MN Wheat Commission and NDSU Agreement for On-Farm Research

Project Title: MN Wheat On-Farm Research Program
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Budget: $60,000/year for 4 years ($240,000)

Project Description

North Dakota State University, the University of Minnesota, extension agents, crop consultants, and farmers will join forces to deploy the Minnesota Wheat On-Farm Research Network, providing integrated research, extension, and education to farmers and the future generation of agriculturalists. Our primary goal is to showcase the value of wheat beyond grain and its impact on soil health. A network of demonstration farms will implement large-scale on-farm research on practices such as nutrient management, reduced tillage, crop rotation, and cover crops, evaluating their impact on soil health, weed suppression, crop yield, and economic viability. This collaborative effort will empower farmers with practical skills and region-specific knowledge, ensuring that soil health improvement strategies are tailored to the unique conditions of each region. As a result of this initiative, we anticipate that farmers will become community leaders and foster a collaborative community of practice to promote regenerative agriculture.

Research Problem

Hard red spring wheat (HRSW) is well adapted to the weather and soils, fits well in crop rotations, and brings several benefits beyond the value of the grain. Nevertheless, HRSW acres are declining in Minnesota at an average of 54,000 acres per year since 1980 (Figure 1).

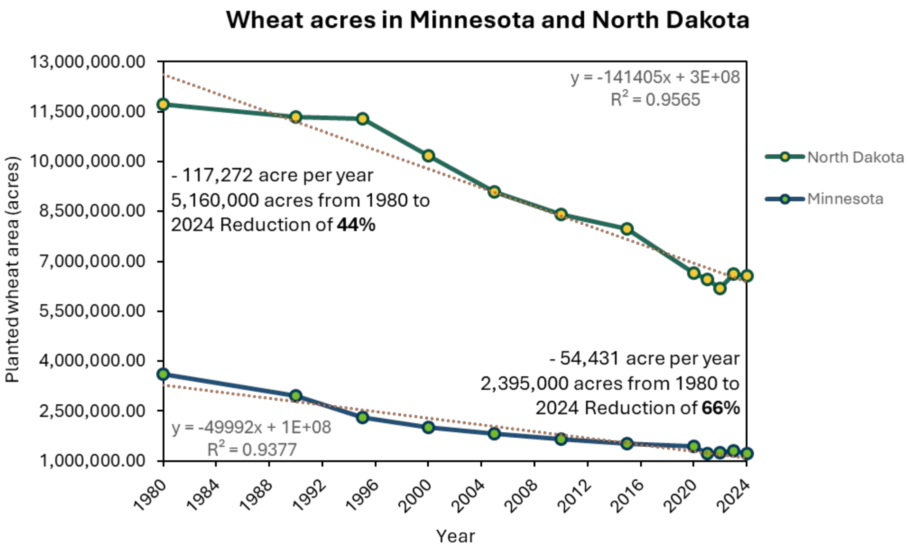

Figure 1. Planted wheat acres in Minnesota as reported by the United States Department of Agriculture National Agricultural Statistics Service.

In other words, the total wheat planted area has decreased by 66% (-2,395,000 acres) from 1980 to 2024. This decline is predominantly due to increases in the acreage of summer crops that offer greater technological options for growers (for example, genetically modified traits and the availability of hybrids). Summer crops may be more profitable, in part, due to new markets such as biofuels and increased demand by other countries. Due to that, producers in

Minnesota may miss the cropping benefits and versatility that wheat brings to the system. Some of the potential benefits include soil health, carbon sequestration, weed suppression, intensification and diversification of cropping systems, reduction of nitrogen losses, and increased yield of the subsequent crop (Figure 2).

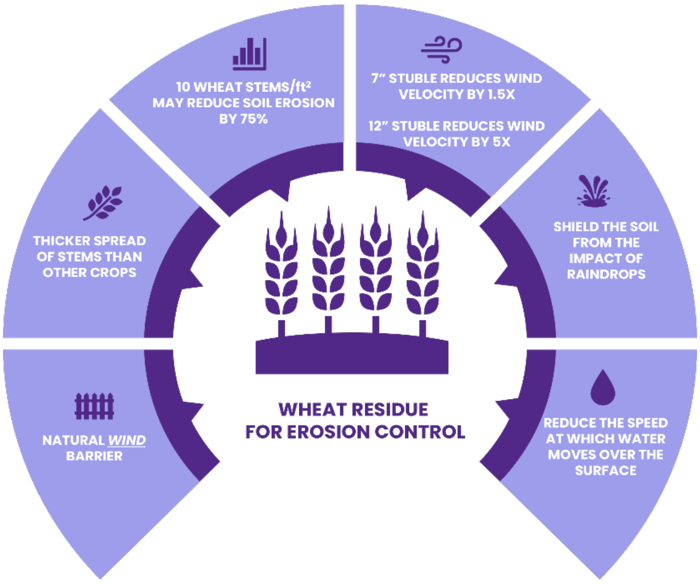

Figure 2. Benefits of wheat residue for soil health and erosion control

Objectives and Outcomes

Our goal is to measure and communicate the agronomic and economic benefits of integrating HRSW and regenerative agriculture practices, providing region-specific education for farmers through NDSU and UMN Extension, and other partners. We aim to recruit farms to implement large-scale on-farm research on regenerative agriculture practices, and to evaluate their effect on soil health, weed suppression, crop yield, and economic viability. Learning outcomes include farmers becoming community leaders and gaining knowledge on regenerative agriculture practices. Action outcomes will focus on improving production systems, demonstrating the viability of HRSW and regenerative agriculture practices.

