Organically-Managed No-tillage Winter Rye-Soybean Systems: Agronomic, Economic, and Environmental Assessment

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Tilled
June 2008


No-till
June 2008

Introduction

Potential benefits of using NT rye cover crop:

- Improved weed management
- Reduced labor inputs
- Prevent soil erosion
- Improved soil quality

Potential risks of using NT rye cover crop:

- Effective methods of rye management
- Delayed soybean planting
- Rye interference and competition with soybean
- Reduced soybean yield and profitability

Methods

Treatment	Rye management	Soybean planting date	Soybean row spacing	Soybean viable seeding rate
	(Month)	Month	in	Seeds acre^{-1}
Tilled	Tilled (April)	Mid-May	30	225,000
Mowed	Mowed (June)	Mid-May	30	225,000
Crimped Drilled	Crimped (June)	Mid-May	7.5	275,000
Mowed Drilled	Mowed (June)	Mid-May	7.5	275,000
Crimped Drilled Late	Crimped (June)	Early June	7.5	275,000
Mowed Drilled Late	Mowed (June)	Early June	7.5	275,000

Mid-May tilled soybean establishment

Treatment	Rye management	Soybean planting date	Soybean row spacing	Soybean viable seeding rate
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Mid-May no-till soybean establishment


Mowed rye in June
mid-May planted soybeans

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June no-till rye management

June no-till soybean establishment

Objectives

Determine the effects of rye management, soybean planting date and soybean row spacing on:

- Soil moisture
- Soybean stand establishment
- Weed suppression
- Soybean yield
- Profitability

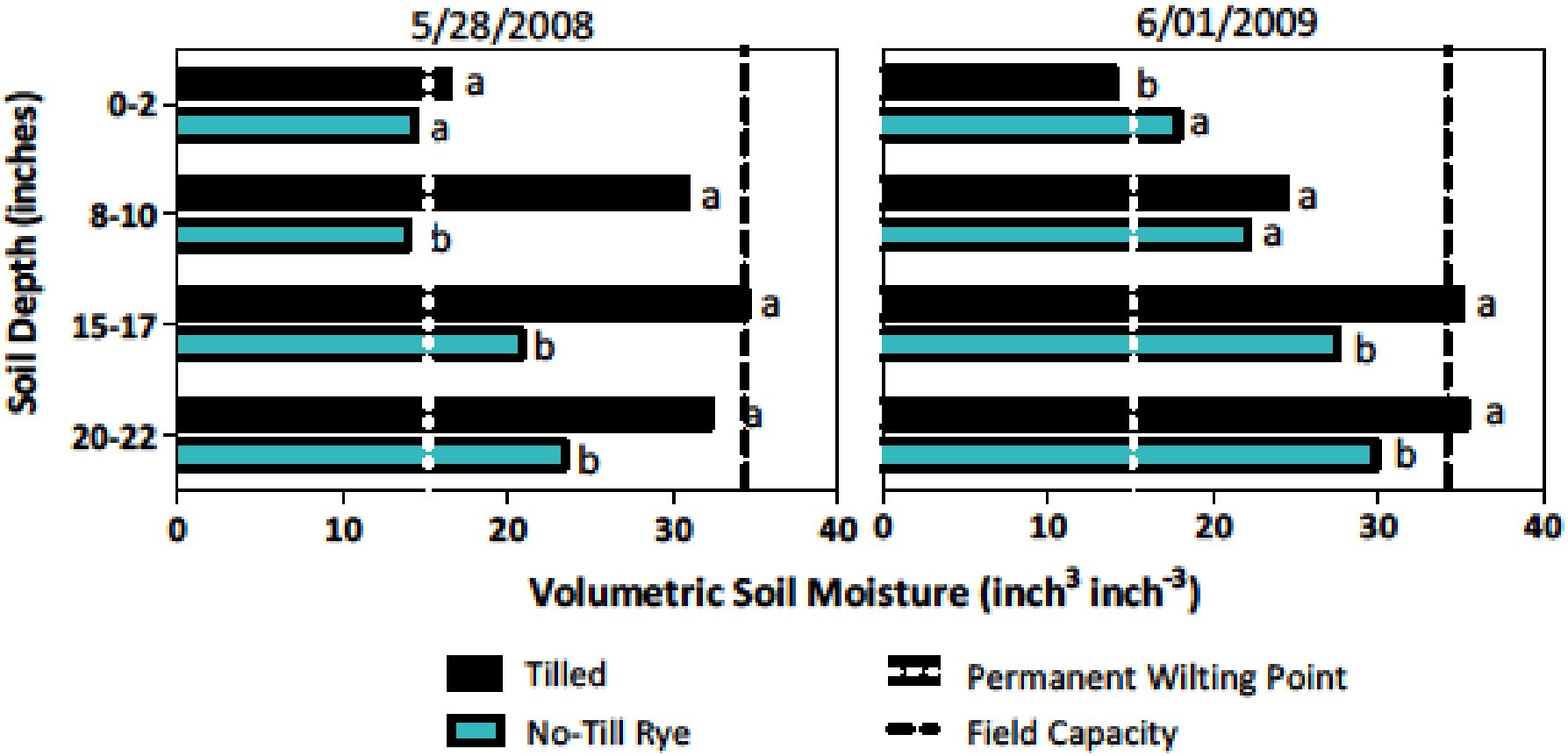
Predict effects of no-till rye on:

- Labor
- Soil loss
- Soil quality

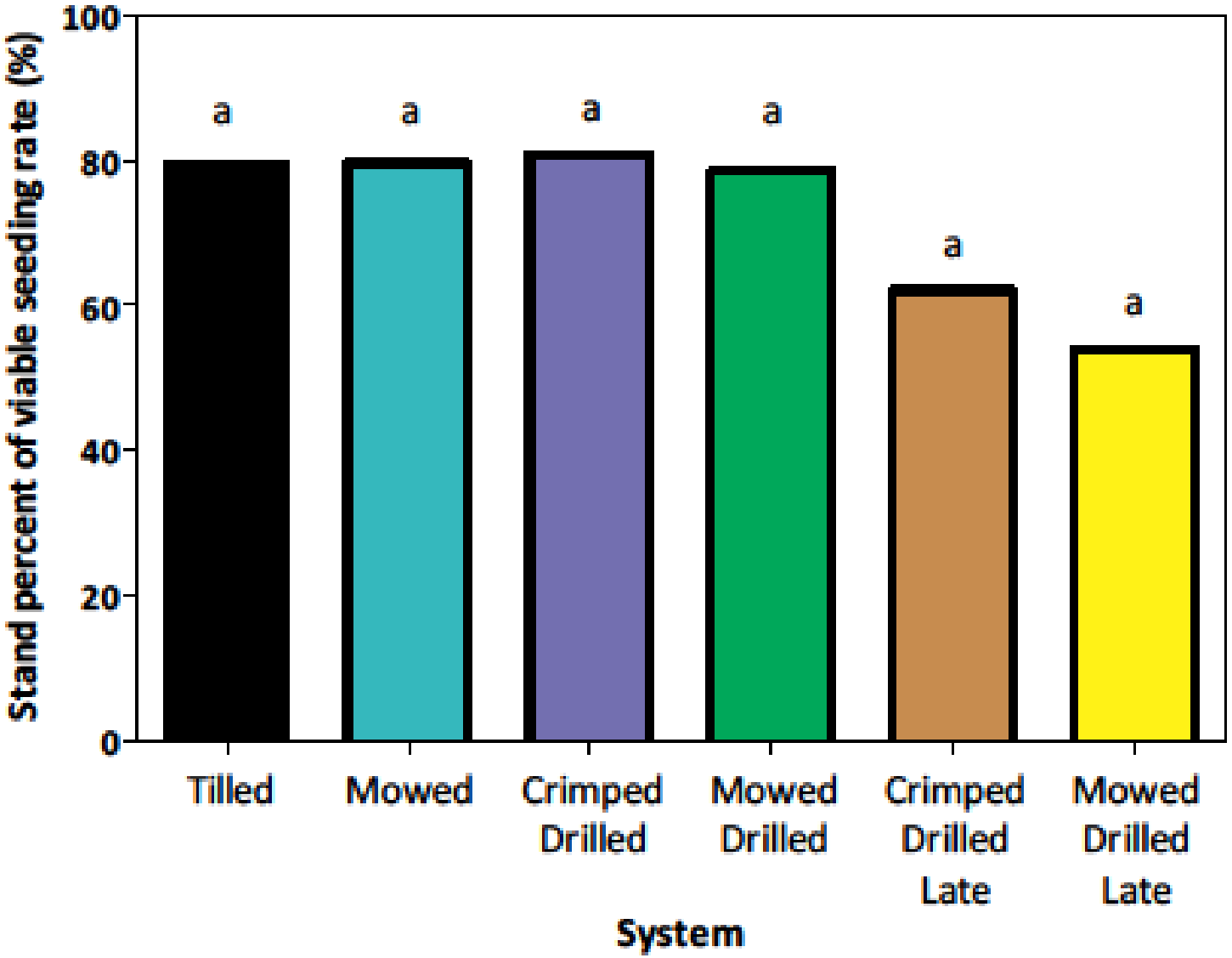
Rye Biomass

System	Time of rye management	Dry shoot mass	
		2008	2009
	month	——— tons acre^{-1} ———	
Tilled	Mid-April	0.7	0.2
No-till	June	4.8	1.9

