

# Potassium, Sulfur, Zinc, Copper and Iron Uptake by Four Faba Bean Cultivars at Four Sites in Saskatchewan

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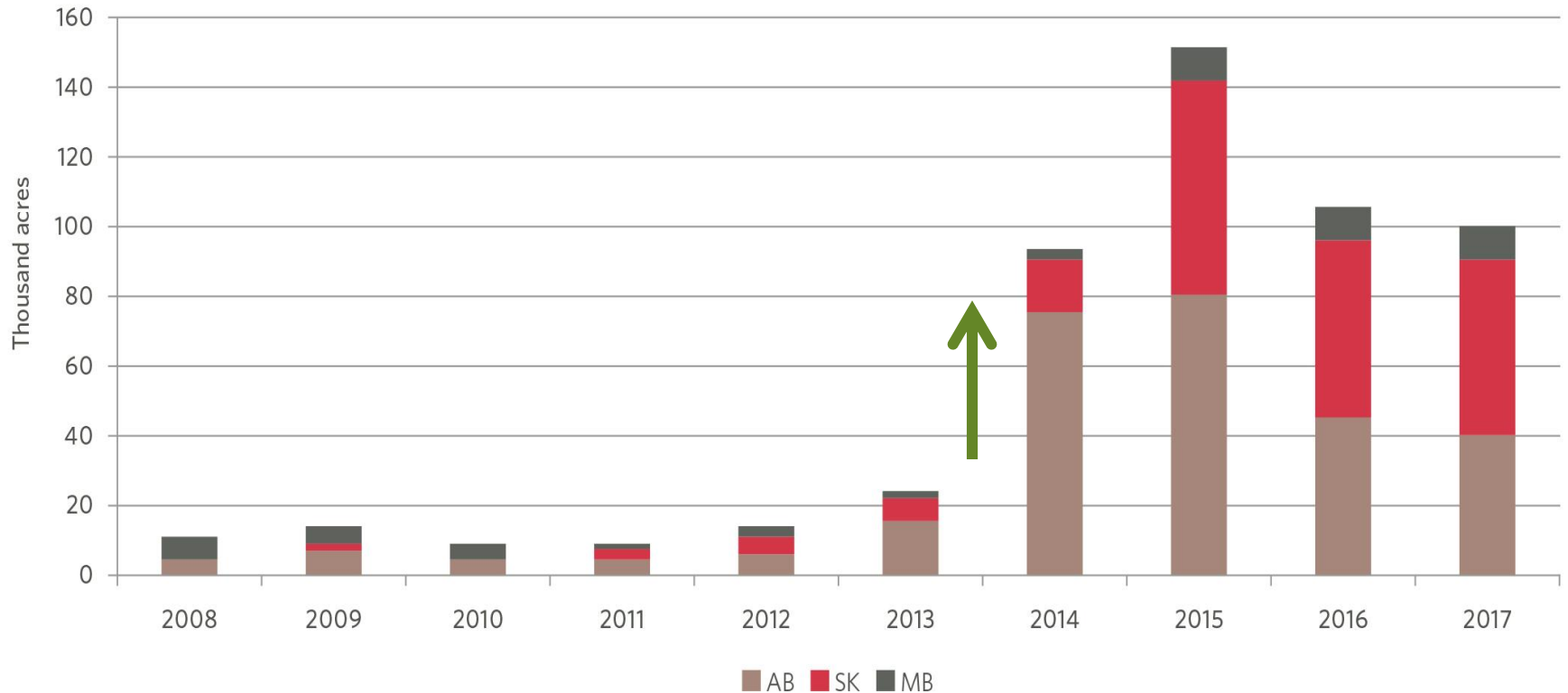


# Faba Bean (*Vicia faba* sp.)

- Grain legume crop
- Food and feed
- High yield potential
- Biological N<sub>2</sub> Fixation (BNF)



## Canadian Faba Bean Seeded Area





# Objective

Assess yield, nutrient uptake by modern faba bean cultivars under Saskatchewan conditions

- Measure:
  - Grain and straw yield
  - Nutrient\* concentration
  - Nutrient\* uptake
  - Response to P, K, S fertilization

