

2026 NAAIC

Agricultural Machinery Traffic Significantly Reduces Alfalfa Production & Persistence

Beatriz Bizzuti (MSU)
Marta Moura Kohmann (UW-Madison)
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This work is funded by the United States Department of Agriculture (USDA) and conducted in collaboration with the USDA–Agricultural Research Service

Machinery traffic effects on alfalfa

Typical alfalfa fields



Alfalfa fields need multiple mechanized operations

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More wheel traffic!
50% field passed 1X

All machinery operations followed for one growing season in a commercial dairy operation



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Adapted from: Bizzuti et al., 2026



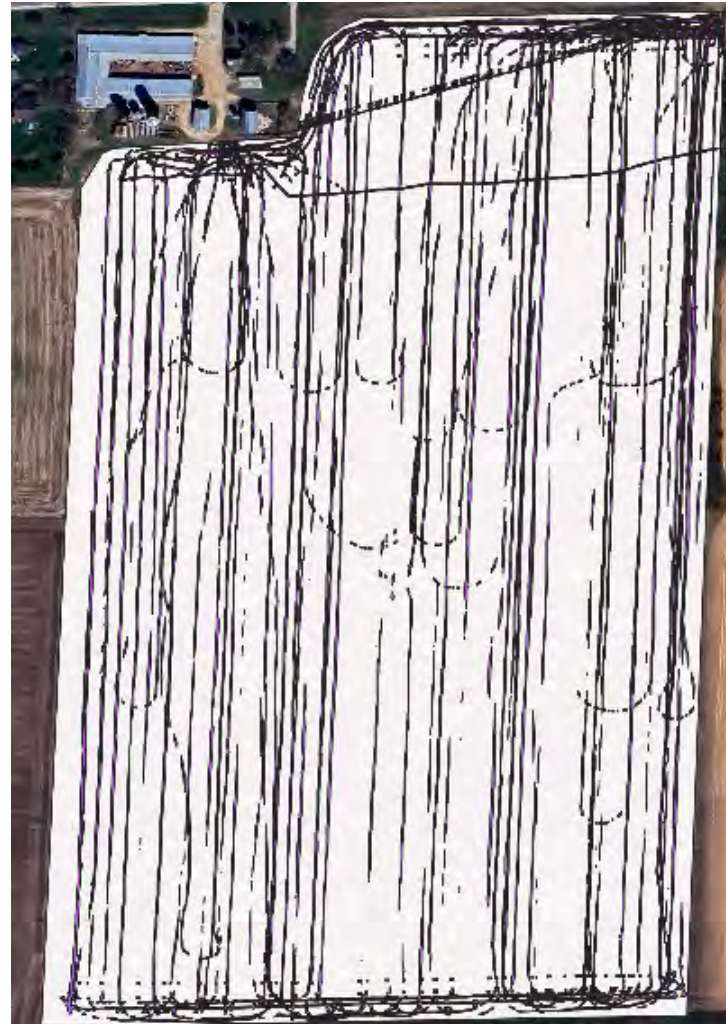
All machinery operations followed for one growing season in a commercial dairy operation

Lines = machinery passes = 50% of the field sees traffic at least once!



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All machinery operations followed for one growing season in a commercial dairy operation

Lines = machinery passes = 50% of the field sees traffic at least once!



Lines = overlap = 14% of the field sees traffic 2x or more!

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Corn-alfalfa interseeded fields



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Additional mechanized operations for growing corn

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Wheel traffic

- Soil compaction
- Damages to alfalfa crown (growing points, increase disease incidence)

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Wheel traffic

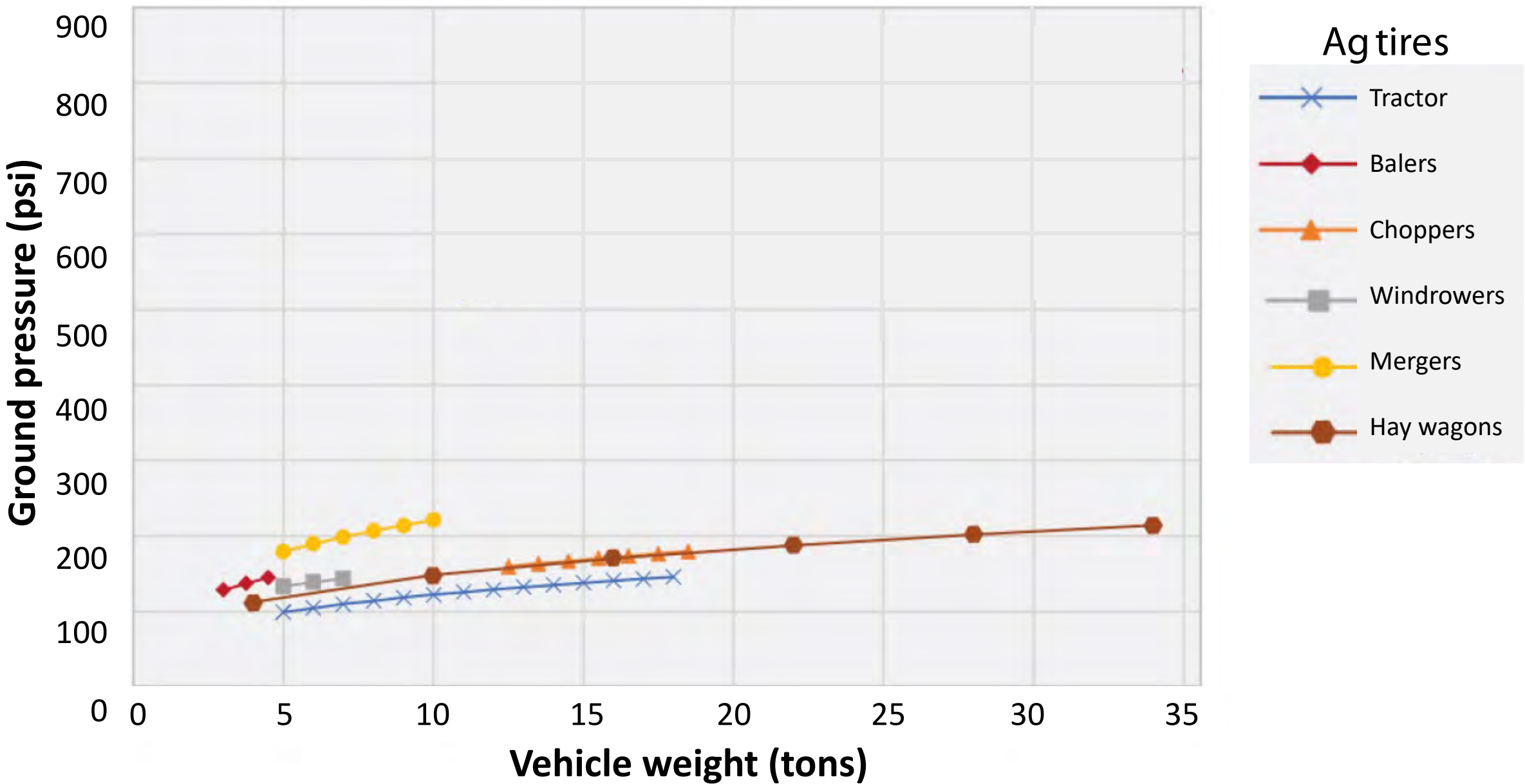
- Soil compaction
- Damages to alfalfa crown (growing points, increase disease incidence)

Previous work:

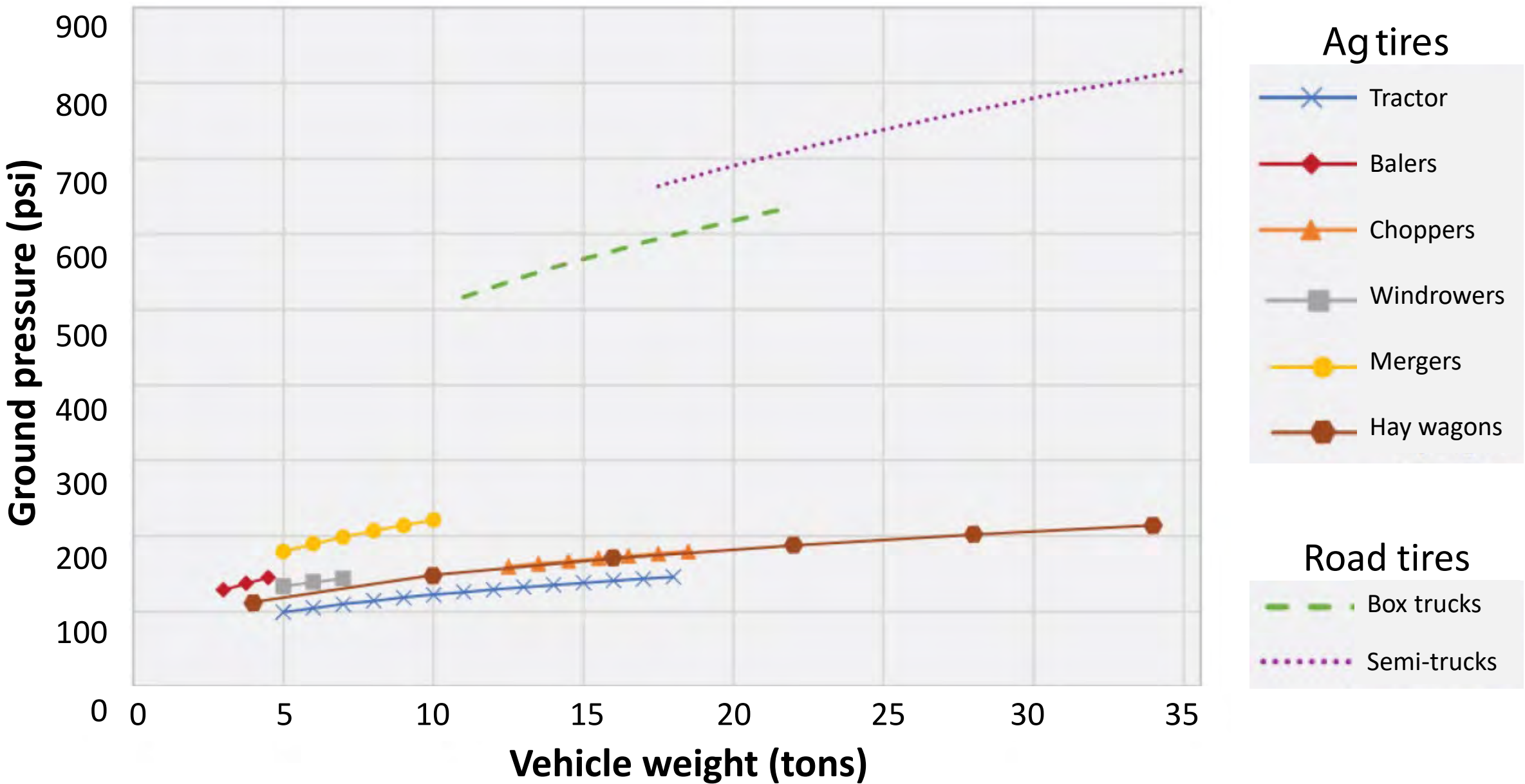
- Reduction in alfalfa biomass = ~10-15%
- Most work done with tractors (agricultural tires)

Machinery traffic effects on alfalfa

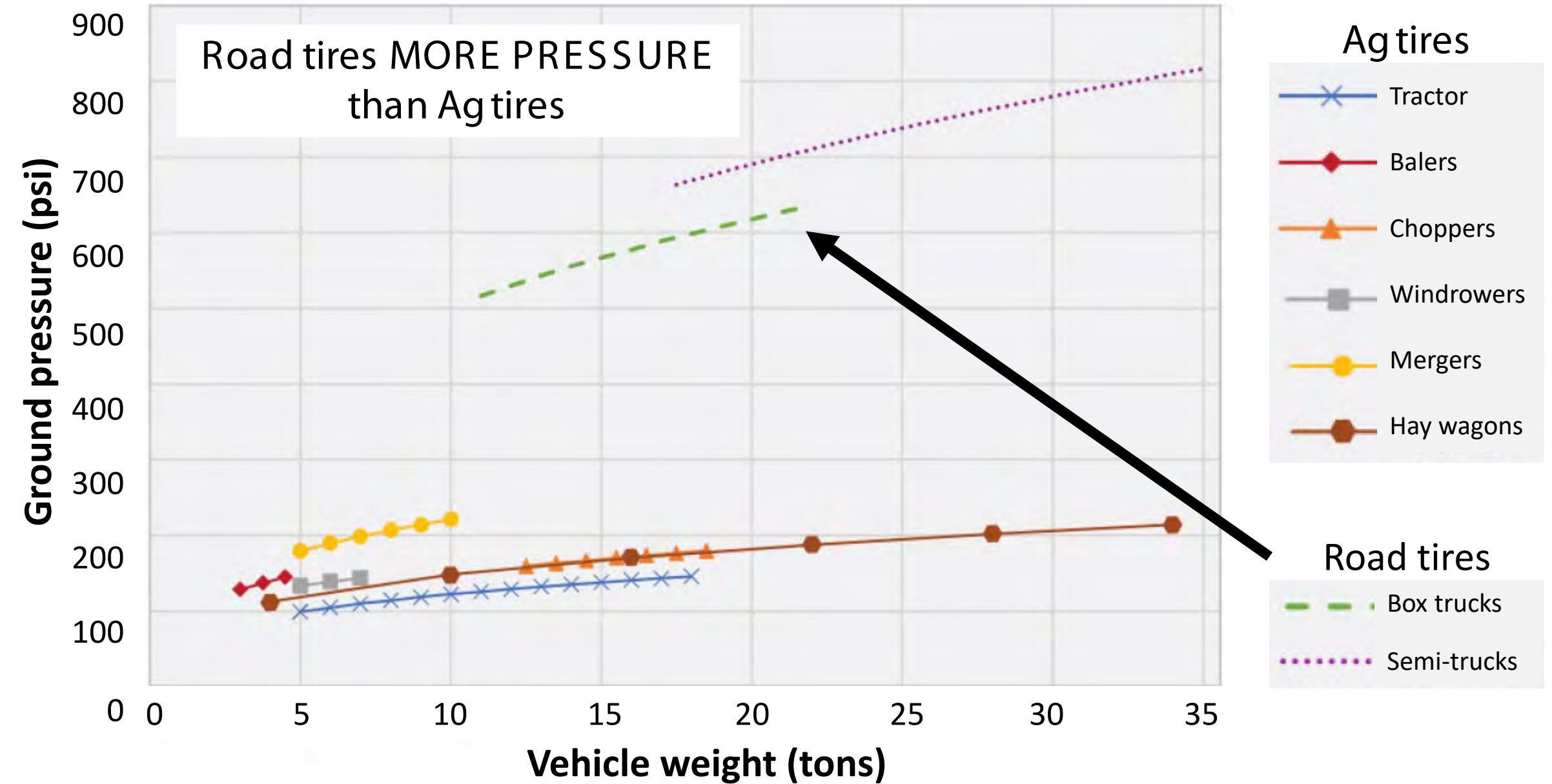
Machinery traffic effects on alfalfa



Machinery traffic effects on alfalfa



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Materials and Methods – treatments

Full factorial in a RCBD and 4 replicates

Corn silage (2024)

No traffic

Chopper (13.6 t)

Truck (22.7 t)

Tractor (27.2 t)

Chopper + Truck

Chopper + Tractor



Materials and Methods – treatments

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Chopper + Tractor	No traffic
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Chopper (13.6 t)	Traffic
Truck (22.7 t)	Traffic
Tractor (27.2 t)	Traffic
Chopper + Truck	Traffic
Chopper + Tractor	Traffic





