

Effects of the Introduction of Feed Grains into Mid-South Soybean Production Systems

Gurpreet Kaur, B.R. Golden, T. Irby, W.J. Ross, G. Stevens, J. Copes, C.B. Neely



RATIONALE AND JUSTIFICATION

➤ Midwest US:

- 3-19% yield advantage for corn after soybean.
- 10% yield advantage for soybean after corn compared to continuous soybean.

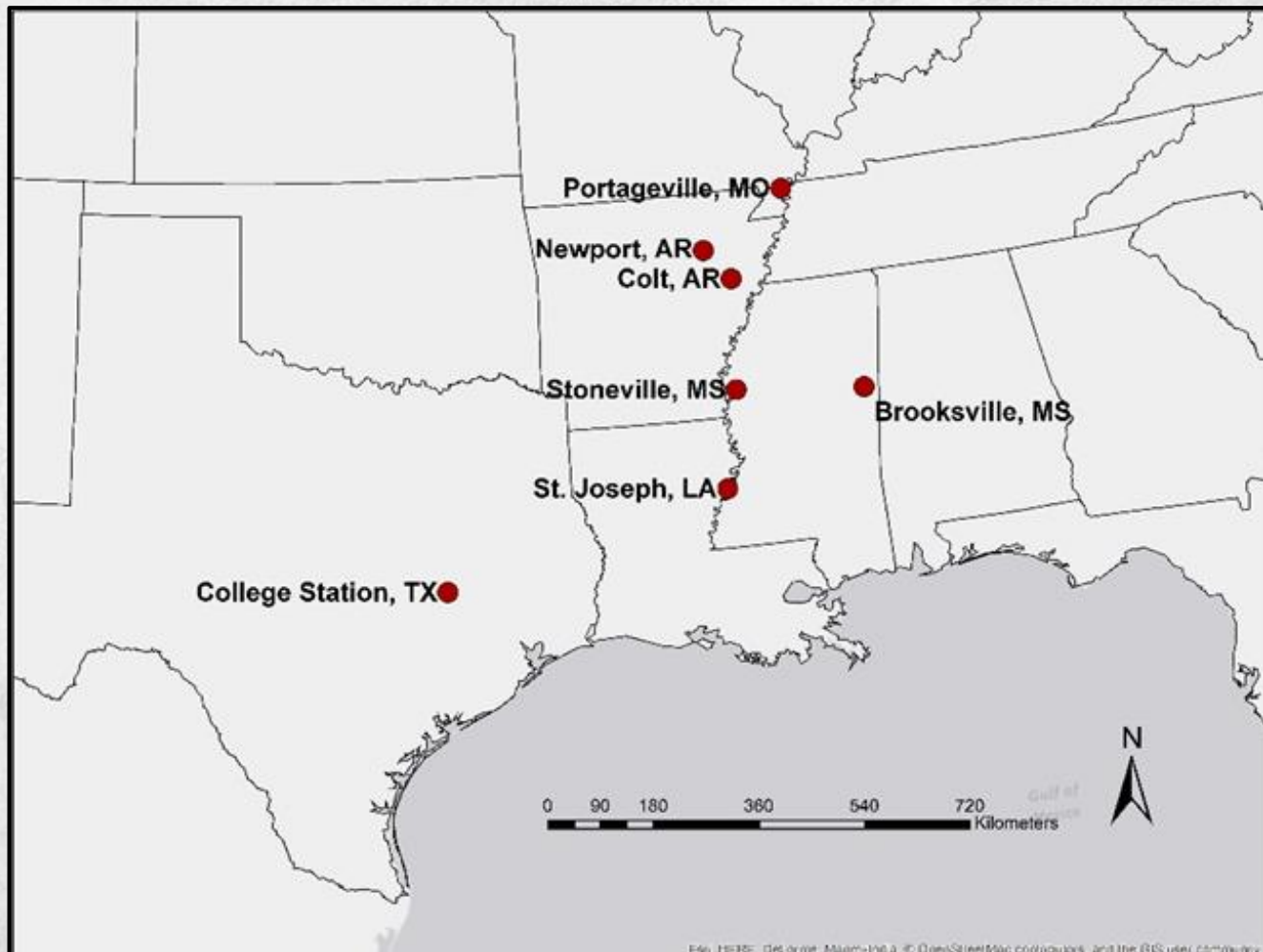
➤ What is the advantage for corn/soybean rotation in the Midsouth US?

➤ Objective:

- Determine the effect of crop rotations and residue management on crop yields (corn, soybean, sorghum), net returns and soil properties in the Midsouthern US.



STUDY LOCATIONS



MISSISSIPPI STATE UNIVERSITY™
DELTA RESEARCH & EXTENSION CENTER

CROP ROTATIONS

Crop Rotations	2014		2015		2016		2017		2018		2019	
1. Continuous Corn 2. Continuous Soybean 3. 1:1 Soybean/Corn 4. 2:1 Soy/Soy/Corn 5. 1:2 Soy/Corn/Corn	CORN		CORN		CORN		CORN		CORN		CORN	
	SOY		SOY		SOY		SOY		SOY		SOY	
	SOY		CORN		SOY		CORN		SOY		CORN	
	SOY		SOY		CORN		SOY		SOY		CORN	
	SOY		CORN		CORN		SOY		CORN		CORN	
6. Continuous Corn 7. Continuous Soybean 8. 1:1 Soybean/Corn 9. 1:1 Soybean/Sorghum 10. Continuous Sorghum	CORN		CORN		CORN		CORN		CORN		CORN	
	SOY		SOY		SOY		SOY		SOY		SOY	
	SOY		CORN		SOY		CORN		SOY		CORN	
	SOY		SORG		SOY		SORG		SOY		SORG	
	SORG		SORG		SORG		SORG		SORG		SORG	
11. Corn/Wheat/DC Soy/Corn 12. Corn/Soy/Wheat/DC Soy	CORN	WHEAT	SOY		CORN		CORN	WHEAT	SOY		CORN	
	CORN		SOY	WHEAT	SOY		CORN		SOY	WHEAT	SOY	

