Stats

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LF vs. RS effect

Generates results for this statement:

In general, a clear reduction in the emission factors after application of the liquid fraction was found relative to application of the raw slurry (Figure 2) ($p < 1 \cdot 10\text{-}8$ from F-test based on 2-factor ANOVA) .

```
dd <- subset(dat, frac.stud != 'mix')

mod <- lm(log10(EFp.field) ~ frac.stud.nm + interaction(source, set), data = dd)
anova(mod)
```

```
## Analysis of Variance Table
##
## Response: log10(EFp.field)
##                           Df  Sum Sq Mean Sq F value    Pr(>F)
## frac.stud.nm               1  1.6299 1.62993 41.9598 4.668e-09 ***
## interaction(source, set) 52 10.9074 0.20976  5.3998 1.338e-12 ***
## Residuals                91  3.5349 0.03885
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
coef(mod)[1:3]
```

```
##                                       (Intercept)
##                                         0.9278041
##                                      frac.stud.nmLF
##                                          -0.2050109
## interaction(source, set)Anderson et al, in prep.1
##                                         0.5854482
```

```
100 * (10^coef(mod)[1:3] - 1)
```

```
##                                       (Intercept)
##                                         746.84543
##                                      frac.stud.nmLF
##                                           -37.62808
## interaction(source, set)Anderson et al, in prep.1
##                                         284.98892
```

```
mod <- lm(log10(EFp.field) ~ DM, data = dd)
anova(mod)
```

```
## Analysis of Variance Table
##
```

```
## Response: log10(EFp.field)
##            Df  Sum Sq Mean Sq F value  Pr(>F)
## DM          1  0.6335 0.63349  5.8676 0.01667 *
## Residuals 143 15.4387 0.10796
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
summary(mod)
```

```
##
## Call:
## lm(formula = log10(EFp.field) ~ DM, data = dd)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.8924 -0.1325  0.0366  0.2224  0.6345
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.14040    0.05566  20.490   <2e-16 ***
## DM           0.02526    0.01043   2.422   0.0167 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3286 on 143 degrees of freedom
## Multiple R-squared:  0.03942,    Adjusted R-squared:  0.0327
## F-statistic: 5.868 on 1 and 143 DF,  p-value: 0.01667
```

