



Extension

UNIVERSITY OF WISCONSIN-MADISON

Effect of Traffic on Alfalfa Production

2024 Badger Crops and Soils Update Meetings

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What are the concerns with traffic?

Beatriz Bizzuti, Marina Costa, Scott Newell, Brian Luck, Francisco Arriaga, Mark Renz, John Grabber, and Heathcliffe Riday

Typical alfalfa fields



Alfalfa fields need multiple mechanized operations

More wheel traffic!
50% field passed 1X

Wheel traffic

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

Reduced water infiltration, increase resistance to root growth, reduced oxygen diffusion through soil profile...

Study in Minnesota:

- 4 alfalfa cultivars with various levels of disease resistance
- 2 years, 2 locations
- Traffic applied 48 h after harvest (~5,000 lb)
 - Forage harvested: ↓13 to 16% with traffic
 - Plant counts: ↓13 to 16% with traffic
 - Crown rot: ↑crown disease

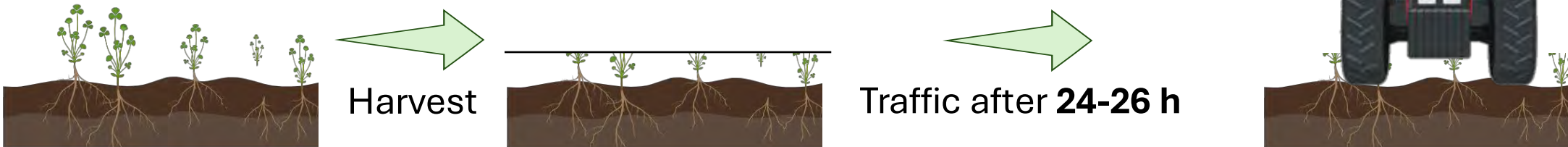
Source: Samac, D.A., Lamb, J.F.S., Kinkel, L.L. et al. Effect of wheel traffic and green manure treatments on forage yield and crown rot in alfalfa (*Medicago sativa*). Plant Soil 372, 349–359 (2013). <https://doi.org/10.1007/s11104-013-1746-5>

What are the concerns with traffic? Understanding alfalfa operations

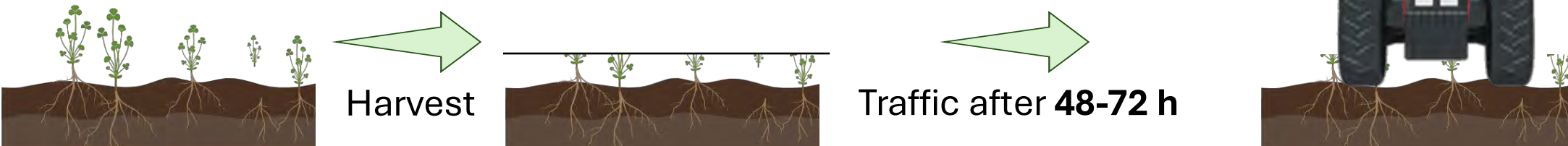
Typical traffic imposed on alfalfa fields established under moderate till over 3 years (2019-2021):

Treatment	Traffic Simulated
No traffic	None
3-Pass Silage	Mower, merger, forage harvester
5-Pass Silage	Mower, merger, rake, forage harvester, transport vehicle
3-Pass Hay	Mower, merger or rake, baler
5-Pass Hay	Mower, merger, rake, baler, transport vehicle

