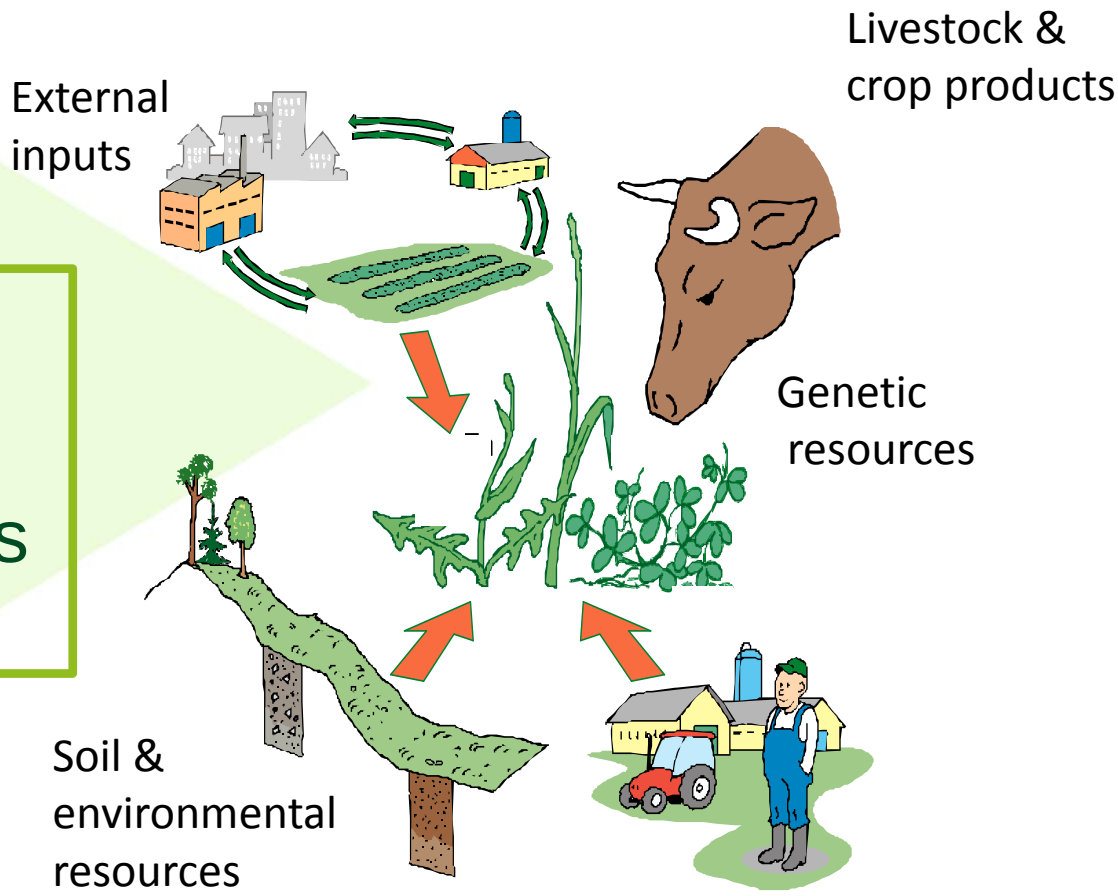
Nutrient budgeting to improve nutrient use efficiency