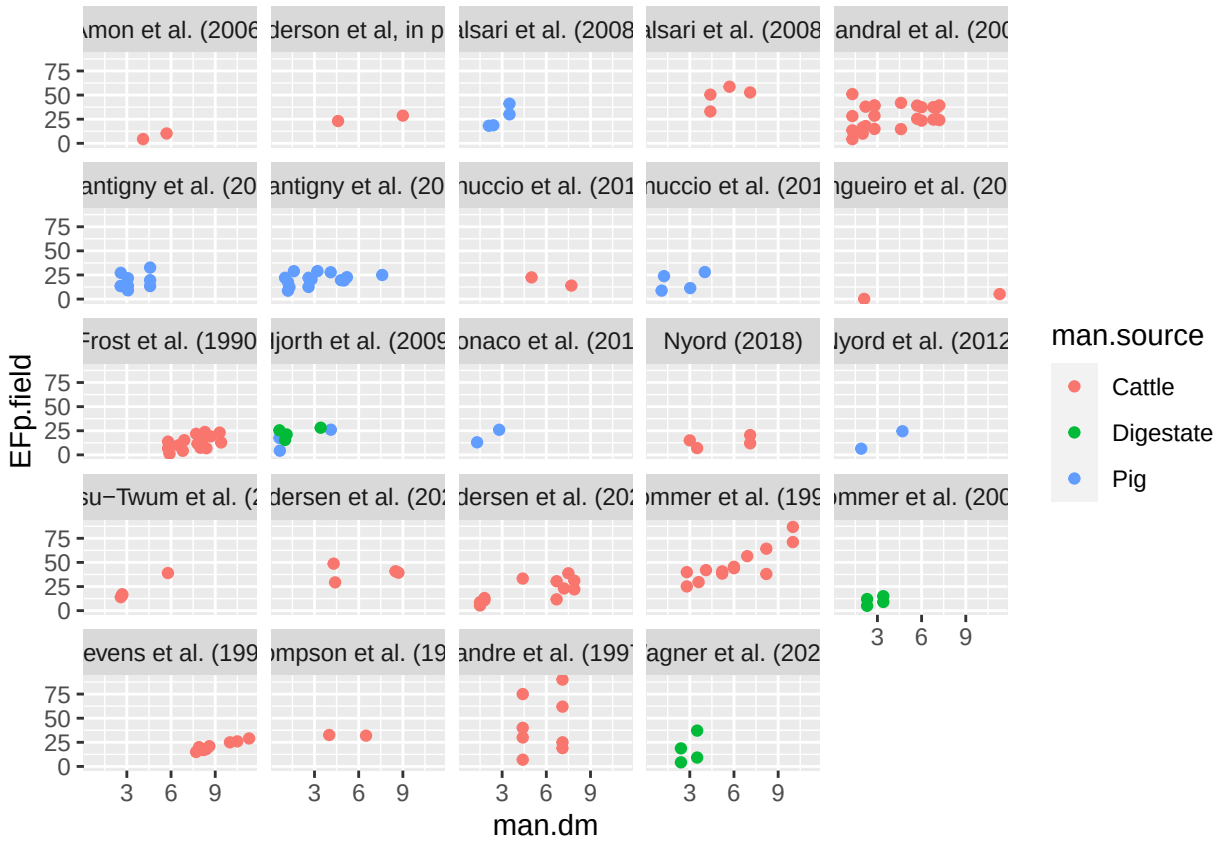
Compare EF vs. DM slopes for measurements and ALFAM2 predictions

Comparison for this statement:

```
The average EFemission factors vs. DM slope from literature data is 3.3
(95% CI: 2.1, 4.6) vs. 4.6 for model predictions
(units are % applied TAN per % of fresh mass).
```

CI on slope for measurements.

```
ggplot(dat, aes(man.dm, EFp.field, colour = man.source)) + geom_point() + facet_wrap(~ source)
```




```
cc <- plyr::ddply(dat, c('source', 'set', 'man.source'), function(x) coef(lm(EFp.field ~ man.dm, data =
t.test(cc$man.dm[cc$man.source == 'Cattle'])
```

```
##
##  One Sample t-test
##
## data:  cc$man.dm[cc$man.source == "Cattle"]
## t = 3.9019, df = 36, p-value = 0.000401
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  1.450128 4.589233
## sample estimates:
## mean of x
##  3.019681
```

```
t.test(cc$man.dm[cc$man.source == 'Pig'])
```

```
##
##  One Sample t-test
##
## data:  cc$man.dm[cc$man.source == "Pig"]
## t = 2.6265, df = 15, p-value = 0.01907
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  0.6231923 5.9895545
## sample estimates:
## mean of x
##  3.306373
```

```r
t.test(cc$man.dm[cc$man.source == 'Digestate'])
```

```
##
##  One Sample t-test
##
## data:  cc$man.dm[cc$man.source == "Digestate"]
## t = 2.2289, df = 4, p-value = 0.08972
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  -1.480859 13.538283
## sample estimates:
## mean of x
##  6.028712
```

```r
t.test(cc$man.dm)
```

```
##
##  One Sample t-test
##
## data:  cc$man.dm
## t = 5.2274, df = 57, p-value = 2.541e-06
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  2.071762 4.644573
## sample estimates:
## mean of x
##  3.358168
```

```r
range(cc$man.dm)
```

```
## [1] -5.555556 22.222222
```

```r
median(cc$man.dm)
```

