

International Rice Sustainability Comparison

Opportunities for cooperation

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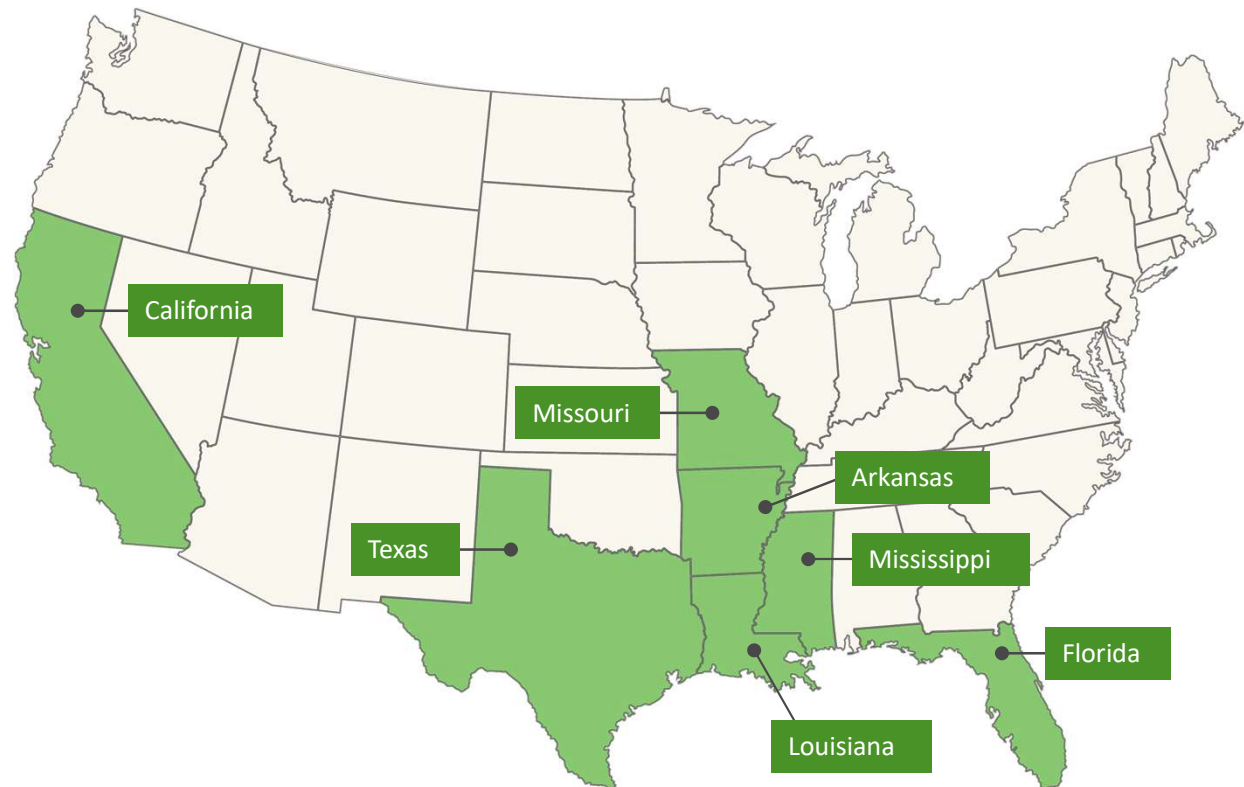
Chair USA Rice Sustainability Committee





