Cover Crops in Tennessee



Lori Duncan
Row Crop Sustainability Specialist
UT Extension

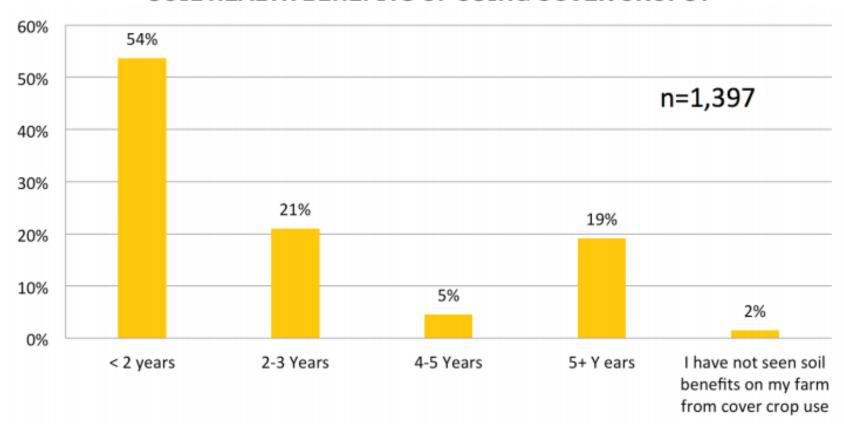


- Less erosion
- Scavenge nutrients
- Reduce N fertilizer costs
- Suppress weeds
- Better infiltration
- Increase organic matter
- Conserve soil moisture



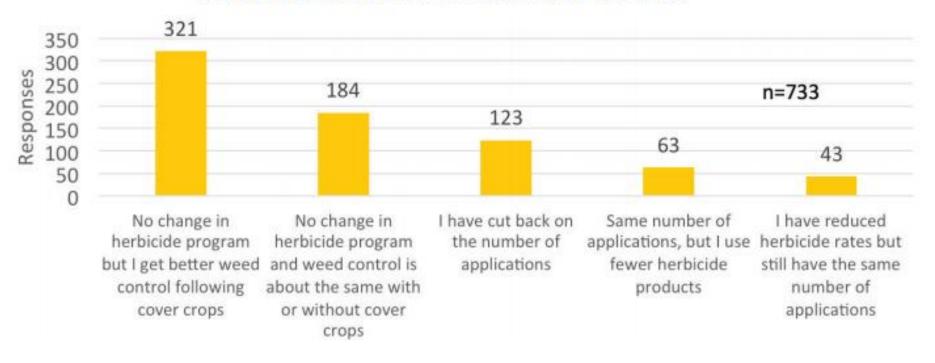


WHEN DID YOU BEGIN TO SEE SOIL HEALTH BENEFITS OF USING COVER CROPS?





COVER CROPS AND RESISTANT WEEDS





- Revised Universal Soil Loss Equation (RUSLE)
- Gibson county; Grenada soil (2 to 6% slope)

[Soil losses in tons per acre per year]

	Plow	No-till	No-till w/ cover crop
Corn	64	1.4	0.97
Soybeans	95	14	3.8
Cotton	100	19	4.8

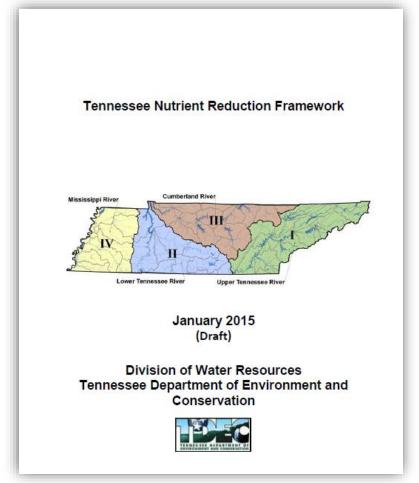


Initiatives in TN (and beyond)





