

FIELD DAY: Eastern South Dakota Soil and Water Research Farm

“Crop Legacies–Preparing the Ground for Followers” June 21, 2022

The 28th annual summer field day on Tuesday, June 21 @ 10:00 am at the Eastern South Dakota Soil and Water Research Farm will focus on crop legacies and their effect on crop yields, profitability, and soil health. Diversifying crop rotations with small grains, pulse crops, forage, sunflower, and cover crops can increase corn and soybean yields, build healthy and erosion-resistant soils, while reducing economic risk. The diversification of crop rotations also provides an opportunity to examine the effects of the preceding crop which creates a crop legacy that influences the success of the following crop. We have found that crop legacies include significant effects on soil microbial communities which mediate the outcomes for the following crop. Shannon Osborne (USDA-ARS) will share research conducted on a 20-year field experiment wherein crop legacies influenced subsequent crop yield, root architecture, and N availability. Tong Wang (SDSU) will discuss analyses of crop diversification and its potential to improve economic returns and promote resilience of crop yields to variable weather. Patrick Ewing (USDA-ARS) will demonstrate how management in oat-forage systems can produce milling-grade grain, establish soil-building forage, and slash herbicide usage even in hot, dry years. Karl Roeder (USDA-ARS) will share research where he has found that cover cropping stimulates plant-pollinator interactions in sunflowers included in diversified rotations. Eric Barsness, Conservation Agronomist with the NRCS, will speak about federal and private sector cost-share programs that support diversification of crop rotations and cover cropping management practices.

10:00 – 10:45

1.0 CEU Area - Crop Production

Improving crop growth through diversified rotations - Shannon Osborne, NCARL

Summary: Developing crop rotations to support sustainable agriculture depends on understanding how crop rotations affect crop characteristics and soil properties. Research will be presented that found that rotations that include small grains resulted in greater root length density than grain legumes. Soybean yield was greater following winter wheat than other rotations. Soybean grown following winter wheat produced greater crop yield with less below-ground root length, compared to soybean following corn in the crop rotation. Corn grown following peas resulted in greater yield compared to corn following other crops with less fertilizer nitrogen application.

Economics of conventional vs. diversified crop rotation systems in South Dakota - Tong Wang, South Dakota State University

Summary: Relatively low profitability of 3rd and 4th crops could pose a barrier to farmers' adoption decisions. In a recent study, we compared three 4-yr diverse crop rotations with the 2-yr corn-soybean (CS) rotation. The 4-yr diverse crop rotations were (1) corn–pea–winter wheat– soybean (CPWwS), (2) corn-soybean–spring wheat–pea (CSSwP), and (3) corn–oat–winter wheat–soybean (COWwS). Our comparison indicates that the right selection of crop rotation system plays an important role in optimize economic returns. The 2-yr CS rotation may achieve the highest economic returns with sufficient fertilizer input, yet it lacks resilience when N fertilizer is under-applied. Our study suggests that extending the CS rotation to the more diversified crop rotation, such as CSSwP, offers the potential to improve economic returns and reduce the overreliance on N fertilizer.

10:45 – 11:30

1.0 CEU Area – Crop Production

Oats: An *Avena*-ue toward flexible, productive, weather-resistant cropping systems - Patrick Ewing, NCARL

Summary: Oats are the foundation for flexible, productive, and weather-resistant farm systems. Research Agronomist Patrick Ewing will showcase this potential in two phases of an ongoing experiment. Phase one demonstrates how management in oat-forage systems can produce milling-grade grain, establish soil-building forage, and slash herbicide usage even in hot, dry years. Phase two quantifies nitrogen credits to corn from oat-established medium red clover and the additional boost to corn health from adding oat to the corn-soybean rotation.

Cover crops plus pollinators improve yield of sunflowers in crop rotations - Karl Roeder, NCARL

Summary: Cover crops provide a plethora of environmental benefits to agroecosystems by diversifying habitat for wildlife while reducing soil erosion, suppressing weeds, and improving soil fertility. Yet, we still lack fundamental knowledge on how cover crops directly and indirectly affect plant-pollinator interactions and if those interactions will lead to increases in food production. Today we will be talking about some of those interactions and how cover crops can benefit sunflowers and the wild bees that visit them.

11:30 – 12:00

0.5 CEU Area – Crop Production

Financial incentives and management considerations for diversified rotations - Eric Barsness, NRCS

Summary: I will be talking about various cost share programs from NRCS and other agencies. Other topics include “What is it about rotations that make a difference in the soil and profitability?” and “How can a slight adjustment to a rotation make a difference in dealing with wild weather?”