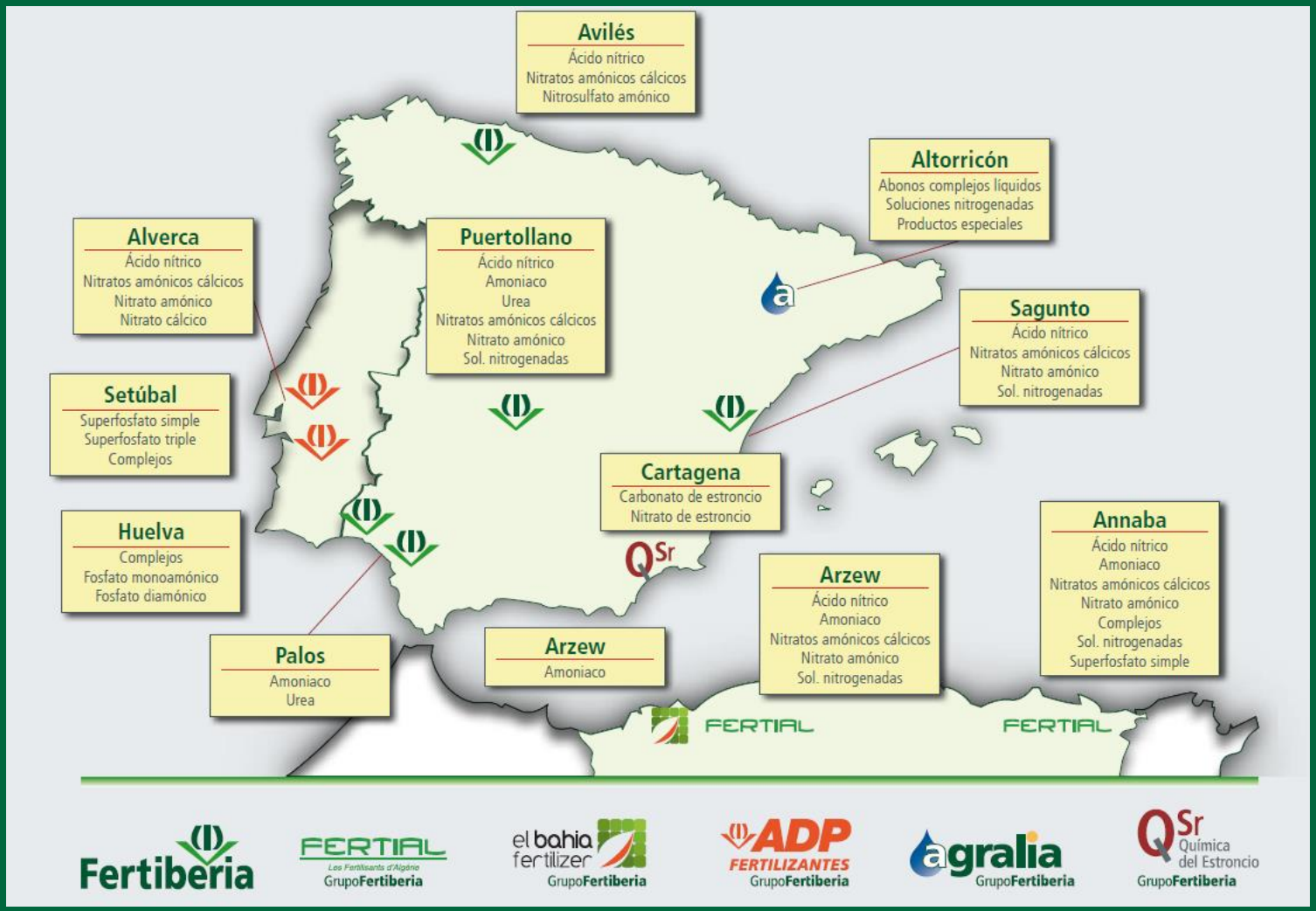
Fertiberia

Javier Brañas Lasala

Agricultural phosphorus efficiency and sustainable intensification

2P15 BERLIN
European Sustainable Phosphorus Conference

PRODUCTION PLANTS

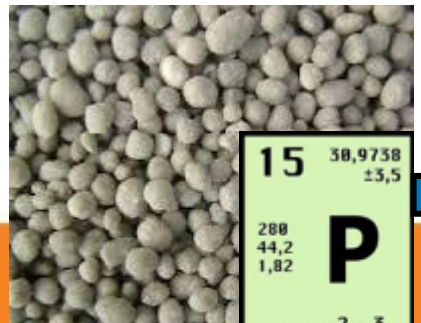


The importance of phosphorous

"Photosynthesis would be a fruitless tour de force if it were not followed by the phosphorylation of the sugar produced" (Deevey, 1970)

Some facts:

- P is an essential nutrient
- P is irreplaceable / has no substitute
- P is an essential nutrient in plants although the content in the plant is in a modest concentration (2 g per kilo of dry matter).
- The lithosphere has a low P content (granite has 0.6 g kg–1; slate: 0.8 g kg–1; basalt: 1.5 g kg–1) and "almost all of it in the same package": apatite

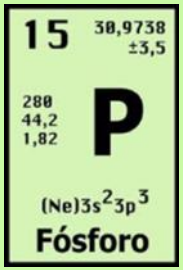


Minimum P needs:

