EMEP/EEA Manure management N-flow tool

TFEIP Agriculture and Nature Expert Panel

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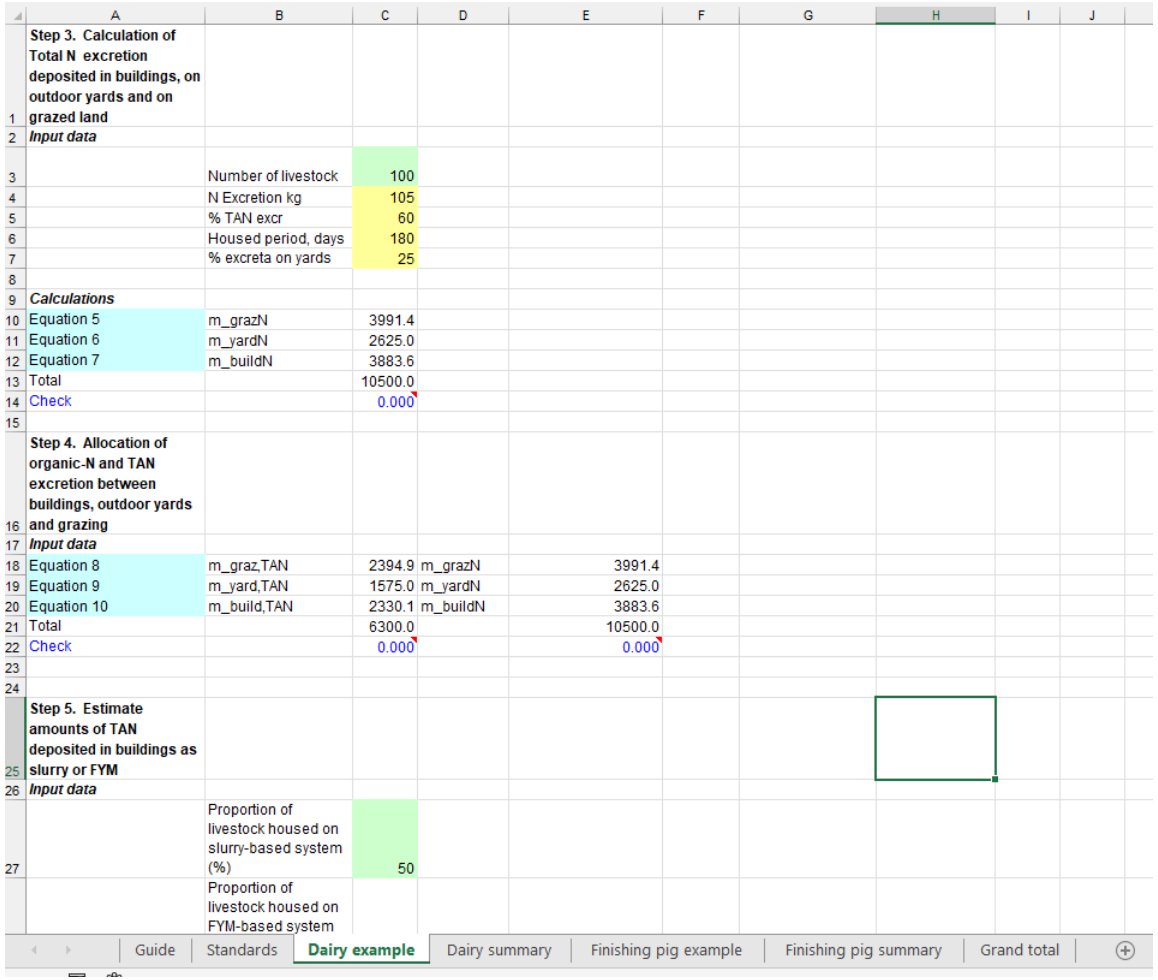
Aether

Outline

1. Brief history of the N-flow tool
2. Description of the tool – scope and functionality
3. Getting help and support
4. Future updates and additional functionality
5. Prompts for discussion

