

NITROGEN CYCLING IN MIXED FARMING SYSTEMS

THE COATES FARM STUDY 1995-2003

Nitrogen (N) is a vital element in agricultural systems but it is not always efficiently used

EFFICIENT N USE MAKES

- Economic sense
- Environmental sense

INEFFICIENT N USE IS

- A waste of purchased inputs
- Potentially damaging to the environment

Detailed monitoring of Nitrogen (N) cycling for seven years at the Royal Agricultural College's Coates Farm has provided information on the fate of N in a variety of farming systems and suggested ways of reducing N losses. N use efficiency (NE) is measured as :

$N \text{ IN SOLD PRODUCTS} / \text{TOTAL } N \text{ INPUTS}$.

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COATES FARM

Soil: Sherborne series - shallow (30 cm), stony clay loam to clay over limestone

Systems: 1995 - 2000: 117 ha arable, 160 dairy cows, visiting sheep.

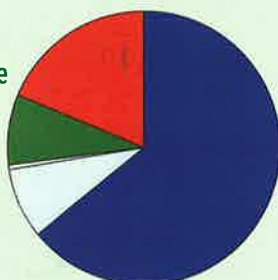
2001 - 2003: 152 ha arable, 550 ewes; separate dairy, 300 cows, 6945 litres/cow.



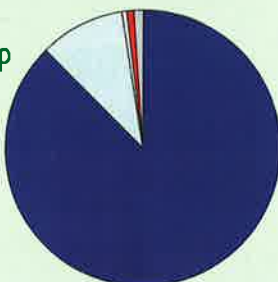
Distribution of N inputs and outputs for different farming systems

INPUTS

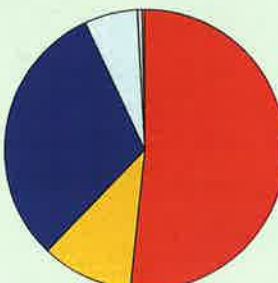
Dairy + arable
+ sheep
1995-2000
NE = 45 %



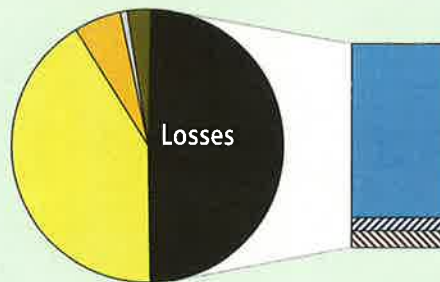
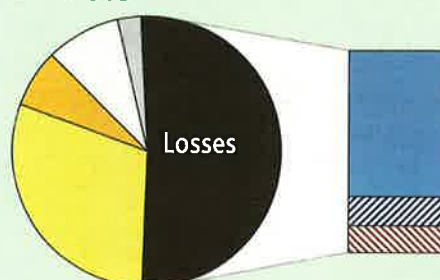
Arable + sheep
2001-3
NE = 47 %



Dairy 2001-3
NE = 20 %



OUTPUTS



INPUTS

- Fertiliser
- Fixation
- Straw
- Purchased feed
- Deposition
- Livestock
- Seed

OUTPUTS

- Grain & Seed
- Milk
- Silage
- Straw
- Livestock/wool
- Leaching
- Volatilisation
- Denitrification

In mixed systems in the Cotswolds, fertiliser is the greatest N input and leaching the greatest N loss (average 85 kg N/ha/year). Livestock use N less efficiently than crops. Some losses of N are inevitable, through natural processes which cannot be fully controlled. The weather will always have a large influence. However, management practices such as those listed below can help to reduce the losses and improve farm nitrogen use efficiency, thus making better use of purchased inputs.

REDUCING N LOSSES ON SOILS PRONE TO LEACHING

AVOID

Large manure/slurry applications to stubble/fallow in autumn



Grazing stubble turnips in wet autumn conditions (earlier grazing, higher leaching losses)



Large single N fertiliser applications
Early spring fertiliser applications to poorly established cereal crops prior to wet weather



Intensive cultivations when converting grassland to arable use



AIM FOR

Slurry applications in spring/summer rather than late autumn/winter

Later grazing of stubble turnips (late Nov-Dec)

Reduced stocking rate

Early autumn crop establishment
Amending spring fertiliser applications in the light of spring soil N reserves after soil testing
Split N applications resulting in lower rates at each dressing

Reduced cultivations when converting grassland to arable use

Further details available from:

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