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The Economics of Regenerative Agriculture in the Texas High Plains

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2025 Southwest Cotton Physiology Conference
February 13, 2025

Regenerative agriculture (#RegenAg)

Sustainable agricultural intensification and enhancement using regenerative agricultural practices

USDA Award Number: 2021-68012-35897

Our project goal is to intensify agricultural production in an environmentally sustainable manner that enhances the agronomic, economic, and community resiliency in the Southern Great Plains.

Collaborators -

Acknowledgements

C.D. Ray White, Ph.D., J. Wayne Keeling, Ph.D., Cecil Haralson, Aileen Malabanan

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Texas Water Resources Institute — make every drop count
Texas A&M AgriLife Research
Texas A&M AgriLife Extension
Soil Health Institute
Kansas State University

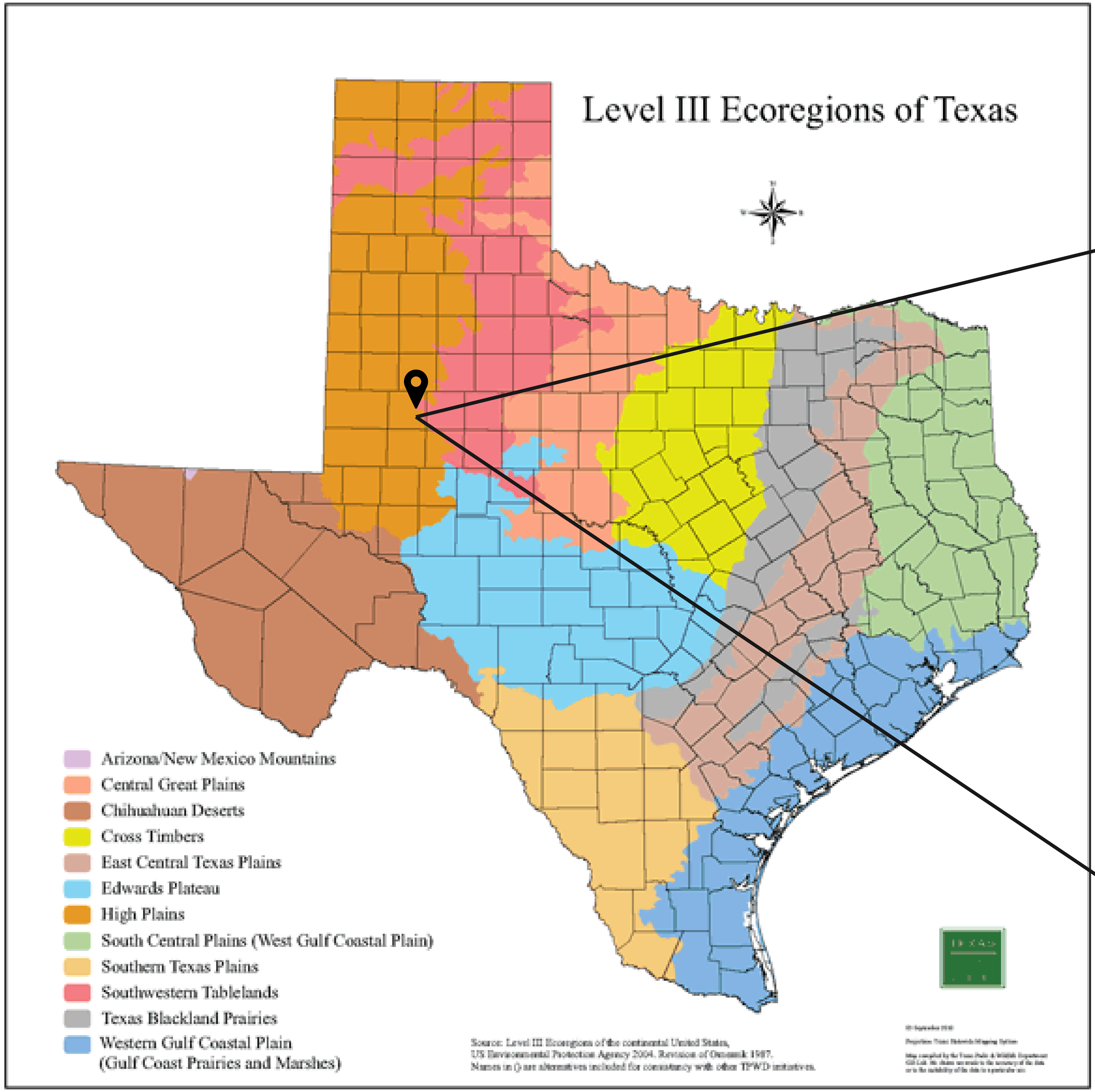
This work is supported by the Sustainable Agriculture Systems program grant no. 2021-68012-35897 from the USDA National Institute of Food and Agriculture. Any opinions, findings, and conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Agriculture.

Introduction

- Two Issues
  - Soil health & impact of regenerative and climate-smart agricultural practices
  - Declining water availability due to reduced irrigation capacity from Ogallala Aquifer

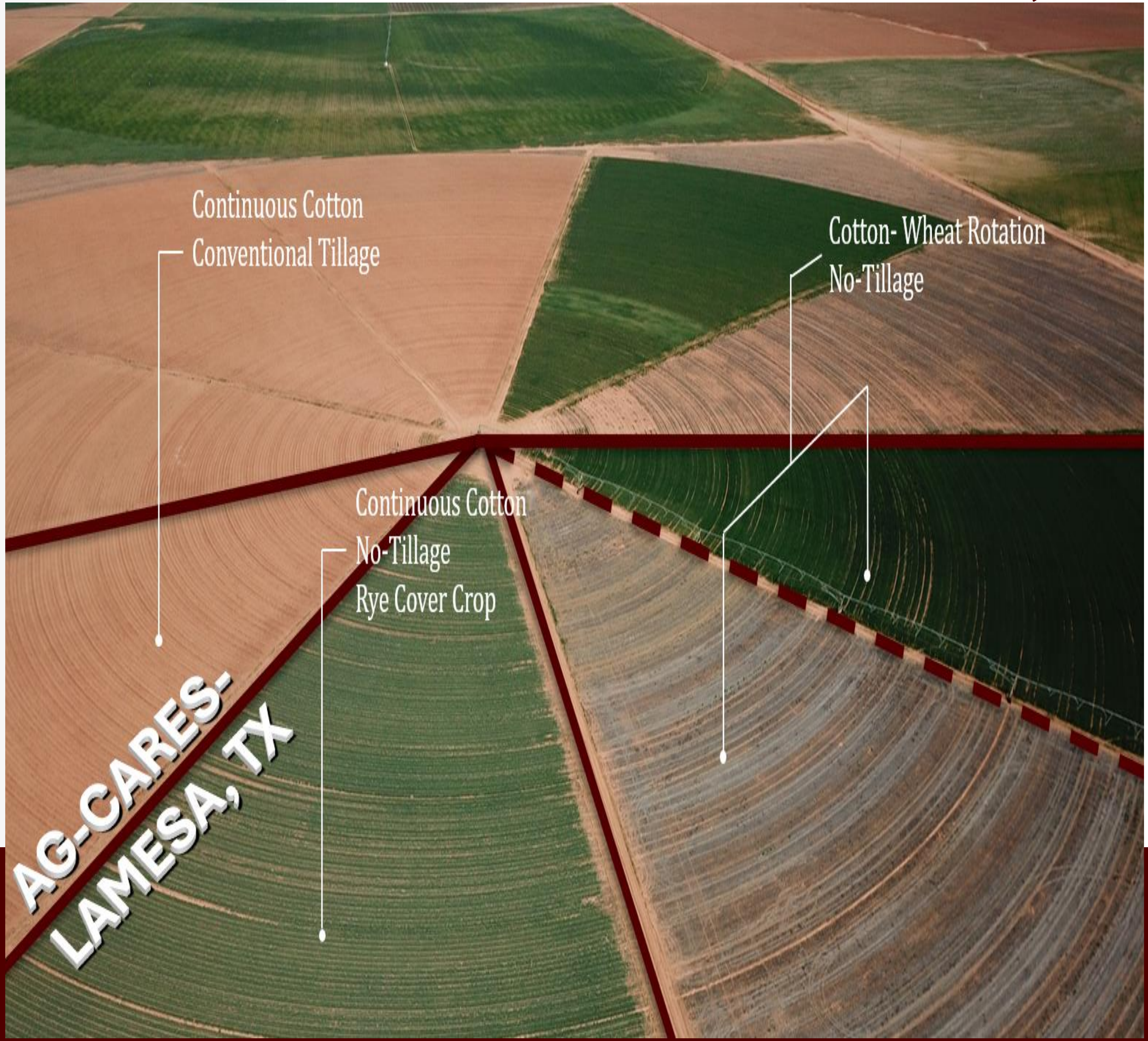
- Study objectives
  - Evaluate the impact of regenerative agricultural practices on deficit-irrigated cotton production in the Southern Texas High Plains
  - Evaluate the potential short-term profitability and long-term risk associated with these practices

