Nitrified Urine Fertilizer: A Transdisciplinary Approach to Solutions-Oriented Community Development

Mercator Research Program Call 5
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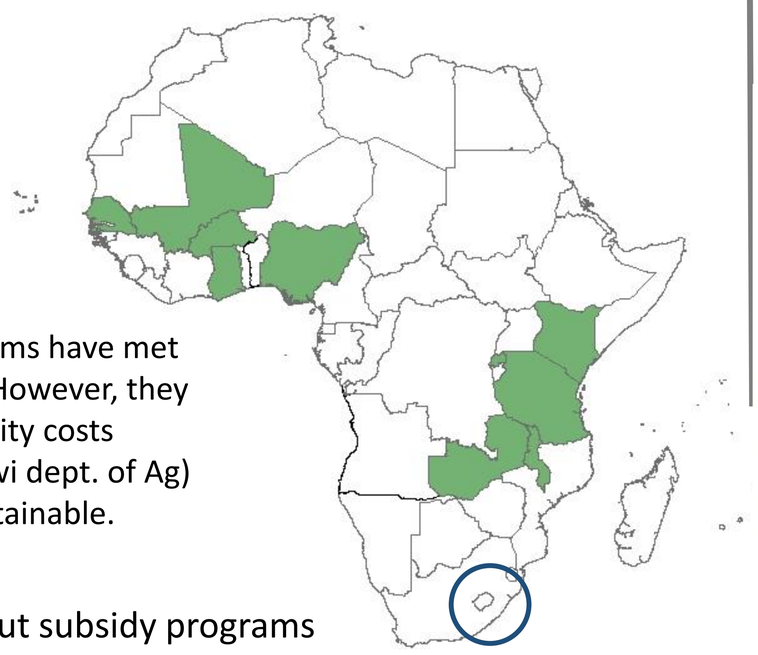
Food System Relevance

Poor soil fertility is a leading biophysical cause of food insecurity in Africa. This research is focused on assessing the biophysical and social implications of utilizing nitrified urine as a sustainable fertilizer source to ameliorate this development challenge.

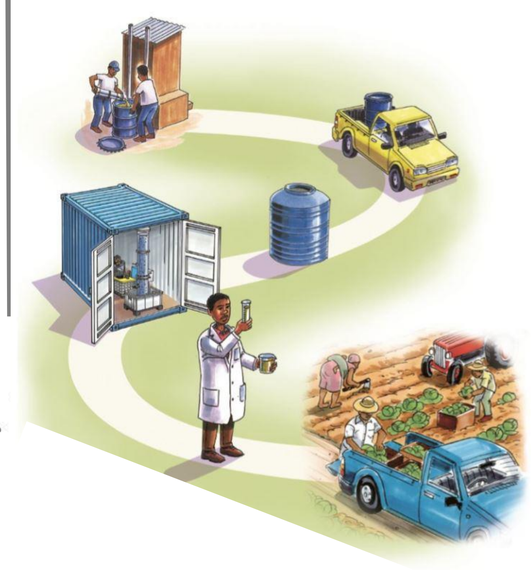
Existing Solution:
Fertilizer input subsidy programs are employed extensively across Africa to combat food insecurity.



Input subsidy programs have met with some success. However, they incur large opportunity costs (54.4% of the Malawi dept. of Ag) and are likely unsustainable.

Can innovative sanitation technologies play a role in providing alternatives to chemical fertilizer inputs in order to improve soil fertility in Africa?

NUFSOC builds on VUNA, a recently completed research project that sought to "develop a new and improved sanitation system that allows for nutrient recovery from urine in order to promote sanitation." A key product of this research was the successful development of Nitrified Urine Fertilizer (NUF). The final product differs from raw urine in three critical aspects:



- Nitrogen stable
- Hygienically Safe
- Reduced Pharmaeuticals

Ion	Concentration
Nitrogen (N)	50 g/L
Phosphorus (P)	2.1 g/L
Potassium (K)	15 g/L
Sulphur (S)	1.6 g/L
Calcium (Ca)	0.4 g/L
Sodium (Na	25 g/L
pH	3.7

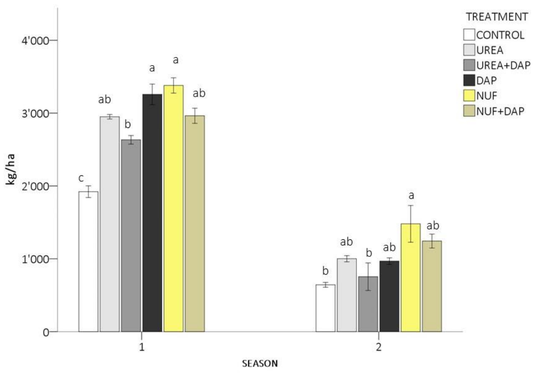
https://www.eawag.ch/en/department/eng/projects/vuna/

