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Department of Agriculture

Reduced Soil Disturbance in Sandy Soils Under Conservation Agriculture: A Path to Sustainable Wheat Production

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Background & Challenges

- Hopefield, Western Cape, South Africa (2018–2024, ongoing)
- Sandy soils: < 4% clay, < 0.5% organic carbon (snowy white sand on clay)
- Conventional practices threaten sustainability
- Conservation agriculture (CA) is expanding, but disc drills and reduced tillage are underutilised on sand

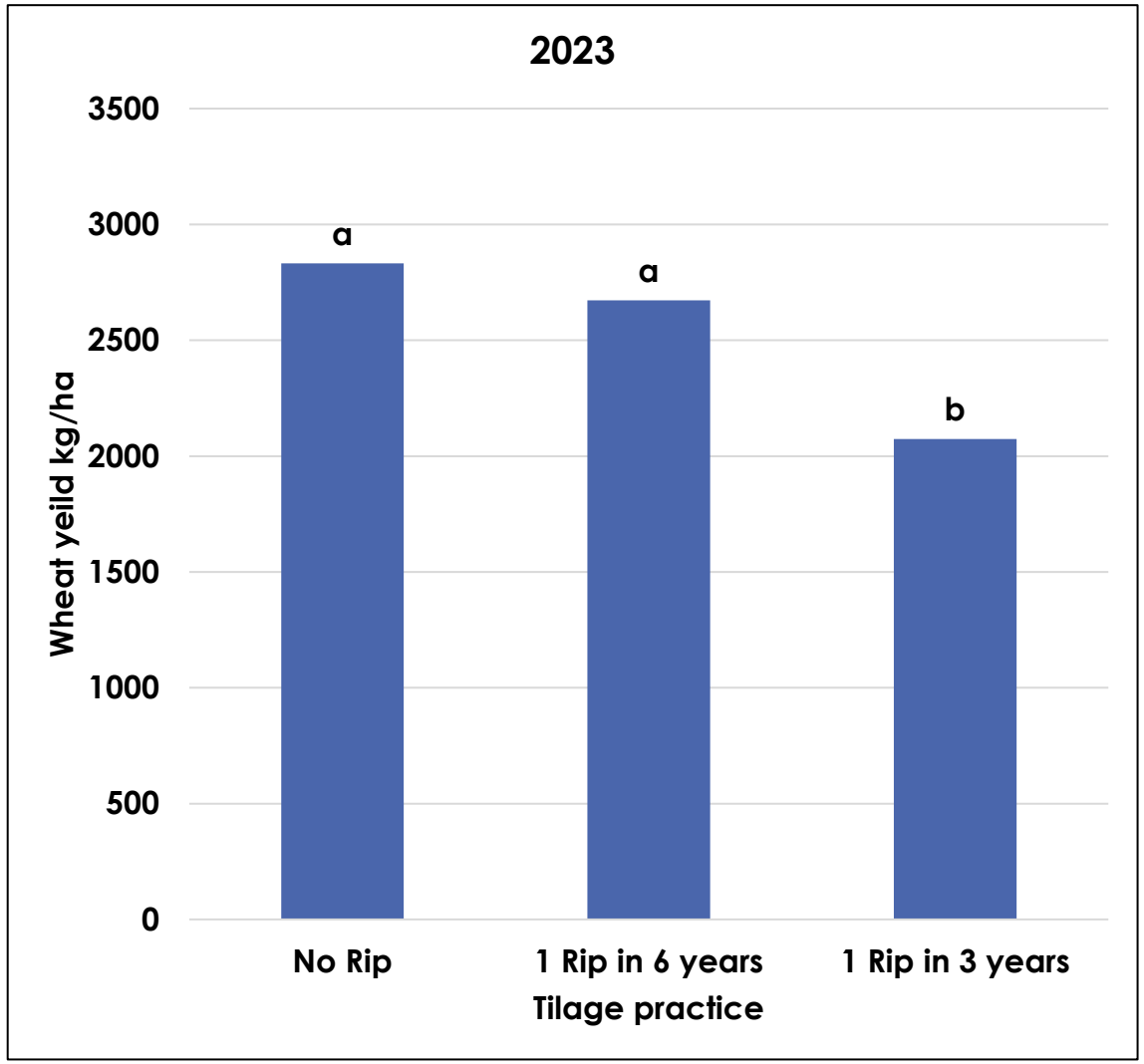
Aim of the Study

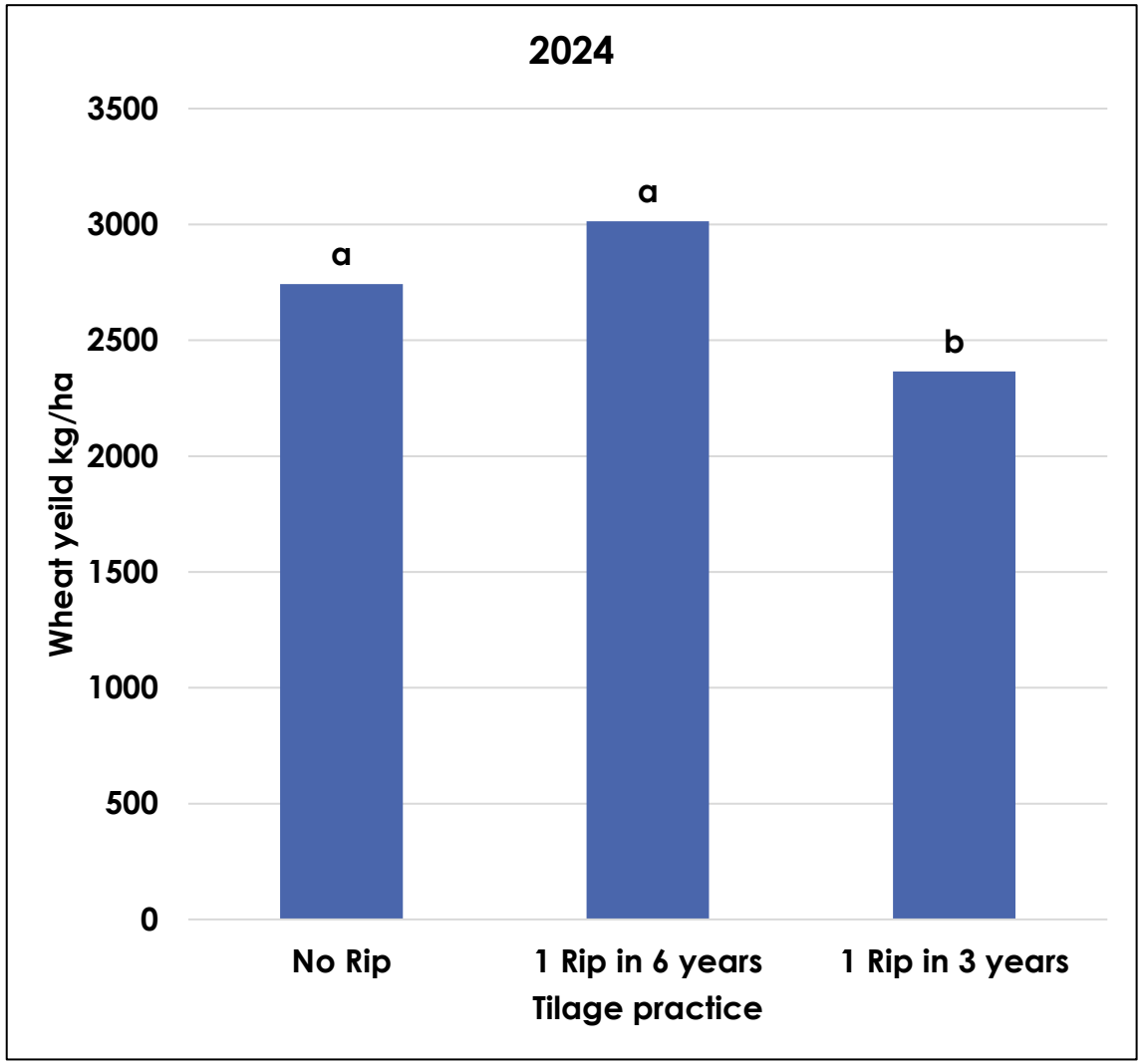
- Evaluate soil disturbance and planter type in a healthy long-term CA rotation
- Measure effects on:
  - Wheat yield and quality
  - Soil chemistry (focus on organic carbon)

