

- 1. Project Title:** Evaluating the placement of companion crops in forage seed production
Continuation of ADOPT 20130352 – Second year of meadow brome grass seed production
- 2. Producer Group Sponsoring the Project:** Saskatchewan Forage Seed Development Commission (SFSDC)

3. Project Location(s):

Northeast Agriculture Research Foundation
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5. Project objectives:

SFSDC wanted to determine if there are any residual effects of planting meadow brome grass in alternate rows with wheat on seed yield of the forage in the second year of seed production.

6. Methodology:

On May 28, 2014, using a double shoot ConservaPak airseeder with 9 inch row spacing, we planted each of two forage seed crops, meadow brome grass and perennial ryegrass as follows: i) without a companion crop in 9" rows; ii) without a companion crop in 18" rows; iii) in the same rows with Unity VB wheat as the companion crop; iv) with wheat in alternating rows. We also planted v) wheat in 9" rows and vi) wheat in 18" rows. By placing forage seed with the seed opener and wheat through the fertilizer opener, we attempted to achieve optimum seed depths for both crops.

The ports to alternate rows on the seeder were diverted at the meters, so that when we seeded at 18" spacing the seed from 2 rows was combined into 1 row. This ensured that seed rates did not change when row spacing changed.

The plot size was 24 feet x 12 feet and the treatments were replicated 4 times in a randomized complete block design.

Cross band Nitrogen @ 90 lb/ac actual N (195 lb/ac of 46-0-0) fertilizer was applied to the entire project area prior to planting the crops.

Spectrum plus Puma Advance herbicides were applied according to the product labels using a tractor-mounted sprayer to all treatments for broad spectrum weed control.

The wheat plots were harvested with a plot combine on October 10, 2014 after it had dried sufficiently to straight cut, followed by cleaning and weighing the grain and adjusting seed moisture content to 14.5 per cent. Broadcast Nitrogen @ 80 lb/ac actual N was applied on the forage grass plots on November 19, 2014.

Unfortunately, the perennial ryegrass suffered extensive winter-kill and these plots were abandoned.

In 2015, prior to planting canola, Roundup Weathermax at 0.5 l/ac was applied. Canola (Invigor L140P) was planted at 6.2 lb/ac on June 1, 2015 in 9" rows along with Nitrogen fertilizer @ 90 lb/ac actual N using the same Conservapak airseeder in the same plots where wheat alone was grown in 2014. Liberty herbicide was applied at 1.34 l/ac on the canola plots on June 25, 2015. Canola was direct harvested on October 8, 2015 after it had dried sufficiently to straight cut, followed by cleaning and weighing the grain and adjusting moisture content to 10 per cent.

The meadow brome grass plots were harvested with a small plot combine on July 30, 2015 and samples were cleaned and weighed to obtain clean seed yield. A bulk sample of seed from the four replicates was submitted for seed purity and germination analysis.

Immediately after harvest, the meadow brome grass plots were mowed. Regrowth of meadow brome grass forage was cut with a Haldrup harvester on September 25, 2015. Forage fresh weight was determined in the field, and a grab sample was weighed, dried and re-weighed to determine dry matter per cent. This data was used to calculate forage dry matter yield.

Broadcast Nitrogen @ 80 lb/ac actual N was applied on the meadow brome grass plots in November 2015. The meadow brome grass plots were relatively weed free in 2016 and no herbicides were applied. The meadow brome grass plots were harvested with a small plot combine in July of 2016 and samples were cleaned and weighed to obtain clean seed yield. The rationale behind this data collection was to determine if there were residual effects from the 2015 treatments since brome grass yield was significantly affected by treatment in 2015.

Treatments:

1. Meadow Brome grass seeded at 5 lb/ac alone in 9" rows.
2. Meadow Brome grass seeded at 5 lb/ac alone in 18" rows.
3. Meadow Brome grass @ 5 lb/ac in the same rows as the wheat companion crop @ 90 lb/ac (forage sown shallow through seed tubes, wheat deeper through fertilizer knives).
4. Meadow Brome grass @ 5 lb/ac in alternate rows to wheat @ 90 lb/ac.
5. Perennial Ryegrass seeded at 7 lb/ac alone in 9" rows.
6. Perennial Ryegrass seeded at 7 lb/ac alone in 18" rows.
7. Perennial Ryegrass @ 7 lb/ac in the same rows as the wheat companion crop @ 90 lb/ac (forage sown shallow through seed tubes, wheat deeper through fertilizer knives).
8. Perennial Ryegrass @ 7 lb/ac in alternate rows to wheat @ 90 lb/ac.
9. Wheat sown alone at 90 lb/ac in 9" rows in 2014. Canola sown alone at 6.2 lb/ac in 9" rows in 2015.
10. Wheat sown alone at 90 lb/ac in 18" rows. Canola sown alone at 6.2 lb/ac in 9" rows in 2015.

