Use of Random Forest to predict the main factors that affects ammonia volatilization in Mediterranean climate cropping systems

J. Hurtado Patiño, E. Velázquez, L. Lassaletta, G. Guardia, E. Aguilera, A. Sanz-Cobeña

WORK SHOP 2022 MADRID

POLITÉCNICA

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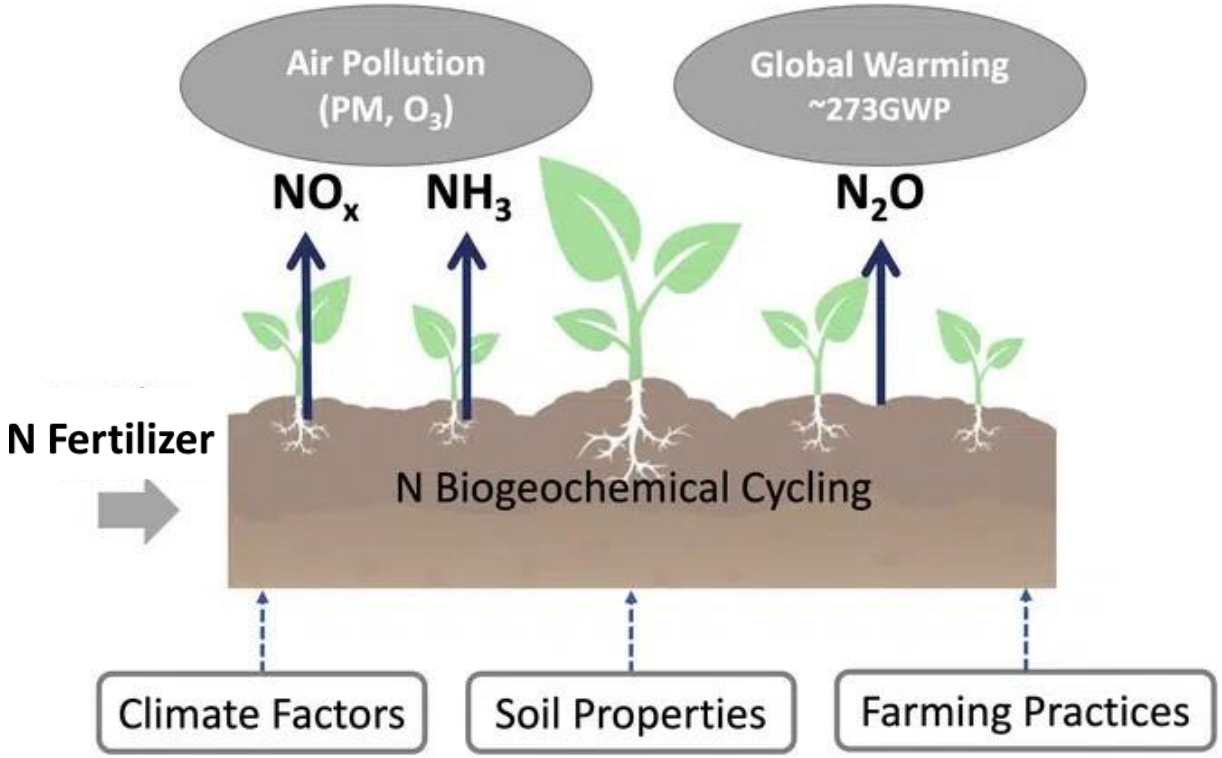
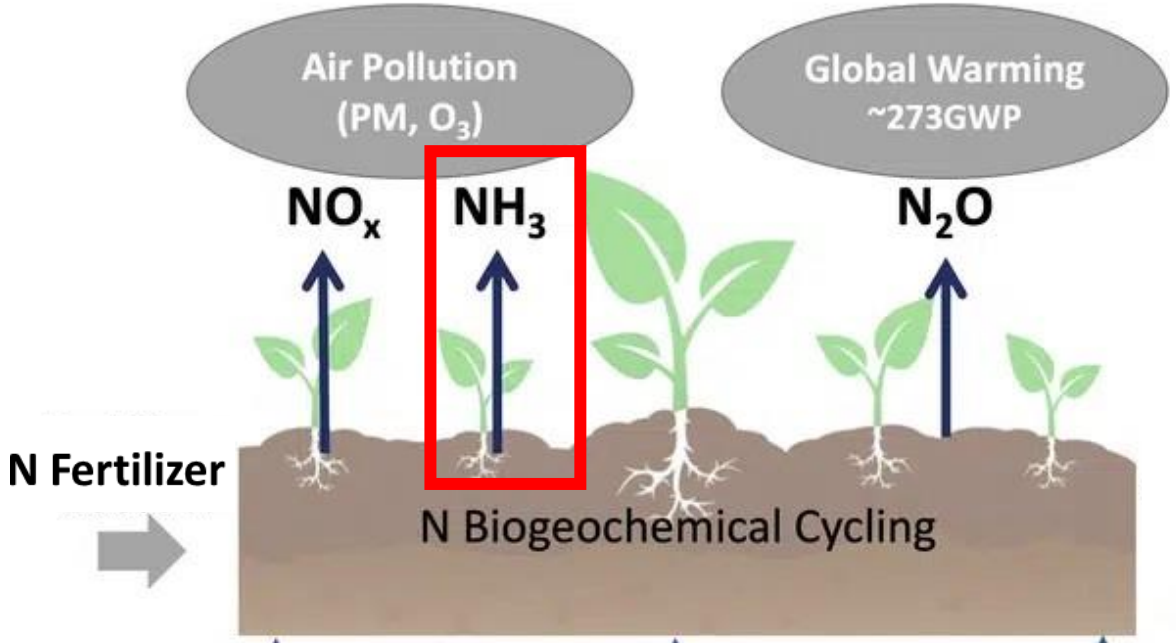


