

Unit D: Animal Management

Lesson 2: Managing Livestock Waste

Student Learning Objectives: Instruction in this lesson should result in students achieving the following objectives:

1. Describe qualities of manure.
2. List uses and value of manure.
3. Discuss environmental concerns with manure

Recommended Teaching Time: 3 hours

List of Resources: The following resources may be useful in teaching this lesson:

Ensminger, M. E., *The Stockman's Handbook*. Danville, Illinois: Interstate Publishers, Inc. 1992

Ensminger, M. E., *Animal Science*. Danville, Illinois: Interstate Publishers, Inc. 1991 :

Jackson, Nancy S., Greer, William J., and Baker, James K. *Animal Health*. Danville, Illinois: Interstate Publishers, Inc. 2000

Internet keywords: manure, nitrogen, phosphoric acid, potassium, methane, global warming

List of Equipment, Tools, Supplies, and Facilities:

- Writing surface
- PowerPoint Projector
- PowerPoint Slides
- Transparency Masters
- Copies of student lab sheet
- Paper

Terms: The following terms are presented in this lesson (shown in bold italics): **PowerPoint Slide 2.**

- Fertilizer
- Global climate change
- Greenhouse effect
- Manure
- Methane
- Nitrate
- Organic matter

Interest Approach. Use an interest approach that will prepare the students for the lesson.

Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Bring in items such as a cloth bag, an old shoe, a piece of string, a tin can etc. Set these items on the front table and ask students to tell you what they are. Most likely students will say “A shoe, a bag, a piece of string etc.” Then, tell students to make a list of as many possible uses these items could have besides what they are used for everyday. For example, the string could make a bracelet, the tin can could hold pencils or nails. When students are finished have them share their lists out loud. Have them explain why it is important to use items to their fullest ability. Lead this into objective 1.

Summary of Content and Teaching Strategies

Objective 1: Describe qualities of manure.

Anticipated Problem: What qualities does manure have?

Ask students to refer to the opening activity. Recall how they thought of other uses for items around the house. Those items had a value besides the primary use. Now, lets think about something that animal producers will have a lot of – manure. What qualities does manure have that might be of use to humans?

Also, have students create a “Manure Manual” to take important notes in. Have them fold 2 pieces of paper in half for the manual.

- I. **Manure** is a byproduct of raising animals. It is used for energy, organic matter, and as a fertilizer for crops. Manure has value because of its contents. **PowerPoint Slide 3.**
 - A. Since manure is produced by all animals raised, it is very available and inexpensive. 909 kilograms or one ton of manure contains an average of 227 kilograms or 500 pounds organic matter, 4.5 kilograms or 10 pounds nitrogen, 2.3 kilograms or 5 pounds phosphoric acid, and 4.5 kilograms or 10 pounds of potassium. Since plants need all of these to grow successfully, it is a great source of fertilizer. **PowerPoint Slides 4 and 5.**
 - B. Manure requires equipment and time to utilize in the fields to grow crops. Commercial Fertilizers in other parts of the world have taken the place of manure on many fields. The advantage of manure over commercial fertilizers is that it contains organic matter in addition to nutrients. **Ask students “What is the advantage of manure over commercial fertilizers?” PowerPoint Slide 6.**
 - C. Since commercial fertilizers in other parts of the world are oil and petroleum based some are concerned that the energy crisis will lead to high priced fertilizer. Manure is being used more often in recent years by farmers that are returning to organic means. **PowerPoint Slide 7.**

Use TM: 2-1 and the PowerPoint Slides to discuss qualities of manure. Make sure students have all important information copied in the manure manual. Also, ask students again “What is the advantage of manure over commercial fertilizers?”

Objective 2: List uses and value of manure.

Anticipated Problem: What are uses and value of manure?

Have students create a list of all the uses of manure. Share the list with a partner.

- II. Manure is plentiful. It has great value and several uses.
 - A. The value of manure depends on a couple specific factors:
 - 1. Kinds of animals producing the manure.

Why would this be a factor? How much manure would a cow produce versus that of a goat? Are the diets of animals different? Would that change the nutrient factor of the manure?

- 2. What feed the animals are consuming and how much of the nutrients are going to the animals
- 3. How the manure is handled

Have students discuss the different possibilities for getting manure to the crops.

- 4. How the manure is managed during application to crops
- 5. What kind of soil, crops, and slope of the land the manure is applied to

PowerPoint Slide 8.

- B. Uses of manure vary but include:
 - 1. Fertilizer
 - 2. Organic matter
 - 3. Increased crop yields for many years
 - 4. Can be used on both crop fields and pasture or range areas **PowerPoint Slide 9.**
- C. **Organic matter** is dead plant and animal matter that originates from living organisms. **Fertilizer** is a material that contains nutrients needed by plants.
- D. Care needs to be taken with applying too much manure because excess application can lead to salt problems and nitrate problems. **Nitrate** is the form of nitrogen used by plants. **PowerPoint Slide 10.**

Use TM: 2-2 as an overhead or handout to discuss uses of manure. Also, if possible have an area farmer come to the classroom and discuss the manure management practices of their farm. Have students prepare 2 questions each to ask during the discussion.

Objective 3: Discuss environmental concerns with manure.

Anticipated Problem: What environmental concerns are there with manure?

