NO-TILL OPTIONS FOR HEMP PRODUCTION

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KY Fish and Wildlife Resources

KY NO-TILL TOBACCO PROJECT

- Partnered with Pulaski and Christian County Conservation Districts with the Equipment
- Partner with UK to do research related to project
- Received Funding from Burley Tobacco Growers Cooperation, Council For Burley Tobacco, and KY Farm Bureau for portion of equipment

PROJECT GOAL

Implement Best Management Practice (No-Till) on working tobacco farms throughout KY.

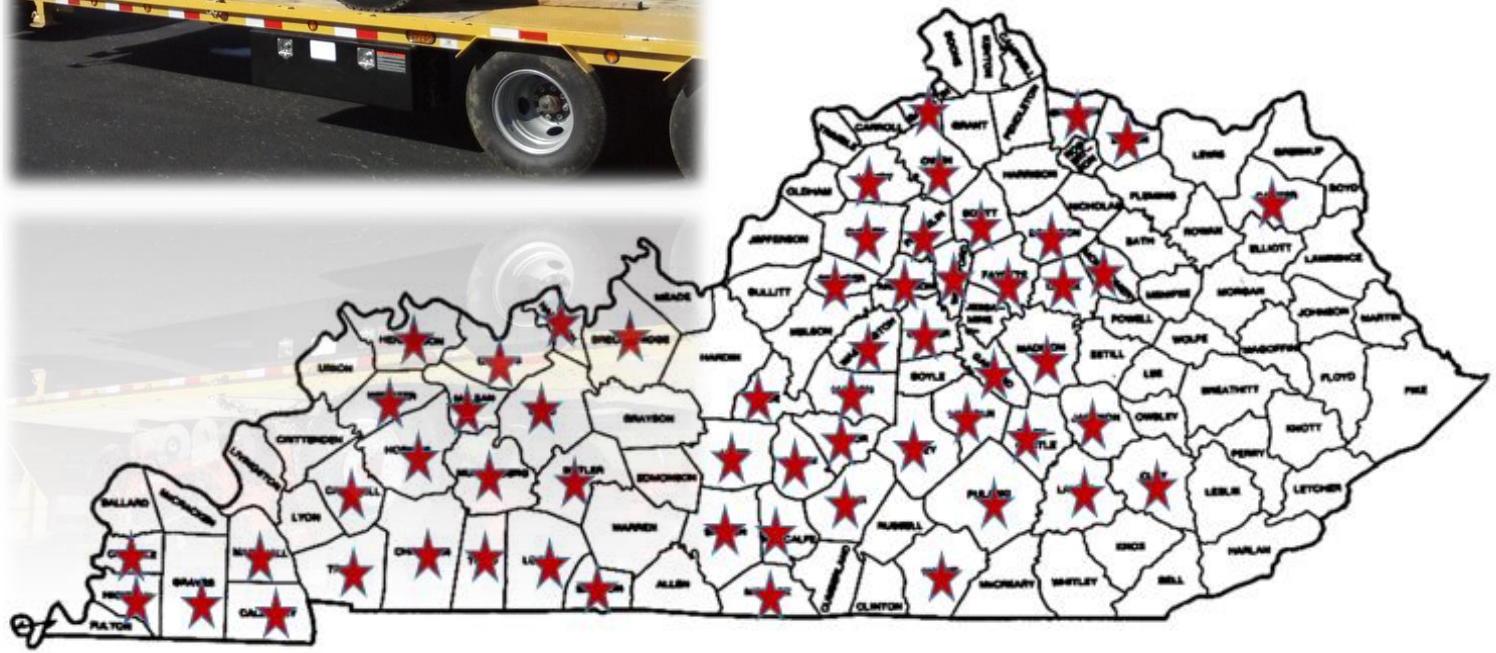
Reduce Soil Erosion

Improve Soil Health

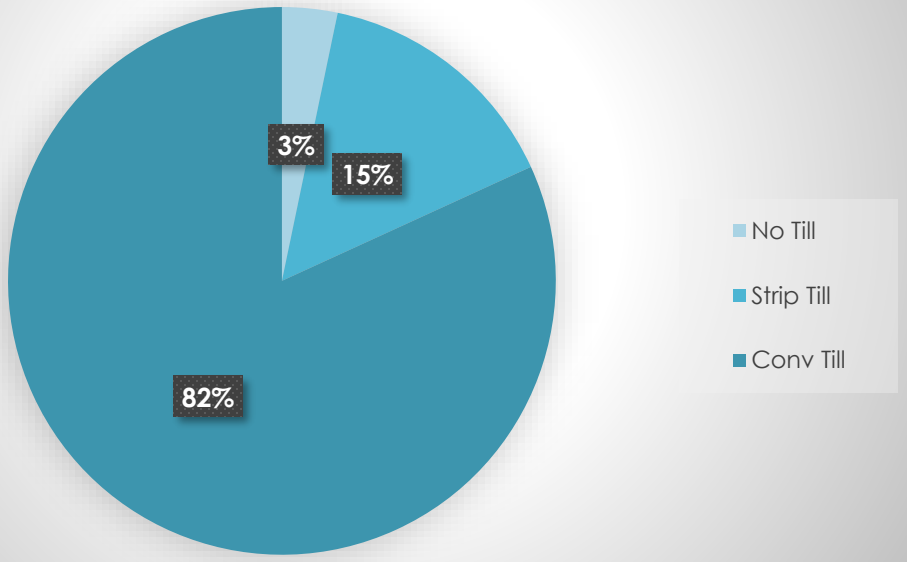
Water Quality

NO TILL TOBACCO PROJECT TOTALS

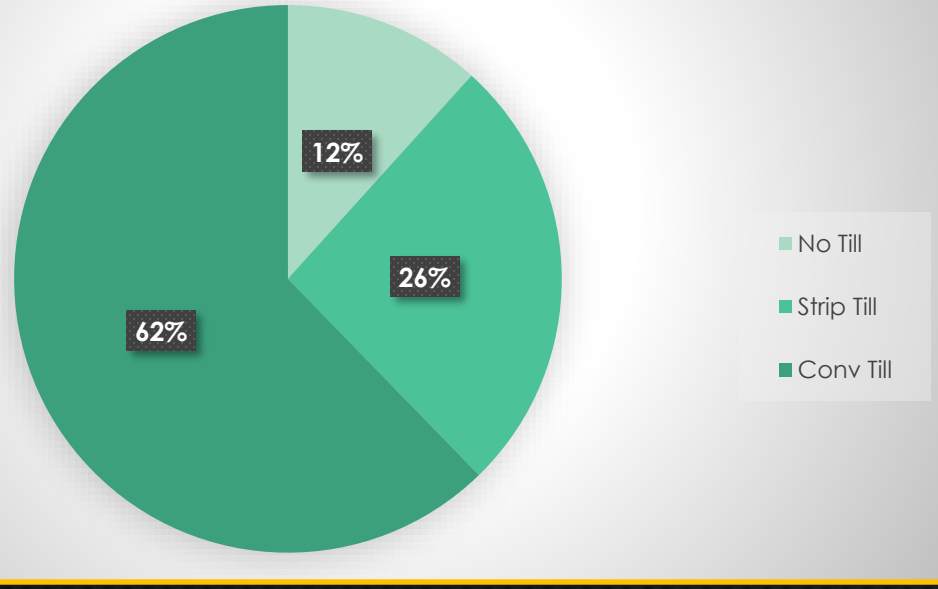
- ACRES SET = 2507 ACRES (2013-2019)
- 6 NO-TILL TRANSPLANTERS



