February 9, 2018

1. **Project Title:** Evaluating the Placement of Companion Crops in Forage Seed Establishment and Production
2. **Producer Group Sponsoring the Project:** Saskatchewan Forage Seed Development Commission (SFSDC)
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3. **Funder:** The project was supported by the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canada-Saskatchewan Growing Forward bi-lateral agreement.
4. **Researchers:** Jessica Pratchler and Stewart Brandt, Northeast Agriculture Research Foundation (NARF), Melfort, SK.
5. **Objectives:**
   The objective is to demonstrate the agronomic and economic advantages of alternate row planting using modern air-seeder technology and provide an economic analysis of planting methods and deliver these results to new and existing forage seed growers. With the adoption of advanced direct seeding equipment throughout Saskatchewan, forage seed producers are looking to find the most effective and economic method to plant forage seed crops. Perennial forage seed crops require a year to establish before seed production occurs. Some growers are less willing to accept a year without economic return and forage seed crop acres are declining in part due to competition from canola and wheat acres. They see the most productive and economic method of planting a forage seed crop is with a companion crop. Saskatchewan Forage Seed Development Commission (SFSDC) wanted to continue the work started with ADOPT 20130352 to demonstrate the effectiveness of using alternate row companion crop planting when establishing forage seed crops. By doing this project again, we hope to be able to recommend this methodology to forage growers for crop establishment.
6. **Methodology:**
   An area of wheat stubble in black clay soil was selected for the project at the Agriculture and Agri-Food Canada (AAFC) Research Farm near Melfort, SK. A pre-seed weed control application of glyphosate (Roundup Ultra II) was made on May 30, 2017. An application of 46-0-0 fertilizer at 90 lb/ac (90N) was made in a mid-row band on May 31, 2017.
   On June 1, 2017, using a double shoot 3.75m wide Conserva-Pak air drill seeding on 23 cm (9 inch) row spacing (**Figure 1**), the trial was planted as follows: i) meadow bromegrass without a companion crop in 9 inch rows **(Figure 3)**; ii) meadow bromegrass without a companion crop in 18 inch rows; iii) meadow bromegrass in the same rows with a wheat companion crop; and iv) meadow bromegrass with wheat in alternate rows **(Figure 5)**. We will also planted; v) wheat in 9 inch rows **(Figure 4);** and vi) wheat in 18 inch rows.
   By placing the meadow bromegrass with the seed opener and the wheat through the fertilizer opener, we attempted to achieve optimum seeding depths for both crops. Crop seeding rates were as outlined in **Table 1**. The 5.6 kg/ha (5 lb/ac) of meadow bromegrass was mixed with 28 kg/ha (25 lb/ac) of 11-52-0 fertilizer to ensure uniform seed flow and the two were seeded at a combined rate of 33.5 kg/ha (30 lb/ac).

The treatments were replicated 4 times in a randomized complete block design and the plot size was 3.6 m x 7.2 m (12 feet x 24 feet).

Table 1: Treatment list for planting meadow bromegrass and wheat alone or as a companion crop in 2017. Melfort, SK.

Treatment	Description
1	Meadow Bromegrass alone in 9 inch rows at 5.6 kg/ha (5 lb/ac)
2	Meadow Bromegrass alone in 18 inch rows at 5.6 kg/ha (5 lb/ac)
3	Meadow Bromegrass at 5.6 kg/ha (5 lb/ac) with wheat at 101 kg/ha (90 lb/ac) in the same rows
4	Meadow Bromegrass at 5.6 kg/ha (5 lb/ac) with wheat at 101 kg/ha (90 lb/ac) in alternate rows
5	Wheat alone in 9 inch rows at 101 kg/ha (90 lb/ac)
6	Wheat alone in 18 inch rows at 101 kg/ha (90 lb/ac)

In-crop weed control was not applied; however, meadow bromegrass only plots were mowed multiple times throughout the growing season as a weed control measure. Wheat plots were harvested with a Wintersteiger plot combine after it had dried sufficiently to straight cut on September 15, 2017. Grain samples were cleaned and weighed and seed moisture content was adjusted to 14.5 per cent to assess wheat yield. The number of forage and wheat plants per unit area and weed biomass and forage biomass were not determined due to an oversight, and uneven crop emergence. To collect suitable data we plan to measure meadow bromegrass establishment using a line transect method in spring 2018 when bromegrass is 2.5-7.5 cm (1-3 inch) tall, and to determine weed numbers and species present in each plot when early emerging annual weeds are at the 1 to 3 true leaf stage.

7. Results:

The 2017 growing season was drier and warmer than the long-term climate average (**Table 2**).