- 12 Crop rotations: Irrigated (7) and Dryland (5)
- 2-yr rotations: 2 rotation cycles completed in 2017
- 3-yr rotations: 1 rotation cycle completed in 2016



TREATMENTS

Irrigated Cont. Corn	Irrigated Cont. Soybean	1:1 Irrigated Soy/Corn	2:1 Irrigated Soy/Corn	1:2 Irrigated Soy/Corn	Dryland Cont. Corn	Dryland Cont. Soybean	1:1 Dryland Soy/Corn	1:1 Dryland Soy/Sorg	Dryland Cont. Sorghum	Irrigated Corn/Wht/ Soy	Irrigated Corn/Soy /Wht
No Res Mgmt		Res Mgmt	No Res Mgmt	Res Mgmt	No Res Mgmt		Res Mgmt	No Res Mgmt	Res Mgmt	No Res Mgmt	Res Mgmt
Alley											
Irrigated Cont. Corn	Irrigated Cont. Soybean	1:1 Irrigated Soy/Corn	2:1 Irrigated Soy /Corn	1:2 Irrigated Soy/Corn	Dryland Cont. Corn	Dryland Cont. Soybean	1:1 Dryland Soy/Corn	1:1 Dryland Soy/Sorg	Dryland Cont. Sorghum	Irrigated Corn/Wht/ Soy	Irrigated Corn/Soy /Wht
Res Mgmt		No Res Mgmt	Res Mgmt	No Res Mgmt	Res Mgmt		No Res Mgmt	Res Mgmt	No Res Mgmt	Res Mgmt	No Res Mgmt
1	2	3	4	5	6	7	8	9	10	11	12
Irrigated					Dryland					Irrigated	

➤ Residue Management: Burn vs No-burn



Stoneville, MS: Corn Yields 2018

Rotation	Residue Management	Crop Yield (Bu/A)	Difference (Bu/A)	Yield (combined)
Continuous Corn	Burn	192		189 ^a
	No Burn	186	-6	
1:2 Soy/Corn/Corn	Burn	166		158 ^b
	No Burn	151	-15	
Continuous Corn	Burn	157		162 ^b
	No Burn	166	+9	

- Difference = No burn – Burn
- “+” = No-burn > Burn
- “-” = Burn > No-burn



Stoneville, MS: Soybean Yields 2018

Rotation	Residue Management	Yield (Bu/A)	Difference	Yield (Combined)	
Continuous Soybean	No Burn	39		38 ^c	13
1:1 Soybean/Corn	Burn	52		51 ^{ab}	bu/A
	No Burn	51	-1		
2:1 Soybean/Soybean/Corn	Burn	42		42 ^{bc}	
	No Burn	41	-1		
Corn/wheat/DC Soybean/corn	Burn	19		19 ^d	
	No Burn	19	0		
Corn/Soybean/Wheat/DC Soybeans	Burn	57		57 ^a	
	No Burn	56	-1		
Continuous Soybean	No Burn	26		26 ^d	25
1:1 Soybean/corn	Burn	49		51 ^{ab}	bu/A
	No Burn	52	+3		
1:1 Soybean/Sorghum	Burn	43		45 ^{bc}	19
	No Burn	47	+4		bu/A

➤ Growing soybeans in rotation with corn or sorghum increases soybean yield than continuous soybeans



Brooksville, MS: Corn Yields 2018

Rotation	Residue Management	Crop Yield (Bu/A)	Difference (Bu/A)
Continuous Corn	Burn	66.38	
	No Burn	52.15	-14.23
1:2 Soybean/Corn/Corn	Burn	52.80	
	No Burn	65.98	13.18
Continuous Corn	Burn	59.83	
	No Burn	53.20	-6.63

- Difference = No burn – Burn
 “+” = No-burn > Burn and “-” = Burn > No-burn

- Low corn yields → Lodging in corn
- No significant differences between rotations and residue management



Brooksville, MS: Soybean Yields 2018

Rotation	Residue Management	Yield (Bu/A)	Difference
Continuous Soybean	No Burn	49	
1:1 Soybean/Corn	Burn	53	
	No Burn	51	-2
2:1 Soybean/Soybean/Corn	Burn	54	
	No Burn	49	-6
Continuous Soybean	No Burn	53	
1:1 Soybean/corn	Burn	51	
	No Burn	52	+1
1:1 Soybean/Sorghum	Burn	51	



Portageville, MO: Corn Yields 2018

Rotation	Residue Management	Crop Yield (Bu/A)	Difference	Yield (combined)
Continuous Corn	Burn	119		114 ^b
	No Burn	109	-10	
1:1 Soybean/Corn	Burn	168		164 ^a
	No Burn	161	-8	
1:2 Soy/Corn/Corn	Burn	161		161 ^a
	No Burn	161	0.25	
Continuous Corn	Burn	115		110 ^b
	No Burn	106	-8	
1:1 Soybean/Corn	Burn	133		139 ^{ab}
	No Burn	145	+12	

47-50
bu/acre

- Growing corn in rotation with soybean increases corn yield than continuous corn under irrigated conditions



Portageville, MO: Soybean Yields 2018

Rotation	Residue Management	Yield (Bu/A)	Difference	Yield (combined)
Continuous Soybean	No Burn	56		56 ^{ab}
2:1 Soybean/Soybean/Corn	No Burn	49		49 ^b
Continuous Soybean	No Burn	53		53 ^b
Corn/wheat/DC Soybean/corn	Burn	33		37 ^c
	No Burn	41	+8	
Corn/Soybean/Wheat/DC Soybeans	Burn	66		65 ^a
	No Burn	63	-3	

