

An evaluation of soil water use efficiency for different seeding row spacing and stubble height

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Introduction

- ✓ Different results were reported in terms of row spacing effects on crop yield.
- ✓ Narrow spacing increases equipment cost and draft (more openers per length of toolbar).
- ✓ Narrow spacing may increase water use, decreasing water use efficiency (WUE).
- ✓ Higher stubble was reported to increase yield and WUE.
- ✓ Water is often the limiting factor for soil productivity in Saskatchewan.



Objective

□ To examine whether row spacing and stubble height have any significant impact on spring wheat and canola yield and WUE in the Brown soil zone in southwestern Saskatchewan.



Methodology

Study site


- Experimental years: 2012 (wet), 2013 (normal)
- Randomized complete block design
- Spring wheat and canola
- Direct seeding

Swift Current

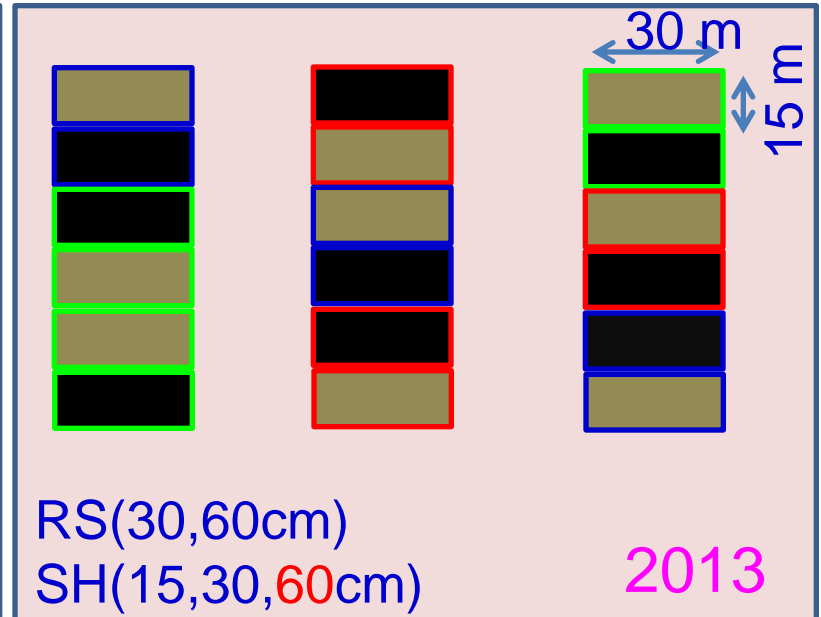
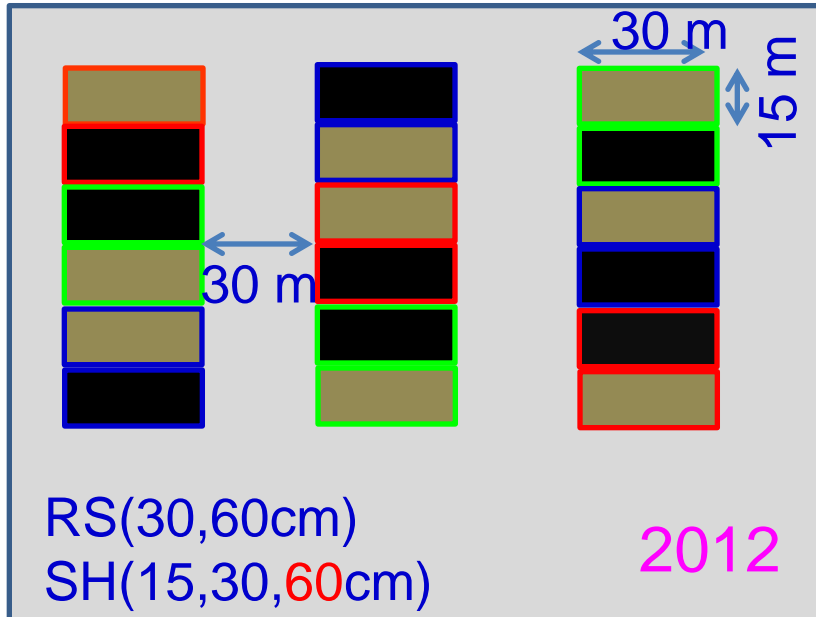
Central Butte