Christine Watson, Crop & Soil Systems, SRUC Research

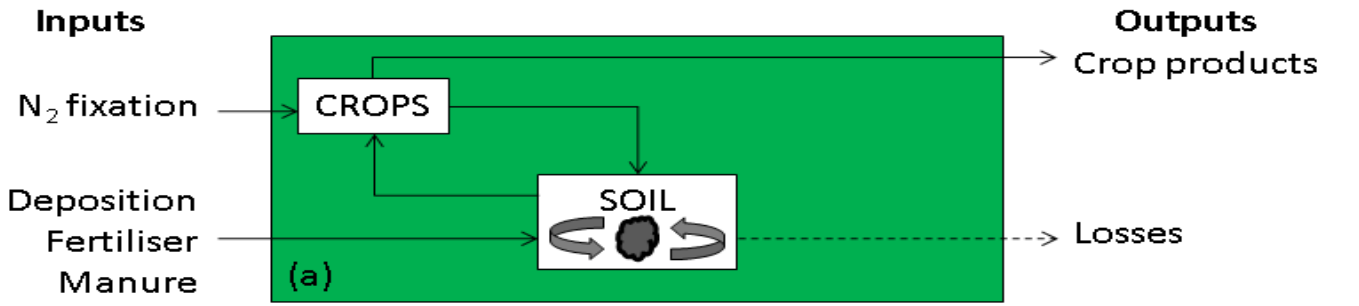
Nutrient management

- N
- PK
- Micronutrients

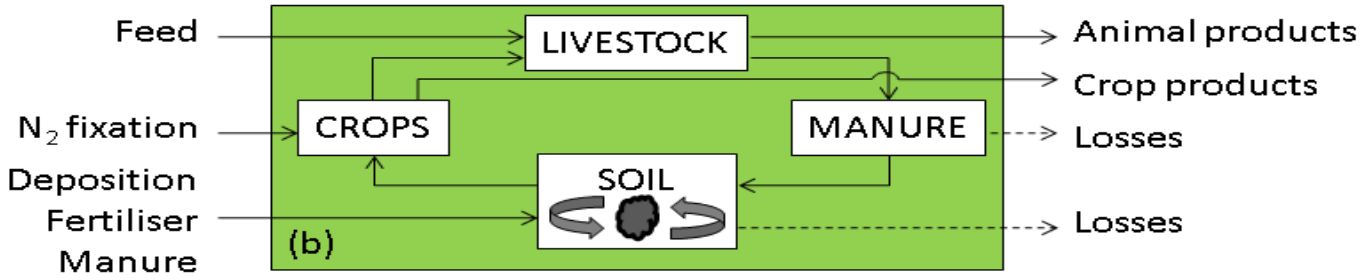


Nutrient budgeting – a useful tool

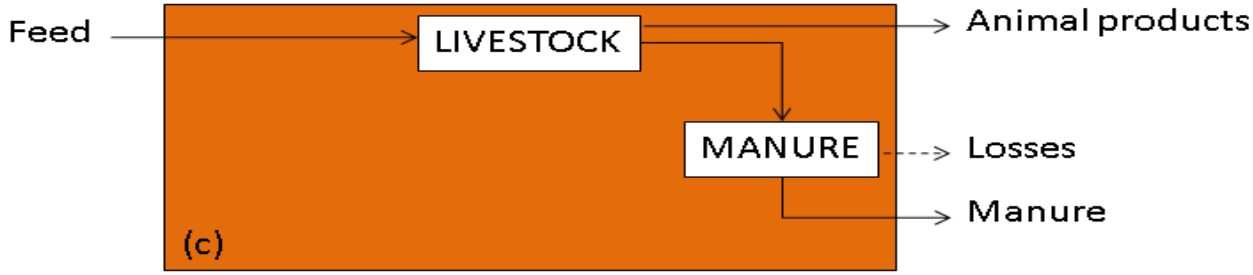