SNAPSHOT OF THE U.S. RICE INDUSTRY

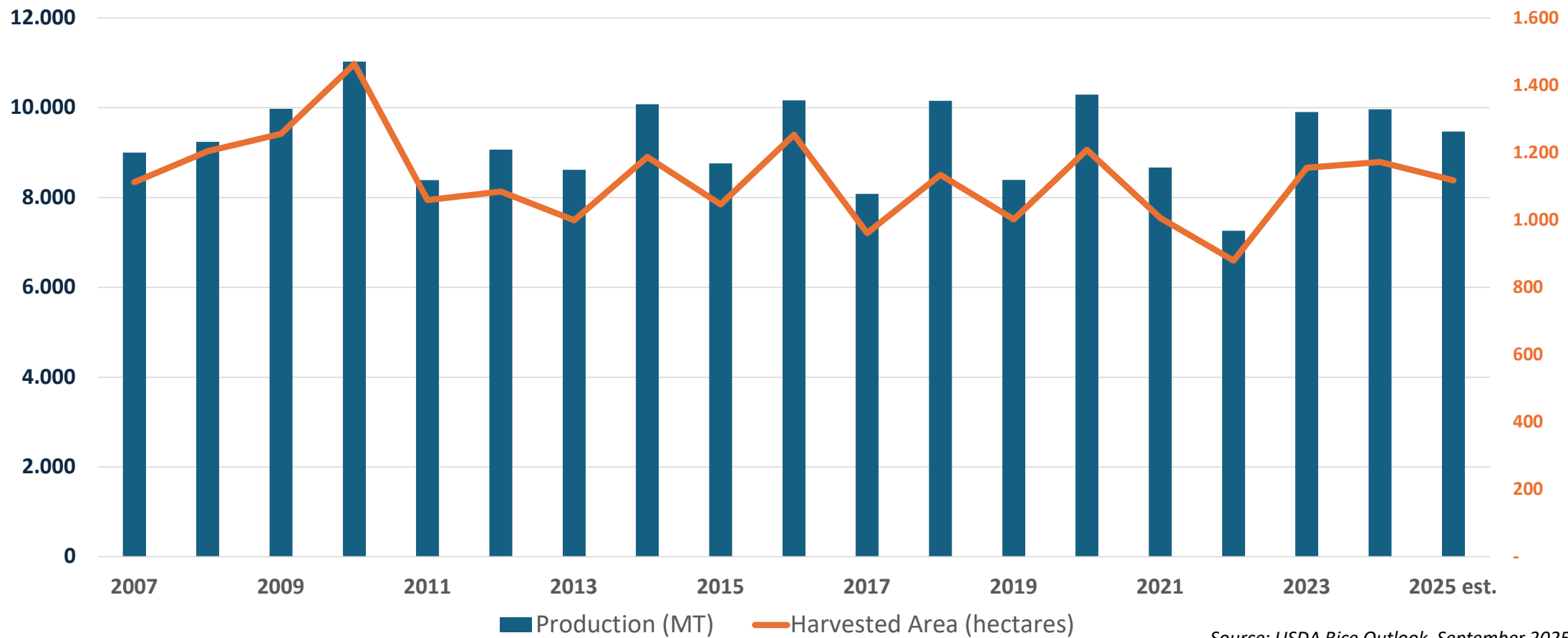
- U.S. farmers grow all types of rice – long, medium, short grain as well as aromatic and specialty varieties
- 1.2 million hectares planted on average annually
- About 70% of rice consumed in the U.S. is grown in the U.S.
- Rice is primarily grown in 7 states
 - Arkansas, California, Florida, Louisiana, Mississippi, Missouri and Texas



