Alfalfa to get back into planetary boundaries

2025 world alfalfa congress
FRANCE REIMS-CHÂLONS

Technologies for alfalfa breeding and production

Julier B. & Noushahi H.

Parallel Session 5

FROM 03 › TO 06 nov. 2025

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Combinations of alfalfa management practices that maximize on farm yields

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U. Wisconsin (USA), SLU (Sweden)

Management practices that maximize alfalfa forage harvested on farms: Insights from technological groups | Agronomy Journal

FROM 03 TO 06 nov. 2025

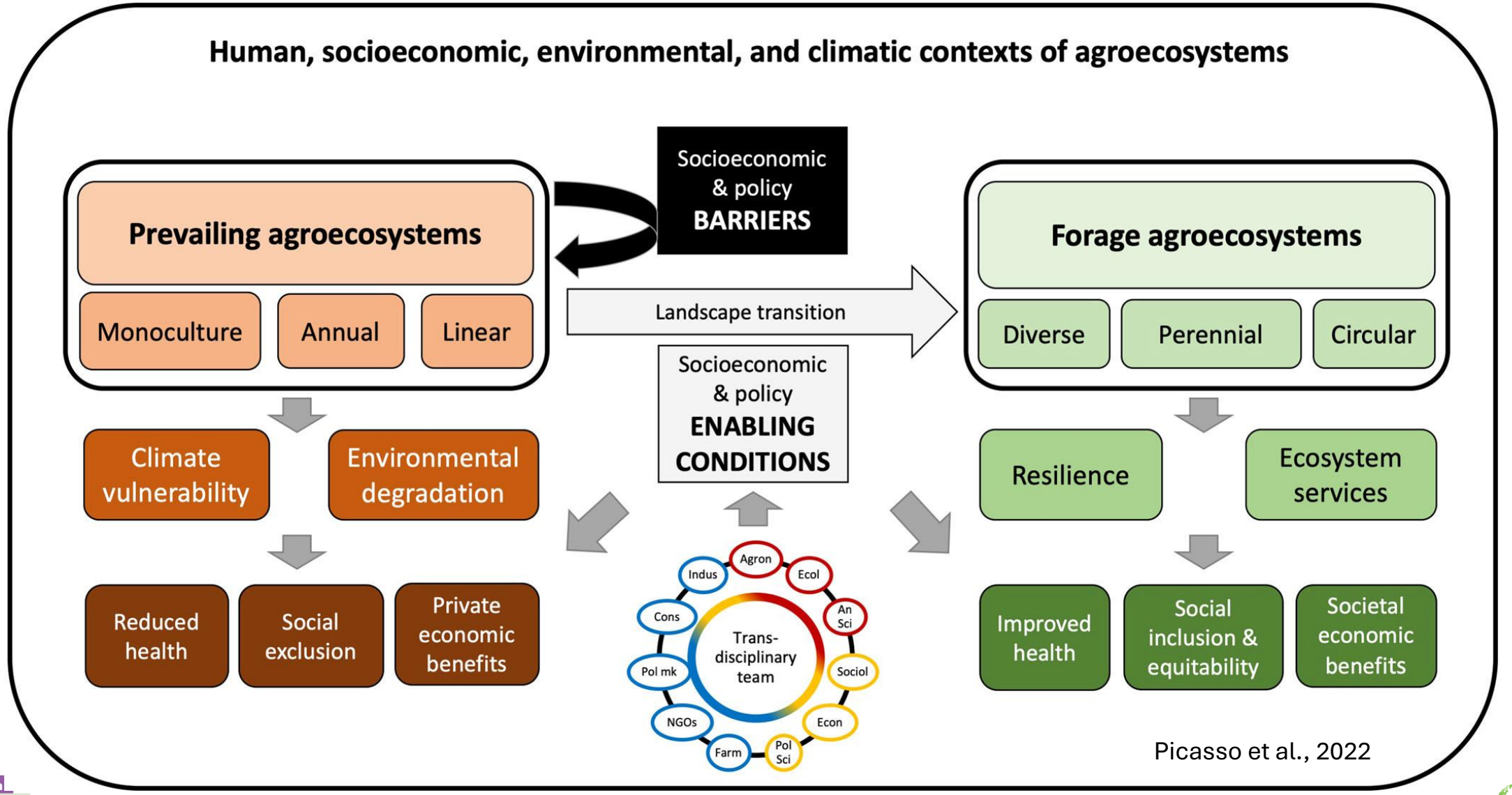
NATIONAL ALFALFA & FORAGE ALLIANCE NAFA

Agricultural Resilience

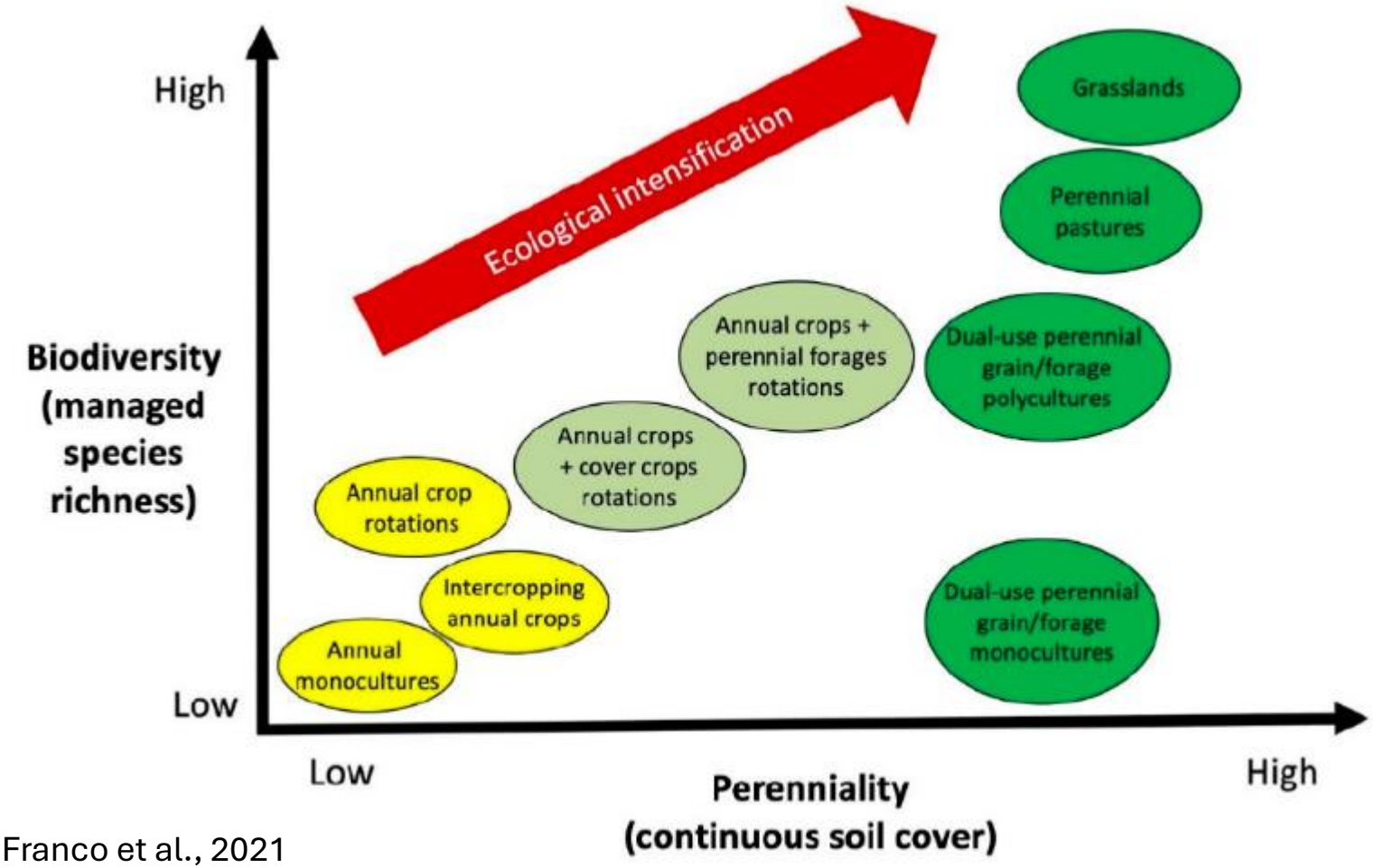
MFA Midwest Forage Association

USDA - NIFA, Sustainable Agricultural Systems Program: Fostering Resilience and Ecosystem Services in Landscapes by Integrating Diverse Perennial Circular Systems, Resilience CAP, Grant No. 2021-68012-35917

