

Lesson Plan 22: Excreta Treatment, Use and Disposal**60 minutes total****Lesson Description**

This lesson is an introduction to treatment, use and disposal of excreta for the purpose of designing an entire sanitation system. Participants learn about ecosanitation and using treated excreta as a valuable product in agriculture. Participants discuss ways to encourage the social acceptance of using human excreta. They also learn different ways to safely dispose of excreta.

Learning Outcomes

At the end of this session participants will be able to:

1. Discuss the value of using treated excreta in agriculture.
2. Discuss the importance of treating excreta before using it.
3. Identify latrine technologies that can treat excreta.
4. Discuss the social acceptance of using human excreta.
5. Identify how to safely dispose of excreta not intended for use.

Materials

- Flipchart paper
- Markers
- Tape
- Apple (or another fruit or vegetable that can be cut into pieces)
- Knife
- Human Nutrient Cycle posters (1 set per group)
- Sanitation System Design Workbook

Optional:

- PowerPoint: Treatment, Use and Disposal
- Computer and projector

Preparation

- Review topic in Technical Brief: Sanitation System – Treating Excreta and Technical Brief: Sanitation System – Using and Disposing Excreta
- Write the heading “*Nutrients for Plant Growth*” on flipchart paper
- Write the heading “*Chemical Fertilizers*” on flipchart paper with the subheadings “*Advantages*” and “*Disadvantages*” in two columns
- Write the heading “*Excreta as Fertilizer*” on flipchart paper with the subheadings “*Advantages*” and “*Disadvantages*” in two columns
- Write the heading “*Excreta Disposal*” on flipchart paper

- Print the Human Nutrient Cycle posters and arrows, cut the arrows into four pieces of paper (1 set per group)
- Optional: Write learning outcomes on flipchart paper
- If using PowerPoint: Treatment, Use and Disposal
 - Review the PowerPoint
 - Print the speaker's notes
 - Cue the presentation on your computer so it is ready to go
 - Check that the projector is working

Introduction**5 minutes**

1. Show the participants an apple and explain that it represents the earth. Cut the apple into quarters. Set aside three of the pieces.
2. Ask the participants "What do these 3 pieces represent?"
 - *Oceans*
3. Ask the participants "What does the last piece represent?"
 - *Land*
4. Cut the land in half. Set aside one of the pieces. Explain that this discarded piece represents the land where people cannot live easily: polar areas, swamps, deserts and mountains. Explain that the 1/8 of the apple that is left is the area where people live, but can't necessarily grow food needed for life.
5. Cut the remaining piece of apple into 4 more pieces. Set aside 3 pieces. Explain that these pieces represent the areas where land is urbanized or too rocky, too cold or too steep to produce food.
6. Show the participants the remaining 1/32 of the apple. Explain that this is all that is left to grow food.
7. Carefully peel the 1/32 slice of the earth. Explain that the tiny bit of peeling represents the part of the earth in which we can grow food. This is topsoil, which is the top 0.3 metres (1 foot) of soil.
8. Ask the participants "What are some of the topsoil issues in the world?"
 - *Topsoil is disappearing due to erosion, which reduces the area we have to grow crops.*
 - *Topsoil is losing its quality due to mainstream farming techniques including the use of commercial fertilizers, topsoil quickly loses nutrients it needs for crops to grow.*
9. Ask the participants "How long do you think it takes topsoil to form?"
 - *Up to 500 years!*



10. Ask the participants “What can we do to keep our topsoil healthy?”

- *Reduce erosion by planting trees or crops*
- *Add nutrients to the soil (fertilizer)*
- *Add soil amendments (organic matter or compost) to help keep the soil structure and retain water*

