

CROP ADVENTURE PROGRAM GUIDE

sponsored by WinField



FAIR OAKS

— FARMS —

ENRICHMENT

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STEM Relation

- **Science** | See how a tractor can tell you how much nitrogen, phosphates and H₂O are in the soil.
- **Technology** | Learn how Satellites, Drones, remote tractors and NASA helps farmers.
- **Engineering** | Explore good bugs & bad bugs and learn about biodiversity on the farm.
- **Math** | Feeding 7 billion people takes a lot of crops! Calculate how many ears of corn are in a bushel, how many bushels of corn are in an acre, how many acres of corn are on a farm... and on and on!

6 Pillars of Sustainability

Safety | Animal Care | Environment |
Employees | Community | Nutrition

Standards based lesson plans and resources to utilize as part of the Fair Oaks Farms field trip experience for grades K-8. MS-PSI-3, MS-LS1-4, MS-LS1-5, MS-LS3-1, MS-LS3-2, 8.RN.1, 8.RV.1. Please see the Standard Alignment Document to see the full list of standards that the curriculum meets.

HOW TO BEST USE THIS GUIDE

Here is how we suggest you use the Winfield Crop Adventure Field Trip Guide.



Our Timeline Suggestions

We are excited that you are planning a visit to Fair Oaks Farms! We have created this guide to help make your experience more engaging when coming to the Farm. In this guide, you will find resources to help prepare you for a fun-filled but educational day. Here is what we suggest:

- Before coming on the field trip:
 - Teach Lesson 1 over the course of two days
 - Teach Lesson 2 over the course of two days
- Make yourself familiar with the "Know Before You Go Guide"
- Print the Field Trip Guide to keep your groups engaged during the day

Example Passports

The passports below will vary on group size and the amount of time you have on campus. You will receive a more detailed passport a week in advance and a final passport the day of.

Dairy Adventure Only

9:00 AM | Arrival

10:00 AM | Dairy Bus

11:30 AM | Lunch

12:00 PM | Free Time

*** Free time is a great time to explore the other buildings.*

Dairy and Pig Adventure

9:00 AM | Arrival

9:30 AM | Pig Bus

11:00 AM | Lunch

12:20 PM | Dairy Bus

*** During any downtime, it is a great opportunity to explore the crop building.*

Crop Adventure Only

9:00 AM | Arrival

9:30 AM | Crop Adventure

11:00 AM | Hands on Workshop

11:00 AM | Lunch

12:00 PM | Free Time

*** Special pricing. Free time is a great time to explore the other buildings.*

Hands On Field Trip

9:00 AM | Arrival

9:30 AM | Pig Bus

11:00 AM | Lunch

12:20 PM | Dairy Bus

2:00 PM | Hands on Activity

***The activity can 15 minutes to 45 minutes depending on the time you have available and the program you want*

KNOW BEFORE YOU GO

Have a field trip with us? Here are some things that may help engage your students during your visit!



Arrival

- Please keep children on the bus until you have checked in.
- Go to the Admissions Building to check-in.
- We will give you a passport to help you stay engaged throughout the day.
- You will be given a lanyard. This identifies your group.
- Bathrooms are located in each building.

Other Buildings

If time allows:

- Get a sneak peek at a working dairy farm on the Dairy Adventure.
- Go hog wild at the Pig Adventure.
- Take a stroll and look for the newest seasonal blooms on the Nature Trail.
- Take your herd over to get a tasty treat or souvenir at the Cowfe.
- See a baby cow being born at the birthing barn.

Places in the Crop Adventure

- **Sphere Room** | In the sphere room, you walk through history and learn how we plan to feed 9 BILLION people. There is also a population counter that tells you the updated population!
- **Limited Resources** | It is amazing what defines a limited resource. Land, soil, and water are all limited!
- **Cob to Consumer** | Corn creates so many things. There is an area that explains from soy to supper, field to flour, cob to consumer, and cotton to cloth.
- **Farming Future** | With limited resources, we have to be creative in how we farm. Check out how we can farm in water, air, and space.

