



# *Principles of Fertigation Grow More With Less*

Roy Peleg, Netafim



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Introduction

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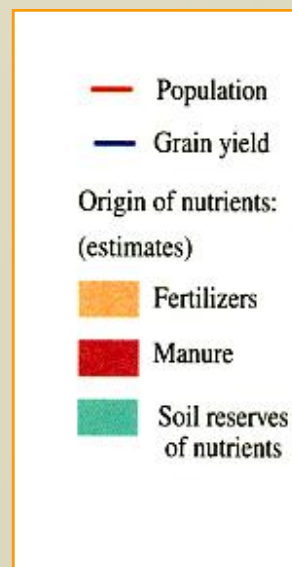
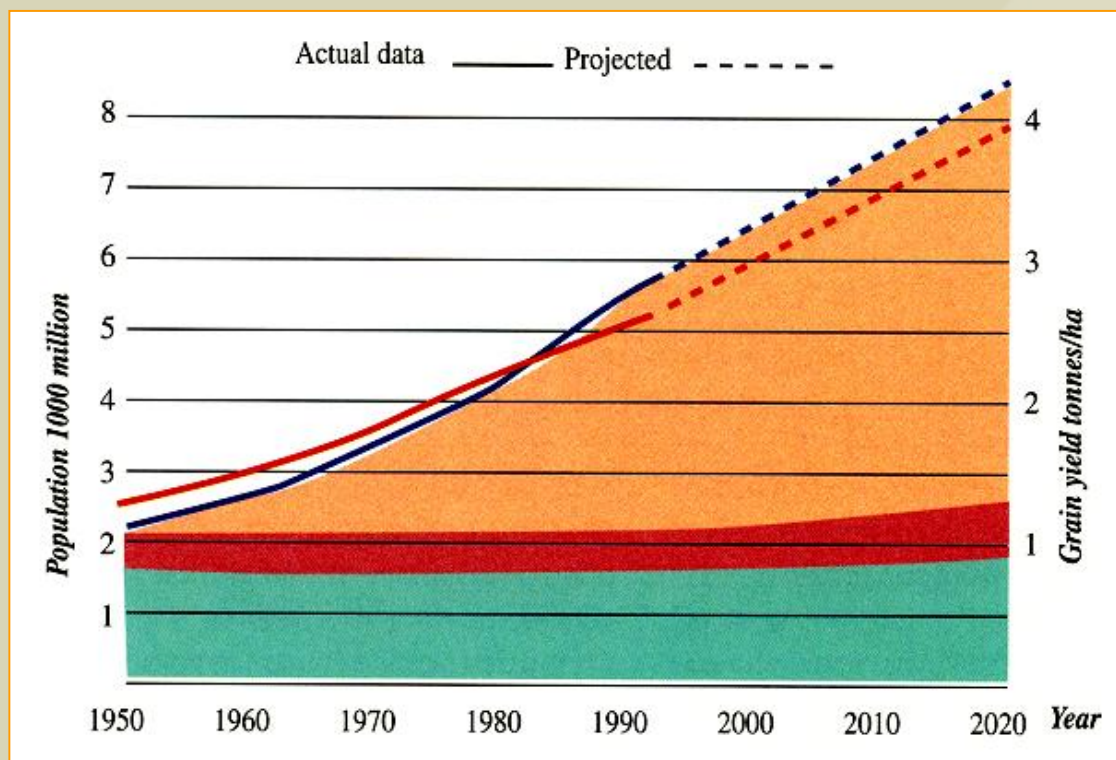
Summary



- § Supplying a **N**itrogen, **P**hosphorus, Potassium and others minerals is essential for optimal plant growth.
- § The nitrogen, phosphorus, potassium is main builder for proteins, amino acids, chlorophyll and enzymes.

