SOIL NUTRIENT SUPPLY OVER THE AGES – WHERE ARE WE NOW?

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Professor of Soil Nutrient Cycling

Brief History

10 000 B.C.

Neolithic revolution

350 B.C.

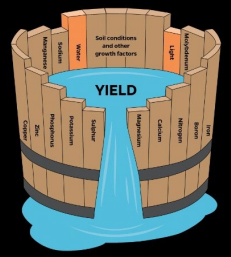
Humus theory

1811

Humus theory

19th century

Agricultural revolution



Law of the minimum

1826-40

1842

Super-phosphate

ROTHAMSTED RESEARCH

1918 & 31

Nitrogen fertilizer

1960s

Machine revolution

1958

MIT of soil nitrogen

Brief History

1960s

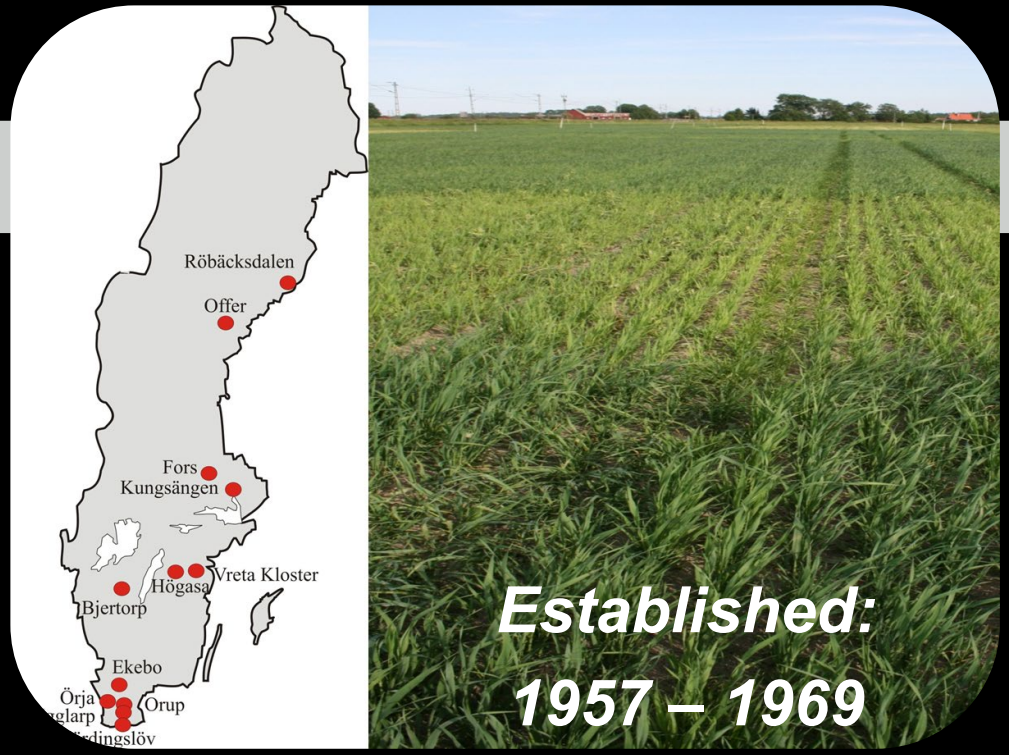
Machine revolution

2000s

Biotech revolution

2020s

IoT revolution



Established:

1957 – 1969

1985

Foundation

Since 1986

Environmental actions:

- *Cover crops*
- *Buffer strips*
- *Wetlands*

Where Are We Now?

Reduce the use of fertilizers by at least 20% by 2030

… promotes a policy of sustainable intensification of agricultural land through e.g. crop diversification

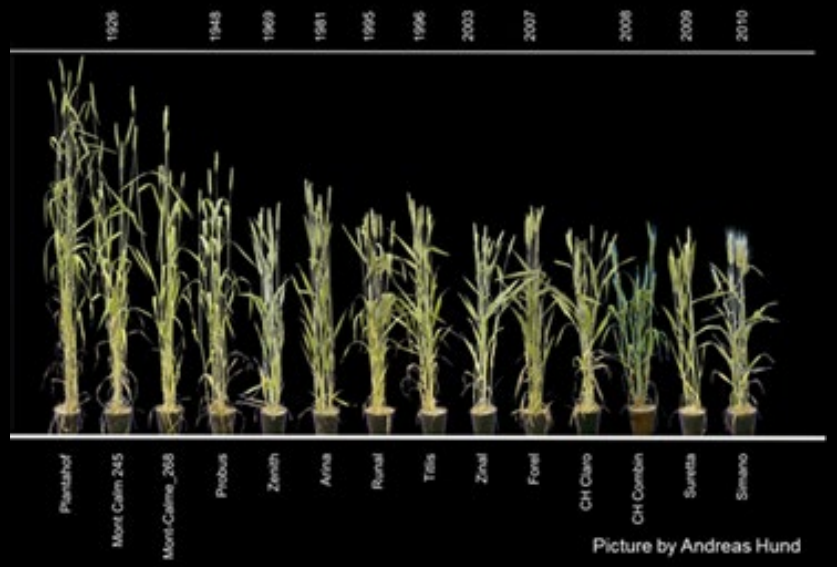
Sustainable Intensification of Agriculture

