

# **FARM DATA NEEDED FOR AGRI-ENVIRONMENTAL REPORTING**

**Technical document summarizing the findings of the DireDate  
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Luxembourg on 28 March 2011<sup>1</sup>**

## **Annex 4. Specific recommendations for collection farm data related to gross nitrogen and phosphorus balances and ammonia and greenhouse gas emissions.**

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### **Authors**

**O. Oenema, B. Amon, C. van Beek, N. Hutchings, M. Perez-Soba, C.  
Procter, S. Pietrzak, G.L. Velthof, F. Vinther, L. Wilson**

### **Consortium**

**DLO-Alterra, Wageningen UR, The Netherlands  
Department of Agro-ecology and Environment, University of Aarhus, Denmark  
Institute of Technology and Life Sciences, ITP/IMUZ, Falenty, Poland  
Department of Sustainable Agricultural Systems, University of Natural Resources and  
Applied Life Sciences, Wien, Austria,  
ADAS, Wolverhampton, United Kingdom**

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#### **Annex 4. Specific recommendations for collection farm data related to gross nitrogen and phosphorus balances and ammonia and greenhouse gas emissions.**

This annex presents 6 tables with specific recommendations for collecting the farm data required to calculate gross nitrogen (N) and phosphorus (P) balances and ammonia (NH<sub>3</sub>) and greenhouse gas (GHG) emissions, as discussed in Chapters 4, 6 and 7. The 6 tables (Tables A4.1 to A4.6) include specifications for:

1. data related to inputs of N and P.
2. coefficients related to inputs of N and P.
3. data related to factors affecting emissions of ammonia and greenhouse gases.
4. coefficients related to factors affecting emissions of ammonia and greenhouse gases.
5. data related to N and P in harvested crop products.
6. coefficients related to N and P in harvested crop products

Table. A4.1. Recommendations for collection of data related to inputs of N and P.

Two scenarios are included. The minimum scenario is the scenario with collection of data which are at least needed for reporting for policies and AEI (e.g. Tier 1) and the optimum scenario is the scenario for collection of data in detailed approaches (e.g. Tier 2 and 3 methods).

Type of data	Scenario	Data specification Number/amount	Unit	Policy need	AEI need	Scale of collection		Source/method
						Spatial	Temporal	
Number of livestock	Minimum	dairy cattle	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Minimum	beef cattle	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Minimum	other cattle	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Minimum	sows, incl.piglets	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Minimum	fattening pigs	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Minimum	broilers	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS

Number of livestock	Minimum	laying hens	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Minimum	other poultry	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Minimum	other	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	dairy cattle	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	beef cattle	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	young cattle	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	calves	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	sows, incl.piglets	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS

Number of livestock	Optimum	fattening pigs	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	boars	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	other pigs	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	broilers	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	laying hens	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	turkey	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	ducks	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	other poultry	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS

Number of livestock	Optimum	sheep	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	goat	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Number of livestock	Optimum	horses	average number of live animals per farm	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Farm	Annual	Livestock registers, FSS
Grazing system	Minimum	dairy cattle	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Minimum	other cattle	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Minimum	other livestock	grazing % of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Optimum	dairy cattle	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Optimum	beef cattle	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Optimum	young cattle	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Optimum	calves	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM

Grazing system	Optimum	sheep	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Optimum	goat	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Optimum	horses	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
Grazing system	Optimum	other grazing livestock	% of time spent outside	UNFCCC, WFD, ND, NECD	11.3, 10.2, 12, 13, 15, 16, 18, 19	Farm	1x 3 yrs	SAPM
N fertilizer consumption	Minimum	ammonium nitrate	kg N per country per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	National	Annual	Calculated on the basis of approved Protocols
N fertilizer consumption	Minimum	calcium ammonium nitrate	kg N per country per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	National	Annual	Calculated on the basis of approved Protocols
N fertilizer consumption	Minimum	anhydrous ammonia	kg N per country per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	National	Annual	Calculated on the basis of approved Protocols
N fertilizer consumption	Minimum	ammonium phosphate	kg N per country per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	National	Annual	Calculated on the basis of approved Protocols
N fertilizer consumption	Minimum	urea	kg N per country per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	National	Annual	Calculated on the basis of approved Protocols
N fertilizer consumption	Minimum	urea-ammonium nitrate solution (UAN)	kg N per country per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	National	Annual	Calculated on the basis of approved Protocols



