

# Building a 'better' crop rotation

Understand all the interactions within a rotation and their effect on yield

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Manitoba is a unique place to farm in the western Canadian Prairies. We enjoy a relatively long growing season, good rainfall (sometimes too much) and have the support of many industry partners, testing a wide range of crop types with adaptation to our climate. With all the crop options we have, a diverse crop rotation seems like a no-brainer, but annually there are always stories of the farmer who planted canola on canola and had a wreck.

Sometimes back-to-back same crop is inevitable, but as a business plan, it is a risky one. Consistently, data from Manitoba Agricultural Services Corporation (MASC) has shown lower yields when a crop is planted back on its own stubble from the previous year. The same 'crop rotation chart' also shows trends for a number of other crop-stubble combinations that have higher-than-average yields. Utilizing the single-year interactions and looking at optimal breaks between the same crop can help give confidence on how frequently to grow the same crop and what other crops would perform better after others.

### Plan next year's crop by considering preceding stubble type

Using the crop rotation data in Table 1 to assist in 2018 upcoming planting decisions can help give a yield edge to your next crop. Please cross-reference to Table 2 to give you an idea of how many fields the results were gath-

ered from. For example, flax on field pea stubble equals 148 per cent potential yield looks amazing, but one per cent of flax acres had that crop sequence. That should make you skeptical that the results could be more due to chance versus a true trend. In addition to the crop rotation charts, financial information should be included to determine if the rotation sequence net returns are positive. A good resource to utilize is Manitoba Agriculture's *Guidelines for Estimating Crop Production Costs* at <http://www.gov.mb.ca/agriculture/business-and-economics/financial-management/cost-of-production.html#crops>.

### Plan for break years between same crop type

A common question when talking about crop rotation usually is, "How often can I grow canola/soybeans?" Crops that continue to hold good value in the commodity market and yield on your farm, is where you should start building your rotation. The risk though is too much of a good thing can go bad quickly and in this case, that could mean reduced yield potential.

The MASC database from 2000-16 was analyzed for annual crop yield and break spacing between the same crop. If a one-year break occurs between the same crop, a positive yield response was found in spring wheat, oat, barley, canola and grain corn. In flax, field peas, non-oil sunflowers and soybeans, it took a three-year break between the same crop types to see a positive yield response. In all crop types, except field peas, the three-year break between the same crop (or a one-in-four-year



Manitoba has more crop choices than many locations on the Prairies, which makes a more diverse crop rotation possible.  
PHOTO: BRADY PENNER

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rotation) showed the highest crop yields.

Not able to wait for three-year break between crops? Look at the orange bars in Figure 1 to show what break intervals contributed to more consistent yield increases. The orange break years show yields higher than the average annual crop in more than 80 per cent of the years analyzed. None of single crop type/break-year combination yielded higher than the average all year — there are

always unknowns that can jeopardize yield, regardless of the crop rotation.

### Good crop rotations are not only about yield

The MASC data is a good indicator of trends in yield, but does not capture all the input and management information that occurred. Other items to keep in mind when designing crop rotations are potential for disease propagation, weed/volunteer

control, herbicide-resistant weed development, soil nutrient mining, soil moisture depletion and building organic matter levels. Record-keeping on crop types, pesticide use, nutrient level and soil attributes based on soil tests will also help in refining your crop rotation to make it more resilient. Looking for more information or assistance? Visit the Manitoba Agriculture website or contact the Crop Knowledge Centre at 204-745-5663 to speak to crop specialists who can answer your specific questions.

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TABLE 1: Yield response of Manitoba crops sown on large (>120 acre) fields of various previous crop (stubble) in rotation (2010-2016 %average of relative yields)

Previous Crop	Crop Planted											
	Spring Wheat	Winter Wheat	Oat	Barley	Canola	Flax	Field Pea	Soybean	Navy Bean	Sunflower	Grain Corn	Potato
Spring Wheat	85	87	94	95	102	104	103	102	109	103	96	102
Winter Wheat	72	83	97	106	101	95	107	104	118	107	95	75
Oat	91	84	79	78	95	92	93	100	79	102	99	89
Barley	88	93	90	82	100	102	91	100	83	96	92	108
Canola	100	104	101	103	87	86	98	100	93	92	99	106
Flax	96	104	90	107	103	83	91	98	NSD	88	85	NSD
Field Pea	102	80	110	106	104	148	NSD	95	NSD	NSD	98	NSD
Soybean	107	96	108	107	103	107	90	93	NSD	103	103	80
Navy Bean	113	NSD	117	NSD	116	NSD	NSD	122	86	NSD	110	79
Sunflower	102	NSD	102	106	90	99	85	93	NSD	82	97	NSD
Grain Corn	98	66	110	94	110	NSD	90	101	103	115	88	109
Potato	106	72	93	108	118	NSD	NSD	109	107	NSD	94	71
Yield/ac	50 bu	64 bu	101 bu	65 bu	36 bu	21 bu	38 bu	35 bu	1739 lb	1607 lb	121 bu	252 cwt

NSD = Not Significant Data to be used in the analysis

TABLE 2: Frequency of Manitoba crops sown on large (>120 acre) fields of previous crops (stubble) in rotation (2010-2016)

Previous Crop	Crop Planted											
	Spring Wheat	Winter Wheat	Oat	Barley	Canola	Flax	Field Pea	Soybean	Navy Bean	Sunflower	Grain Corn	Potato
Spring Wheat	2%	1%	7%	10%	51%	50%	36%	26%	21%	27%	8%	29%
Winter Wheat	<1%	<1%	2%	5%	4%	4%	6%	8%	4%	11%	4%	3%
Oat	1%	1%	2%	2%	5%	8%	6%	8%	4%	14%	3%	2%
Barley	1%	2%	3%	4%	6%	5%	6%	4%	1%	6%	4%	4%
Canola	74%	73%	42%	49%	8%	10%	25%	22%	35%	3%	22%	44%
Flax	2%	<1%	2%	2%	1%	1%	1%	1%	NSD	1%	<1%	NSD
Field Pea	1%	<1%	<1%	1%	<1%	<1%	NSD	<1%	NSD	NSD	1%	NSD
Soybean	10%	1%	26%	8%	6%	6%	3%	16%	NSD	11%	27%	2%
Navy Bean	<1%	NSD	<1%	<1%	<1%	NSD	NSD	0%	13%	NSD	2%	1%
Sunflower	2%	NSD	2%	4%	<1%	1%	<1%	1%	NSD	NSD	2%	NSD
Grain Corn	<1%	<1%	2%	1%	2%	NSD	1%	4%	8%	6%	7%	<1%
Potato	1%	<1%	<1%	<1%	<1%	NSD	NSD	<1%	3%	NSD	5%	<1%
Number Fields	59,640	7,797	8,272	8,341	82,730	2,179	1,761	27,085	848	2,313	5,004	1,254