

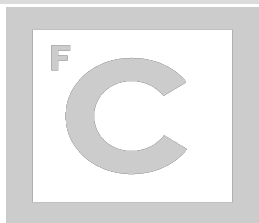
Ciências
ULisboa

Combining biofertilizer application with precision agriculture technologies

<https://videoconf-colibri.zoom.us/j/93556093911>

ccruz@fc.ul.pt | Lisbon June 19-30, 2023



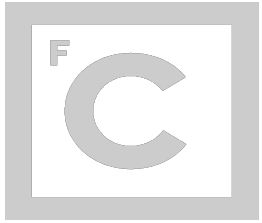


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Date	Name of the lecture
19 June Monday	Introduction to biofertilizers in the context of soil ecology
20 June Tuesday	The need for biofertilizers: a market perspective
21 June Wednesday	From microbes to biofertilizers
22 June Thursday	Technical and legal issues, the business plan associated with biofertilizers
23 June Friday	Alternatives to biofertilizers
26 June Monday	Works on Biofertilizers
27 June Tuesday	Black soldier fly as a soil stimulant
28 June Wednesday	<i>Campo (Alvalade do Sado; Herdade dos Conqueiros)</i>
29 June Thursday	Precision agriculture and biofertilizers, results from field assays
30 June Friday	Biofertilizers in precision agriculture: round table





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Introduction to biofertilizers in the context of soil ecology



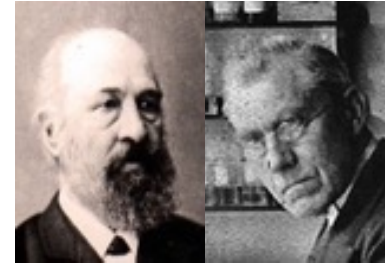
Roots absorb **humus** and transform it into plant substance (384-322 BC)



Water

"The conclusion should have been reached long ago that humus is not such an important substance as we have been led to believe, and that the current doctrine of humus is exceedingly full of contradictions."

Carl Sprengel 1838



1888 – Hellriegel and Wilfarth

Humus Theory

Humus Theory rejection

(N)



Pliny (23-79 AC)
Growing a crop of lupines improves next crop



Justus von Liebig (1844)

