

**"Spring management of cover crops –
how termination timing affects soybean growth and yield"
Progress Report to the Maryland Soybean Board on Project**

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The main objective of this research is to determine how to best manage cover crop termination to optimize the benefits derived from the cover crops with regard to slug damage, water conservation, soil health enhancement, and yields of soybeans and corn

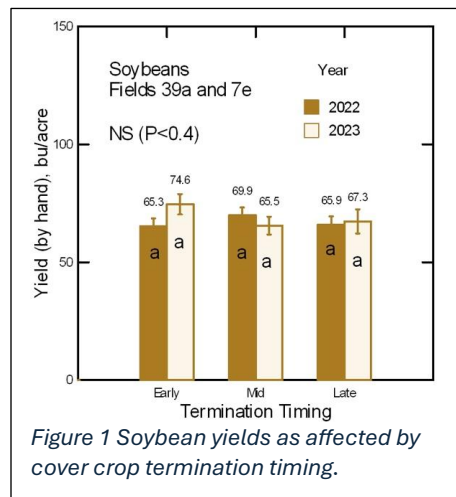


Figure 1 Soybean yields as affected by cover crop termination timing.

grown in rotation. The work was conducted on two contrasting soils, one a very sandy soil in the other a silty clay with somewhat poor drainage. Cover crop main treatments were no cover control (NC), cereal rye pure stand (rye), and a three-species mix of forage radish - crimson clover - cereal rye (3-way). Where soybeans were planted cover crop management options included early termination, mid-termination timing which was simultaneous with planting green, and late termination which was targeting a week to 10 days after planting green.

20th, almost 3 weeks after the mid-termination date and planting green. This later-than-planned determination resulted in effects that were not seen in earlier years when

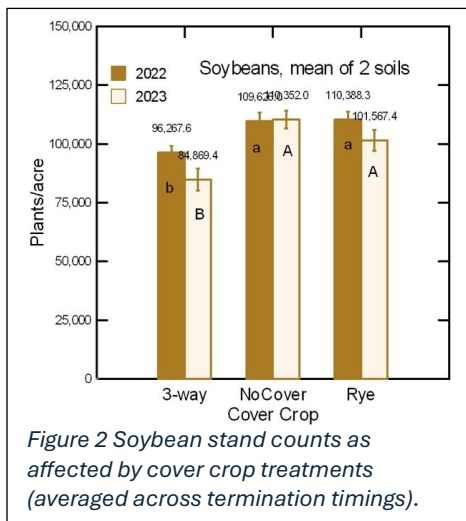
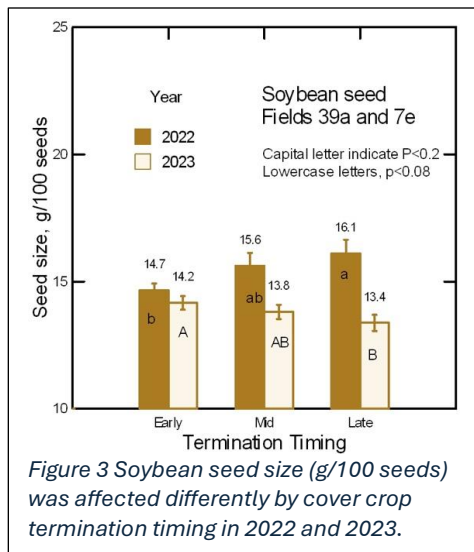


Figure 2 Soybean stand counts as affected by cover crop treatments (averaged across termination timings).

In the spring of 2023, the late cover crop termination was delayed by wet weather and didn't occur until May 20th, almost 3 weeks after the mid-termination date and planting green. This later-than-planned determination resulted in effects that were not seen in earlier years when termination was only 7 to 10 days after planting green. These effects included cooler weather soils during the soybean seedling stage, late emergence of the soybeans, and slightly reduced stands, all of which were reported on in your previous progress report.

This progress report will focus on the cover crop management effects on the yields of soybeans and corn. Soybean yields and fall of 2023 were nearly identical to the yield levels of 2022 and averaged between 65 and 75 bushels per acre. Soybean yields were not affected by cover crop or by cover crop termination timing in either year. This means that cover crops can be allowed to grow late so that soybeans are

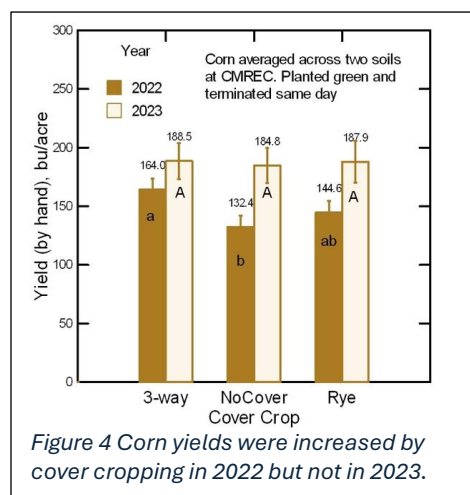
planted green into living cover crops without sacrificing soybean yield. Late termination



