An Overview of Cotton Research and Production in Louisiana

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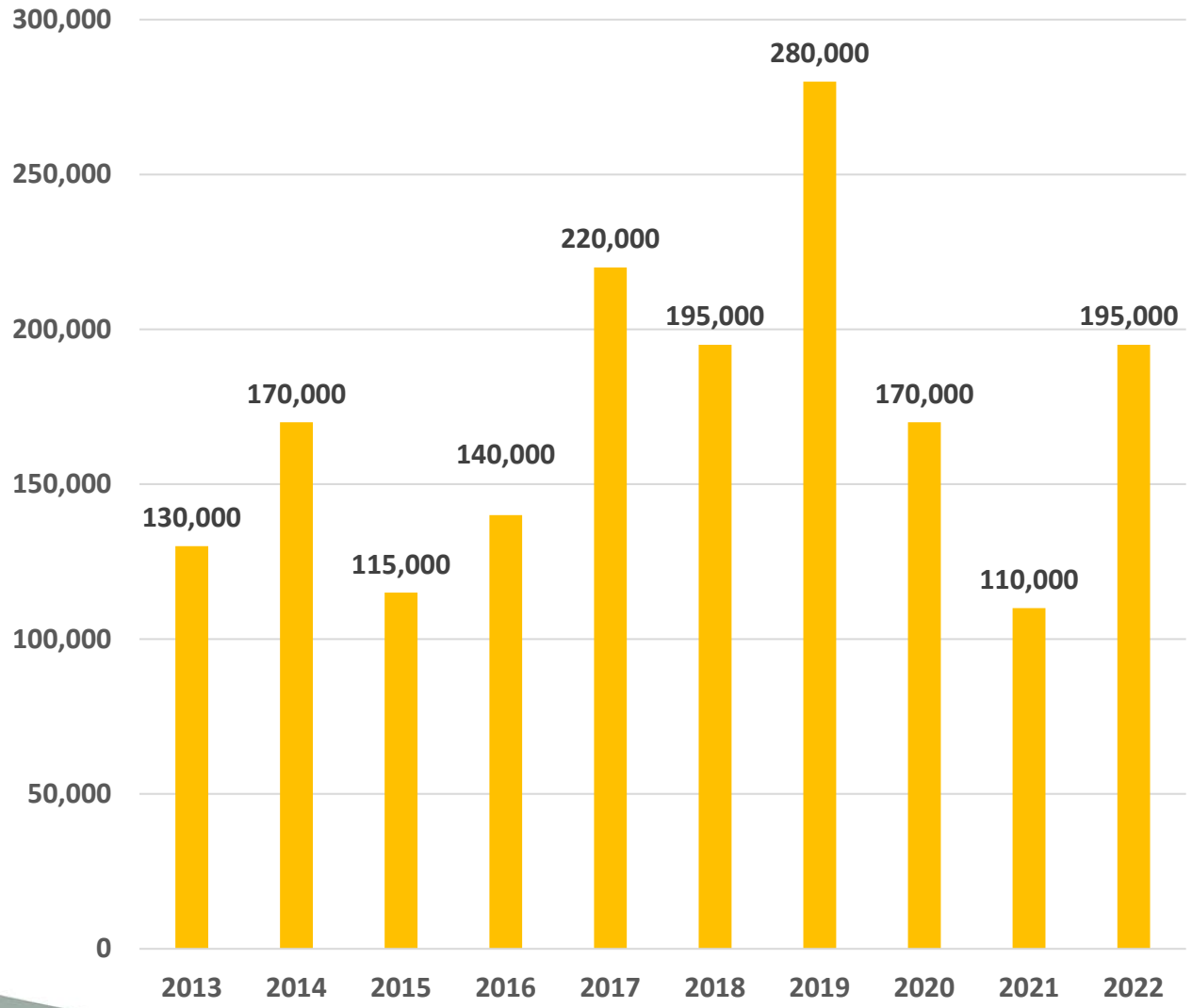
Cotton Acreage in Louisiana



Value of production in 2021 was $82.858 million with an average lint yield of 1,011 lbs/acre. In 2022, lint yield averaged 909 lbs/acre (USDA NASS)

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Why the acreage shift?

