



TECHNOLOGIES FOR URINE TREATMENT AND REUSE

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Environmental Engineering

SANITATION^{360°}



Collection and Storage



Urine **smells** after a short storage time

Transport & Application



Putting things in perspective!

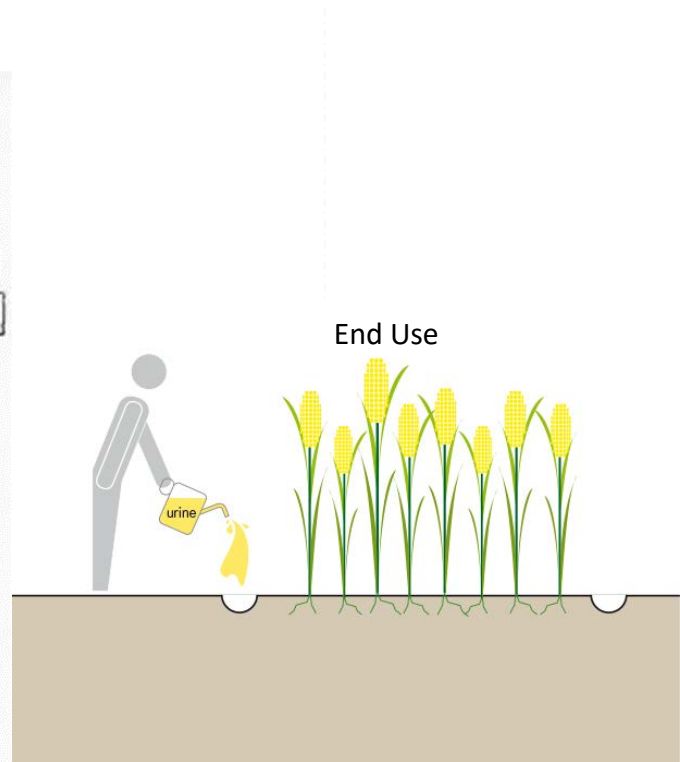
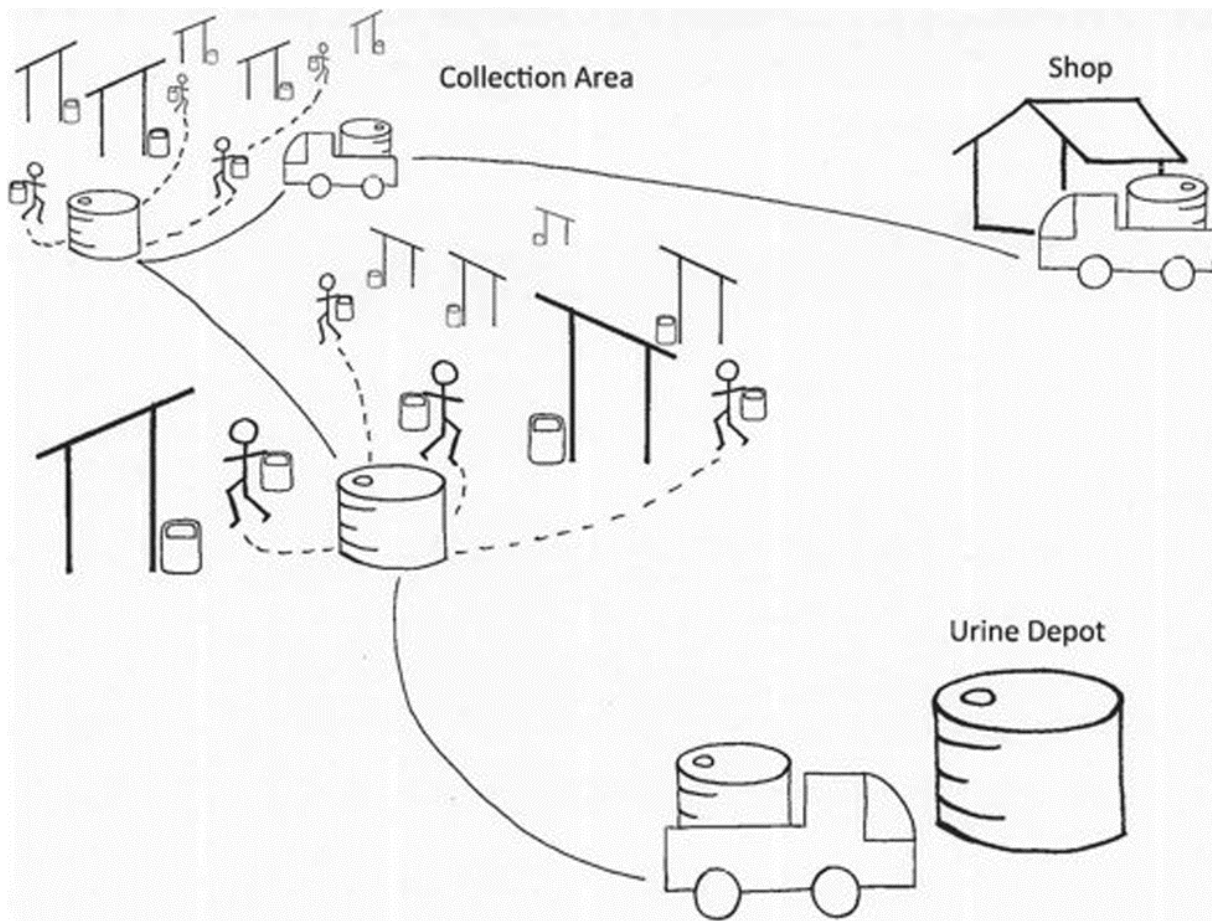


