Nitrogen Use Efficiency (NUE) an indicator for the utilization of nitrogen in food systems

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EU Nitrogen Expert Panel

The EU N Expert Panel

- Established spring 2014
- First meeting:
  - in Windsor, UK,
  - on 15-16 September 2014
- Panel consists of 15-20 experts from:
  - Science (12)
  - Policy (4)
  - Industry (3)

The EU N Expert Panel

- To improve linkages
- To get things done

Science

Permanent members

Practice

Ad hoc members

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Policy

Permanent members

Industry

Permanent members

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Rationale:

- Addressing constraints/barriers to **improving NUE**, generated by the broadly shared conviction that focusing only on his expertise area is more efficient.

  Objective >> **Overcoming some of these barriers by bringing experts together, with dedicated leadership**,

- To facilitate and accelerate solving certain key issues, Fertilizers Europe takes initiative to "**bridge communication**" between:
  - *Scientific community*,
  - *EU and national policies*
  - *Industry*

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General mandate / objectives

- to contribute to improving the nitrogen use efficiency in food systems in Europe, through
  - communicating a **vision and strategies** on how to improve the nitrogen use efficiency in the food systems in Europe
  - generating new ideas, and recommending **effective proposals and solutions**
  - acting as **referee** in controversial issues
  - communicating as **authority**

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Working strategy / methods

Towards actions and effectiveness

- Working with existing materials and science
- Looking for concrete and simple solutions, immediately applicable
- “Making things to happen”

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First mandate of the EU Nitrogen Expert Panel:

>> ***To prepare a well elaborated proposal for assessing NUE in food systems in EU, to be used as indicator by policy and practice***.

NUE - Background

- Currently there is no commonly accepted indicator for NUE used in practice
- Many indicators for NUE used in science
- Need for such indicator:
  - increasing pressure on scarce resources
  - Increasing pressure on the environment.
- The EU Nitrogen Expert Panel may bring new ideas by crossing needs from policy, science and industry

NUE - First task (Sept. 2014)

- To discuss the pros and cons of a proposal for a sound and easy-to-use indicator for NUE of crop production at national scale
- what are the:
  - definitions
  - system boundaries,
  - calculation procedures
  - interpretation guidelines.

An NUE indicator

- Agreement was reached about a robust and easy-to-use NUE indicator, based on the mass balance. NUE should be reported together with nitrogen output and nitrogen surplus.