AG-CARES, Lamesa, TX

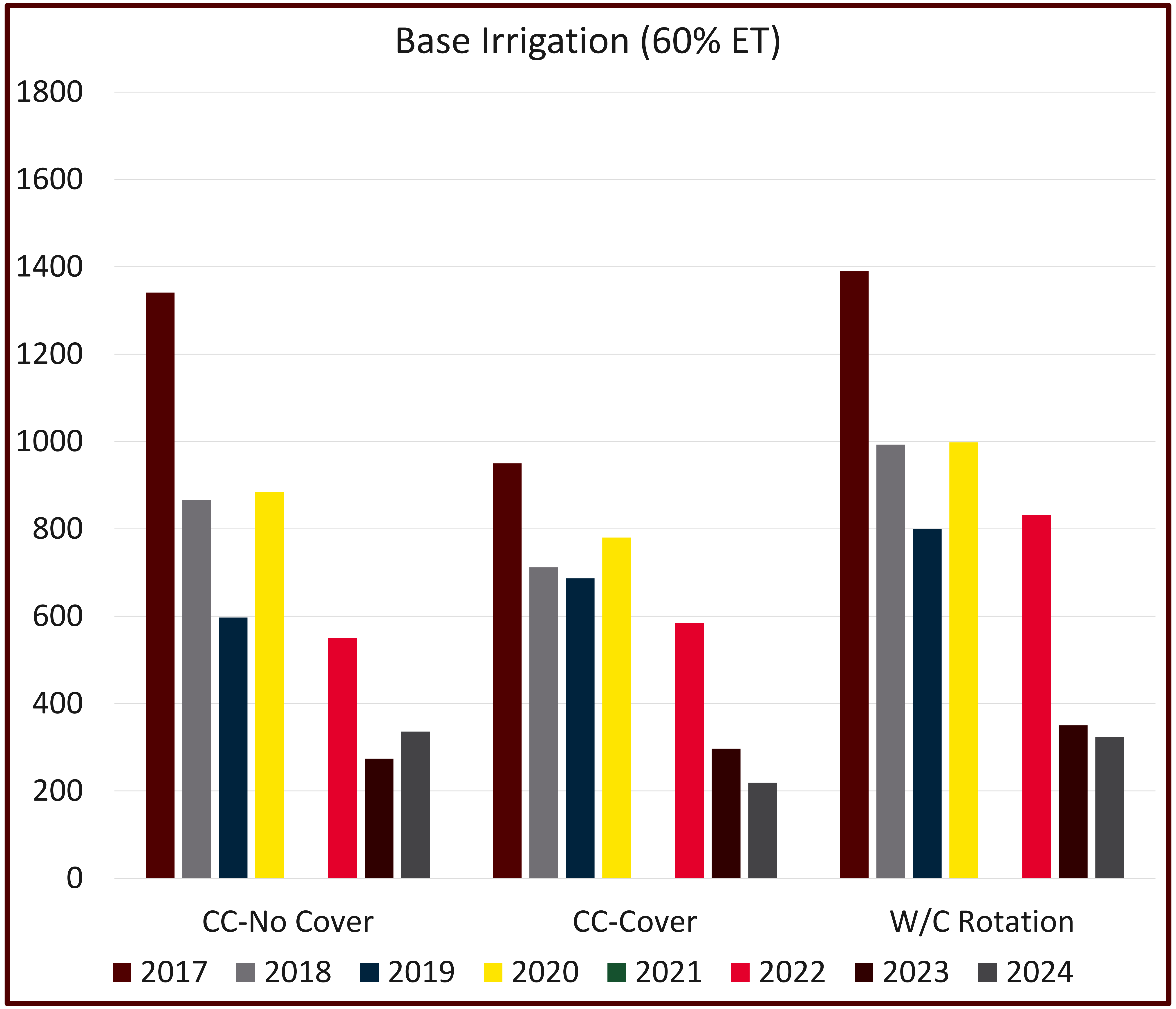


Treatments

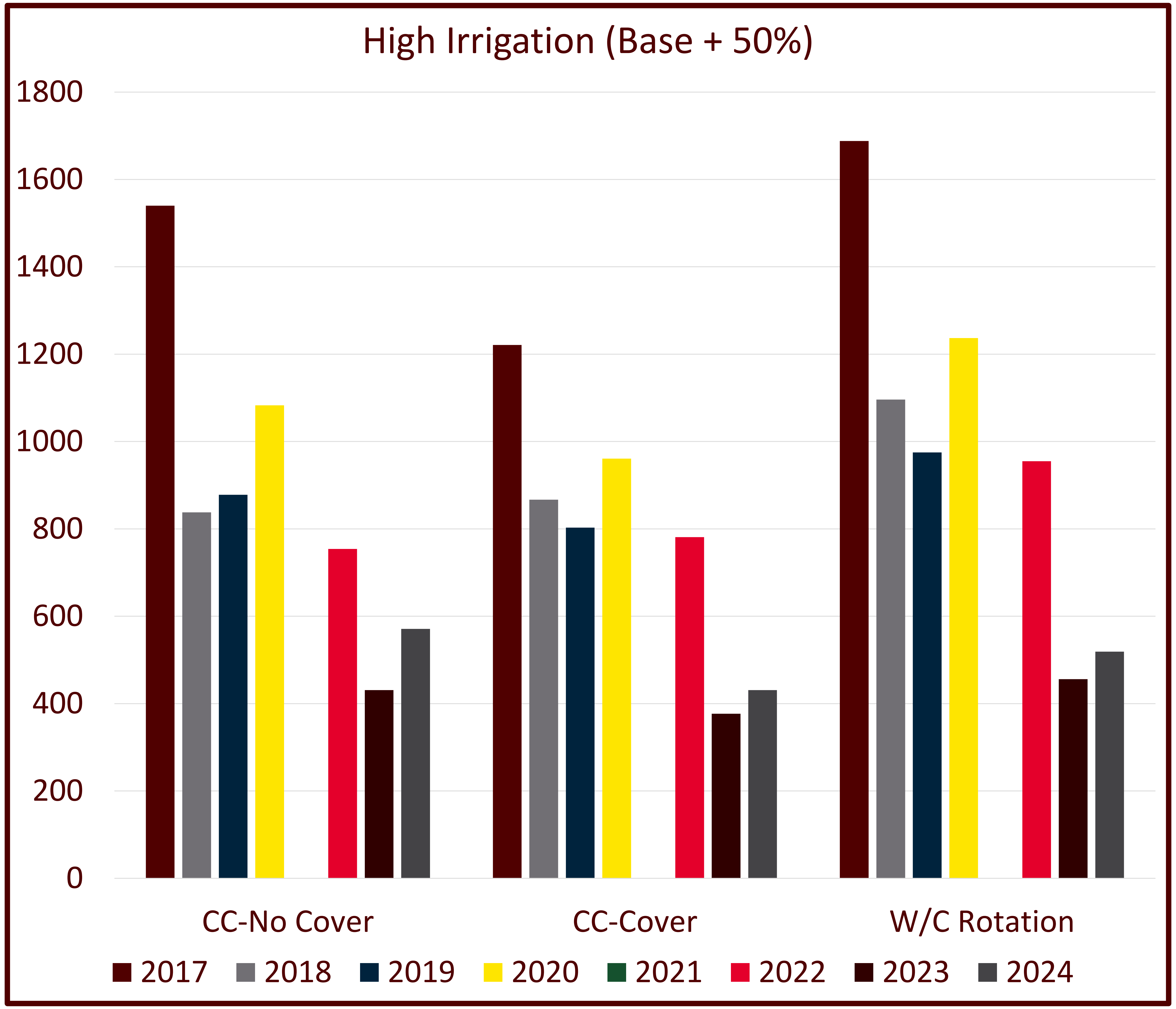
- Cropping Systems
  - Continuous cotton, conventional tillage, established in 1990
  - Continuous cotton, no-tillage, winter rye cover crop, est. in 2014
  - Cotton-wheat-fallow rotation, no-tillage, est. in 2014
- Irrigation Treatments
  - Base (60% ET)
  - Low (Base – 50%)
  - High (Base + 50%)