11. Present the lesson description or learning outcomes.

Ecosanitation

20 minutes



1. Ask the participants “What is ecological sanitation?” This is review from the Lesson Plan: What is Sanitation?

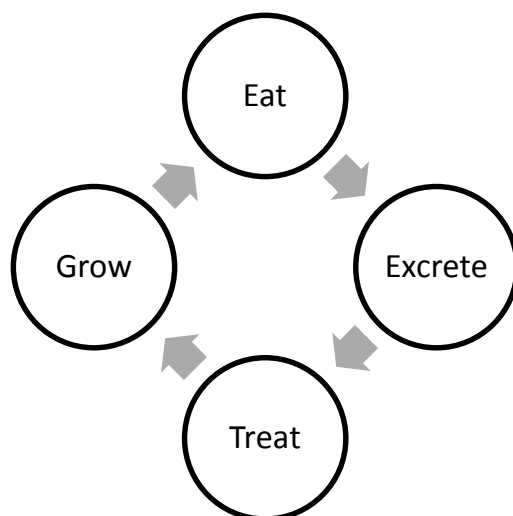
- *Also known as ecosanitation, ecosan or productive sanitation*
- *An approach that aims to safely recycle nutrients, water and/or energy from excreta*

2. Explain that this lesson will focus on using human excreta for agriculture. However, excreta can be used beneficially in other ways, such as converting it into a biofuel for power generation.



3. Divide participants into groups of 3 or 4 people. Hand out the Human Nutrient Cycle posters and arrows to each group. Ask them to fit the posters and arrows together into a diagram. Give them 5 minutes to complete the activity.

4. Put up each poster for each step in the human nutrient cycle. Ask the participants for suggestions on where to place the arrows.






5. Ask the participants “What is an appropriate title for this diagram?” Share some responses as a large group. Explain that this diagram is often called the “human nutrient cycle” and shows how we can use excreta for sustainable agriculture.



6. Ask the participants “What are the three main nutrients needed to grow plants?”

- *Nitrogen, phosphorous and potassium*

7. Write N, P, K on the “*Nutrients for Plant Growth*” flipchart. Explain that these nutrients are also the three main ingredients in chemical fertilizer (also known as inorganic or commercial fertilizer). Discuss how after World War II, there was a big need for increased agricultural production and demand to produce large quantities of fertilizers.
-  8. Ask the participants “What are some advantages of using chemical fertilizer?” Record responses on the “*Chemical Fertilizer*” flipchart.
- *High plant growth rates and yield*
 - *Have smaller bulk and are easy to store, transport and apply*
 - *Chemical fertilizers are nutrient specific. Can choose the content and amount of nutrients to meet the needs of your plants. For example, super phosphate is used in case the soil is deficient in phosphorus.*
 - *Chemical fertilizers are soluble in water and are easily absorbed by plants*
-  9. Ask the participants “What are some disadvantages of using commercial fertilizer?” Record answers on “*Chemical Fertilizers*” flipchart.
- *Resource intensive: It takes a lot of energy to manufacture and transport fertilizer.*
 - *Resource scarce: Phosphorous must be mined and processed. There is a debate whether or not the world is actually running out of phosphorous.*
 - *Increasing cost: As soil depletes you need to purchase more and more. As energy becomes more expensive and phosphorous becomes scarcer, it is believed that the cost of fertilizer will rise.*
 - *Pollution: Nutrient runoff from excessive or incorrect use of fertilizers can contaminate water sources.*
 - *Poor soil quality: Excessive use of fertilizers over a long period may affect the alkalinity or acidity of the soil. It can also reduce the ability of soil to hold water and other nutrients required by plants.*
-  10. Explain that urine and feces also have nitrogen, phosphorous and potassium. Human excreta can be used instead of fertilizer if it is safely treated and used properly. Ask the participants “What are some advantages of using excreta as a fertilizer?” Record responses on the “*Excreta as Fertilizer*” flipchart.
- *Can improve the physical qualities of soil (such as its ability to hold water, allows more air into soil)*
 - *Can help to improve food production and reduce the need for chemical fertilizers. This is especially important for subsistence farmers who otherwise might not be able to afford chemical fertilizers*
 - *Supplies nutrients for a longer amount of time than chemical fertilizers*
 - *Reducing the dumping of harmful untreated excreta*
 - *Conserving and protecting water sources*
 - *Reducing pollution from chemical fertilizers*
 - *Conserving soil and improving its quality*



11. Ask the participants “What are some disadvantages of using excreta as fertilizer?”

- *Need to treat the excreta before it is safe to use in agriculture, do not want to transmit pathogens from using untreated excreta*
- *Bulky which makes it more difficult and expensive to store, transport and apply*
- *Nutrient composition is variable, makes standardization of fertilization procedures difficult*
- *Nutrients are slow to release and not immediately available to plants*
- *Heavy use can accumulate salt in the soil in the which can damage plants*
- *May not be enough supply for the demand, may need to supplement with chemical fertilizers*
- *May not be socially acceptable*

12. Optional depending on time: Use PowerPoint: Treatment, Use and Disposal to show examples of beneficially using human excreta.