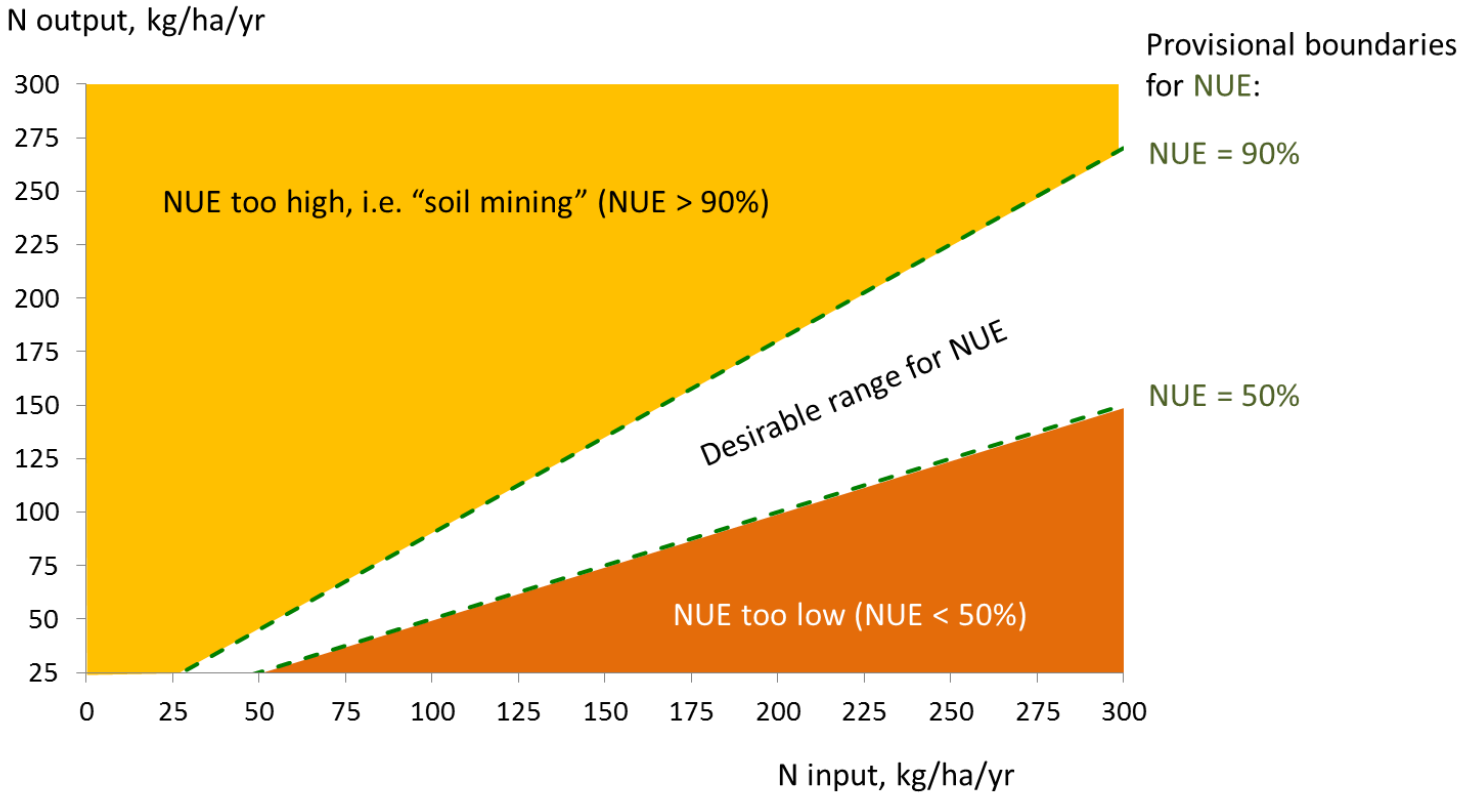
- Hence:
  - NUE = Output / Input
  - N output = N yield
  - N surplus = Input - output

Interpretation

- There are no absolute reference values, but possible target values can be derived.
- Interpretations can be made on the basis of:
  - Changes over time (direction and size of change)
  - Differences between actual and target values (NUE gap)
  - Differences between different cropping systems
  - Differences between different management practices
  - Differences between different countries

