

# Summary of solid manure data

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20 februar, 2023 18:58

```
names(dat)
```

```
## [1] "source"          "abs.emis.info"    "incorp.info"
## [4] "timing.info"      "location"         "manure.source"
## [7] "man.type"        "manure.source.det" "meas.meth"
## [10] "meas.meth.det"   "meas.scale"       "duration"
## [13] "house.inf"       "stor.meth"        "stor.cov"
## [16] "stor.cov.type"   "stor.length"      "man.treat"
## [19] "DM"             "pH"               "TAN"
## [22] "totN"           "X23"              "app.meth"
## [25] "incorp"          "incorp.set"       "incorp.meth"
## [28] "incorp.depth"    "incorp.time"      "amount"
## [31] "season"         "temp.app"         "temp.avg"
## [34] "pres"           "soil.type"        "soil.clay"
## [37] "crop"           "soil.dens"        "soil.water"
## [40] "emis.perc.TAN"   "emis.perc.N"      "emis.source"
## [43] "emis.ID"         "notes"            "row.in.file"
## [46] "fTAN"           "manure.source.nm" "incorp.depth.nm"
## [49] "meas.meth.nm"    "season.nm"        "source.key"
```

## Counts

First plot counts:

```
kable(table(dat$meas.meth, exclude = NULL))
```

Var1	Freq
dynamic chamber	141
micromet	53
NA	1

```
kable(table(dat$manure.source, exclude = NULL))
```

Var1	Freq
cattle	47
pig	66
poultry	81
NA	1

```
kable(table(dat[, c('man.type', 'manure.source')], exclude = NULL))
```

	cattle	pig	poultry	NA
broiler litter	0	0	5	0
deep litter	12	2	0	0
farmyard manure	26	58	0	0
fiber	3	4	0	0
fresh solid manure	1	0	0	0
litter	0	0	43	0
manure	0	0	1	0
solid	2	2	4	0
NA	3	0	28	1

```
kable(table(dat[, c('meas.meth', 'manure.source')], exclude = NULL))
```

	cattle	pig	poultry	NA
dynamic chamber	30	62	49	0
micromet	17	4	32	0
NA	0	0	0	1

Then studies:

```
dat.study <- dat[!duplicated(dat[, c('source', 'meas.meth', 'manure.source')]), ]
kable(table(dat.study$meas.meth, exclude = NULL))
```

Var1	Freq
dynamic chamber	18
micromet	15
NA	1

```
kable(table(dat.study$manure.source, exclude = NULL))
```

Var1	Freq
cattle	12
pig	9
poultry	12
NA	1

```
kable(table(dat.study[, c('man.type', 'manure.source')], exclude = NULL))
```

	cattle	pig	poultry	NA
broiler litter	0	0	1	0
deep litter	3	1	0	0
farmyard manure	4	5	0	0
fiber	2	2	0	0
litter	0	0	6	0

	cattle	pig	poultry	NA
solid	2	1	1	0
NA	1	0	4	1

```
kable(table(dat.study[, c('meas.meth', 'manure.source')], exclude = NULL))
```

	cattle	pig	poultry	NA
dynamic chamber	5	7	6	0
micromet	7	2	6	0
NA	0	0	0	1

Easier combined?

```
kable(
  aggregate2(as.data.frame(dat), 'source',
    by = c('meas.meth', 'manure.source'),
    FUN = list(n.plots = length, n.studies = function(x) length(unique(x))))
)
```

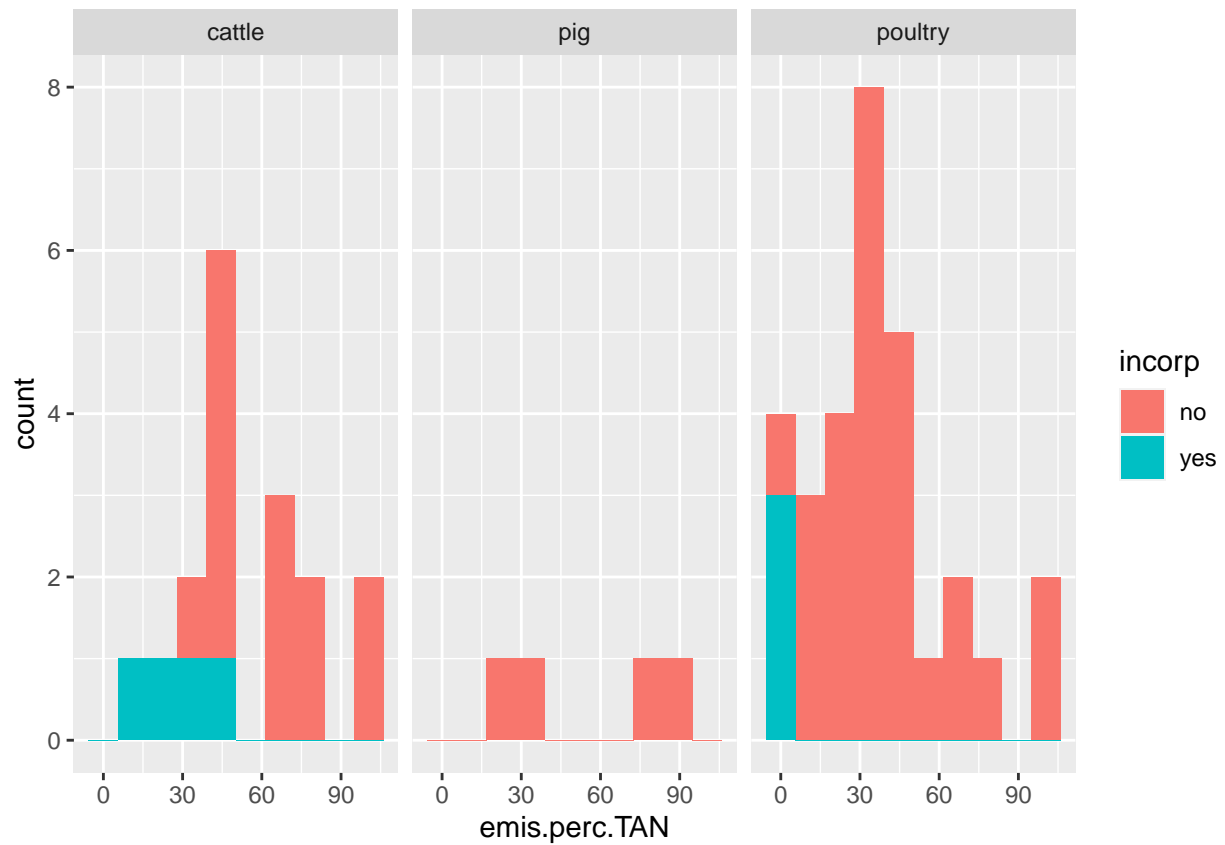
meas.meth	manure.source	source.n.plots	source.n.studies
dynamic chamber	cattle	30	5
micromet	cattle	17	7
dynamic chamber	pig	62	7
micromet	pig	4	2
dynamic chamber	poultry	49	6
micromet	poultry	32	6