➤ Soybean after wheat had lower yield than full season soybeans



St. Joe, LA: Corn Yields 2018

Rotation	Residue Management	Crop Yield (Bu/A)	Difference	Yield (Combined)
Continuous Corn	Burn	207		205 ^a
	No Burn	202	-15	
1:2 Soy/Corn/Corn	Burn	227		217 ^a
	No Burn	207	-20	
Continuous Corn	Burn	177		182 ^b
	No Burn	188	11	

- Difference = No burn – Burn
- “+” = No-burn > Burn
- “-” = Burn > No-burn

Difference between irrigation and dryland rotation = 23-35 bu/acre



St. Joe, LA: Soybean Yields 2018

Rotation	Residue Management	Yield (Bu/A)	Difference
Continuous Soybean	No Burn	71	
1:1 Soybean/Corn	Burn	68	
	No Burn	66	-2
2:1 Soybean/Soybean/Corn	Burn	69	
	No Burn	68	-1
Corn/wheat/DC Soybean/corn	Burn	55	
	No Burn	56	1
Corn/Soybean/Wheat/DC Soybeans	Burn	64	
	No Burn	64	0
Continuous Soybean	No Burn	76	
1:1 Soybean/corn	Burn	79	
	No Burn	76	-3
1:1 Soybean/Sorghum	Burn	75	
	No Burn	77	+2



College Station, TX: Corn Yields 2018

Rotation	Residue Management	Crop Yield (Bu/A)	Difference	Yield (Combined)
Continuous Corn	Burn	87		92 ^b
	No Burn	97	9	
1:2 Soybean/Corn/ Corn	Burn	122		135 ^a
	No Burn	147	25	
Continuous Corn	Burn	82		82 ^b
	No Burn	82	0	

43
bu/acre

Residue management	Corn Yield
No Burn	108 ^a
Burn	97 ^b

11 bu/acre

➤ Growing corn in rotation with soybean increases corn yield than continuous corn



MISSISSIPPI STATE UNIVERSITY™
DELTA RESEARCH & EXTENSION CENTER

College Station, TX: Soybean Yields 2018

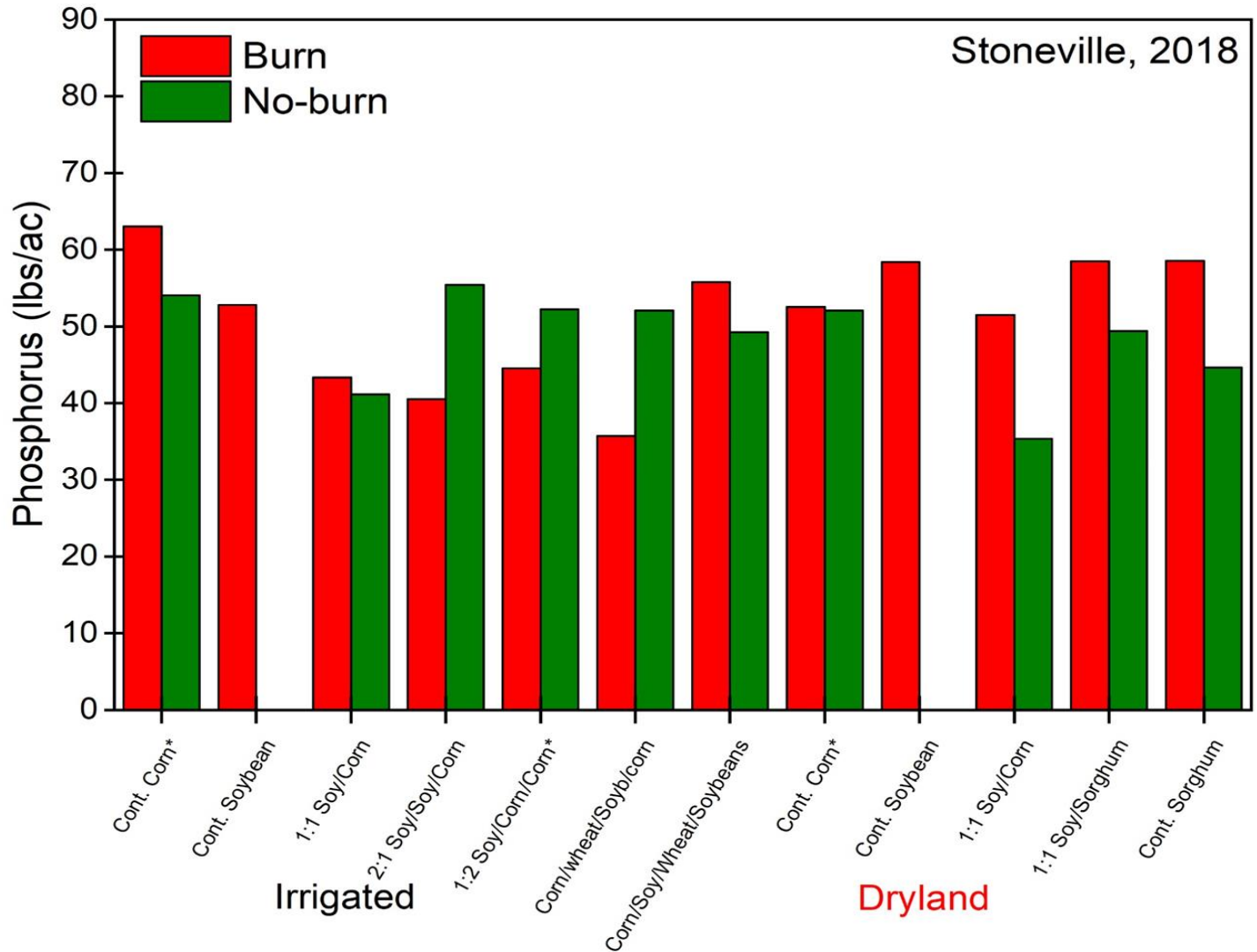
Rotation	Residue Management	Yield (Bu/A)	Difference
Continuous Soybean	No Burn	14	
1:1 Soybean/Corn	Burn	13	
	No Burn	12	-1
2:1 Soybean/Soybean/Corn	Burn	8	
	No Burn	8	0
Corn/wheat/DC Soybean/corn	Burn		
	No Burn	24	-
Corn/Soybean/Wheat/DC Soybeans	Burn	14	
	No Burn	11	-3
Continuous Soybean	No Burn	13	
1:1 Soybean/corn	Burn	10	
	No Burn	11	+1

