

## MPSG ANNUAL EXTENSION REPORT

**PROJECT TITLE:** Rotational effects and optimized spatial arrangement for wheat production in Manitoba

**PROJECT START DATE:** 1 May 2017

**PROJECT END DATE:** 30 April 2021

**DATE SUBMITTED:** 13 August 2019

### **PART 1: PRINCIPAL RESEARCHER**

#### **PRINCIPAL**

<b>NAME:</b>	Rob Gulden	<b>NAME:</b>	
<b>POSITION:</b>	Associate Professor	<b>POSITION:</b>	
<b>INSTITUTION:</b>	University of Manitoba	<b>INSTITUTION:</b>	
<b>EMAIL:</b>	rob.gulden@umanitoba.ca	<b>EMAIL:</b>	
<b>PHONE:</b>	204-474-6080	<b>PHONE:</b>	

### **PART 2: EXECUTIVE SUMMARY**

*Outline the project objectives, their relevancy to pulse and soybean farmers, and a summary of the project to date, including methods and preliminary results.*

Objectives: The objective of this research is to evaluate the performance of cereals in crop rotation with soybean and canola, and to develop optimized wheat spatial arrangement practices that maximize wheat productivity while decreasing the effect of weeds and diseases for wheat production and other crops in rotation. The following key questions are being addressed:

1) What is the effect of including 1 vs. 2 wheat crops in rotation with canola and soybean (i.e., wheat-soybean-canola vs. wheat-soybean-wheat-canola) with different initial weed densities on crop productivity/quality, economic return, disease severity, weed management and herbicide-resistant green foxtail populations.

2) What is the optimum plant density and row spacing combination for productivity for modern wheat varieties and does the preceding crop (canola or soybean) affect this?

The three most common crops in Manitoba currently include wheat, soybean and canola, making wheat the principal cereal crop in an oilseed dominated rotation. As wheat is the most important cereal crop in this rotation, management of wheat and how the frequency of wheat in rotation affects oilseed production is important for productivity, pest management, soil health for Manitoba crop producers.

Results from the first and second years of this study are currently being analyzed, evaluated, and prepared into a thesis. Preliminary results from Year 1 of the rotation study (baseline) and years 1 and 2 of the wheat plant spatial arrangement are discussed here. Deanna McLennan is working on objective 1 and Samantha Clemis (May 2019 start) is now working on objective 2.

### **PART 3: PROJECT ACTIVITIES AND PRELIMINARY RESULTS**

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*Outline project activities, preliminary results, any deviations from the original project and communication activities. You may include graphs/tables/pictures in the Appendix.*

#### Objective 1

In the 2017 field season, three field experiments were conducted within this project. The first experiment, the long-term rotation was converted to the proposed wheat-soybean-canola rotations with different cereal crop intensities and agronomic practices. The weed seedbanks were determined prior to planting using the coring method and grow-outs and the total amount and proportions of herbicide-resistant and herbicide-susceptible green foxtail were determined. Initial analysis indicates that previous GR1 herbicide use intensity affected the size of green foxtail seedbank and the proportion of group 1 herbicide-resistant green foxtail seeds in that seedbank as well as the ratio of green to yellow foxtail (Figure 1 top). The spring seedbank evaluation was conducted again in 2018 and 2019 to determine how the change in rotation and management practices is affecting these populations. These results are currently being evaluated by Deanna McLennan who is preparing her MSc thesis from this work. In addition, to crop performance, quality and weed management, mycorrhizal work has been initiated and sample evaluation and analysis continues.

#### Objective 2

Samantha Clemis joined my lab this spring to work on this part of the project. She is currently conducting this study at 3 locations in Manitoba and will begin analysis of her data including a more thorough analysis of data from previous years this fall. Preliminary analysis of yield data suggests that wheat yield is greater when the preceding crop was soybean compared to canola although this appears to depend on location to some degree. When significantly different, wheat seeded at narrow rows and at higher densities produced the greatest yields. Seed quality and other growth parameter data will be evaluated in the future.