- Increases in grain yield potential and price
- Ease of management in grains
  - Fewer trips across the field
  - Potentially out of the field earlier
  - Requires less hands per acre
- Increased demand for corn
  - Ethanol
- Increased demand for soybeans
  - China

Influential Cotton Research in Louisiana

- Previous research has been instrumental in increasing yields, reducing production costs and minimizing losses from insects, weeds, nematodes and plant diseases

- Key research was conducted to combat the invasive boll weevil, which first appeared in Louisiana in 1903
  - Major yield limiting factor in Louisiana cotton production
  - Cost U.S. cotton producers more than $22 billion in yield losses and control costs

- In the mid-1950's, LSU AgCenter scientists documented boll weevil resistance to DDT

- From the 1950's to the 1970's, LSU AgCenter scientists researched the biology of the boll weevil
  - This research played a critical role in U.S. boll weevil eradication

- LSU AgCenter scientists worked closely with the LDAF's Boll Weevil Eradication Program (established in 1992)

- In 2012, the boll weevil was declared eradicated

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Ongoing Research in Louisiana

- **Patrick F. Taylor Foundation Grant** ($1.4 million)
  - Demonstration and Implementation of Best Management Practices on Model Farms in Louisiana
  - Cotton and grain crops model farm in Tensas parish
    - Hardwick Planting Company
- **Project goals**
  - Demonstrate best management practices which improve soil health and water quality while also promoting agricultural system sustainability to reduce agricultural inputs contributing to the dead zone located in the Gulf of Mexico
  - Identify a portfolio of practices that are economically profitable and environmentally sustainable
- **Practices**
  - Conservation tillage
  - Residue management
  - Cover crops
  - Water management

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Ongoing Research in Louisiana

- Evaluation of cotton with new biotech traits
- Nematode management with germplasm and chemistry
- Wide row spacing
  - Variety response
  - Production practices
- Cotton picker yield monitors
- Novel plant growth regulators
- Novel spray tank cleaners (cotton as a bioindicator)
- Soil applied liquid fertilizers
- Seed quality
- Novel harvest aids
- Variety performance
- Sustainable cotton production training

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Main Cotton Research Partners

Cotton Incorporated

Stoneville Cotton

PhytoGen COTTONSEED

NexGen The Next Generation of Cotton

Seed Source Genetics, Inc.

ARMOR SEED

Mid-South Cotton Specialists' Working Group

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Choosing Varieties

- Importance
  - One of the most important decisions a cotton producer will make for the entire growing season
  - Varieties come and go at a very fast pace
  - New biotechnologies entering the market
  - Seed costs and associated technology fees
- Encourage producers to plant multiple varieties
  - Consider performance across multiple locations and years
  - Yield and fiber quality are important

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2022 Official Variety Trials

- Trials
  - 4

- Entries
  - 6 commercial seed companies
  - 41 varieties

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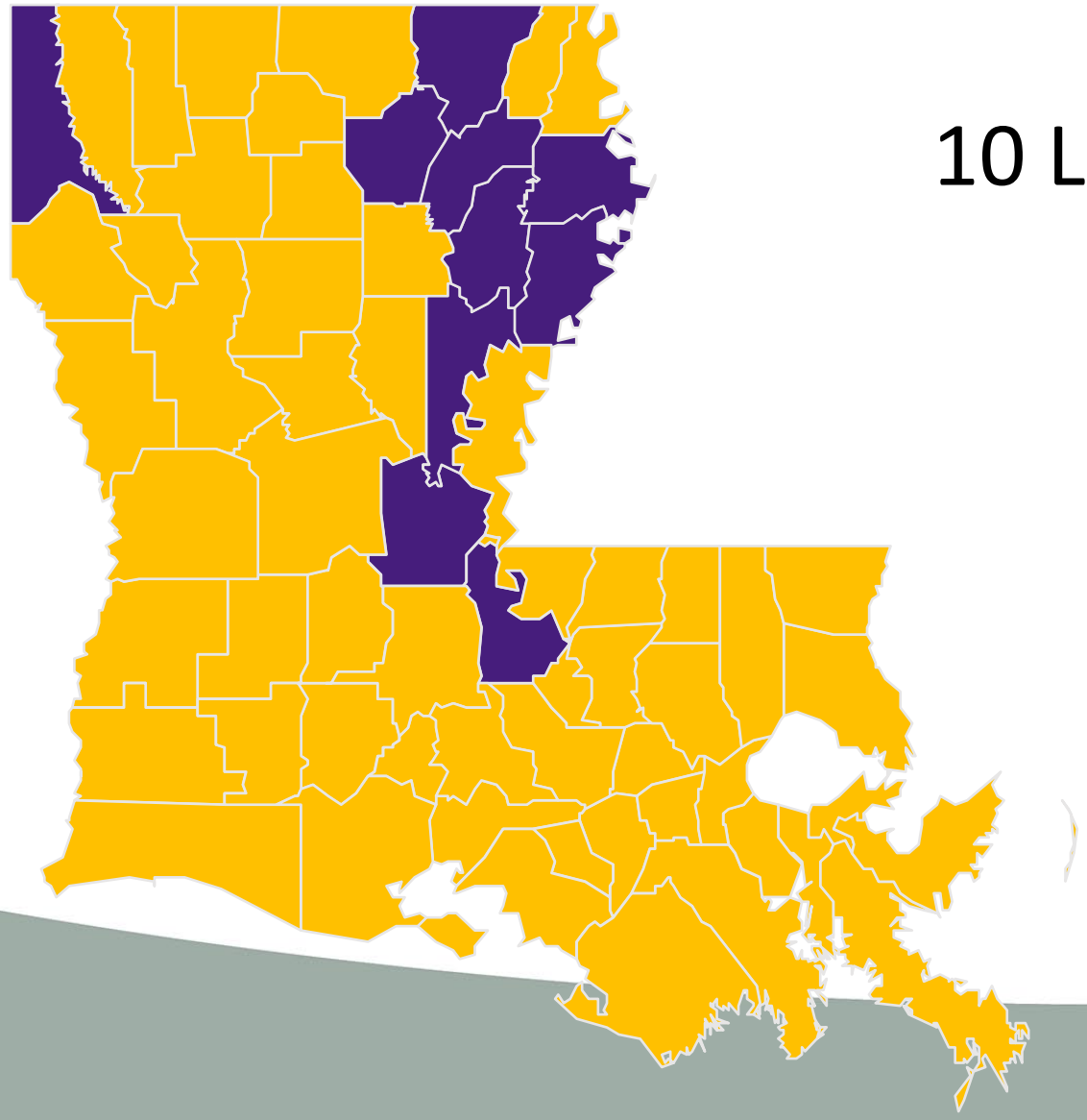
2022 On-Farm Variety Trial Locations