## Emission factors and other variables for micromet observations only

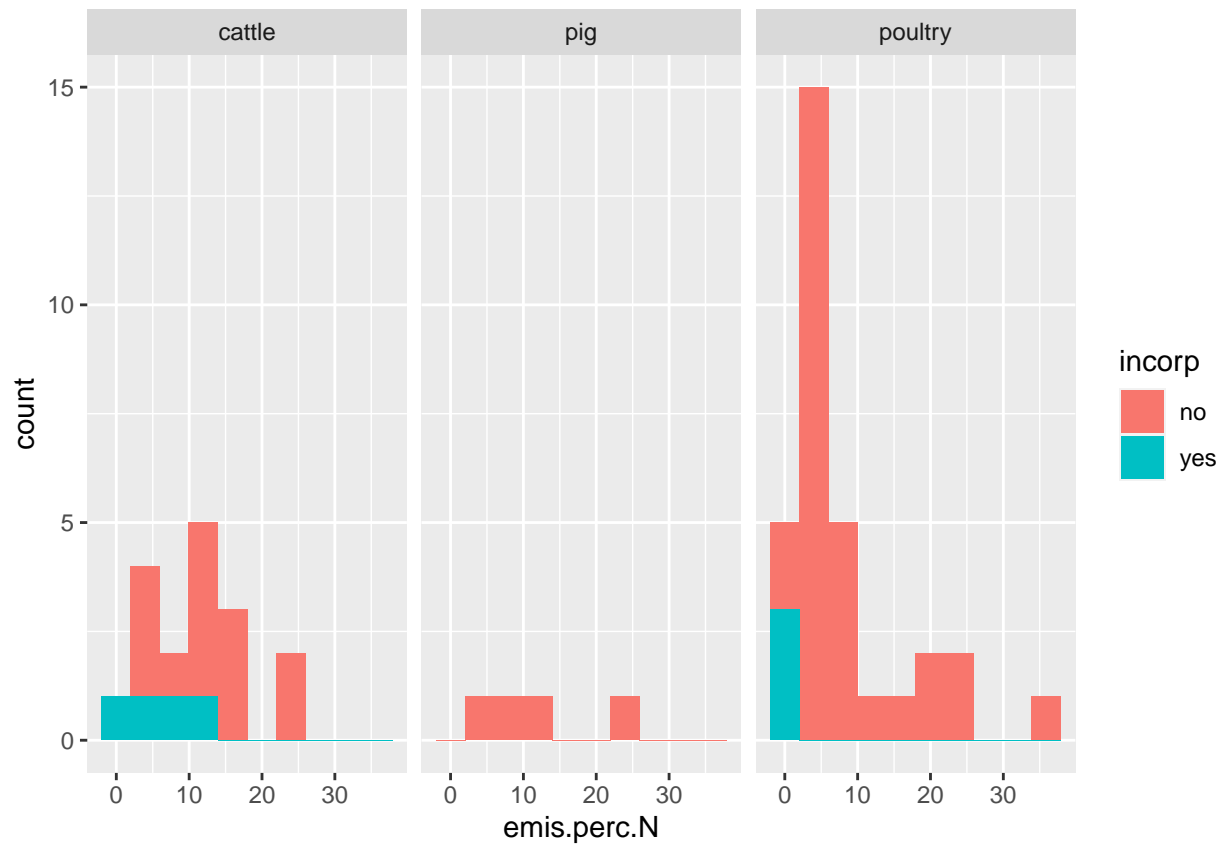
```
datmm <- subset(dat, meas.meth == 'micromet')
```

```
ggplot(datmm, aes(emis.perc.TAN, fill = incorp)) +
  geom_histogram(bins = 10) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

```
## Warning: Removed 2 rows containing non-finite values (stat_bin).
```

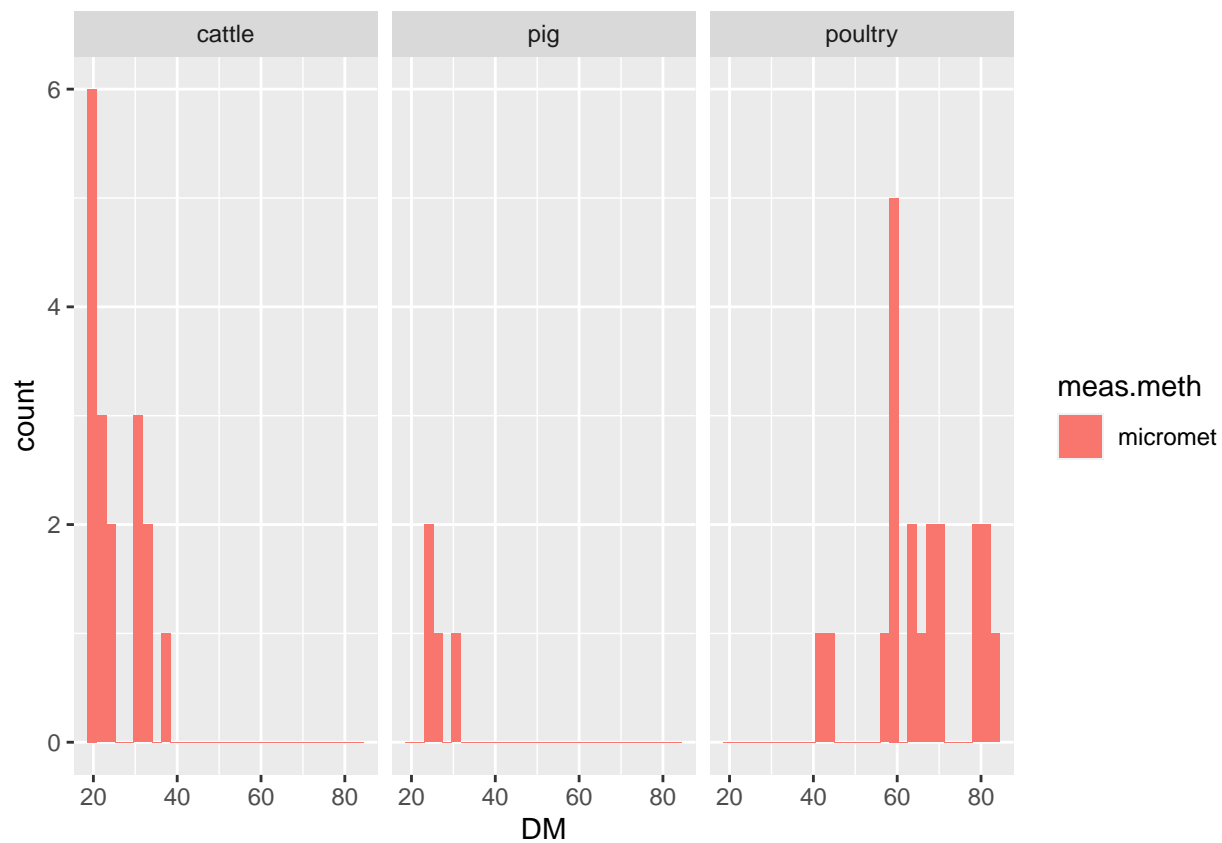


```
ggplot(datmm, aes(emis.perc.N, fill = incorp)) +
  geom_histogram(bins = 10) +
  facet_wrap(~ manure.source, scales = 'fixed')
```



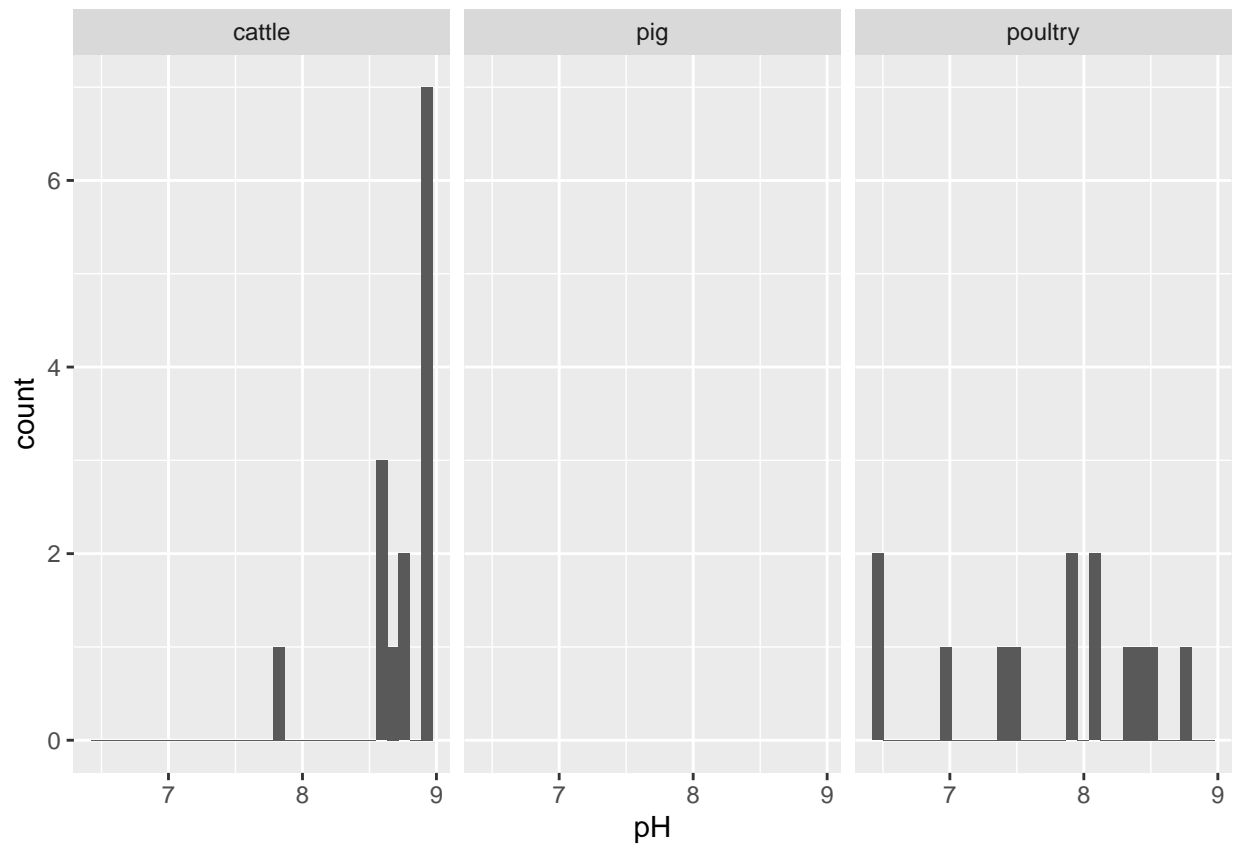
```
ggplot(datmm, aes(DM, fill = meas.meth)) +
  geom_histogram(bins = 30) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

```
## Warning: Removed 12 rows containing non-finite values (stat_bin).
```