Silage

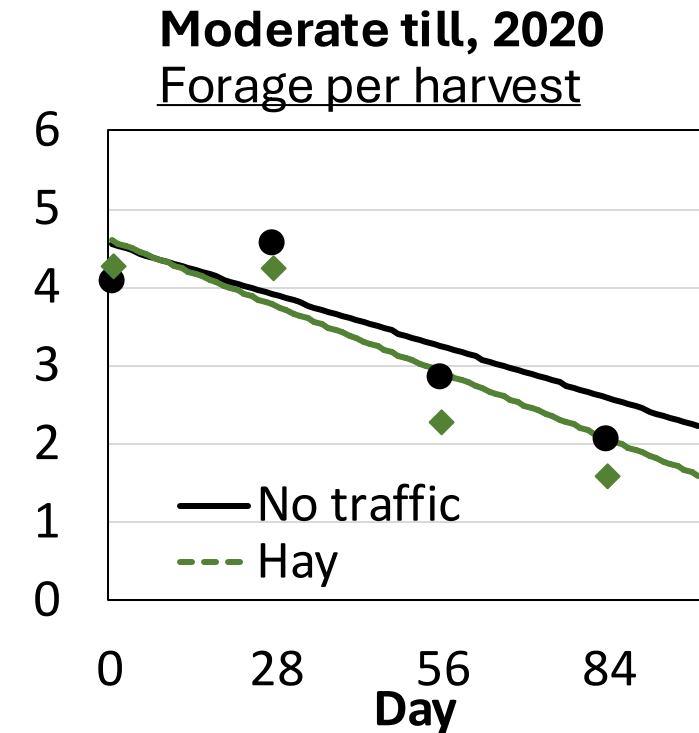
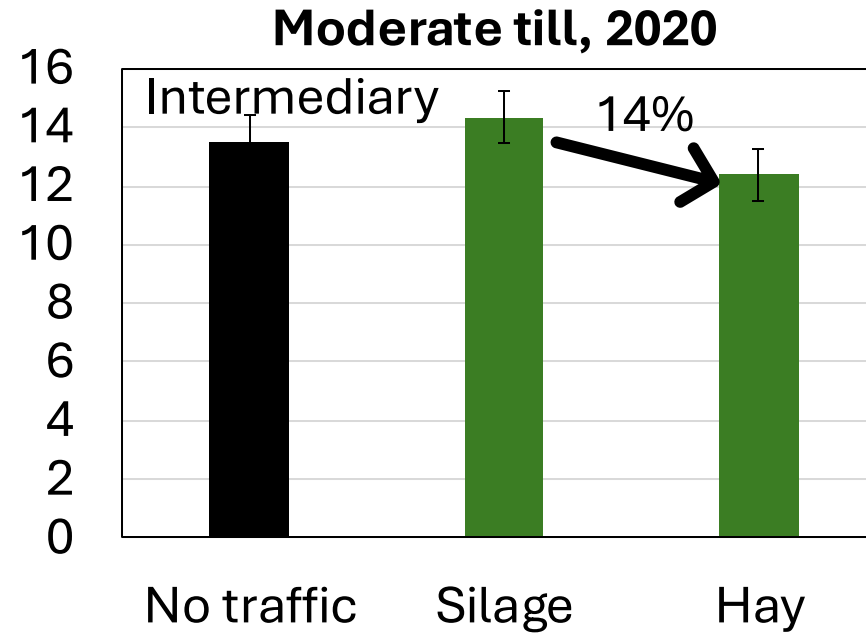
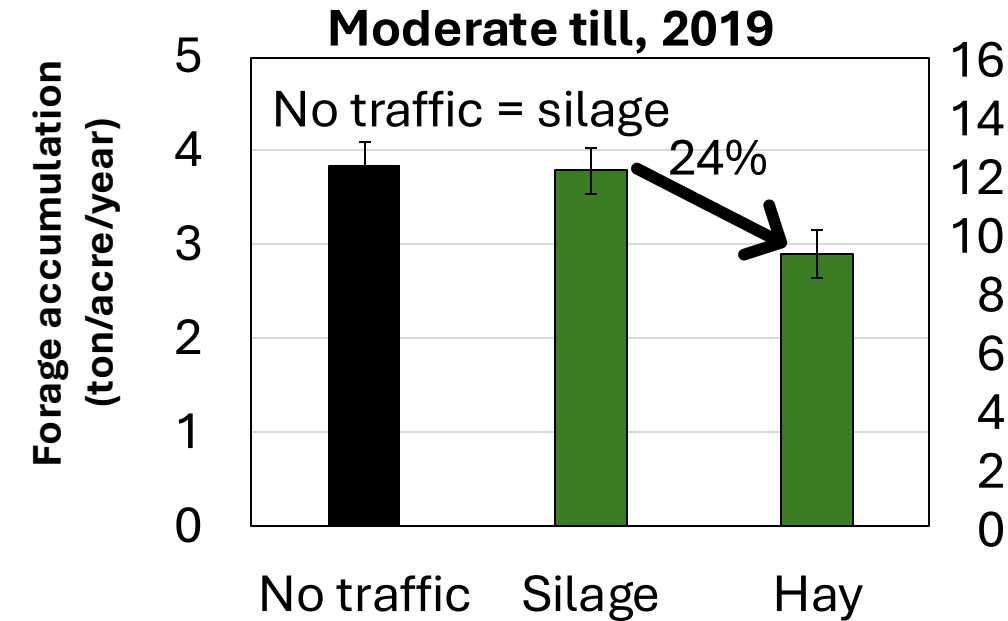