10 Locations

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Cotton Variety Publication

Scientists with the LSU AgCenter annually evaluate cotton varieties in official variety trials (OVTs) at several locations across the state.

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Production Issues

- Nine major issues in mid-south cotton production
  - Herbicide-resistant weeds
  - Herbicide off-target movement
  - Pest pressure
  - Irrigation/drought stress
  - Fertility
  - Earliness/growth management activities
  - Seed quality
  - Volatile weather
  - High input costs

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Glyphosate-resistant Palmer amaranth verified in Louisiana by Dr. Daniel Stephenson in 2010

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2,4-D Injury on Cotton

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Dicamba Injury on Cotton

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Early Season - Thrips

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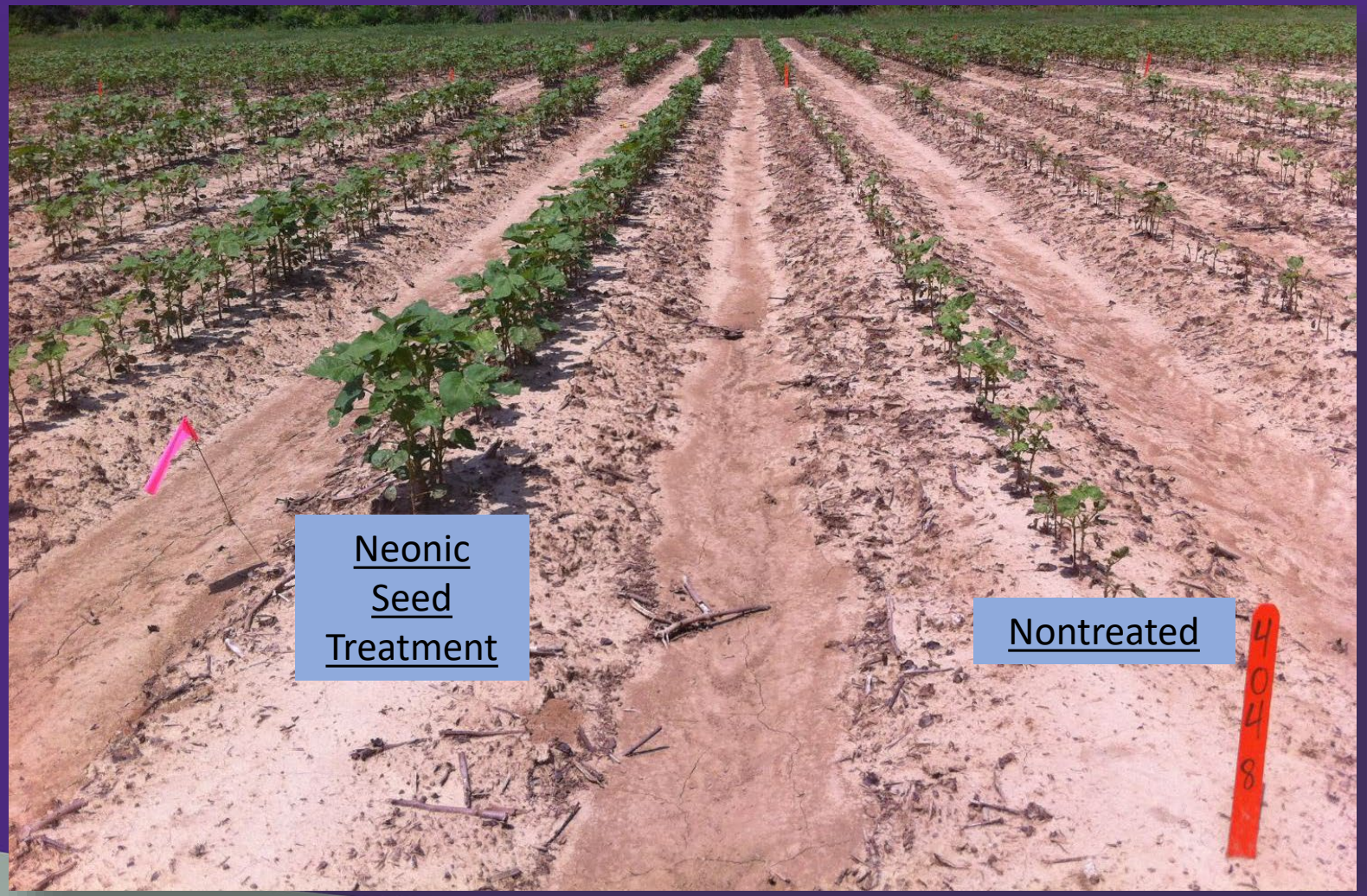
Thrips Injury in Cotton



