Overview of rice breeding programs in the US and the efforts focused on the RiceCAP project

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Rice Breeding in the US

• About 20 US breeders
  – Southern
    • Semi-tropical environment – diseases, insects, long growing season
    • Primarily long grain market - javanicas
  – California
    • Temperate environment
    • Primarily medium grain market - japonicas
Texas Breeding Team

Cultivar development
Molecular breeding
Molecular genetics
Cultivar development
Mutation breeding
Pathology
Cereal chemistry
Mapping populations

Researchable Issues Important to the US Rice Industry

Ideas have been synthesized from stakeholder, collaborator, and customer input gathered over the last three years

- Role of ARS in Meeting Research Needs of the Rice Industry 2/01
- Meeting of rice breeders and rice industry at Rice Outlook Conf. 12/02
- Rice Breeders Meeting 3/03
- CAP proposal announcement 11/03
- Roundtable discussion by researchers 12/03
- Online discussion of researchers
- Researcher meeting at PAG 1/04

RiceCAP
Choice of Researchable Issues

• Trait having **economic value** to the US and global rice industry
• Trait that is **important to breeders** so that they will participate in developing the technology and utilizing it
• **Complex trait, difficult to breed for,** requiring new methods to make significant advances
• Results of this research should result in a **significant breakthrough at both basic and applied levels**
• **New research partnerships** would be developed in the US rice community that would outlive the CAP grant

Milling Quality

• Amount of whole milled grains produced per acre determines the value of the crop
  - **Grain Component - examples**
    • Grain size, shape, uniformity
    • Grain hardness
    • Grain fissuring/cracking
    • Chalkiness
    • Grain chemistry
Milling Quality

– Plant Components – examples
  • Maturity
  • Uniformity of grain fill
  • Number and timing of tiller development
– Plant Response to the Environment - examples
  • Temperature stress
  • Rain during grain dry down

Why Milling Quality?

– Huge impact industry wide
– Important to all US breeding programs
– US may have the best sources of elite germplasm in the world for this trait
– Complexly inherited trait
– Comprised of sub-components that may be more simply inherited
– Opportunity for novel, but difficult, research
Why Sheath Blight Resistance?

- Causal organism *Rhizoctonia solani*
- Common problem wherever rice is grown
- Losses in yield and quality
- Costly chemical control, requires proper timing of application
- There are limited sources of genetic resistance adapted to the US and independent of late maturity and tall plant height
- Difficult to phenotype
- Environmentally sensitive trait

Summary

- All public US rice breeding programs will be involved in the CAP grant through direct participation or training
- Traits were chosen based upon
  - Economic impact
  - Importance in US and internationally
  - Complexly inherited, recalcitrant traits
- CAP project will result in a major leap forward in technology for US breeding efforts and new interdisciplinary teams will be forged