

# Struvite Recovery in Kathamandu: A business model for increased food security

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Siddhipur is a peri-urban farming community in the Kathmandu valley with over 100 urine-diverting dry toilets. The feasibility of collecting urine for struvite production has been investigated.

## Fertilizer

Rising energy prices affect the price of food as well as fertilizers: a double hit for poor, rural farmers. In 2007 the price of fertilizer rose over 700%. Nepal must import all of its fertilizer: mostly from China and India.



## Urine

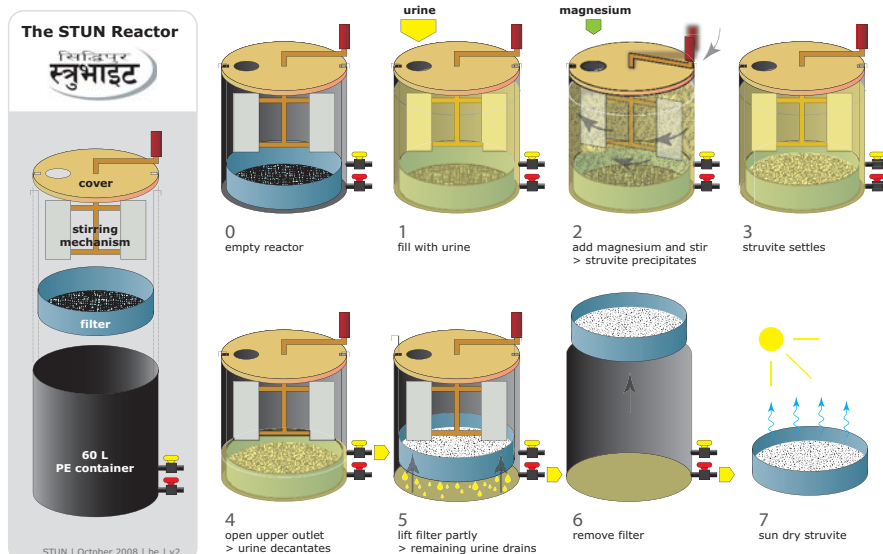
Urine is a natural fertilizer; it contains about 80% of the nitrogen and 50% of the phosphorus that humans excrete. It can be harvested from urine diverting toilets and used directly or processed into a solid powder: struvite



## Struvite

Struvite is magnesium ammonium phosphate ( $MgNH_4PO_4 \cdot 6H_2O$ ): a bioavailable fertilizer. Struvite may form naturally in urine, but its precipitation can be forced by adding magnesium. The reaction is quick (ca. 10 minutes) and the precipitate can be collected and dried: the smaller volume, lighter weight, constant composition and lack of smell make struvite a more attractive option to spreading raw urine.

Urine and magnesium (bittern) are mixed in a 50L reactor using a hand crank. After 10 minutes, the struvite precipitates and is collected on a filter. The reactor and filter are made of local materials and the reactor requires no electric energy.



## Business Model

Currently, the urine is collected from homes with two 20L jerry cans on a bicycle; 400L can be collected per day. Long term business models proposed are:

- free market where urine/struvite is bought and sold centrally
- payment to collector for emptying
- free collection and payment for urine

Struvite could be sold for 43 NRp/kg; the costs to produce struvite are minimal, save for capital and transport costs which must be minimized still for full cost recovery

## Challenges and Opportunities

Increased urine volume and improved filtering are required to generate a higher return; an affordable Mg source is required for economic sustainability. Effluent treatment though irrigation remains promising. Public toilets and urinals may be important sources of urine; the technology will be tested and managed in different applications in the coming year.

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