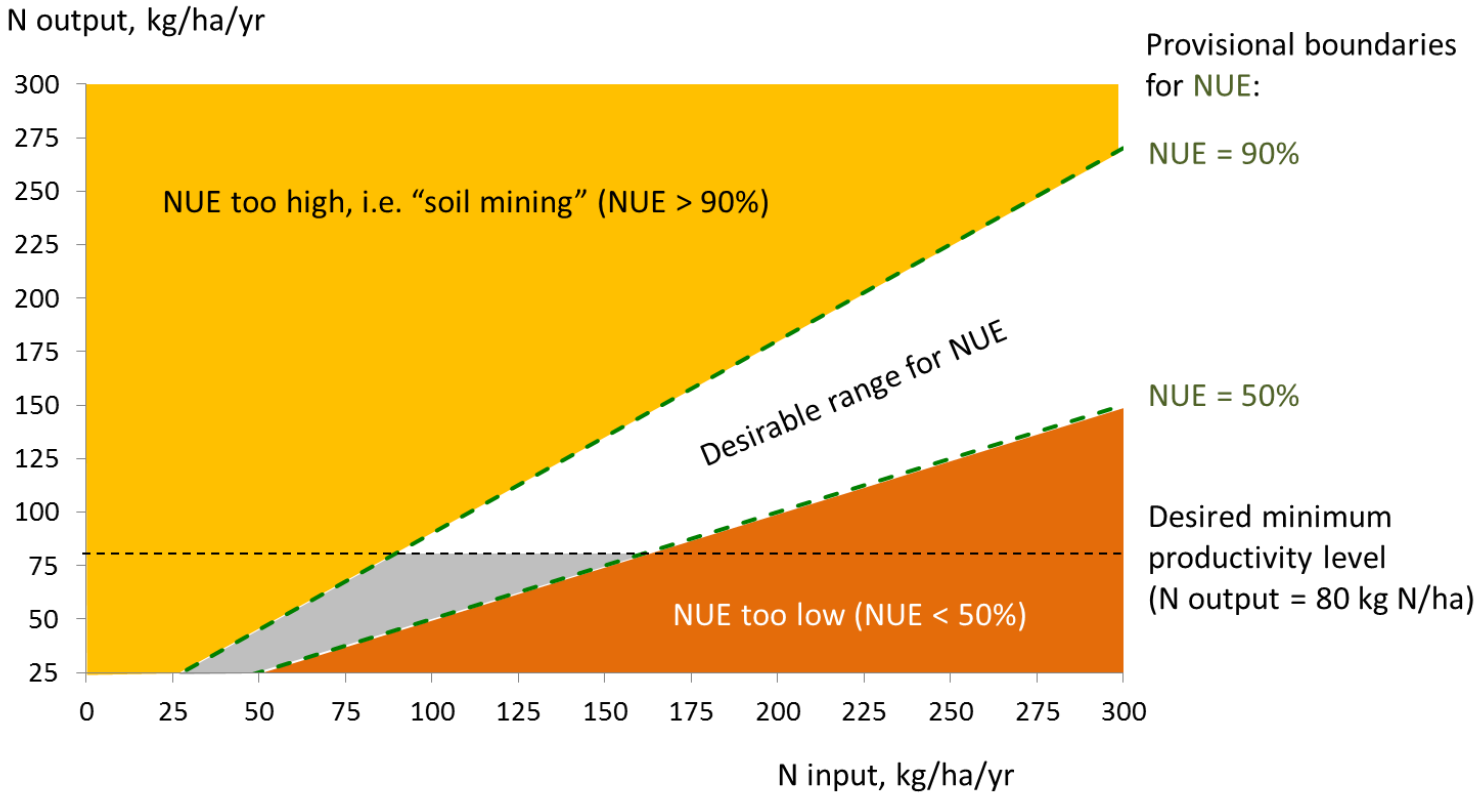
A graphical presentation

Fig. 1a: Definition of acceptable boundaries for N output/input ratios giving a desirable range for NUE
(all values are provisional and only serve as examples)