To Fertilize 1 ha land with 90 kg of N

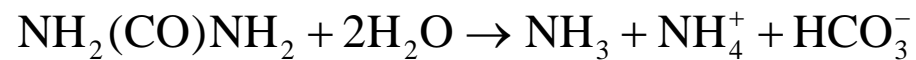
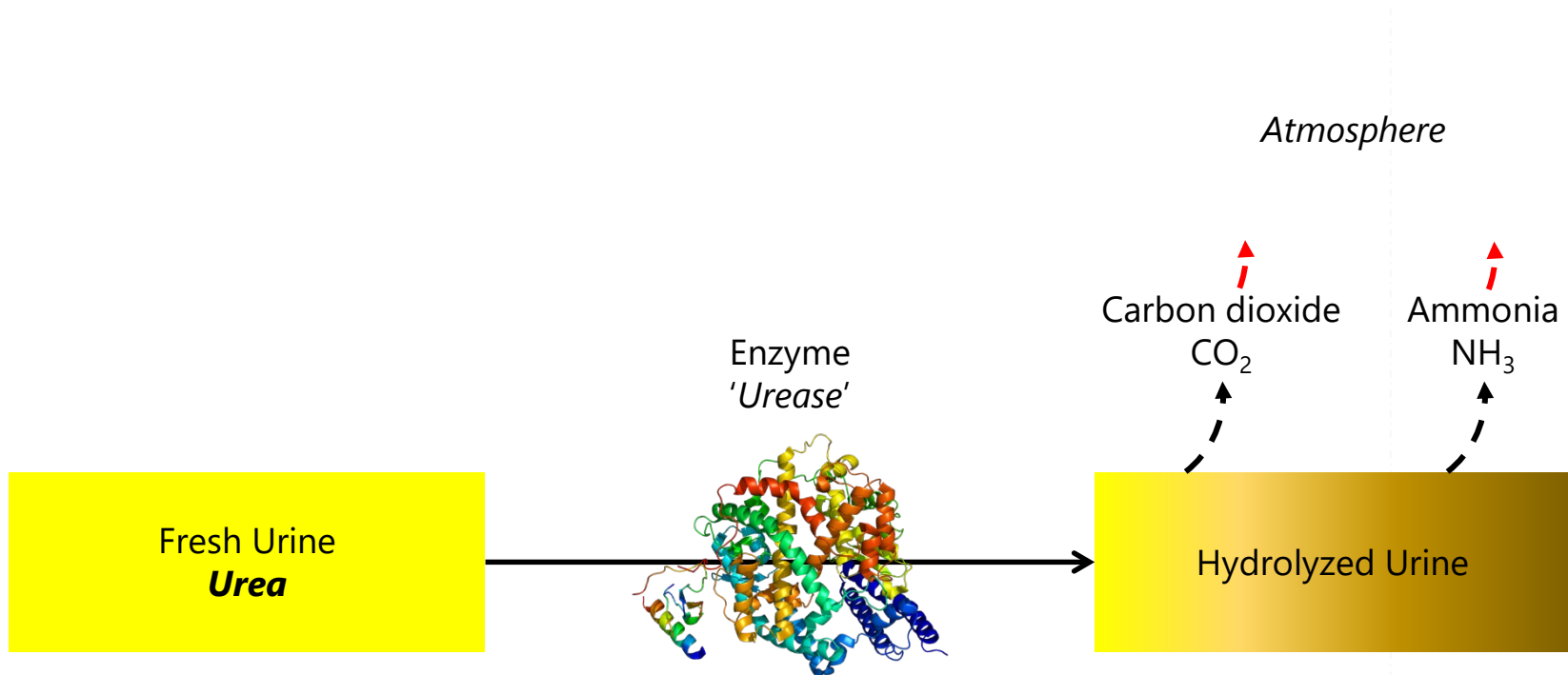
196 kg
UREA (**46% N**)