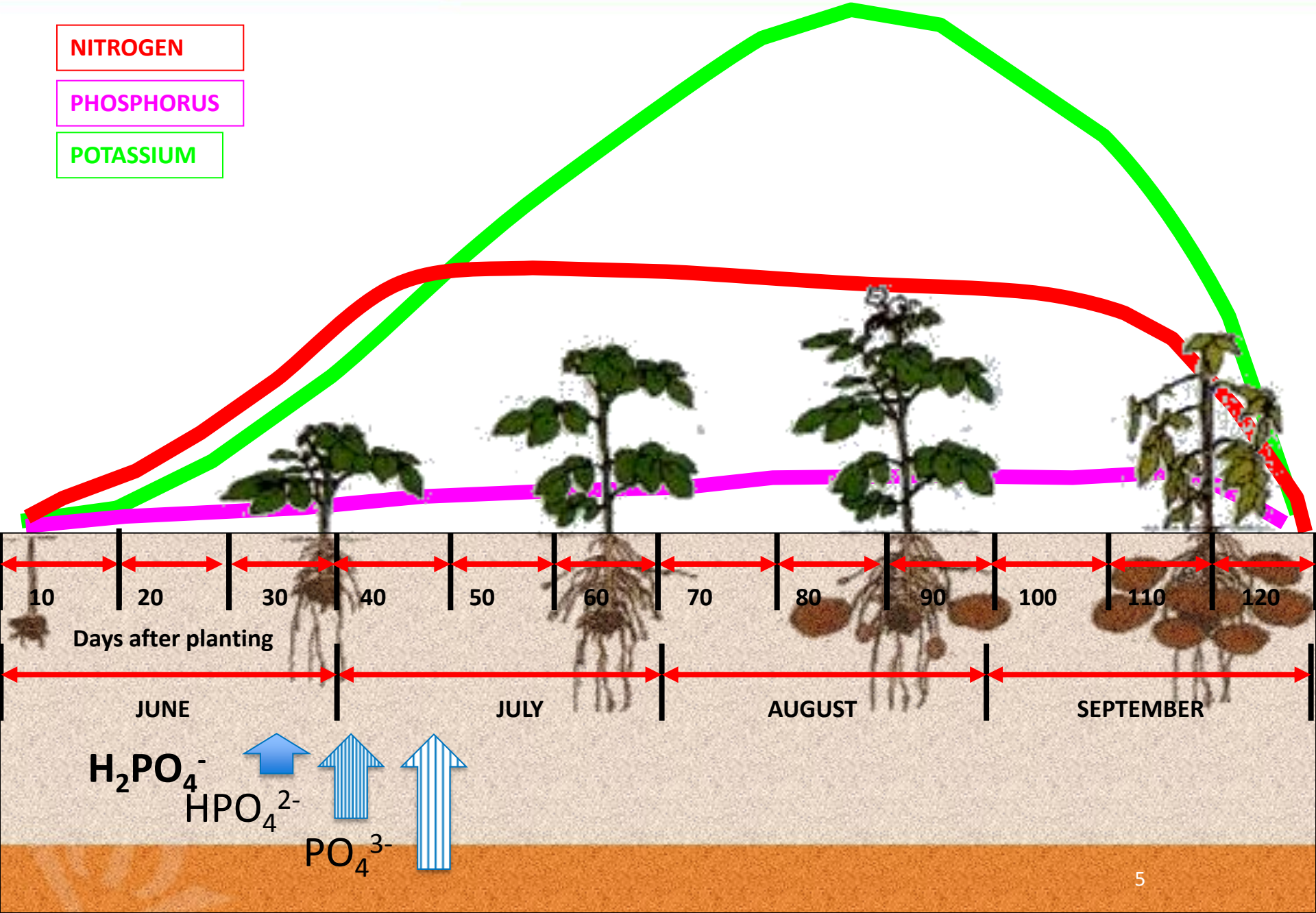
0,6-0,7 g P per person and day

The role of P in the plant

- cell division and albumen and fat formation
- blossoming and fruiting (including seed formation)
- plant ripening
- root developing, in particular secondary and fibrous roots
- straw resistance in cereal crops
- fruit quality, especially in fodder crops and vegetables
- resistance to diseases