Plant mineral nutrition



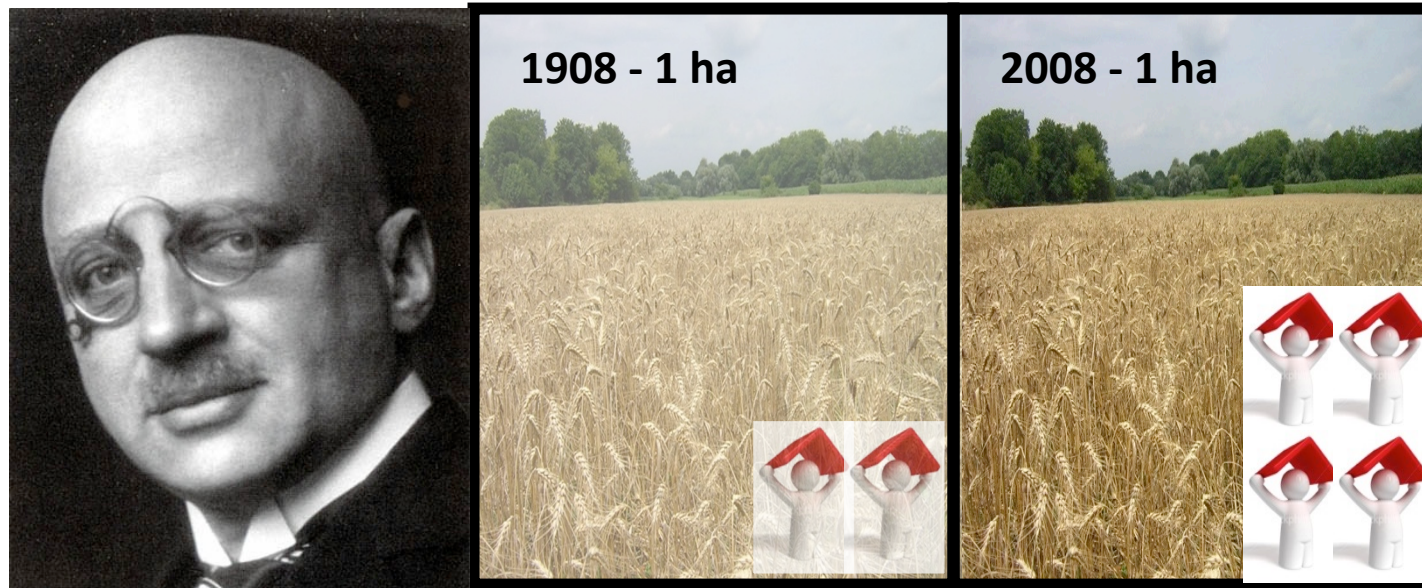
Carl Bosch and Fritz Haber 1900



Reguladores

Used by the plant to form biomass

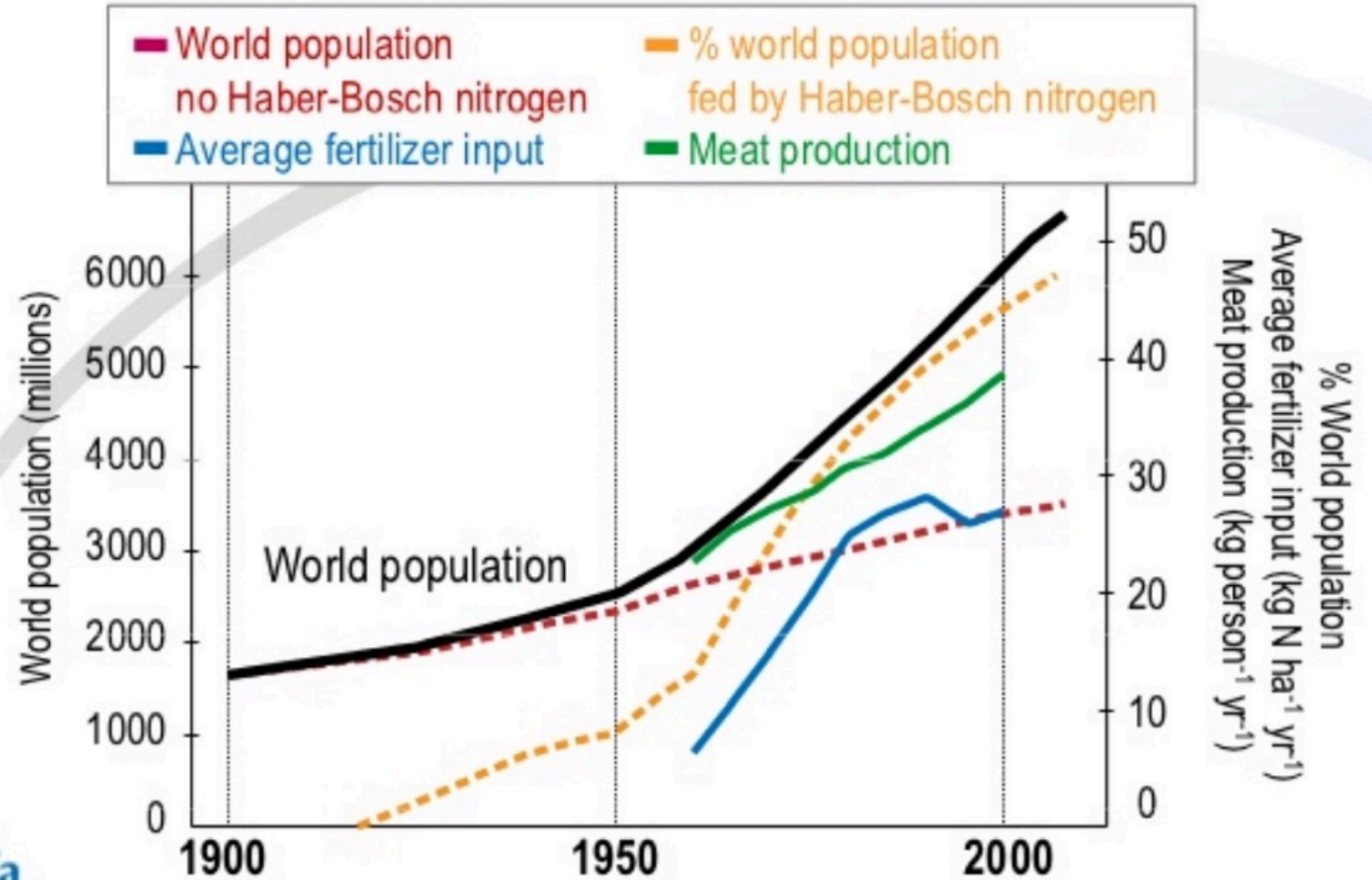
SYNTHETIC NITROGEN FERTILIZERS

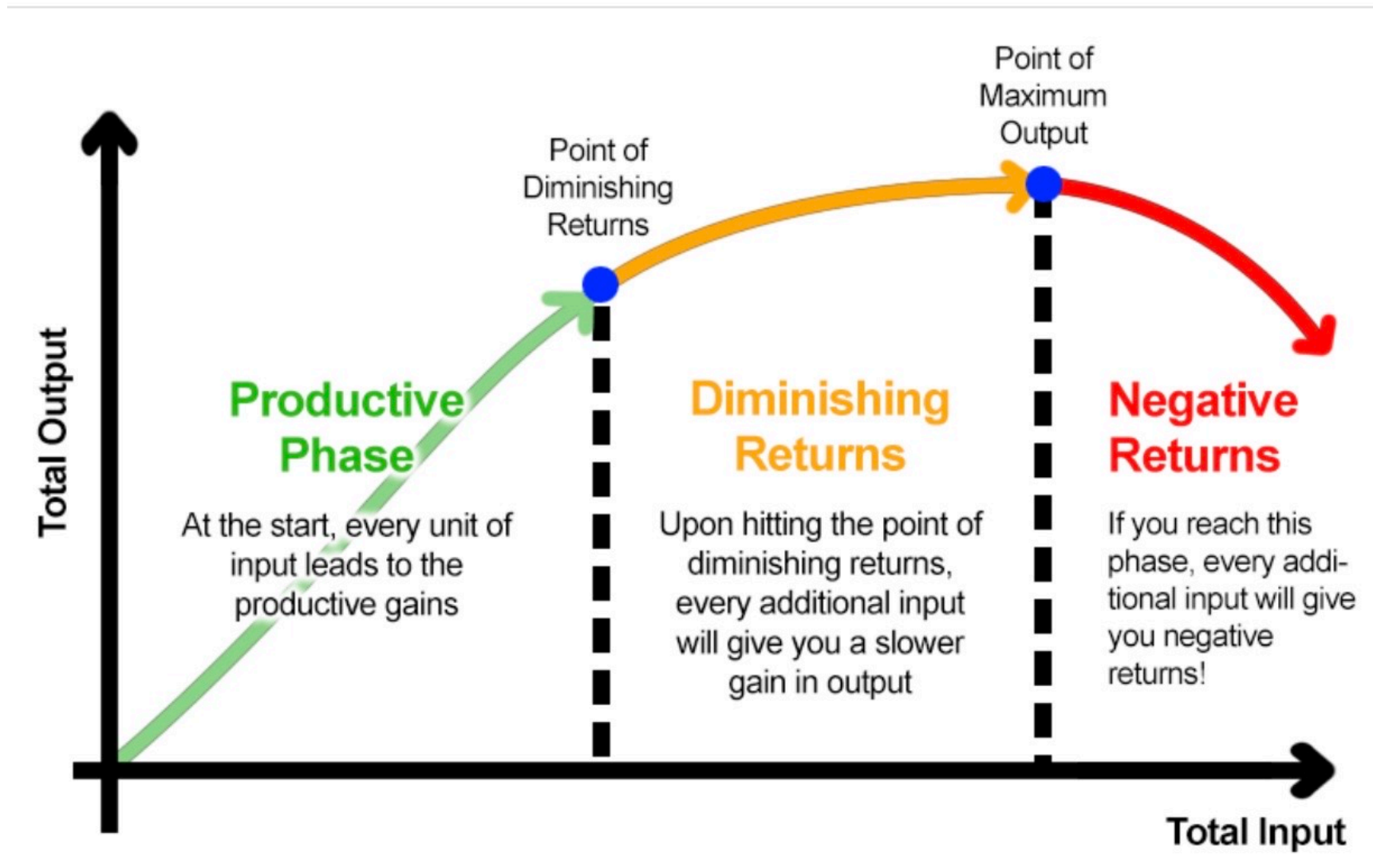


“...It was clear that the demand for fixed N which at the beginning of last century (XX) could be satisfied with a few hundred thousand tons a year, most increase to millions of tons...”