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Plant Bugs

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Plant Bug Damage

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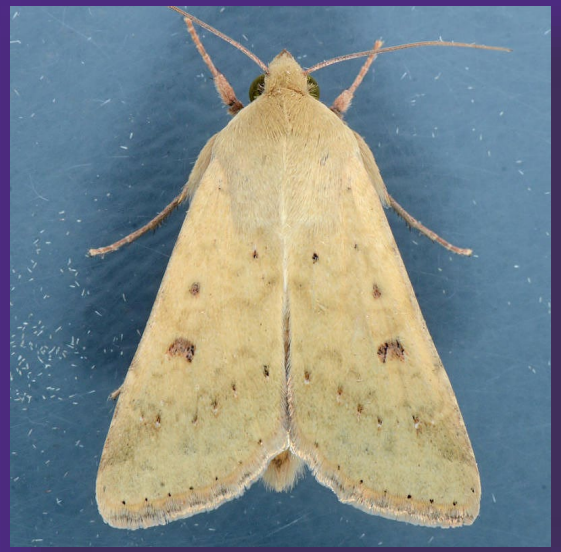
Cotton Bollworm / Tobacco Budworm

Larvae
Indistinguishable



Cotton Bollworm

Tobacco Budworm

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Cotton Bollworm Damage

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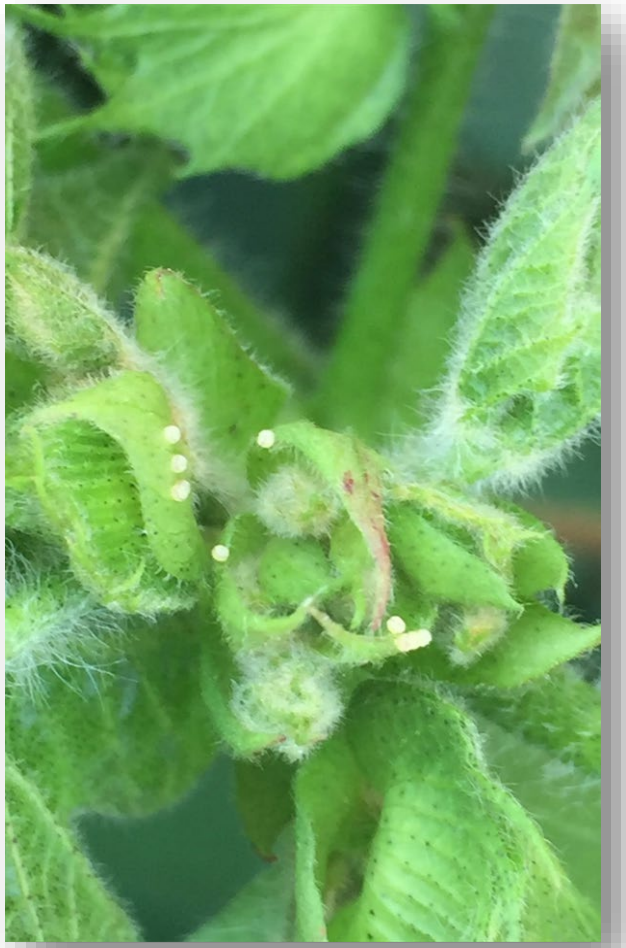
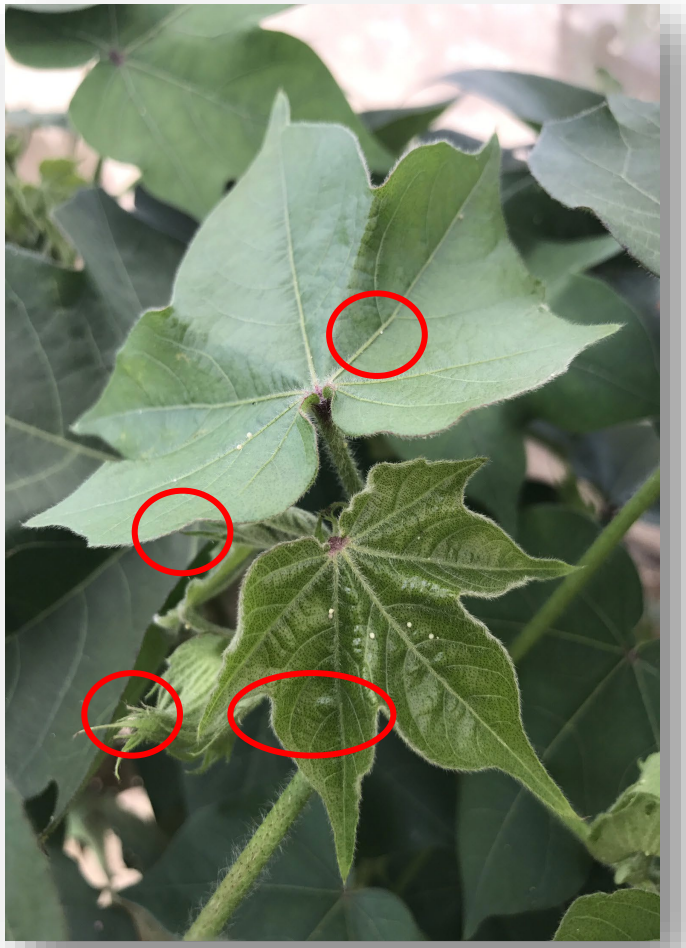
Scouting Bollworm Eggs





