MAKERERE UNIVERSITY

Dewatering Pre-Treatment of Faecal Sludge in Urban Slums

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eawag aquatic research

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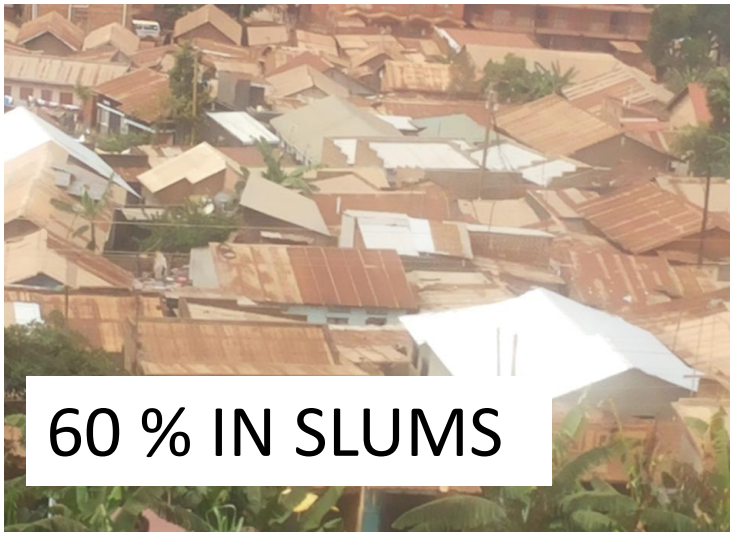
Welcome to UGANDA

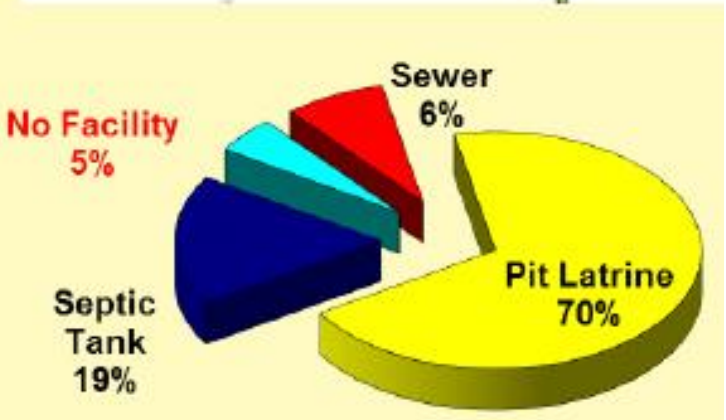
POPULATION

UGANDA	30 MILLION
KAMPALA	1.5 MILLION
	3.0 MILLION (DAY TIME)



KAMPALA – CAPITAL CITY OF UGNADA

Sanitation status – Kampala UGANDA



Over 90 % slum dwellers using **pit latrines**

Pit latrines

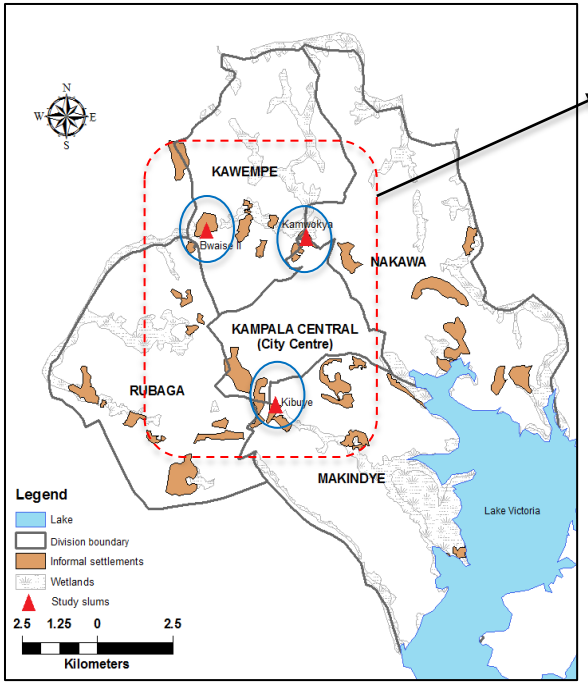
- Lined (70 %)
- Unlined

70 % of the pits are FULL
- Unemptied

Sanitation status – Kampala UGANDA

- Uncollected FS mainly found in Urban slums

- **High housing density**
- **High transportation costs**



Housing Density
(house structures/km2)

