No-Till Cotton:
Past
Present
Future
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What is Conservation Tillage?

- Terms: **No-Till**, Strip Till, Reduced Till, Ridge Till, Low Till
- Conservation Tillage is an Agronomic System That Reduces the Number of Tillage Trips to a Bare Minimum - Leaving as Much or Residue as Possible (plant material, old stalks, or cover crop)
- NRCS – > 30% residue
- **The most cost effective system of controlling erosion & increasing soil health while maintaining or improving yields. JFB**

The Plowman's Folly, 1943

- Book by Edward Faulkner
- " The fact that there is no one has ever advanced a scientific reason for plowing"
- Time Magazine called the statement 'one of the most revolutionary ideas in agricultural history'
- Recommended reading

Soil Erosion: The Issue

- West Tennessee had the highest erosion rate in the US
- Many TN cotton fields were **losing over 80 tons** of top soil per acre per year!
- State of TN was losing an average of 14.5 tons of soil per acre per year (presently >2.0 tons /a/year)

NT Movement Beginning

- 1960's in Western Kentucky
- Shirley Phillips and Harry Young, Christian Co. KY
- Celebrated 50 years of continuous No-Till on first acre of Corn , 2022
- Erosion Control on land coming out of 'land bank'
- Modified mule drawn planter, 2,4-D and Atrazine, paraquat
- KY leads the nation in percent No-till acres today
- 70% NT Wheat, 50% NT Corn and 80% Soybeans, followed by TN and VA
- Tennessee leads the US in % acres **No-Till Cotton**

U of TN follows UK….

- Late 1960's trials and demos begin at UT Milan Research and Extension Center under direction of Tom McCutchen
- Did not have blessing of U of TN administration
- Continued research on 'backside' of Milan Station

Team Approach at U of TN

- University Of Tennessee (A Team of Researchers)
- **Industry- Crop Protection and Equipment Companies**
- **Farmers and Growers**
- NRCS
- TN Dept. Of AG

NT Early Pioneers U of TN TNT- Team and Systems Approach

- Tom McCutchen- Agronomist
- John Bradley - Agronomist
- Bob Hayes- Weed Control
- Don Tyler - Soil Management & Cover Crops
- Charles Graves – Seed and Systems
- Albert Chambers'- Diseases
- Curtis Shelton - Agricultural Engineering
- Donald Howard- Fertility
- Joe Burns – Forage Systems
- Phillip Hoskinson – Cotton Physiology
- Gary Lentz - Entomology
- William Hart – Agricultural Engineering
- Estel Hudson – Agricultural Economics

UT Milan continued…

- First work with corn, soy and double crop wheat and soy
- Research with **NT Cotton** began in 1980 at Milan
- Limited herbicides for weed control
- Limited success with available planting equipment
- Allis Chambers first commercial planter, very slow
- John Deere 7000 planter introduced in mid-1970's
- Attachments came next, coulters, residue managers, down pressure springs etc.
- We worked very closely with industry to make NT success possible

UT Milan

- 1980's New herbicides: Roundup for burndown, Poast, Fusilade (grass control) , Basagran (broad leaf control)

- First NT Field Day 1981 – 500 people, annual event grew to 14,000 by 1996, nationally & internationally known. Continues presently on a biannual basis.

- Early 1980's chemical companies became interested, Bronco (Roundup + Lasso), Bas-A-Plan (Basagran + Post)

Mid 1980's equipment companies started 'converting ' planters and drills.

