



# BLOOMING

Inclusion and Diversity in STEAM

## Lesson Plan: Improving Rice Agronomic Performance Through Breeding

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### Objective:

- To help students understand the key traits and methods used in rice breeding for improving agronomic performance, such as yield, disease resistance, and drought tolerance.

### Materials:

- Rice plant models or pictures
- Genetic trait cards (representing different traits like yield, resistance, etc.)
- Sticky notes or markers for labeling traits
- Scissors (for cutting out trait cards)
- Large paper or board for organizing traits
- Internet or library access for research on rice breeding methods

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### Background Information:

Rice breeding is the process of developing new varieties of rice that possess improved traits such as higher yield, greater resistance to pests, diseases, and better adaptation to environmental stresses like drought. Breeders often use traditional crossbreeding and marker-assisted selection to achieve these goals, but modern techniques such as CRISPR and genomic selection are becoming more prevalent.





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## Steps for Activity:

### 1. Introduction to Traits in Rice Breeding:

- Discuss with students the various traits important for rice breeding (yield, disease resistance, drought tolerance, etc.).
- Show examples of how breeders aim to improve these traits through selective breeding.

### 2. Organize the Traits:

- Distribute genetic trait cards to the students. Each card will describe one key trait, such as "high yield," "pest resistance," or "drought tolerance."
- Have students organize the traits by priority, discussing which traits might be the most important for rice breeders based on different environmental conditions.

### 3. Explore Breeding Methods:

- Discuss the traditional and modern methods used to improve these traits, including:
  - Crossbreeding: Combining desirable traits from two parent plants.
  - Marker-Assisted Selection: Using genetic markers to select plants with specific traits.
  - Genomic Selection and CRISPR: Cutting-edge technologies that allow precise genetic modifications.

### 4. Simulation of Breeding:

- In groups, students will "breed" rice plants by combining two different trait cards, simulating how breeders select traits for improvement.
- Discuss how breeders might face trade-offs (e.g., improving yield might reduce drought tolerance, and vice versa).

### 5. Analyze Breeding Success:



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- Once students have created their “improved” rice varieties, they will present their results, explaining why they selected certain traits and how they achieved a balance between yield, resilience, and other key factors.

#### Visualize and Discuss:

- Create a large poster where students display their improved rice varieties.
- Have students label the key traits and explain why these traits are important for different environments (e.g., tropical vs. temperate climates).

#### Additional Discussion Points:

- Applications: Explain how rice breeding impacts global food security and how advances in genetic technologies can help address challenges like climate change.
- Challenges: Discuss the difficulties breeders face, such as unpredictable environmental changes and pests evolving resistance to genetic modifications.

#### Assessment:

- Ask students to explain in their own words the process of breeding rice for improved agronomic performance.
- Have them describe the role of specific traits and breeding methods in enhancing rice resilience and productivity.
- Evaluate their understanding through reflection questions based on the activity, such as:
  - *What are the most important traits to consider when breeding rice?*
  - *How do modern breeding methods like CRISPR differ from traditional crossbreeding?*



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