2,200
5,080
1,240

- Limited access to mechanized emptying

Sanitation status – Kampala UGANDA

When pit latrines in slums are full

- Abandoned
- Empty into environment
- Use semi-mechanized technologies

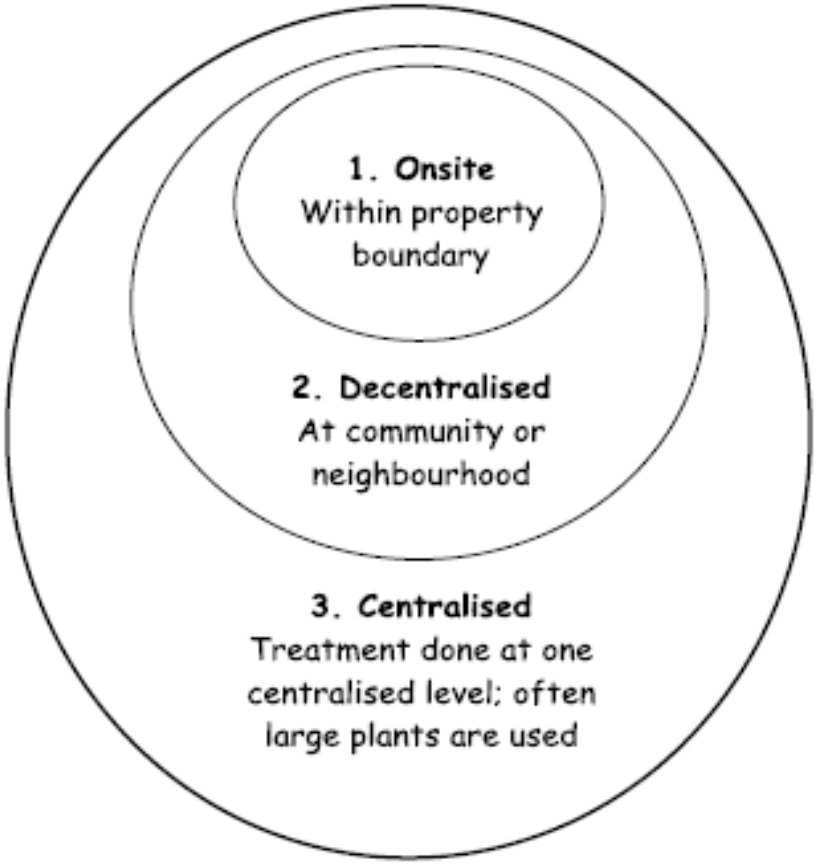
Empty into environment

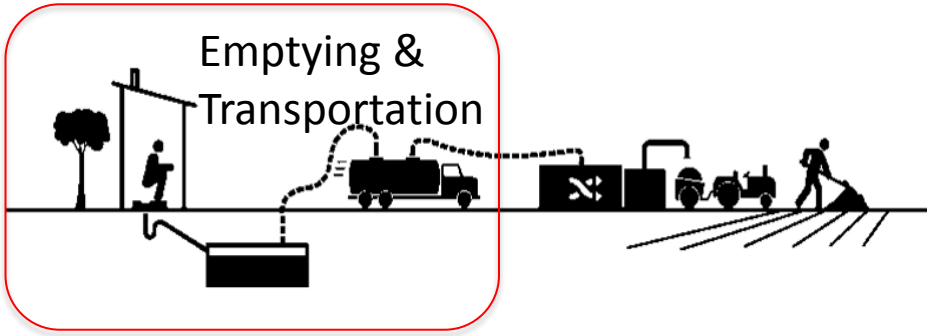
Manual-aided technologies

65% costs on transportation

Decentralized Management

Reduction of emptying costs, increase number of latrines emptied and reduce unsafe disposal into environment and related public Health risks