2012 KY Tobacco Breakdown (According to 1193 Surveys)



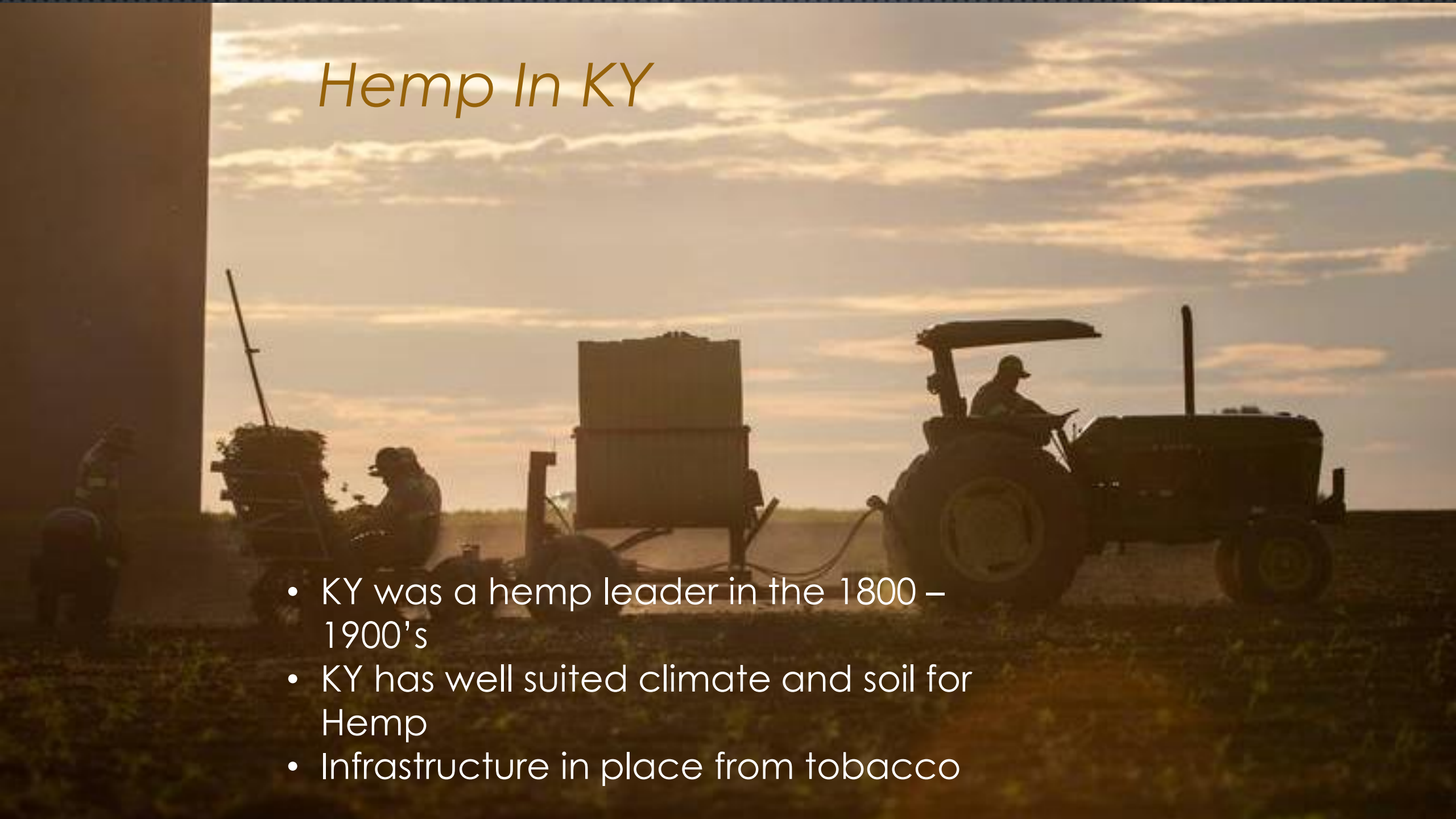
2017 KY Tobacco Breakdown (According to 1193 Surveys)



WHY DO NO-TILL?

- Greatly Reduces Runoff and Erosion
- Less Disturbance to Soil Structure
- Increased Water Infiltration
- Increased Moisture Holding Capacity In Soil
- Much Less Labor Inputs
- Reduced Weed Pressure

Hemp In KY



- KY was a hemp leader in the 1800 – 1900's
- KY has well suited climate and soil for Hemp
- Infrastructure in place from tobacco

KDA Industrial Hemp Research Pilot Program

Annual Overview

Production Year	# University Projects	Approved Processors	Approved Growers	KY Counties with Hemp	Approved Acres	Planted Acres	Harvested Acres	% Grain or Seeds	% Fiber	% CBD	% Grain & CBD	% Seed & Fiber
2014	7	9	20	14	-	33	-	47%	32%	21%		
2015	8	29	99	41	1,742	922	500	47%	6%	47%		
2016	17	45	137	60	4,600	2,300	2,000	34%	6%	60%		
2017	17	49	204	71	12,800	3,200	2,300	36%	5%	27%	32%	
2018	14	72	210	73	16,100	6,700	6,000	18%	4%	61.5%	14%	2.5%
2019	12	200	978	102	60,000	26,500	24,900	2%	4%	92%	0	2%

National 2018 100,000
2019 500,000 (250,000 Harvested)