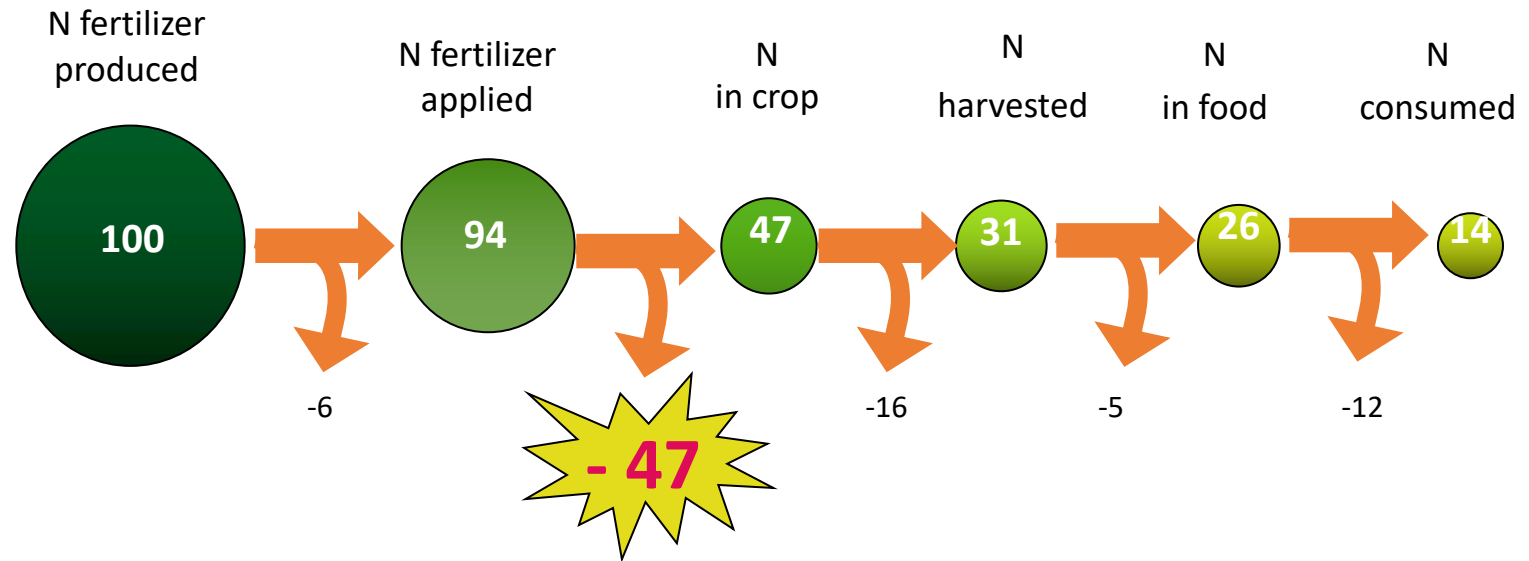
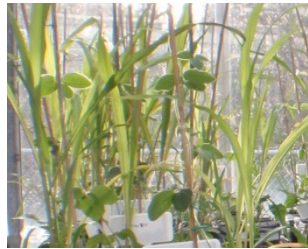


Population trends and nitrogen use during the 20th century

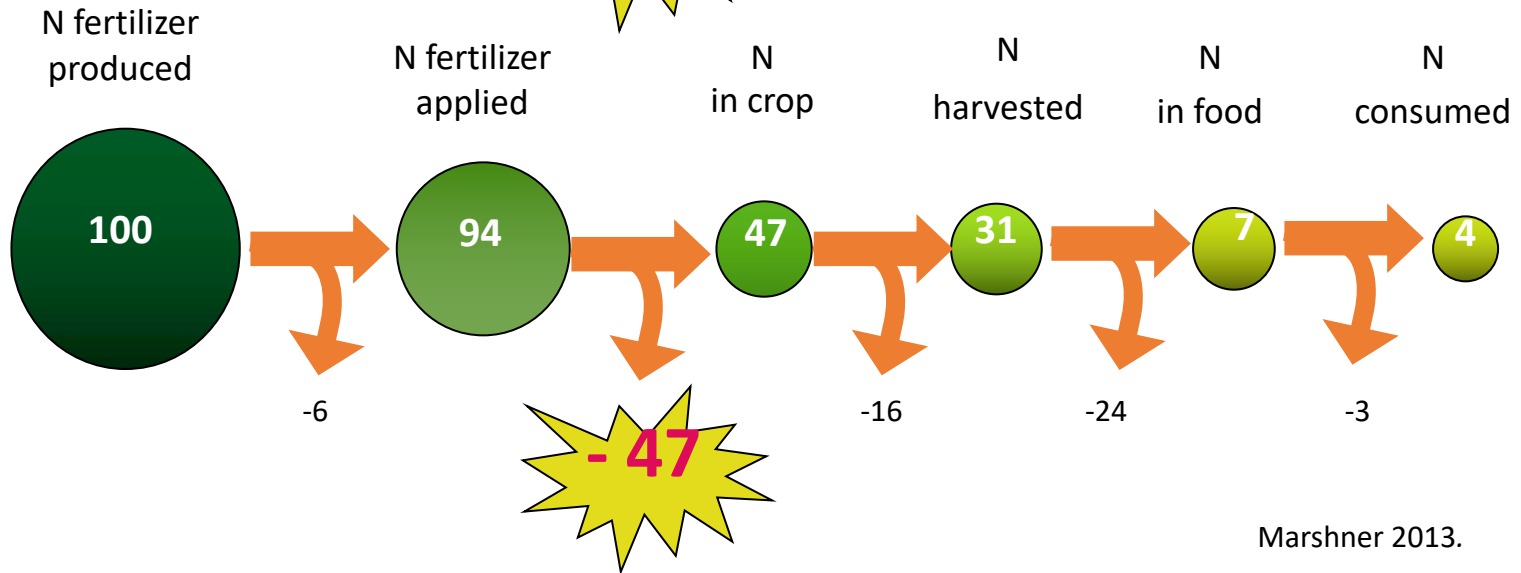
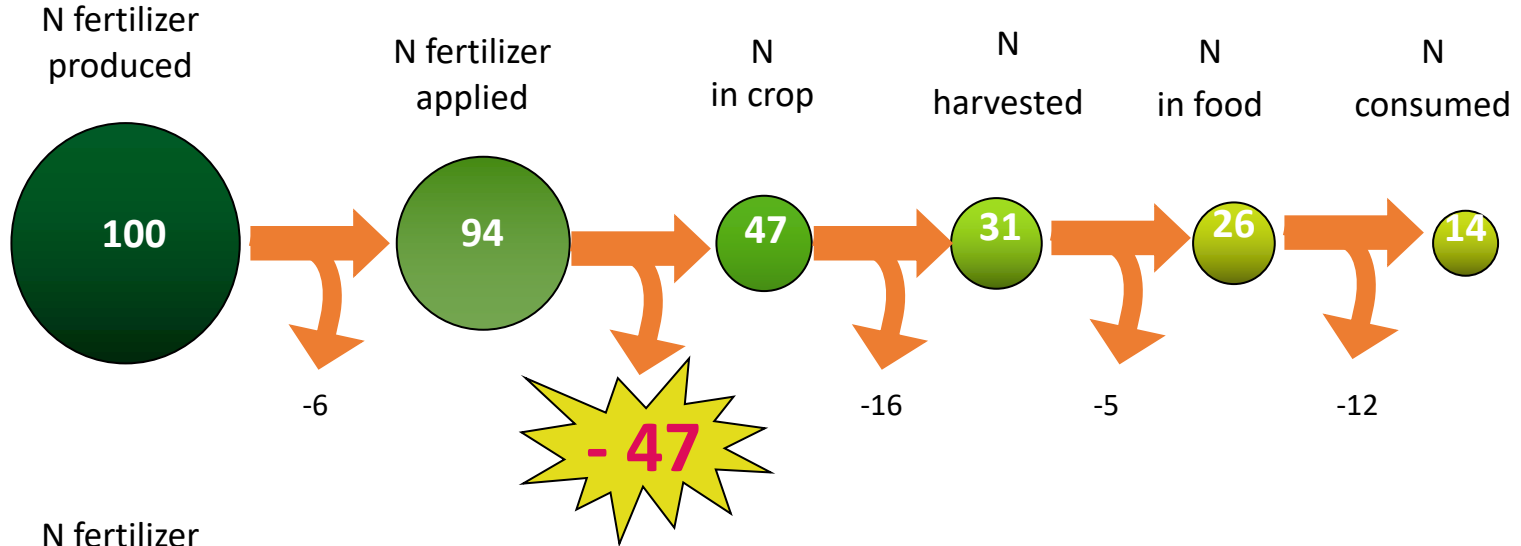


