ON-FARM SURVEY OF COMBINE GRAIN LOSS IN CANOLA ACROSS WESTERN CANADA - 2019

Project Description

Canola is an essential crop in the Canadian Prairies, and canola losses are an unfortunate part of harvest that must be managed by producers. Canola losses can be categorized as environmental losses, header losses, or combine losses. Combine losses occur during harvesting and refer to grain lost (discarded with the chaff and straw) from the separation and cleaning systems; these losses were the focus of this project.

The objective of this project was to obtain a snapshot of the canola combine losses that producers are experiencing across Western Canada and to gain a better understanding of these losses by determining which variables are most likely to have an effect. A secondary goal was to continue to provide awareness to the seriousness of combine losses and to educate producers on methods for measuring their losses.

The in-field testing for this project occurred during the 2019 harvest season, between August 22 and October 18. PAMI visited 31 producers (**Figure 1**) across Alberta, Saskatchewan, and Manitoba and measured canola combine losses from 50 combines. Six combine manufacturers were represented during testing with a total of 40 different combine models.

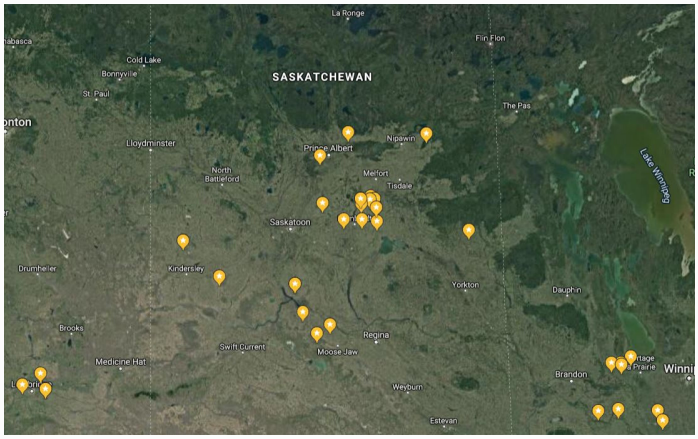

Figure 1. *The 31 field test locations.*

Methodology

Drop pans provided by Bushel Plus and Schergain (**Figure 2**) were used to measure the canola losses from the combines. The drop pans were attached underneath the combine and were dropped once the combine reached a steady state.

Figure 2. *Drop Pans. Schergain (left; https://www.schergain.ca/pricing/), Bushel Plus (right; http://bushelplus.ca/bushel-plus-harvest-loss-system/).*

The canola seed was separated from the chaff/straw and was weighed. Losses were calculated using the collected sample weight, cut width, discharge width, catch area, and canola density. To ensure an accurate representation of producer's losses was obtained, each combine loss test was repeated three times per combine, and producers were asked to run at their normal operating conditions during testing. PAMI followed strict biosecurity procedures to prevent the transfer of crop contaminants, such as weed seeds, insects, and pathogens.

Of the 50 combines tested, 44 dropped their straw into windrows during the loss testing, while the remaining 6 spread their straw. Due to the reduced accuracy experienced when spreading straw (unpredictability of the distribution of grain throughout the discharged material), the results from these tests were not included in the data analysis.

The following variables were investigated to determine their potential impact on combine losses: harvest timing, ambient temperature, relative humidity (RH), weather conditions, wind conditions, harvest practices (straight-cut, swathed), grain moisture content, canola variety (shatter resistant, non-shatter resistant), ground speed, grain feed rate, combine settings, combine age, and separator hours.

Results & Conclusions

A statistical data analysis was conducted to identify whether differences observed in the combine loss data were due to the measured variables listed above or due to random variability. Along with this in-depth statistical analysis, the following summary of the combine losses experienced was completed.

- Minimum combine losses measured: **0.2 bu/ac** (0.4% of producer's yield)
- Maximum combine losses measured: **4.1 bu/ac** (10.7% of producer's yield)
- Average combine losses measured: **1.3 bu/ac** (2.8% of producer's yield)
- Estimated financial losses experienced collectively by the producers who participated were calculated using the average combine losses measured (1.3 bu/ac), total canola acres seeded by participating producers (70,400 ac) and a canola price of $9.50/bu. Estimated total: **$870,000**; Average per acre: **$12.35/ac**.

Table 1 shows the variables that were found to have a significant impact on canola combine losses, along with the observed losses. For all other variables investigated (not included in table), no significant differences were observed in the data collected from the 2019 harvest season.

Table 1. *Variables that were found to have a significant impact on canola combine losses during the 2019 combine loss testing.*

Combine Loss Variables	Variable Boundaries	Average Losses (bu/ac)	Number of Combine Test Repetitions	Conclusions
Ambient Temperature	< 23.0°C	1.4	96	Significantly lower losses experienced with higher ambient temperature.
	≥ 23.0°C	0.8	36	
Relative Humidity	< 45% RH	1.2	108	Significantly lower losses experienced with lower relative humidity.
	≥ 45% RH	1.6	24	
Weather Conditions	Sunny	1.0	33	Significantly lower losses experienced with sunny conditions compared to cloudy and partially cloudy compared to cloudy.
	Partially Cloudy	1.1	60	
	Cloudy	1.7	39	
Harvest Practice	Straight-Cut	1.5	30	More testing required to better understand results.
	Swathed	1.2	102	
Canola Variety	Shatter Resistant	1.3	87	More testing required to better understand results.
	Non-Shatter Resistant	1.1	45	
Ground Speed	< 4.3 mph	1.2	123	Significantly lower losses experienced with slower ground speed. Take note of small sample size for higher ground speed results.
	≥ 4.3 mph	2.2	9	
Grain Feed Rate	< 350.0 bu/hr	0.5	6	Significantly lower losses experienced with lower grain feed rate. Take note of small sample size for lower grain feed rate.
	≥ 350.0 bu/hr	1.3	123	
Combine Age	1993 to 2005	0.8	33	Regarding losses, a well-set older combine can outperform a poorly set newer combine.
	2006 to 2014	1.5	57	
	2015 to 2019	1.3	42	

This project highlights how important it is for producers to set their combines for current weather conditions and to use loss measurement as a way of verifying these settings. Combine loss measurement can be completed using equipment supplied by companies such as Bushel Plus and Schergain; however, if producers do not have access to this equipment, any pan or tray can be used to obtain a rough estimate of combine losses. It is important for producers to reassess their combine losses as conditions change throughout the harvest day and season. To fully understand existing limitations, further investigation is required for each variable listed above.

Acknowledgements

The Prairie Agricultural Machinery Institute (PAMI) acknowledges funding and support from the following groups: Canola Council of Canada, SaskCanola, Manitoba Canola Growers, Bushel Plus, Schergain, and all of the canola producers throughout Alberta, Saskatchewan, and Manitoba who volunteered for the project. In-kind funds were also provided by PAMI to support the research and development of topics that are important to producers.