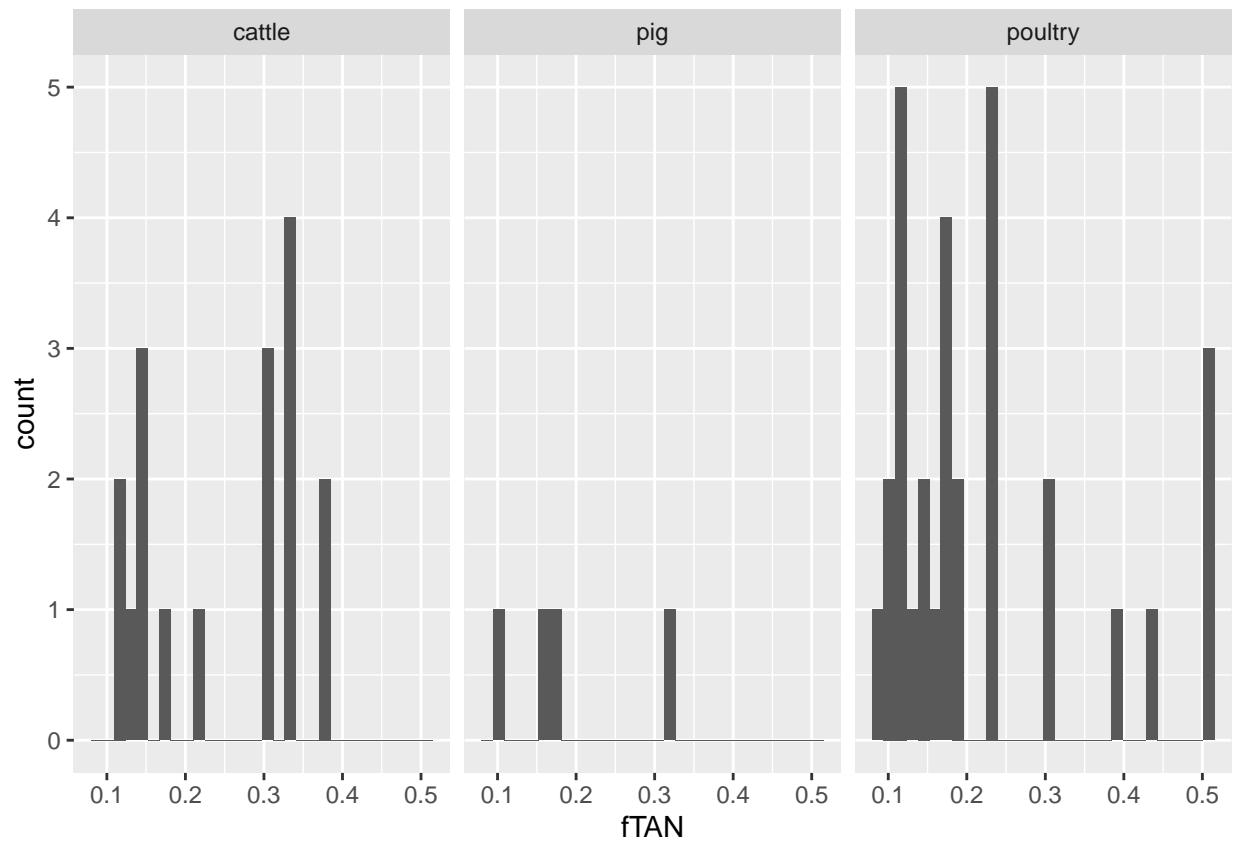
```
ggplot(datmm, aes(pH)) +
  geom_histogram(bins = 30) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

## Warning: Removed 26 rows containing non-finite values (stat\_bin).



```
ggplot(datmm, aes(fTAN)) +
  geom_histogram(bins = 30) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

```
## Warning: Removed 2 rows containing non-finite values (stat_bin).
```

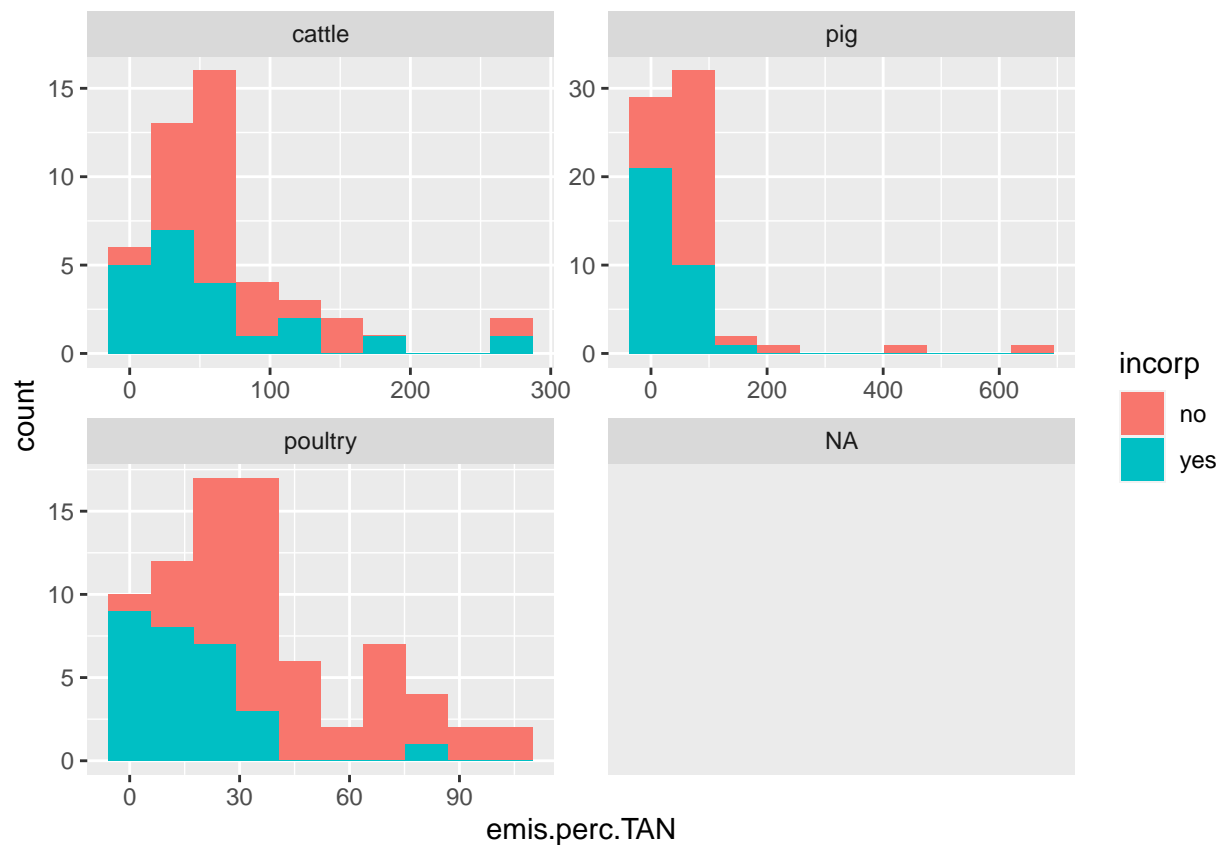


## Emission factors and other variables for all observations

```
ggplot(dat, aes(emis.perc.TAN, fill = incorp)) +
  geom_histogram(bins = 10) +
  facet_wrap(~ manure.source, scales = 'free')
```