Table 2: Mean temperatures and precipitation collected from the Environment Canada Weather Station at Melfort, SK., for May to October 2017.

	May	June	July	August	Sept	Oct	Average/ Total
				--- Temperature (°C) ---			
2017	10.8	15.2	18.7	17.2	12.5	4.3	13.1
Long-Term[x]	10.7	15.9	17.5	16.8	10.8	3.3	12.5
				--- Precipitation (mm) ---			
2017	46.4	44.1	33.3	3.1	13.2	43.5	183.6
Long-Term[x]	42.9	54.3	76.7	52.4	38.7	27.9	292.9

[x] Long-Term Climate normals from Melfort Environment Canada Weather Station (1981-2010) (52°49'00 N, 104°36'00 W).

July to October was at least a degree warmer than normal, with September being almost 2 degrees warmer. May and October were the only months to receive more precipitation than average. This precipitation in May, along with the saturated soil conditions from the previous fall made for difficult seeding conditions. Very dry

conditions in early June, just after seeding, meant the meadow bromegrass emergence was variable with most not emerging until late June. The increased precipitation in October would normally have presented a challenge, however due to the extremely dry conditions in July, August, and September; the precipitation was welcomed and did not considerably delay harvest. Overall, the warm weather was favorable for wheat production in northeast Saskatchewan. This combination of environmental factors resulted in good wheat yields. The first killing frost (-2°C) occurred on October 9, 2017 after the crop was harvested.

Overall, wheat yield was not significantly affected by treatments **(Table 3)**. However, there was a trend for wheat yield to be lower where it was grown alone than where it was grown with meadow bromegrass (by almost 6 bu/ac). In addition, there was a trend for wheat grown in 9 inch rows to be higher yielding that where it was grown in 18 inch rows (by more than 6.5 bu/ac). Lower wheat yield at wider row spacing was not unexpected and agrees with observations made in the trial (ADOPT 20130352) in 2014. Furthermore, lower yield for wheat grown alone was not expected.

Table 3. Wheat yield (kg/ha and bu/ac) when planted alone or in combination with meadow bromegrass at Melfort, SK. 2017.

Treatment	Wheat yield (kg/ha)	Wheat yield (bu/ac)
Meadow bromegrass alone in 9 inch rows at 5.6 kg/ha (5 lb/ac)	-	-
Meadow bromegrass alone in 18 inch rows at 5.6 kg/ha (5 lb/ac)	-	-
Meadow bromegrass at 5.6 kg/ha (5 lb/ac) with wheat at 101 kg/ha (90 lb/ac) in the same rows	5,290	78.5
Meadow bromegrass at 5.6 kg/ha (5 lb/ac) with wheat at 101 kg/ha (90 lb/ac) in alternate rows	4,818	71.5
Wheat alone in 9 inch rows at 101 kg/ha (90 lb/ac)	4,866	72.2
Wheat alone in 18 inch rows at 101 kg/ha (90 lb/ac)	4,441	65.9
LSD (P=0.05)	ns	ns

8. Conclusions and Recommendations:

The project was planted on time and meadow bromegrass and wheat plots established well. This project will continue in 2018.

9. Acknowledgements:

This project was supported financially by Saskatchewan Ministry of Agriculture through their ADOPT program. ADOPT funding for the project was acknowledged on the SFSDC website, and in Newsletter and Magazine articles listed in the Extension section above. Thank you to DLF Pickseed, Dow Agrosciences and Bayer Cropscience for supplying seed and pesticide for the project. Thank you to Clayton Myhre, DLF Pickseed, Al Foster, Saskatchewan Ministry of Agriculture, Morley Doerksen and James Silcox for their cooperation in planning and carrying out this project. Thank you to the Directors and producers of the Saskatchewan Forage Seed Development Commission for their support

and guidance in planning this project.
Special thanks to Jessica Pratchler, Stewart Brandt and the crew at NARF as well as Brett Mollison and the crew at AAFC, Melfort for their advice, expertise, time and efforts to carry out this project.

Figure 1. Planting wheat and meadow bromegrass in alternate rows. Melfort SK. June 1, 2017. Source: SFSDC

Figure 2. Stu Brandt describing project at field tour. Melfort SK. July 27, 2017. Source: SFSDC

Figure 3. Meadow bromegrass alone 9 inch rows. Melfort SK. July 27, 2017. Source: SFSDC

Figure 4. Wheat alone. Melfort SK. July 27, 2017. Source: SFSDC

Figure 5. Meadow bromegrass and wheat in alternate rows. Melfort, SK. July 27, 2017. Source: SFSDC