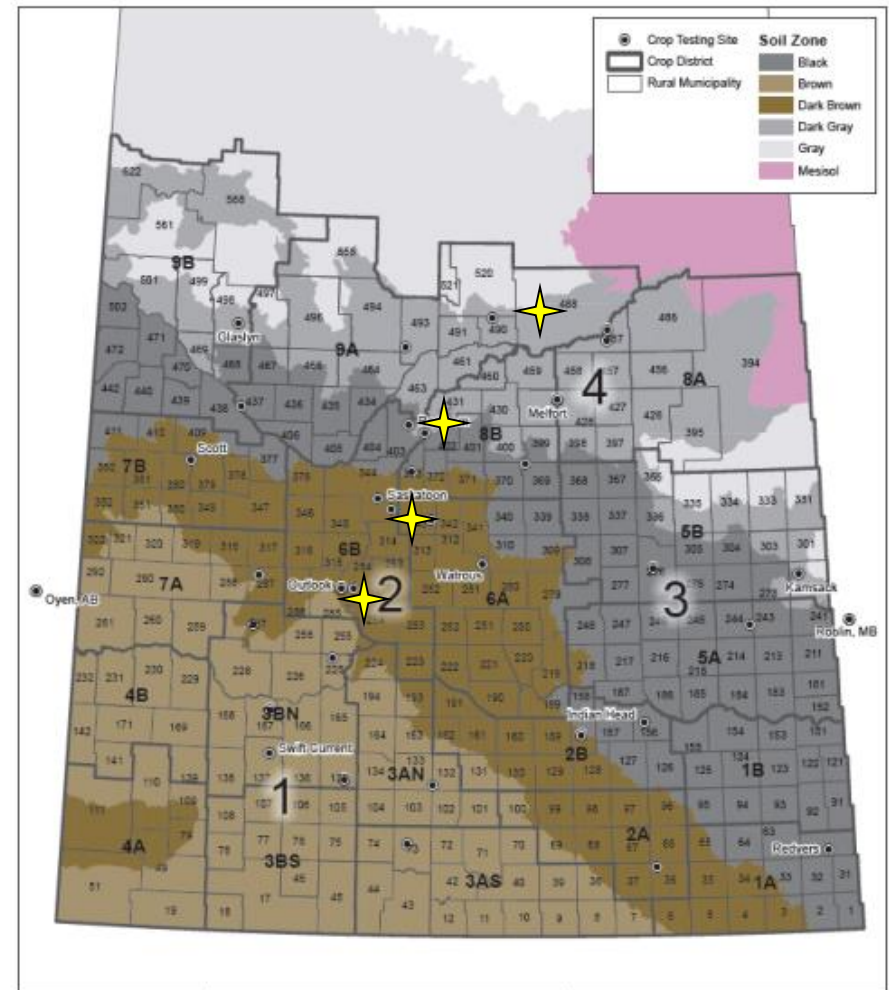
# Goal

- Improve
  - Fertilizer recommendations
  - Crop nutrition planning
- Meet nutrient requirements



# Nutrient Uptake Field Study 2016

- 4 Site locations
  - Saskatoon (Dark Brown)
  - Outlook\* (Dark Brown)
  - Rosthern (Black)
  - Meath Park (Dark Gray)
  
- Experimental Design
  - Split Plot Design



NOTE: \*Irrigated; (Soil Zone)

# Nutrient Uptake Field Study 2016

- 2 fertilizer treatments
  - No fertilizer
  - N,P,K,S blend
    - *kg ha<sup>-1</sup>: 11 N, 52 P<sub>2</sub>O<sub>5</sub>, 44 K<sub>2</sub>O, 17 S*