With every advantage comes a disadvantage. Ask students what some of the disadvantages may be to using manure for other purposes.

III. There are some environmental concerns with the production of manure.

- A. The **greenhouse effect** is the term used to describe trapping of radiation in the lower atmosphere. Greenhouse gases have been increasing and therefore trap more heat. This may cause global climate changes over a period of time. **Global climate change** describes changes in global temperature and precipitation patterns. **PowerPoint Slides 11 and 12.**
- B. Major greenhouse gases are carbon dioxide and methane. The increase of manure causes increase of methane in the atmosphere. In addition to manure, many other sources of methane production exist including landfills, oceans, coal, and many others. **PowerPoint Slide 13.**
- C. Currently and in the future, regulations are being made to decide how manure is stored and distributed. It is important to remember that global warming may or may not be in progress. Over the years there have been many trends in temperature including the ice age.
- D. In addition to domesticated animals, manure from wild animals also produces methane so it is difficult to track the problem. **PowerPoint Slide 14.**

Use LS: 2-1 to research global warming. Also, be sure students have all the important information copied into the Manure Manual.

Review/Summary: Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Ask students to describe qualities of manure. Then, have them list uses and value of manure. Finally, discuss environmental concerns with manure

Application: Application can involve student activity with the provided labs.

Evaluation: Evaluation should focus on student achievement of the objectives for each lesson. Various techniques can be used, such as performance on the application activities. A sample written test is attached.

Answers to Sample Test:

Part One: Matching

1 = b, 2 = c, 3 = d, 4 = e, 5 = a

Part Two: Completion

1. Nitrate
2. Organic matter
3. Carbon dioxide
4. 1.3 billion

Part Three: Short Answer

Any four of the following five answers are correct:

1. Fertilizer
2. Organic matter
3. Methane gas used for electricity
4. Increased crop yields for many years.
5. Can be used on both crop fields and pasture or range areas.

Any four of the following five are correct:

1. Kind of animals producing the manure
2. What feed the animals are consuming and how much of the nutrients are going to the animals.
3. How the manure is handled
4. How the manure is managed during application to crops
5. What kind of soil, crops and slope the manure is applied to.

Sample Test

Name_____

Test

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | | |
|---------------|--------------------------|----------------------|
| a. Fertilizer | c. Global climate change | e. Greenhouse effect |
| b. Manure | d. Methane | |

- _____ 1. A byproduct of raising animals used for energy, organic matter and as a fertilizer for crops.
_____ 2. Changes in global temperature and precipitation patterns.
_____ 3. A gas that is given off from organic matter.
_____ 4. Trapping of radiation in the lower atmosphere.
_____ 5. A material that contains nutrients needed by plants.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. _____ is the form of nitrogen used by plants.
2. _____ is dead plant and animal matter that originates from living organisms.
3. Major greenhouse gases are _____ and methane.
4. There is about _____ tons of manure created annually in the U.S.

Part Three: Short Answer

Instructions. Provide information to answer the following questions.

What are four uses of manure?

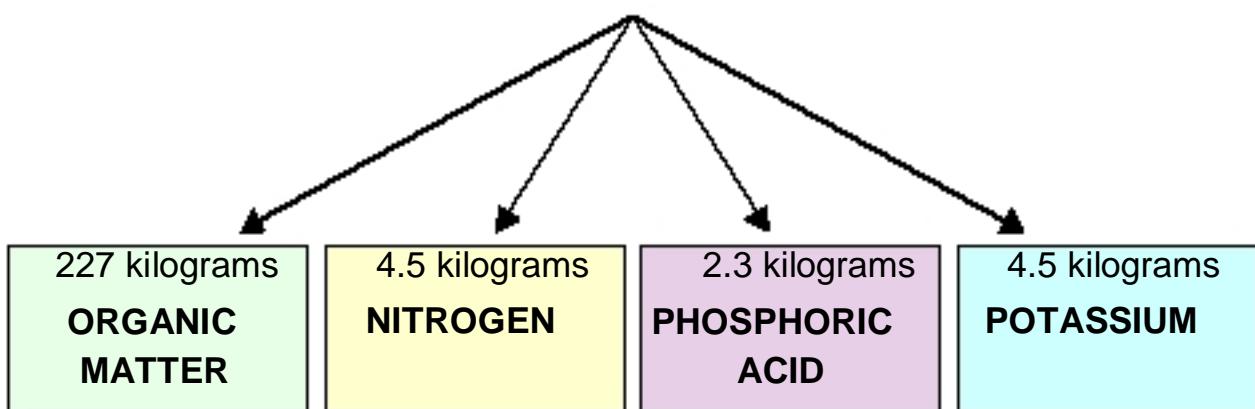
- 1.
- 2.
- 3.
- 4.

The value of manure depends on a couple specific factors. Name four of them:

- 1.
- 2.
- 3.
- 4.

THE QUALITIES OF MANURE

909 kilograms Average Manure Contains



POSITIVE USES FOR MANURE

Uses of manure vary but include:

- Fertilizer
- Organic matter
- Methane gas
- Increased crop yields for many years
- Can be used on both crop fields and pasture or range areas.

Lab Sheet

Manure and Global Warming

Purpose:

To research the effects of manure on the greenhouse effect.

Procedure:

Obtain enough research materials to write a one minute speech on manure and the greenhouse effect, be prepared to present your information in front of your class.