Hay

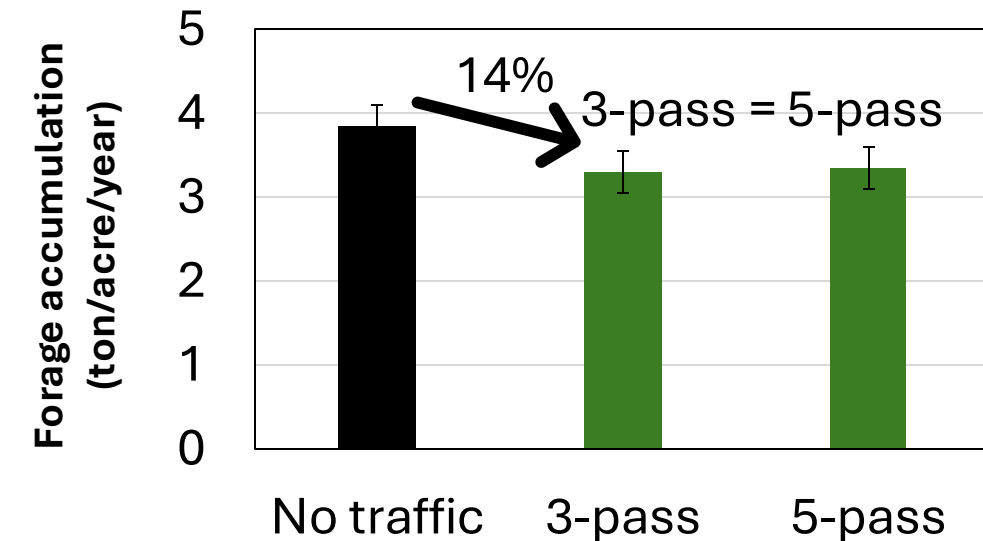


What are the concerns with traffic? Understanding alfalfa operations

What is the effect of time (24-26 h versus 48-72 h)?



What is the effect of frequency (3 versus 5 passes)?



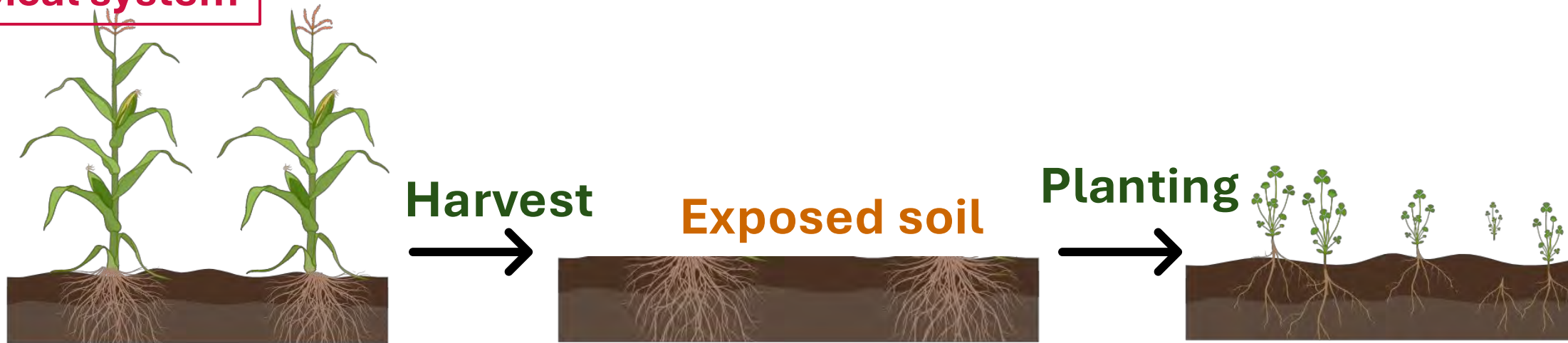
Take home messages:

- Wheel traffic from typical operations reduce alfalfa production
- Greater interval between harvest and traffic is worst!
 - More time for regrowth = greater damage to new shoots... but no effect on the 3rd year
- More frequent traffic also worst – but effect is not as intense as timing

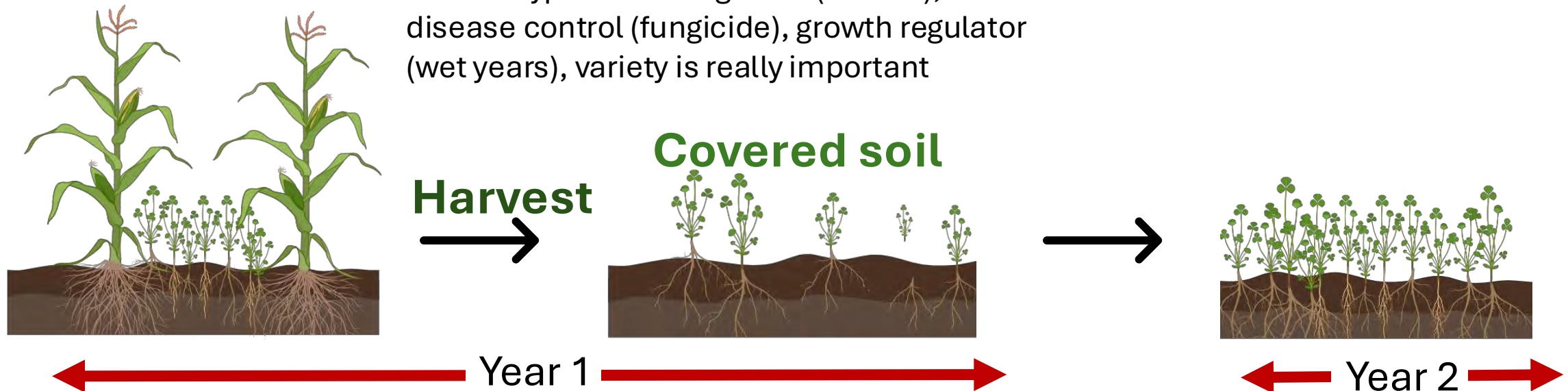
Alternative production systems – the case of interseeding and traffic

What do large scale plots tell us?