N fertilizer consumption	Minimum	other N fertilizers	kg N per country per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	National	Annual	Calculated on the basis of approved Protocols
P fertilizer consumption	Minimum	P fertilizers (all types)	kg P per country per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	National	Annual	Calculated on the basis of approved Protocols
N fertilizer consumption	Optimum	calcium ammonium nitrate	kg N per ha per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	Farm	Annual	Farm survey
N fertilizer consumption	Optimum	anhydrous ammonia	kg N per ha per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	Farm	Annual	Farm survey
N fertilizer consumption	Optimum	ammonium phosphate	kg N per ha per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	Farm	Annual	Farm survey
N fertilizer consumption	Optimum	urea	kg N per ha per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	Farm	Annual	Farm survey
N fertilizer consumption	Optimum	urea-ammonium nitrate solution (UAN)	kg N per ha per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	Farm	Annual	Farm survey
N fertilizer consumption	Optimum	other N fertilizers	kg N per ha per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	Farm	Annual	Farm survey
P fertilizer consumption	Optimum	P fertilizers (all types)	kg P per ha per year	UNFCCC, WFD, ND, NECD	12, 13, 15, 16, 18, 19	Farm	Annual	Farm survey
Biological N fixation	Minimum/optimum	clover	ha	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	Annual	FSS / Farm survey
Biological N fixation	Minimum/optimum	peas	ha	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	Annual	FSS / Farm survey
Biological N fixation	Minimum/optimum	beans	ha	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	Annual	FSS / Farm survey

Biological N fixation	Minimum/optimum	soya bean	ha	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	Annual	FSS / Farm survey
Biological N fixation	Minimum/optimum	lucerne	ha	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	Annual	FSS / Farm survey
Biological N fixation	Minimum/optimum	lupins	ha	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	Annual	FSS / Farm survey
Atmospheric N depostion	Minimum/optimum	dry deposition	kg N per ha per year	UNFCCC, WFD, ND, NECD	15, 18, 19	Regional	Annual	EMEP data base
Atmospheric N depostion	Minimum/optimum	wetdeposition	kg N per ha per year	UNFCCC, WFD, ND, NECD	15, 18, 19	Regional	Annual	EMEP data base

Table A4.2. Recommendations for collection of coefficients related to inputs of N and P.

Two scenarios are included. The minimum scenario is the scenario with collection of data which are at least needed for reporting for policies and AEI (e.g. Tier 1) and the optimum scenario is the scenario for collection of data in detailed approaches (e.g. Tier 2 and 3 methods).

Type of coefficient	Scenario	Data specification	Unit / dimension	Policy need	AEI need	Scale of estimate		Source/method
						Spatial	Temporal	
N excretion	Minimum	dairy cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Minimum	beef cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Minimum	other cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Minimum	sows, incl.piglets	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Minimum	fattening pigs	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Minimum	broilers	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Minimum	laying hens	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Minimum	other poultry	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols

N excretion	Minimum	other	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	dairy cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	beef cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	young cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	calves	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	sows, incl. piglets	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	fattening pigs	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	boars	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	other pigs	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	broilers	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	laying hens	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols

N excretion	Optimum	turkey	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	ducks	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	other poultry	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	sheep	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	goat	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
N excretion	Optimum	horses	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Minimum	dairy cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Minimum	beef cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Minimum	other cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Minimum	sows, incl.piglets	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Minimum	fattening pigs	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols

P excretion	Minimum	broilers	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Minimum	laying hens	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Minimum	other poultry	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Minimum	other	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	dairy cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	beef cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	young cattle	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	calves	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	sows, incl.piglets	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	fattening pigs	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	boars	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols

P excretion	Optimum	other pigs	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	broilers	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	laying hens	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	turkey	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	ducks	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	other poultry	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	sheep	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	goat	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
P excretion	Optimum	horses	kg/animal/yr	UNFCCC, WFD, ND, NECD	10.2, 12, 13, 15, 16, 18, 19	National	1 x 3 yr	Calculated on the basis of approved Protocols
Biological N fixation	Minimum/optimum	clover	kg N per ha leguminous crop per year	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols
Biological N fixation	Minimum/optimum	peas	kg N per ha leguminous crop per year	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols

Biological N fixation	Minimum/ optimum	beans	kg N per ha leguminous crop per year	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols
Biological N fixation	Minimum/ optimum	soya bean	kg N per ha leguminous crop per year	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols
Biological N fixation	Minimum/ optimum	lucerne	kg N per ha leguminous crop per year	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols
Biological N fixation	Minimum/ optimum	lupins	kg N per ha leguminous crop per year	UNFCCC, WFD, ND	4, 12, 13, 15, 16, 18, 19	Regional	1 x 3 yr	Calculated on the basis of approved Protocols



*Table A4.3. Recommendations for collection of data related to factors affecting emissions of ammonia and greenhouse gases.*

*Two scenarios are included. The minimum scenario is the scenario with collection of data which are at least needed for reporting for policies and AEI (e.g. Tier 1) and the optimum scenario is the scenario for collection of data in detailed approaches (e.g. Tier 2 and 3 methods).*

Type of data	Scenario	Data specification	Required data	Unit / dimension	Policy need	AEI need	Scale of estimate		Source / method
							Spatial	Temporal	
Housing system	minimum	dairy, beef, and other cattle	Manure type; Solid/liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	minimum	dairy, beef, and other cattle	Manure type; Solid/liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	dairy, beef, and other cattle	tied housing with fully-slatted floor	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	dairy, beef, and other cattle	tied housing partially slatted floor	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	dairy, beef, and other cattle	loose housing with fully-slatted floor	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	dairy, beef, and other cattle	loose housing partially slatted floor	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	dairy, beef, and other cattle	tied housing with fully-slatted floor with scrubbers/biofilters	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	dairy, beef, and other cattle	tied housing partially slatted floor with scrubbers/biofilters	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	dairy, beef, and other cattle	loose housing with fully-slatted floor with scrubbers/biofilters	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM

Housing system	optimum	dairy, beef, and other cattle	loose housing partially slatted floor with scrubbers/biofilters	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	dairy, beef, and other cattle	solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	dairy, beef, and other cattle	liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	dairy, beef, and other cattle	manure separation	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	dairy, beef, and other cattle	liquid with anaerobic digestion without supplements	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 24, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	dairy, beef, and other cattle	liquid with anaerobic digestion with supplements	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 24, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	minimum	pigs	Solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	minimum	pigs	Liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	minimum	pigs	Solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	minimum	pigs	Liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	pigs	Solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	pigs	Liquid with scrubbers/biofilters	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM

Manure storage system	optimum	pigs	solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	pigs	liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	pigs	manure separation	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	pigs	liquid with anaerobic digestion without supplements	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 24, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	pigs	liquid with anaerobic digestion with supplements	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 24, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	minimum	poultry	Solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	minimum	poultry	Liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	minimum	poultry	Solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	minimum	poultry	Liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	poultry	Battery cages	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	optimum	poultry	Battery cages with drying	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	poultry	Free range	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM

Manure storage system	optimum	poultry	Aviary house	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	poultry	Other	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	poultry	Solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	optimum	poultry	Liquid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Housing system	minimum	other	Solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure storage system	minimum	other	Solid	Dimension less	UNFCCC, ND, NECD	11.3, 12, 16, 18, 19, 28	Farm	1 x 5 yr	FSS; SAPM
Manure application technique	minimum	grassland and arable land	surface spreading	Dimension less	UNFCCC, ND, NECD	11.2, 12, 15, 16, 18, 19	Farm	1 x 3 yr	FSS; SAPM
Manure application technique	minimum	grassland and arable land	reduced ammonia application	Dimension less	UNFCCC, ND, NECD	11.2, 12, 15, 16, 18, 19	Farm	1 x 3 yr	FSS; SAPM
Manure application technique	optimum	grassland and arable land	Broadcast - no incorporation	Dimension less	UNFCCC, ND, NECD	11.2, 12, 15, 16, 18, 19	Farm	1 x 3 yr	FSS; SAPM
Manure application technique	optimum	arable land	Broadcast - incorporation <2hrs	Dimension less	UNFCCC, ND, NECD	11.2, 12, 15, 16, 18, 19	Farm	1 x 3 yr	FSS; SAPM
Manure application technique	optimum	arable land	Broadcast - incorporation <1 day	Dimension less	UNFCCC, ND, NECD	11.2, 12, 15, 16, 18, 19	Farm	1 x 3 yr	FSS; SAPM

Manure application technique	optimum	grassland and arable land	Band spread	Dimension less	UNFCCC, ND, NECD	11.2, 12, 15, 16, 18, 19	Farm	1 x 3 yr	FSS; SAPM
Manure application technique	optimum	grassland and arable land	Deep injection	Dimension less	UNFCCC, ND, NECD	11.2, 12, 15, 16, 18, 19	Farm	1 x 3 yr	FSS; SAPM
Manure application technique	optimum	grassland and arable land	Shallow injection	Dimension less	UNFCCC, ND, NECD	11.2, 12, 15, 16, 18, 19	Farm	1 x 3 yr	FSS; SAPM

Table. A4.4. Recommendations for collection of coefficients related to factors affecting emissions of ammonia and greenhouse gases.

Two scenarios are included. The minimum scenario is the scenario with collection of data which are at least needed for reporting for policies and AEI (e.g. Tier 1) and the optimum scenario is the scenario for collection of data in detailed approaches (e.g. Tier 2 and 3 methods).

Type of data	Scenario	First data specification	Second data specification	Unit / dimension	Required coefficient	Policy need	AEI need	Scale of estimate		Source/method
								Spatial	Temporal	
Housing system	minimum	dairy, beef, and other cattle	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Housing system	minimum	dairy, beef, and other cattle	Liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	minimum	dairy, beef, and other cattle	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	minimum	dairy, beef, and other cattle	Liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	tied housing with fully-slatted floor	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	tied housing partially slatted floor	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	loose housing with fully-slatted floor	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	loose housing partially slatted floor	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	tied housing with fully-slatted floor	% of N excreted	ammonia emission	UNFCCC, ND,	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook

Housing system	optimum	cattle dairy, beef, and other cattle	with scrubbers/biofilters tied housing partially slatted floor with scrubbers/biofilters	% of N excreted	ammonia emission factor	NECD UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	loose housing with fully-slatted floor with scrubbers/biofilters	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	loose housing partially slatted floor with scrubbers/biofilters	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	manure separation	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	liquid with anaerobic digestion without supplements	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	liquid with anaerobic digestion with supplements	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	minimum	pigs	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook

Housing system	minimum	pigs	Liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	minimum	pigs	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	minimum	pigs	Liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	pigs	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	pigs	Liquid with scrubbers/biofilters	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	pigs	solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	pigs	liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	pigs	manure separation	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	pigs	liquid with anaerobic digestion without supplements	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	pigs	liquid with anaerobic digestion with supplements	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	minimum	poultry	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook



					factor	NECD				
Housing system	minimum	poultry	Liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	minimum	poultry	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	minimum	poultry	Liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	poultry	Battery cages	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Housing system	optimum	poultry	Battery cages with drying	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Free range	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Aviary house	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Other	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Liquid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook

Housing system	minimum	other	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure storage system	minimum	other	Solid	% of N excreted	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure application technique	minimum	grassland and arable land	surface spreading	% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure application technique	minimum	grassland and arable land	reduced ammonia application	% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Manure application technique	optimum	grassland and arable land	Broadcast - no incorporation	% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure application technique	optimum	arable land	Broadcast - incorporation <2hrs	% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure application technique	optimum	arable land	Broadcast - incorporation <1 day	% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure application technique	optimum	grassland and arable land	Band spread	% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure application technique	optimum	grassland and arable land	Deep injection	% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
Manure application technique	optimum	grassland and arable land	Shallow injection	% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	EEA/EMEP Guidebook
N fertilizer	Minimum/optimum	ammonium nitrate		% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook

N fertilizer consumption	Minimum/optimum	calcium ammonium nitrate		% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
N fertilizer consumption	Minimum/optimum	anhydrous ammonia		% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
N fertilizer consumption	Minimum/optimum	ammonium phosphate		% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
N fertilizer consumption	Minimum/optimum	urea		% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
N fertilizer consumption	Minimum/optimum	urea-ammonium nitrate solution (UAN)		% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
N fertilizer consumption	Minimum/optimum	other N fertilizers		% of N applied	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Grazing	Minimum/optimum	grazing livestock	Solid	% of N excreted during grazing	ammonia emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	EEA/EMEP Guidebook
Housing system	minimum	dairy, beef, and other cattle		% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Housing system	minimum	dairy, beef, and other cattle	Liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Manure storage system	minimum	dairy, beef, and other cattle	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology

Manure storage system	minimum	dairy, beef, and other cattle	Liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	dairy, beef, and other cattle	tied housing with fully-slatted floor	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	dairy, beef, and other cattle	tied housing partially slatted floor	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	dairy, beef, and other cattle	loose housing with fully-slatted floor	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	dairy, beef, and other cattle	loose housing partially slatted floor	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	dairy, beef, and other cattle	tied housing with fully-slatted floor with scrubbers/biofilters	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	dairy, beef, and other cattle	tied housing partially slatted floor with scrubbers/biofilters	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	dairy, beef, and other cattle	loose housing with fully-slatted floor with scrubbers/biofilters	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	dairy, beef, and other cattle	loose housing partially slatted floor with scrubbers/biofilters	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure storage	optimum	dairy, beef, and other	solid	% of N excreted	nitrous oxide emission	UNFCCC, ND,	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology

system		cattle			factor	NECD				
Manure storage system	optimum	dairy, beef, and other cattle	liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure storage system	optimum	dairy, beef, and other cattle	manure separation	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure storage system	optimum	dairy, beef, and other cattle	liquid with anaerobic digestion without supplements	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure storage system	optimum	dairy, beef, and other cattle	liquid with anaerobic digestion with supplements	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	minimum	pigs	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Housing system	minimum	pigs	Liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Manure storage system	minimum	pigs	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Manure storage system	minimum	pigs	Liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Housing system	optimum	pigs	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	pigs	Liquid with scrubbers/biofilters	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology

Manure storage system	optimum	pigs	solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure storage system	optimum	pigs	liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure storage system	optimum	pigs	manure separation	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure storage system	optimum	pigs	liquid with anaerobic digestion without supplements	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure storage system	optimum	pigs	liquid with anaerobic digestion with supplements	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	minimum	poultry	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Housing system	minimum	poultry	Liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Manure storage system	minimum	poultry	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Manure storage system	minimum	poultry	Liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Housing system	optimum	poultry	Battery cages	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Housing system	optimum	poultry	Battery cages with drying	% of N excreted	nitrous oxide emission	UNFCCC, ND,	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology

Manure storage system	optimum	poultry	Free range	% of N excreted	factor	NECD					
Manure storage system	optimum	poultry	Aviary house	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology	
Manure storage system	optimum	poultry	Other	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology	
Manure storage system	optimum	poultry	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology	
Manure storage system	optimum	poultry	Liquid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology	
Housing system	minimum	other	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology	
Manure storage system	minimum	other	Solid	% of N excreted	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology	
Manure application technique	minimum	grassland and arable land	surface spreading	% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology	
Manure application technique	minimum	grassland and arable land	reduced ammonia application	% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology	
Manure application technique	optimum	grassland and arable land	Broadcast - no incorporation	% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology	