15,000 kg
URINE (**0.6% N**)

Transport & Application



Challenges: Collection & Storage



Our UD Research over time



- Technical function Sweden; 1994-
- Composition and generation; 1998-
- Chemical activities in system; 1998-
- UD in developing countries; 2000-
- Pathogens in UD systems; 2002-
- Urine Dehydration; 2006-



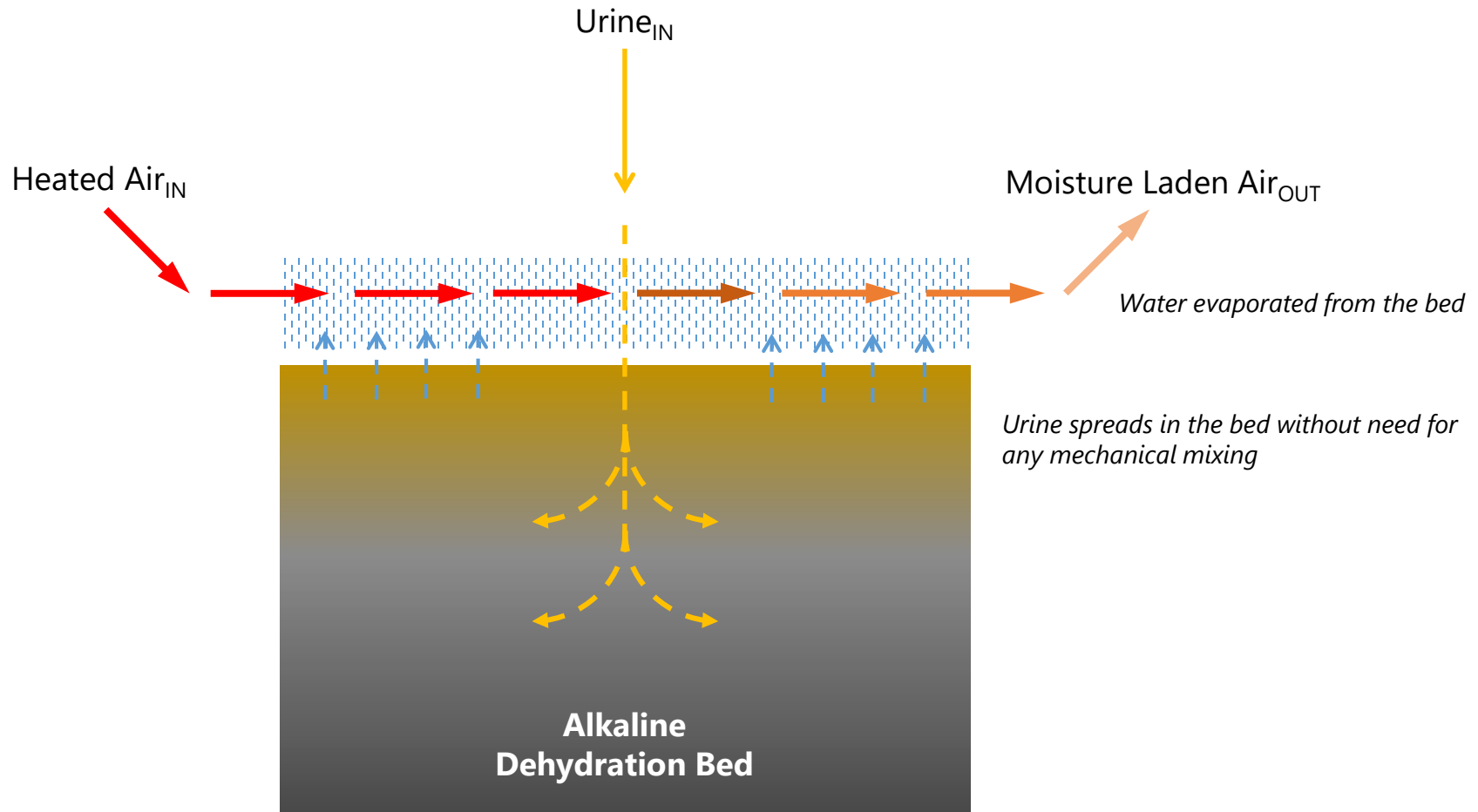
Current Focus: Urine Dehydration



Research Objectives

1. On-site treatment
2. Nitrogen Recovery ($> 90\%$)
3. Volume Minimisation (Water Removal $> 90\%$)
4. End product ($> 15\%$ N)
 - Dry concentrated fertilizer