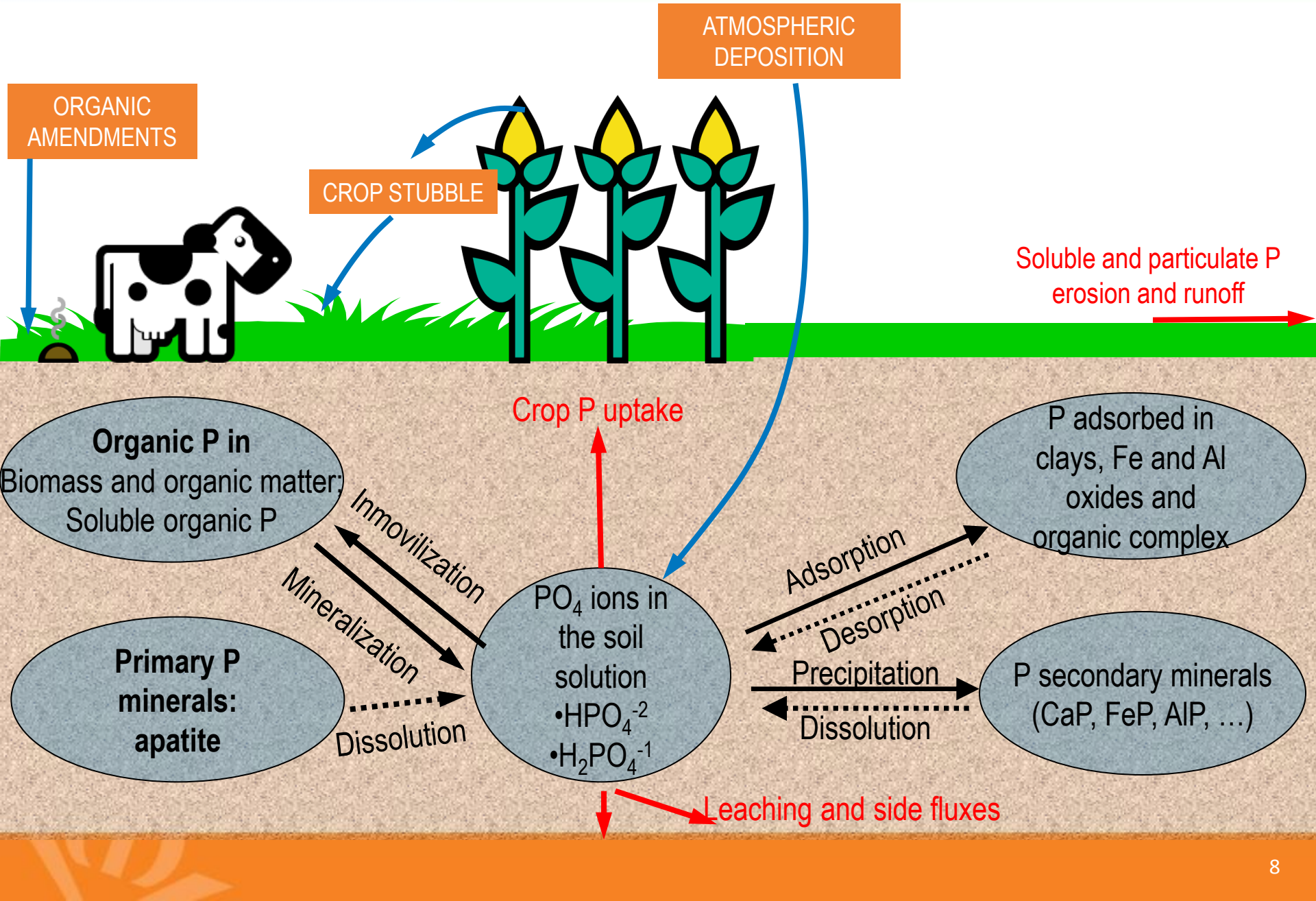
P absorption



P concentration (as PO_4^{3-}) in the soil solution is below **10^{-6} M** in many virgin or non-fertilized soils, and between **10^{-6}** to **10^{-4} M** in many fertilized soils.

…. that means it lasts less than a sweet at the gates of a school

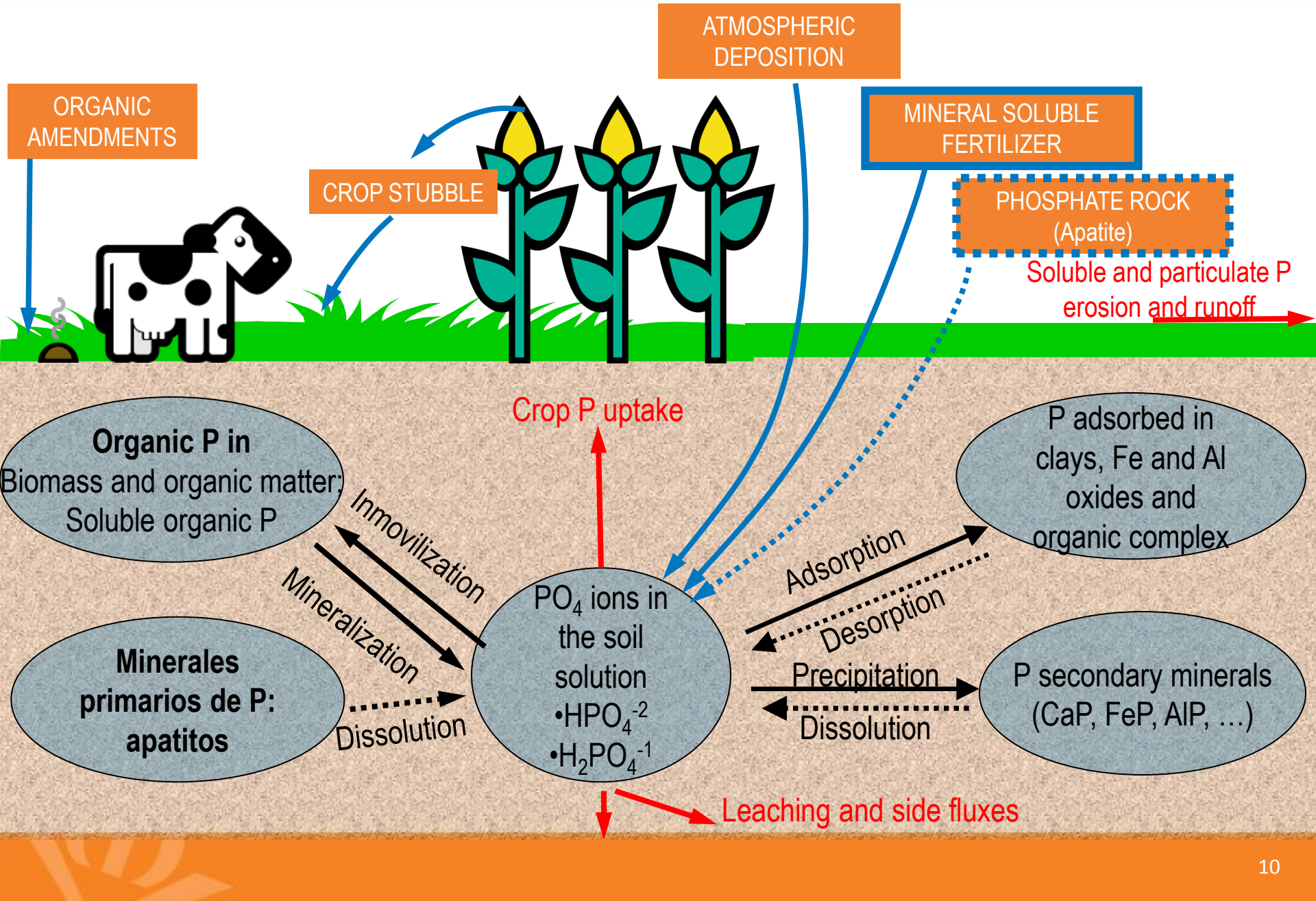
P cycle


ATMOSPHERIC DEPOSITION
ORGANIC AMENDMENTS
CROP STUBBLE
Soluble and particulate P erosion and runoff
Crop P uptake
Organic P in Biomass and organic matter; Soluble organic P
Inmovilization
Mineralization
Primary P minerals: apatite
Dissolution
PO4 ions in the soil solution
•HPO4-2
•H2PO4-1
Adsorption
Desorption
P adsorbed in clays, Fe and Al oxides and organic complex
Precipitation
Dissolution
P secondary minerals (CaP, FeP, AlP, …)
Leaching and side fluxes

