

Tier 3 ammonia emissions from field-applied slurry - update on the ALFAMI project

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ALFAMI project introduction

ALFAMI stands for

Ammonia Losses from Field-Applied Slurry: a Model-Based Approach for Emissions Inventories

Or, an application of the **ALFAM2** model for Inventory calculations.

It is a 2 year (2022-2023) project **aimed at developing a Tier 3 methodology for ammonia loss from field-applied animal slurry.**

We are developing a **method and a software tool** that we hope will become popular for inventory calculations.

ALFAMI project progress

- ① ALFAM2 database expansion ✓
- ② ALFAM2 model improvement ✓
- ③ ALFAMI software tool development
- ④ ALFAMI description and application

Presentation topics

- 1 ALFAMI software tool
- 2 ALFAM2 model
- 3 Weather/climate and other inputs
- 4 Next steps

Objectives

- Presenter to audience: inform prospective users about a new tool
- Audience to presenter: help ensure the tool is useful

10 minute presentation + 5 minutes for discussion

ALFAMI software package components

- ALFAMI R package that streamlines and automates calculation of emissions
- Familiarity with R not required—users may focus on only input and output

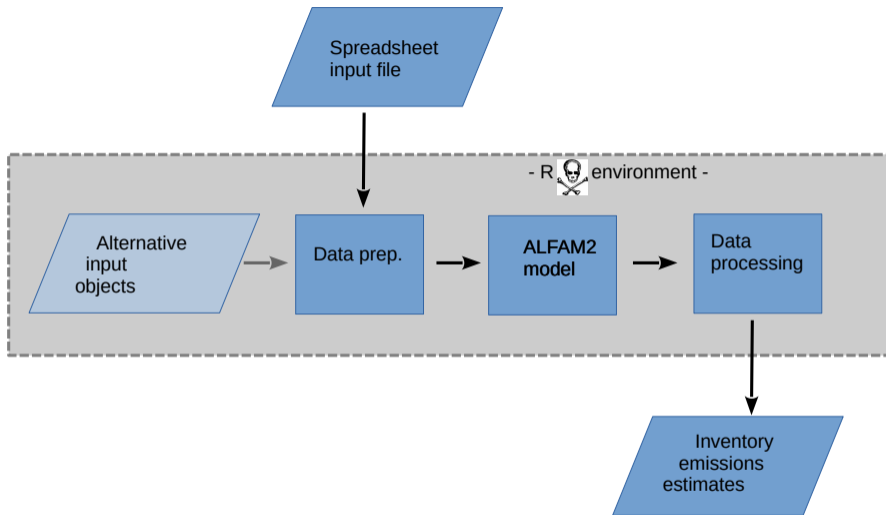


Figure 1: *ALFAMI software components and workflow*

The ALFAM2 model for emission calculations

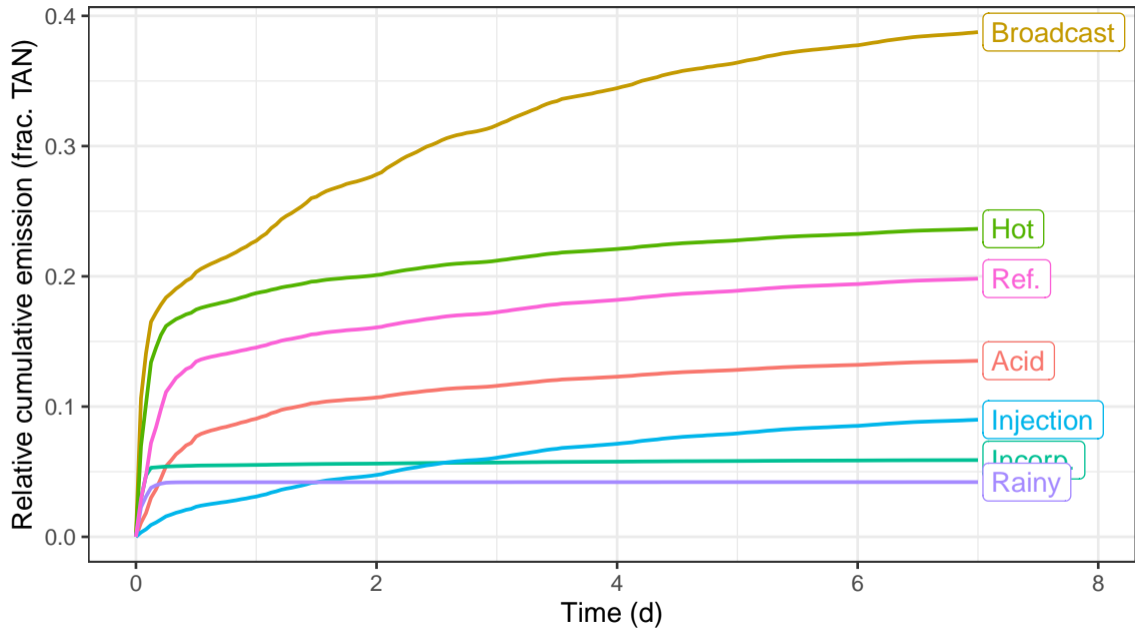
The ALFAM2 model¹ will be the “calculation core” of the new software tool. It is a semi-empirical (semi-mechanistic) model, presently available as an R package or a simpler spreadsheet file.

¹See ww.alfam.dk for details on the ALFAM2 model and ALFAM2 database

Why use the ALFAM2 model?

It is available in an R package that is

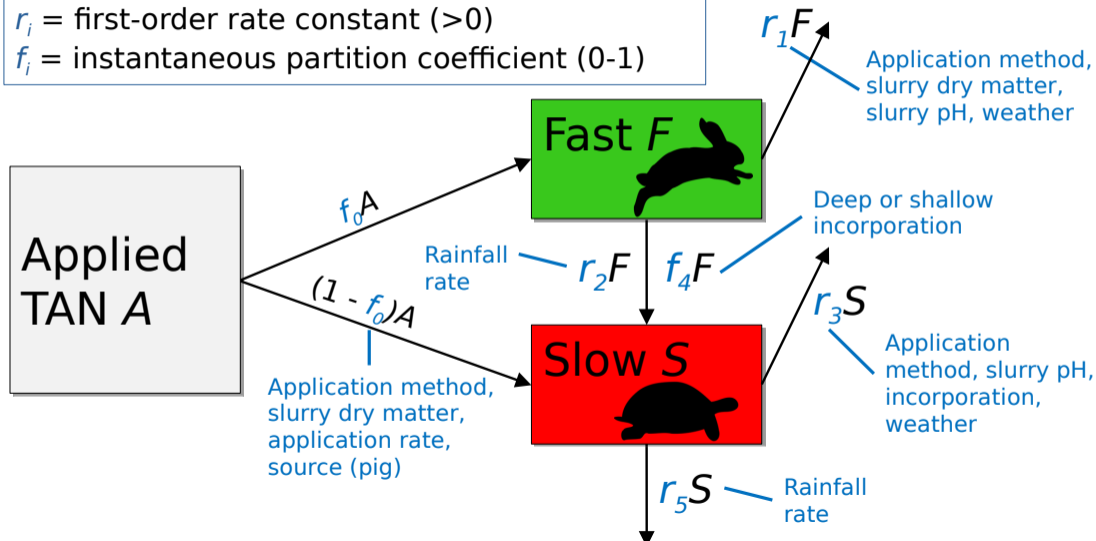
- free
- open-source
- maintained and updated
- supported by empirical data
- plausible
- flexible



The ALFAM2 model

r_i = first-order rate constant (>0)

f_i = instantaneous partition coefficient (0-1)



ALFAMI input data

The ALFAMI tool needs at least:

- Weather or climate
- Slurry properties
- Application methods
- Slurry quantities
- Field areas

Data entry should be easy, flexible, and consistent with approaches used for other emission sources

Spreadsheet input file

Spreadsheets are widely used and have some convenient features

- Separate worksheets for different types of inputs
- Data validation
- Links between cells
- Color coding
- Comments

