



Food for the Future

How do scientists work together to solve real world problems?

Skill Level: Senior (14-18 years old) or 9-12th Grade

Learner Outcomes:

Understands that sometimes elected officials and scientists work together in teams to solve real world problems.

Education Standards:

NSES: Science in Personal and Social Perspectives.

NETS: Communications and Collaboration; Research and Information Fluency; Critical Thinking, Problem Solving, and Decision Making.

Sunshine State Standards: SC.912.L.17.8; SC.912.L.17.18; SC.912.N.4.2; SS.912.A.1.5; SS.912.G.5.3

Success Indicator:

Can explain that over time, resistant plants can become susceptible to disease as pathogens mutate.

Life Skill(s): Teamwork; Decision Making; Problem Solving

Tags: wheat rust

Time Needed: 60 minutes

Materials List: four copies of Rust Never Sleeps Scenario; access to a library or the internet (or facilitator can print out information for each team ahead of time)

The need for plant breeders is increasing every day due to a growing world population, new plant diseases, and changes in climate. In the first three lessons, you learn about how plant breeders use genetics to breed plants that help solve problems, such as better nutrition, less fertilizer or pesticides, etc. In the fourth lesson, you also learned about the work that Norman Borlaug did to breed wheat that was resistant to stem rust.

But in 1999 a new form of wheat rust disease was found in a Ugandan wheat field. Fungal diseases mutate over time and wheat varieties that resisted the disease for over 40 years are now succumbing to a virulent new form called Ug99. This new disease is destroying the varieties of wheat which were once resistant to wheat stem rust, and is affecting one of the world's largest wheat growing countries, Punjab, India. Wheat is the most widely planted crop in the world, covering more surface area than any other crop. A world-wide wheat rust epidemic could wipe out fifty to seventy-five percent of the world's wheat.

In business, politics and other arenas of life, problems are solved by working in teams, or committees. Each member of the team brings his or her own expertise and is assigned as specific role. To be an effective team, each member needs to be able to work cooperatively and communicate clearly. Sometimes this can be a challenge, as you may be asked to work with someone who is very different from you (has a different personality, culture, or beliefs). As our economy becomes increasingly globalized

Learn More:

Find out more about what plant breeders do on the National Association of Plant Breeders website:

<http://www.plantbreeding.org/naph/index.htm>

Virtual Fun:

Play interactive games to learn more about the nutritive value of wheat on the Wheat Council's website:

<http://www.wheatfoods.org/>



we must work cooperatively with people of many nations, ethnicities, and beliefs. This is the case with wheat rust, a disease that knows no geographic boundaries.

WHAT TO DO

Divide the group into four teams:

1. Plant breeders and plant pathologists
2. Malthus scholars
3. Nutritionists
4. Elected officials

Give each team a copy of the Rust Never Sleeps handout, and review the information about each team and what their assignment is. Allow 20-30 minutes for research and discussion, then ask the first three teams to report back to the elected officials. Process the activity by answering the “Talk it Over” questions.

TALK IT OVER:

Share. . . .

- What were some of the decisions you had to make to complete this activity?
- Did everyone in your group agree on what to do? If not, how did you come to a consensus?

Reflect. . .

- What did you learn from this activity that you didn’t know before?
- What might be some of the obstacles you might face when working on a multi-national team? How might you overcome them?

Generalize. . . .

- Why are plant breeders only one part of the global hunger problem/solution?
- Why is it important for countries to work together to solve the wheat rust problem?

Apply. . .

- Can you think of some situations that would require you to make decisions as a team in the future?
- What would you do differently if you conducted this activity again?

Did You Know?

The state of Kansas is the largest wheat producers and North Dakota is the second largest wheat producer.

Glossary Words

Wheat Rust
Fungal
Virulent
Mutate
Epidemic

Related Activities

(Link to Activities in the 4-H Directory of Materials)



References

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Rust Never Sleeps Scenario

In the fourth lesson, you learned about the work that Norman Borlaug did to breed wheat that was resistant to stem rust. But in 1999 a new form of wheat rust disease was found in a Ugandan wheat field. Fungal diseases mutate over time and wheat varieties that resisted the disease for over 40 years are now succumbing to a virulent new form called Ug99. This new disease is destroying the varieties of wheat which were once resistant to wheat stem rust, and is affecting one of the world's largest wheat growing countries, Punjab, India. Wheat is the most widely planted crop in the world, covering more surface area than any other crop. A world-wide wheat rust epidemic could wipe out fifty to seventy-five percent of the world's wheat.

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Team Viewpoints:

Plant breeders/ Plant pathologists: Research wheat stem rust, either in a library or online. Remember to use reputable sources of information (usually college or government websites). Find out what is currently being done to develop resistant breeds of wheat. Where are the genes for resistance to this disease coming from? How is breeding for rust resistance progressing?

Malthus scholars: Thomas Malthus (1776-1834) was nineteenth century British scholar/ philosopher. One of his theories had to do with the ability of mankind to keep growing in population *and* still feed itself. Research Malthus' theory either in a library or online. Remember to use reputable sources of information (usually college, encyclopedia, or government websites). How could his theory, largely debunked over the years, be coming true? What recommendations does your committee have to solve this dilemma that Malthus theorized?

Nutritionists: Worldwide, the human population receives 30-50% of its energy needs from wheat. Using a library or the internet, research the nutritive value of wheat. Remember to use only reputable online sources of information. What type of nutrients does wheat provide? Which countries use wheat as a *staple food*? What could you recommend to your nation to replace this food energy? Assuming people in your country get 30% of their food energy from wheat and 50% of the crop were to get destroyed by rust disease, how short would your people be for food energy?

Elected Officials: Elected officials often they work with policies affecting other nations, like wheat rust. Making international policy decisions often falls to politicians who listen to recommendations from other experts. This team will listen to the reports of the other team, and make recommendations for dealing with wheat rust, should it become a global epidemic in world wheat crops.

Technology is an important part of plant breeding and science in general but international problems require cooperation between countries. How could counties help one another as rust disease moves around the world? What difficulties may one country face when dealing with another over the advance of rust disease around the globe?