Fostering Diverse, Perennial, Circular Systems

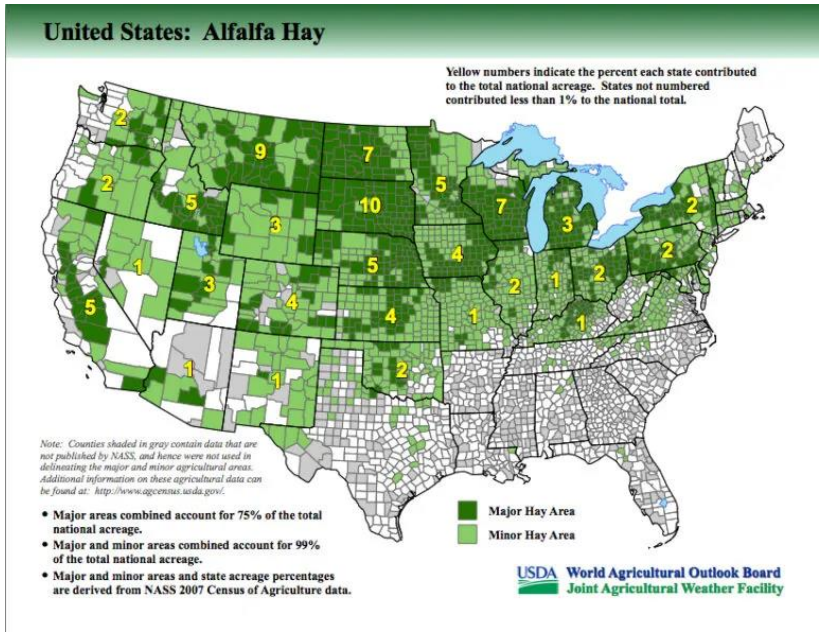


Picasso et al., 2022



Franco et al., 2021

Alfalfa is key for diverse, perennial, circular systems

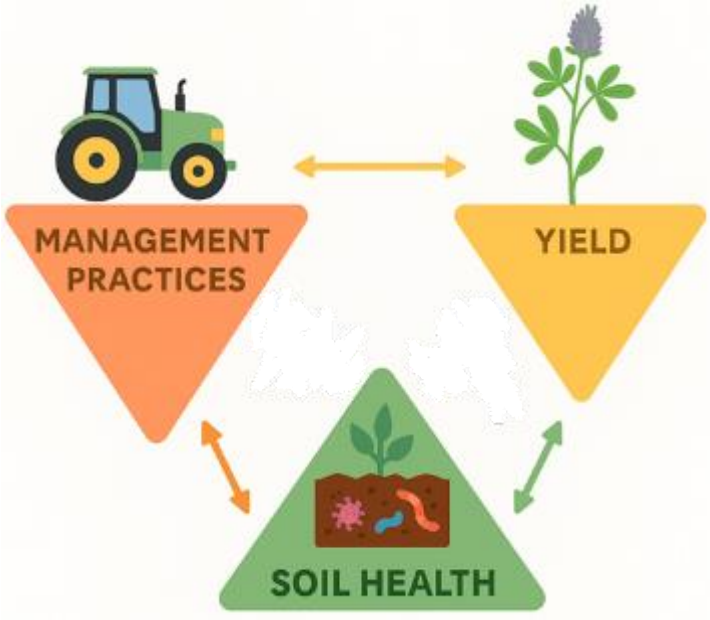


Research questions

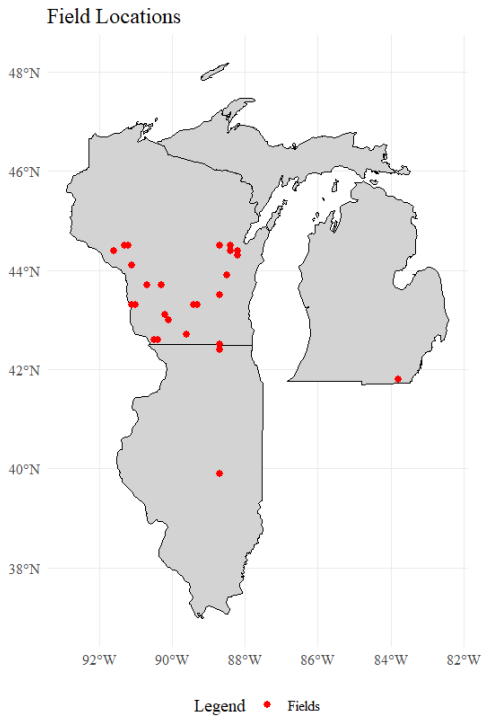
1. Which management practices are associated with higher forage yields?