Typical system

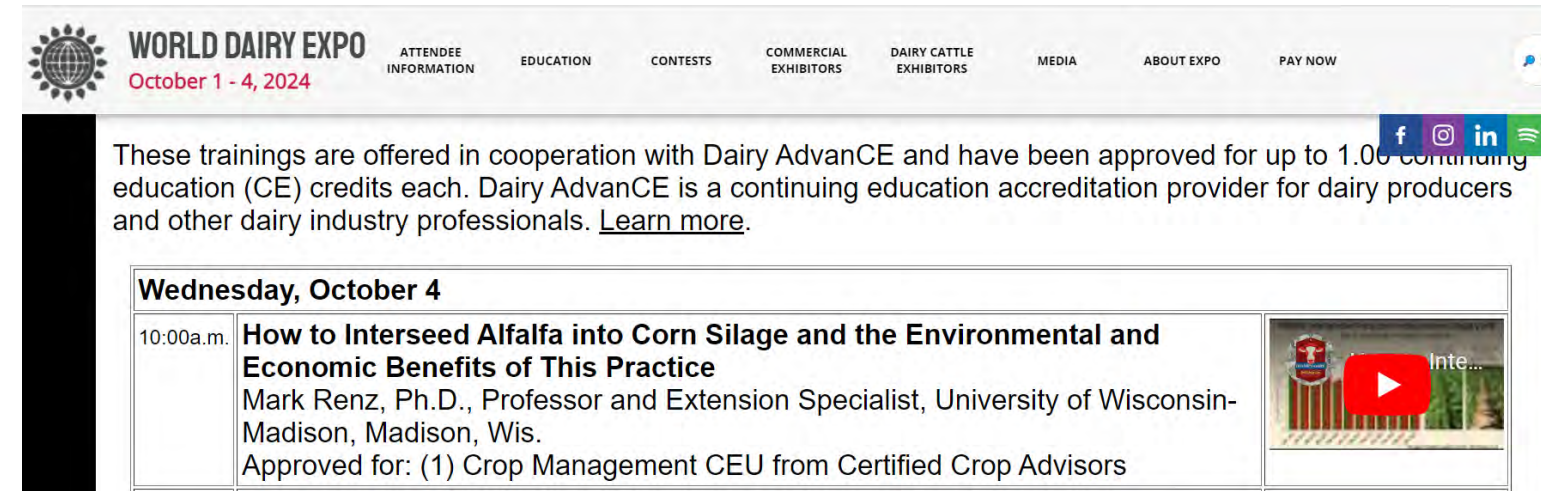


Interseeded system



Additional information:

- How to Interseed Alfalfa into Corn Silage and the Environmental and Economic Benefits of This Practice (World Dairy Expo), by Dr. Mark Renz. <https://worlddairyexpo.com/pages/Dairy-Forage-Seminars.php>



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Wednesday, October 4

10:00a.m. **How to Interseed Alfalfa into Corn Silage and the Environmental and Economic Benefits of This Practice**
Mark Renz, Ph.D., Professor and Extension Specialist, University of Wisconsin-Madison, Madison, Wis.
Approved for: (1) Crop Management CEU from Certified Crop Advisors

- Corn-Alfalfa Interseeding – A Unique Strategy for Alfalfa Establishment (UW Crops and Soils, Division of Extension), By Scott Newell et al. <https://cropsandsoils.extension.wisc.edu/articles/corn-alfalfa-interseeding-a-unique-strategy-for-alfalfa-establishment/>



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Corn-Alfalfa Interseeding – A Unique Strategy for Alfalfa Establishment

Written by Scott Newell, Marta Kohmann and Mark Renz

Download the full factsheet



Interseeding alfalfa into silage corn

CURRENT RECOMMENDATIONS

Over the last decade, scientists at the USDA-Agricultural Research Service, the University of Wisconsin, Michigan State University and Penn State University have been developing reliable methods for establishing alfalfa in high yielding silage corn. Based on this work, the following represents our current recommendations for implementing this practice on farms. Establishment of alfalfa by interseeding into corn has:

BENEFITS

- Up to 2-fold greater 1st year alfalfa yield compared to conventional spring-seeded alfalfa and greater overall forage production from corn silage-alfalfa rotations
- Profitability of corn silage-alfalfa rotations increased by 7-15% under typical production conditions
- Soil and nutrient loss from cropland decreased by 37-87% due to greater soil

CHALLENGES

- Competition from interseeded alfalfa seedlings can reduce corn silage yield by 0-15%
- Wet soil conditions during corn silage harvest can damage alfalfa stands
- 1-3 extra passes are required for agrichemical application to ensure

When trying new practices, it's always a good idea to start small!

