ALFAM2 example

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Objective

The objective is to sort out an apparent inconsistencies in output from the spreadsheet and R package versions of the ALFAM2 model.

Package

```
library(ALFAM2)
packageVersion('ALFAM2')
```

```
## [1] '3.17'
```

Inputs

Original inputs from Jerome:

```
dat1 <- data.frame(ctime = 72,
                   TAN.app = 48,
                   man.dm = 6,
                   air.temp = 13,
                   wind.2m = 2.7,
                   man.ph = 7.5,
                   app.mthd.bc = TRUE,
                   incorp.deep = FALSE,
                   incorp.shallow = FALSE,
                   rain.rate = 0,
                   man.source.pig = FALSE)
```

Add application rate:

```
dat2 <- data.frame(ctime = 72,
                   TAN.app = 48,
                   app.rate.ni = 40,
                   man.dm = 6,
                   air.temp = 13,
                   wind.2m = 2.7,
                   man.ph = 7.5,
                   app.mthd.bc = TRUE,
                   incorp.deep = FALSE,
                   incorp.shallow = FALSE,
                   rain.rate = 0,
                   man.source.pig = FALSE)
```

Simpler equivalent alternative (because some inputs are at default levels):

```
dat3 <- data.frame(ctime = 72,
                   TAN.app = 48,
                   app.rate.ni = 40,
                   man.dm = 6,
                   air.temp = 13,
                   wind.2m = 2.7,
                   man.ph = 7.5,
                   app.mthd.bc = TRUE,
                   rain.rate = 0)
```

Even simpler if there are more categorical inputs:

```
dat4 <- data.frame(ctime = 72,
                   TAN.app = 48,
                   app.rate.ni = 40,
                   man.dm = 6,
                   air.temp = 13,
                   wind.2m = 2.7,
                   man.ph = 7.5,
                   app.mthd = 'broadcast', # Or 'bc'
                   rain.rate = 0)
```