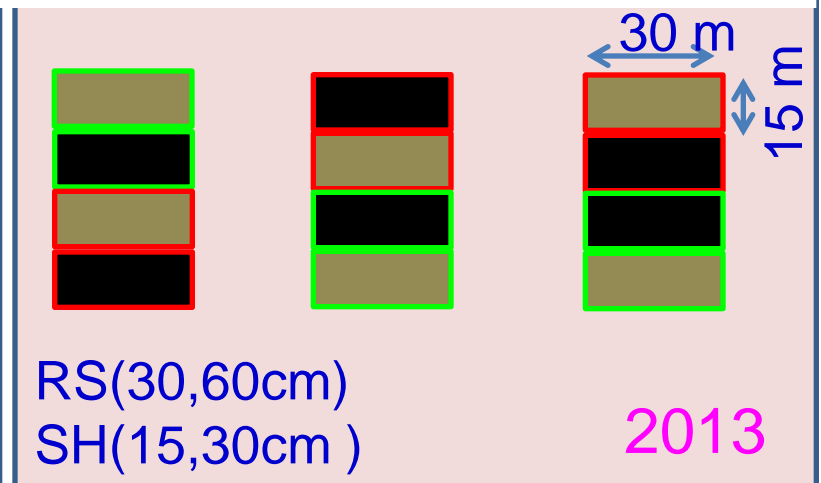
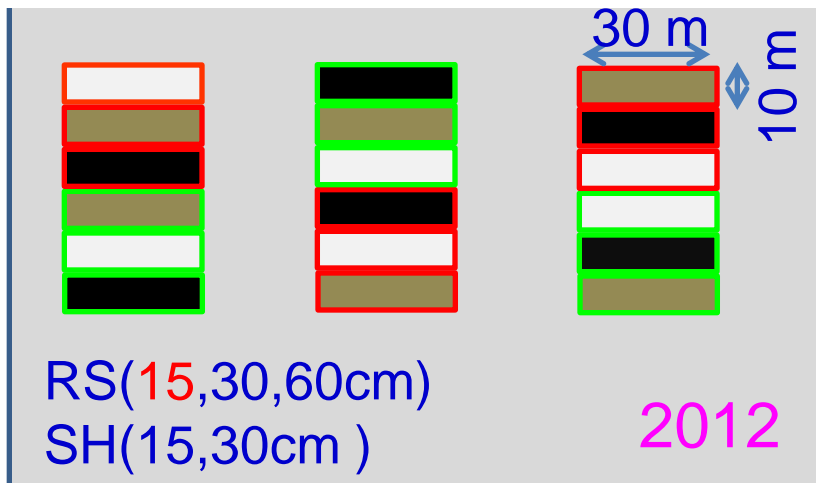
Experimental design Swift Current