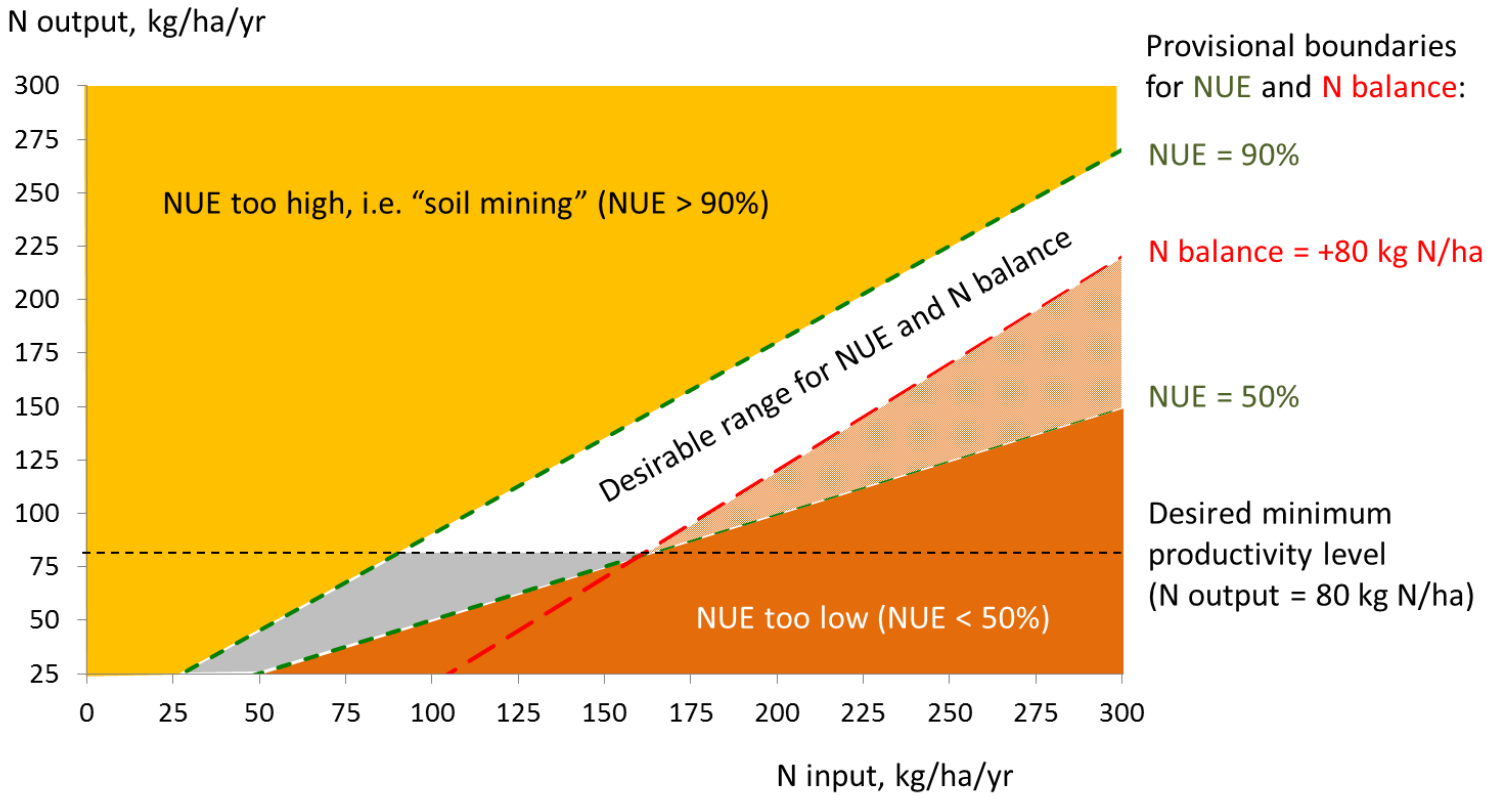
A graphical presentation

Fig. 1b: Definition of acceptable boundaries for N output/input ratios giving a desirable range for NUE – supplemented by a desired minimum productivity level
(all values are provisional and only serve as examples)