Holistic approach

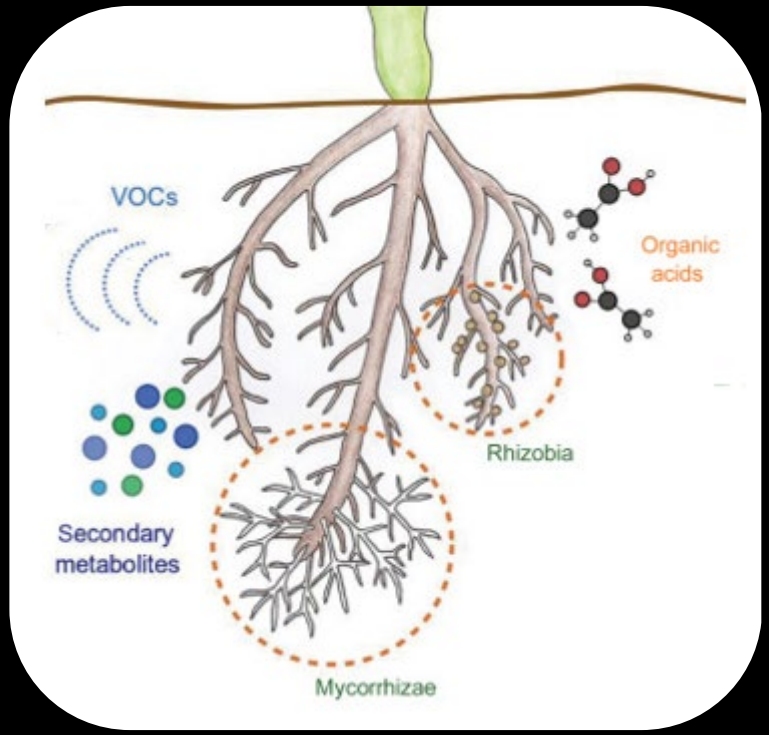
increase crop yield from existing arable land and at the same time reduce the environmental impact

- Crop diversification:
  - **INTRA**specific:
    deep & shallow root crops
  - **INTER**specific:
    intercropping of legumes or cover crops
- Circular production

