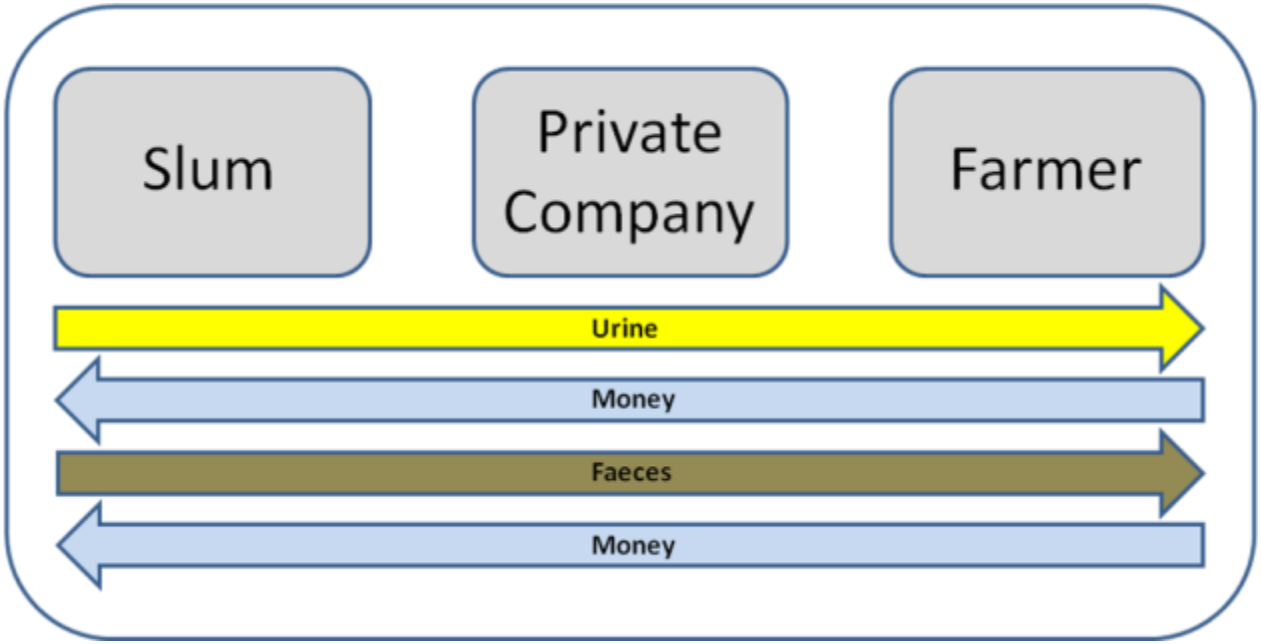
Marketing Human Excreta



A study of possible ways to dispose of urine and faeces from slum settlements in Kampala, Uganda

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sustainable sanitation design

ded Deutscher Entwicklungsdienst

sustainable sanitation alliance

Structure

- Introduction
- Methods
- System Designs
- Conclusion

Introduction

Objectives

- Develop an option for improved slum sanitation
- Using Urine Diversion Dehydration Toilets (UDDTs)
- Study area: Kampala, Uganda

UDDTs in urban areas – general issue

- Need for fertiliser in the city is low.
- How to remove the separated excreta from the city?

→ Logistics system connecting slums with farmers outside the city

→ Economically self sustaining system through marketing of sanitised, separated excreta as fertiliser