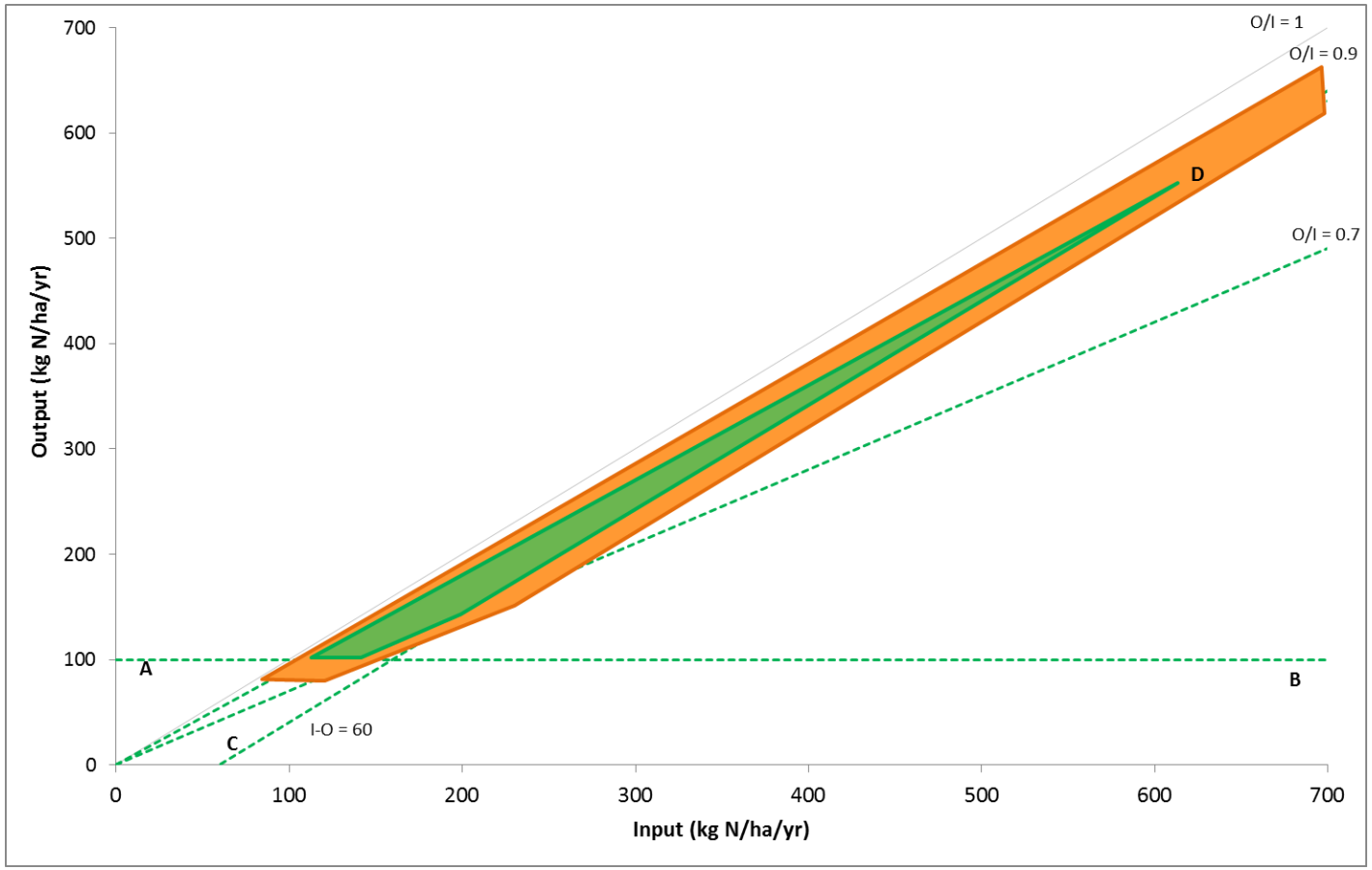


A graphical presentation

Fig. 1c: Definition of acceptable boundaries for N output/input ratios giving a desirable range for NUE – supplemented by an acceptable N balance surplus
(all values are provisional and only serve as examples)