Materials and Methods – timeline

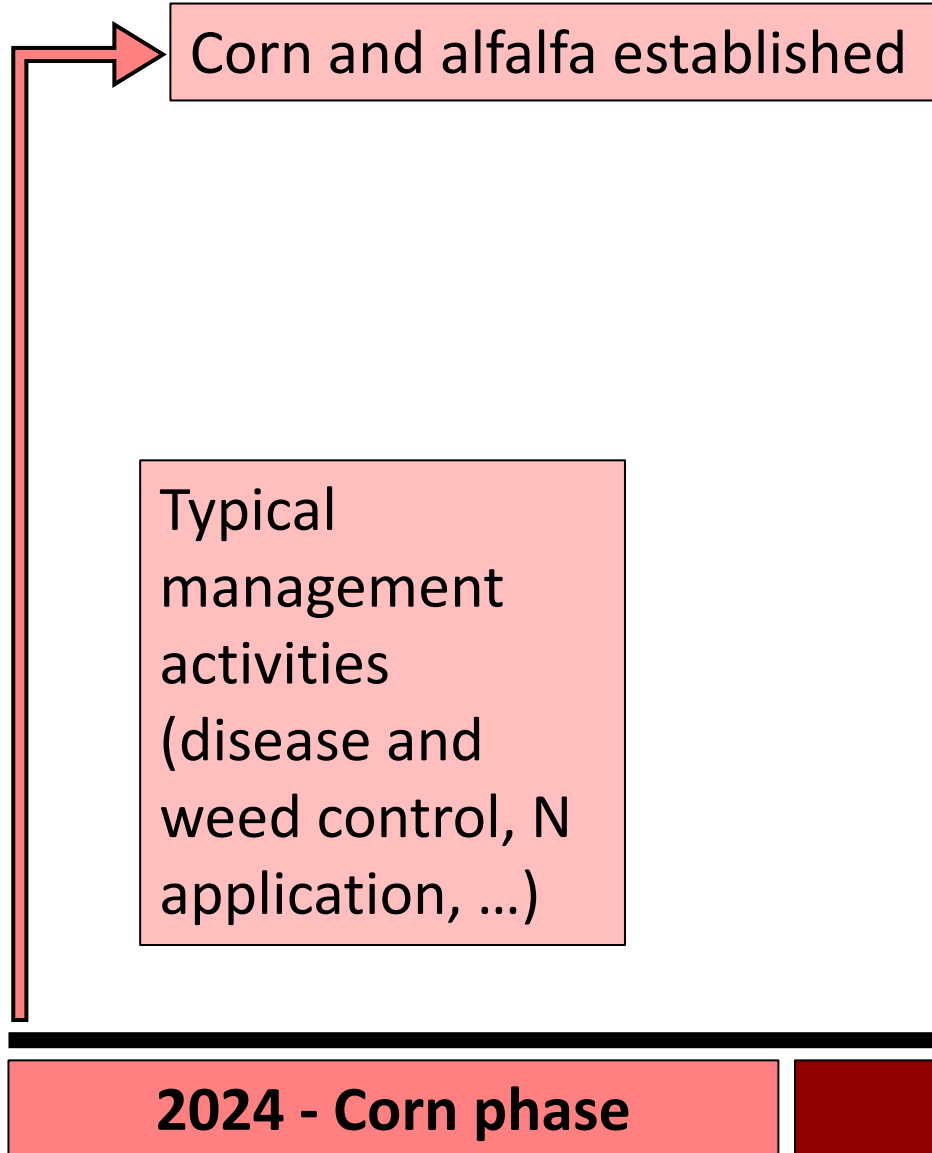


Materials and Methods – timeline

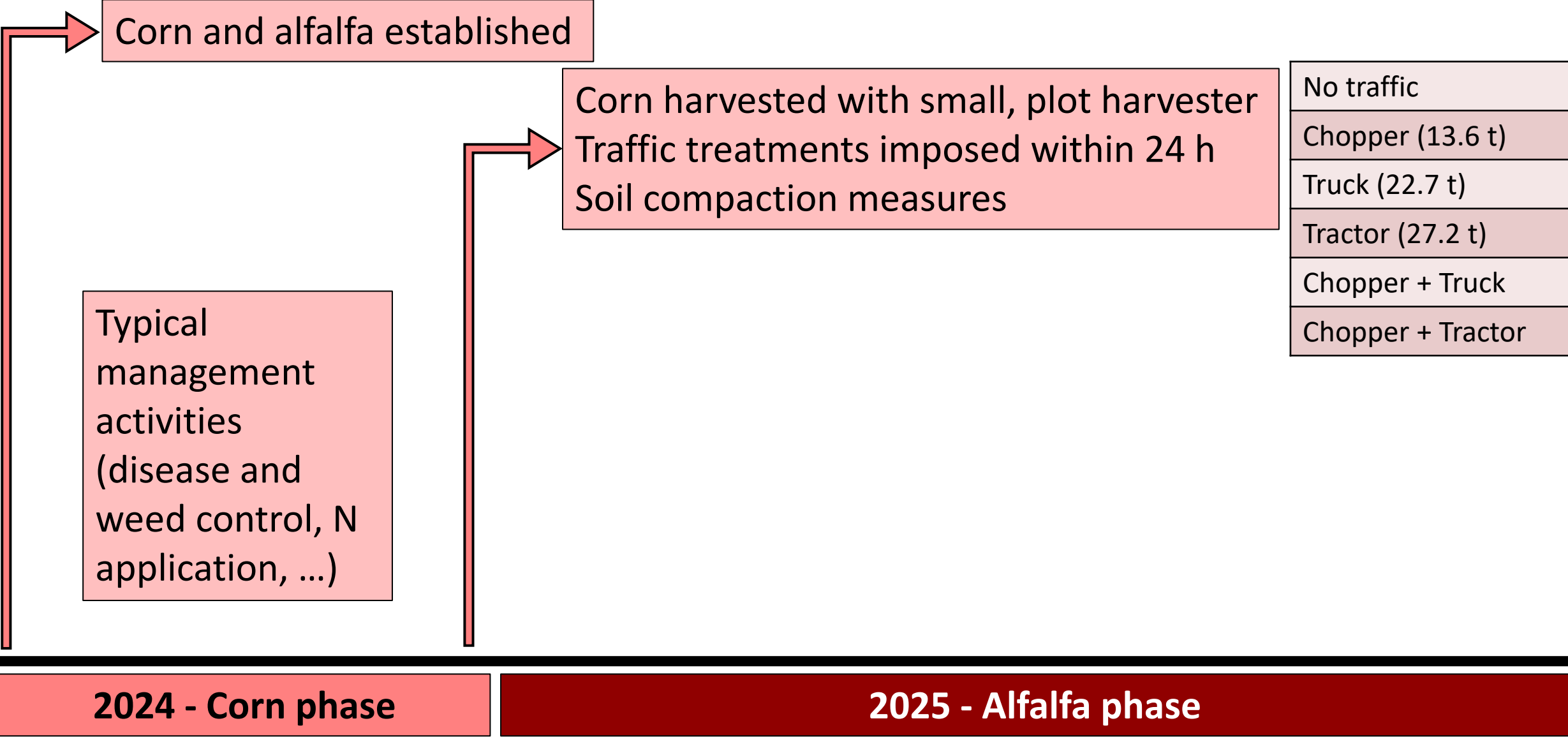
2024 - Corn phase

2025 - Alfalfa phase

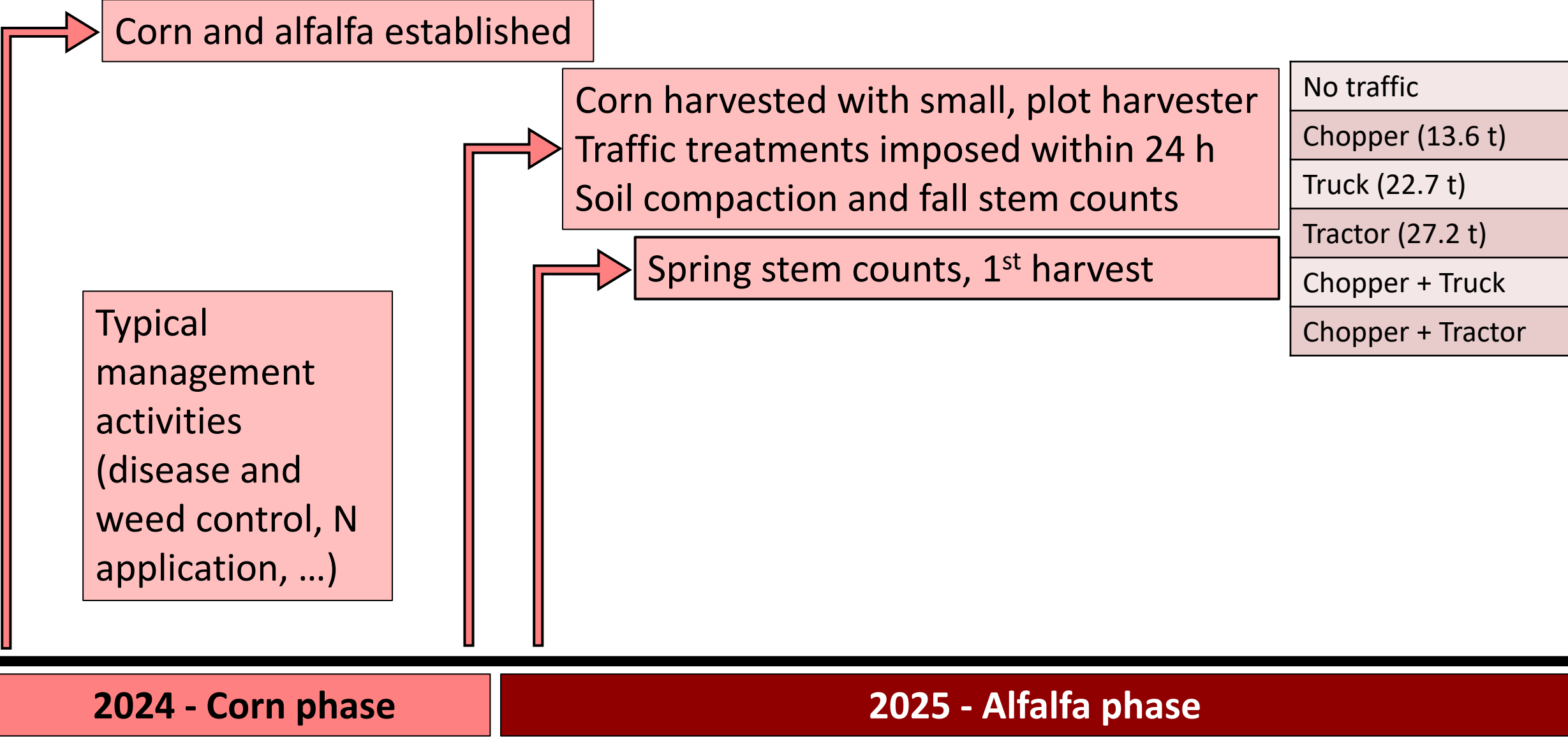
Materials and Methods – timeline



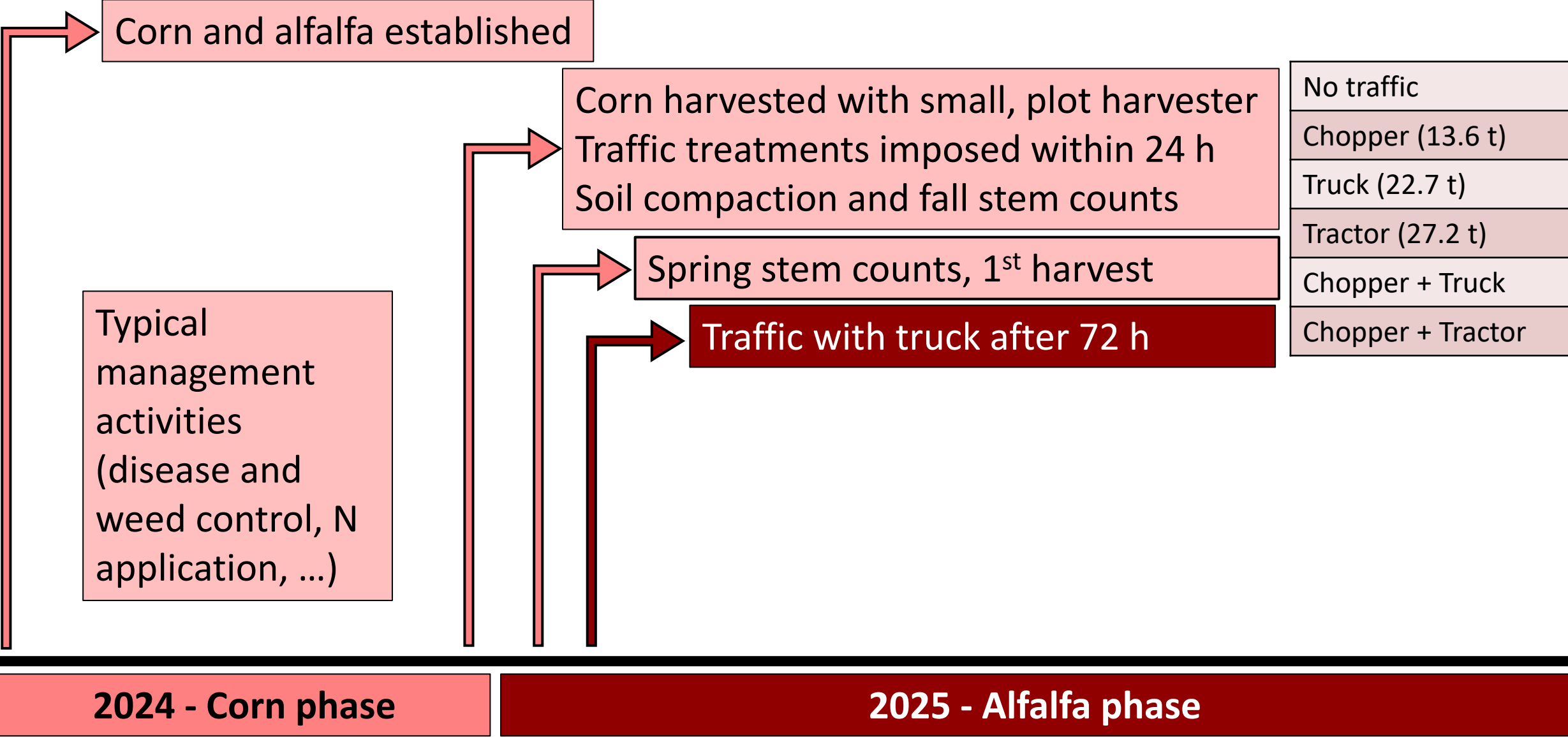
Materials and Methods – timeline



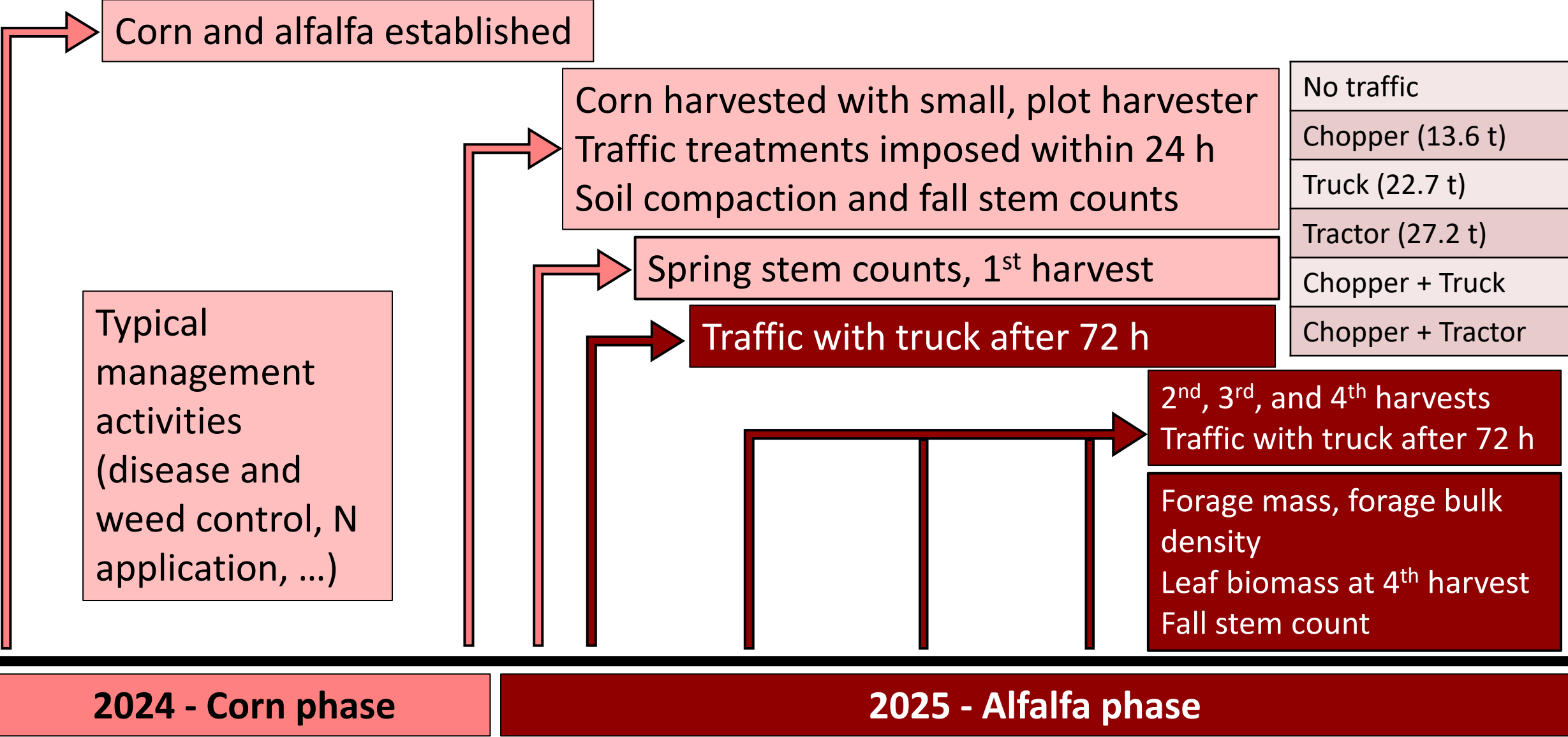
Materials and Methods – timeline



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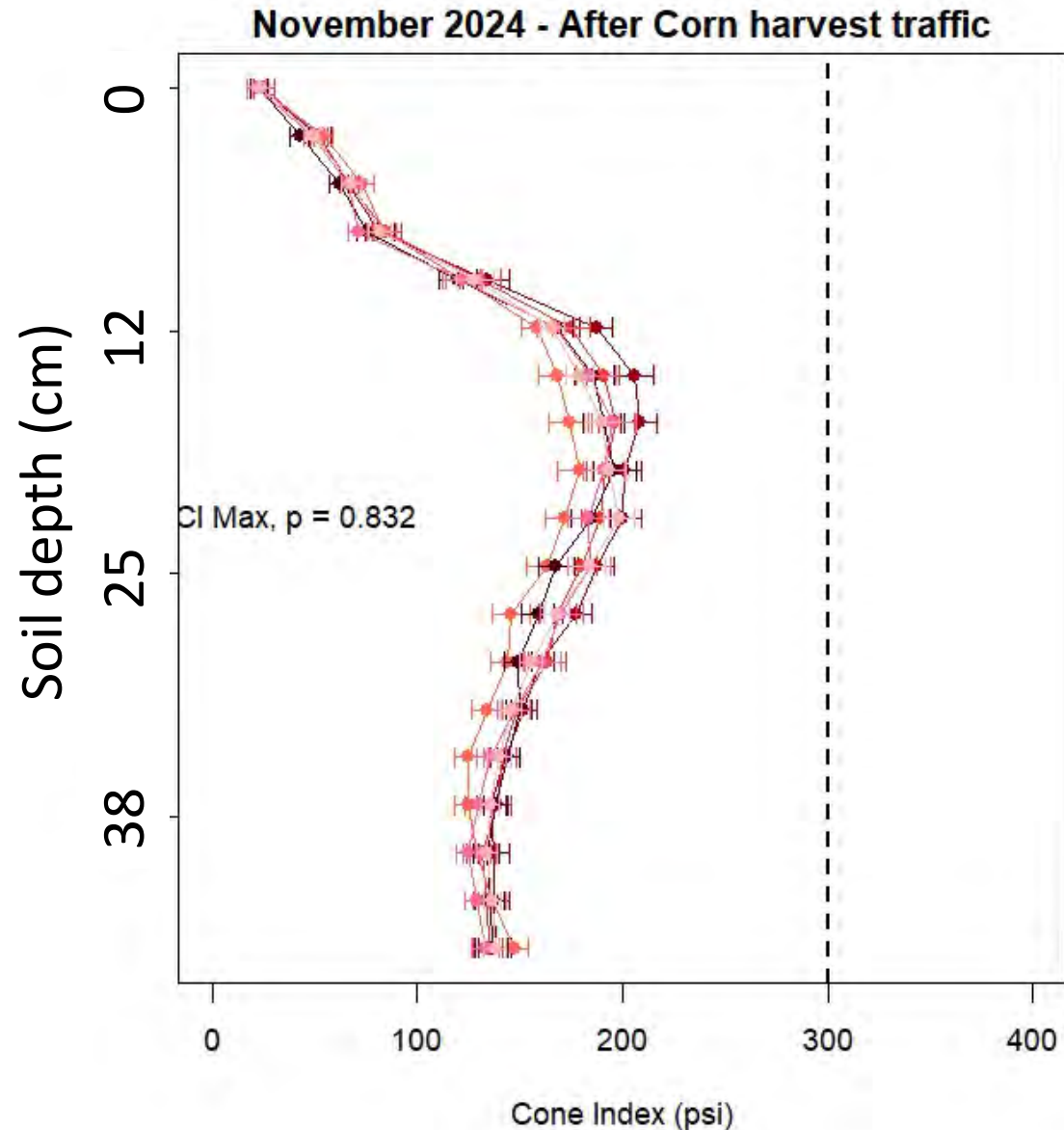
