

# RESILIENT ROTATIONS: EXAMINING PRECIPITATION USE EFFICIENCY 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 **precipitation use efficiency**.

## MAKING THE MOST OF RAINFALL

With the growing unpredictability of Prairie weather, producers must make the most of the precipitation they receive. One way to measure how well different crop rotations use rainfall is to measure **precipitation use efficiency** – the total grain yield produced (expressed as canola equivalent yield) divided by the growing season rainfall.

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.



**Integrated Crop  
Agronomy Cluster**

## PRECIPITATION USE EFFICIENCY AND RAINFALL AT STUDY LOCATIONS, 2018-2021

Location	Precipitation Use Efficiency (2018-2021)		Precipitation from May 1 to August 31 in mm (% of long-term average)			
	kg CEY ha <sup>-1</sup> mm <sup>-1</sup>	bu CEY ac <sup>-1</sup> inch <sup>-1</sup>	2018	2019	2020	2021
Beaverlodge, AB	7.6	3.5	305.7 (130%)	228.7 (97%)	205.9 (88%)	155.8 (66%)
Lacombe, AB	10.8	4.9	203.1 (72%)	250.2 (89%)	321.5 (114%)	244 (87%)
Melfort, SK	11.8	5.4	197.8 (87%)	209.6 (93%)	201.3 (89%)	138.5 (61%)
Scott, SK	9.5	4.3	130.7 (59%)	236.2 (106%)	257.8 (115%)	149.4 (62%)

**Note:** In general, the research was done in years that were drier than the long-term average.

 = Wetter than average     = Average rainfall     = Drier than average

**PRECIPITATION USE EFFICIENCY BY CROP ROTATION IN ALBERTA, 2018-2021**

Rotation Treatment	Crop Species Used Based on Local Growing Conditions				Precipitation Use Efficiency Ranking*	
	Year 1	Year 2	Year 3	Year 4	Beaverlodge	Lacombe
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		

**PRECIPITATION USE EFFICIENCY BY CROP ROTATION IN SASKATCHEWAN, 2018-2021**

Rotation Treatment	Crop Species Used Based on Local Growing Conditions				Precipitation Use Efficiency Ranking*	
	Year 1	Year 2	Year 3	Year 4	Melfort	Scott
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		

**Precipitation Use Efficiency Ranking\***

- = good precipitation use efficiency
- = statistically lower use efficiency
- = statistically lowest use efficiency

\*Precipitation Use Efficiency Ranking is calculated by location

**THE BOTTOM LINE**

- There is not a consistently 'better' precipitation use efficiency rotation in the northern Canadian Prairies.
- Researchers did find a consistent trend for the **soil-health rotation** to have lower precipitation use efficiency due to the lack of grain production in the green-manure phase of the rotation.

**FOR MORE INFORMATION**

More information on how these crop rotations stack up in terms of risk, economics 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.

This 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**  
[wgfr.ca/resilient-rotations-factsheet/](http://wgfr.ca/resilient-rotations-factsheet/)