



AGRONOMY GROW WITH IT!

Activity Packet for Educators

AGRONOMY LESSONS

American Society of Agronomy



www.agronomy4me.org



5585 Guilford Rd.
Madison, WI 53711-5801
agronomy.org



Chapter 1

Corn: Your Preference is the New Variety

Standards

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms

Potential Extensions:

MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation

MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects the structure and function of the organism.

Objectives

Students will be able to:

list examples of beneficial characteristics that resulted from plant breeding.

assess potential crosses in a plant breeding program to be positive or negative.

Materials

Copies of activities (one per student)

Corn: What's Your Preference?

Corn: Find Your Variety

Agronomy Grow With It

Colored pencils or markers

A coin for each student

Time

Part 1: 25 minutes, Part 2: 40 minutes

Grades

6-8

Prior to the Activity

Read the entire *Agronomists Feed the World* chapter of the book *Agronomy-Grow With It!*

Author

John Nelson, Agri-Science Instructor

This activity is designed to provide an opportunity for students to evaluate a corn plant for traits that could be beneficial to society. In this process they will also see the basic steps that scientists use to select traits and to breed for different varieties of a specific crop to meet a production goal.

Have students read the *Agronomists Feed the World* chapter of the book *Agronomy-Grow With It!*

In the last 50 years the proportion of hungry people has decreased in developing countries

- Ask students why the proportion has decreased, what has changed
- Allow students to answer but let them talk about what could have changed... Most will say something about technology or wasting less.

Students should find more examples of what has changed to help decrease world hunger

Ask students "what do we use plants for?"

Students should respond with food, animal food, medicine, turf, fuel, fiber and protection and enrichment of soil. Students may need coaching on these uses, but could be coached to get the right answers (See page 10 of *Agronomy Grow With It* for extra examples of each use)

Ask students if all plants do the 7 tasks and have them explain

Students should quickly say no, and provide an example of something common like a tree and explain how we do not wear a tree, or use it to power our cars.

Once students provide these examples have them think of ways that these plants are specialized. How some trees will produce fruit, how a cotton plant will produce a fiber we use for our clothes, and finish with what they know to be the differences in corn.

Ask the class if all corn is the same? (No there are multiple varieties with different characteristics.) Then ask what different kinds there are.

Students should come up with corn varieties like sweet corn, corn for animals (field corn), popcorn, and potentially ornamental corn—if you can provide some pictures of the differences it may help.

Have the students independently think about what a good corn plant would be like (at this time you will need to hand out the first activity "Corn: What's Your Preference?")

Review the Activity

Explain some characteristics that corn varieties already express.

- **tall/short**—A taller corn plant would have more of an ability to get nutrients to its grain to produce more food. When the corn plant (not grain) is harvested as silage and fed to livestock we want more plant material to produce more feed. (a taller plant should produce more food)
- **long cob/short cob**—A longer cob will have more space for corn kernels to develop and will produce more grain. (A longer cob should increase production)
- **strong stem/weak stem**—Sometimes in harsh weather corn can be blown over or break. If this happens, the corn plant will not grow correctly and decrease the productivity of the plant. Blown over corn is also harder to harvest.
- **yellow kernel/multi-color**—The multi-color corn relates more to ornamental corn versus typical field corn for grain. The ornamental corn is used for the single purpose of being fun to look at.

AGRONOMY LESSONS
American Society of Agronomy



Corn: Your Preference is the New Variety

- **thirsty/not thirsty**—This characteristic is related to the corn's ability to save water. If a corn plant is more drought resistant (not thirsty) it can thrive in areas that receive a lower amount of rainfall and still produce well.
- **healthy/unhealthy**—This characteristic relates to specific varieties that are resistant or more immune to specific pests or known concerns that a plant may be exposed to. A "healthier" corn plant in this scenario is going to withstand more of these issues without extra resources being used to prevent or treat an issue, which results in a decrease in production costs.

Read the directions with the students about how they will need to select specific traits from the options to draw their corn. *be sure they circle or underline their desired traits as some may be difficult to distinguish strictly from the drawing at the bottom of the page. Draw attention to the example image for a reference while they work and have students complete the activity (10-20 minutes).

At the end of the allotted time ask students what traits they selected and why they would be good.