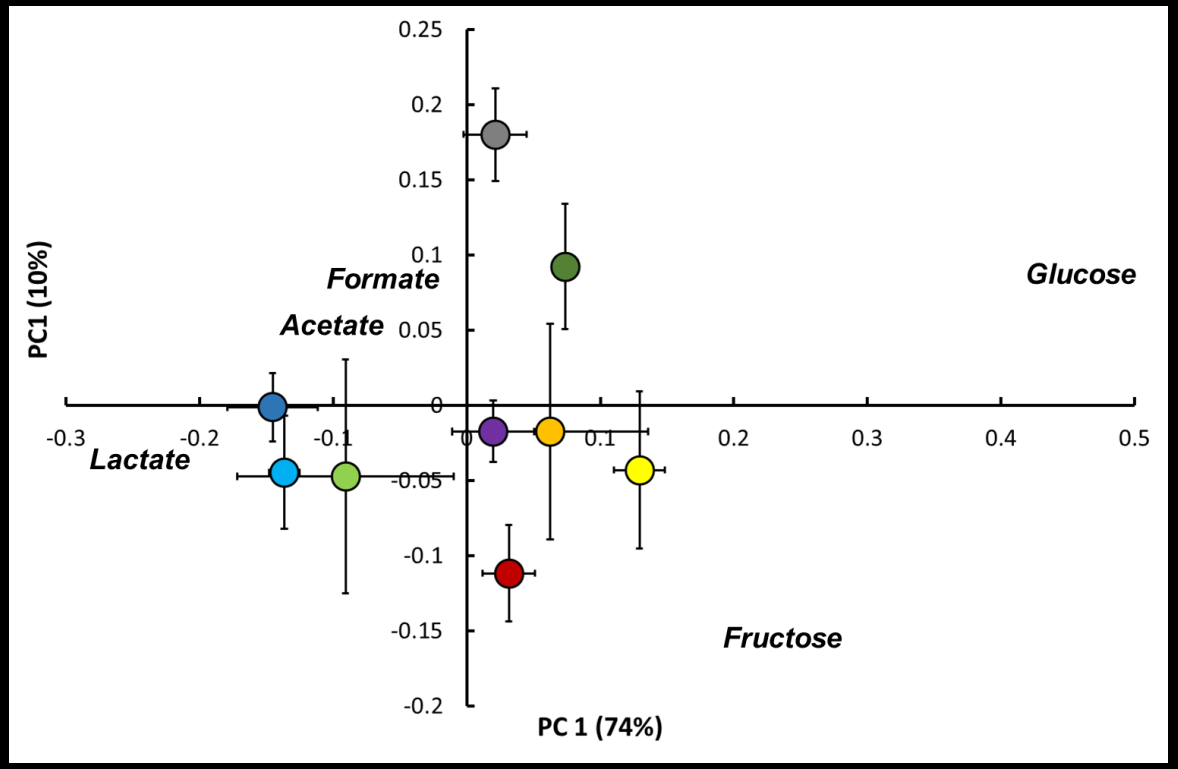
Intraspecific Crop Diversity – Cereals

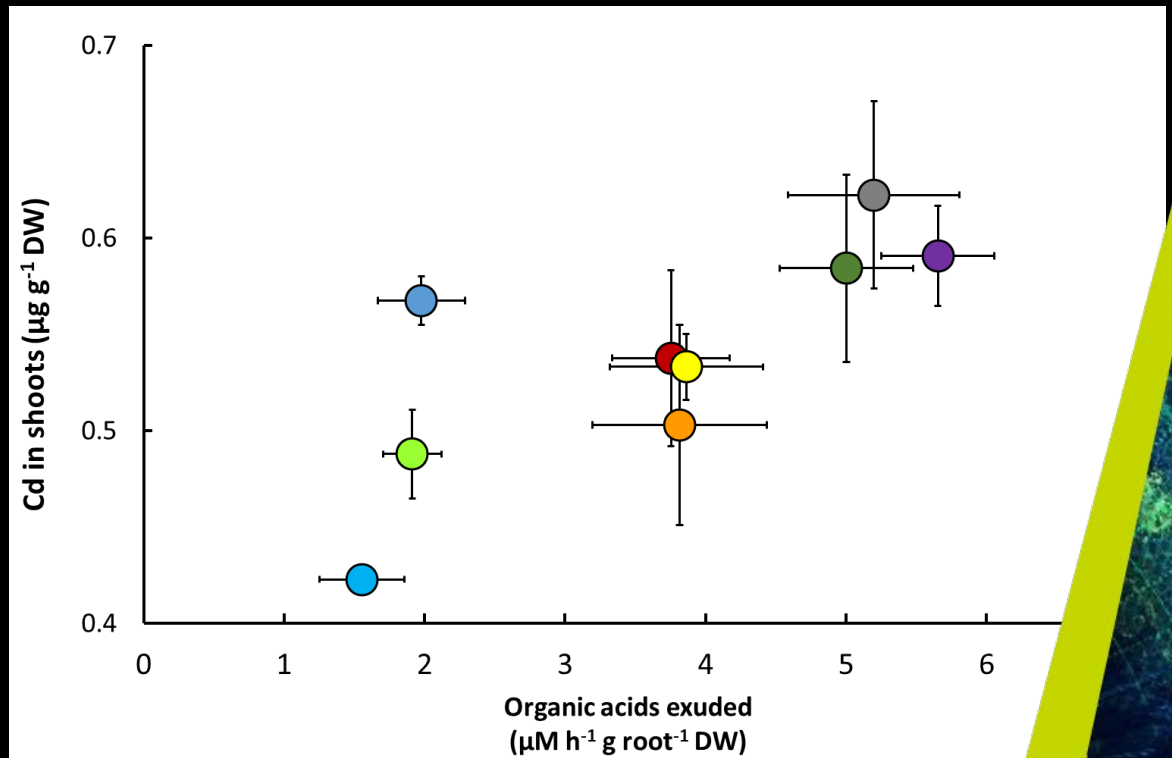


Differences in cadmium mobility in the soil plant system?