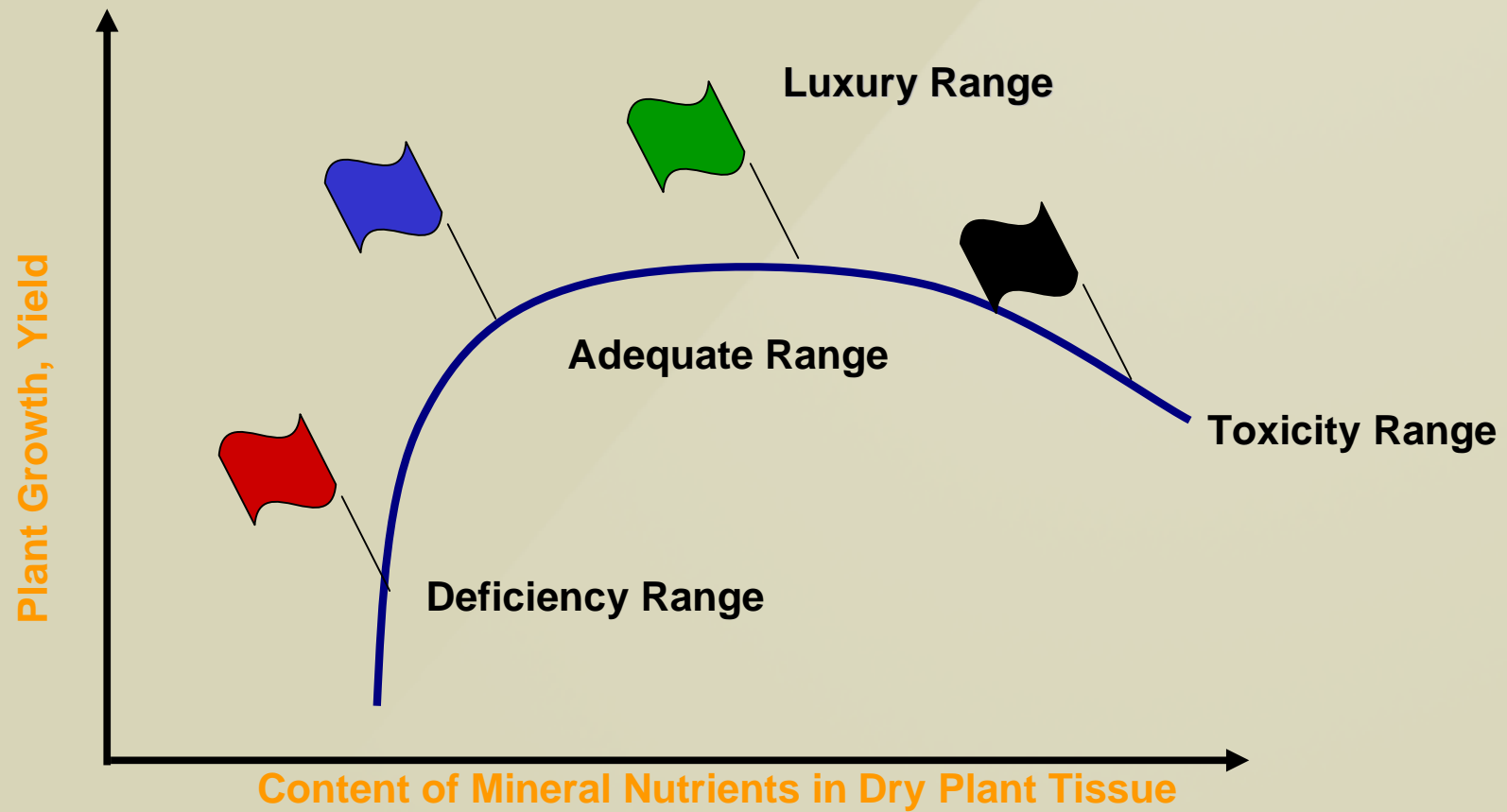


# Global Trends In Population Growth



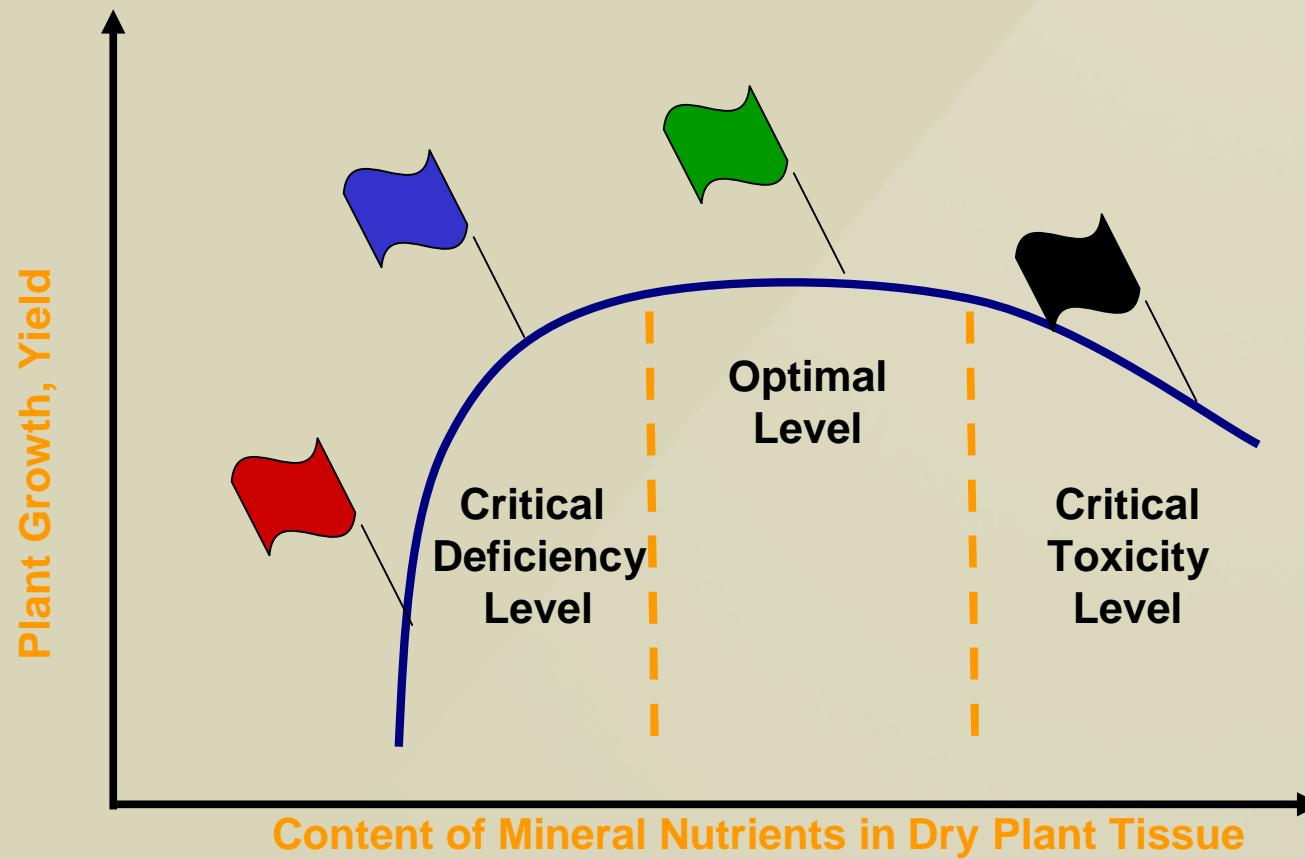
# Nutrient / Growth Ratio

Introduction



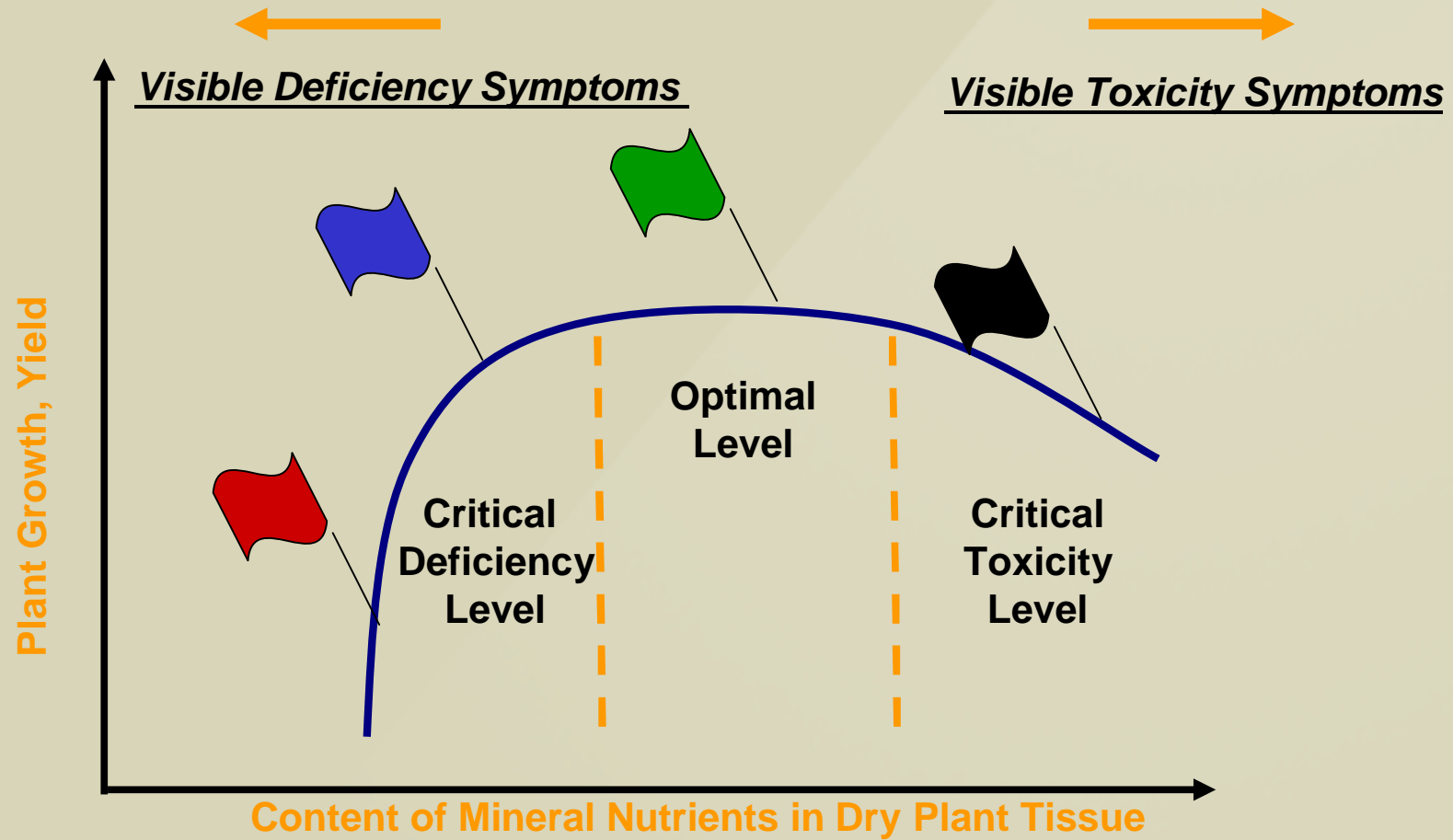
# Nutrient / Growth Ratio

Introduction



# Nutrient / Growth Ratio

Introduction



## Plants Fertigation

Essential  
Elements

### Is Based on Essential 16 Elements

§ Optimal plant fertigation will include 16 elements which are characterized as microelements consisting of Nitrogen – Phosphorus – Potassium as well as calcium magnesium and sulfur.

§ Microelements consist of the following elements:

Fe, Mn, Zn, Cu, Mo, B, Cl and H<sub>2</sub>O and C which are supplied as water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>).