Trial Design

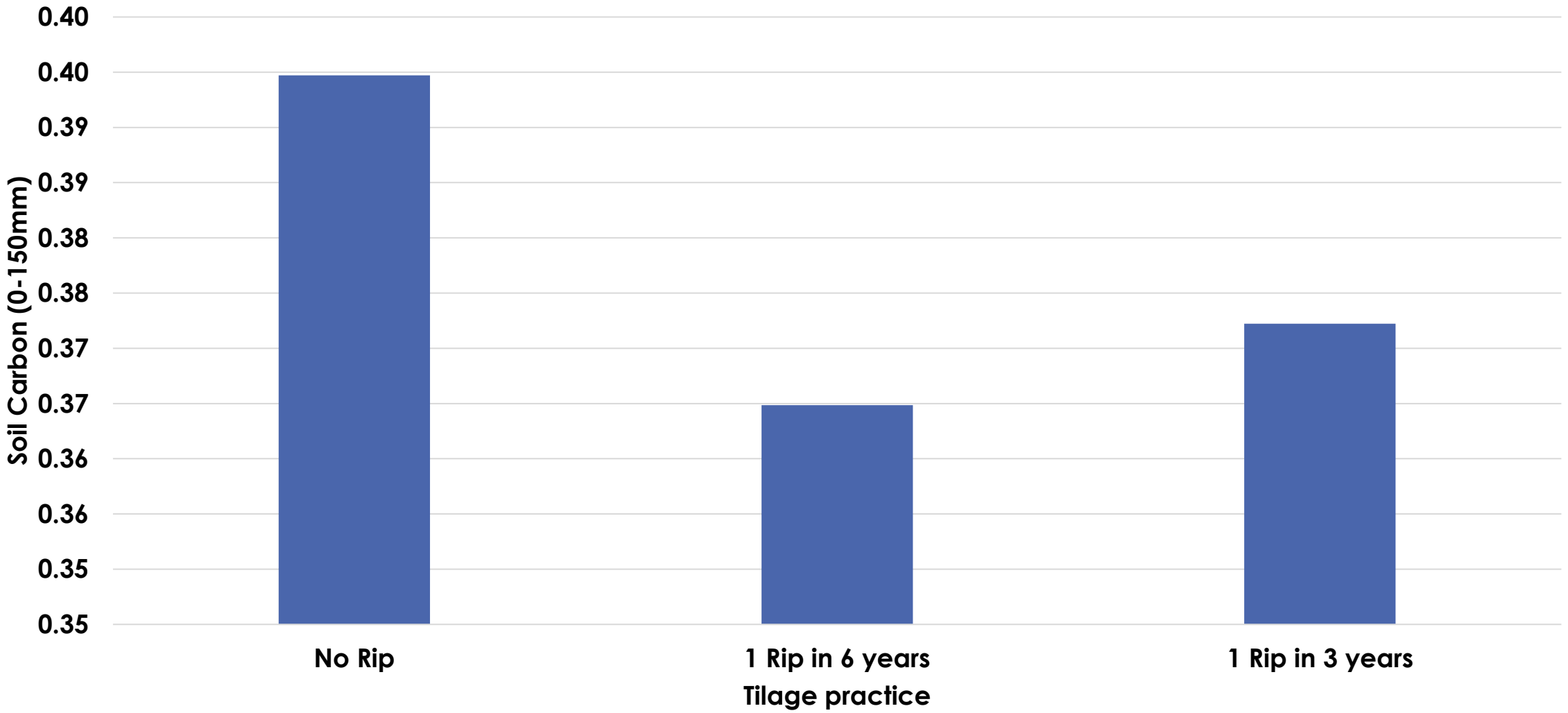
- 6-year CA rotation (Wheat – Cover Crop Mix - Canola - Wheat – Cereal for Hay - Lupin) every crop is represented each year
- 6 treatments combining:
  - Ripping (every 3 or 6 years) vs No Ripping
  - Disc vs Tine Planters
- 3 replications → 108 plots
- Note: 2023 = first full rotation cycle completed