Treatment Options

15 minutes



1. Ask the participants “Why is it so important to treat excreta before using it in agriculture?”



- *To prevent the transmission of pathogens*
- *The greatest health risk is usually associated with soil-transmitted helminths from feces: roundworms (*Ascaris lumbricoides*) and hookworms (*Necator americanus* and *Ancylostoma duodenale*)*
- *Helminth infections are transmitted in several ways:*
 - *Eggs attached to vegetables are ingested when the vegetables are not carefully cooked, washed or peeled*
 - *Eggs are ingested from contaminated water sources*
 - *Eggs are ingested by workers who handle the excreta and children who play in soil, and then put their hands in their mouths without washing them*
 - *Eggs hatch in the soil, releasing larvae that mature into a form that can penetrate the skin. People become infected with hookworm mainly by walking barefoot on the contaminated soil.*
- *Urine from a healthy person does not generally contain pathogens. Pathogens that may be transmitted through urine are rarely sufficient to cause a significant public health problem. *Schistosoma haematobium* is an exception in tropical areas, although it has a low risk of transmission.*




2. Explain that some latrine technologies provide primary treatment (sometimes called pre-treatment, partial treatment or primary processing) while the excreta is collected and stored in the pit or chamber. Primary treatment can reduce the volume and weight of excreta to help lessen the transportation and secondary treatment requirements, as well as reduce the pathogen levels to make the excreta safer to handle.

3. Ask the participants “Which latrine technologies provide primary treatment of the excreta?”
 - *Composting latrines, dehydrating latrines, Arborloo latrines, twin pit latrines, biogas reactors*
4. Explain that the level of primary treatment varies depending on the latrine technology design and its operation. It should not be assumed that excreta removed from these latrines is fully treated or safe to handle. It is important to ensure that the excreta receives any necessary further treatment (also called secondary treatment) before it is used or disposed. The World Health Organization provides guidelines on the safe use of treated excreta.
5. Remind participants that urine can be source-separated using urinals or urine diverting toilets. Simply storing urine for 1 to 6 months is enough treatment to reduce any pathogens. When single households use urine as a fertilizer, there is no need for storage prior to using it.
6. Explain that the proper treatment, handling and application of excreta are not discussed in detail in this workshop. CAWST provides a workshop called Fecal Sludge Management. The Technical Briefs and Fact Sheets can also be found online at: resources.cawst.org.
7. Explain that often the biggest barrier to using urine or feces in agriculture is social acceptance. Ask the participants “What are the local attitudes to handling and using excreta in your community?”
 - *Depends on the local culture and religious beliefs*
 - *Excreta can have a strong smell and some people may find it offensive to work with or be near*
 - *Using excreta may be less accepted in urban or peri-urban areas where household gardens are closer to houses than in rural areas where houses and crop lands are separated*
8. Divide the participants into groups of 3 or 4 people. Ask them to brainstorm ways they could encourage social acceptance of using human excreta.
9. After 5 minutes, ask each group to share one idea. Continue until all groups have shared their ideas.