# Nitrogen

Essential  
Elements

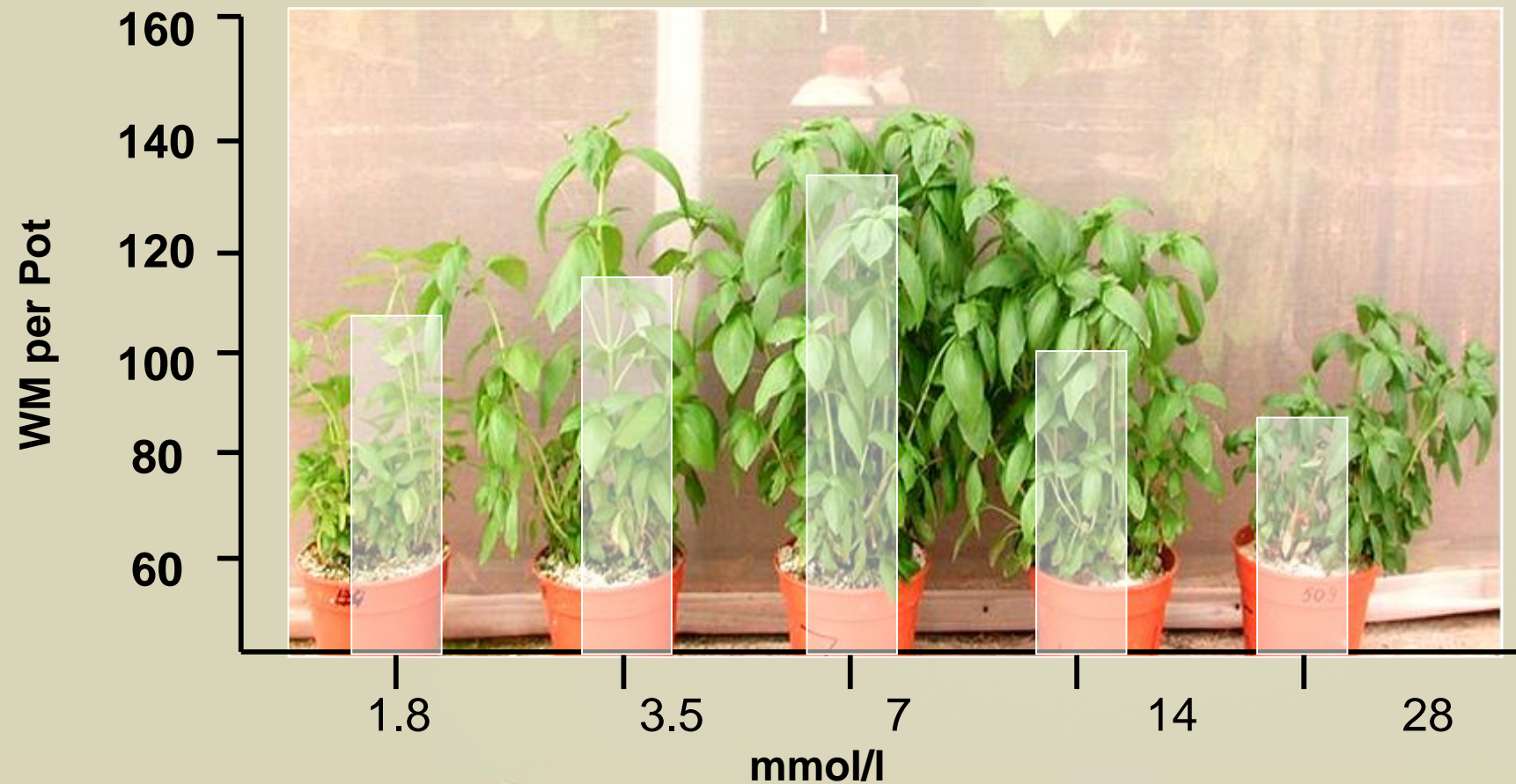
- § Nitrogen is the builder of proteins, amino acids, chlorophyll & enzymes.
- § Responsible for vigorous plant growth.



# Nitrogen

Essential  
Elements

## Effect of Nitrogen on Yields of Sweet Basil (*Ocimum basilicum* L.)



# Phosphorous

Essential  
Elements

Phosphorous (P) is vital to plant growth and is found in every living plant cell.

Involved in several key functions:

- § Energy transfer & Photosynthesis
- § Transformation of sugar and starches
- § Nutrient movement within the plant
- § Transfer of genetic characteristics



# Phosphorous

Essential  
Elements

Increases transformation of sugar and starches and energy transfer process



# Potassium

Essential  
Elements

- § Potassium compensates the osmotic pressure in the plant
- § Potassium is located in the stomata's guard cell and neutralizes charges differences



