Alfalfa to get back into planetary boundaries

2025 world alfalfa congress
FRANCE REIMS-CHÂLONS

Water management in alfalfa crops

Jézéquel S. & Arcia Ruiz I.

Parallel session 1

FROM 03 › TO 06 nov. 2025

Alfalfa to get back into planetary boundaries

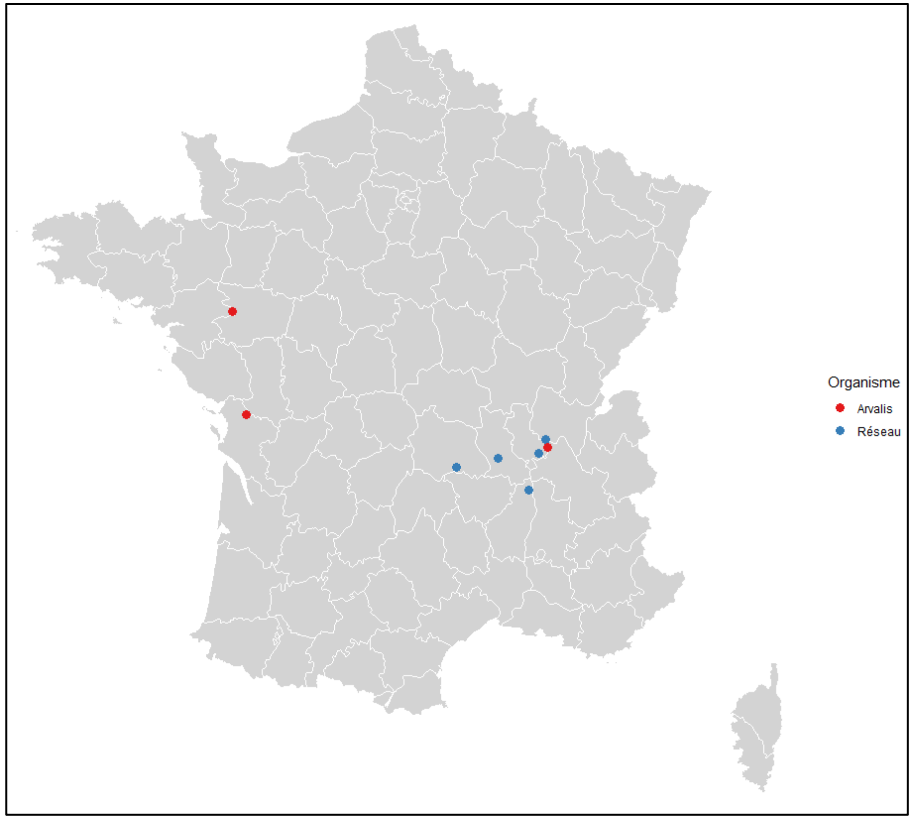
2025 world alfalfa congress
FRANCE REIMS - CHÂLONS

Effects of Water Stress on Alfalfa and Impacts of Irrigation

Pierre Larsonneau

FROM 03 › TO 06
nov. 2025

Introduction



- 4 years of experiment
- 3 trials in Arvalis sites, 5 trials in agricultor fields
- Understanding the response to irrigation of major forrage grasses and alfalfa

Introduction

- 5 Modalities studied :

→ **ETM**: irrigation aims to meet 100% of the crop's water requirements.

→**ETM 130**: 30% more water than the ETM treatment.

→**ETM 50**: 50% of the water supplied under ETM conditions.

→**Rainfed**: no irrigation applied.

→**"Managed" irrigation**: A single irrigation after each harvest if needed.