Specialist Cropping System



Mixed System

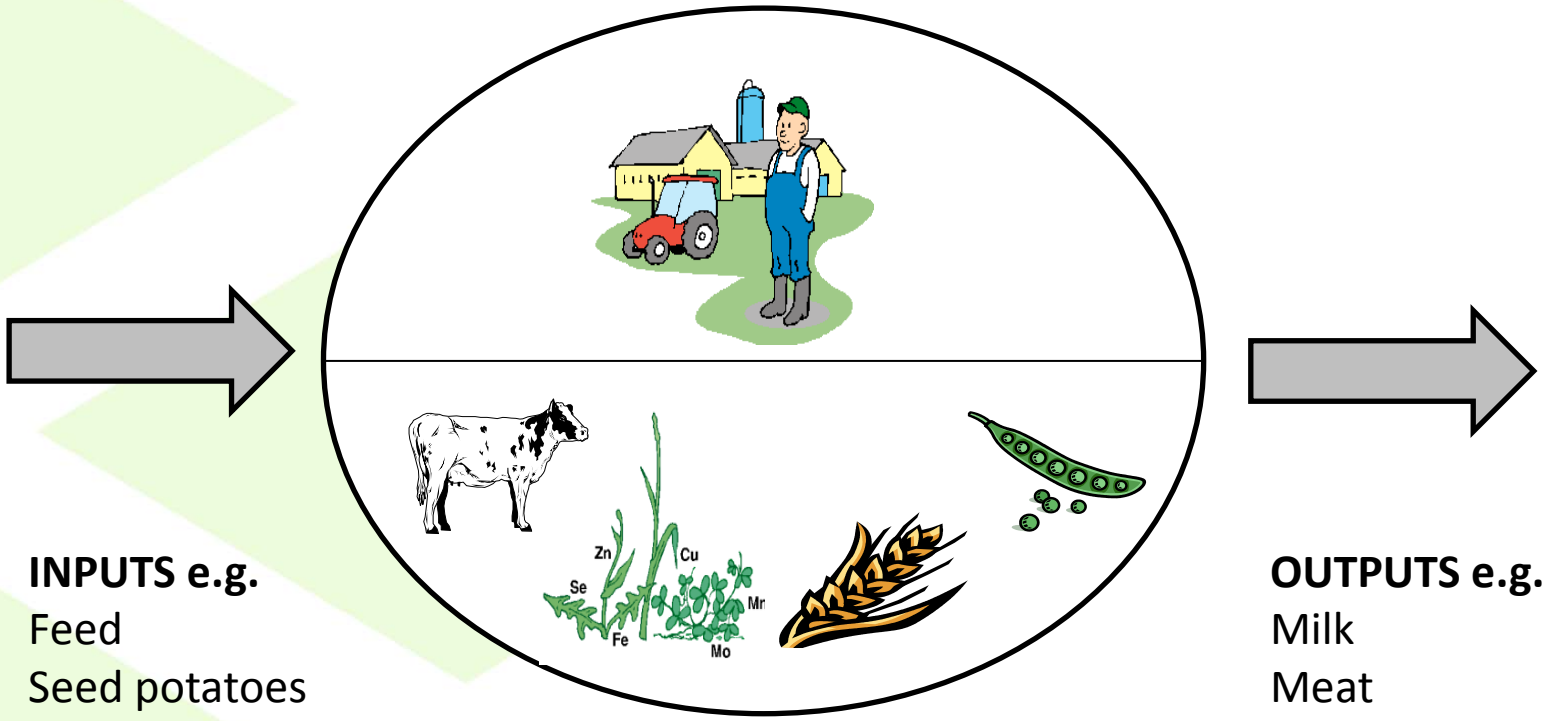


Specialist Livestock System



(Based on Oenema & Pietrzak 2002)

Farmgate nutrient budgets



INPUTS e.g.
Feed
Seed potatoes
Bedding
Fertilizers
Manure
Mineral supplements
Livestock