Guide student responses toward identifying the traits that will help meet one or more of the 7 uses of plants.

Activity two picks up by directing the students to record the characteristics they selected for their idea corn in column two of the chart.

After students have recorded the ideal characteristics read the directions for the second step of the activity with the students. Be sure they understand how they are selecting the traits of the original parent. Hand out coins for each student to complete the second step.

Once the students have recorded the original parent characteristics they will begin to look ahead and think about what they will be trying to accomplish.

Ask the class if anyone got their ideal corn plant as their starting parent.

Most students will not have the same ideal traits. Pose the question of what are you going to do to get your ideal corn plant. Write your strategy in the lines provided.

Ask students if they looked ahead and saw the mating columns

Most will have looked ahead already and thought about the process of going from one trait to the next

Ask students what we know about mating and passing traits

Students should answer that you get traits from the parents

If needed ask if anyone has ever said that you look just like your mom or dad? Most will begin to think about getting traits from the parents

The next point is to get students to start thinking about changing the traits. How will they do that?

Ask students if they are exactly like one of their parents

Students should answer no—follow up and ask why don't you look like one parent

The students should answer with the simple fact that they have two parents and get traits from both.

This is a great time to introduce heredity—the passing of traits from parents to offspring. This is also a good time to explain that these traits are a part of the genetic code or directions that we call DNA, and that we get a copy of each parent's DNA.

- Tangent to talk about: sexual reproduction vs. asexual

Direct the students to use the strategy they outlined for achieving the ideal corn plant to select a mate for their corn.

Once students have found a mate it is important to explain the following:

The mating may only work for one person and is not mandatory for both to record the same mating.

The probability is low unless they cheated, but if a student did get the then you have some good options

You can tell them that they still need to find a mate to produce more seed. That mating should make them change characteristics—if not they selected a mate that would maintain the ideal corn which is the goal.

Students need to record their mate's traits in the Mate 1 column

The need to flip a coin to see if they get the new trait or keep the original trait

Remind students to record the new characteristics in the offspring column

Students should be instructed that the offspring is now the parent that they are using for the second generation.

This is a good time to explain how the second generation should be getting closer to the ideal corn plant

They can repeat the steps for the remaining generations to try to achieve the ideal corn plant. They will need multiple crosses (partners).

Mid way through the generations, try to spark student interest by seeing who is getting close to meeting their goal. Ask the class who is within 3 traits, 2 traits and even 1 trait. Naturally students will be competitive and will want to beat their classmates. At the completion of generation 5 see how many students were successful

Talk through the process of meeting the goal of producing the ideal corn plant. Ask the following questions and direct their responses to the anticipated answers

What was the strategy—should be something on the lines of selecting a mate that has the traits you are looking for.

Did this always work—No it probably did not each time, Explain how this is science it's not perfect, but repetition helps.

What made it not work—if there was a trait that was undesirable,

How do we fix that problem—limit the incorrect traits, this is a good time to bring up gene mapping

Explain that this is what Norman Borlaug did with wheat, and what B.B. Singh did with cowpeas. They took the seed from the plants that expressed the traits that they wanted. They did this enough times that they got the results that they wanted and were beneficial to the world.



Knowing that what you want doesn't always happen on the first try, you have major challenge ahead of you!

Using the ideal corn plant that you created on the other handout, you next need to complete the "ideal" column of the chart below.

Hint: to fit better in the table use the identifying letter in the characteristic column.

Once you have filled in the ideal characteristics, determine what you are characteristics you starting your breeding program with. To determine the characteristics of the original parent, will flip a coin. Heads = first option, Tails = second option.

Example: Height: Heads = Tall, Tails = Short

*** Be sure to record your original parent characteristics in the correct column**

After determining your original parent characteristics you will notice this is not your ideal corn plant. So, you need to breed your corn to create the ideal plant! What is your master plan to beat the challenge to create your ideal corn plant? Write your secret below.

Using your strategy above, select a mate that will help give you the perfect plant. Write their characteristics below in the "Mate 1 column."

*Each of you may not need the same characteristics so your mate might not need you to meet their goal!