- Each trial is equipped with capacitives probes to monitor water consumption

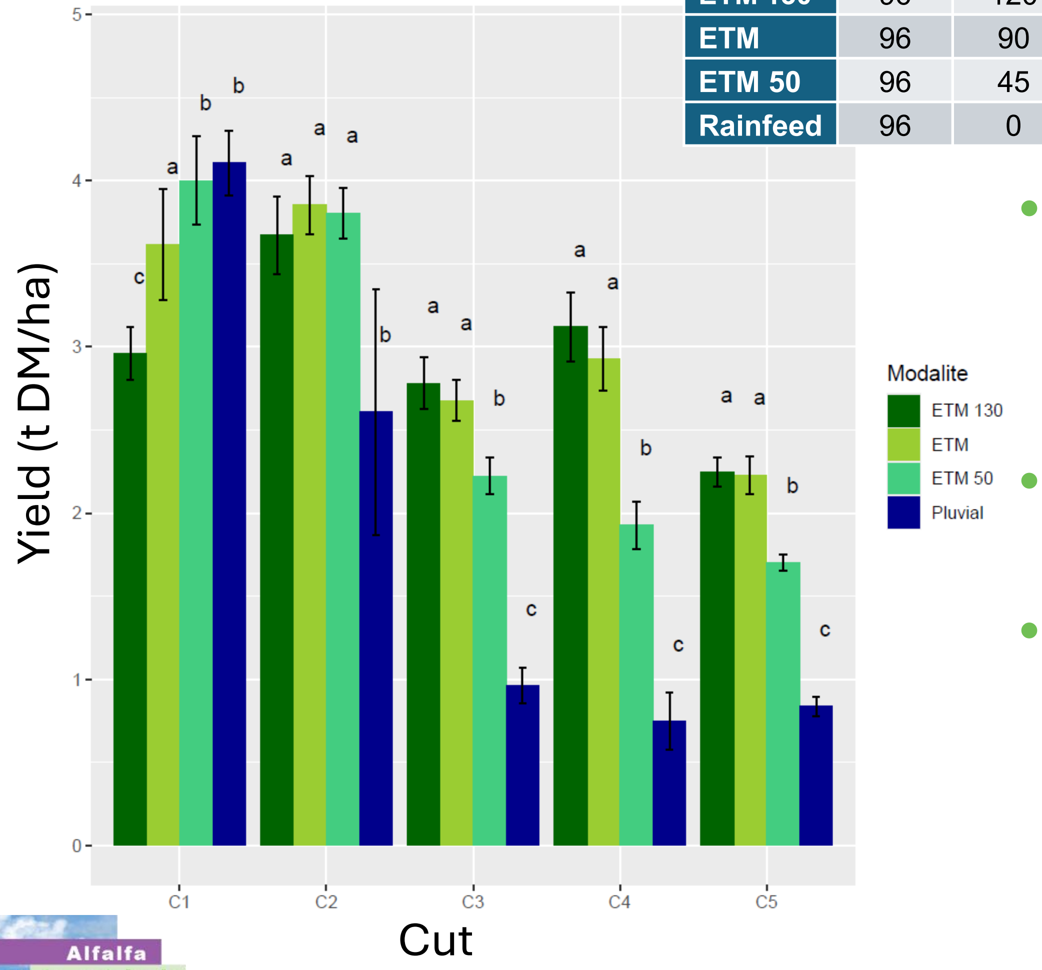
- $iWUE(Treatment) = \frac{Yield\ (treatment) - Yield(rainfeed)}{Irrigation(treatment) - Irrigation(rainfeed)}$

