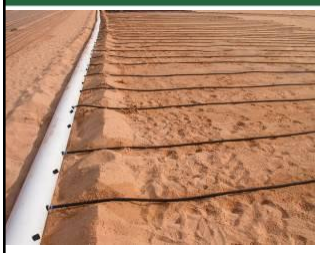


Water flow → determine concentration

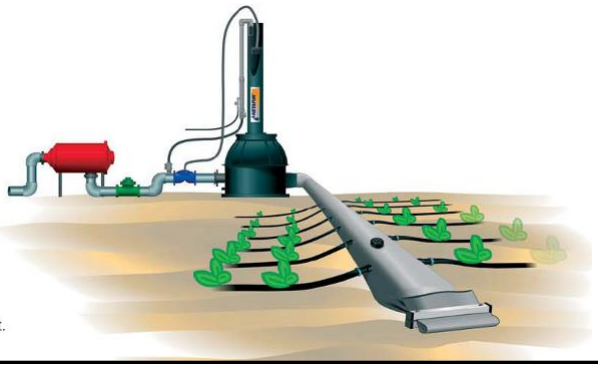
All nutrients in their soluble form

Fertilizer solution (determine composition)

Low Pressure Systems – high tech



- Replace flood (furrow)
- Inexpensive (relatively)
- Low energy
- Level fields

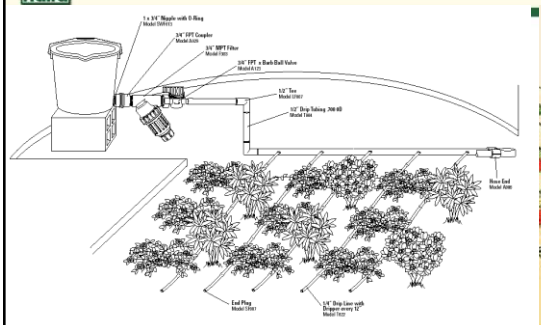


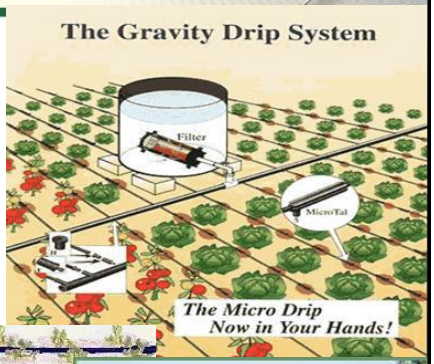
- Low flow rate drippers – long laterals – uniform application
- Long daily irrigations

Proportional, controlled *Nutrigation*™ through high or low pressure, above or subsurface high tech irrigation

- ***Solutions for advanced, large farms !***

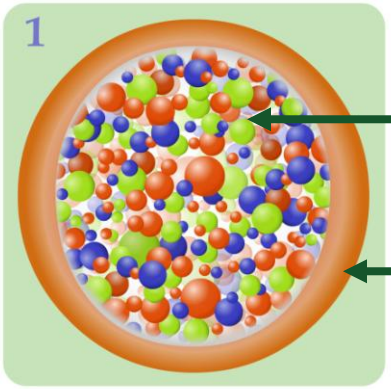
Low Pressure Systems – low tech





Controlled Release Nutrition

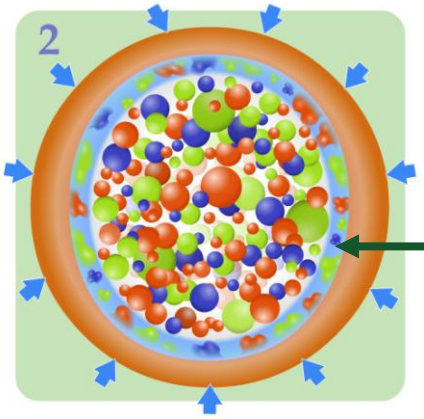
Polymer coated Technology



Core:
Soluble nutrients

Shell:
Polymer coating

Polymer coated Technology



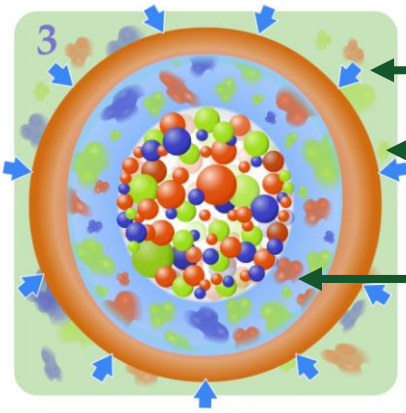
After application in the soil:

Water penetration

Gradual dissolution of the nutrients

This stage takes 7-10 days, depending on duration and level of moisture in the soil