Early Barriers To Adoption

- Tradition/Peer Pressure/Image
  - Fear of Change/Risk
  - Fear of failure
  - Cost of conversion -- Equipment cost, Increase crop protection cost
  - Agronomics i.e. yields, soil type/conditions, crop rotation, disease/insects, weed control
  - Perception of lower yields (No-Till = No Yield!)
  - Was not visually acceptable ('Farming Ugly')
  - Lack of know how, local expertise, information
  - Lack of strong third party support
  - Landlords/Bankers
  - Insurance on No-Till crops

No-Till Cotton in Cotton Residue

No-Till Cover Crops For Cotton

- Single, Mix or Match?
- Grass and/or legume?
- Annual Rye Grass * 20-25 lbs./ac
- Cereal Rye 20-25 lbs./ac
- Wheat 25-35 lbs./ac
- Crimson Clover 6-8 lbs./ac
- Rye Grass plus Crimson Clover
- No need for ‘Duke’s Mixture’ (hodgepodge)

Seeding Methods for Cover Crops In Cotton

- No-Till Drill preferred: immediately after harvest and stalk shredding
- Arial seeding (plane or drone): 10-14 days prior to defoliation
- Many different bed or row configurations: broadcast ,on top of rows/beds, between beds

No-Till Cotton In Wheat/Soy Residue


JOHN DEERE
1560
Wheat On Corn

Why Annual Rye Grass?

- Dr. Lloyd Murdock's, U of KY Princeton Research,
- " Breaking the Fragipan", Soil Health, 'Making Fragipan Soils More Productive with a Ryegrass Cover Crop'.
- What is a fragipan soil? A near impervious aluminosilicate and iron layer that is 6" to 30" below the soil surface. 'Cement Layer'
- Occupies 12% or 50,000,000 acres of US soils
- Kentucky, Pennsylvania, Mississippi, New York, Arkansas, Southern Illinois and Indiana, Ohio and Tennessee.
- Impedes rooting development and internal drainage

How Ryegrass Works

- Fibrous root system
- Roots excrete certain exudates (chemical secretions) that have a degrading effect on the fragipan.
- In addition annual ryegrass roots exert 1,200 psi on the pan to help penetrate.
- It takes 10-15 years to completely fracture the fragipan
- The pan is broken 0.6 to 2.5 inches per year
- Research was conducted with 20 lbs. of ryegrass per acre per year and burned down prior to booting

Yield Reduction on Fragipan Soils - Soybeans

- 1984
- Yield on fragipan soil with pan depth of 30 inches was 42 bu./acre of Soybeans
- Yield on fragipan soil with a pan depth of 20 inches was 25 bu./acre Soybeans
- Yield on fragipan soil with a pan depth exposed was 7 Bu./Acre bu./acre Soybeans
- Corn followed the same trend, 159, 110, and 87 bu./acre in a heavy rain fall season.

Management of Cover Crops In No-Till Cotton

- Management required!
- Seed Early as possible! immediately after stalk destruction
- Drilling (no-till) preferred method
- Arial seed prior to defoliation, Airplane, Drone
- Two part burndown approach prior to planting
- Full Rate of glyphosate followed by paraquat
- Two weeks prior to planting, start clean!
- Cover crop may be grazed prior to planting
- Planting ‘green’ not recommended in cotton
- Crimson clover contributes ~ 20-30 lbs. of nitrogen per acre and may delay maturity and boll opening in studies at MREC.

Why No-Till ??

- Reduced Labor Requirements
- Time Savings
- Field Accessibility
- Lower Machine Investment and Reduced Operating Cost
- Reduced soil erosion
- Improved Water Infiltration
- Increased Organic Matter
- Decreased Soil Compaction
- Improved Soil Tilth
- Increased Wildlife and Food Habitat
- Reduced Air Pollution
- Major increase in Earthworms and Biological Activity
- Other…

Planting 'Rules'