Method/Approach

Research

The MN Wheat On-Farm Research Network will recruit farms in Minnesota to implement large-scale on-farm research to test the effects of integrating HRSW and regenerative agriculture practices. Tested practices may include nutrient management, reduced tillage, cover crops, and crop rotation. When implementing cover crops, the species used may vary from year to year based on cropping systems, seed availability, and cost. Given Minnesota weather conditions, there is no one-size-fits-all. This project is designed to be adaptable on the go, which is critical for conducting research in real-world scenarios. These farms will serve as showcases for other farmers interested in implementing regenerative agriculture practices.

The experimental design may vary slightly depending on the implemented practice, but it will generally consist of four randomized replicated strips of each treatment (standard practice *vs.* regenerative agriculture practice) in a randomized complete block design (RCBD). Each strip will cover a minimum of 2.5 acres, resulting in a total minimum research area of 20 acres (2 treatments * 4 reps = 8 strips; Figure 3). Since this project is a collective effort and involves real farms, the exact practices to be implemented will be determined after we sign contracts with the farmer-cooperators. Ideally, the implemented practice will be of interest to the surrounding community or region, and we will take into consideration aspects such as environmental conditions, the available machinery, and logistics. This aspect is important to achieve the proposed outcomes.

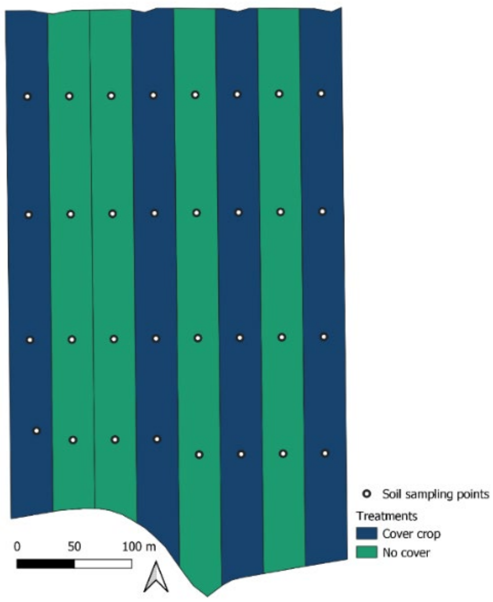

Figure 3. Example of the proposed experimental design with sampling points. Cover crops were used as an example of implemented practice.

Crop row spacing, plant density, pest management, and variety will be based on local and regional standard practices and team member inputs. The characterization and evaluation parameters include (a) crop yield, (b) cover crop biomass, NDVI, and canopy cover, (c) weed suppression, (d) soil type (SSURGO), (e) elevation, (f) weather data, and (g) chemical, physical, and biological soil health indicators. Indicators include pH, EC, N, P, K, soil organic carbon, total nitrogen, aggregate stability, bulk density, phospholipid fatty acids (microbial community), enzyme activity (C-N-P-S), and permanganate oxidizable carbon. Inherent soil properties such as texture and CEC will also be analyzed. Baseline soil samples will be taken on a GPS-coordinated grid at 0-2 and 2-6 inches soil depth in the starting year for each selected farm. Subsequent soil sampling will be conducted in year 3 for temporal variability interpretations. The economic viability of the implemented practices will be calculated using economic data on inputs (e.g., seeds, fertilizer, herbicides), farm operations (e.g., planting, spraying, harvest), and the cost of goods sold.

Budget

Expenditure	Total
Personnel	$30,900
Supplies	$10,000
Travel	$7,100
Other - Fees for soil analysis and land use	$12,000
Total	$60,000

- Salary and fringe benefits: Request funds for a graduate student to coordinate study implementation, soil sampling, data analysis, and overall project coordination ($30,000/year). Fringe benefits are calculated at a 3% rate ($900). Total: $30,900/year.
- Research supplies: Supplies are budgeted at $10,000 and will cover the cost of soil and plant analysis, and other field material needed for research. Total: $10,000/year.
- Travel: Request travel funds for traveling to research sites; estimate 4020 miles per year at the state fleet rate of $0.72/mile for a heavy pickup ($2,894) and monthly depreciation for six months at $175/month ($1,050) and per diem for 34 trips at $34/day ($1,156). Request travel funds for the student to attend a national conference and share research findings ($2,000; includes registration, airfare, lodging, and per diem). Total $7,100/year.
- Fees for soil analysis and land use: Request funds for organic matter, pH, N, P, K, and EC analysis at Agvise ($7,000) and to cover farmers' compensation (land use) for participating in the project, estimating $1,000/each for five farmers ($5,000). Total $12,000/year.