



Reducing Animal Effects on the Environment

Middle School Food and Agricultural Literacy Curriculum

Precepts

- C. Vision
 - C1. Contemplate the future

National Standards

- AS.08.01.01.b. Outline methods of reducing the effects of animal agriculture on the environment.
- ESS.03.03.04.b. Describe precautions taken to prevent/reduce contamination of groundwater supplies.
- NL-ENG.K-12.4 – Communication Skills
- NL-ENG.K-12.12 – Applying Language Skills
- NS.5-8.3 – Life Science
- NS.5-8.6 – Science in Personal and Social Perspectives

Student Learning Objectives

- As a result of this **unit** the students will...
 - Identify environmental impacts related to animal production.
- As a result of this **lesson** the students will...
 - Outline methods of reducing the effects of animal agriculture on the environment.

Content Outline

Outline methods of reducing the effects of animal agriculture on the environment.

- I. **Outline methods of reducing the effects of animal agriculture on the environment.**
 - A. **Waste management**
 - 1. Odor control
 - a. State and local regulations
 - b. Mix oxygen with manure
 - c. Use of masking agents

Time

Instruction time for this lesson: 45 minutes.

Resources

Gillespie, James R. (1998). *Animal Science*. Albany, NY: Delmar Thomson Learning. — *Introduction to Livestock & Companion Animals*, Third Edition. — Taylor, R.E. & Field, T.G. (2007). *Scientific Farm Animal Production*, Ninth Edition. Upper Saddle River, NJ: Prentice Hall.

Tools, Equipment, and Supplies

- Writing utensils
- MS.IAS.6.3.AS.A – five copies for each group member, on five different pieces of colored paper
- MS.IAS.6.3.AS.B – five copies for each group member, on five different pieces of colored paper
- MS.IAS.6.3.AS.C – five copies for each group member, on five different pieces of colored paper
- MS.IAS.6.3.AS.D – one per teacher
- MS.AS.6.3.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

Waste management

Contamination

- 2. Manure management
 - a. Fertilizer
- 1. Create economic and environment benefits
 - b. Methane from manure
 - 1. Manure mixed with water and pumped into covered lagoons
 - 2. Manure heated and mixed to produce biogas where a covered digester catches methane.
- B. Water quality
 - 1. **Contamination** of water supply
 - a. Adequately plan facility building and drainage systems
 - b. Manage runoff and use soil conservation practices in crop fields where manure is applied as a fertilizer



Lesson Number: MS.AS.6.3

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Interest Approach

Copy five each of **MS.AS.6.3.AS.A**, **MS.AS.6.3.AS.B**, and **MS.AS.6.3.AS.C** on three different colors of paper. (This number would be correct for a class of fifteen. Larger or smaller class sizes will ultimately change the number of copies. Just ensure that there are at least three to five people per group. For large class sizes, more than three colors may be used to form more groups.) As students walk in the door, hand them a scenario and instruct them to keep the blank side up. After attendance is taken and announcements are made, have students locate others with like-colored papers and form groups around the room.

Welcome class! We were all given a colored sheet of paper when we entered the class today. The contents of this paper are top secret for the time being, so keep them upside down as you find the other insert number of other students in the group that have the same colored paper as you. Find a comfy spot in the room to sit together.

After students have collected in their groups, give the following instructions:

In just a moment we will all step into new roles. We will each take the identity of a livestock producer somewhere in the United States. Here is the task before us: When I say **ROLE IT**, groups will have five minutes to read the scenario given on the sheet and provide advice where it is requested. Remember, groups have five minutes to complete this task, so think hard about what is being asked of you and give creative solutions to the scenarios. What questions are there? **ROLE IT!**

After five minutes, bring the students back with a countdown. Next, find a volunteer from each group to stand up and read the scenario. Then select another student from the group to share the thoughts and suggestions created by the group. Continue this process for all three scenarios.

Let's bring it back in 10....5 – 4 – 3 – 2 – 1. First up, insert student's name, please read for us the scenario your group was given.

Allow time for student to read scenario aloud.