Intraspecific Crop Diversity – Cereals





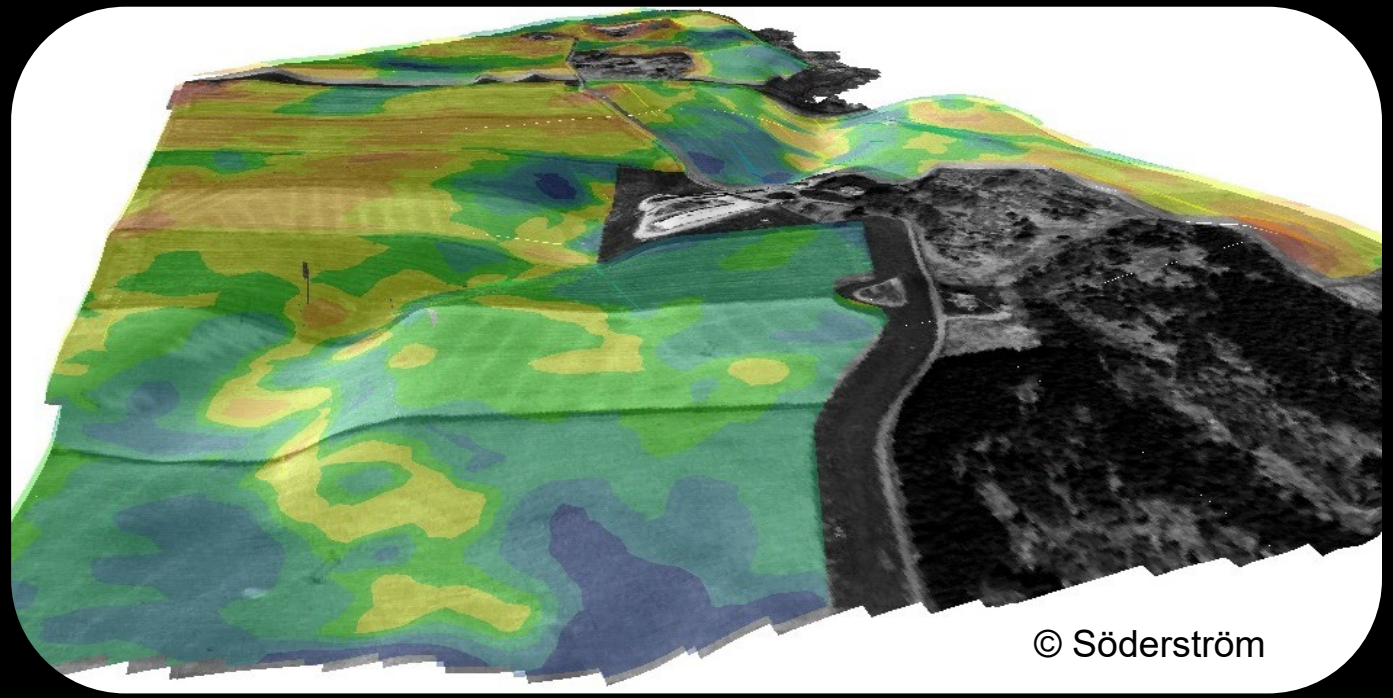
- *Alderon*
- *Bjarne*
- *Boett*
- *Dacke*
- *Dala LR*
- *Diskett*
- *Happy*
- *Quarna*
- *Rohan*

Where Are We Now?

Development of climate-smart resilient cropping systems

=> *Clear potential to use intraspecific genotype mixtures*

=> *Adopting plant breeding to cropping systems*



Hidden underground engineering

Precision agriculture

Spatial patterns

e.g. nutrients,

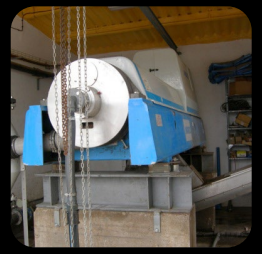
heavy metals

Circular Production

Manure Digestate

Nutrient rich but contains too much phosphorus in relation to nitrogen and crops needs