Alkaline Dehydration of Urine



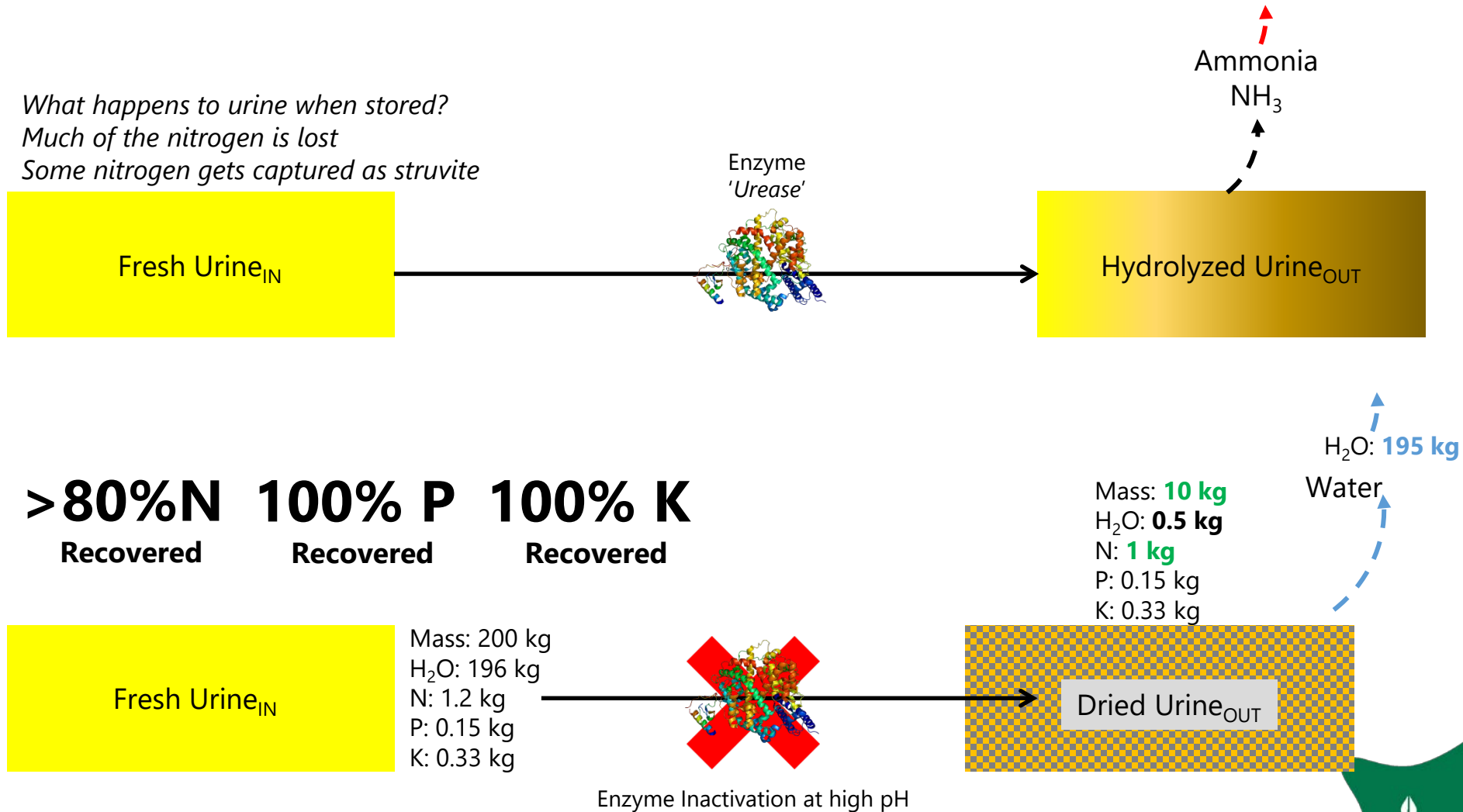
**Blocking the *Urease* enzyme through alkalinity (high pH)
Stabilization and Dehydration of Urine**

Why Dehydration makes sense?