RS  15cm  30cm  60cm
 SH  15cm  30cm  60cm

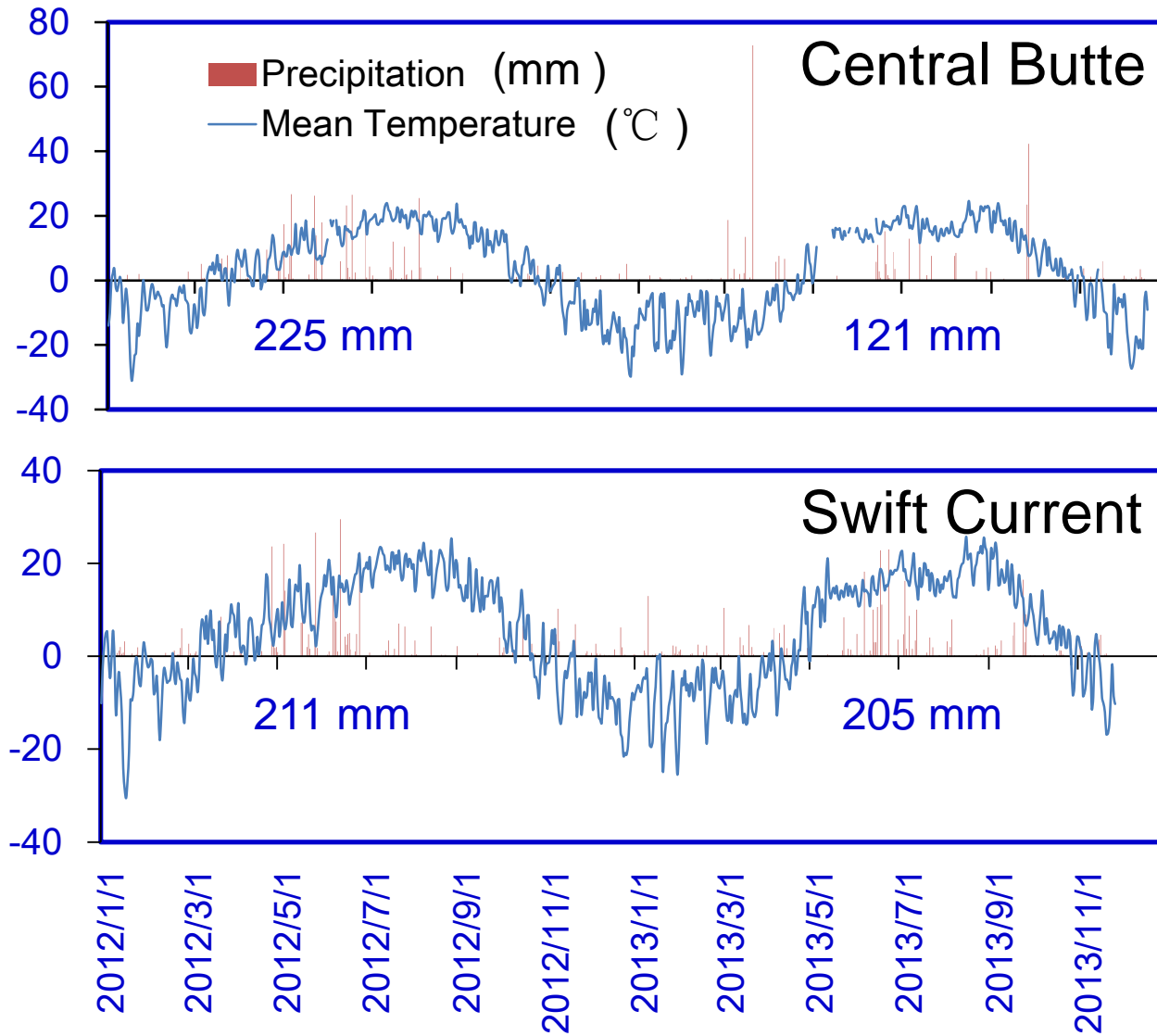
Canola



Wheat



Precipitation and temperature



Measurements and calculations

□ Soil water storage (SWS)

SWS in root zone (0-1.2 m) in mm were measured by gravimetric method just prior to seeding and just after harvest.

□ Water use (WU)

$WU = (\text{SWS at seeding} - \text{SWS at harvest stage in root zone}) + \text{total precipitation during the crop growth period.}$

□ Yield (Y)

Grain yield in kg/ha was measured by hand, taking grain yield of a harvested row (1 m) for each plot.

□ Water use efficiency (WUE)