PLANT COMPARISON

TOBACCO TRANSPLANT

HEMP TRANSPLANT

TRAY COMPARISON

TOBACCO TRAY

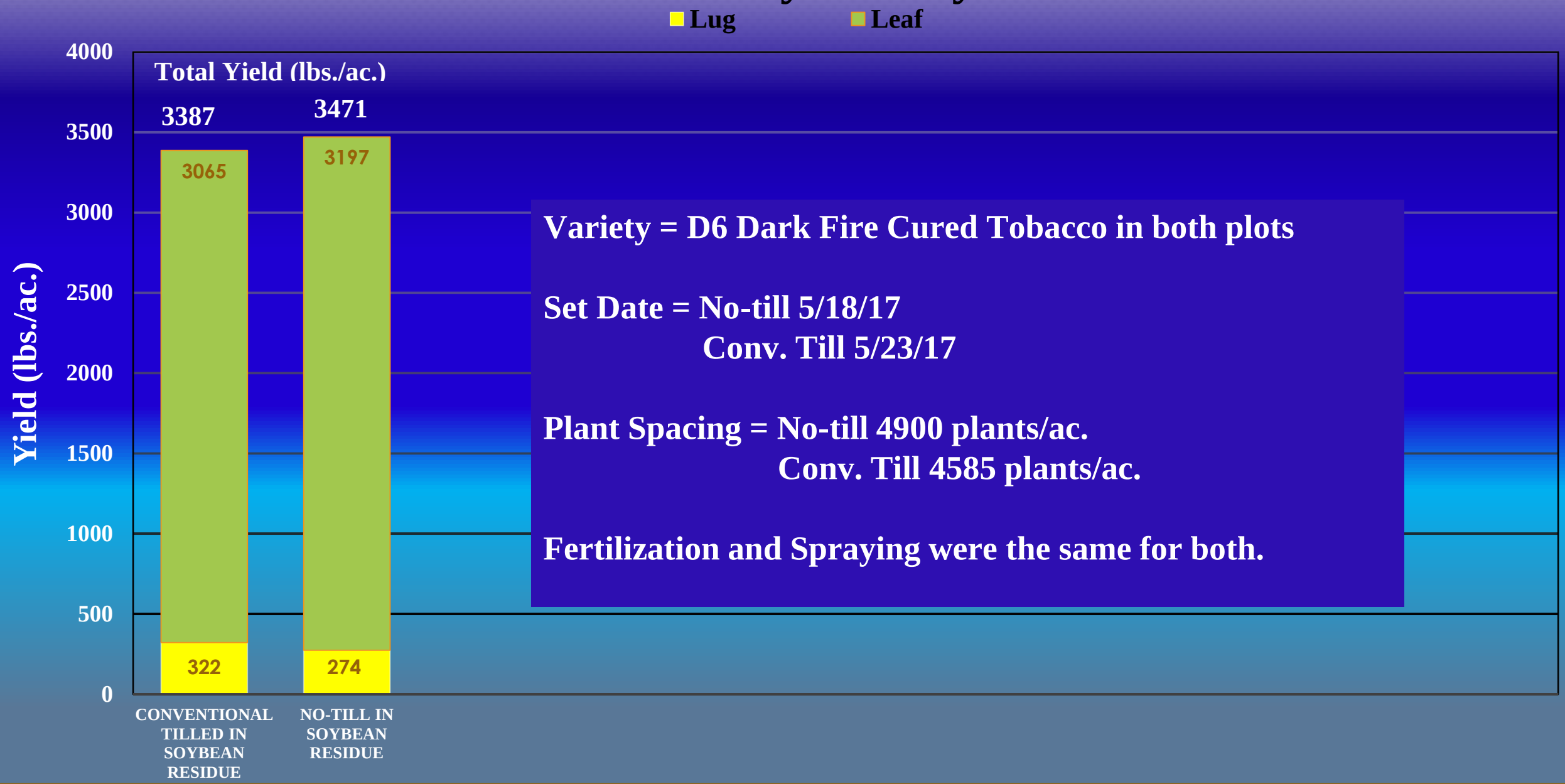
HEMP TRAY

ENERGY INPUTS

CONVENTIONAL

NO-TILL

2017 No-till Tobacco Yield Plot in Calloway County



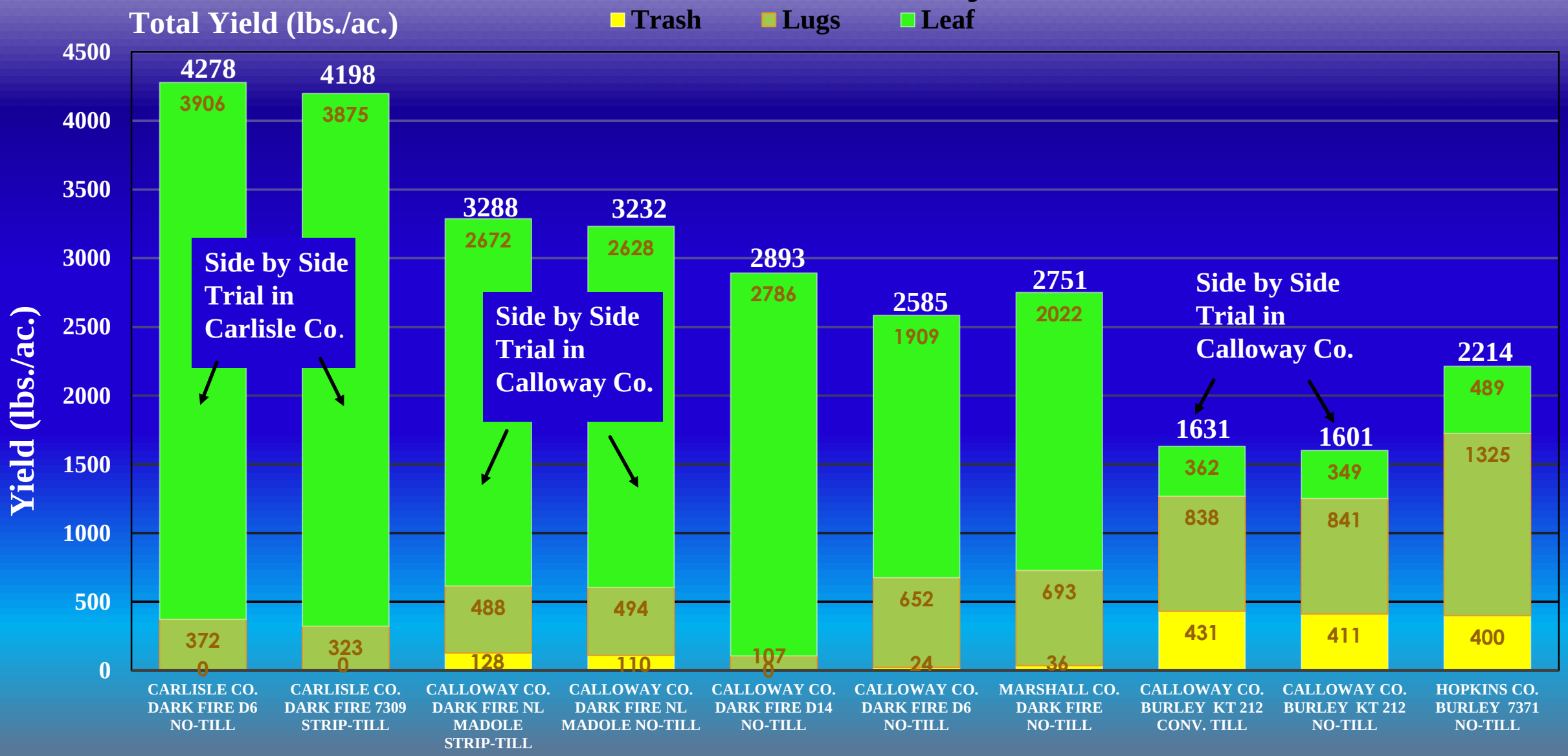
Variety = D6 Dark Fire Cured Tobacco in both plots

Set Date = No-till 5/18/17
Conv. Till 5/23/17

Plant Spacing = No-till 4900 plants/ac.
Conv. Till 4585 plants/ac.

Fertilization and Spraying were the same for both.

2016 No-till Tobacco Yield Plot Data
Western Kentucky



* Yields were greatly affected by heavy amounts of rain and the presence of disease in many areas during the 2016 growing season.

