

SARE PLANTING GREEN WORKSHOP 2024:

MANAGING COVER CROPS TO ENHANCE THEIR CLIMATE AND AGRONOMIC SERVICES

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Background.

Winter cover cropping expands the annual period that soils are vegetated with living roots from 4 months with just annual crops to nearly 12 months. Cover crops (CCs) can help agriculture enhance soil and water quality and mitigate climate change by adding carbon to soils. Unlike most farmland in the world, typical cropland here at the Beltsville Facility of Central Maryland Research and Education Center (CMREC) and in much of Maryland has been managed with some form of no-till and cover cropping for decades.

Current CMREC (Beltsville) Experiments.

Field experiments were established in 2020 on two soils (one sandy, one clayey) at CMREC to test the effects of enhanced cover crop management on nitrogen (N) cycling, soil health indicators, carbon fixed in above- and below-ground biomass, water conservation, and pest (especially slug) management.

- Two cash crops in corn/soybean rotation.
- Three CC treatments: sole rye (**rye**), forage radish + crimson clover + rye (**3-way**), & control (**NC**) where previous cover cropping ceased.
- Relatively short-season soybean & corn cultivars.
- CC overseeded in corn, ~mid-July to mid-August ahead of rain if possible.
- CC overseeded in soybean at leaf drop ~ Sept.5
- If CC has to be drilled later than Sept. 15, substitute 2 lbs rapeseed for radish.
- Total N applied to corn = 160 lb N/A in 39a, 180 lb N/acre in 7e. Split with 40 lb at planting.
- Uniform lime, P, K, S, Zn, B to corn by soil tests.

Variables studied so far.

- CC biomass for shoots and roots
- CC N uptake and leaching water N conc.
- Slug activity and damage to crop seedlings.
- Crop stand establishment.
- Soil water (tension and volumetric content).
- Soil carbon (SOC and POXC) and aggregates.
- Crop yields.

Cover Crop Biomass Data from 2023.

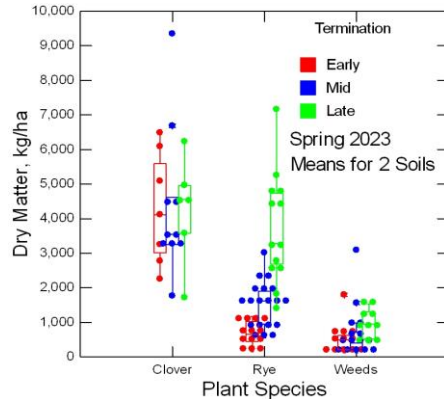


Figure 1. Boxplots of termination timing effect on aboveground biomass averaged across rye and 3-way cover crops and two soils. Rye biomass increased with later termination, but clover did not.

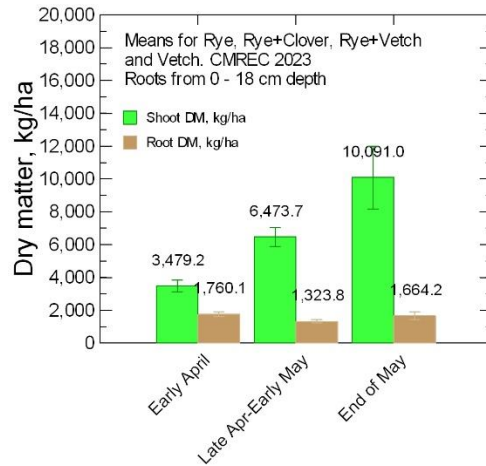


Figure 2. Root and shoot dry matter as affected by termination timing (means for rye, rye+clover, and vetch cover crops). Shoot biomass tripled, but root biomass did not change from early April to Late May.

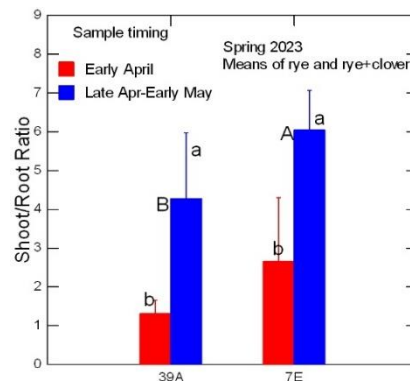


Figure 3. Shoot to root ratio as affected by termination timing (means for rye, and rye+clover cover crops). The shoot/root was greater in the clayey soil and at the late April termination. Clearly the ratio is not constant for a species.



Figure 4. Meadow slugs feeding on soybean and cover crops.

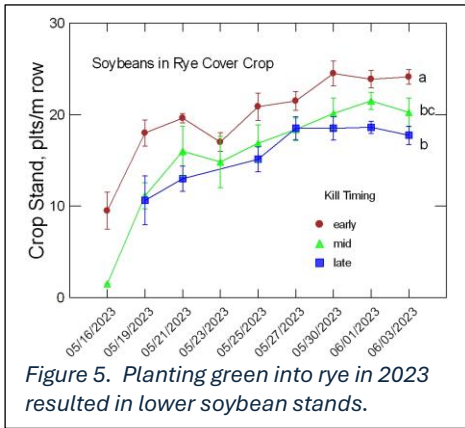


Figure 5. Planting green into rye in 2023 resulted in lower soybean stands.