$WUE = Y / WU$

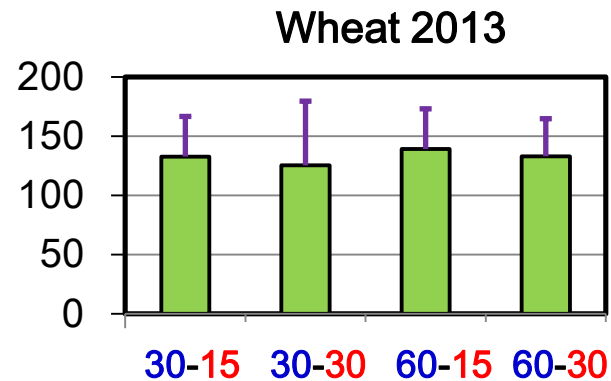
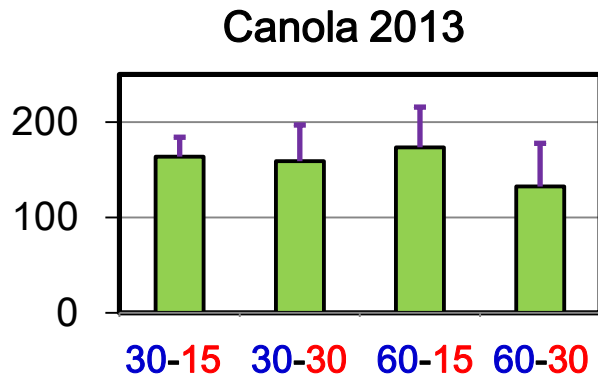
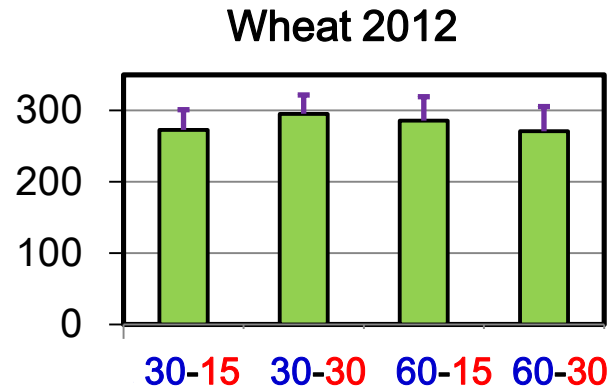
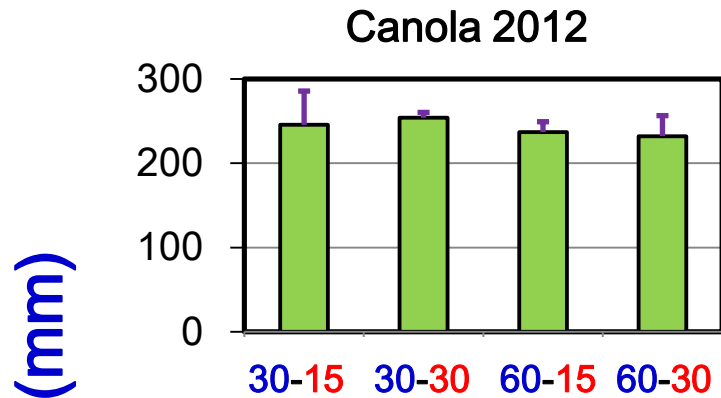
Statistical analysis

Analysis of variance

whether the row spacing, stubble height, and their interaction had any significant ($P < 0.05$) effects on WU, yield, and WUE.

Results

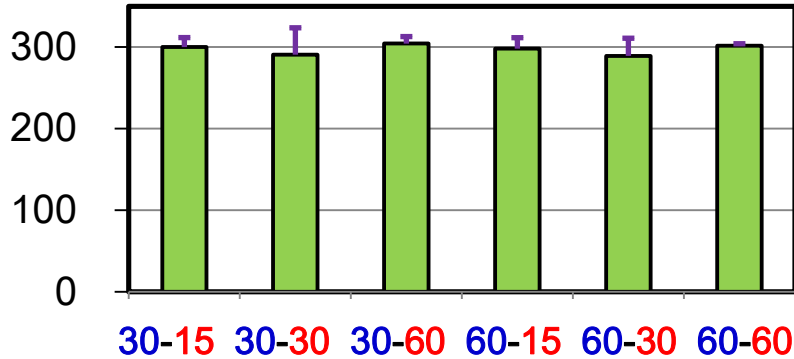
Water Use Central Butte



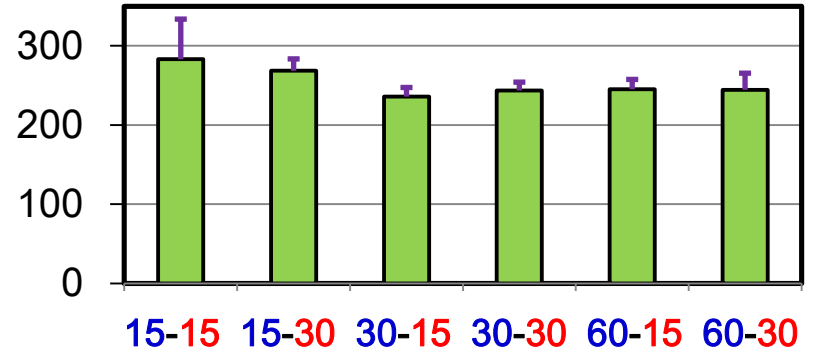
Row spacing (cm)-Stubble height (cm)