PLANNING FOR NO-TILL

START EARLY WITH SITE SELECTION

KNOW YOUR SOIL TYPE

NO-TILL WORKS BEST ON MEDIUM TEXTURED SOIL (SILT LOAM TO SANDY LOAM)

CAN PERFORM AND DO WELL IN CLAY SOILS, HOWEVER TAKES LONGER DRYING TIME FOR TRANSPLANTING

CONSIDER WEED CONTROL OPTIONS

- Limited Options for hemp
- Choose sites that have low weed pressure (avoid pastures, feed areas, and sparse cover sites)
- For hard to kill weeds spray timely application the year prior to transplanting (Check with Purchaser)

Plant a Cover Crop

- Best Weed Control
- Plant Cover Crop or use previous Crop Residues
- Keep transplanting time Frame in mind when choosing and terminating covers
- Consider C:N Ratio (24:1 for best residue decomposition and nitrogen cycling)

CRIMPING COVER CROP

- In a ideal situation you would want to crimp when legumes are in bloom stage to get most benefit from them.
- Unless cereal grains are mature, likely will need herbicide application to terminate.
- termination depends on desired transplant timing and soil type.
- Planting covers early the fall before for most benefit

LIVE COVER CROP

ROLLER CRIMPER

TRANSPLANTER IN ROLLED COVER

AFTER TRANSPLANTING

SEVERAL WEEKS LATER

FERTILIZATION

- SOIL TEST EARLY
- CAN ALL BE APPLIED PRE PLANT OR AS SPLIT APPLICATION.
- APPLY LIME, PHOSPHORUS, AND POTASSIUM IN FALL IF POSSIBLE WHEN USING NO-TIL
- SOIL PH WAS 5.8 AND LIME NOT INCORPORATED
- NUTRIENT AVAILABILITY

SOIL CONDITION AT TRANSPLANTING

GOOD QUALITY SET

BAD QUALITY SET

AVOID TRANSPLANTING IN WET CONDITIONS

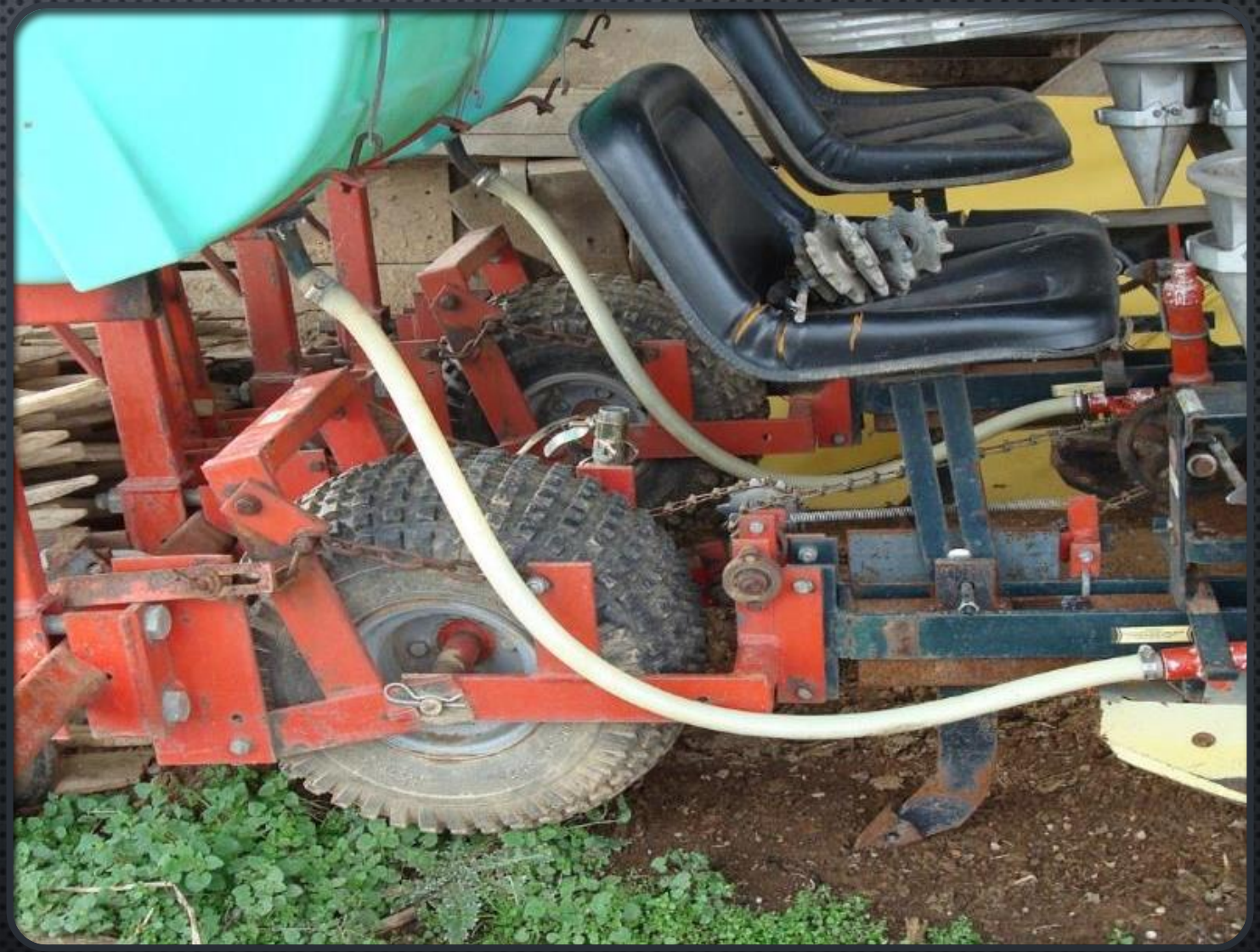
- NO-TILL CAN TAKE UP TO 2-3 DAYS LONGER TO DRY THAN CONVENTIONAL TILLAGE.
- USE OF HEAVY THICK COVER CROPS CAN PREVENT DRYING DURING EARLY SEASON.
- CAN GREATLY REDUCE YIELDS DUE TO SIDEWALL COMPACTION.

NO-TILL TRANSPLANTERS

SETUP AND DESIGN

OLD STYLE NO-TILL SETTER

- Modified conventional transplanters
- Lacked weight
- Poor quality transplant compared to newer machines



RJ TRANSPLANTERS

MECHANICAL TRANSPLANTER

CM TRANSPLANTERS

COMPARING SHANKS

- LEFT IS FACTORY CM SHANK.
- RIGHT IS MODIFIED AFTER MARKET BOOT STYLE SHANK

NEW CM TRANSPLANTER OPTIONS

TRANSPLANTING SCENARIOS

TERMINATION, TRANSPLANTING EXPERIENCES

TRANSPLANTING INTO RYEGRASS COVER CROP

- Really like the ryegrass influence on the soil and easy setting conditions.
- Spray before seed heads start to appear and maybe more ideally about 8’-12’ tall. Terminates easily.
- Annual Rye Grass does leave residue on surface nearly as long as the cereal grain. (C:N = 20.5:1)

