



**Project Identification**

**Project Title:** Increasing the adoption of new green and yellow pea varieties

**Project Number:** ADOPT 20200530

**Producer Group Sponsoring the Project:** Northeast Agriculture Research Foundation

**Project Location(s):** RM of Star City no. 428 SE 31-44-18 W2

**Project start and end dates (month & year):** April 2021 to February 2022

**Project contact person & contact details:**

Brianne McInnes AAg  
Operations Manager  
Northeast Agriculture Research Foundation  
Box 1240  
Melfort, SK  
S0E 1A0  
email: [neag.agro@gmail.com](mailto:neag.agro@gmail.com)

David MacTaggart AAg  
Associate Research Manager  
Northeast Agriculture Research Foundation  
Box 1240  
Melfort, SK  
S0E 1A0  
email: [research.narf@gmail.com](mailto:research.narf@gmail.com)

**Objectives and Rationale:**

**Project objectives:** To bring awareness to the yield potential of newer field pea varieties for better producer adoption; and to compare the agronomics and economics of yellow versus green pea varieties under different management systems.

**Project Rationale:**

Field pea is one of the most widely grown pulse crops in Canada with 3.8 million acres being planted in 2021 (Statistics Canada, 2021). Yellow pea is the most common market class being grown on approximately 75% of pea acres in Canada followed by green pea, which occupies 15-20% of the national pea acres in 2020 (Barker, 2020). Many new varieties have been released for these two market classes in recent years, however varieties like CDC Meadow released in 2004 continue to dominate, being grown on 23% of all prairie pea acres in 2021 (The Western Producer, 2022). By maintaining older varieties, farmers may be losing out on the higher performance of new varieties because of improvements in yield, disease resistance, and agronomics. Understanding how recently released pea varieties respond to crop inputs under varying environments is an important factor to their greater adoption. This project was undertaken to compare the performance of newer and older yellow and green pea varieties under different management systems.

**Methodology and Results**

**Methodology:**

This small plot demonstration was conducted at SE 31-44-18 W2 in the RM of Star City near Melfort, SK. The demonstration was set up in a 2 X 2 factorial with 4 replicates. Variety was the first factor and management system was the second factor. There were 8 treatments (Table 1) that varied based on four different pea varieties and two different management plans that are described in Table 2.

**Table 1.** Treatments used in Increasing the adoption of new green and yellow pea varieties in Melfort, SK 2021.

Treatment #	Variety	Management Systems
1	CDC Meadow (Yellow)	Basic
2		Enhanced
3	CDC Spectrum (Yellow)	Basic
4		Enhanced
5	CDC Raezer (Green)	Basic
6		Enhanced
7	CDC Forest (Green)	Basic
8		Enhanced

**Table 2.** Description of the two management plans making the second factor of the 2-way factorial design for Increasing the adoption of new green and yellow pea varieties in Melfort, SK 2021.

Management Component	Basic Management	Enhanced Management
Seeding rate	75 plants/m <sup>2</sup>	100 plants/m <sup>2</sup>
Fertility (N-P-K-S kg/ha)	5-22-0-0	19-45-0-11
Seed Treatment	No	Yes
Fungicide	No	Yes

At Melfort, plots were 2-m wide by 7-m long. Prior to seeding, the test site was soil sampled for residual nutrient levels (Table 3). On May 12<sup>th</sup>, 2021 all plots were seeded at a 2-inch depth into wheat stubble. Seeding was completed using a 6-row Fabro plot seeder on 30.5cm row spacing. The fertilizer for each treatment was side band at seeding at rates indicated in Table 2. Phosphorus was applied as 11-52-0 (MAP) and sulphur as 21-0-0-24 (AMS). All applied nitrogen was from the MAP and AMS application rates. All treatments were inoculated with Nodulator Duo SCG at 3 kg/ha. The seed of the enhanced treatments was treated with Apron Maxx at 325mL/100kg of seed and Vibrance 500FS at 10mL/100kg of seed for early protection from seed and soil borne diseases.

**Table 3:** Residual soil nutrient levels found in Increasing the adoption of new green and yellow pea varieties in Melfort, SK 2020. Residual nitrogen and sulfur was from 0-30cm while phosphorus and potassium was from 0-15cm.

