ravensdown

ClearTech

Award-winning effluent treatment system

The solution is clear

ClearTech® - the solution is clear


ClearTech
by ravensdown

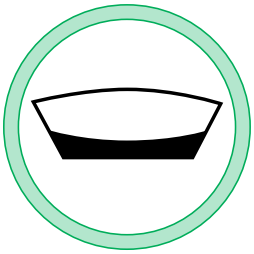
What is ClearTech?

A fully automated system for treating farm dairy effluent. ClearTech produces clarified water for recycling and reduces environmental risks from land application of effluent.

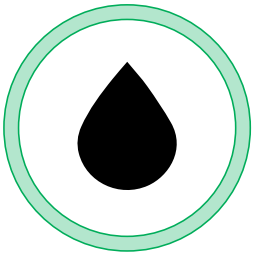
Intelligent technology automatically calculates and mixes the right amount of specifically formulated liquid coagulant to bind the fine effluent particles together.

The system can be configured for each farm and will be installed by a licensed installer in conjunction with Ravensdown's support.

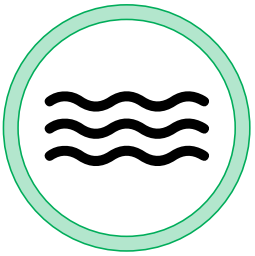
The patented technology can be retrofitted between a dairy shed and an effluent pond.



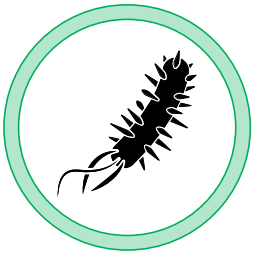
Financial
Increase pond storage capability



Environmental
Decrease risk of phosphorus leaching



Water
Reduce yard fresh water use by up to 2/3



Safety
Decrease risk of *E.coli* by up to 99.9%

Why ClearTech® is right for you

Need to get control of your effluent capacity and compliance headaches?

Do the right thing and save money doing it.

Save on effluent pond storage
- Double or triple your days of effluent pond storage capability
- Lower your risk of consent breaches and fines
- Improve timing of your effluent application
- Help to meet Farm Environment Plan (FEP) audit for storage

Save on phosphate
- Re-use the phosphate in effluent without adding to run-off risk
- Meet NZ dairy industry strategy
- Meet government strategy
- Meet public expectations

Save on compliance costs
- Renewing compliance with councils can be cheaper with a ClearTech system

Save on pumping and irrigation runs
- Reduce time shifting effluent irrigator - 75 fewer runs (Bowler, Dairy NZ)
- Less fresh water use means less water to pump

Like to know more about ClearTech?
Call us today on 0800 100 123, go to www.ravensdown.co.nz/cleartech or cleartech@ravensdown.co.nz

Award-winning technology

- **Winner; Agri Innovation Awards, South Island Agricultural Field Days 2019**
- **Winner; Science & Research Award, Primary Industry New Zealand Summit 2019**
- **Highly Commended; Fieldays® Innovation Awards 2019**

Winners Keith Cameron and Hong Di with the PINZ Science and Research award.

