The 2017 Fertilizer Canada Manitoba Demonstration Farms focused on these three projects:

1. Partnership with R & D McLean Farms Ltd developing a canola 4R Nitrogen demonstration trial.
2. Partnership with Marsh River Farms Ltd demonstrating grain corn a 4R Nitrogen management trial.
3. Assist Mario Tenuta’s University of Manitoba (U of M) group with their communication to the industry & public concerning their 4R nutrition research.

1. R & D McLean Farms Ltd

This past 2017 growing season, Robert and Don McLean from Manitou, Manitoba (south central MB — located along the North Dakota border) participated with a canola 4R Nitrogen demonstration farm.

All aspects of 4R Nutrient Stewardship management practices were evaluated at this site. Enhanced Efficiency Fertilizer (EEF) products along with Urea, were mid-row banded (MRB) at multiple rates. There was also a strip within the trial that had seed placement of EEFs — such as Environmentally Smart Nitrogen (ESN). The following attachment (Page 9) outlines the demonstration farm schematic.

As a general summary concerning the growing season of this site, it went well with no major adverse environmental conditions. This site started with adequate soil moisture and received approximately 5.5 inches throughout the growing season. This would be considered slightly lower than normal average precipitation for this region. The precipitation at this site was received at very crucial stages of the canola crops physiological development. The initial mid slope GIS referenced soil test indicated very low levels of Nitrate (12 lbs N03-N) present in a 0-24 inch core. These low levels of available N set up a great site area for Nitrogen (N) crop response. The soil would be classified as clay loam with the soil test revealing the organic matter as 5.6 in the 0-6 inch core and 3.1 in the 6-24 inch core.

The seeding tool used at this trial was a Bourgault 3310. This particular seeding tool has 10 inch seed spacing with the capacity to mid row band (MRB) and/or seed place fertilizer. The elevated rates of Urea (>100 lbs actual N) MRB, did create lodging issues which lowered yield from the average N rates. MRB rates using EEFs did consistently out yield the urea MRB equated rates.

The EEF products also demonstrated less lodging which contributed to these higher yields. An interesting
evaluation was the higher yields built with lower EEF rates than elevated & equaled Urea rates. This may point to productivity and profitability increases with optimal nitrogen. These increased stewardship efficiencies benefit the environment as well as all stakeholders involved.

We also noticed in the demonstration strip that involved 30 lbs actual ESN and 20 P2O5 as MAP seed placed (10 inch spacing) had a 10 per cent negative impact concerning seed mortality. This observation was not ground truthed by replicated plant counts, but visually you could notice that at the four to six inch leaf crop stage there was a lower plant population vs. the surrounding strips. The amount of nutrients used in this strip must have been the cause of this seedling mortality drop. There are many factors that need to be taken into consideration with seed placed nutrition:

Rates of Nitrogen & all nutrition products seed placed.

- Salt content of the fertilizer used.
- Per cent seed bed utilization (SBU) & seed row spacing.
- Soil type.
- Soil moisture & temperature.
- Seeding tool placement. (Disk vs. Knife)
- Seeding tool ground speed.
- Seeding tool fan speed.
- Seeding tool fertilizer & seed delivery plumbing system.

2. Marsh River Farms Ltd

The Marsh River group participated with a 4R Nitrogen corn demonstration farm in 2017. The synthetic Nitrogen fertilizer & manure was applied in the fall of 2016. This Nitrogen consisted of multiple ESN and Urea blends, along with chicken manure.
3. Mario Tenuta’s Present & Future Of 4R Crop Nitrogen Tour Summary
(June 28, 2017, Carmen, Manitoba)

The tour was well attended, with approximately 45 individuals representing agriculture producers, industry and government. The content of the tour consisted of Nitrogen 4R management research demonstrations with corn and wheat production. The continuing adaptation of EEF products (Enhanced Efficiency Fertilizers) was a large focus of the work provided by Mario Tenuta’s group.