TRANSPLANTING INTO ROLLED COVER CROP MIXES

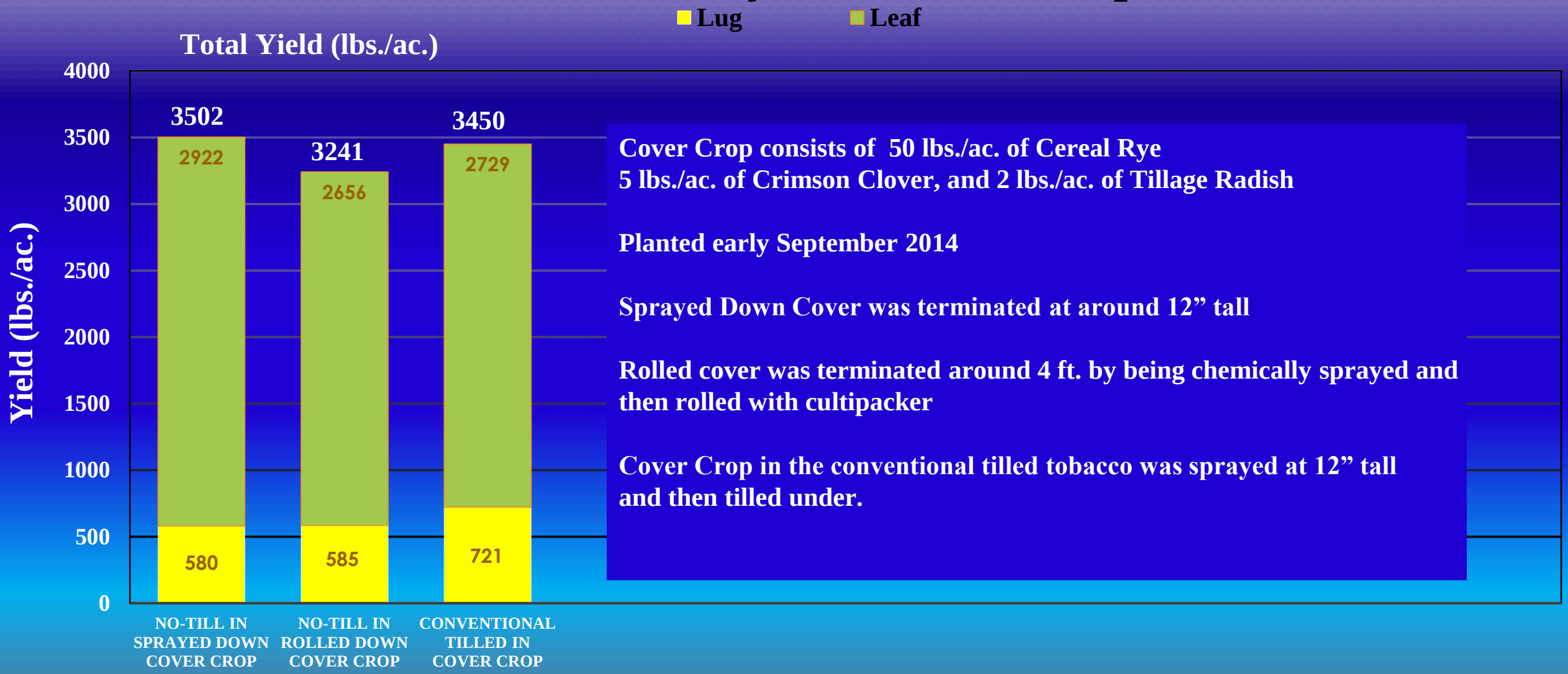
- Most preferred method for soil health, however can present some challenges at transplanting.
- Transplanters do fine in these conditions as long as cover is dry and crunchy.
- Moist soil underneath can present undesirable setting conditions.
- This field was rolled with cultipacker and sprayed with Glyphosate

COVER CROPS IN NO-TILL TOBACCO RESEARCH UK

RESEARCH PERFORMED BY BOB PEARCE, ERIN HARAMOTO, AND BEN GOFF

- What is the "value" of mixed cover?
  - Nutrient addition/immobilization?
  - Weed suppression?
- How should we manage cover crops?
  - Termination timing
  - Can we extract economic value from cover crop without putting cash crop at risk?

2015 No-till Tobacco Yield Plot in Webster County with Cover Crops



Cover Crop consists of 50 lbs./ac. of Cereal Rye
5 lbs./ac. of Crimson Clover, and 2 lbs./ac. of Tillage Radish

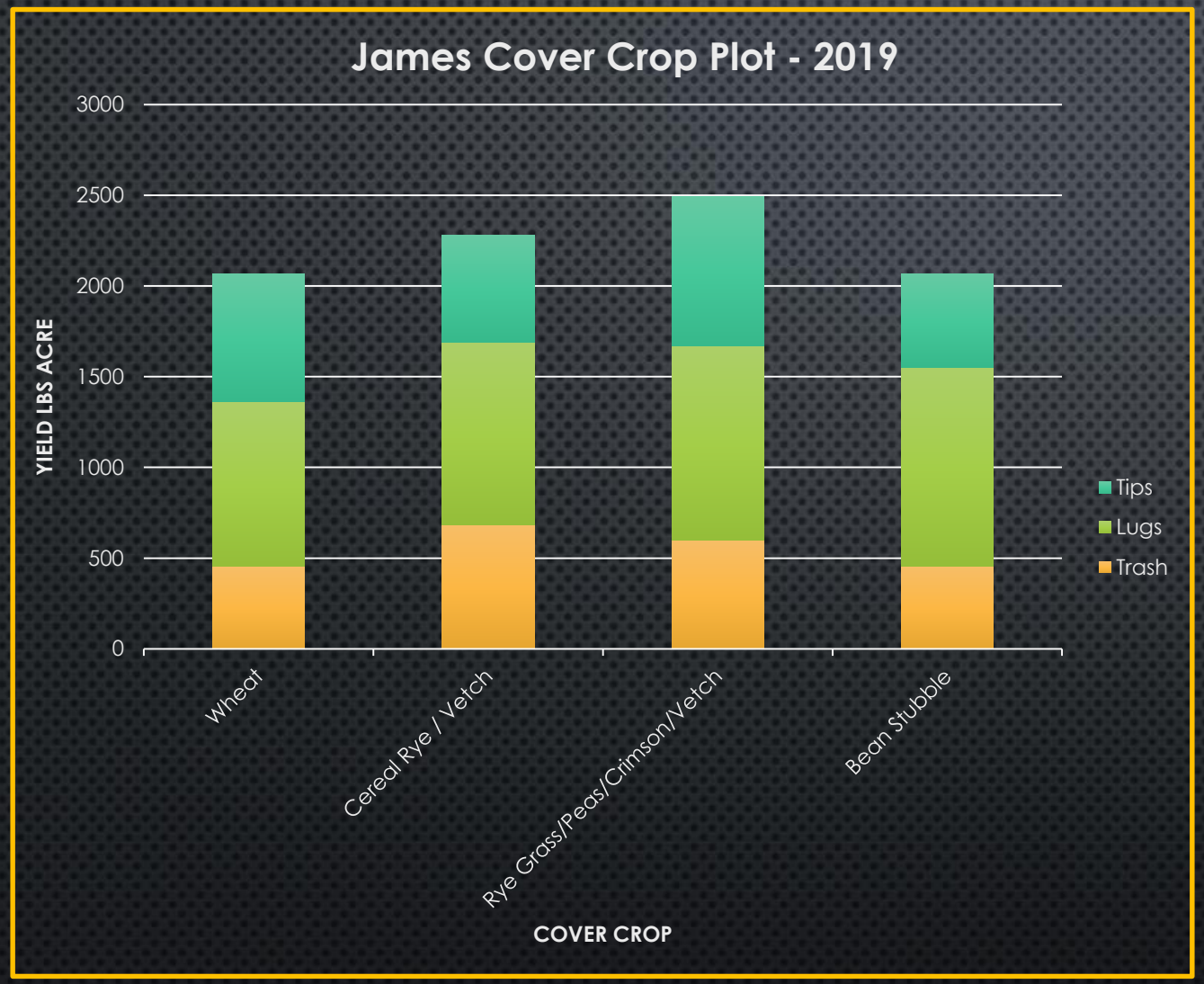
Planted early September 2014

Sprayed Down Cover was terminated at around 12" tall

Rolled cover was terminated around 4 ft. by being chemically sprayed and then rolled with cultipacker