Results

- An example : Pusignan (69) 2022

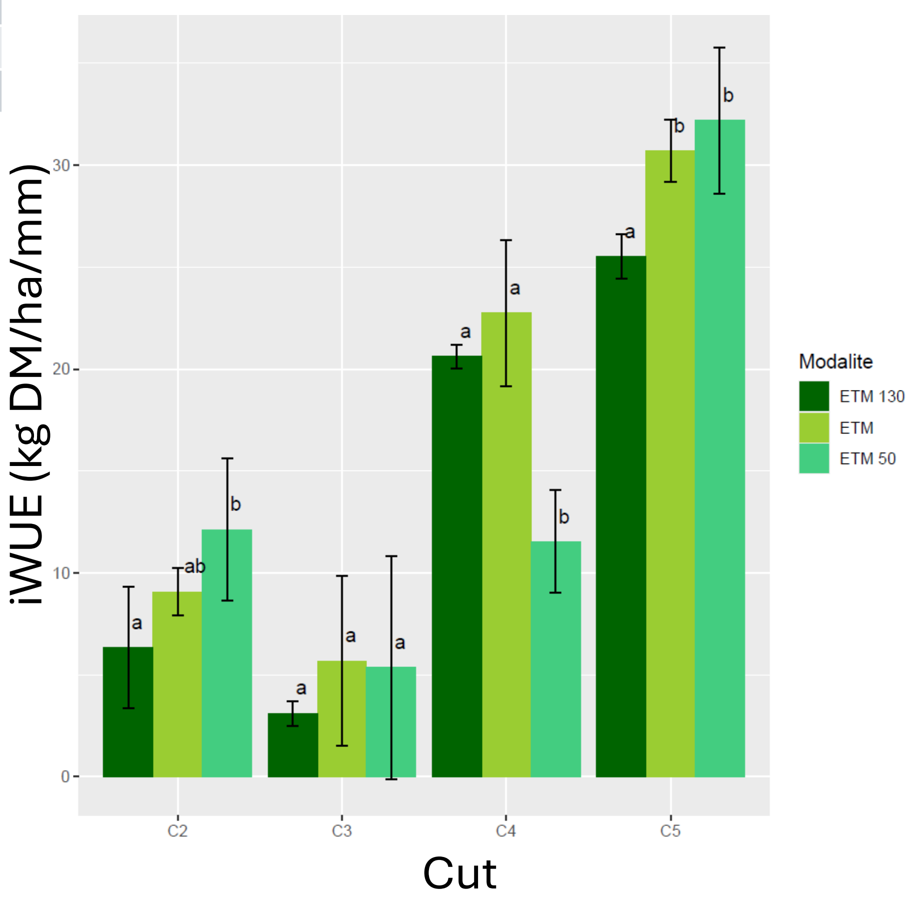
Irrigation per cut et modality (mm)						
Modality	C1	C2	C3	C4	C5	C6
ETM 130	96	120	80	150	80	0
ETM	96	90	60	120	60	0
ETM 50	96	45	30	75	30	0
Rainfeed	96	0	0	30	0	0