All right, sounds like quite a predicament. Insert student's name, let's hear the advice your group gave Tim Joe before beginning this project.

Allow time for student to share their suggestions.

Interesting thoughts. Thanks! Now, let's hear about Farmer Smith.

Continue this process for the next two scenarios.

At the conclusion of the final scenario, lead students to the realization that today we will be finding solutions to these scenarios.

Great work, students! Today we have already taken great strides. We've put on our thinking caps and given these farmers some great ideas for solving their environmental problems. We will continue that journey today. Please keep those thinking caps on, but be willing to explore even deeper into what livestock producers can do to be good stewards of the environment.

In fact, soon we will realize that farmers are already practicing many of these techniques; we may just need to continue the practice or increase the level in which they are being implemented. So, let's be on our way as we discover how we can further help farmers like Tim Joe, Farmer Smith, and Billy Jean.

Summary of Content and Teaching Strategies

Objective 1. Outline methods of reducing the effects of animal agriculture on the environment.

Students will use the Little Professor e-Moment® as they discover two areas of environmental concern: waste management and water quality. Divide the class into two groups and the content into two equal portions. Each group will have two roles: one as professors and one as students of the professor. Refer to Group 1 as Professor 1s and Group 2 as Professor 2s.

While Professor 1s are learning from you and taking notes, Professor 2s are quiet and "invisible." Keep your teaching short and to the point. When you are finished, Professor 1s teach Professor 2s what they just learned. Repeat this cycle for Professor 2s.



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Professor 1s will teach odor control, Professor 2s will teach manure management, then Professor 1s will teach water quality. Students will complete **MS.AS.6.3.AS.D** during this activity.

Break students into pairs dividing students into Professor 1s and Professor 2s.

As we begin to discover how we can be good stewards for the environment, I need the attention of Professor 1s. You are the experts for this voyage and can otherwise be referred to as Professor 1s. Professors 2s, your job is to remain quiet and ignore everything I say. Tune me out, and wait for your expert professor to bring you back to class.

Professor 1s, lend me your ears...

Present the students with the following information, allowing them to complete **MS.AS.6.3.AS.D**. At the conclusion of this process, students will get the attention of their partners and teach them the same information.

The first concern in **waste management** is odor control. Livestock producers have a number of options when it comes to odor control, but they must first comply with all state and local regulations defined for their particular area.

In order to accommodate these restrictions, many livestock producers will mix oxygen with the manure whether it is through the lagoon process or the natural process animals assist with while in the feedlot.

Manure is readily available in a feedlot. As cattle move around they walk atop the manure, breaking up both dried and fresh pieces, and allowing oxygen to be added to the contents of the manure.

Finally, some producers choose to use a masking agent like a deodorant to cover the odor of the livestock with a variable odor. These masking agents can be added to the manure, given as a digestive agent to eliminate the odor during digestion, or can be added over a large surface area to absorb the odor before they are emitted into the environment. Any of these three would be acceptable ways for livestock producers to control odor on their farms.

Upon presenting this information recall the three solutions with Professor 1s.

Let's recall this information. What are three ways livestock producers can help control odor on their farms?

Responses should include: following state and local regulations, mixing oxygen with manure, and using masking agents.

Professor 2s, welcome back. Please ask Professor 1s for the information they have to share about how livestock producers can help control odor within their livestock operation. Professor 1s, be sure to help Professor 2s complete their activity sheet outline. You have three minutes.

At the conclusion of three minutes, bring the entire class back together and review to ensure Professor 2s have the information.

Complete the same process as above using Professor 2s to teach the manure management techniques.

Professor 2s, lend me your ears...

Present the students with the following information, allowing them to complete **MS.AS.6.3.AS.D**. At the conclusion of this process, students will get the attention of their partners and teach them the information.

The second concern in **waste management** is manure management. There are a variety of techniques farmers may use in order to properly use and/or dispose of their livestock manure.

First, farmers may use this manure as fertilizer on their crop fields. This creates both an economic and environmental benefit as farmers do not have to pay for fertilizer and are disposing of the manure at the same time. Farmers do need to be careful with this process, though, and need to properly test their soil in order to maintain that excess manure is not running off the fields.