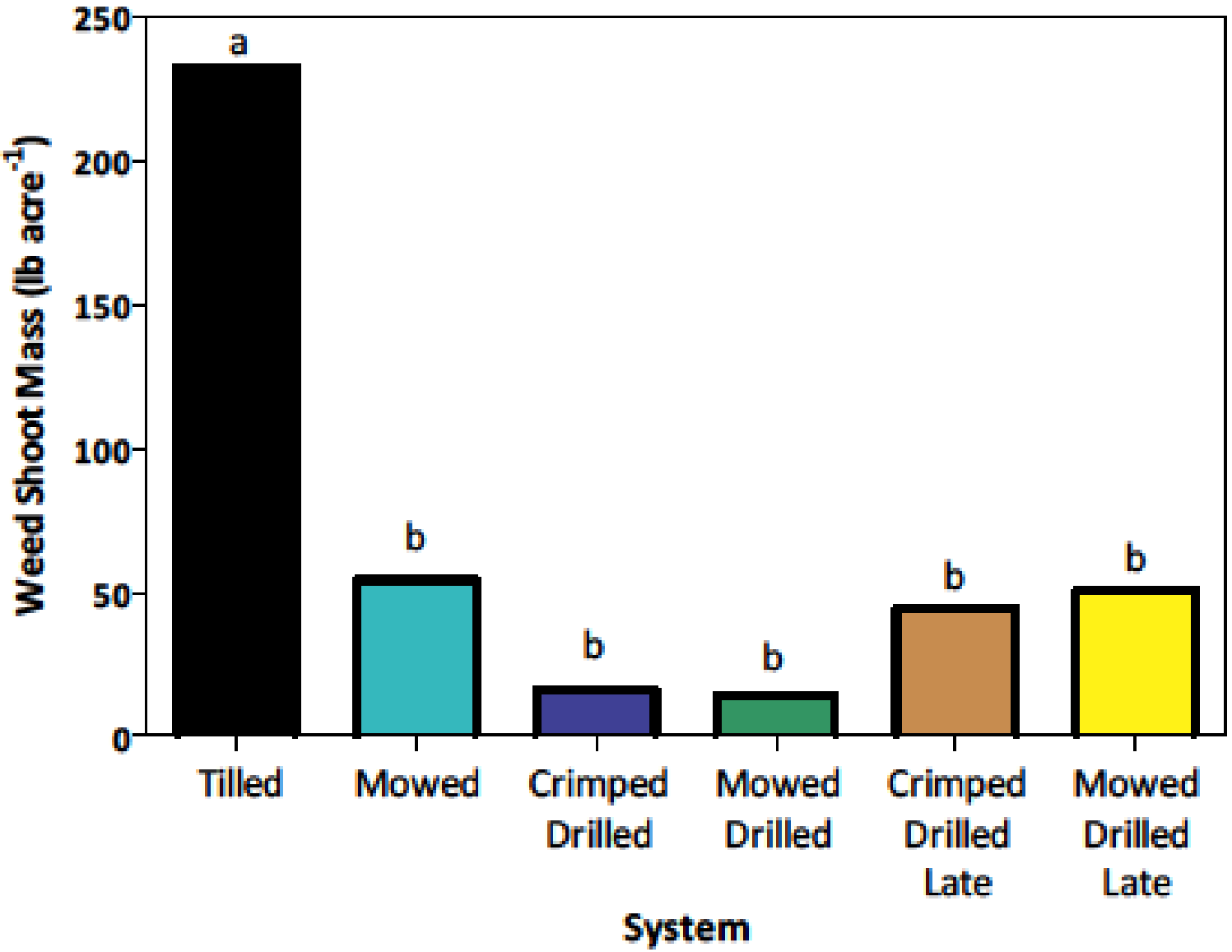
Early-Season Soil Moisture



Soybean Stand