Residual Soil Levels			
<i>Nitrogen (lb/ac)</i>	<i>Phosphorus (ppm)</i>	<i>Potassium (ppm)</i>	<i>Sulphur (lb/ac)</i>
32	7	474	24

Two passes of in-crop herbicide were applied for weed control. Viper ADV (0.4L/ac) was applied on June 8<sup>th</sup> and Assure II (0.3L/ac) was applied at on June 14<sup>th</sup>. The fungicide Priaxor (180 ml/ac) was applied to the enhanced agronomy treatments on July 8<sup>th</sup>. All plots were desiccated on August 5<sup>th</sup> with Glyphosate 540 at 0.67L/ac. All plots were harvested on August 17<sup>th</sup> with a plot combine, in which 5 full crop rows were collected.

To assess treatment differences, data collection consisted of plant density, lodging, maturity, seed yield, and seed protein content. Methodology for this data collection is described below. The single site year of data was analyzed using Randomized Complete Block in Statistix 10.

## Results

### Environmental Conditions:

The environmental conditions of 2021 were marked by being warmer and dryer than the long-term average for several months of the growing season. The monthly mean temperature was greater than the long-term average from June-September (Table 4). The deviation from the long-term mean temperature was most pronounced in September and July when the temperature was 3.2°C and 2.6°C greater than the mean respectively. May was the only month that was cooler than average with a monthly mean of 9.6°C relative to the long-term mean of 10.7°C (Table 4). From May to September, Melfort received 55% of normal precipitation with all months except August (16.9mm above normal) that received below

average precipitation. This deficit was most pronounced in July and September which received 76.5mm and 31.2mm of precipitation less than the long-term average.

**Table 4:** Mean temperatures and precipitation collect from the Environment Canada Weather Station at Melfort SK., from May to September 2021.

	May	June	July	August	September	Average/Total
	--- Mean Temperature (°C) ---					
2021	9.6	18.2	20.1	16.9	14	15.8
Long-Term <sup>x</sup>	10.7	15.9	17.5	16.8	10.8	14.3
	--- Total Precipitation (mm) ---					
2021	31.4	37.6	0.2	69.3	7.5	146.0
Long-Term <sup>x</sup>	42.9	54.3	76.7	52.4	38.7	265.0

<sup>x</sup> Long-term climate normal from Environment Canada Weather Station located at Melfort SK., from 1981-2010

Plant Density:

Plant density was assessed on June 7<sup>th</sup>, 2021 by counting the number of emerged seedlings along two 1-meter sections of crop row per plot. The results of the analysis of variance (ANOVA) described in Table 5 identified that there were significant differences between the plant densities of the different management plans ( $p < 0.05$ ). The enhanced management had a higher plant density which was reasonable given the higher seeding rate of this treatment (Table 2). There were no significant differences between the plant densities of the varieties ( $p = 0.1949$ ) or the interaction between management and variety ( $p = 0.0586$ ). For the individual varieties, the difference between the plant densities of the enhanced and basic treatments was the most pronounced for CDC Spectrum (26.66 plants/m<sup>2</sup> greater) and CDC Meadow (26.25 plants/m<sup>2</sup> greater) and the least pronounced for CDC Forest where there was no difference in the density of basic and enhanced treatments.

Lodging:

Lodging was assessed on August 17<sup>th</sup>, 2021 using the Belgian lodging scale. The ANOVA identified that there were highly significant differences in lodging based on variety ( $p < 0.001$ ) while there were no significant differences in the lodging of the two management systems and the interaction between management and variety (Table 5). With pairwise comparison, two groups of lodging intensity emerged among the varieties. The newer varieties CDC Spectrum (Lodging=0) and CDC Forest (Lodging=2.2) had significantly lower lodging intensity than CDC Meadow (Lodging=5.35) and CDC Raezer (Lodging=5.4) which together formed the high lodging group. Therefore, both of the newer pea varieties demonstrated significantly less lodging as compared to the older variety of the same market class.