Luo et al., 2022

DATA COLLECTION



- ✓ Report NH_3 emissions after N fertilization
- ✓ Field experiments

Climate Factors

- Temperature
- Precipitation

Soil Properties

- pH
- Soil texture
- Soil organic matter (SOM)

Farming Practices

- N fertilizer, rate and application
- Crop type
- Rainfed/irrigated

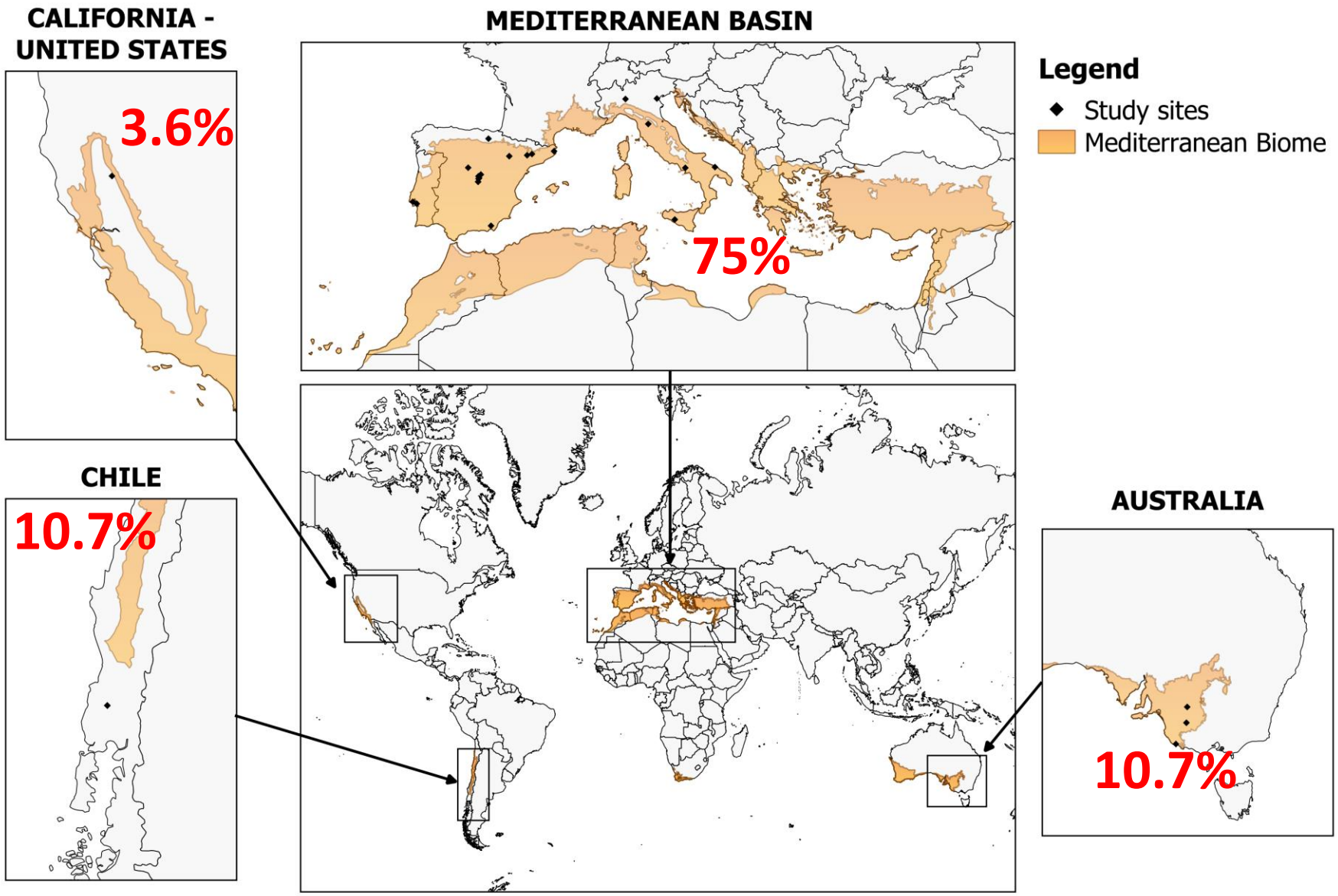
- Measurement Technique

DATA COLLECTION

Response variables:

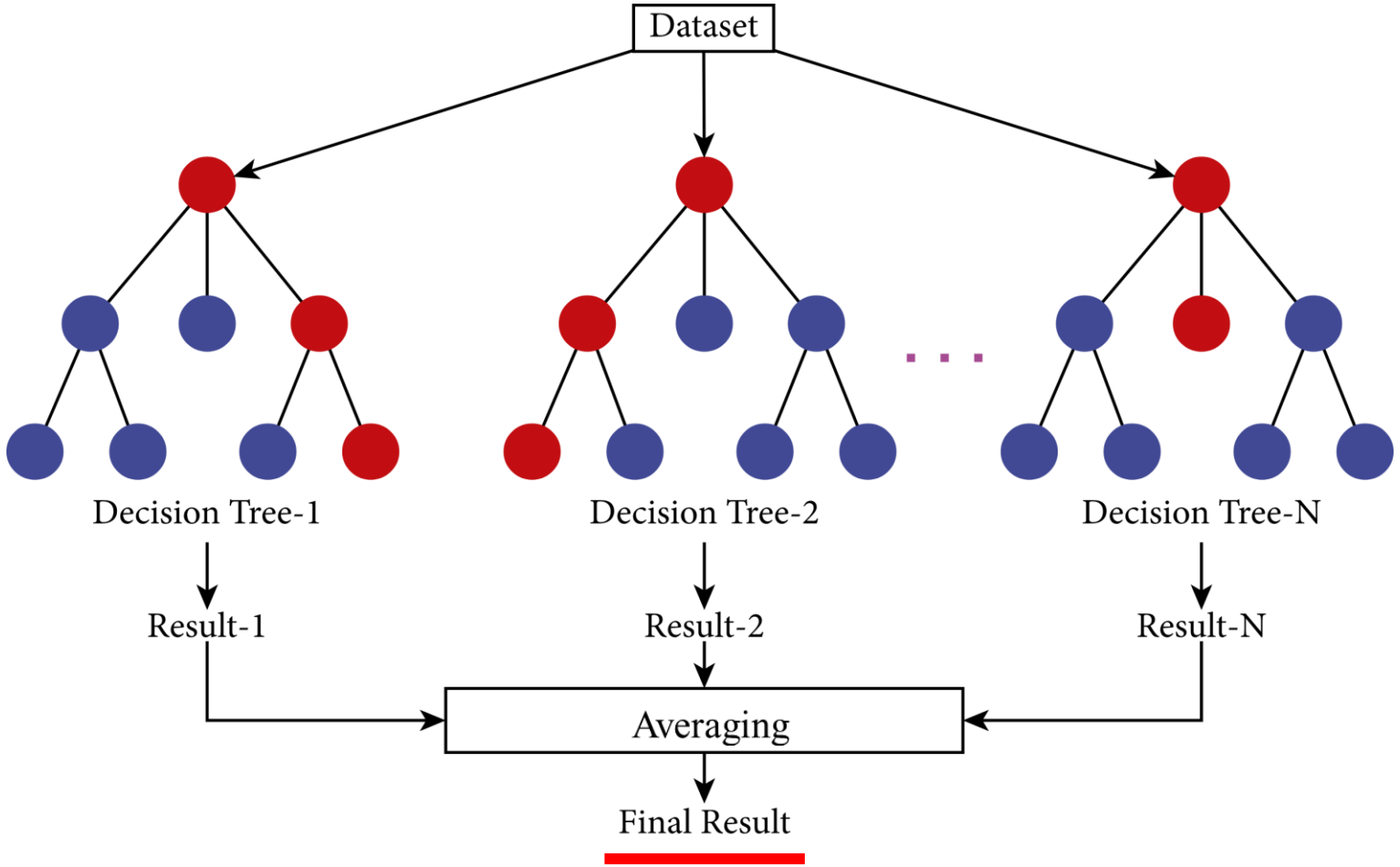
1. **Cumulative NH_3 emissions (kg NH_3/ha)**
2. **Emission factor (EF, %)**

233 treatments – 28 research articles (WOS)



RANDOM FOREST MODEL

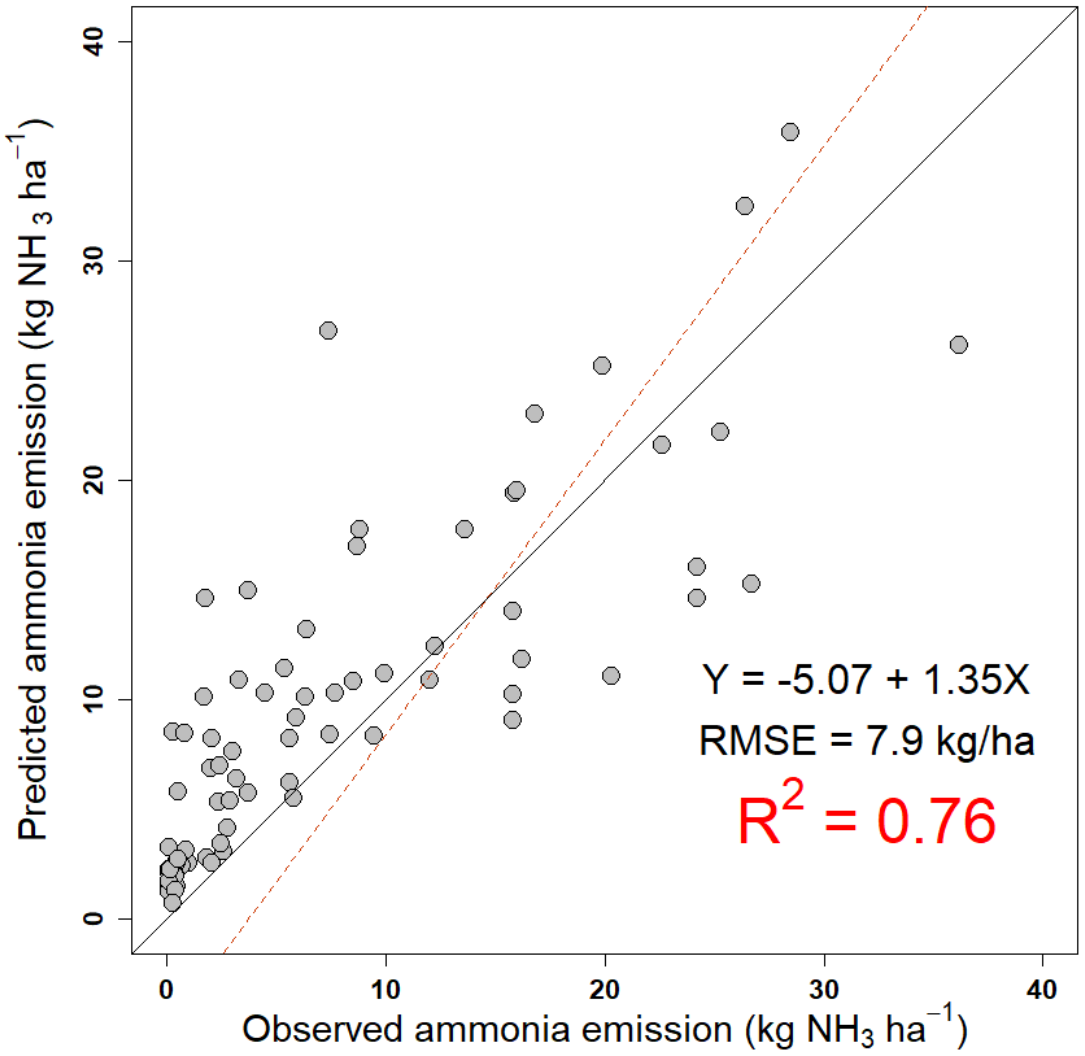
- ✓ Machine learning technique
- ✓ Non-linear relationship between input and response variables