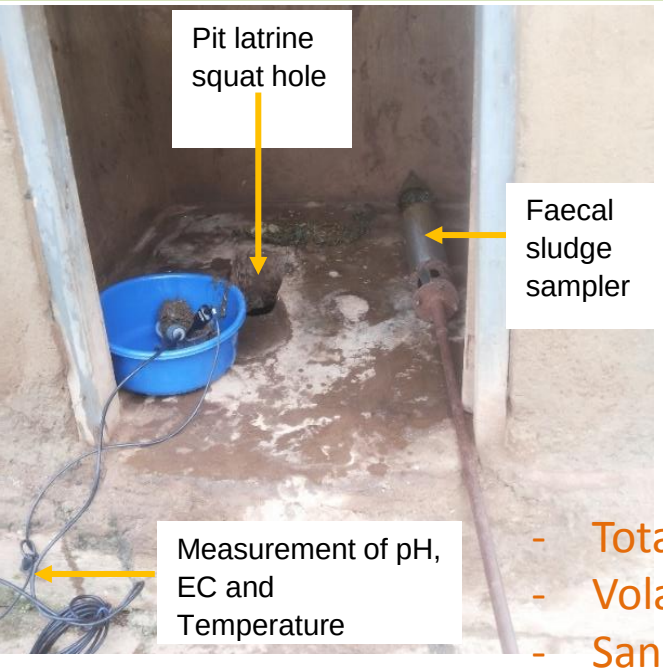


- Work done on emptying and more underway

Treatment – Dewatering ???????

FS>90% water. Increase of sludge dry solids by 10 % decreases in initial sludge volume by over 85 %