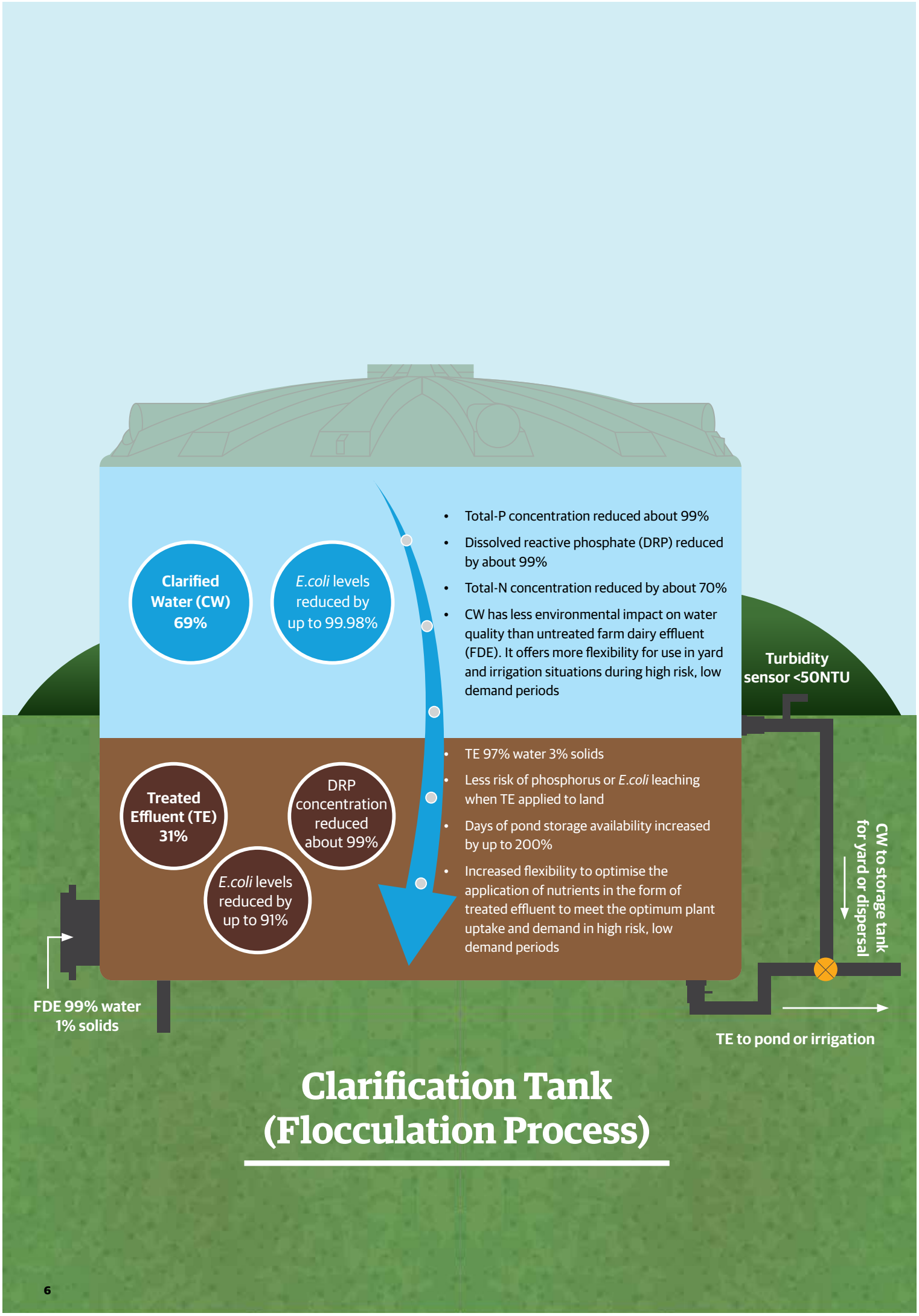
ClearTech® takes first prize

Ravensdown's ClearTech® dairy effluent treatment system has taken first prize in the South Island Agricultural Field Days' Agri Innovation Awards 2019.

The judges commented on the calibre of entrants across the Agri Innovation Awards and were impressed with the collaborative approach to the development of ClearTech. "The application of known technology, used elsewhere, to solve a widely recognised farm-scale problem was truly innovative. It was a bonus that ClearTech would also enhance our clean, green image."

Carl Ahlfeld, Ravensdown Product Manager, believes the development is important because "the dairy sector's nutrient and bacterial impacts on waterways are under scrutiny, farmers want to demonstrate they are doing the right thing and the government and regional councils are committed to good farming practice."

Ravensdown Product Manager Carl Ahlfeld with the ClearTech demonstration unit.



Clarification Tank (Flocculation Process)

How does ClearTech® fit into your existing effluent system?

ClearTech is designed to run parallel with your existing effluent system.

The system collects and uses effluent from most dairy shed configurations and requires fresh effluent (1-3 days) to best utilise the efficiency of the clarification process.

Effluent from the dairy yard backing gate, flood wash or hand-held hose washes, via a stone trap or wedge, into a sump or saucer. The sump or saucer should ideally be 10-30,000L capacity. The ClearTech system draws the effluent by sump pump into the clarification tank.

The clarification process takes around three to four hours and, once the settling process has completed, the clarified water is then pumped into a storage tank ready for use to clean the yard at the next milking. The remaining treated effluent is pumped to the pond or existing effluent configuration.

Quality you can rely on.

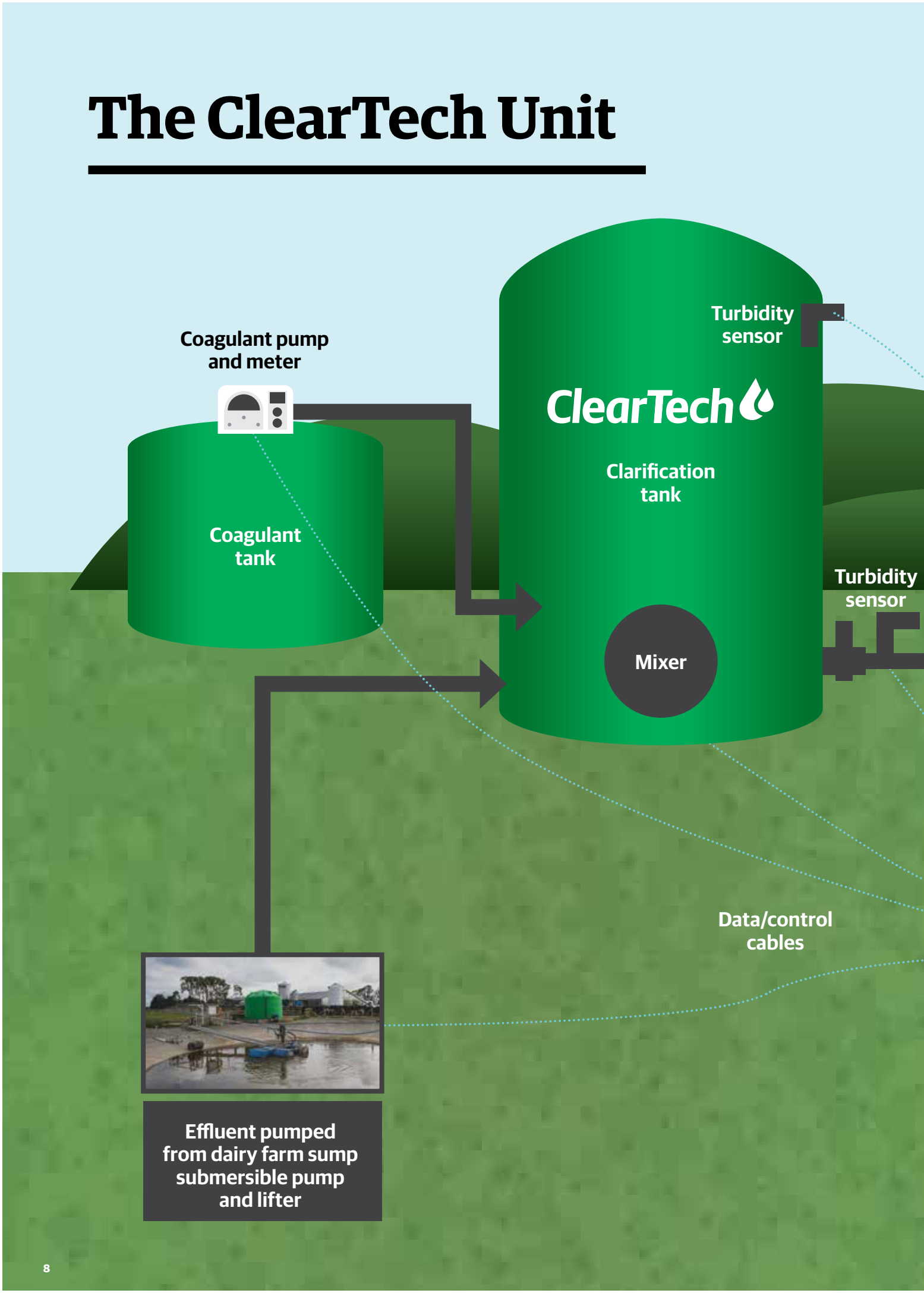
Made from high-quality components and workmanship, ClearTech gives you peace of mind operation in your effluent treatment system.