Arlington demonstration plots

Data from Dr. Mark Renz and Dr. Rayhan Shaheb

	Traditional corn silage (Year 1) and spring seeded alfalfa (Year 2)	Alfalfa interseeded into corn silage – fungicide, insecticide, and plant growth regulator	Alfalfa interseeded into corn silage – fungicide and insecticide
2022	<u>Establishment:</u> • Corn planted 5/16 <u>Management (2 passes):</u> • Herbicide 6/01 • Herbicide 7/01	<u>Establishment:</u> • Corn planted 5/16 • Alfalfa planted 1 day after corn <u>Management (4 passes):</u> • Herbicide 6/01 (alfalfa emergence) • Herbicide 7/01 • Plant growth regulator 6/30 • Insecticide and disease 7/8	<u>Establishment:</u> • Corn planted 5/16 • Alfalfa planted 1 day after <u>Management (3 passes):</u> • Herbicide 6/01 (alfalfa emergence) • Herbicide 7/01 • Insecticide and disease 7/8
2023	<u>Establishment:</u> Spring	<u>Alfalfa stem count:</u> 78 stems/ft ²	<u>Alfalfa stem count:</u> 56 stems/ft ²
Production			
2022	<u>Corn silage yield:</u> 7.2 t DM/A	<u>Corn silage yield:</u> 7.2 t DM/A <u>Alfalfa cover (fall):</u> 59%	<u>Corn silage yield:</u> 7.5 t DM/A <u>Alfalfa cover (fall):</u> 55%
2023	<u>Harvest:</u> • 1st cut: 0.6 t DM/A • 2nd cut: 1.7 t DM/A • 3rd cut: 1.6 t DM/A <u>Total:</u> 3.9 t DM/A	<u>Harvest:</u> • 1st cut: 1.8 t DM/A • 2nd cut: 1.3 t DM/A • 3rd cut: 2.1 t DM/A • 4th cut: 1.5 t DM/A <u>Total:</u> 6.7 t DM/A	<u>Harvest:</u> • 1st cut: 1.4 t DM/A • 2nd cut: 1.5 t DM/A • 3rd cut: 2.4 t DM/A • 4th cut: 1.5 t DM/A) <u>Total:</u> 6.8 t DM/A
	Total = 11 t DM/acre	Total = 14 t DM/a (↑26%)	Total = 14.3 t DM/a (↑30%)

Lancaster demonstration plots

Data from Dr. Mark Renz and Dr. Rayhan Shaheb

	Traditional corn silage (Year 1) and spring seeded alfalfa (Year 2)	Alfalfa interseeded into corn silage – fungicide, insecticide, and plant growth regulator	Alfalfa interseeded into corn silage – fungicide and insecticide
2022	<u>Management (2 passes):</u> • Herbicide 6/01 • Herbicide 7/01	<u>Management (3 passes):</u> • Herbicide 6/01 • Herbicide 7/01 • Plant growth regulator 6/30	<u>Management (2 passes):</u> • Herbicide 6/01 • Herbicide 7/01
2023	<u>Establishment:</u> Alfalfa	<u>Alfalfa stem count:</u> 25 stems/ft ² (5/3)	<u>Alfalfa stem count:</u> 22 stems/ft ² (5/3)
Production			
2022	<u>Corn silage yield:</u> 8.7 t DM/A	<u>Corn silage yield:</u> 9.4 t DM/A <u>Alfalfa cover (fall):</u> 55%	<u>Corn silage yield:</u> 9 t DM/A <u>Alfalfa cover (fall):</u> 45%
2023	<u>Harvest:</u> • 1st cut: 0.4 t DM/A • 2nd cut: 1.1 t DM/A • 3rd cut: 0.4 t DM/A <u>Total:</u> 1.9 t DM/A	<u>Harvest:</u> • 1st cut: 1.7 t DM/A • 2nd cut: 1.0 t DM/A • 3rd cut: 1.4 t DM/A • 4th cut: 0.5 t DM/A <u>Total:</u> 4.6 t DM/A	<u>Harvest:</u> • 1st cut: 1.4 t DM/A • 2nd cut: 1.2 t DM/A • 3rd cut: 1.6 t DM/A • 4th cut: 0.7 t DM/A <u>Total:</u> 5.0 t DM/A
	Total = 11 t DM/A	Total = 14 t DM/A (↑32%)	Total = 14 t DM/A (↑32%)

Alternative production systems – the case of interseeding

What are the concerns with traffic?