Water Use Swift Current

Canola 2012

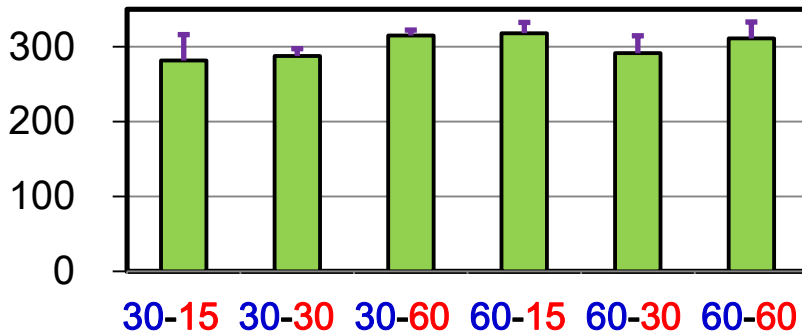


Wheat 2012

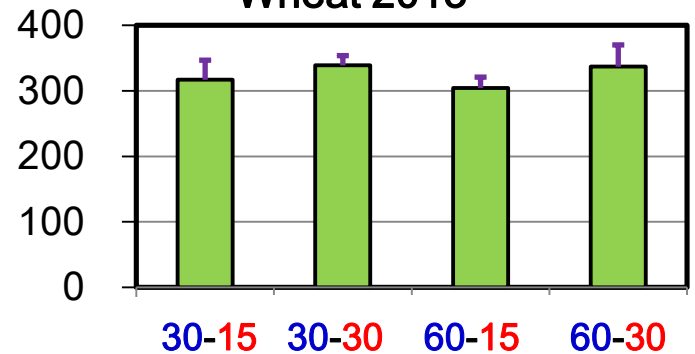


Row spacing: 15 cm > 30cm = 60cm

Canola 2013



Wheat 2013

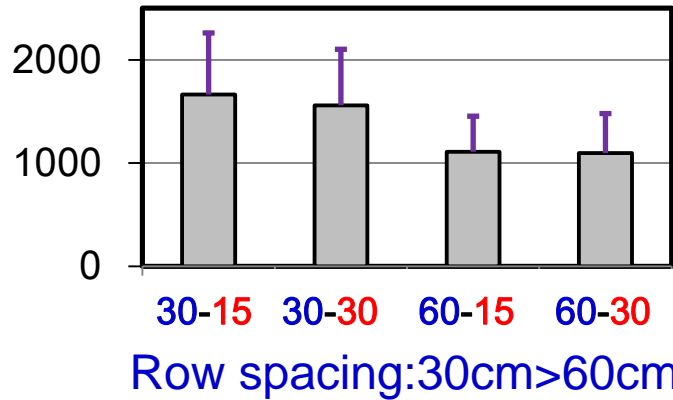


Row spacing (cm) - Stubble height (cm)

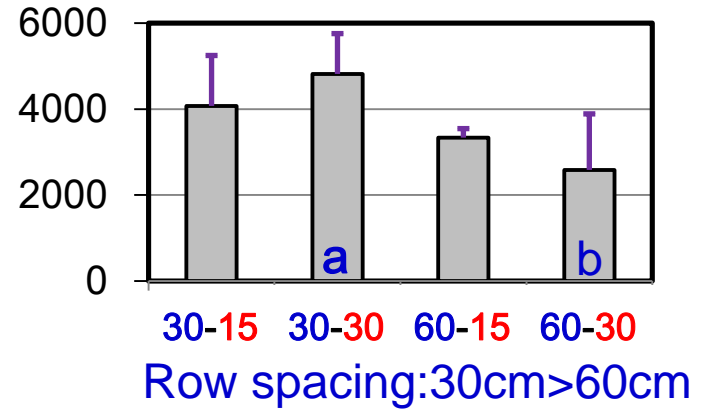
Water use (mm)