Exceptionally wet conditions at harvest, delayed harvest; very poor quality seed

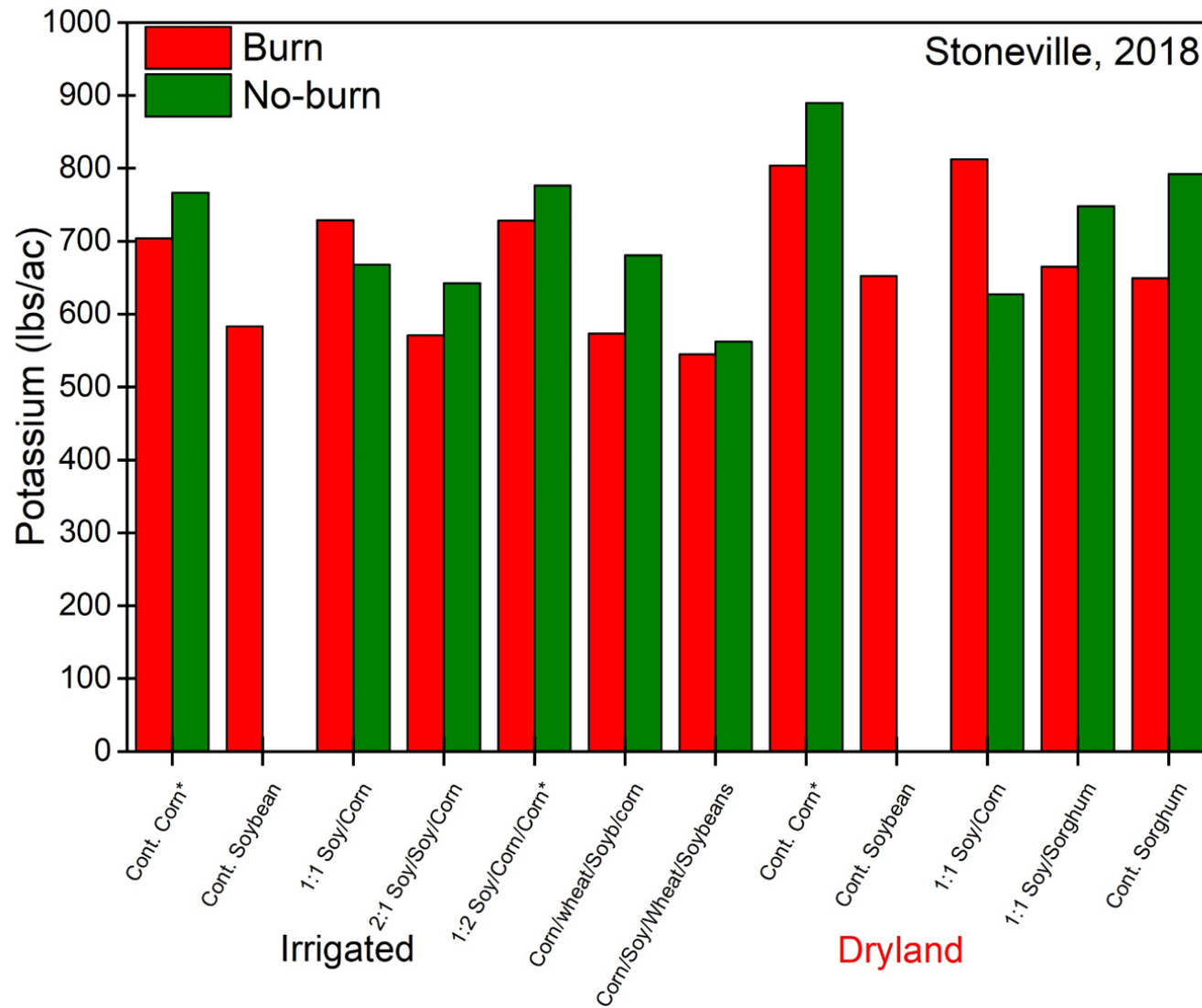


MISSISSIPPI STATE UNIVERSITY™
DELTA RESEARCH & EXTENSION CENTER

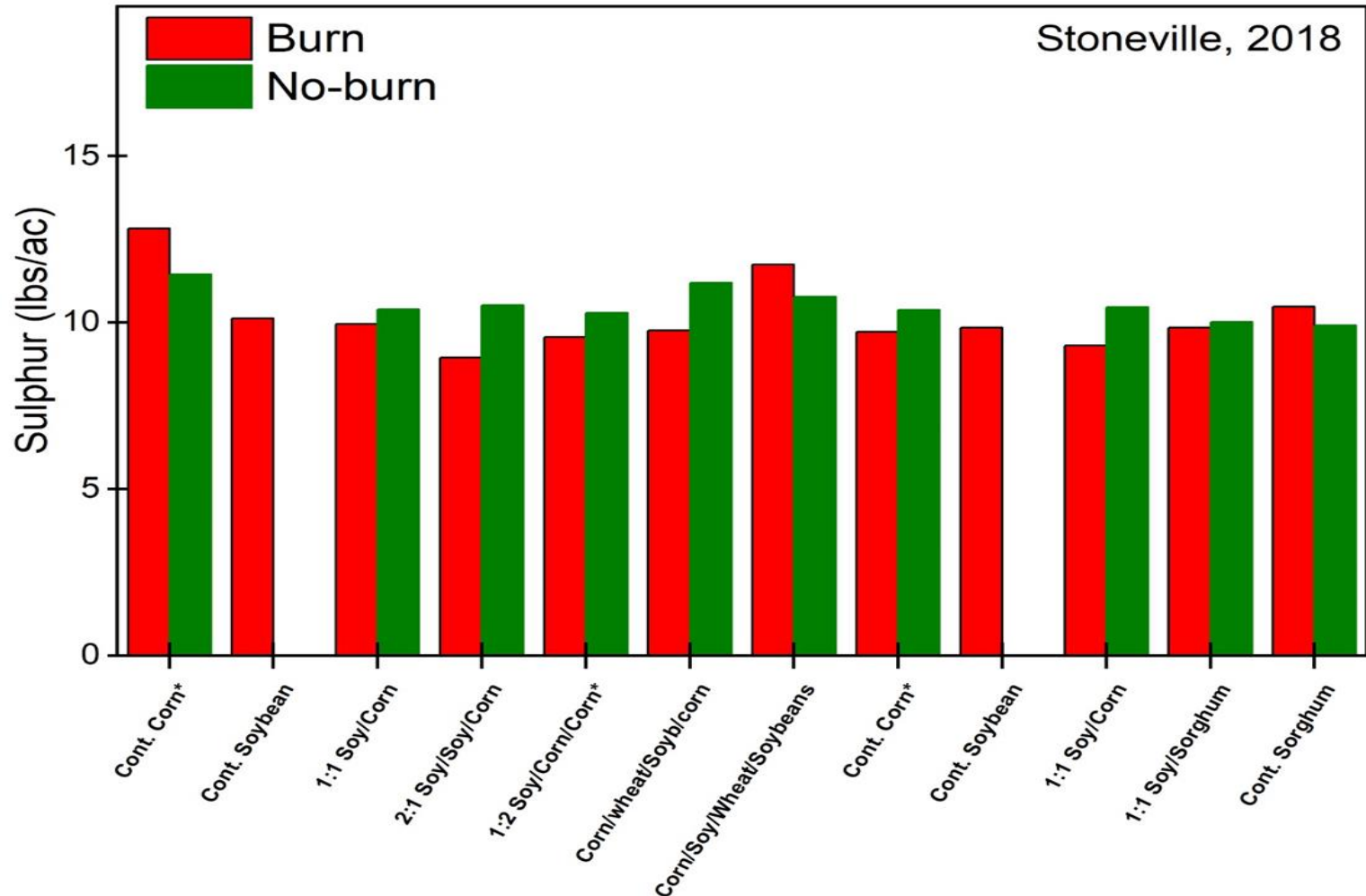