# Nutrient Uptake Field Study 2016

- 4 recent faba bean cultivars

  - Smaller seeded*

    - CDC Snowdrop
    - 219-16

  - Larger seeded*

    - Snowbird
    - Tabasco



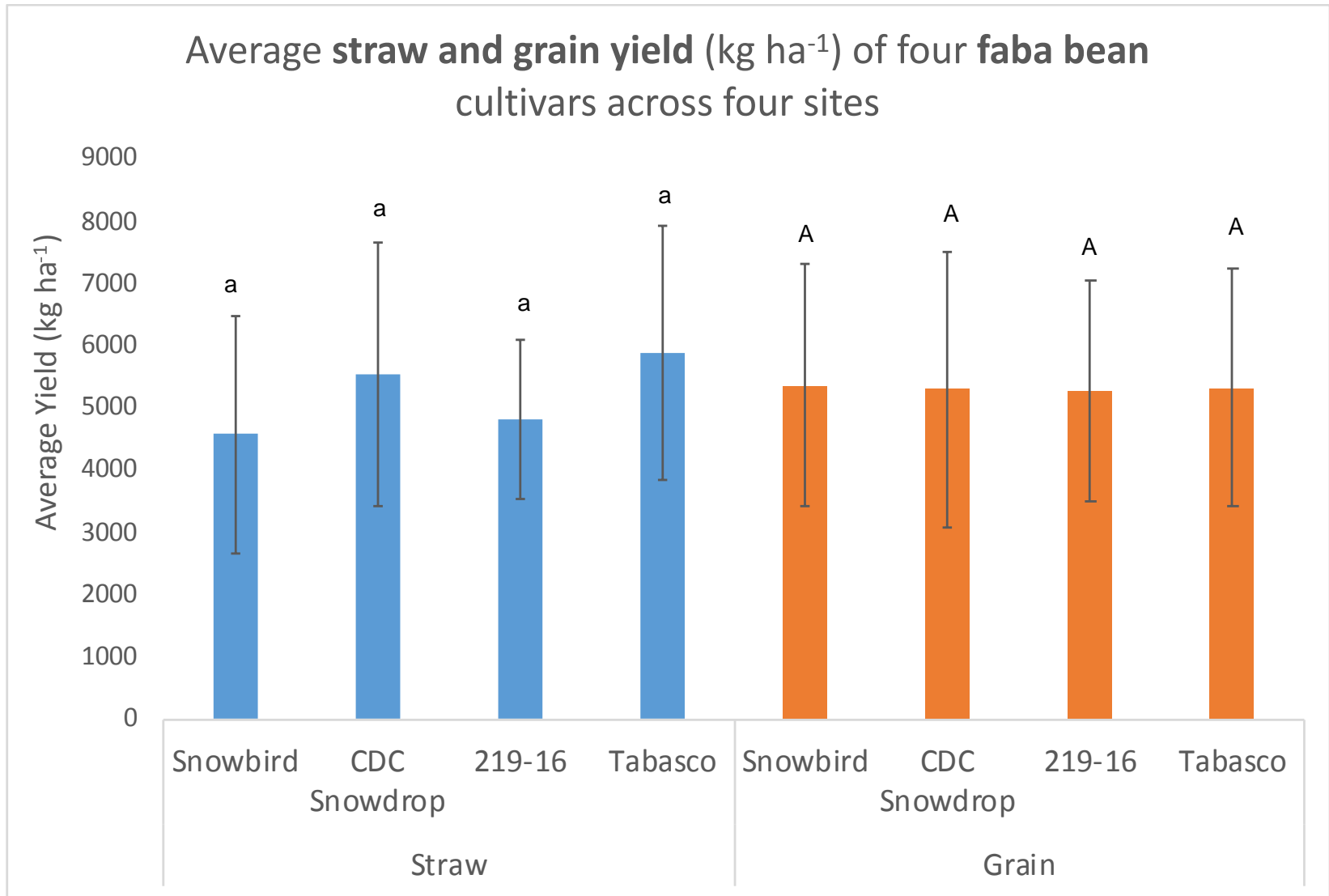
# Spring 2016 Soil Fertility

**Table 1** Available nutrient concentrations (kg ha<sup>-1</sup>), pH and EC at 0-15 cm soil depth prior to seeding at four field sites in spring 2016.

Site	K	SO <sub>4</sub> -S	Zn	Cu	Fe	pH	EC
	kg ha <sup>-1</sup>						dS m <sup>-1</sup>
Saskatoon	867.9	9.2	1.5	1.6	76.3	6.4	0.1
Outlook	281.7	7.3	0.8	0.9	17.8	7.6	0.1
Rosthern	299.2	10.8	1.9	2.2	93.4	6.7	0.1
Meath Park	483.5	7.7	4.4	0.9	117.1	6.3	0.1