Beatriz Bizzuti, Marina Costa, Scott Newell, Brian Luck, Francisco Arriaga, Mark Renz, John Grabber, and Heathcliffe Riday

Typical alfalfa fields



Alfalfa fields need multiple mechanized operations

➤ More wheel traffic!
50% field passed 1X

Corn-alfalfa interseeded fields



Additional mechanized operations for growing corn

➤ Even more wheel traffic!

Wheel traffic

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

Producers' concerns

- Traffic from corn harvest damaging alfalfa
- In some cases, alfalfa re-growth was very poor
- Worst when/where soils were high in moisture

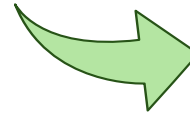
Alternative production systems – the case of interseeding

What are the concerns with traffic?

Corn silage (2024)
No traffic
Chopper (30,000 lb)
Truck (50,000 lb)
Tractor (60,000 lb)
Chopper + Truck
Chopper + Tractor



24 hours



Alternative production systems – the case of interseeding

What are the concerns with traffic?

No traffic



Chopper + Truck



Wet spring – difficult for alfalfa
Dry at time of traffic
Soil respiration (soil health)
Stand evaluation

Alternative production systems – the case of interseeding

What are the concerns with traffic?

No traffic

7 days

10 days



Chopper + Truck

7 days

10 days

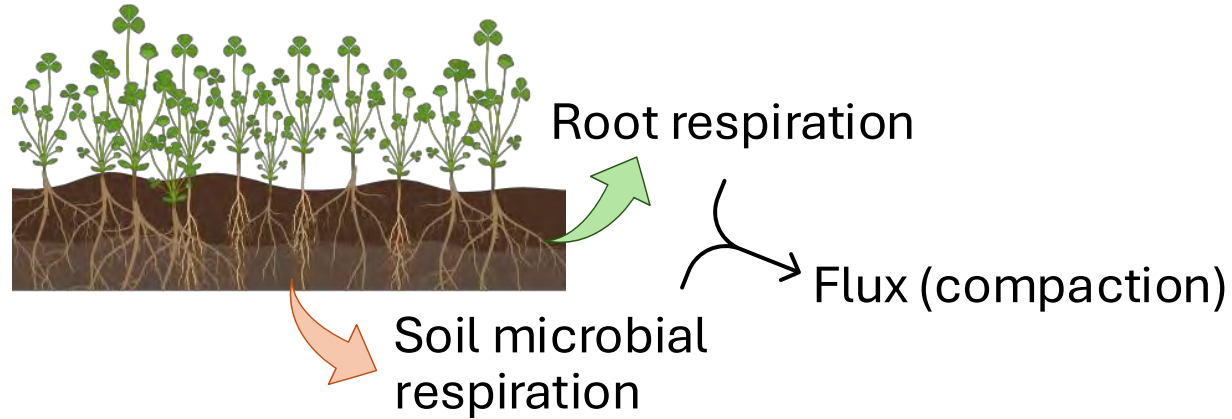


 ~ 7 days after traffic (1.7 inches)

Alternative production systems – the case of interseeding

What are the concerns with traffic?