2. What soil health indicators are linked to higher forage yields?

3. Are groups of farms associated with specific soil health indicators?



Methodology



24 farmers contributed forage yield data from 38 alfalfa fields.

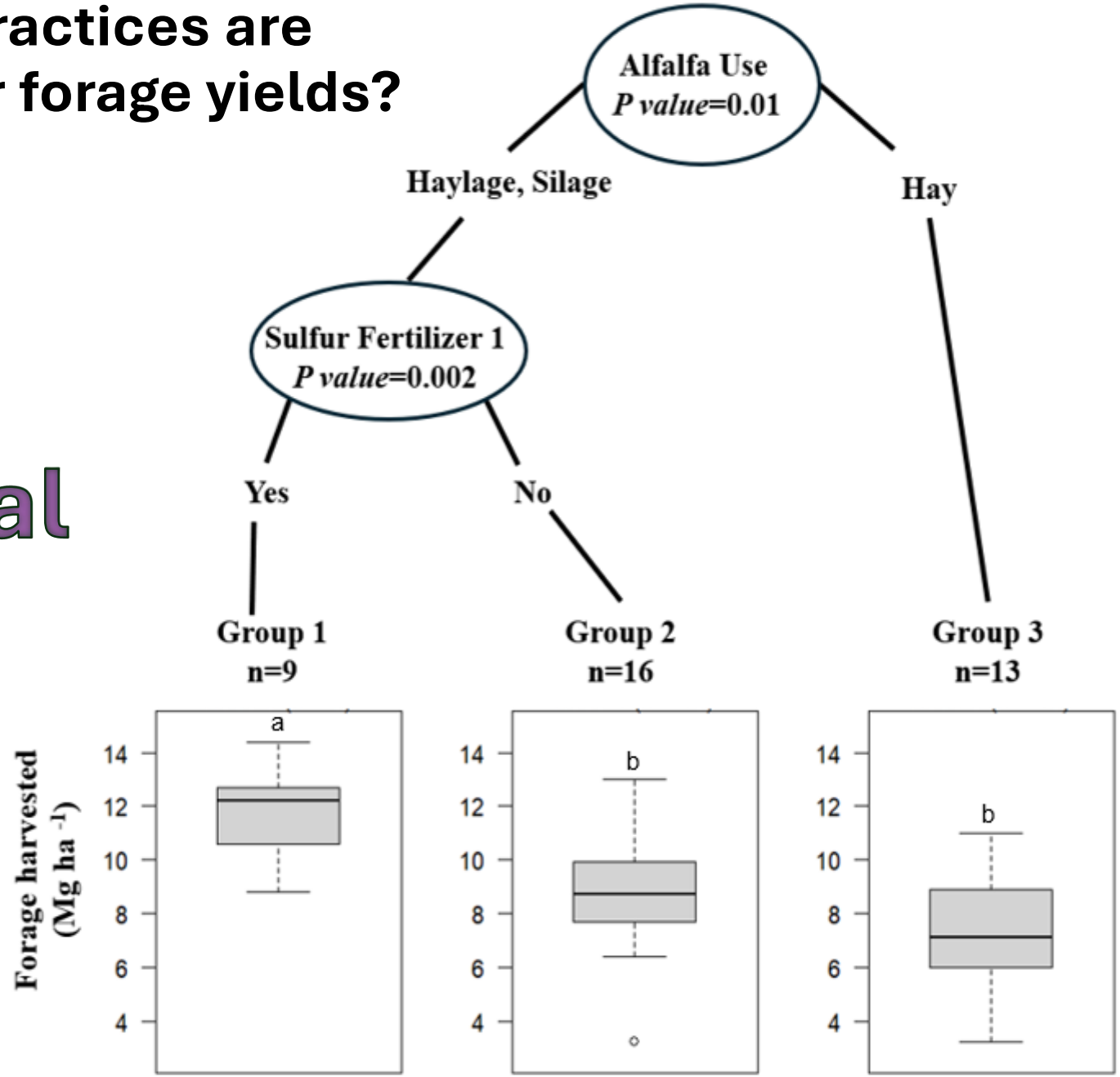
Complete an in-depth questionnaire of management practices designed by the research team.