In order to determine the next generation's characteristics you will follow the following rules of genetics:

- If the two plants share a characteristic (both tall) the next generation will be tall
- If the two plants have opposite characteristics you will flip a coin to see which characteristic the offspring will express
 - If heads, the offspring will have the characteristic that is listed first
 - If tails, the offspring will have the characteristic that is listed second
- After mating, the offspring becomes the new parent.
- You will need to use multiple crosses (other parents) to breed (make) the ideal corn plant!

Your challenge is to make your ideal corn plant. See if you can do this in 5 generations (abbreviated Gen.)

Characteristic	Ideal Corn	Original Parent	Mate 1	Offspring Gen. 1	Mate 2	Gen. 2	Mate 3	Gen. 3	Mate 4	Gen. 5	Goal Met? Y or N?
Height: T / S											
Cob Length: L / S											
Stem Strength: S / W											
Kernel Color: Y / Multi											
Water use: T / Not T											
Health: H / Not H											



For the following activity you need to draw and color a corn plant that has the following characteristics listed below. **Circle six** of the characteristics that your ideal corn is going to have. Follow the example below to help.

Example:

- tall/short
- long cob/short cob
- strong stem/weak stem
- yellow kernel/multicolor
- thirsty/not thirsty
- healthy/unhealthy



Characteristics: *circle six*

- tall (tall stalk) / short (short stalk)
- long cob / short cob
- strong stem (upright stalk) /
weak stem (stalk leaning over)
- yellow kernels / multi-color kernels
- thirsty (curled leaves) / not thirsty (straight leaves)
- healthy (perky leaves) / unhealthy (wilted leaves)





Chapter 2

Crops, Would You Invest?

Standards

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

CCSS.ELA-LITERACY.RST.6-8.7

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually

CCSS.ELA-LITERACY.RST.6-8.10

By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

Objectives

Students will be able to list alternative uses for crops.

Students will be able to evaluate effective uses for crops outside their intended uses.

Students will be able to describe how crops are harvested and processed.

Students will be able to describe how the public will benefit from an alternative use of various crops.

Materials

“Crops, Would You Invest?” handout

Time

45 minutes

Prior to the Activity

Read “Crops: Sooo Much More Than Food” (pg. 20) *Agronomy Grow With It!*

Author

John Nelson, Agri-Science Instructor

We all know that crops are usually produced for food. Either we eat them or feed them to the animals that produce other consumable products like the dairy cow. Agriculture has become efficient in using crops for more than one purpose.

Think of a popular crop. For example: Corn. What do we use corn for?

- Students should respond we use corn for feeding animals like beef and dairy cattle, pigs, chickens, and maybe they will say for humans to eat as well.

There are many alternative uses as well. See the chart on pages 28-29 in *Agronomy Grow With It!*

Ask students to think of a crop that has an alternative purpose.

- Students may come up with a few products that are used in multiple ways.

Read “Crops: Sooo Much More Than Food” (pg. 20) in *Agronomy Grow With It!*

- Begin a discussion about the alternative uses of common crops.
- Have students provide an example from the reading they found interesting or surprising.
- If needed, have them reference the chart at the end of the section (page 28 and 29).

Ask students if they knew there were this many alternative uses of crops?

Distribute the “Crops, Would You Invest?” handout

Begin by selecting or numbering the options from the chart that best fits your class or region. Then break the class into groups of 3.

Allow students to select from the preferred list or draw a number to determine which of the crops and associated product their group will be working with.

- Instruct students to be sure they record their selections on the handout
- Read the directions of the “Crops, Would You Invest?” handout with the class.
- The internet will be the simplest resource for this broad of a topic area.

Related ideas:

Students could research the products that use a crop product in them and find what that crop product has replaced. What is the environmental impact of using the crop, a renewable resource, instead of the component that has been used?

Extra credit opportunities could include finding an addition to the list, and they could design their own alternative product.

Look for videos that fit with the student’s examples which may be a fun way to help explain. (if students don’t find the videos first)

Look for the genetic alterations that have taken place to grow crops that are more suited for alternative uses. Example: from the chapter (pg. 26) the sugar cane is being selected for varieties that will grow in cooler environment to increase the production to meet a larger demand.

AGRONOMY LESSONS
American Society of Agronomy



www.agronomy4me.org



5585 Guilford Rd.
Madison, WI 53711-5801
agronomy.org

AGRONOMY LESSONS: AMERICAN SOCIETY OF AGRONOMY

Worksheet Chapter 2: Crops, Would You Invest?