Alfalfa Yield, Pusignan 2022

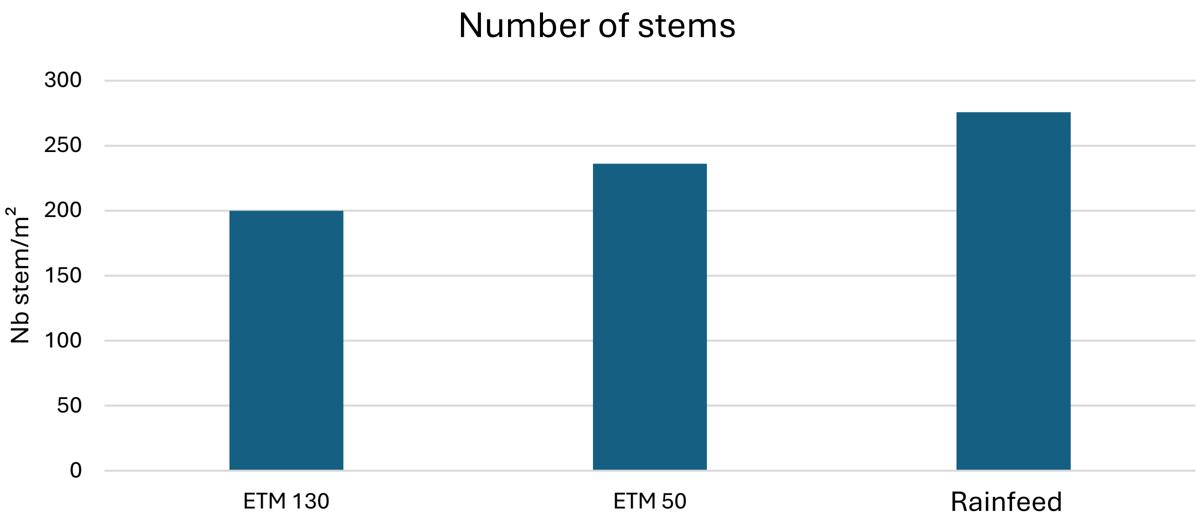


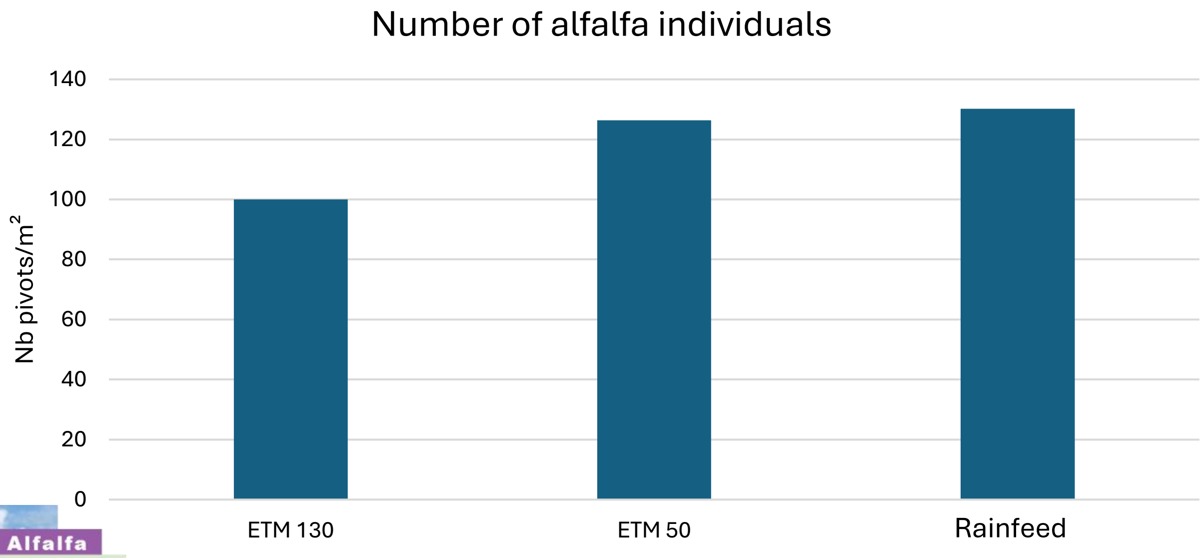
- Block trial to enhance statistical power (Tukey test)
- High variability for iWUE
- Negative impact of the irrigation for N+1