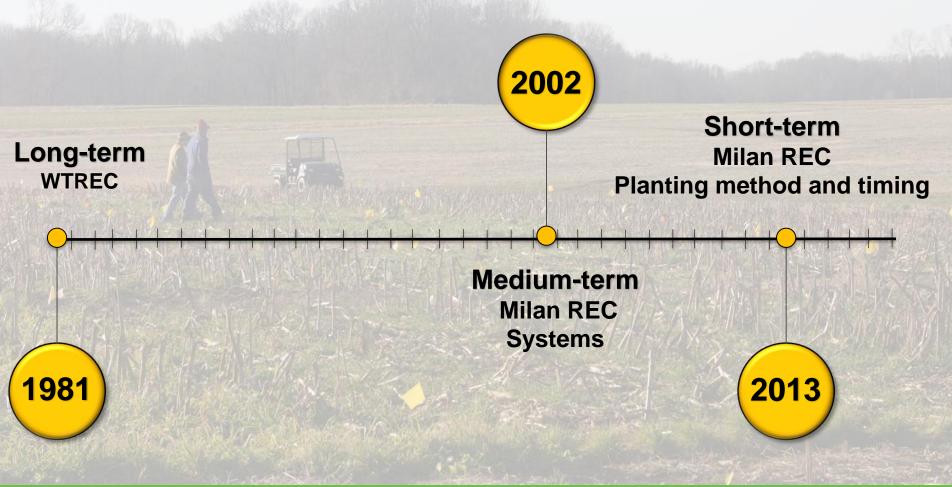
Natural Resources
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Long-term

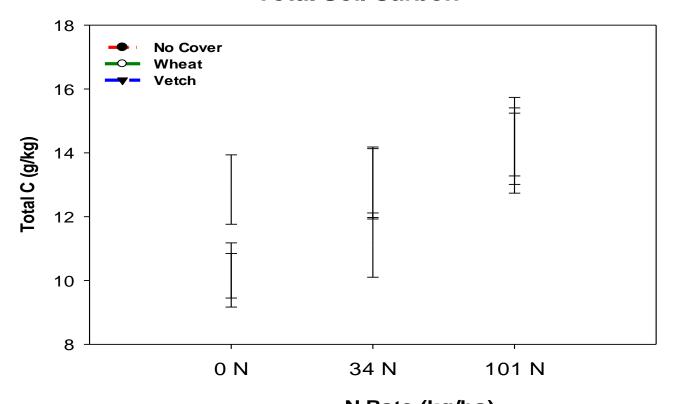
- Dr. Don Tyler
- West Tennessee Research and Education Center
- Cotton
- Single-species cover crops
 - Wheat
 - Vetch





Long-term

Total Soil Carbon



More C with unfertilized vetch than wheat or control C sequestered in wheat or control increases with N



Long-term

Treatments	Wet Aggregate stability (%)	Wet Aggregate stability (%)	Soil water retention during dry period (cm³ cm⁻³)	Soil water retention during dry period (cm³ cm³)	Hydraulic conductivity (mm h ⁻¹)	Hydraulic conductivity (mm h ^a)
	(2015)	(2016)	(2015)	(2016)	(2015)	(2016)
Cover Type						
Vetch	56.4 a	62.5 a	22.6 a	22.4 a	6.88 a	10.26 a
Wheat	51.7 ab	58.0 ab	17.4 ab	19.5 a	6.40 a	9.73 a
No cover	50.1 b	55.7 b	15.9 b	19.2 a	2.56 b	5.50 b
	P=.0477	P=.105	P=.0514	P=.208	P=.002	P=.005
Tillage						
Conv Till	49.1 b	55.7 b	20.2 b	18.4 b	3.35 b	5.76 b
No-till	56.4 a	61.7 a	26.2 a	22.4 a	7.21 a	11.24 a
	P=.0017	P=.027	P=<.0001	P=.022	P=.0002	P=.0001

McClure et al. 2017. Cover Crop Quick Facts. UT Extension W417.



Medium-term

- Dr. Fred Allen and Dr. Virginia Sykes
- REC at Milan
- Cropping system study
- Corn, soybeans, cotton
- Cover crops
 - Winter pea
 - Hairy vetch
 - Wheat





Systems Study

Main plots

2014	2015	2016	2017
soy	cotton	soy	cotton
soy	cotton	corn	soy
soy	soy	corn	cotton
soy	soy	soy	soy
Buffer	Buffer	Buffer	Buffer
corn	soy	corn	soy
corn	corn	soy	cotton
corn	cotton	soy	corn
corn	corn	corn	corn
Buffer	Buffer	Buffer	Buffer
cotton	corn	cotton	corn
cotton	corn	cotton	soy
cotton	soy	corn	cotton
cotton	cotton	cotton	cotton
cotton	soy	cotton	corn