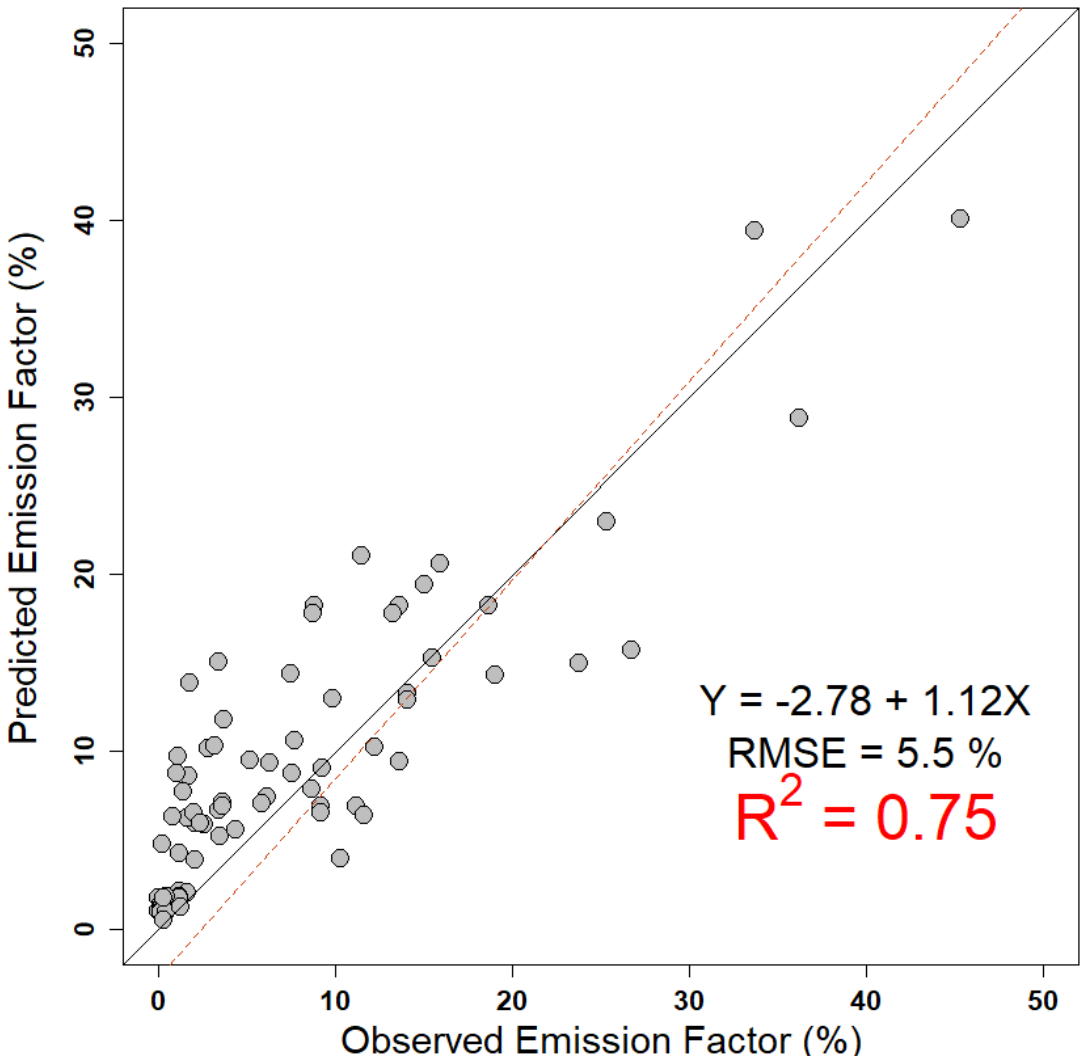


Yaseen Khan et al., 2021

1. Predicition of NH_3 emissions and EF
2. Variable importance ranking

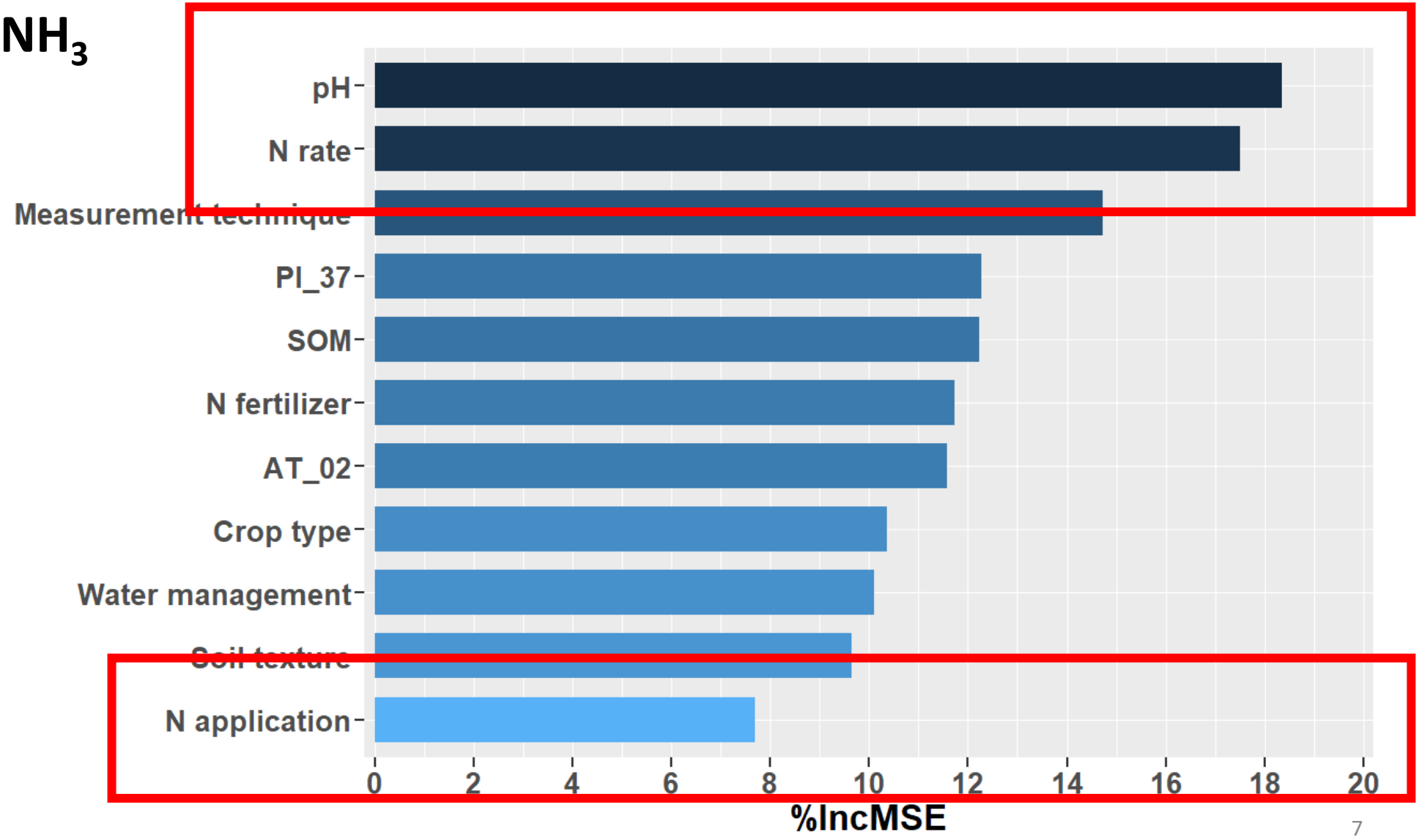
MODEL PERFORMANCE

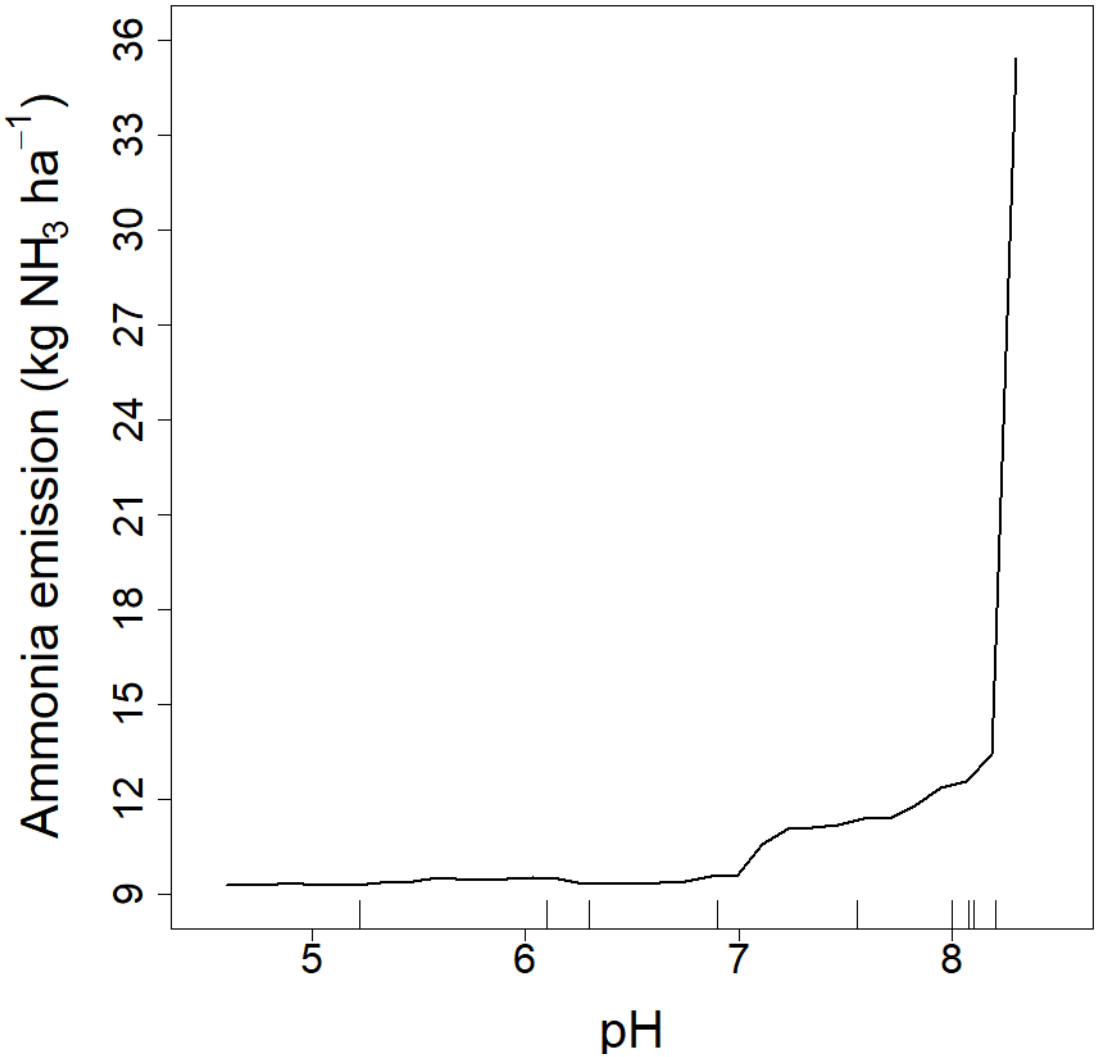