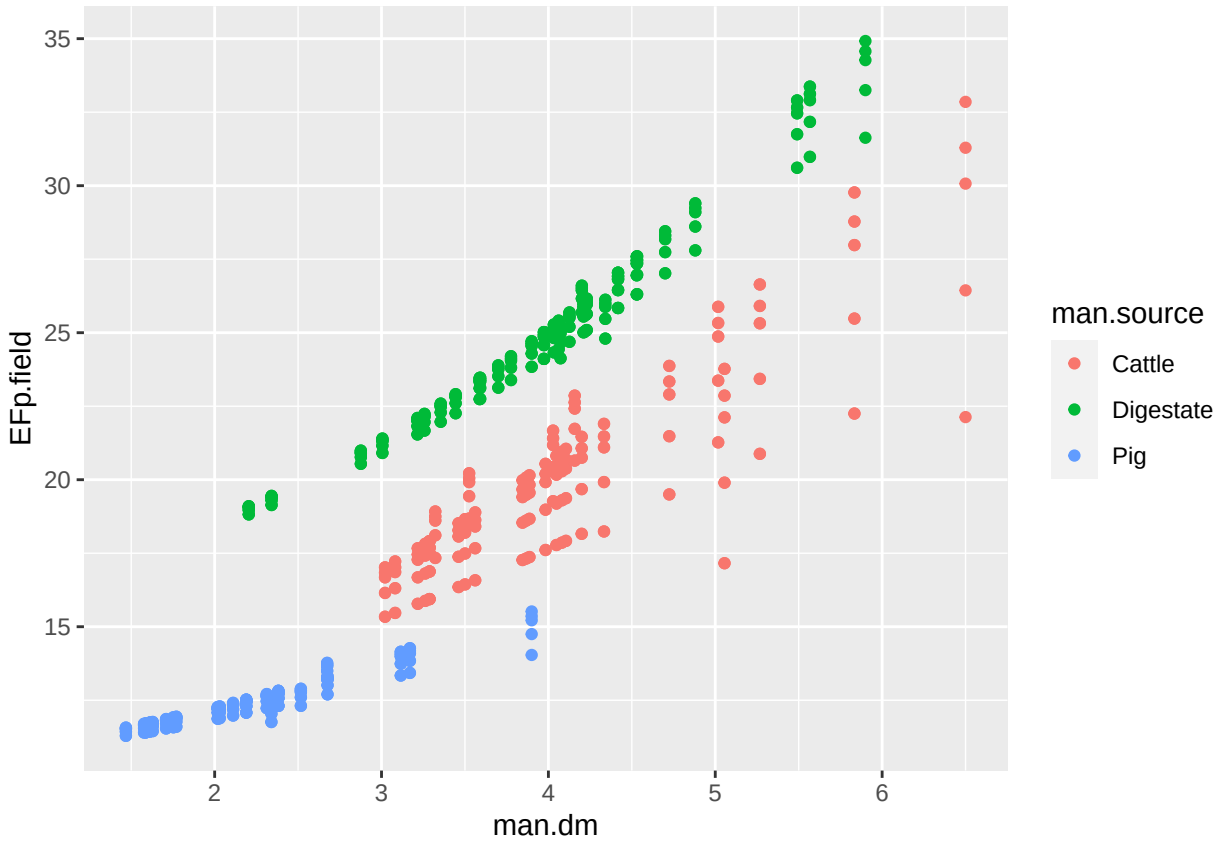
```
## [1] 2.62178
```

```r
mean(cc$man.dm)
```

```
## [1] 3.358168
```

Model slope.

```r
ggplot(a2dat, aes(man.dm, EFp.field, colour = man.source)) + geom_point()
```




```r
mod2b <- lm(EFp.field ~ man.dm, data = a2dat)
summary(mod2b)
```

```
##
## Call:
## lm(formula = EFp.field ~ man.dm, data = a2dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -11.676  -1.992   0.003   2.688   5.210
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.66878    0.31271   11.73   <2e-16 ***
## man.dm       4.63650    0.08609   53.86   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.769 on 853 degrees of freedom
## Multiple R-squared:  0.7727, Adjusted R-squared:  0.7725
## F-statistic:  2900 on 1 and 853 DF,  p-value: < 2.2e-16
```