Senior High School

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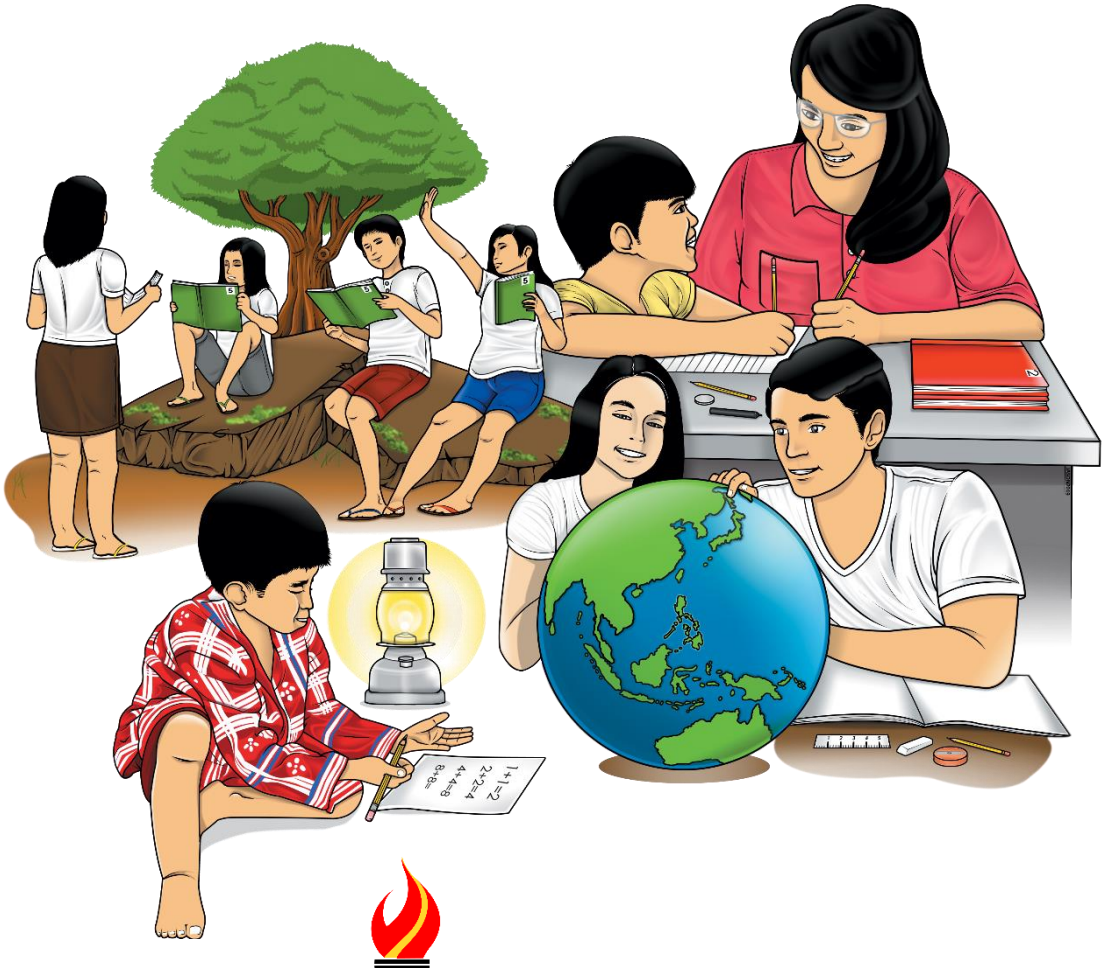
Earth Science for STEM

Quarter 1 – Module 11:
Human Activity
and the Environment



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ADM

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

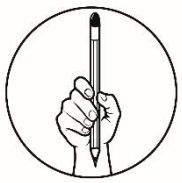
In this lesson, the learner will identify human activities, such as farming, construction of structures, and waste disposal that affect the quality and quantity of the soil. To achieve this learning competency, the learner should define and explain how human activities such as farming, construction of structures and waste disposal affect the quality and quantity of soil.

The lesson identifies human activities, namely:

- Farming
- Construction of Structures
- Waste Disposal

After going through this module, you are expected to:

1. evaluate why soil is a necessary resource;
2. analyze how people's use of land affects soil; and
3. devise a sustainable plan on soil protection and conservation for future generation;



What I Know

Directions: Choose the letter of the correct answer and write it in your answer sheet.

1. Which is NOT part of the environment?
   a. Soil
   b. Water
   c. Living organism
   d. None of the above

2. It helps sustain life on Earth including _____.
   a. Air
   b. Water
   c. Soil
   d. All of the above

3. Which ONE involves land preparation for crops planting by cutting trees and other plants followed by plowing the soil?
   a. Construction and Development
   b. Farming
   c. Mining
   d. Waste Disposal

4. Which process involves improper disposal of waste products with hazardous chemicals that cause soil pollution?
   a. Construction and Development
   b. Farming
   c. Mining
   d. Waste Disposal

5. Soil is composed of_____.
   a. organic matter produced by organisms
   b. fragments of bedrock
   c. clay minerals formed by the chemical alteration of bedrock
   d. All of these

6. What is the first option in the waste management hierarchy?
   a. Disposal
   b. Treatment
   c. Recycling
   d. Reduction

7. It includes the adding of nutrients to the soil in the form of organic or artificial fertilizers to make their crops grow better.
   a. Construction and Development
   b. Farming
   c. Mining
   d. Waste Disposal

8. Which types of waste is produced by stripping land to obtain ores?
    a. Production of pest
    b. Recycling of water
    c. Desertification
    d. Eutrophication of bodies of water

9. This are a major input into agriculture to provide stable optimum growing conditions, meet plant nutrient demand and maintain a balanced nutrient.
    a. Lime and mineral fertilizers
    b. Growing plants
    c. Desertification
    d. Herbicides