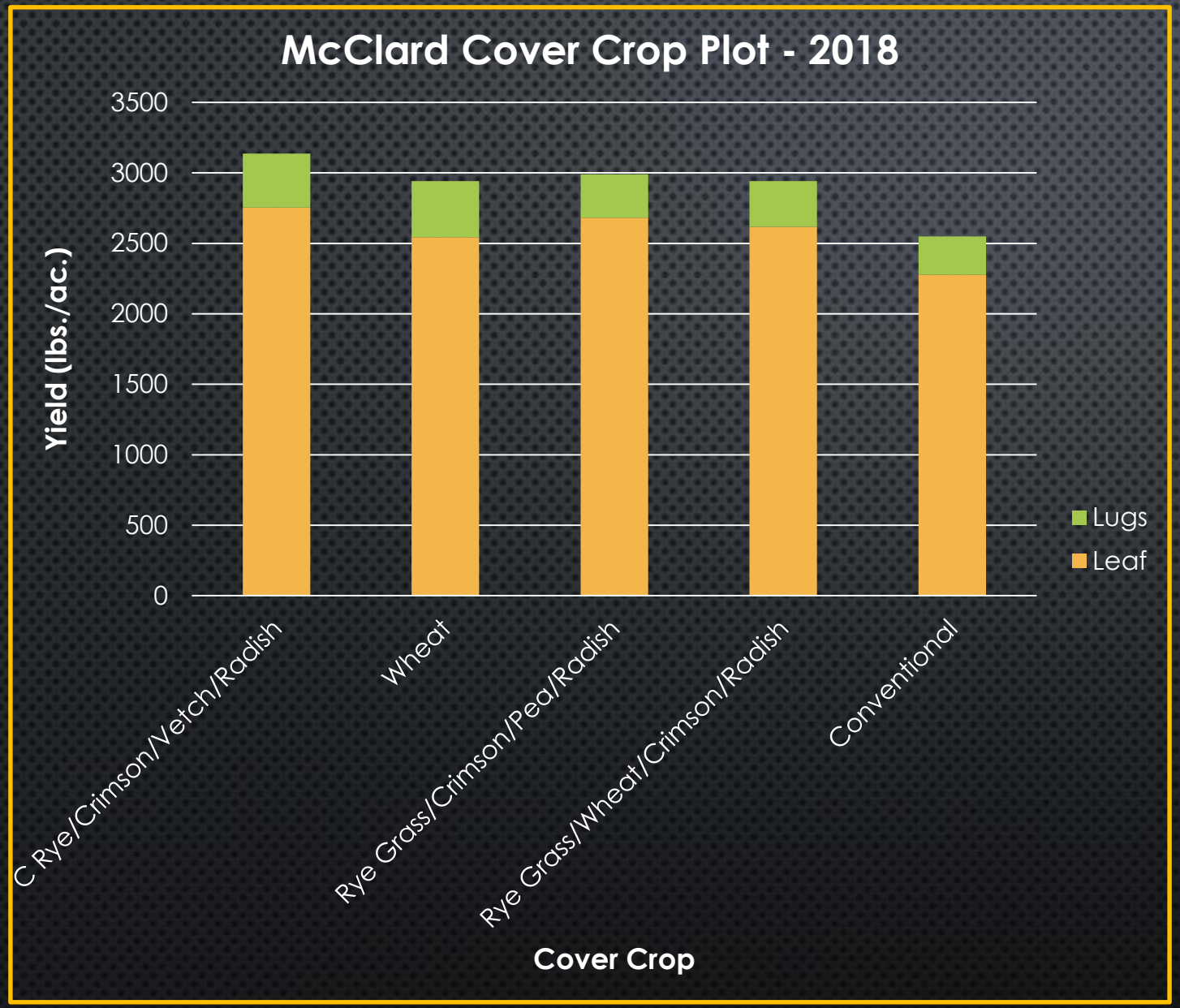
Cover Crop in the conventional tilled tobacco was sprayed at 12" tall and then tilled under.

JAMES COVER CROP PLOT



Variety – Hybrid 404LC or HB 4488 PLC
Spacing – 40"x 22" (7128 Plants/Ac)
Set Date - Mid-Late May
Strip Date – Dec 6 2019
Cover Crop Plant Date – Nov 4 2018
Cover Crop Kill Date – April 23 2019

McClard Cover Crop Plot



Variety – PD 7318LC

Spacing – 40"x 32" (4901 Plants/Ac)