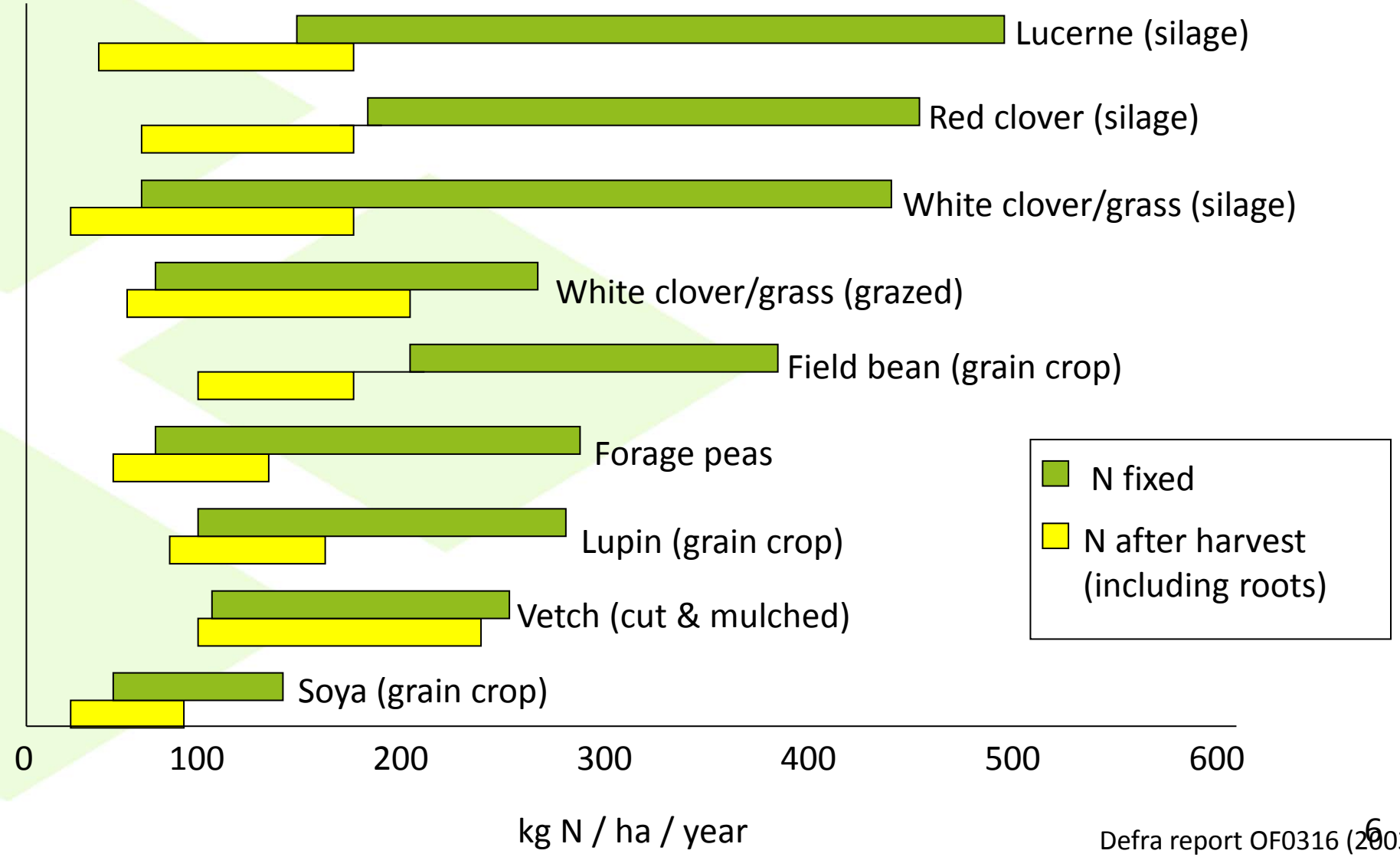
OUTPUTS e.g.
Milk
Meat
Eggs
Livestock
Cereals
Potatoes

Watson et al. 2012

Are nutrient budgets useful?