10. These are a diverse group of chemicals used to control insects and other harmful organism to cultivate plants and animals.
    a. Growing Plants
    b. Veterinary Medicines
    c. Pesticides
    d. Tillage

11. It is generated operation in large amount of rocks and soils are removed to extract the valuable ores and the waste materials are left outside the site.
    a. Construction and Development
    b. Farming
    c. Mining
    d. Waste Disposal

12. It is a common form of waste derived from farming and poultry.
    a. Construction and Development
    b. Agricultural Waste
    c. Mining
    d. Waste Disposal

13. It is hazardous chemicals that get into the soil can harm plants when they take up the contamination through their roots.
    a. Construction and Development
    b. Agricultural Waste
    c. Mining
    d. Waste Disposal

14. The main effect on soil organisms and consequently on soil health is indirect.
    a. Irrigation and drainage
    b. Agricultural Waste
    c. Mining
    d. Waste Disposal

15. People need to dig up the soil which causes it to wash or blow away because its protective plant cover has been removed to make roads, houses, shopping malls, and other buildings.
    a. Construction and Development
    b. Farming
    c. Mining
    d. Waste Disposal

Lesson 1 Human Activities that Affect the Quality and Quantity of Soil

Philippines is an agricultural country with a land area of 30 million hectares, 47% of which is agricultural land (https://pinas.dlsu.edu.ph/2020). However, urban development activities contribute to conversion of agricultural land to other purposes in order to support the rapid growing population of 108.8 M (PSA, 2020). Urbanization also affects the quality and quantity of available soil for planting crops.

Why is soil important? How is it affected by human activities?

What's In

In our past lesson, you learned how various activities affect the quality and availability of water for human consumption. You also learned that it is not too late for us to promote and contribute to advocacies on conserving and protecting or water resources.

Like water, soil is an important abiotic factor that enables life on earth. Let us try to find out how human activities affect the quality and quantity of soil by doing our next activity.

List down all human activities that may affect the quality and quantity of soil. Round up the activity by filling in the gaps – identifying human activities that have not been mentioned. Use the guide list below.

Guide List: Write it on your answer sheet.

1. Agricultural Depletion
   _____
   _____
2. Mining
   _____
   _____
3. Deforestation
   _____
   _____

Notes to the Teacher

Monitor students' progress you may use notes and place a check mark once a lesson is done to give the learners an idea of their progress and create a sense of accomplishment as they progress through the lessons. Encourage and engage the learners as they do the tasks included in the module by allowing them to manage their own learning.

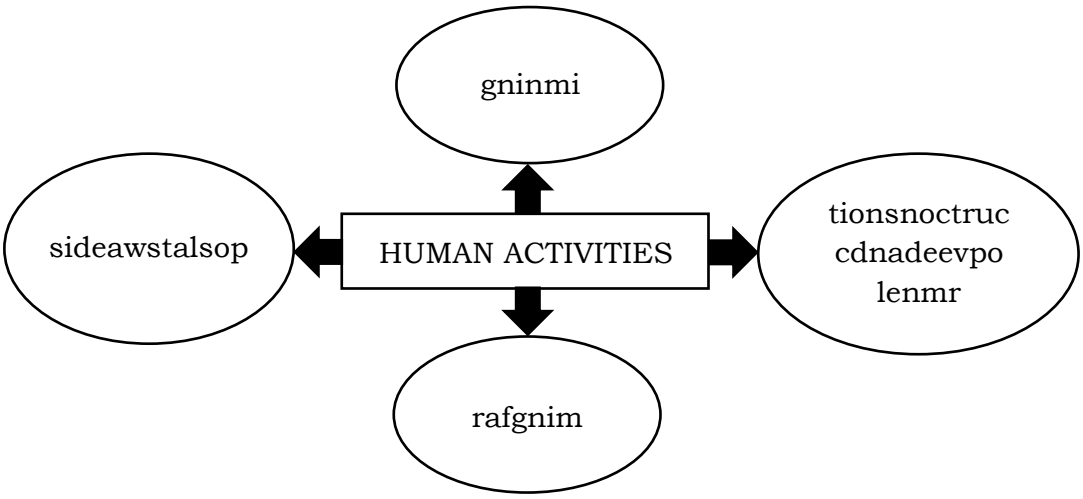
What's New

How do human activities affect soil? Let us try to find out what are the human activities that affect the quality and availability of soil by accomplishing the next activity.

Activity 1.1 Arrange and Explore

The amount of knowledge gained in biology is so large that it has many branches. The following table lists some of the major ones.

Directions: Using a graphic organizer rearrange the word/s to identify the human activities that affect the quality and quantity of the soil. Write it on your answer sheet.



Activity 1.2 Situate and Engage Yourself

Directions: Using the checklist below, put a check mark (✓) on the column whether the given activity affects the soil or not. Write it on your answer sheet.

Human Activity	Affect the soil	Does not Affect the soil
1. People often sweep the ground.		
2. People dump garbage on their backyard.		
3. People clear trees and other plants to plant crops.		
4. People cultivate the soil in the garden.		
5. People often add nutrients to soil in the form of organic or artificial fertilizers to make crops grow better.		
6. People used chemicals to control insects and other organisms to cultivated plants and animals.		
7. People used organic manures and other organic fertilizers.		
8. People develop urban activities such as construction of structure		
9. People used direct application of anti-microbials and nematicides as veterinary medicines to soil.		
10. People used lime and mineral fertilizers to provide stable optimum growing conditions of plant nutrients.		

What is It

Based from the previous activity, what are the human activities that affect the quality and quantity of soil? What is soil? Why is it considered a necessary resource?

Soil can be defined as the organic and inorganic materials on the surface of the earth that provide the medium for plant growth. Soil develops slowly over time and is composed of many different materials through the process of weathering.

