Activity 16

Assessment of the Impact and Interactions of Emerging Crops on potato-Based Cropping Systems

Annual Report – March 31, 2016

Overall Objective

The primary objective of this activity is to generate local data and an understanding of the impact of oilseed production in a region that has traditionally been focused on potatoes. Oilseeds are a relatively new addition to the potato rotation. This activity will be implemented through four sub-activities:

1. Evaluate the different temporal positions in the cropping system where oilseeds could potentially fit.
2. Measure any carry-over benefits realized during the potato year, as well as any other carry-over effects from oilseeds realized in other crops in the rotation.
3. Build on the previous AAFC-funded research under DIAP, as well as work done in both Maine and Manitoba.
4. Evaluate the most effective management options for eliminating canola volunteers during the potato year.

Audience

The audience is crop producers, specifically those who grow or who have an interest in growing canola.

Performance Measures

Media Reports

Two media reports were given during the year:

1. Potato Alternatives; An article published in Spudsmart magazine. This is a technical publication sponsored by the potato industry in Canada.; 2016/01/01 - 2016/03/31 (Invited)
2. East Coast researchers test canola in potato rotations; An article in Canola Digest, a technical publication put out by the Canola Council of Canada.; 2016/01/01 - 2016/03/31 (Invited)

Highlights

The present study was developed to measure and illustrate interactions between emerging crops, primarily canola and soybean, and potatoes. These crops are of relatively high value and will add diversity to cropping systems in PEI.

- All cropping systems are planted and the experiment is well under way
- Data collection and wrangling is proceeding on schedule

Outcomes

The innovative design relies on a “phased-in” approach to cropping systems evaluation. The power of this design lies in the ability to remove variability affected by “year” by treating it as a replicate rather than including replicates within the field for any given year (Figure 1). This allows the study to measure more

rotations over a longer period of time. The design has all years of all rotations being planted each year. By removing the "year" variability, the conclusions of the study hold more statistical power. The negative side of the design is that the results can only begin to be analyzed with confidence following the completion of the first 3-year rotation phase (after the 2016 growing season). The first true season for the project was 2014; 2015 was the first year where the carry-over effects of the previous crops on potato could be analyzed. The 2016 growing season will be the 3rd year of the 3-year rotation phase and will be when the bulk of the analysis of the project will begin.

To this point, a significant amount of agronomic data has been recorded. Measurements of soil chemistry and biology are part of the regular sampling protocol. As well as plant biomass and yield with special focus on potato quality and yield. Soil biological measurements consist of phospholipid fatty acid profiling which provides a snapshot of the soil microbial community at the time of sampling. These organisms have previously been shown to be bioindicators of the effects of management on soil health. Additionally, the nematode populations are being identified to the family levels. Nematodes, as with PLFA profiling, provide an excellent indicator of soil health and organic matter turnover relative to management practices; plant parasitic nematodes result in significant economic losses in many crops, potatoes in particular.

	Year			
Rotation	2014	2015	2016	2017
1	BuckWheat	BuckWheat	Potato	BuckWheat
2	Corn	Homestead	Potato	Corn
3	Canola	Homestead	Potato	Canola
4	Barley	Forage	Potato	Barley
5	Soybean	Homestead	Potato	Soybean
6	Canola	WinWheat	Potato	Canola
7	Corn	Soybean	Potato	Corn
8	Corn	Canola	Potato	Corn
9	Soybean	Soybean	Potato	Soybean
10	Canola	Canola	Potato	Canola
2	Potato	Corn	Homestead	Potato
4	Potato	Barley	Forage	Potato
1	Potato	BuckWheat	BuckWheat	Potato
6	Potato	Canola	WinWheat	Potato
3	Potato	Canola	Homestead	Potato
8	Potato	Corn	Canola	Potato
5	Potato	Soybean	Homestead	Potato
10	Potato	Canola	Canola	Potato
7	Potato	Corn	Soybean	Potato
9	Potato	Soybean	Soybean	Potato
3	Homestead	Potato	Canola	Homestead
1	BuckWheat	Potato	BuckWheat	BuckWheat
5	Homestead	Potato	Soybean	Homestead
2	Homestead	Potato	Corn	Homestead
7	Soybean	Potato	Corn	Soybean
4	Forage	Potato	Barley	Forage
9	Soybean	Potato	Soybean	Soybean
6	WinWheat	Potato	Canola	WinWheat
10	Canola	Potato	Canola	Canola
8	Canola	Potato	Corn	Canola

Figure 1: Experimental design for the present experiment illustrating the "phased in" research design approach. Diagram shows how a larger number of rotations (10) can be accommodated given spatial and resource restrictions. Analyses beginning in 2016 will allow the measurement of the "average" potato crop over the duration of the study. The rotation highlighted in orange shows an example of how the iterations of the effects of different rotations can be measured through this design.

An attempt to recruit a graduate student for this project was attempted early in 2015, however no suitable candidates were found.

One of the biggest challenges of the current project has been the attempt to establish research trials with 3rd party and/or private sector farms. The lack of specialized equipment, knowledge and expertise resulted in an overall lack of usable data under the project.

Future Work

There is growing interest in this project within the industry in the region. The evaluation of these cropping systems is research that is relevant to the industry. The topics evaluated through this work build on previous efforts in other potato producing regions in North America and the evaluation of both chemical and biological factors that are affected through a cropping system decision process will provide relevant information for growers in the region.

The value of this study will be augmented by its longevity. The longer this particular study can proceed, the more relevant and hence, more applicable the data will be. The first round of analyses will begin following the 2016 growing season. The 2017 growing season will be the initiation of the next 3-year phase, as well as the initiation of the economic analysis of each of the rotations. Similar studies conducted at Harrington over the past decade have indicated that the greatest effects of cropping system management occur after the second phase. With the establishment of this study and infrastructure moving into the first phase, the opportunity to carry this project through the second phase until 2019 would add significant value to the effort already put into this project.