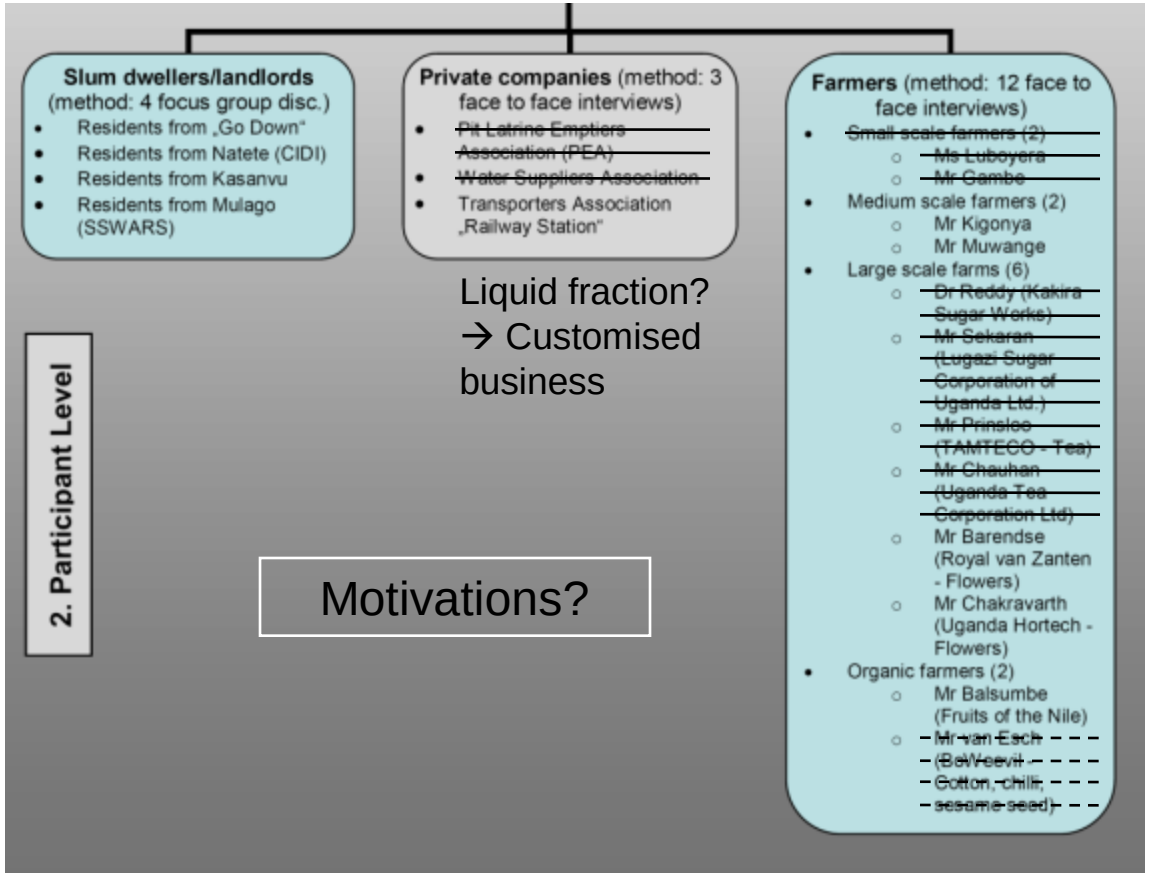
Methods

Methodological mix

1. Expert interviews
2. Interviews with potential participants of a logistics system
3. Field data collection
4. Observation
5. Logistics system design
6. Cost calculation (EXCEL model)