Yield Central Butte

Canola 2012

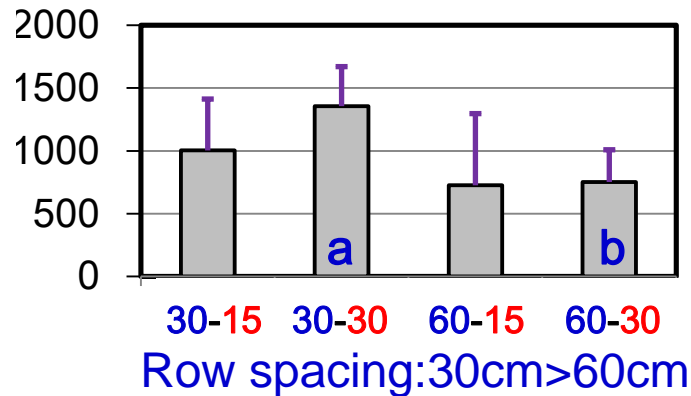


Wheat 2012

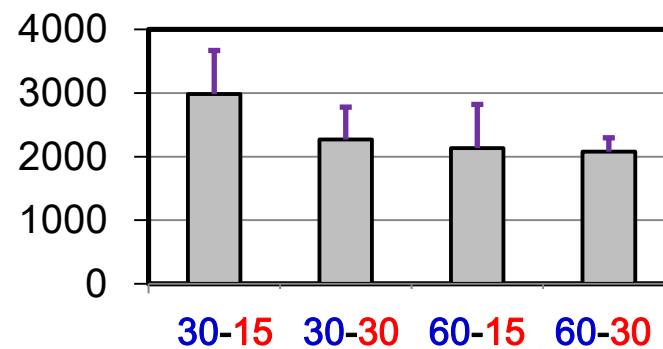


Yield (kg/ha)

Canola 2013



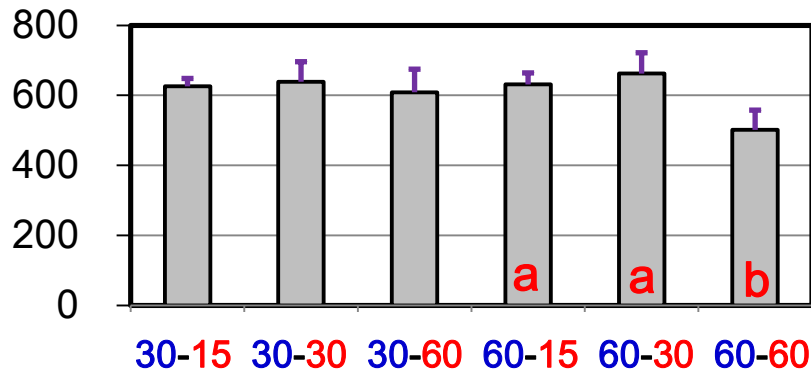
Wheat 2013



Row spacing (cm) - Stubble height (cm)