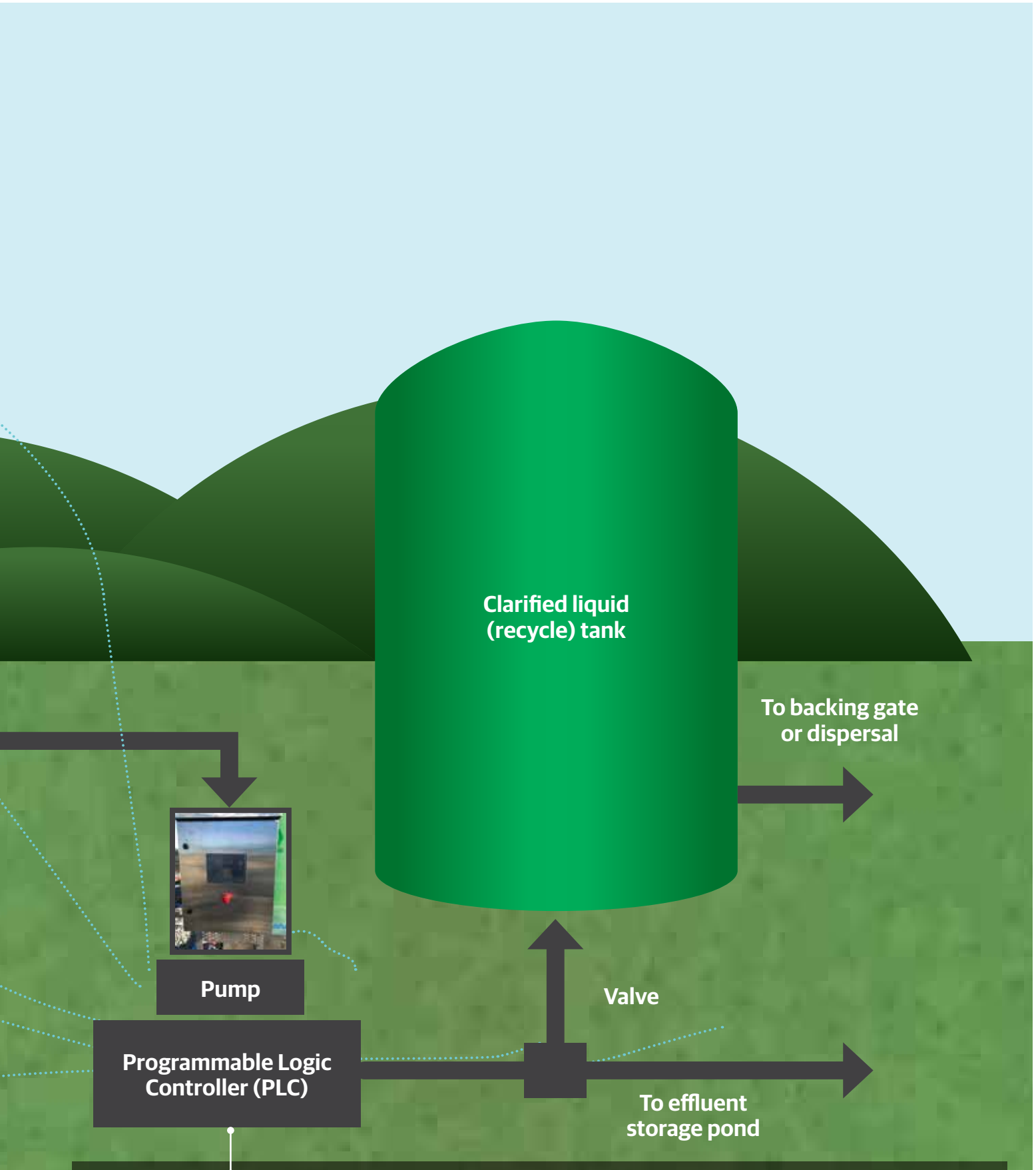
The system incorporates a Remote Monitoring Unit (RMU) that will allow data to be collected, faults recorded and alerts to be sent to the service team via GSM communication.

Data collected includes power monitoring, total clarified water saved (for yard washing), total effluent processed through the system, total coagulant used and average coagulant used per cycle.

Note: To ensure seamless operation, any system failures see the ClearTech unit default back to the existing effluent sump.

The ClearTech Unit





Capturing and sharing proof

The computer-controlled ClearTech system has been expertly designed for ease of use and minimal farmer input. The system will record a range of data consisting of;

- Litres of water reclaimed in total and by each cycle
- Cycles completed, including rejected cycles potentially consisting of milk spill
- Power used, fault recording and monitoring for prompt response by a service agent
- Coagulant use for ease of supply and automatic refilling by a preferred transport agent

Data recorded by the PLC can be used for a Farm Environment Plan to help you with your compliance obligations.

Case Study:

ClearTech helps get the "A" grade

Using ClearTech to recycle water and reduce the volume of effluent to be managed has been revolutionary at the Lincoln University Dairy Farm (LUDF).

In 2018 LUDF achieved a coveted "A" grading for their Farm Environment Plan audit, a grade that is achieved by less than 10% of New Zealand dairy farms. Since effluent storage is the key regulatory requirement, the work of the flagship ClearTech system helped to ensure this success.

By recycling wash water LUDF can effectively double the number of days of effluent storage in the existing pond. Each day the yard and milking shed wash from 555 cows generates about 58,000L of effluent. The ClearTech system is able to clarify two 27,000L tank loads per day, so with just two runs it can treat over 90% of all effluent produced at LUDF.

Professor Keith Cameron, Head of Centre for Soil and Environmental Research at Lincoln University and co-leader of the ClearTech science explains that "ClearTech means farmers have better opportunities to manage their effluent system. They can recycle water used for washing the yards which saves water use at the shed and reduces the amount of effluent produced or needing storage. This reduces the pressure on the farmer around both storage and the risk that untreated effluent poses to the environment."