Farmers are also looking at ways to control particular gases that are emitted from manure. Methane is one of these gases. In order to limit the amount of methane released from manure, livestock producers may mix manure with water and pump it into covered lagoons.

Producers may also heat and mix the manure to produce a biogas. This mixture is covered and methane is caught by a digester. Either method, whether fertilizing or controlling emitted gases, will be successful in helping livestock producers to manage their manure.



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Upon presenting this information recall the three solutions with Professor 2s.

Let's recall this information. What are the two ways livestock producers can help control odor on their farms?

Responses should include: using manure as fertilizer on fields or using methods to control particular gas emissions from manure.

Professor 2s, bring back your partners and teach them how livestock producers can help manage manure within their livestock operation. Be sure to help them complete their activity sheet outline. You have three minutes.

At the conclusion of three minutes, bring the entire class back together and review to ensure group I has the information.

Complete the same process as above using Professor I to teach the water quality concerns.

Dr.'s _____, lend me your ears...

Present the students with the following information, allowing them to complete **MS.AS.6.3.AS.D**. At the conclusion of this process, students will get the attention of their partner and teach them the information.

Along with **waste management**, water quality tops the list of environmental concerns involved in the production of livestock. **Contamination** of the water supply seems to be a major concern to many environmentalists and a caution to producers.

There are two ways farmers work to ensure this is not an issue. First, by adequately planning their livestock facilities and drainage systems, livestock producers can ensure that manure is not running off into local rivers, lakes, and streams.

In addition, producers manage runoff by using soil conservation practices within their crop fields where manure is applied as a fertilizer. Fertilizer is applied in many crop operations. Gardeners put fertilizer on their fruit and vegetables, greenhouse growers put fertilizer on their plants, and farmers put fertilizer on their crops.

This fertilizer contains valuable nutrients that help increase the plants' growth and development. Fertilizer is to a plant as a vitamin is to us. Vitamins gives us those extra nutrients that our body uses to help keep us strong healthy. Fertilizer does the

same for plants. Both methods accurately help control the water quality in and around livestock production areas.

Upon presenting this information recall the three solutions with Professor 2s.

Let's recall this information. What are the two ways livestock producers can help control water quality?

Responses should include: adequately planning their livestock facilities and drainage systems, and by using soil conservation techniques in the crop fields where manure is applied as fertilizer for the land.

Professor 2s, bring back your partners and teach them how livestock producers can help control the water quality in and around livestock production areas. Be sure to help them complete their activity sheet outline. You have three minutes.

At the conclusion of three minutes, bring the entire class back together and review to ensure group II has the information.

Great work! It looks like we have a grasp on to how to handle environmental concerns in reference to animal production.

Review/Summary

Students will use the Hieroglyphics e-Moment to review the methods livestock producers use in order to reduce the negative effects of animal agriculture on the environment. Students will create small pictures to represent the information, concepts, or steps in a process to help them remember the information. Students will share their creations.

Let's take a moment or two to reflect upon what we have just discovered today. Animal agriculturalists are continually working to produce their livestock while still maintaining healthy environmental standards.

Today we have looked at a number of methods livestock producers use on their farms. Take the next five minutes to review these techniques, drawing a symbol in the left hand margin of your activity sheet which represents each of these techniques. What clarification is needed?



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At the conclusion of five minutes, bring the students together to discuss what the world would look like if livestock producers were not concerned about the environment and the effects animal agriculture production has on it.

Now that we have all had the chance to collect our thoughts on the great things livestock producers are currently doing to help control the negative effects animal agriculture may have on the environment, let's step back and think about what the world would be like if they had no concern for the environment at all.

On the back of your activity sheet, illustrate or draw your thoughts about the following question: What if farmers had no regard for the environment as they worked to produce their livestock?

Allow students three minutes to complete this activity.

Let's wrap up our illustrations. Now take the next two minutes to explain to a partner the illustration and vision for what the world would be like if livestock producers had no regard for the environment.