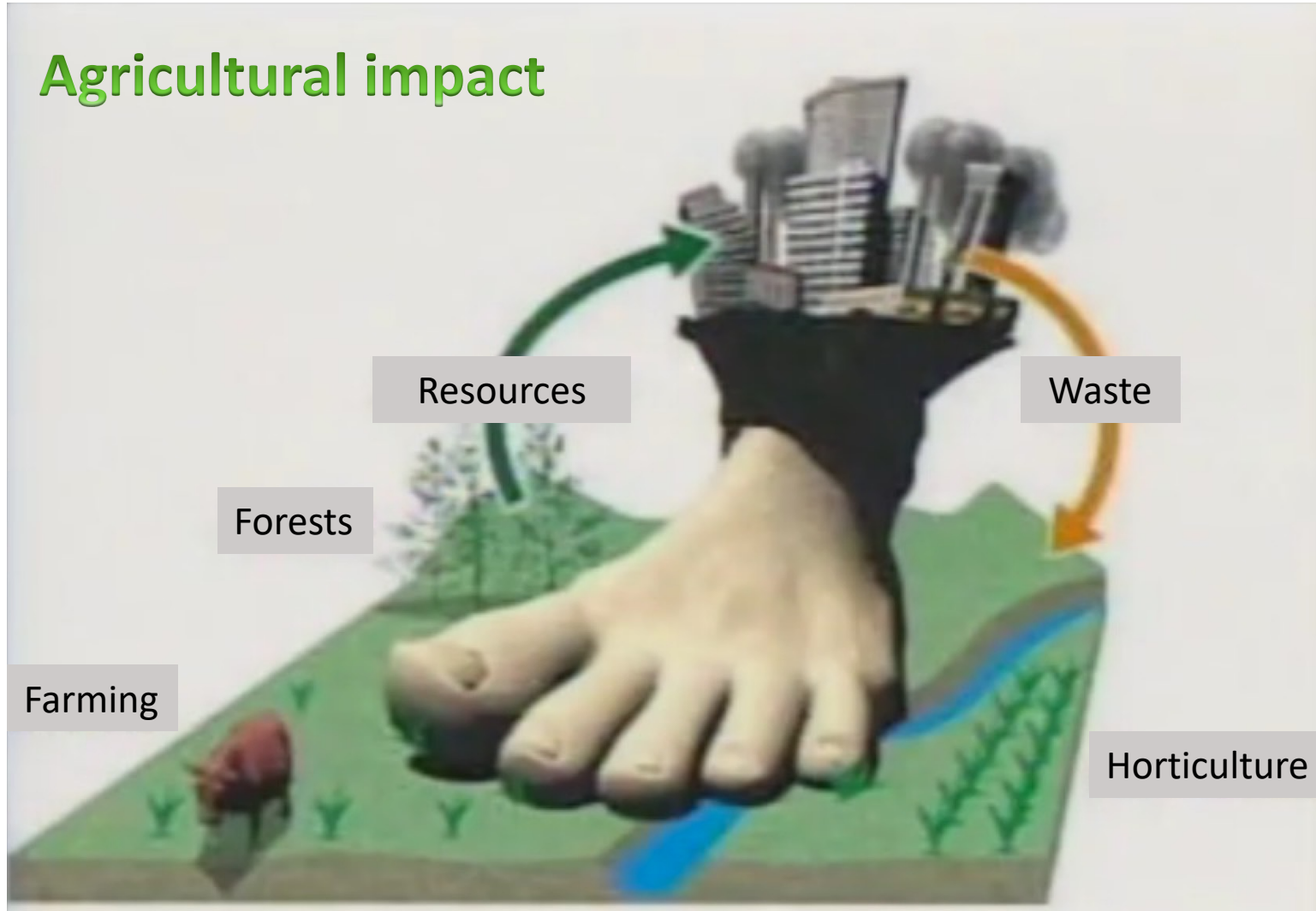


Introduction to biofertilizers in the context of soil ecology



Introduction to biofertilizers in the context of soil ecology





1. SOIL HEALTH

Introduction to biofertilizers in the context of soil ecology

- Soil health is the capacity of soil to function within ecosystem and land use boundaries, to sustain productivity maintain environmental quality, and promote plant and animal health.





