

Pilot to Paddock - Innovative on-farm water, energy and nutrient technologies and practices for Australian Dairy, Egg, Pork and Cropping industries



Australian Government
Department of Agriculture,
Water and the Environment



AUSTRALIAN EGG
CORPORATION LIMITED



Centre for Agricultural
Engineering



Queensland Government



Background

- On-farm technologies and practices are required to process wastes from agricultural production into products that enable beneficial reuse of water, energy and nutrient resources in the wastes.
- The value of products from waste processing also needs to be confirmed, as do their environmental credentials (e.g. greenhouse gas emissions) to support prospective markets for such products.

Novel solid-liquid separation of dilute manures

- The project tested a novel separation technology called the Z-Filter at large pilot-scale on a commercial dairy farm in the Scott River region, Western Australia. Z-Filter was originally developed in Australia.
- Measurements tested organic matter and nutrients recovery from dilute effluent into separated manure solids and tracked energy use and operational costs. Lime and cationic polyacrylamide flocculant were also tested as chemical aides to enhance the separation.



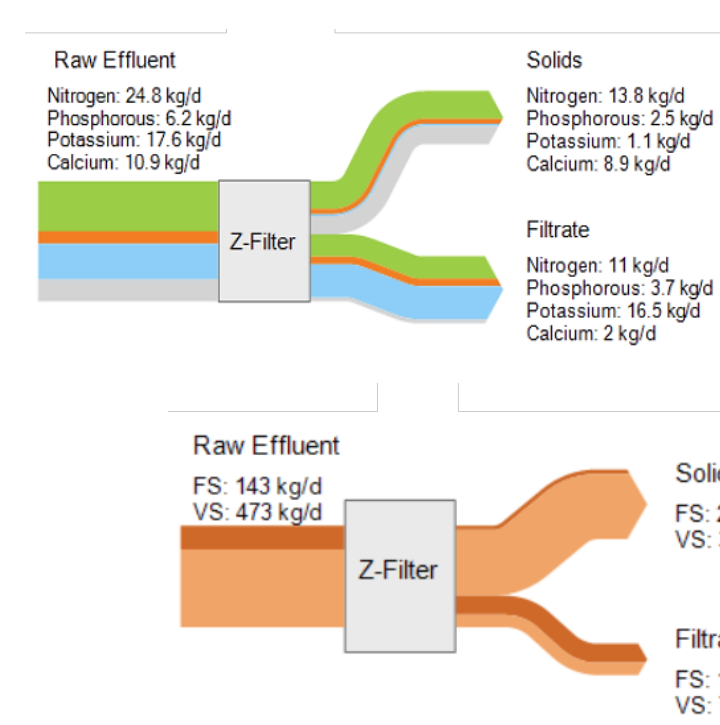
Dilute dairy effluent (0.5% dry matter)



