

DAIRY ADVENTURE PROGRAM GUIDE

A dairy good time!



TABLE OF CONTENTS

How to Use this Guide
Know Before you Go
Field Trip Guide

Lesson 1 | Cow Care
Supplemental Activity | TMR

Lesson 2 | Dairy Products
Dairy Product Up Close
Cow to Carton Cards
Matching Game
Supplemental Activity | Magic Milk

KWL Chart
Answers & Resources

STEM Relation

- **Science** | Understanding TMR and the science behind the nutrition delivered to animals.
- **Technology** | Learn about 21st-century Robotics in a Voluntary Milking System.
- **Engineering** | Explore the structure of the ecosystem in a milking parlor with sophisticated temperature and air quality monitoring systems.
- **Math** | Discover why logistics plays a vital role in a vertically integrated farm operation.

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 Dairy 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 on engaged during the day

Example Group 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 Only

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.*

Pig Adventure Only

9:00 AM | Arrival

9:30 AM | Pig Bus

11:00 AM | Lunch

12:00 PM | Free Time

*** 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

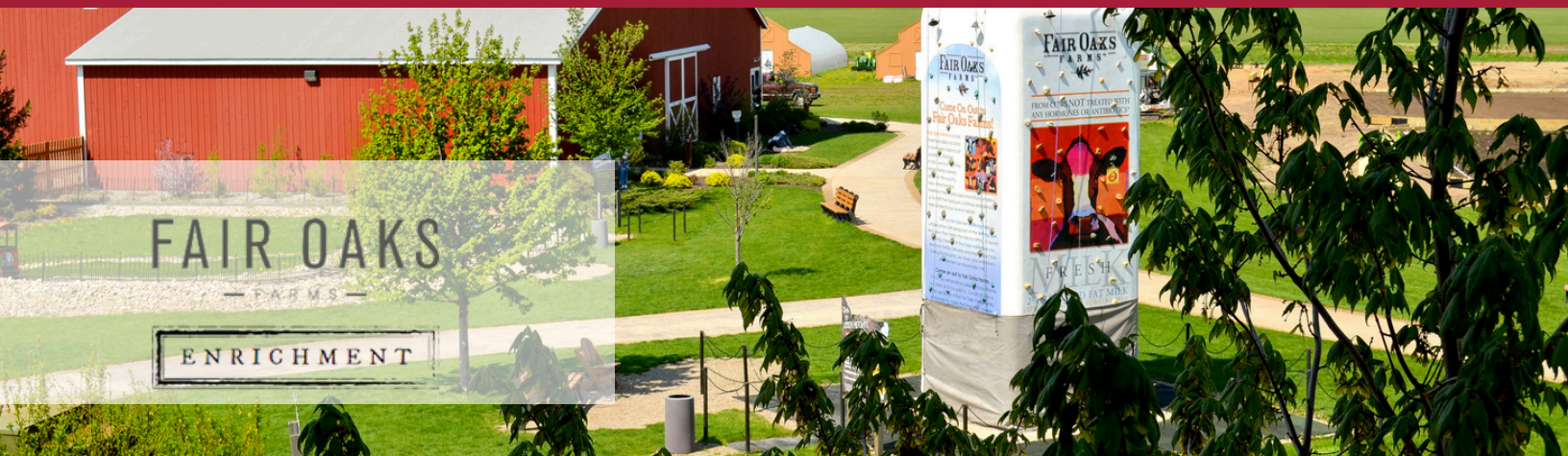
12:20 PM | Dairy Bus

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 your 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:

- Go hog wild at the **Pig Adventure**.
- Learn how we can feed 9 Billion people at the **Crop 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 **Cowfé**.
- See a baby cow being born at the **Birthing Barn**, go when the light is green.