**What's
on my
food?**

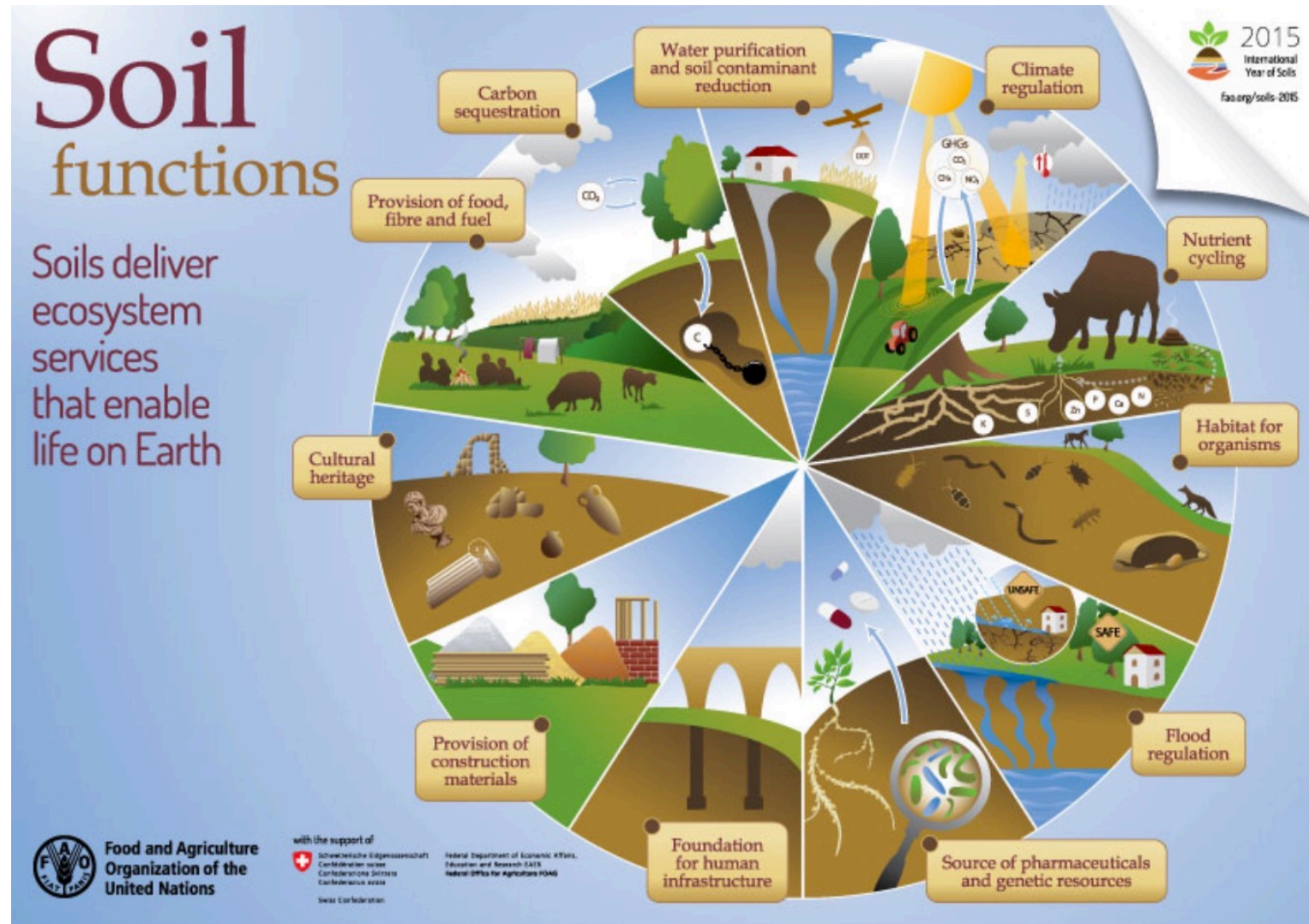
2.EFFECT ON WATER

- Water become unfit for drinking.
- The runoff of agrochemicals into streams, lakes, and other surface waters can increase the growth of algae.
- Eutrophication- Change in quality and composition of aquatic ecosystems by accumulation of excessive chemicals in water bodies.



- Polluted water leading to the death of fish and other aquatic animals.
- Excessive use of agrochemicals has led to the contamination of groundwater .





Soil: natural capital



INTEGRATING PLANT AND SOIL MICROBIOME IN PLANT NUTRITION AND THE



CEPT

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18



Reguladores

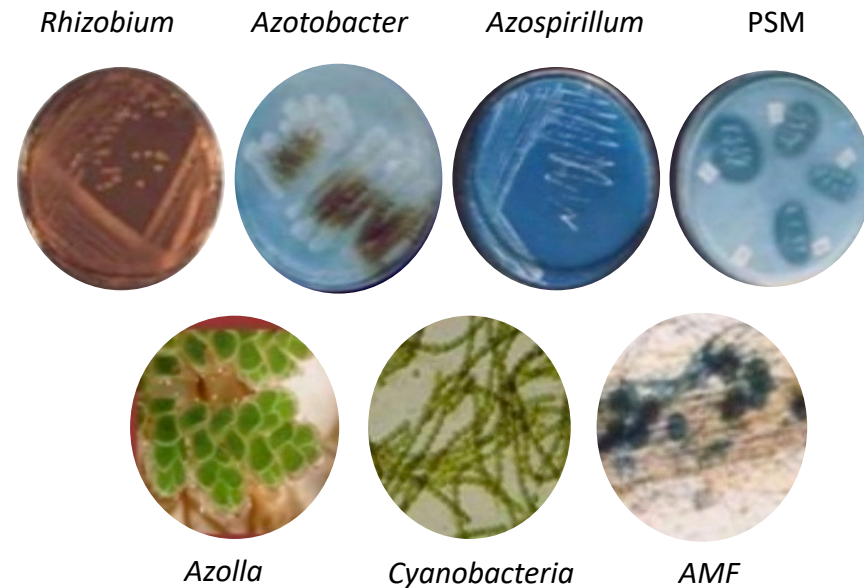
Used by the plant to form biomass

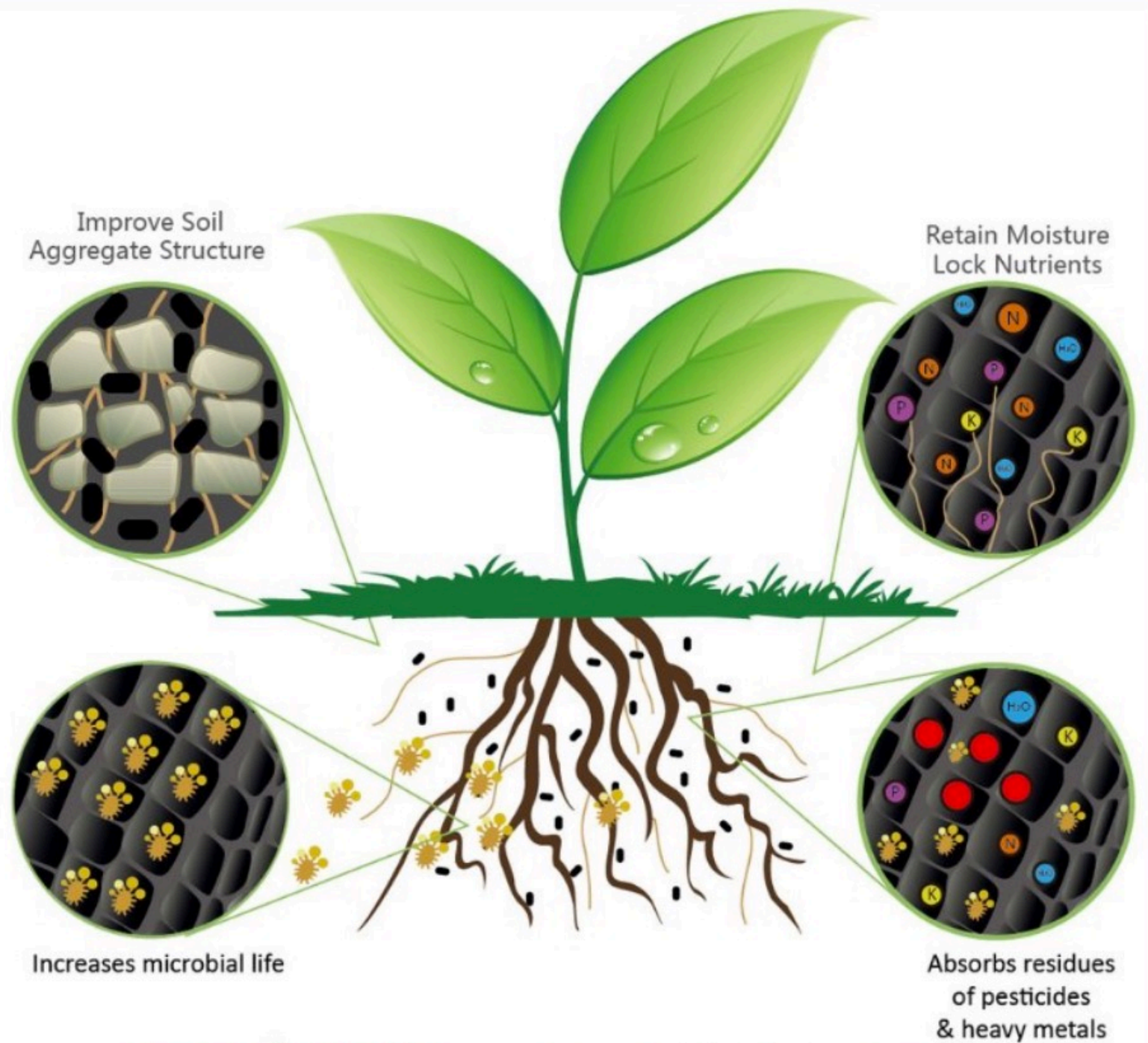
What is a biofertilizer?