John Heard (MB Provincial Nutrition Specialist)

Mario Tenuta and the research group discussed corn Nitrogen management with a focus on placement. This placement was demonstrated as fall applied NH₃, along with in-season Y droplet technology which places liquid N on the soil surface near the base of the established corn plant.
Amy Mangin
(University of Manitoba Soil Fertility Technician)

Amy provided a walking tour of the second field season of spring wheat field trials designed to update nitrogen recommendations for high-yielding spring wheat varieties in Manitoba. The project objectives are to determine appropriate nitrogen rates based on yield and protein goals, as well as the most effective combination of timing, placement, and source of nitrogen fertilizer. Additionally, tools for predicting in-season nitrogen sufficiency and potential mineralization of organic soil nitrogen have been investigated. Trials will be conducted at eight sites across Manitoba in the 2016-2018 growing seasons. The data and observations from the previous years of work is itemized in graphs included in the appendix.
Acknowledgements

Appreciation is expressed to the following organizations and their people for their partnership and dedication culturing this 4R Nutrient Stewardship initiative;

• All demonstration farm producer partners;
  R & D McLean Farms Ltd
  • Robert & Marina McLean
  • Don & Stephanie McLean
  Marsh River Farms Ltd
  • Harold & Cindy Janzen
  • Lorne Janzen
  • Marvin & Mildred Janzen
  • Marshall Janzen
  • All producers who attended our summer demonstration farms tours.

• John Heard, Mitch Timmerman & all Manitoba Agriculture staff involved with implementation of this project.

• Mario Tenuta from the University of Manitoba and his staff for their contribution with demonstration farm work and tour event participation.

• Amy Mangin, Soil Fertility Technician from the University of Manitoba.

• Allan Dawson from the Manitoba Co-operator.

• Industry partners; Mitch Poiron from Agrium & Regas Karamanos from Koch Fertilizer.

• The Manitoba Memorandum of Understanding group and Fertilizer Canada for its continued support.

Appendix

EEF — Enhanced Efficiency Fertilizer
ESN — Environmentally Smart Nitrogen
GIS — Geographic (or Geospatial) Information System
MRB — Mid Row Band. The placement of fertilizer in between the rows of seed
MAP — Monoammonium Phosphate. This is a dry granular form of Phosphate.
SBU % — Seedbed Utilization percentage is a term that has been developed to describe the effect of row spacing and the opener type on seed furrow fertilizer concentration.

FERTILIZER CANADA 4R NUTRITION DEMONSTRATION SITE

R & D McLean and Steve Barron on behalf of Fertilizer Canada have created a farm demonstration site to help deliver the message of the benefits that the adoption of 4R nutrition stewardship can provide. This message is geared to the general public, industry, government and all active producers who participate in nutrition management.

The 4R stewardship practice is the adoption of Right Source, Right Rate, Right Time and Right Place. The purpose of the trial site is to assist with our nutrition knowledge. This information will increase farm gate profits while protecting the environment for future generations.

Sowed May 19 2017
Invigor L 157 (TKW 4) @ 5 LBS / ACRE
Bourgault MRB 10 Inch Spacing
NE 23-2-8W1

To learn more about these trials or about 4R stewardship practices contact
Steve Barron 1-204-825-8510. steve@doublediamond.mb.ca

Thank you to R & D Mclean for creating this site.
Present and Future of 4R Crop Nitrogen Management Tour  
Wednesday June 28, 2017 9:00-1:00  
Target Audience: Growers, Consultants, Reps, Research Funders, Students  
Cost of Admission: Willingness to Ask Questions

**Schedule**

9:00-10:00    Stop 1 (Five Corners): Fall/Spring Enhanced Efficiency N Spring Wheat  
11:40-12:20 Stop 3 (Carman Station): N Management for Protein in Spring Wheat  
12:30-1:00    Hot Lunch at Carman Station

**Stop 1 and Presenters**  
Mario Tenuta, U Manitoba – 4R management and what it means for the future?  
Lanny Gardiner, U Manitoba – Trial walk about  
Matthew Wood, U Manitoba– What’s up with N2O?  
Steve Baron, Double Diamond– What source of N to use?