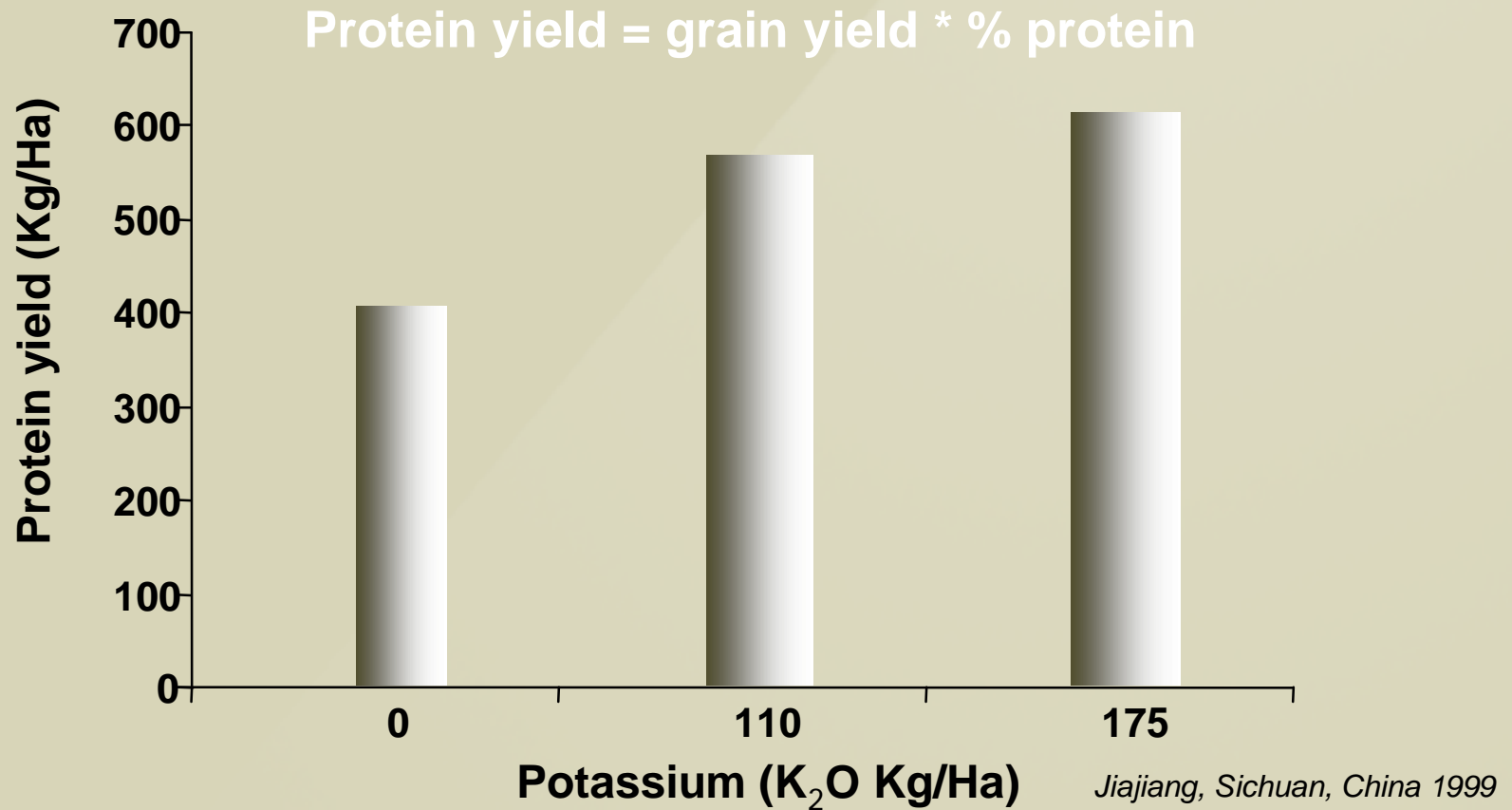
Without K



With K

# K Increases Protein Content in Corn

Essential Elements



## *Resulted from Inefficient Fertigation*

Plants Disorder

- § Keeping an accurate supply of nutrients to the plant, is crucial.
- § Deficiency of nutrients could cause plants disorders.
- § Disorders symptoms are usually seen on leafs or fruits.
- § When symptoms are identified, damage is usually irreversible.



# Resulted from Inefficient Fertigation Nitrogen

Plants Disorder



*Nitrogen deficiency in  
Bananas stem and leaves*



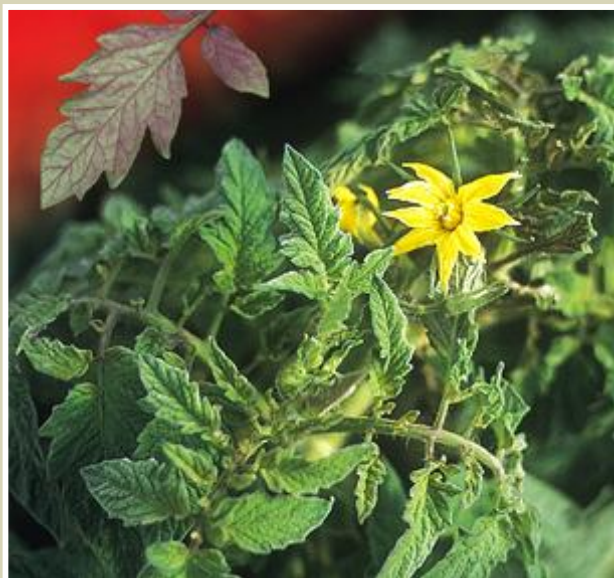
*Nitrogen deficiency  
in cucumber*



# Resulted from Inefficient

# Fertigation Phosphorus

Plants Disorder



*Red veins in tomato leaf as result of phosphorus deficiency*



*Phosphorus deficiency in Avocado*

# Resulted from Inefficient

# Fertigation Potassium

Plants Disorder



*Potassium deficiency  
in grape leaves*



*Potassium deficiency  
Resulting with Cucumber  
leaves bleaching*



# Calcium

Plants Disorder



*Browning symptoms as result of calcium deficiency in lettuce*



*Calcium deficiency Resulting with blossom end rot in Sweet pepper*

- § Plan your fertigation strategy according to the crop needs, environment conditions and soil conditions.
- § Use monitoring tools in order to adjust your strategy according to continuously changes.
- § Keep proportional fertigation or just keep fertigation
- § Choose the proper fertigation systems
- § Use fertilizers coming only from reliable producers.