ClearTech has the potential to significantly reduce the risk of nutrient and *E.coli* losses to the environment. Having the increased pond storage ability means that the treated effluent can be strategically applied at the right time, avoiding periods when soils are saturated.

"The studies we have done, show that applying treated effluent onto land results in lower leaching losses of phosphorus and *E.coli* than applying untreated farm dairy effluent," explains Professor Hong Di, Professor of Soil and Environmental Science at Lincoln University and co-leader of the ClearTech science. "It reduces the risk of negative impact on surface and groundwater resources, and treated effluent showed no negative impact on plant growth or N-cycling mechanisms and microbes in the soil."

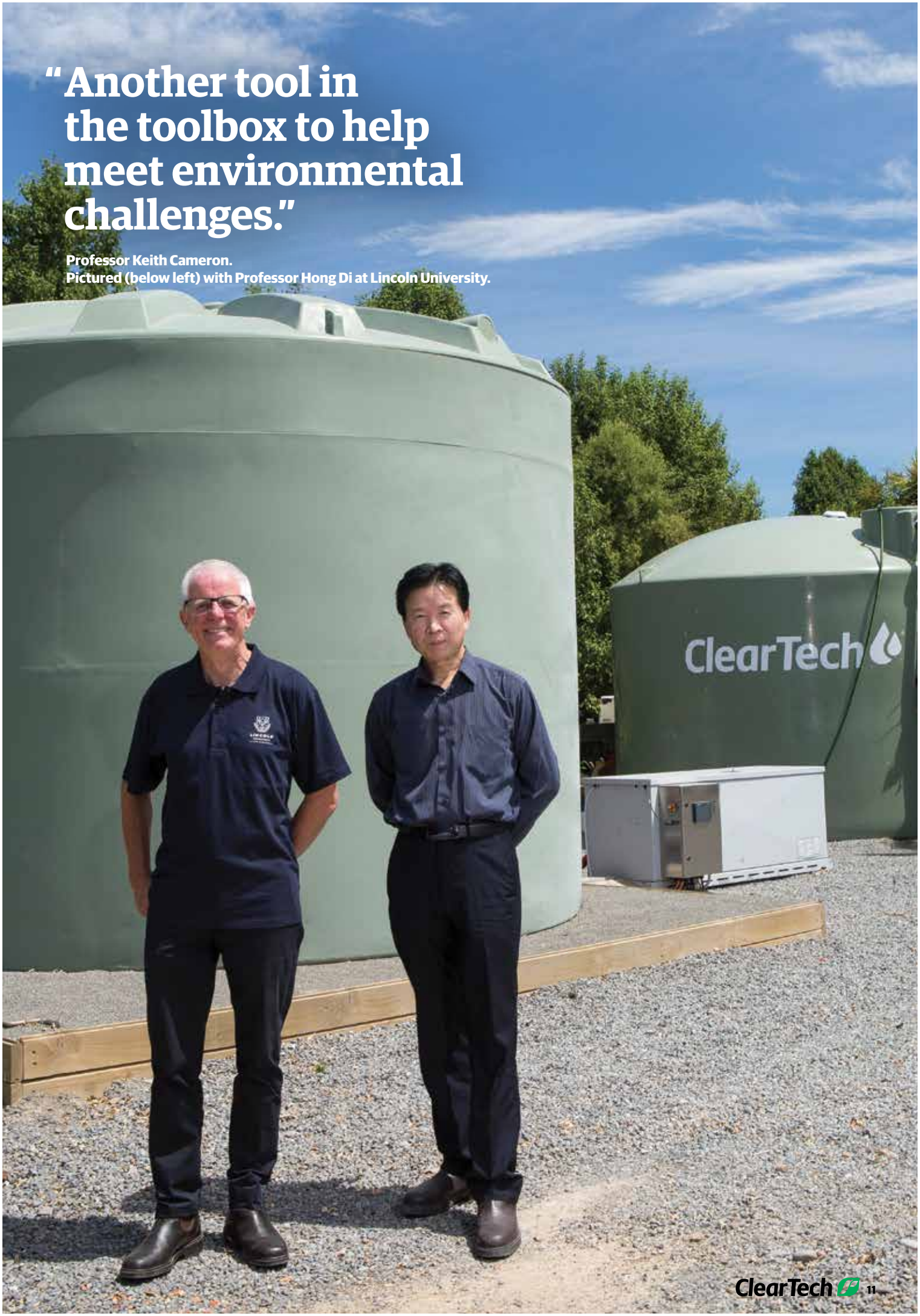
In the treated farm dairy effluent *E.coli* and dissolved reactive phosphorus (DRP) were reduced by up to 91% and up to 99% respectively. The coagulant used to treat the effluent binds the phosphate, temporarily turning it into a slow release form of phosphorus which mitigates the risk of phosphate run-off leaching.

The ClearTech system therefore allows LUDF to match their effluent applications to the plant nutrient demand / supply on farm, reducing risks of nutrient loss.

"ClearTech gives farmers another tool in the toolbox to help them meet their environmental challenges and helps them with their farm environmental planning," says Professor Keith Cameron. "We hope that this new technology will help farmers to solve some of the challenges to the sustainability of their business and reduce the impacts on the environment."

What is an FEP audit?

The Environment Canterbury (ECan) Farm Environment Plan (FEP) audit is an on-farm independent assessment of the implementation of an FEP, checking that identified risks are being managed and good management practices, particularly around water quality, are being applied. The timeframe of these audits depends on the audit grade awarded at the time of the previous audit. So for the Lincoln University Dairy Farm (LUDF), passing their 2018 ECan FEP audit with an "A" grade means they have three years before their next renewal, rather than the two-year, one-year or six-monthly renewals that come with lower grades.



"Another tool in the toolbox to help meet environmental challenges."

Professor Keith Cameron.
Pictured (below left) with Professor Hong Di at Lincoln University.

Case Study:

The solution is now clear

Reduce, reuse, recycle is the environmental mantra now possible for Farm Dairy Effluent (FDE).

Something an early adopter of ClearTech, Tom Mason of Green Park Dairies, says has been a gamechanger for his farm business that's surrounded by urban sprawl.