Places in the Dairy Adventure

- **Friends of the Forest** | Learn how to we give back to the land in this 3D animated area. You will also learn that The Dairies of Fair Oaks have roughly 20,000 acres of land, that is 1 acre per cow. This is a fun space for the kids!
- **Farmhouse Kitchen** | In here, the "Farmer Family" will talk about different aspects of a dairy operation. There are a few different videos that play.
- **Milking Station** | The milking station is a fun place for the kids to try milking a cow! There are a bunch of facts on the wall that kids can read.
- **Freestall Barns** | The free-stall barn houses Diva, who is laying on a bed much like our cows on the farms. This area is full of fun facts about how we care for our cows.

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.

We have both the Rotary Parlor and Robotic Dairy Farm. The Rotary Parlor is the best of current technology! The Rotary Parlor takes about 3 minutes for a cow to be milked for a total time of 6 minutes on the rotary. We love showing off the Rotary to our visitors! The Robotic Dairy farm has allowed Fair Oaks Farms to explore the newest technology in modern agriculture.

The anaerobic digester devours the manure and produces a biogas. That biogas contains 70% methane gas. Since this is a closed system none of this gas can escape into the air, it is all collected, and the methane gas is used to run generators that produce electrical power for the farms!

DAIRY ADVENTURE GUIDE

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

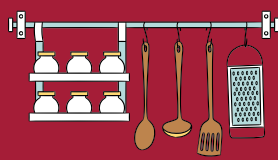
DAIRY MUSEUM

FRIENDS OF
THE FOREST



LISTEN TO HEAR WHY
WE HAVE 20,000
ACRES!

FARMHOUSE
KITCHEN



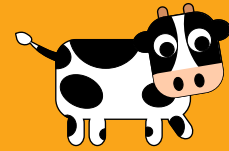
FIND OUT WHAT IS
HAPPENING ON THE
FARM!

MILKING
STATION



COWS PRODUCE 10
GALLONS OF MILK A
DAY!

FREE STALL
BARN



CHECK OUT WHY OUR
COWS SLEEP ON FIBER
FROM THE DIGESTER.

BUS TOUR

ANAEROBIC
DIGESTOR



THIS CREATES A
BIOGAS THAT POWERS
THE FARM.

CORN
SILAGE



CORN SILAGE IS THE
BULK OF OUR TOTAL
MIXED RATION.

CALF
HUTCHES



WE USE CALF HUTCHES
TO KEEP OUR GIRLS
AND CALVES HEALTHY.

BROWN
COW



WE HAVE A FEW
BROWN COWS MIXED
IN OUR HOLSTEIN HERD.

DAIRY FARM

MILK FIRST
GATE



SEE IF ANY OF OUR
GIRLS GO THROUGH
THE MILK FIRST GATE!

VOLUNTARY
MILKING
SYSTEM



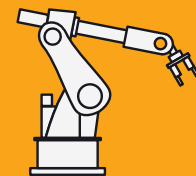
FIND A RESTING COW,
THEY LIKE TO SLEEP
BEFORE MILKING!

BUTLER
BRUSH



SEE HOW MANY
BRUSHES YOU CAN
COUNT!

ROBO
7



ROBOTS CAN MILK 75
COWS, AVERAGING
225 MILKINGS A DAY!

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

- Go hog wild at the Pig Adventure.
- Learn how we can feed 9 Billion people at the Crop 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

Cow Care



FAIR OAKS

— FARMS —

ENRICHMENT

SOME BACKGROUND

Dairy cows are amazing animals! Before we can care for our animals we need to know how they behave and how they need for optimal care. Our herdsmen keep a close eye on our girls in the barns, and even monitor their health remotely.

Each cow has an ear tag that has a Radio Frequency Identification Tag or RFID tag that will scan every time she goes into the Milking Rotary or Robotic Milking Pen. Once her tag is scanned each girl's information goes directly to our system so the herdsmen can see how many times she went to be milked that day and the amount of milk she has produced. Our cows also wear collars that are transponders much like a Fitbit to track her movements and lifestyle. This helps us take care of each cow individually!

At Fair Oaks Farms we take care of a lot of cows. In our robotic dairy barn alone we house 800 cows, in total we have about 20,000 cows!



