

# Executive Summary – PrairieSpark Field Performance Pilot (2019–2024)

## Problem / Context

- Real yield records from a 3,500-acre Saskatchewan grain farm across 2019–2024.
- **Goal:** identify consistently high-performing fields, unstable/risky fields, and rotations that over/underperform.

## Approach

### Data Prep

- Digitized handwritten yield logs into Excel and standardized columns/units (2019–2024).
- Anonymized fields (e.g., F###) and removed legal land descriptions for a public-ready dataset.
- Created split labels (A/B) and unique split IDs for multi-crop field-years to prevent overwrite and double-counting.

### SQL Model

- Loaded the cleaned public dataset into SQL Server and created a reusable base view (`dbo.v_field_year_base`) that:
  - Selects the **dominant crop** to collapse each field-year to one record.
  - Calculates **area-weighted yield** so small-acre fields don't skew performance.

### Power BI Dashboard Deliverables

- **Farm Overview / Field Performance:** What are top/bottom fields and crops overall? *Drill-through to a field's full history + metrics.*
- **Field Stability & Risk:** Which fields are most volatile vs consistent over time? *Drill-through to year-by-year field details.*
- **Rotation Performance:** Which previous crop → current crop combos perform best/worst? *Drill-through to rotation history across years/fields.*

# Key Findings (2019–2024)

## Overview/Coverage(2019-2024)

**40 fields (2019–2024), 766,186 total bushels, 18,881 acres** (sum of acres reported across all field-years), overall area-weighted avg yield = **40.6 bu/ac.**

### Top 5 fields by Average Yield With Total Acres $\geq 500$

1. F017 — 53.2 bu/ac — 38,304 bushels — 720 acres
2. F033 — 46.8 bu/ac — 42,150 bushels — 900 acres
3. F026 — 43.9 bu/ac — 32,080 bushels — 730 acres
4. F001 — 42.9 bu/ac — 37,179 bushels — 866 acres
5. F019 — 42.6 bu/ac — 21,939 bushels — 515 acres

### Bottom 5 Fields by Average Yield With Total Acres $\geq 500$

1. F025 — 34.3 bu/ac — 23,185 bushels — 675 acres
2. F007 — 34.4 bu/ac — 30,771 bushels — 895 acres
3. F024 — 35.5 bu/ac — 31,950 bushels, 900 acres
4. F010 — 35.8 bu/ac — 20,735 bushels — 580 acres
5. F034 — 36.4 bu/ac — 35,460 bushels — 974 acres

### Top 5 Most unstable fields With Total Acres $\geq 500$

1. F023 — CV 0.59 — Yield swing 22.22 bu/ac — 37.60 bu/ac — 759 acres — 5 yrs of data
2. F019 — CV 0.46 — Yield swing 19.65 bu/ac — 42.60 bu/ac — 515 acres — 5 yrs of data
3. F007 — CV 0.46 — Yield swing 15.96 bu/ac — 34.67 bu/ac — 895 acres — 6 yrs of data
4. F004 — CV 0.42 — Yield swing 16.36 bu/ac — 39.00 bu/ac — 775 acres — 5 yrs of data
5. F025 — CV 0.42 — Yield swing 14.93 bu/ac — 35.93 bu/ac — 675 acres — 6 yrs of data

## Rotation combos with consistent underperformance

**Barley → Canola:** 28.78 bu/ac — Rotation occurred 11 times

**Wheat → Canola:** 32.23 bu/ac — Rotation occurred 16 times

**Wheat → Barley:** 39.22 bu/ac — Rotation occurred 4 times

## Recommendations

### 1. "Stop-the-bleeding" targets (big acres + below-average yield)

Prioritize the largest **yield gaps** first:

- **F007: 34.4 bu/ac on 895 total acres → -6.2 bu/ac gap vs farm avg**  
≈ +5,549 bu upside over the dataset (≈ 925 bu/year)
- **F024: 35.5 bu/ac on 900 total acres → -5.1 bu/ac gap**  
≈ +4,590 bu upside (≈ 765 bu/year)
- **F025: 34.3 bu/ac on 675 total acres → -6.3 bu/ac gap**  
≈ +4,253 bu upside (≈ 709 bu/year)
- **F034: 36.4 bu/ac on 974 total acres → -4.2 bu/ac gap**  
≈ +4,091 bu upside (≈ 682 bu/year)

### 2. Volatility control (protect profit on high-acre, high-CV fields)

High-CV fields are where you get surprised and lose money if you treat them like stable ground.

- **F023: CV 0.59, yield swing 22.22 bu/ac, 759 acres-years, 5 years**  
Drill-through shows **canola years crashing (15 bu/ac in 2019 & 2021)** while **barley years were strong (63 in 2020; 55 in 2022)**.
- **F007: CV 0.46, yield swing 15.96 bu/ac, 895 acres-years, 6 years**  
Drill-through shows **two extreme lows (15 bu/ac in 2019 & 2021)** mixed with strong years (53 in 2022).

### 3. Rotation policy changes backed by sample size (Transition Count)

Prefer / scale (stronger performance with meaningful samples):

- **Canola → Barley: 49.71 bu/ac, 16 transitions**
- **Barley → Barley: 50.62 bu/ac, 9 transitions**
- **Oats → Oats: 51.09 bu/ac, 6 transitions**
- **Canola → Wheat: 41.97 bu/ac, 15 transitions**

### 4. Protect your winners (don't "optimize" the wrong thing)

These are benchmark fields to **standardize best practices** (high yield with decent acres):

- **F017: 53.2 bu/ac on 720 acres-years** (*also low volatility: CV 0.17*)
- **F033: 46.8 bu/ac on 900 acres-years**
- **F001: 42.9 bu/ac on 866 acres-years**
- **F016: 41.9 bu/ac on 842 acres-years**