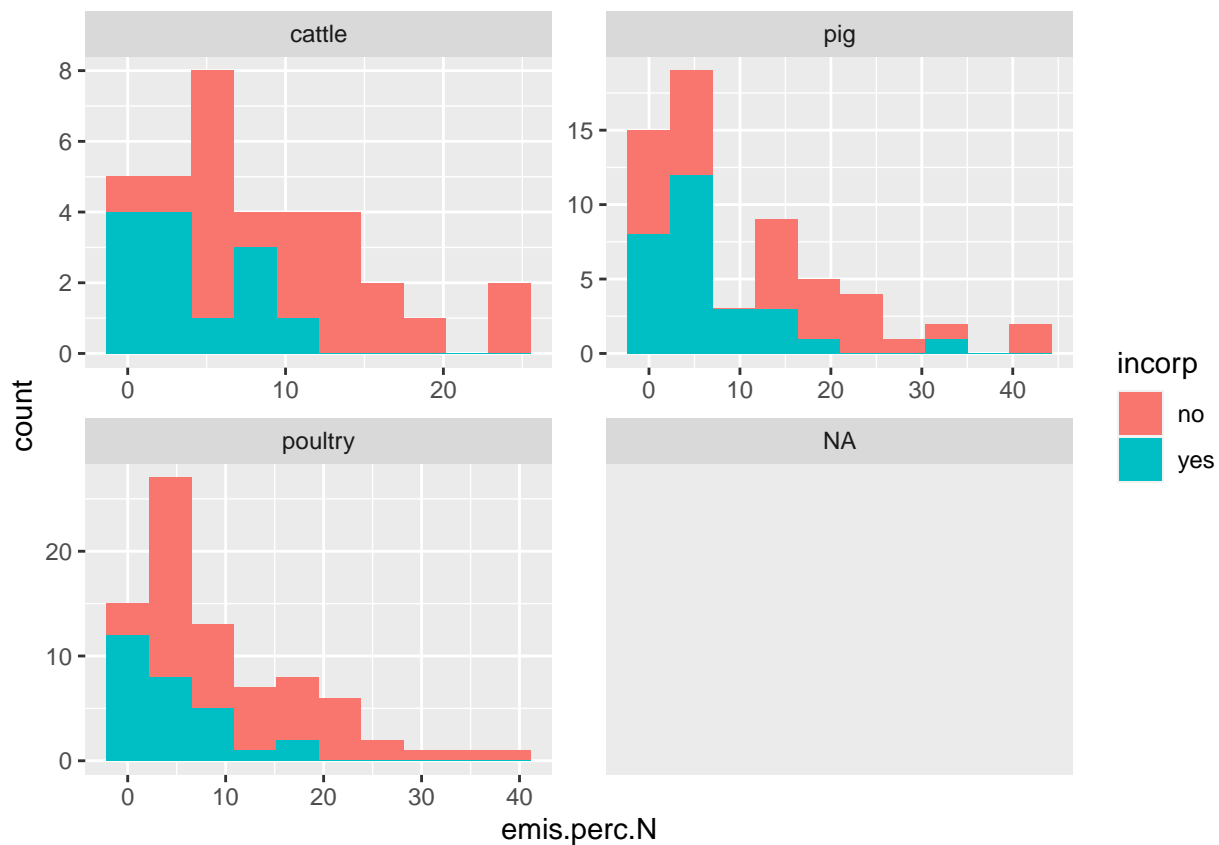
## Warning: Removed 3 rows containing non-finite values (stat\_bin).





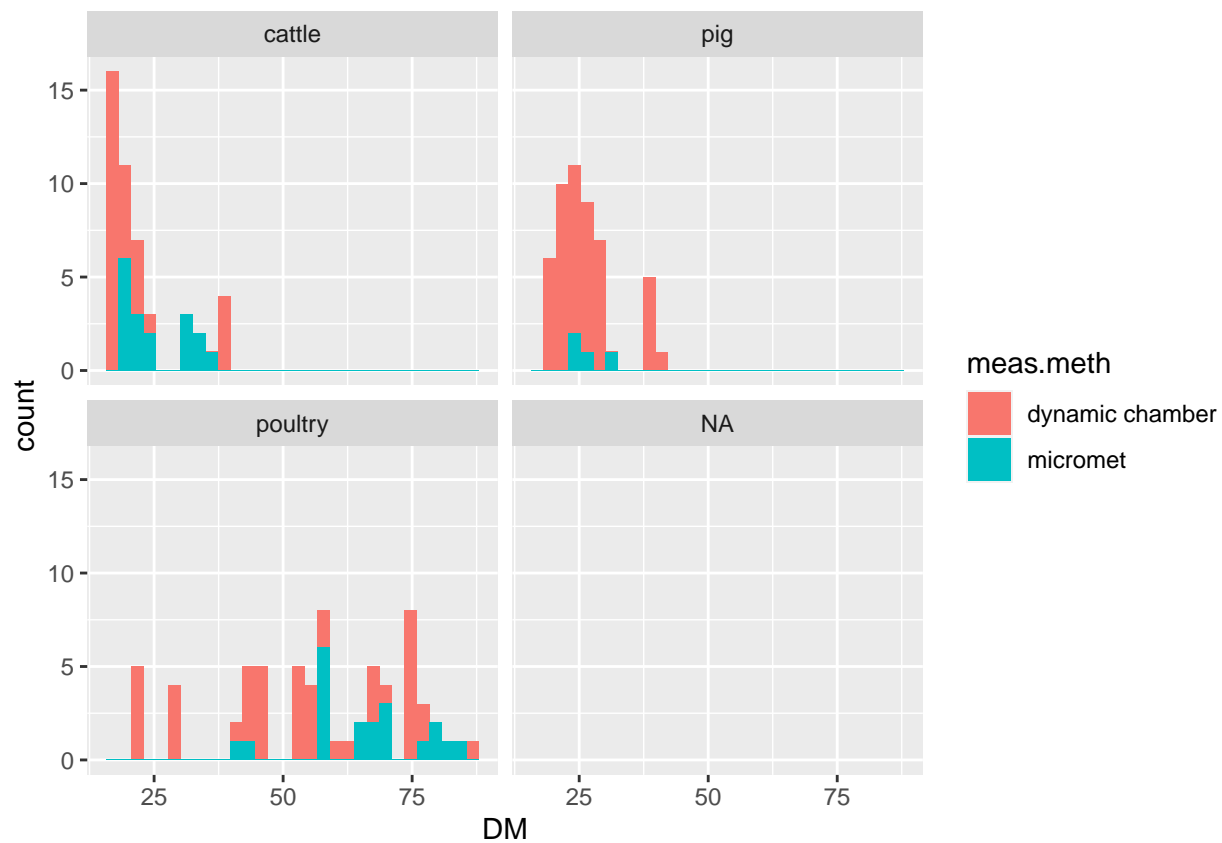
```
ggplot(dat, aes(emis.perc.N, fill = incorp)) +
  geom_histogram(bins = 10) +
  facet_wrap(~ manure.source, scales = 'free')
```

```
## Warning: Removed 19 rows containing non-finite values (stat_bin).
```