Therefore, it is necessary to keep an adequate P level in the soil solution

….and it is here where **fertilizers play a key role**

P cicle & Fertilizers



The soil P fixation is determined by:

- pH
- soluble iron, aluminium and manganesium
- presence of minerals containing iron, aluminium and manganesium
- availability of calcium and calcium minerals
- the amount and decomposition of organic matter and the microbial activity

The soil P fixation is determined by:

pH

- soluble iron, aluminium and manganesium
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- availability of calcium and calcium minerals
- the amount and decomposition of organic matter and the microbial activity

Which is the role of fertilizers?

to increase the concentration of soluble P forms in the soil solution, in such a way that it will be more easily available for the roots

Fertilizer industry

Natural Gas
Air
Water

→ Ammonia

Ammonia → + O_2 → Nitric Acid → + Ammonia → Ammonium Nitrates

Ammonia → + Sulphuric Ac. → Ammonium Sulphate

Ammonia → + CO_2 → Urea

Natural Phosphates
Phosphate Rock

→ + Sulphuric Ac. → Phosphoric Ac. → + Ammonia → Ammonium Phosphates

→ + Sulphuric Ac. → Superphosphates

Potassium Salts
Potassium Chloride

→ + Sulphuric Ac. → Potassium Sulphate

N source
P source
K source

→ NPK fertilizer

Which trends in the fertilizers world are related to P and farm intensification?

To improve the analytical methods and the strengthening of the interpretation in order to improve the diagnosis and fertilizer recommendation

Fertiberia provides a diagnosis and recommendation tool (“SIDDRA”) available for its customers

siddra
Sistema Integrado de Diagnóstico y Recomendaciones de Abonado

Trends in the fertilizer world

To improve the analytical methods and the strengthening of the interpretation in order to improve the diagnosis and fertilizer recommendation

To find new P sources in Europe, with high quality and high P available content.

Close the loop

high P concentration
safety
stability
availability
economic viability

Trends in the fertilizer world

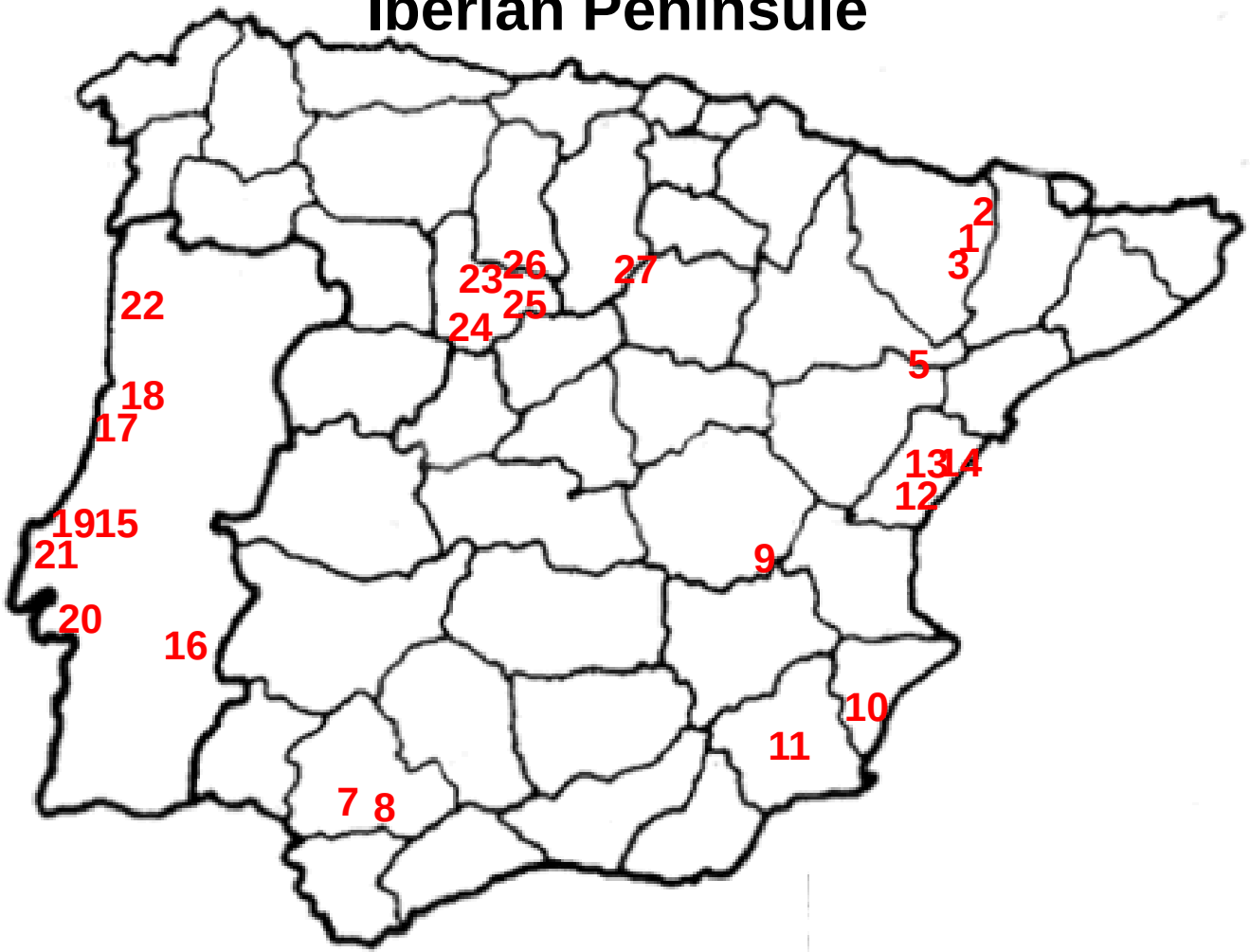
To improve the analytical methods and the strengthening of the interpretation in order to improve the diagnosis and fertilizer recommendation

To find new P sources in Europe, with high quality and high P available content.