A **biofertilizer** is a substance which contains living microorganisms which, when applied to

- seeds
- plant surfaces
- soil

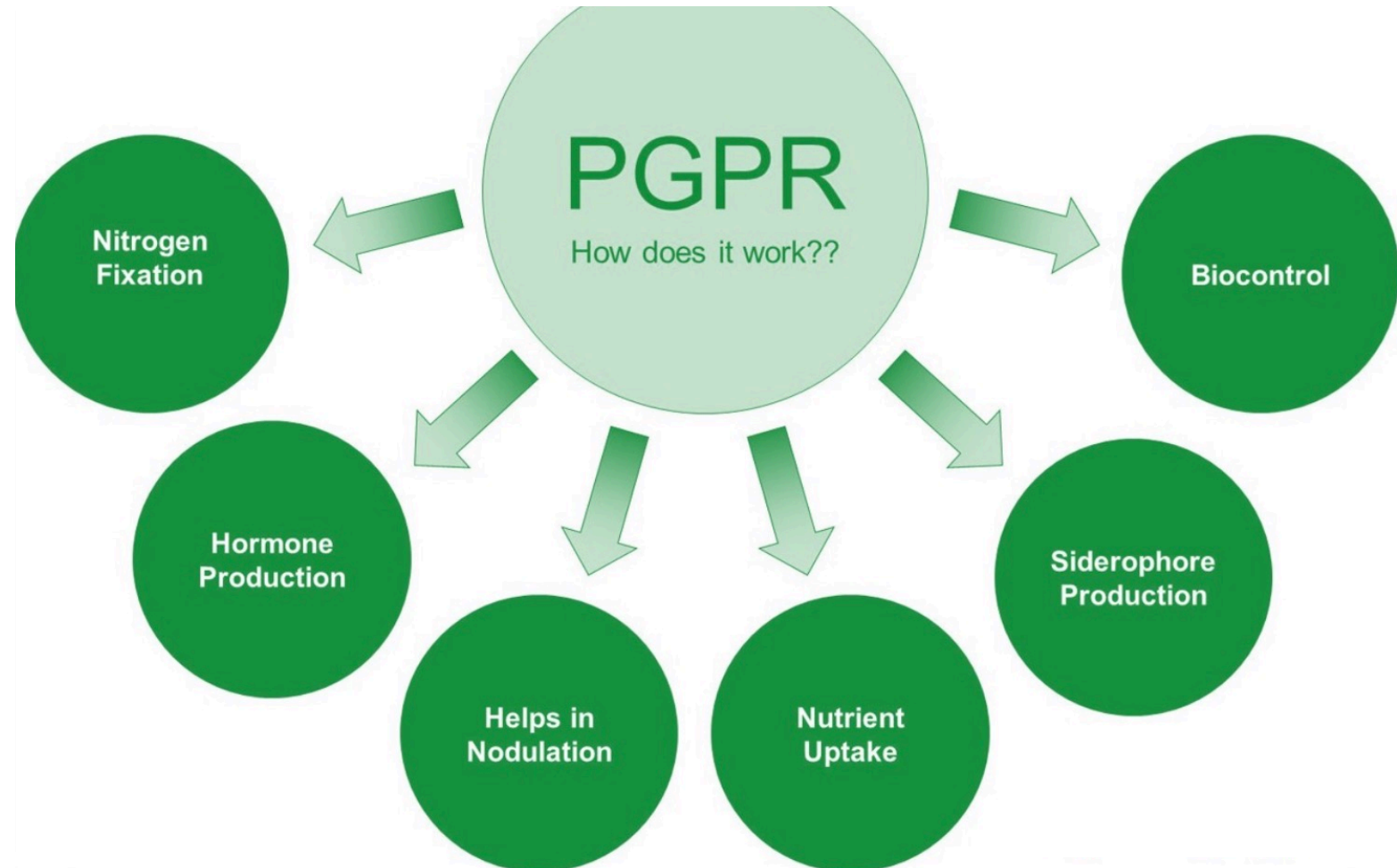
colonizes the rhizosphere or the interior of the plant and promotes growth by **increasing the supply or availability of primary nutrients to the host plant.**