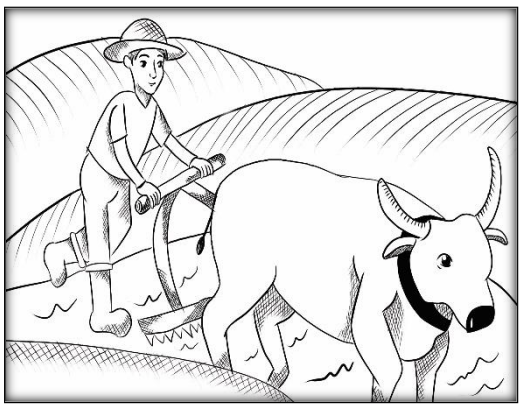
Soil is a necessary resource because it helps sustain life on Earth including humans, animals and plants. Aside from life sustaining roles, soil helps purify, or clean, water as it drains through the ground and into rivers, lakes, and oceans. In addition, decomposers in soil also help recycle nutrients by breaking down the remains of plants and animals, releasing nutrients that living plants use to grow. Soil also provides a home for a variety of living things, from tiny one-celled organisms to small mammals.

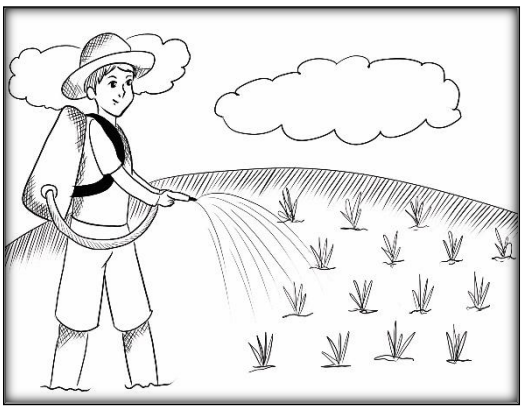
Despite the mentioned importance in sustaining life on earth, there are serious issues concerning the soil's good qualities and availability. In fact, a review of soil degradation in the Philippines (Asio, V. 2009) revealed that soil degradation, the physical, chemical and biological decline in soil quality is a major agricultural and environmental problem in the Philippines due to erosion. Loss of nutrients and organic nutrients, salinization, acidification, pollution, compaction and subsidence are other soil degradation processes cause by erosion.

Aside from natural causes of soil erosion, there are some other human activities that contribute to the loss of good quality soil. We are going to limit our discussion on the three major human activities that cause soil degradation.

FARMING

Farming is one of the traditional sources of income in our country done by planting crops or raising livestock. Listed below are some positive and negative effects of farming.





Positive Effect of Farming

Application of herbicide, a pesticide used to kill unwanted plants used in farming has a positive benefit on soil health. Lime and mineral fertilizers added to soil provide stable optimum growing conditions for plants. Organic manures and other organic fertilizers provide a source of food/energy for many soil organisms thus making the soil healthy and good for planting. Even the growing plants help in stabilizing the soil structure.

Another important effect of farming on soil health is the provision of water through irrigation and drainage. Irrigation/drainage water stabilizes the soil moisture thus making it healthier and more suitable for planting.

Negative Effect of Farming

Tillage in farming is the preparation of soil for planting and the cultivation of soil after planting. It can cause direct damage to soil microorganisms and potentially expose those to new predators. Though pesticides are found beneficial to soil, it was found to have long term harmful effects on the overall activity or population of soil organisms. Some applied veterinary medicines are found to affect the normal degradation rate of some insects and animals, thus altering the soil's health.

Construction of Structure

Construction activities, such as grading and filling, reduce soil quality on construction sites. Land use conversion usually done to support urbanization activities can cause rapid soil degradation and sedimentation. Soil nutrients are washed away making it unsuitable for farming.

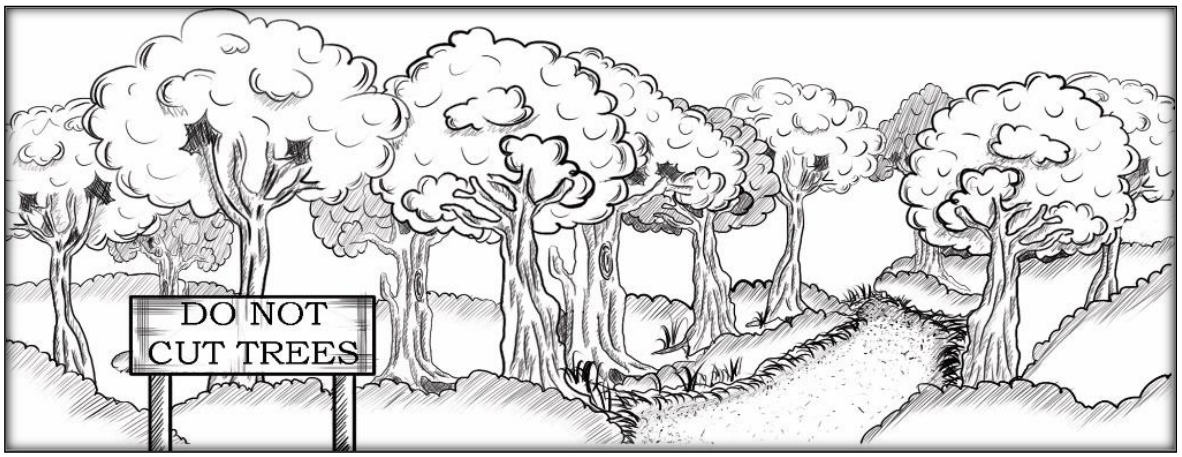
Waste Disposals

Soil quality is adversely affected by improper waste disposal. Soil pollution happens when hazardous chemicals from human and industrial sewage are carelessly disposed of, altering soil's natural health and quality.

At this point, you have learned about the effects of human activities on quality of soil. It is therefore imperative that we protect and preserve soil. There are methods of soil conservation and protection that can be observed in order to protect and conserve our soil at the same time. The goal here is to reduce erosion and to ensure the soil's fertility.