U.S. RICE PRODUCTION & AREA

Thousand MT

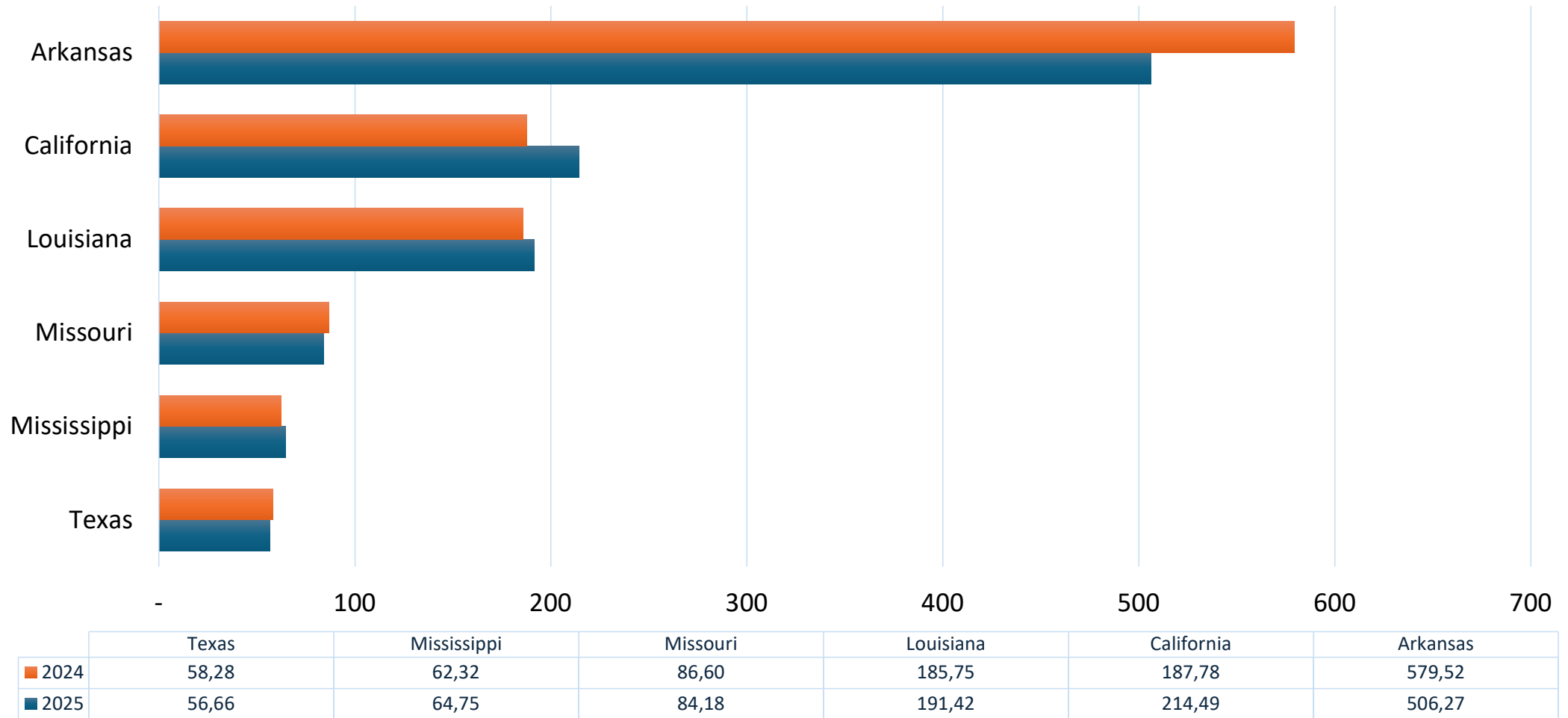
Thousand Hectares



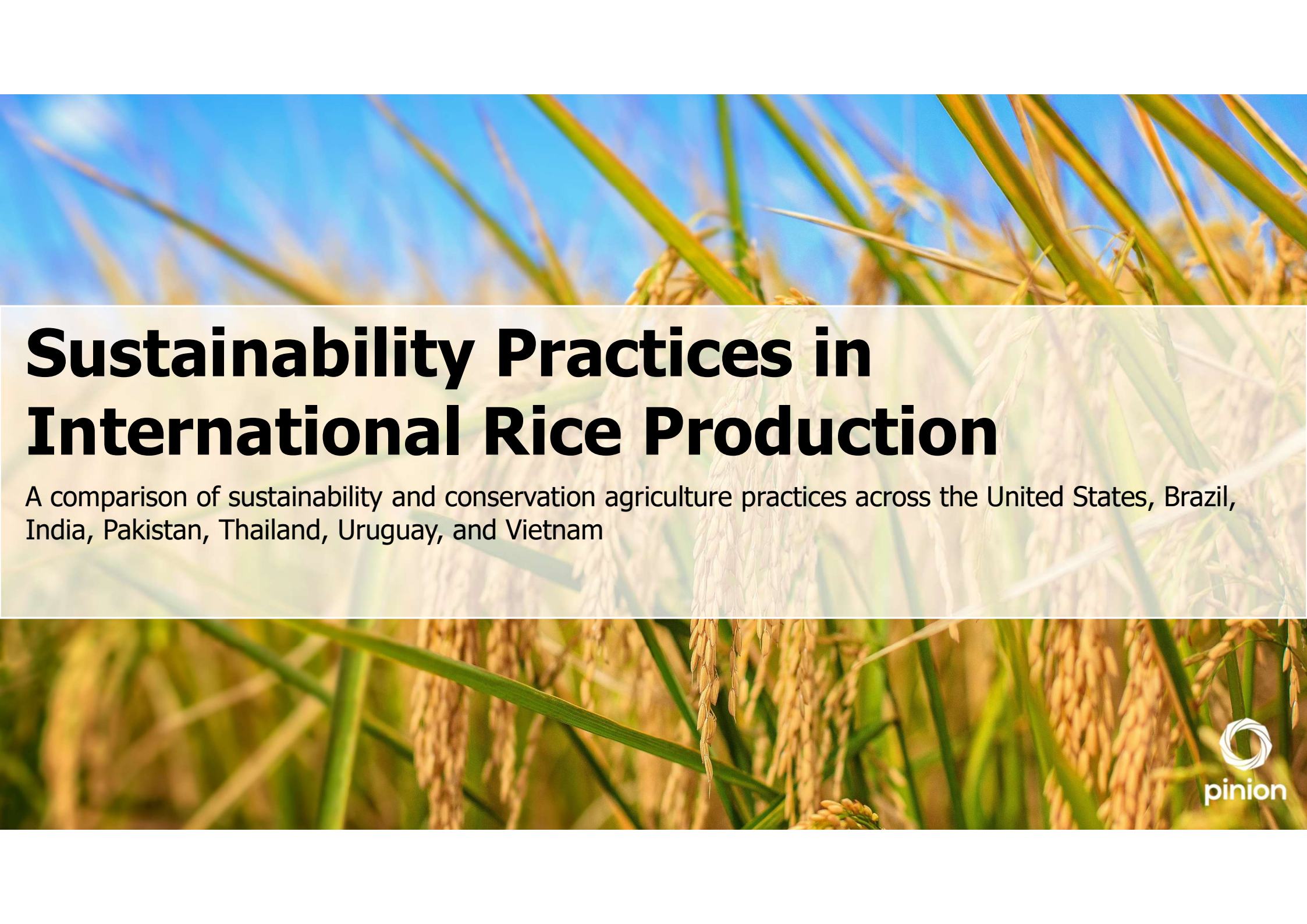
Source: USDA Rice Outlook, September 2025