Sub-	-plots	<u>s</u>												40
		Rep 3	3		Rep 2				Rep 1				40 ft	
3065	3052	3039	3026	3013	2065	2052	2039	2026	2013	1065	1052	1039	1026	1013
														1012
														1011
3062	3049	3036	3023	3010	2062	2049	2036	2023	2010	1062	1049	1036	1023	1010
3061	3048	3035	3022	3009	2061	2048	2035	2022	2009	1061	1048	1035	1022	1009
														1008
														1007
3058	3045	3032	3019	3006	2058	2045	2032	2019	2006	1058	1045	1032	1019	1006
3057	3044	3031	3018	3005	2057	2044	2031	2018	2005	1057	1044	1031	1018	1005
														1004
														1003
														1002
3053	3040	3027	3014	3001	2053	2040	2027	2014	2001	1053	1040	1027	1014	1001

2 locations

- Spring Hill (16 rotations, no cotton)
- Milan (13 rotations)

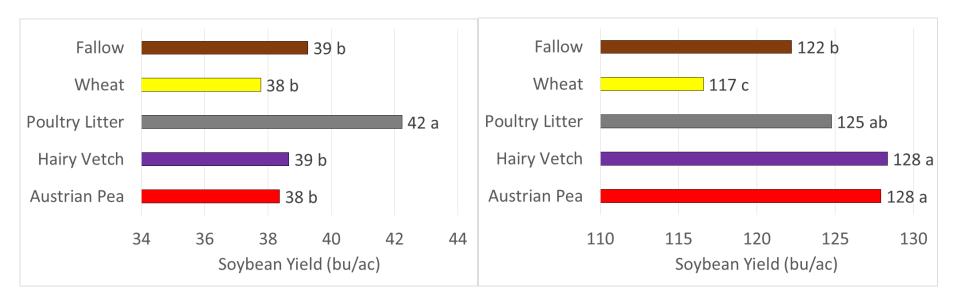
Austrian winter pea				
hairy vetch				
wheat				
poultry liter				
fallow				
buffer				

Real. Life. Solutions.

Source: Virginia Sykes



Average Yield Impacts



Soybean Yield (bu/ acre)

Corn Yield (bu/ acre)

Cotton Yields = no change

Source: Virginia Sykes



Short-term

Evaluate the influence of **planting date and method** on:

- (1) <u>stand establishment</u>, cover crop species composition and biomass production of single and multi-species cover crops
- (2) the effectiveness of recommended NRCS cover crop species/mix on weed suppression
- (3) the influence of cover crops on **yield**







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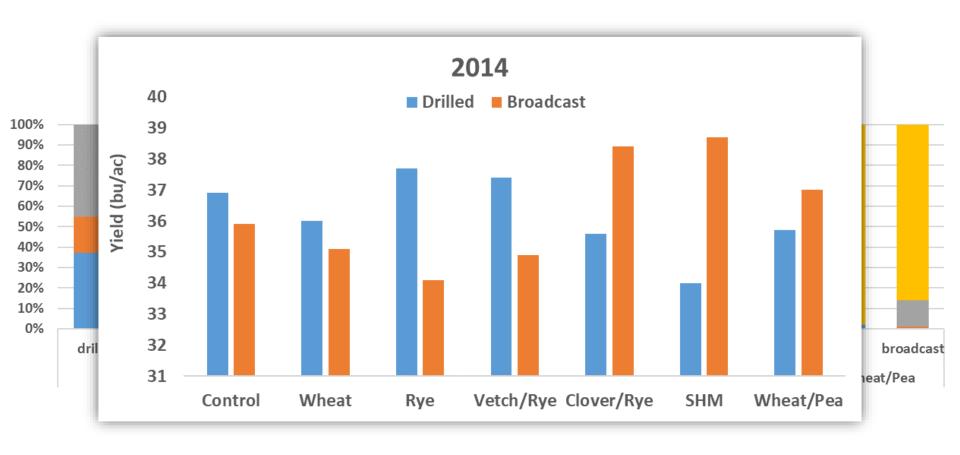
Species/Mixture

- 1. Wheat
- 2. Cereal Rye
- 3. Cereal Rye + Crimson Clover
- 4. Cereal Rye + Hairy Vetch
- 5. Soil Health Mix
 - Cereal Rye, oats, crimson clover, winter pea, purple top turnips, daikon radish
- 6. 2x SHM