Results

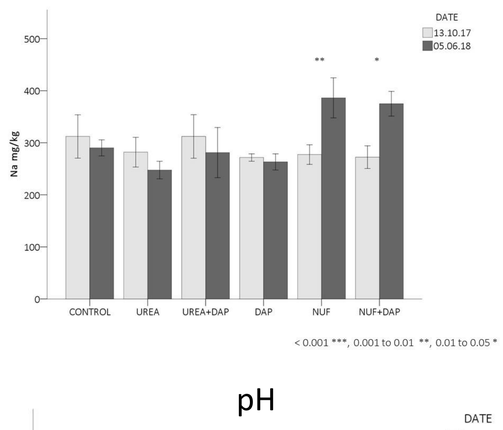
Biophysical Research

Objective: to assess the field-scale performance of NUF

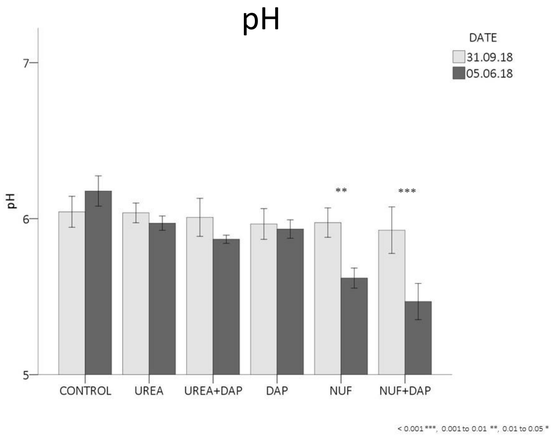
Maize Yield



Sodium



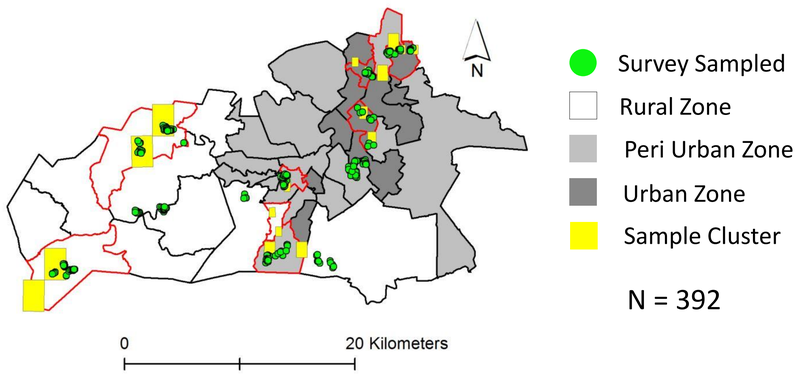
pH



Social Research

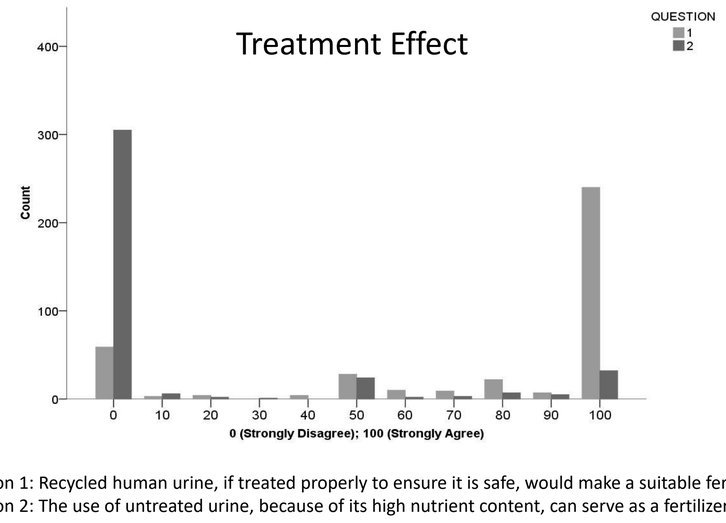
Objective: to assess consumer attitudes towards food grown with recycled nutrients

Msunduzi Municipality



N = 392

Treatment Effect



Question 1: Recycled human urine, if treated properly to ensure it is safe, would make a suitable fertilizer.
Question 2: The use of untreated urine, because of its high nutrient content, can serve as a fertilizer for food crops.

SOURCES OF CONTINUED CONCERN

Conclusions

- NUF improved maize yields by 76 % (S1) and 130 % (S2) compared to the unfertilized control. In addition, NUF performed as well as the chemical fertilizers utilized in this trial, demonstrating the potential of NUF to serve as a replacement to imported chemical fertilizers.
- Sodium accumulation and a reduction in pH were associated with the NUF fertilized plots, indicating that long term application of NUF could have negative consequences for soil health.
- The treatment of raw urine into NUF dramatically improved attitudes towards the use of recycled nutrients, indicating that recycled nutrients are looked upon more favorably than raw waste within Msunduzi.
- Continued concern about adverse health effects was the major reason cited by respondents who did not express a change in attitude due to the treatment process.

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