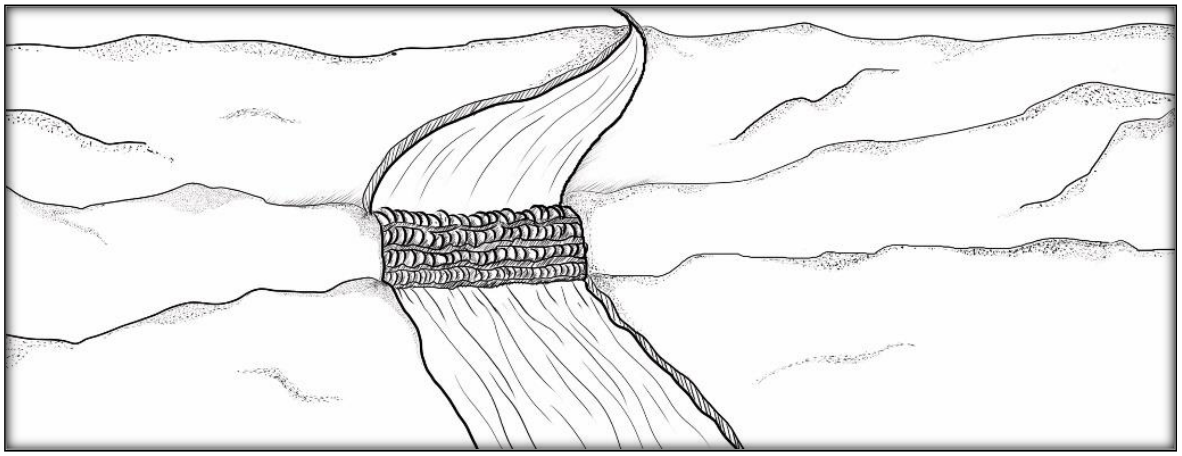
Let's take a look these remarkable ways to protect and conserve the soil.

Forest Protection



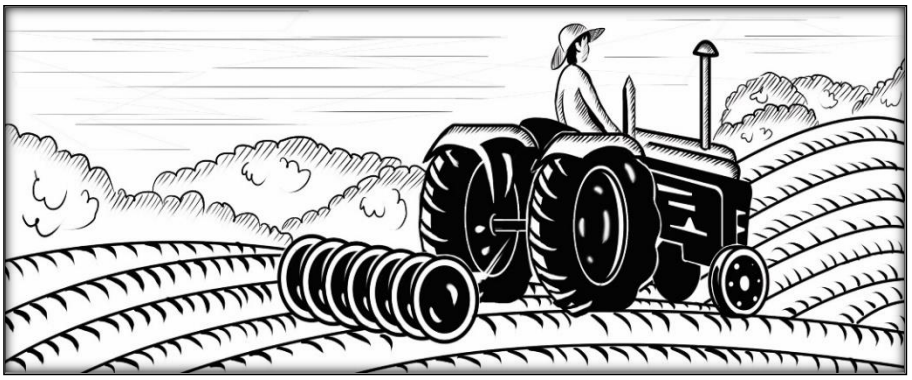
Trees as well as other plants and vegetation in the forest are important in the creation of new soil as leaves and other vegetation rot and decompose. Hence, soil qualities are ensured when forest are protected and conserved.

Buffer Strips



Buffers are strips or corridors of permanent vegetation used to reduce water and wind erosion. They provide protection where stream banks exist. They can be created with grass, trees and shrubs.

No-Till Farming

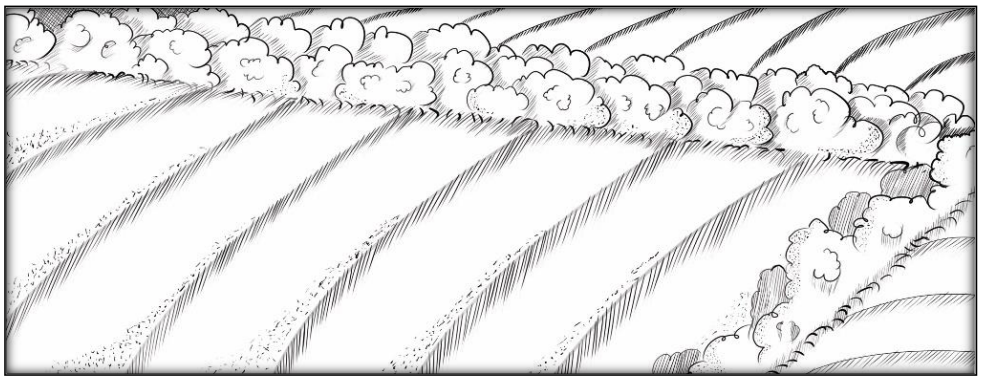


No-till farming is an approach that allows crops to remain in place for a season. This keeps the soil from being left bare and unprotected.

Fewer Concrete Surfaces

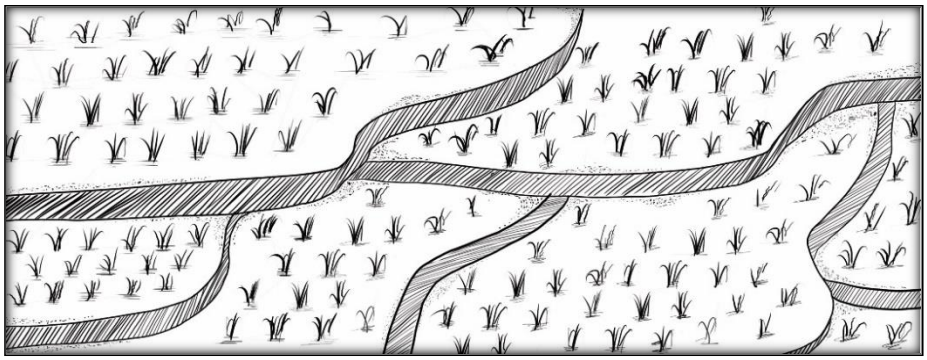
Soil requires an adequate amount of water in order to function properly. Lots of concrete surfaces, especially in residential areas make it difficult for water to get to the soil. Using paving stones for patios and gardens work to protect the soil. They are also a tool to prevent soil erosion in specific areas.