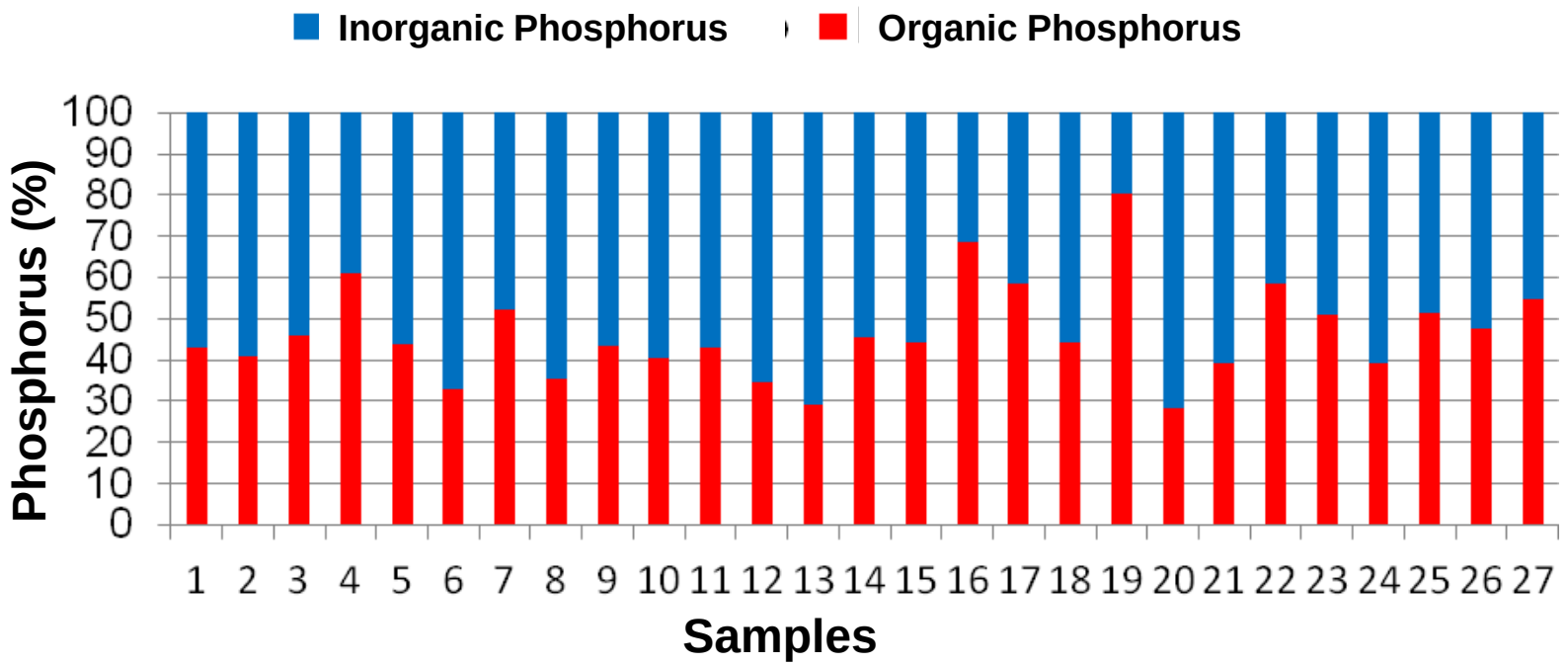
To improve the management of fertilizers and crops

- Best fertilizer management
- Mobilise the phosphorus fixed in the soil
  - organic P
  - inorganic P

P potentially available in agricultural soils in the Iberian Peninsule



Mobilise the phosphorus fixed in the soil



Inorganic and Organic P percentage in each soil sample

Average Organic P content: 46,6 %

Organic P: 922 kg P/ha (2110 kg P_2O_5/ha).

Therefore, there is an important P organic concentration in Iberian agricultural soils which is expected to be useful for crops after its mineralisation

Trends in the fertilizer world

To improve the analytical methods and the strengthening of the interpretation in order to improve the diagnosis and fertilizer recommendation

To find new P sources in Europe, with high quality and high P available content.