Other Fun Things about the Farm

Here are some other fun facts about the farm that can be used to explore STEM deeper in your classroom before your visit.

The future of farming will have to change as the population continues to grow and the amount of resources we have become more limited. Have students do some research on hydroponic farming and make a small prototype. There is also vertical farming and even farming in space.

Challenge your students to think about other ways to farm with the limited resources available. Limited resources include land and water.

CROP ADVENTURE GUIDE

Keep your eyes and ears open! Find each of these on the farm.

CROP ADVENTURE

SPHERE ROOM



BY 2050, GRAIN PRODUCTION MUST DOUBLE!

POLLINATOR POWER



OUR POLLINATOR FRIENDS LOVE TO SUCK UP NECTAR!

SOIL DOCTOR



LEARN HOW WORMS KEEP OUR SOIL HEALTHY!

LIMITED RESOURCE



FIND THE APPLE GRAPHIC TO UNDERSTAND WHY SOIL IS A LIMITED RESOURCE!

COB TO CONSUMER



SEE THE MANY PRODUCTS CORN HELPS MAKE!

WATER MOVEMENT



SAND, SILT, AND CLAY ARE THE THREE TYPES OF SOIL!

HARVEST GROCERY



95% OF AMERICA'S NEWSPAPERS ARE PRINTED WITH SOY INK!

FARMING FUTURE



WE CAN FARM IN THE AIR, WATER, AND UP THE SIDES OF STRUCTURES!


THE GARDEN

CORN




WE GROW POPCORN, SWEET CORN, AND FIELD CORN.

SOYBEANS




SOY IS FOUND IN MANY COMMON HOUSEHOLD PRODUCTS!

GRAIN SORGHUM



GRAIN SORGHUM IS A COVER CROP, USED TO ENRICH THE SOIL.

ALFALFA



ALFALFA IS IN THE LEGUME FAMILY!

Fair Oaks Farms has far more than we can ever discover in a day, but here are some other class favorites if time allows:

- Get a sneak peek at a working dairy farm on the Dairy Adventure.
- Go hog wild at the Pig Adventure.
- Take a stroll and look for the newest seasonal blooms on the Nature Trail.
- Take your herd over to get a tasty treat or souvenir at the Cowfe.
- See a baby cow being born at the birthing barn, go when the light is green.

LESSON 1

Science of Crops



SOME BACKGROUND

Soybeans can be used for so many different things! The variety of products includes edible or non-edible items. The soybean was first mentioned in the New World in 1804 when it was suggested as a crop for Pennsylvania. In 1829, US Farmers grew the first crop of soybeans. They were used for soy sauce and during the Civil War soldiers would use them to brew coffee as coffee was scarce. Then in 1889, new varieties of soybeans were introduced from Asia by the United States Department of Agriculture. George Washington Carver began studying soybeans at the Tuskegee Institute in Alabama along with understanding and putting crop rotation into effect in 1904. Through research, he found that soybeans can provide nutrients to the soil for the next crops planted in that spot! Then in 1930, Henry Ford made all kinds of things with soybeans. He even made a soybean car! While today we do not have soybean cars, we do grow soybeans in more than 30 of the 50 states.





Lesson 1 | Science of Crops

Learning Objectives

Students will be able to:

- Be able to name three soybean products
- Describe what a soybean needs to grow
- Define germination

Vocabulary

- **Soybean** | Species of legume native to East Asia, widely grown for its edible bean, which has numerous uses.
- **Crop Rotation** | Practice of planting different crops sequentially on the same plot of land to improve soil health, optimize nutrients in the soil, and combat pest and weed pressure
- **Legume** | Any plant of the legume family, especially those used for feed, food, or as a soil-improving crop.
- **Seed Coat** | The outer shell, skin, or rind of a seed.
- **Germination** | The beginning of the growth of a seed, spore, or bud. The germination of most seeds and spores occurs in response to warmth and water.
- **Biotechnology** | Biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc.

