

**Lesson Plan: Faecal Sludge Use (Resource Recovery)****60 minutes****Lesson Description**

This lesson introduces the value of using faecal sludge (faecal sludge) treatment products. Participants will identify different treatment products and their uses. Participants will also discuss other factors that should be considered when deciding on a use, like health and environmental protection, social acceptance, and market demand.

**Learning Outcomes**

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

1. Discuss the value of using faecal sludge.
2. List at least five different faecal sludge treatment products.
3. Identify different ways to use faecal sludge treatment products.
4. Discuss health, environmental and social considerations related to using faecal sludge.

**Materials**

- Flip chart paper
- Markers
- Tape
- Introduction items: four items made from plastic (bucket, ball, stapler, pen)
- Activity: Treatment Products and Uses (1 set for every 2 or 3 people)
- Case Studies (1 per participant)
- Faecal Sludge Management Exercise Book (1 per participant)

**Preparation**

- Review Chapter 10: Enduse of Treatment Products in the book *Faecal Sludge Management: Systems Approach for Implementation and Operation*
- Print and cut out the Activity: Treatment Products and Uses (1 set for every 2 or 3 people)
- Place the introduction activity items on display on a table, in front of participants.
- Optional: Write the learning outcomes on flip chart paper

**Introduction****5 minutes**

1. Ask participants to look at the items on the table and share (1) what is each item made from and (2) what is each item's use.

2. Explain that these are all products that are made from plastic, come from different factories and have very different uses. Similarly, in this lesson we will learn about the variety of products that come from faecal sludge treatment technologies and their different uses.
3. Present the lesson description or learning outcomes.

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**Faecal Sludge Use**
**15 minutes**

1. Divide participants into groups of 2 or 3 people (or use the case study groups).
2. Explain that faecal sludge is transformed by treatment technologies into different products. These products can be sold and used in different ways. Using a product rather than creating waste is called “resource recovery”.



3. Hand out the Activity: Treatment Products and Uses. Explain that there are duplicates of some treatment products because some ‘uses’ have multiple ‘products’. Also, each treatment product has an example of treatment technology that produces that product.
4. Explain that participants may not know all the treatment products. These will be further discussed in the treatment technologies lesson plan.

Ask participants, “Do you have any questions about the products?” For now, all participants need to know is that:

- *Dewatered faecal sludge is still quite wet (mainly water).*
- *Dry faecal sludge has less moisture.*
- *Use the analogy of a wet towel. Wringing the towel is like dewatering. Then putting the towel out in the sun is like drying.*



5. Hand out the faecal sludge use options. Tell the participants to match treatment products to possible uses. They have 10 minutes to complete the activity.
6. Review solutions as a large group.

Faecal Sludge Use	Treatment Product
Irrigation	Effluent
Energy	Biogas, dry faecal sludge (solid fuel)
Agriculture	Dewatered or dry faecal sludge (low pathogens)
Livestock	Insect larvae, plants
Construction	Dry faecal sludge (building materials)
Forestry	Dewatered or dry faecal sludge
Aquaculture	Fish, aquatic plants, insect larvae

7. Review key points and clarify questions with the group:
  - *Energy (solid fuel), Construction: Can use dry faecal sludge with pathogens.*

- *Forestry: Can use dewatered or dry faecal sludge with higher pathogens than used in agriculture.*
- *Aquaculture:*
  - *WHO has developed guidelines to “maximize public health protection and the beneficial use of important resources. (The) purpose of the (guidelines are) to ensure that waste-fed aquacultural activities are made as safe as possible so that the nutritional and household food security benefits can be shared widely in affected communities. Thus, the adverse health impacts of waste-fed aquaculture should be carefully weighed against the benefits to health and the environment associated with these practices.” Nutrition from aquaculture has the ability to improve nutrition, especially for children.*
  - *This practice is primarily done in South East Asia, where both fish and aquatic plants from fish ponds or floating plant ponds are consumed directly by humans or used as animal feed.*
  - *Aquatic plants include watercress, water chestnut, water spinach, water mimosa and duckweed.*
  - *Black soldier fly larvae are being tested as fish food, for example, with catfish and tilapia.*
  - *Using aquatic plants as animal feed is likely a safer use than direct consumption by humans.*
  - *This is more accurately a “disposal product” rather than a “treatment product”*

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## Value of Faecal Sludge in Resource Recovery

15 minutes



1. Explain that during treatment, faecal sludge is turned into products that can be a valuable asset with economic and environmental benefits. Historically, the most common use for faecal sludge has been agriculture. But as the introduction activity showed, there are several other use options for faecal sludge. Research is being done on new ways to beneficially use faecal sludge, such as a biofuel or using black soldier flies to make animal protein.
2. Explain that the case study groups will work together to identify faecal sludge treatment products and uses for their case study. They will brainstorm what is being used now that can be replaced with faecal sludge products. For example, farmers are currently buying plants to feed their animals. They could instead use plants grown from a faecal sludge drying bed. They have 5 minutes to brainstorm their ideas and record them in the first question of Section 3: Faecal Sludge Use (Resource Recovery) in their Exercise Book. Encourage the groups to be creative in recording their ideas. They can use illustrations, diagrams, or words.