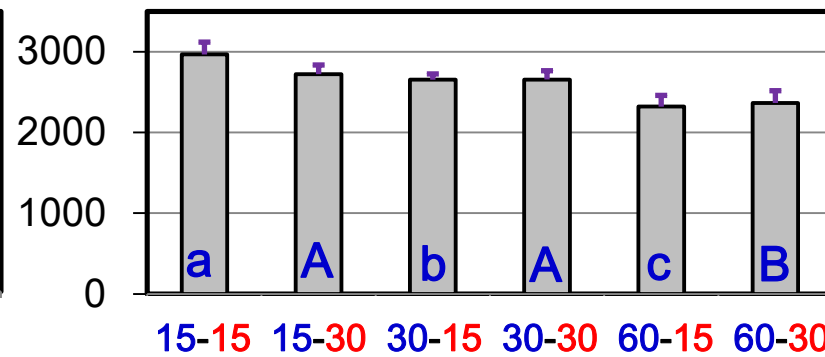
Yield Swift Current

Canola 2012



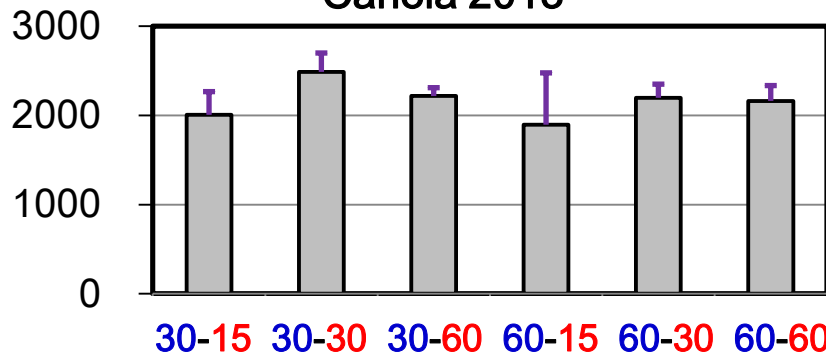
Stubble height: 15cm=30cm>60cm

Wheat 2012

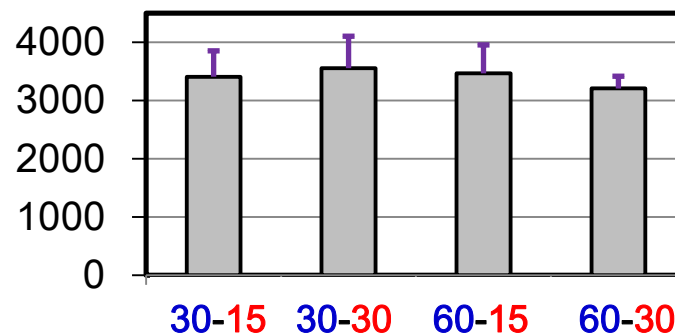


Row spacing: 15cm>30cm>60cm

Canola 2013



Wheat 2013



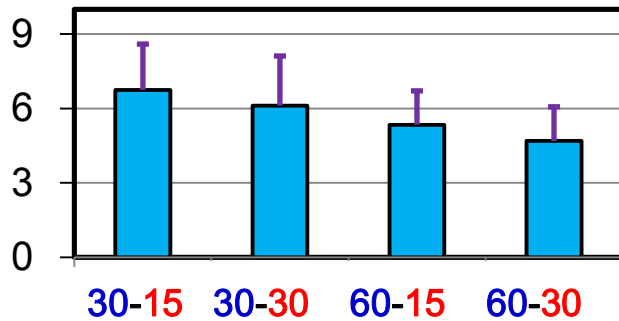
Row spacing (cm) - Stubble height (cm)

Yield (kg/ha)

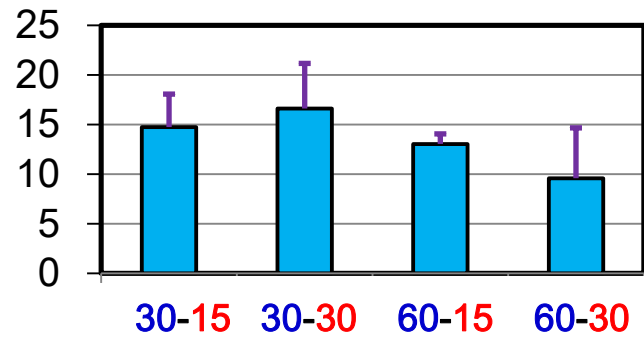
WUE Central Butte

WUE (kg/ha mm)

