

# Nutrient (re)cycling from human urine

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## Why recycle human urine?

- Rich source of plant nutrients: 90% nitrogen (N) and 60% phosphorus (P) excreted by humans in urine fraction
- Phosphorus scarcity: unknown remaining rock-phosphate reserves. Need for alternative P fertilizers
- In developing countries, recovery of nutrients with fertilizer market value could trigger implementation of salubrious sanitation systems

## Aim of MSc project

Evaluation of two urine based fertilizers (UBF), SNUS and struvite as potential valuable recycling fertilizers. N & P plant uptake investigated with isotopic tracers <sup>15</sup>N & <sup>33</sup>P

## M & M + Results: How were both fertilizers produced and evaluated?

### 1/ Production of synthetic urine & labeling with <sup>33</sup>P + <sup>15</sup>N

#### Struvite

- Magnesium ammonium phosphate
- Processing: precipitation + filtration
- Aim: recover all urine phosphate ions and a fraction of urine-N
- P fertilizer

#### SNUS

- Synthetic Nitrified Urine Solid
- Processing: nitrification + distillation
- Newly developed by eawag, 1<sup>st</sup> time tested as plant fertilizer
- Aim: recover all urine nutrients
- Complete fertilizer rich in N

### 2/ Processing into struvite & SNUS

### 3/ Test UBFs in plant growth study

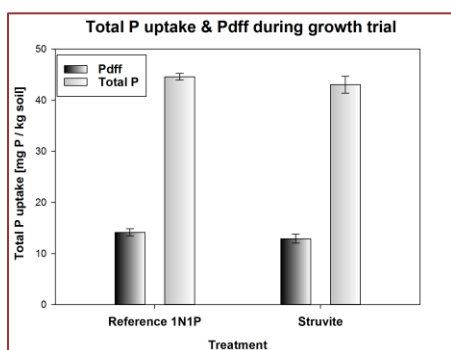


Fig 1: Struvite-P and water soluble  $\text{KH}_2\text{PO}_4$ -P taken up in equal amounts by plants. Pdf = P derived from the fertilizer

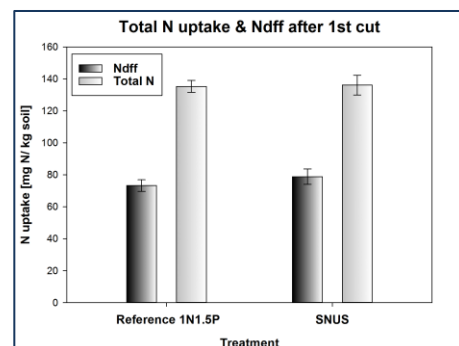


Fig 2: SNUS-N and water soluble  $\text{NH}_4\text{-NO}_3$ -N were recovered in same amounts by plants, Ndff = N derived from the fertilizer

### 4/ Evaluate UBFs in terms of N & P fertilizer recovery

## Conclusions

- Struvite: efficient slow releasing P fertilizer
- SNUS: similar N supply as reference N fertilizer
- Both UBFs are valuable N & P recycling fertilizers
- Further studies necessary on other soils & crops.



Fig 3: Struvite powder before soil application



Fig 4: Rye grass as test plant for growth trial