Compare predictions

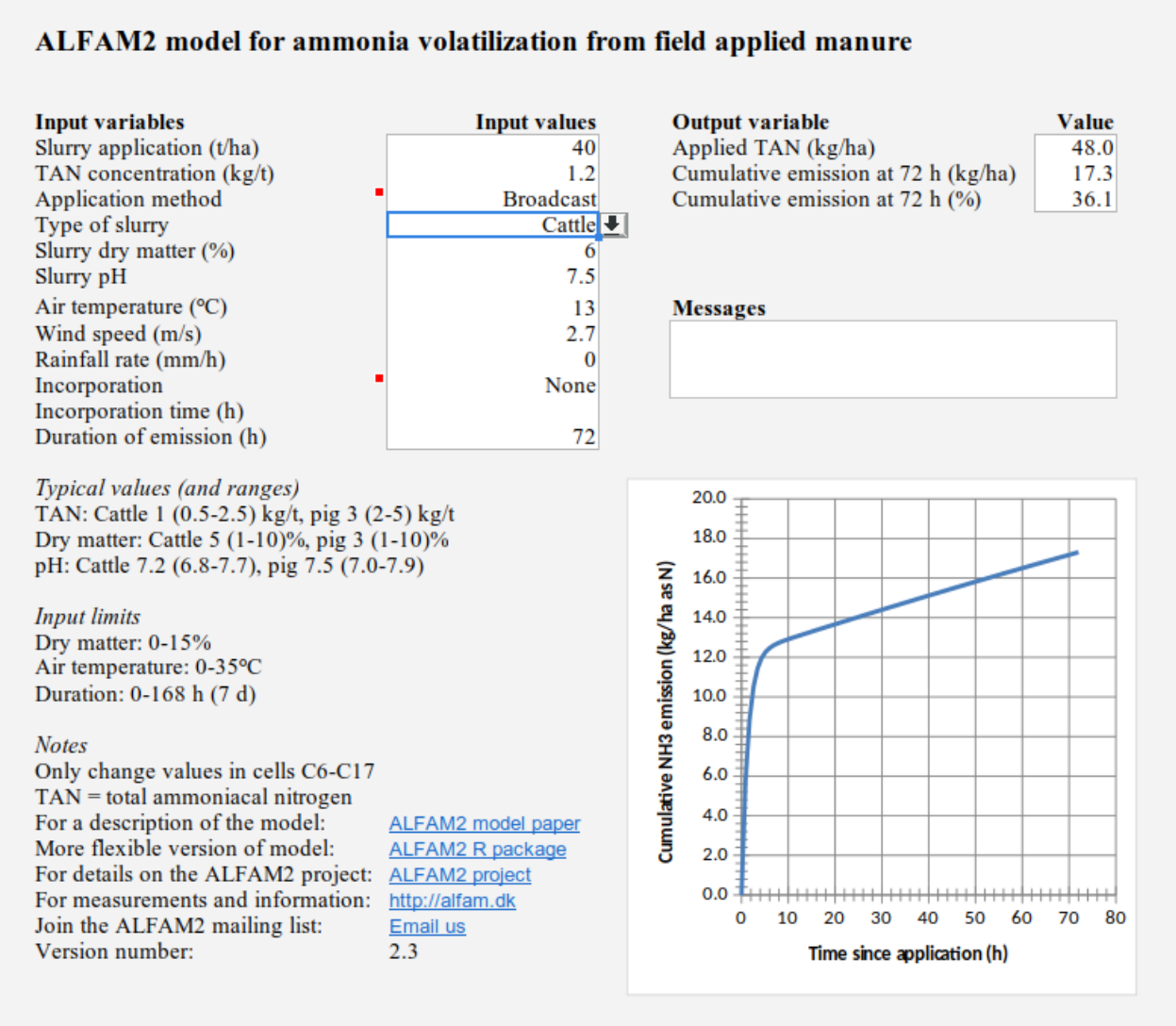
```
alfam2(dat1, time.name = 'ctime')
```

```
## Default parameters (Set 2) are being used.
## Warning in alfam2(dat1, time.name = "ctime"): Running with 18 parameters. Dropped 6 with no match.
## These secondary parameters have been dropped:
##   app.mthd.os.f0
##   app.rate.ni.f0
##   app.mthd.cs.f0
##   app.mthd.ts.r1
##   ts.cereal.hght.r1
##   app.mthd.cs.r3
##
## These secondary parameters are being used:
##   int.f0
##   man.dm.f0
##   man.source.pig.f0
##   int.r1
##   app.mthd.bc.r1
##   man.dm.r1
##   air.temp.r1
##   wind.2m.r1
##   man.ph.r1
##   int.r2
##   rain.rate.r2
##   int.r3
##   app.mthd.bc.r3
##   man.ph.r3
##   incorp.shallow.f4
```

```
##   incorp.shallow.r3
##   incorp.deep.f4
##   incorp.deep.r3
```

```
##   ctime dt            f     s     e e.int         j       er        f0
## 1    72 72 2.370782e-22 26.91 21.09 21.09 0.2929167 0.439375 0.3530445
##          r1         r2          r3 f4 r5
## 1 0.7150059 0.01587869 0.002153413  1  0
```

Compare to Excel model v2.3 with default inputs:



ALFAM2 model for ammonia volatilization from field applied manure

Input variables	Input values
Slurry application (t/ha)	40
TAN concentration (kg/t)	1.2
Application method	Broadcast
Type of slurry	Cattle
Slurry dry matter (%)	6
Slurry pH	7.5
Air temperature (°C)	13
Wind speed (m/s)	2.7
Rainfall rate (mm/h)	0
Incorporation	None
Incorporation time (h)	
Duration of emission (h)	72

Output variable	Value
Applied TAN (kg/ha)	48.0
Cumulative emission at 72 h (kg/ha)	17.3
Cumulative emission at 72 h (%)	36.1

Messages

Typical values (and ranges)
TAN: Cattle 1 (0.5-2.5) kg/t, pig 3 (2-5) kg/t
Dry matter: Cattle 5 (1-10)%, pig 3 (1-10)%
pH: Cattle 7.2 (6.8-7.7), pig 7.5 (7.0-7.9)

Input limits
Dry matter: 0-15%
Air temperature: 0-35°C
Duration: 0-168 h (7 d)

Notes
Only change values in cells C6-C17
TAN = total ammoniacal nitrogen

For a description of the model:	ALFAM2 model paper
More flexible version of model:	ALFAM2 R package
For details on the ALFAM2 project:	ALFAM2 project
For measurements and information:	http://alfam.dk
Join the ALFAM2 mailing list:	Email us
Version number:	2.3

