

Unit F: Soil Fertility and Moisture Management

Lesson 2: Determining the Value of Manure and Compost

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: 1 hour

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

- A PowerPoint has been developed for use with this lesson plan
- <http://cwmi.css.cornell.edu/compostbrochure.pdf>
- www.gardeningguides.com/how-to/tiptechniques/planning/compost.asp

List of Equipment, Tools, Supplies, and Facilities:

Writing surface
PowerPoint Projector
PowerPoint Slides
Examples of fertilizers

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

- Compost
- 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.

Display examples of fertilizers of different types. Ask students to identify the differences they observe. Direct the discussion towards the plant nutritional value.

Summary of Content and Teaching Strategies

Objective 1: Describe qualities of manure.

(PowerPoint 3)

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 4)

A. Since manure is produced by all animals raised, it is very available and inexpensive. One ton of manure contains an average of 226 kilograms organic matter, 4.5 kilograms nitrogen, 2.2 kilograms phosphoric acid, and 4.5 kilograms of potassium. Since plants need all of these to grow successfully, it is a great source of fertilizer.

(PowerPoint 5)

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.

(PowerPoint 6)

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.

**** Ask students what they do with the manure from their animals; compile a list before moving on to Objective 2.**

Objective 2: List uses and value of manure.

(PowerPoint 7)

II. Manure is plentiful and has great value and several uses.

A. 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

(PowerPoint 8)

B. 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

(PowerPoint 9)

- C. **Organic matter** is dead plant and animal matter that originates from living organisms.
- D. **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.

Objective 3: List uses and value of compost.

(PowerPoint 10)

III. **Compost** is made by piling alternate layers 10 to 15 centimeters deep of plant material (grass clippings, old sod straw, or leaves) and soil. Adding nitrogen fertilizer and keeping the pile moist speeds up the decay. Organic matter added by the cover crop or compost helps keep the soil loose, adds nutrients, improves drainage, and increases moisture holding capacity.

(PowerPoint 11)

- A. Compost can be made out of leaves, grass clippings, vegetable and fruit scraps, coffee grounds and filters, tea bags, wood chips, straw, and small twigs.
- B. Tiny living things do much of the work of breaking down organic materials to form compost. These tiny workers are called microorganisms and include such things as bacteria and fungi. Animals living in the soil help microorganisms break down organic materials. Worms and pill bugs are examples of soil animals that help change organic waste into compost.

(PowerPoint 12)

- C. As microorganisms and soil animals turn organic materials into compost, they use the organic materials as food. The organic materials provide many of the nutrients that plants need for growth and activity. Eventually, these nutrients are turned to the soil, to be used again by trees, grass, and other plants.

(PowerPoint 13)

By using compost you return organic matter to the soil in a usable form. Organic matter in the soil improves plant growth by helping to break up heavy clay soils and improving their structure, by adding water and nutrient-holding capacity to sandy soils, and by adding essential nutrients to any soil. Improving your soil is the first step toward improving the health of your plants. Healthy plants help clean our air and conserve our soil, making our communities healthier places in which to live.

(PowerPoint 14)

- D. Compost can be used to enrich the flower and vegetable garden, to improve the soil around trees and shrubs, as a soil amendment for

houseplants and planter boxes and, when screened, as part of a seed-starting mix or lawn top-dressing. Before they decompose, chipped woody wastes make excellent mulch or path material. After they decompose, these same woody wastes will add texture to garden soils. By composting and mulching you can save money by reducing your fertilizer and landscaping bills.

****Ask the students if they have a compost pile at home. What do they do with it? What do they put in it? If resources are available the class can create compost near the school. PowerPoint Slide 15 shows a troubleshooting chart as a guide to more efficient composting using a turning unit.**

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 students taking the information they learn and applying it in their lives.

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,

Part Two: Completion

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

Part Three: Short Answer

1. 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.

2. 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.

3. Any four of the following are correct: leaves, grass clippings, vegetable and fruit scraps, coffee grounds and filters, tea bags, wood chips, straw, and small twigs.

Test

Unit F Lesson 2: Determining the Value of Manure and Compost

Part One: Matching

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

- | | |
|---------------|------------|
| a. Fertilizer | c. Compost |
| b. Manure | d. Methane |

- _____ 1. A byproduct of raising animals used for energy, organic matter and as a fertilizer for crops.
- _____ 2. Made by piling alternate layers 10 to 15 centimeters deep of plant material and soil.
- _____ 3. A gas that is given off from organic matter.
- _____ 4. 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.

- 1 . What are four uses of manure?

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

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

1.

2.

3.

4.

3. List four materials that can be used in a compost pile?

1.

2.

3.

4.