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A concept for a sustainable sanitation chain based on semi-centralized production of terra preta for Moldova

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Content

- Background
- Terra preta Sanitation
- Applying terra preta for an UDDT system
- Pilot experiments
- Field experiments
- Further research

Sanitation in rural Moldova

- Limited access of rural population to conventional sewerage system
- Main form of sanitation – pit latrines, pollute the groundwater
- UDDTs introduced in the Center and North of Moldova (16 school and over 100 household)
- UDDTs - well accepted by the population, but there is still lack of reuse practice

UDDT examples in Moldova

Challenges in UDDT

- Limited reuse practice of human excreta
- Faecal matter not enough treated - potential health risk
- Some people are skeptical of using urine
- Lack of attitude for maintaining a toilet (faecal chamber used as a waste bin)

→ insufficient sanitisation
→ exposure to risks

Problems with excreta management in school UDDTs

- Lack of spraying equipment, hesitation in applying → accumulation of big amount of urine
- Too much covering material → low quality final product
  - soil: too hard, still smelly
  - fine sawdust: too dusty

Problems with excreta management in school UDDTs

Too much soil is added to faeces

Too much sawdust added, also sanitary pads, toilet paper thrown inside toilet chamber

Moderate sawdust added, faeces kept in closed plastic bags

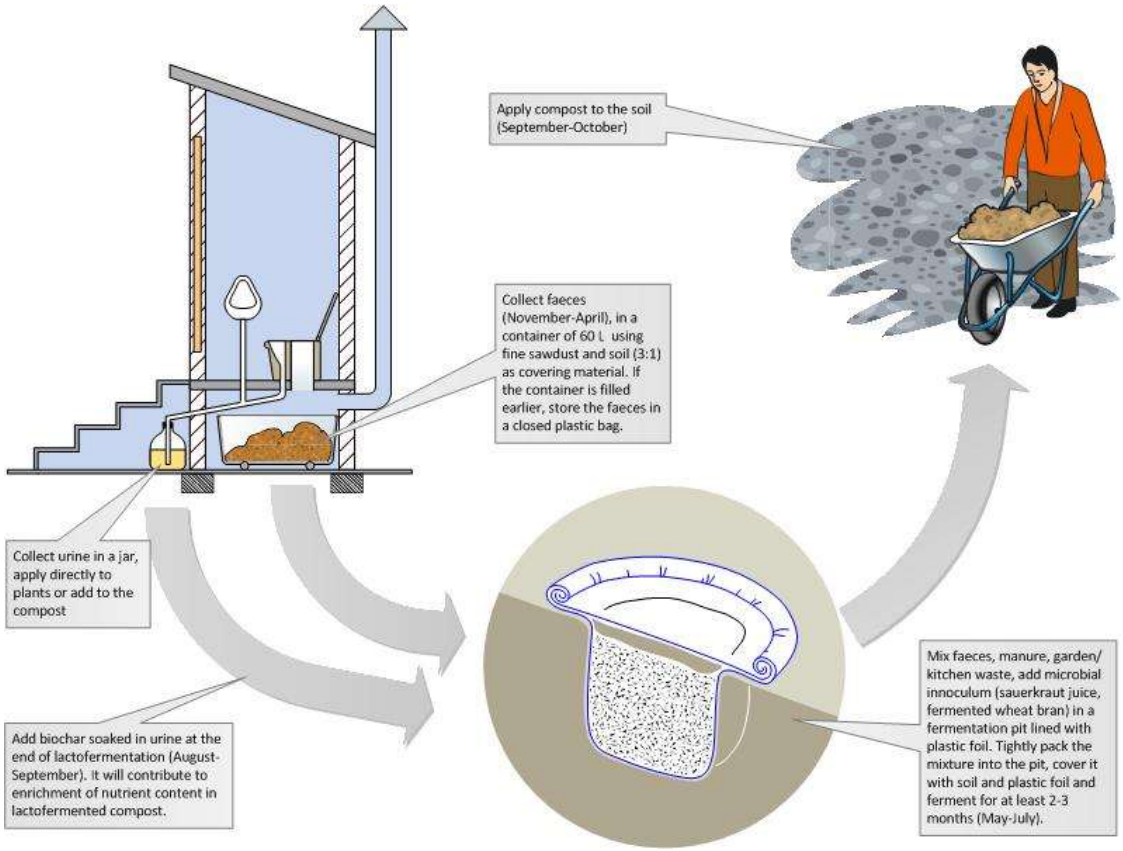
Terra preta sanitation

- TPS was inspired from Amazonian dark earths (terra preta)
- Terra preta are artificial soils created by pre-Columbian civilization via unintentional and intentional disposal of organic waste (including human excreta) and charcoal
- TP soils can maintain their fertility during long period of time

Benefits of TPS

- Improvement of the management in source separated sanitation by shortening time for faeces sanitization
- Returning more nutrients to crops
- Reducing smell problems
- Recycling of excreta together with other types of waste (for example food and garden waste, manure)
- Linking sanitation and agriculture with an ultimate goal to protect soil fertility and water resources.