HARVESTED AREA BY STATE

THOUSAND HECTARES



Source: NASS Quick Stats, September 2025

A close-up photograph of rice stalks with golden-brown grains and green leaves, set against a clear blue sky. The image is used as a background for the title and subtitle.

Sustainability Practices in International Rice Production

A comparison of sustainability and conservation agriculture practices across the United States, Brazil, India, Pakistan, Thailand, Uruguay, and Vietnam



pinion

INTL SUSTAINABILITY REPORT

Highlight the **differences in sustainability and conservation agriculture practices** in seven top rice exporting countries:

- Brazil
- India
- Pakistan
- Thailand
- Uruguay
- USA
- Vietnam



REPORT METHODOLOGY

1. **Conduct a literature review** of global and regional rice sustainability and conservation agriculture practices
2. **Collect expert opinions** to determine current practice adoption and confirm the research accurately reflects the practices occurring in each region
3. **Categorize practices into focus areas** based on the sustainability outcomes and the intention behind the practice to facilitate the analysis:



Land Use and Soil Conservation



Water Use and Quality



Energy Use and Air Quality



Biodiversity

4. **Compare focus areas across countries**



SNAPSHOT OF RESULTS

	United States	Brazil		India		Pakistan	Thailand	Uruguay	Vietnam	
		Northern	Southern	Indo-Gangetic Plain	Southern				Double Crop	Triple Crop
Human labor (h/Mg rice)	1	25	7	141	170	N/A	30	4	31	87
Yield (Mg/ha)	8.7	3.5	8.1	4.5	2.8 first 4.3 second	3.8	4.8 first 4.6 second	8.9	4.2 first 7.1 second	6.9 first 5.3 second 4.1 third
Yield (% of actual to potential)	69.3%	38.3%	54.7%	46.1%	41.1%	N/A	50.3%	61.4%	56.4%	57.2%
GHG emissions (Mg CO ₂ e/ Mg rice)	0.6	0.3	0.8	0.8	1.2	N/A	0.9	0.5	0.9	0.7
Energy use (GJ/ha)	23.4	20.8	10.9	14.3	14.4	N/A	15.2	16.4	19.1	17.2
Nitrogen input (kg/Mg rice)	12.0	1.5	5.1	22.1	35.8	N/A	10.7	0.6	7.2	1.1
Pesticide use (applications / Mg rice)	0.8	0.9	0.9	0.9	1.4	N/A	1.1	0.4	1.6	1.3
Water use (mm/Mg rice)	147.3	303	173	233	364	N/A	263	146	191	148
Water Stress Analysis	Low Stress	Low stress	Low stress	Extremely high stress	Extremely high stress	High stress	Extremely high stress	Low stress	Low-medium stress	Low-medium stress

