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| **Course** | Agricultural Science II |
| **Unit** | Soil Science |
| **Lesson** | Soil Sampling and Interpreting Soil Test Results |
| **Estimated Time** | Two 50-minute blocks |

**Student Outcome**

Prepare a soil sample for analysis.

**Learning Objectives**

1. Explain why soil samples are taken.
2. Identify the factors which influence the number of samples that are taken.
3. Identify when and how often a soil sample should be taken.
4. Explain the procedure which should be followed to obtain a good soil sample.
5. Explain how to take a soil sample for a cultivated field, no-till field, and a lawn or garden.
6. Identify some pitfalls to avoid when obtaining a good soil sample.
7. Identify what soil testing services are locally available.
8. Explain why information about crop history should be included with the soil sample.
9. Identify what data can be obtained from a soil test report.

**Grade Level Expectations**

**Resources, Supplies & Equipment, and Supplemental Information**

**Resources**

1. PowerPoint Slides
   - ☐ PPt 1 – Methods of Taking a Soil Sample
   - ☐ PPt 2 – Taking a Soil Sample from a Cultivated Field
2. Activity Sheet
   - AS 1 – Take a Soil Sample
3. Minor, Paul E. *Soil Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1995.
4. *Soil Science Curriculum Enhancement.* University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

**Supplies & Equipment**

- ❑ Obtain Soil Sample Information sheets for each student from Extension's website or refer to the example in AS 1. See AS 1 for materials and equipment needed to complete the Activity Sheet.

**Supplemental Information**

1. Internet Sites
   - ❑ Soil Sample Information Sheet for Field Crops. University of Missouri Extension. Accessed May 19, 2008, from http://extension.missouri.edu/explorepdf/miscpubs/MP0188.pdf.

- ❑ Soil Test Interpretation Guide. Oregon State University Extension Service. Accessed May 19, 2008, from http://extension.oregonstate.edu/catalog/pdf/ec/ec1478.pdf.
- ❑ Soil Testing. Home and Garden Information Center, Clemson University Cooperative Extension Service. Accessed May 19, 2008, from http://hgic.clemson.edu/factsheets/hgic1652.htm.

2. Print
   - ❑ Ashman, Mark R., and Geeta Puri. *Essential Soil Science: A Clear and Concise Introduction to Soil Science.* Malden, MA: Blackwell Publishing, 2002.
   - ❑ Brady, Nyle C., and Ray R. Weil. *The Nature and Properties of Soils.* 14th ed. Upper Saddle River, NJ: Prentice Hall, Inc., 2007.
   - ❑ Coyne, Mark S., and James A. Thompson. *Fundamental Soil Science.* Clifton Park, NY: Delmar CENGAGE Learning, 2005.
   - ❑ Donahue, Roy L., and Roy Hunter Follett. *Our Soils and Their Management*. Danville, IL: Interstate Publishers, Inc. 1990.
   - ❑ Plaster, J. Edward. *Soil Science and Management.* 2nd ed. Albany, NY: Delmar Publishers, Inc., 1992.
   - ❑ White, Robert E. *Principles and Practice of Soil Science: The Soil as a Natural Resource.* 4th ed. Malden, MA: Blackwell Publishing, 2005.

**Interest Approach**

Discuss why soil tests are important. Compare the analysis of a soil test to your doctor taking your blood pressure and reading your x-rays. Obtain actual Soil Sample Information sheets for each student from Extension's website or refer to the example in AS 1 for this lesson. Review this form with the students to gain clues as to proper soil sample collecting procedures.

**Communicate the Learning Objectives**

1. Explain why soil samples are taken.
2. Identify the factors which influence the number of samples that are taken.
3. Identify when and how often a soil sample should be taken.
4. Explain the procedure which should be followed to obtain a good soil sample.
5. Explain how to take a soil sample for a cultivated field, no-till field, and a lawn or garden.
6. Identify some pitfalls to avoid when obtaining a good soil sample.
7. Identify what soil testing services are locally available.
8. Explain why information about crop history should be included with the soil sample.
9. Identify what data can be obtained from a soil test report.

| Instructor Directions | Content Outline |
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| **Objective 1**<br><br>*Evaluate the importance of a soil test. Discuss why we should have a soil test made after each crop.* | **Explain why soil samples are taken.**<br><br>1. To produce healthy, high-yielding plants at minimal cost<br>2. To determine the percentage of the organic matter<br>3. To determine the pH<br>4. To determine the amount of available nutrients in the soil |
| **Objective 2**<br><br>*Explain why it is necessary to limit the number of acres included in the soil test. Refer to Figure 9.1 of the student reference.* | **Identify the factors which influence the number of samples that are taken.**<br><br>1. Size of the area to sample (20 acres or fewer)<br>2. Areas of different soil<br>3. Areas growing different crops<br>4. Various surface textures<br>5. Eroded areas<br>6. Wet areas |
| **Objective 3**<br><br>*Discuss how often a soil test should be made and what time of year is the best for taking a soil sample?* | **Identify when and how often a soil sample should be taken.**<br><br>1. Can be taken at any time of the year<br>2. When soil is dry enough to till or is slightly wet – not when soil is muddy<br>3. Retest every 3 to 4 years |