Soil samples were collected from 32 fields during the 2021 and 2022 growing seasons.

Soil samples were analyzed for chemical (pH, extractable nutrients), physical (bulk density, aggregate stability), and biological (SOM, POX-C, microbial communities via PLFA) indicators.

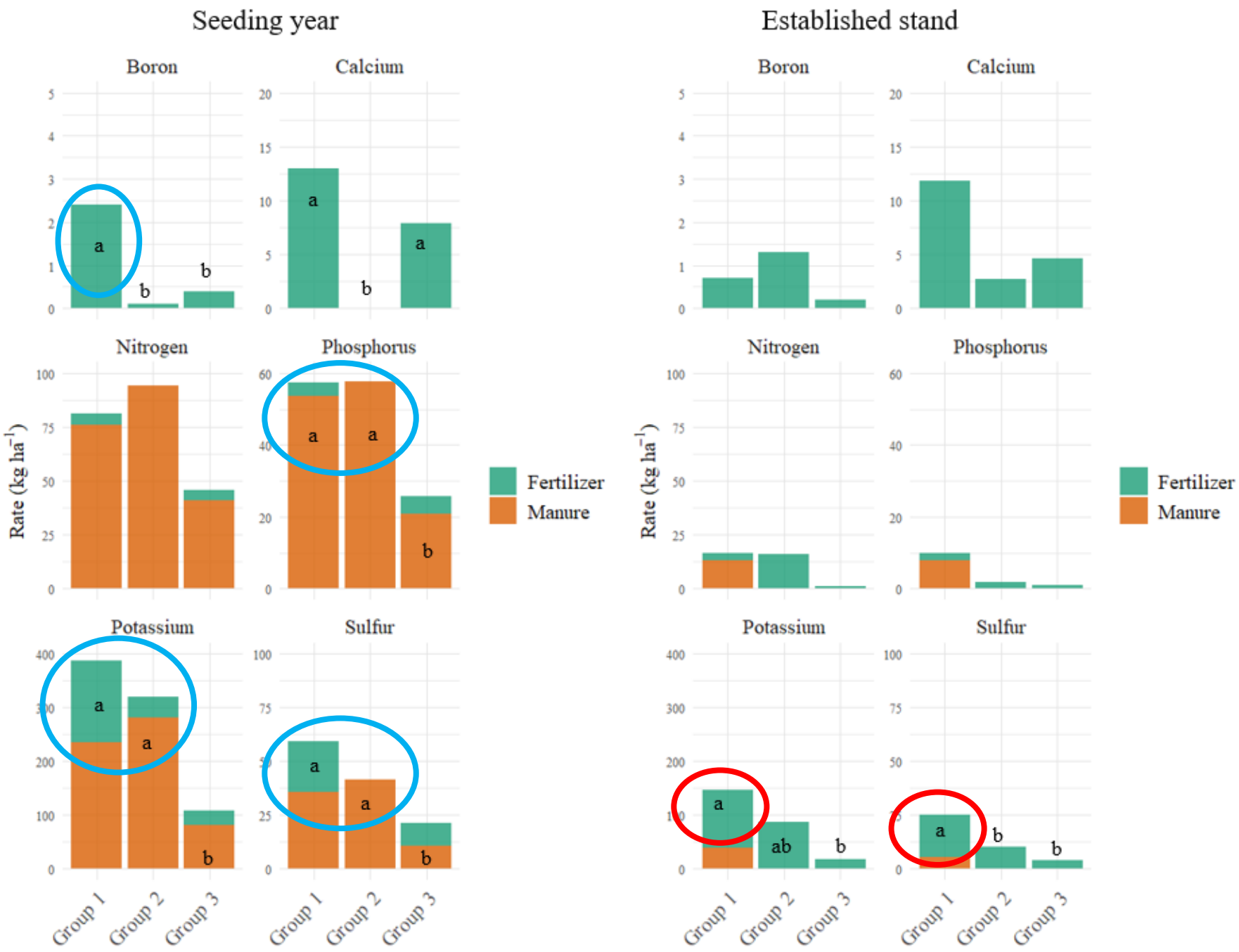
1. **Which management practices are associated with higher forage yields?**