Polymer coated Technology

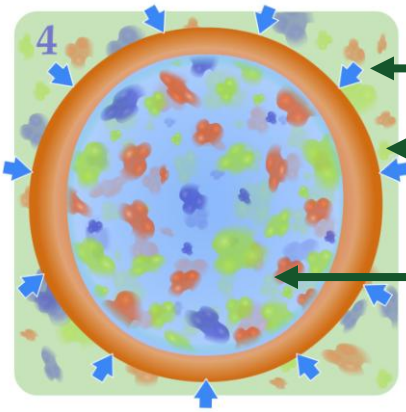


Water penetration

Diffusion of nutrients through the coating to the soil

Further dissolution of nutrients

Polymer coated Technology



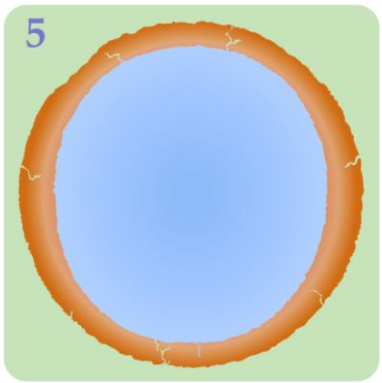
Water penetration

Diffusion of nutrients through the coating to the soil

Complete dissolution of nutrients

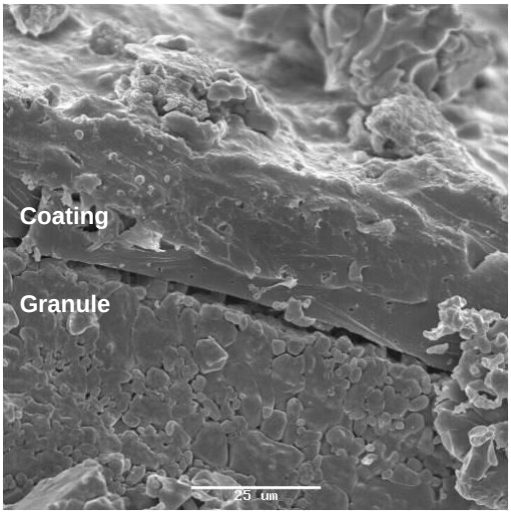
At this stage the release rate decays, according to Fick's 2nd law of diffusion.

Polymer coated Technology



After the release is complete, the coating will degrade gradually, leaving no residues in the soil = Biodegradability

Multicote® Polymer coated Technology

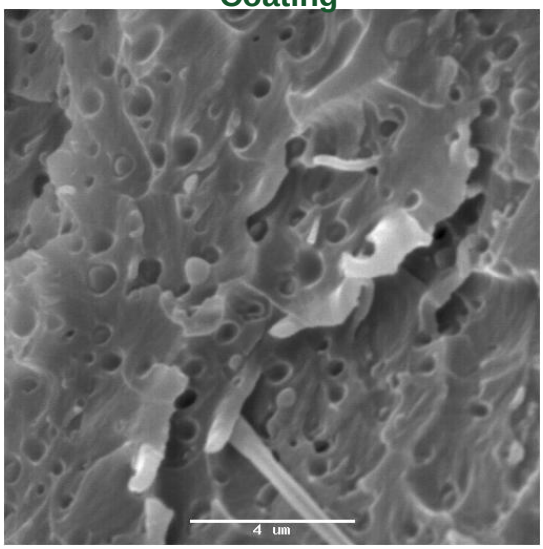


Scanning Electron Microscope picture of NPK granule

Haifa Chemicals internal data, 2002

Multicote® Polymer coated Technology

Coating

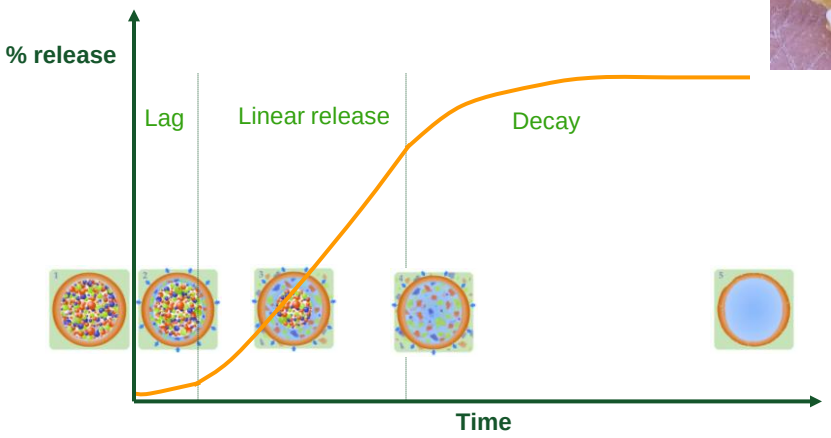


Scanning Electron Microscope of NPK granule

Haifa Chemicals
internal data, 2002

Polymer coated Technology

Typical release curve:



Controlled-release nutrition

Fertilization is independent of irrigation system:

- Reduced losses by leaching
- No need for "technical irrigations"
- No need for sophisticated dosing systems and its maintenance
- Nutrition synchronized with plant needs

Controlled-release nutrition

On light soils

Controlled-release nutrition

Under high precipitation

Controlled-release nutrition

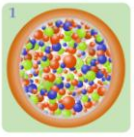
Where mid-season application is not feasible

