

Nitrogen management & Feeding

Chair: Oene Onema

Rapporteur: Nick Hutchings

UNIVERSITY OF AARHUS

Faculty of Agricultural Sciences



Cost of improving N management

- **Assess N management using Nitrogen Use Efficiency (NUE)**

$$NUE = \frac{N_{output}}{N_{input}}$$

- **N output = N in crop and animal products**
- **N input = N in fertiliser, imported manure, fixation, animal feed etc**

Cost of improving N management



- **Cost of data collection is €300-500 per farm per year**
- **Calculating cost of improving NUE is more complex**
- **Numerous ways to improve NUE**
- **e.g. reduce NH₃, N₂O or N₂ emission**
 - More crop growth (increase N output), *or*
 - Less need for N fertiliser (decrease N input)
- **e.g. reduce emissions from outdoor pigs**



Cost of improving N management



- **Opportunities and costs differ between farm types and countries**
- **How to make progress?**

Vegetable & arable farms

Ambition level	Vegetable & arable farms				Increase	Cost
	N input	N output	Nsurplus	NUE	NUE	Euro/kg N
	kg/ha/yr	kg/ha/yr	kg/ha/yr	fraction	%	Euro/kg N
Reference level	400	200	200	0.50		
	200	120	80	0.60		
	100	80	20	0.80		
Nsurplus -30%	340	200	140	0.59	18	-0.5 to +0.5
	176	120	56	0.68	14	-0.2 to +0.5
	94	80	14	0.85	6	-0.0 to +1.0
Nsurplus -20%	360	200	160	0.56	11	-0.7 to +0.5
	184	120	64	0.65	9	-0.3 to +0.5
	96	80	16	0.83	4	-0.3 to +0.5
Nsurplus -10%	380	200	180	0.53	5	-1.0 to +0.5
	192	120	72	0.63	4	-0.7 to +0.5
	98	80	18	0.82	2	-0.5 to +0.5

Dairy farms



Ambition level	Dairy farm				Increase	Cost
	N input	N output	Nsurplus	NUE	NUE, %	Euro/kg N
	kg/ha/yr	kg/ha/yr	kg/ha/yr	fraction	%	Euro/kg N
Reference level	400	60	340	0.15		
	300	60	240	0.20		
	200	60	140	0.30		
Nsurplus -30%	298	60	238	0.20	34	-0.5 to +0.5
	228	60	168	0.26	32	-0.0 to +0.5
	158	60	98	0.38	27	+0.5 to +2.0
Nsurplus -20%	332	60	272	0.18	20	-0.7 to +0.5
	252	60	192	0.24	19	-0.3 to +0.5
	172	60	112	0.35	16	-0.0 to +0.5
Nsurplus -10%	366	60	306	0.16	9	-1.0 to +0.5
	276	60	216	0.22	9	-0.7 to +0.5
	186	60	126	0.32	8	-0.2 to +0.5

Mixed pig/arable farms

Ambition level	Mixed pig farm				Increase	Cost
	N input	N output	Nsurplus	NUE	NUE, %	Euro/kg N
	kg/ha/yr	kg/ha/yr	kg/ha/yr	fraction	%	Euro/kg N
Reference level	400	100	300	0.25		
	300	80	220	0.27		
	200	70	130	0.35		
Nsurplus -30%	310	100	210	0.32	29	-0.5 to +0.5
	234	80	154	0.34	28	-0.2 to +0.5
	161	70	91	0.43	24	-0.0 to +2.0
Nsurplus -20%	340	100	240	0.29	18	-0.7 to +0.5
	256	80	176	0.31	17	-0.3 to +0.5
	174	70	104	0.40	15	-0.0 to +0.1
Nsurplus -10%	370	100	270	0.27	8	-1.0 to +0.5
	278	80	198	0.29	8	-0.7 to +0.5
	187	70	117	0.37	7	-0.5 to +0.5

Feeding measures - pigs

- **Focus on finishers (greatest impact)**
- **Reference system**
 - Single crude protein concentration throughout (17-18%)
 - No large variation across Europe

Ambition level	Finishing Pigs
Reference level CP	15-18
	€/kg NH ₃ N
A: 15 %	-1.0 to +1.0
B: 10 %	-1.5 to +1.0
C: 5%	-2.0 to +0.5

Feeding measures - poultry

- **Much has already been achieved**
 - To achieve more – expensive and welfare

Ambition level	Poultry	Poultry
Reference level CP	18-22	19
	€/kg NH ₃ N	% increase
A: 15 %	-0.0 to +1.5	NA
B: 10 %	-0.5 to +1.5	1.00%
C: 5%	-1.0 to +1.0	0.50%

Martin Raaflaub

Feeding measures - cattle

- **Need for separate targets and costs for grazing and non-grazing**
 - Different options available
- **Agreed that Oene would make proposal**
 - Housed only

Ambition level	Dairy cattle
Reference level	16-24
	€/kg NH ₃ N
A: 15 %	-0.5 to +1.0
B: 10 %	-0.7 to +0.5
C: 5%	-1.0 to +0.3