Understanding **Dewaterability** of faecal sludge from slums

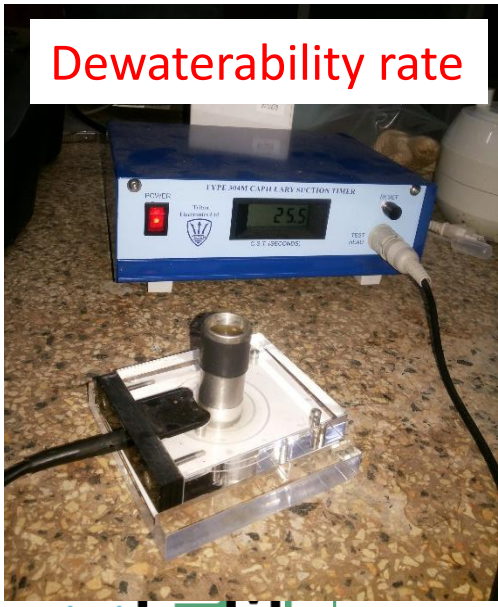


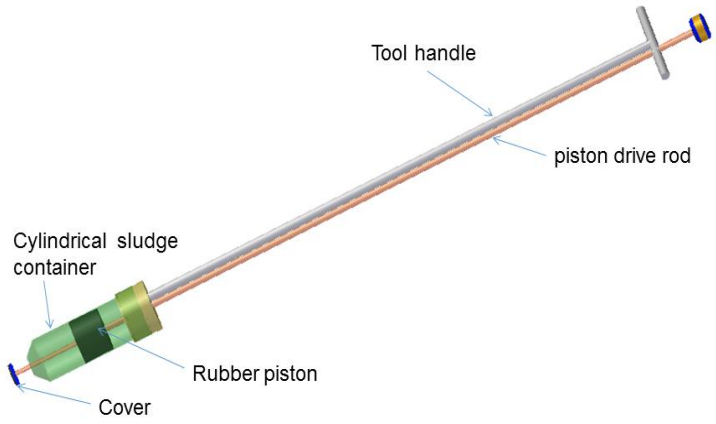
Lined & Unlined pits

- Total solids
- Volatile solids
- Sand content
- Crude protein

Dewaterability extent

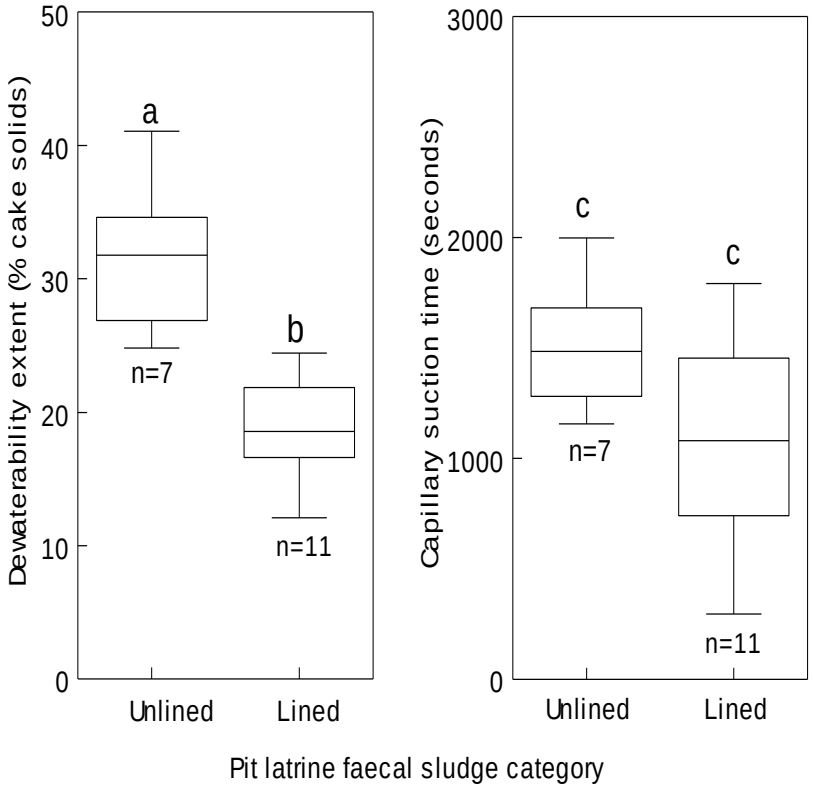
Dewaterability rate



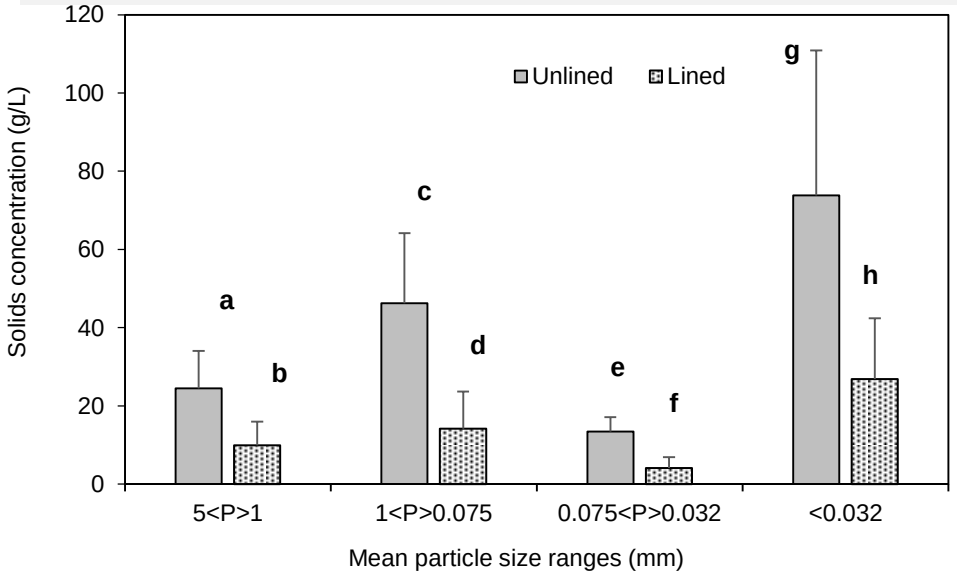


Understanding Dewaterability of faecal sludge from slums

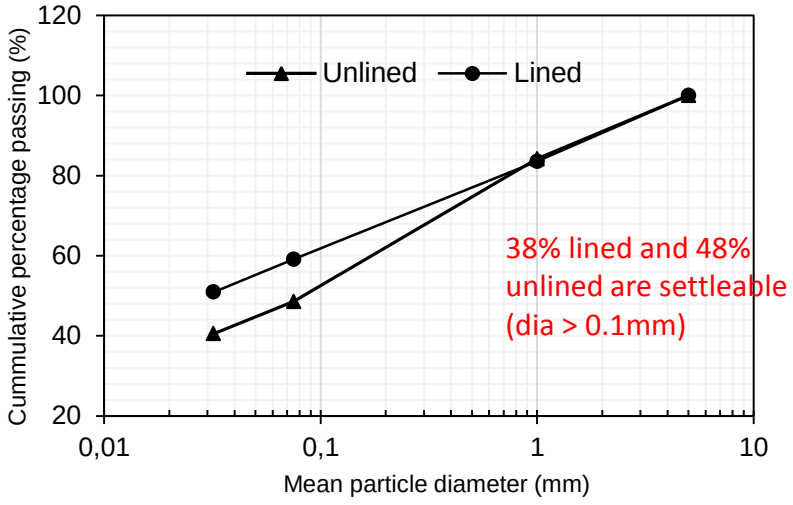
Dewaterability extent and rate



Solids concentration (lined and unlined)