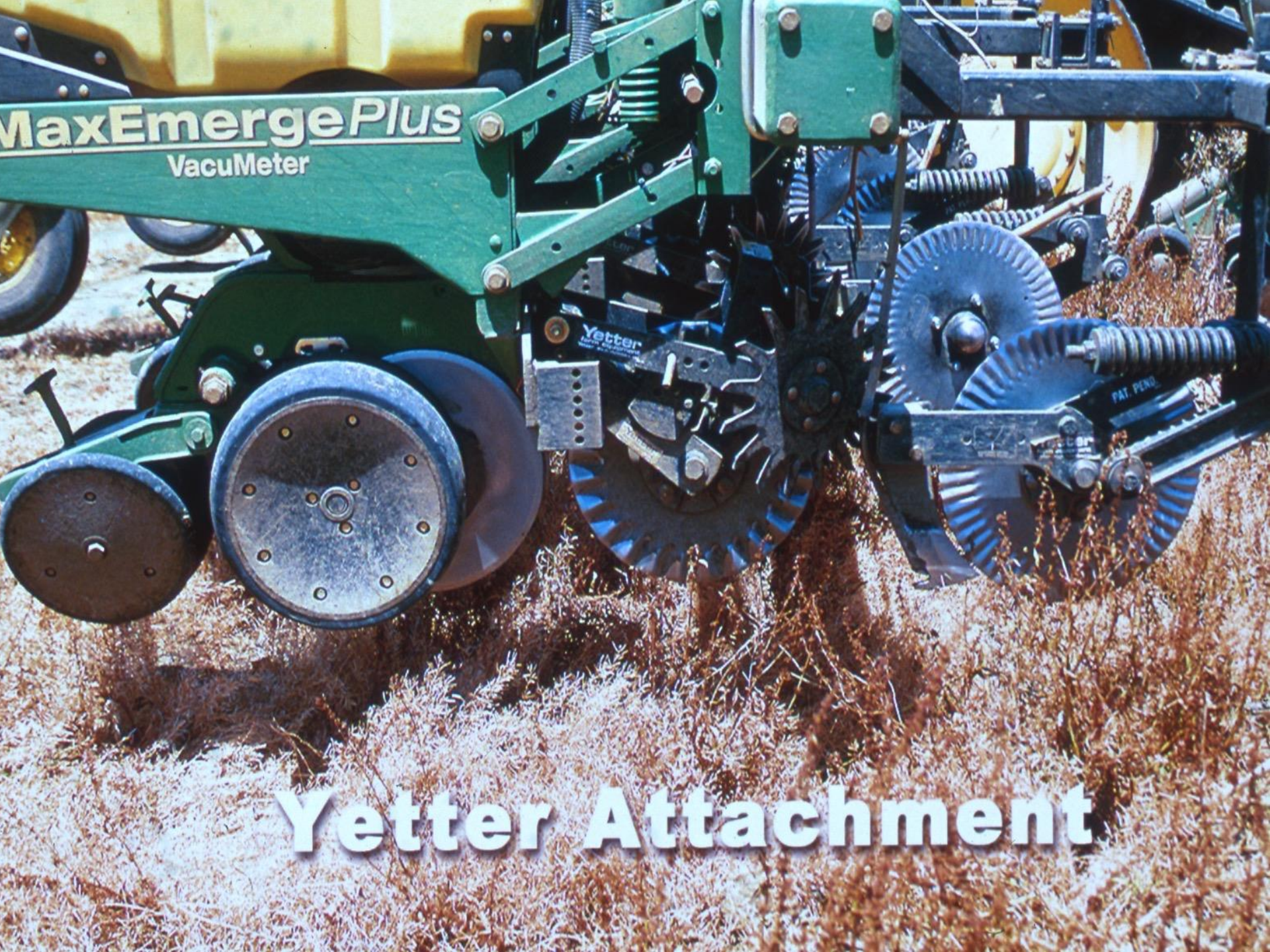
- "Cotton wants to die as soon as it planted"
- Start clean with all vegetation dead or dying.
- 65 F at 3"- 4"depth, three consecutive days, 5 day outlook should have temps of above 50 F
- May 1st is optimum planting for Tennessee cotton, April 25-28 was best for highest yields
- Plant ½ to 1 inch deep!
- Plant fungicide and insecticide treated seed
- 40,000 to 50,000 seed per acre
- Apply preemergence herbicides at or near planting
- Proven Biologicals