Note: Participants should list the different possible uses, not rate them. Groups should hopefully eliminate a few options.

3. After 5 minutes, ask each group to share 1 idea for faecal sludge use from faecal sludge products to the large group. Briefly discuss each idea after it is presented. Continue going through the groups until there are no more ideas.
4. Discuss how selling faecal sludge is unlikely to fully cover all of the treatment costs, but it could be a significant portion of the budget and help offset the costs. For example, they could generate maybe 5–15% of the total annual faecal sludge treatment plant operating costs.

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## Other Considerations

5 minutes



1. Explain that the previous activity looked at using faecal sludge only from a technical perspective. There are other things that need to be considered for when deciding on a use, such as health risks and environmental contamination. Ask participants, “What is the biggest health risk when using faecal sludge?”
  - *Transmission of faecal pathogens*
  - *Need to consider health risks for any use; they are all just different levels and types of risks. For example, faecal sludge needs to be treated to reduce pathogens to a safe level if used in agriculture, especially if people are going to eat uncooked crops. For pellets used as fuel, pathogen transmission is also important, but maybe in that case it only means protective clothing for workers while they handle the pellets.*
  - *Other barriers can also be put in place to reduce the risk of pathogen transmission, like crop restrictions (for example, above ground crops like fruit trees), application techniques, protective equipment, waiting period and food preparation. For more information, refer participants to the World Health Organization (WHO) Guidelines for the Safe Use of Wastewater, Excreta and Greywater (2006) and the WHO Sanitation safety planning: manual for safe use and disposal of wastewater, greywater and excreta (2015).*
2. Ask participants, “Apart from health risks, what else do you need to consider when deciding on a use?”
  - *Environmental impact*
  - *Social factors:*
    - *Acceptance of the product (for example, some cultures reject the use of excreta, whereas others have a long history of excreta use in agriculture)*
    - *Market demand (for example, people actually want and will use the product)*
  - *Regulations, if they exist*
  - *Competition from other products on the market*
  - *Treatment technologies required to treat faecal sludge*
3. Emphasize that every solution is context specific. It important to evaluate the local health, environmental and social factors before deciding on a treatment and use plan.

**Optional: Risk Management****5 minutes**

1. Explain that there are several barriers that can be put in place to avoid the spread of faecal pathogens when using faecal sludge. These barriers will depend on the type of use.
2. Ask participants to stand up if their barrier reduces the spread of faecal pathogens for agricultural use (see Lesson Plan: Risk Management). Explain that faecal sludge should be treated to remove pathogens before it is applied to crops. However, it is difficult to treat and monitor faecal sludge to ensure that it is completely free of pathogens. As such, there are several barriers that can be put in place after treatment to avoid the spread of pathogens in agriculture.
3. Ask participants, “Are there any other barriers that could be put in place when using faecal sludge in agriculture?”
  - Crop restriction
  - Application techniques
  - Protective equipment
  - Waiting period
  - Food preparation
  - Handwashing
  - Cleaning tools
  - Training
  - Deworming

**Exercise Book****10 minutes**

1. Ask the case study groups to use their Exercise Book and complete the analysis of the other factors (health risks, environmental impact, social factors, regulation, competition, and treatment technologies required). Ask the groups to recommend a treatment product and faecal sludge use for their case study. Emphasize that there is no right answer. Groups may change their decision after learning about the treatment technologies, in another lesson. Each group has 10 minutes to complete Section 3 of the Exercise Book.

**Review****5 minutes**

1. Ask participants to find a partner from another case study group. Ask them to share one another possible treatment product and faecal sludge use their group could have selected.

**Reflections on Lesson**

**Activity: Treatment Products and Uses**

<b>Treatment Products</b>	
<b>Biogas</b>  Treatment technology example: Anaerobic digester	<b>Dewatered or Dry faecal sludge</b>  Treatment technology example: Unplanted drying bed
<b>Dewatered or dry faecal sludge (with low pathogens)</b>  Treatment technology example: Co-composting	<b>Dry faecal sludge</b>  Treatment technology example: Unplanted drying bed
<b>Insect larvae</b>  Treatment technology example: Black soldier fly larvae	<b>Dry faecal sludge</b>  Treatment technology example: Unplanted drying bed
<b>Insect larvae</b>  Treatment technology example: Black soldier fly larvae	<b>Plants</b>  Treatment technology example: Planted drying bed
<b>Effluent</b>  Treatment technology example: Co-treatment with wastewater	<b>Aquatic plants</b>  Disposal example: Fish and floating plant ponds
<b>Fish</b>  Disposal example: Fish and floating plant ponds	



## Faecal Sludge Use

Energy  
(solid fuel)



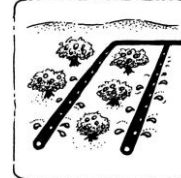
Construction  
(building materials)



Aquaculture



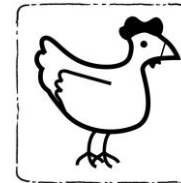
Irrigation



Agriculture, horticulture



Livestock



Forestry



Energy  
(biogas)