System design

Stakeholder selection



According to the interview statements, the stakeholders have been selected

„No line" = potential participant

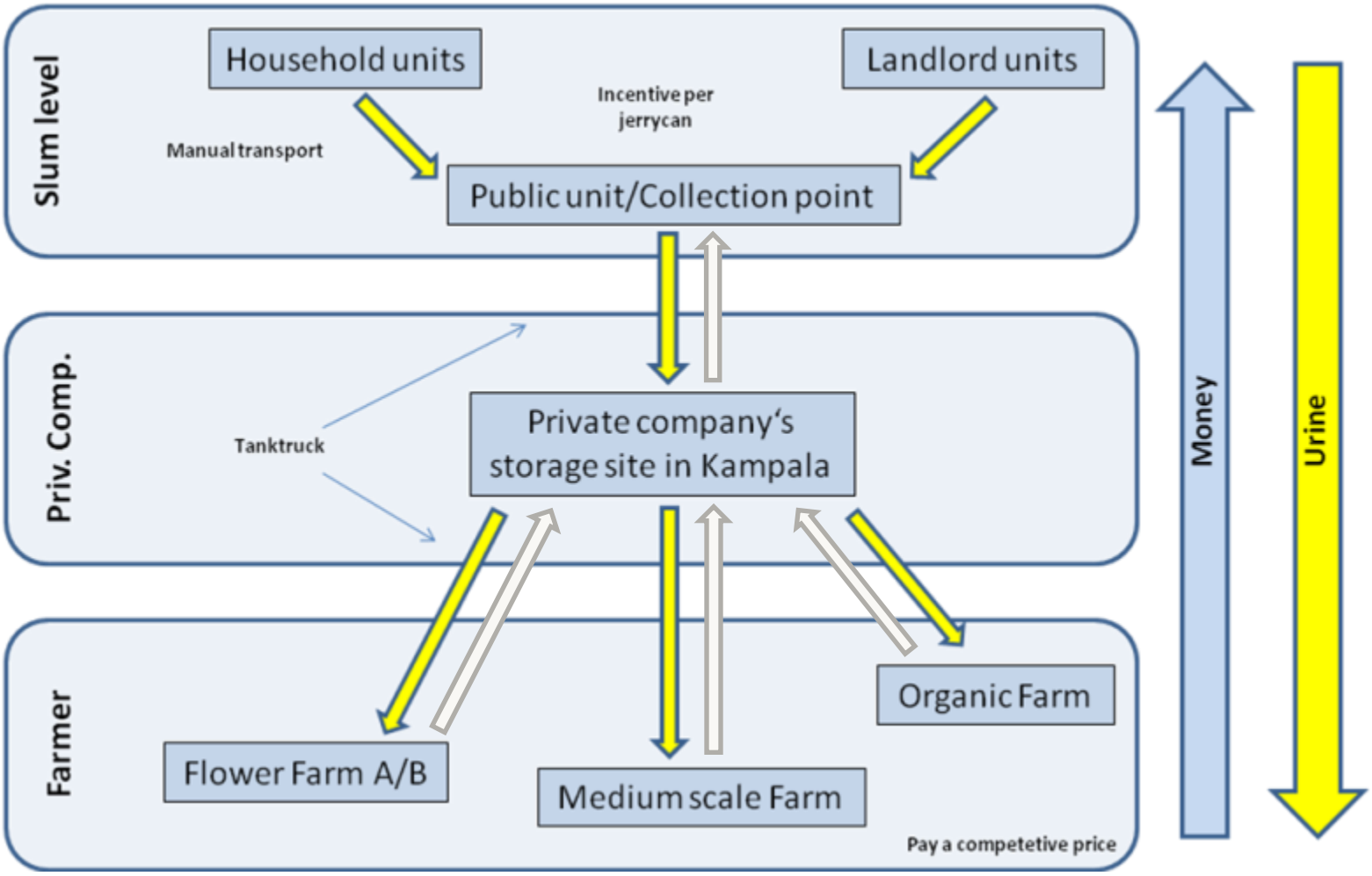
——— = not a potential participant (when it comes to urine)

- - - - - - = potential participant (only solid fertiliser)

Logistics system designs

- Two logistics systems have been designed:
  - System A: only urine
  - System B: urine and faeces

System A - Urine



System A:
Cost calculation – Assumptions

- Income for the system: urine sales = 0.01 EUR/l (Replacement Cost Approach)
- Project lifetime: 5 years (period, everything is depreciated in)
- System working to capacity: 10,000 l units
- Collection efficiency: 30%
- Average volume of urine in Uganda: 1 l/day
- Company operating 10 hours per day, 30 days per month
- Fuel price: 0.71 EUR/l
- Incentive level per jerrycan: 0.04 EUR/l
- Upfront investments included in the calculation (20% interest rate):
  - Collection point tanks
  - Tank trucks
  - Storage tanks
  - Office building
- Hidden costs: 5%

(For more details please see the underlying study)

System A: Cost calculation – Results

	Small scale I	Small scale II	Large scale I
N demand [kg/month]	1,200	1,808	11,663
Urine equivalent [l/month]	398,182	599,927	3,869,995
# Of people producing it	44,242	66,659	429,999
Workload indicator (Bad workload = 0; Good workload = 1)	0.664	1.000	0.992
Monthly income from urine fertiliser sales [EUR]	4,267	6,429	41,472
Monthly costs [EUR]	5,353	5,730	32,473
Monthly balance [EUR]	-1,086	699	9,000
Monthly return on sales [%]	**n/a**	**11**	**22**
Start-up investment [EUR]	128,465	128,465	732,775
Repayment period [yrs]	**n/a**	**15**	**7**

- *Small scale I: All input parameters are based on a flower farm where one interview took place. In this case the system was not working to full capacity.*
- Small scale II: Equal to “Small scale I”, but working to full capacity.
- Large scale I: Calculations have been made for a system covering all people living in slum settlements in Kampala.

