

Lesson B6–2

Managing Livestock Waste

Unit B. Animal Science and the Industry

Problem Area 6. Meeting Environmental Requirements of Animals

Lesson 2. Managing Livestock Waste

New Mexico Content Standard:

Pathway Strand: Natural Resources and Environmental Systems

Standard: VIII: Understand environmental service systems.

Benchmark: VIII-A. Understand pollution control measures to maintain a safe facility environment.

Performance Standard: 1. Identify types of pollution (e.g. ground, surface water, air, noise, radioactive contamination). 2. Describe environmental impact from industrial and non-industrial processes.

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.

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

Lee, Jasper S. *Introduction to Livestock and Companion Animals 2nd Edition*. Danville, Illinois: Interstate Publishers, Inc. 2000

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

Recommended Resources. One of the following resources should be selected to accompany the lesson:

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

Other Resources. The following resources will be useful to students and teachers:

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

List of Equipment, Tools, Supplies, and Facilities

Writing surface

Overhead projector

Transparencies from attached masters

Copies of student lab sheet

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

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.

Summary of Content and Teaching Strategies

Objective 1: Describe qualities of manure.

Anticipated Problem: What qualities does manure have?

- 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.
 - A. Since manure is produced by all animals raised, it is very available and inexpensive. One ton of manure contains an average of 500 pounds organic matter, 10 pounds nitrogen, 5 pounds phosphoric acid, and 10 pounds of potassium. Since plants need all of these to grow successfully, it is a great source of fertilizer.
 - B. Manure requires equipment and time to utilize in the fields to grow crops. Commercial fertilizers 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.
 - C. Since fertilizers 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.

Use TM: B6–2A as an overhead to discuss qualities of manure.

Objective 2: List uses and value of manure.

Anticipated Problem: What are uses and value of manure?

- II. Manure is plentiful in the United States. It has great value and several uses.
 - A. There is about 1.3 billion tons of manure created annually in the U.S. Acre for acre, you could put $\frac{3}{4}$ of a ton on each acre of land in the U.S. each year. Compared to the value of commercial fertilizers and the pounds produced, the manure produced is worth over 10 billion dollars.
 - B. The value of manure depends on a couple specific factors:
 1. Kinds 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
 - C. Uses of manure vary but include:
 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
- D. **Organic matter** is dead plant and animal matter that originates from living organisms. **Methane** is a gas that is given off from organic matter. **Fertilizer** is a material that contains nutrients needed by plants.
- E. 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.

Use TM: B6–2B as an overhead or handout to discuss uses of manure.

Objective 3: Discuss environmental concerns with manure.

Anticipated Problem: What environmental concerns are there with manure?

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.
- 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.
- 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.

Use LS: B6–2A to research global warming.

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used to determine which objectives need to be reviewed or taught over with a different approach. Questions provided in the recommended textbooks may also be used to help review.

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

Lesson B6–2: Managing Livestock Waste

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?

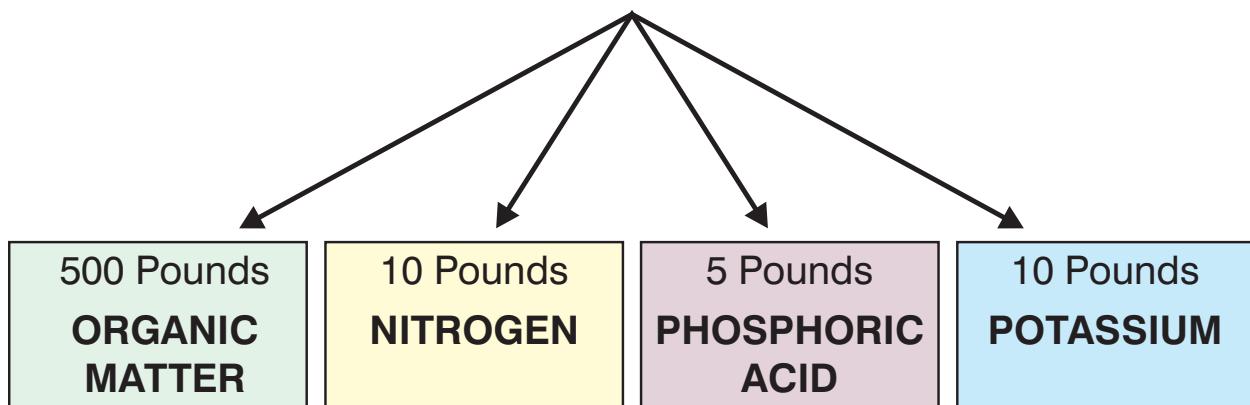
- 1.
- 2.
- 3.
- 4.

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

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

THE QUALITIES OF MANURE

One Ton of 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.