Machinery traffic effects on alfalfa – corn phase

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 *Threshold: 590 stems/m²

Fall stem counts (after corn traffic): 660 stems/m² (NS)

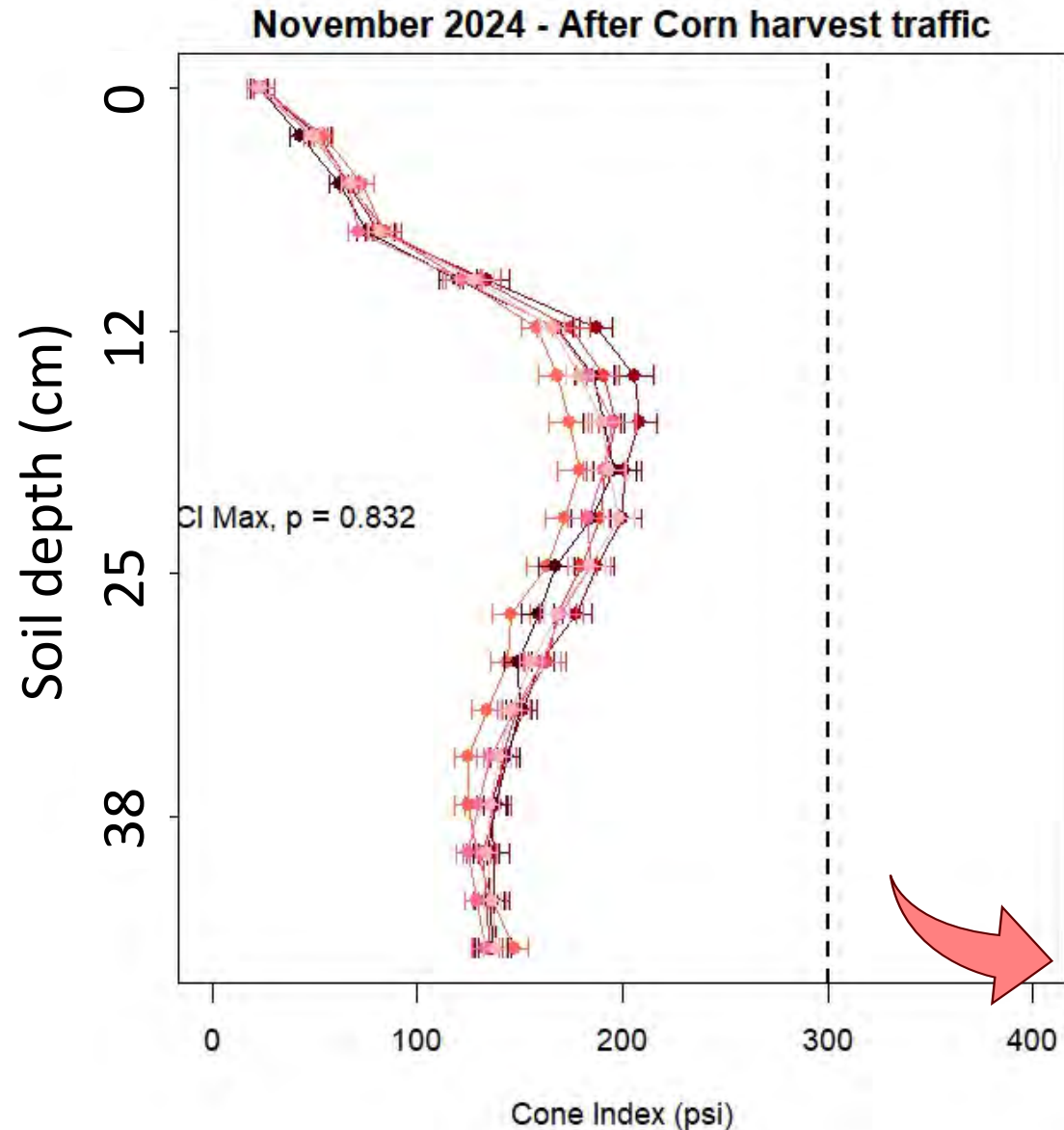
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Machinery traffic effects on alfalfa – corn phase



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Fall stem counts (after corn traffic): 660 stems/m² (NS)