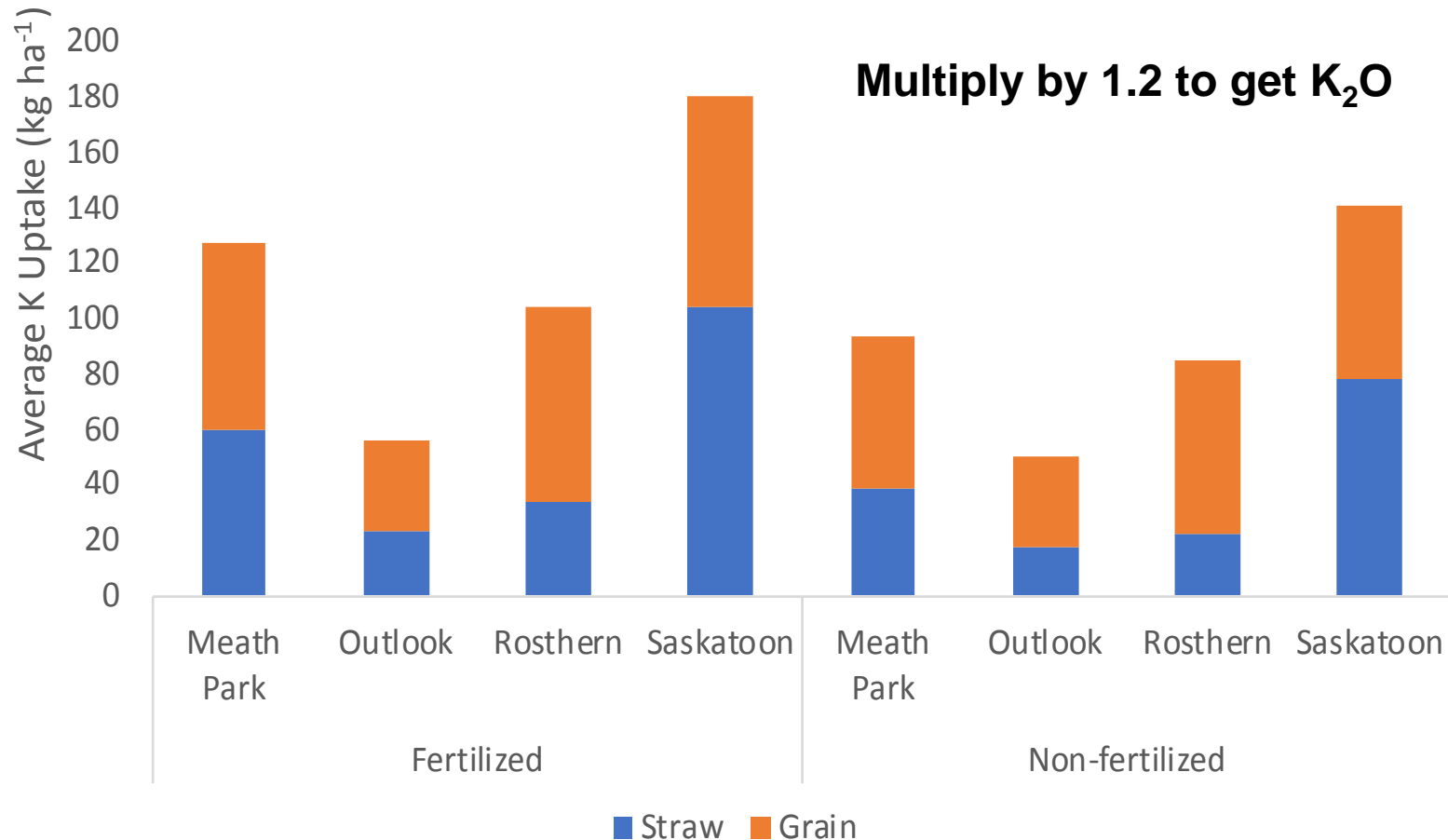


# 2016 Results



- **Very good faba bean yields in 2016**

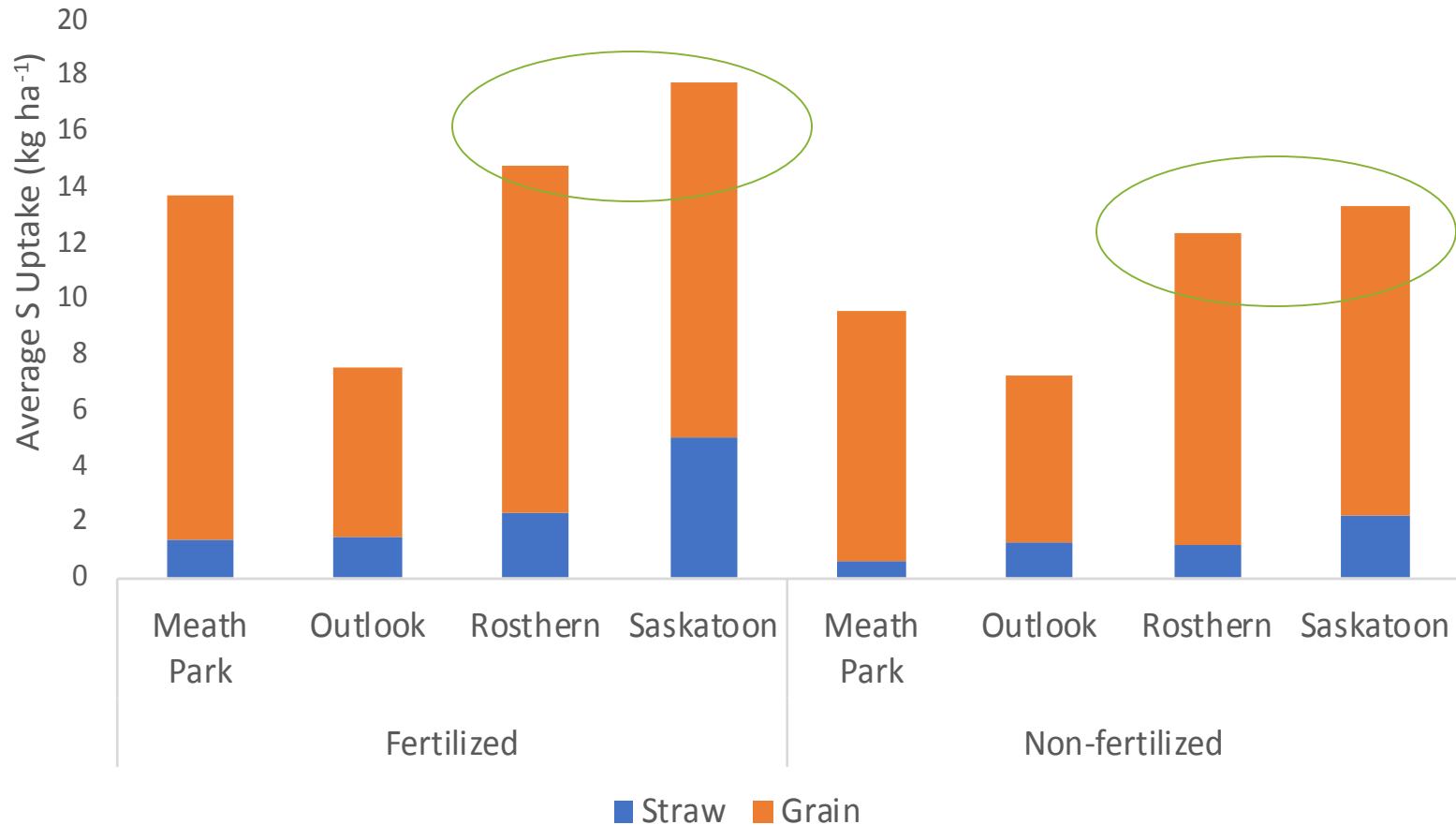
Average straw and grain K uptake ( $\text{kg ha}^{-1}$ ) of four faba bean cultivars across four sites