Establishment (2008–2009)



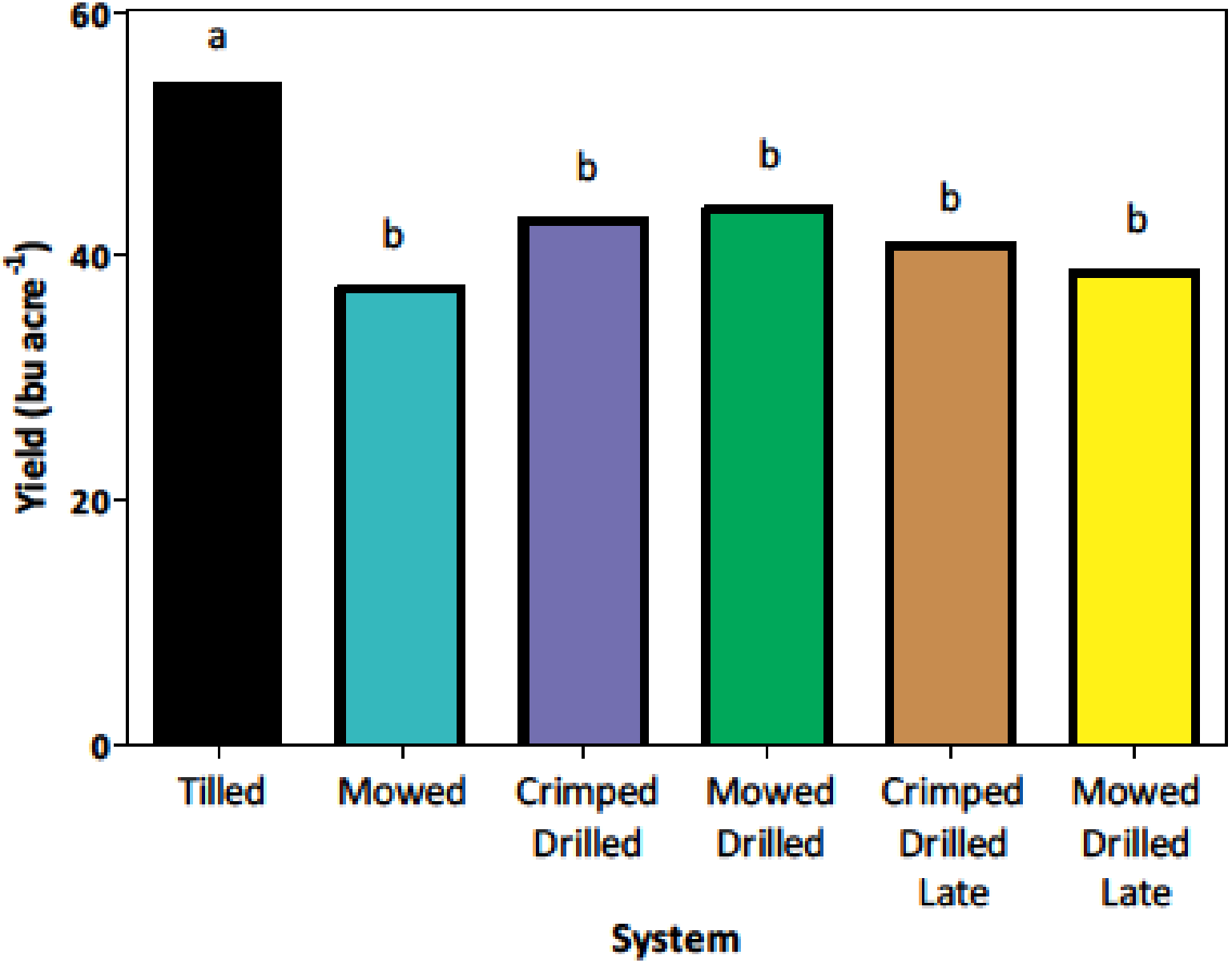
Weed Biomass (2008-2009)