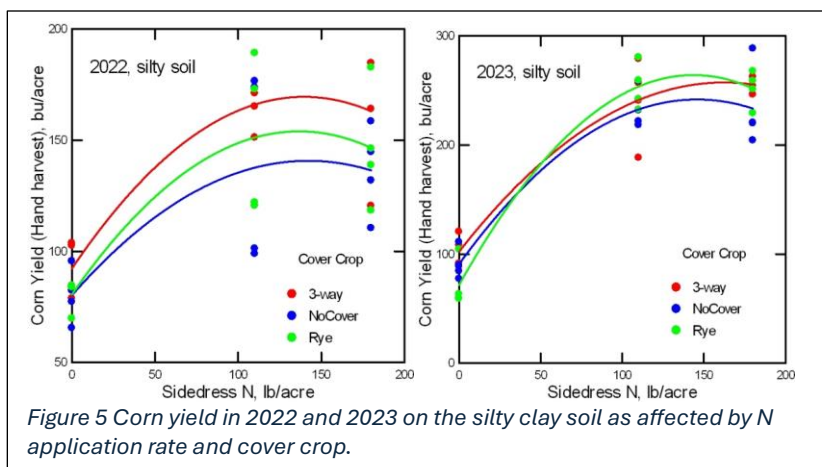
allows cover crops to grow much larger biomass and therefore provide a thicker, longer-lasting mulch that conserves water during the summer. In years with severe moisture stress in the summer soybeans have been shown to yield better following a cover crop that left a thick water-conserving mulch on the surface.

Even though soybean yields were not affected, the cover crop treatments did affect both soybean stand counts and the seed size of the soybeans. The main effect that was seen was that the three-way cover crop mixture, especially when terminated late some 3 weeks after planting green, reduced the soybean stand somewhat (figure 2) and also the seed size, see Figure 3. Termination timing had contrasting effects on seat

size in 2022 compared to 2023. Later termination of cover crops decreased the soybean seed size (g/100 seeds) in 2023 but increased it in 2022.

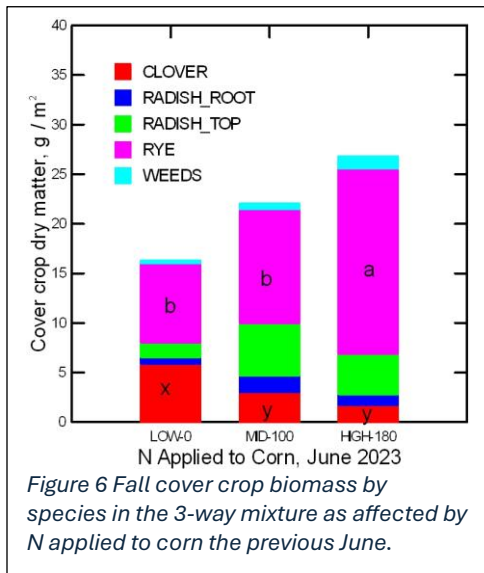


For corn the effect of cover crops was different in 2022 than 2023. When considering only the corn that received realistic nitrogen rates open parentheses between 100 and 180 lb N per acre), yields in 2023 averaged about 186 bushels per acre and were unaffected by the cover crop treatments. This is in contrast to the corn yields in 2022 when both rye and three-way cover crops produced higher corn yields than the no-cover treatment. In 2022 the 3-way cover crop corn produced 32 bushels more per acre than the nail cover crop and the nitrogen response indicated that only part of this yield increase was due to increased nitrogen availability.



In 2022 corn yields were greatest after the three-way cover crop, next highest after the ride cover crop, and lowest after no cover crop regardless of nitrogen application rate open parentheses Figure 5). By contrast, in 2023 on the fine-textured soil, corn yields were considerably higher but unaffected by cover crop. Corn yields at the 110

pound/acre nitrogen rate were no different from those at the 180 pound/acre nitrogen rate in either year (see Figure 7).



Finally, cover crops intersown into standing corn before harvest produced more biomass by early December in plots where the corn had had 180 lb of nitrogen per acre than in plots where corn had received lower amounts of nitrogen (Figure 6). This suggests that nitrogen fertilizer applied at side-dressing time was not efficiently used by the corn such that significant amounts of N were left over in late fall and still available for cover crop to take up. The effect on the cover crop productivity was more dramatic considering that during the cover crop establishment and early growth the corn that had received low rates of nitrogen provided less competition for light and water compared with the more heavily fertilized corn.