Irrigation Water Use Efficiency Pusignan 2022



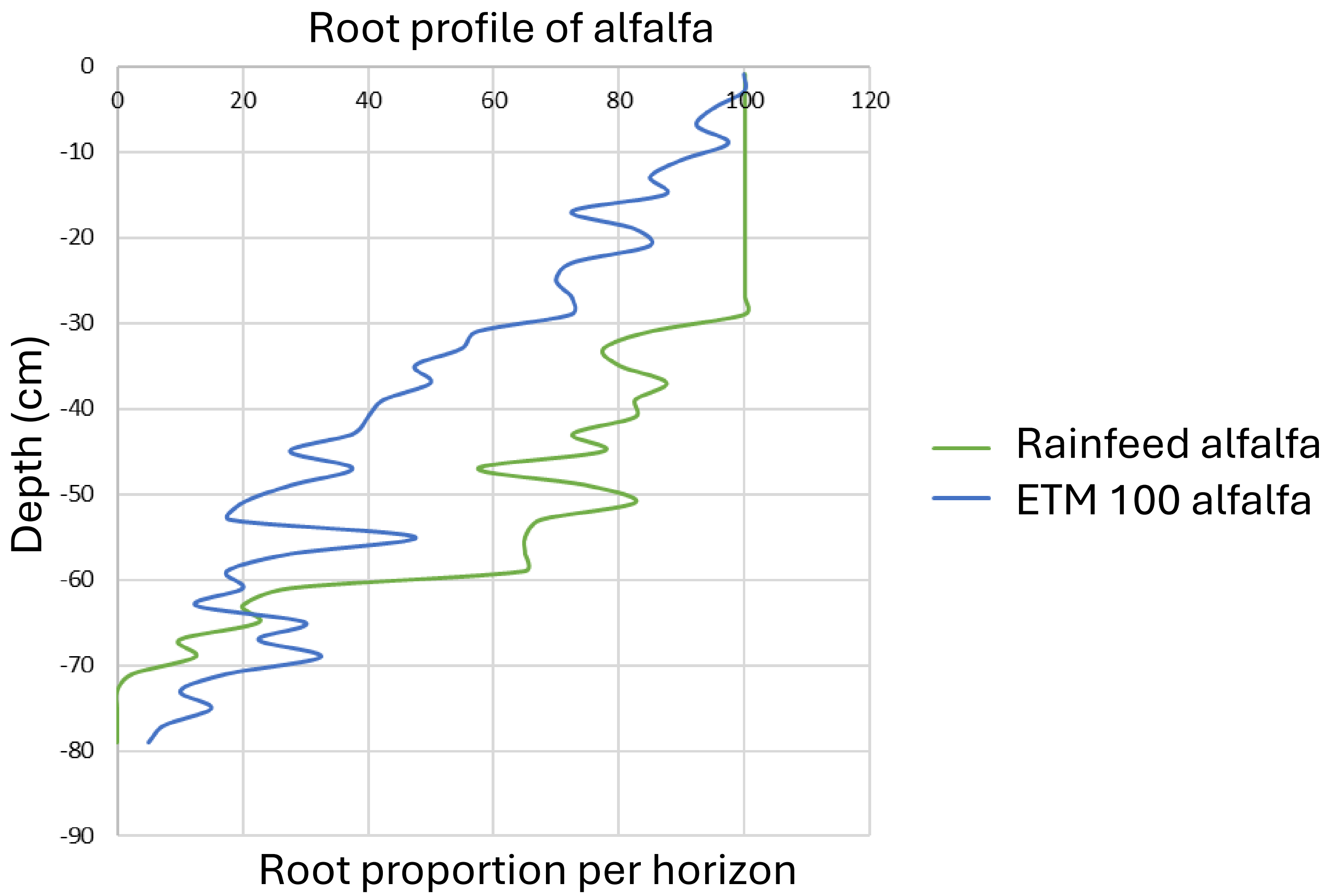
Results





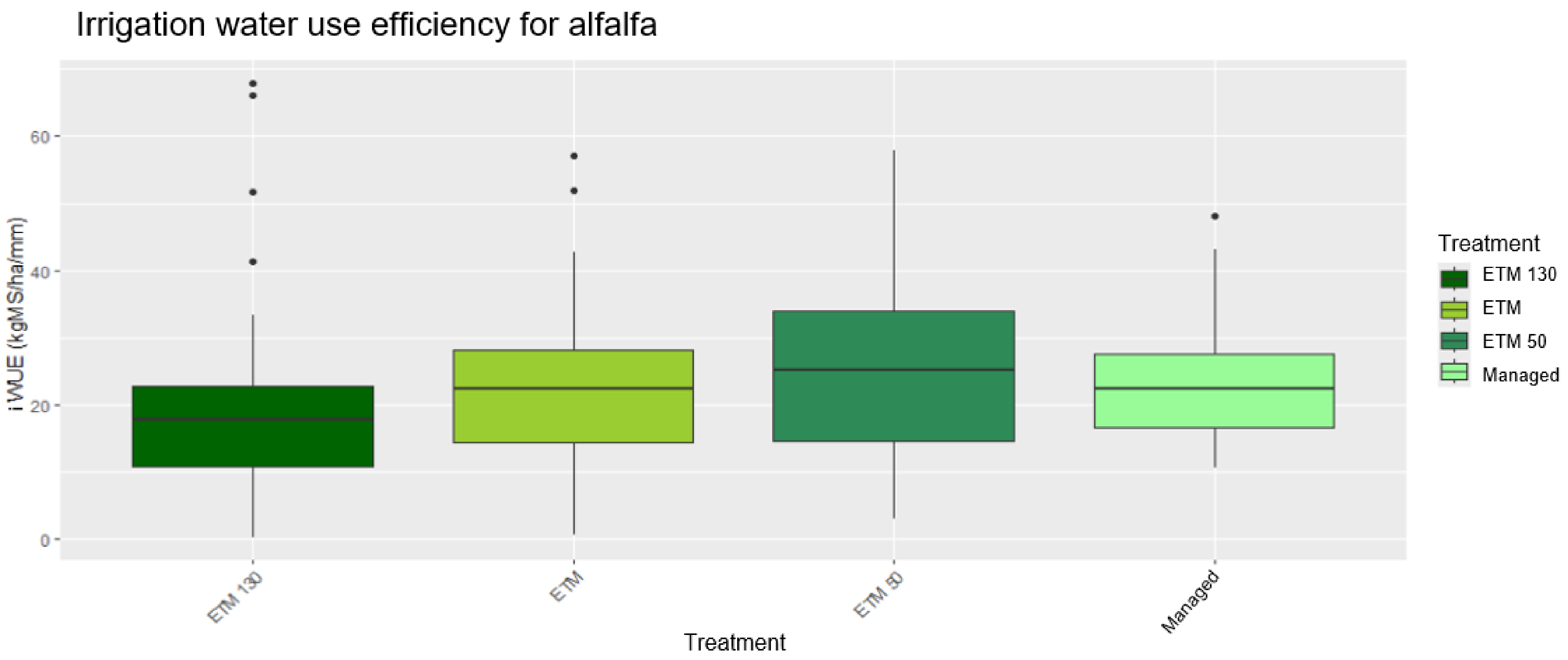
- Observations on 16/05
- Water regime had a marked effect on plant population
- -27% stems between Rainfeed and ETM130
- -23% alfalfa individuals between Rainfeed and ETM130