To improve the management of fertilizers and crops

Design of new fertilizer products that enhance P use efficiency

e^3 Technology: organic molecule consortium with enzimatic activity



Enzimatic activity

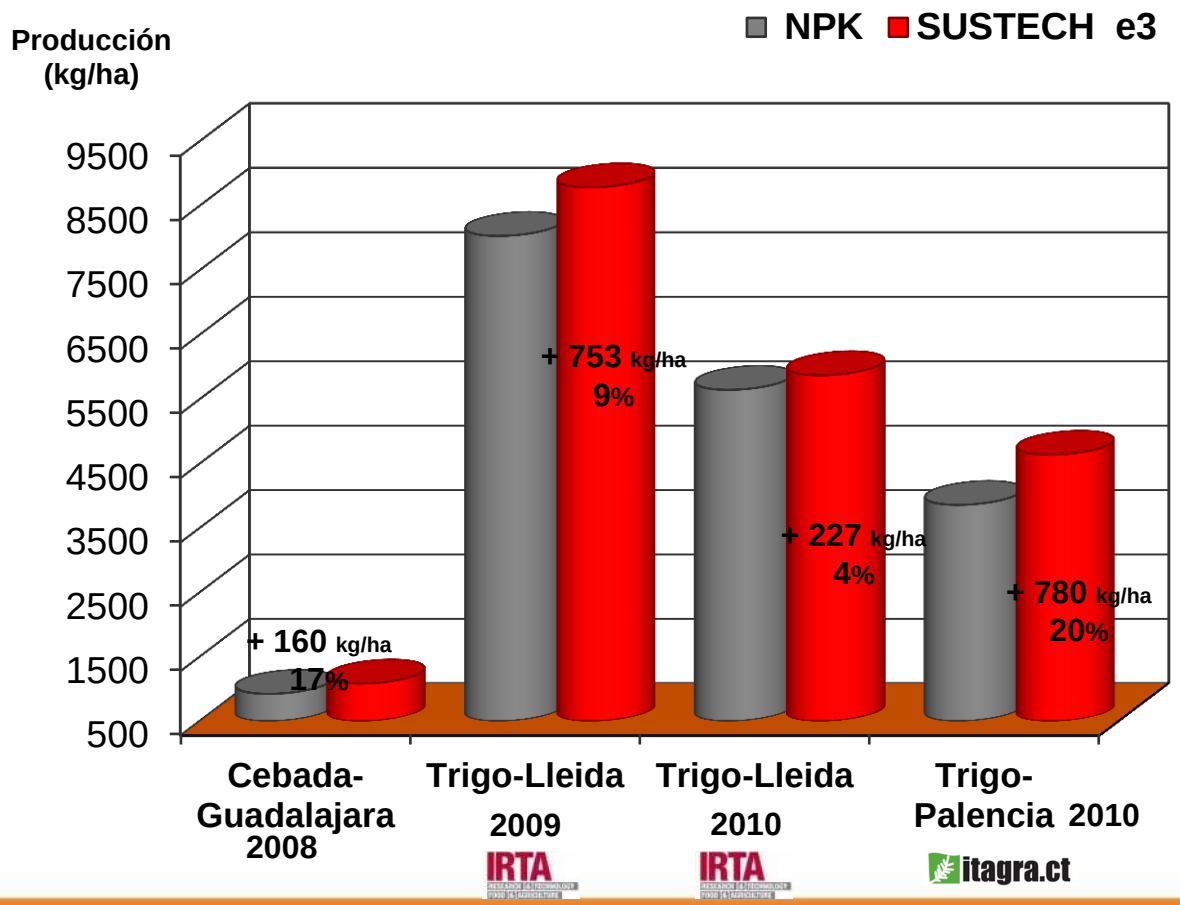
Transformation of organic P to inorganic P.

Humic Substances formation

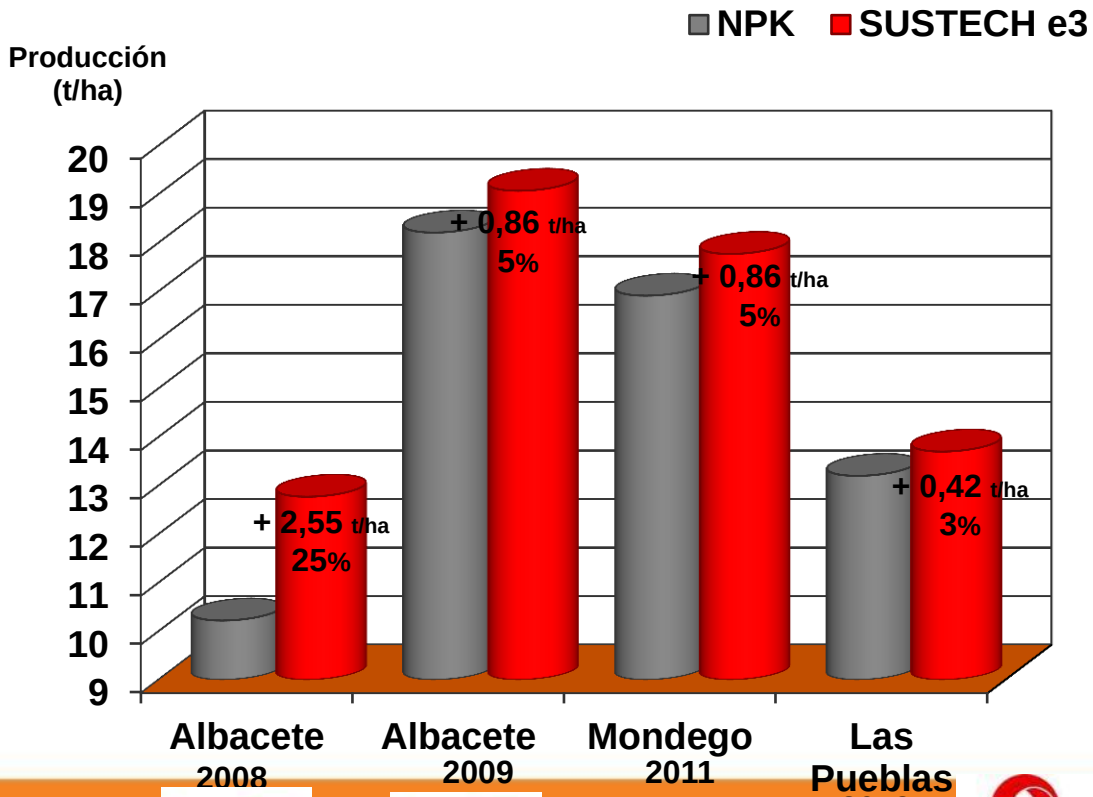
Molecule consortium e^3	
Fosfatasa (µmol PNP / ml x hora)	0,059
Ureasa (µmol N-NH_4^+/ ml x hora)	0,079
Polifenol oxidasa (mM pyrogallol /ml x hora)	1,356
β glucosidasa (µmol PNP / g solo seco x hora)	0,81