Threshold for root growth restriction

Machinery traffic effects on alfalfa – corn phase

Spring 2025

Machinery traffic effects on alfalfa – corn phase

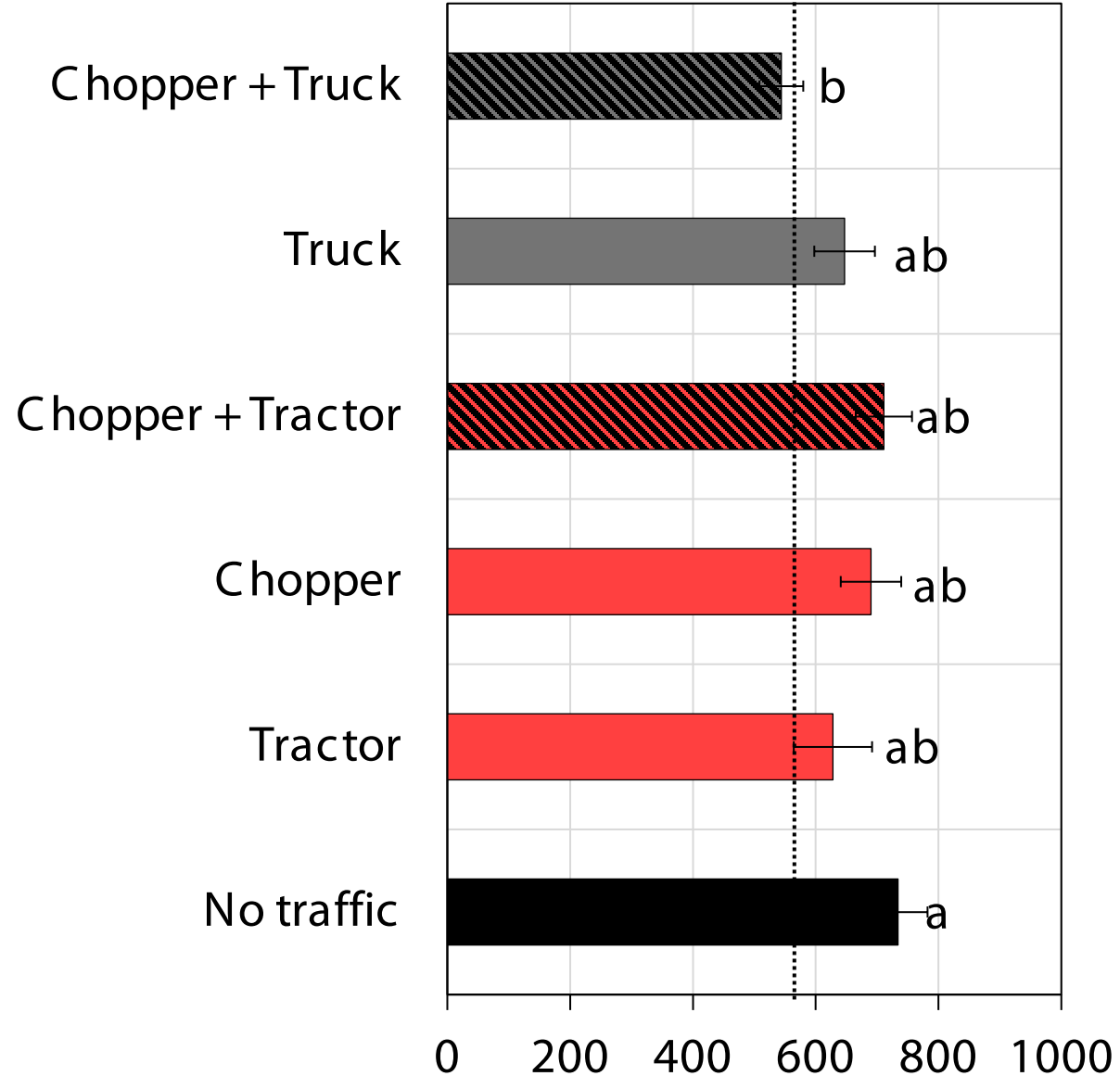
Spring 2025



Machinery traffic effects on alfalfa – corn phase

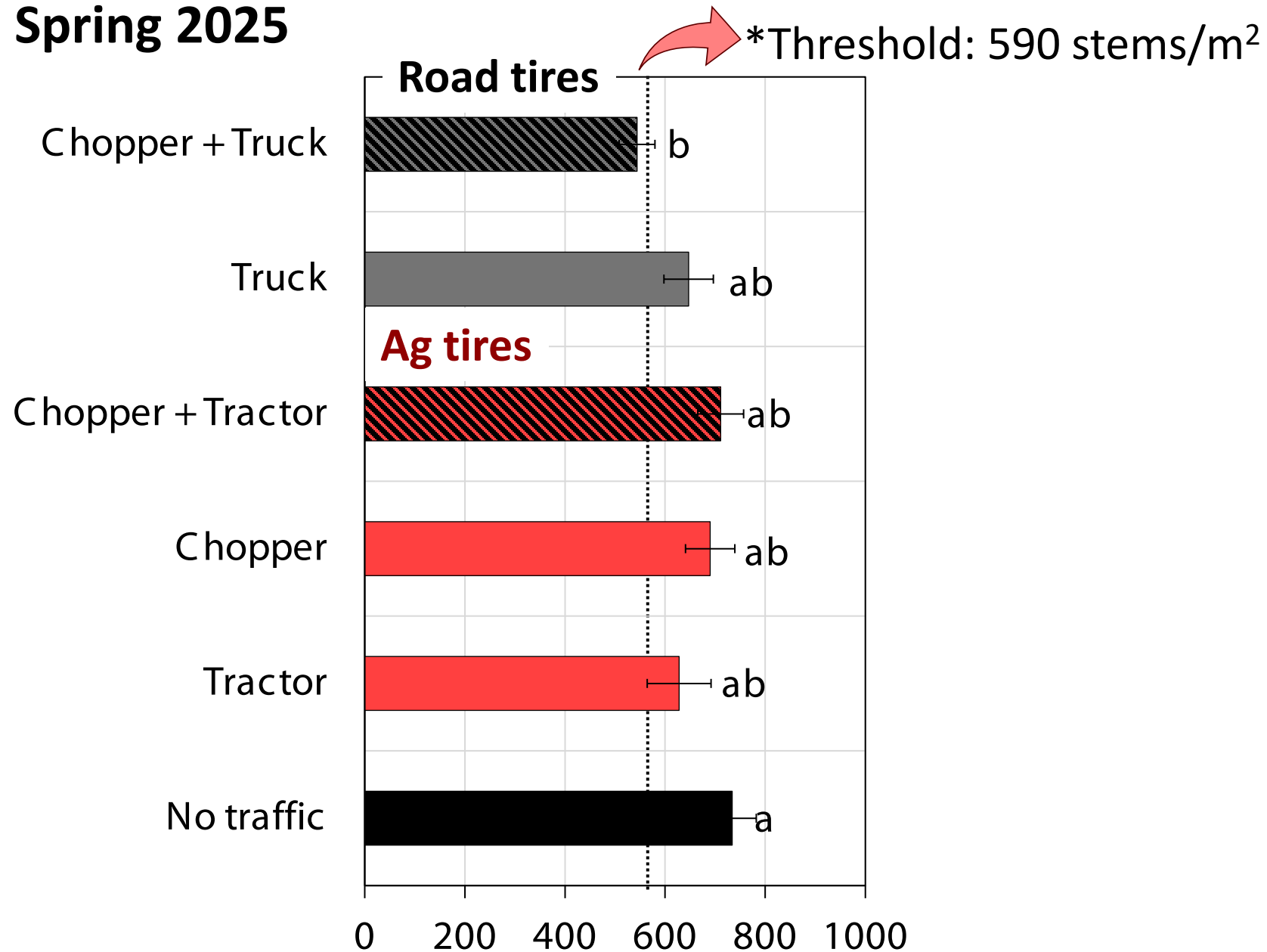
Spring 2025

*Threshold: 590 stems/m²



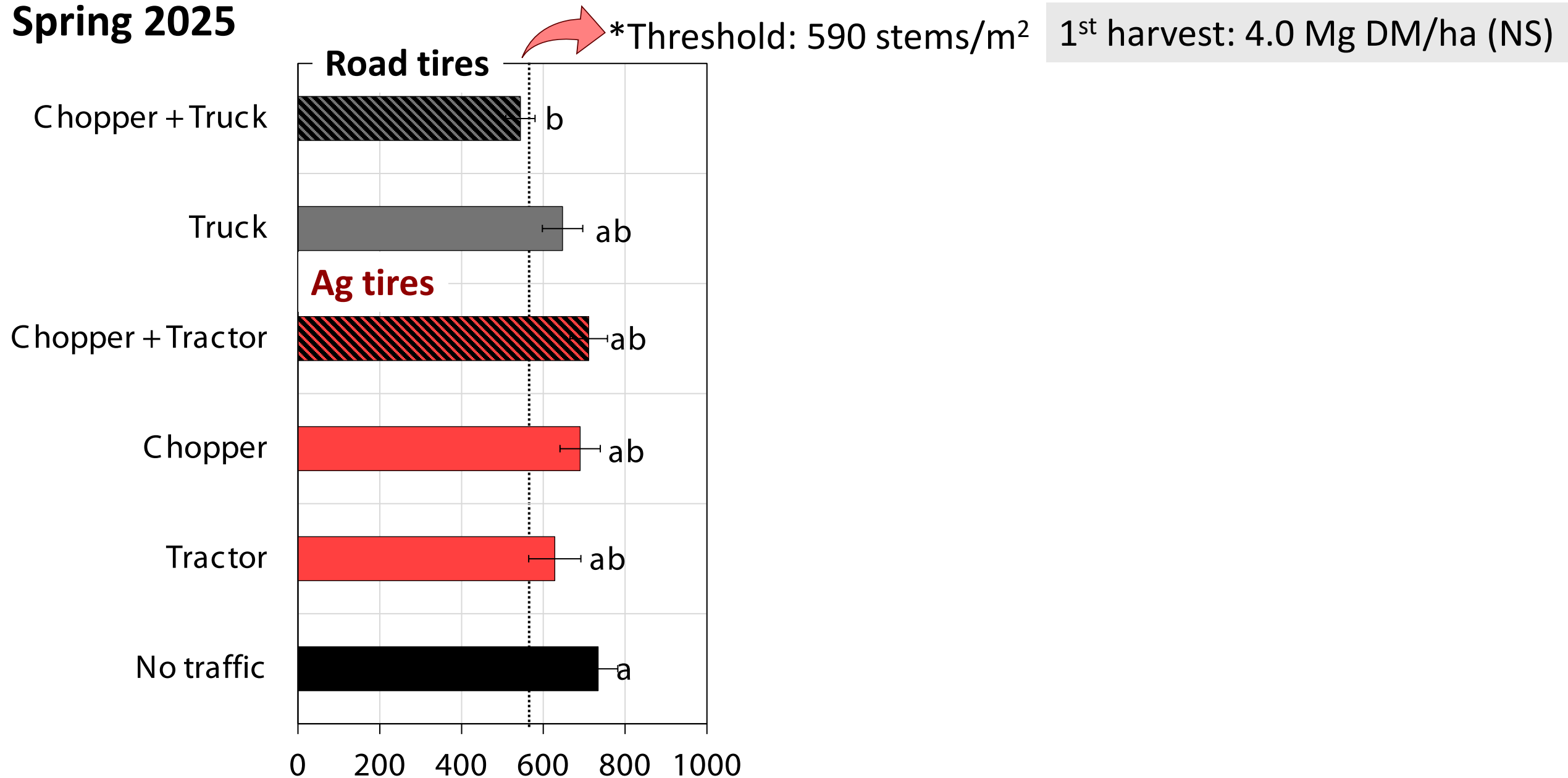
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Spring 2025



Machinery traffic effects on alfalfa – corn phase

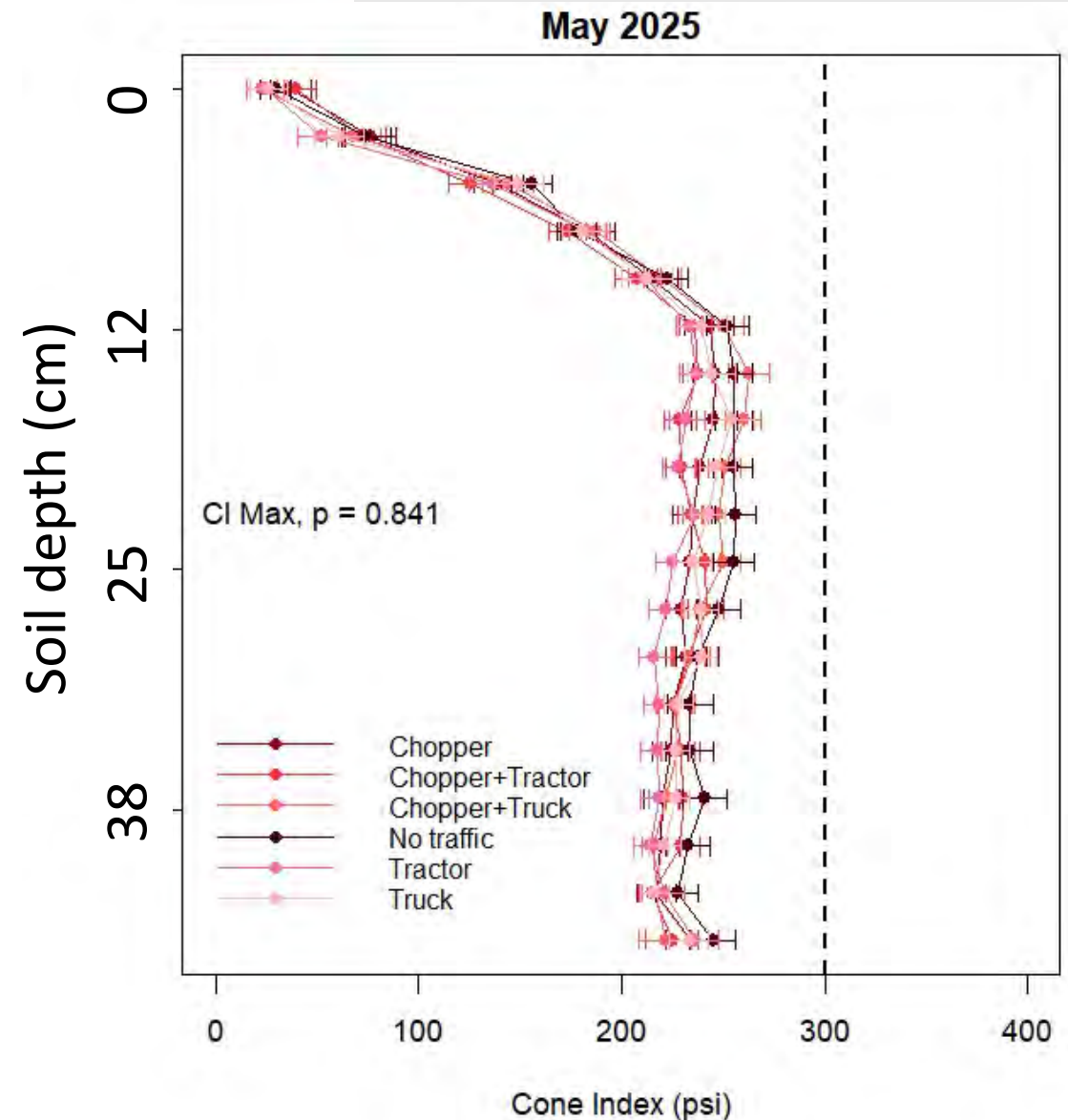
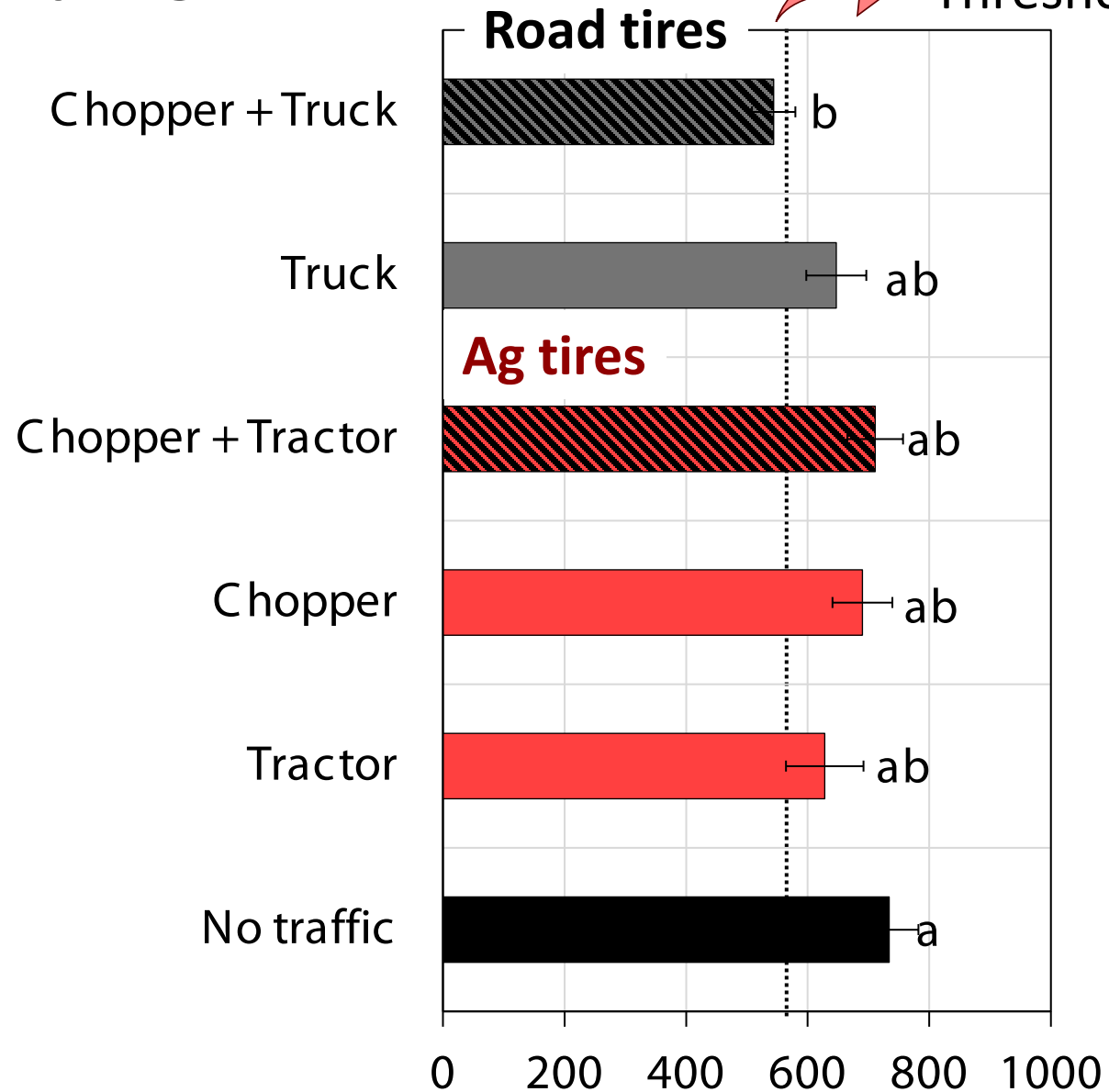
Spring 2025