- Losses are uneconomic
- How can you make the best of purchased nutrients?
- Protection of the environment
- Not an exact science – but a simple tool
- Use with soil analysis

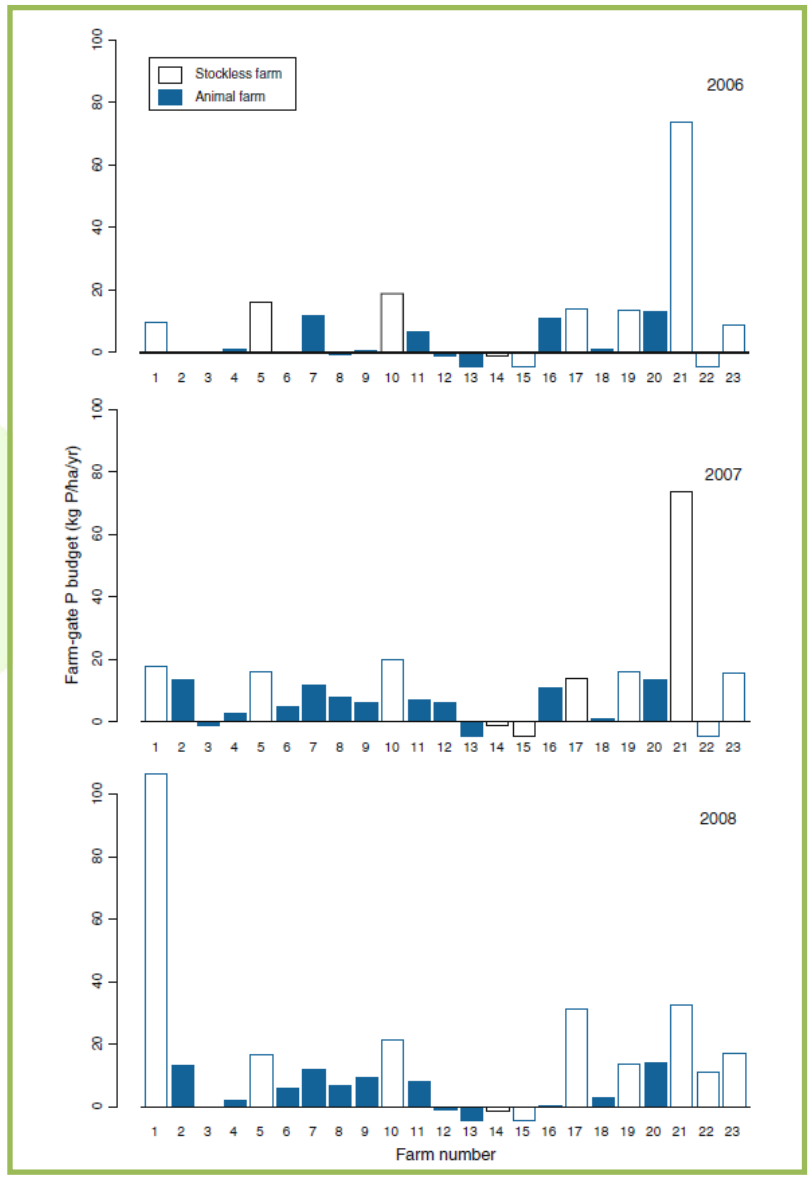
N fixation estimates



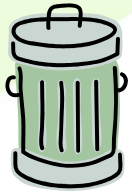
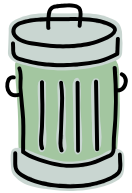
Defra report OF0316 (2003)