From the chart on page 28 and 29 of *Agronomy Grow With It!* each group will receive (or select) a crop and a product that is produced by using this crop.

Please record your crop and product below:

Crop _____ Product _____

Once you have received your product the challenge begins.

You have been hired as a consultant for a multi-billion dollar investment company to find the next million dollar deal. Your job is to report back to your advisory board and convince them the crop you selected will be the next great investment.

Being well trained in the investment industry, you know that your proposal to the advisory board will need to have either a power point presentation or poster showcasing extensive research why your product is a million dollar investment. The company will use your research to determine how they can invest in the production of the product with a high probability of future growth. The decision to invest will be determined by the quality of information provided and the benefits that this product will bring to the American consumer.

In your presentation you should include the following information:

Harvest method – How is your crop harvested?

Process of production – How the product from your selection is produced?

Product benefits – How the product you selected will benefit the public?



5585 Guilford Rd.
Madison, WI 53711-5801
agronomy.org

AGRONOMY LESSONS: AMERICAN SOCIETY OF AGRONOMY

Worksheet Chapter 2: Crops, Would You Invest?



From the chart on page 28 and 29 of *Agronomy Grow With It!* each group will receive (or select) a crop and a product that is produced by using this crop.

Please record your crop and product below:

Crop _____ Product _____

Once you have received your product the challenge begins.

You have been hired as a consultant for a multi-billion dollar investment company to find the next million dollar deal. Your job is to report back to your advisory board and convince them the crop you selected will be the next great investment.

Being well trained in the investment industry, you know that your proposal to the advisory board will need to have either a power point presentation or poster showcasing extensive research why your product is a million dollar investment. The company will use your research to determine how they can invest in the production of the product with a high probability of future growth. The decision to invest will be determined by the quality of information provided and the benefits that this product will bring to the American consumer.

In your presentation you should include the following information:

Harvest method – How is your crop harvested?

Process of production – How the product from your selection is produced?

Product benefits – How the product you selected will benefit the public?



5585 Guilford Rd.
Madison, WI 53711-5801
agronomy.org



Chapter 3

Pests What's the Problem? —A Public Service Announcement

Standards:

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment

*Potential standard if discussing the importance of completing pest control correctly to eliminate producing pests that are resistant or more resilient to control methods

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms

*Potential to discuss how we have selected and bred plants that are resistant to certain sprays or produce their own method of pest resilience.

Objective

Students will be able to:

identify common crop pests.

identify sustainable methods to control common pests.

inform their peers about methods used to manage pests.

evaluate and determine the more appropriate method of controlling common crop pests.

Materials

Students will need access to the internet to gather information. Depending on the type of public service announcement they will create, they may need a computer or electronic device that has a camera, a voice recorder, webpage development software, or poster materials.

Time

3 hours depending on how elaborate the public service announcements are.

Prior to the Activity

Read "Problems with Pests" chapter in *Agronomy Grow With It!*

Author

John Nelson, Agri-Science Instructor

Ask students what a pest is:

An expected response will be something that bothers you or is a nuisance.

Ask students if this is positive thing or a negative thing?

Students should all agree that pests are usually bad. Sometimes pests may be a benefit to other organisms besides the crops that we are concerned about. See pg. 39 *Agronomy Grow With It!*

Direct students to discuss the negative things a pest can do. What affect do they have?

During the student discussion they should come up with some examples that pertain directly to their personal environment-something that affects them directly.

Direct students to thinking about other things like do your pets have any pests that we need to think about. (Fleas and Ticks are common ones)

What other organisms have to deal with pests Students should think about other species that are affected by a pest. They should come up with some examples. If not, start providing some easy examples:

A woodpecker will damage the tree

A gopher that digs holes in the lawn

A rabbit that eats the flowers or vegetables in the garden

Once students have started thinking about a pest they will be able to put together a better description of a pest.

Ask students to define: "Pest"

Help students think about the issues in a broad sense to provide a more inclusive definition

Have the students work in a partnership or small group to write a definition

At this time have the students read *Agronomy Grow With It!* "Problems With Pests" pg. 30-43?

Instruct students to alter their definition of "Pests" as they learn more about what a pest is.