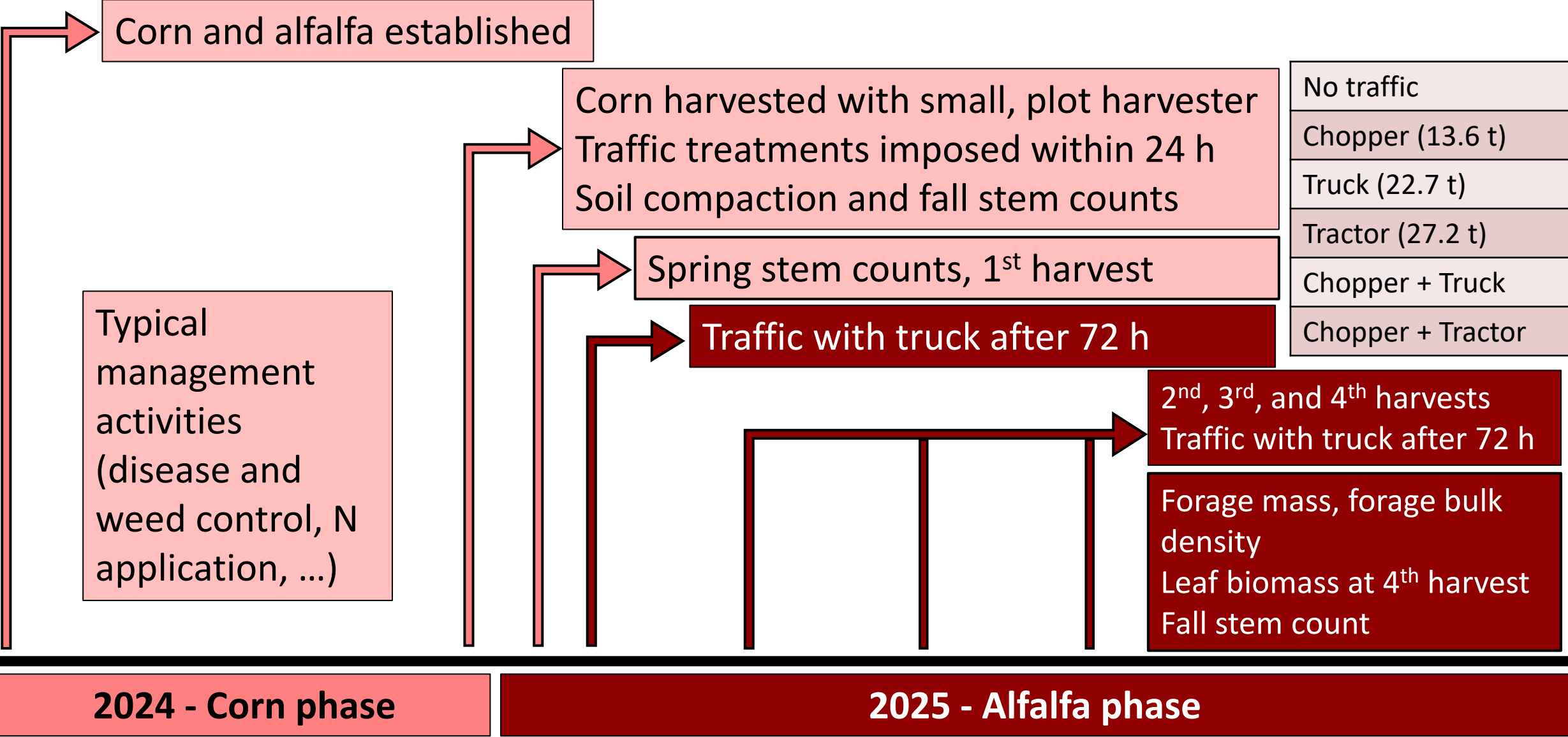
Machinery traffic effects on alfalfa – corn phase

Spring 2025

*Threshold: 590 stems/m² 1st harvest: 4.0 Mg DM/ha (NS)



Materials and Methods – timeline



Materials and Methods – treatments

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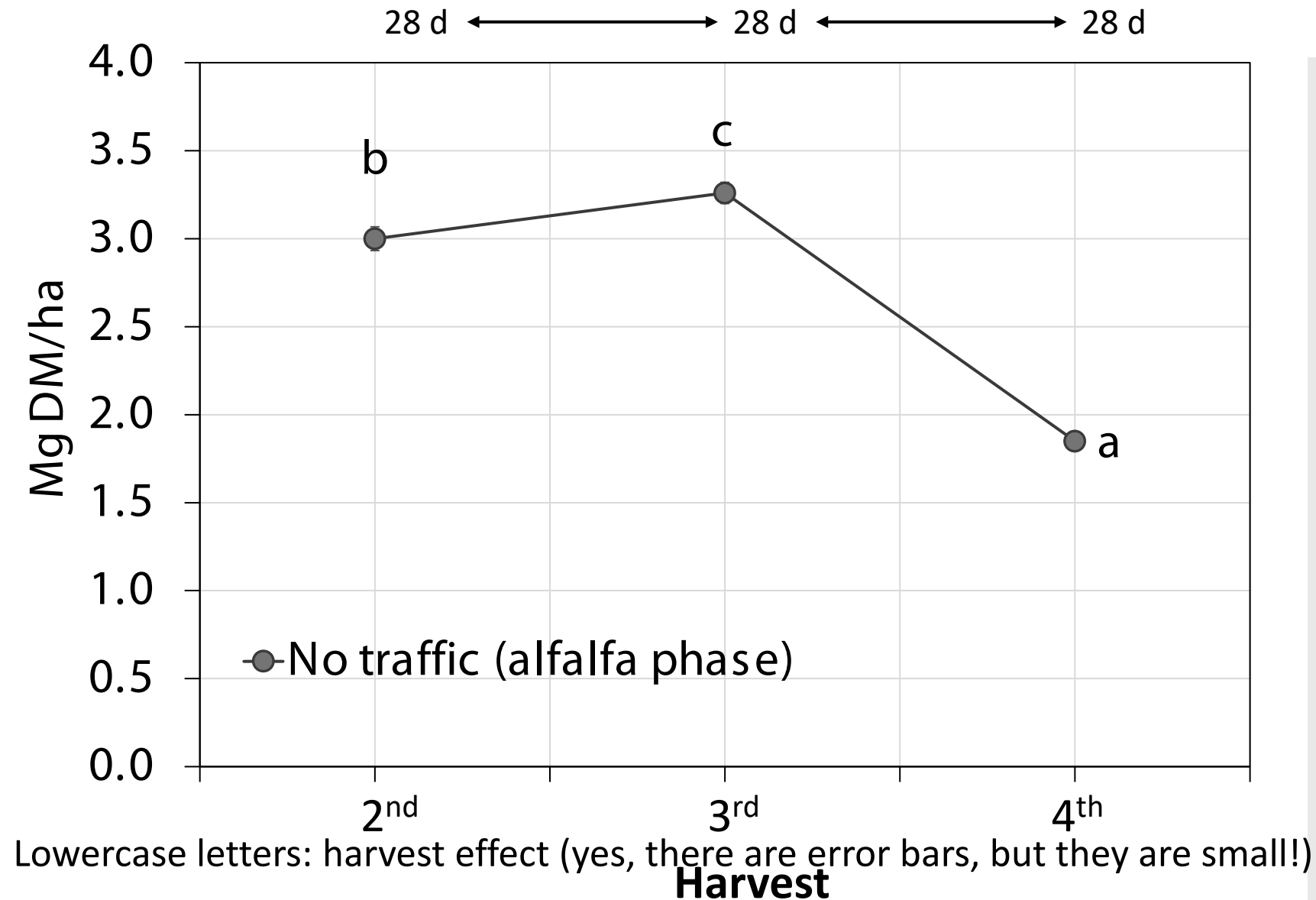


Machinery traffic effects on alfalfa– alfalfa phase

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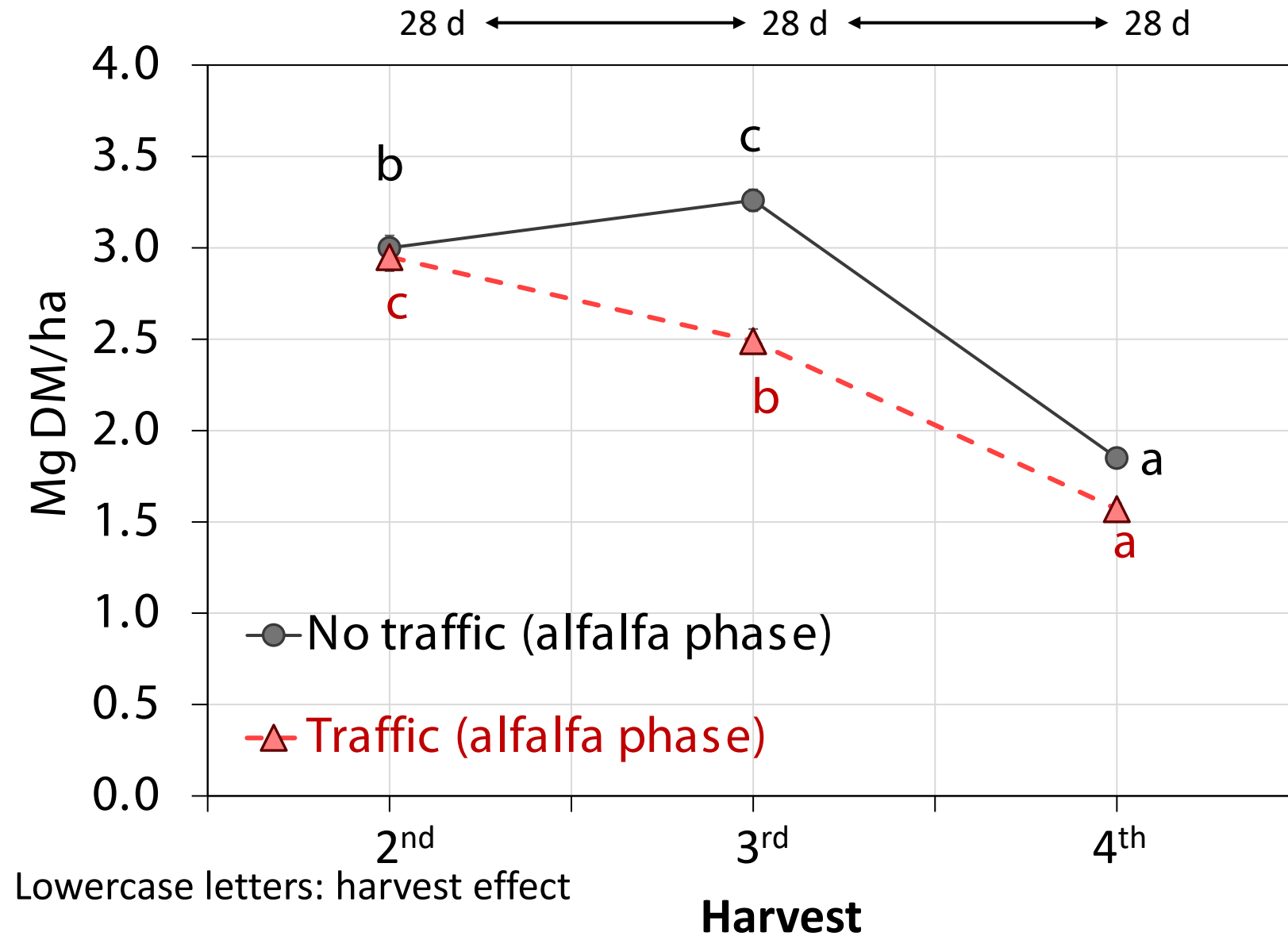
Corn phase traffic → No effect

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Corn phase traffic → No effect

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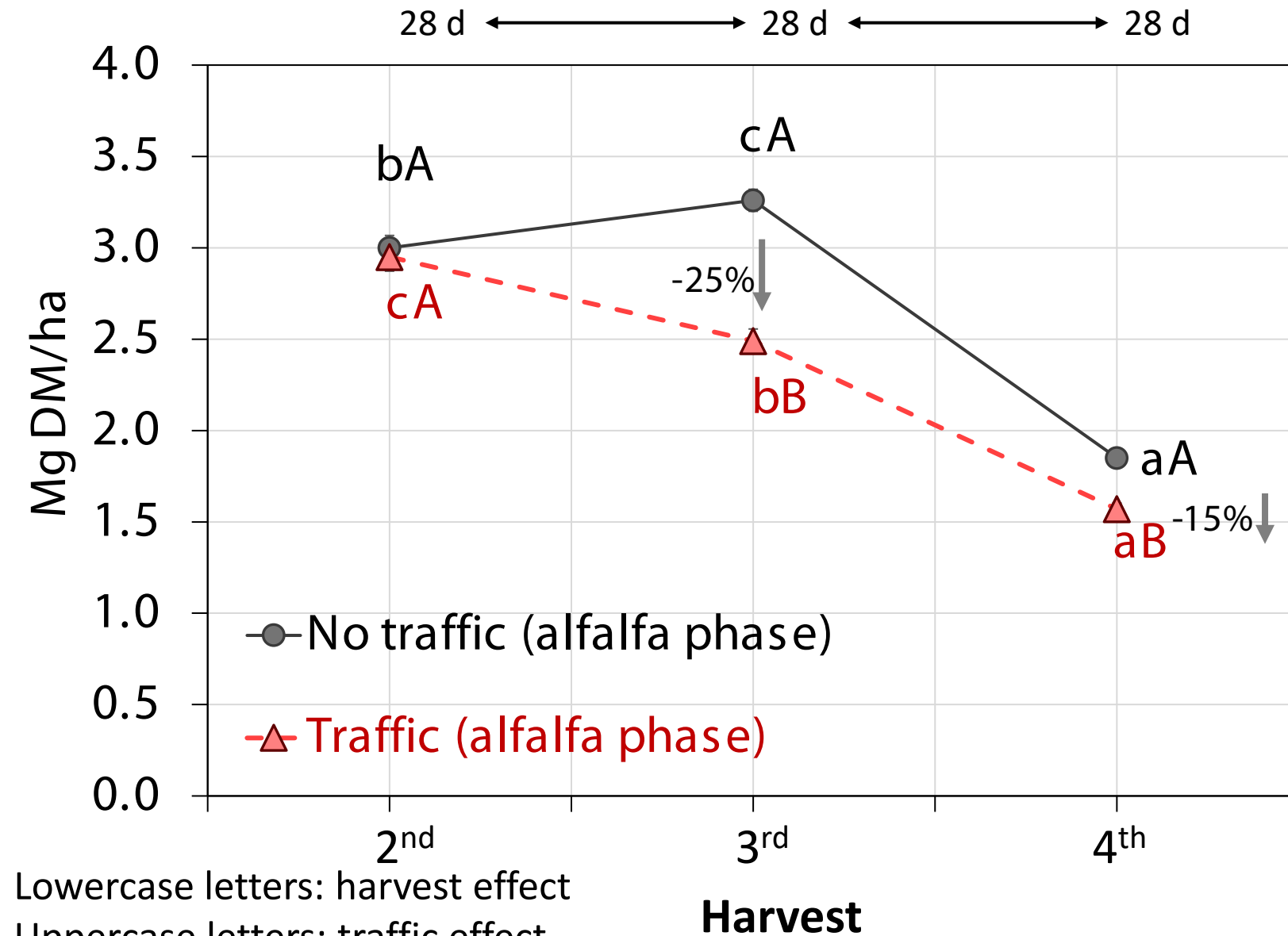