**Table 5.** Statistical analyses and treatment means for Increasing the adoption of new green and yellow pea varieties in Melfort, SK 2021.

	Plant Density (plants/m <sup>2</sup> )	Lodging	Maturity	Yield (kg/ha)	Yield (bu/ac)	Protein (%)
Management	0.0014**	0.97	0.51	0.13	0.1291	0.078
Variety	0.1949	<0.0001***	<0.0001***	0.001*	0.001*	0.0006***
Variety*Management	0.0586	0.79	0.72	0.25	0.2506	0.71
Grand Mean	77.6	3.2	80.1	3219.1	47.8	22.30
CV	14.67	57.21	2.29	10.70	10.7	2.02
Enhanced	85.0 a	3.2 a	80.3 a	3315.3 a	49.3 a	22.45 a
Basic	70.2 b	3.3 a	79.9 a	3123.0 a	46.4 a	22.16 a
CDC Spectrum	76.3 a	5.4 a	76.0 c	3463.0 a	51.5 a	22.14 b
CDC Meadow	84.3 a	0.0 b	79.3 b	3204.7 ab	47.6 ab	22.30 b
CDC Raezer	71.6 a	5.4 a	82.1 a	2738.3 b	40.7 b	22.94 a
CDC Forest	78.3 a	2.2 b	83.0 a	3470.6 a	51.6 a	21.84 b
CDC Meadow Basic	63.2 b	5.4 a	76.0 b	2919.8 ab	43.4 ab	21.97 ab
CDC Meadow Enhanced	89.4 ab	5.4 a	76.0 b	3489.7 ab	51.8 ab	22.31 ab
CDC Spectrum Basic	71.0 ab	0.0 b	79.3 ab	3508.5 ab	52.1 ab	22.07 ab
CDC Spectrum Enhanced	97.6 a	0.0 b	79.3 ab	3417.5 ab	50.8 ab	22.52 ab
CDC Raezer Basic	68.5 b	5.0 a	81.3 a	2731.6 b	40.6 b	22.96 a
CDC Raezer Enhanced	74.6 ab	5.9 a	83.0 a	2745.0 b	40.8 b	22.93 a
CDC Forest Basic	78.3 ab	2.7 ab	83.0 a	3332.0 ab	49.5 ab	21.63 b
CDC Forest Enhanced	78.3 ab	1.7 ab	83.0 a	3609.1 a	53.6 a	22.05 ab

\* significant  $p < 0.05$ ; \*\* significant  $p < 0.01$ ; \*\*\* significant  $p < 0.001$

#### Maturity:

Maturity was measured between July 27<sup>th</sup> and August 3<sup>rd</sup> in which the date that the majority of pods (approximately 80%) per plot were brown was documented. The difference in days from seeding to maturity for every plot was used to determine days to maturity for every treatment (Table 5). The ANOVA results indicated that there were highly significant differences in the maturity of different varieties ( $p < 0.001$ ) but no difference based on management system ( $p = 0.51$ ) or the interaction between variety and management ( $p = 0.72$ ) (Table 5). Pairwise comparison of the different varieties identified three groups with no overlap. CDC Meadow (76 days to maturity) was the earliest maturing variety which was significantly different than the two later maturing groups. CDC Spectrum (79.3 days to maturity) made up the mid-maturity group which was significantly less than the late maturity group of CDC Raezer (82.1 days to maturity) and CDC Forest (83 days to maturity). Our results indicate that yellow pea varieties matured significantly earlier than green pea varieties. These results were comparable to the approximate days to maturity in the Saskatchewan Seed Guide for these four varieties, whereas CDC Meadow has the earliest maturity, CDC Spectrum had similar maturity to CDC Forest, and CDC Raezer had the latest maturity (Warkentin et al., 2007; Warkentin et al., 2014; Warkentin et al., 2017 a; Warkentin et al., 2017 b).