SOIL P



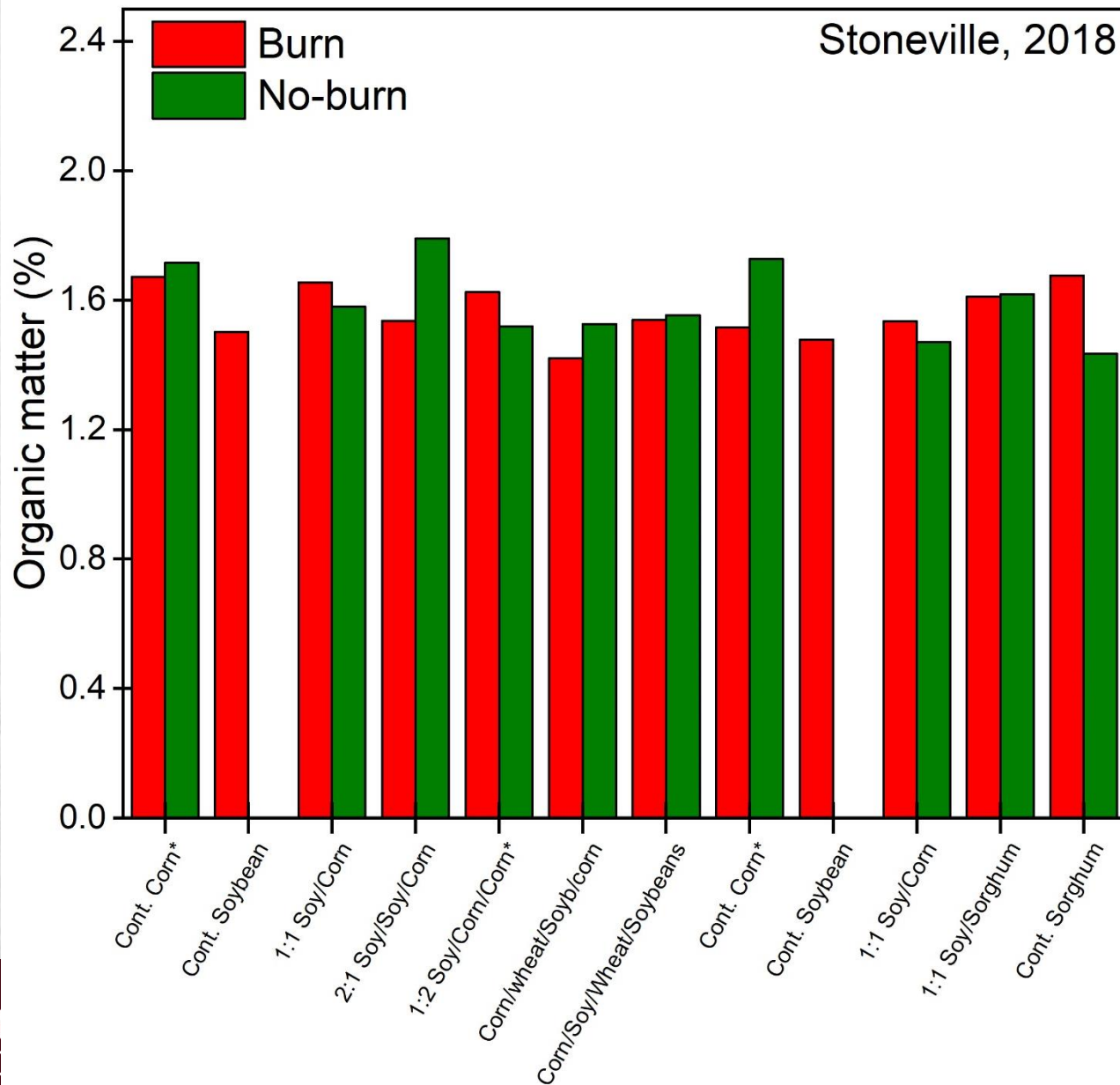
SOIL K



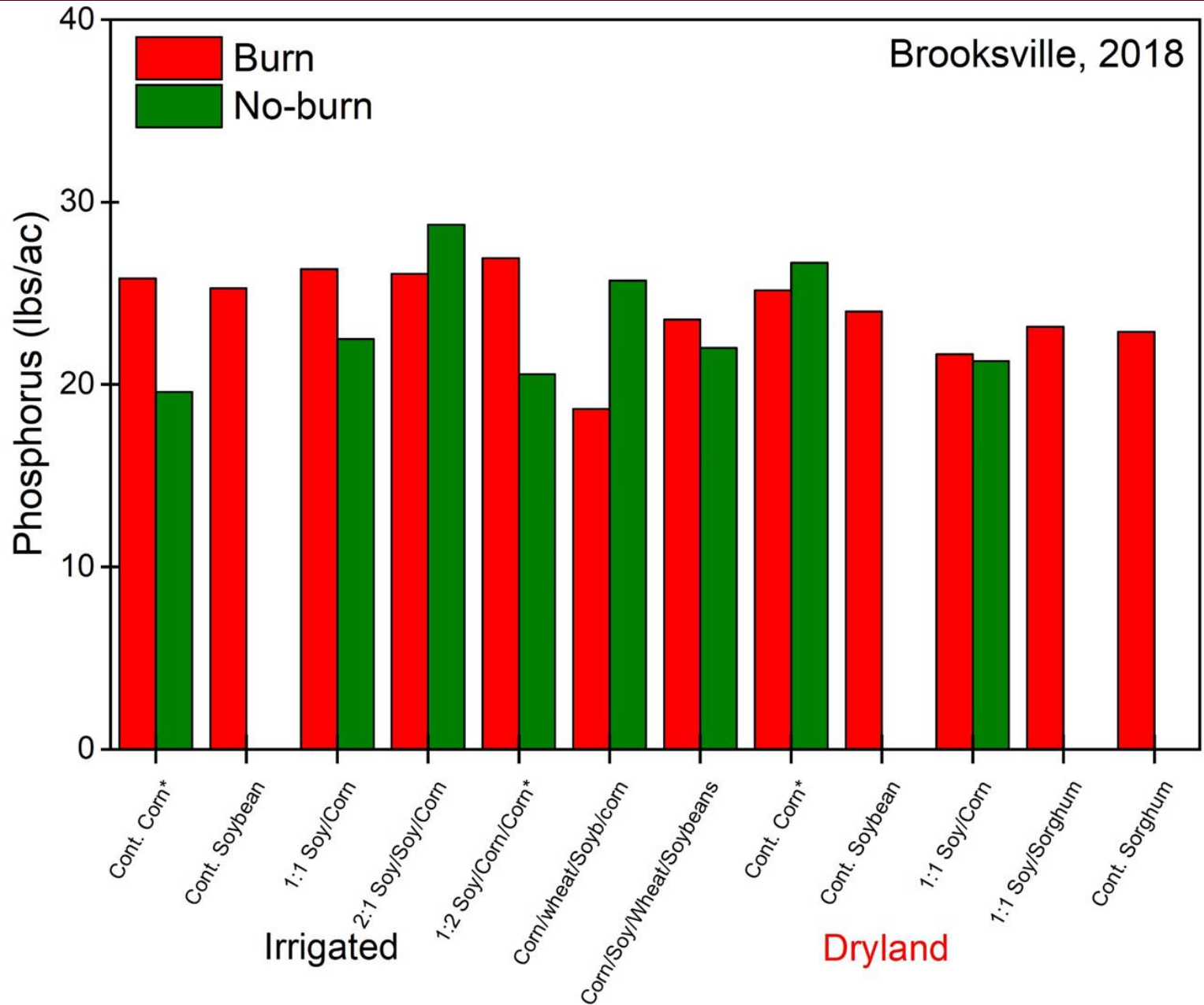
SOIL S



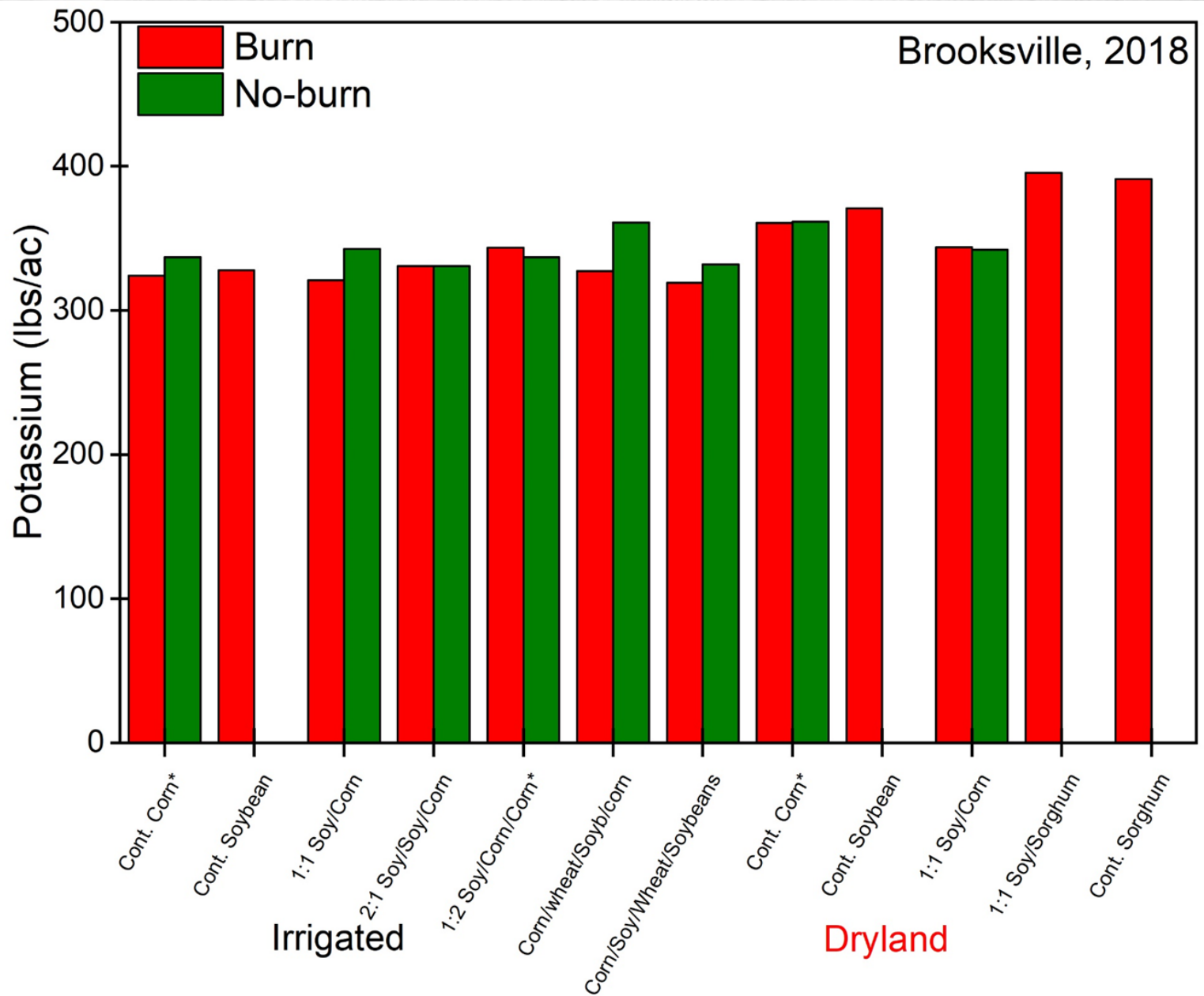
SOIL ORGANIC MATTER



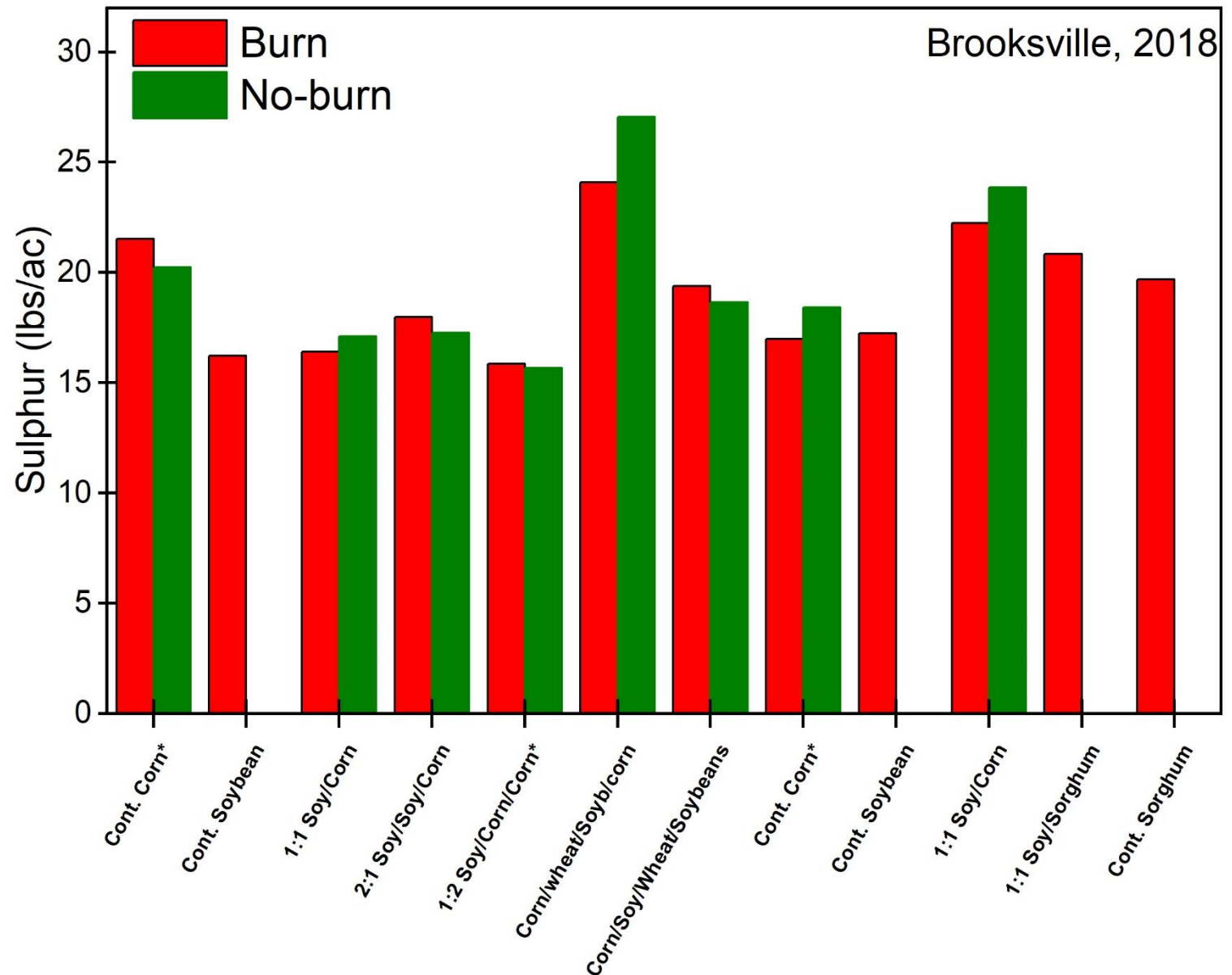