Corn phase traffic → No effect

Harvest time

Last harvest → less biomass

Machinery traffic effects on alfalfa– alfalfa phase



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Harvest time

Last harvest → less biomass

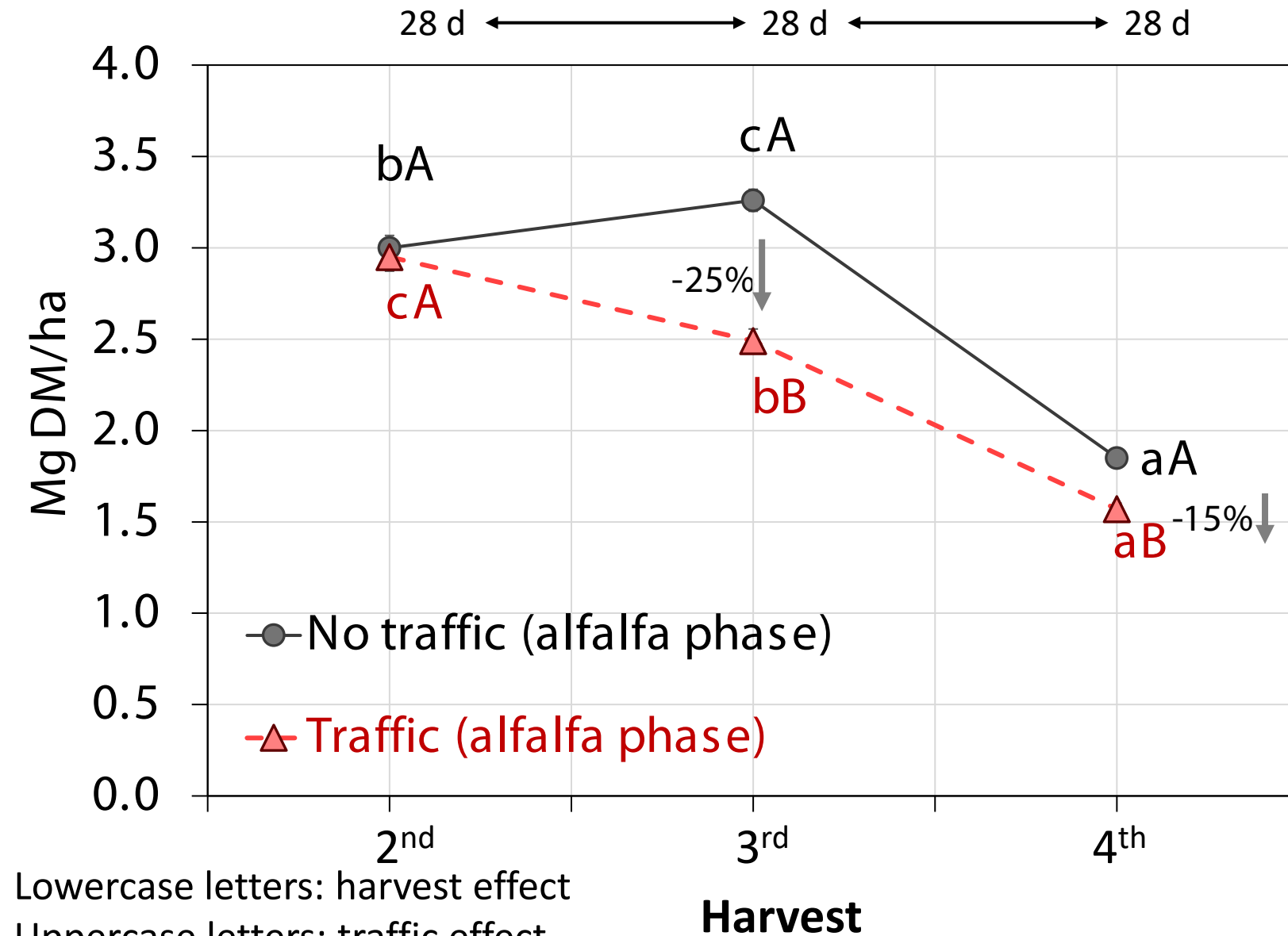
Alfalfa phase traffic (truck)

No traffic > Traffic in H3 & H4

H3: -25%

H4: -15%

Machinery traffic effects on alfalfa– alfalfa phase



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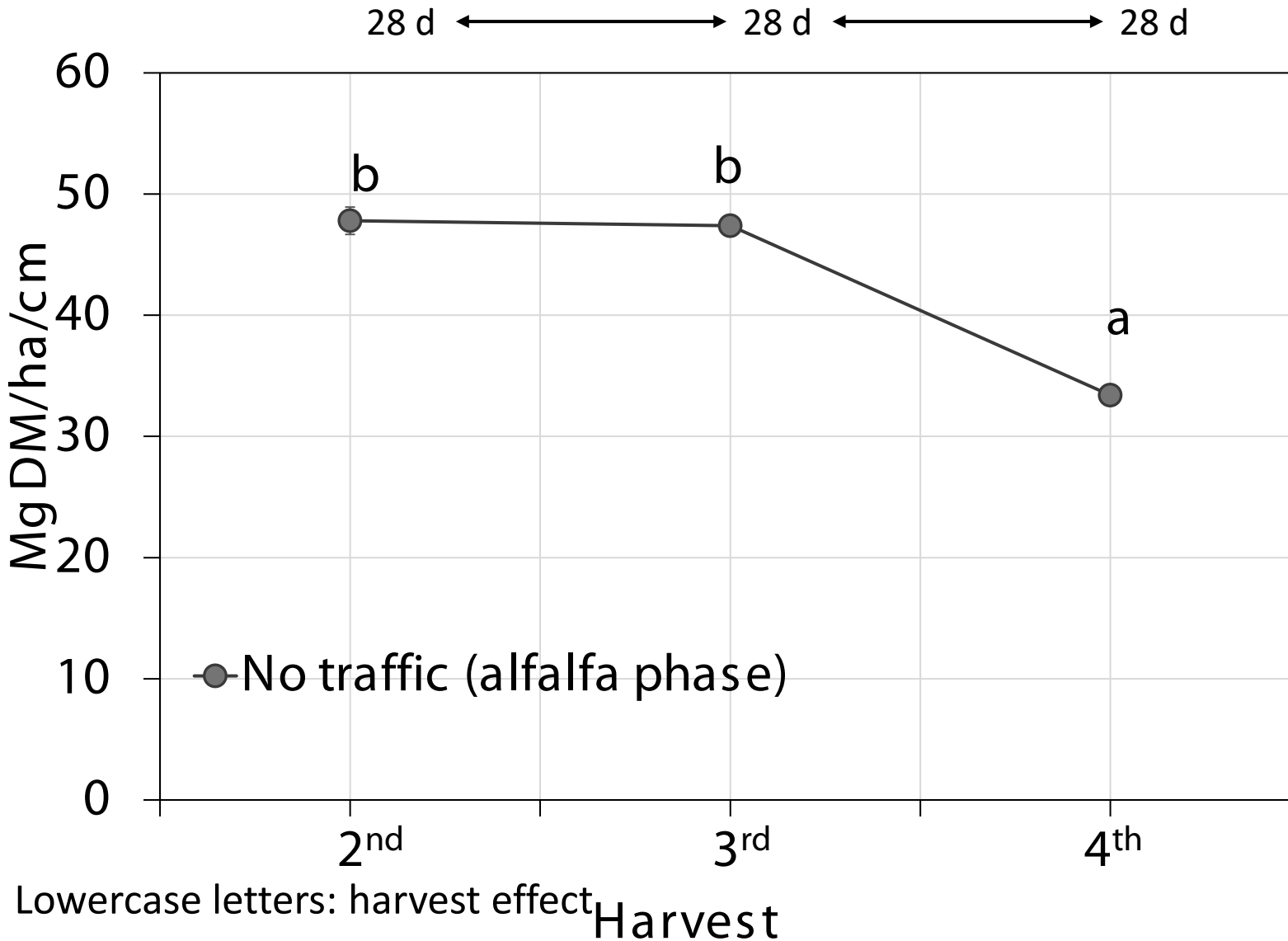
H3: -25%

H4: -15%

Greater reduction than previous work (done with Ag tires)

Machinery traffic effects on alfalfa– alfalfa phase

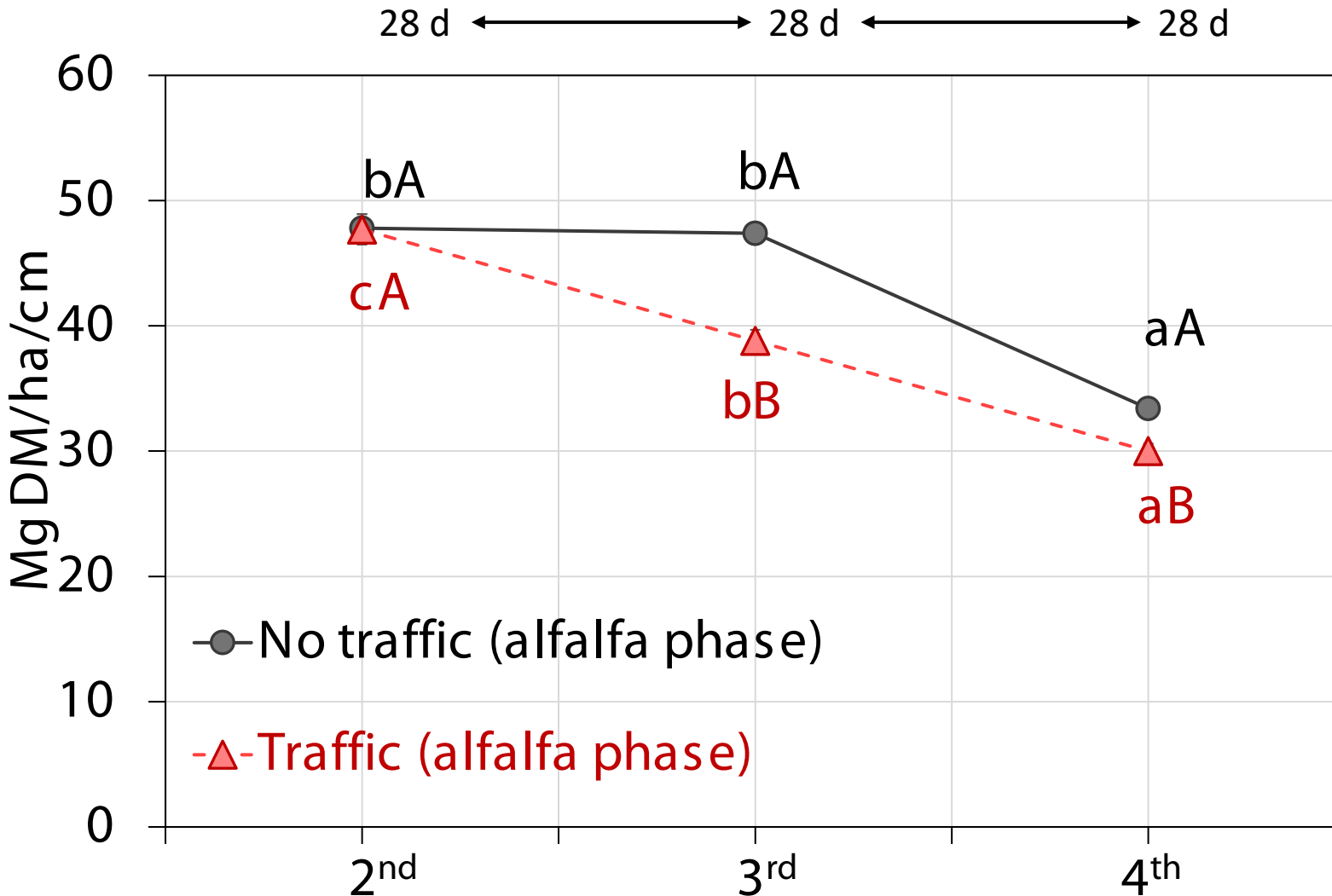
Machinery traffic effects on alfalfa– alfalfa phase



Harvest time

Last harvest → smaller forage
bulk density

Machinery traffic effects on alfalfa– alfalfa phase



Lowercase letters: harvest effect
Uppercase letters: traffic effect

Harvest time

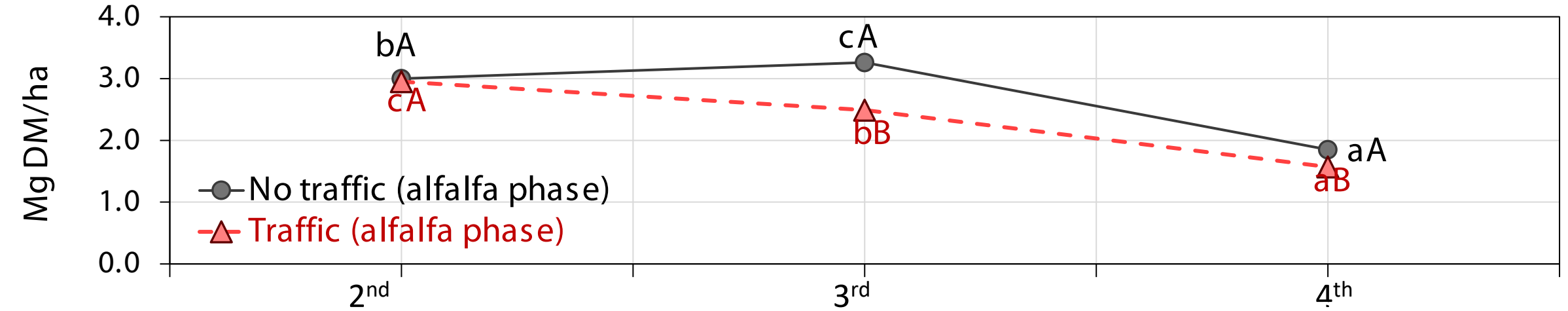
Last harvest → smaller forage bulk density
Less biomass/ha per every cm harvested

Alfalfa phase traffic (truck)

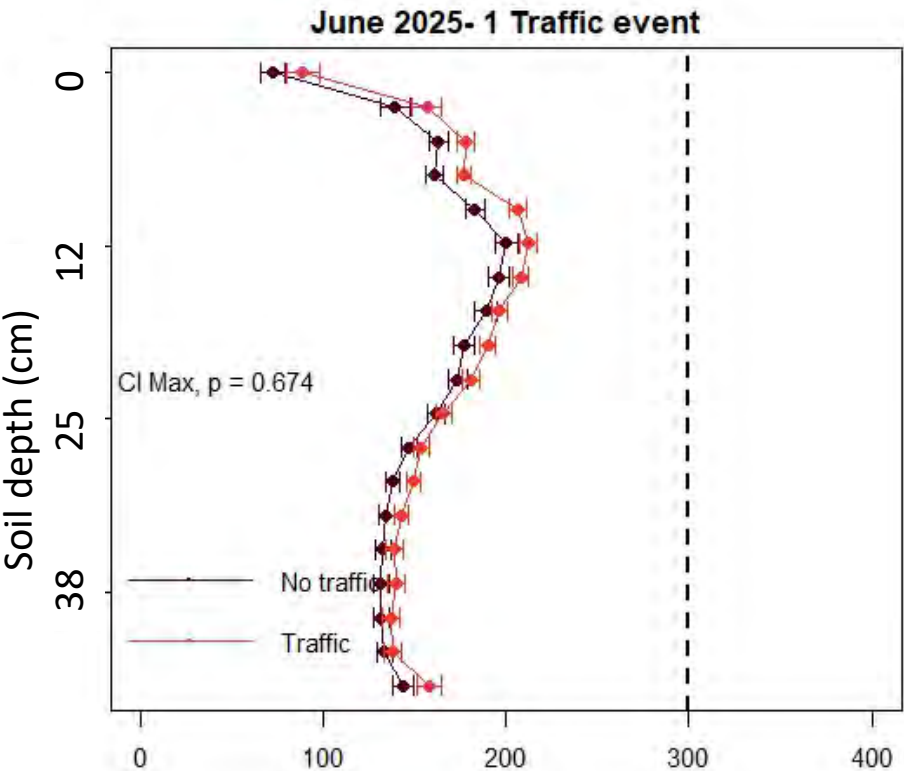
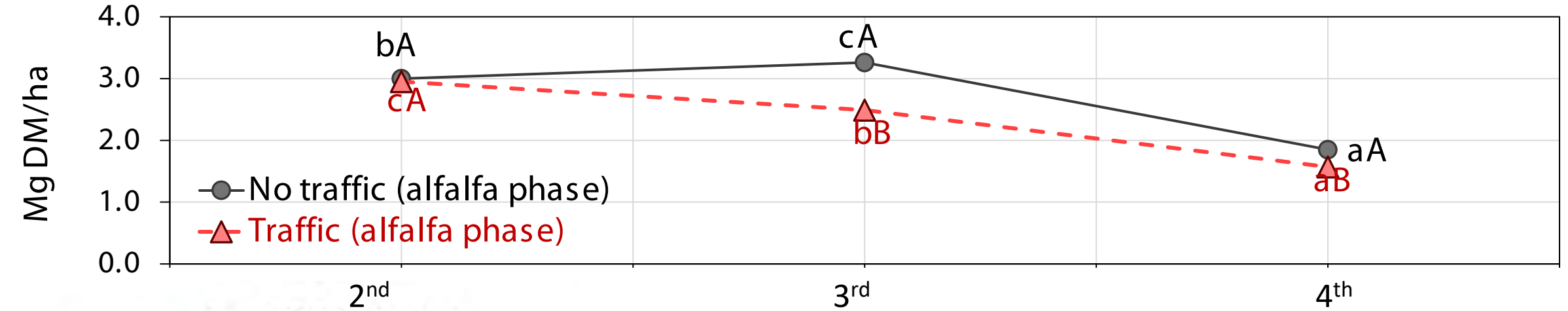
No traffic > Traffic in H3 & H4