Brief history of the N-flow tool

2009 – 2016 EMEP/EEA Guidebook



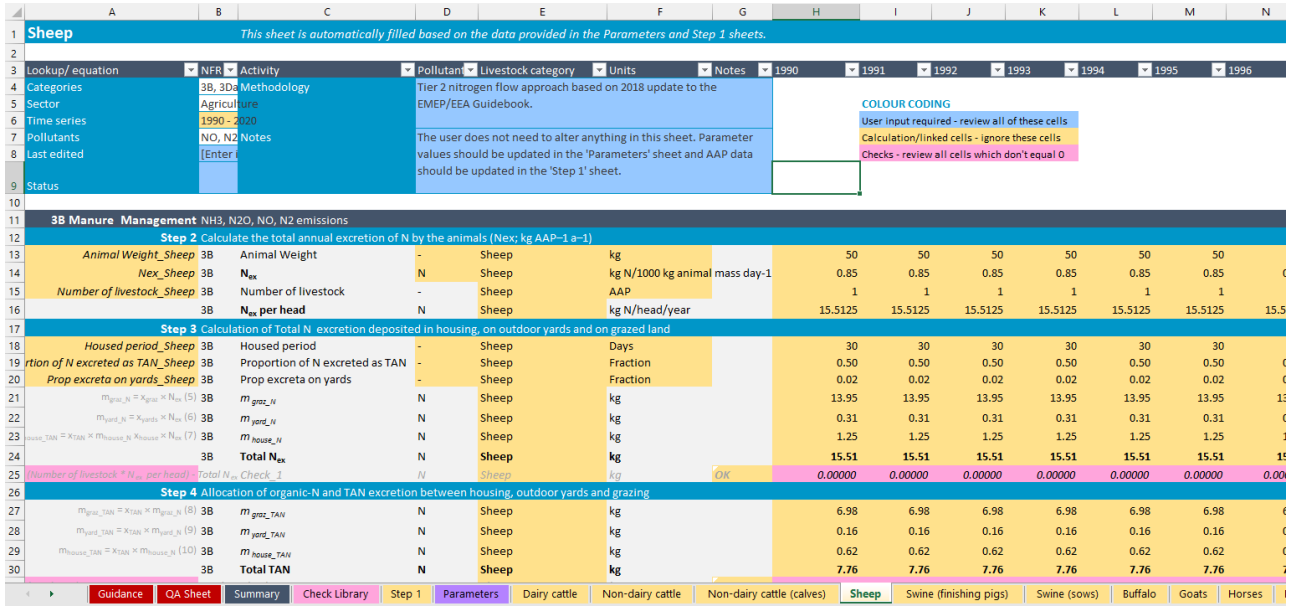
	A	B	C	D	E
1	**Step 3. Calculation of Total N excretion deposited in buildings, on outdoor yards and on grazed land**				
2	***Input data***				
3		Number of livestock	100		
4		N Excretion kg	105		
5		% TAN excr	60		
6		Housed period, days	180		
7		% excreta on yards	25		
8					
9	***Calculations***				
10	Equation 5	m_grazN	3991.4		
11	Equation 6	m_yardN	2625.0		
12	Equation 7	m_buildN	3883.6		
13	Total		10500.0		
14	Check		0.000		
15					
16	**Step 4. Allocation of organic-N and TAN excretion between buildings, outdoor yards and grazing**				
17	***Input data***				
18	Equation 8	m_graz,TAN	2394.9	m_grazN	3991.4
19	Equation 9	m_yard,TAN	1575.0	m_yardN	2625.0
20	Equation 10	m_build,TAN	2330.1	m_buildN	3883.6
21	Total		6300.0		10500.0
22	Check		0.000		0.000
23					
24					
25	**Step 5. Estimate amounts of TAN deposited in buildings as slurry or FYM**				
26	***Input data***				
27		Proportion of livestock housed on slurry-based system (%)	50		
		Proportion of livestock housed on FYM-based system			

Guide | Standards | **Dairy example** | Dairy summary | Finishing pig example | Finishing pig summary | Grand total

- Simple, concise structure in Excel demonstrating the Tier 2 N-flow method
- Only 2 worked examples, for 1 year
- An important purpose was educational to aid understanding of the method, to facilitate shift from Tier 1 to Tier 2
- Available (to all) from: https://www.eea.europa.eu/publications/emep-eea-guidebook-2013/part-b-sectoral-guidance-chapters/4-agriculture/3-b-appendix-b/view