Highly sustainable

Medium-high sustainability

Moderately sustainable

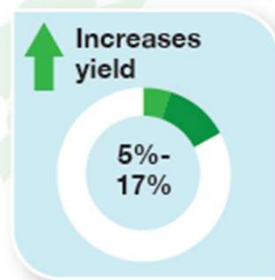
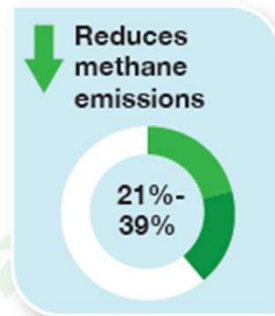
Low sustainability

Not available (N/A)

U.S. RICE + SUSTAINABILITY

Sustainable U.S. Rice Production Practices

- **Conservation tillage** increases soil organic carbon, reduces methane emissions by 21%-39%, reduces erosion, increases phosphorus and potassium levels in the soil, reduces water use by 20%-30%, and increases yield by 5%-17% when compared to full till.

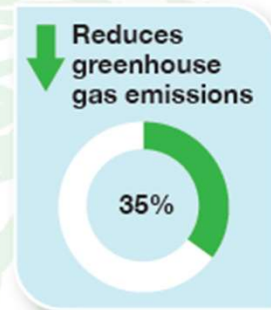


- U.S. rice has the highest percentage of production in **precision levelled fields** (77%) which leads to higher flooding efficiency, a reduction in water use, and improves overall irrigation efficiency by 21%. In addition, methane production is reduced, yields are increased, seeding rates are lowered and expenses are reduced.



U.S. RICE + SUSTAINABILITY

■ **Rice straw incorporation and retention**, a practice that increases soil organic carbon, improves soil health, increases water use efficiency, increases yield for the next crop when compared to straw removal and reduces greenhouse gas emissions by 35%.



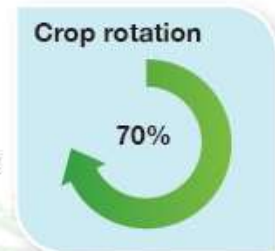
■ Rice produced in the U.S. has the highest ratio of **actual yield** to potential yield of countries researched.



■ Over 40% of U.S. rice production acres are reflooded during the winter following harvest **enhancing biodiversity** and creating habitat for migratory waterfowl, other waterbirds, as well as amphibians, reptiles, and mammals.



■ Nearly 70% of U.S. rice production practices **crop rotation** which improves soil fertility, reduces pest pressure and pest control costs, and increases species biodiversity.



■ The U.S. has the highest percentage of **certified seed** use in rice production. This increases yield, net income, productivity and greatly decreases the potential for the introduction of weed seed into rice production fields.



LAND USE + SOIL CONSERVATION

Practice	U.S.	Brazil	India	Pakistan	Thailand	Uruguay	Vietnam
Biochar Application	1%	1%	No estimate provided	No estimate provided	0%	N/A	No estimate provided
Conservation Tillage (including Zero-Till)	41%	54%	3%	No estimate provided	N/A	90%	N/A
Cover Crop	2%	1%	N/A	N/A	N/A	N/A	N/A
Organic Fertilizer Application	8%	N/A	No estimate provided	No estimate provided	1%	N/A	No estimate provided
Rice Straw Incorporation & Retention	76%	42%	No estimate provided	No estimate provided	4%	100%	7%
Use of Certified Seeds	96%	No estimate provided	No estimate provided	No estimate provided	50%	95%	3%

Common adoption	Practice is implemented on over 50% of the rice area.
Moderate adoption	Practice is implemented on 16%-50% of the rice area.
Minimal adoption	Practice is implemented on 1%-15% of the rice area.
No adoption	Practice is not implemented on any rice acreage given available data but may still be appropriate for the region.
No estimate provided	Practice may be occurring, but estimates were not available from industry experts.