Plant Windbreak Areas



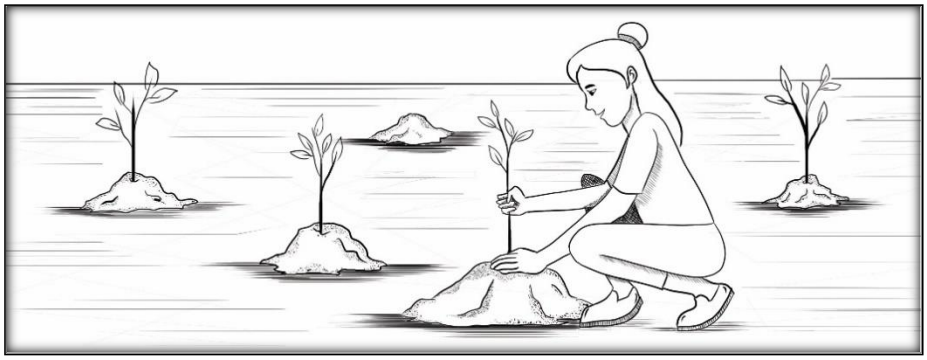
Windbreaks are composed of shrubs, plants and trees. They work in combination and serve a conservation purpose. These will work together to slow the force of wind over ground areas. This is a method that can also work to prevent erosion of the soil.

Terrace Planting



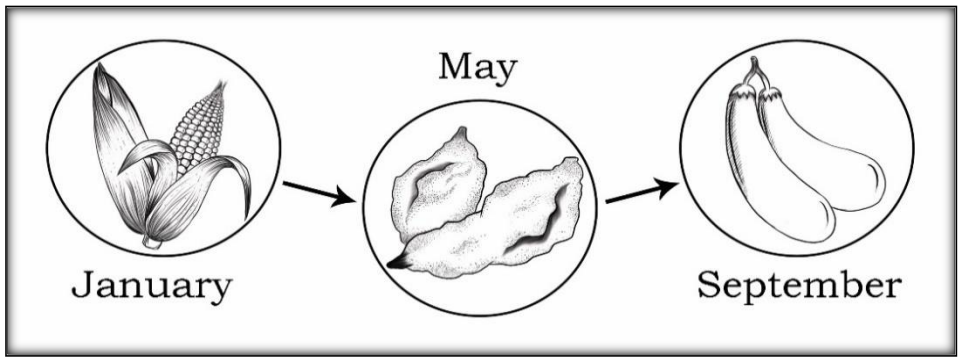
This type of planting is done by maximizing the topography of the land. It benefits from the way the rain water flows naturally. This is a way to protect the soil from erosion. It is also a proven method to encourage growth from moist soil areas.

Plant Trees



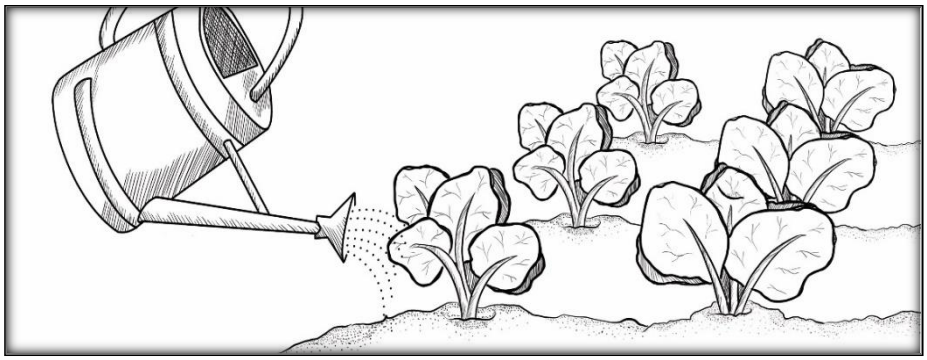
Simply planting trees is a good conservation method. As the tree grows, its roots become even more secure in the soil. This soil is protected in numerous ways because of the trees' existence. Erosion is prevented from this planting process.

Crop Rotation



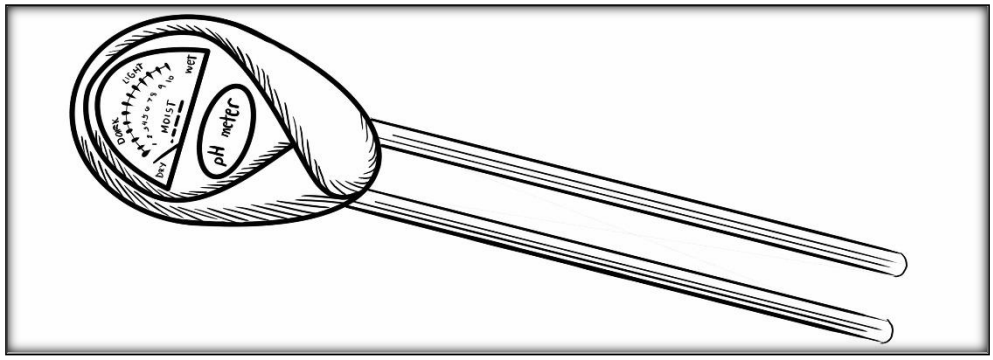
Crop rotation is a process that works to conserve soil. It is accomplished by planting and growing a serious of different crops in the same soil. This process prevents overgrowth of pathogens and a lack of fertility in the soil, overall.