Manure application technique	optimum	arable land	Broadcast - incorporation <2hrs	% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure application technique	optimum	arable land	Broadcast - incorporation <1 day	% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure application technique	optimum	grassland and arable land	Band spread	% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure application technique	optimum	grassland and arable land	Deep injection	% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
Manure application technique	optimum	grassland and arable land	Shallow injection	% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology
N fertilizer	Minimum/optimum	ammonium nitrate		% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
N fertilizer consumption	Minimum/optimum	calcium ammonium nitrate		% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
N fertilizer consumption	Minimum/optimum	anhydrous ammonia		% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
N fertilizer consumption	Minimum/optimum	ammonium phosphate		% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
N fertilizer consumption	Minimum/optimum	urea		% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
N fertilizer consumption	Minimum/optimum	urea-ammonium nitrate		% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology



N fertilizer consumption	Minimum/optimum	solution (UAN) other N fertilizers		% of N applied	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Grazing		grazing livestock		% of N excreted during grazing	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Crop residues				% in crop residue	nitrous oxide emission factor	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology
Housing system	minimum	dairy, beef, and other cattle	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	minimum	dairy, beef, and other cattle	Liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	minimum	dairy, beef, and other cattle	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	minimum	dairy, beef, and other cattle	Liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	tied housing with fully-slatted floor	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook

Housing system	optimum	dairy, beef, and other cattle	tied housing partially slatted floor	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	loose housing with fully-slatted floor	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	loose housing partially slatted floor	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	tied housing with fully-slatted floor with scrubbers/biofilters	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	tied housing partially slatted floor with scrubbers/biofilters	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	loose housing with fully-slatted floor with scrubbers/biofilters	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	dairy, beef, and other cattle	loose housing partially slatted floor with scrubbers/biofilters	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook

Manure storage system	optimum	dairy, beef, and other cattle	liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	manure separation	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	liquid with anaerobic digestion without supplements	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	dairy, beef, and other cattle	liquid with anaerobic digestion with supplements	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	minimum	pigs	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	minimum	pigs	Liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	minimum	pigs	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	minimum	pigs	Liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook

Housing system	optimum	pigs	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	pigs	Liquid with scrubbers/biofilters	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	pigs	solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	pigs	liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	pigs	manure separation	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	pigs	liquid with anaerobic digestion without supplements	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	pigs	liquid with anaerobic digestion with supplements	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	minimum	poultry	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook

Housing system	minimum	poultry	Liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	minimum	poultry	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	minimum	poultry	Liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	poultry	Battery cages	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	optimum	poultry	Battery cages with drying	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Free range	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Aviary house	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Other	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook

Manure storage system	optimum	poultry	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	optimum	poultry	Liquid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	National	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	minimum	other	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Manure storage system	minimum	other	Solid	% of N excreted	total denitrification loss	UNFCCC, ND, NECD	15, 16, 18, 19	No; default	1 x 5 yr	IPPC methodology/ EEA/EMEP Guidebook
Housing system	minimum	dairy, beef, and other cattle	Enteric fermentation	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Manure storage system	minimum	dairy, beef, and other cattle	Solid	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Manure storage system	minimum	dairy, beef, and other cattle	Liquid	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Housing system	minimum	pigs	Enteric fermentation	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Manure storage system	minimum	pigs	Solid	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Manure storage system	minimum	pigs	Liquid	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology

system					factor					
Manure storage system	minimum	poultry	Solid	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Manure storage system	minimum	poultry	Liquid	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Housing system	minimum	other	Enteric fermentation	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Manure storage system	minimum	other	Solid	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology
Manure storage system	minimum	other	Liquid	kg CH <sub>4</sub> /animal/yr	methane emission factor	UNFCCC	19	No; default	1 x 5 yr	IPCC methodology





Table A4.5. Recommendations for collection of data related to N and P in harvested crop products.

Two scenarios are included. The minimum scenario is the scenario with collection of data which are at least needed for reporting for policies and AEI (e.g. Tier 1) and the optimum scenario is the scenario for collection of data in detailed approaches (e.g. Tier 2 and 3 methods).

