

RESILIENT ROTATIONS: EXAMINING PRECIPITATION USE EFFICIENCY RED RIVER VALLEY



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 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.









PRECIPITATION USE EFFICIENCY AND RAINFALL AT STUDY LOCATION, 2019-2022

Location	Canola Equivalent Yield (2019-2022)		Precipitation from May 1 to August 31 in mm (% of long-term average)			
	kg CEY ha ⁻¹ mm ⁻¹	bu CEY ac ⁻¹ inch ⁻¹	2019	2020	2021	2022
Carman, MB	8.3	3.8	194 (61%)	178 (56%)	225 (71%)	288 (91%)




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 MANITOBA, 2019-2022

Rotation Treatment	Crop Species Used Based on Local Growing Conditions				Precipitation Use Efficiency Ranking*
	Year 1	Year 2	Year 3	Year 4	Carman
Control	Wheat	Soybean	Wheat	Canola	
Intensified	Soybean	Wheat	Soybean	Canola	
Diversified	Canola	Winter Wheat	Soybean	Canola	
Market Driven	Corn	Corn	Oat	Canola	
High Risk	Corn	Dry Bean	Canola	Sunflower	
Soil Health	Green Manure	Fall Rye	Corn - Soybean	Canola - Pea	

Precipitation Use Efficiency Ranking*

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

THE BOTTOM LINE

- The **high risk** and the **market driven** rotations had better precipitation use efficiency, due to the high corn yields in these rotations.
- The study was conducted under drier than average conditions, which favored corn. In growing seasons with more precipitation, the other crop species may have better performance.

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 – lead 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/