Urea transformation

Field trial e^3 in winter cereals



Field trial e^3 maize

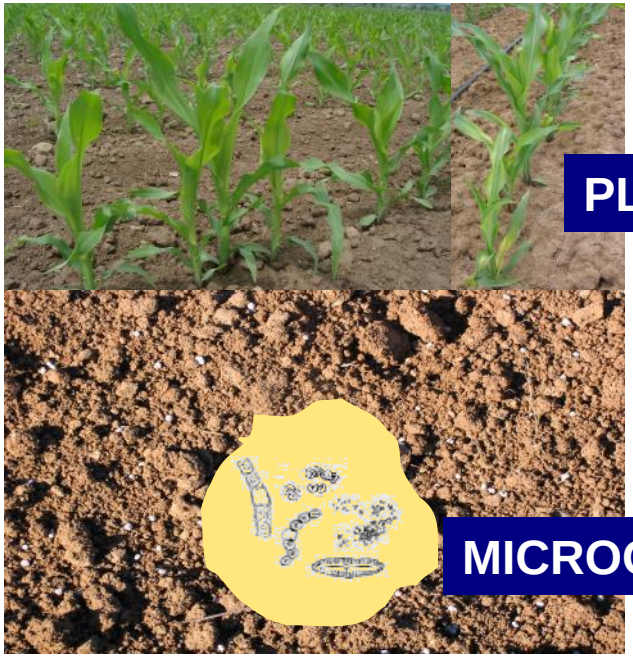


ADP FERTILIZANTES

AMICOTE TECNOLOGIA C-VIDA

C-Vida Technology: metabolites of beneficial microorganisms + organic molecules

Synergy MICROORGANISMS, PLANT, NUTRIENTS



PLANT

- Provides energy to ryzosphere microorganisms:
  sugar, aminoacids, organic acids.
- Better root development.
- More efficient nutrition.

MICROORGANISMS

- Fitohormons for plants.
- Enzimatic activity and nutrient solubilization.
- Competition with pathogens.

NUTRIENTS

- Higher N efficiency.
- P solubilization.

C-Vida Technology: metabolites of beneficial microorganisms + organic molecules

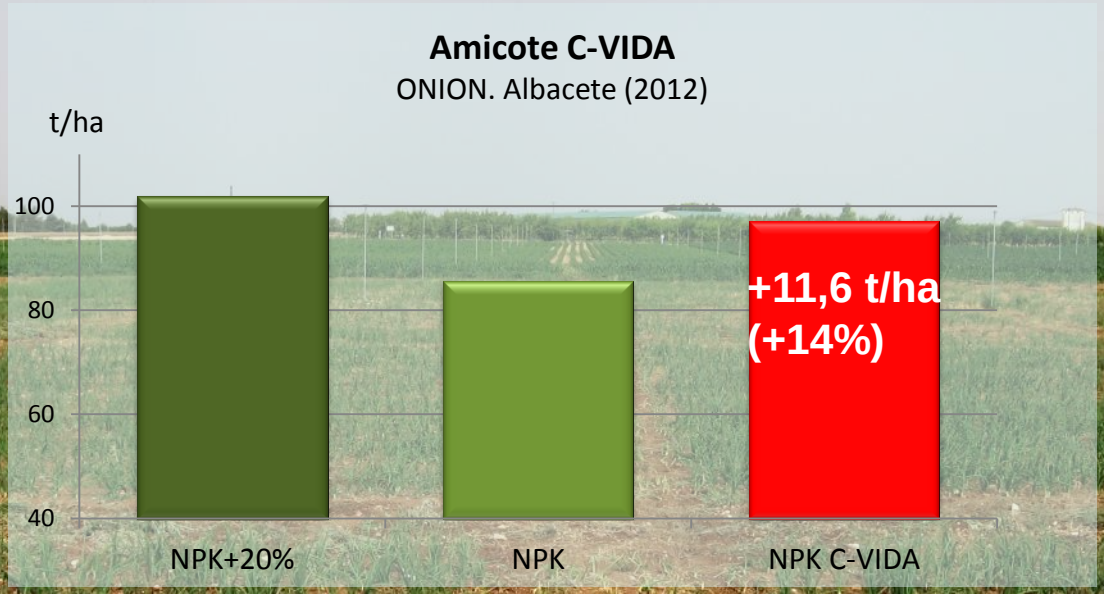
Synergy MICROORGANISMS, PLANT, NUTRIENTS

Ensaio em vasos CUF – Adubos de Portugal. Junho 2008.

❖ Higher root development.