Residue Management for Cotton

- Terminate 10-14 days prior to anticipated planting, (Roundup/glyphosate preferred herbicide)
- Add 2,4-D for added winter broadleaf control 21-30 days prior to planting
- Terminate cereal rye when is about hip high
- Apply follow up application of paraquat just prior to planting, at planting or just after planting.
- Planting ‘green’ very challenging with NT Cotton
- Choose planter attachment as soil conditions and moisture
- Coulters & Residue movers needed in most cases when planting in previous crop residue

No-Till Planter Focus

- Transmission
- Parallel linkage
- Down pressure
- Row units – calibration
- Row cleaners
- No-till coulters
- Opening disc
- Guage wheels
- Seed tubes
- Closing wheels



Yetter Attachment

Fertilization of NT Cotton

- Soil Test
- pH 5.8-7.0 , best at 5.8-6.5
- Nitrogen- consideration previous crops (ie Soybeans) 80-100 lbs. per acre, best if split
- Phosphorus
- Potassium: very essential
- Boron: 1-2 pounds per acre preplant, 0.1 lb. foliar 3 application during season
- Sulfur: add 10 lbs. to basic program, on high pH soils and low OM soils
- Starter Fertilizer: placed beside, under or over the row (surface) **NOT** on the seed in the row.
- Cotton responds to foliar applications per tissue testing
- 4 R's, Right Source, Right Rate, Right Time and Right Place

Insect Management For No-Till Cotton

- Much the same as tilled cotton
- Recommend at at or near planting: Pyrethrin for cutworm control.
- IPM Program
- Cotton scout or consultant to check cotton weekly throughout growing season and make recommendations
- Technology in the seed traits: aphids, plant bugs (Lygus), thrips, bollworms, army worms, plant bugs, white flies

Cotton Technology
“it is in the seed’

- Bollgard 1 (1996)
- Roundup Ready (1997)
- Bollgard II (~2005)
- Dicamba + Liberty Link (2020)
- Enlist (2,4-D)
- Bollgard III (2021) includes WideStrike
- ThryvOn plus Bollgard 3 (2024)
- ThryvOn 2 (2027)

