Developing a new indicator to assess nitrogen efficiency of various farming systems

O. Godinot, M. Carof, F. Vertès, P. Leterme

UMR INRA AGROCAMPUS OUEST 1069 SAS

Introduction

- Improving N efficiency to increase food production and agricultural sustainability
- Nitrogen use efficiency shows some limitations
- We developed a new indicator to solve these problems
- System N efficiency proves to be a better tool to evaluate N efficiency of farming systems

1.1. Context

- Nitrogen (N) crucial for food production

  40% food from synthetic N fertilizer *(Smil, 2002)*

- N losses have major negative impacts

  on water, air and soil quality, on biodiversity and human health *(Galloway et al., 2008; Sutton et al., 2011)*

- Improve N efficiency

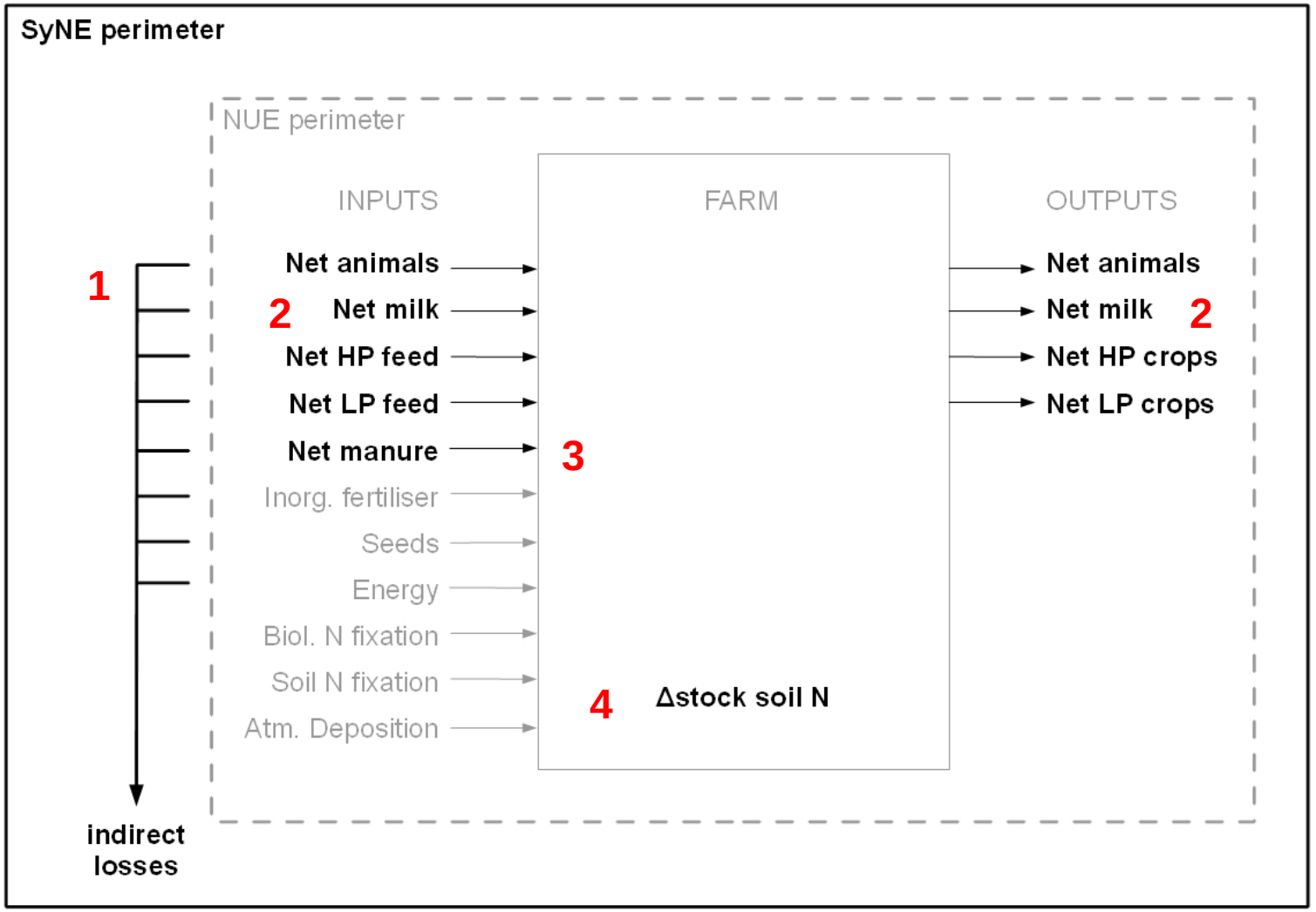
  A promising way to conciliate food production and environment preservation *(Foley et al., 2011; Sutton et al., 2011; Peyraud et al., 2012)*