Give students two minutes to complete their share. At the conclusion of this time, randomly select students to share their results with the class. This may lead to further discussion on the topic, and/or other students may then volunteer to share their ideas.

Let's share our thoughts. Insert student's name, what are your thoughts on this topic?

Continue this process until a minimum of three students has been interviewed.

Wow. Those are some intense thoughts! Thanks for having foresight and being able to see that livestock producers do need to be concerned with the environment. In fact, we all need to do our part. It goes far beyond just livestock producers and farmers. We should find ways in our daily lives to conserve, recycle, and improve the environment in which we live.

Application

Extended classroom activity:

Utilize resources on the Internet to research alternative methods for water quality control and waste management. Present this information in the form of an advertisement, persuading farmers and livestock producers to jump on board with the student's new idea.

FFA activity:

Prepare a seminar for local farmers and livestock producers on how to combat the negative effects of agriculture on the environment. Invite local conservation agents, soil and water conservation district representatives, and other community members to present information and new techniques to the farmers and producers.

SAE activity:

Interview local farmers and livestock producers about the management and conservation techniques they use on their farms in order to combat the negative effects of animal agriculture.

Evaluation

MS.AS.6.3.ASSESS.A

Answers to Evaluation

1. Answers may include: following state and local regulations, mixing oxygen with manure, or using masking agents.
2. Fertilizer
3. Methane
4. Answers may include: adequately planning facilities and drainage systems and managing runoff by using soil conservation practices in crop fields where manure is applied as fertilizer.



Name _____

Directions: Complete the following statements.

1. Livestock producers can help control odor by _____
2. Livestock producers may use manure as a _____ on their crop fields.
3. _____ is one of the harmful gases emitted from livestock manure that producers are looking to control through the use of water in lagoons and digesters.
4. Two ways livestock producers can help control the water quality in and around livestock producing areas is by _____ and _____



Tim Joe

Tim Joe is a local pork producer. He has three production buildings on his family's 100-year-old farm. These buildings house 400 pigs each. Even 20 years ago, when these buildings were being built, odor control and waste management were considerations.

However, Tim has noticed that, over the years, regulations have changed and new technologies and best management practices have become available. Tim realizes it has been a number of years since the buildings were built, when all the most current management techniques were in place. However, he is thinking it may now be time to update and renovate the buildings in order to keep up with new practices and technologies.

In his hog buildings, manure is released via slotted floors in the building and then pumped with water into the lagoon. He has noticed recently though that there is an odd odor coming from the lagoon. Tim is concerned about this for him and his family and also considers what his neighbors might be thinking.

Please provide some advice to Tim on ways to handle this situation.



Farmer Smith

Farmer Smith is a feedlot operator. At times his operation can accommodate up to 500 head of cattle. He has sufficient space for this size of herd, but is always looking for ways to expand his operation.

Recently, Farmer Smith has subscribed to a sustainable farming magazine. He reads about new ideas for farmers to implement in order to maintain their facilities and production while helping the environment.

Farmer Smith has been pondering just what he can do to help. With nearly 500 cattle on his property nearly year-round, surely there is something he could do to help the environment. He wonders if he can play a part in manure management.

What ideas do you have for Farmer Smith?



Billy Jean

Billy Jean has always had an interest in production agriculture. In fact, she has helped out on her family's farm for the past 25 years. Now, after getting a general agriculture degree from the local college, Billy Jean has decided she wants to return to the family farm and carry on the next generation.

Billy Jean's family has always raised hogs. They have two outdoor barns and cement slabs. This operation has worked for the family for the last 50 years, but having seen other operations while she was studying in college, she has realized there are other options out there that will allow their farm to be more productive.

Billy Jean has decided a modern building facility is the answer. Before plans are made and a location is determined, though, Billy Jean plans to sit down and think about this new venture.

What things should Billy Jean be considering as she is planning the construction of the new facility and the site of the building?



Effects of Animal Agriculture on the Environment

Waste Management

- Odor Control

1. _____

2. _____

3. _____

- Manure Management

1. _____

2. _____

Water Quality

- Contamination of the water supply

1. _____

2. _____