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Seedling Vigor

- The product of several factors related to genetics, environmental influences, and crop management

- <u>Why is seedling vigor important?</u>
  - Important in stand establishment, especially in the early part of our planting window when conditions can be relatively cool

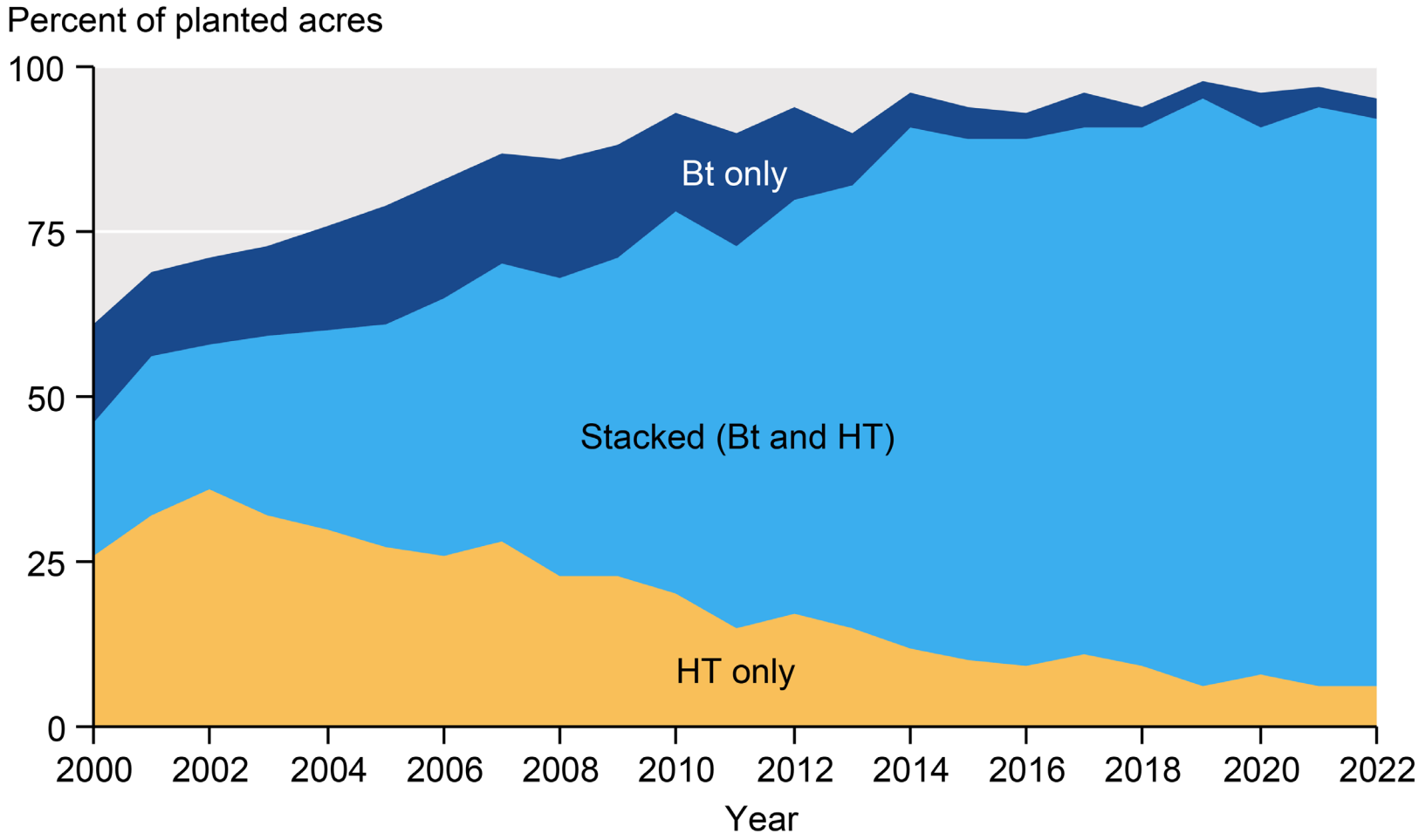
  - When planting in excellent conditions, growers may still notice small differences in high and low vigor seedlings, but these differences often disappear later in the season and may not translate into differences in yield