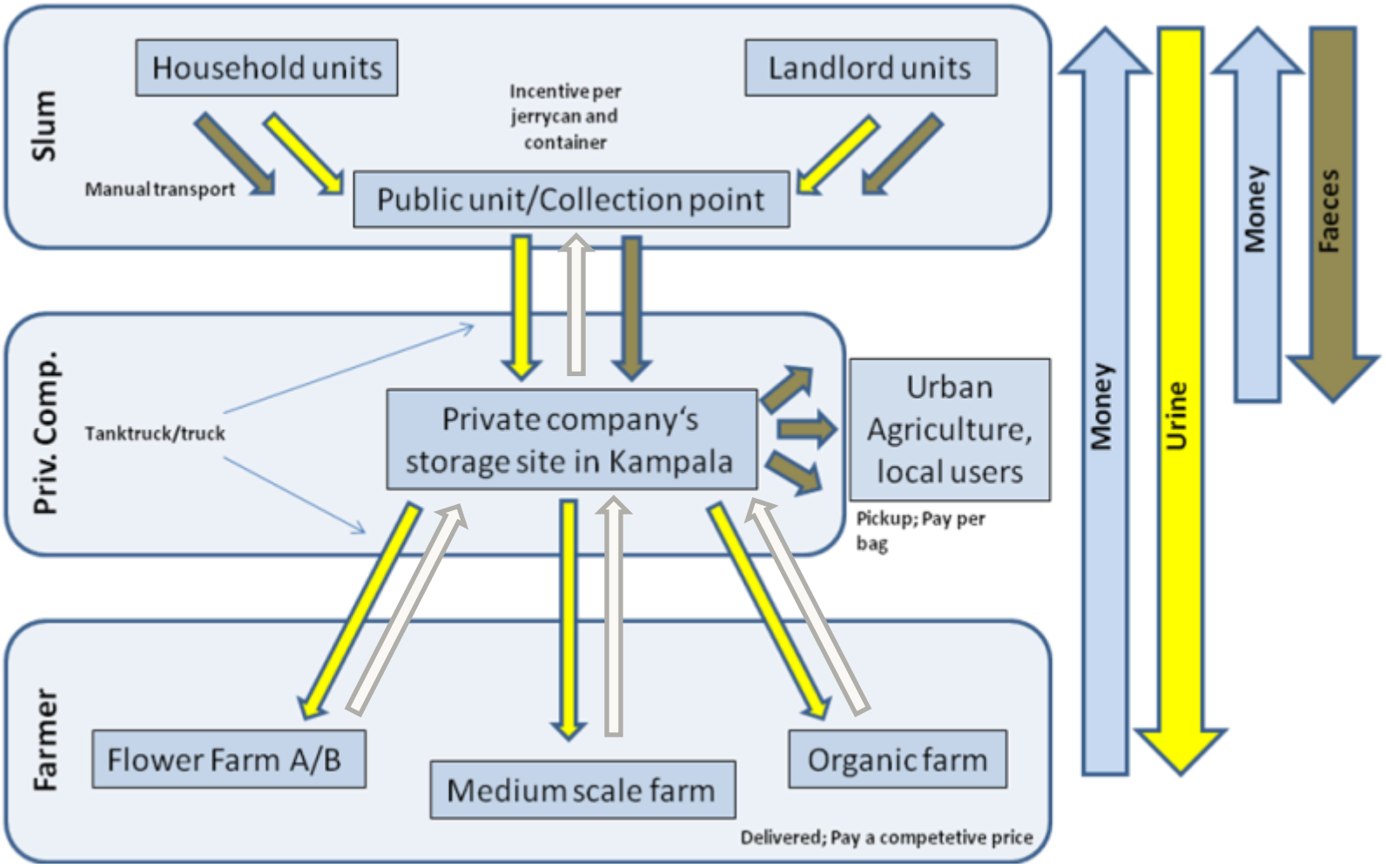
Summary: System A

- The higher the N demand → the bigger the system → the higher the return on sales and the shorter the repayment period (modularity)
- The “small scale I scenario” is not viable
- Major cost constituents are (“small sc. II” and “large sc. I”):
  1. “Urine varying transport costs – fuel” (35% and 40%)
  2. “Urine fix transport costs - monthly truck depreciation” (25% and 24%)
  3. “Costs of incentives for the jerrycans per month” (20% and 22%)