Materials & Setup

- KWL Chart (on the last page of this guide) – Printed for each student
- Soybean activity more details on page 3
 - Drawing Option
 - Building Option
 - Writing Option
- For the optional Germination Activity, you will need extra materials.

Recommended Timeline

Estimated Time: 45 to 55 minutes or two days (recommended)

- Engage | 5 minutes | 10 minutes
- Explore | 15 to 20 minutes | 30 minutes
- Explain | 10 to 15 minutes | 10 minutes
- Elaborate | 10 minutes | 25 minutes
 - 2 options and can be extended if you would like
- Evaluate | 5 minutes | 5 minutes

Engage

Students will have a quick introduction to Fair Oaks Farms Crop Adventure. Students will then engage in various activities related to the Crop Industry. Provide KWL Chart, this can be done individually (recommended), in groups, or as a class.

Today we are going to learn about Fair Oaks Farms' Crop Adventure. As the population increases, the amount of water and land will remain the same. To meet this challenge, we need to protect our natural resources and reduce our environmental impact. In addition to being innovative or finding alternate ways to farm. Some forms of farming would be hydroponics, aeroponics, and vertical farming. Farmers are also using science, more specifically biotechnology. Technology has allowed farmers to help plants fight disease, produce more food, and feed more people. Today, you are going to learn the basics about the science behind crops! First, let's see what you already know. In your "K" section of your worksheet, write what you know about farming and crops!

Give students two to three minutes to brainstorm what they know about crops and farming. Once complete ask a few to share.



Lesson 1 | Science of Crops

Explore

Once they have finished the "K" section divide students into small groups.

Biotechnology has allowed scientists and farmers to develop *Genetically Modified Organisms* or *GMOs*. Can anyone name something they think is a *GMO*? (apples, cotton, corn, canola, potato, etc.). Scientists and farmers have bred and developed plants that help produce a better quality crop and benefit the planet. For example, *GMO soybean crops* have helped decrease soil erosion by 90%, saving 37 million tons of topsoil, that is roughly 5 male elephants! Now, let's think of all the possibilities that we can use soybeans for.

Have students write, draw, or build something with tissue paper, tape, glue and pipe cleaners that they think comes from soybeans. At the end of this lesson there is a handout of all the uses of soybeans.

Explain

Use the video to explain the processing of soybeans.

Excellent job! You all have some awesome ideas and uses for soybeans. Let's check out this video about the life of a soybean.

Elaborate

Option 1 | After watching the short video kids can complete the soybean word search (on page 5) and check out the sheet about all the things soybeans can make. This is also a good time for them to fill out the "W" portion of the KWL chart in regards to what they want to know when they go to Fair Oaks Farms (if you are taking a field trip there).

Option 2 | Germination of a Soybean Activity | See full instructions on the next page

Farmers put a lot of work into their fields and want each plant to be successful. Try your hand at growing your own plant! It is harder than it looks.

Evaluate

You can edit, adjust, or add to the the following questions but by the end of the lesson students should be able to answer the following.

- *What are three items that can be made from soybeans? Is there something that you use everyday?*
- *Describe what a soybean needs to grow*
- *Define germination*

Field Trip Suggestions & Links for this Lesson

When you return from your field trip finish the KWL chart.

Use the adventure guide to make sure you get all of the highlights and have fun!

Soybean Video | https://youtu.be/7p_7IAfBo3o

Word Search | https://www.ilsoy.org/sites/default/files/media/pdfs/Kids_Coloring_Packet.pdf

Soybean Sheet | <https://glassbarn.org/wp-content/uploads/2022/05/soybean-uses-poster-1.pdf>

GERMINATION

Lesson 1 | Elaborate | Option 2

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Materials

- Soybeans (one per kid or a few for the classroom)
- Small Plastic Baggies
- Spray Bottle with Water
- Cotton Balls
- Markers

Introduction to Activity

Each seed has a seed coat, the outside of the seed, and an embryo containing tiny leaves, a stem, and roots. Once the seed is ready the seed coat will take in oxygen, moisture, and water enlarging the inside of the seed and will eventually split open. In which a tiny root will grow downward, and the shoot which contains the leaves and stem.