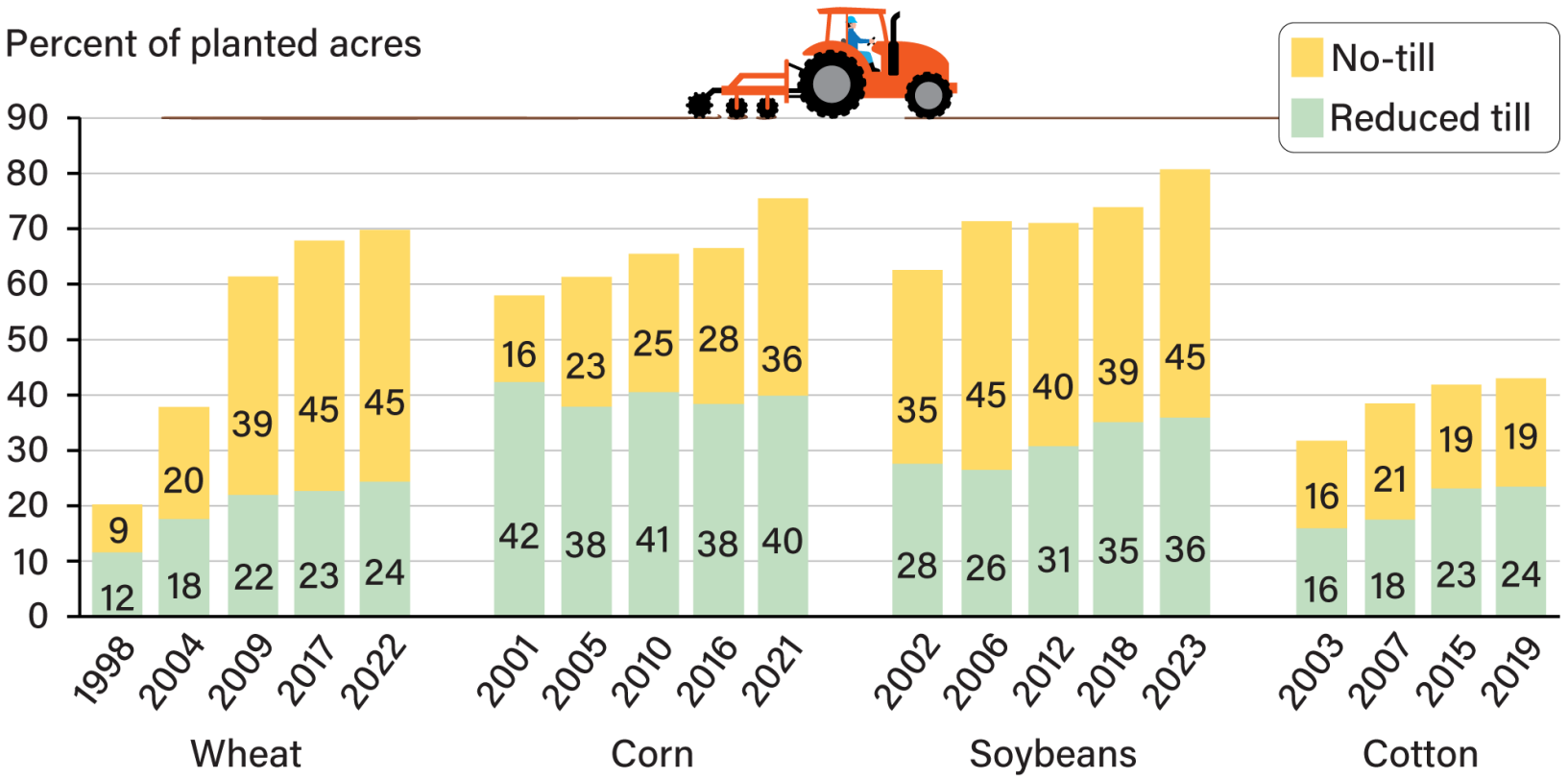

D&PL
Delta and Pine Land Company
Paymaster
PM 1560 BG/RR
D&PL
Delta and Pine Land Company
Paymaster
PM 1560 BG/RR

Present

- CTIC stopped preforming national CT Surveys in 2008
- No-Till and CT has leveled out or stagnated in recent years in most all states.(1-1.5 % growth)
- **We have more positive tools to address the barriers to NT than ever in history of the NT movement**
- Precision ag, GPS (vs. mechanical row markers, foam markers, chains etc.), GIS, auto steer, cab control down pressure, seeding rate, planting depth, seed population….
- Modern sprayers
- GMO Cotton (Boll Guard and RR in 1997)
- Modern precision NT planters (faster and accurate seed placement) , Hydraulic down Pressure)
- No-Till fertilizer placement
- NT attachments with quick adjustments
- Data for decision making process
- Most all crops, tobacco, veggies, rice, sugar cane etc.

Percent of no-till and reduced till acreage for select crops, 1998–2023

USDA Economic Research Service
U.S. DEPARTMENT OF AGRICULTURE



Note: A field is considered to be no-till if the producer reported no tillage operations on the field, and fields are considered to be reduced tillage if the Soil Tillage Intensity Rating (STIR) calculated for the field based on tilling operations is less than 80. STIR values range from 0 to 200. Wheat includes winter, spring, and durum wheat combined.

Source: USDA, Economic Research Service (ERS) using USDA, ERS and USDA, National Agricultural Statistics Service Agricultural Resource Management Survey data.