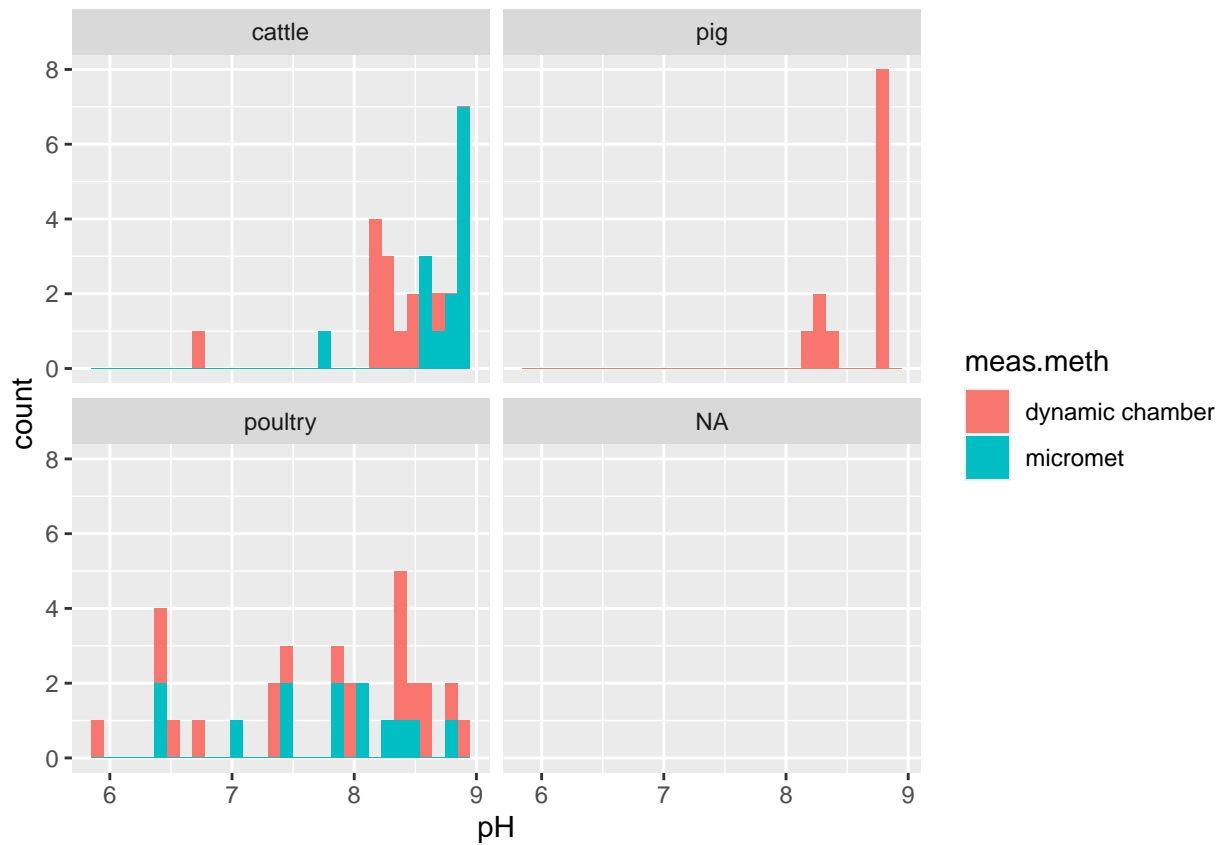
```
ggplot(dat, aes(DM, fill = meas.meth)) +
  geom_histogram(bins = 30) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

```
## Warning: Removed 31 rows containing non-finite values (stat_bin).
```



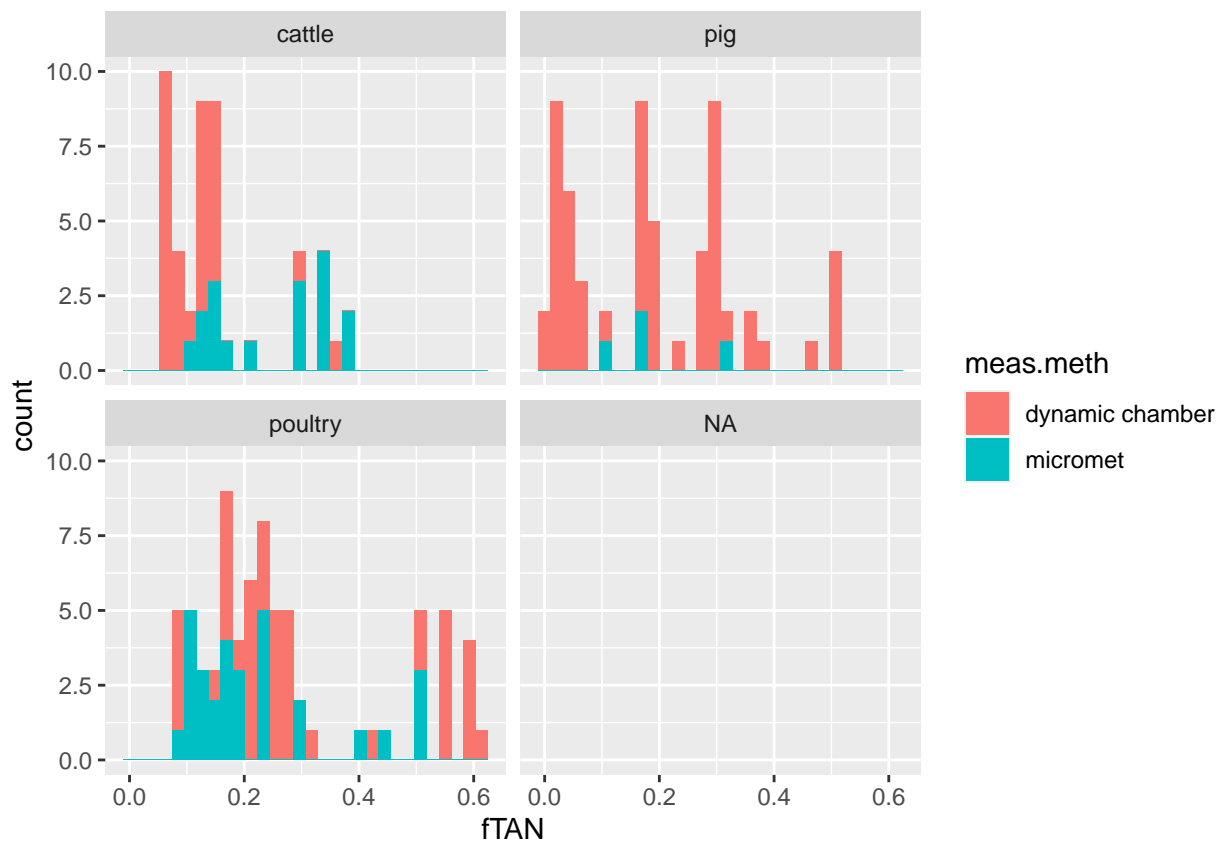
```
ggplot(dat, aes(pH, fill = meas.meth)) +
  geom_histogram(bins = 30) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