Ingredients

Some seeds need special treatment such as cold temperatures before sprouting or being in a dark space. However, the seeds you will start the process with today will just need the three main ingredients. Which are? (Moisture, Oxygen, and Warm Temperature)

The germination process will produce a seedling which produces the new plant.

Ask them again what seeds need to germinate (moisture, warm temperatures, and oxygen). Explain that we are going to start a seed that they can take home to plant once the seed germinates.

Do the activity with the youth.

1. Open the cotton ball a little and place the seed in the middle (it should look like a cloud)
2. Spray the cotton ball so it is damp. It should not be soaking wet, just damp.
3. Place the damp cotton balls in the plastic bag and close it.
4. You do not want to seal it completely because the seed needs oxygen.

If you are doing this as a classroom you can also buy small starter kits for the kids to grow instead. However, it may be fun for each kid to have their own seed to take care of!

LESSON 2

Feeding the World



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SOME BACKGROUND

In 1900, 41% of the United States Workforce was employed in agriculture. That is nearly half of the workforce! In 2000 that number dropped to 2% of the workforce. That means for every 100 people 2 people are employed in agriculture and our population is not shrinking, it is growing. Thus, agricultural improvements must be made. Some improvements may include faster equipment, better seed, precise understanding of soil, and so much more make feeding the population possible. Farmers must adjust to challenges such as limited land, climate change, population growth, and limited water.

Farmers have also utilized their time more efficiently in order to be more productive in the field with satellites, unmanned aerial vehicles (UAVs), self-driving equipment, sensor technology, and even robots! The WinField Crop Adventure shows that together, we can ensure that hunger never outgrows our ability to produce food that feeds the world with new, innovative ideas!





Lesson 2 | Feeding the World

Learning Objectives

Students will be able to:

- Discuss sustainability & one method that Fair Oaks Farms uses
- Describe modern practices that help farms increase production
- Apply mathematical concepts to agriculture information

Vocabulary

- **Sustainability** | Fulfilling the needs of current generations without compromising the needs of future generations, while ensuring a balance between economic growth, environmental care and social well-being.
- **Tillage** | The preparation of land for growing crops.
- **Irrigation** | The supply of water to land or crops to help growth, typically by means of channels.
- **IPM** | Integrated Pest Management System, focuses on long-term prevention of pests and the damage they may cause through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

Materials & Setup

- KWL Chart - Printed for each student (last page of this guide)
- Extra Paper
- Cow to Carton Cards
- Zoomed in Dairy Picture
- For optional magic milk you will need a few different types of milk

Recommended Timeline

Estimated Time: 45 to 55 minutes or two days (recommended)

- Engage | 5 minutes | 10 minutes
- Explore | 15 to 20 minutes | 30 minutes
- Explain | 10 to 15 minutes | 10 minutes
- Elaborate | 10 minutes | 25 minutes
 - 2 options and can be extended if you would like
- Evaluate | 5 minutes | 5 minutes

Engage

Students will have a quick introduction to Fair Oaks Farms Crop Adventure. Students will then engage in various activities related to the Agriculture Industry. Provide KWL Chart, this can be done individually (recommended), in groups, or as a class.

Today we are going to learn how farmers plan to feed an ever growing population with limited resources and improved technology. Today one farmer can feed 165 people per year. In 1930 a farmer could feed 10 people for a year. Farmers must find ways to be more productive through the use of GMOs, sustainability, and advancing in crop production.

Give students two to three minutes to brainstorm what they know about farming and techniques used to grow food for the population. Once complete ask a few to share.

Explore

Once they have finished the "K" section divide students into small groups.