Applying terra preta in an UDDT system



Pilot experiments

Methodological approach

- Plastic and glass jars (3l and 1 l)
- Stored/fresh human faeces (30-60%)
- Cow manure (30-40%)
- Wood charcoal (5-10 %)
- Carbohydrate source (fruit/vegetable residues) (10-20%)
- Molases (5-8%)
- Microbial innoculum (sauerkraut, fermented wheat bran – 3-5%)

Methodological approach

- Rapid decrease in pH and stabilization (4.5 or lower)
- No offensive smell

- Earthworm acceptance

Results

- Charcoal addition could lower the pH in the first 3-5 days, but did not stabilize it
- Fresh faeces more effective in lacto-fermentation than the stored faeces
- Sauerkraut was more effective than fermented wheat bran
- Pre-fermenting the fruit/vegetable residues could decrease the initial pH for the field scale experiments (from 8.7 to 7.4)

Results

- Earthworms accepted lactofermented substrate, however:
  - An additional layer of vermicompost needed to be added on the top or
  - when lactofermented material was left for few days in aerobic condition

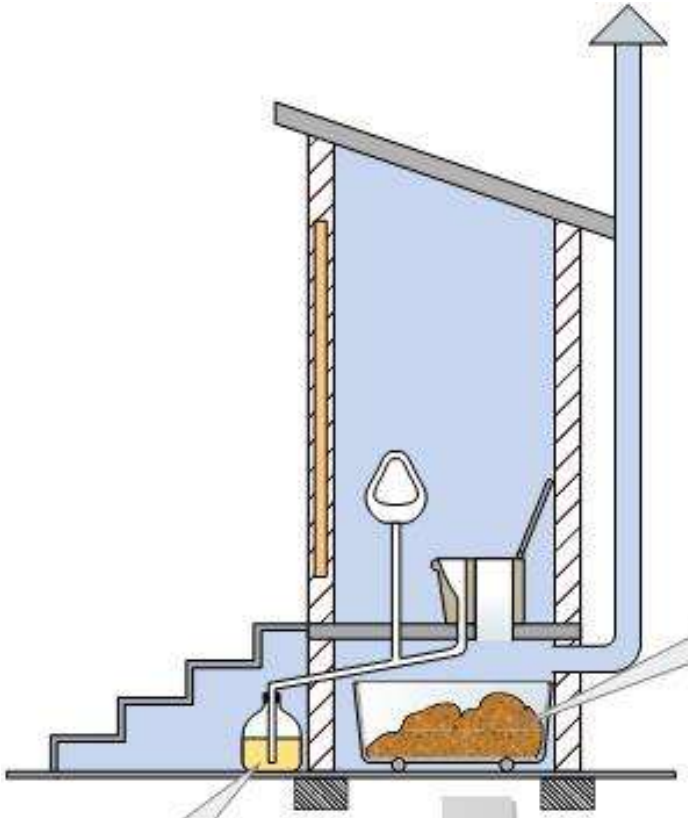
Field experiments

Stages in filling the fermentation pit, its pressing and covering with plastic foil and soil

Further research questions:

- Can we improve the lacto-fermentation by optimizing the collection of faeces (type of covering material used, application ratio etc.)
- Is biochar effective in adsorbing nutrients from urine and enriching terra preta?
- What is the effect of lacto-fermented compost on soil quality and corn yield (2 year experiment)?

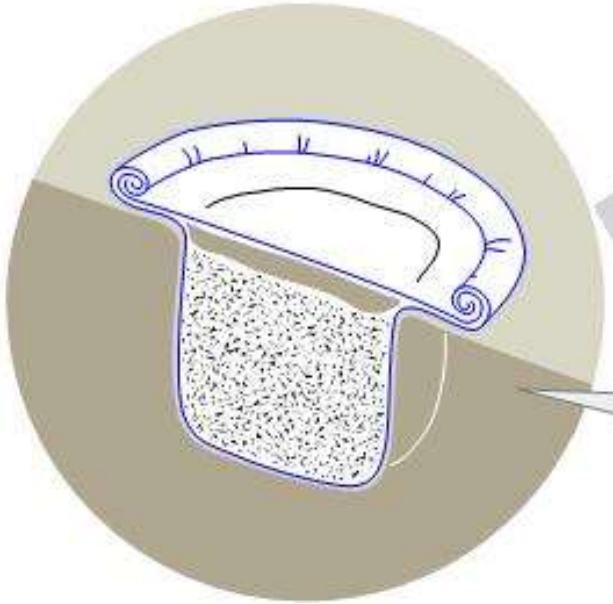
Thank you!



Collect faeces (November-April), in a container of 60 L using fine sawdust and soil (3:1) as covering material. If the container is filled earlier, store the faeces in a closed plastic bag.

Collect urine in a jar, apply directly to plants or add to the compost

Add biochar soaked in urine at the end of lactofermentation (August-September). It will contribute to enrichment of nutrient content in lactofermented compost.



Mix faeces, manure, garden/ kitchen waste, add microbial innoculum (sauerkraut juice, fermented wheat bran) in a fermentation pit lined with plastic foil. Tightly pack the mixture into the pit, cover it with soil and plastic foil and ferment for at least 2-3 months (May-July).

Apply compost to the soil (September-October)