Biofertilizer

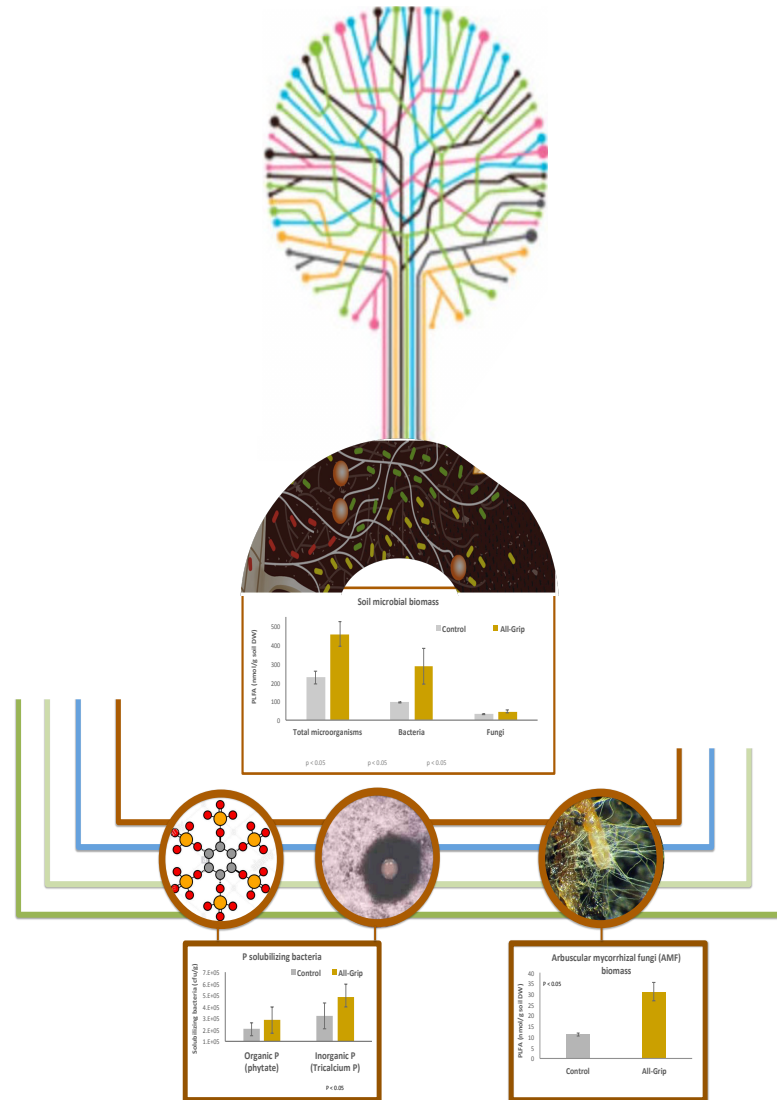
Biofertilizer



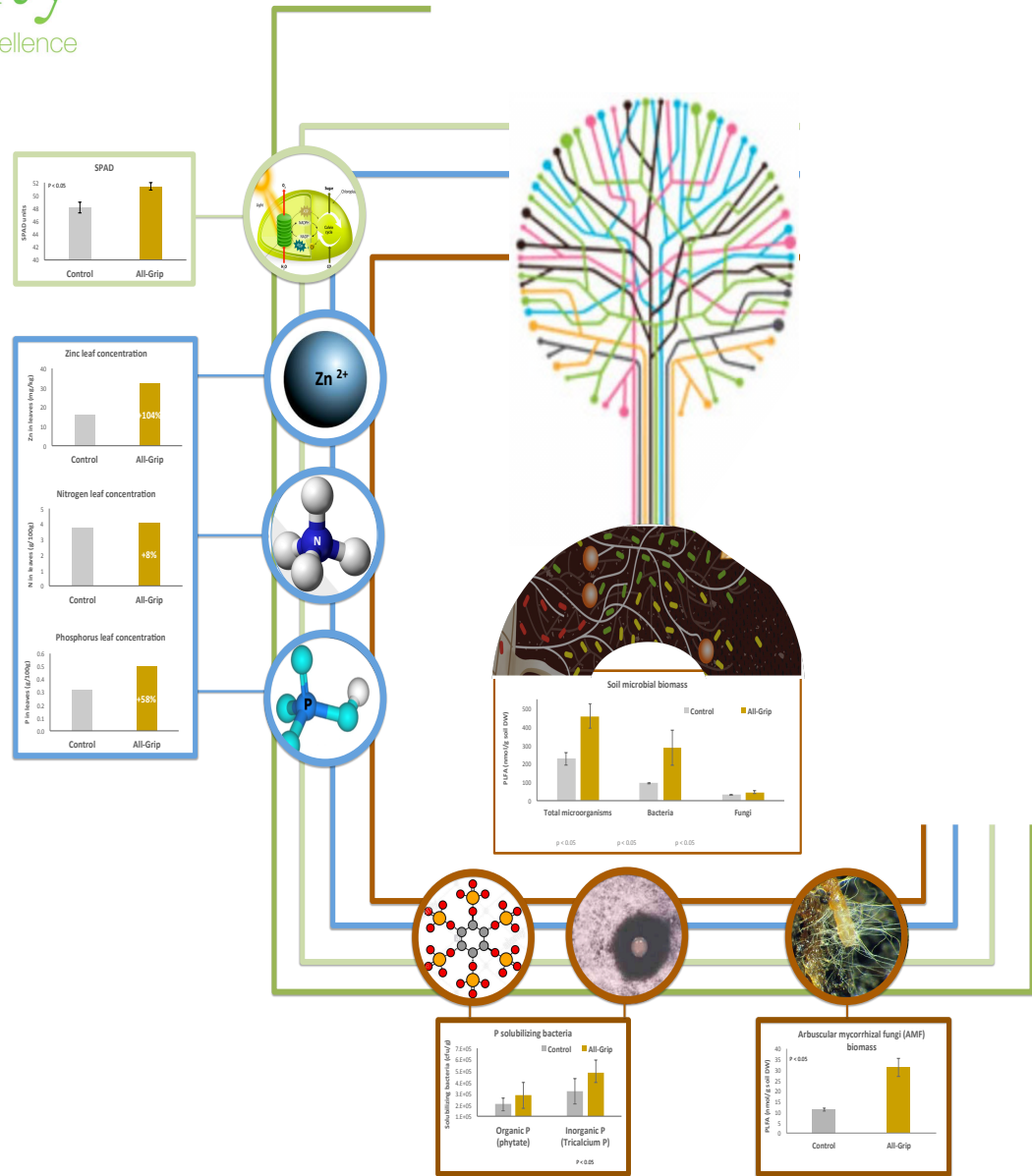
BiOfertilizer



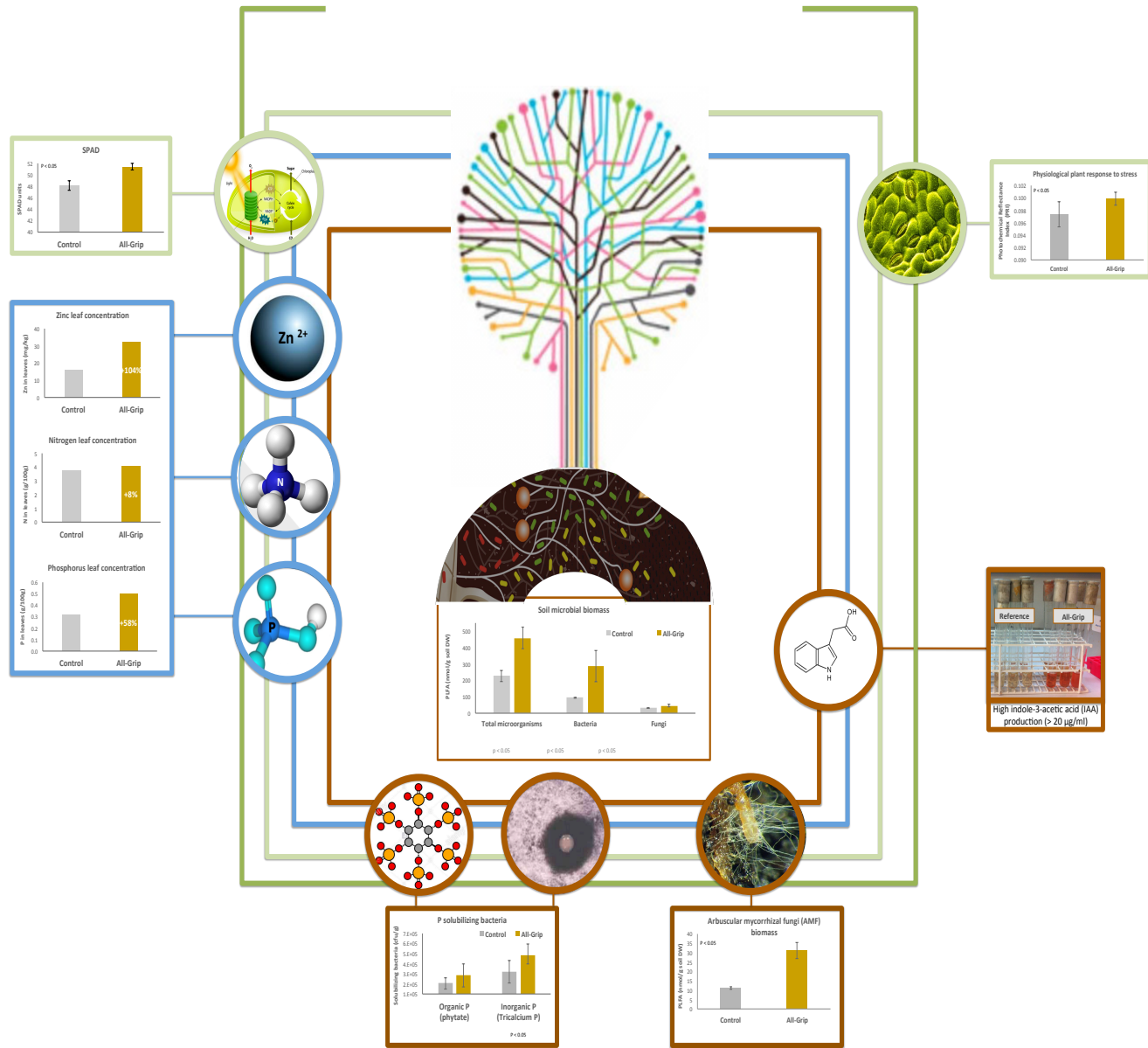