# The Onion Shaped Wetting Zone

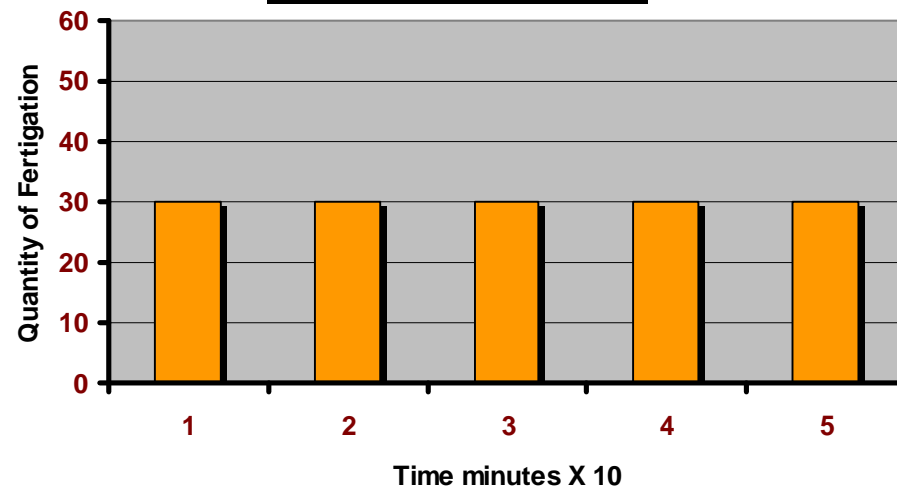
Fertigation  
Concepts



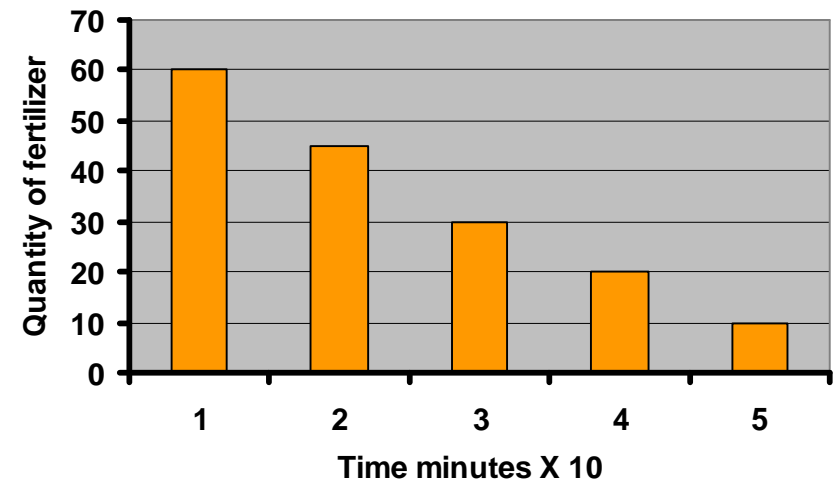
# Fertigation Concepts

Fertigation  
Concepts

Proportional Fertigation



Quantitive fertigation



# *Uniform Wetting Points Along the Row*

Fertigation  
Concepts



# Wetted Area By Dripper in Different Soils

Fertigation  
Concepts



# Advantages of Fertigation

Fertigation  
Concepts

- § Nutrient requirements according to crop stages (teaspoon feeding).
- § More uniform distribution and closer to root system.
- § Better availability of nutrients to plants.
- § Nutrient uptake increases.
- § Reduced application losses of nutrients by leaching.
- § Less costly application labor.
- § Application flexibility (time, weather, soil).