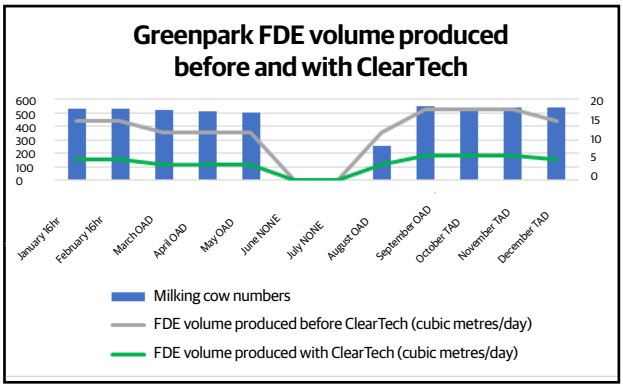
"The freshwater conservation that ClearTech offers saves us at least 30,000 litres of water per milking because we are able to recycle our water to wash the cow yard," Tom says.

"When we're milking twice a day, we're saving up to 60,000 litres of freshwater. That's three times the capacity, which means there are fewer days we have to spread effluent."

Greenpark dairy farm is located 7km south east of Lincoln on the Canterbury Plains, 3.3km north of Lake Ellesmere. Milking 540 cows through a 40-bale herringbone shed, with a backing gate circular yard wash, the dairy produces an average volume of 14,500L FDE/day. With an enviro-saucer of 22,000L usable volume and an above ground Kliptank of 558,000L usable volume. Existing storage equates to 40 milking days of storage.

Farm owner, Tom Mason, was concerned about the risk of becoming non-compliant of their discharge consent if they were forced to irrigate effluent during wet spring conditions, to avoid overflowing the holding pond.

The business risk of compliance costs is real, with penalties up to $600,000, under the RMA, for a company in breach of its effluent consent ($300,000 for an individual). An additional $10,000 a day offence can also be accrued for any continuing.



ClearTech effluent treatment system was installed September 2019 to reduce the volume of effluent and therefore reduce the risk associated with irrigating at high risk times.

Using ClearTech Greenpark was able to recycle 66% of the volume of effluent produced as yard washdown water. This increased the storage volume from 40 to 116 milking day's storage and gave the farm manger more flexibility with when to irrigate as the storage capacity was increased. This enabled the start date of effluent irrigation to be delayed into the spring, reducing labour demands during calving. Freshwater consumption was reduced by 2,885,700 litres per year.

Environmental benefits can be achieved without sacrificing current pasture production potential – with research indicating no significant difference between pasture dry matter yield following application of ClearTech treated effluent compared to the untreated effluent.

With many lifestyle blocks in the area, and heightened concerns about effluent runoff and odour, Tom sees ClearTech as being an investment in his ongoing environmental and social licence to farm.

"We're in a sensitive environmental area here that is also quite densely populated, so, we were really looking for the next level on environmental mitigation," Tom says. "ClearTech has significantly increased our effluent storage capacity.

"We're maintaining our right to keep dairy farming here. There are real pressures on this area, with subdivision into lifestyle blocks, so we need to be doing the right thing. ClearTech is an important tool helping us to do that."

"We're saving up to 60,000 litres of freshwater."

Tom Mason - Green Park Dairies

Cost benefits

The proof is in the pudding and Tom is seeing some financial and business benefits beyond the environment.

Labour savings: By reducing the amount of effluent to pump from Tom's holding pond by 2,841m^3 (from 5,890m^3 to 3,049m^3), on average the number of irrigation runs could be reduced by 117 runs. At 2 hours labour per run at a cost of $20/hr, that is a $4,662 per year Tom could save.

Freshwater Savings: By recycling the clarified water through the backing gate and yard hoses, it is estimated that 2,885,700 litres per year of freshwater consumption can be avoided.

Electricity, wear and tear savings from reduced pumping: The 2,841m^3 volume reduction of effluent to pump to paddocks at a rate of 10L/sec would save 79 hours of pumping a year. (Recycling water to the yard avoids pumping it out of the ground but extra pumping is required to move it from the ClearTech unit to the storage tank so these saving are cancelled out).

Improvements in animal health: Better yard hygiene from more water available for wash down reduced mastitis meaning more milk production and reduced cost of anti-biotics.

Compliance costs: Reduced risk of fines/abatement notices from effluent management non-compliance events.

Coagulant costs: Based on 5,890m^3 of FDE being treated per year the total cost would be $5,546 /year, using 4,908 litres of coagulant at $1.13/L. The above coagulant usage and costs are approximate and based on the 'mean effluent volume produced per year' by the Dairy Effluent Storage Calculator and excludes dumped tanks whilst the system configuration was being fined tuned. The rate of coagulant usage will vary over the milking season in line with the volume of FDE produced.

Research update:

Lincoln study reinforces ClearTech benefits

A Lincoln University study, published in the NZ Journal of Agricultural Research, provides further verification of the environmental benefits that ClearTech offers when applying Clarified water (CW) and/or Treated effluent (TE) to Land.

The study was carried out by Christopher Chisholm, Keith Cameron, Hong Di, and Tim Green and used large soil lysimeters to measure the effect of applying treated farm dairy effluent and clarified water on leaching losses, greenhouse gas emissions and pasture growth. These findings further support the environmental benefits of ClearTech which were published earlier (Cameron and Di, 2019; Wang et al., 2019; Chen et al., 2019).

The results confirm that, compared to untreated Farm Dairy Effluent (FDE), E. coli concentrations leached from the ClearTech treated effluent and clarified water were reduced dramatically by 99.97% and 99.99%, respectively. This is due to the coagulation process which reduces E. coli through lowering of effluent pH as well as flocculation. This reduction in E. coli is of considerable value in reducing farm environmental impacts on water quality and helps address water quality concerns in the New Zealand Government's discussion document on freshwater.

Phosphorus leaching losses

Total-P losses from the lysimeters applied with ClearTech treated effluent (TE) and Clarified water (CW) were 90.5% and 85.7% lower than from the untreated FDE lysimeters, respectively.

Similarly, the dissolved reactive phosphate (DRP) reductions from CW & TE compared to untreated FDE were 99.9% and 99.5% respectively.