Production by Year (LB/ac)



Production by Year (LB/ac)



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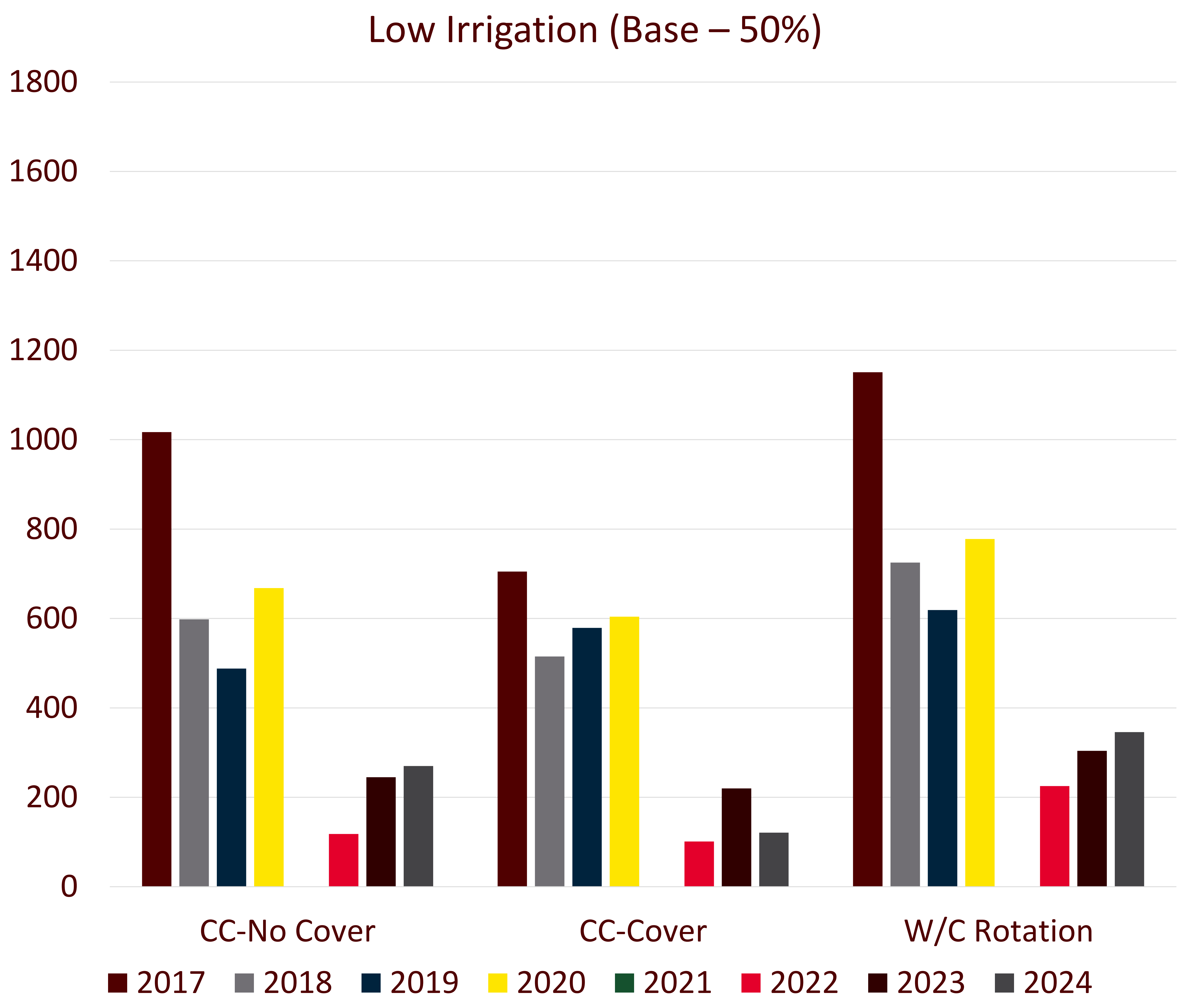
Production by Year (LB/ac)