Disposal Options

10 minutes

1. Discuss how excreta that is not used must finally be disposed in a safe way. When there is no demand or acceptance for the beneficial use of excreta, contained and controlled disposal is far preferable to uncontrolled dumping.
2. Ask the participants “What are some ways to dispose excreta?” Record answers on the “*Excreta Disposal*” flipchart.
 - *Buried in monofills (landfills meant only for excreta)*
 - *Placed into permanent piles (surface disposal)*
 - *Infiltrate urine into the ground using a soak pit or infiltration trench.*

3. Ask the participants “What can you do if you want to bury the excreta, but you are concerned that it will contaminate the groundwater?”
 - *You can treat it by composting it in piles and then bury it.*
-  4. Ask the participants “Why is planning what you will do for treatment, use or disposal important an important part of the design process?”
 - *If this part of the project is planned, then people will know what to do when their latrine is full.*
 - *The systems and costs can be put in place early in the project so that nobody is surprised later.*
 - *Often projects are implemented for only a few years and end before people’s latrines are full. The latrine owners may not be organized or knowledgeable about what to do when the latrines are full.*

Review**10 minutes**

-  1. Ask the participants to turn to the Excreta Treatment, Use and Disposal section in their Sanitation System Design Workbook. Tell them they will have 10 minutes to complete the worksheet.
2. Remind the participants to make sure that their choice matches the other sanitation technologies they have previously selected. Ensuring that the entire system works together as you gather new information is part of good design. Their design might go through many iterations.
3. Encourage participants to discuss any questions or challenges with each other or with you.

Reflections on Lesson

Human Nutrient Cycle Posters and Arrows



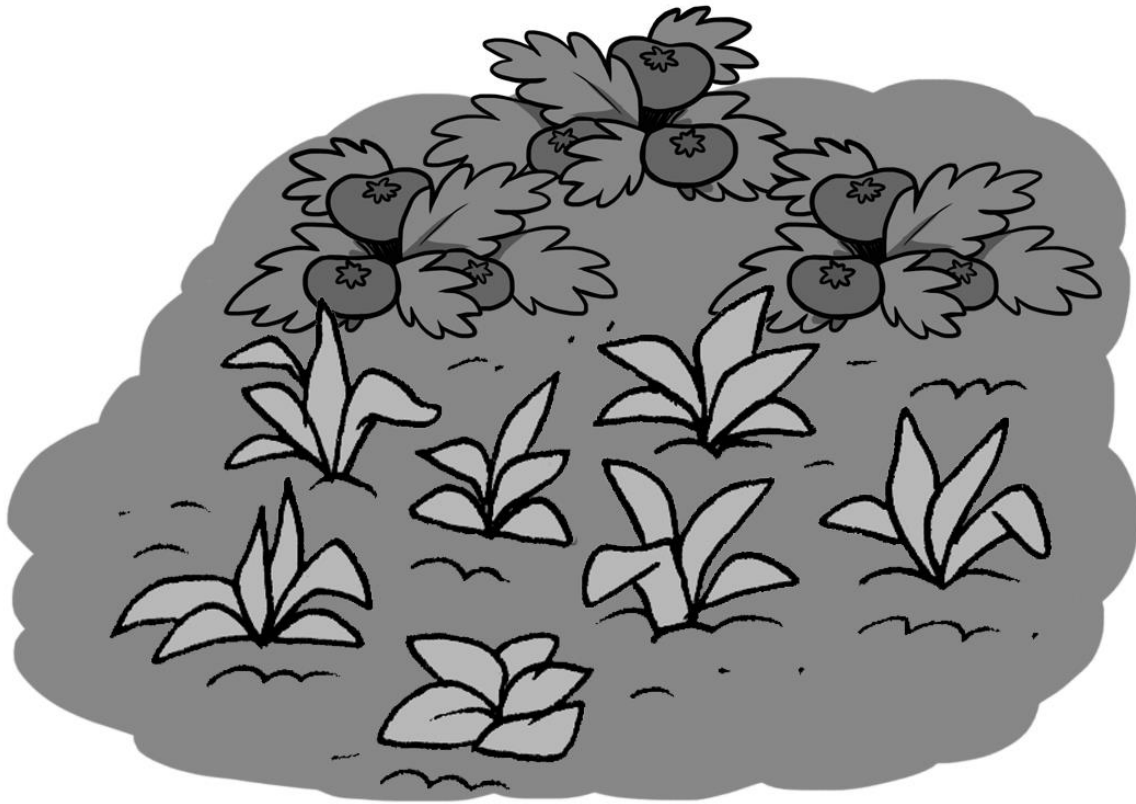
EAT



EXCRETE



TREAT



GROW