As students are reading have them make a note on a separate sheet of paper the things that surprised them and what they found interesting in the reading

Ask students to share their notes they took. What was a surprise and what was interesting.

As students share be sure they elaborate and engage their classmates to get a discussion going. Have the students try to run the discussion and help answer and think about the different topics.

Have them reference the book in the discussion to look for further information

As students are talking see if they have had an experience with a pest.

Many students have some experience with a pest or have heard about some in their life.

AGRONOMY LESSONS
American Society of Agronomy



Pests What's the Problem?—A Public Service Announcement

Begin the activity: Pests, What's the Problem?

Allow students to select their own pests for the activity or provide a sample list for them. Below you will find links to a listing of some pests that you can either share with your students or use to generate your own list for students to select from. Note: This is not an inclusive list

Be sure to look at the resources ahead of time to provide the best directions for students about how to interpret what they see on the links

Garden pest list: <https://www.planetnatural.com/pest-problem-solver/garden-pests/>

Crop Pest link: <http://www.ers.usda.gov/media/1762872/ah717b.pdf>

Advanced* non native pest list http://www.iatp.org/files/Invasive_Pest_Species_Impacts_on_Agricultural_.htm

Continuation:

Have the students create a public service announcement that will inform the public about one of the pests from their list. There are many different options that students can choose to make the public service announcement depending on the available technology. Making a video commercial, radio commercial, or an advertisement campaign (poster, flyer, web page, etc) are a few options to think about.

Other tangents and continuation:

Construct a calendar of when you need to be looking for potential pests.

Have students research old methods of controlling pests before it was realized the method was harmful to the environment

Literacy Connection: *Silent Spring* by: Rachel Carson

Ask a county extension agent to come and speak for your class or help you find someone who could discuss integrated pest management further.



Chapter 4

Agriculture a Winning Relationship

Objective

Students will be able to:
identify the relationships between agriculture products and the resources that are used to produce them.

list byproducts of agricultural production and explain how these can be used to make the product more sustainable.

list methods used in agriculture to decrease the impact production has on the environment.

Materials

yarn and index cards

Time

50 minutes

Prior to the Activity

Read “Bringing Crops and Livestock to the Farm... Together” in *Agronomy Grow With It!*

Author

John Nelson, Agri-Science Instructor

Standards

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Have students read the section “Bringing Crops and Livestock to the Farm... Together” in *Agronomy Grow With It!* so students will have been introduced to beneficial relationships found in agriculture.

There are many examples of integrated crop-livestock systems ranging from cattle ranches that also grow grain crops or pasturing beef cattle over the winter on plants that are used to help protect the soil.

Direct students to select an agricultural product found in your area. Students should select something that is a common. Then direct them to find the following information and record it on the activity sheet *Agriculture a Winning Relationship*.

Products of production – What is produced with your agricultural product. Be sure to include any byproducts (something gained by producing the agricultural product, but is not the primary focus of production)

Example: Beef products are the meat, byproduct would be their manure

Consumed products for production – What is used to produce the primary product?
Example: Beef cattle use grain like corn and hay made of alfalfa or other types of grasses

What relationships exist between your agricultural product and others found in your area?

Example: Beef cattle need corn to grow so a farmer may grow corn to reduce the amount of corn they would have to purchase

How agriculture is using your product to aid in the production of another product?

How agriculture has changed to improve the environmental impact your product has?

Once students have found and recorded the information from the above questions they should have an idea as to how agriculture has partnered different products together to be more efficient and help the environment.

Reference the reading “Bringing Crops and Livestock to the Farm... Together” to provide students some added ideas concerning relationships that are found in agriculture.

At this time have the students list their products on the board randomly. The students will also need to record this information on the back of their activity sheet, *Agriculture a Winning Relationship*.

Once the class is done, ask the students if they found any relationships between their product and their peers’ products. Have them draw lines on their own paper to connect the products that have an effect on another.

Provide 10 minutes to work or until students seem to have quit finding relationships →

AGRONOMY LESSONS
American Society of Agronomy



Agriculture a Winning Relationship

There are two options for the next part. Depending on class size, time and materials you can select which option to go with.