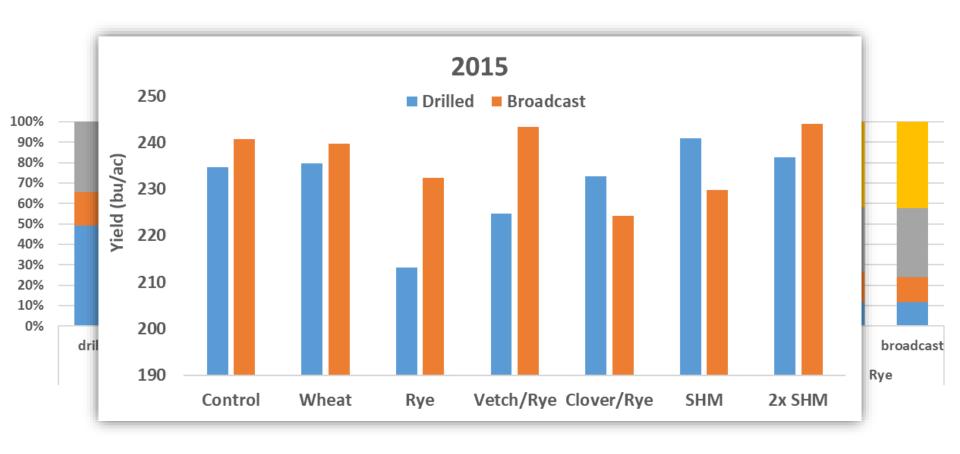
Planting Method

- 1. Broadcast
- 2. Drilled

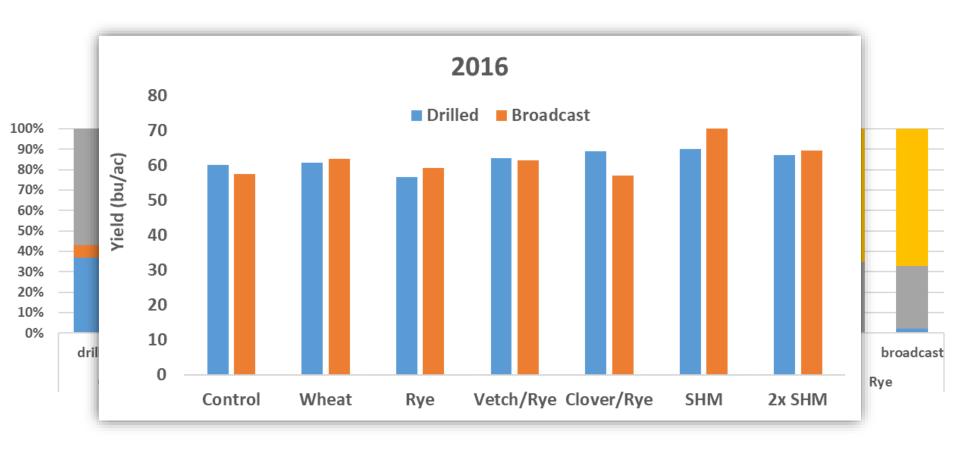




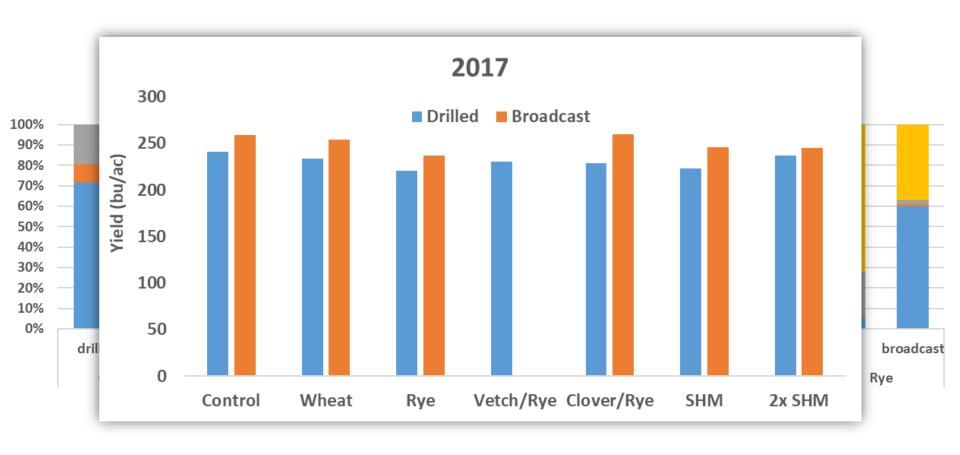




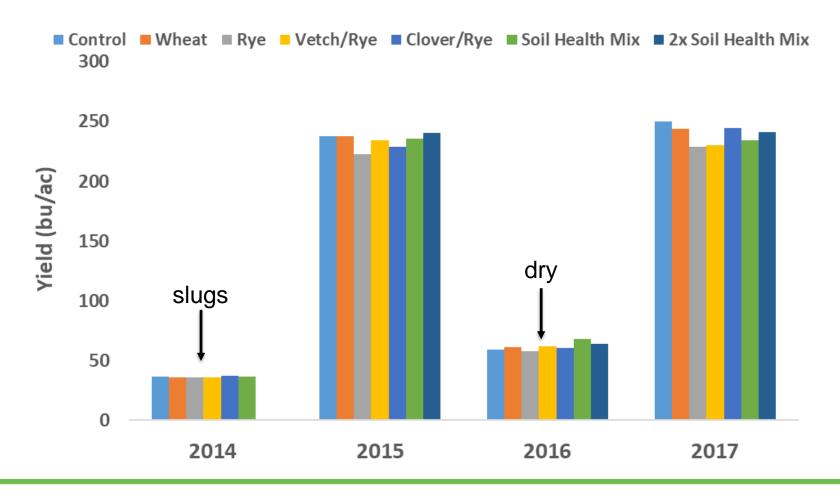




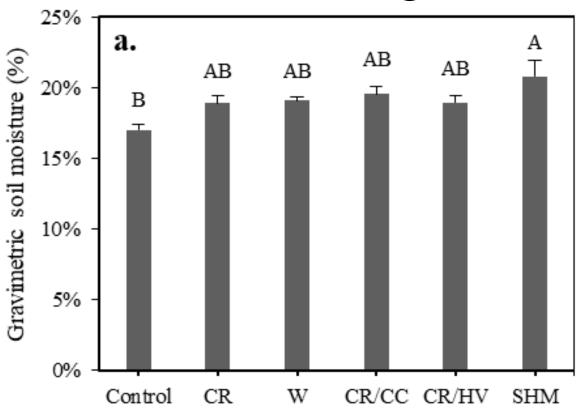














- Broadcast CC prior to rainfall or irrigation
- Rye having a negative effect on corn yields
- Multi-species CC helped yields in dry year
- No significant yield increase otherwise



