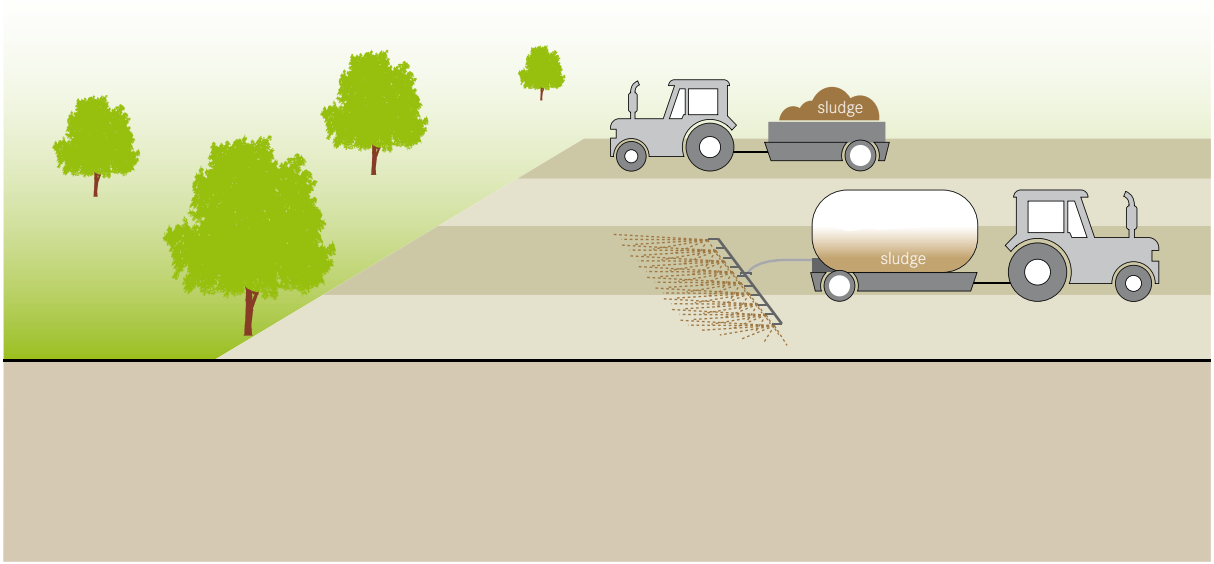
D.5 Application of Sludge

Applicable to: **Systems 1, 5-9**

Application Level:	**Management Level:**	**Inputs:** Sludge
Household	★★ Household	
★ Neighbourhood	★★ Shared	**Outputs:** Biomass
★★ City	★★ Public	



Depending on the treatment type and quality, digested or stabilized sludge can be applied to public or private lands for landscaping or agriculture.

Sludge that has been treated (e.g., Co-Composted or removed from a Planted Drying Bed, etc.) can be used in agriculture, home gardening, forestry, sod and turf growing, landscaping, parks, golf courses, mine reclamation, as a dump cover, or for erosion control. Although sludge has lower nutrient levels than commercial fertilizers (for nitrogen, phosphorus and potassium, respectively), it can replace an important part of the fertilizer need. Additionally, treated sludge has been found to have properties superior to those of fertilizers, such as bulking and water retention properties, and the slow, steady release of nutrients.

Design Considerations Solids are spread on the ground surface using conventional manure spreaders, tank trucks or specially designed vehicles. Liquid sludge (e.g., from anaerobic reactors) can be sprayed onto or injected into the ground.
Application rates and usage of sludge should take into account the presence of pathogens and contaminants, and the quantity of nutrients available so that it is used at a sustainable and agronomic rate.

Appropriateness Although sludge is sometimes criticized for containing potentially high levels of metals or contaminants, commercial fertilizers are also contaminated to varying degrees, most likely with cadmium or other heavy metals. Faecal sludge from pit latrines should not have any chemical inputs and is, therefore, not a high-risk source of heavy metal contamination. Sludge that originates at large-scale wastewater treatment plants is more likely to be contaminated since it receives industrial and domestic chemicals, as well as surface water run-off which may contain hydrocarbons and metals. Depending on the source, sludge can serve as a valuable and often much-needed source of nutrients. Application of sludge on land may be less expensive than disposal.

Health Aspects/Acceptance The greatest barrier to the use of sludge is, generally, acceptance. However, even when sludge is not accepted by agriculture or local industries, it can still be useful for municipal projects and can actually provide significant savings (e.g., mine reclamation).

Depending on the source of the sludge and on the treatment method, it can be treated to a level where it is generally safe and no longer generates significant odour or vector problems. Following appropriate safety and application regulations is important. WHO guidelines on excreta use in agriculture should be consulted for detailed information.

Operation & Maintenance Spreading equipment must be maintained to ensure continued use. The amount and rate of sludge application should be monitored to prevent overloading and, thus, the potential for nutrient pollution. Workers should wear appropriate protective clothing.

Pros & Cons

+ Can reduce the use of chemical fertilizers and improve the water-holding capacity of soil
+ Can accelerate reforestation
+ Can reduce erosion
+ Low costs
- Odours may be noticeable, depending on prior treatment
- May require special spreading equipment
- May pose public health risks, depending on its quality and application
- Micropollutants may accumulate in the soil and contaminate groundwater
- Social acceptance may be low in some areas

References & Further Reading

_ Strande, L., Ronteltap, M. and Brdjanovic, D. (Eds.) (2014). *Faecal Sludge Management. Systems Approach for Implementation and Operation.* IWA Publishing, London, UK. Available at: www.sandec.ch
(Detailed book compiling the current state of knowledge on all aspects related to FSM)

_ U.S. EPA (1999). *Biosolids Generation, Use, and Disposal in the United States.* EPA-530/R-99-009. U.S. Environmental Protection Agency, Washington, D.C., US. Available at: www.epa.gov

_ U.S. EPA (1994). *A Plain English Guide to the EPA Part 503 Biosolids Rule.* EPA832-R-93-003. U.S. Environmental Protection Agency, Washington, D.C., US. Available at: www.epa.gov

_ WHO (2006). *Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Volume 4: Excreta and Greywater Use in Agriculture.* World Health Organization, Geneva, CH. Available at: www.who.int