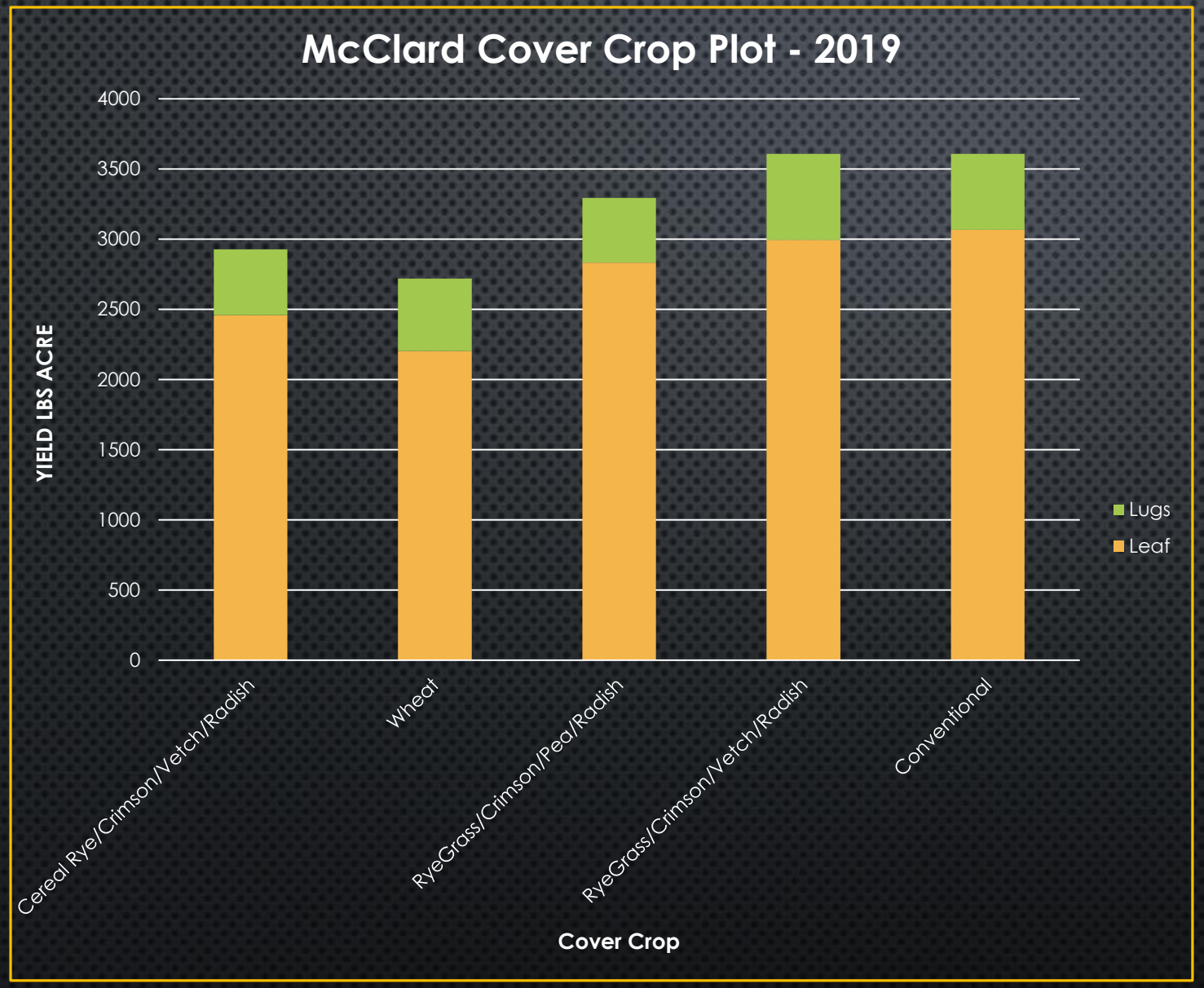
Set Date – May 17 2018 Conv-Till

May 18 2018 No-Till

Strip Date – Nov 19 2018

Cover Crop Plant Date – Oct 26 2017

Cover Crop Kill Date – N/A



Variety – D17

Spacing – 40"x30" (5227 Plants/Ac)

Set Date – June 13 2019

Strip Date – Dec 4 2019

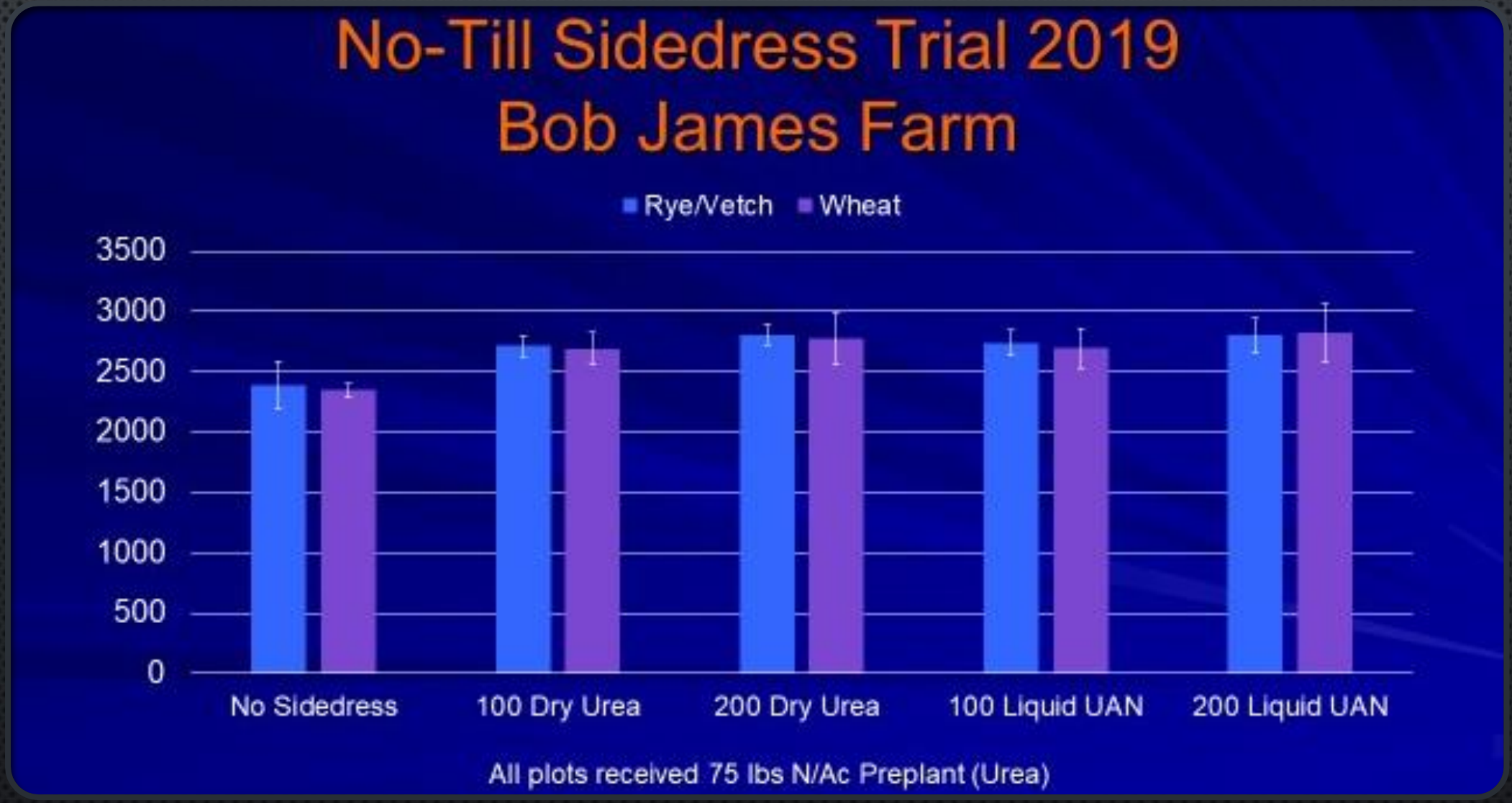
Cover Crop Plant Date – Sept 6 2018

Cover Crop Kill Date – May 6 2019
Bush Hogged, Sprayed w/ Roundup on May 13 2019, Sprayed with Gramaxone on June 5 2019 (Approx.. 36" tall)