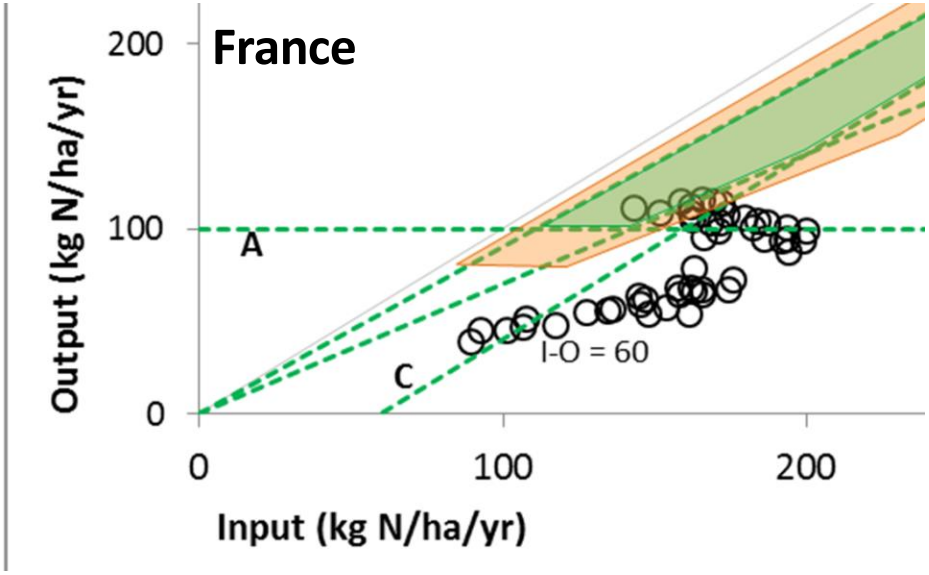


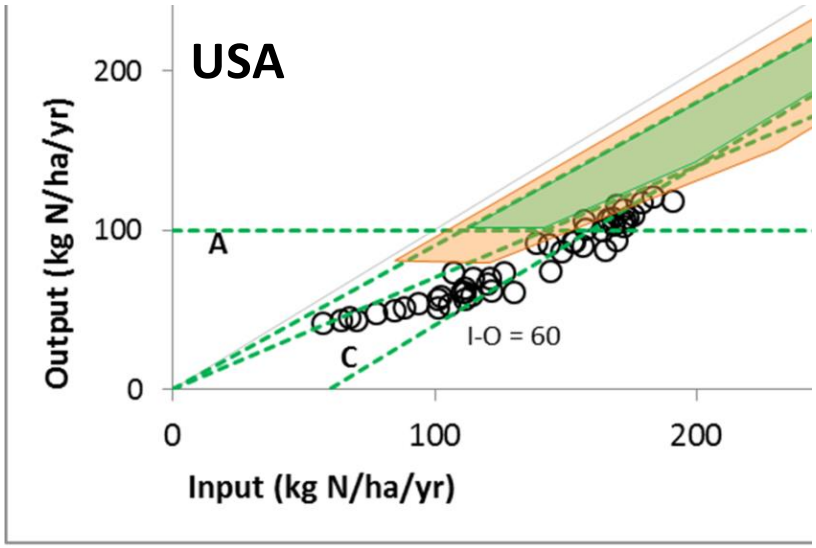
Introducing variances
towards "traffic light indicator"



Trends in NUE over time

Plotting historical data





Evolution over time could be plotted on the NUE 2D graph:
>> Identifying area for improvements

Data from Lassaletta et al., 2014

Next steps (i)

- The Panel will meet twice a year.
- The Panel will continue its work on nitrogen use efficiency. The Panel is working now on adapting the nitrogen use efficiency indicator for:
  - whole food production – consumption systems with approach for each food chain actor
  - farming systems

Next steps (ii)

- The panel will seek cooperation with bodies working on similar or related subjects, at EU and global level

- The Panel will seek further cooperation with farmers' organizations and industries involved in food systems.

Summary “EU NEP”

- The EU Nitrogen Expert Panel aims to contribute to improving NUE in food systems in Europe;
- It seeks cooperation with other bodies, that have similar objectives;
- The challenge is to derive easy-to-use indicators for whole food systems and also for farms; the NUE indicator is first task.

The EU N Expert Panel

Thank you for your attention!

