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The Next 30 Years of Sustainable Agriculture

SARE PROJECT OS16-096

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Cover Crop Influence on Stored Soil Water Availability to Subsequent Crops

Statement of Problem

Reducing weed pressure on crops without affecting soil health through intense and frequent tillage and cultivation practices is a major challenge in sustainable crop production. South Carolina SARE Program farmer stakeholders have identified "cover cropping for weed management" as the highest priority topic for research and training. Despite the potential benefits, few grain producers in the southeast have included cover crops as part of their cropping systems because of several challenges. One of the major concerns of producers is the possibility that cover crops may reduce the amount of water stored in the soil profile for the next grain crop, potentially reducing yields. Therefore, it is imperative to test the effect of cover crops on stored soil water before they are introduced to the cropping system for sustainably managing weeds and improving soil health.

Research Question

If I plant a cover crop, how much soil water does it use and will it cause water stress to the subsequent cash crop?

Approach and Methods

We evaluated the common cover crop species in South Carolina for water use and biomass production. We evaluated seven cover crop treatments including grasses, legumes, and brassicas as single species or in mixtures, and compared them with two controls, a weed-free fallow and a weedy fallow, in an on-farm trial (Millam Farm, Pendleton, South Carolina) during 2016-2017. Soil moisture content was measured at 10, 20, 30, 40, 60, and 100 cm depths at approximately biweekly intervals during cover crop season and at one month after cover crop termination. Biomass was measured at monthly intervals during the cover crop season.

Results

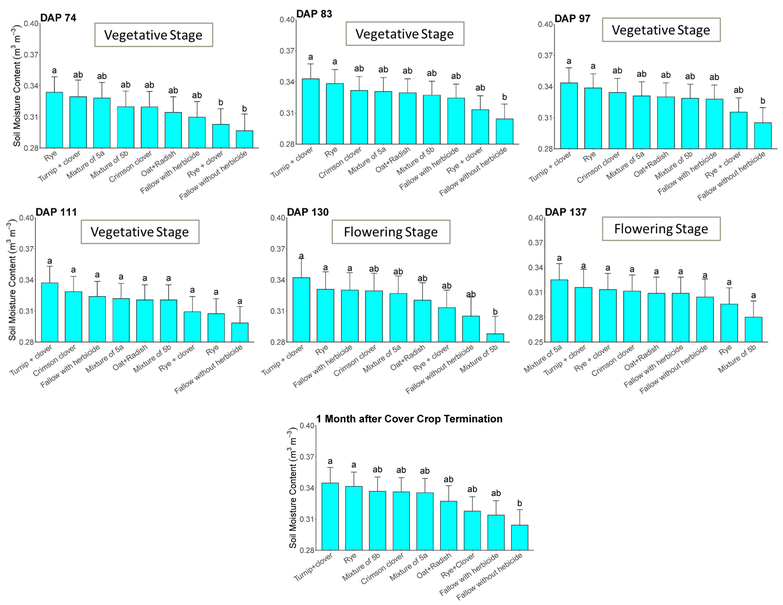

Fig. 1. Effect of cover crops on soil moisture content (Mixture of 5a- Austrian winter peas, Crimson clover, Hairy vetch, Rye, and Oats; Mixture of 5b - Crimson clover, Radish, Turnip, Wheat, and Oats)

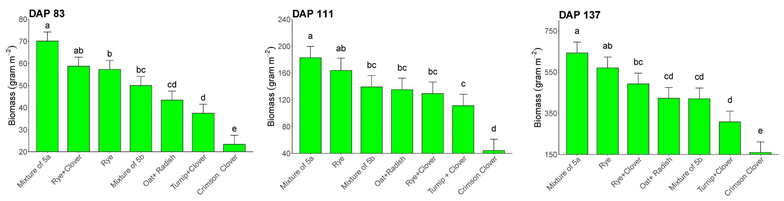

Fig. 2. Cover crops biomass production

Best ground covers

Rye

Austrian winter pea, Rye, Clover, Hairy vetch, and Oats

Intermediate ground covers

Rye and Clover

Radish, Turnip, Wheat, Oats, and Clover

Worst ground covers

Crimson clover

Oat and Radish

Turnip and Clover

- All cover crop treatments retained more or equal amount of soil moisture compared to controls (weed-free or weedy fallow).
- Rye and the mixture of Austrian winter pea, crimson clover, hairy vetch, oat, and rye were good ground covers in terms of number of plants per meter square, and had highest amount of biomass and water use efficiency (biomass produced per unit amount of water used) values.
- Though crimson clover and the mixture of turnip and crimson clover retained good amount of moisture in the soil, they were poor biomass producers and ground covers.

Future Works

- Determine the effect of cover crops on soil health and weed suppression, and their impact on the performance of the following cash crop.

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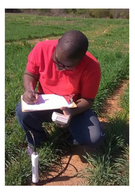
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