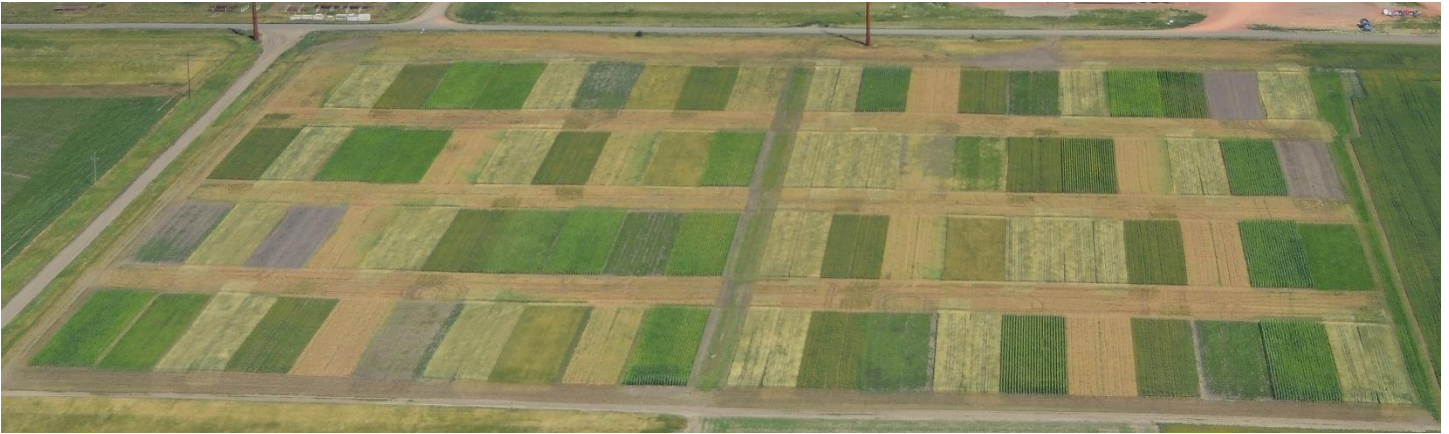


Sustainable Agroecosystem for Soil Health in the Northern Great Plains A New Project at the Williston Research Extension Center

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In 2013, the Williston Research Extension Center initiated a new project investigating diversifying dryland crop rotations. The objectives of this project are to “Develop agricultural systems to improve soil health, crop production, precipitation use, and economic sustainability.” This will be a long term research project involving multiple researchers from various disciplines. Don Tanaka, formerly USDA-ARS Scientist from Mandan and currently WREC seasonal scientist, is serving as the project coordinator of this project. Gautam Pradhan, WREC Research Agronomist is investigating agronomic and physiological aspects. Jim Staricka, WREC Soil Scientist, is investigating soil water use and physical soil quality aspects. Jerry Bergman, WREC Director, is responsible for the overall administration and is assisting in the agronomic component of the study. Chet Hill, WREC Area Extension Ag Diversification Specialist, is conducting economic analysis. Kyle Dragseth, WREC Farm Manager, is overseeing the field work, applying best management practices in the production of all crops. Diana Amiot, WREC Crop Production Research Specialist, is assisting in plot maintenance and data collection. WREC plans to recruit additional personnel with expertise in the areas of plant disease, insects, and soil microbiology to participate in the project.

Experimental Detail

- Treatments:
 - 5 Fixed Rotations and 6 “Dynamic” Rotations.
 - Each phase of every rotation included each year (fixed rotations).
- Field Design:
 - Randomized Complete Block; 4 Replications.
 - Individual plots are 60 by 200 feet. Total area (including roadways and borders) is 40 acres.
- All plots will be No-Till.

The 5 Fixed Rotations

2013	2014	2015	2016	2017
Durum	Fallow	Durum	Fallow	Durum
Durum	Durum	Durum	Durum	Durum
Durum	BP1*	Pea	Corn	Safflower
Durum	HRWW/ BP2	Pea/BP3	Corn	Safflower
.....Perennial Grass Mix with Pollinator Plants.....				

* BP1 = Biological primer 1; BP2 = Biological Primer 2; BP3 = Biological Primer 3; HRWW = Hard Red Winter Wheat.

What are the Biological Primers?

- Biological Primer 1 is a full season cover crop mix, seeded between June 1st and June 20th.
- Biological Primer 2 is a cover crop mix seeded after winter wheat but before August 10th.
- Biological Primer 3 is a cover crop mix seeded after pea.

“Dynamic” Rotations

- Crops will be determined each year based on weather and market conditions and using the following tools:
 - The USDA-ARS Crop Sequence Calculator (An interactive program for viewing crop sequencing information and calculating returns; www.mandan.ars.usda.gov)
 - The NDSU Projected Crop Budgets for North West North Dakota (www.ag.ndsu.edu/publications/farm-economics-management).
- The crops will include a mix of cool-season grasses, warm-season grasses, cool-season broadleaves, and warm-season broadleaves.
- Each year durum will be grown in one of the rotations to serve as a comparison.

The Dynamic Rotations to Date

2013	2014	2015	2016	2017
Durum	HRWW	TBD	TBD	TBD
Corn	Soybean	TBD	TBD	TBD
Soybean	Sunflower	TBD	TBD	TBD
Safflower	Barley	TBD	TBD	TBD
Sunflower	HRSW	HRWW	TBD	TBD
Pea	Durum	TBD	TBD	TBD

TBD = To be determined; HRSW = Hard Red Spring Wheat; HRWW = Hard Red Winter Wheat.

Measurements

- Crop Performance: Leaf chlorophyll, canopy temperature, grain yield, protein & oil content; grain carbon, nitrogen and phosphorus amounts; total dry matter; straw production; straw carbon, nitrogen & phosphorus amounts; crop water use.
- Soil Quality: Infiltration; aggregate stability; bulk density; organic matter amount, plant-available levels of nitrogen, phosphorus, potassium and other nutrients; pH; salinity.
- Pests: Diseases, insects, weeds.
- Soil microbial parameters: To be determined.