## Warning: Removed 124 rows containing non-finite values (stat\_bin).



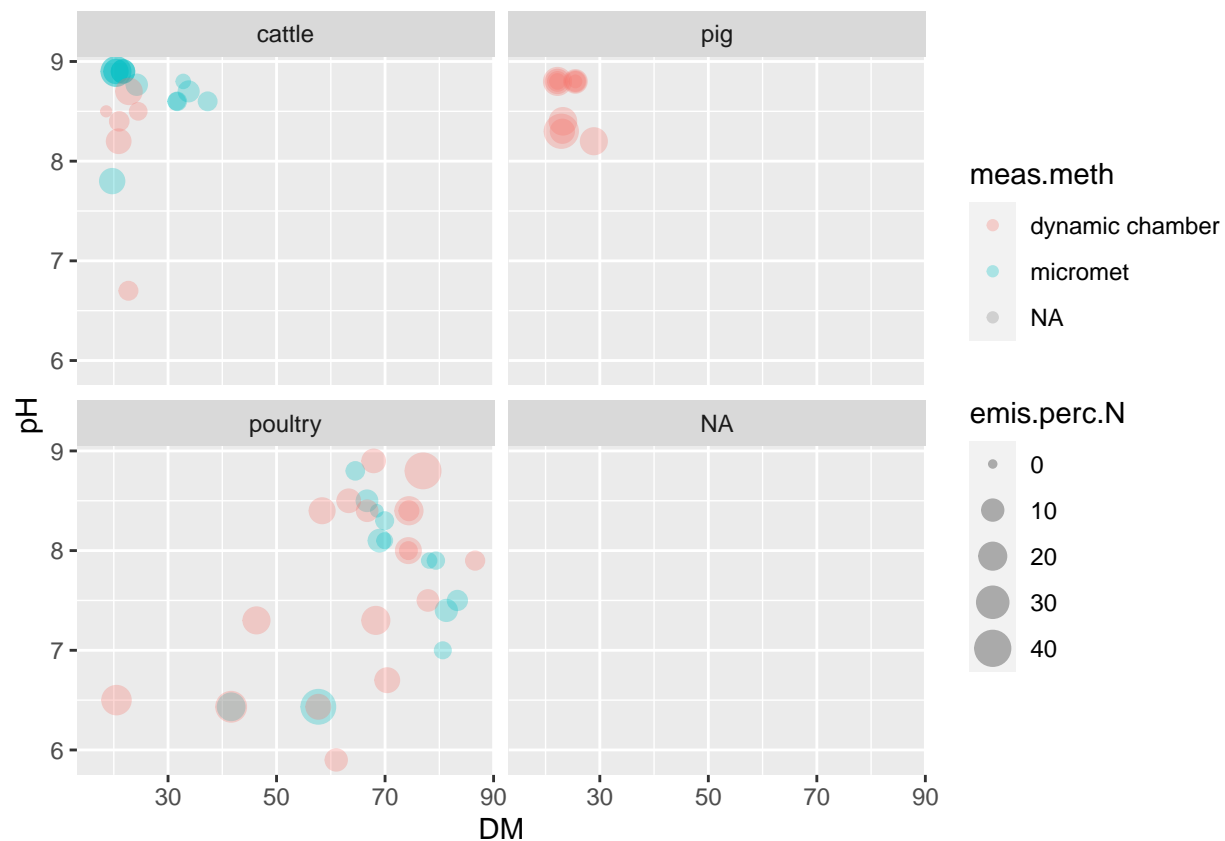
```
ggplot(dat, aes(ftAN, fill = meas.meth)) +
  geom_histogram(bins = 30) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

## Warning: Removed 14 rows containing non-finite values (stat\_bin).



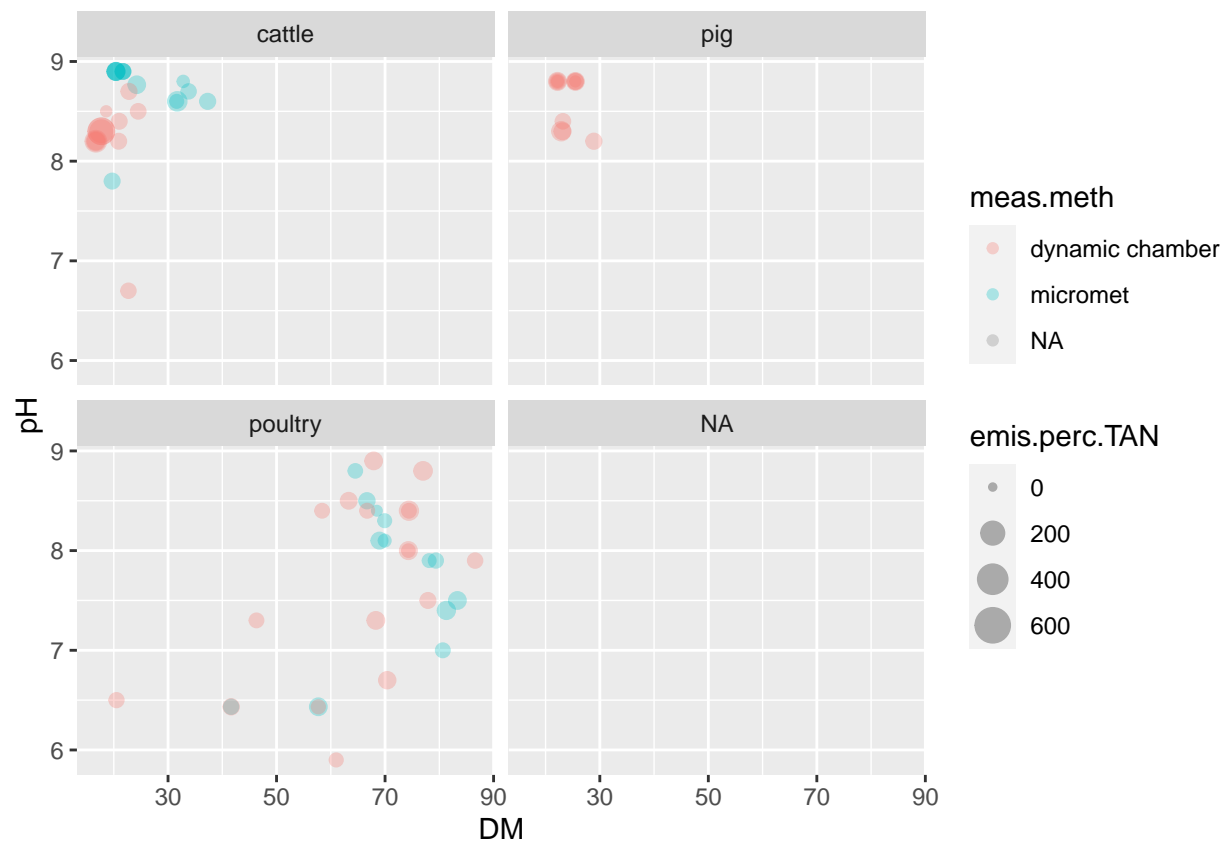
```
ggplot(dat, aes(DM, pH, size = emis.perc.N, colour = meas.meth)) +
  geom_point(alpha = 0.3) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

## Warning: Removed 132 rows containing missing values (geom\_point).



```
ggplot(dat, aes(DM, pH, size = emis.perc.TAN, colour = meas.meth)) +
  geom_point(alpha = 0.3) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

```
## Warning: Removed 126 rows containing missing values (geom_point).
```

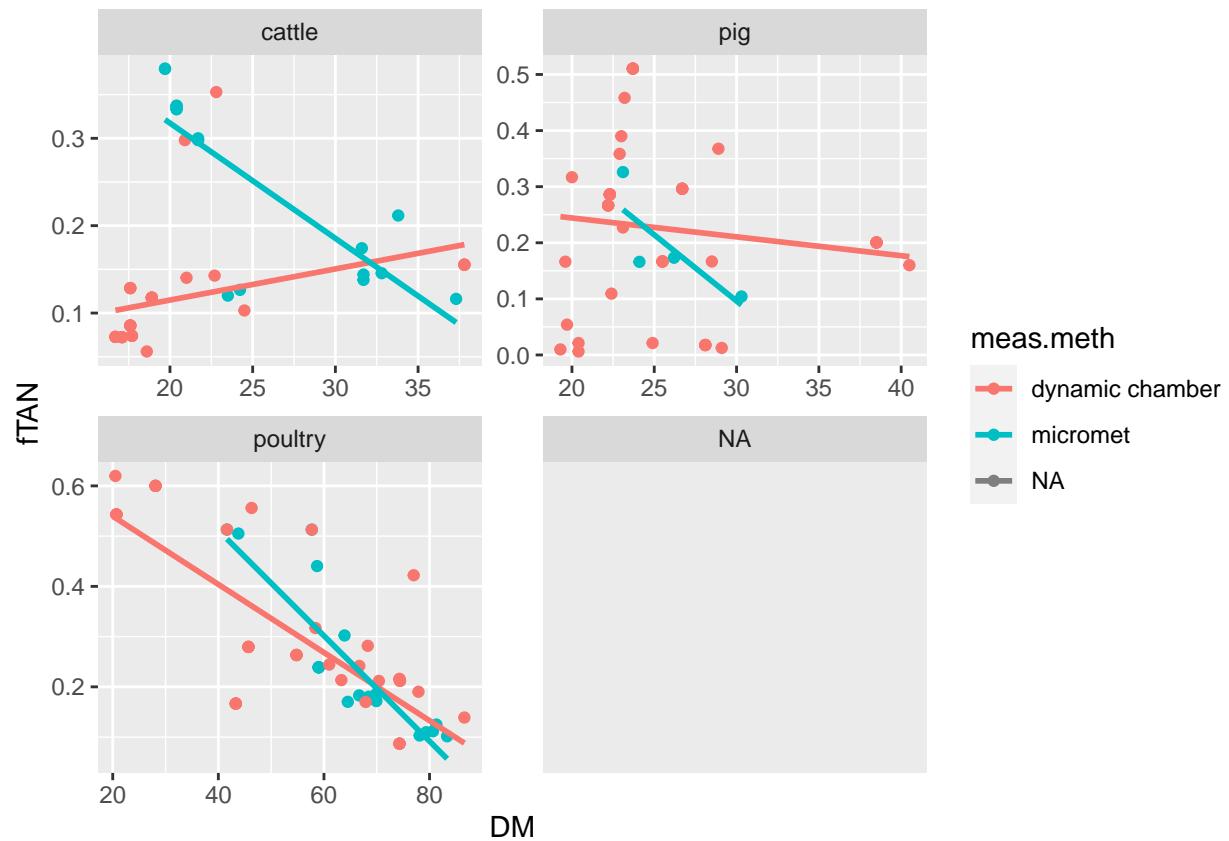


```
ggplot(dat, aes(DM, fTAN, colour = meas.meth)) +
  geom_point() +
  geom_smooth(method = lm, se = FALSE) +
  facet_wrap(~ manure.source, scales = 'free')
```