Separated solids fraction, offsetting commercial compost



Separated filtrate, offsetting fertiliser use via land application

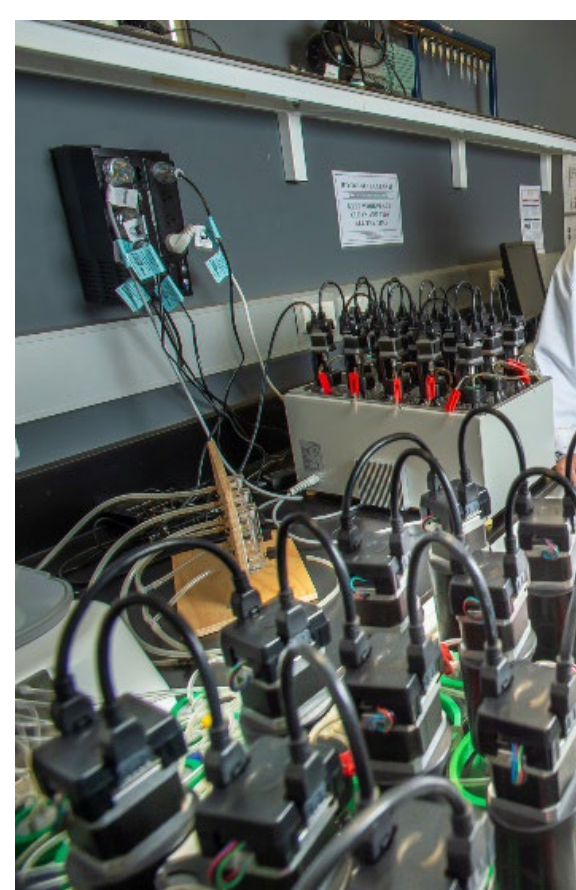


Up to 90% of phosphorus and organic matter recovered to solids fraction

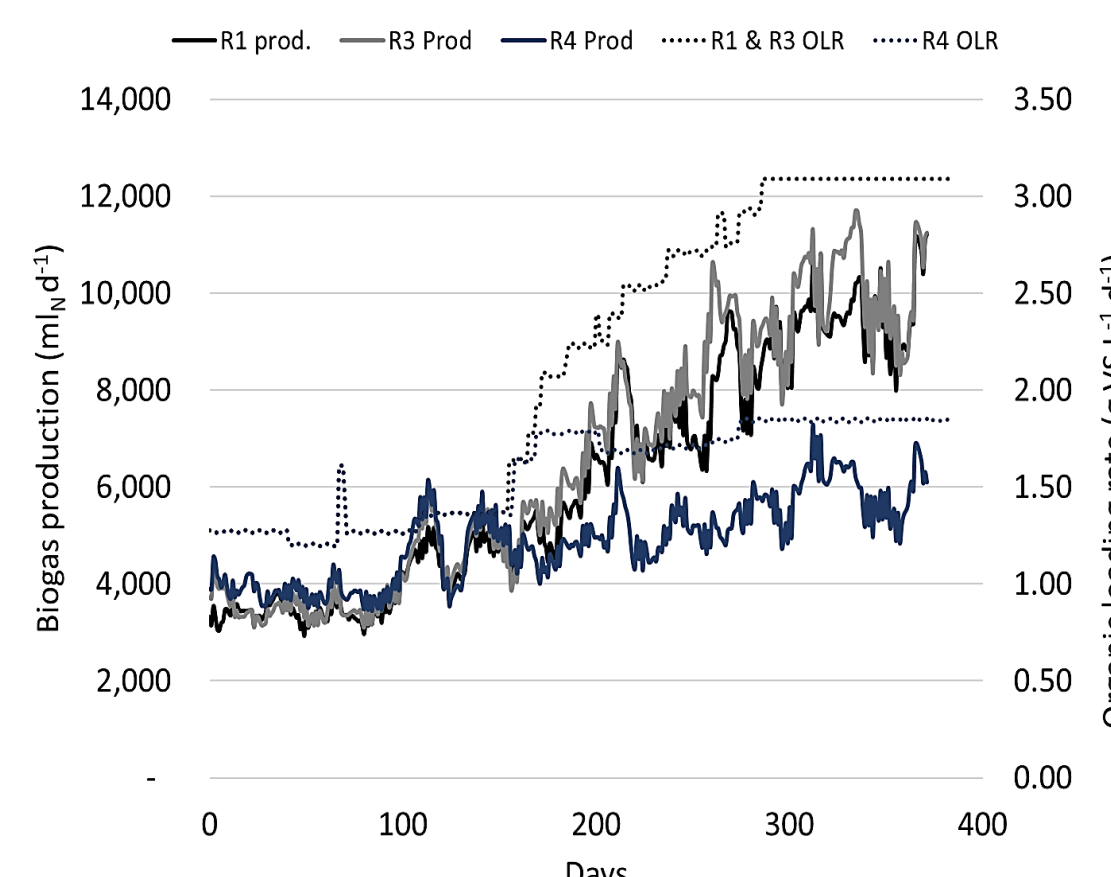
Payback period as short as 3.5 years, mostly due to displaced cost for commercial compost

Renewable biogas energy recovery from Australian dairy manure

- The subsequent conversion of recovered manures into renewable biogas energy by anaerobic digestion was also tested, to quantify energy yield and determine practical digestion conditions that increase energy recovery.



- The project measured batch biochemical methane potential for Australian dairy manure (a key data gap), found to be $\sim 150 \text{ m}^3_{\text{N}} \text{ tonne}_{\text{VS}}^{-1} \text{ fed.}$



- Targeted continuous digestion experiments identified conditions to enhance biogas production, and showed loadings of up to $3 \text{ tonne}_{\text{VS}} \text{ m}^{-3} \text{ d}^{-1}$ are realistic.

Outcomes

- Dilute effluent is an important dairy production waste. Separation of dilute effluent can enable beneficial reuse of nutrients and organic matter that is both cost-feasible and practical.
- Anaerobic digestion of dairy manure provides additional benefit in the form of biogas as a renewable energy source.