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 ≥ 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 ≥ 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 ≥ 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**

5. Canola Is the Highest-Leverage Profit Opportunity

- **Biggest opportunity on whole-farm results:** Canola represents the **largest share of acres** but has the **lowest 6-year area-weighted yield** (**27.7 bu/ac**). Improving canola performance has the greatest impact on total farm revenue.
- **Benchmark gap:** Saskatchewan's **2019–2024 average canola yield is ~37.6 bu/ac**, which puts this farm at an estimated **~10 bu/ac yield gap** (37.6 – 27.7). Closing even part of this gap is the highest-ROI opportunity.
- **Dollar impact (illustrative, using ~$15.5 CAD/bu):** With **~6,600 canola acre-years** across the 6-year dataset:
  - **+1 bu/ac** improvement = **6,600 additional bu** over 6 years → **$102,300 CAD total** (= **~$17,050/year avg**)
  - **+5 bu/ac** improvement = **$511,500 CAD total** (**$85,250/year avg**)