```
## `geom_smooth()` using formula 'y ~ x'
```

```
## Warning: Removed 36 rows containing non-finite values (stat_smooth).
```

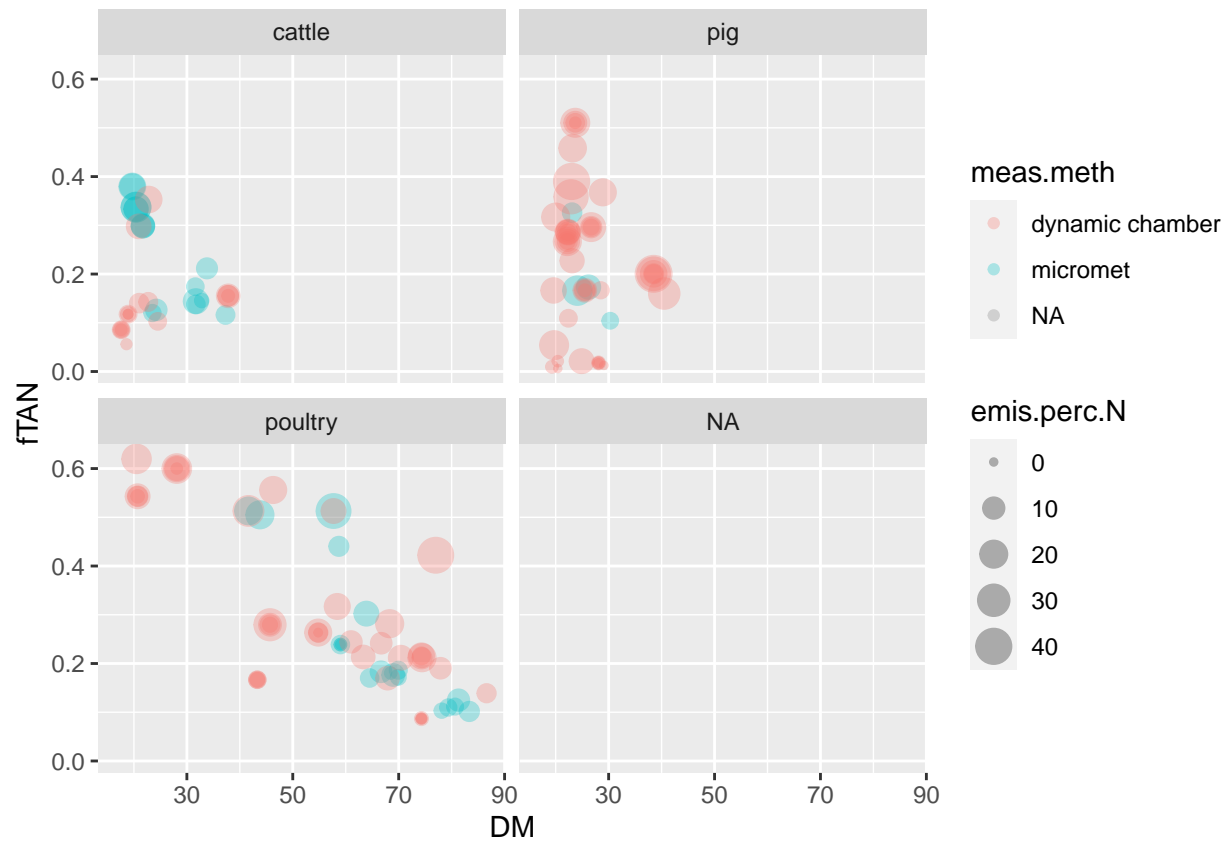
```
## Warning: Removed 36 rows containing missing values (geom_point).
```



```
ggplot(dat, aes(DM, fTAN, size = emis.perc.N, colour = meas.meth)) +
  geom_point(alpha = 0.3) +
  facet_wrap(~ manure.source, scales = 'fixed')
```

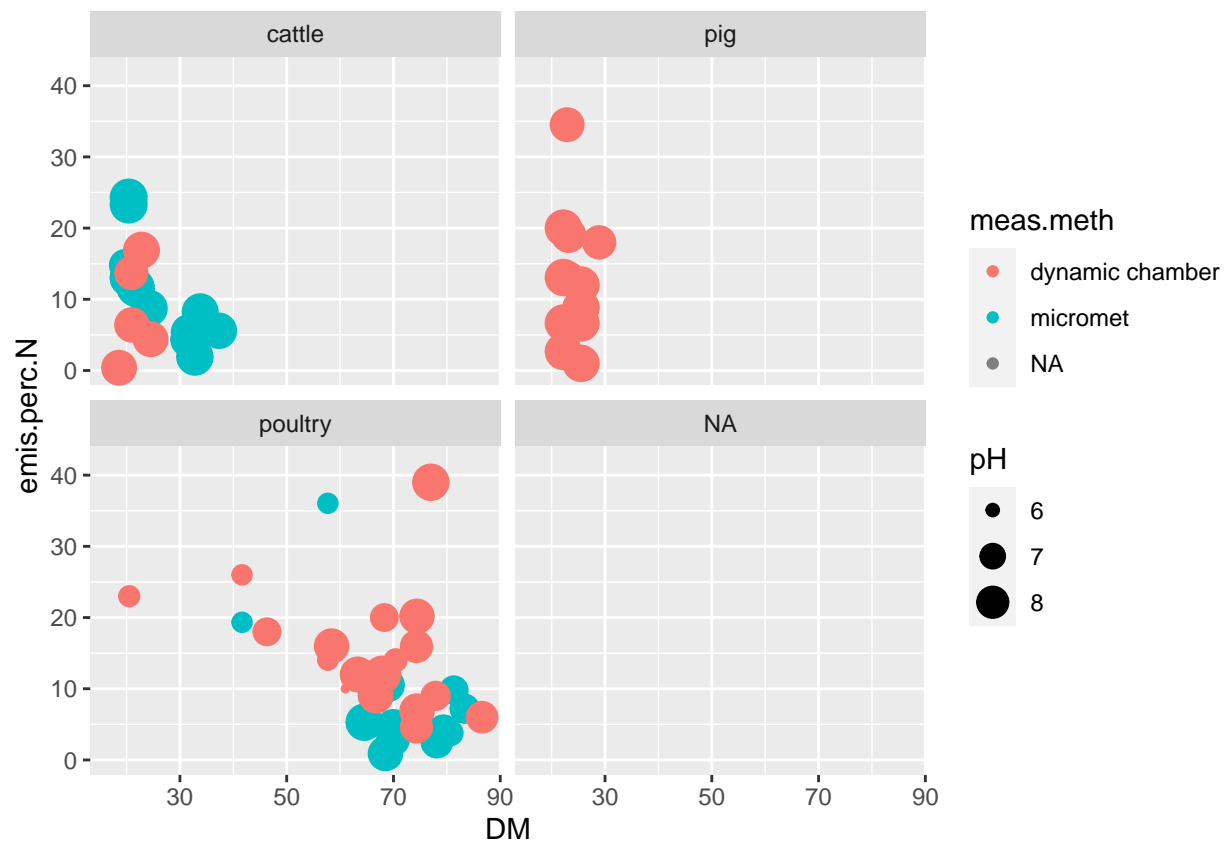
```
## Warning: Removed 48 rows containing missing values (geom_point).
```





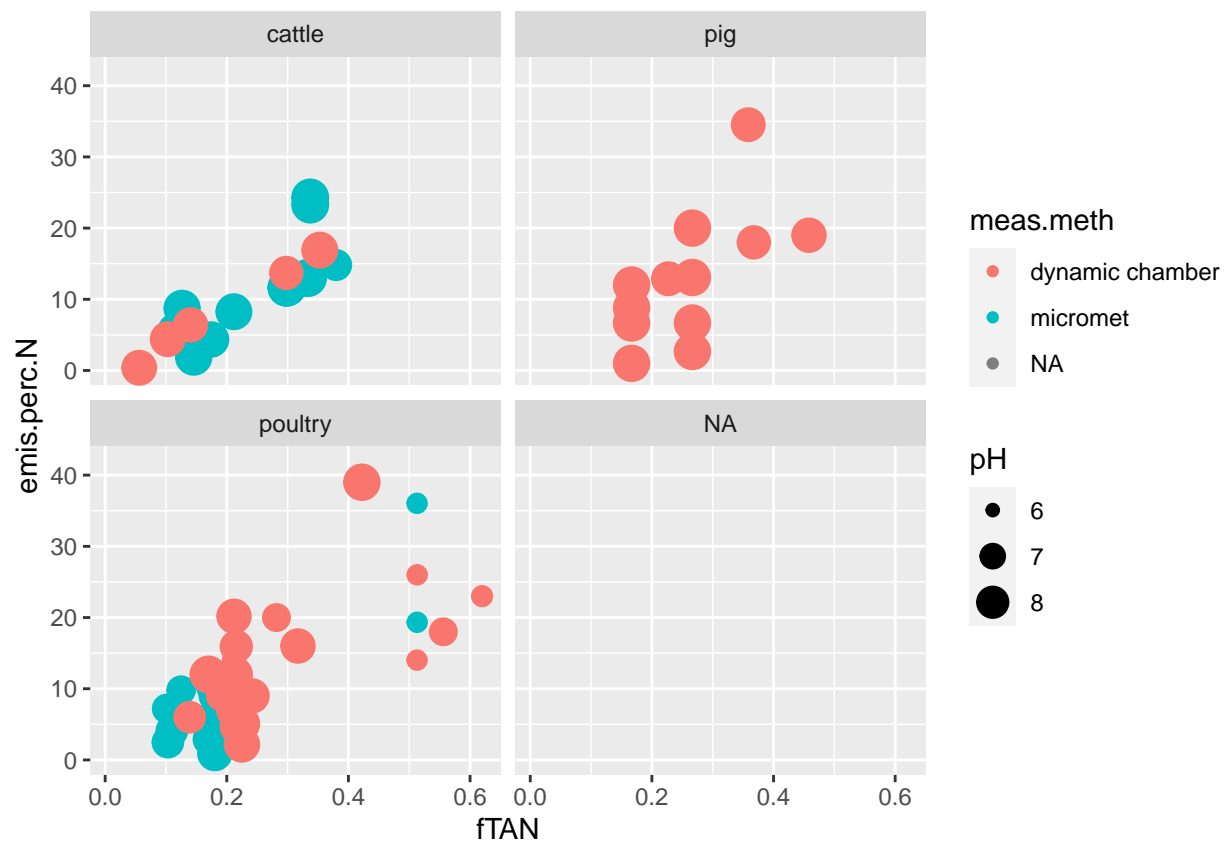
```
ggplot(dat, aes(DM, emis.perc.N, size = pH, colour = meas.meth)) +
  geom_point() +
  facet_wrap(~ manure.source, scales = 'fixed')
```

