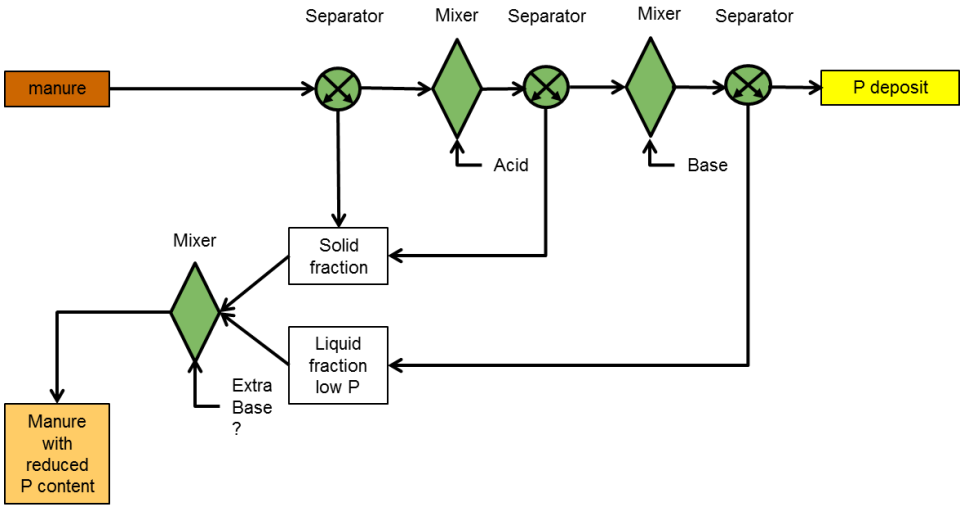
Phosphorus recovery from animal manure

INTERREG IVB

The Biorefine project aims to provide innovative strategies for the recycling of inorganic chemicals from agro- and bio-industry waste streams. The project is financed via Interreg IVB
http://www.biorefine.eu/

Introduction The manure surplus in the Netherlands is about 25% of total manure produced, expressed in mass of phosphate. The other 75% can be applied on agricultural land in the Netherlands, within the current nutrient application standards. The surplus is mainly produced on pig farms that own little land, and has to be processed into secondary fertilizer and/or exported. Costs of manure processing and export are high, so new, simple and cheap innovative techniques are requested. Laboratory experiments were done to explore such techniques. Main focus was to lower pig slurry P content with 25%, thus contributing to a decrease in the contribution of pig breeding to the manure surplus.

Methods Pig slurry, or its digestate, was separated by centrifugation at different speeds into a liquid and a solid fraction. Acidification to a range of final pH was applied on either these fractions or on unseparated slurry, in order to solubilize P. Subsequent neutralisation of the acidic solutions caused precipitation of the released P. As an alternative, by adding Mg salts to the slurry liquid fraction, Mg-P salts could be precipitated directly and removed by filtering (see figure). Costs of chemicals needed were estimated for different slurries and experimental conditions.



Example of scheme showing how pig slurry is separated into a liquid and a solid fraction. Acid is added to the liquid phase, that is mixed and separated again into a solid and a liquid fraction. Solid fractions are combined, and base is added to the liquid fraction from which a P deposit is separated for reuse. A liquid fraction remains that can be combined with the solid fractions into manure with a lowered P content.

Results Large differences were found in amount of P extracted from fractions of different slurries; the amount of acid needed for acidification was strongly influenced by the contents of dry matter, ammonium and bicarbonate of the slurry fractions. The cost of chemicals needed are expected to be less than 5 €/ton pig slurry in this explorative study. For the possibility to decrease slurry P content by 25 %, the proof of principle was given, and now research at larger scales has to be done. Also, end-users of the recovered phosphorus will set requirements on the quality of the products to be delivered, which will make process optimization necessary. Using this option of manure treatment less manure has to be exported, so more nitrogen and organic matter from manure can stay in The Netherlands.

Further reading O.F. Schoumans et al. (2014) Alterra Report xxx. [*link*]

ALTERRA WAGENINGEN UR

for more info contact :

Oscar.Schoumans@wur.nl
Alterra, Wageningen, The Netherlands