Comparing Ion Exchange and Electrochemical Nitrogen Recovery from Source-Separated Urine

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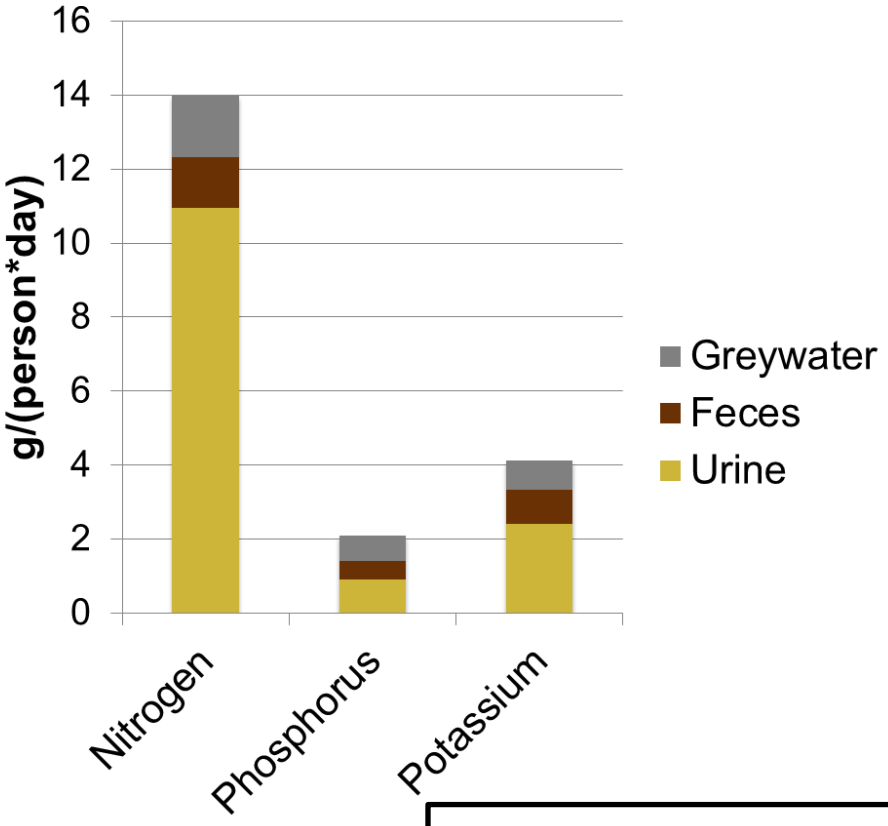
Introduction



- Urine: majority of nutrients
- Extract nitrogen as ammonia
- Create fertilizers or disinfectants

Problem parameters

Dependable, efficient N recovery

Urban scaling

Minimal behavior change

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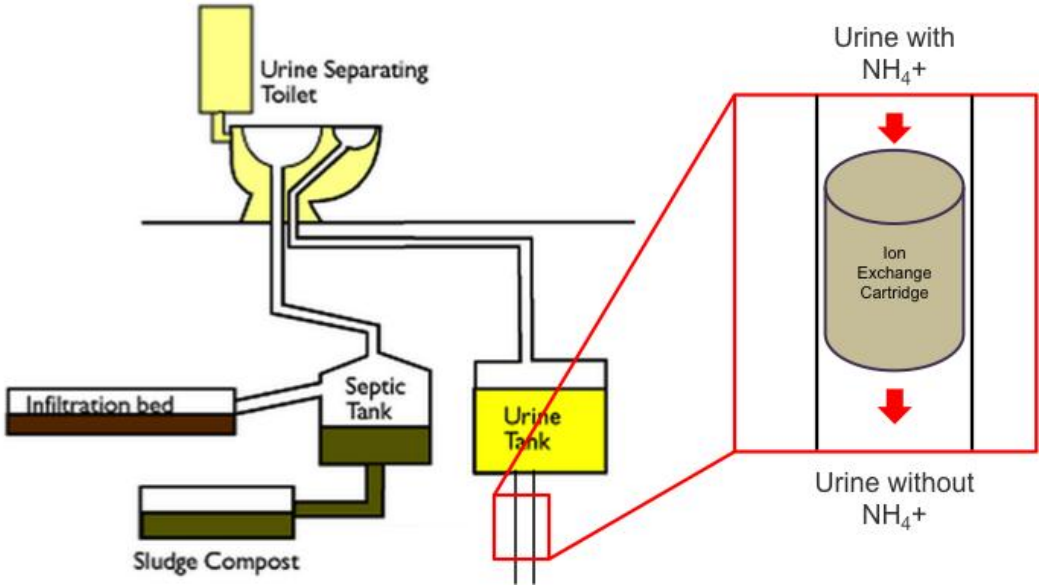
Technology 1: Ion Exchange Cartridges