Seedling Injury

Biotech Cotton

Adoption of genetically engineered cotton in the United States, by trait, 2000–22



Note: HT indicates herbicide-tolerant varieties; Bt (Bacillus thuringiensis) indicates insect-resistant varieties (containing genes from the soil bacterium Bt).
Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, (annual) June Agricultural Survey.

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Past and Current Herbicide Technologies in Cotton

Company	Technology	Tolerance to:
Monsanto	Roundup Ready (1997)	Glyphosate
Monsanto	Roundup Ready Flex (2006)	Glyphosate (increased tolerance during fruiting)
Bayer	LibertyLink (2004)	Glufosinate
Bayer	GlyTol (2011)	Glyphosate
Bayer	GlyTol + LibertyLink (2011)	Glyphosate and Glufosinate
Monsanto	XtendFlex (2015)	Dicamba, Glyphosate, and Glufosinate
Dow	Enlist (2016)	2,4-D, Glyphosate, and Glufosinate

Future Herbicide Technologies in Cotton

Company	Technology	Tolerance to:
BASF	Axant Flex (anticipated in 2024)	Isoxaflutole, Dicamba, Glyphosate, and Glufosinate
Bayer	HT4 (under development)	Glyphosate, Dicamba, Glufosinate, HPPD, and PPO

Past and Current Bt Cotton Technologies

Company	1st Gen (1996)	2nd Gen (2003)	3rd Gen (2016)	3rd Gen (2017)
Monsanto	Bollgard (Cry1Ac)	Bollgard 2 (Cry1Ac+Cry2Ab)		Bollgard 3 (Cry1Ac+Cry2Ab+Vip3A)
Dow		WideStrike (Cry1Ac+Cry1F)	WideStrike 3 (Cry1Ac+Cry1F+Vip3A)	
Bayer		TwinLink (Cry1Ab+Cry2Ae)		TwinLink Plus (Cry1Ab+Cry2Ae+Vip3A)

Future Bt Cotton Technologies

Company	Technology
Bayer	ThryvOn (Cry51Aa2) (2023)
Bayer	Bollgard 4 (under development)

Cotton Variety Examples

- DP 1646 B2XF
- DP 2127 B3XF
- DP 2141NR B3XF
- PHY 411 W3FE
- UA 222
- ST 4550GLTP
- DP 341 RF Pima
- DP 1822 XF
- DP 2211 B3TXF

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ThryvOn Cotton

- Industry's first cotton biotech trait of its kind
  - Provides defense against key tarnished plant bug and thrips species, which are two of the most economically detrimental pests in U.S. Cotton production.
    - Cost growers a combined $351 million in yield losses and insecticide applications (2021 Cotton Crop Loss Report)
  - Full commercialization of Bollgard® 3 ThryvOn™ cotton with XtendFlex® Technology announced by Bayer on February 7, 2023

ThryvOn Cotton

- This technology protects young cotton plants from thrips species by deterring adult feeding and egg-laying.
- For plant bugs, the technology is mainly lethal to small nymphs, and serves as a deterrent to plant bug feeding and (most likely) egg-laying.
  - Not highly lethal to adults
  - Reproduction can still occur on ThryvOn cotton

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ThryvOn Cotton

- Overall goal is to reduce average season-long injury from these harmful pests, which can improve crop yield potential and ROI

- <u>Cost of the technology</u>
  - Estimated at $36 to $40 per acre in the Midsouth

  <u>However,</u>
  - Potential to add money back to the bottom line with no control measures needed for thrips, fewer insecticide applications for plant bugs (fewer trips across the field), and increased crop yield potential