Results



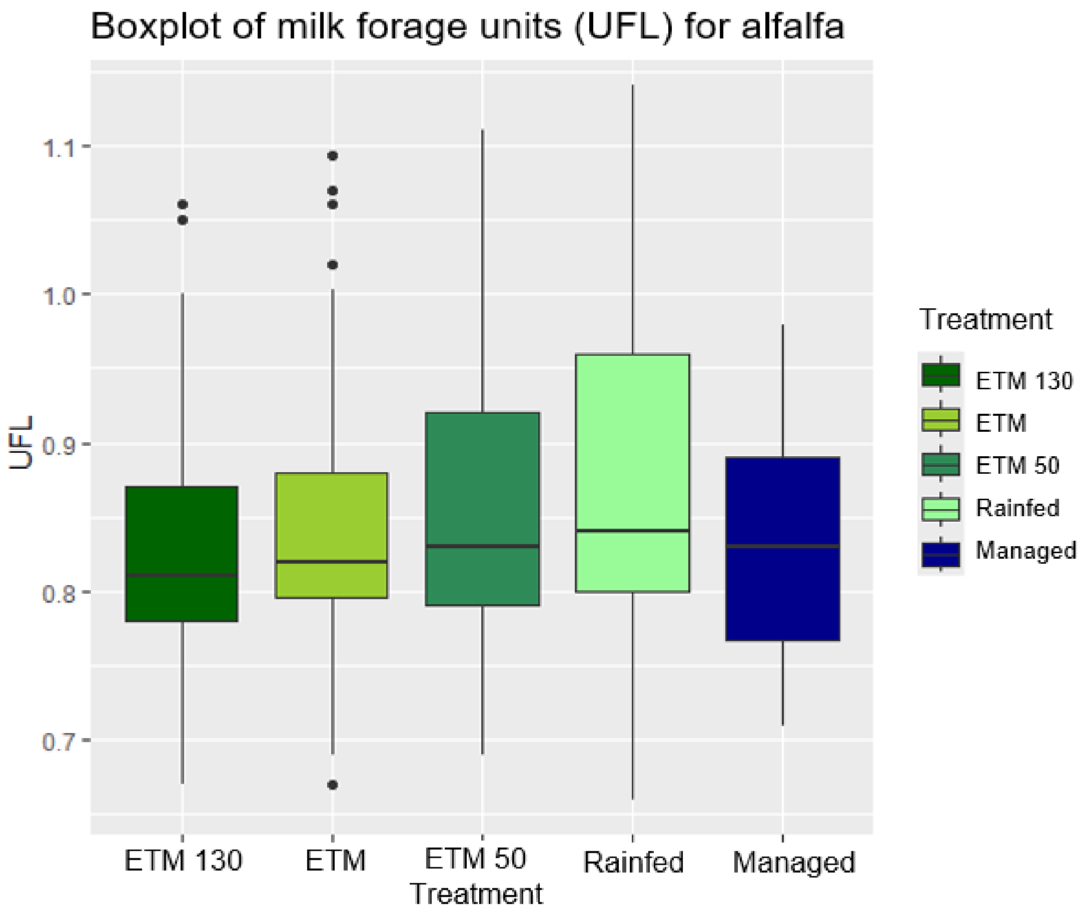
- Water regime seems to impact the root profile of alfalfa