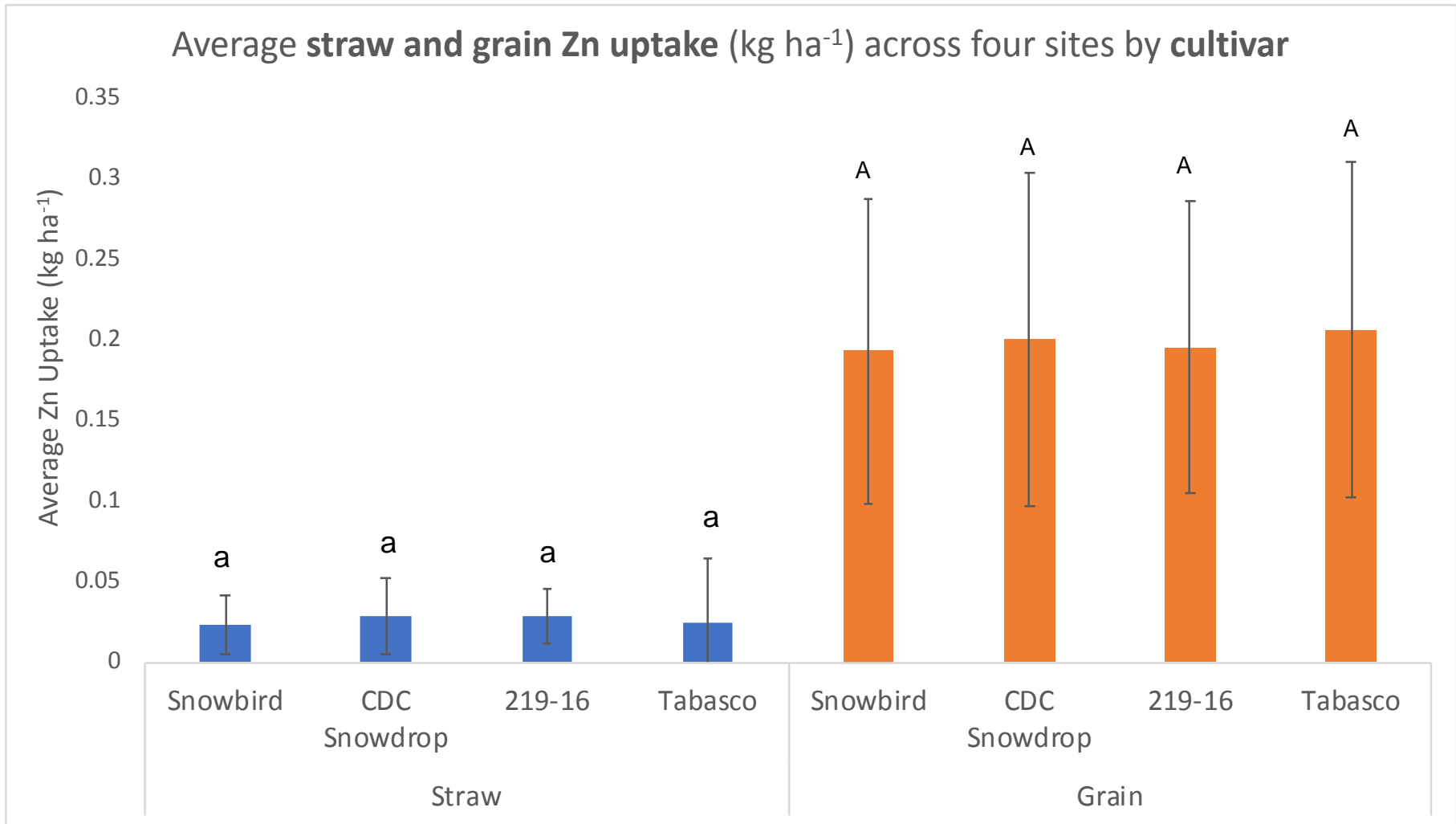
- High K users:  $\sim 120 \text{ kg K}_2\text{O ha}^{-1}$  in above-ground biomass
- Half of this is in grain
- Fertilization increased K uptake but not yield



