PPP for Sustainable Sludge Management Services in Faridpur, Bangladesh

## Faecal Sludge Treatment Plant in Faridpur, Bangladesh

- Implemented by :
- Technical Assistance by :
  - Funded by :
- Faridpur Municipality
- Practical Action Bangladesh
  - : Bill & Melinda Gates Foundation, UKAid





ion	Total Population	150,000	
Basic Informat	Area	17.38 sq. KM	
	Type of Sanitation Option	On site system (pits and septic tank)	
Geographic Information	Flood Situation	Seasonal Flood Prone	
	Weather	Tropical	
	Monsoon	3 season	
	Average Temperature	25°C	
	Average Rainfall	1,127 mm	

- ✓ Have moderately improved faecal sludge collection and transportation system (using Vacutug);
- ✓ No faecal sludge treatment facility or fixed dumping place for disposal;
- ✓ Have experience on FS treatment in pilot scale to sort out possible best solution considering local context since 2009;
- ✓ Have sufficient land to establish a FS treatment facility at just outside of the city;

- ✓ The FS plant will be PPP lead;
- ✓ The plant will serve FSM services to whole city;
- ✓ The options will be focused on a business opportunity using the end-product co-composting with municipal solid waste;
- Zero artificial energy consumption;
- ✓ Scope for future expansion;





#### Properties of Faecal Sludge



Docign Critoria	Treatment system		Commonte		
Design Citteria	Unplanted	Planted	comments		
Solid content of FS	15 kg TS/m3	15 kg TS/m3			
Moisture content	90%	90%			
Leachate production	0.9m <sup>3</sup> per m <sup>3</sup> fresh FS	0.7m <sup>3</sup> per m <sup>3</sup> fresh FS	Evapotranspiration in Planted Drying Bed		
FS Loading Rate	200 KG TS/m <sup>2</sup> /year	200 KG TS/m²/year			
Drying Time	15 days min <sup>m</sup>	1 year min <sup>m</sup>	Depends on Seasons. May require more time.		
Thickness of Sludge	0.2 m	0.2 m			



If the municipality has 2 vacutug of capacity 2m<sup>3</sup> each. Considering two different groups with the two vehicles working for six hours in a day and 1 hour time required for a round single trip, the maximum number of trips will be 12 that will be delivered to plant. So, the quantity of sludge for designing is considered as 24m<sup>3</sup> in a day.

#### **Unplanted Bed**



- ✓ Will have mainly a filtering facility and be covered with transparent material at the top;
- ✓ The waste water will get filtered and drain out and the sludge on the top will get heated up to 54.5°C;
- ✓ This setup will be rest same for the next 15 days to dry the sludge;
- ✓ 1 day for preparation and emptying, in total 16 days will be needed for drying. So, number of bed needs for a complete cycle will be 16;
- ✓  $6m^3$  of Sludge will be dumped directly in a single day;
- ✓ 3 filter medium will be used like Gravel, small stone and sand of FM>2.5
- ✓ Considering the above 10m X 3m X 1m bed size is designed.





Section: Unplanted Drying Bed (Not to scale)

#### **Planted Bed**



- ✓ Will have mainly a filtering facility and Antelope grass will be planted on the top of filter medium;
- ✓ The waste water will get filtered and drain out and the sludge on the top of the filter media will get naturally treated;
- ✓ This setup will be filled up for the a year and another one year to dry the sludge;
- ✓ There will be 6 number of planted drying bed where only one will be used in a single day. So, rotationally after 1 week, the sludge will be dumped in the same bed;
- ✓ A same setup of 6 beds will be constructed and used at the drying time;
- ✓ 18m<sup>3</sup> of Sludge will be dumped directly in a single day;
- ✓ 3 filter medium will be used like Gravel, small stone and sand of FM>2.5
- $\checkmark$  Considering the above a 8m X 8m X 1.5 m bed size is designed.





Section: Planted Drying Bed (Not to scale)

### **Planted Drying Bed**





#### Cesspool



- ✓ Water from unplanted drying bed and planted drying bed (both after filtration) will come and pass through the cess pool;
- ✓ There will be 6 chambers in the cess pool and all will be connected in Baffled mechanism;
- ✓ All the chambers, except the first, will be filled with bricks bats so that algae and good bacteria can grow;
- ✓ Total leachate quantity 18m<sup>3</sup> is considered (5.4m<sup>3</sup> from unplanted and 12.6m<sup>3</sup> from planted bed;
- ✓ Retention Time is considered 7 days and void space 50%;
- ✓ Considering the above a 21.5m X 12.25m X 1m size pond is designed;



## Csspool



Section: Cess pool (Not to scale)









#### **Maturation Pond**



- ✓ Water from cess poll will come to maturation pond and pass through the maturation pond to the surface water body;
- ✓ 18 cum of waste water will come to Maturation Pond from cess pool;
- ✓ Retention Time is considered 12 days;
- ✓ Considering the above a 10m X 12.5m X 1.75m size pond is designed;







Section: Maturation Pond (Not to scale)

#### **Maturation Pond**







## **Partial Top view**







#### **Process Flow Diagram**



#### Consideration



	Treatmer			
Design Criteria	Unplanted	Planted	Comments	
Number of Working days per week	6	6	Friday is a rest day.	
Number of working weeks per year	48	48		
Maximum volume of raw FS delivered	6 m <sup>3</sup> per day	18 m³ per day	Based on two 2 cum capacity Vacutug making up to 12 deliveries to the FSTP	

#### **Operational Simulation**



Activity schedule							
Process		UPDBs			PDBA		
Cycle for UPDB	Day	Sludge to UPDB	to compost	Cleaning & preparation	Sludge to PDB	Remarks	
	1	UPDB-01			PDB-01		
	2	UPDB-02			PDB-02		
	3	UPDB-03			PDB-03		
[	4	UPDB-04			PDB-04		
[	5	UPDB-05			PDB-05		
	6	UPDB-06			PDB-06		
[	7	REST DAY					
[	8	UPDB-07			PDB-01		
CYCLE 1	9	UPDB-08			PDB-02		
	10	UPDB-09			PDB-03		
	11	UPDB-10			PDB-04		
	12	UPDB-11			PDB-05		
	13	UPDB-12			PDB-06		
	14	REST DAY					
	15	UPDB-13			PDB-01		
	16	UPDB-14	UPDB-01		PDB-02		
	17	UPDB-15	UPDB-02	UPDB-01	PDB-03		
	18	UPDB-16	UPDB-03	UPDB-02	PDB-04		

# **Thank You**