The initial objectives have been achieved and the project continues to progress as planned. A talk describing the spring 2018 the result of the green foxtail seedbank densities and proportion of resistant plants as affected by the previous long-term rotation of wheat-flax-oats-canola were presented at the annual meeting of the Canadian Weed Science Society and the Manitoba Agronomist conference:

McLennan D & Gulden RH (2018) Characterizing ACCase resistant green foxtail and weed diversity in a long-term rotation. Canadian Society of Weed Science CWSS-SCM Annual Meeting, Niagara Falls, ON, Canada. Nov. 19-22.

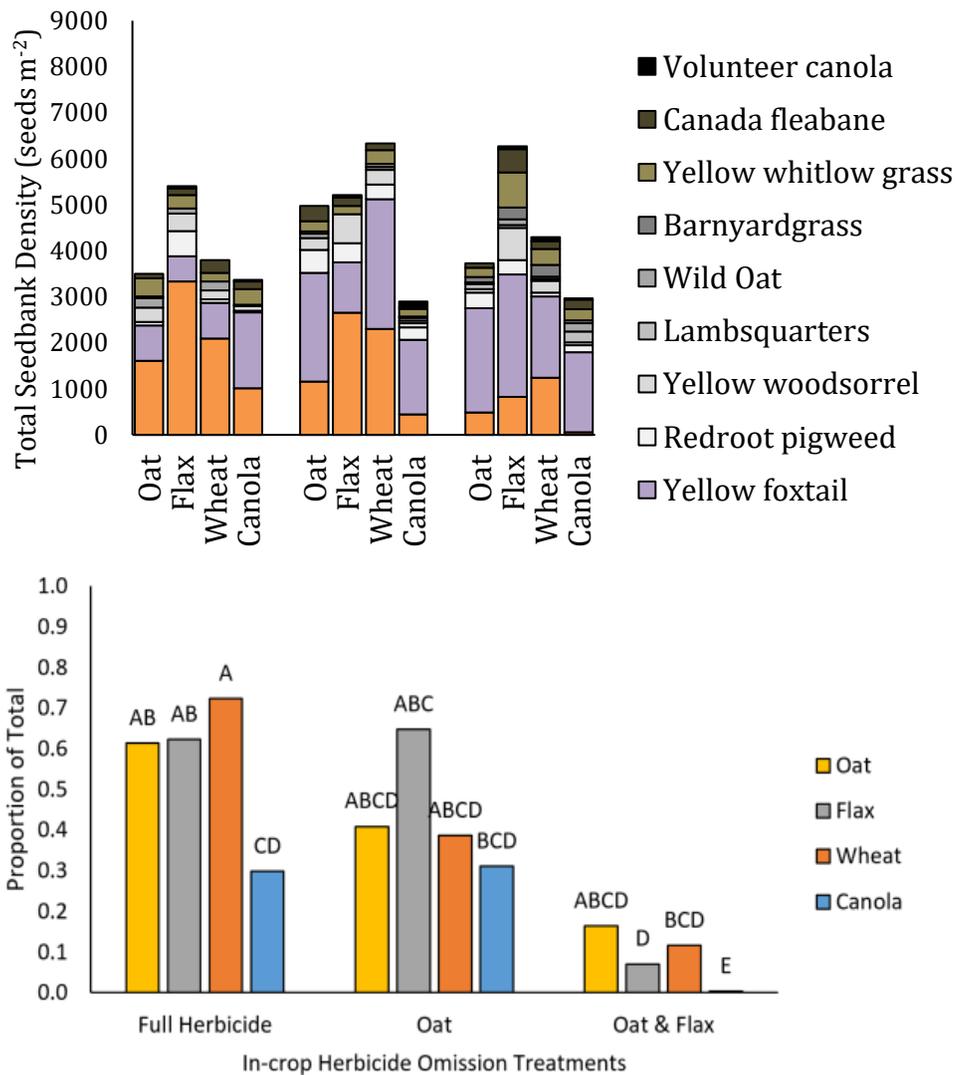
There have not been any departures from the original project.

No changes to the budget are required for this reporting period.



APPENDIX

Include up to 1 page of tables, graphs, pictures.



**Figure 1.** Total spring seedbank density and species composition (top) and group 1 herbicide-resistant proportion of the green foxtail seedbank as influenced by preceding crop and herbicide omission treatments.