CHARTS of NOTE

2024 Tillage Methods In Tennessee (%)

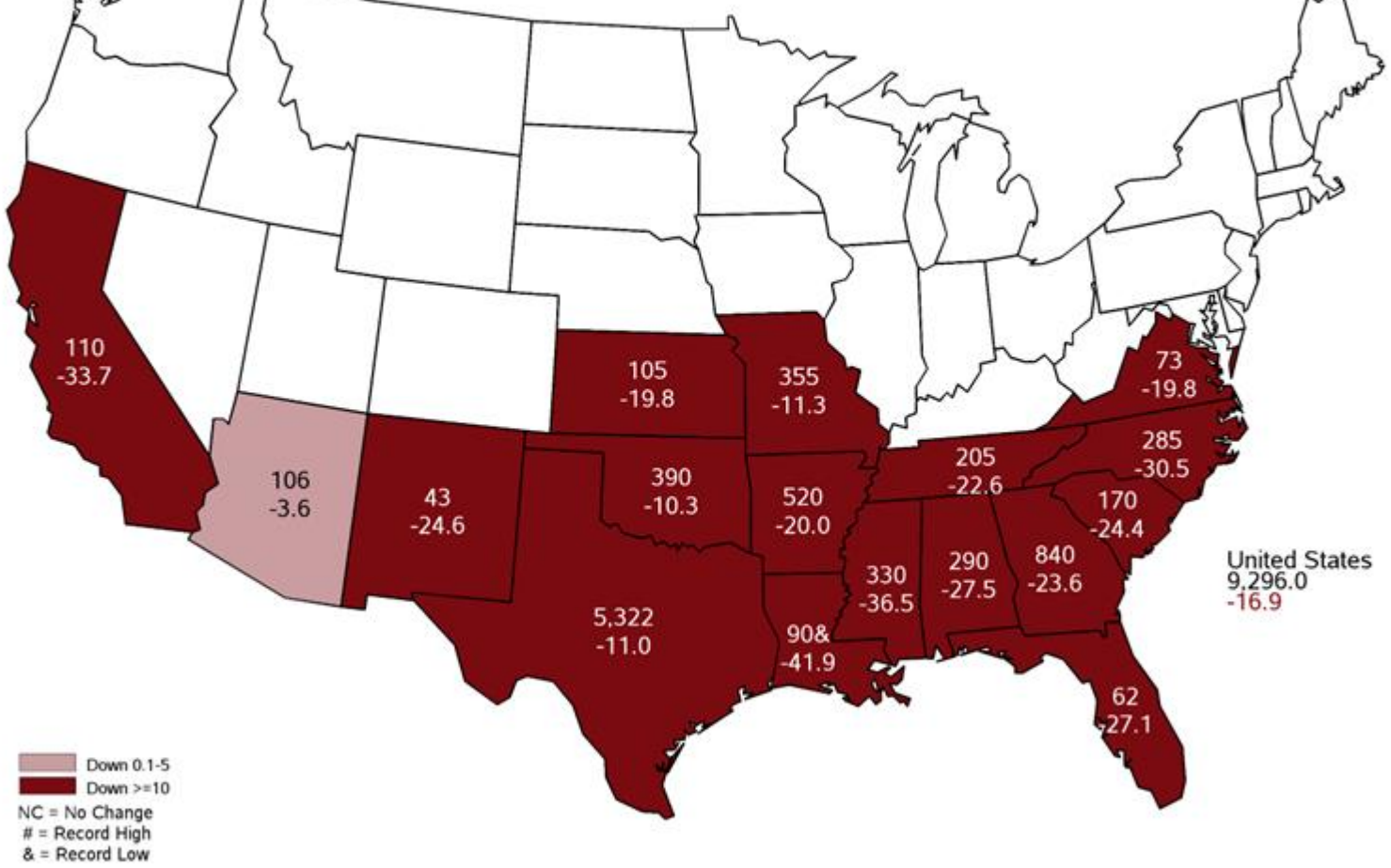
	Cotton	Corn	Soybeans	All crops
Percent				
No-till	78	75.9	81.8	78.6
Con-Till	21.7	19.4	15.3	17.5
Convent	3.3	4.7	2.9	3.9

2023 US Acres in CT & NT

- Soybeans – FS- 62% (45% NT)
- Soybeans – DC- 76% (71% NT)
- Corn – 76% (36% NT)
- Small Grains – Fall- 69% (45% NT)
- **Cotton - 43% (18% NT)**
- Argentina – 85% + (NT)
- Brazil- 85% + (NT)
- US - 35 % (NT)
- World – 7% (NT)

