Alfalfa to get back into planetary boundaries

2025 world alfalfa congress
FRANCE REIMS-CHÂLONS

Sequence 3: Genetics and breeding

Dr. Charlie Brummer

Young professionals event

FROM 03 TO 06 nov. 2025

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Using High-Throughput Phenotyping Techniques and Genome Wide Association Studies (GWAS) to Select Drought Tolerant Alfalfa (*Medicago sativa* L.) Populations in Mediterranean Drought-Prone Environments

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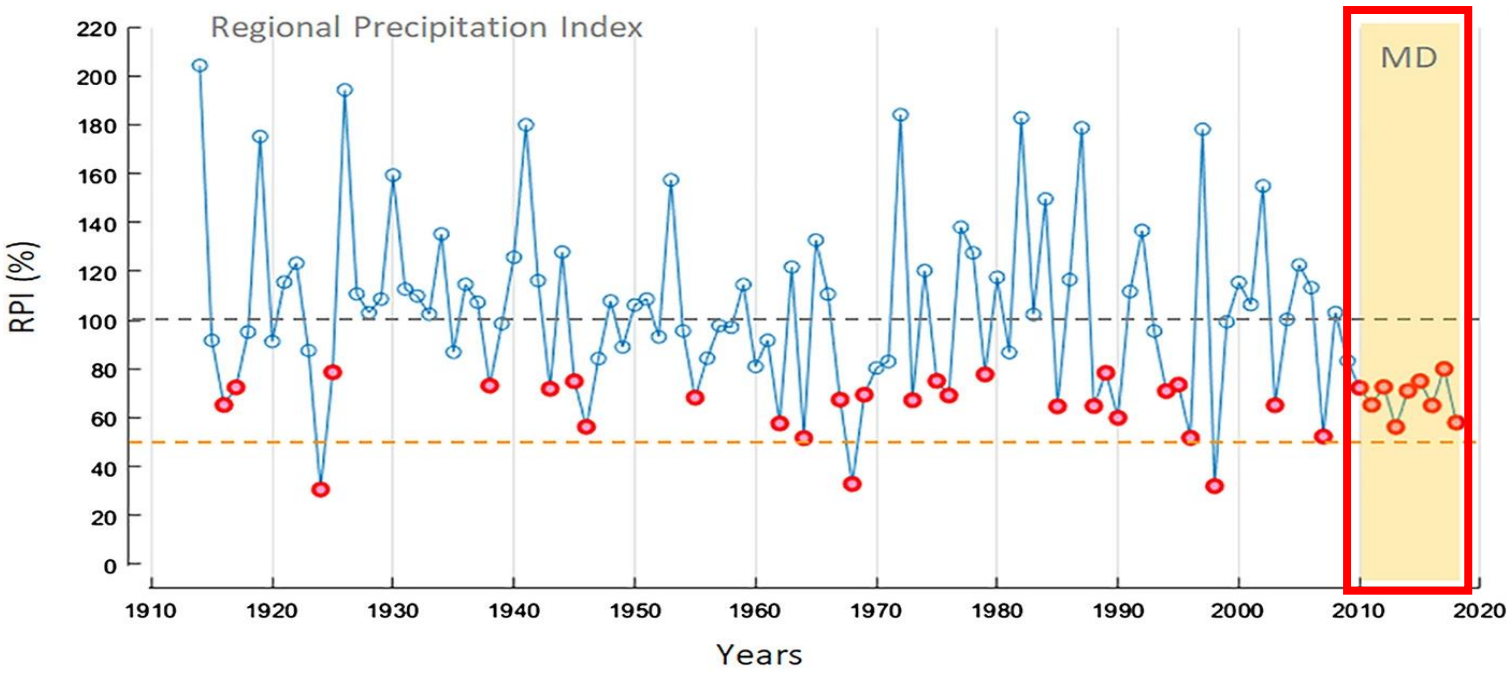
FROM 03 TO 06 nov. 2025

Research Gap/Problem



Need of the hour

High yielding and drought resistant Alfalfa Varieties

Garreaud et al. (2020), *International Journal of Climatology*, 40(1): 421-439

Graphical Illustration of project

Central Chile

Phenotyping


Remote Sensing Indexes


Forage Yield


Stem Traits

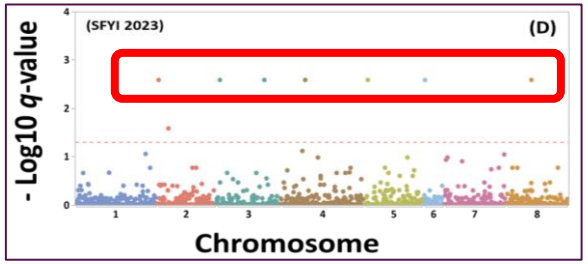

Leaf Traits

Genotyping (GBS)

- Group 1 = 2387 SNPs
- Group 2 = 5386 SNPs
- Group 3 = 9065 SNPs
- *Ind. n* = 250

FY *vs* HTPP Indices	
Negatively Correlated	Positively Correlated
CTD	Hue
Intensity	Saturation
Lightness	b* , v*
a*	GA
u*	GGA

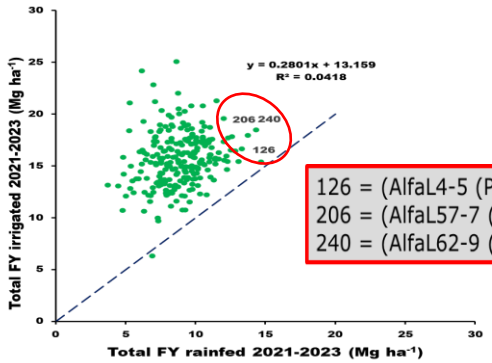
GWAS (SNP-Trait Association) Tetraploid Additive Models



Significant SNPs for DT *vs* FY

Final Outcomes:

- ✓ FY varied in both water regimes.
- ✓ Winter FY ranged 1.4–8.2 Mg ha^{-1}.
- ✓ Total FY ranged 3.7–25.1 Mg ha^{-1}.
- ✓ CTD negatively correlated with FY.
- ✓ GWAS identified Novel SNPs.
- ✓ SNPs Functional annotation support alfalfa breeding.



126 = (AlfaL4-5 (Progenitor SARDI7)
206 = (AlfaL57-7 (Progenitor WL903)
240 = (AlfaL62-9 (Progenitor Baldrich350)