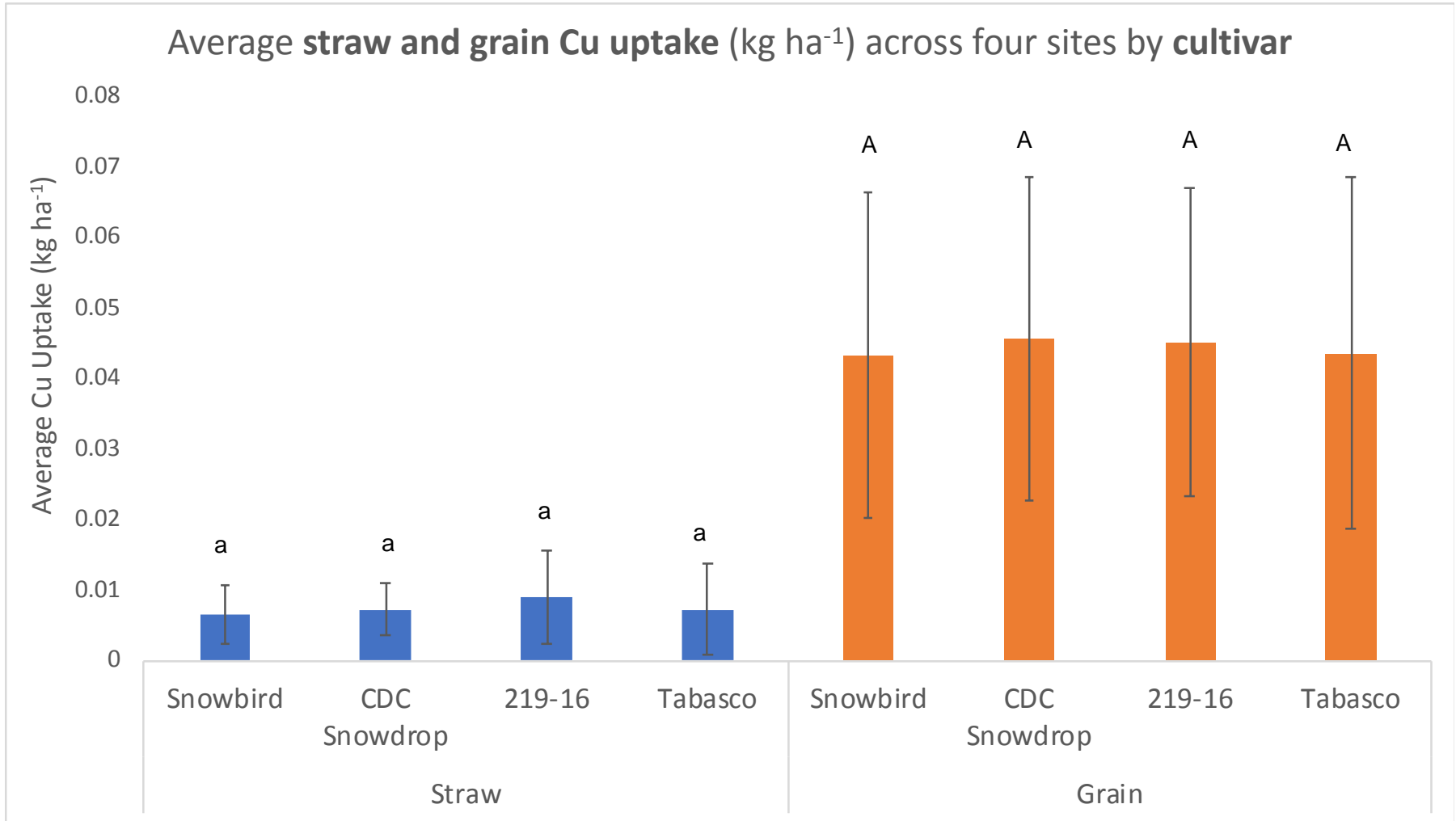
## Average straw and grain S uptake ( $\text{kg ha}^{-1}$ ) of four faba bean cultivars across four sites