Wheat yield under different tillage practices



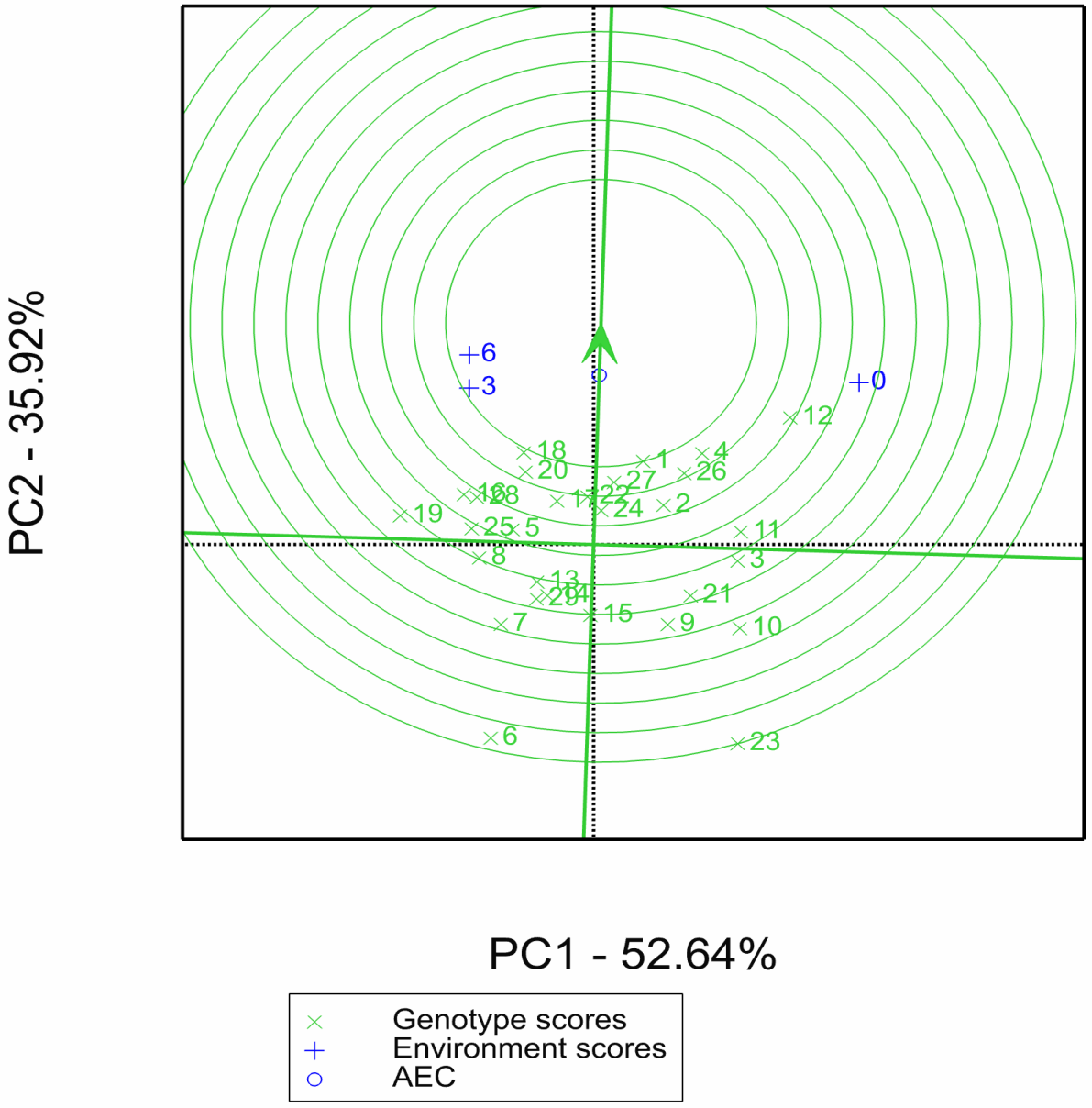


Soil Carbon


0.40
0.40
0.39
0.39
0.38
0.38
0.37
0.37
0.36
0.36
0.35
0.35
Soil Carbon (0-150mm)
No Rip
1 Rip in 6 years
1 Rip in 3 years
Tilage practice

GGE Biplot for Soil Carbon 2019 to 2023

Year x Sequence as genotipe and soil disturbance as environment



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Result summary

- Seed drill (Disc vs Tine) had no effect on wheat yield
- Reduced soil disturbance significantly improved wheat yield
- Wheat quality improved following legumes and when yields were reduced
- Soil carbon increased by 7% under no-tillage compared to rip treatments

Practical Takeaways

- No-tillage systems increase soil carbon and wheat yield
- Deep ripping (every 3 or 6 years) offers no yield or soil benefit
- Planter type does not affect yield
- Disc drills still have operational advantages (fuel, ease)

Conclusion & Impact

- Disc planting without ripping was the most profitable and sustainable option.
- In healthy CA systems, soil structure was maintained >6 years. If strategic tillage intervals are too short, it risks reducing long-term sustainability, especially without full system implementation.
- The trial continues to identify when, if ever, strategic tillage becomes necessary.

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Thank you

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