=> New manure-based digestate products with increased nutrient efficiency



- Low P content
- High mineral N
- High K content

- High organic N
- Medium mineral N
- Most of total P

FORMAS

Baltic Waters 2030

RI. SE

Circular Production: Resource Use Efficiency

Carbon sequestration potential

Manure digestate

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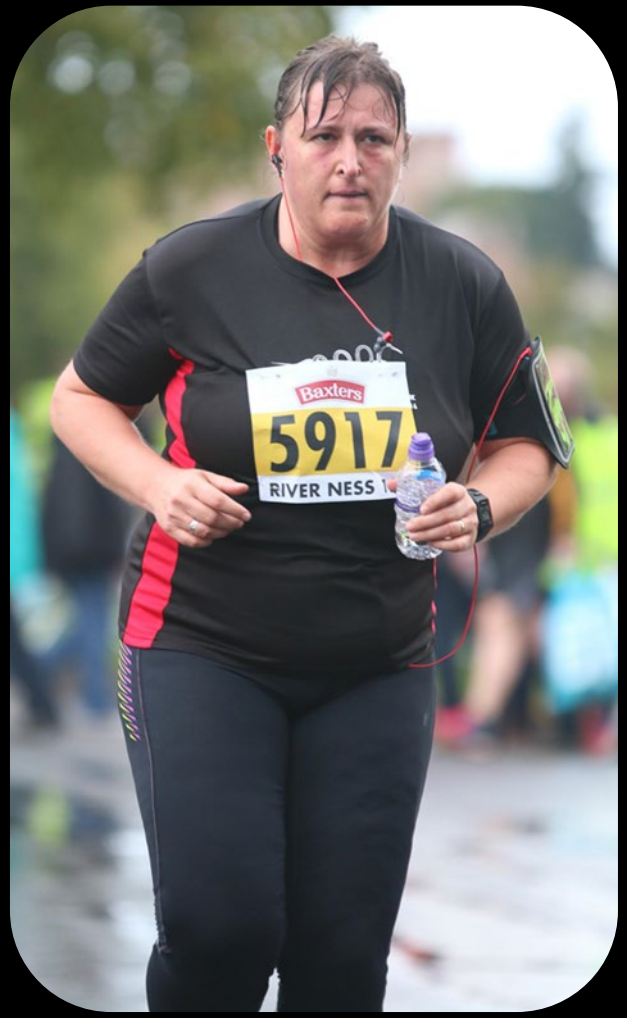
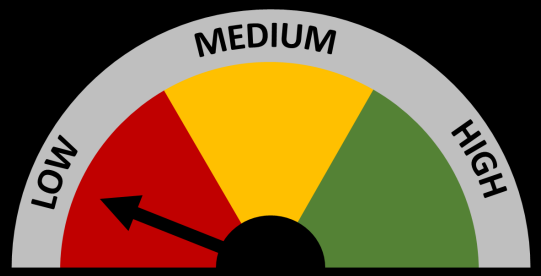
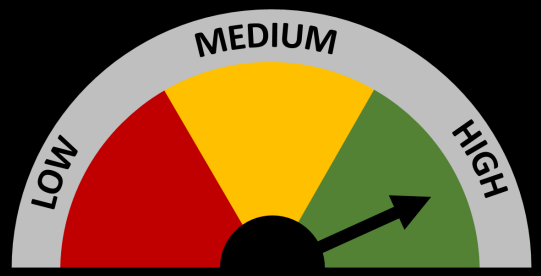