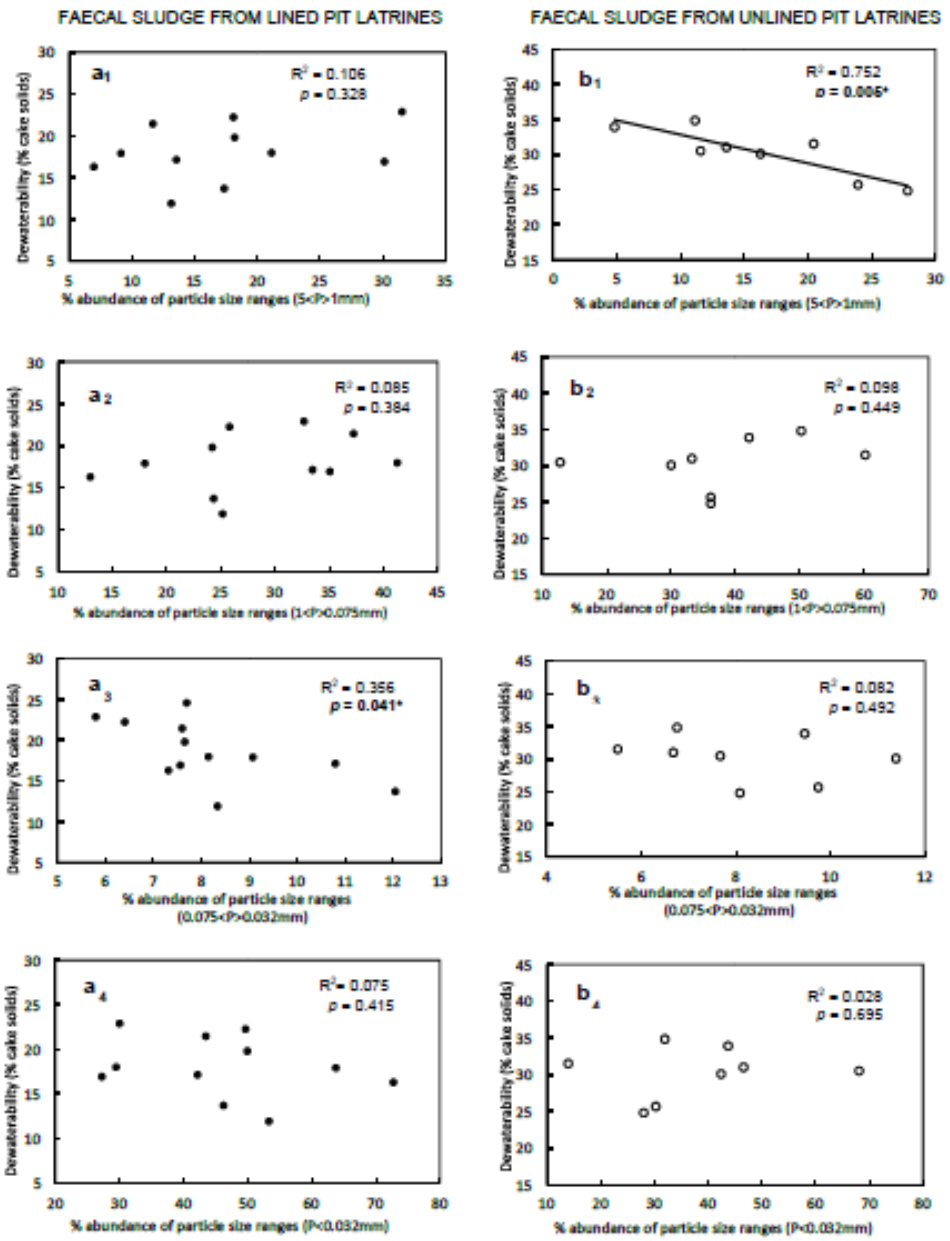
Particle size distribution



Relating dewaterability extent to FS characteristics

FS type		TS	EC	COD	TVS/ protein	Sand content
FS from lined pit latrine (n=11)	R^2	0.001	0.030	0.024	-0.459	0.719
	p	0.907	0.590	0.631	0.016*	0.001*
FS from unlined pit latrine (n=7)	R^2	0.768	0.172	0.156	0.010	0.269
	p	0.004*	0.307	0.333	0.815	0.188

Understanding Dewaterability of faecal sludge from slums



- Increasing size proportions of particles has no effect on dewaterability extent
- High dewaterability in unlined PFS < 1 mm

- Reduction in compressibility to improve porosity/rigidity
- TVS/ crude protein related to low dewaterability extent.
- Reflection of sludge structure which hold water (EPS)
- Modifications by use of physical conditioners