Mass and Nutrient Balance

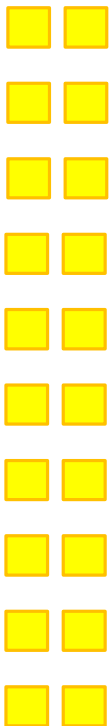
What happens to urine when stored?
 Much of the nitrogen is lost
 Some nitrogen gets captured as struvite



Why Dehydration makes sense?



20 kg
0.6% N



1 kg
>15% N



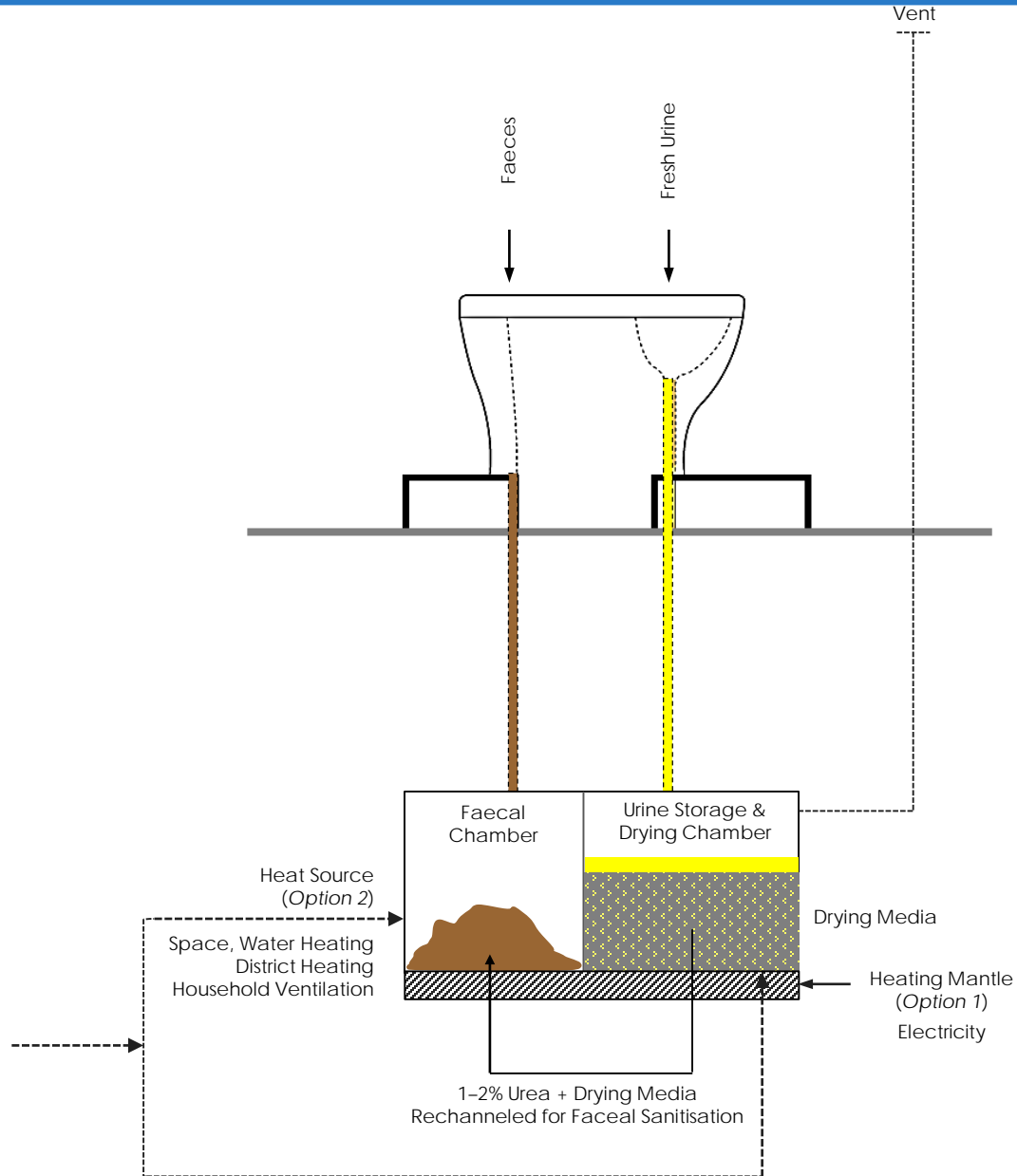
Dried
Urine

20 times
VOLUME REDUCTION

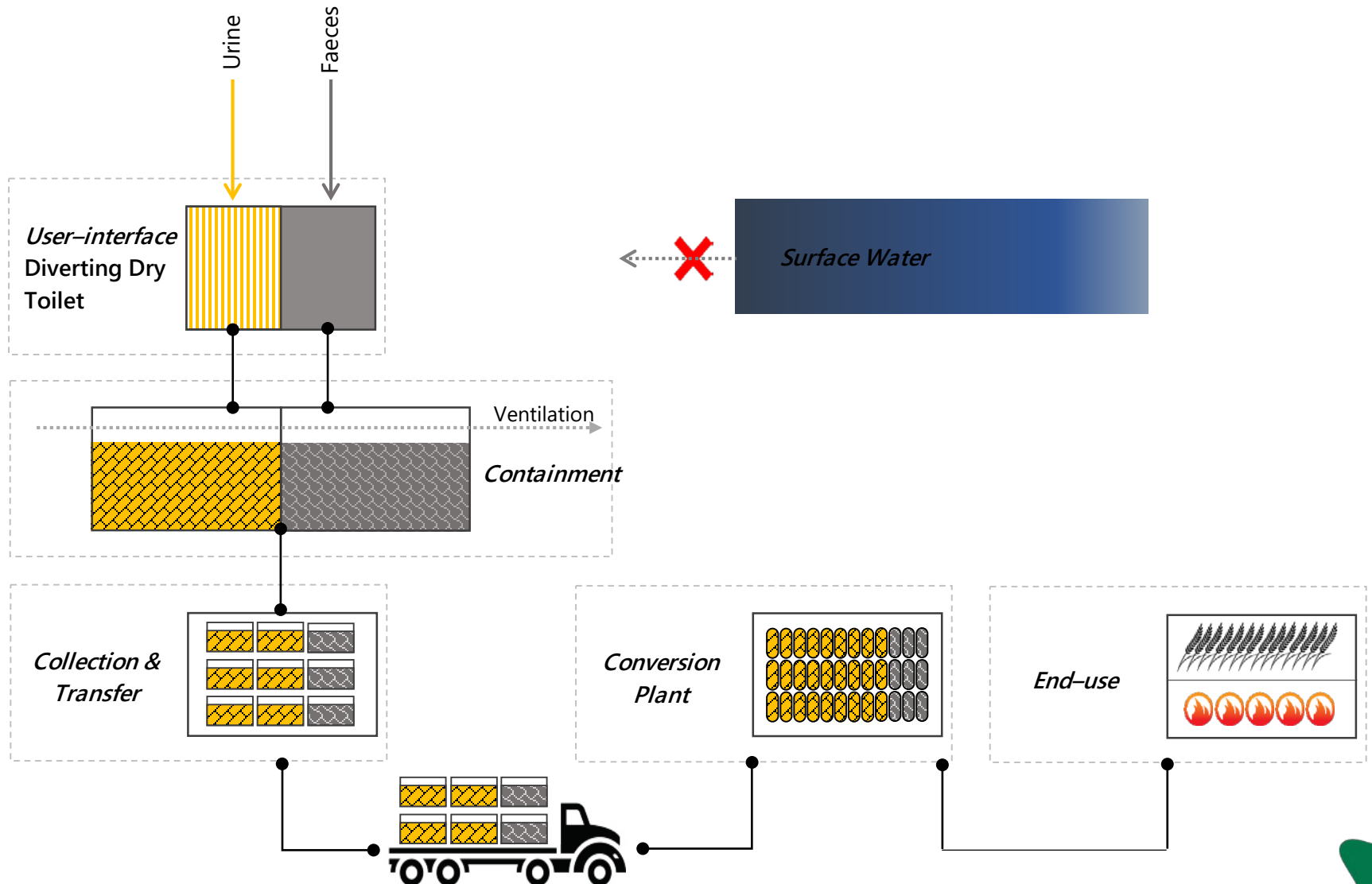
25 times
NITROGEN CONCENTRATION

Liquid Urine

A New Toilet Design



A New Sanitation Chain



Current Research: PhD Candidates



JENNA SENECAI

- System Hygiene Aspects
- System Functionality
- Cold Climate Sanitation



PRITHVI SIMHA

- Drying technologies/Process Engineering
- Process Simulation and Optimisation
- Upscaling and Intensification

THANK YOU FOR YOUR ATTENTION

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