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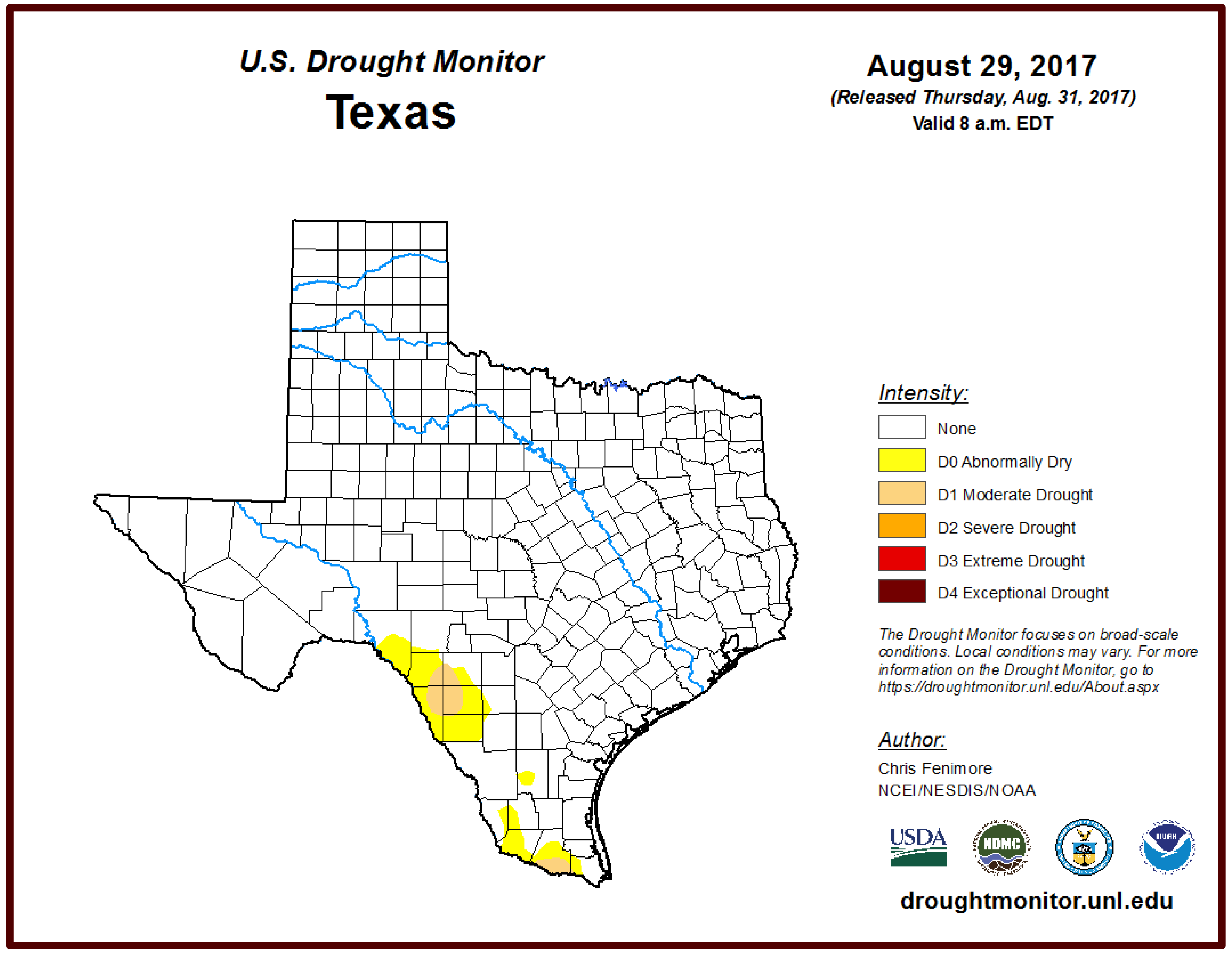
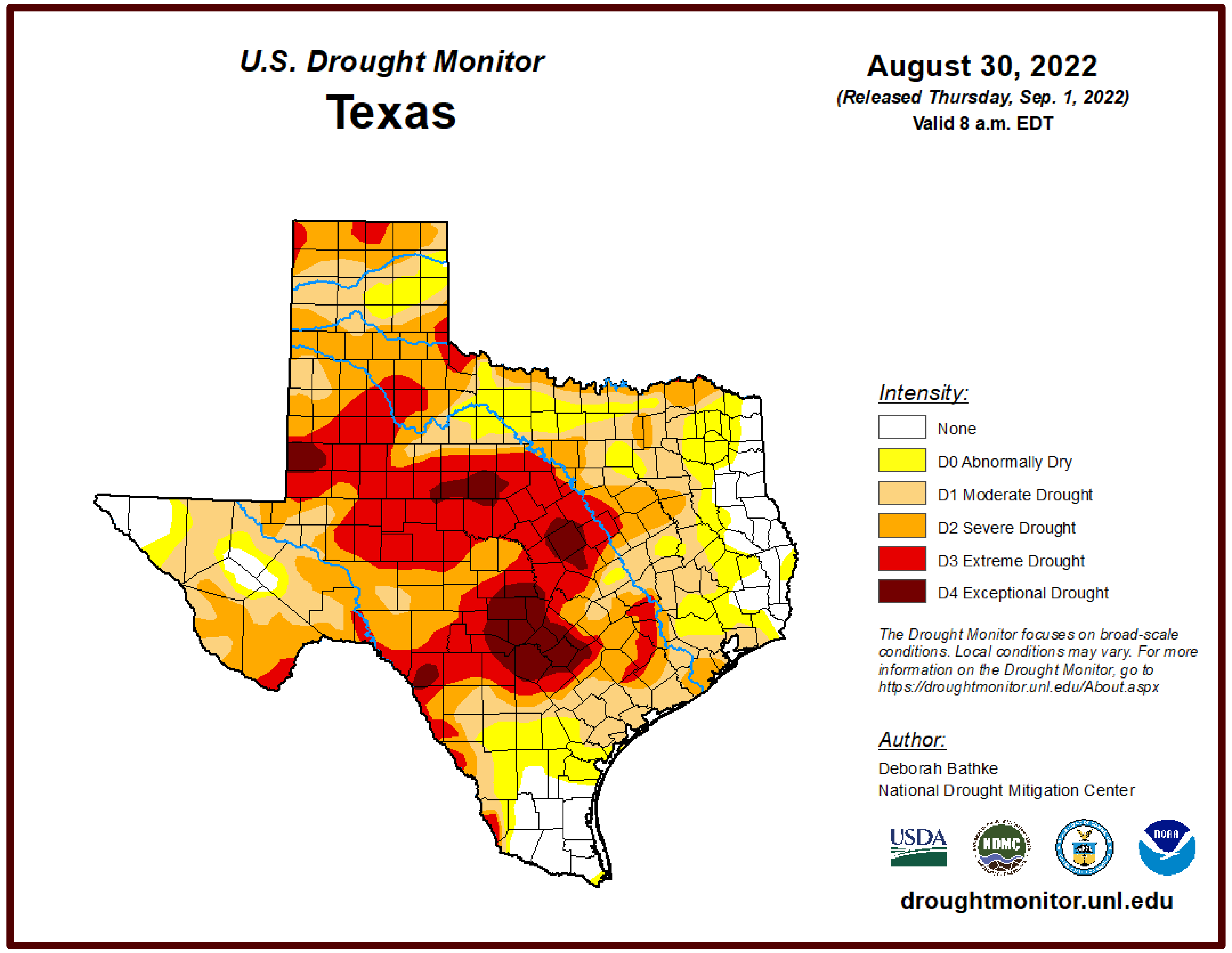
There's Been Some Hot, Dry Years… 2020 vs. 2022