Option 1. Students will stay seated for the activity and will be a small visual on the board:

As a class you can take turns having each student draw or direct you to making one of the connections between the products on the board. Have them explain how they are related. Make a simple note about the relationship for future reference on activity sheet, Agriculture a Winning Relationship. Once you have identified each of the relationships you should have a rather well connected web as each area has the potential to affect multiple others.

Option 2. Students will stand and be a part of the making of the web of relationships in agriculture:

Have the students make a circle in the center of the room or in a big open space where everyone is a part of the circle. Have them make a product tag that identifies the different products that are represented in the circle. Have the students either hang the tag around their neck, tape or pin it to their shirt, or hold it. Students then use a ball of yarn or string to identify the relationships they see in agriculture. The first student will begin with the ball. They select a product that it relates to and explain that relationship and then throw the ball of yarn to the person with the other product. The second person will do the same identifying a product that they are related to. Once you are able to finish the activity your end result should be a large web of connections in agriculture. Have students write a short journal explaining how their product fits into the “agricultural product web.” They should highlight the close relationships between their product and the others from the class but also explain the benefits of the relationship.



There are many examples of integrated crop-livestock systems ranging from cattle ranches that also grow grain crops or pasturing beef cattle over the winter on plants that are used to help protect the soil.

Select an agricultural product found in your area.

Product: _____

Once you have selected a product find the following information for your product of choice

1. Products of production – What is produced with your agricultural product? Be sure to include any byproducts (something gained by producing the agricultural product, but is not the primary focus of production)

Example: Beef products are the meat, byproduct would be their manure

2. Consumed products for production – What is used to produce the primary product?

Example: Beef use grain like corn and hay made of alfalfa or other types of grasses

3. Begin thinking about relationships that could exist between your agricultural product and others found in your area

Example: Beef cattle need corn to grow so a farmer may grow corn to reduce the amount of corn they would have to purchase

4. How is agriculture using your product to aid in the production of another product?

5. How has agriculture changed to improve the environmental impact your product has?

At this point you should have a few ideas as to how agriculture has partnered different products together to be more efficient and sustainable. Be prepared to identify and explain the relationships you found. →





Space for the relationship web:

Write a short journal explaining how their product fits into the “agricultural product web.”



5585 Guilford Rd.
Madison, WI 53711-5801
agronomy.org



Objectives

Students will be able to:

list multiple ways to limit their personal water use.

identify agricultural methods limit water use or waste.

describe methods used in agriculture to promote efficient use of water resources.

Materials

writing instrument and notebook or computer

Time

45 minutes divided over a few days to allow the students to identify methods to journal about.

Prior to the Activity

Read "Water Matters! Getting Enough... Keeping It Safe" in *Agronomy Grow With It!*

Author

John Nelson, Agri-Science Instructor

Chapter 5 Water! How Can You Help?

Standards

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Have students read "Water Matters! Getting Enough... Keeping It Safe" in *Agronomy Grow With It!* This will provide information to students on some methods that are commonly used in agriculture to increase efficient water use, and limit water waste.

Typically, students don't think about their water use on a daily basis. So, ask students to estimate how much water they use on a daily basis and what they use water for. This should include taking showers, using the restroom, drinking water, brushing teeth, washing hands, cooking, etc.

- For reference have a gallon or 5 gallon bucket to give them a way to compare what they think they will use in a day.

Write the students guesses down on the board and find an average to give a reference point.

- Likely students will guess a lower number than the real average

Once students have provided their guess reveal that an average American will use between 80 and 100 gallons of water per day according to the United States Geological Society (<http://water.usgs.gov/edu/qa-home-percapita.html>)

- Refer to the link to see the average amount of water used for daily tasks.

After students realize the amount of water that can be used on a daily basis they should be more aware of their own personal water use.

Relate the water use back to *Water Matters! Getting Enough... Keeping It Safe* in the book *Agronomy Grow With It!* to use as an opener to re-visit the methods used to limit water use in agriculture as well.

Once students have looked at the potential methods used in agriculture and thought about their own personal water use habits introduce the following activity.

Have students keep a journal identifying the following:

Two methods you used to personally save water

Two situations you saw someone else wasting water

Two methods you observed someone in their neighborhood that is saving water (not personal water use ex. a shower)

Two situations you saw someone wasting water in their neighborhood (not personal water use ex. a shower) →

AGRONOMY LESSONS
American Society of Agronomy





AGRONOMY LESSONS: AMERICAN SOCIETY OF AGRONOMY

Water! How Can You Help?