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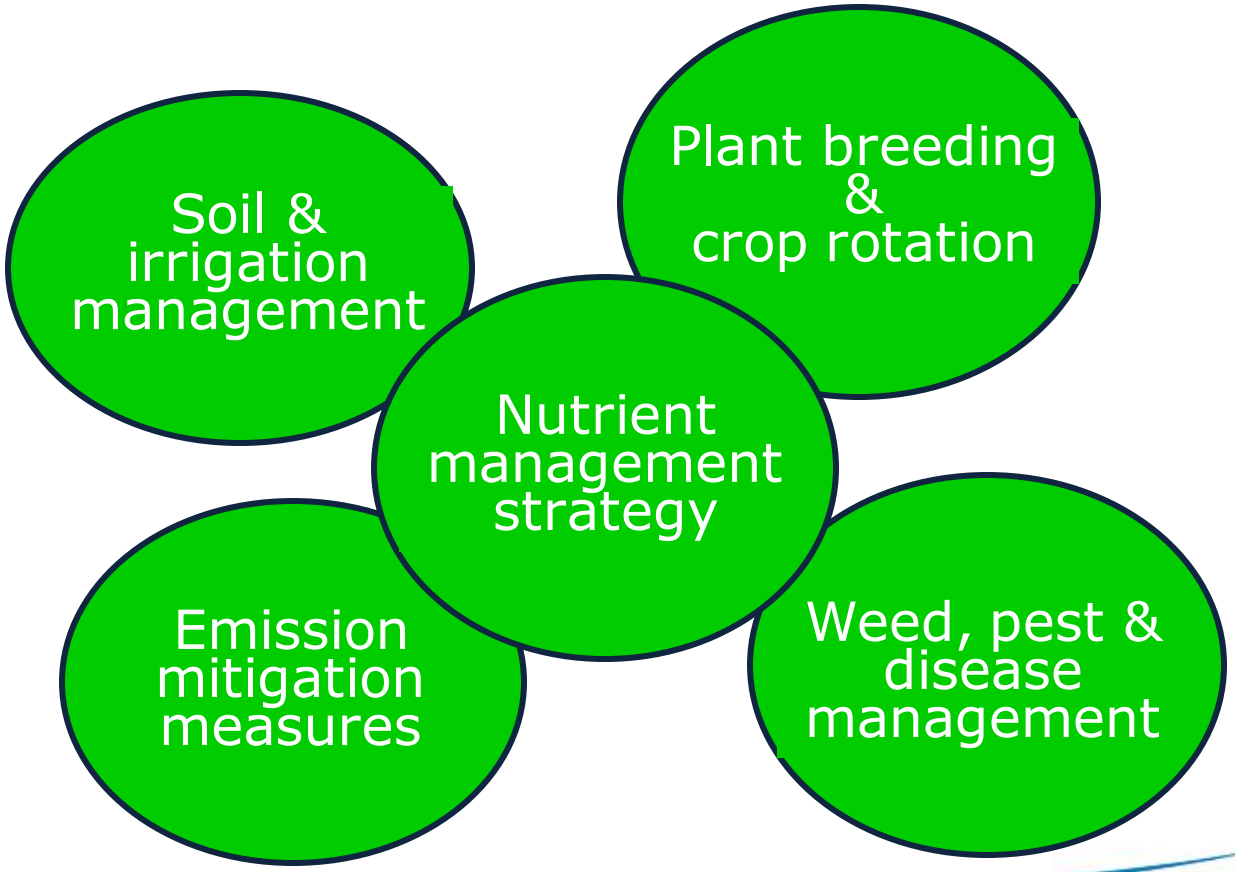
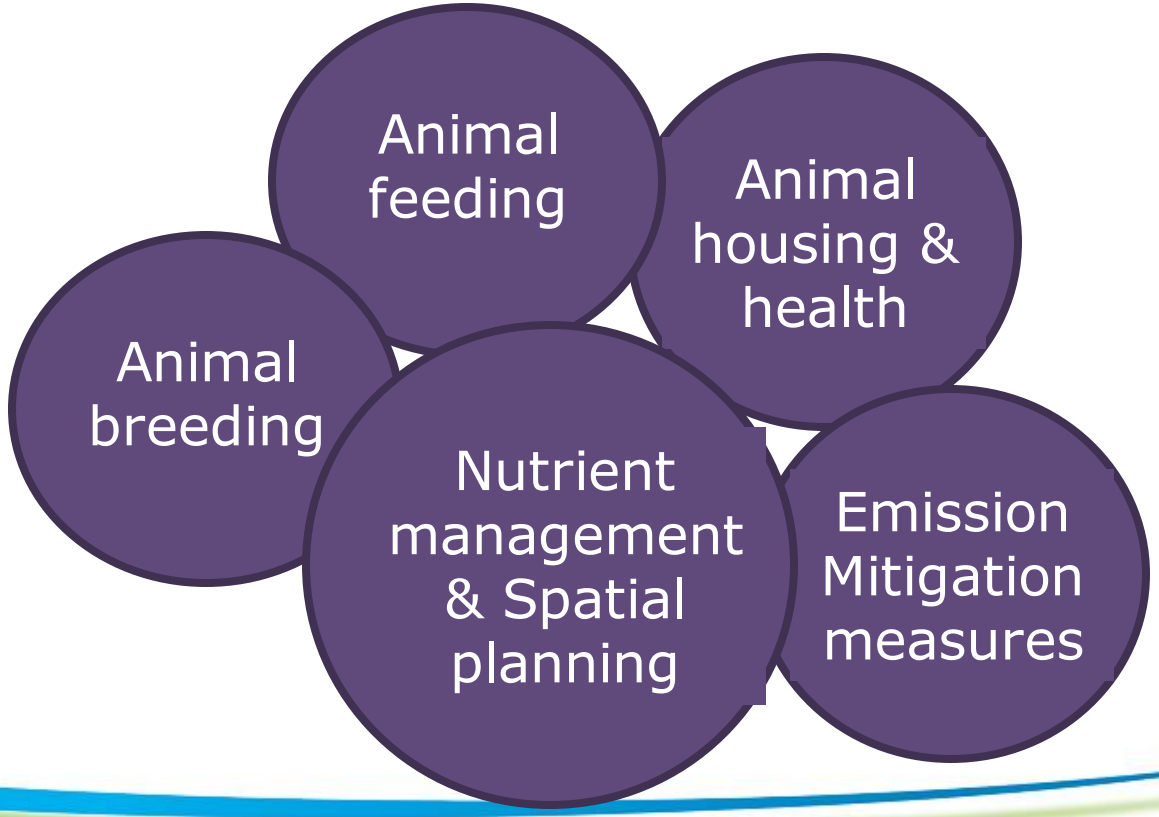
Increasing NUE
in **crop production**

