

Effect of long-term integrated crop and livestock systems on extended grazing and finishing, soil fertility, nitrogen mineralization, carbon sequestration, and profitability

Sustainable Agriculture Research & Education Project LNC16-381

### **Progress Report**

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The integrated systems research combines a diverse, 10-year, crop rotation comprised of spring wheat, cover crop, corn, pea-barley mix, and sunflower crops for either grain or oilseed production and annual forage grazing. Started in 2011, this long-term project is studying the effects of a crop rotation that includes cool- and warm-season grass and broadleaf plants on soil dynamics, which change slowly. For the current research (LNC16-381), short and long-term carbon pools, water soluble soil organic nitrogen, seasonal soil NO<sub>3</sub>-N fertility, residual soil nitrogen pools, microbial CO<sub>2</sub>-C and soil C:N ratio change between crops within the rotation, soil microbial PFLA microbial biomass and microbial functional groups, soil GHG emissions, soil bulk density change, and soil water dynamics are being evaluated. Farmer/rancher demonstration projects will integrate annual forage grazing into their grazing plans. Research data measuring long-term effects and on-farm cooperator projects will coalesce into a combined effort to increase awareness for agricultural and non-agricultural stakeholders providing a better understanding of integrated production principles, logistics, and economics. Outreach programming is engaging producers with the research findings through community café meetings and workshop.

Abstracts and progress reports are presented in this annual report under separate titles.

#### **Educational and Outreach Programming:**

Outreach programming for farmers, ranchers, extension, government agency personnel, and other interested stakeholders was offered through multiple community café small group meetings (range: 10 to 40 people) and a soil health workshop designed for university students and farmers and rancher from northern Great Plains region states, and a popular press article.

#### **Café Meeting Locations:**

Pierce, Logan, McIntosh, Adams, Hettinger, Bowman, Ward, and Stark counties.

#### **Invited Speaker Presentations:**

Midwest Soil Health Summit, Fergus Falls, MN  
Dickinson State University, Farm and Ranch Management Class  
Western Section, American Society of Animal Science, Fargo, ND  
World Cattlemen's Cow Efficiency Congress, Dickinson, ND (Songul Senturklu – Presenter)  
ND Extension Livestock In-Service, Washburn, ND  
Nebraska Northern Panhandle Cattlemen's Alliance Annual Meeting, Chadron, NE  
Chadron State College, Farm and Ranch Management Class, Chadron, NE  
Managing Soil – Maximizing Profit Conference, South Dakota State University, Extension Soil Health Program

#### **Workshop:**

Soil, Crop, and Livestock Workshop – “Healthy Soils = Healthy Environment & More Profit”

#### **Popular Press:**

The Sunflower magazine - “Cover Crops & Cattle – Western ND Study Shows Value of Rotation, Diversity, Soil Health & Cattle Production”

#### **Participation Summary:**

Farmer/Ranchers: 303; Ag Professionals: 211