

The Carolina Gold Rush: Learning new secrets from heirloom rice



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The Connecticut
Agricultural Experiment
Station



CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

Agricultural research started well before 1875



Our food security: built by seed savers



Why do we study rice?

Eaten by 50% of humans each day.

Better rice production reduces:

- poverty and malnutrition
- water use
- pesticide use
- CO₂ emissions



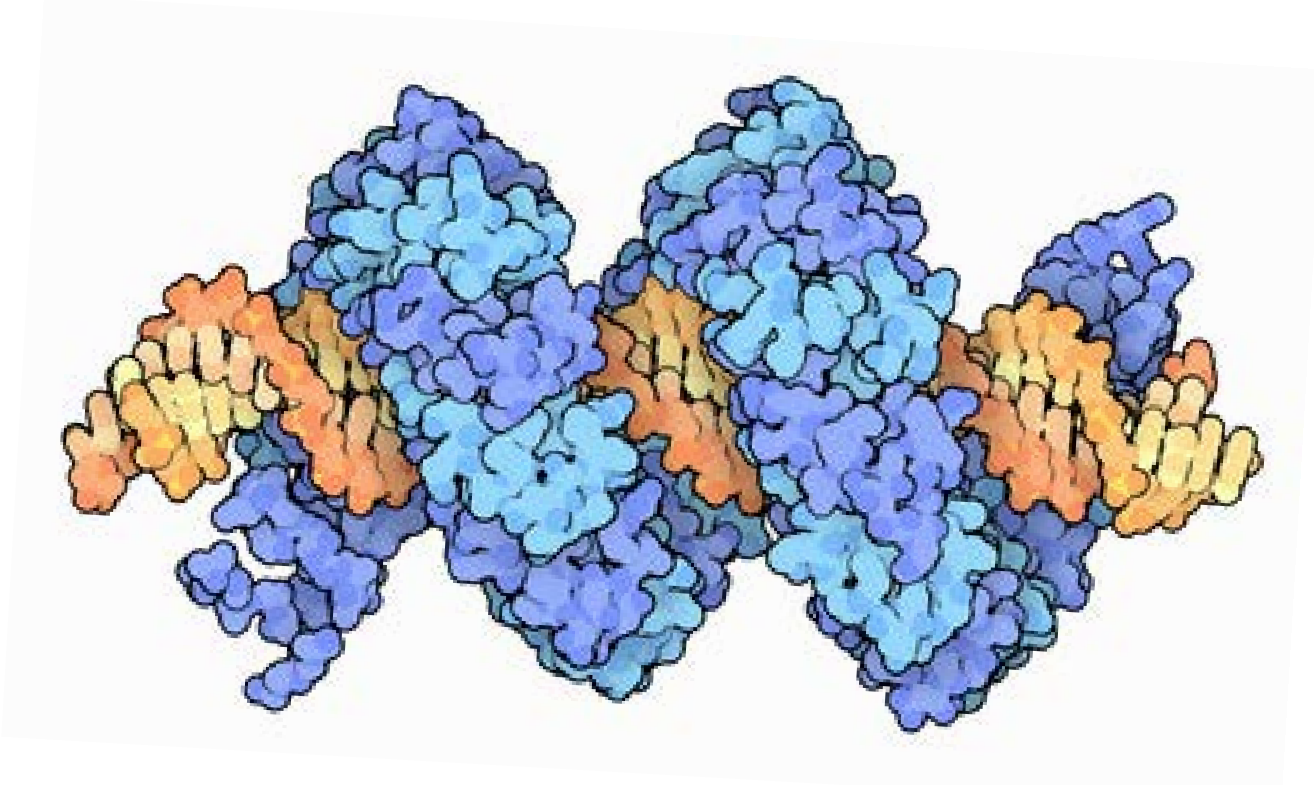
37% of rice yield is lost to pests and disease



Bacterial leaf streak has no known genetic resistance.

My research observation:

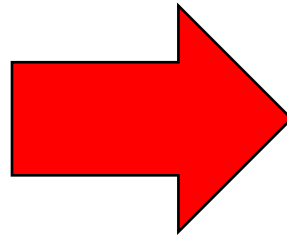
The bacteria growing on rice in America were missing something.



Where did rice come from?



Oryza rufipogon



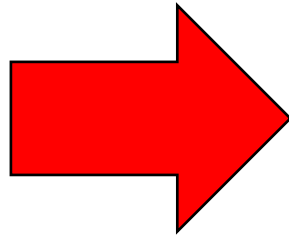
Oryza sativa

7,000 years ago in China

Where did rice come from?