Right, these do not match. The difference is in `app.rate.ni` (slurry application rate, but *n*ot for *i*njection). These should both match the Excel version:

```
alfam2(dat2, time.name = 'ctime')
```

```
## Default parameters (Set 2) are being used.
```

```
## Warning in alfam2(dat2, time.name = "ctime"): Running with 19 parameters. Dropped 5 with no match.
## These secondary parameters have been dropped:
##   app.mthd.os.f0
##   app.mthd.cs.f0
```

```
##   app.mthd.ts.r1
##   ts.cereal.hght.r1
##   app.mthd.cs.r3
##
## These secondary parameters are being used:
##   int.f0
##   app.rate.ni.f0
##   man.dm.f0
##   man.source.pig.f0
##   int.r1
##   app.mthd.bc.r1
##   man.dm.r1
##   air.temp.r1
##   wind.2m.r1
##   man.ph.r1
##   int.r2
##   rain.rate.r2
##   int.r3
##   app.mthd.bc.r3
##   man.ph.r3
##   incorp.shallow.f4
##   incorp.shallow.r3
##   incorp.deep.f4
##   incorp.deep.r3
```

```
##   ctime dt            f       s       e   e.int         j        er        f0
## 1    72 72 1.738643e-22 30.6952 17.3048 17.3048 0.2403445 0.3605167 0.2589096
##          r1         r2          r3 f4 r5
## 1 0.7150059 0.01587869 0.002153413  1  0
```

```
alfam2(dat3, time.name = 'ctime')
```

```
## Default parameters (Set 2) are being used.
```

```
## Warning in alfam2(dat3, time.name = "ctime"): Running with 14 parameters. Dropped 10 with no match.
## These secondary parameters have been dropped:
##   app.mthd.os.f0
##   man.source.pig.f0
##   app.mthd.cs.f0
##   app.mthd.ts.r1
##   ts.cereal.hght.r1
##   app.mthd.cs.r3
##   incorp.shallow.f4
##   incorp.shallow.r3
##   incorp.deep.f4
##   incorp.deep.r3
##
## These secondary parameters are being used:
##   int.f0
##   app.rate.ni.f0
##   man.dm.f0
##   int.r1
##   app.mthd.bc.r1
##   man.dm.r1
##   air.temp.r1
##   wind.2m.r1
```

```
##   man.ph.r1
##   int.r2
##   rain.rate.r2
##   int.r3
##   app.mthd.bc.r3
##   man.ph.r3
```

```
##   ctime dt            f       s       e   e.int         j        er        f0
## 1    72 72 1.738643e-22 30.6952 17.3048 17.3048 0.2403445 0.3605167 0.2589096
##          r1         r2          r3 f4 r5
## 1 0.7150059 0.01587869 0.002153413  1  0
```

To use `dat4` with package v3.17 you need the `prep` argument.

```
alfam2(dat4, time.name = 'ctime', prep = TRUE)
```

```
## Default parameters (Set 2) are being used.
```

```
## Warning in alfam2(dat4, time.name = "ctime", prep = TRUE): Running with 18 parameters. Dropped 6 wit
## These secondary parameters have been dropped:
##   man.source.pig.f0
##   ts.cereal.hght.r1
##   incorp.shallow.f4
##   incorp.shallow.r3
##   incorp.deep.f4
##   incorp.deep.r3
##
## These secondary parameters are being used:
##   int.f0
##   app.mthd.os.f0
##   app.rate.ni.f0
##   man.dm.f0
##   app.mthd.cs.f0
##   int.r1
##   app.mthd.bc.r1
##   man.dm.r1
##   air.temp.r1
##   wind.2m.r1
##   app.mthd.ts.r1
##   man.ph.r1
##   int.r2
##   rain.rate.r2
##   int.r3
##   app.mthd.bc.r3
##   app.mthd.cs.r3
##   man.ph.r3
```

```
##   app.mthd.ts app.mthd.bc app.mthd.os app.mthd.cs ctime dt            f       s
## 1           0           1           0           0    72 72 1.738643e-22 30.6952
##         e   e.int         j        er        f0        r1         r2
## 1 17.3048 17.3048 0.2403445 0.3605167 0.2589096 0.7150059 0.01587869
##             r3 f4 r5
## 1 0.002153413  1  0
```

This changes in the new version of the R package, where the `prepDat` argument is `TRUE` by default. You can get it with:

```
remove.packages('ALFAM2')
devtools::install_github("sashahafner/ALFAM2", ref = 'dev', build_vignettes = TRUE)
```

With that you could use:

```
alfam2(dat4, time.name = 'ctime')
```