Traffic stress reduced forage bulk density

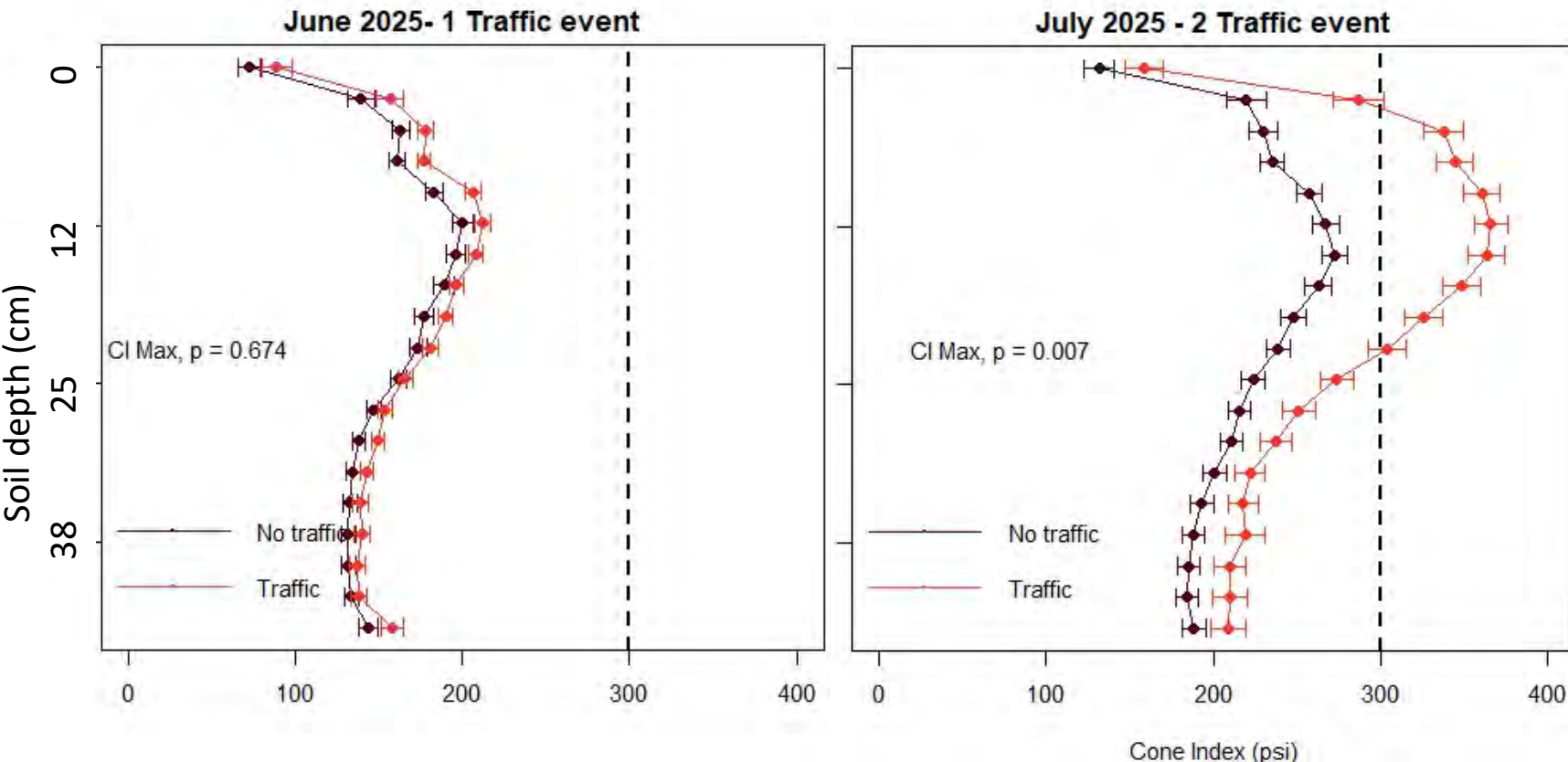
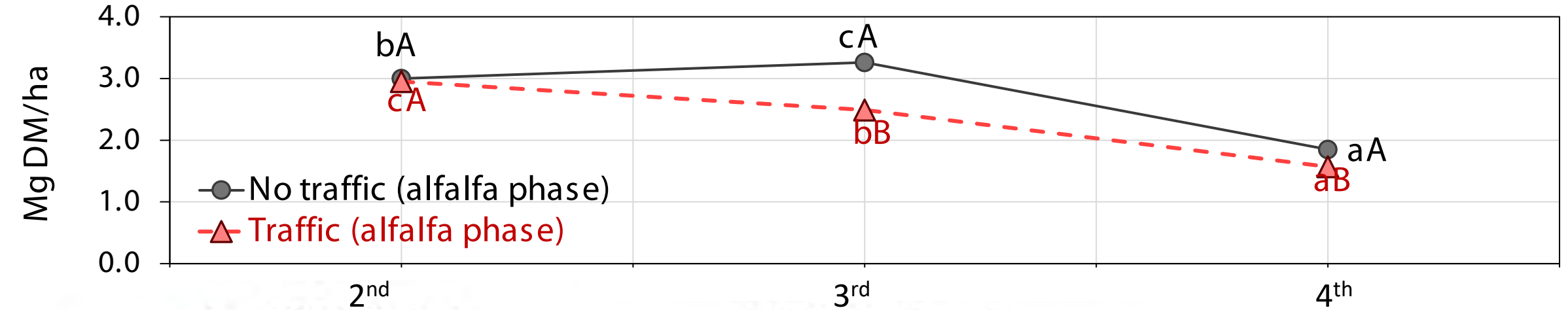
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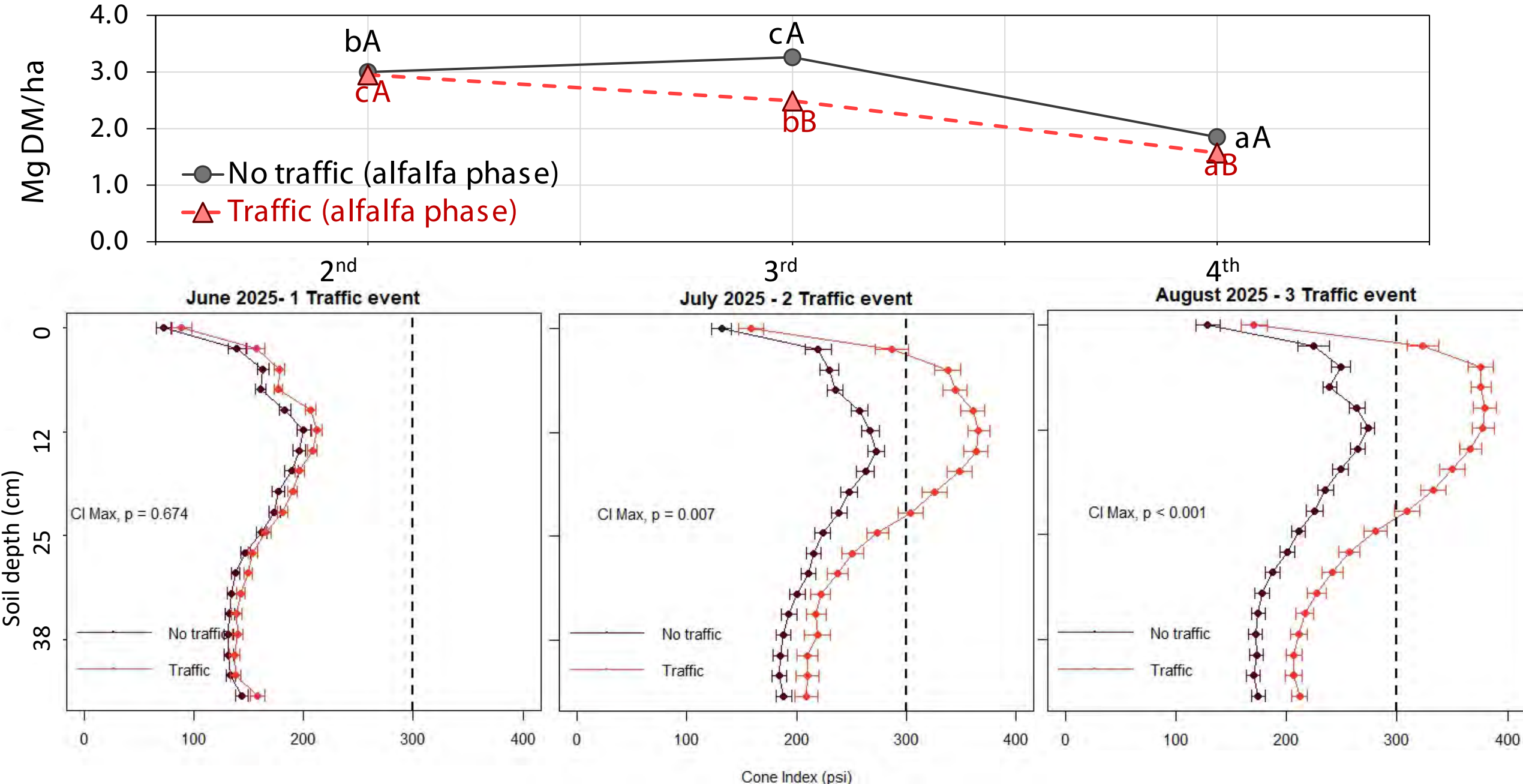
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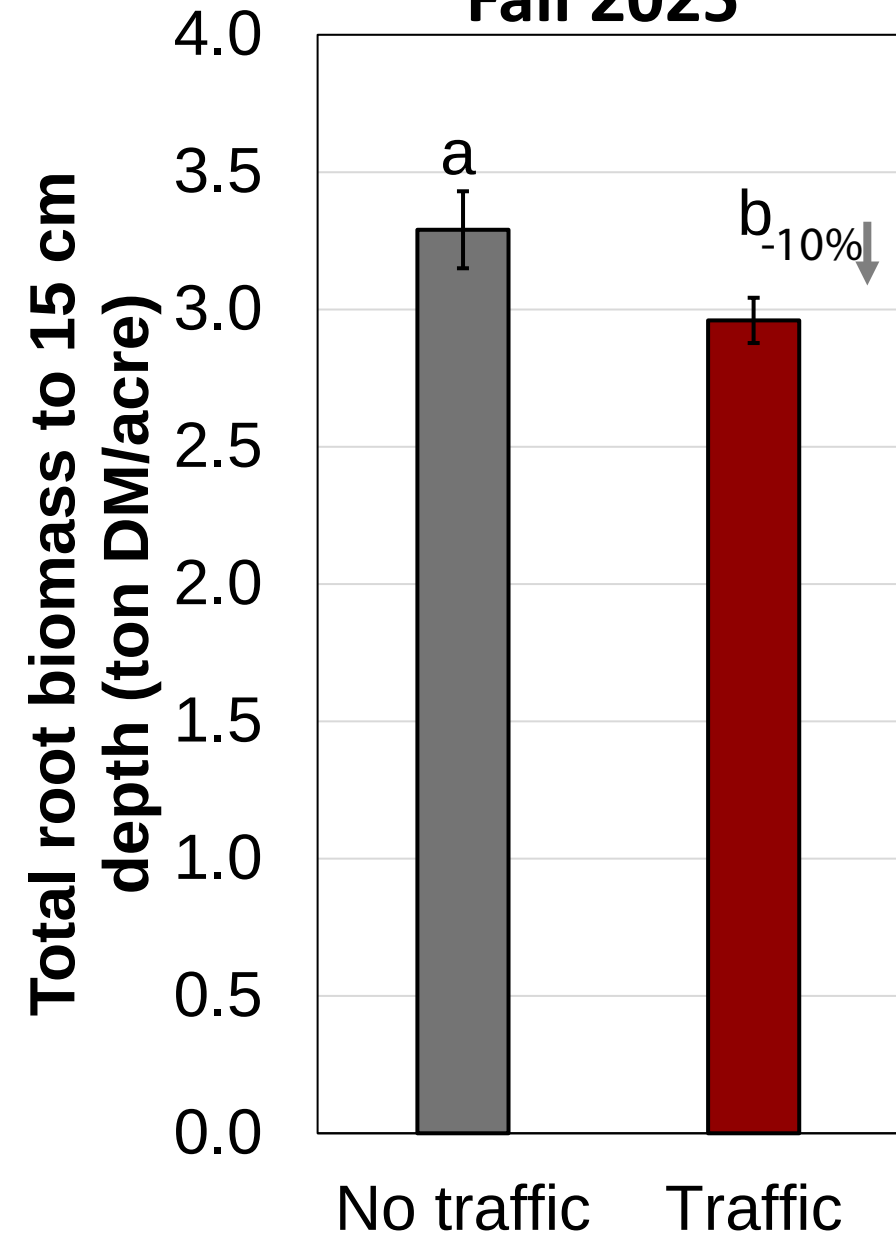