Evaluation:

In 2014, we determined the number of forage and wheat plants per unit area by counting two 1 meter row lengths of crop at three weeks after emergence.

In 2014, we determined wheat, weed and forage biomass on 2 m² areas per plot (all plots, not just wheat) at harvest stage of the wheat.

In 2014, we determined wheat grain yield when the wheat was ready to be straight combined.

In 2015, we determined meadow brome grass seed yield and well as canola yield. The meadow brome grass seed was cleaned to obtain a clean seed yield and the meadow brome grass regrowth was cut and dried to determine regrowth weight. Seed purity and germination analysis was completed on meadow brome grass samples.

Unfortunately, the perennial ryegrass suffered extensive winterkill in the plot area in early 2015 and seed yields and regrowth data was not available.

In 2016, we determined meadow brome grass seed yield only.

7. Results:

2016 Meadow Brome grass yield

As reported earlier, meadow brome grass yield was significantly affected by treatments in 2015 (Table 1). Planting the forage seed crop in either the same rows as wheat or in alternate rows with wheat resulted in a 68 to 75% reduction in forage seed yield in 2015. This was most probably due to competition with the wheat crop. However, in 2016, any impact of the preceding treatments had disappeared and meadow brome grass yields were very similar where it was established alone or in combination with wheat. However, where meadow brome grass was established alone in 18" rows forage seed yield was 10% less than where it was established alone in 9" rows. While this difference was not statistically significant it does suggest that the narrower row spacing might be of some benefit. Meadow brome grass yield for the

other 3 treatments were within 2 per cent of one another.

Table 1. Meadow bromegrass clean seed yield (kg/ha) when planted in 2014 alone or in combination with wheat at Melfort, 2015 and 2016.

Treatment	Seed Yield (kg/ha)	
	2015	2016
Meadow Bromegrass seeded at 5 lb/ac alone in 9” rows.	930a	893a
Meadow Bromegrass seeded at 5 lb/ac alone in 18” rows.	896a	803a
Meadow Bromegrass @ 5 lb/ac in the same rows as wheat @ 90 lb/ac	236b	882a
Meadow Bromegrass @ 5 lb/ac in alternate rows to wheat @ 90 lb/ac.	289b	878a

Yield values followed by the same letter do not differ statistically at the 5% level of probability

Economic Analysis: Table 2 (below) contains an economic analysis of the three years of the project.

8. Acknowledgements:

Thank you to DLF Pickseed, Dow Agrosiences, and Bayer CropScience for supplying seed and herbicides for the project. Thank you to the Directors and producers of the Saskatchewan Forage Seed Development Commission for their financial support and guidance with this project. Special thanks to Stewart Brandt and Stephanie Ginter of NARF as well as Brett Mollison and all the crew at Agriculture and Agri-Food Canada, Melfort for their advice, expertise, time and efforts to carry out this project.



Second year of meadow bromegrass seed production
2016 Melfort SK. Source: SFSDC

Economic Analysis for 3 Years

Table 2. Revenue, Variable Expenses and Returns over Variable Expenses Per Treatment for 3 years combined