Water the Soil



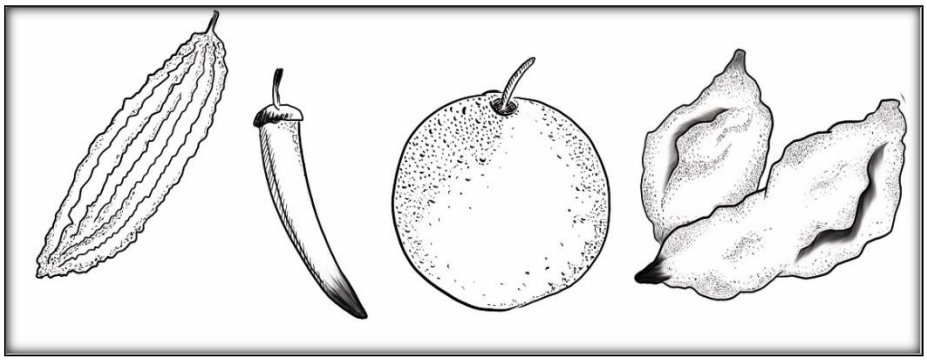
This is a simple process that provides a lot of benefits to the soil. Watering your soil along with plants and vegetables is important. This helps to not only nourish the soil but to protect it. Moist soil is not in danger of erosion due to wind activity.

Maintain pH



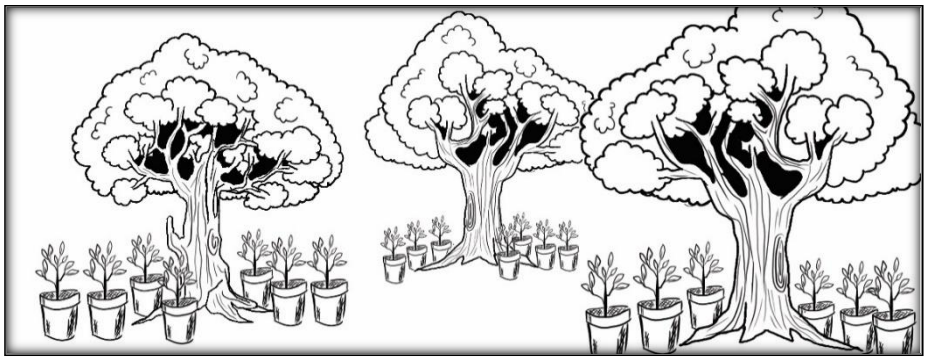
Soil pH or soil reaction is an indication of the acidity or alkalinity of soil and is measured in pH units. A pH range of approximately 6 to 7 promotes the readiest availability of plant nutrients. The pH levels in the soil can be affected by a number of pollutants and acid.

Indigenous Crops



Indigenous crops are native crop options that enhance the soil. Planting these is a way to ensure conservation efforts. They should be planted even when diverse crops are being planted, as well.

Afforestation

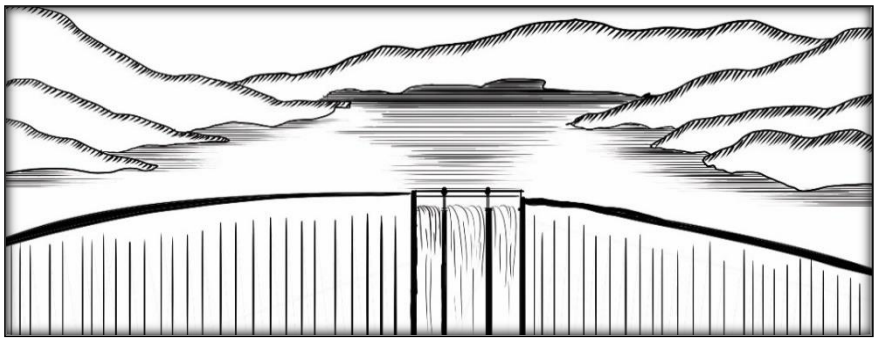


Planting trees is a method of conserving the soil. Afforestation is another of tree planting method wherein the areas under trees are protected. This is usually done by planting foliage in forest undergrowth areas. It encourages healthy soil and water absorption.

Monitor Grazing

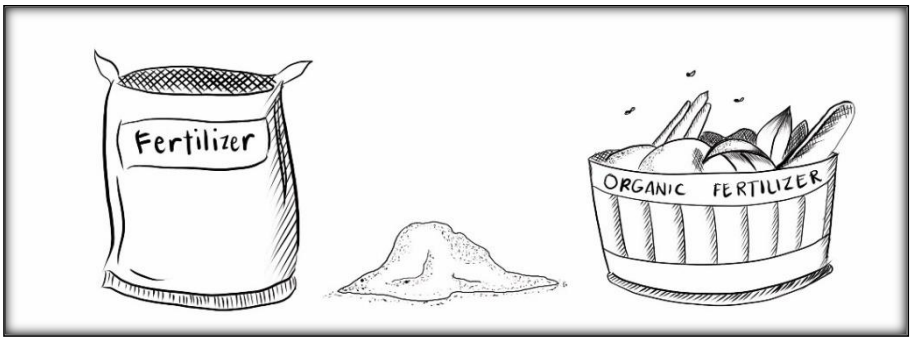
Animal grazing plays a critical role in conserving soil. Monitoring the areas where cows and other animals graze is important. This helps to prevent depletion of the soil. It also addresses the issue of hoof damage, which can occur to the soil.

Dams



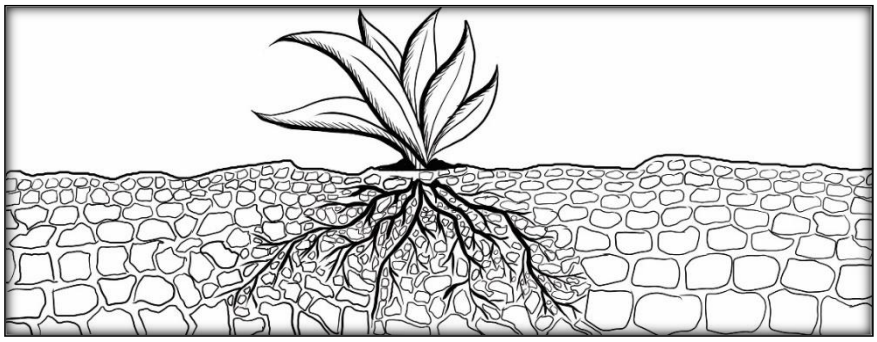
Dams are important resources when it comes to soil conservation. These structures work to prevent soil erosion. This is especially important in areas where rivers exist. Flooding of rivers has been the cause for many instances of soil erosion. Dams offer additional protection.