Baxters
5917
RIVER NESS


SWE
GLS
34
PLAN
GLS
1352
PLAN


Heat
CO_2


LOW
MEDIUM
HIGH
EFFICIENCY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MEDIUM
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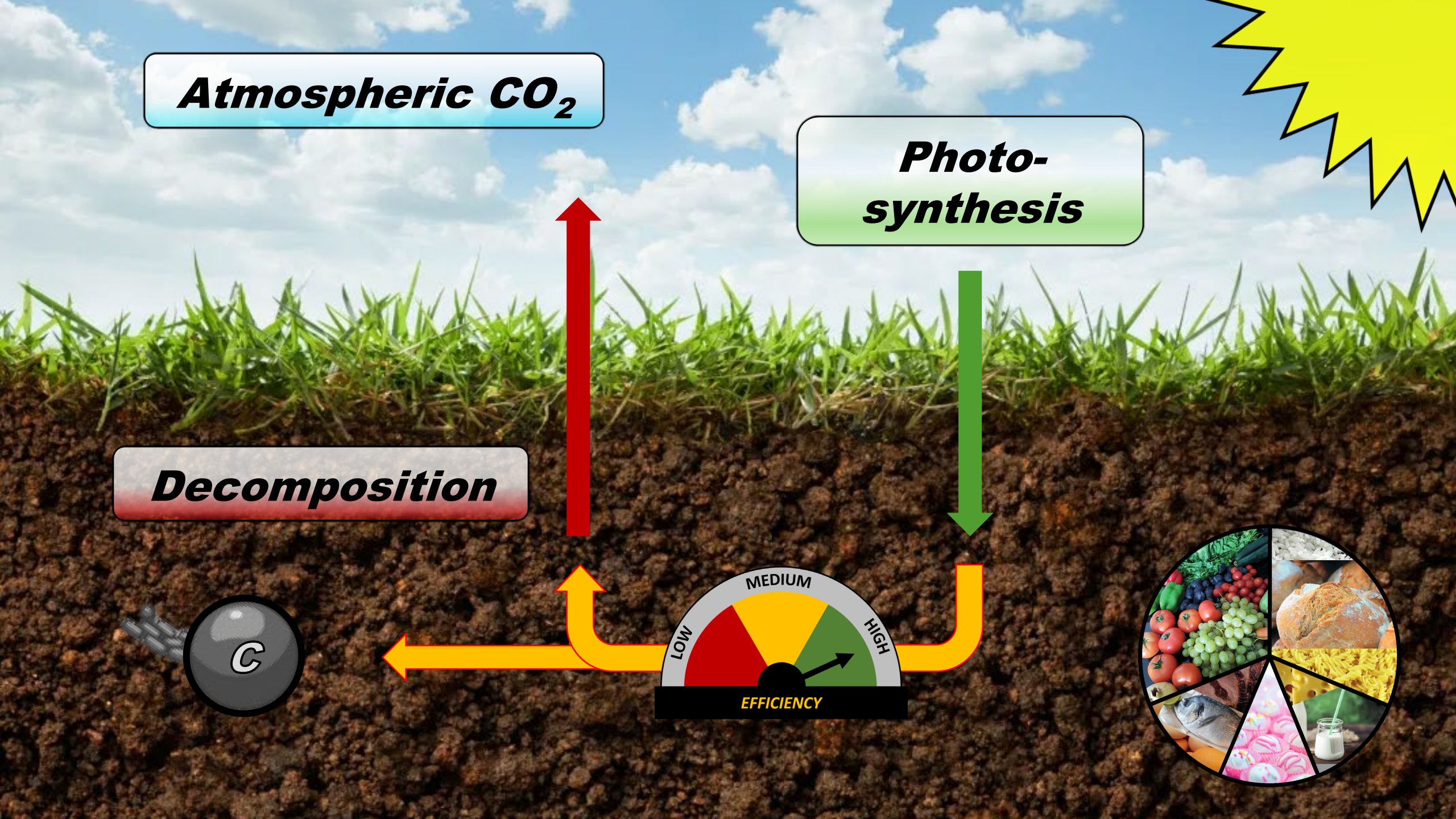
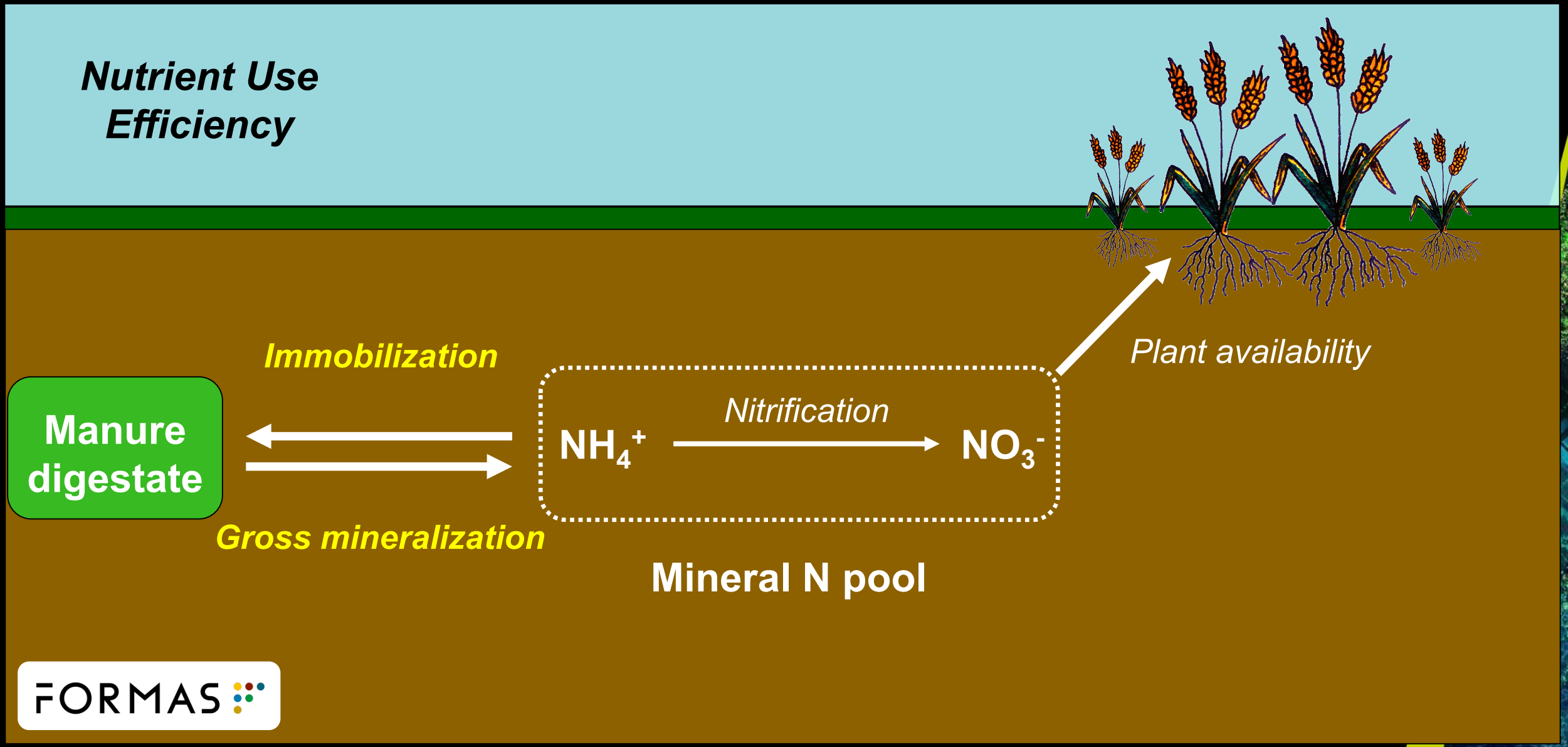
EFFICIENCY