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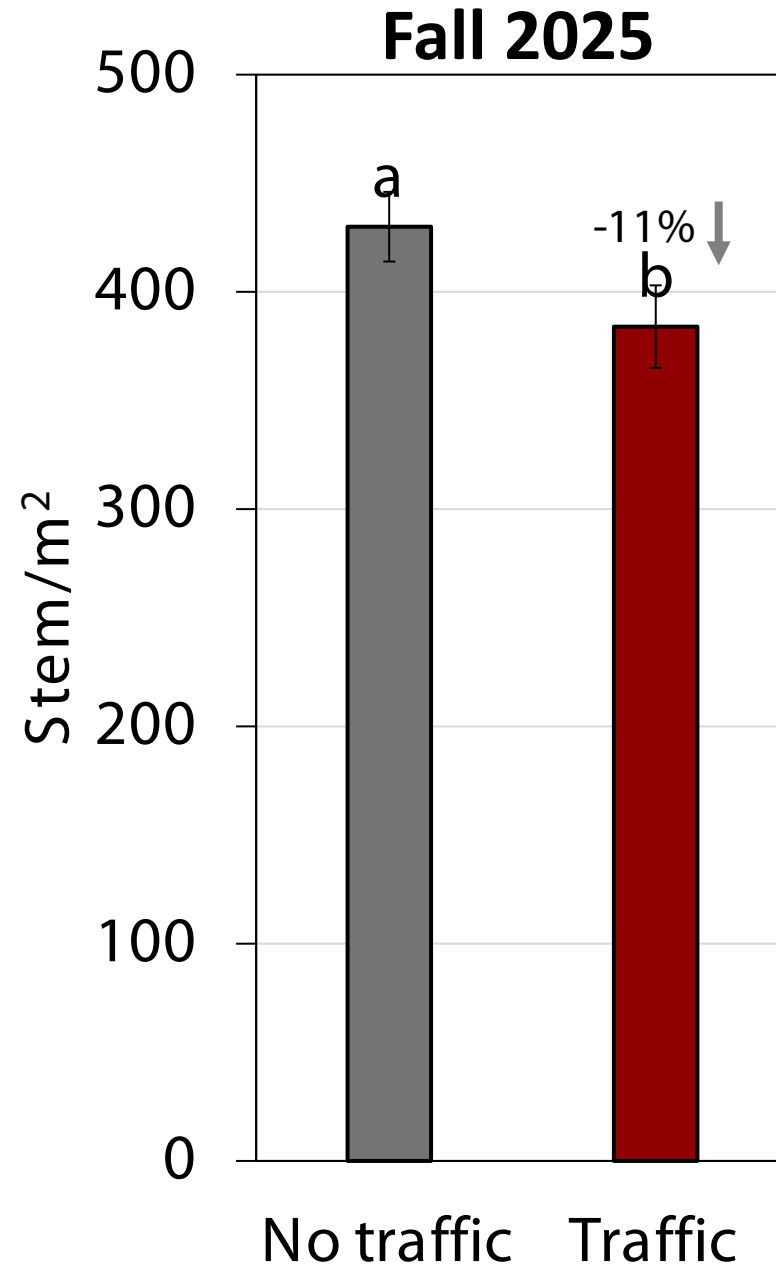
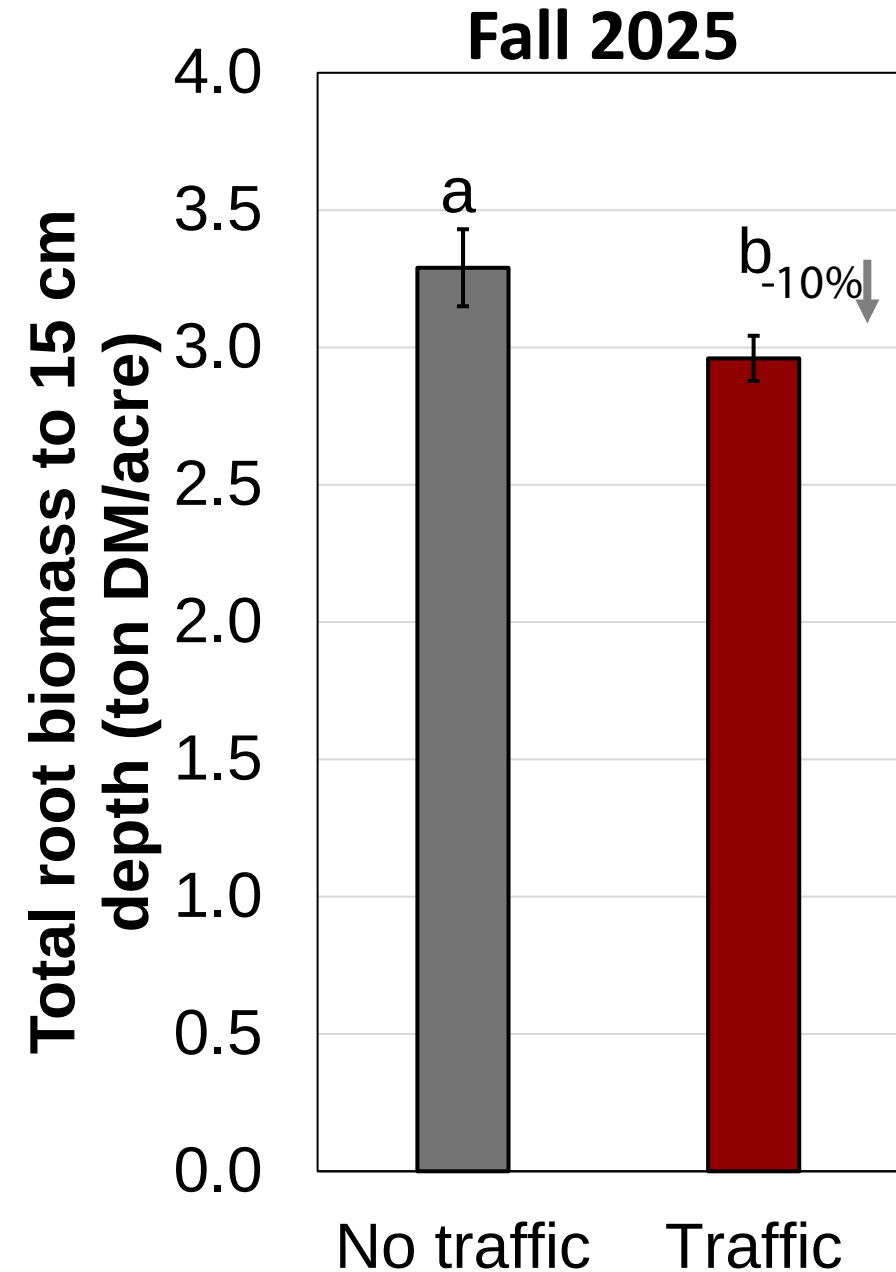


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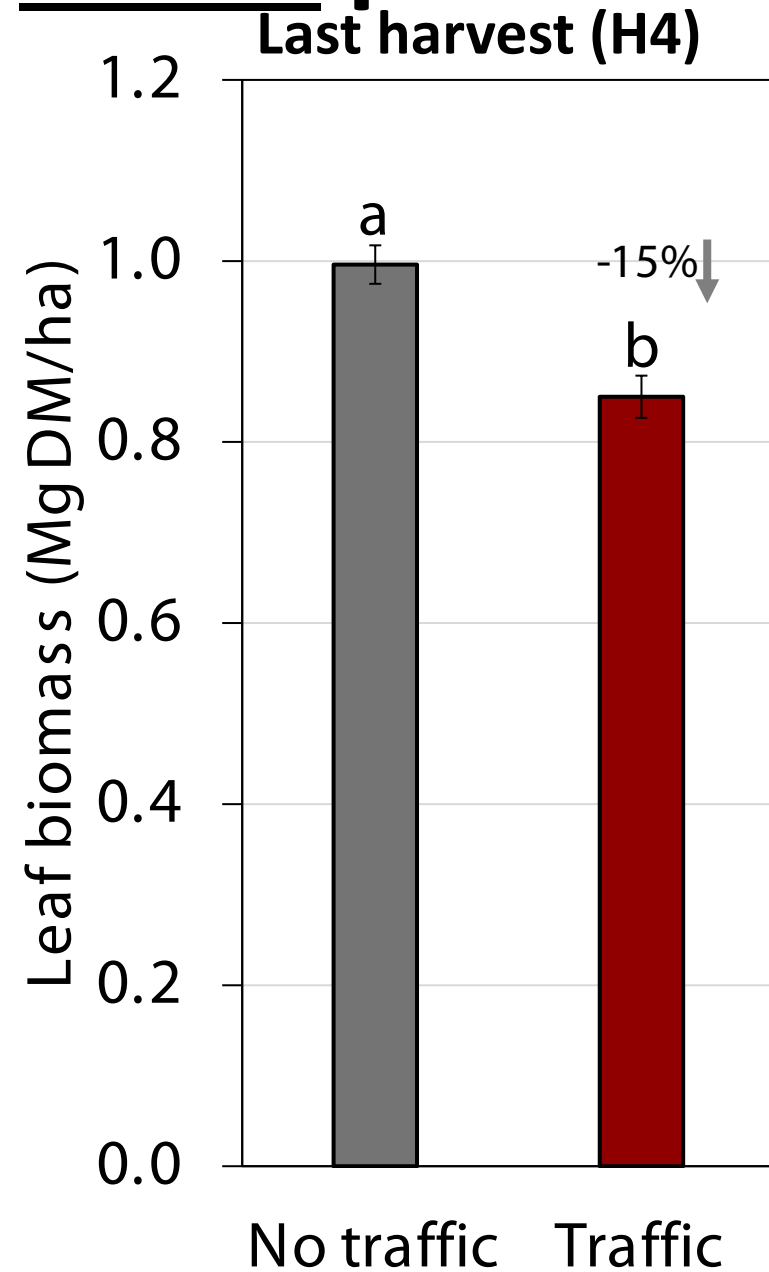
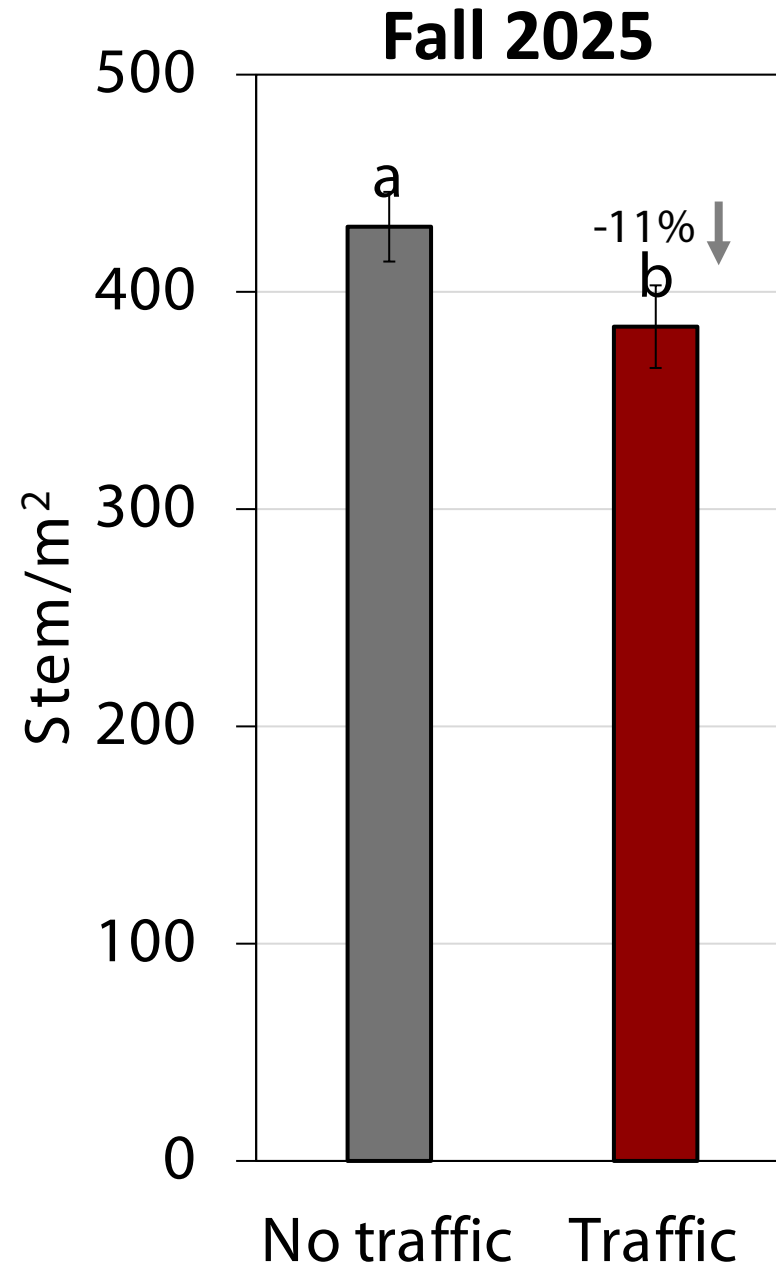
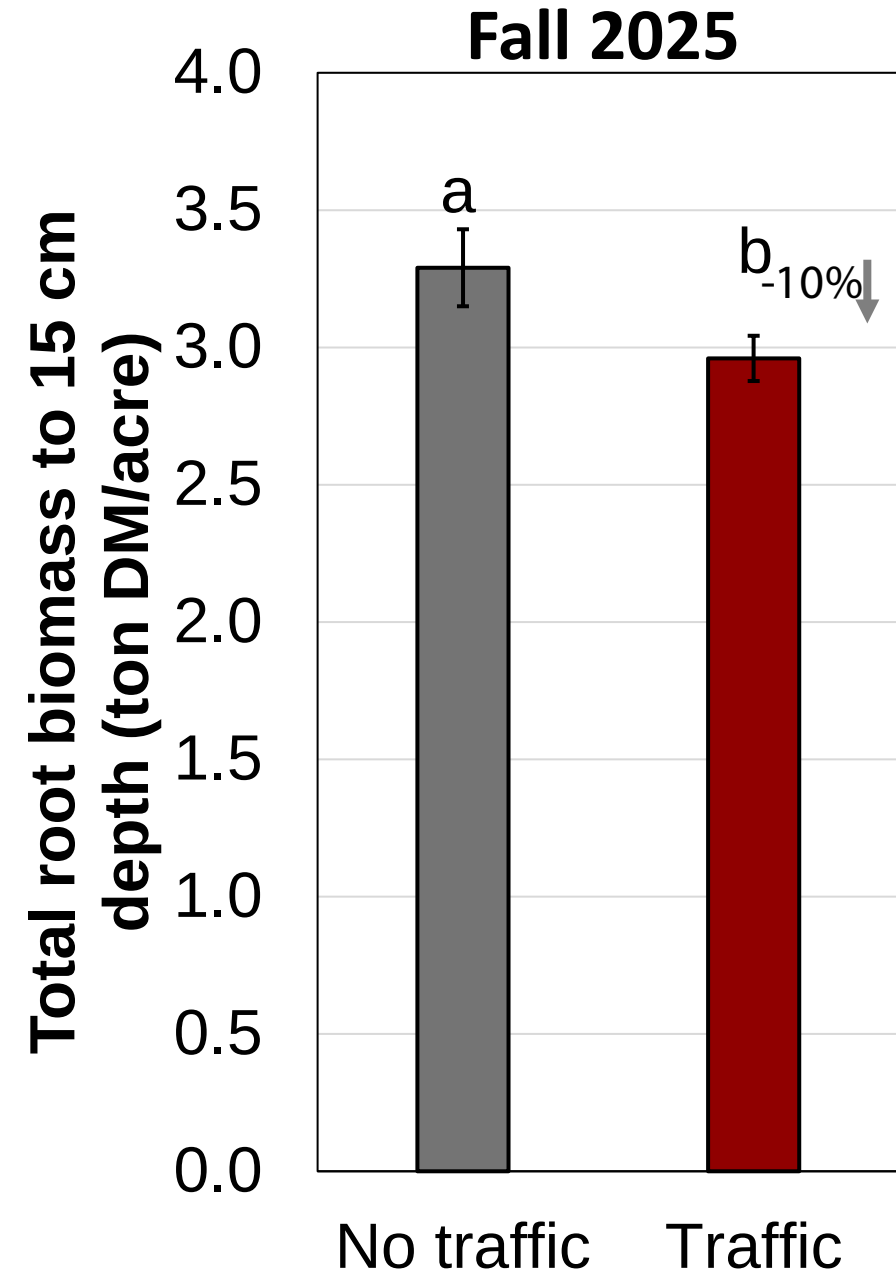
Fall 2025



Machinery traffic effects on alfalfa– alfalfa phase



Machinery traffic effects on alfalfa– alfalfa phase



Take home messages:

[1] Machinery traffic reduces various productivity responses in alfalfa (up to 25% per harvest)

[2] Alfalfa IS resilient – effects from corn phase traffic had *little to no effect* on productivity responses if they were not trafficked again during the alfalfa phase

[3] Incremental traffic from different alfalfa harvest operations increase cone index values, reduce root growth, and forage harvested

[4] Road tires consistently worse than ag tires – production (NV and persistence will continue to be evaluated)

[5] Studies are still ongoing for year 2

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