```
## Warning: Removed 132 rows containing missing values (geom_point).
```



```
ggplot(dat, aes(fTAN, emis.perc.N, size = pH, colour = meas.meth)) +
  geom_point() +
  facet_wrap(~ manure.source, scales = 'fixed')
```

```
## Warning: Removed 130 rows containing missing values (geom_point).
```



## Variable summary

```
dfsumm(as.data.frame(dat))
```

```
##
## 195 rows and 51 columns
## 195 unique rows
##
##          source abs.emis.info incorp.info timing.info
## Class          character      numeric      numeric      numeric
## Minimum      Balsari et al. (2008a)          0          0          0
## Maximum      Williams et al. (2003)          1          1          1
## Mean          <NA>          0.242          0.598          0.469
## Unique (excl. NA)      25          2          2          2
## Missing values          1          1          1          1
## Sorted          FALSE          FALSE          FALSE          FALSE
##
##          location manure.source      man.type
## Class          character      character      character
## Minimum      Canada, British Columbia      cattle broiler litter
## Maximum          UK      poultry      solid
## Mean          <NA>          <NA>          <NA>
## Unique (excl. NA)      11          3          8
## Missing values          1          1          32
## Sorted          FALSE          FALSE          FALSE
##
```

```

##          manure.source.det      meas.meth meas.meth.det meas.scale
## Class          character          character      character  character
## Minimum          beef dynamic chamber          IHF field plot
## Maximum          turkey          micromet      wind tunnel laboratory
## Mean              <NA>              <NA>          <NA>          <NA>
## Unique (excl. NA)          5              2              4              2
## Missing values          126              1              37              1
## Sorted              FALSE              FALSE              FALSE              FALSE
##
##          duration house.inf          stor.meth stor.cov
## Class          character character          character character
## Minimum          120 outdoor 1 L container, 5C, laboratory          no
## Maximum          96 outdoor          stockpile          yes
## Mean              <NA>          <NA>          <NA>          <NA>
## Unique (excl. NA)          19              1              8              2
## Missing values          33          193          129          161
## Sorted              FALSE          TRUE          FALSE          FALSE
##
##          stor.cov.type      stor.length man.treat      DM      pH
## Class          character          character character numeric numeric
## Minimum          plastic sheeting          0 wetted      16.7      5.9
## Maximum          plastic sheeting several months wetted      86.6      8.9
## Mean              <NA>          <NA>          <NA>      37.7      8.17
## Unique (excl. NA)          1              7              1      80      22
## Missing values          182          145          193      31      124
## Sorted              TRUE          FALSE          TRUE      FALSE      FALSE
##
##          TAN      totN      X23 app.meth      incorp incorp.set
## Class          numeric numeric numeric character character      numeric
## Minimum          0.0389      2.1      2.6 broadcast          no              1
## Maximum          18.9      59.3      9.4 broadcast          yes              12
## Mean              3.15      14.2      4.68          <NA>          <NA>          4.29
## Unique (excl. NA)          96      103      13              1              2              12
## Missing values          14      12      180          23              1              80
## Sorted              FALSE      FALSE      FALSE          TRUE          FALSE          FALSE
##
##          incorp.meth incorp.depth
## Class          character      character
## Minimum          disc          deep
## Maximum          vaste-tandcultivator (fixed tine cultivator)          shallow
## Mean              <NA>          <NA>
## Unique (excl. NA)          13              3
## Missing values          114          87
## Sorted              FALSE          FALSE
##
##          incorp.time amount      season temp.app temp.avg      pres
## Class          character numeric character numeric numeric numeric
## Minimum          6          2.5      autumn          10          2.4          4
## Maximum          6          70.6      winter          31          27.8          119
## Mean              <NA>          21.8          <NA>          22.7          14.1          41
## Unique (excl. NA)          8          89          5          8          28          17
## Missing values          109          6          0          179          117          176
## Sorted              FALSE      FALSE      FALSE      FALSE      FALSE      FALSE
##

```

```

##          soil.type soil.clay      crop soil.dens soil.water
## Class      character    numeric character    numeric    numeric
## Minimum    caly soil      1.94    grass      0.75      0.09
## Maximum    silt loam      64     stubble     4.5      0.28
## Mean        <NA>         22.3    <NA>        1.85      0.166
## Unique (excl. NA)      8       9       3         3         13
## Missing values      83      120     117      186      175
## Sorted      FALSE      FALSE     FALSE     FALSE     FALSE
##
##          emis.perc.TAN emis.perc.N emis.source
## Class          numeric    numeric    character
## Minimum          0         0    Figure 14
## Maximum        658        42    Table 7
## Mean            52.8       9.35    <NA>
## Unique (excl. NA)    173     151      19
## Missing values       3       19       1
## Sorted            FALSE     FALSE     FALSE
##
##                                     emis.ID
## Class                                     character
## Minimum    Aerobic, 24 h/Pig FYM, 1999, Uncompacted 24
## Maximum                                     Winter 2001, PP
## Mean                                             <NA>
## Unique (excl. NA)                             135
## Missing values                                54
## Sorted                                         FALSE
##
##
## Class
## Minimum
## Maximum    Same data as in Sommer and Hansen (2022). Hansen and Birkmose writes that the soi
## Mean
## Unique (excl. NA)
## Missing values
## Sorted
##
##          row.in.file    fTAN manure.source.nm incorp.depth.nm
## Class          numeric numeric    character    character
## Minimum          4 0.00621    Cattle        Deep
## Maximum        198 0.62      Poultry        Shallow
## Mean            101 0.219    <NA>          <NA>
## Unique (excl. NA)    195 104       3          3
## Missing values       0 14        1          87
## Sorted            FALSE  FALSE     FALSE      FALSE
##
##          meas.meth.nm season.nm source.key
## Class          character    factor    factor
## Minimum    Dynamic chamber    Spring      1
## Maximum    Micrometeorological Unknown     25
## Mean        <NA>      Autumn     16
## Unique (excl. NA)      2        5     25
## Missing values      1        0      1
## Sorted            FALSE  FALSE     FALSE
##

```