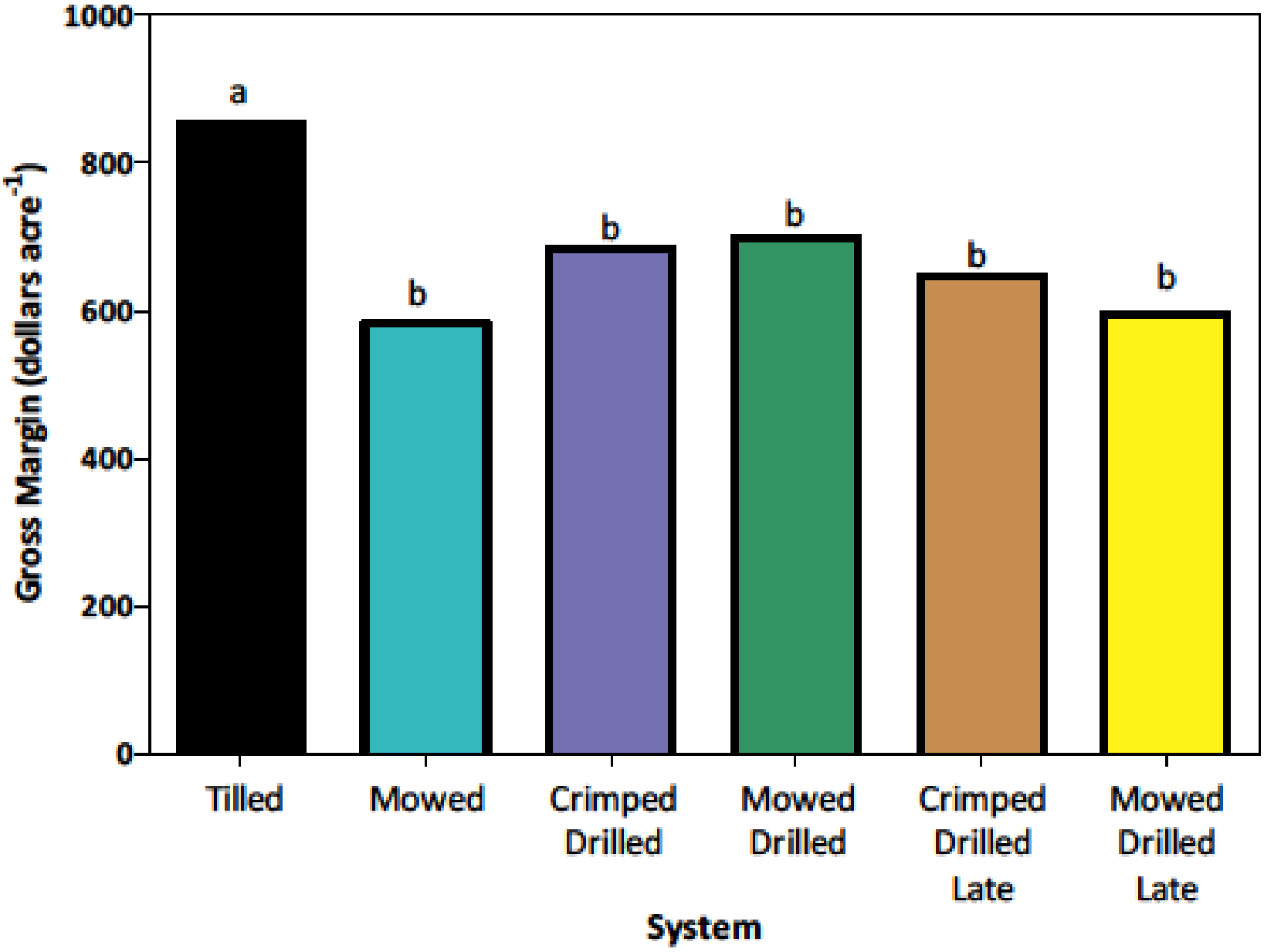
Tilled
Sept. 2008

No-till
Sept. 2008