Have the students design a new technology or crop that they think could help farmers make farming easier or more productive. This could be a crop that is resistant to some type or bug or pest or a piece of equipment that only picks good crops.

Continued on the next page.



Lesson 2 | Feeding the World

Explore Continued

They could draw or make a 3D model of a piece of equipment or new crop. You could use items from a makerspace but let them be creative. Have them explain their models!

Explain

Great job creating such cool plants and equipment! Engineers, farmers, and scientists do this everyday to see how they can continue to feed the growing population. Let's see how some of them are dealing with pests in their fields.

Watch the video about IPM or Integrated Pest Management.

Elaborate

Option 1 | After watching the short video about IPM see if the students have other innovative ideas or things to add to their equipment or crop. The class could do a quick search about other sustainability measures that farmers are using to preserve the limited resources they have to farm on. Have them do a quick report out on the different methods they find. OR talk about how Fair Oaks Farms is reducing their Carbon Footprint by using poop to power our trucks and farms! We have an anerobic digester that turns the poop from the cows and pigs into biodiesel. Then have the students fill out the "W" portion of the KWL chart in regards to what they want to know when they go to Fair Oaks Farms (if you are taking a field trip).

Option 2 | Poop Power | See full instructions in the handout section.

Farmers of all kinds are looking for new ways to keep the impact on the land down and use the resources we have readily available. Dairy and hog farmers have a lot of poop so we use it to power our trucks and farms!

Evaluate

You can edit, adjust, or add to the the following questions but by the end of the lesson students should be able to answer the following.

- *What is sustainability?*
- *What is one way Fair Oaks Farms reduces their carbon footprint?*
- *Describe modern practices that help farms increase production*

Field Trip Suggestions & Links for this Lesson

When you return from your field trip finish the KWL chart.

Use the adventure guide to make sure you get all of the highlights and have fun!

IPM Video | <https://www.youtube.com/watch?v=7qQCLMFjRew>

Anerobic Digester | <https://www.youtube.com/watch?v=g-urlj9oqug>

POOP POWER

Lesson 2 | Elaborate | Option 2



Materials

- Plastic Bags (3)
- Seltzer Tablets (3 ½)
- Tap Water
 - Not bottled water

Introduction to Activity

Greenhouse gases include carbon dioxide, methane, water vapor, ozone, and nitrous oxide. Some greenhouse gases stay in the atmosphere longer than others. Water vapor is a greenhouse gas, but it is removed from the air every time it rains. Methane stays in the air for hundreds of years so emitting even a little bit of extra methane can have an effect for a long time. Greenhouse gasses are reported in pounds of CO₂ equivalent per year.

Instructions

1. Explain what you are going to do and ask the students what they think will happen.
2. Ask them what the plastic bags represent and what the seltzers represent. Plastic bags = atmosphere, and seltzers = carbon footprint.
3. Add roughly a half cup of water to each of the plastic bags.
4. Make sure to close the bag just enough to let the tablet fit as you are going to want to close the bag quickly.
5. Make sure the bag is sealed and then shake the bag for 3 seconds.

Reflect

1. How can you reduce your carbon footprint?
2. Which greenhouse gasses does Fair Oaks Farms release?
3. How does Fair Oaks Farms reduce its carbon footprint?

The Digester uses chambers to breakdown the waste and turn waste into methane gas. The gas is captured and run through generators to create electricity and compressed to create our own biofuel. We can produce enough electricity with each of the 3,000 cow dairies to power 750 homes everyday! Our trucks are powered by the biofuel and transport a cumulative 118 million gallons of milk a year. The biofuel replaces the diesel trucks and saves 2.2 million gallons of diesel annually. The trucks lower emissions by 60% and help make our carbon footprint smaller. Anything left over is used on our fields to irrigate and fertilize crops! Fair Oaks Farms then uses some of the crops to feed our cows so they can produce more manure! We would like to reach a zero carbon footprint.

KWL

Know | Want to Know | Learned



K - What I know

W - What I want to know

L - What I learned