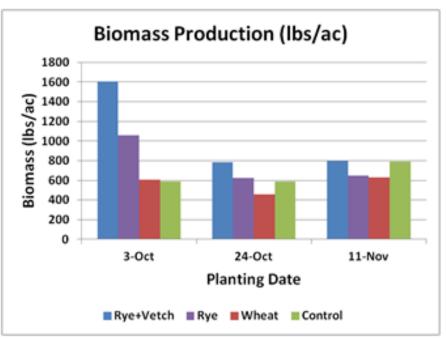
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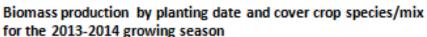
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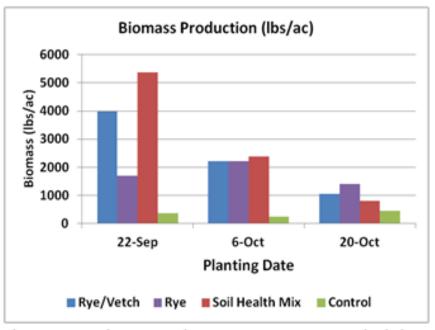
Planting Date

- 1. Broadcast into standing soybeans or corn
- 2. Drilled at harvest
- 3. Drilled 2-4 weeks after harvest





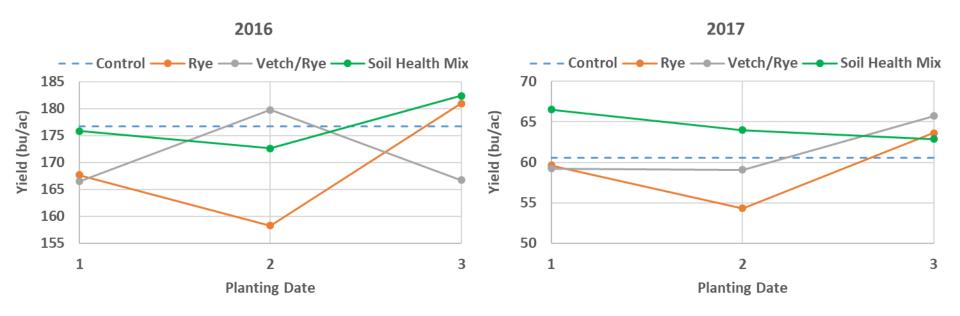




Biomass production by planting date and cover crop species/mix for the 2014-2015 growing season