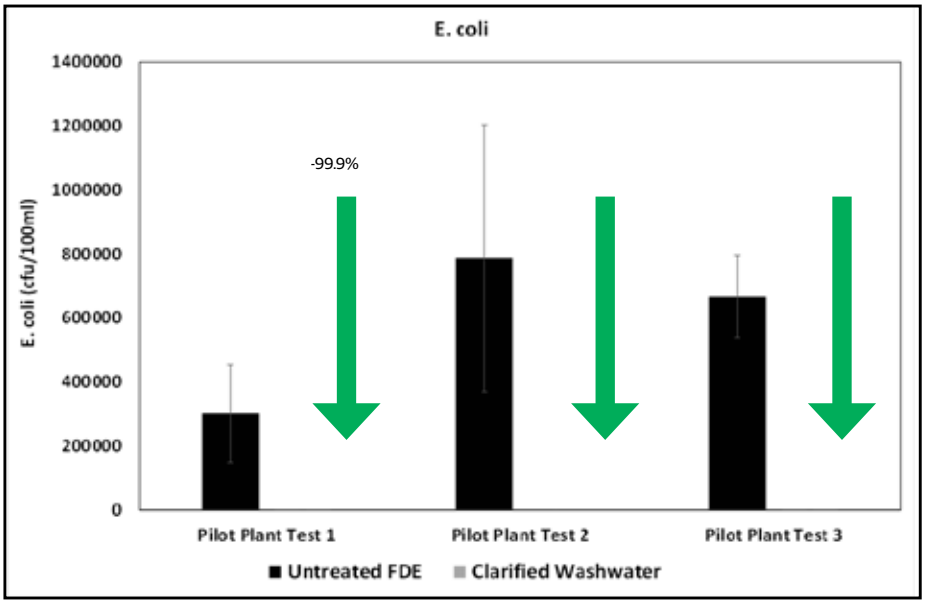
These reductions in phosphate leaching loss can lessen the impact of agriculture on water quality and can help when preparing a farm environment plan.

Table 1. E. coli, Total-P, DRP, Mineral-N and Iron leaching losses from the lysimeters receiving the different treatments. Values with a letter in common are not statistically different.

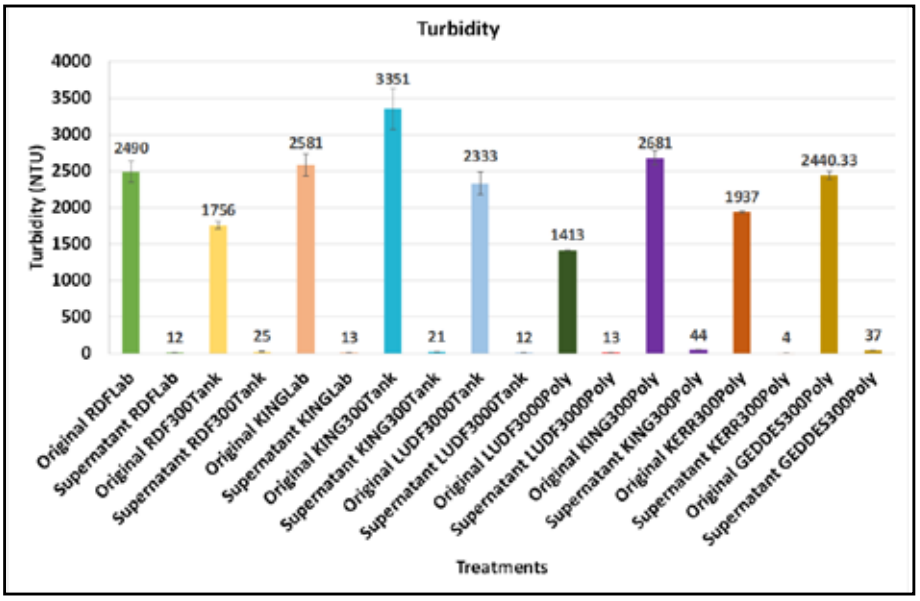
	E. coli (cfu ha^{-1})	Total-P (kg P ha^{-1})	DRP (kg P ha^{-1})	Mineral-N (kg N ha^{-1})	IRON (kg Fe ha^{-1})
Farm Dairy Effluent (FDE)	3.5E+12 a	1.1 a	0.2 a	1.7 a	17.4 a
Treated Effluent (TE)	8.8E+08 b	0.1 b	0.0 b	0.5 a	8.50 a
Clarified Water (CW)	3.4E+08 b	0.2 b	0.0 b	1.6 a	7.70 a
Mixture of TE and CW	9.3E+08 b	0.1 b	0.0 b	2.3 a	8.30 a
Water (Control)	4.4E+08 b	0.1 b	0.0 b	1.1 a	12.9 a

Appendix

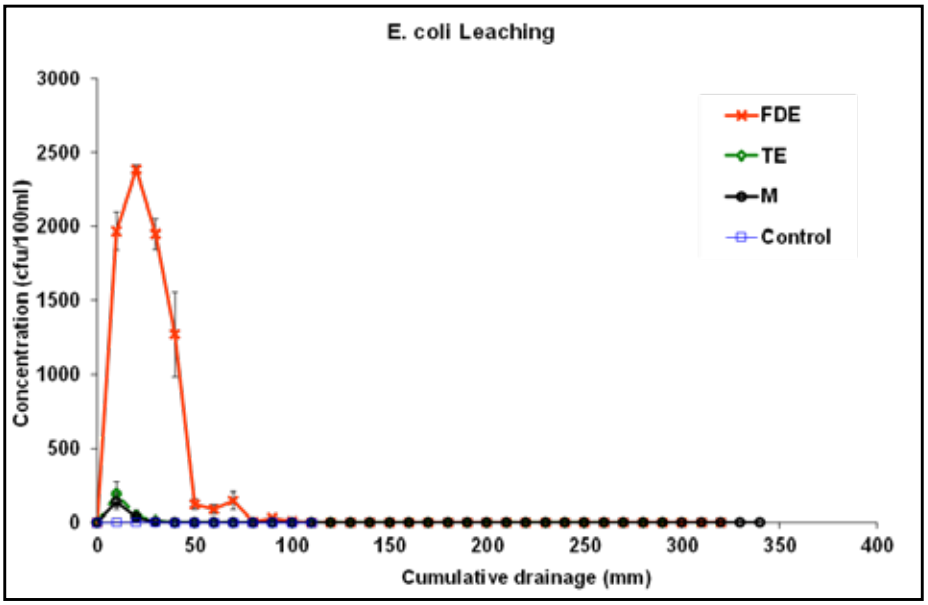
E. Coli reduced by 99.9% in clarified washwater