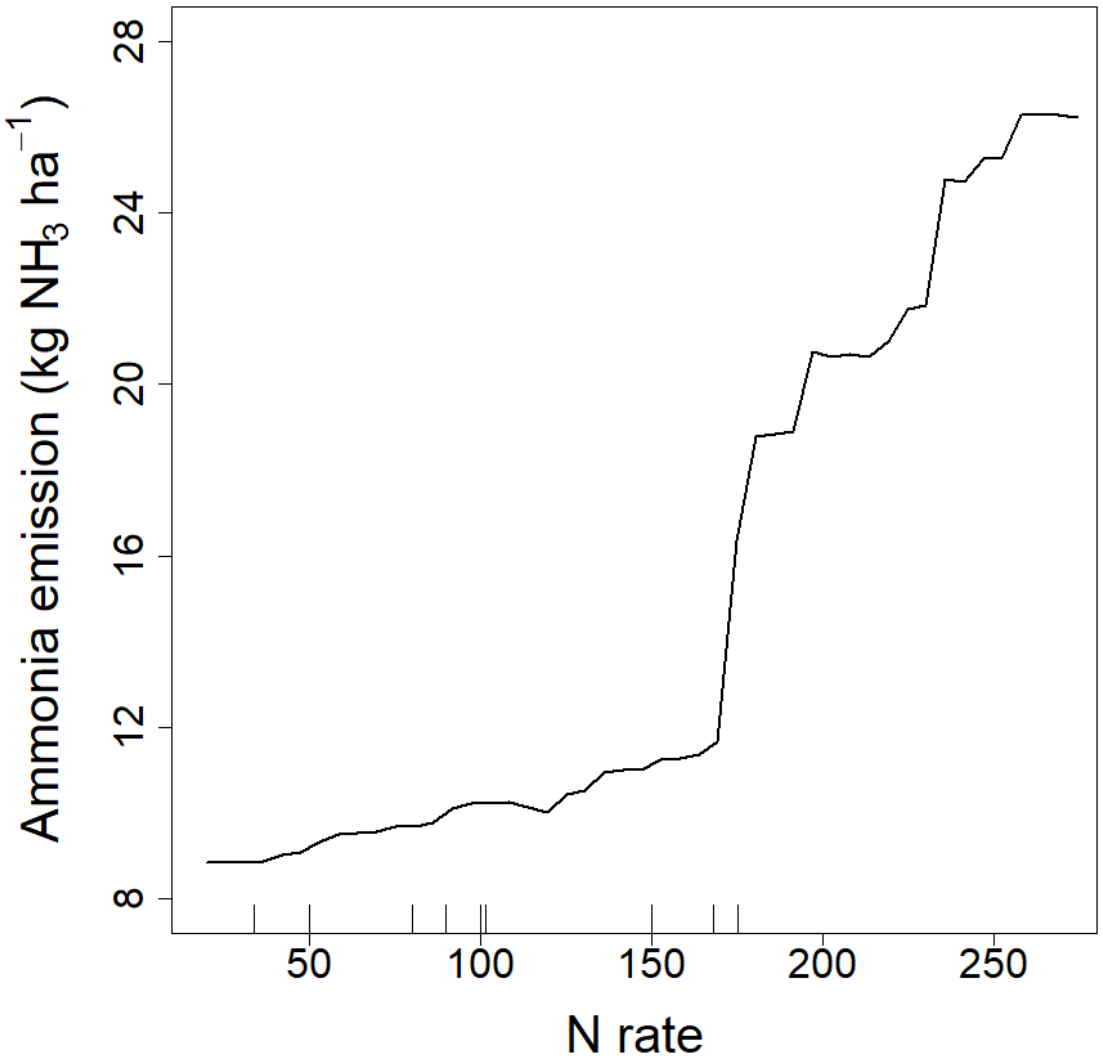


VARIABLE IMPORTANCE

1. Cumulative NH_3 emissions (kgN/ha)

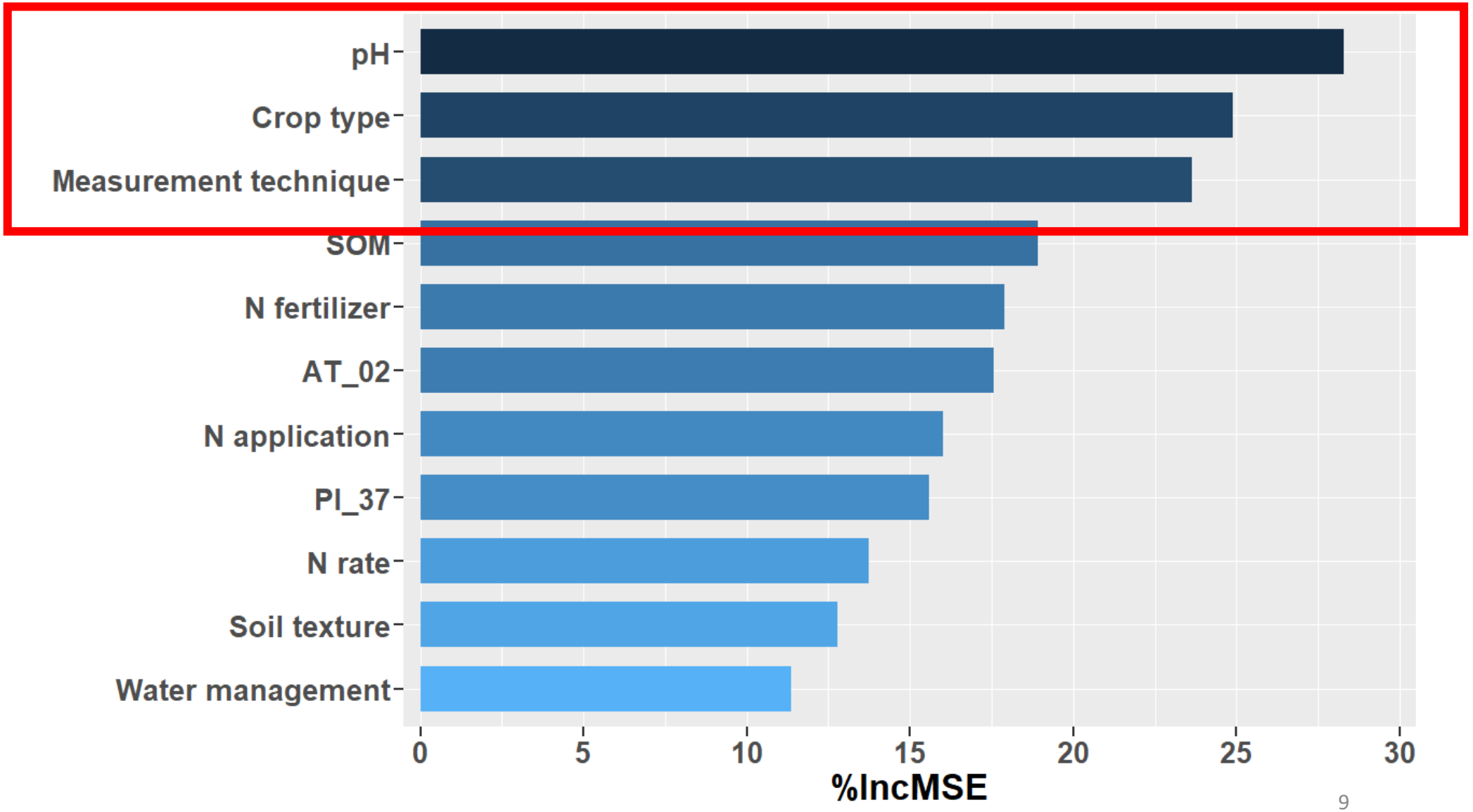


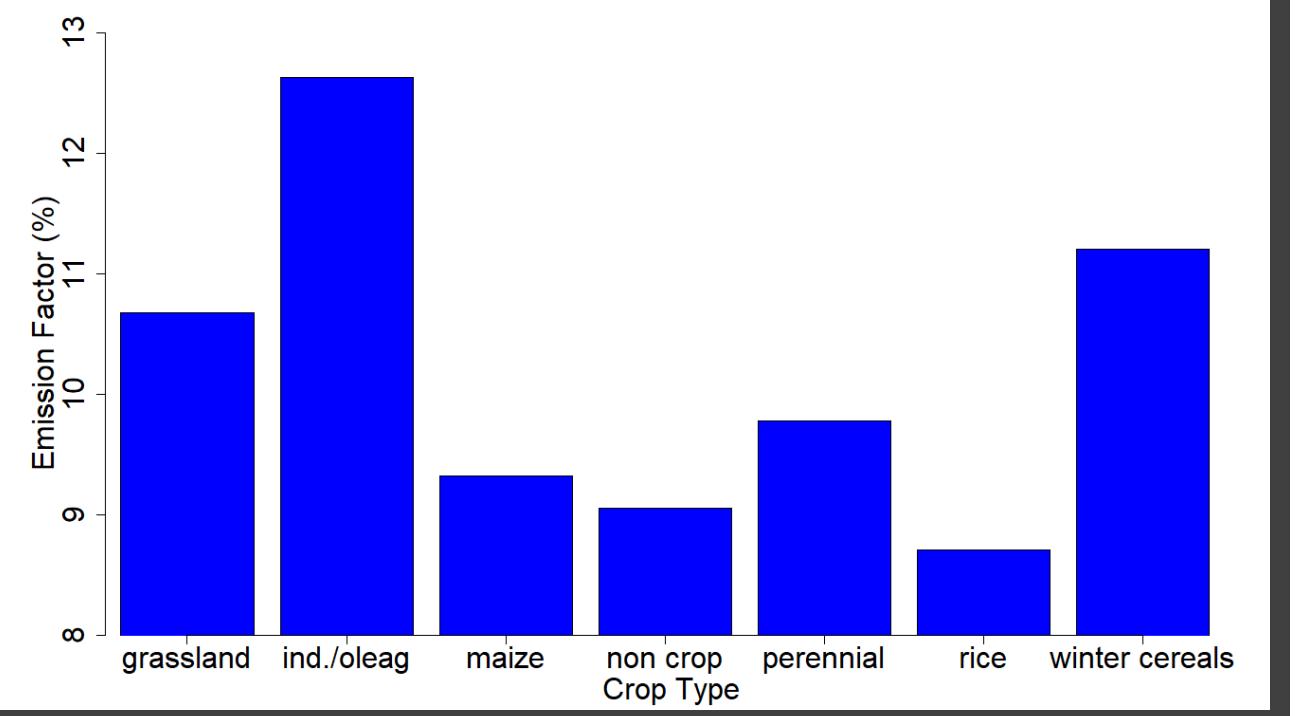

Ammonia emission (kg NH_3 ha^{-1})
9
12
15
18
21
24
27
30
33
36
5
6
7
8
pH

