

RESILIENT ROTATIONS: YIELD AND YIELD STABILITY NORTHERN PRAIRIES



Research has shown the benefits of diversifying crop rotations, and yet most Prairie farmers keep their rotations short and simple with cereals and oilseeds being intensively grown. For the past four years, researchers across Western Canada have compared different crop rotations to measure the drawbacks and benefits. This work is designed to help farmers make crop rotation decisions that are the best fit for their operation, based on local research.

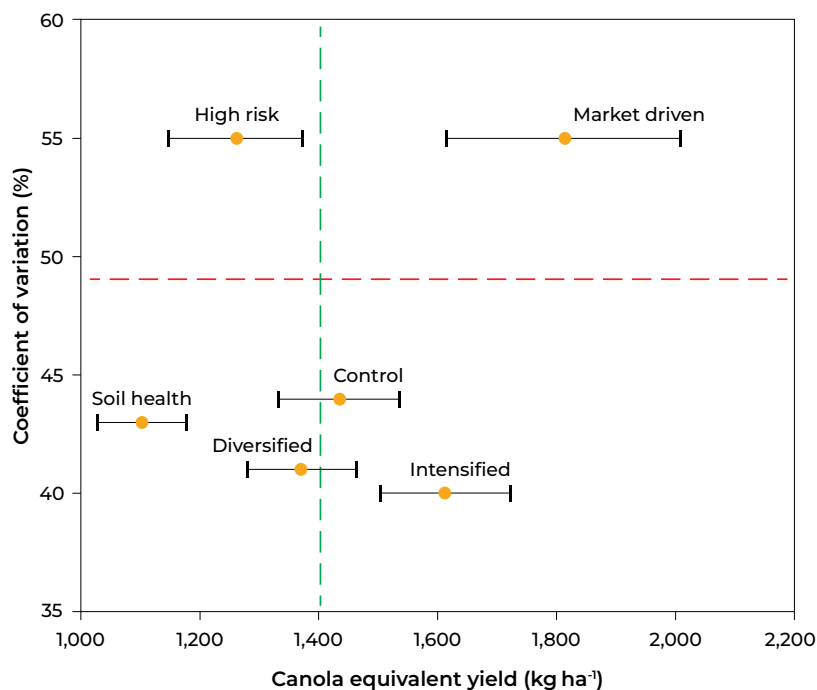
Six different crop rotations were studied in Alberta, Saskatchewan and Manitoba to represent growing conditions in the northern Canadian Prairies. This factsheet looks at the differences between rotations for **yield and yield stability**.

Canola Equivalent Yield (CEY) allows for yield comparisons between different crop rotations by standardizing the crop rotation's yield based on the price ratio of different crop types relative to canola.

COMPARING YIELD PERFORMANCE

To evaluate crop rotations based on **yield and yield stability** (from year to year), it's critical to identify rotations that are more consistently high or low yielding. It's important to note that the highest yielding rotations varied depending on the geographic region.

The Coefficient of Variation (CV) is used to assess the yield stability of rotational treatments. When averaged across all six rotations, the **intensified** rotation (CV=40%) was the most stable crop rotation. The **market driven** and the **high risk** rotations (CV=55%) were the least stable.



This chart shows the yield stability of the crop rotation treatments averaged over 27 site years. The horizontal black bars represent standard error of the mean. The vertical green line indicates CEY across all six crop rotations. The horizontal red line is the average CV across all six crop rotations.





YIELD AND YIELD STABILITY BY CROP ROTATION IN ALBERTA, 2018-2021

Rotation Treatment	Crop Species Used Based on Local Growing Conditions				Canola Equivalent Yield Ranking of Various Crop Rotations*	
	Year 1	Year 2	Year 3	Year 4	Beaverlodge	Lacombe
The CEY at Beaverlodge was 1,516 kg ha ⁻¹ (27 bu ac ⁻¹). The CEY at Lacombe was 2,850 kg ha ⁻¹ (51 bu ac ⁻¹).						
Control	Wheat	Pea	Wheat	Canola		
Intensified	Wheat	Canola	Wheat	Canola		
Diversified	Pea	Winter Wheat	Faba Bean	Canola		
Market Driven	Canola	Malt Barley	Canola	Canola		
High Risk	Flax	Soybean	Durum	Canola		
Soil Health	Forage Pea Green Manure	Winter Wheat	Faba Bean	Canola		

THE BOTTOM LINE

- There was rarely one rotation that was the highest yielding at individual sites.
- When choosing a multiple high yielding rotation, select one with more than two crop species, and select for more pulse crops in rotation.
- The **high risk** rotation had lower CEY in part because crops were not well suited to the environment where they were planted.
- The yield stability of the **intensified** rotation makes it well suited for managing yield and yield risks.

YIELD AND YIELD STABILITY BY CROP ROTATION IN SASKATCHEWAN, 2018-2021

Rotation Treatment	Crop Species Used Based on Local Growing Conditions				Canola Equivalent Yield Ranking of Various Crop Rotations*	
	Year 1	Year 2	Year 3	Year 4	Melfort	Scott
The CEY at Melfort was 1,724 kg ha ⁻¹ (31 bu ac ⁻¹). The CEY at Scott was 1,536 kg ha ⁻¹ (27 bu ac ⁻¹).						
Control	Canola	Wheat	Pea	Wheat		
Intensified	Canola	Wheat	Canola	Wheat		
Diversified	Pea	Winter Wheat	Faba Bean	Canola		
Market Driven	Oat (Melfort) Canola (Scott)	Canola	Wheat (Melfort) Green Pea (Scott)	Canola		
High Risk	Flax	Soybean	Durum	Canola		
Soil Health	Forage Pea Green Manure	Winter Wheat	Faba Bean	Canola		

FOR MORE INFORMATION

More information on how these crop rotations stack up in terms of economics, precipitation use and nutrient use will be covered in separate factsheets as part of this series. These results are based on the first four years of the study.

More robust results are expected if a second four-year cycle of the study is completed.

The factsheet is part of a series by Resilient Rotations – a project of the Integrated Crop Agronomy Cluster – led by Kui Liu, AAFC Swift Current. The project examines the benefits and drawbacks of different crop rotation options for farmers across Western Canada.

To find out more visit wgrf.ca/resilient-rotations-factsheet/

Canola Equivalent Yield Ranking*

= good CEY = statistically lower CEY = statistically lowest CEY

*CEY ranking is calculated by location