A snapshot in time

Nesme et al. 2012
P budgets organic farms
SW France

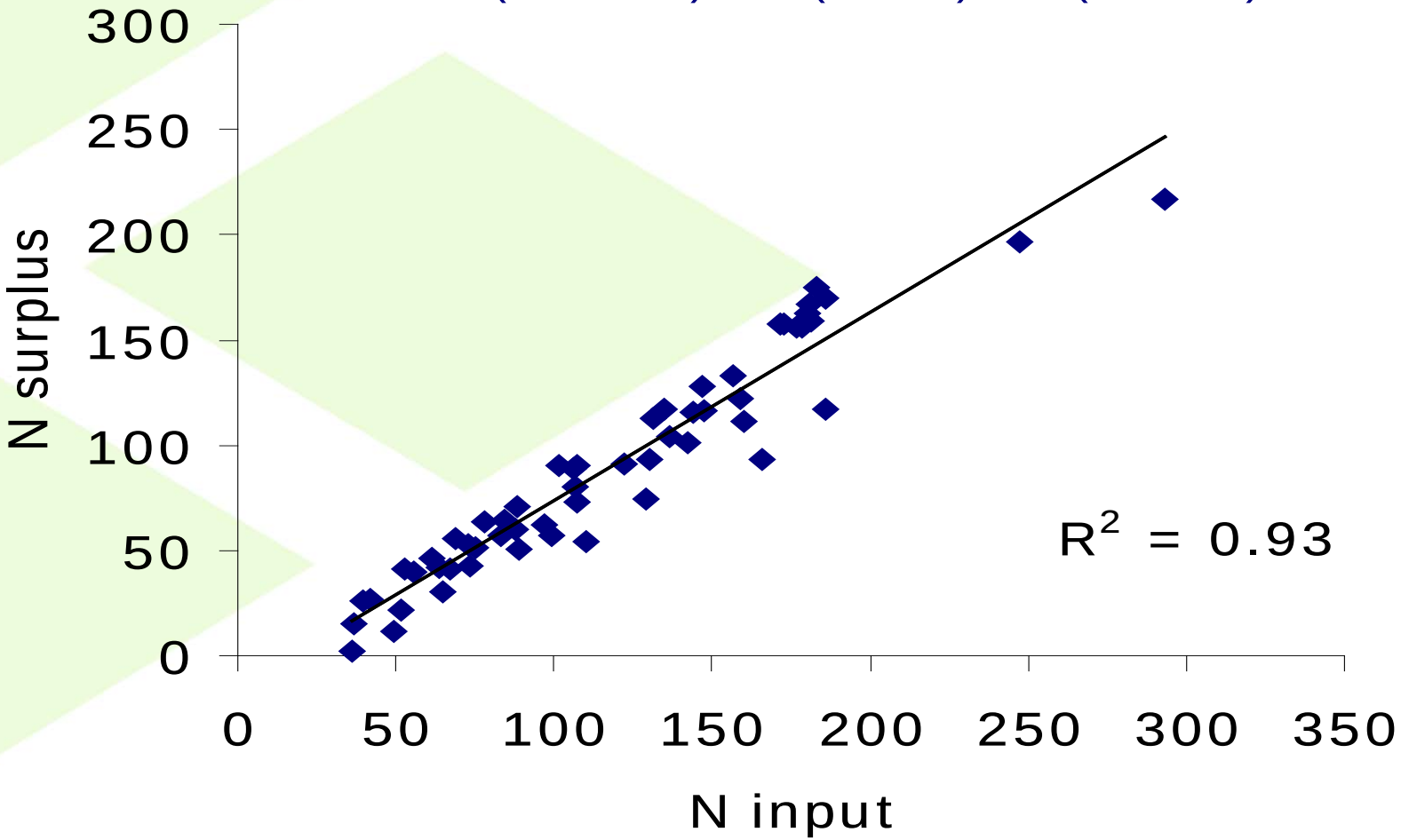


Things to consider

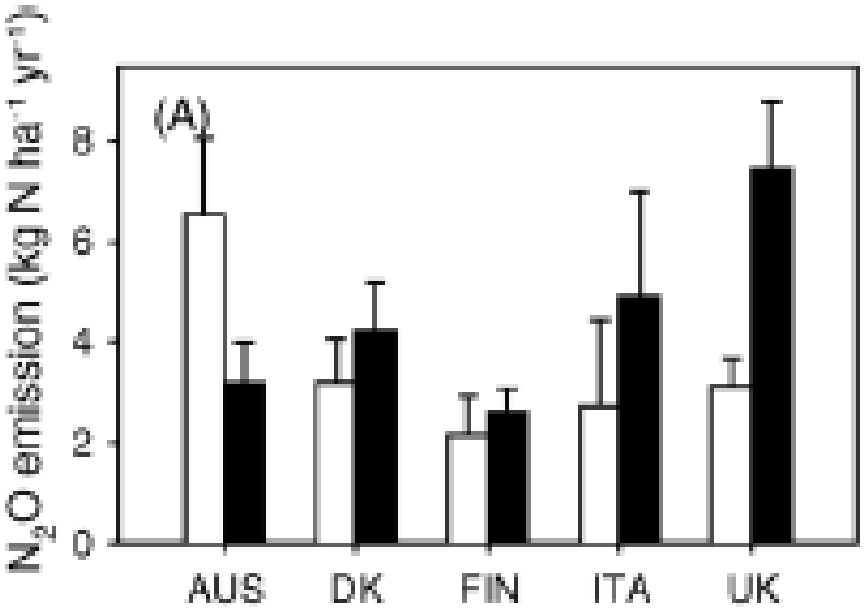
- Inputs> product outputs = loss
- Product outputs > inputs = mining fertility
- Trends are important – positive or negative?
- Helping to get the balance right (inputs/outputs but also ratios of nutrients)
- In organic systems few sources are single nutrients (feed, green waste, seaweed)!
- Timescale – need to cover a rotation 
-  in =  out

N inefficiency ? Surplus v input on 56 organic dairy farms (kg N ha^{-1})