Through an integrated "**5 actions strategy**", crop yields and nutrient use efficiency can be increased by 10 to more than 100%



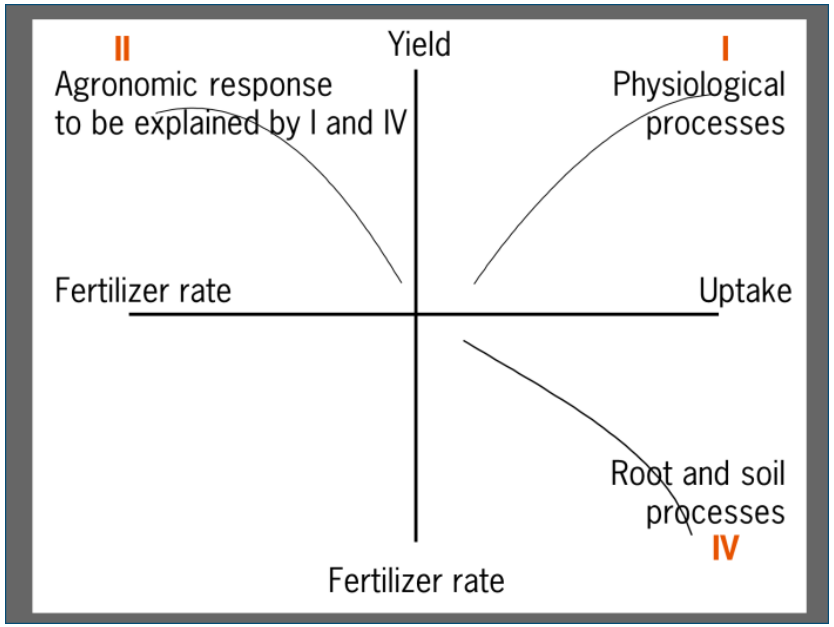
Increasing NUE
in **animal production**

Through an integrated "***5 actions strategy***", animal productivity and nutrient use efficiency can be increased by 10 to more than 100%.



NUE indicators in use

- **RE** = apparent recovery efficiency of applied nutrient
- **PE** = Physiological efficiency of applied nutrient
- **IE** = Internal utilization efficiency of nutrient
- **AE** = Agronomic efficiency of applied nutrient
- **PFP** = Partial factor productivity of applied nutrient



Dobermann, 2008