LAND USE + SOIL CONSERVATION

U.S. Practices

Conservation tillage:

- Increases soil organic carbon
- Reduces CH₄ emissions
- Reduces erosion
- Increases P and K levels in the soil
- Reduces water use
- Increases yield

Rice straw incorporation or retention:

- Increases soil organic carbon
- Reduces GHG emissions (compared to straw burning)
- Reduces erosion
- Improves soil health
- Increases water use efficiency
- Increases yield

Certified seeds:

- Increases yield, net income, and productivity



Metrics

Percentage of actual yield to potential:

Highest percentage of actual yield to potential yield ratio

WATER USE + QUALITY

U.S. Practices

Direct Seeding:	Reduces water use
	Reduces GHG emissions
	Reduces input and labor costs
	Increases yield

Dry seeding:	Reduces CH4 emissions
	Reduces water use

GNSS or laser land leveling:	Improves water coverage
	Increases yield

Metrics

Water Stress:

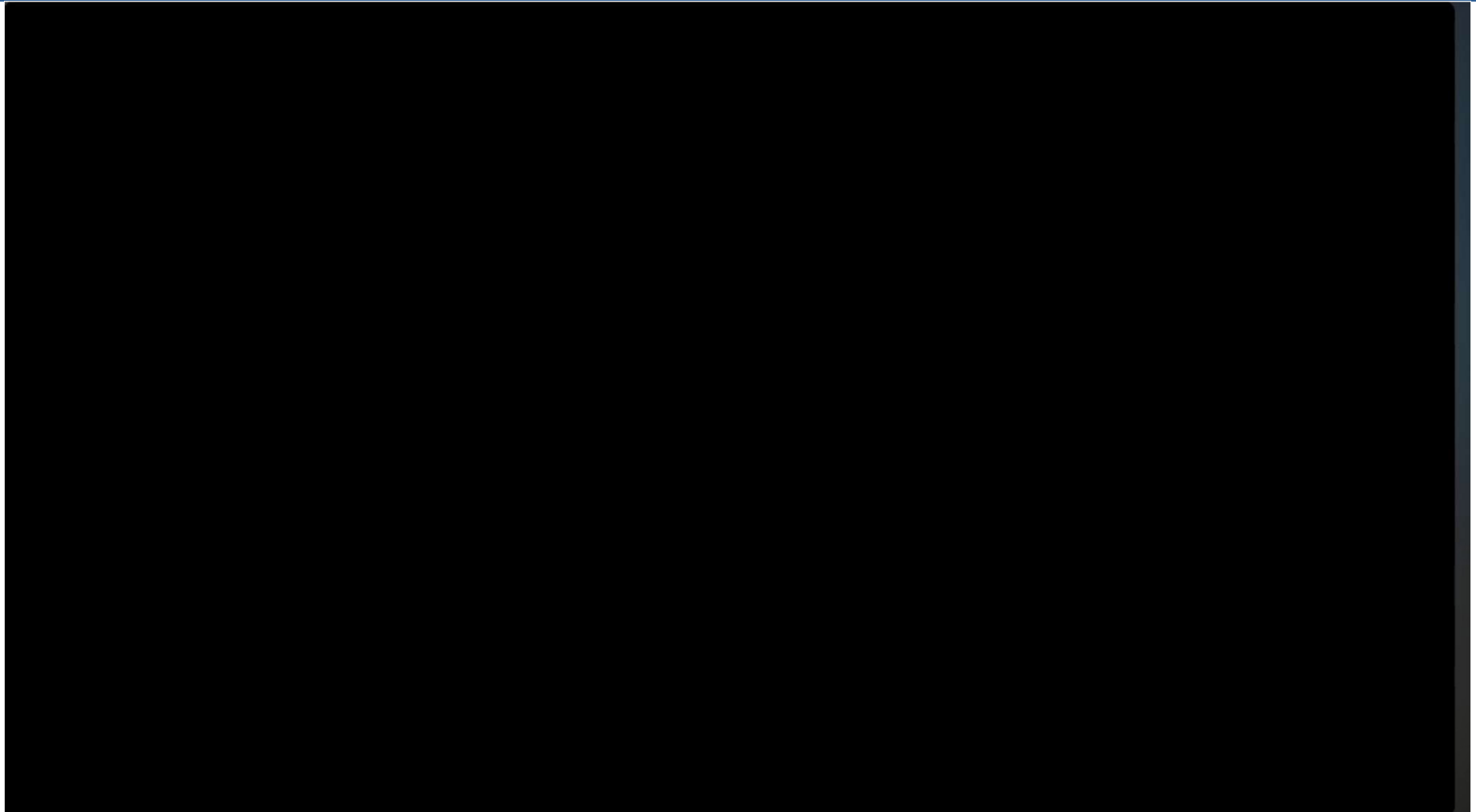
Rice is produced in a low water stress region





