

Waituna Fine Particle Application (FPA) Demonstration

9 February 2017 – Update 2



What is FPA?

Fine Particle Application (FPA) is an alternative distribution system for solid fertilizer. It is not a fertilizer product or additive, but rather a fertilizer application technology designed to improve fertilizer application efficiency and thereby fertilizer performance. This is achieved through a more even distribution pattern resulting in better surface coverage compared to the distribution of granular fertilizer, which tends to result in more variation of granular distribution.

Benefits of FPA

In a recent review of experimental trials in New Zealand, FPA was found to provide numerous benefits. These are as follows:

- ✦ Produces significantly more pasture dry matter, exhibits higher N response and response efficiencies than granular form. The Winton Trials indicated more than just a nitrogen response the FPA applied urea with the possibility of increasing the mineralisation rates of N.
- ✦ FPA delivers an even spread of applied fertiliser on a per plant basis. Because of this, enables the plants to take up Urea-N and Ammonium-N directly, resulting in a quicker response to the applied N.
- ✦ FPA was found to be a good a management tool for enhancing N response and has greater potential for improved economic returns if applied in the right conditions.
- ✦ Cumulative nitrate leaching losses were significantly reduced when urea was applied in FPA form compared to granular form. Urea applied in FPA form alone, also reduced N₂O and NH₃ emissions and NO₃⁻ leaching losses.
- ✦ Total N uptake by the herbage was also significantly greater and Total N recovery was significantly greater when urea was applied in FPA form than in granular form.
- ✦ FPA results in uniform distribution per plant (approx. 70%), therefore a significant proportion of the applied urea is seen in small particles on pasture leaves during the first 12 hours of application. These deposited urea particles may enable pasture plants to absorb urea directly through their leaves/cuticles and facilitates efficient conversion of urea into plant protein.

Studies have been collated in a Literature Review which is available at www.livingwater.net.nz

The Waituna demonstration

The demonstration aims to show nitrogen fertiliser is utilised more efficiently by plants if it is applied more uniformly using FPA spreading technology. The outcome expected is a similar amount of pasture dry matter will be grown by applying 30kg of Urea/ha in FPA form as what would be grown using 60kg of granular Urea/ha.



Preliminary results from the Waituna demonstration

Treatments are as follows:

Treatment	Kg Urea/ha	grams Urea/ha equivalent
FPA 60	60	27.6
FPA 30	30	13.8
G 60	60	27.6
G 30	30	13.8
Control	0	0.0

The table below provides cumulative data for each treatment over the four cuts carried out to date:

	Total Cumulative growth per treatment (kgDM/ha)						
	26/04/17	1/06/17	10/08/17	7/09/17	10/10/17	10/11/17	7/12/17
FPA 30	1,872	3,380	4,836	5,536	7,498	16,662	19,699
G 30	1,766	2,812	3,967	4,502	5,924	13,400	16,090
C	1,558	2,305	3,136	3,563	4,416	9,915	12,498
G 60	1,918	3,049	4,450	5,083	6,982	16,156	19,272
FPA 60	1,827	3,647	5,284	6,129	8,419	18,345	22,021

At this stage, FPA60 has grown the most in total and G30 the least. This is expected. On a cumulative basis, FPA30

is growing marginally more than G60. FPA 30 is growing 22.4% more than G30, while FPA60 is growing 14.3% more than G60.

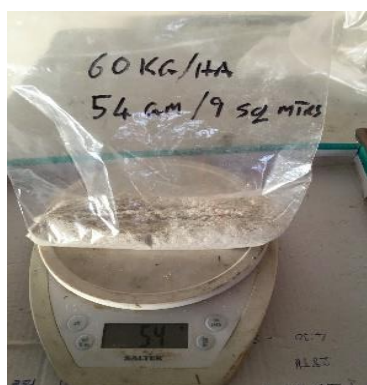
Approach to the demonstration

It is important to note that this is a demonstration exercise and not a scientific trial in and of itself. However, the utmost care is taken when cutting pasture off the plots, measuring the pasture cut, calibrating the FPA spreading truck and weighing the fertilizer collected off the plastic covers to confirm the correct calibration of the truck.

To ensure the FPA spreading truck is properly calibrated, covers are laid down to protect the plots that do not require FPA treatment. These covers (including the FPA30 plot covers) are carefully lifted and taken to the workshop to be dried out. Once dry, the fertilizer is swept up and weighed to measure the weight of the fertilizer applied.



The FPA truck applying FPA60 over the demo plots showing covers in place to shield the remaining plots.



Confirming the calibration of the FPA spreading truck



Fertilizer following FPA application



Mowing each plot and collecting the respective plots pasture grown.

Preliminary Economics

FPA grown over granular	G30	F30	G60	F60
kg Urea/ha	30	30	60	60
Cumulative kgDM grown/ha to date	5363	6566	6424	7340
Cumulative kgDM grown/ha to date less cumulative Control growth	4166	4166	4166	4166
KgDM/ha grown from applied N	1197	2400	2258	3174
Total Units N applied	96.6	96.6	193.2	193.2
Response ratio/kg N	12.4	24.8	11.7	16.4
Total Spreading Cost \$/ha 7 applications	\$77	\$207	\$88	\$263
Cost Urea applied \$/ha @\$476/ton	\$99.96	\$99.96	\$199.92	\$199.92
Cost of N/ha applied (\$N/ha)	\$177	\$306	\$287	\$462
Cost \$/kgDM grown	\$0.148	\$0.128	\$0.127	\$0.146

These results were achieved from late March 2017, when the demonstration plots were set up, until early December 2017, which is both the cold winter and the warmer wetter period of late spring, which this season resulted in low growth rates. The table below indicates the actual growth rates through winter in kgDM/ha/day:

	KgDM/day
FPA 30	6.93
G 30	5.50
C	3.96
G 60	6.67
FPA 60	7.79

What next?

The FPA demonstration will continue until June 2018. Future open days at the demo plot site will be held so that interested people can stay up to date with progress.

To find out more or to register your interest in getting email updates contact Chris Crossley on 027 7065261, chris.crossley@afic.nz or Cain Duncan on 027 7031743, cain.duncan@fonterra.com