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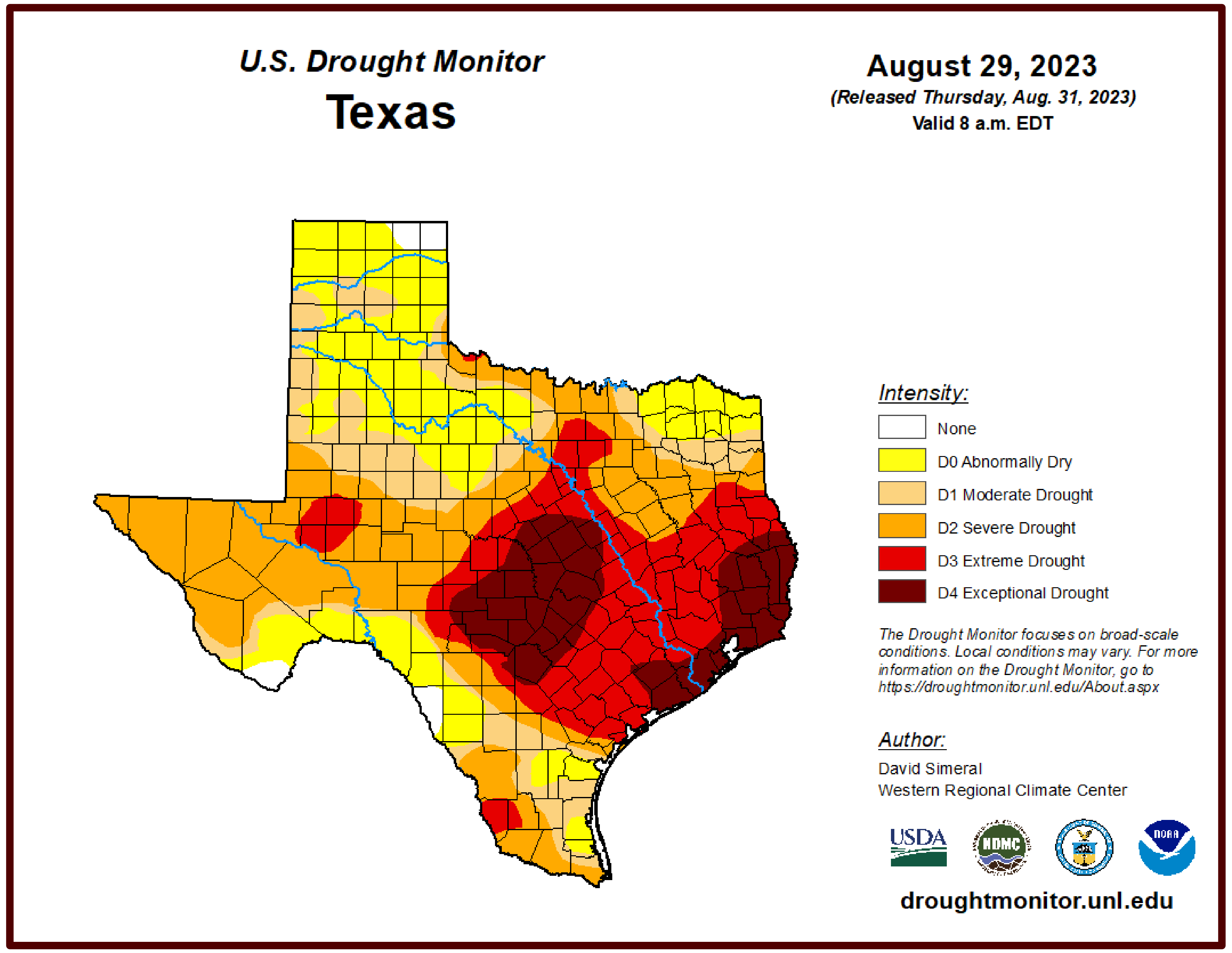
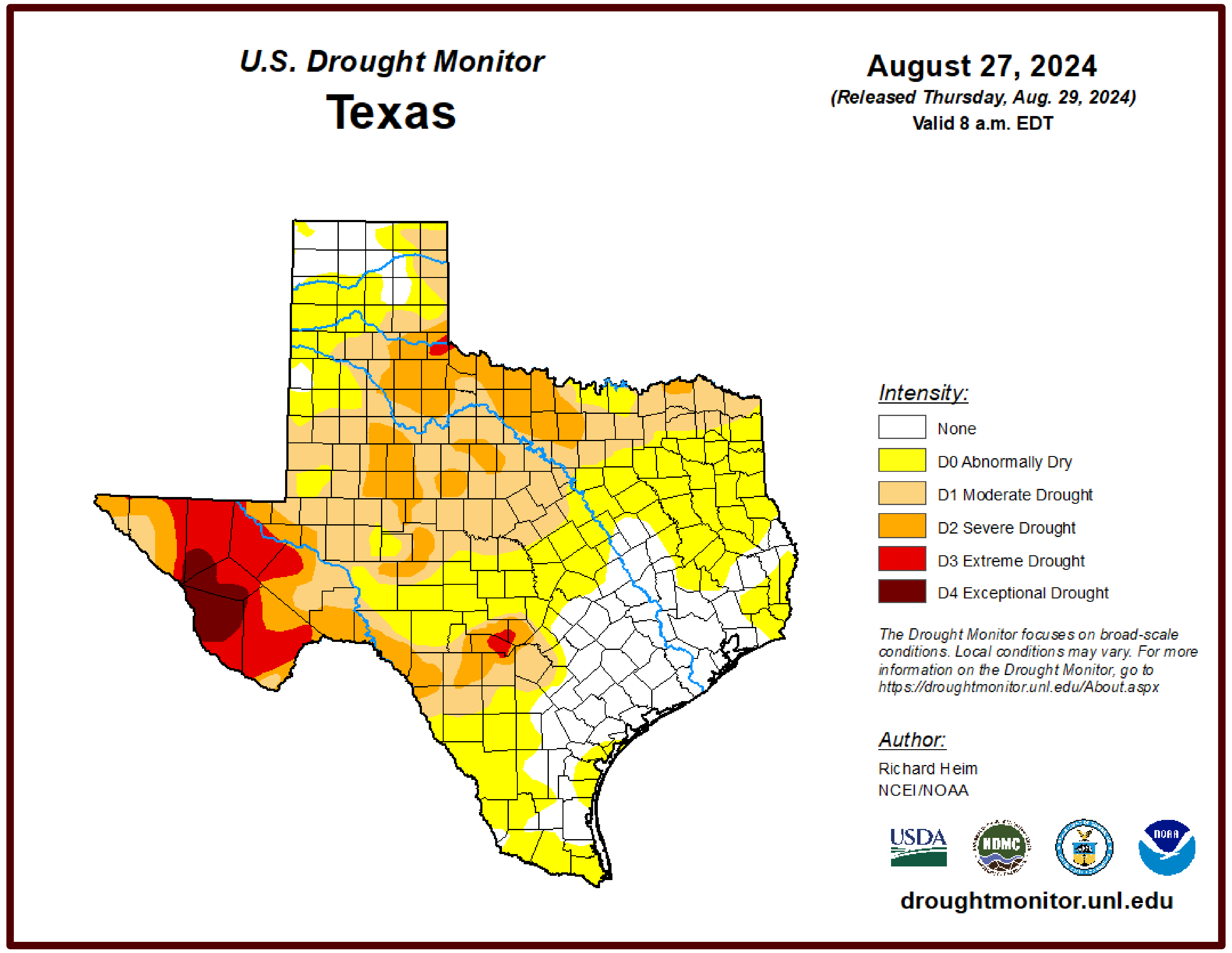
There's Been Some Hot, Dry Years… 2023 & 2024





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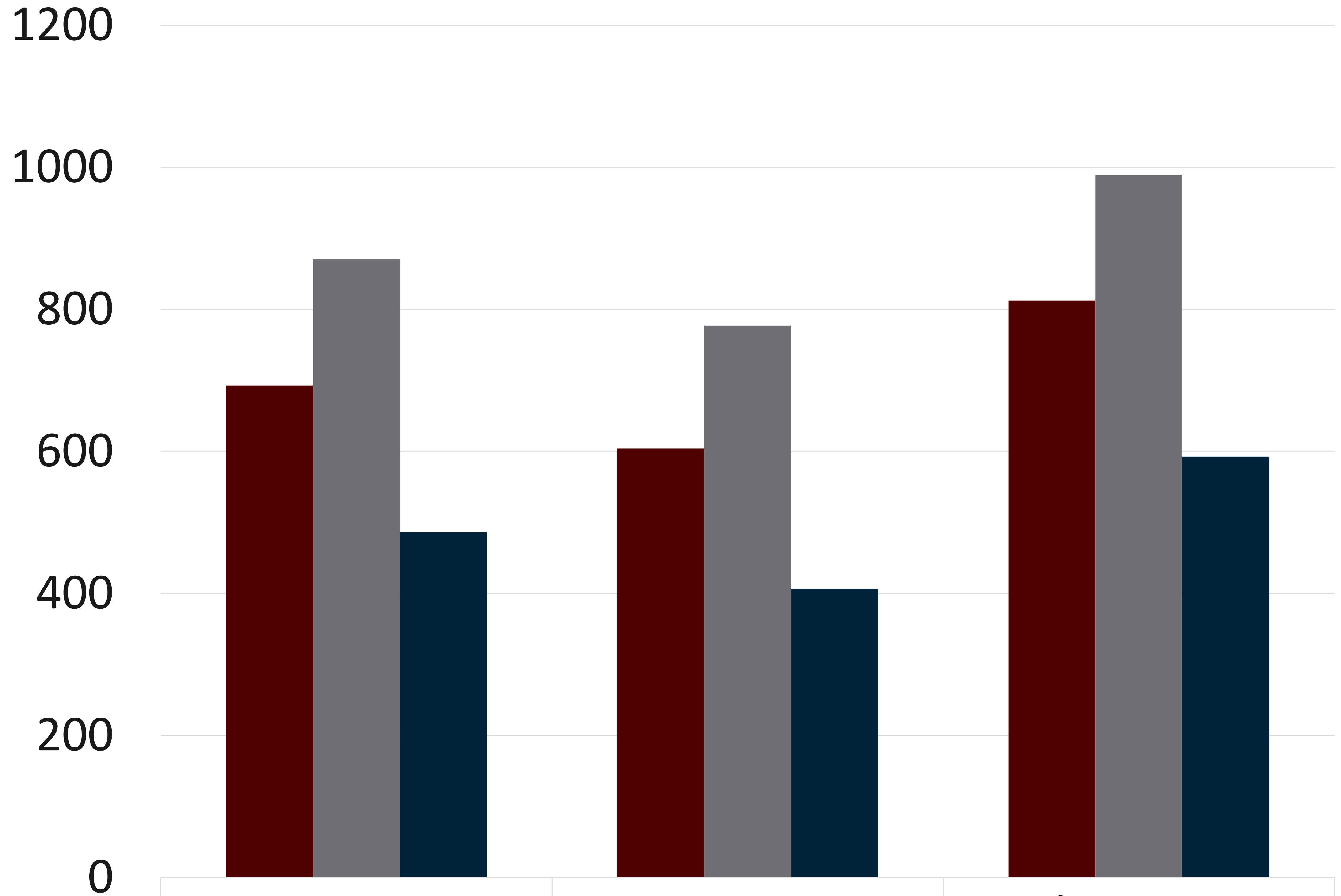
Average Production (LB/ac)