LASER LAND LEVELING

ALTERNATE WETTING & DRYING



ENERGY USE + AIR QUALITY

U.S. Practices:

4R, nitrogen efficiency, nutrient management plans:	Reduces GHG emissions
	Improves nutrient use efficiency
	Increases yield
	Reduces input costs

Sulfate containing fertilizers:	Reduces GHG emissions
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Urease inhibitors:	Reduces N ₂ O emissions
	Reduces ammonia loss
	Reduces nitrogen loss
	Increases yield

Metrics

GHG Emissions:	Lower emissions compared to others in this report (except Northern Brazil and Uruguay)
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BIODIVERSITY

U.S. Practices:

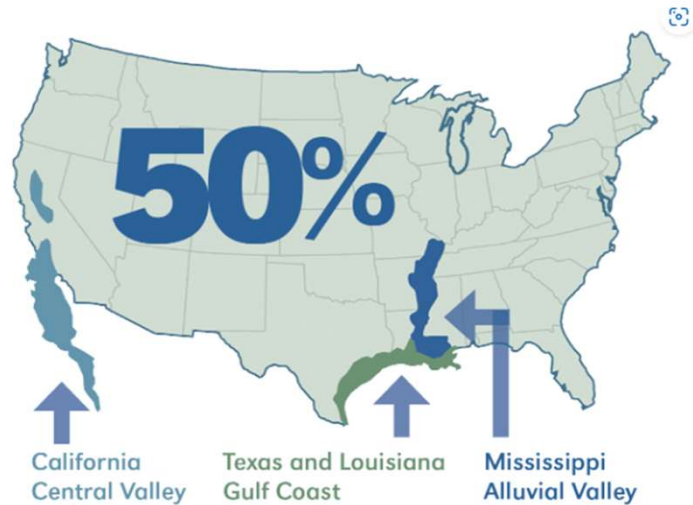
Crop rotation:	Increases species diversity
	Reduces pest pressure
	Improves soil fertility
	Reduces weed/pest control costs

Rice-crawfish rotation:	Increases species diversity
	Reduces pest and weed pressure
	Improves soil fertility
	Increases income but can decrease rice yield

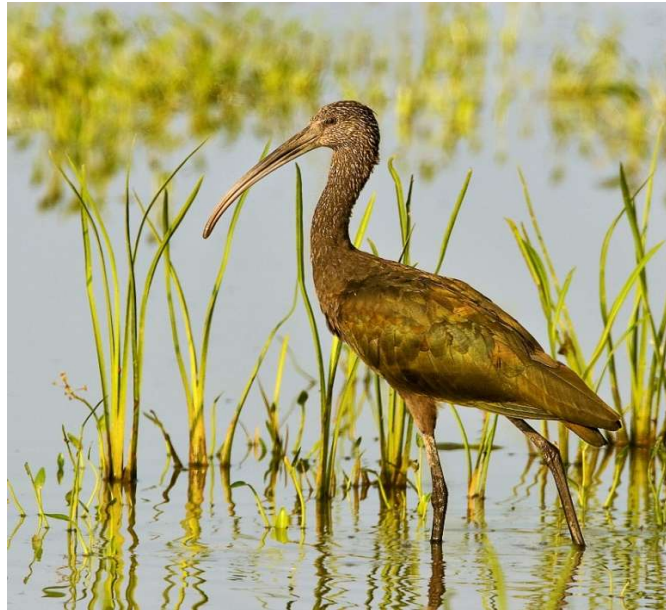
Winter flooding:	Creates habitat for migratory birds
	Reduces winter weeds
	Improves water quality
	Increases soil retention



MIGRATORY BIRD HABITAT



Over half of North America's ducks and waterfowl winter in one of these regions — which overlap with virtually all of the rice lands in America.



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U.S. Rice Industry 2030 Sustainability goals



Note: It is assumed that certain regions may be more successful at reaching or exceeding some goals because of production practices, climate, etc. Any evaluation relative to these goals will not compare regional performance.



Thank you!

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