Oryza barthii



Oryza glabberima

3,000 years ago in Africa

America's Rice Heritage

- Attempts by colonists from 1640s
- 1685- Captain John Thurber brought "Golde Seede Rice"



Dr. Henry Woodward

“Carolina Gold”



- Famous for delicate, nutty flavor
- 30,000 tons exported by 1760
- 55% of the Carolinas economy

Challenges of tidewater rice



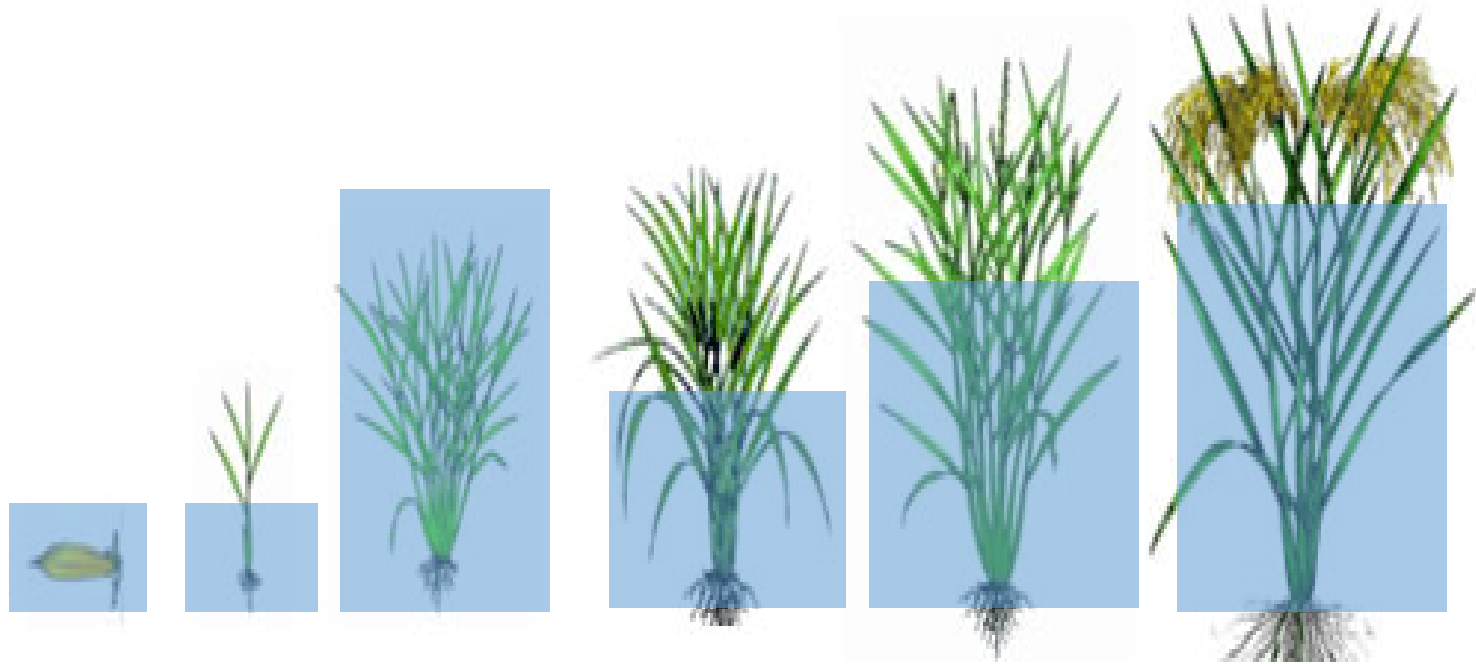
Precise field preparation

- Treeless
- Flat
- Surrounded by irrigation dikes and canals





Planting and irrigation must be timed to control weeds and pests



How were these practices adopted in a short time by people with no experience?

Historians now know...

