

# Crop Vulnerability Update for Rice

## Vulnerabilities & Threats

- Susceptibility to many current, evolving and emerging pests (nematodes), and fungal, bacterial and viral pathogens (panicle blight caused by *Burkholderia glumae*, bacterial leaf blight caused by *Pantoea ananatis*, Hoja Blanca disease caused by rice *Hoja blanca* tenuivirus, RHBV), some seedborne and of quarantine importance, e.g., kernel smut, false smut and rice blast.
- Susceptibility to increasing temperature especially during reproductive stage resulting in lower grain yield, high grain fissuring, lower head rice yield, chalkiness, and overall lower grain quality
- Narrow US genetic base, with fewer than 10 varieties on most US acreage; California medium grain has a particularly narrow base.
- Inorganic arsenic accumulation in rice grains grown; methane emission under anaerobic, flooded conditions.
- Difficult to access seed (or clones) of crop wild relatives (CWR) and information on key traits due to international restrictions and benefit-sharing laws.
- Reduced budgetary support for PGR (plant genetic resources) management, research, and breeding.

## Genetic research & breeding capacities

- ARS genetics and breeding programs at Stuttgart, AR and Davis, CA; genome databases including Gramene at Cold Spring Harbor, NY and Ricebase, an integrative database for rice, at Stuttgart, AR and Breeding insight (hosted at Cornell U).
- US university genetics and breeding programs at U Arkansas; U California-Davis (associated with CCRRF); Louisiana State U; Mississippi State U; Texas A&M U.
- US industry breeding programs (e.g., RiceTec, California Cooperative Rice Research Foundation (CCRRF), Lundberg Family Farms, Nutrien Ag Solutions).
- Strong national research and breeding programs in numerous Asian nations.
- Strong international research and breeding programs in Asia, Central and South America, and genebank capacity at CGIAR centers like IRRI, Philippines and AfricaRice Center, Côte d'Ivoire.

## NPGS PGR Status & Impacts

- **Status:** Collection of varieties, breeding stocks, and CWR (19,200+ accessions) at Aberdeen, ID; genetic stocks (33,000+ accessions) at Stuttgart, AR safeguarded as seeds in cold storage. Most accessions available for distribution and backed up at Ft. Collins. Seeds regularly tested for germination and/or seedborne diseases and regenerated as needed.
- **Impacts:** Protects and genetically improves valuable US grain crop with more than \$3 billion/year in production value.
- Preserves and distributes base germplasm (9,500 packets/yr) as potential sources of host-plant resistance to diseases and pests; materials for rice research; and base genetics for specialty rice varieties and rice breeding.
- The NSGC rice collection distributed 980 packets in 2024 for 74 seed requests.
- The genetic stocks distributed 7,437 packets in 2024 for 70 seed requests.

## Priority Issues

- Genetic base of US rice must be broadened due to production and weather changes, emerging diseases (e.g. kernel smut, false smut, bacterial leaf blight, narrow brown leaf spot, and Hoja Blanca), and increase yield by identifying donors with novel yield-and grain quality enhancing alleles.
- Additional budgetary support crucial for automating NPGS rice genebanks, for regenerating samples, developing improved high throughput phenotyping methods, handling high demand, evaluations for resistances to diseases and insect pests, adaptation to new cultivation systems, and grain quality traits.
- More budgetary support for expanded public-sector breeding capacity to enhance resistance to biotic and abiotic stresses and quality traits.
- Accelerate rate of importing exotic PGR including new aromatic rice, health beneficial and stress tolerant rice from IRRI under quarantine conditions and with acceptable access and benefit-sharing arrangements.