Biofertilizer



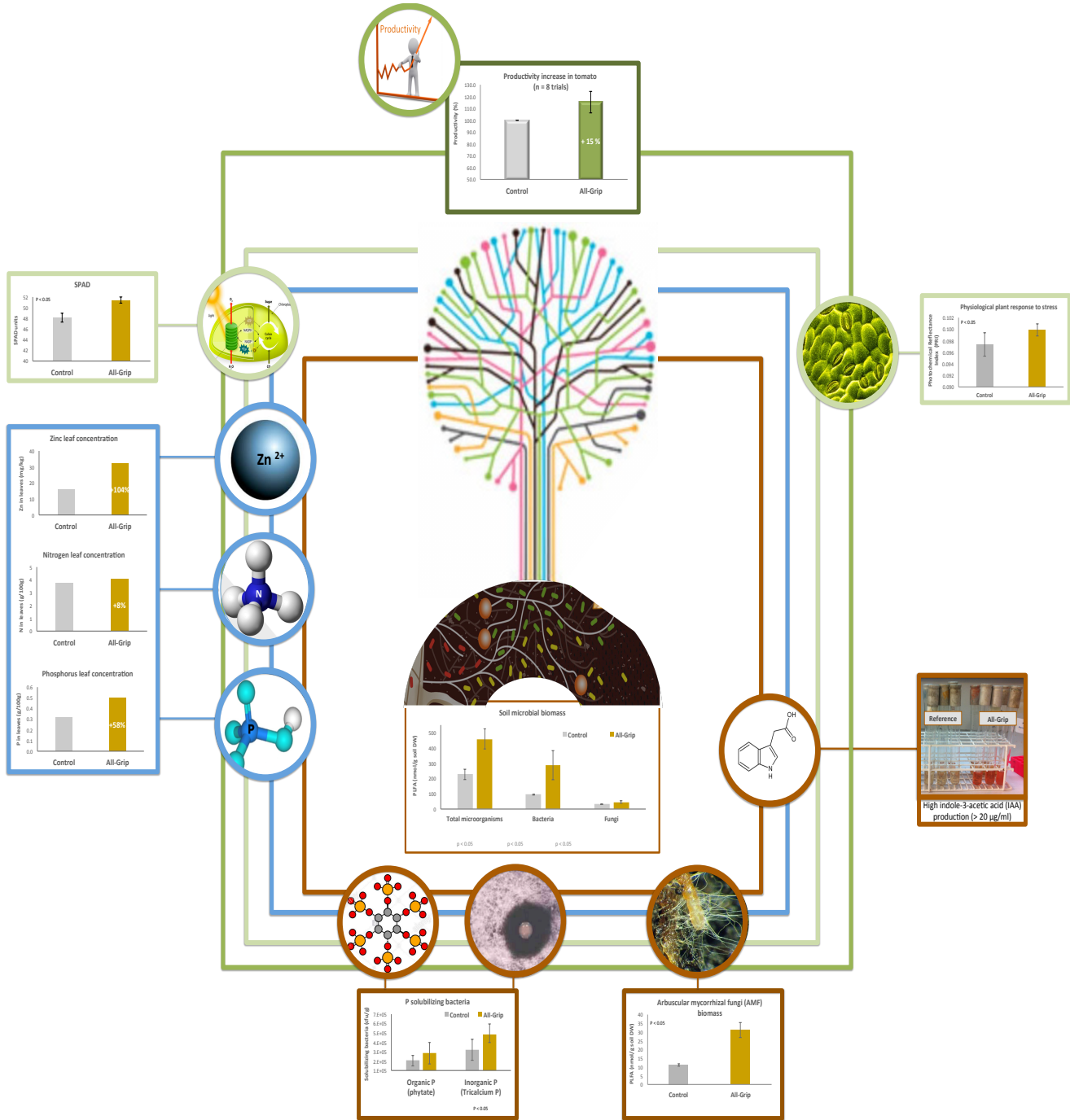
o Biofertilizante



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Biofertilizer