Use of physical conditioners

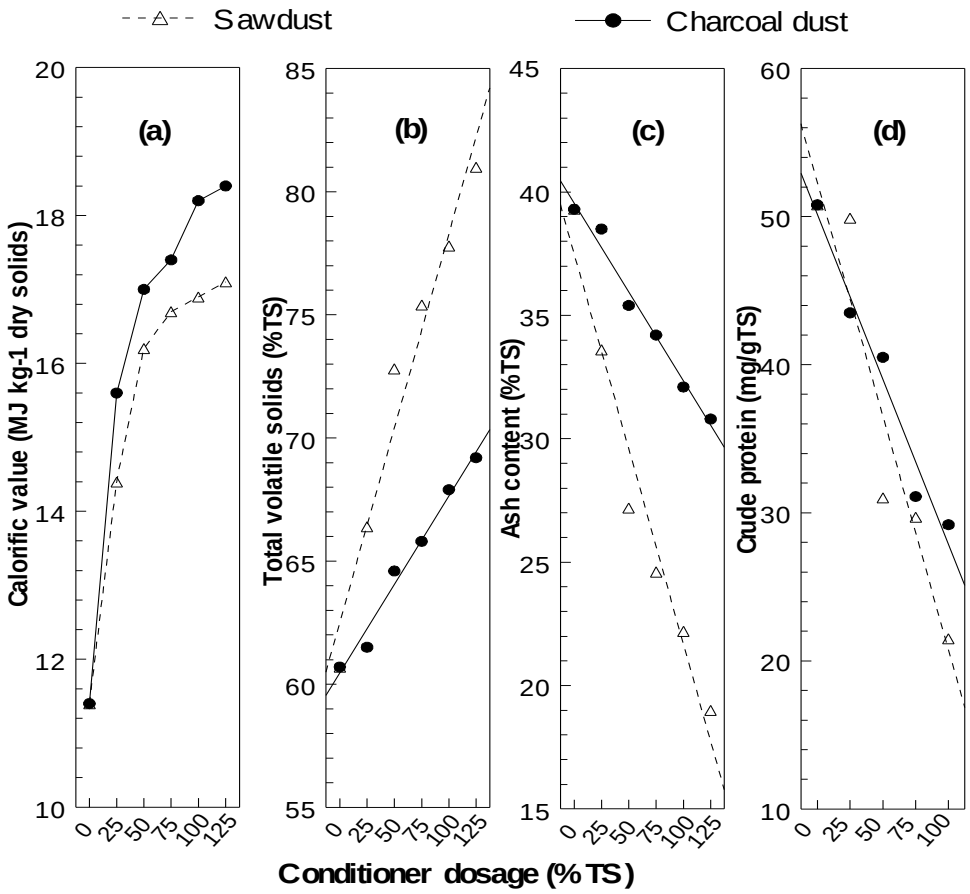
Sawdust and Charcoal dust used as physical conditioners.

- Availability in slums or vicinity
- Low or no cost
- Enhance end-use potential

FS from lined pit latrines considered

Use of physical conditioners

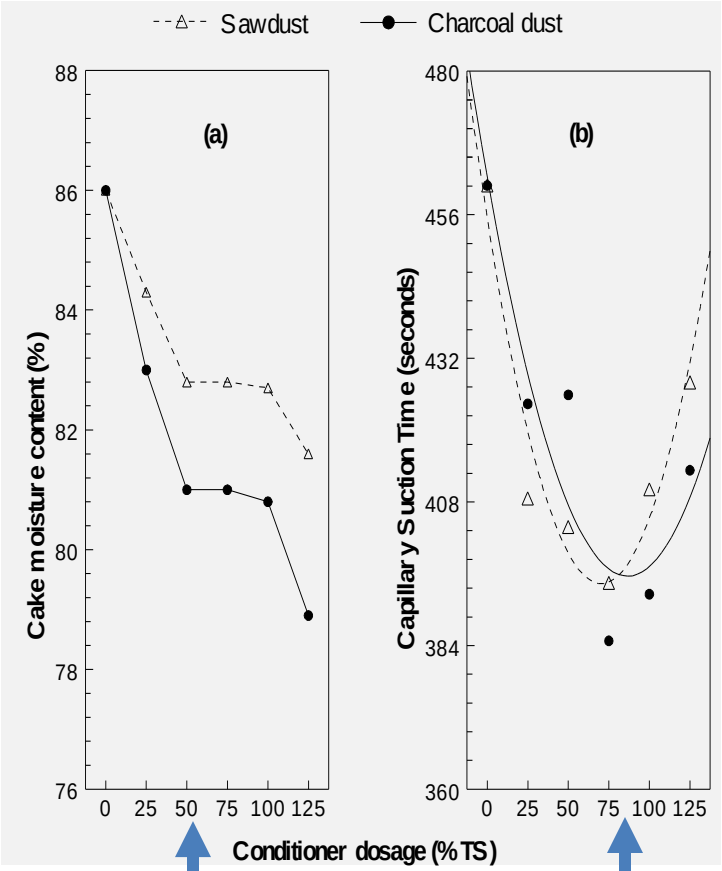
Conditioner dosage and FS characteristics