Ammonium Solution
NH_4Cl

→

Synthetic Urine
$(NH_4,K,Na)Cl$

→

Real Urine
$(NH_4,K,Na)Cl$ + COD

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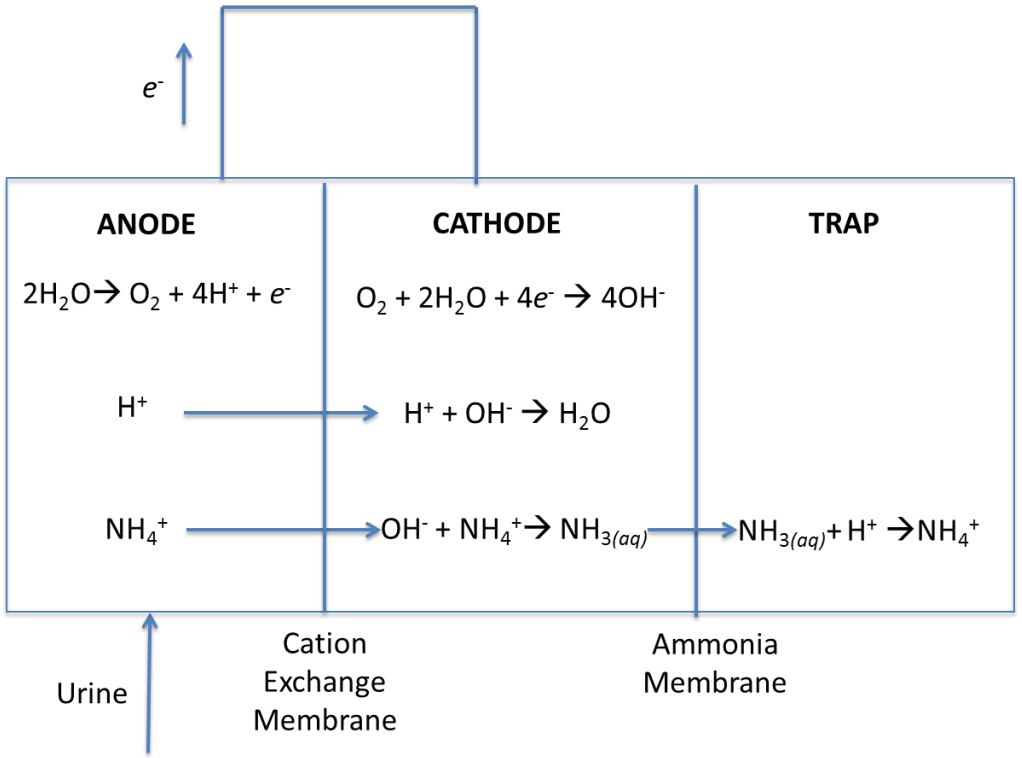
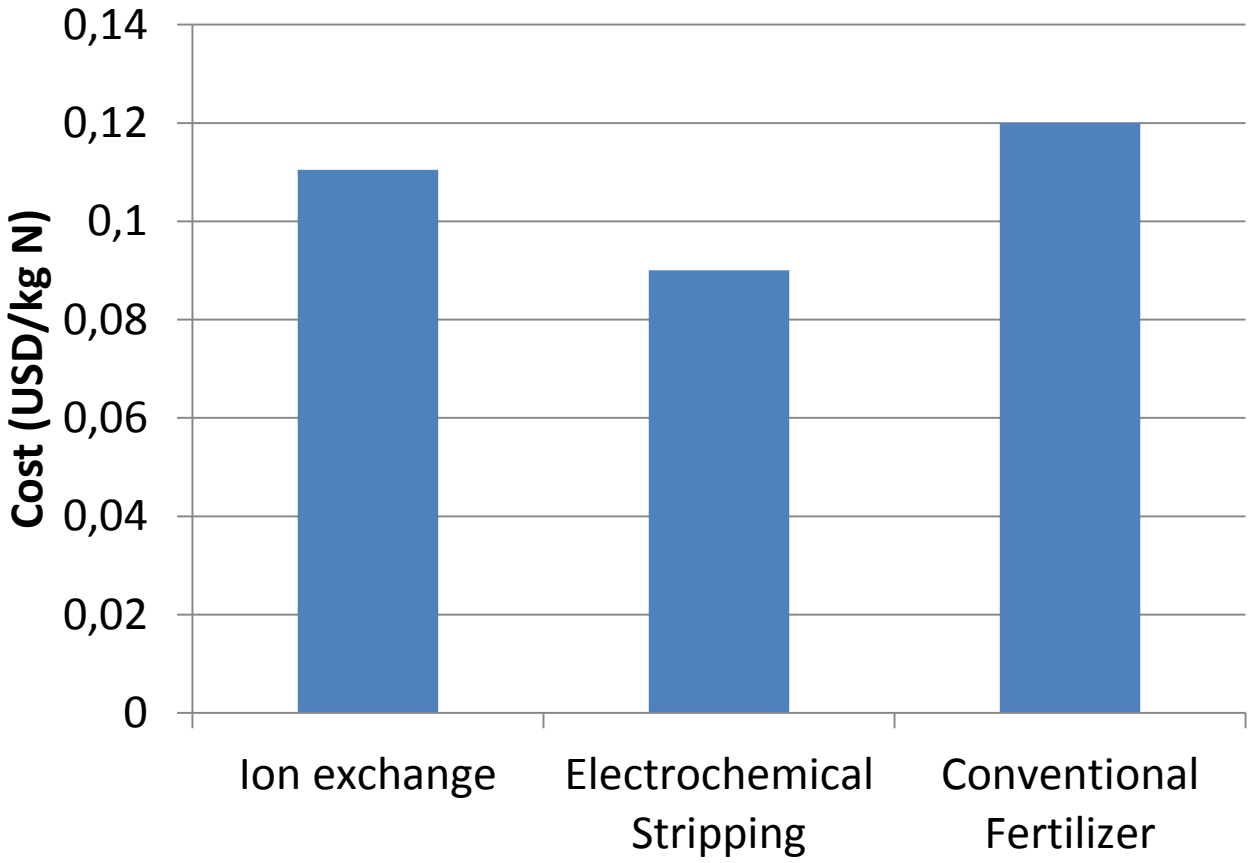
Technology 2: Electrochemical Stripping



Ammonium Solution $(NH_4)_2SO_4$ → Synthetic Urine $(NH_4,K,Na)_2SO_4$ → Real Urine $(NH_4,K,Na)_2SO_4$ + COD

Technology Comparison



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Preliminary Conclusions and Future Work

Preliminary Lab Data

Secondary Market Data

Electrochemical stripping is more cost-competitive than ion exchange in Kenyan context

<u>Future Work</u>

More realistic urine solutions

Field trial performance

Primary market assessment

Life-cycle assessment

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