

## **Enhancing Profitability of Soybean Production and Soil Health through Livestock Integration**

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### **Why the Research is Important to North Dakota Soybean Producers**

Livestock integration may be a missing factor in achieving the full potential of cover crops. Livestock use can build organic matter and improve soil nutrient cycling, while creating a return in the form of a forage crop. Winter rye is often incorporated in soybean production systems as a cover crop, managing winter rye with grazing has the ability to extend the grazing season, while benefiting soils, crops, and economics.

### **Research Conducted**

In fall of 2022, four winter rye and grazing management strategies were established at the Central Grasslands Research Extension Center (CGREC) and Carrington Research Extension Center (CREC): dual (fall + spring) grazing, spring grazing, no grazing, and no rye. Cattle grazed each applicable treatment during the fall and/or spring seasons. Soil samples were collected to determine soil nutrients – total nitrogen, phosphorous, potassium, total carbon, organic matter, as well as bulk density. Additionally, winter rye forage yield, animal performance, ground cover, and soybean production were evaluated.

This project will continue into the 2024 season after another winter rye grazing season following soybean harvest. Corn is planned for the summer of 2024 to recreate a typical soybean-corn rotation.

### **Findings of Research**

In the first year of the on-going trial, lack of fall moisture slowed the establishment of the winter rye, shortening the fall grazing period. The fall grazing period averaged 4 days at 1 head per acre across both locations. Dual grazing cattle lost an average of 4.5 lbs/day across locations. Weather also delayed growth and the grazing period in the spring. The spring grazing period averaged 14 days at 1.9 head per acre across both locations. Spring livestock production was variable, with an average gain of 0.5 lbs/day at CGREC and -1.4 lbs/day at CREC.

Winter rye suppressed weeds, resulting in significantly lower weed pressure in all treatments compared to no rye. Fall grazing did not reduce rye yield or cover in the spring when comparing dual grazing to the other rye treatments. Soil nitrate was significantly higher for the CREC no rye compared to the no grazed rye, while the grazing treatments did not differ from either the no graze or no rye treatments. No differences were observed for the other soil chemical properties. Bulk density was unaffected by grazing, indicating trampling from livestock was not severe enough to impact soil structure. Soil properties can be slow to change, continuation into 2023-2024 will aid in further evaluating the influence of livestock integration.

## **Captions**

*Figure 1. Absolute ground cover at Central Grasslands Research Extension Center (CGREC) and Carrington Research Extension Center (CREC) 2023. Ground cover was classified pre- and post-grazing and included living rye, residue, bare ground, and weeds.*

*Figure 2. Spring grazing cattle at the Central Grasslands Research Extension Center (CGREC)*

*Figure 3. Soybeans in heavy winter rye residue within a no graze plot at Carrington Research Extension Center (CREC).*