Summary: System A – sensitivity

- "Sensitivity" → change in monthly return on sales
- Most sensitive to ("small sc. II" and "large sc. I"):
  1. Reduced transport dist. (+120% and +91%)
  2. Extended project lifetime (+81% and +34%)
  3. Increased fuel price (-72% and -36%)
  4. Rising truck prices (-50% and -21%)
  5. Increased incentives (-40% and -20%)
  6. Supply chain failure (-19% and -10%)

System B – Urine and faeces



System B: Cost calculation – Assumptions

- General framework: same as for system A
- Additional income from faeces fertiliser bags sales
- Collection efficiency of faeces: 50%
- Urea costs: 0.46 EUR/kg (4% are added per weight unit)
- Incentive per container: 0.04 EUR
- Upfront investments that were included in the calculation (20% interest rate):
  - "PooBoxes" for exchange at the collection points
  - Lorries
  - Drying bed

(For more details please see the underlying study)

System B: Cost calculation – Results

	Small scale I	Small scale II	Large scale I
N demand [kg/month]	1,200	1,808	11,663
Urine equivalent [l/month]	398,182	599,927	3,869,995
# Of people producing it	44,242	66,659	429,999
Amount of faeces [kg/month]	92,909	139,983	902,999
Workload indicator urine (Bad workload = 0; Good workload = 1)	0.664	1.000	0.992
Workload indicator faeces (Bad workload = 0; Good workload = 1)	0.310	0.467	0.752
Monthly income from urine fertiliser sales [EUR]	4,267	6,429	41,472
Monthly income from the "Faecifert" sales [EUR]	2,860	4,309	27,794
Total monthly income [EUR]	7,127	10,738	69,267
Monthly costs [EUR]	8,587	10,076	56,917
Monthly balance [EUR]	-1,460	662	12,349
Monthly return on sales [%]	**n/a**	**6**	**18**
Start-up investment [EUR]	160.022	163,376	843,427
Repayment period [yrs]	**n/a**	**21**	**6**

- Small scale I: All input parameters are based on a flower farm where one interview took place. In this case the system was not working to full capacity.

- Small scale II: Equal to "Small scale I", but working to full capacity.
- Large scale I: Calculations have been made for a system covering all people living in slum settlements in Kampala.

Summary: System B – overview and cost constituents

- The higher the N demand → the bigger the system → the higher the return on sales and the shorter the repayment period (modularity)
- The small scale I scenario is not viable
- Major cost constituents are ("small sc. II" and "large sc. I"):
  1. "Monthly urea costs" (27% and 31%)
  2. "Urine varying transport costs – fuel" (20% and 23%)
  3. "Urine fix transport costs - monthly truck depreciation" (14% and 14%)
  4. "Costs of incentives for jerrycans per month" (11% and 13%)

Summary: System B – sensitivity

- "Sensitivity" → change in monthly return on sales
- Most sensitive to:
  1. Reduced transport dist. (+127% and 66%)
  2. Extended project lifetime (+127% and +31%)
  3. Rising nutrient prices (-103% and -34%)
  4. Increased fuel price (-83% and -28%)
  5. Rising truck prices (-70% and -18%)
  6. Increased incentives (-52% and -18%)
  7. Supply chain failure (-20% and 7%)

Conclusion

Theoretically feasible, but... Technology/Design issues

- Narrow choice of consumers
  - Large proportion of small scale farmers, fertile soils, handling of liquid fertiliser is considered to be problematic
- Bad road conditions, high rate of road accidents
  - High risk of supply chain failure (manageable?)
- Marketing a solid fertiliser:
  - No special means of transportation
  - No distribution
  - No vulnerable supply chain
  - No special storage requirements

  → Feasibility would have to be tested on the ground

…Economic issues

- Low fertilising value to weight ratio of human excreta
  - Higher transport costs
  - Higher handling costs
- Alternative fertiliser needs to be competitive in terms of
  - Nutrient content and plant availability
  - Managing effort
  - Product price
- System has to work to full capacity
- Sensitivity → **transp. dist., project lifetime**, **urea**, fuel, incentives

…Acceptance and general issues

- High socio-cultural barriers (all stakeholders)
  - Can possibly be changed by
    - »Incentives
    - »Sensitisation
    - »Economical competitiveness

→Positive outcome → profitability proven!