	CC-No Cover	CC-Cover	W/C Rotation
Base	693	604	812
High	871	777	989
Low	486	406	593

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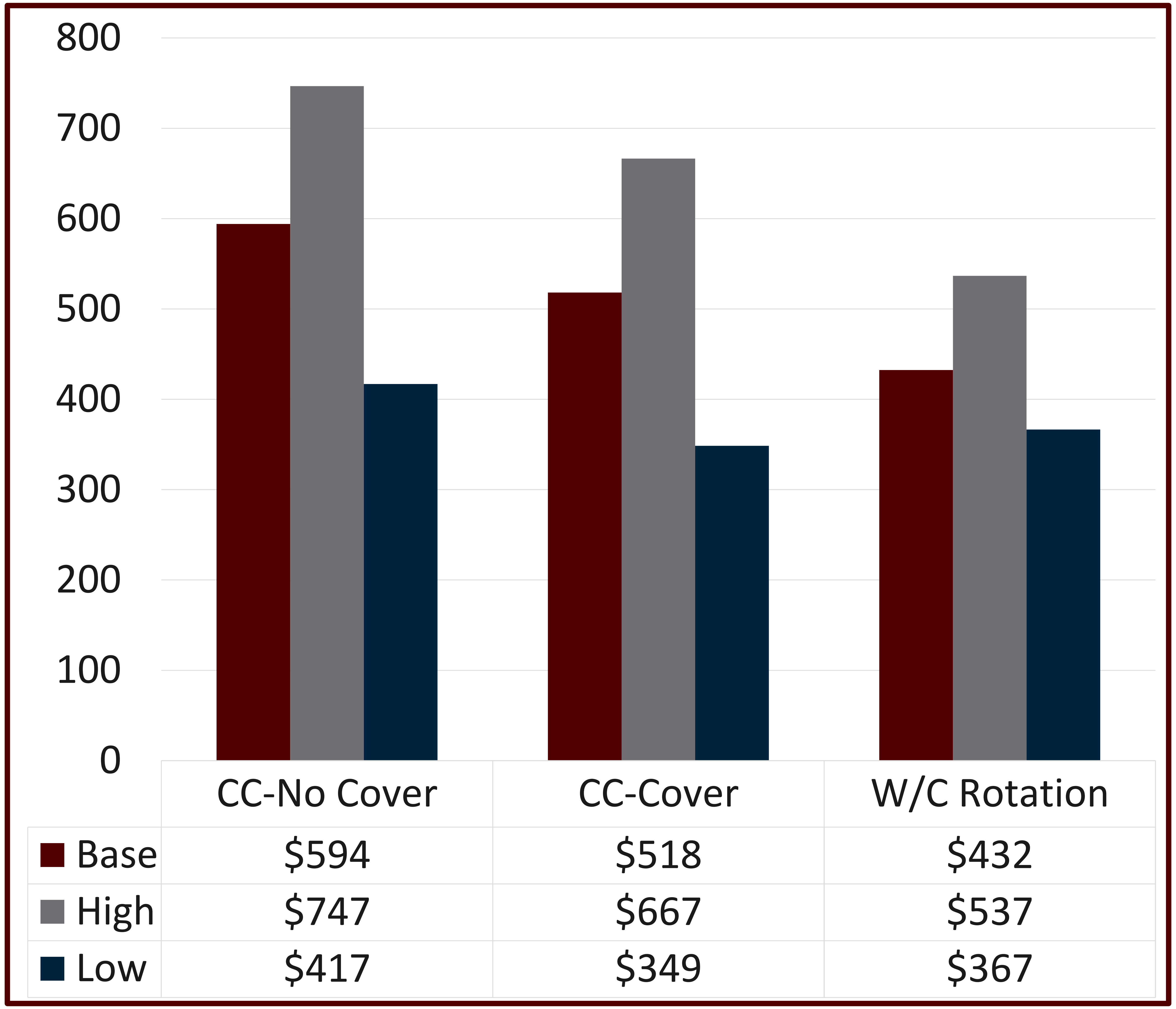
Revenue ($/ac)

- $0.70/LB (lint) & $210/ton (cottonseed)
- $5.60/BU wheat



	CC-No Cover	CC-Cover	W/C Rotation
Base	$594	$518	$432
High	$747	$667	$537
Low	$417	$349	$367

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Variable Costs-Base Irrigation

- Documented inputs from each cropping system
- Rates obtained from the 2020 Texas A&M AgriLife Extension Custom Rates survey and the 2024 Texas A&M AgriLife Extension crop budgets.

Expenses	CC-No Cover	CC-Cover	Rotation-Cotton	Rotation-Wheat
Seed	$75	$90	$75	$15
Herb.	$91	$110	$110	$20
Fert.	$58	$58	$58	$29
Tillage	$94	$15	$-	$-
Crop. Ins.	$-	$-	$-	$-
Irrigation	$53	$56	$52	$20
Interest	$15	$13	$12	$3
Ginning	$65	$57	$76	
Harvest	$62	$54	$73	$25
Total	**$513**	**$453**	**$456**	**$112**

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Variable Costs-High Irrigation

Expenses	CC-No Cover	CC-Cover	Rotation-Cotton	Rotation-Wheat
Seed	$75	$90	$68	$14
Herb.	$91	$110	$110	$20
Fert.	$58	$58	$58	$29
Tillage	$94	$15	$-	$-
Crop. Ins.	$-	$-	$-	$-
Irrigation	**$64**	**$67**	**$63**	$20
Interest	$15	$14	$12	$3
Ginning	**$82**	**$73**	**$93**	
Harvest	**$78**	**$70**	**$89**	$25
Total	**$557**	**$496**	**$493**	**$111**

Variable Costs- Low Irrigation

Expenses	CC-No Cover	CC-Cover	Rotation-Cotton	Rotation-Wheat
Seed	$75	$90	$68	$14
Herb.	$91	$110	$110	$20
Fert.	$58	$58	$58	$29
Tillage	$94	$15	$-	$-
Crop. Ins.	$-	$-	$-	$-
Irrigation	**$38**	**$41**	**$37**	$20
Interest	$14	$13	$11	$3
Ginning	**$46**	**$38**	**$56**	$-
Harvest	**$44**	**$37**	**$53**	$25
Total	**$459**	**$401**	**$393**	**$111**