Brief history of the N-flow tool

2019 EMEP/EEA Guidebook update



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Sheep**	*This sheet is automatically filled based on the data provided in the Parameters and Step 1 sheets.*												
2														
3	Lookup/ equation	NFR	Activity	Pollutant	Livestock category	Units	Notes	1990	1991	1992	1993	1994	1995	1996
4	Categories	3B, 3Da	Methodology	Tier 2 nitrogen flow approach based on 2018 update to the EMEP/EEA Guidebook.					COLOUR CODING					
5	Sector	Agriculture							User input required - review all of these cells					
6	Time series	1990 - 2020							Calculation/linked cells - ignore these cells					
7	Pollutants	NO, N2	Notes	The user does not need to alter anything in this sheet. Parameter values should be updated in the 'Parameters' sheet and AAP data should be updated in the 'Step 1' sheet.					Checks - review all cells which don't equal 0					
8	Last edited	[Enter												
9	Status													
10														
11	**3B Manure Management** NH3, N2O, NO, N2 emissions													
12	**Step 2** Calculate the total annual excretion of N by the animals (Nex; kg AAP−1 a−1)													
13	*Animal Weight_Sheep*	3B	Animal Weight	-	Sheep	kg		50	50	50	50	50	50	
14	*Nex_Sheep*	3B	N_{ex}	N	Sheep	kg N/1000 kg animal mass day-1		0.85	0.85	0.85	0.85	0.85	0.85	0
15	*Number of livestock_Sheep*	3B	Number of livestock	-	Sheep	AAP		1	1	1	1	1	1	
16		3B	**N_{ex} per head**	N	Sheep	kg N/head/year		15.5125	15.5125	15.5125	15.5125	15.5125	15.5125	15.5
17	**Step 3** Calculation of Total N excretion deposited in housing, on outdoor yards and on grazed land													
18	*Housed period_Sheep*	3B	Housed period	-	Sheep	Days		30	30	30	30	30	30	
19	*rtion of N excreted as TAN_Sheep*	3B	Proportion of N excreted as TAN	-	Sheep	Fraction		0.50	0.50	0.50	0.50	0.50	0.50	0
20	*Prop excreta on yards_Sheep*	3B	Prop excreta on yards	-	Sheep	Fraction		0.02	0.02	0.02	0.02	0.02	0.02	0
21	$m_{graz_N} = x_{graz} \times N_{ex}$ (5)	3B	m_{graz_N}	N	Sheep	kg		13.95	13.95	13.95	13.95	13.95	13.95	13
22	$m_{yard_N} = x_{yards} \times N_{ex}$ (6)	3B	m_{yard_N}	N	Sheep	kg		0.31	0.31	0.31	0.31	0.31	0.31	0
23	$_{use_TAN} = x_{TAN} \times m_{house_N} x_{house} \times N_{ex}$ (7)	3B	m_{house_N}	N	Sheep	kg		1.25	1.25	1.25	1.25	1.25	1.25	1
24		3B	**Total N_{ex}**	N	**Sheep**	**kg**		**15.51**	**15.51**	**15.51**	**15.51**	**15.51**	**15.51**	**15**
25	*(Number of livestock * N_{ex} per head) - Total N_{ex} Check_1*			*N*	*Sheep*	*kg*	*OK*	*0.00000*	*0.00000*	*0.00000*	*0.00000*	*0.00000*	*0.00000*	*0.00*
26	**Step 4** Allocation of organic-N and TAN excretion between housing, outdoor yards and grazing													
27	$m_{graz_TAN} = x_{TAN} \times m_{graz_N}$ (8)	3B	m_{graz_TAN}	N	Sheep	kg		6.98	6.98	6.98	6.98	6.98	6.98	6
28	$m_{yard_TAN} = x_{TAN} \times m_{yard_N}$ (9)	3B	m_{yard_TAN}	N	Sheep	kg		0.16	0.16	0.16	0.16	0.16	0.16	0
29	$m_{house_TAN} = x_{TAN} \times m_{house_N}$ (10)	3B	m_{house_TAN}	N	Sheep	kg		0.62	0.62	0.62	0.62	0.62	0.62	0
30		3B	**Total TAN**	**N**	**Sheep**	**kg**		**7.76**	**7.76**	**7.76**	**7.76**	**7.76**	**7.76**	

Guidance | QA Sheet | Summary | Check Library | Step 1 | Parameters | Dairy cattle | Non-dairy cattle | Non-dairy cattle (calves) | Sheep | Swine (finishing pigs) | Swine (sows) | Buffalo | Goats | Horses