Atmospheric CO_2
Photo-synthesis
Decomposition
C
LOW
MEDIUM
HIGH
EFFICIENCY

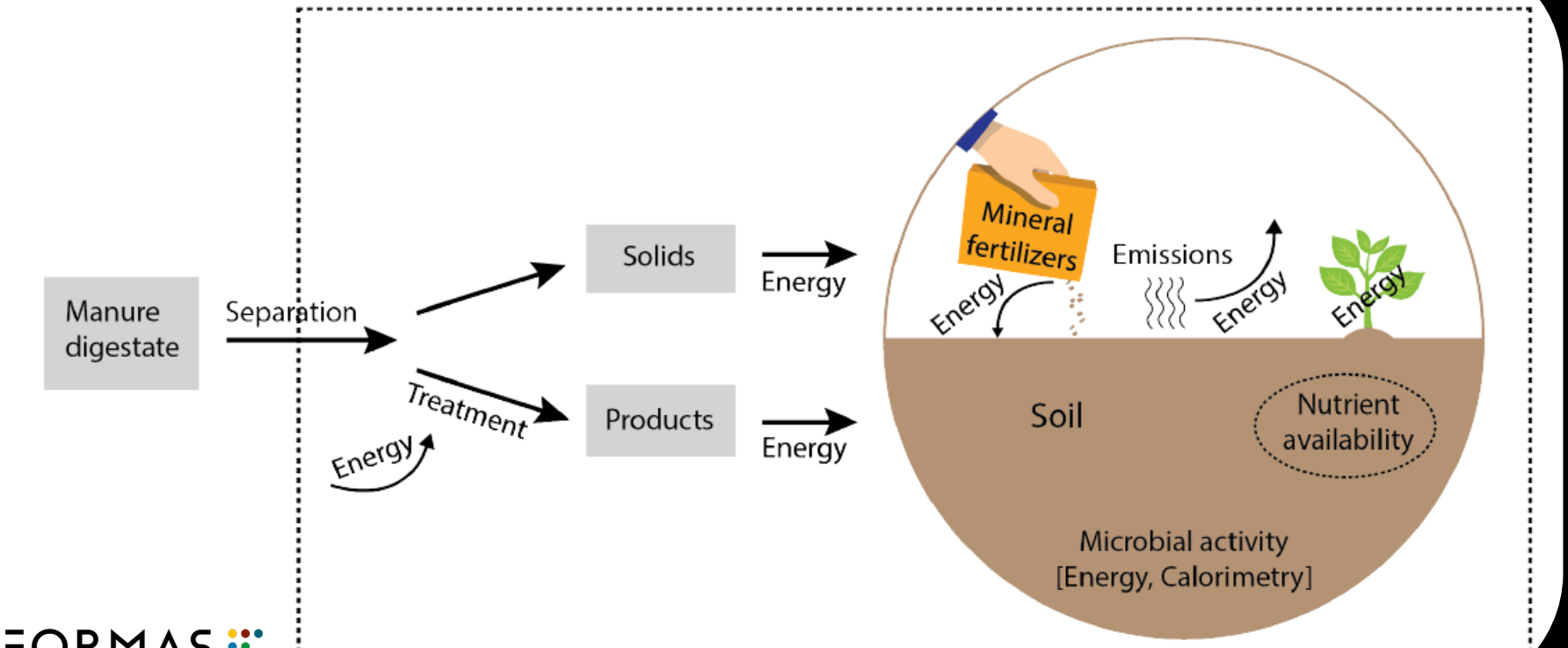
Circular Production: Resource Use Efficiency