Provide a few days or nights to make these observations. The more time students are allotted for this activity you should see a better representation of methods that are used to save water and identify the ways people are wasting water.

As a class have a discussion using examples from their journal of how they observed water preservation methods in their area to share their thoughts and experiences. Students should share their observations to develop a larger list of methods to save water.

Possible Continuation:

Have students calculate how much water they use by taking the average time it take to complete each task from the United States Geological Society website (<http://water.usgs.gov/edu/qa-home-percapita.html>) and multiply to determine the number of gallons used for each activity. Students can tally up their results to see their personal impact. They could also do this as a family activity and bring in the results to class.



Objectives

Students will be able to:

- identify variations in soil samples.
- match soil types with the correct soil properties.
- form an analysis of soil properties to determine its quality for a given characteristic.

Materials

small shovel, zip top sandwich bags

Time

90 minutes

Prior to the Activity

Have students read "Soil: We Gotta Have It, But Will We?" in *Agronomy Grow With It!* so students will have been exposed to variations that can be found in soil.

Find a location on your school grounds or in your community where students could collect different soil samples.

- With advanced notice samples could be collected when on vacation and saved year to year. In addition to collecting your own samples, students could bring in samples from their home (or vacation areas).

Author

John Nelson, Agri Science Instructor

Chapter 6 Soil What's the Difference

Standards

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Collecting samples:

In either small groups or as individuals, direct students to collect soil samples in the identified areas.

Direct students to not go in the same areas as their classmates to decrease duplicates

Have students look for areas that have different purposes that will potentially have different soils

Instruct students to collect a zip sealed sandwich bag full from each site.

The volume of soil is important for the students to analyze completely without running out

A similar volume should be collected from home as well (if possible).

Allow students 30 minutes to collect their samples at the site.

You will need to evaluate your class and location to determine their ability to complete portion in small groups or whether you need to bring in samples instead.

They should label or name the samples so they are able to identify each sample correctly.

Once you are back in the classroom have students compare the samples.

Students should reference Soil: We Gotta Have It, But Will We? chapter. Here they will find that there are many different characteristics that they can use to compare the soil samples.

Examples:

- Color
- Texture
- Structure

As a group select 5 of the samples that seem to provide the most significant differences.

Have students compare the five different soil samples for the traits above using the Soil, What's the Difference activity sheet.

Once the students compare the different samples by ranking them they should answer the questions below the chart. These questions will allow the students to think about the soil characteristics and match them with the properties that we consider when discussing soil quality.

Soil samples are also available for a small fee through the Undergraduate Student Agronomy Club at Purdue University:

https://ag.purdue.edu/agry/agryclub/Pages/soil_textures.aspx

AGRONOMY LESSONS
American Society of Agronomy



AGRONOMY LESSONS: AMERICAN SOCIETY OF AGRONOMY

Worksheet Chapter 6: Soil What's the Difference



You have just collected samples of soil to analyze. As a class your next job is to select five different soil samples that you will use for the activity below.

- It is important that the entire class uses the same samples.
- Make sure that these five samples are easily identifiable by labeling the bag.

Rank the soil samples 1 – 5 for the color and texture and select which structure most closely represents the sample (each term can be used more than once). Write down other observations you see as well that may give you a clue to the quality of the soil.

Sample Number	Color Lightest (1) - Darkest (5)	Texture Smoothest (1) – Grittiest (5)	Structure Blocky, Columnar, Platy, Mas- sive, Single Grain	Other Observations

Using the chart from above answer the following questions and explain your response.

Which soil sample should contain the highest amount of organic matter?

Which sample will have the largest pore space that will allow water to penetrate the soil?

Which sample has the least amount of sand in the sample?

Which sample seems to have the easiest structure to identify?

The descriptions for the structures are listed in the reading “Soil: We Gotta Have It, But Will We?”



5585 Guilford Rd.
Madison, WI 53711-5801
agronomy.org



Objectives

Students will be able:

- construct an educated response about the causes of climate change.
- identify methods to limit their negative effect on climate change.
- explain data that showcases climate change.