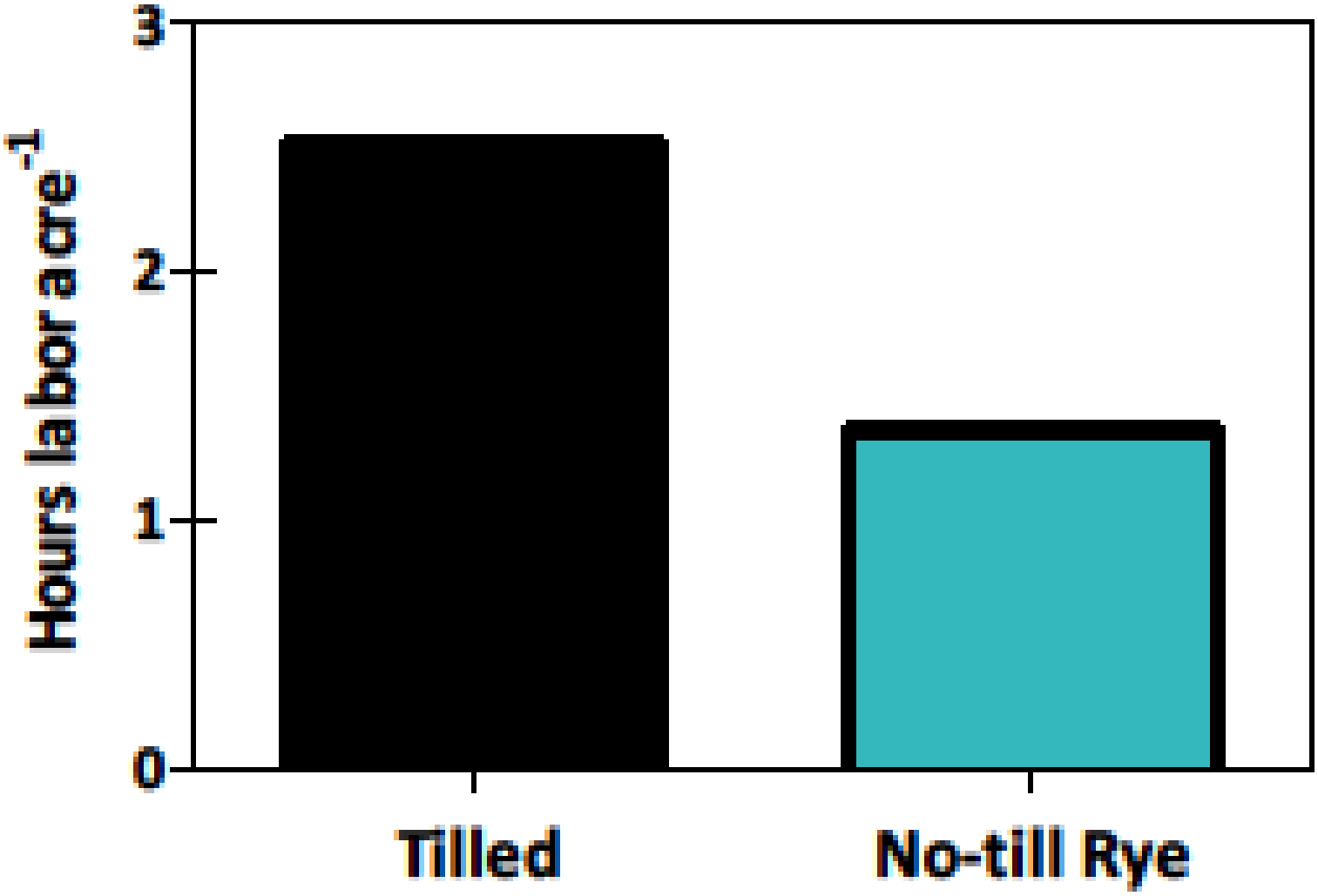
Soybean Yield (2008-2009)