Lesson 1 | Cow Care

Learning Objectives

Students will be able to:

- Identify and name two different dairy breeds
- Describe the daily life of a cow at Fair Oaks Farms
- Know the different milking stages of a dairy cow

Vocabulary

- **Cow** | Female who has already given birth to a calf.
- **Heifer** | Female who has not given birth to a calf, she would be pregnant with her first calf.
- **Steer** | Male who cannot reproduce, he is castrated (he has been snipped).
- **Bull** | Male who can reproduce, he is intact.
- **Calf** | A female or male baby.
- **Bedding** | Material used to absorb moisture and provide a comfortable area for cows to rest.

Materials & Setup

- KWL Chart - Printed for each student (at the end of this guide)
- Building Materials
 - Drawing Option
 - Index cards, tape, glue, scissors
 - Maker Space Option
 - Legos, Strawbees, or combination
- Power Point
- For optional TMR activity you will need items for trail mix

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 Dairy Adventure. Students will then engage in various activities related to the Dairy Industry. Provide KWL Chart, this can be done individually (recommended), in groups, or as a class.

Today we are going to learn about the operations at The Dairies of Fair Oaks. There are a lot of daily tasks that go into owning and operating a large scale dairy farm, even small farms are hard work! Our farmers and herdsmen and women love the dairy cattle that they care for. Thus, they learn as much as they can about each cow individually. Today, you are going to learn the basics about dairy cattle! First, let's see what you already know. In your "K" section of your worksheet, write what you know about how dairy cows are cared for and where they live.

Give students two to three minutes to brainstorm what they know about dairy cows. Once complete ask a few to share.



Lesson 1 | Cow Care

Explore

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

You are going to build a barn for your small dairy herd. Some things to keep in mind when building: shelter, water, feed, and how to clean the barn.

There are multiple options on how to complete this. Students can draw something, they can build something with index cards or construction paper, tape, glue and other art items, or they can build something from a maker space kit (i.e. Leogs, Strawbees, or a combination of items).

Explain

Use the short power point provided to explain how Fair Oaks Farms operates and how we care for our animals.

You all did a wonderful job designing a barn. Let's see how Fair Oaks Farms cares for their Dairy cows and what breed of cows they care for.

Elaborate

Option 1 | After reviewing how Fair Oaks Farms takes care of their cows have the students re-design their barns, just in case they missed something. 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 | Total Mixed Ration (TMR) activity | See full instructions on the next page

Dairy farmers put a lot of effort into their feed. What the cows eat is what is put into the milk. Thus, we want the milk to be nutritious so we feed our cows very specific diets. As a class we are going to make our own Total Mixed Ration.

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.

- *Which breed of dairy cow does Fair Oaks Farms raise? Why? What is the name of another breed?*
- *What type of barns are used at Fair Oaks Farms? How are the cows milked?*
- *What are the different stages of cows? When are they producing milk?*

Field Trip Suggestions

**When you return from your field trip finish the KWL chart.
Use the adventure guide to make sure you get all of the highlights.
Have fun!**

TOTAL MIXED RATION

Lesson 1 | Elaborate | Option 2



Materials

- Mini Pretzels
- M&Ms
- Raisins
- Smarties
- Popcorn
- Scale
- Mixing Bowl
- Spoon
- Small Cups or Bowls

Introduction to Activity

TMR stands for Total Mixed Ration, this is what farmers use to make sure their cows get a balanced diet. At Fair Oaks Farms, we have a nutrition specialist that measures and weighs different ingredients to make sure our cows are getting the right amount of nutrients. Much like how trail mix has the right amount of sweet and salty.

Ingredients

Most of the ingredients will provide energy to the cow as it takes a lot of energy to produce milk!