### Seed Yield:

Seed yield was assessed by cleaning and weighing every harvested plot sample. Plot weights were converted in kg/ha and bu/ac equivalents while correcting to 16% seed moisture. The ANOVA results were the same from the kg/ha and bu/ac perspectives and identified that there were significant differences ( $p < 0.01$ ) in the seed yield of the varieties. There were no differences in yield based on the management strategy ( $p = 0.13$ ) or the interaction between management and variety ( $p = 0.25$ ). Pairwise comparison of the varieties presented two overlapping yield groups. CDC Forest (3470.6 kg/ha & 51.6 bu/ac) and CDC Spectrum (3463.0 kg/ha & 51.5 bu/ac) had the highest seed yields that were significantly greater than CDC Raezer (2738.3 kg/ha & 40.7 bu/ac). Of the four tested varieties, CDC Forest and CDC Spectrum were the most recently released. CDC Meadow (3204.7 kg/ha & 47.61 bu/ac) was statistically similar to CDC Raezer, CDC Forest and CDC Spectrum. This order of varietal yield was slightly different than the variety registration articles for these four varieties where Spectrum had the highest yield followed by Forest and Raezer which had comparable yield, and Meadow had the lowest yield (Warkentin et al., 2007; Warkentin et al., 2014; Warkentin et al., 2017 a; Warkentin et al., 2017 b). Pairwise comparison of the individual treatments of management: variety showed that CDC Forest with enhanced management (3609.1 kg/ha & 53.62 bu/ac) had significantly higher seed yield than CDC Raezer under both basic (2731.6 kg/ha & 40.58 bu/ac) and enhanced (2745 kg/ha & 40.78 bu/ac) management (Table 5). All other treatments of management: variety were statistically similar.

### Protein:

A dry seed sample was sent to Seed Solutions Lab in Swift Current, SK for seed protein to be determined. The ANOVA identified highly significant differences ( $p < 0.001$ ) in the seed protein based on variety, but no significant difference based on management ( $p = 0.078$ ) or the interaction between management and variety ( $p = 0.71$ ). Pairwise comparison of the varieties identified that CDC Raezer (22.94% Protein) had the highest seed protein that was significantly greater than the three other varieties. A pairwise comparison of the treatments of management: variety identified that CDC Raezer under the basic (22.96% protein) and the enhanced management (22.93% protein) had significantly greater protein than CDC Forest under basic management (21.63% protein). In comparison, all yellow pea varieties had statistically comparable % protein regardless of management.

### Economics:

Economic analysis was conducted using the 2021 Saskatchewan Crop Production Guide (Saskatchewan Ministry of Agriculture, 2021) and current agricultural commodity prices reported by the Saskatchewan Ministry of Agriculture. In January of 2022, the price of edible yellow peas was \$17.51/bushel (\$0.64/kg) and edible green peas were \$16/bushel (\$0.59/kg) (Saskatchewan Ministry of Agriculture, 2022). Commodity prices used for economical analysis were the same for both varieties of each market class. It is important to note that newer green pea varieties, such as CDC Forest are more prone to bleaching, which may affect the profitability of this treatment, due to possible downgrading. Prices for the costs that varied between the two management systems are listed in Table 6. Of the eight treatment combinations, all treatments were profitable. CDC Spectrum-Basic had the highest profitability at \$1,412.22/ha followed by CDC Meadow-Enhanced at \$1,159.39/ha, and CDC Forest-Basic at \$1,118.06/ha (Table 7). The profitability of CDC Spectrum-Basic was driven by having the highest gross revenue among the eight treatments and the third lowest total cost. While CDC Forest-Basic had a lower gross revenue than CDC Spectrum-Basic and CDC Meadow-Enhanced, it had the

second lowest total cost among the eight treatments (\$836.72/ha). The lowest net profitability came from CDC Raezer-Enhanced (\$427.90/ha). This treatment had the highest cost of the eight treatments because the seed lot used for CDC Raezer had the highest seed weight and lowest germination of the four varieties. This led to higher costs for seed and seed treatments.

**Table 6:** Cost of components per hectare that varied between the treatments of Increasing the adoption of new green and yellow pea varieties in Melfort, SK 2021.