* Set under heavy soil conditions in 2019

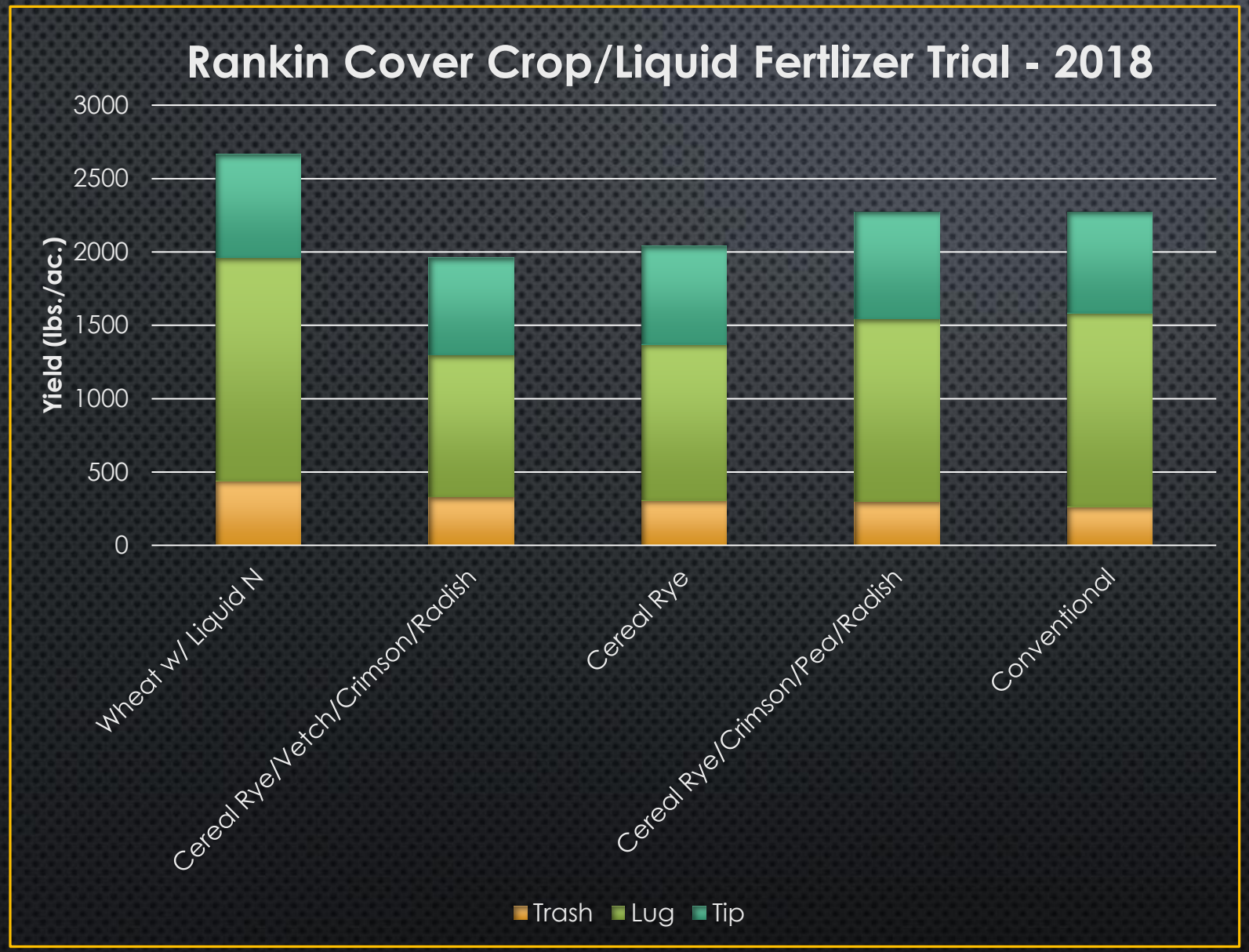
LIQUID APPLICATOR W/ SPIKE WHEEL INJECTORS

(PURCHASED WITH FUNDS PROVIDED BY THE BURLEY TOBACCO GROWERS COOPERATIVE ASSOCIATION)



The advantages of the spike wheel is that it injects the fertilizer below the surface making it less prone to losses from volatilization or surface runoff.

RANKIN LIQUID FERTILIZER TRIAL



Variety – Hybrid 404

Spacing – 40"x20" = 7841 Plants/Ac

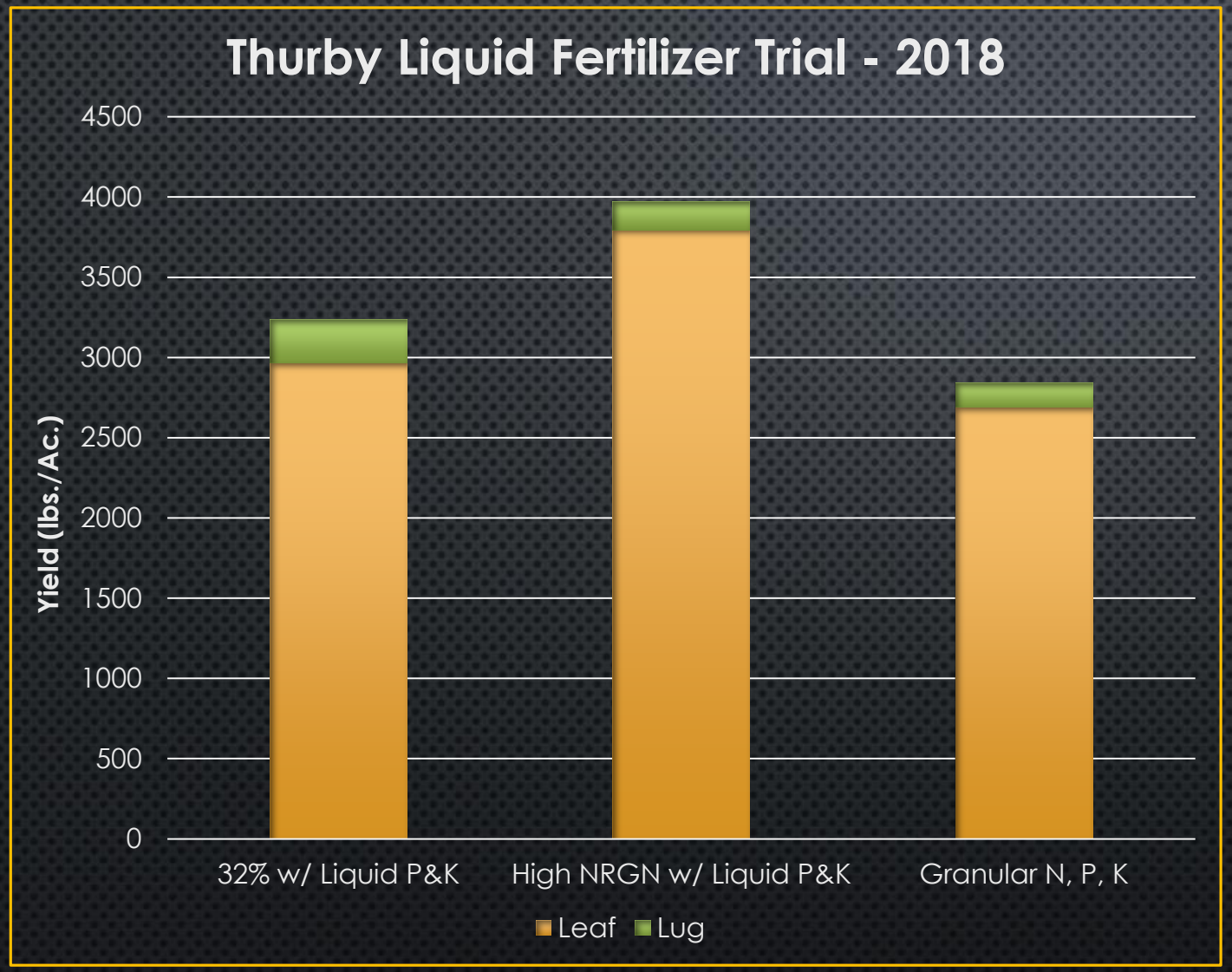
Set Date – June 9

Soil Test – 250-0-300

* *Applied full rate dry bulk fertilizer preplant to all strips with exception to wheat, applied 75-0-150 preplant*

- *Applied 147 lb/ac N (UAN 32%) and 173 lb/ac K on wheat plot on June 29*
- *Patch did have areas of black shank*

THURBY LIQUID FERTILIZER TRIAL



Variety – KTD8

Spacing – 40'x32" (4901 Plants/Ac)

Set Date – June 3 2018

Strip Date – Jan 2 2019

Liquid Application Date – July 2 2018

Soil Test – 250-50-125

- *Applied 76 gal/ac 32% UAN, 5 gal/ac P, 10 gal/ac K*
- *Applied 54 gal/ac High NRGN, 5 gall/ac P, 10 gal/ac K*
- *Granular applied preplant*
- *Tobacco green at weighing (weather related)*

QUESTIONS?