Cake moisture Vs crude protein

	*R*2	*p*
Sawdust	0.92	0.009
Charcoal	0.96	0.004

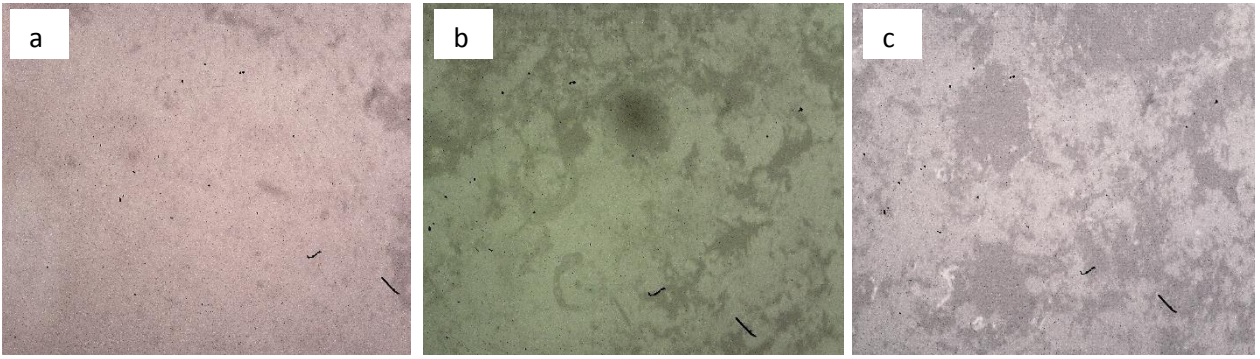
Conditioner effect on dewatering extent and rate



	Sawdust	Charcoal
% cake solids increase	22.9%	35.7%
Dewatering rate increase	14.3%	15.8%

Use of physical conditioners

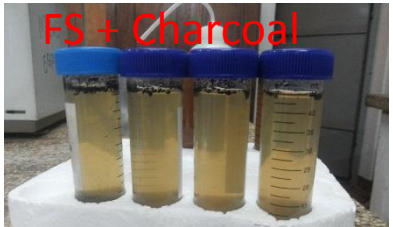
Conditioned FS micro-structure (Mg X 100)

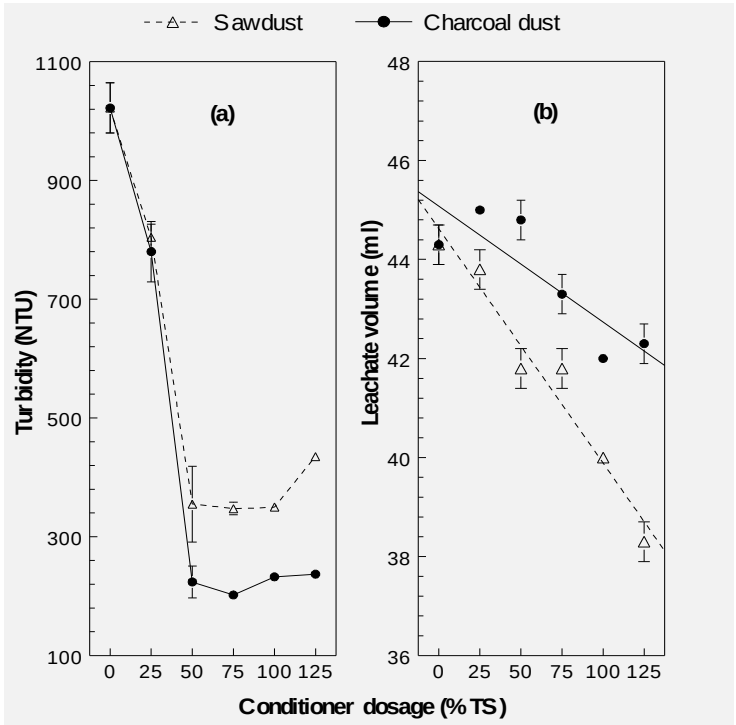


Raw FS | FS + Sawdust | FS + Charcoal

Cake porosity improved through pore formation

Leachate production





Linear regression (Cake moisture and leachate volume)