# Fertigation Devices

Fertigation  
Devices

## § Pressure devices

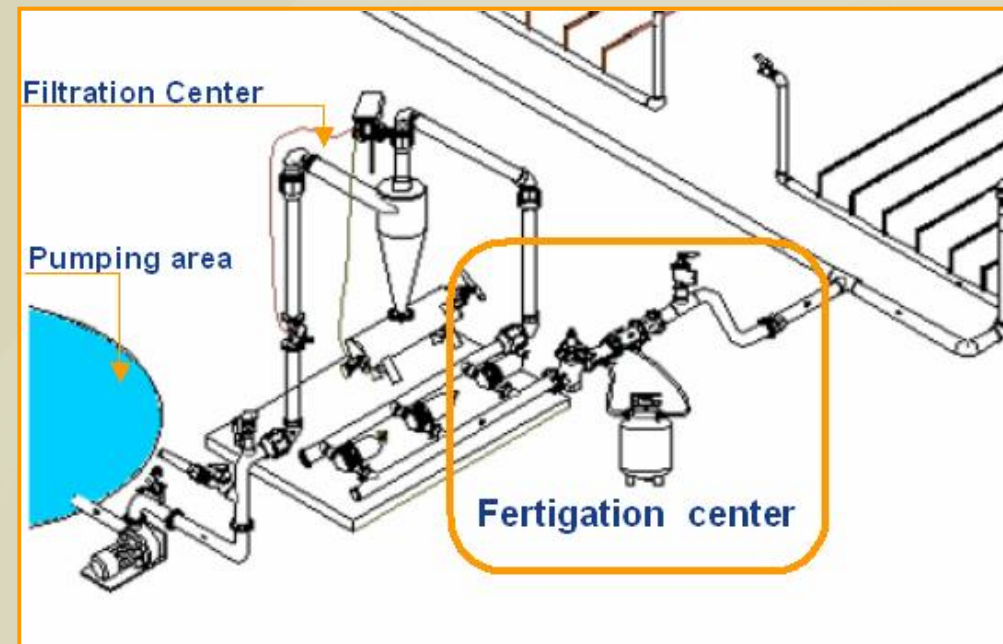
Fertilization tank  
Venturi injector

## § Hydraulic Systems

Quantitative hydraulic pump  
Proportional hydraulic pump

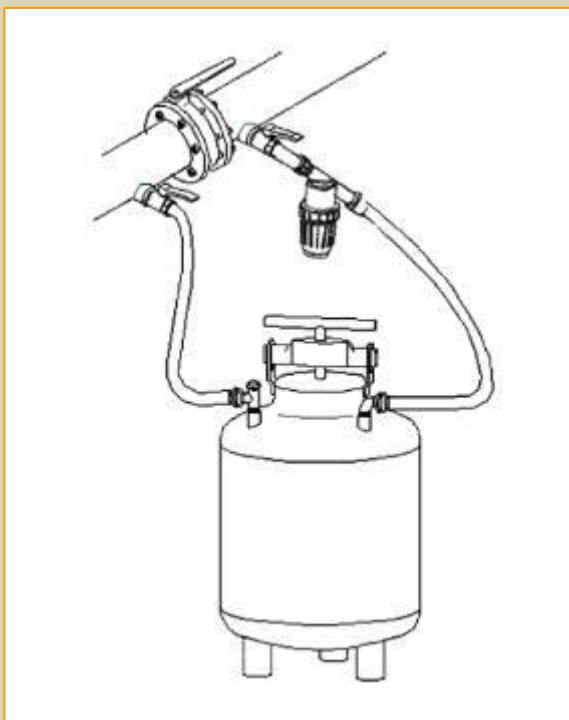
## § Dosing units systems

Principles  
Inline-Jet  
Bypass-Jet



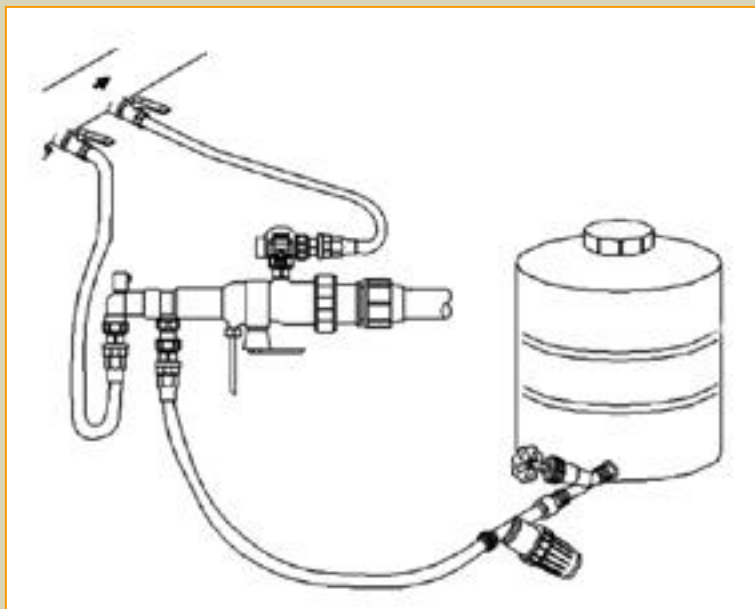
# Fertigation Tank

Fertigation  
Devices



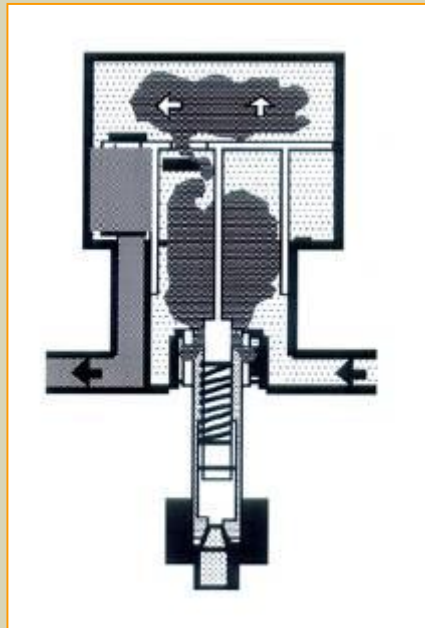
# Venturi Injector

Fertigation  
Devices



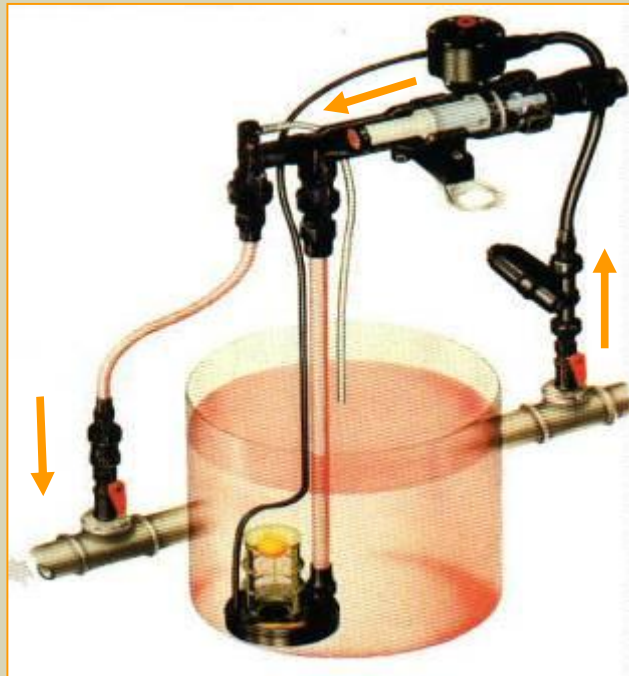
# Proportional Hydraulic Pump

Fertigation  
Devices



# Quantitative Hydraulic Pump

Fertigation  
Devices

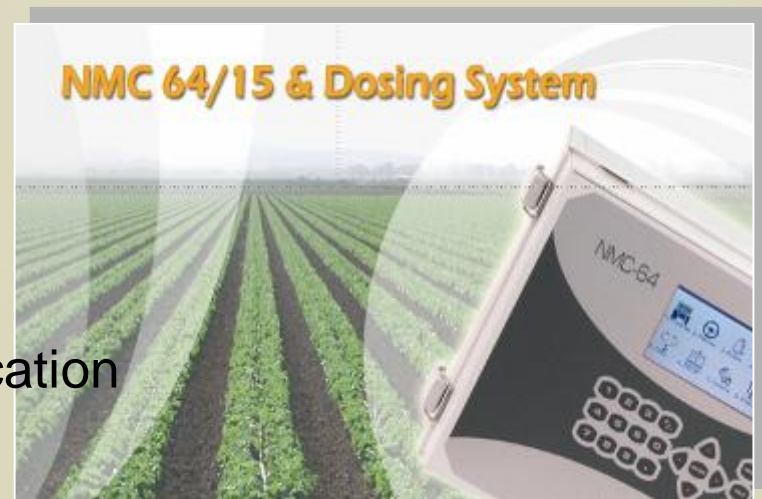


# NMC 64/15 & Dosing System

Dosing System

The Netaget dosing unit ensures outstanding accuracy, homogeneous solution and simplicity  
User friendly controller consisting of:

- § Large graphic display
- § Flexible hardware structure
- § Suitable for Irrigation and climate application