Fertilizers



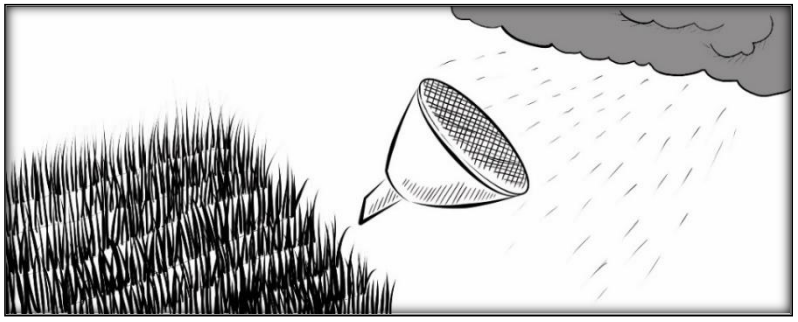
Not all fertilizer products are effective for conservation efforts. The composition of these fertilizers can be the problem. The use of organic fertilizer improves the quality of soil because it is composed of readily biodegradable materials make better nutrient sources.

No Soil Compacting



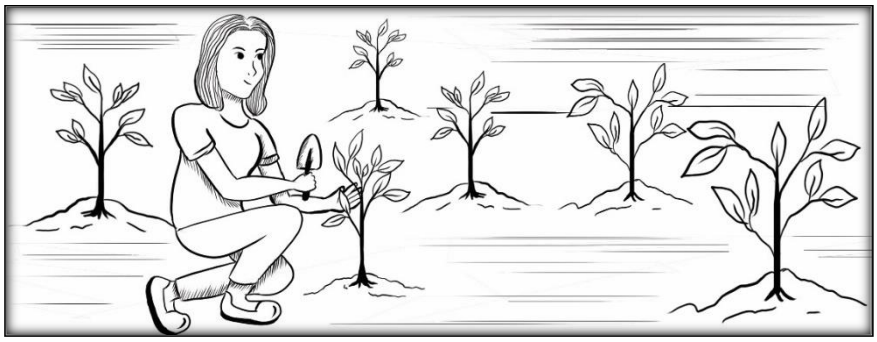
A simple conservation method that some gardeners and farmers apply is not to compact the soil. This is a protection method that is helpful. You can do this by creating dedicated paths in your garden. This helps you to not walk on wet soil causing it to be compacted.

Control Storm Water



Instead of allowing water to puddle in yards or gardens, it is important to control it. Storm water can easily cause flooding or problems in these areas. Setting up large container to hold excess water in problem locations is helpful. This water can be re-used for watering gardens and yards.

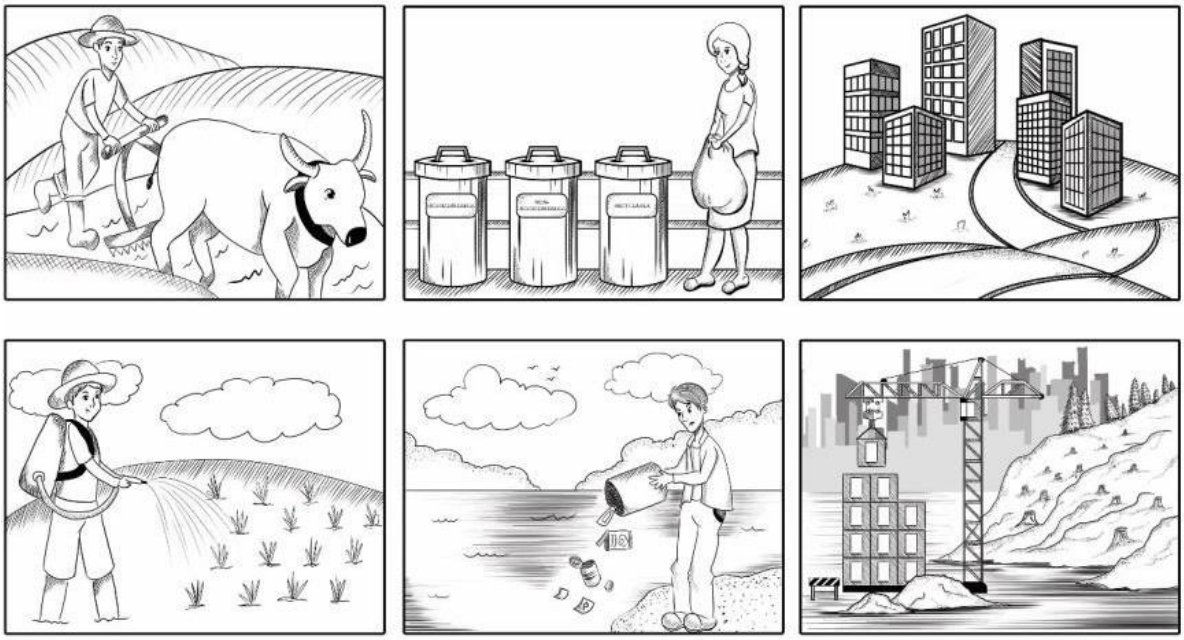
Monitor Growth



When crops or plants grow normally, they have a healthy appearance. It there is a problem with the growth, often the soil is the issue. Checking the salient composition and fertility is important. This is done through regular monitoring of the soil and overall plant growth.