Treatment	Seed	Seed Treatment	Phosphorus (11-52-0)	Sulphate (21-0-0-24)	Fungicide
Meadow Basic	\$190.17		\$12.19		
Meadow Enhanced	\$253.56	\$67.05	\$24.37	\$9.70	\$111.35
Spectrum Basic	\$203.40		\$12.19		
Spectrum Enhanced	\$271.20	\$71.71	\$24.37	\$9.70	\$111.35
Raezer Basic	\$250.09		\$12.19		
Raezer Enhanced	\$333.45	\$88.17	\$24.37	\$9.70	\$111.35
Forest Basic	\$199.39		\$12.19		
Forest Enhanced	\$265.86	\$70.30	\$24.37	\$9.70	\$111.35

When examining the effect of management system on profitability, the basic management was more profitable for three of the four varieties (Table 7). CDC Meadow was the only variety where the enhanced management was more profitable than the basic management. This difference was driven by the much higher yield of enhanced management and the price of yellow peas was greater than that of green peas.

Comparing the older and newer varieties with management and market class considered equal, it was more profitable in most instances to grow a newer variety (CDC Spectrum-Yellow, CDC Forest-Green) versus the older variety of the same market class (CDC Meadow-Yellow, CDC Raezer-Green) (Table 7). The exception was for yellow peas under enhanced management where CDC Meadow was more profitable than CDC Spectrum.

Considering the market class of pea with varietal age and management being considered equal, yellow peas had a higher profitability than green peas (Table 7). The main driving factors were the higher price of yellow peas versus green peas and in most instances, the yellow market class had a higher yield than the green market class. The exception was for new varieties under enhanced management where CDC Forest-Green (3609.1 kg/ha) outyielded CDC Spectrum-Yellow (3417.5 kg/ha).

**Table 7:** The profitability of treatments tested in Increasing the adoption of new green and yellow pea varieties in Melfort, SK 2021.

Variety	Management	Gross Revenue (\$/ha)	Total Cost (\$/ha)	Net Profitability (\$/ha)
CDC Meadow	Basic	\$1,874.61	\$829.18	\$1,045.43
	Enhanced	\$2,240.50	\$1,048.63	\$1,191.87
CDC Spectrum	Basic	\$2,252.57	\$807.87	\$1,444.70
	Enhanced	\$2,194.15	\$1,070.93	\$1,123.22
CDC Raezer	Basic	\$1,602.54	\$854.93	\$747.60
	Enhanced	\$1,610.40	\$1,150.02	\$460.38
CDC Forest	Basic	\$1,954.77	\$804.24	\$1,150.54
	Enhanced	\$2,117.34	\$1,064.55	\$1,052.79

### Conclusions and Recommendations

The objective of this experiment was to bring awareness to the yield potential of newer field pea varieties for better producer adoption; and to compare the agronomics and economics of yellow versus green pea varieties under different management systems.

At the Melfort site in 2021, growing a new pea variety under basic management was the most successful based on profitability, yield, and agronomic performance. With high commodity prices, all treatments were profitable. The new varieties CDC Spectrum (Yellow Market Class) and CDC Forest (Green Market Class) under basic management generally had superior profitability, yield, and lodging resistance compared to the older varieties of their respective market classes. Yellow pea varieties were generally more profitable and earlier maturing than green pea varieties. Based on this site year, the enhanced management system was not as profitable as the basic management system with the variety CDC Meadow being the exception.

Farmers may consider using the enhanced management system if growing peas in years with greater moisture. Higher moisture conditions that favor the spread of soil borne and foliar diseases may make the use of seed treatment and foliar fungicide more profitable. These conditions could also allow the crop to take advantage of the higher fertility provided in the enhanced management system.

#### Extension Activities

The experiment was described in the 2021 Northeast Agriculture Research Foundation virtual field day. Results will be posted on [neag.ca](http://neag.ca)

### Supporting Information

#### **Acknowledgements**

The Northeast Agriculture Research Foundation would like to express our gratitude to the Saskatchewan Ministry of Agriculture’s ADOPT program for funding this demonstration and for providing signage. We would like to thank Jessica Slowski and Brianne McInnes of NARF for coordinating the project protocol, data analysis and report writing for this project. Thank you to David MacTaggart of NARF for completing the economic analysis as well as report writing. Finally, NARF would like to thank Gayelene Dagenais, Caitlyn Hartman, and Carter Fettes for their hard work and dedication in completing this project.