# Dosing Units

Dosing System

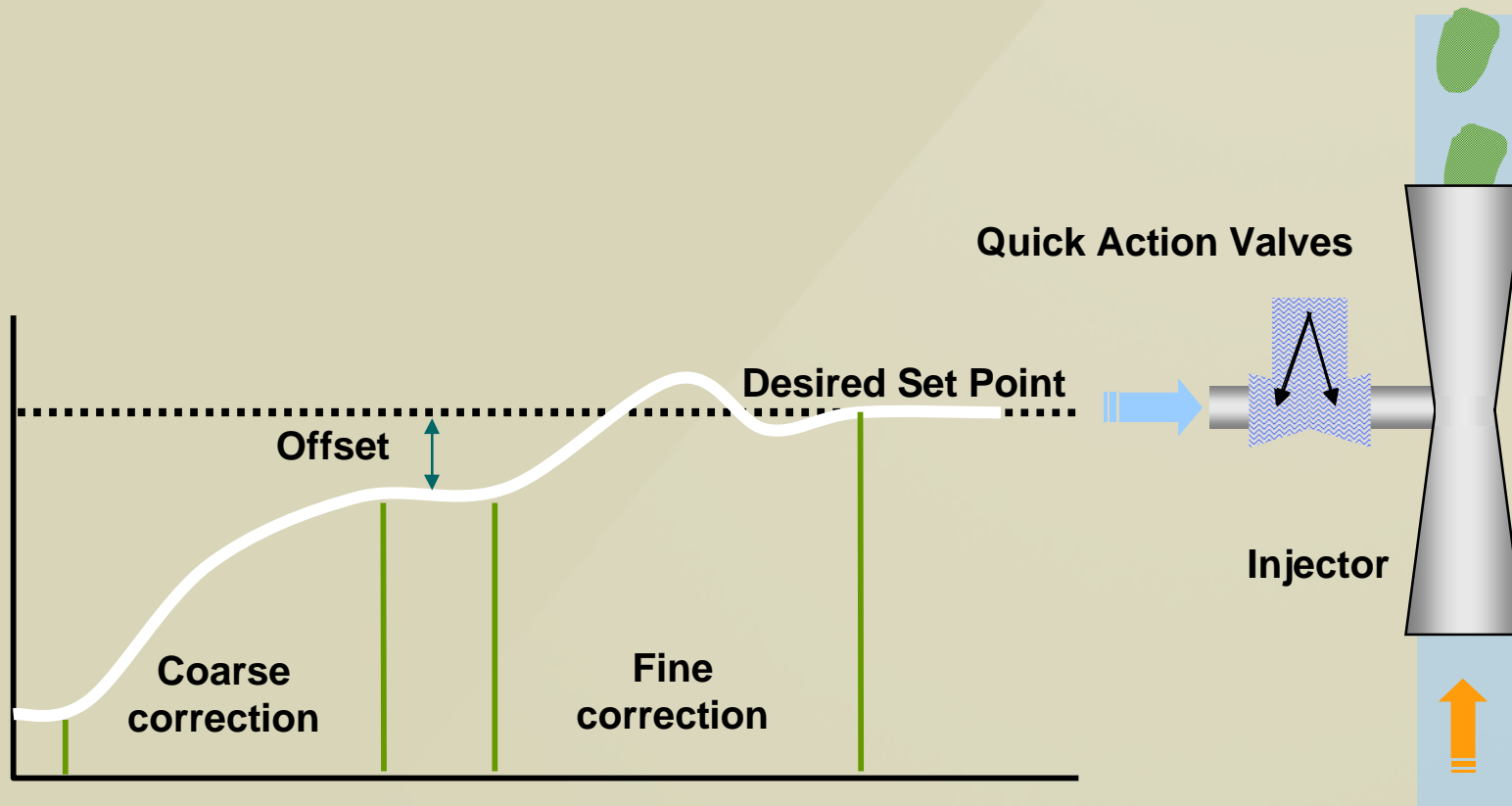
## Main Benefits

- § State of the art technology ensures precise fertigation
- § Unique hydro-mix technology
- § Dosing channels based on Venturi injector with no moving parts
- § Quick action valves
- § EC/pH measurement and control



# Important Features

Dosing System

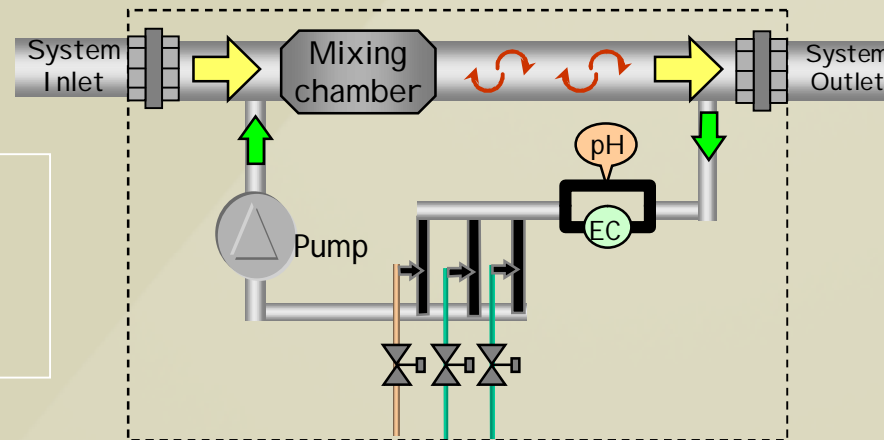


# NetaJet Types

Dosing System

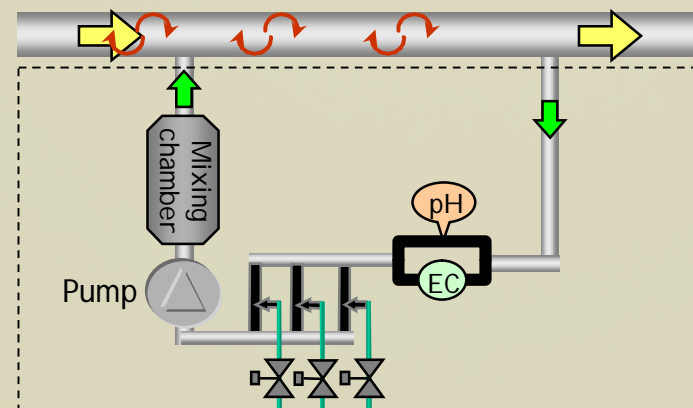
## Netafim Inline-Jet:

Flow rates:  
5 – 20 m<sup>3</sup>/h



## Netafim Bypass-Jet:

Flow rates:  
20 – 100 m<sup>3</sup>/h



# Summary

Summary

- § Fertigation is one of the major foundations for a plant growth
- § Optimal plant fertigation will include 16 elements
- § Keeping accurate nutrient content is very important for optimal growth and maximum yield
- § Deficiency of nutrients could cause plants disorders
- § Preventing fertigation disorders in Plants is based on good monitoring, keeping proportional fertigation and choosing the proper fertigation system.