	A	B	C	D	E	F	G	H	I
1	Name	Location	Manure type	Application	Application area	Application method	Application year		
2				Mg	ha		YYYY or YY* etc.		
3	spring cattle LS	Lower Saxony	Cattle A	8000000	200000	Trailing hose	199*		
4	summer cattle LS	Lower Saxony	Cattle B	8000000	200000	Broadcast	199*		
5	spring cattle SH	Schleswig-Holstein	Cattle A	8000000	200000	Open slot injection	200*		
6	spring pig LS	Lower Saxony	Pig B	8000000	200000	Trailing hose	200*		
7									

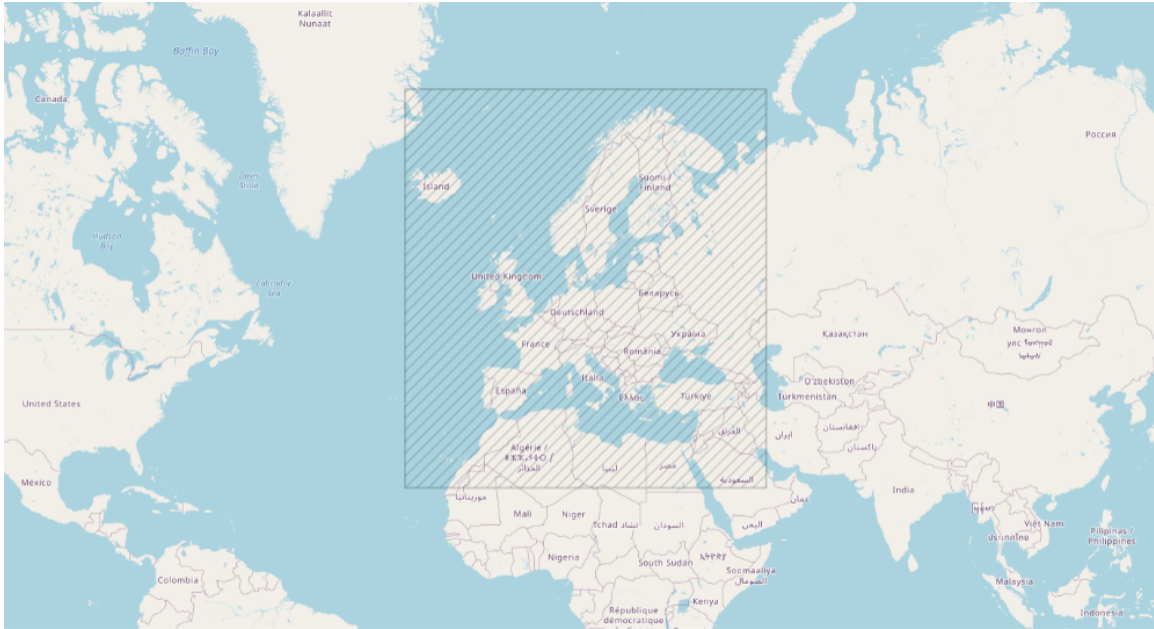
Use * in place of number to include 0-9, e.g., 199* will select all years from 1990-1999.

Figure 4: Example input data in ALFAMI spreadsheet input file

Weather data

JRC EMO-1 integrated in ALFAMI tool

- The European Commission's Joint Research Centre (JRC) maintains a weather data product with a 1 km grid: "EMO-1"
(<https://data.jrc.ec.europa.eu/dataset/0bd84be4-cec8-4180-97a6-8b3adaac4d26>)
- Format is netCDF, easily integrated into an R package
- Download each file once
- Drawback: user will have to store large files (1-2 GB per variable x 4 variables)
- Drawback: temporal resolution: 2-4 observations per day
- Alternative? User finds weather data



Next steps

- 1 Present draft ALFAMI tool to advisory group (early May)
- 2 First release and testing by advisory group (summer +/-)
- 3 Application to German inventory by ALFAMI consortium (autumn)

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Thank you for your attention!

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