→Is the business profitable enough to attract investors (considering the risks)?

→Kick-off funding might be inevitable

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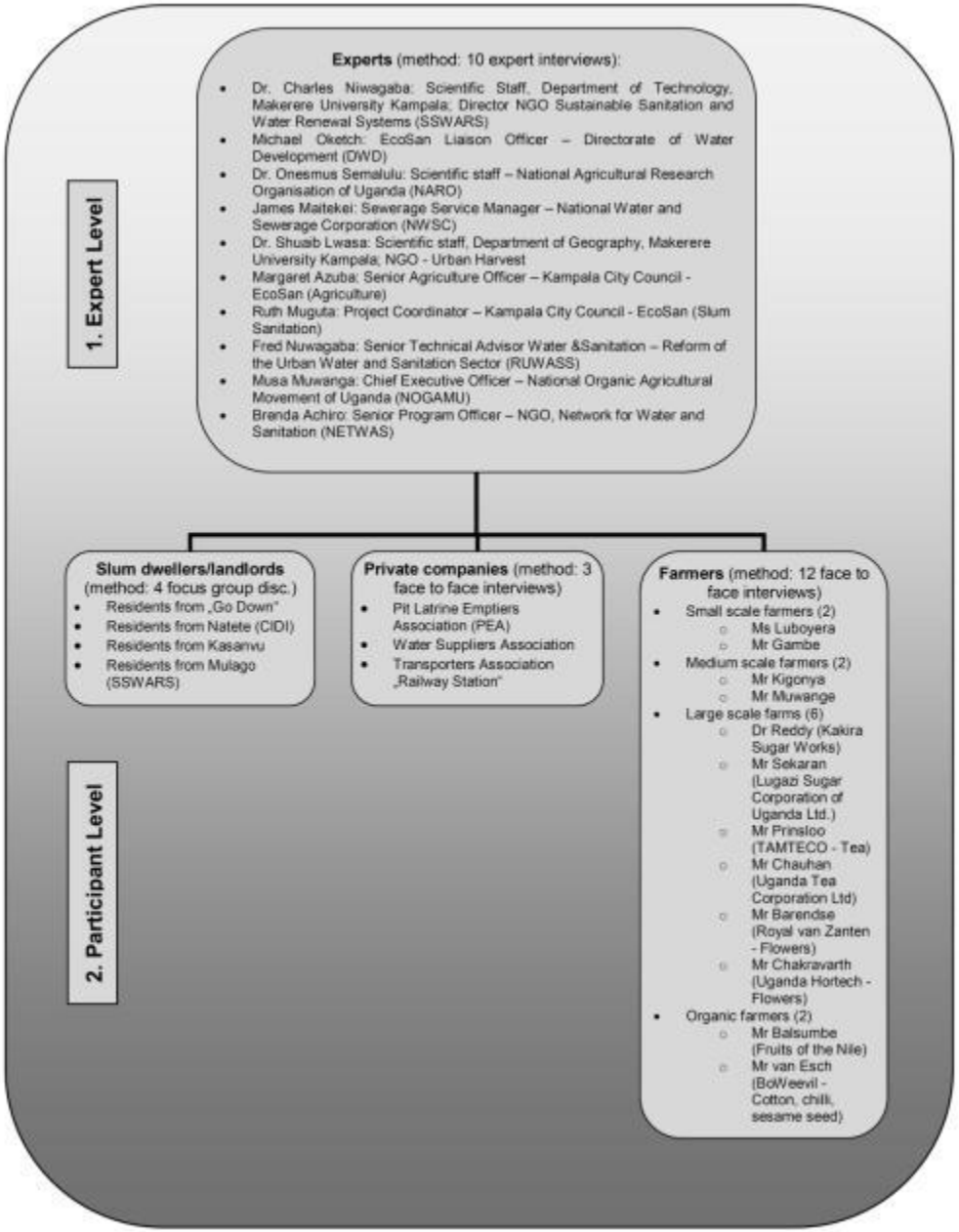
Appendix