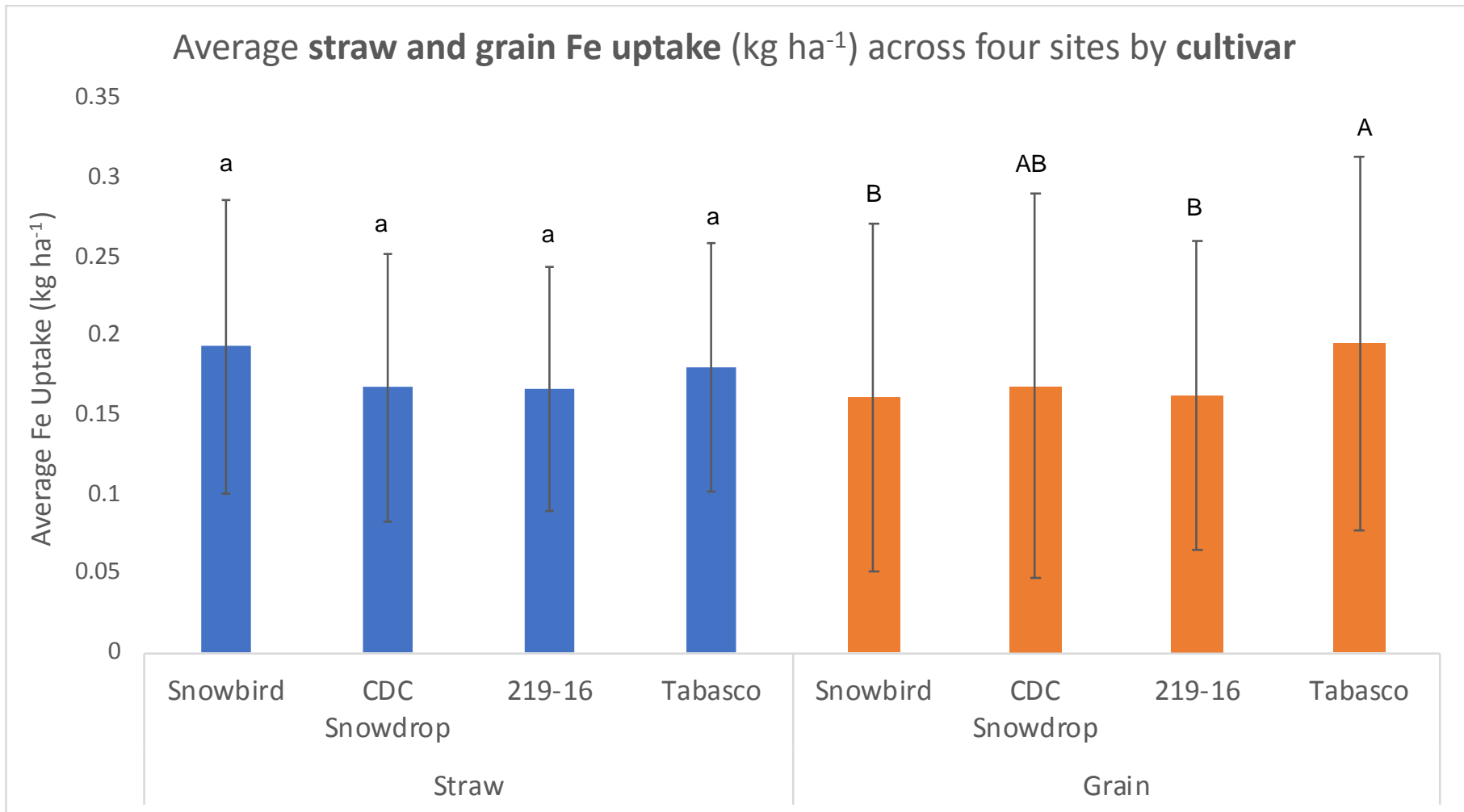
- **$\sim 12 \text{ kg S ha}^{-1}$  uptake in above-ground biomass (straw and grain)**
- **Most of S is in grain (S containing amino acids in protein)**
- **Fertilization increased S uptake at higher yielding sites**



- Above-ground biomass Zn uptake  $\sim 0.2 \text{ kg ha}^{-1}$
- Most of Zn is in grain
- No difference in uptake among cultivars