- **Mini Pretzels** | Forages like corn silage or alfalfa high. These provide the cow with high energy through protein and calcium.
- **M&Ms** | These are extra protein for the cow to help provide energy.
- **Raisins** | These represent cottonseed, a great source of fiber, protein, and fat.
- **Smarties** | These are the sugar source or sticky a sticky ingredient to help dry feed stick together. We will use molasses occasionally but it is not always added. It provides carbohydrates, sugars, proteins, and additional nutrients.
- **Popcorn** | This is corn which is yet another energy source for the cow.

If there is something you do not like or the class does not like you can substitute any of the items listed. For an extra challenge see if you can make this into a 10 lb mix (.55 lbs X 10).

Suggested Mix

55% Forage - 1 Cup + 1 Tbsp 2 Tsp (275 ml) Pretzels
20% Corn - .20 lbs. Popcorn
15% Protein - .15 lbs. M&Ms

5% Cottonseed - .05 lbs. Raisins
5% Sugar Source - .05 lbs. Smarties

Mix together and enjoy. This will make 2 Cups (500ml by Volume) of trail mix.

LESSON 2

Dairy Products



FAIR OAKS

— FARMS —

ENRICHMENT

SOME BACKGROUND

Dairy cows produce nearly 10 gallons of milk each day, or more at the Robotic Dairy. That is a lot of milk! Cows get milked 2 to 3 times a day. At Fair Oaks Farms we have a Robotic Dairy and a Rotary Parlor. Each cow has an ear tag that has a Radio Frequency Identification Tag or RFID tag that will scan each time she goes into the rotary parlor or robotic commitment pen. This helps us keep track of how much milk she is producing. If it is low we know to check on that cow later. The robotic dairy uses a Milk First System, meaning the cows have to get milked before they eat. They are then moved into a Voluntary Milking System or VMS, where they can get milked whenever they want. Once the cow is milked it travels through a series of pipes and ends up in a bulk tank where it is held at a constant 34 degrees.

Did you know? We produce 40 tanker truck loads of milk each day! That's 250,000 gallons of milk! Where does all the milk go? Well, the spread of population, as well as climate and product demand, determine where those trucks head to.



Lesson 2 | Dairy Products

Learning Objectives

Students will be able to:

- Describe how milk gets from cow to consumer
- Name two dairy products
- Understand what nutrients are in milk

Vocabulary

- **Bulk Tank** | A refrigerated storage tank on the farm, to hold milk as soon as it leaves the cow.
- **Nutrient** | Compounds in food that are used by the body to help us grow.
- **Pasteurization** | A method used to kill harmful pathogens through heat treatment.
- **Robotic Milkers** | On-farm technology that allows cows to be milked without human interaction.
- **Milking Parlor** | A specialized area on the dairy farm where cows are milked two or three times a day. Fair Oaks Farms has a rotatory parlor.

Materials & Setup

- KWL Chart - Printed for each student (on 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 Dairy Adventure. Students will then engage in various activities related to the Dairy Industry. Provide KWL Chart, this can be done individually (recommended), in groups, or as a class.

Today we are going to learn about dairy cows and what they produce. There is a lot to be done before you can get milk from the cow to you. Today, you will learn what it takes to milk a cow, what else a cow can provide, and what nutrients are in your cup of milk! In your "K" section of your worksheet, write what you know about how milk gets from the cow to you.

Give students two to three minutes to brainstorm what they know about how milk gets from cow to consumer. Once complete ask a few to share.

Explore

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

*I am going to show you some [zoomed in pictures](#). On your piece of paper, see if you can identify them. ****Hint, they are all foods.***

Continued on the next page.



Lesson 2 | Dairy Products

Explore Continued

Once they have identified the pictures ask:

What do all of these products have in common? Students should determine that they are all dairy products and contain milk.

Pass out the Cow to Carton Cards and instruct students to place each card in sequential order in which they think milk is processed from cow to carton. Show students the short Farm to Store video clip. Let the students know it is okay to rearrange their cards as they watch the video.

Explain

Use the matching sheet below to explain what each nutrient provides us.