1.2. Nitrogen efficiency indicator

- Nitrogen Use Efficiency (NUE)
- NUE = N outputs / N inputs

- Some limitations *(Schröder et al., 2003)*

2.1. Perimeter of NUE and SyNE

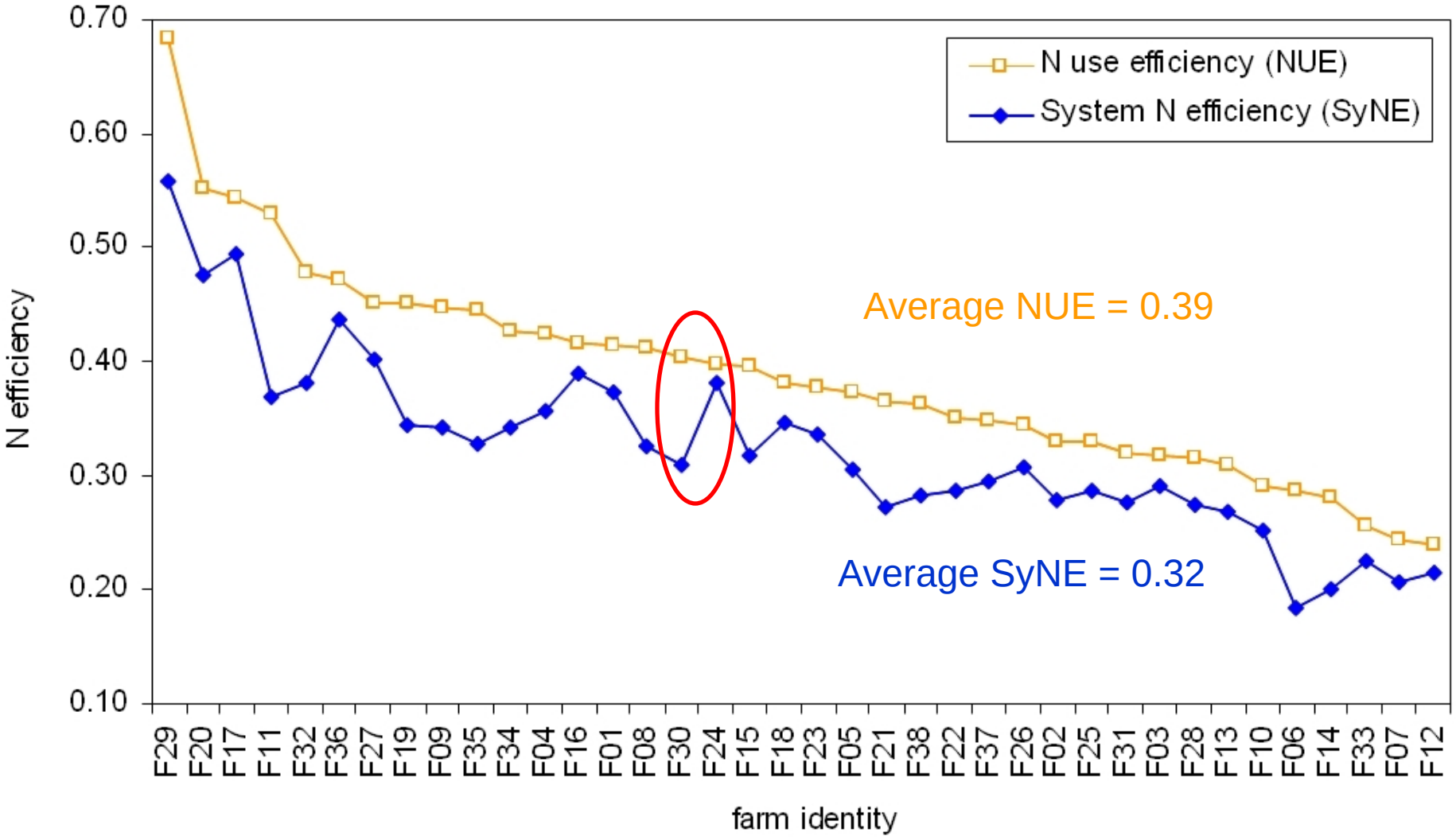


HP: high protein; LP: low protein

2.2. Calculating NUE and SyNE

- Sample: 38 mixed farms, Brittany
- Comparison of the results for both indicators
- Sensitivity analysis for input and output variables of NUE and SyNE

3. Comparison of NUE and SyNE



4.1. Interests of SyNE

1. More precise estimation of N efficiency at system scale
2. Allows more relevant comparisons between farming systems
3. Expresses the efficiency of conversion of inputs into end products
4. Change in soil N stock is the most influential variable on SyNE

4.2. Discussion

- Soil N modeling and uncertainty
- Status of outputs
- Efficiency complementary with N balance
- How to compare different systems ?

5. Conclusion

- SyNE corrects NUE limitations
- Useful to compare similar systems
- How to compare different systems ?

Thank you

for your attention.