2022 LSU AgCenter ThryvOn Cotton Trials

- Agronomic observations:
  - Good seedling vigor and emergence
  - Excellent germplasm
  - Competitive yield potential (superior in some cases)
  - Good response to plant growth regulators
  - On-time maturity and good defoliation

ThryvOn Take Away Points

- Possibly eliminate 1 to 2 insecticide sprays for tarnished plant bugs
  - Help preserve beneficial insects
    - Keep other pests down (spider mites, bollworm, aphids, etc.
  - Provide more leeway for timely applications
  - Reduce input costs

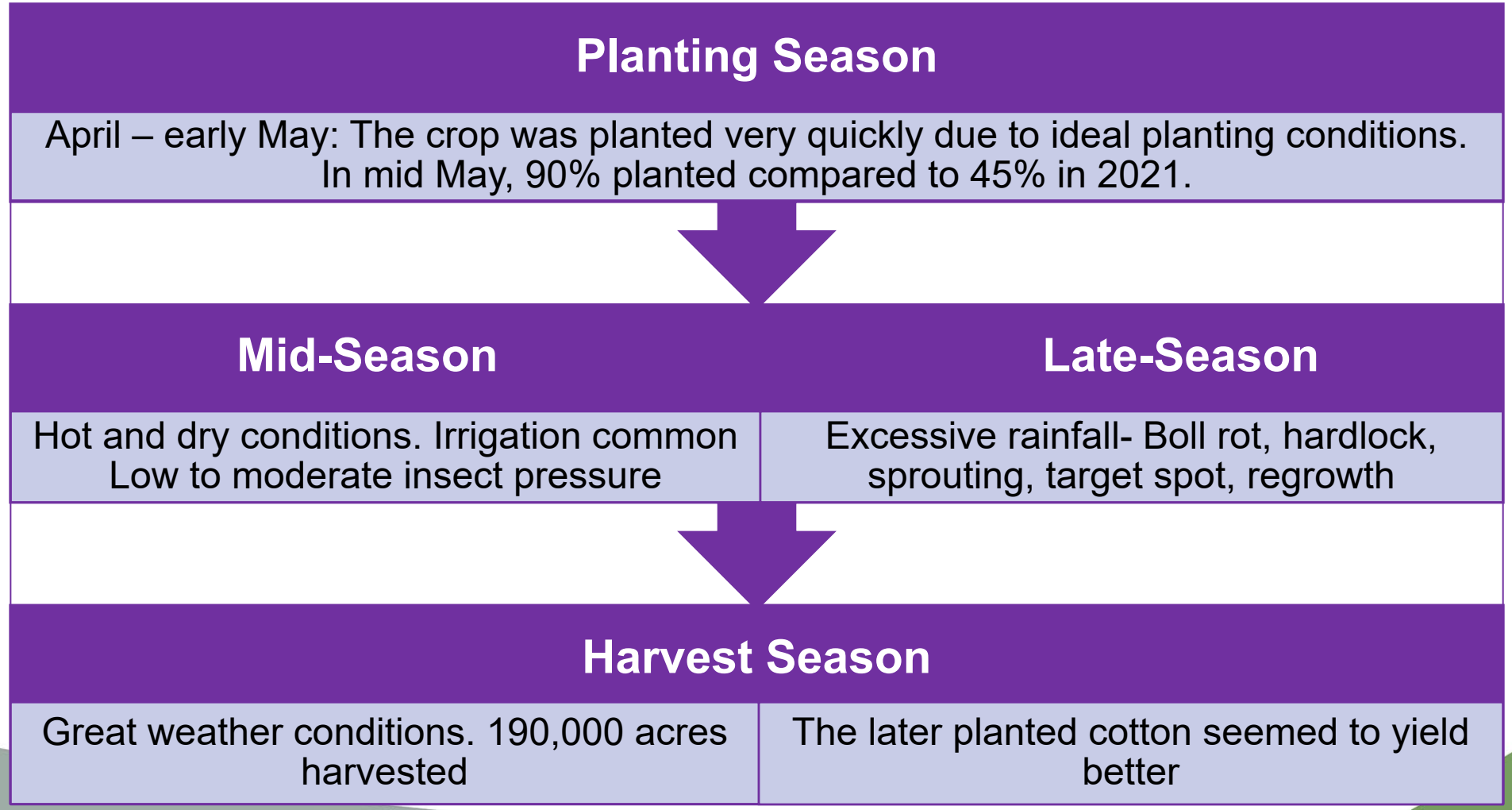
- Excellent thrips control
  - No additional in-furrow or foliar insecticide needed, thus reducing input costs
  - Technology will be packaged with an insecticidal seed treatment (imidacloprid) for resistance management