Great job organizing the cow to carton cards. Now that you know how milk gets to you, let's see what is in our nutritious cup of milk! There are 9 essential nutrients in milk those are: Calcium, potassium, phosphorus, protein, vitamin D, vitamin A, vitamin B12, Riboflavin, and Niacin.

Elaborate

Option 1 | After reviewing how milk gets from cow to consumer, complete the matching activity about the essential nutrients in milk. This can be done a few ways: you can pass out the sheet, you can write them on the board and work together, or you can have kids draw a milk carton then write the name of the essential elements and cut out the description. 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 | Magic Milk Activity | See full instructions in the handout section.

Milk has a mixture of water, fat, vitamins, and minerals. Watch as a quick experiment shows how colors mooove across the milk at different rates.

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.

- *How many times are cows milked per day?*
- *How many gallons does a cow produce a day?*
- *Briefly describe how milk gets from cow to consumer.*
- *Name two essential nutrients in milk.*

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!

Cow to Carton | https://cdn.agclassroom.org/media/uploads/LP792/Cow_to_Carton_cards.pdf

Dairy Product Pictures | https://cdn.agclassroom.org/media/uploads/LP792/Zoomed_in_on_dairy_2.png

9 ESSENTIAL NUTRIENTS

Lesson 2 | Elaborate | Option 1



Nutrient

Calcium
Potassium
Phosphorus
Protein
Vitamin D
Vitamin A
Vitamin B12
Riboflavin
Niacin

The Benefit

Converts Food into energy
Builds and maintains strong teeth
Maintains a healthy blood pressure
Maintains healthy vision
Maintains an active metabolism
Builds and maintains strong bones
Builds and repairs muscle tissue
Generates energy in the body's cells
Builds healthy red blood cells

MAGIC MILK

Lesson 2 | Elaborate | Option 2



Materials

- Food coloring
- Few shallow bowls or paper plates
- A few milks with different fat percentages
 - Skim, 1%, 2%, Whole, Half and Half
 - If you are only using one milk use whole milk
- Dish Soap
- Q-Tips (Optional)

Introduction to Activity

As we learned milk has 9 essential nutrients. There are also water and fats in milk. The percentage is how much fat is in the milk, whole milk has the most fat and skim has nearly none. Does anyone have an idea of what might happen when we add food coloring and dish soap to the milk?

Instructions

1. *Pour milk into a shallow bowl or paper plate to cover the bottom (make sure it is covered)*
2. *Add some drops of food coloring*
 - a. *Use a variety of colors if possible*
 - b. *Be sure to add 3 to 4 drops of each color*
3. *Add a drop of dish soap to the center (you can also dip a Q-Tip in dish soap and place it in the middle of the colors)*
4. *Watch the magic happen*

Reflect

Does anyone have a guess why the colors moved like they did? Did anyone notice a difference in the different milks? Why is that? When soap is added to the milk, it helps to separate the water and fat in the milk. The soap molecules connect to the fat molecules, the molecules of the food coloring get pushed around everywhere resulting in an explosion of color! As the majority of soap molecules attach to the fat molecules and the soap spreads throughout the milk, the color explosion will slow and eventually stop. Add more soap and see if there are more fat molecules that haven't attached to soap – if there are unattached fat molecules still, the color explosion will begin again.

KWL

Know | Want to Know | Learned



K - What I know

W - What I want to know

L - What I learned

ANSWERS AND RESOURCES



Matching Answers

Calcium	Converts Food into energy
Potassium	Builds and maintains strong teeth
Phosphorus	Maintains a healthy blood pressure
Protein	Maintains healthy vision
Vitamin D	Maintains an active metabolism
Vitamin A	Builds and maintains strong bones
Vitamin B12	Builds and repairs muscle tissue
Riboflavin	Generates energy in the body's cells
Niacin	Builds healthy red blood cells

Links & Acknowledgments

[Milk to Table Video](#)
Some resources were adopted from [Ag in the Classroom](#)
Want more?! Check out these [Dairy Modules](#)
[Ag Foundation](#) has some great resources!

Cow to Carton