Stakeholders and the two level approach to the interviews

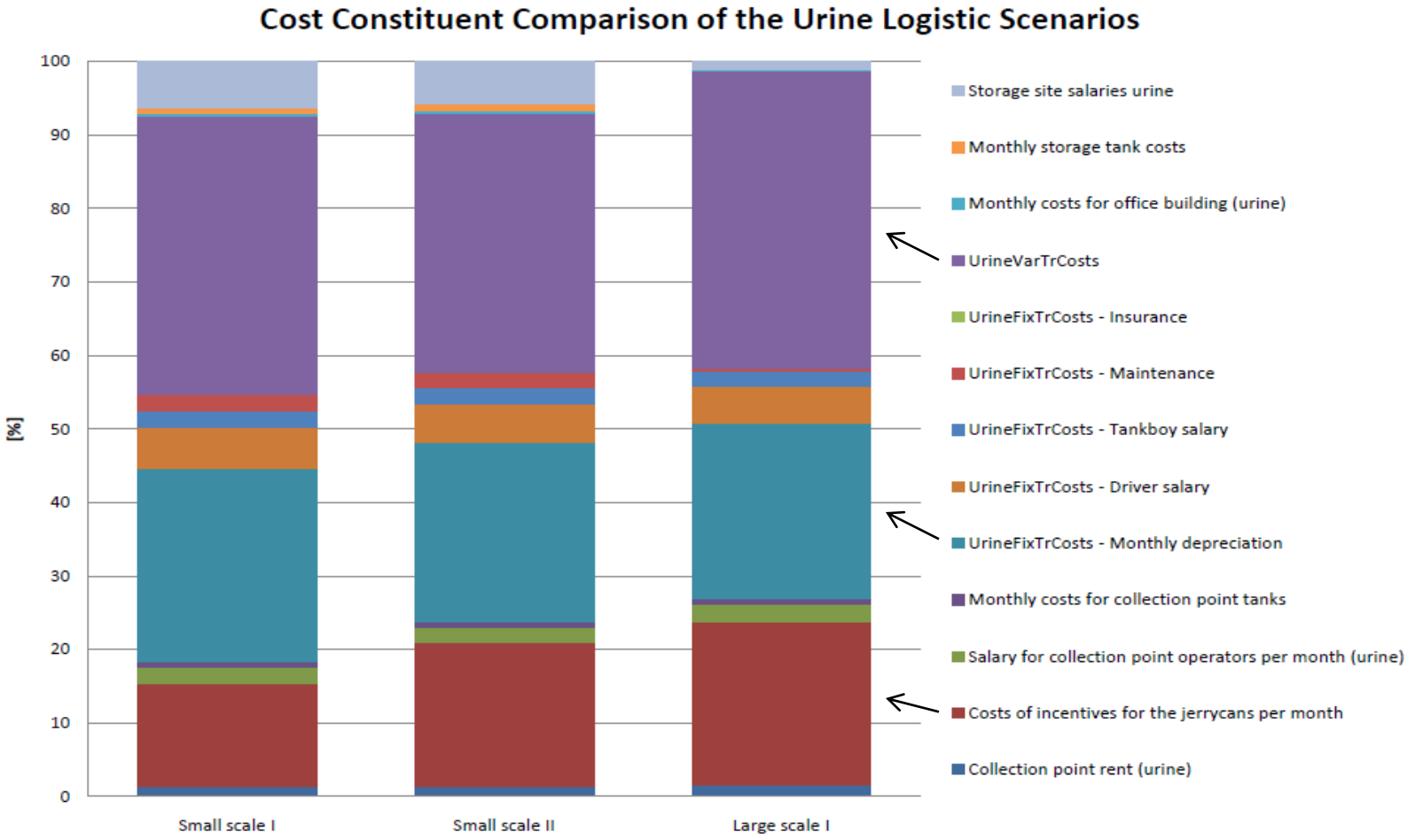


Slum sanitation – different sanitation modes

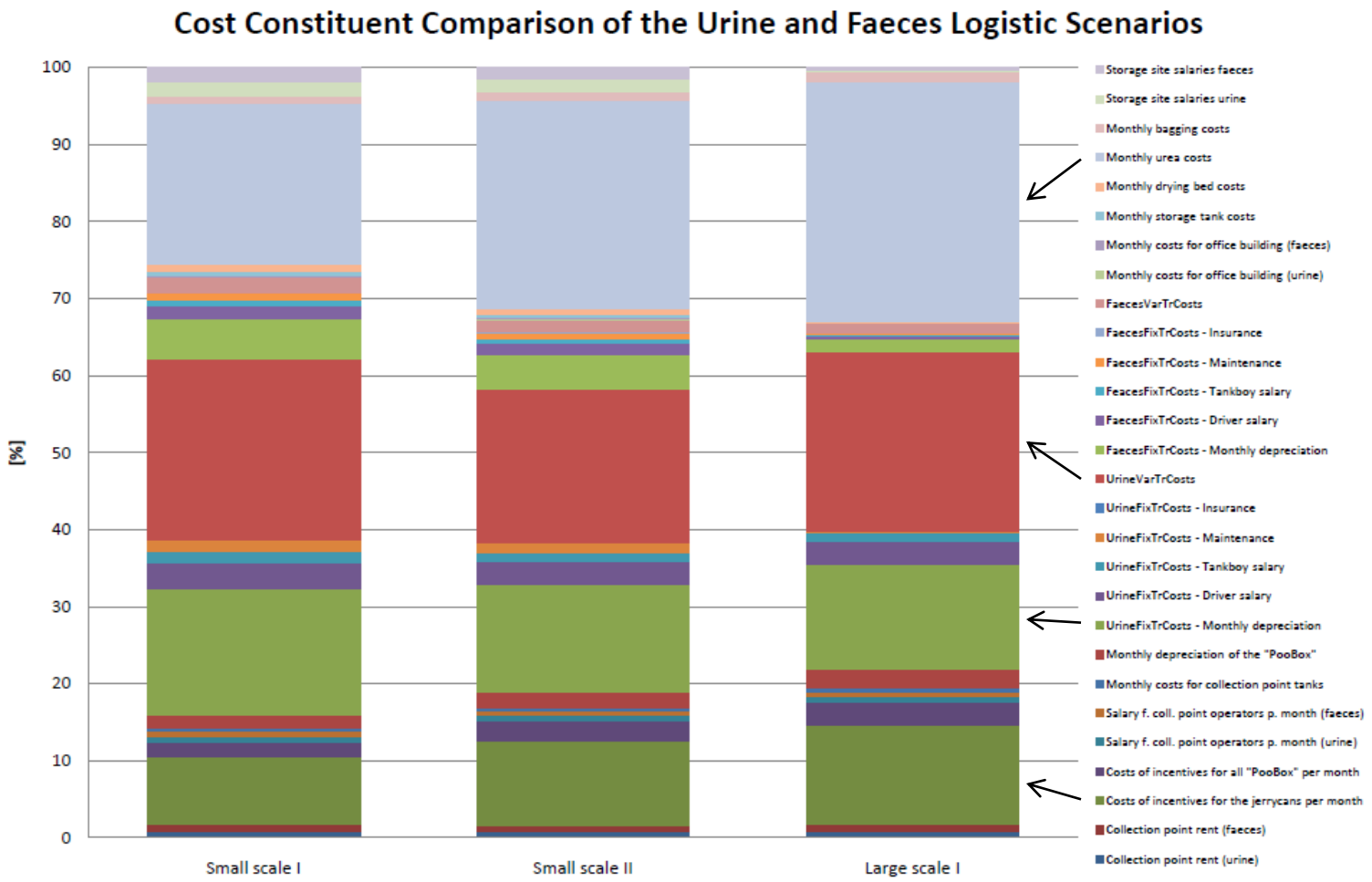
- About 60%* use shared pit latrines, provided by the landlord
- About 30%* use public toilets; User fee: approx. 0.04 EUR
- About 10%* rely on “other means”: flying toilets or open defecation

*)Estimated numbers, based on expert interviews

System A: Cost constituents



System B: Cost constituents



Typical pit latrine

Photo by Steffen Blume (2009)

Alternative means…

Photo by Enno Schröder (2009)

Flower farmers

Fertiliser/irrigation water mixing station. →

← Fertigation in greenhouse

Photos by Enno Schröder (2009)