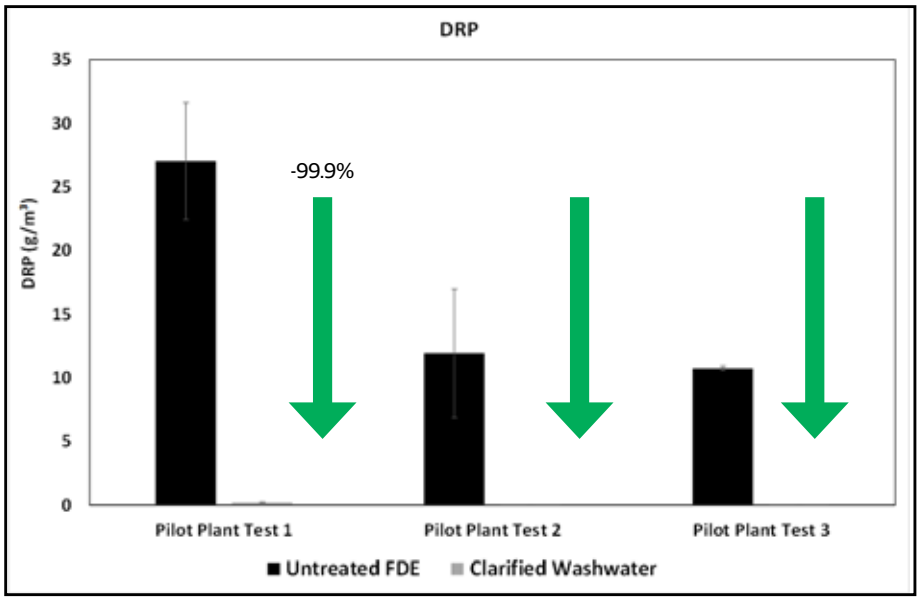
New Treatment system effective on effluent from multiple farms



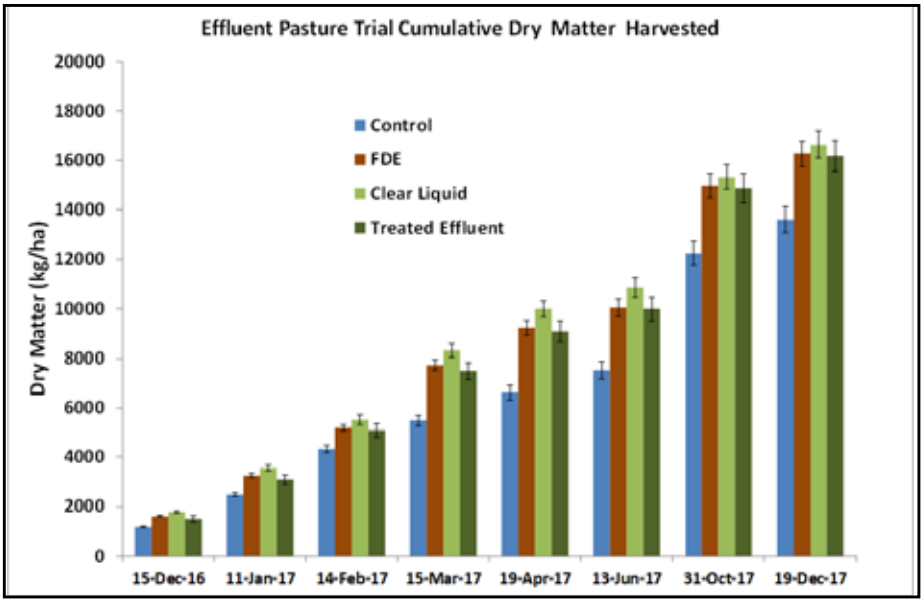
E. Coli leaching loss reduced by 99.9% (Lysimeter Trial from 4 replicates, each lysimeter is 700mm deep and 500mm diameter)



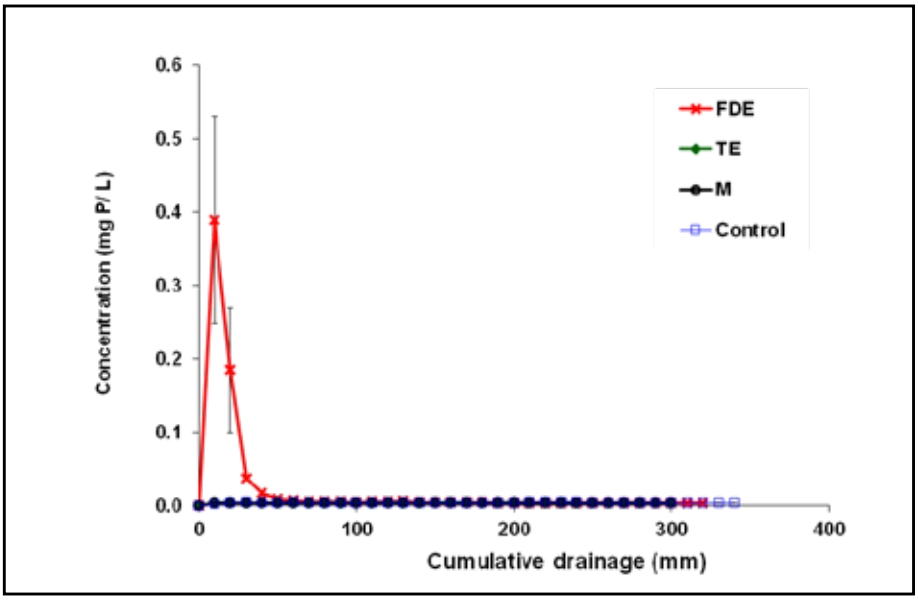
Dissolved Reactive Phosphate (DRP) reduced by >99% in clarified washwater