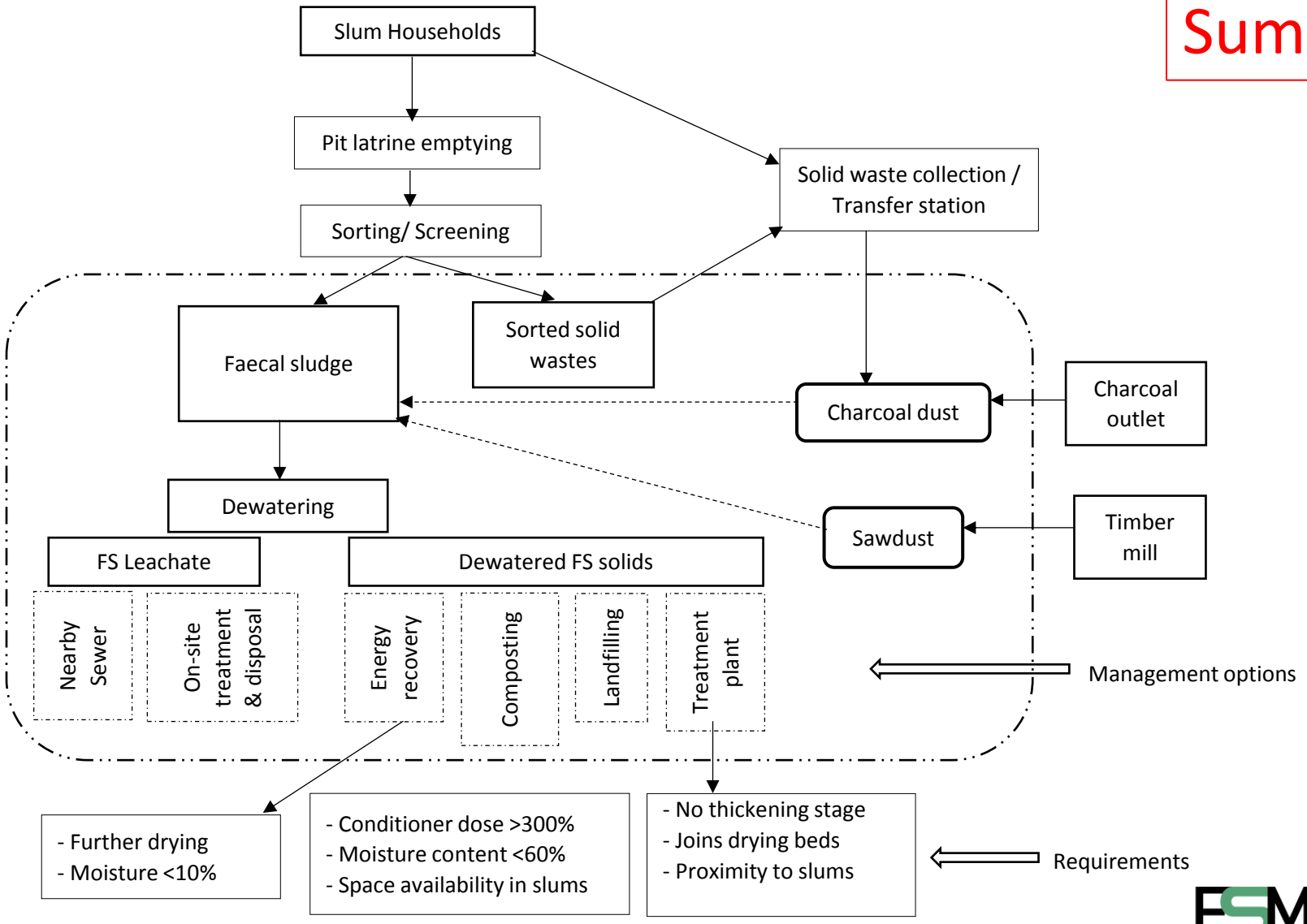
	R2	p
Sawdust	0.89	0.000
Charcoal	0.56	0.005

Dewaterability extent governed by;

- absorption in sawdust
- Rigid structure creation

Implications to FSM in urban slums

Summary



DECENTRALIZED FSM IN SLUMS

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