**Stop 2 Presenters**  
John Heard, MB Ag – Getting best use of N in corn  
John Heard, MB Ag- Trial walk about  
Adam McKnight, Pioneer– Demo: Soil nitrate testing isn’t just for the lab anymore  
John Heard, MB Ag-Demo: In season plant testing for corn N

**Stop 3 Presenters**  
Amy Mangin, U Manitoba – Need and Strategies to Get Higher Protein in New Wheat Varieties  
Amy Mangin, U Manitoba – Trial walk about  

*Look for Road Signs: Snacks, Coffee, Drinks and Lunch Provided*

**RSVP by email**
mario.tenuta@umanitoba.ca  
On tour day  
call 204-290-7827 with issues

A joint event hosted by the  
University of Manitoba,  
Manitoba Agriculture, and  
Fertilizer Canada
Optimum nitrogen fertilizer management strategies for high-yielding spring wheat in Manitoba

A. Mangin1, D. Flaten1, J. Heard2

1Dept. Soil Science, University of Manitoba; 2Manitoba Agriculture *(Amy.Mangin@Umanitoba.ca)

Table 1. Treatment list for U of M (Gold) and Diversification Centre (Silver)

<table>
<thead>
<tr>
<th>Variety</th>
<th>N Rate (lbs/ac)</th>
<th>Source Timing/Placement</th>
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<td>Prosper</td>
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</tbody>
</table>

Introduction

Manitoba producers are growing varieties of hard red spring wheat with very high yield potential, which has brought out challenges in our agronomic and environmental risk for these high yielding varieties. Midseason N application may mitigate this risk but there is currently debate over the best method and timing for midseason application to best utilize fertilizer.

Research Objectives

1. Determine appropriate N rates based on yield and protein goals for most effective and efficient combinations of timing, placement and source, especially for midseason applications.
2. Evaluate soil tests for measuring potential mineralization of organic soil N that can be released during the growing season.
3. Develop decision tools for midseason evaluation of N sufficiency.

Methods

Two-year field research project with sites conducted across Manitoba, including two intensive “Gold Sites” hosted by University of Manitoba, and four less intensive “Silver Sites” executed primarily by Manitoba’s Diversification Centres. Treatments were designed to address 4R N management for two high yielding spring wheat varieties (Table 1).

Harvest Measurements

At maturity differences in Prosper wheat at Brunkild, MB when 30 lbs. N/ac was applied at stem elongation (A) compared to post anthesis as UAN (B) to 80 lbs. N/ac base rate (left). Leaf burn from post anthesis foliar applied UAN in Carman, MB (right).

Mineralization Tests

To estimate potential organic N mineralized during the growing season three methods were evaluated: Sharifi’s sodium bicarbonate extraction, Les Henry’s sample incubation test, and Solvita CO2 burst test on the 0-15cm portion of the soil profile sampled at seeding.

Observations

Throughout the growing season a number of measurement tools were used to help estimate if adequate N was present to obtain yield and protein goals. Greenseeker, an active NDVI sensor, and SPAD chlorophyll meter readings were taken before each in-season N application at stem elongation, flag leaf and anthesis. Flag leaf samples for N content and soil nitrate-N were also taken just before heading.

Figure 1

Preliminary yield data for 2016 Gold sites located in Carman and Brunkild with, 46 and 40 lbs. background soil-N nitrate, respectively. Yield data is corrected to 14.5% moisture content.

Figure 2

Induction pushes farmers to test spray nozzles

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The 4R nutrition concept is becoming widely adapted as a positive movement forward in our Manitoba region. The partnership of our academic institutions, government, and industry will be key to the continued success of 4R nutrition management in agriculture.