2025 Cotton Yields by States (lint lbs./ac)

California	1,610	0%
Arkansas	1,540	14%
Louisiana	1,490	12%
Tennessee	1,440	78%
Missouri	1,331.	19%
Mississippi	1,330.	18%
Arizona	1,260.	10%
Virginia.	1,170	45%
North Carolina	1,150	28%
Georgia.	1,010	31%
Alabama.	1,010	15%
South Carolina	977	
Florida	960	
Texas	667	1.7 %



ted States Department of Agriculture
onal Agricultural Statistics Service

September 12, 2025

Down >=10
NC = No Change
# = Record High
& = Record Low

United States Department of Agriculture
National Agricultural Statistics Service

September 12, 2025

Why No or Slow Growth?

- Prosperity – growers have not been as cost oriented in recent years due to high commodity prices, with current economics NT should grow
- Growers love big, new, shiny, and powerful equipment
- New tillage introduced ‘tools’, vertical tillage, ‘harrows’ etc….
- Larger and more ‘wholesale farmers’
- Tillage recommendations for resistance weed control
- Lack of technical support and emphasis (NRCS, new research, Extension, consultants)

Future

- No-Till and Conservation tillage will grow and regain some acre losses as commodity prices decrease – 1.5% growth per year
- ‘Soil Health’ will continue to become more and more important
- Continued environmental concerns from public
- Cover crops planting in NT cotton will continue to increase
- NT and CT will continue to grow at a rapid rate in under developed countries

KEYS TO SUCCESS IN NO-TILL

- Positive Attitude
- Systems Approach
- Address Compaction before starting
- Obtain a Stand / Population (correct planter/drill settings)
- Control Pests (Weeds, Insects, Diseases)
- Apply Fertilizer Correctly (placement very important)
- **Have a Mentor!**
- Practice! And continued on going research!
- Be Committed and Patient

No-Till FACTS: That You Can Bank On It !

- Soil Organic Matter will not increase (never ever) in clean tilled fields
- Soil health will not improve in clean tilled fields, biological activity will stay a ‘0’.
- You will see very few, if any, earthworms in tilled fields
- Tilling and plowing under residue in wet soils creates soil compaction, especially a disc.
- No-till or strip till is the best way to manage and preserve crop residue to obtain the positive benefits and it is cost effective.
- No-Till, does not mean ‘Never Till’!

Thank You!

Questions? Comments?