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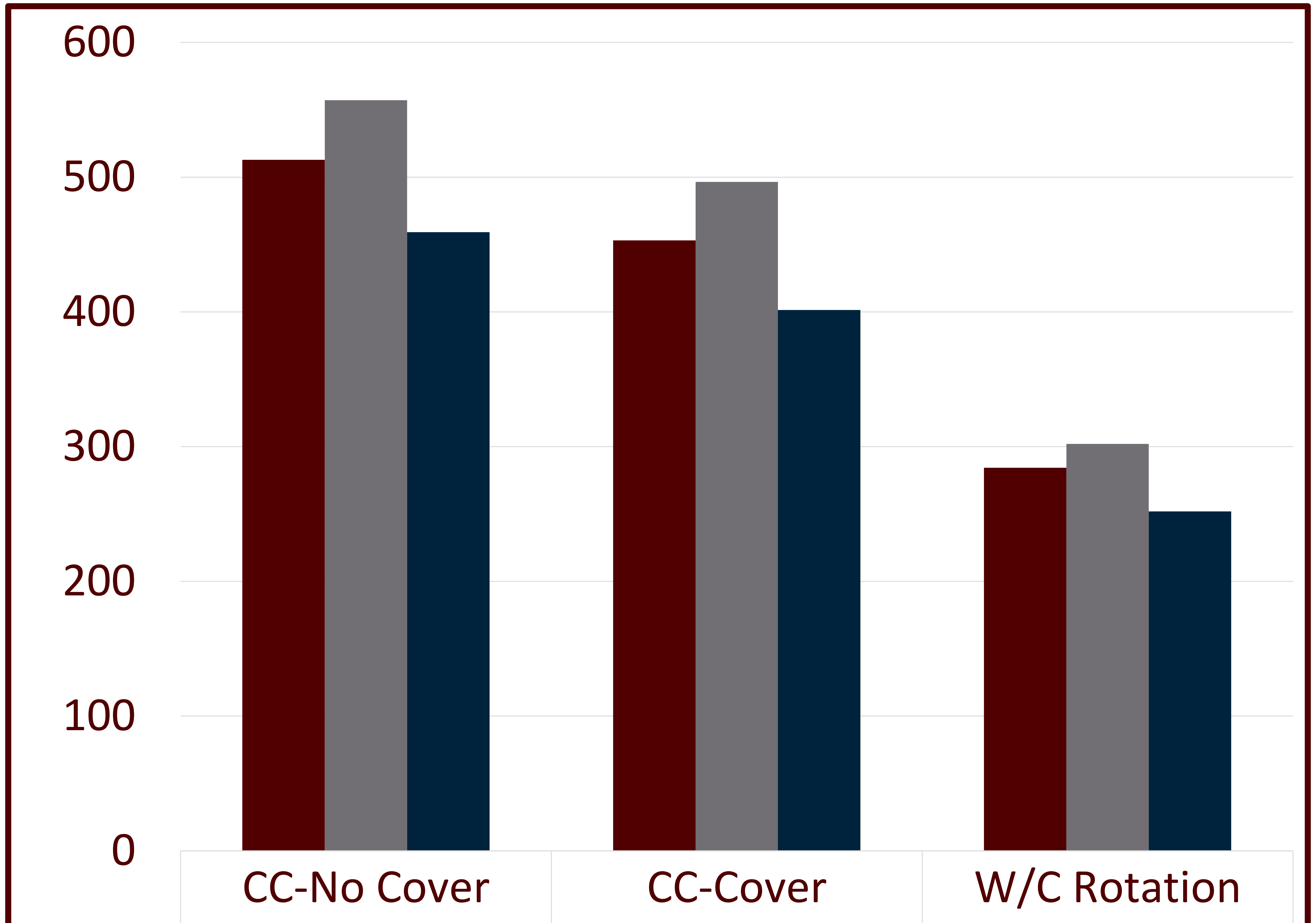
Average Cost ($/ac)



	CC-No Cover	CC-Cover	W/C Rotation
Base	$513	$453	$284
High	$557	$496	$302
Low	$459	$401	$252

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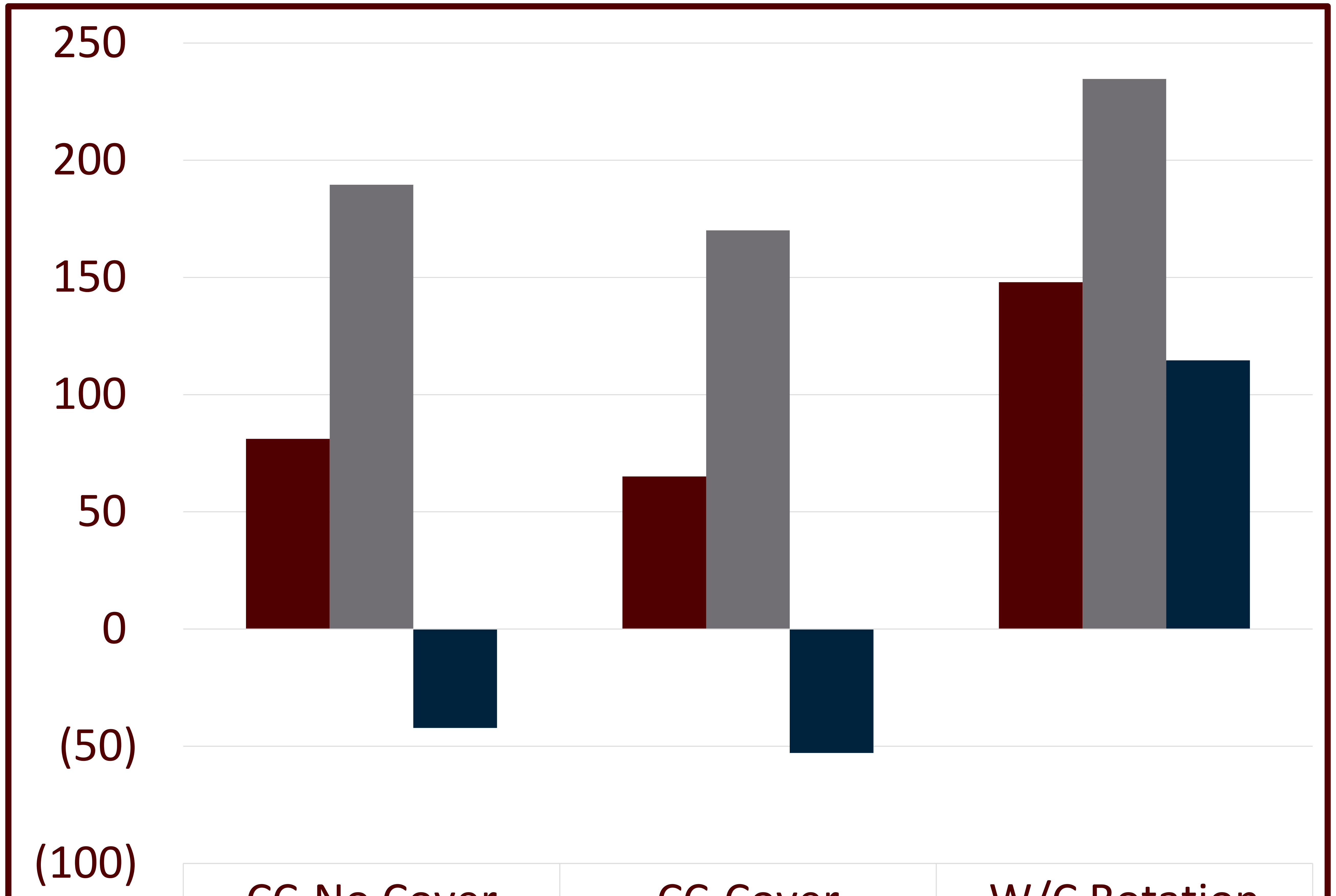
Returns Above Variable Costs



	CC-No Cover	CC-Cover	W/C Rotation
Base	$81	$65	$148
High	$190	$170	$235
Low	$(42)	$(53)	$115

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Discussion- Returns Above Variable Cost

- Wheat/cotton rotation results in the highest yields and returns across all irrigation treatments

- Continuous cotton w/ cover results in the lowest yields and returns across all irrigation treatments

- Wheat/cotton rotation becomes more profitable relative to continuous cotton as irrigation levels decline