Alfalfa technological groups



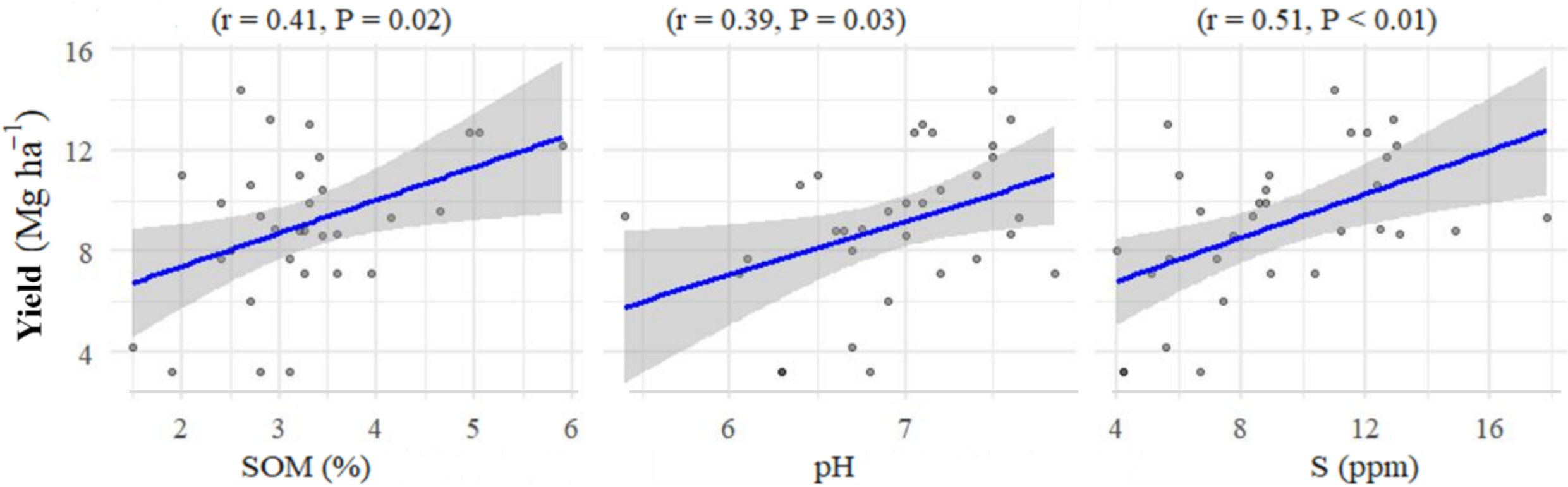
Management practices associated with each group

	Group 1: High input silage and haylage	Group 2: Medium input haylage	Group 3: Hay fields	P value
Average number of Cuts	4 a	4 a	3 b	0.02
Percentage of farms with more than 3 cuts	78%	100%	31%	
Alfalfa Use				<0.01
Percentage of farms with Hay	0	0	100%	
Percentage of farms with Haylage	44%	94%	0	
Percentage of farms with Silage	56%	6%	0	



Total nutrients from fertilizer and manure (kg ha^{-1}) application per technological group.

2. What soil health indicators are linked to higher forage yields?



3. Are these farm groups associated with soil health indicators?

	Group 1: High input silage and haylage		Group 2: Medium input haylage		Group 3: Hay fields		P value
Number of Fields	8		12		12		
Perform Soil test (% Fields)	75		58		25		0.07
pH	7.2	a	7.2	a	6.5	b	< 0.01
SOM (%)	3.8		3.2		2.9		0.10
N (ppm)	11.9	a	9.2	ab	6.9	b	0.03
P (ppm)	34.4		39.1		40.0		0.89
K (ppm)	157.1	a	116.9	ab	96.8	b	0.04
S (ppm)	12.6	a	8.9	b	7.3	b	< 0.01
POX-C (ppm)	1075.5		841.4		915.0		0.08
Total Biomass (ng/g)	4106.7		3280.0		2830.4		0.48
Total Bacteria Biomass (ng/g)	1721.3		1370.7		1010.2		0.27
Total Fungi Biomass (ng/g)	278.4		252.4		180.3		0.55

Conclusions

Strategic nutrient management, especially sulfur, potassium, boron, and phosphorus, is key to maximizing alfalfa yield.

The intended use of alfalfa (hay, haylage, or silage) determines harvest frequency, input use, and strongly influences productivity.

Higher SOM and optimal pH are closely linked to greater yield potential.

Data-driven practices, such as frequent soil testing and efficient input use, as seen in Group 1, could help reduce the alfalfa yield gap through improved management and enhanced soil health.