Canola 2012

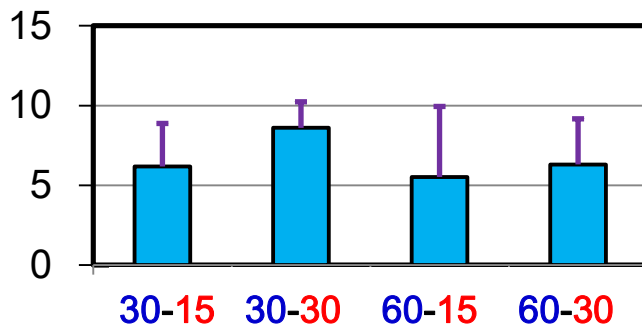


Wheat 2012

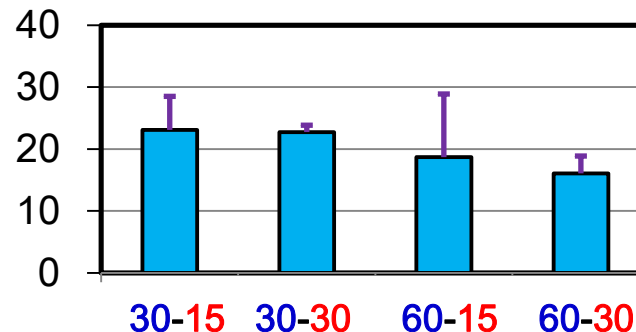


Row spacing: 30cm > 60cm

Canola 2013



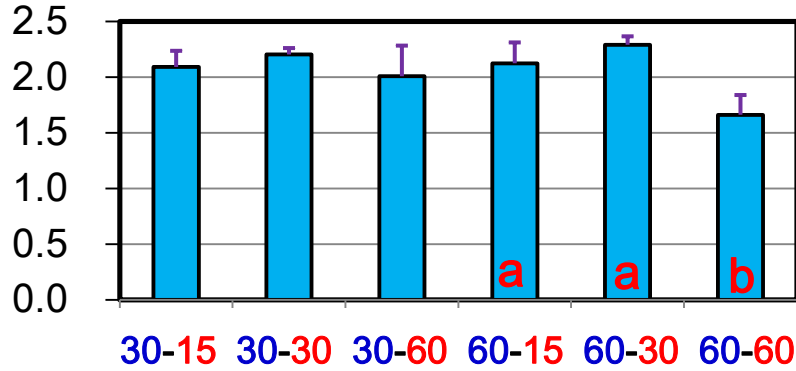
Wheat 2013



Row spacing (cm) - Stubble height (cm)

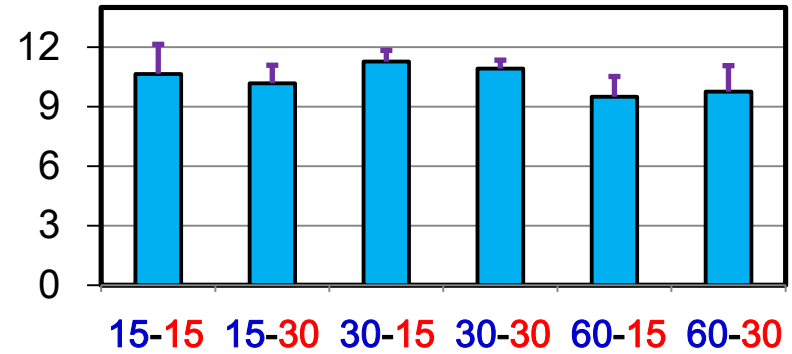
WUE Swift Current

Canola 2012

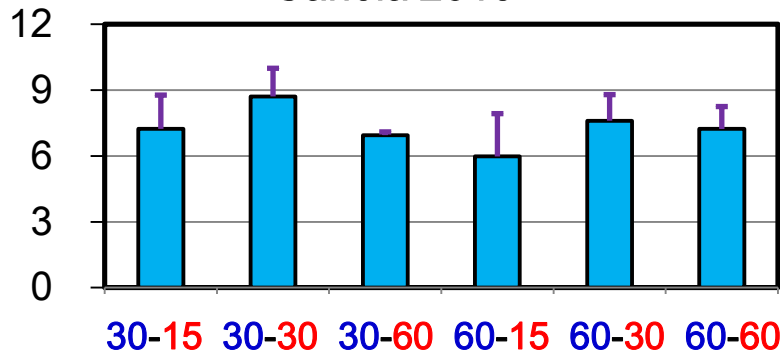


Stubble height: 15cm=30cm>60cm

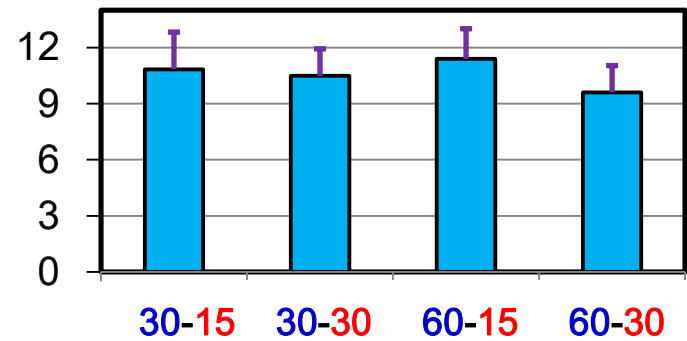
Wheat 2012



Canola 2013



Wheat 2013



Row spacing (cm)-Stubble height (cm)

WUE (kg/ha mm)

Summary

Central Butte

- A 30 cm row spacing generally produced higher wheat and canola yield and WUE than a 60 cm spacing.
- Stubble height did not significantly influence yield and WUE for both crops.

Swift Current

- Row spacing significantly influenced wheat yield, and stubble height significantly influenced canola yield and WUE in 2012.
- Both row spacing and stubble height did not significantly influence yield and WUE for both crops in 2013.

Recommendations

A row spacing of 30 cm and stubble height of 30 cm appears to be optimum as it most consistently produced the highest yields and water use efficiency.

Thanks to

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Thanks for your attention!