What's More

Activity: Illustration Case Analysis



Directions: Gather the necessary information on how do human activities affect soil in different situations? Let us try to find out what are the human activities that affect the quality and availability of soil by analyzing the different illustration given.

Your analysis should include these general sections, introduction, background information, evaluation of the case, propose solution and recommendation.

These may differ on your directions or your case study:

I. Introduction

- Identify the key problems about the issue.
- State a thesis statement that has the outcome about the related analysis that pertains to different situations that can affect soil.

II. Background Information

- Background information, relevant facts and present most important issues about soil conditions in different situations that can be pointed out through your analysis.
- Does the situation such as farming, construction of structure and waste disposal affect the soil quality and availability? Summarize your outcome in 1-2 sentences.

III. Evaluation of the Case

- Imagine what happens when soil quality has been affected caused by different situations such as farming, construction of structure, and waste disposal.
- Find any person connected to the issue and know their experience and daily cycle can be 1 person per situation.

IV. Propose Solution

- State your proposal, a reliable, significant and workable solution about the issue.
- Explain your chosen solution and why you can say your proposed solution can work.
- Give some phases or directions when applying your proposed solution.

V. Recommendation

- Explain your own experience or strategy when doing the analysis and add some accomplishing acts that you have known that is applicable to some related issues.
- If your analysis solution is effective, what should be done and who should do it?

What I Have Learned

Activity Challenge? What do you think?

Directions: Answer the following questions: Write your answer on a separate sheet of paper.

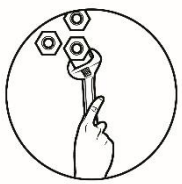
1. Why is soil a necessary resource?
   _____
   _____
   _____

2. How do land-use practices in farming, construction and development, and waste disposal affect soil?
   Farming
   _____
   _____

   Construction and development
   _____
   _____

   Waste disposal
   _____
   _____

3. Describe at least five methods of soil conservation.
   _____
   _____
   _____



What I Can Do

Activity: My Soil Conservation Advocacy Campaign

Getting involved in advocacy materials on how to conserve and protect the soil it can be an effective area of advocacy work for local communities who may be affected by problems such as the farming, construction development and waste disposal.

Once you have identified the issues on which to advocate and the causes of the problem, consider the Steps in developing a strong advocacy material on how to conserve and protect the soil. Write it on a separate sheet of paper.

I. Problem Identification

II. Gathering Information

III. Planning

IV. Action

V. Evaluation

I. Problem identification: What is the root cause of the situation? Could it be changed through advocacy work?

II. Gather Information about the causes and effects of the problem and identify possible solutions.

III. Plan and make an action including the goal, objectives, outputs, and means of measuring success, and methods.

IV. Action that provides ideas about the different ways to take action.

V. Evaluation Monitor progress. What was worked well? What was not worked well? What could be done differently in future?

Assessment

Directions A: Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Based on the selection, which of the following is the organic and inorganic materials on the surface of the earth that provides the medium for plant growth?
   a. food
   b. animals
   c. soil
   d. water

2. What are the main activities that affect soil resources?
   a. construction and development
   b. farming
   c. mining
   d. all of the above

3. Which of the following ways to protect and prevent depletion of the soil?
    a. Fertilization
    b. Control Storm Water
    c. Afforestation
    d. Monitor Growth

4. What will happen if soil is exposed to any human activity?
    a. Soil will become fertile.
    b. Soil amount will decrease.
    c. Soil amount will increase.
    d. Soil loss may occur.

5. This are remarkable ways to protect and conserve the soil?
    a. Indigenous crop
    b. Crop rotation
    c. Maintaining PH
    d. All of the above

Directions B: Write True if the statement is correct and False if it is not. Write it on your answer sheet.

1. Farming is one of the traditional sources of income in our country done by planting crops or raising livestock.

2. Land use conversion usually done to support urbanization activities can cause rapid soil degradation and sedimentation.

3. Clearing trees and other plants and plowing up the soil to plant crops increases the quantity and quality of the soil.

4. Throwing waste products which are full of chemicals which are not originally found in nature can lead to soil pollution.

5. People produce a certain amount of personal waste products by way of urine and feces.

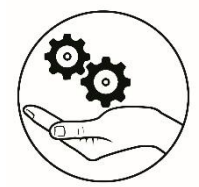
6. Checking the salient composition and fertility of the soil is important.

7. Every deposit of fresh garbage is not covered with a layer of soil to prevent it from blowing around.

8. Solid waste is also produced by several industrial processes.

9. Waste comes from household, commercial establishment, institution and some industrial source is part of waste disposal.

10. Simply planting trees is a good conservation method.



Additional Activities

Reflection

Compare and Contrast

How might the problem of soil loss on flat land be different from that on sloping land?

_____
_____
_____
_____
_____

Apply

If you were building a new home in an undeveloped area, what steps would you take to reduce the impact of construction on the soil?

_____
_____
_____
_____
_____

You have advised an inexperienced farmer to practice strip-cropping, but the farmer wants to plant all the land in wheat in order to grow as much as possible. What argument would you use to convince the farmer?

_____
_____
_____
_____
_____

Answer Key

What I Know

1. d
2. c
3. b
4. d
5. d
6. c
7. b
8. d
9. a
10. c
11. c
12. b
13. d
14. a
15. a

What's More

Activity 1.1

✓ Construction and Development
✓ Farming
✓ Mining
✓ Waste Disposal

Activity 1.2

1. Does not affect the soil
2. Affect the soil
3. Affect the soil
4. Does not affect the soil
5. Affect the soil
6. Affect the soil
7. Does not affect the soil
8. Affect the soil
9. Affect the soil
10. Does not affect the soil

Assessment

Multiple Choice

1. c
2. d
3. a
4. b
5. d

True or False

1. True
2. True
3. False
4. True
5. True
6. True
7. False
8. True
9. True
10. True

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