 Note: Cover crops planted later after the 2013 soybean crop compared to the 2014 corn crop





- 1 broadcast prior to harvest
- 2 drilled immediately after harvest
- 3 drilled 2-4 weeks after harvest

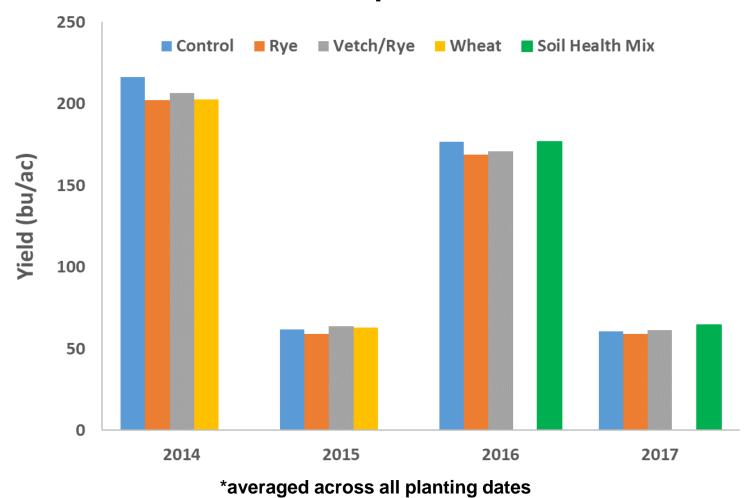


Rye and Corn Yields



- 1 broadcast prior to harvest
- 2 drilled immediately after harvest
- 3 drilled 2-4 weeks after harvest







The earlier, the better

Negative corn yield effect with rye

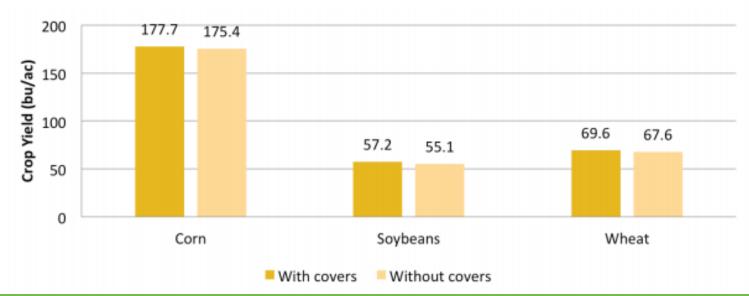
- No other significant yield differences
 - *except 2016 (dry) cotton under SHM cover



Take Home Message

- Slight increases in yields with proper management
- Short to mid-term: insurance for weather extremes?
- Long-term: potentially more with multi-species

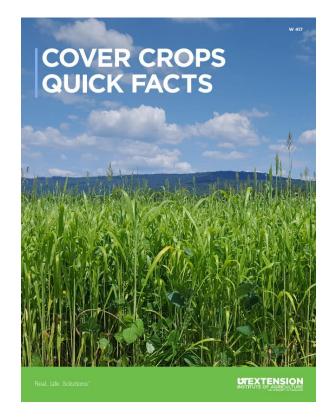
CROP YIELDS INCREASED FOLLOWING COVER CROPS





Take Home Message

- Many other benefits
- Weed suppression
 - Reducing applications
- Improve soil structure
 - Handle flooding events better
- Increase soil water holding capacity
 - Handle dry spells better
- Reduce erosion, improve water quality



McClure et al. 2017. Cover Crop Quick Facts. UT Extension W417.



Take Home Message





Future Issues / Concerns

- Planting into green covers "green bridge" more insect carryover
- Grass after grass; legume after legume = more disease potential?
- Termination with chemicals delays in planting based on label, or use rollers?
- Making cover crops pay yield + weed suppression (+ other benefits?)
- Need a low-cost, rapid soil health test