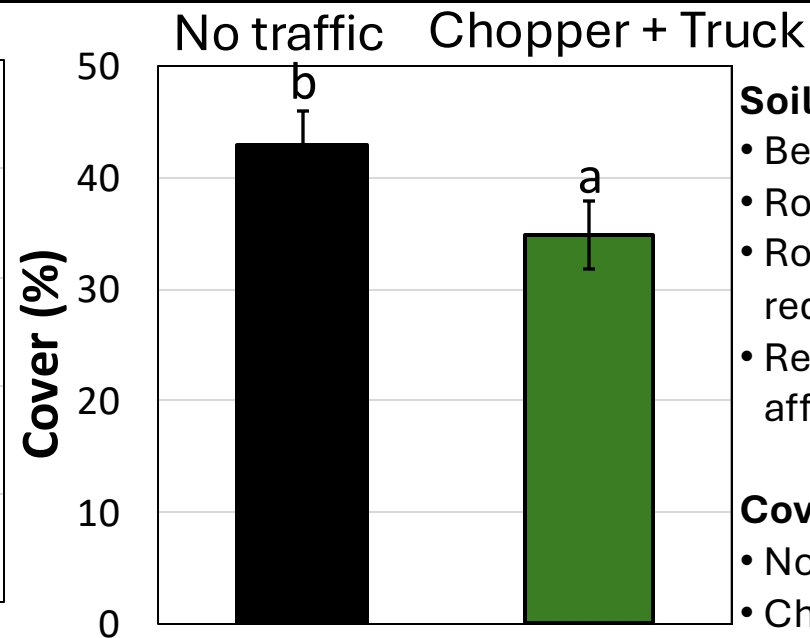
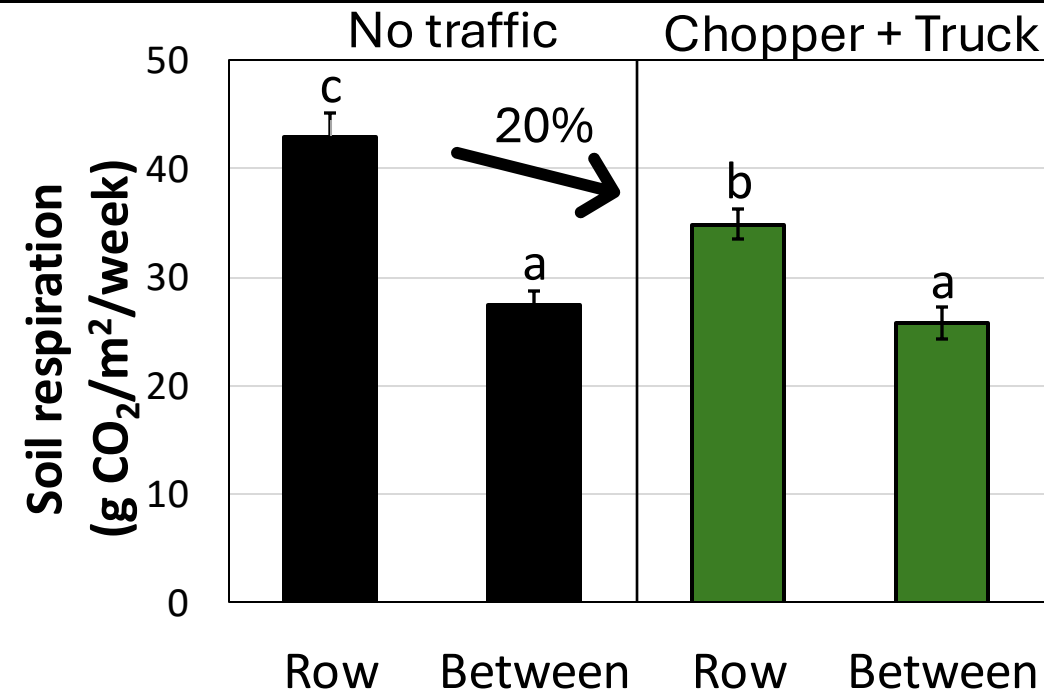
Soil respiration is a proxy for soil health



On alfalfa row



Between alfalfa rows



Take home messages:

Soil respiration:

- Between rows (soil): limited effect
- Row (plant + soil) > Between row (soil)
- Row (alfalfa + soil): traffic significantly reduced soil respiration
- Results suggest plants were more affected than soil

Cover (%) in October:

- No traffic = 43%
- Chopper + Truck = 35%

Alternative production systems – the case of interseeding

What are the concerns with traffic?

Corn silage (2024)	Alfalfa (2025)
No traffic	No traffic
Chopper (30,000 lb)	No traffic
Truck (50,000 lb)	No traffic
Tractor (60,000 lb)	No traffic
Chopper + Truck	No traffic
Chopper + Tractor	No traffic
No traffic	Traffic
Chopper	Traffic
Truck	Traffic
Tractor	Traffic
Chopper + Truck	Traffic
Chopper + Tractor	Traffic





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