- Tarnished plant bug scouting is required

- Tarnished plant bug applications are necessary, especially in high adult migration locations

- Much needed tool for the cotton industry

2022 Cotton Growing Season in Louisiana



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Hurricane Season is Always a Concern

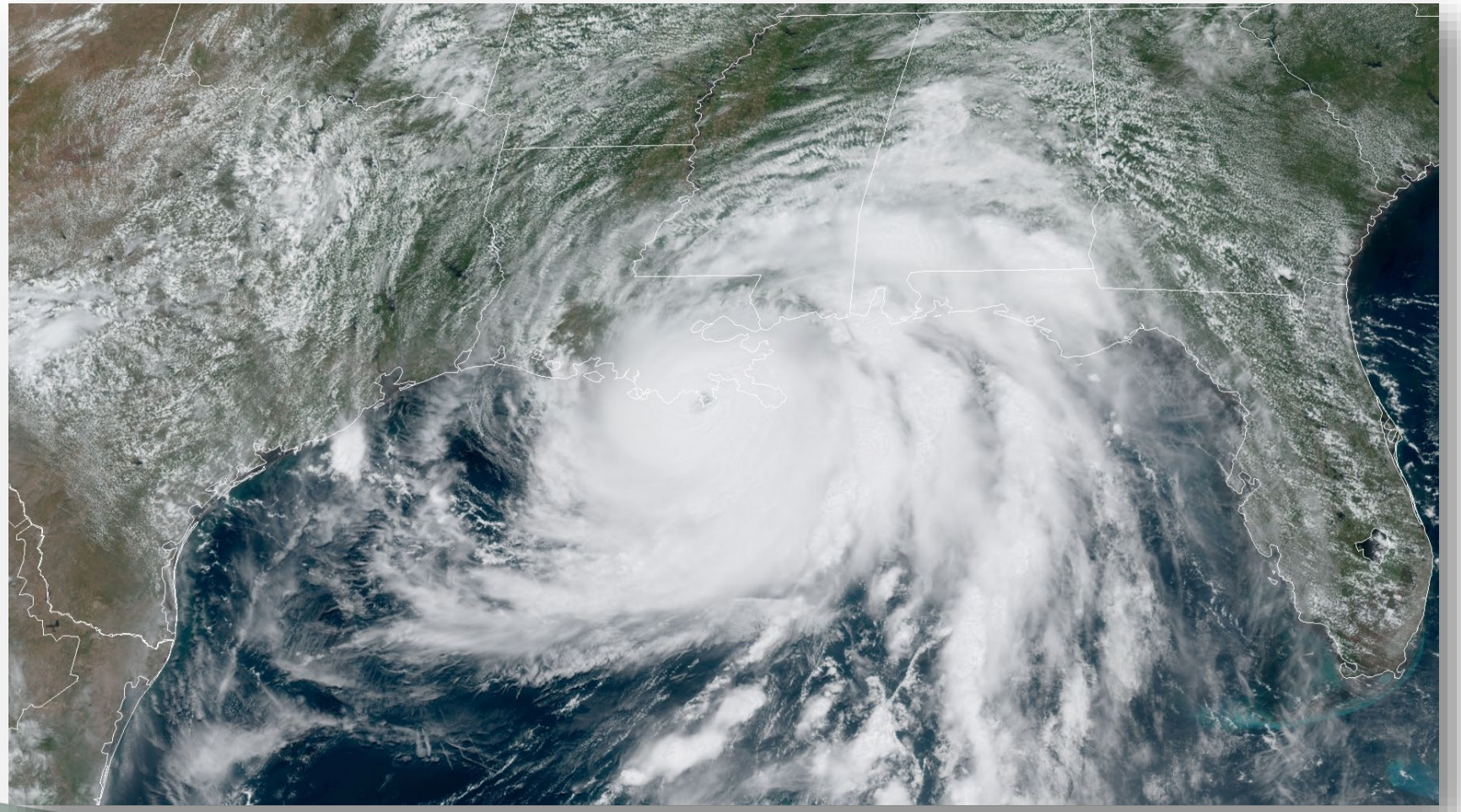

Photo by NOAA satellite imagery

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2022 Crop Damage in Louisiana

Photo by Craig Gautreaux- LSU AgCenter

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2022 Crop Damage in Louisiana

Photo by Trey Price- LSU AgCenter

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Looking Forward

- According to the National Cotton Council's 42nd Annual Early Season Planting Intentions Survey, cotton acreage intentions in Louisiana are at 156,390 acres, down 19.8% from 2022.

  - Mainly due to lower price ($0.81 per pound), high input costs, and a lower state average yield for the 2022 crop due to adverse weather conditions.

  - For the 2023 crop, it is estimated that growers will need a break-even price of $0.92 per pound to meet their direct, fixed, and overhead expenses.

Thanks!

Questions?

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