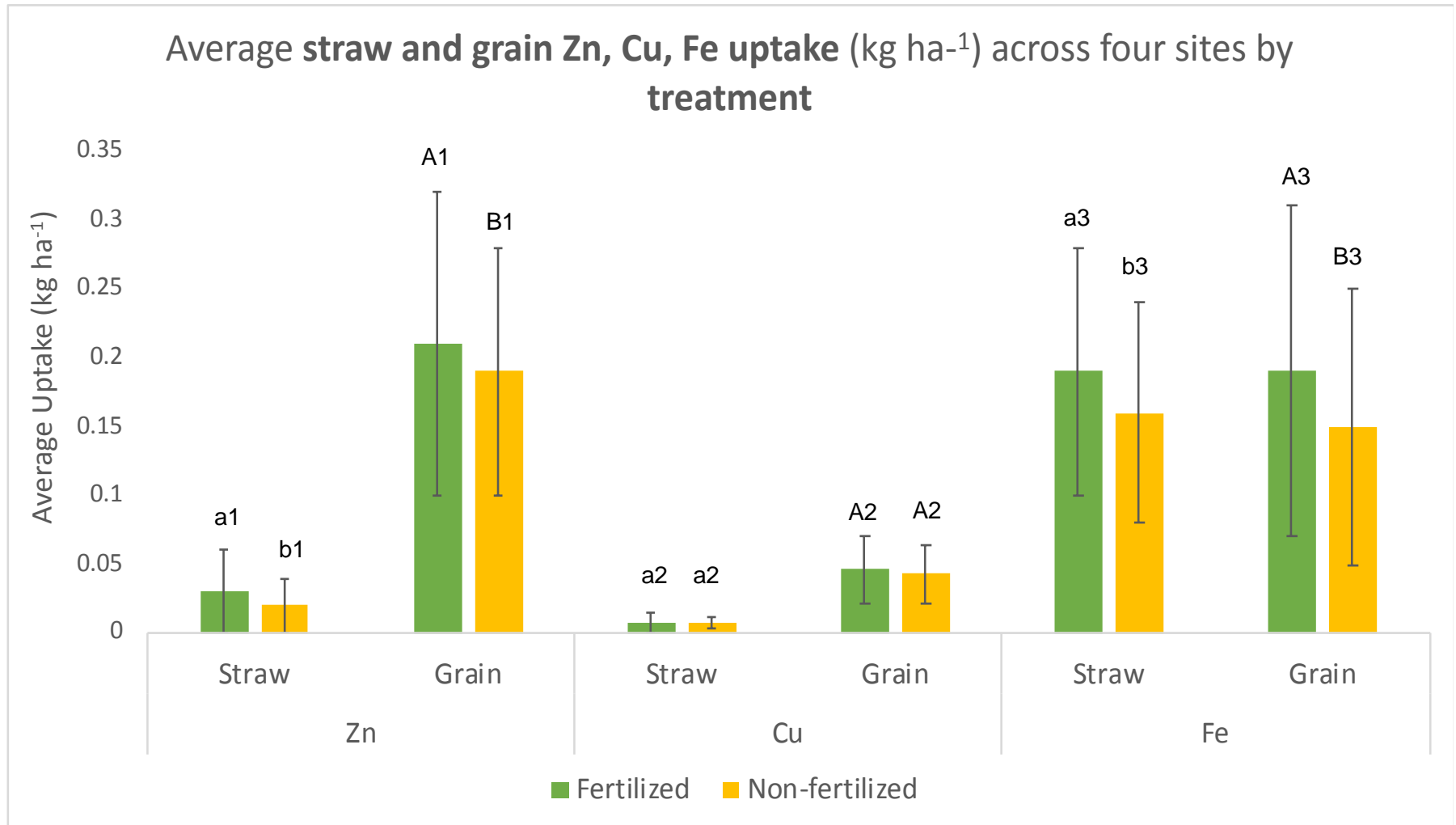


- Above-ground biomass Cu uptake  $\sim 0.05 \text{ kg ha}^{-1}$
- Like Zn, much of Cu in grain
- No difference in uptake among cultivars



- Above-ground biomass Fe uptake  $\sim 0.35 \text{ kg ha}^{-1}$
- More even distribution between straw and grain
- Tabasco Fe uptake slightly higher than other cultivars





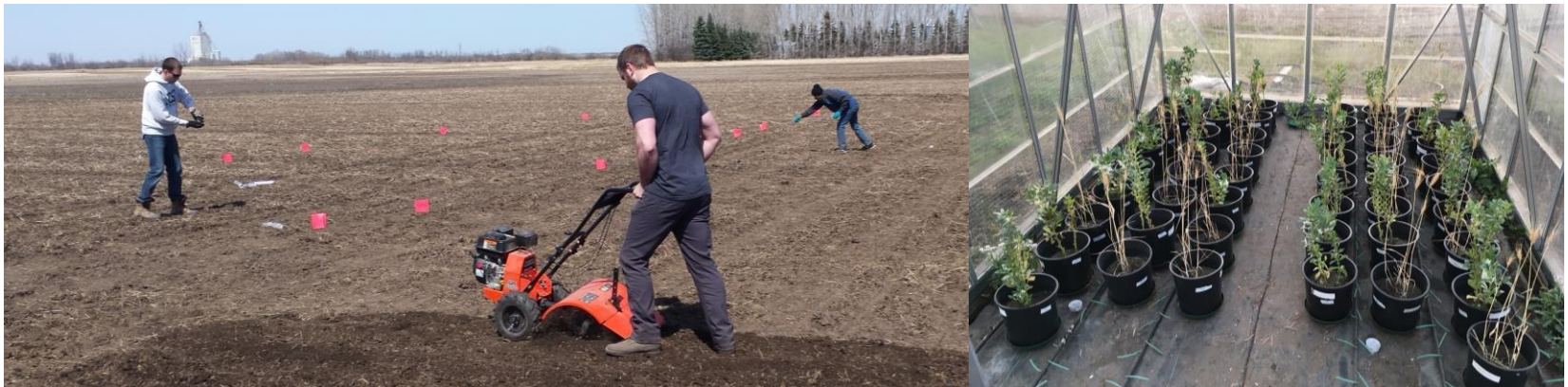
- **Fertilization with P,K,S increased Zn and Fe uptake**

## Conclusions

- *Modern faba bean cultivars*
  - Very good yield potential
  - High K, moderate S users
  - Most of S, Zn, Cu is in the grain
  - Fertilization increased uptake
  - Yield and nutrient uptake did not differ by cultivar

# 2017 Season and Future Work

- Field sites
  - Saskatoon, Rosthern, Meath Park, ~~Outlook~~
- P fertilizer response greenhouse study
- Estimate BNF contribution
  - Measure % ndfa using  $^{15}\text{N}$  labelled urea



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# Thank you!

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