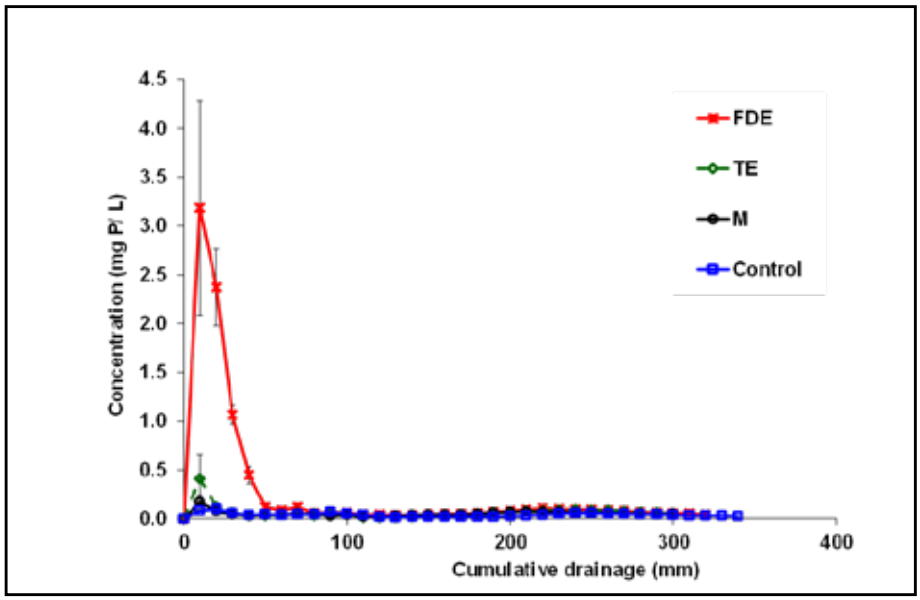
No difference in DM production between effluent types (1-year)



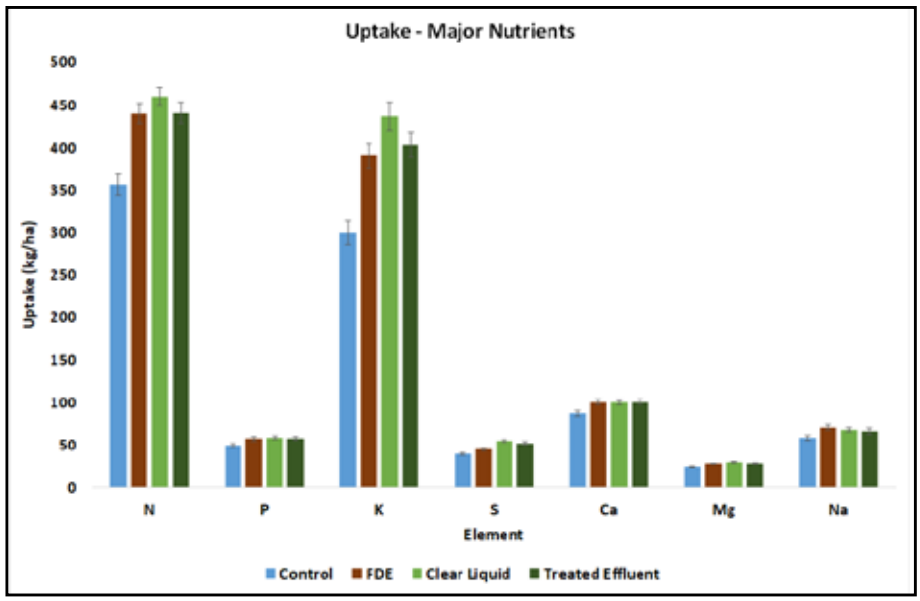
Dissolved Reactive Phosphate (DRP) leaching loss reduced to background (i.e. control) levels
(Lysimeter Trial from 4 replicates, each lysimeter is 700mm deep and 500mm diameter)



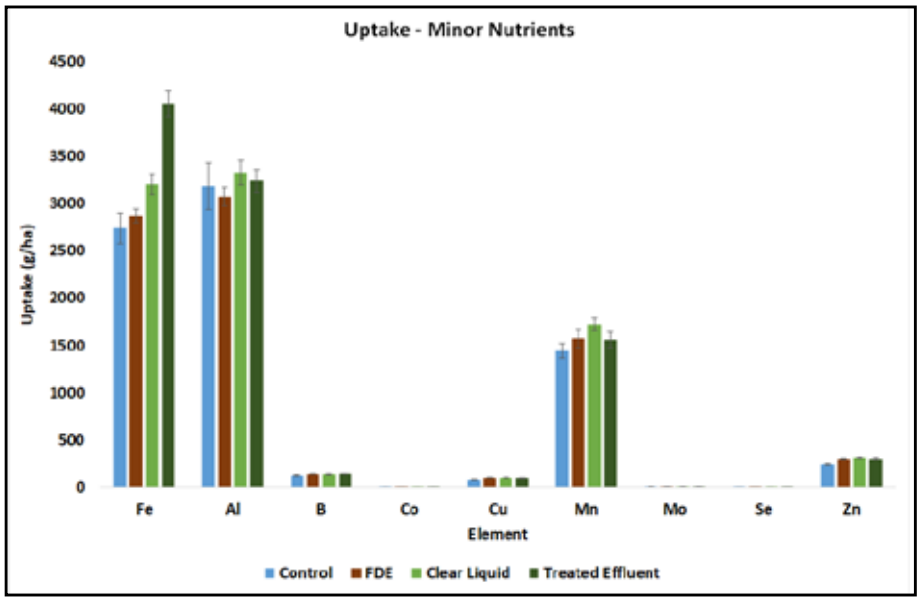
Total-P leaching losses reduced to background (i.e. control) levels



Uptake of Macro Nutrients is not reduced when using treated Clear Liquid or Treated Effluent (1-year)



Uptake of Micro Nutrients is not reduced when using treated Clear Liquid or Treated Effluent (1-year). Slight increase in uptake of iron from treated effluent



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