	<u>Treatments</u>					
	Meadow Bromegrass (MB) alone 9" row spacing	Meadow Bromegrass (MB) alone 18" row spacing	Meadow Bromegrass (MB) + Wheat in Same Row		Meadow Bromegrass (MB) + Wheat in Alternate Row	
	MB	MB	Wheat	MB	Wheat	MB
Revenue Per Acre						
Yield from trial (bu/ac) : year 1 (A)			56		57	
Yield from trial (lb/ac, bu/ac) : year 2 (A)	828	798		210		257
Yield from trial (lb/ac, bu/ac) : year 3 (A)	795	715		785		782
Estimated On-Farm Market Price / lb, bu (B ¹)	\$1.75	\$1.75	\$5.00	\$1.75	\$5.00	\$1.75
(B ²)	\$2.00	\$2.00	\$6.00	\$2.00	\$6.00	\$2.00
(B ³)	\$2.25	\$2.25	\$7.00	\$2.25	\$7.00	\$2.25
Est. Gross Revenue/ac (A x B ¹) per crop	\$2,840	\$2,648	\$280	\$1,741	\$285	\$1,818
Est. Gross Revenue/ac (A x B ¹) per treatment = C ¹	\$2,840	\$2,648	\$2,021		\$2,103	
Est. Gross Revenue/ac (A x B ²) per crop	\$3,246	\$3,026	\$336	\$1,990	\$342	\$2,078
Est. Gross Revenue/ac (A x B ²) per treatment = C ²	\$3,246	\$3,026	\$2,326		\$2,420	
Est. Gross Revenue/ac (A x B ³) per crop	\$3,652	\$3,404	\$392	\$2,239	\$399	\$2,338
Est. Gross Revenue/ac (A x B ³) per treatment = C ³	\$3,652	\$3,404	\$2,631		\$2,737	
Variable Expenses Per Acre						
Seed* : year 1	\$20.00	\$20.00	\$10.35	\$20.00	\$10.35	\$20.00
*: year 2						
Fertilizer* - Nitrogen : year 1	\$48.42	\$48.42	\$24.21	\$24.21	\$24.21	\$24.21
*. Nitrogen : year 2	\$43.04	\$43.04		\$43.04		\$43.04
****. Nitrogen : year 3	\$43.00	\$43.00		\$43.00		\$43.00
Crop Protection - Herbicides** : year 1	\$18.00	\$18.00	\$9.00	\$9.00	\$9.00	\$9.00
- Herbicides** : year 2						
Machinery Operating - Fuel** : year 1	\$19.98	\$19.98	\$9.99	\$9.99	\$9.99	\$9.99
- Fuel** : year 2	\$9.99	\$9.99		\$9.99		\$9.99
- Fuel***** : year 3	\$9.03	\$9.03		\$9.03		\$9.03
- Repair** : year 1	\$12.38	\$12.38	\$6.19	\$6.19	\$6.19	\$6.19
- Repair** : year 2	\$6.19	\$6.19		\$6.19		\$6.19
- Repair***** : year 3	\$6.57	\$6.57		\$6.57		\$6.57
Custom Work and Hired Labour** : year 1	\$19.00	\$19.00	\$9.50	\$9.50	\$9.50	\$9.50
** : year 2	\$9.50	\$9.50		\$9.50		\$9.50
***** : year 3	\$9.50	\$9.50		\$9.50		\$9.50
Crop Insurance Premium** : year 1			\$14.27		\$14.27	
Field Inspection Fees*** : year 2	\$3.57	\$3.57		\$3.57		\$3.57
Field Inspection Fees***** : year 3	\$3.57	\$3.57		\$3.57		\$3.57
Utilities and Miscellaneous** : year 1	\$4.80	\$4.80	\$2.40	\$2.40	\$2.40	\$2.40
Utilities and Miscellaneous** : year 2	\$4.80	\$4.80		\$4.80		\$4.80
Utilities and Miscellaneous***** : year 3	\$4.89	\$4.89		\$4.89		\$4.89
Total Variable Expenses per crop	\$296.23	\$296.23	\$85.91	\$234.94	\$85.91	\$234.94
Total Variable Expenses per Treatment (D)	\$296.23	\$296.23	\$320.85		\$320.85	
Returns Per Acre						
Return over Variable Expenses Per Treatment (C ¹ -D)	\$2,544.02	\$2,351.52	\$1,700.40		\$1,782.40	
(C ² -D)	\$2,949.77	\$2,729.77	\$2,005.15		\$2,099.15	
(C ³ -D)	\$3,355.52	\$3,108.02	\$2,309.90		\$2,415.90	

* Expense prices from Saskatchewan Agriculture Crop Planning Guide 2015 for Black Soil Zone

**** Expense prices from Saskatchewan Agriculture Crop Planning Guide 2016 for Black Soil Zone

** Expense costs from Saskatchewan Agriculture Crop Planning Guide 2015 for Black Soil Zone

***** Expense costs from Saskatchewan Agriculture Crop Planning Guide 2016 for Black Soil Zone

*** Expense costs from Manitoba Agriculture Guidelines for Estimating Forage Seed Production Costs 2015

***** Expense costs from Manitoba Agriculture Guidelines for Estimating Forage Seed Production Costs 2016