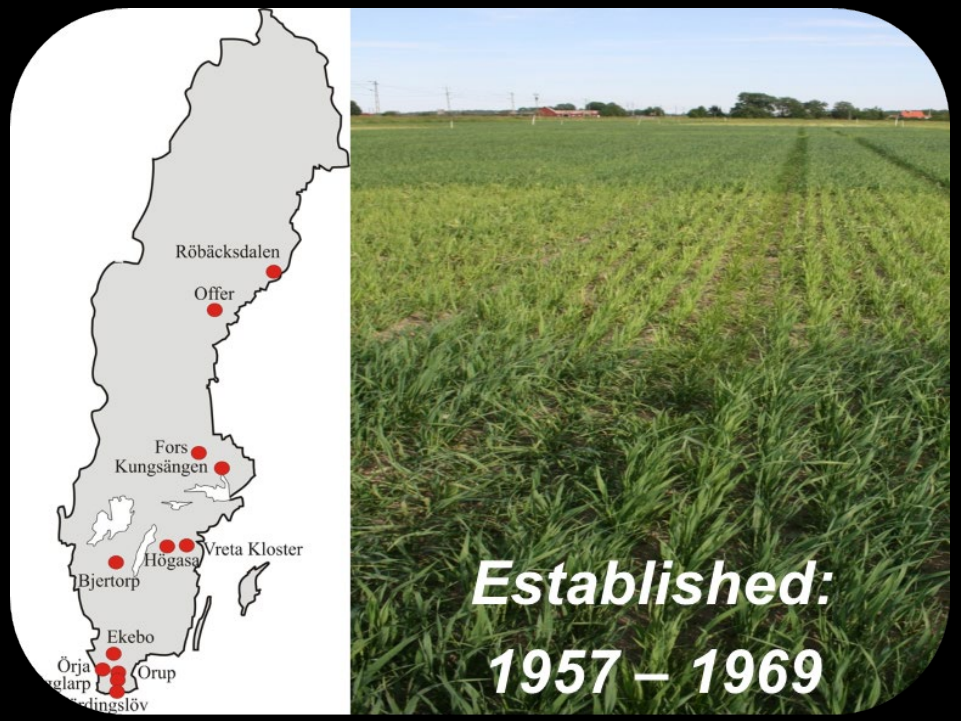
Circular Production: Emergy Accounting Model

Energy **fundamental dimension/unit**

⇒ **Currency of the soils economy**



Brief History – Where are we now?



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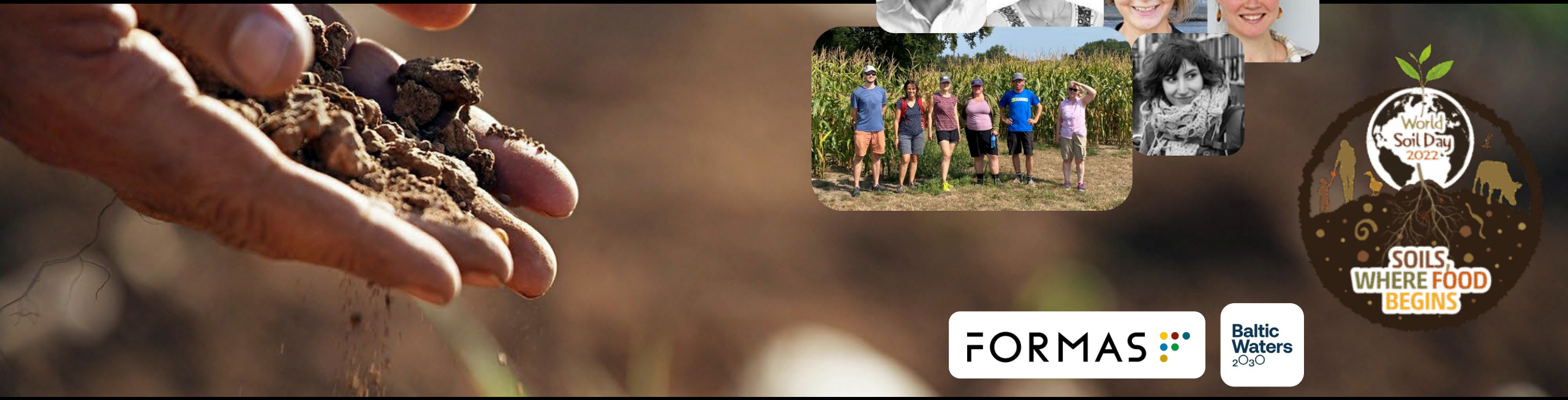

FORMAS

Baltic Waters 2030

World Soil Day 2022 SOILS WHERE FOOD BEGINS

Lantmännen

Thank you for your attention!