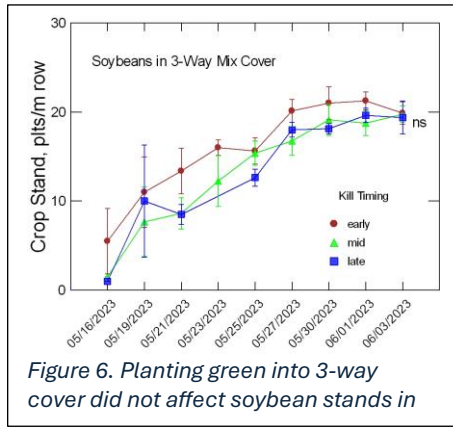


Figure 6. Planting green into 3-way cover did not affect soybean stands in

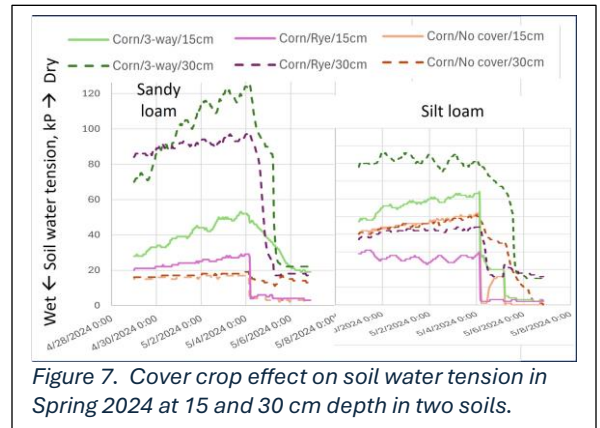


Figure 7. Cover crop effect on soil water tension in Spring 2024 at 15 and 30 cm depth in two soils.

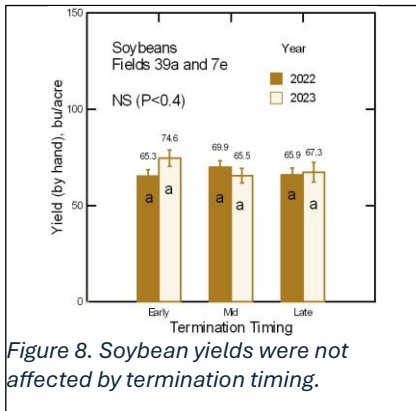


Figure 8. Soybean yields were not affected by termination timing.

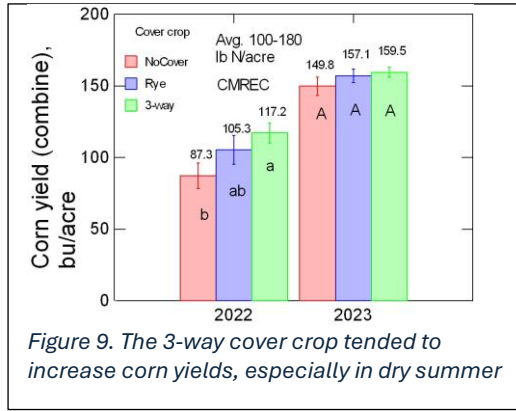


Figure 9. The 3-way cover crop tended to increase corn yields, especially in dry summer

Preliminary Conclusions.

1. CCs did not hurt, occasionally helped yields.
2. Extra month of warm growing time in spring can increase CC biomass by 3x to 4x.
3. Cover crops have not made slug damage worse, nor has planting green, which in 1 year of 3 reduced slug damage to soybean.
4. Planting green did not hurt soybean yields, with or without slug infestation.
5. CC's use mainly subsoil water in dry spring.
6. Planting green seems practical and cost-effective for maximizing cover crop benefits.

Experiment Plan on Fields 5-7E (Silty clay) & 39A (Sandy loam), CMREC Research Site, 2020-2026

REP 4	Treatment	60'	60'	60'	30'	Alleyway	REP 2	Treatment	60'	60'	60'	30'	main farm lane
	No cover	416	417	418				3-WayMix	216	217	218		
	3-WayMix	415	414	413				Rye	215	214	213		
	Rye	410	411	412				No cover	210	211	212		
	3-WayMix	409	408	407				No cover	209	208	207		
	Rye	404	405	406				3-WayMix	204	205	206		
	No cover	403	402	401				Rye	203	202	201		
	Rye	316	317	318				Rye	116	117	118		
	3-WayMix	315	314	313				3-WayMix	115	114	113		
	No cover	310	311	312				No cover	110	111	112		
	3-WayMix	309	308	307				3-WayMix	109	108	107		
	Rye	304	305	306				Rye	104	105	106		
No cover	303	302	301	No cover	103	102	101						

Grass lane

Crop Rotation

Crop (Flag colors)	Spring cover termination dates (2020-2023 corn had 3 N rates)			2020	/	2021	/	2022	/	2023	/	2024	/	2025	/	2026
No cover	early-Apr8-12	mid-May1-5	late-May9-13	<-Soybean	/	Corn	/	Soybean	/	Corn	/	Soybean	/	Corn	/	Soybean
3-WayMix	early-Apr8-12	mid-May1-5	late-May9-13	<- Corn	/	Soybean	/	Corn	/	Soybean	/	Corn	/	Soybean	/	Corn
Rye																