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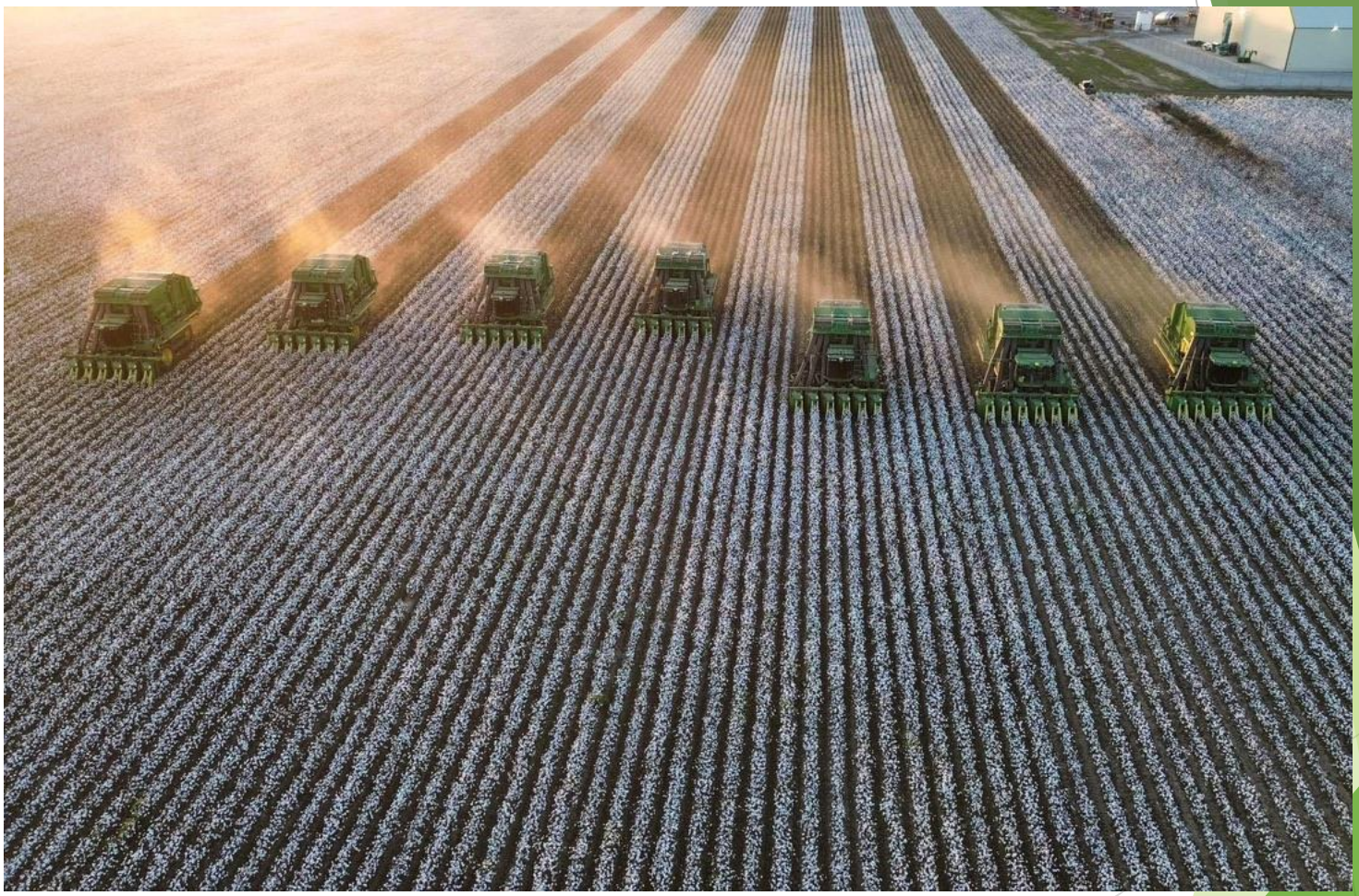
John Gibson



Cotton Acreage and Tillage Practice, 2003

Cotton acreage and tillage practices, 2003

State	Planted	With no tillage operations	With residues > 30 percent (conservation till)	With residues > 30 percent and no tillage operations	With 15-30 percent residues (reduced till)	With residues < 15 percent (conventional till)
	Acres		*Percent of acres*			
Alabama	522,699	50.6	53.7	45.8	20.5	25.8
Arizona	217,291	# 3.7	# 3.7	# 3.7	L	92.6
Arkansas	975,694	12.2	* 9.2	* 9.1	* 3.6	87.2
California	693,613	0.0	0.0	0.0	0.0	100.0
Georgia	1,282,497	* 39.5	* 38.1	* 31.6	* 15.3	46.6
Louisiana	518,923	a 6.8	# 7.9	a 6.8	* 6.2	85.9
Mississippi	1,104,050	20.1	* 21.5	18.9	* 5.1	73.4
Missouri	394,201	21.9	23.3	19.4	* 8.6	68.1
N. Carolina	795,162	34.2	36.6	28.1	17.8	45.5
S. Carolina	220,000	L	L	L	L	L
Tennessee	557,258	54.0	51.3	49.8	* 9.8	38.9
Texas	5,540,529	* 1.7	* 4.1	# 1.6	* 8.7	87.2
All	12,821,917	15.2	16.2	13.1	9.1	74.6


The
End
2025