| Instructor Directions | Content Outline |
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| **Objective 4**<br><br>*Demonstrate the proper procedure for taking a soil sample. Use PPt 1 to discuss soil sampling techniques. Have students complete AS 1. Explain why it is necessary to include the top 7 inches of soil. Refer to Figure 9.1 of the student reference.*<br><br>☐ PPt 1 – Methods of Taking a Soil Sample<br><br>AS 1 – Take a Soil Sample | **Explain the procedure which should be followed to obtain a good soil sample.**<br><br>1. Use a soil auger, probe, or spade.<br>2. Include the top 7 inches of soil in each subsample.<br>3. Samples should be taken from different areas of the field and mixed thoroughly.<br>4. Place about a quart of the sample material in a small box or bag.<br>5. Identify each sample by field number and field map.<br>6. Air-dry sample in a dust-free area.<br>7. Take the sample to local University Extension Center for analysis. |
| **Objective 5**<br><br>*Discuss how to sample soils correctly. Ask students what problems they have in taking a soil sample from a cultivated field. Refer to PPt 2.*<br><br>☐ PPt 2 – Taking a Soil Sample from a Cultivated Field | **Explain how to take a soil sample for a cultivated field, no-till field, and a lawn or garden.**<br><br>1. Press freshly cultivated soil down slightly to obtain a natural depth. Take 10-20 subsamples in a cultivated field.<br>2. Two samples are needed from a no-till field.<br>a. Take 10-20 subsamples from the top 3 inches.<br>b. Take another 10-20 subsamples from the next 4 inches.<br>3. A garden requires 4-10 subsamples from the top 7 inches of soil. |
| **Objective 6**<br><br>*Discuss the importance of obtaining a good soil sample. Ask the students what areas to avoid when taking soil samples.* | **Identify some pitfalls to avoid when obtaining a good soil sample.**<br><br>1. Do not take samples from areas that are not representative of the entire field.<br>a. Field boundaries, dead furrows, and end rows<br>b. Areas near limestone gravel roads<br>c. Severely eroded areas<br>d. Wet spots<br>e. Old barn lots<br>2. Do not dry samples by oven or microwave. |
| **Objective 7**<br><br>*Ask students what soil testing services are available in your area.* | **Identify what soil testing services are locally available.**<br><br>1. University Extension Center<br>2. Fertilizer companies<br>3. Independent laboratories |

| Instructor Directions | Content Outline |
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| **Objective 8**<br><br>*Discuss the importance of crop history. Compare your bank account to the soils account for your fields or gardens.* | **Explain why information about crop history should be included with the soil sample.**<br><br>1. Helps explain test results<br>2. Helps in making future crop recommendations |
| **Objective 9**<br><br>*Discuss an actual soil test for a garden and a cropping field.* | **Identify what data can be obtained from a soil test report.**<br><br>1. Percentage of organic matter content<br>2. pH<br>3. CEC<br>4. Calcium<br>5. Magnesium<br>6. Phosphorus<br>7. Potassium<br>8. Available neutralizable acidity (NA)<br>9. Available nitrogen is not tested because it is quickly exhausted and replenished as needed for each crop |
| **Application**<br><br>AS 1 – Take a Soil Sample | Answers to AS 1:<br>No questions – students can be graded on participation at the instructor's discretion.<br><br>Other activities:<br>1. Invite an agent from University Extension to explain soil test data or tour a soil testing facility.<br>2. Demonstrate the proper technique in taking a soil sample from a test area. Send the sample to a lab for analysis. Use the data to have the students make recommendations. |
| **Closure/Summary** | Soil samples are needed every 3 to 4 years to determine the organic matter content, the pH, and the amount of available nutrients in the soil. Samples should be representative of the field or plot. Ten to 20 subsamples should be taken from large fields when the soil is dry enough to cultivate. Subsamples should be thoroughly mixed together, air-dried, and taken to an independent laboratory. |

| Instructor Directions | Content Outline |
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| **Evaluation: Quiz** | Answers:<br>1. Can be taken at any time of the year. Soil should be dry enough to till.<br>2. a. Use a soil auger, probe, or spade.<br>b. Include the top 7 inches of soil in each subsample.<br>c. Samples should be taken from different areas of the field and mixed thoroughly.<br>d. Place about a quart of the sample material in a small box or bag.<br>e. Identify each sample by field number and field map.<br>f. Air-dry sample in a dust-free area.<br>g. Take the sample to local University Extension Center for analysis.<br>3. Crop history helps to explain unusual test results and present nutrient levels. It also helps in making recommendations for future crops.<br>4. To produce healthy, high-yielding plants at minimal cost by determining the percentage of the organic matter, the pH, and the amount of available nutrients in the soil. |