- Updated by Aether in 2018/19, with QA/QC from TFEIP and comparison with previous tool.
- Still Excel, but easier to integrate with other compilation files (i.e., more of a “tool”), following feedback.
  - Restructured to include a time series
  - Tabs for **all** default livestock categories

- Integration of emissions from biological treatment of manure (5B2), and NO_x and N_2O emissions from manure applied to soils / deposited whilst grazing
- Time series makes it easier to handle varying input parameters over time (e.g. mitigation measures)
- Available (to all) from: https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/4-agriculture/manure-management-n-flow-tool/view

Description of the N-flow tool

Scope

Pollutants

Categories

	NH_3	NO_x	N_2O	NMVOC	PM	CH_4
3B Housing and storage	✓	✓	✓	X	X	X
3Da2a application to soils	✓	✓	✓	X	X	X
3Da3 urine and dung whilst grazing	✓	✓	✓	X	X	X
5B2 Biological treatment of manure	✓	X	X	X	X	X
3Da1, 3Da2b+c other fertilisers applied to soils	X	X	X	X	X	X
3Db – 3Df, 3F, 3I Other agricultural sources	X	X	X	X	X	X

Description of the N-flow tool

Functionality

DEMO

Input

- Activity data and parameters for N-flow by year
- Can either enter CS parameters, or use defaults from 2019 Guidebook

Output

- “Flat” format summary tab by detailed NFR category, pollutant and year. Not precisely NFR format, but easy to link to.

Checks

- Automatic system of checks on N-balance, sense-check of manure fractions etc.

Description of the N-flow tool

Adapting / configuring the tool

- Being an Excel file, any number of modifications can be made by the user.
- Modelling of mitigation / abatement measures is not currently part of the tool, so requires “pre-calculation” of abated EFs and other parameters elsewhere.
  - Guidance on this produced during 2021 on this via a Commission project
- Local systems or livestock categories can be reflected by adding additional tabs (straightforward), or additional steps within the calculations (trickier).

Ultimately, the user is responsible for making sure modifications work properly!

Getting help and support

Guidance and technical documentation:

- The “Guidance” tab in the spreadsheet is the first point of reference for understanding how to use the tool.
- It is designed to be used alongside the Guidebook chapter 3B, so to understand the parameters required and the logic of the algorithm, refer to pages 21-28 in that chapter.
- Commission guidance from 2021 support project to address “FAQs”(?)

Enquiries:

- Feedback and questions can be directed to the TFEIP secretariat: TFEIP@aether-uk.com
  - These will then be passed on to the relevant person, e.g. staff involved in developing the tool, or guidebook chapter author

Future updates and additional functionality

To discuss!

Future updates to keep up with Guidebook

- **Version control:** difficult for compilers to keep updating the entire tool version they're using, if already heavily integrated into systems, and/or heavily modified.
- Keen to support and update if a need is demonstrated
  - **But updates require funding!**

Additional functionality

- Several additional features and updates have been suggested / drafted following feedback from users, but not yet released – depends on this discussion!

Prompts for discussion

Key Questions – we welcome your thoughts!

- **Additional features**
  - Is there any point increasing the scope? Where would a natural boundary be?
  - Should the tool have more built-in flexibility to suit different circumstances, or are needs too varied?
  - Should mitigation impact be included in the tool? (2021 project concluded not)
- **Is there a more (cost) efficient way to support compilers than further updates to the entire official tool?**
  - By providing advice / support to modify existing spreadsheets to add functionality and update EFs etc?
  - More targeted updates to specific parts of tool? E.g. publishing an updated default EFs tab to copy in?
- **Is there value in a different kind of tool?**
  - E.g. an EF pre-calculator to capture impact of abatement, to complement the AgrEE tool?

Prompts for discussion

Key Questions – we welcome your thoughts!

- **More generally:**
  - Is there a continued role for an excel tool alongside the AgrEE tool?
  - If so, what kind of tool? and how should it be kept up to date?

Aether

Pros and cons

Pros	Cons
Offline, so no GDPR or privacy issues	Offline, so difficult to roll out changes
Available to all to download, so transparent and accessible	Smaller in scope than AgrEE tool
In Excel, which is flexible and easy to integrate into other compilation files	Although working visible, quite complicated to follow in Excel
Easily visible calculations	