Materials:

Laptop and/or paper

Time

3 hours

Prior to the Activity

Read "Coping With Climate Change," in *Agronomy Grow With It!*

Author

John Nelson, Agri Science Instructor

Chapter 7

Climate What's Your Prediction?

Standards

MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing human impact on the environment

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Have students read "Coping With Climate Change," in *Agronomy Grow With It!* Students will be introduced a few of the projected concerns and issues associated with climate change.

Set up the class for either an all-class discussion or small group discussions.

Have students take a minute to consider the following questions independently prior to discussing in either the full-class or small group discussion.

Based on the information from the reading, how will the climate change in your area?

Will these projected climate changes affect agriculture in your area? If so, how?

As they independently consider the questions, have students make notes on a separate sheet of paper, including the facts that will aid them in discussing the questions above.

Conduct the discussion as a large group or allow students to begin their discussion in small groups.

Students should use the information from the text to formulate answers to the discussion questions.

Hint: Instruct students to write down the highlights from the discussion. This will provide the students a starting point for their essays.

Once the discussion done, highlight some of the major points or have the small groups share their responses to the discussion questions.

Direct students to write an essay describing their reactions and thoughts associated with the reading.

Students should use the following questions to write their essays:

Based on the information from the reading, how will the climate change in your area?

Will these projected climate changes affect agriculture in your area? If so, how?

In your opinion, what can we do to help slow or stop these negative trends in global warming and climate change?

AGRONOMY LESSONS
American Society of Agronomy



www.agronomy4me.org



5585 Guilford Rd.
Madison, WI 53711-5801
agronomy.org



Write an essay describing your reactions and thoughts associated with the reading, "Coping With Climate Change," and from other research you have conducted on climate change.

Use your notes on the discussion highlights to help you organize your essay.

Use the following questions to write your essay:

Based on the information from the reading, how will the climate change in your area?

Will these projected climate changes affect agriculture in your area? If so, how?

In your opinion, what can we do to help slow or stop these negative trends in global warming and climate change?





Objectives

Students will be able to:
identify potential career options in the Agronomy field.

describe education requirements for Agronomy careers.

identify beneficial employee attributes for a career in Agronomy.

Materials

A computer with internet access

Time

2 Hours

Prior to the Activity

Read the Is Agronomy the Career for You? section in *Agronomy-Grow With It!*

Author:

John Nelson, Agri-Science Instructor

Chapter 8

Agronomy: a Career for All

Standards

AFNR Standards:

CD3: Students will create and manage a flexible and responsible individualized learning plan to meet their career goals

CD3: Students will identify and apply employability skills

Using the list of agronomy related careers on pages 90 and 91 students should select one of interest to them.

If you want to limit duplicates instruct students to sign up for specific careers.

Once they have selected a career, instruct students to access a computer to complete the activity.

Students should create a job posting of the career that they chose.

Suggest these resources to gather the career information:

www.careerplacement.org/career-tools

www.onetonline.org/find/career?c=1

The job posting should include all the following information:

Company name

Job Title

Job description

what the daily expectations are for the position

Education requirements

Required Skills

Work conditions - what would the work environment look like

Typical hours - start time and hours per week

Job location

Employee characteristics

Special certifications

Beneficial experience

Salary

Have students share their job posting with the class.

As a group discuss the opportunities that are out there in the Agronomy field.

Extension:

Check with your guidance counselor to determine if there is a specific career research or profile test that your district uses to help guide students into finding a career that matches their interests.

Check with local Agricultural businesses, extension agents, or post-secondary schools to come and speak to the class about agricultural careers.

AGRONOMY LESSONS
American Society of Agronomy



www.agronomy4me.org



5585 Guilford Rd.
Madison, WI 53711-5801
agronomy.org



Select a career option from the list on pages 90 and 91 of *Agronomy Grow With It!*.

Once you have selected your career your task is to create a Job Posting

Suggested Resources:

www.careerplacement.org/career-tools

www.onetonline.org/find/career?c=1

In your job posting you need to include the following information:

- Company name
- Job Title
- Job description
 - what the daily expectations are for the position
- Education requirements
- Required Skills
- Work conditions - what would the work environment look like
- Typical hours - start time and hours per week
- Job location
- Employee characteristics
- Special certifications
- Beneficial experience
- Salary

Your job posting should highlight all the information job applicants will want to know.