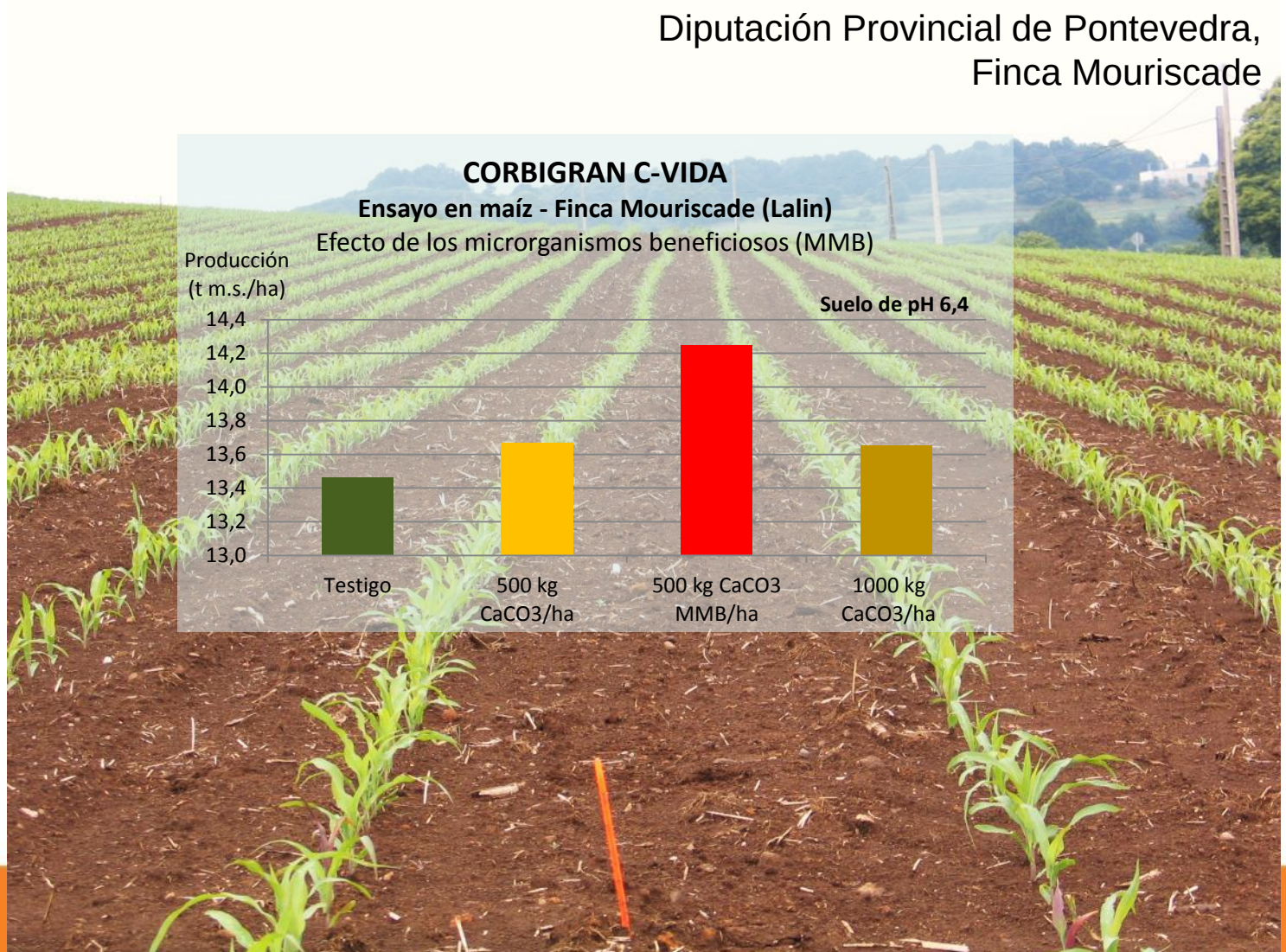
Field trial: Onion

Instituto Técnico Agronómico Provincial de Albacete (ITAP)

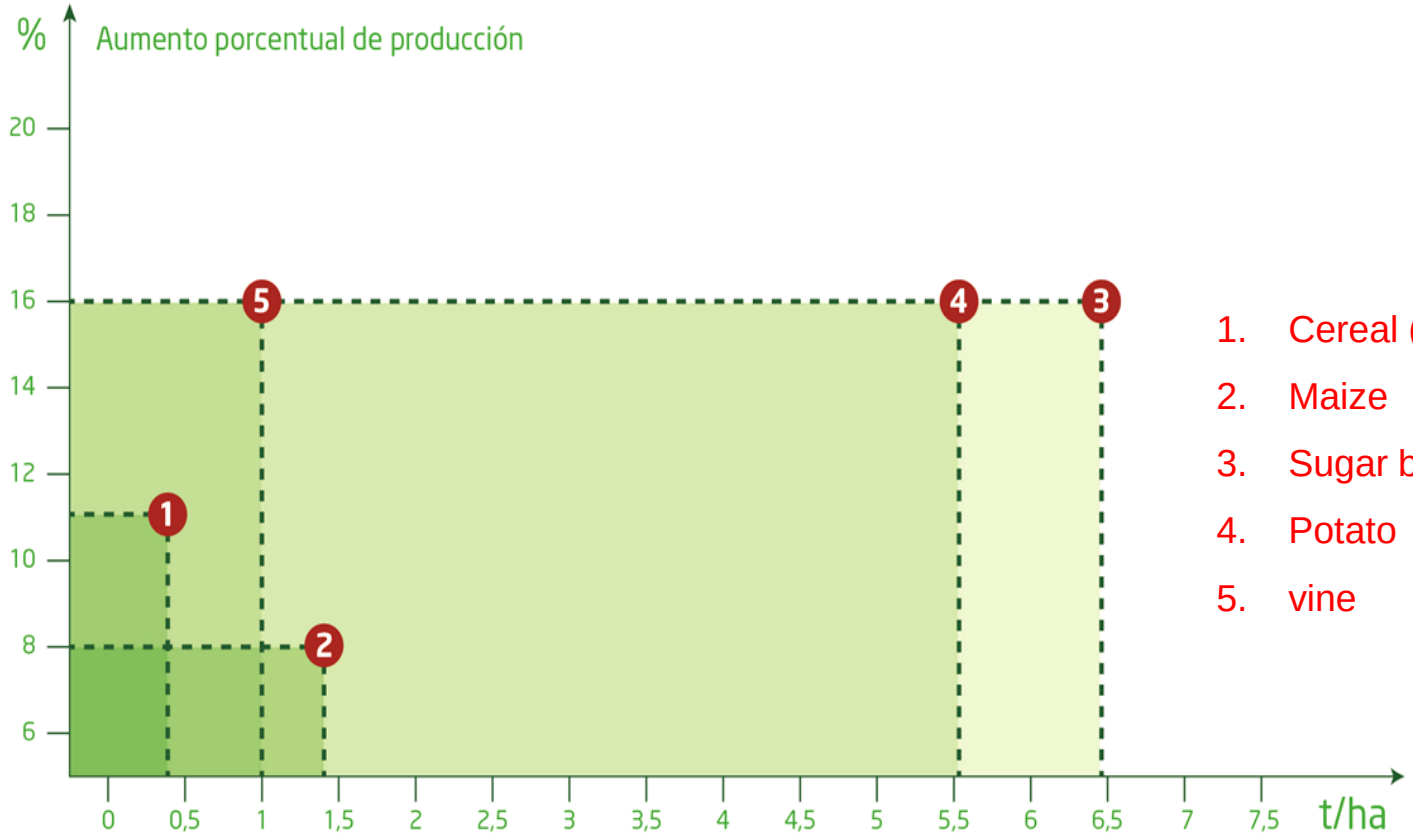


Field trial: Maize

Diputación Provincial de Pontevedra,
Finca Mouriscade



Field trials



1. Cereal (wheat and barley)
2. Maize
3. Sugar beat
4. Potato
5. vine

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