SOIL P



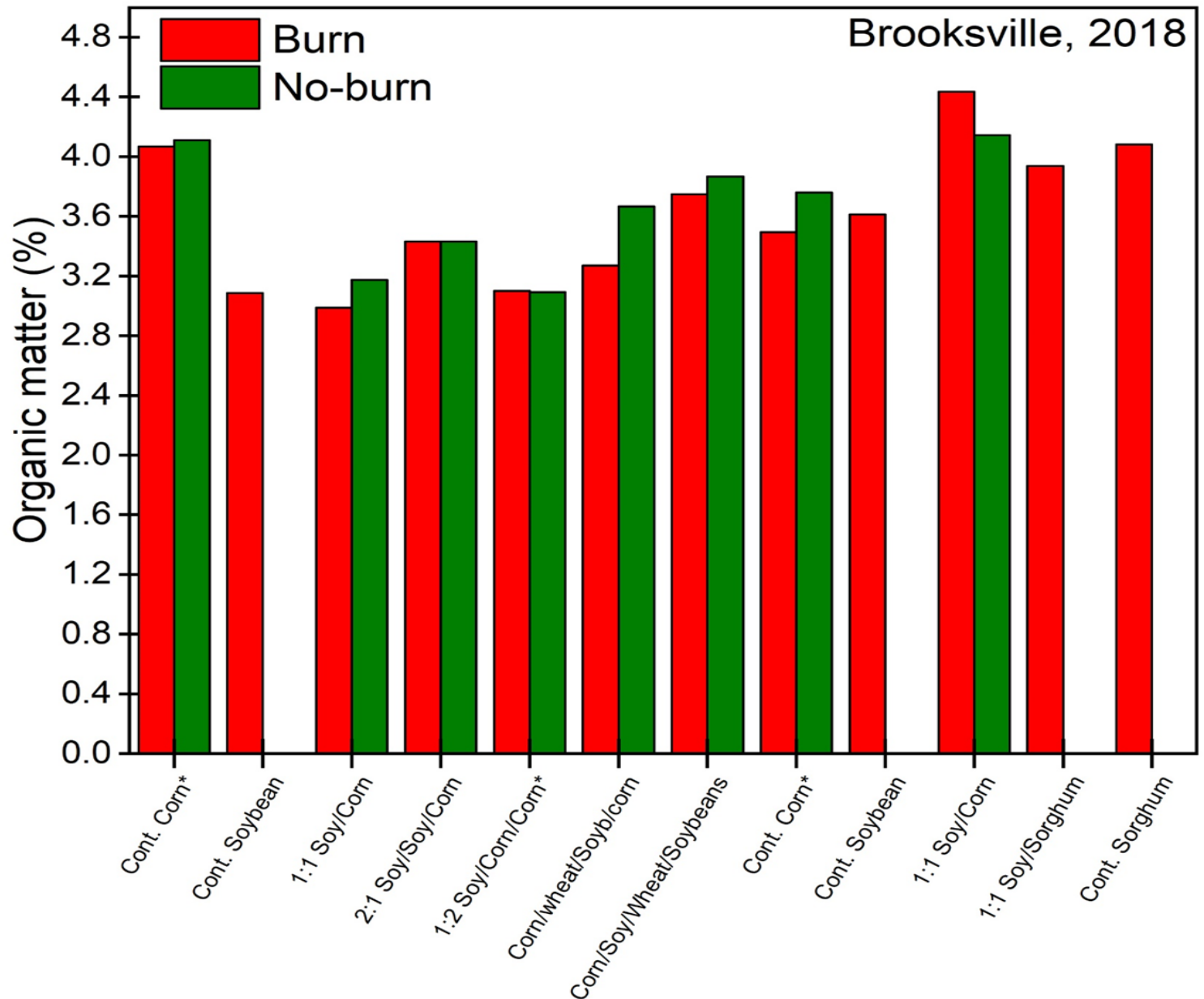
SOIL K



SOIL S



SOIL ORGANIC MATTER



2019 Update

2018

- **Soil samples**
 - ✓ **Nematode: Analyzed at DREC**
 - ✓ **Nutrient concentrations: in process**

2019

- **Locations: 6 (MO, AR, MS, LA)**
- **Replanting at some locations (MO, AR)**
- **Crops look good at this time**



2019 Update

2019

- **Soil samples: will be analyzed by summer 2020**
- **Publication: to be accepted or published by end of year 2020**
- **Time extension on project**
- **Some locations might be continuing this project for more years also.**



Thank You



MISSISSIPPI STATE UNIVERSITY™
DELTA RESEARCH & EXTENSION CENTER