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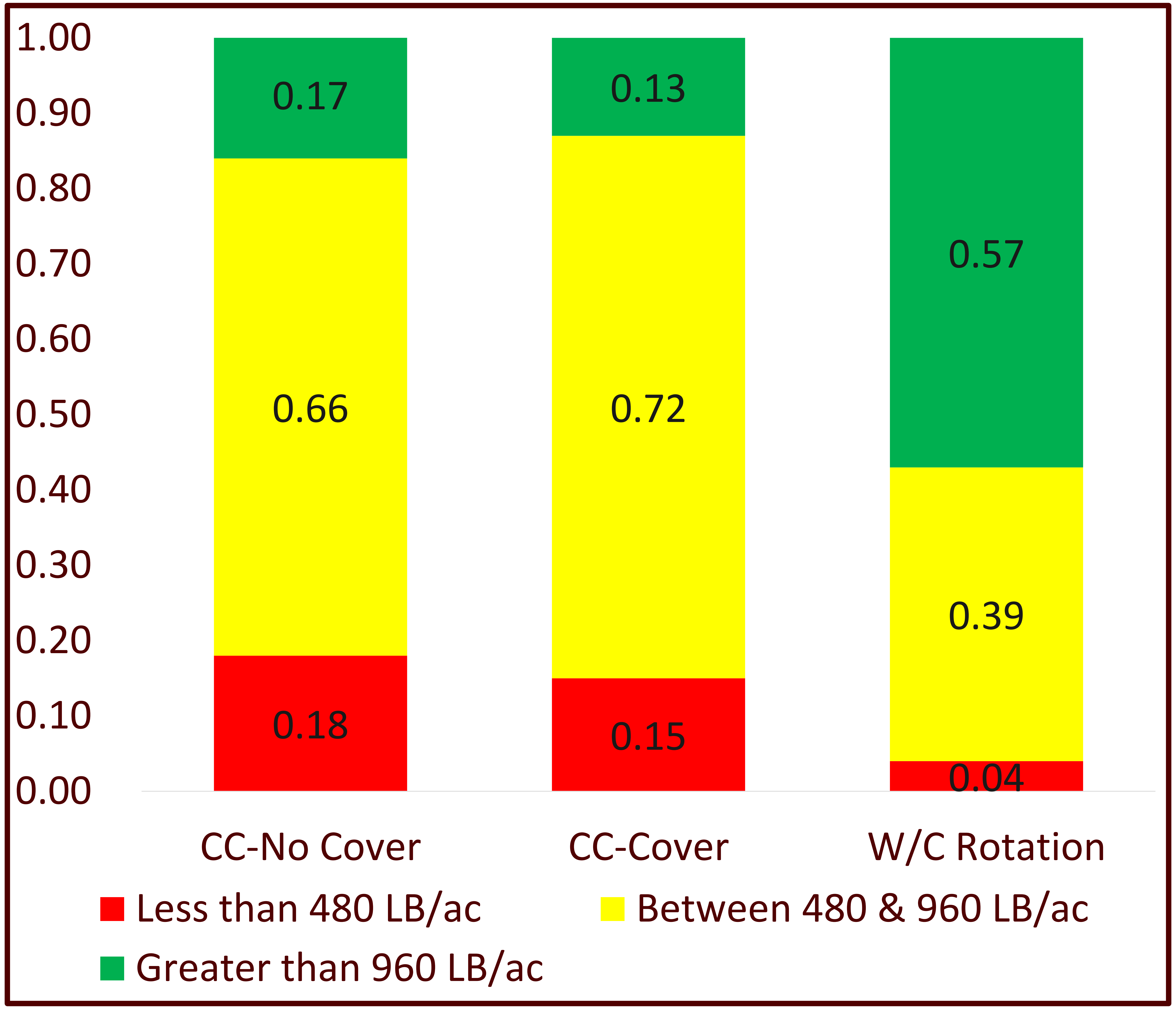
Risk Simulation-Production

Probability of yields:

- Less than 480 LB/ac
- Between 480 LB/ac and 960 LB/ac
- Greater than 960 LB/ac



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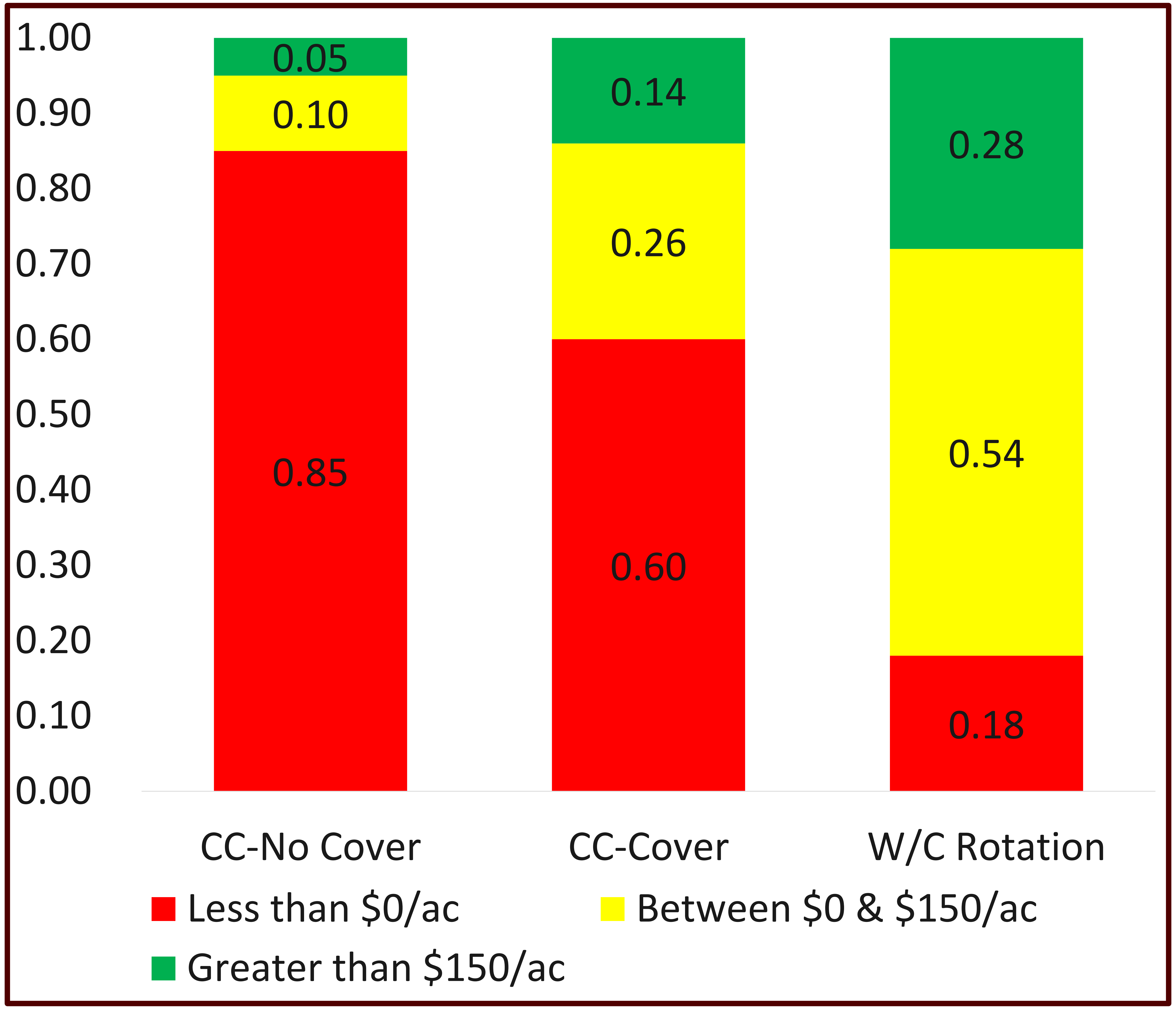
Risk Simulation-Returns

Probability of Returns Above Variable Cost:

- Less than $0/ac
- Between $0/ac and $150/ac
- Greater than $150/ac



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Discussion- Risk

- Yield risk is similar for continuous cotton with and without a cover crop
- Less yield risk for the wheat/cotton rotation
- The likelihood of high returns over variable costs (> $150/ac) is low for all cropping systems; best for the W/C rotation
- Significant risk of negative returns above variable costs for continuous cotton systems

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Conclusions

- Regenerative agriculture is not a “silver bullet” for profitability
- Wheat/cotton rotations appear to do well in deficit-irrigation scenarios
- The best-suited cropping system will depend on the local characteristics of each operation

Sources

Malabanan, A. and D. Mitchel. (2024). Personal Communication. Risk simulation results for AG-CARES data, 2017-2023.

McCallister, D., B. Guerrero, W. Keeling, A. Wright, J. Burke, and K. Lewis. 2023. Profitability comparisons of regenerative agricultural practices in deficit-irrigated systems. 2023 Annual Water Resources Conference, Fort Collins, CO.

Keeling, W., D. McCallister, A. Wright, and B. Guerrero. 2025. Economics of Regenerative Agriculture in the Texas High Plains. Selected poster presented at the Southern Agricultural Economics Association Annual Meetings, Irving, TX, February 2025.

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