Results

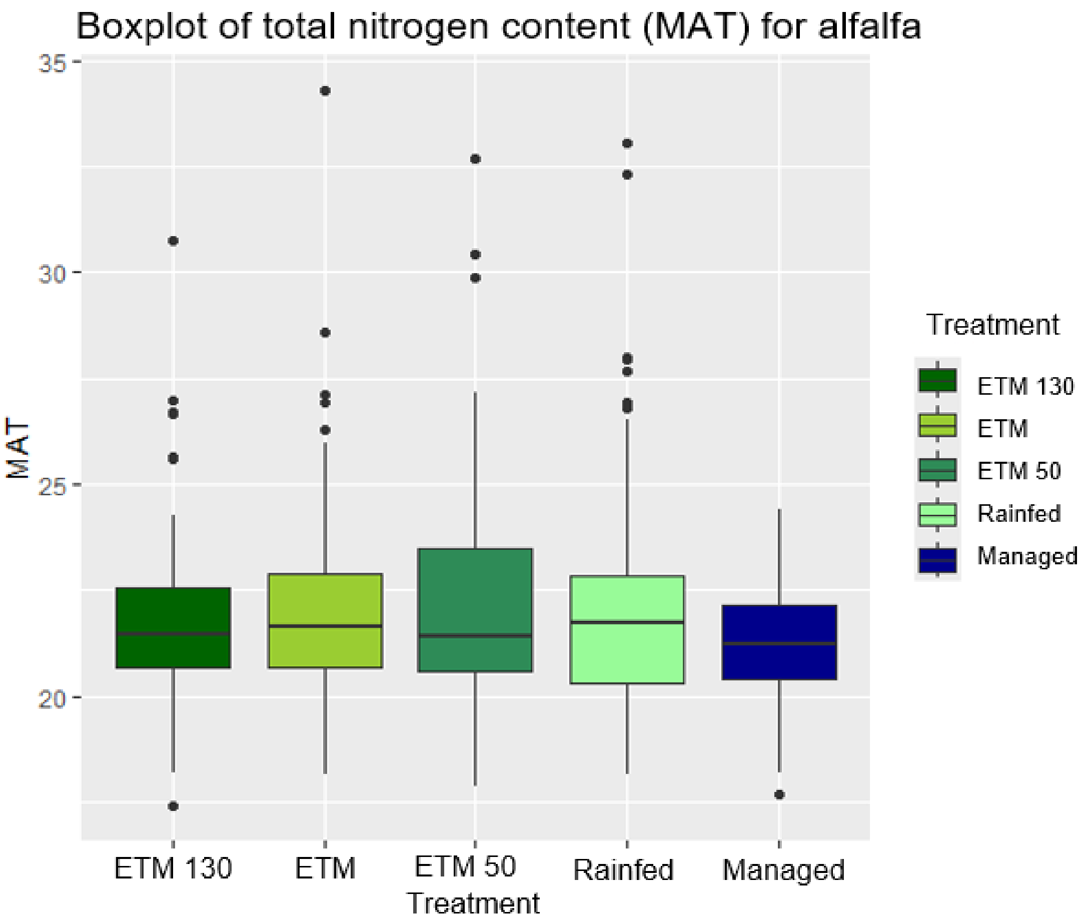


Irrigation water use efficiency for alfalfa
iWUE (kgMS/ha/mm)
0
20
40
60
ETM 130
ETM
ETM 50
Managed
Treatment
Treatment
ETM 130
ETM
ETM 50
Managed

Result



Boxplot of milk forage units (UFL) for alfalfa
UFL
1.1
1.0
0.9
0.8
0.7
ETM 130
ETM
ETM 50
Rainfed
Managed
Treatment
Treatment
ETM 130
ETM
ETM 50
Rainfed
Managed



Boxplot of total nitrogen content (MAT) for alfalfa
MAT
35
30
25
20
ETM 130
ETM
ETM 50
Rainfed
Managed
Treatment
Treatment
ETM 130
ETM
ETM 50
Rainfed
Managed

Conclusion

- The irrigation water use efficiency for alfalfa observed in this trial is around 22 kg DM ha^{-1} mm^{-1}
- There is large variability between cuts, locations, and years.
- Further analysis is ongoing to better understand the overall water use efficiency of alfalfa and the factors affecting both iWUE and WUE.