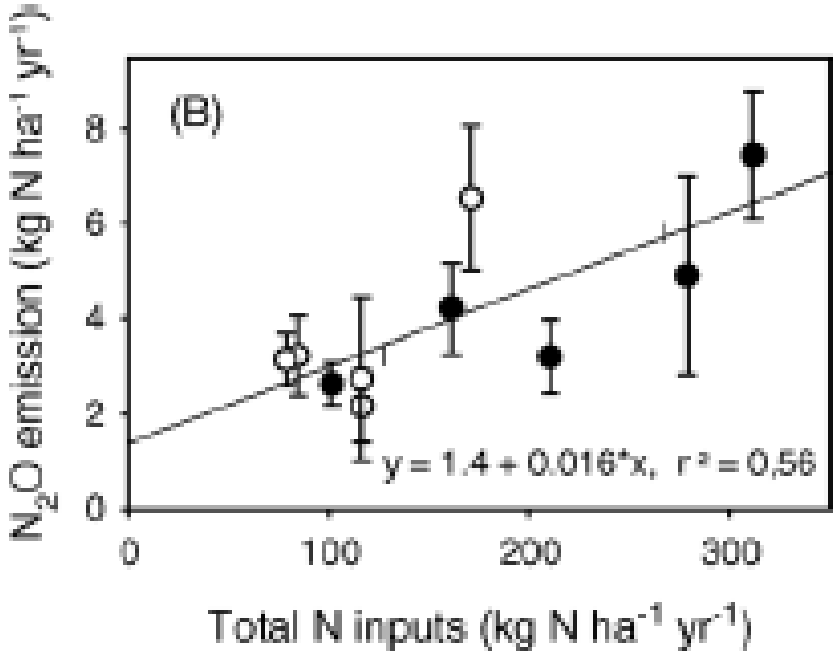
	Input	Output	Surplus
N	118 (36 – 293)	28 (8 – 76)	90 (2 – 217)



Organic and conventional dairy production at 5 European sites



Nitrous oxide emissions



Emissions as a function of input

● Conventional

○ Organic

Petersen et al. 2006

So, things to think about....

- What alternatives are available?
- N is easiest?
- Where will P and K come from?
- Consider analysing products
- What about other (macro and micro) nutrients?
- IOTA guidance note http://www.organicadvice.org.uk/tech_leaflets/nutrient_budgeting_final.pdf