Type of data  Crop type	Scenario	Data specification	Unit / dimension	Policy need	AEI need	Scale of collection		Source/method
						Spatial	Temporal	
Wheat	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Rye	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Barley	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Spring barley	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Oats	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Grain maize	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Sorghum	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS

Triticale	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Rice	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Other cereals	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Peas	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Beans	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Potatoes	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Sugar beet	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Fodder beet	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Other root crops	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Rape	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS

Sunflower seed	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Soya bean	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Other oil seeds	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Industrial crops (flax, hemp, cotton, tobacco, hops)	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Officinal herbs, aromatic plants	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Silage maize	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Clover and mixtures	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Lucerne	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Temporary grassland	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS

Permanent grassland	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Common pasture, heathland, rough grazing	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Fruit trees	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Olives	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Vineyards	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Other permanent crops	Optimum	area	ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	FSS
Wheat	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Rye	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys

Barley	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Spring barley	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Oats	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Grain maize	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Sorghum	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Triticale	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Rice	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Other cereals	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys

Peas	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Beans	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Potatoes	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Sugar beet	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Fodder beet	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Other root crops	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Rape	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Sunflower seed	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys

Soya bean	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Other oil seeds	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Industrial crops (flax, hemp, cotton, tobacco, hops)	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Officinal herbs, aromatic plants	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Silage maize	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Clover and mixtures	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Lucerne	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys

Temporary grassland	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	Estimated on the basis of approved Protocol
Permanent grassland	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	Estimated on the basis of approved Protocol
Common pasture, heathland, rough grazings	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	Estimated on the basis of approved Protocol
Fruit trees	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Olives	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Vineyards	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys
Other permanent crops	Optimum	harvested yield	kg product per ha	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Farm	Annual	MARS, FADN, crop yield surveys



Table A4.6. Recommendations for collection of *coefficients related to N and P in harvested crop products*.

Two scenarios are included. The minimum scenario is the scenario with collection of data which are at least needed for reporting for policies and AEI (e.g. Tier 1) and the optimum scenario is the scenario for collection of data in detailed approaches (e.g. Tier 2 and 3 methods).

Type of Data Crop type	Scenario	Data specification	Unit	Policy need	AEI need	Scale of collection		Source/method
						Spatial	Temporal	
Wheat	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Rye	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Barley	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Spring barley	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Oats	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Grain maize	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study

Sorghum	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Triticale	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Rice	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Other cereals	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Peas	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Beans	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Potatoes	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Sugar beet	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study

Fodder beet	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Other root crops	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Rape	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Sunflower seed	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Soya bean	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Other oil seeds	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Industrial crops (flax, hemp, cotton, tobacco, hops)	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study

Official herbs, aromatic plants	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Silage maize	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Clover and mixtures	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Lucerne	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Temporary grassland	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Regional	1x 5 yr	Results desk study
Permanent grassland	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Regional	1x 5 yr	Results desk study
Common pasture, heathland, rough grazing	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Regional	1x 5 yr	Results desk study

Fruit trees	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Olives	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Vineyards	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Other permanent crops	Optimum	N content	kg N per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Wheat	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Rye	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Barley	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Spring barley	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study

Oats	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Grain maize	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Sorghum	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Triticale	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Rice	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Other cereals	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Peas	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Beans	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study

Potatoes	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Sugar beet	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Fodder beet	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Other root crops	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Rape	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Sunflower seed	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Soya bean	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Other oil seeds	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study

Industrial crops (flax, hemp, cotton, tobacco, hops)	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Officinal herbs, aromatic plants	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Silage maize	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Clover and mixtures	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Lucerne	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Temporary grassland	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Regional	1x 5 yr	Results desk study
Permanent grassland	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Regional	1x 5 yr	Results desk study



Common pasture, heathland, rough grazing	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	Regional	1x 5 yr	Results desk study
Fruit trees	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Olives	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Vineyards	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study
Other permanent crops	Optimum	P content	kg P per kg harvested product	UNFCCC, LULUCF, ND, NECD, FDSUP, RDP	5, 6, 7, 8, 9, 10.1, 10.2, 11.1, 15, 16, 26	EU	1 x 5 yr	Results desk study