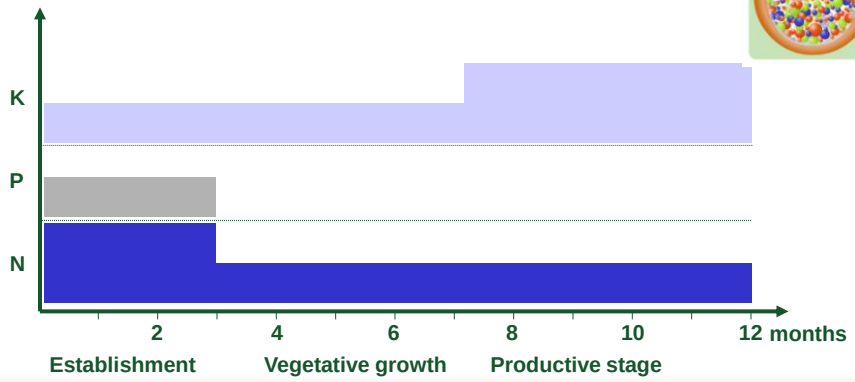
Controlled-release nutrition

Where nitrogen application is restricted

Multicote® by "growth stages":

Typical NPK blend with nutrient ratio to meet actual growth requirements





Multicote ®: Controlled Release Nutrition

Wisdom and high-tech are already implemented - fit for various management levels

The Brains Inside = crop specific formula

Controlled Release applications

Foliar Nutrition

Foliar Nutrition

Complementary nutrition
with high benefit / cost value

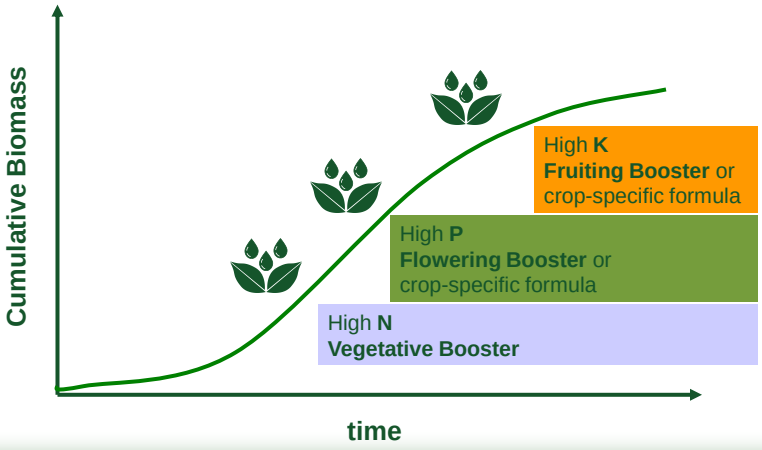
Foliar Nutrition

For immediate corrective nutrition
when deficiencies are observed

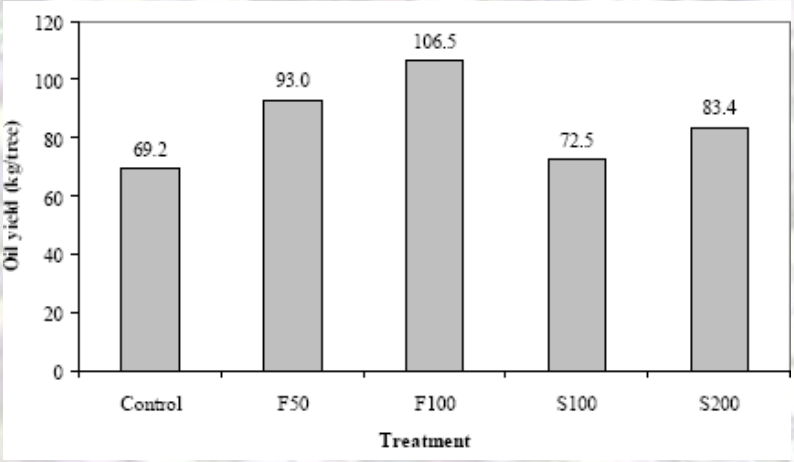
Foliar Nutrition

For boosting growth
during critical stages of plant development

Poly-feed® Foliar Teaspoon Nutrition

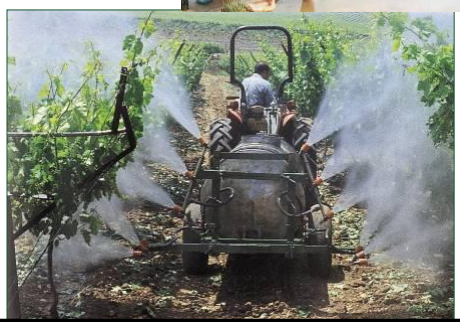


Tunisia: Effect of soil and foliar KNO_3 treatments on oil yield of olive



Source: Ben Mimoun et al., 2008. e-ifc 18. http://www.ipipotash.org/eifc/2008/17/5

Foliar Applications fit all sizes and levels of farms



Multicote® Controlled Release - a brainy fertilizer

Looks simple, but perform sophisticatedly

Teaspoon Feeding™ - summary

- 4Rs in Teaspoon Feeding improve both NUE and WUE
- Feed the plant as it needs:
  - Nutrigation
  - Controlled release
  - Foliar application
- Available, practical technological innovations can significantly improve productivity and profitability.