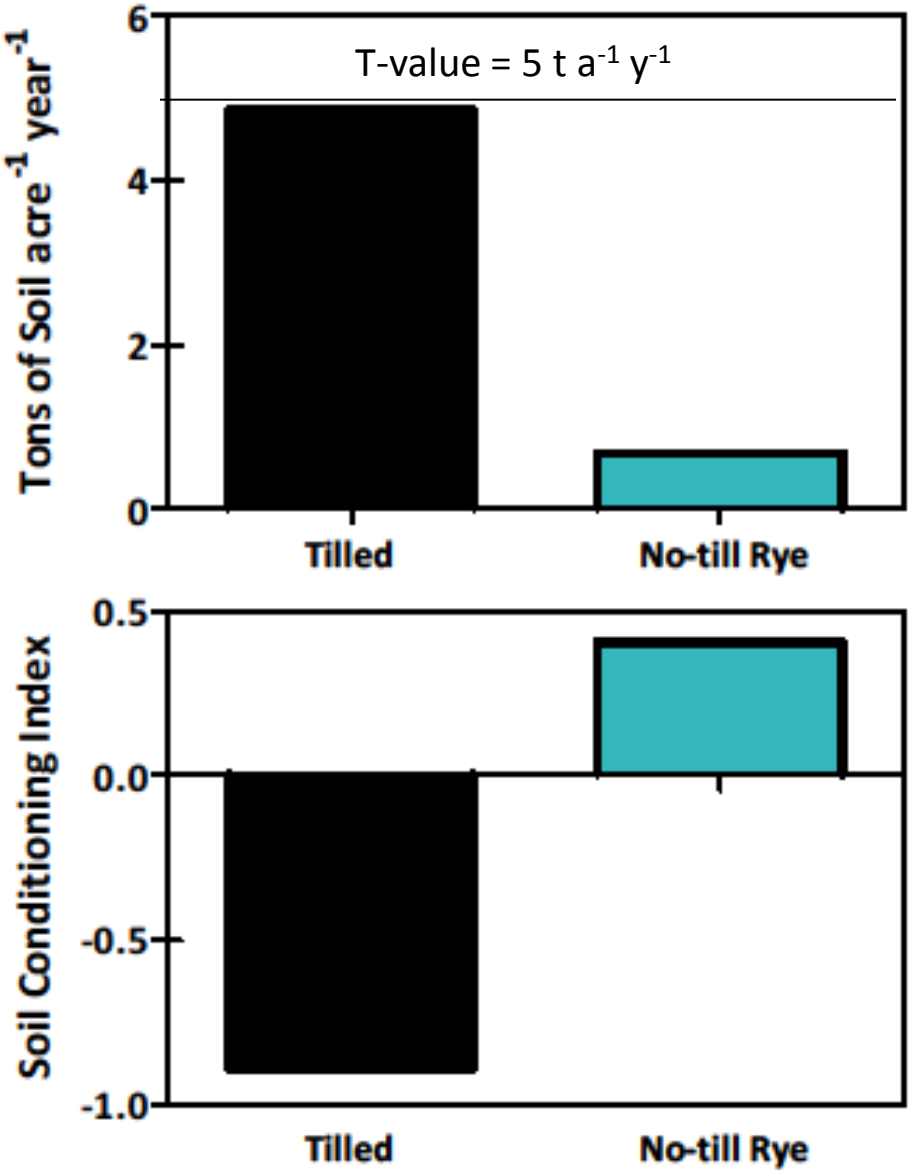
Profitability (2008-2009)



Labor Inputs (2008-2009)



Soil Erosion and Quality (2008-2009)



Conclusions

Rye and soybean management factors within no-till systems

Rye management:

- Sickle-bar mower and roller-crimper performed similarly

Soybean planting date:

- Greater stand establishment in early- than late-planted soybeans
- Less weed biomass in early- than late-planted soybeans

Soybean row spacing:

- Less weed biomass in narrow- than wide-row soybeans
- Greater soybean yield in narrow- than wide-row soybeans

Risks and benefits of using NT rye cover crop

Perceived agronomic and economic risks ?

- 24% less soybean yield in NT than tilled system
- 25% less profitability in NT
- Little or no competition for soil moisture between rye and soybeans
- Little effect of rye on soybean stand establishment

Benefits ?

- 85% less weed biomass in NT than tilled system
- Labor inputs were 42% less in NT
- 86% less soil erosion in NT (predicted for 1% slope)
- Predicted increase in soil organic matter over time