- Tidewater rice production = adopted from West African rice production



Similarities in tools, cooking styles, and division of labor

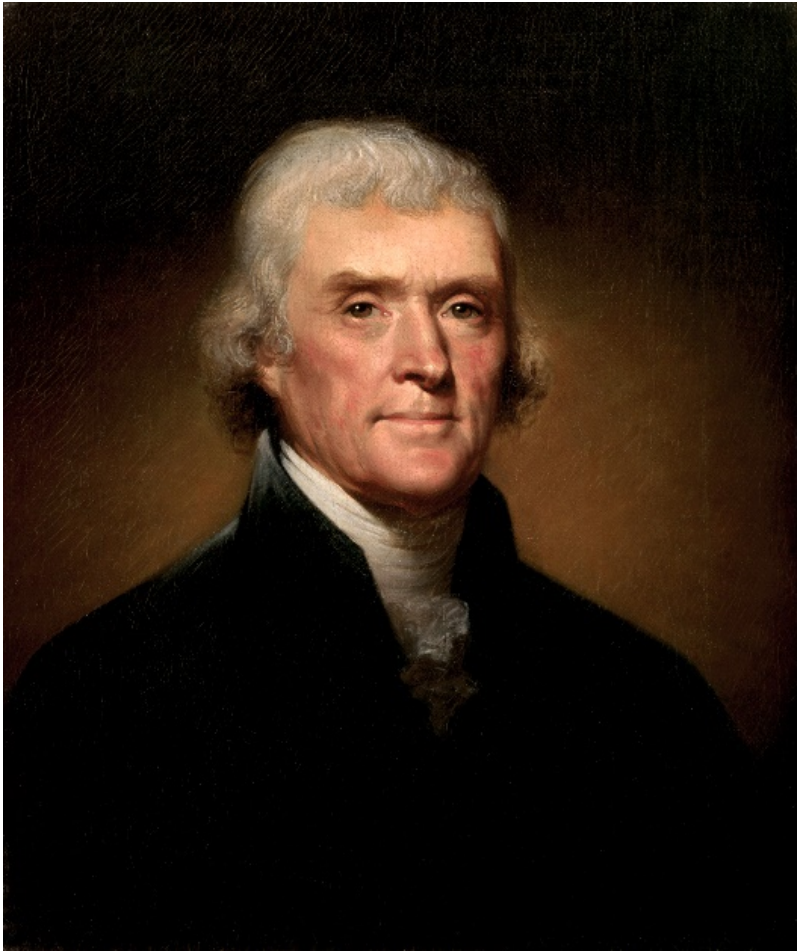


How was Carolina Gold established in America?



Through the technology and expert skills of enslaved people.

Rice culture was grueling and dangerous



“Rice is a plant which sows life and death with even hand”

-Thomas Jefferson

Gullah-Geechee culture grew from the relative isolation



Decline and Rescue

- Rice cultivation abandoned by 1920
- Saved in USDA seed collections
- 1980s- Dr. Richard Schulze decided to try farming it



- Glenn Roberts started commercial production in 2001
- > 1000 acres now in production



My research observation:

The bacteria on rice from America were missing an important protein.

Is there something different about the type of rice grown in America (Carolina Gold?)

Our finding: Carolina Gold Rice is resistant to bacteria that have the missing protein.

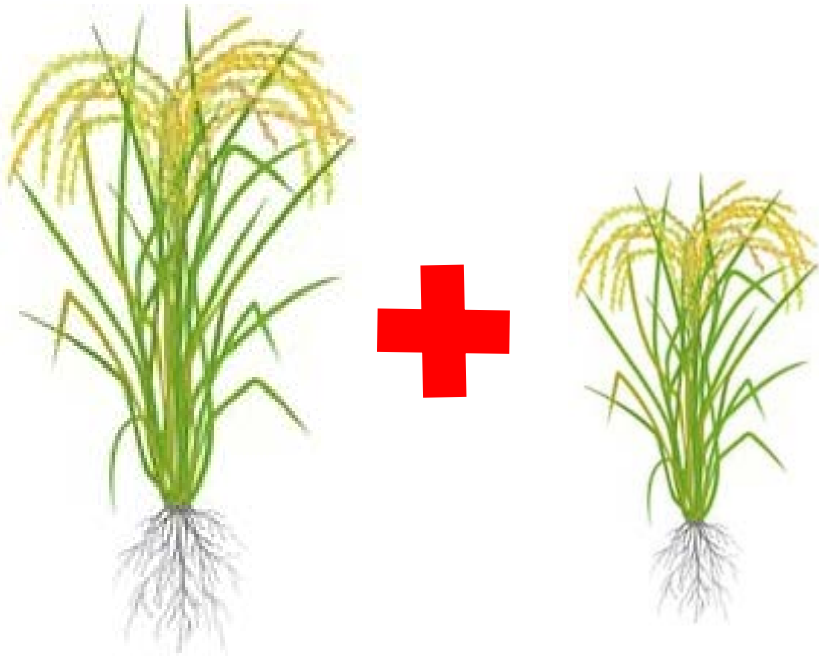


**Bacteria
without
protein**



**Bacteria
with
protein**

Mating Carolina Gold allowed us to find the source of resistance



- Studied DNA from offspring
- Identified a new resistance gene

Xo-1 is the first genetic resistance against Bacterial Leaf Streak.



- Could prevent yield loss of up to 30%.

The protein that triggers resistance in Carolina Gold is also found in other crop diseases.



MANGO



TOMATO



SOYBEAN



CITRUS

In conclusion:

Early experimenters and seed-savers laid the groundwork for modern plant breeding.

The knowledge of enslaved and Native people were essential in developing American agriculture and cuisine.

These resources enabled the discovery of resistance to an important modern rice disease.

What secrets do other heritage crops hold?



Cherokee Purple

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