## Works Cited

- Barker, B. 2020. Pea Seed Guide 2020. Saskatchewan Pulse Growers. Online. Available: [https://saskpulse.com/files/newsletters/200309\\_Pea\\_Varieties\\_2020.pdf](https://saskpulse.com/files/newsletters/200309_Pea_Varieties_2020.pdf) [January 17, 2022].
- Saskatchewan Ministry of Agriculture. 2021. Crop Planning Guide 2021. Online. Available: <https://publications.saskatchewan.ca/#/products/111426> [January 18, 2022].
- Saskatchewan Ministry of Agriculture. 2022. AGR Market Trends. Online. Available: <https://applications.saskatchewan.ca/agrmarkettrends> [January 18, 2022].
- Statistics Canada. 2021. June estimates of principal field crop areas. Online. Available: <https://www150.statcan.gc.ca/n1/daily-quotidien/210629/t001b-eng.htm> [January 17, 2022].
- Warkentin, T., Vandenberg, A., Tar'an, B., Banniza, S., Barlow, B., Ife, S. 2007. CDC Meadow field pea. *Can. J. Plant Sci.* **87**: 909-910.
- Warkentin, T., Vandenberg, A., Tar'an, B., Banniza, S., Arganosa, G., Barlow, B., Ife, S., Horner, J., de Silva, S., Thompson, M., Parada, D., Wagenhofer, S., Prado, T. 2014. CDC Raezer green field pea. *Can. J. Plant Sci.* **94** (8): 1535-1537.
- Warkentin, T., Tar'an, B., Banniza, S., Vandenberg, A., Bett, K., Arganosa, G., Barlow, B., Ife, S., Horner, J., de Silva, S., Wagenhofer, S., Liu, Y., Prado, T., Mikitu, K. 2017. CDC Forest green field pea. *Can. J. Plant Sci.* **98** (1): 227-229.
- Warkentin, T., Tar'an, B., Banniza, S., Vandenberg, A., Bett, K., Arganosa, G., Barlow, B., Ife, S., Horner, J., de Silva, S., Wagenhofer, S., Liu, Y., Prado, T., Mikitu, K. 2017. CDC Spectrum yellow field pea. *Can. J. Plant Sci.* **98** (1): 230-232.
- The Western Producer. 2022. Saskatchewan Seed Guide 2022.

## Abstract

### **Abstract/Summary**

Field pea is one of the most widely grown pulse crops in Western Canada with yellow and green market classes being the most common. In recent years, Canadian field pea acres have been decreasing in part because of greater disease incidence. While new varieties have been recently released, the most widely grown yellow and green pea varieties have been on the market for 10-20 years. Adoption of new pea varieties with the proper crop management could improve the performance of field pea in crop rotations across Western Canada. The objective of this research was to bring awareness to the yield potential of newer field pea varieties for better producer adoption; and to compare the agronomics and economics of yellow versus green pea varieties under different management systems. A demonstration was conducted in the RM of Star City during the 2021 growing season which was marked by warmer than average temperatures and low precipitation. A 2x2 factorial design was used to understand how variety and crop management affects the performance of yellow and green peas. The varieties CDC Meadow (Yellow), CDC Spectrum (Yellow), CDC Raezer (Green), and CDC Forest (Green) were grown

under basic and enhanced management, which differed in seeding rate, fertility level, and the use of seed treatment and foliar fungicides. The newer varieties of each market class CDC Spectrum and CDC Forest generally outperformed older varieties under similar management with significantly greater lodging resistance, numerically greater yield and profitability. When comparing pea market classes, yellow pea treatments matured 1.9- 7 days earlier and were generally more profitable because of higher prices. Management had an effect on the plant density and profitability of the different treatments. While all treatment combinations had positive net profits, the basic management was the most profitable in 2021 due to lower input costs. Our results indicate that growing newer varieties of yellow and green pea can improve crop performance and that basic management is profitable under the dry conditions and high commodity prices experienced during this project.

### **Finances**

#### **Budget Report**

See attached excel spreadsheet