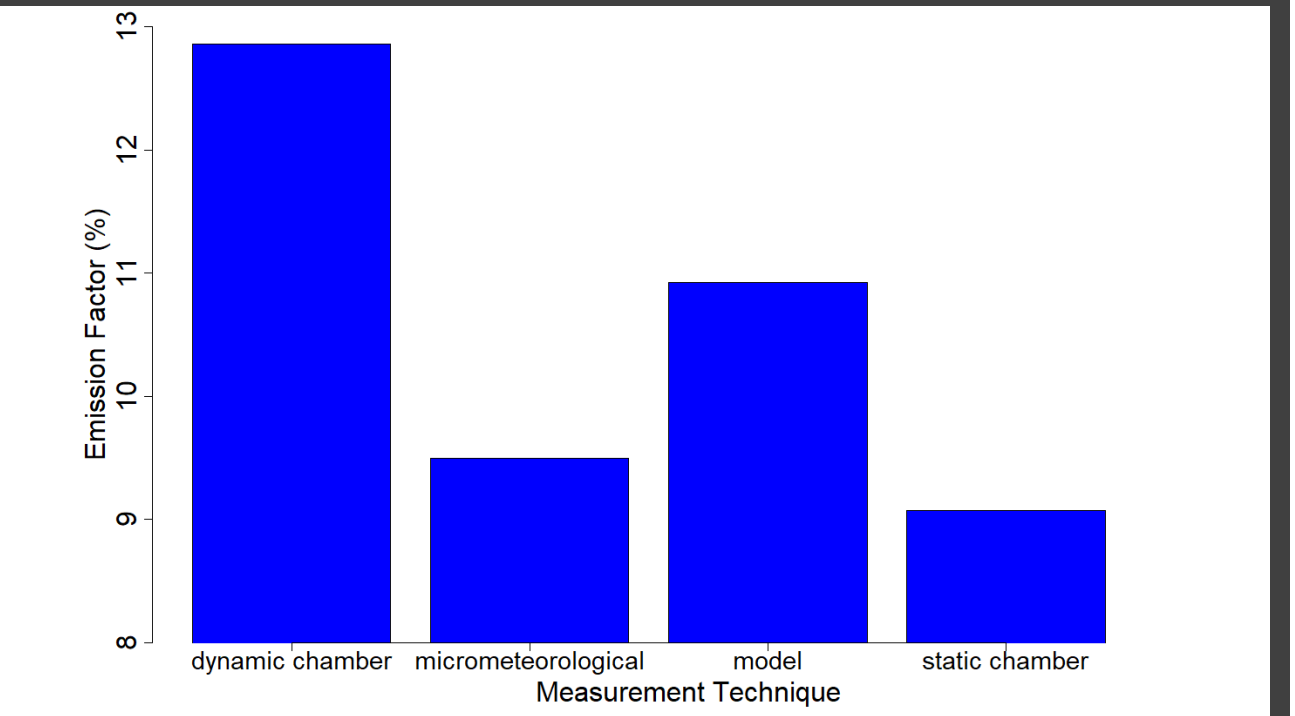

Ammonia emission (kg NH_3 ha^{-1})
8
12
16
20
24
28
50
100
150
200
250
N rate

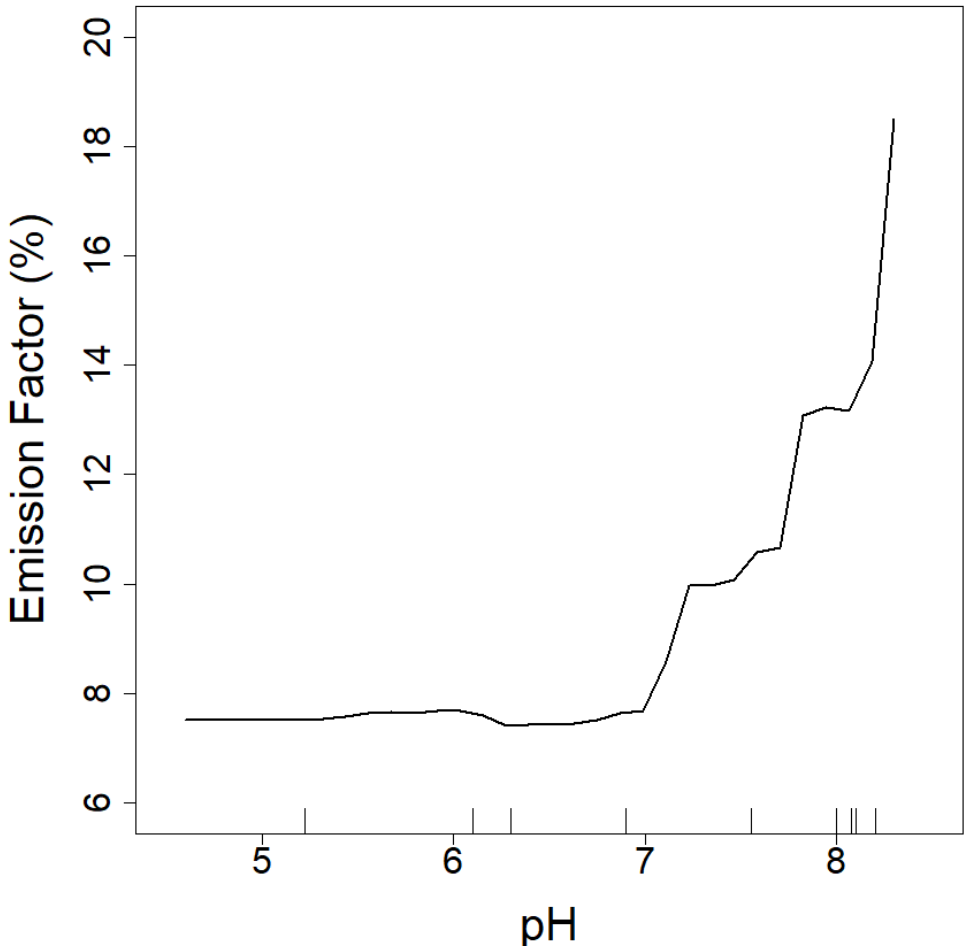
VARIABLE IMPORTANCE

Emission Factor (%)




Emission Factor (%)
8
9
10
11
12
13
grassland
ind./oleag
maize
non crop
perennial
rice
winter cereals
Crop Type


Emission Factor (%)
8
9
10
11
12
13
dynamic chamber
micrometeorological
model
static chamber
Measurement Technique


Emission Factor (%)
6
8
10
12
14
16
18
20
5
6
7
8
pH

SUMMARY AND CONCLUSIONS

- Random Forest is a suitable method to predict ammonia emissions.
- Soil pH is the most important variable that affects ammonia volatilization.
- We still cannot conclude that the intrinsic Mediterranean characteristics influence ammonia emissions.

THANKS FOR YOUR ATTENTION!

j.hurtadop@upm.es