# Waituna Fine Particle Application (FPA) Demonstration 5 July 2018



# What is FPA?

Fine Particle Application (FPA) is an alternative application 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 of plant material compared to the distribution of granular fertilizer, which tends to result in more variation of granular distribution.

## FARM SYSTEM BENEFITS FPA

FPA provides significant benefits at the farm system level. These benefits stem from the technology that produces a fine particle of less than 1 mm that when applied to pasture achieves the following:

- An even and significantly improved coverage of the plant leaf material with the fine particles;
- This enables faster uptake of the nitrogen in the urea form enabling faster and greater uptake through the leaves;
- Greater uptake of both urea and ammonium providing energy efficiency benefits for the plant;
- It provides for greater dispersion of nitrogen through the soil profile, providing access to a larger root surface area;
- Significantly, FPA provides for faster uptake of nitrogen resulting in lower losses of ammonia and nitrous oxide gases;
- As a result of the fineness of the FPA particles and the significantly improved uniformity resulting from its application technology, plants are able to take advantage of the nutrients being more readily available, enabling faster growth rates as well as significantly more total pasture Dry Matter (DM) grown;
- When the normal commercial nitrogenous fertilisers available in the industry are applied through the FPA system, there are significant productivity gains to be realised through both pasture growth rates (kgDM/day) and pasture response rates (kgDM/kg N applied), that can lead to increased farm productivity and financial gains.

The expected outcome was that a similar quantity of pasture would be grown using 30kg of Urea applied as FPA to the quantity grown by applying 60kg of granular Urea.



The demonstration plot layout



#### What next?

The FPA demonstration was completed in June 2018.

For the reports and further information visit: <u>https://www.livingwater.net.nz/catchment/waituna-lagoon/fine-particle-fertiliser-application-demonstration/</u>

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### Final results from the Waituna demonstration

The table below provides cumulative data for each treatment over the twelve cuts carried out:

Total Cumulative growth per treatment (kgDM/ha) at 20%DM											
	26/04/17 1/06/17		10/08/17	7/09/17	10/10/17	10/11/17					
FPA 30	1,872	3,380	4,836	5,536	7,498	16,662					
G 30	1,766	2,812	3,967	4,502	5,924	13,400					
с	1,538	2,285	3,117	3,543	4,397	9,896					
G 60	1,918	3,049	4,450	5,083	6,982	16,156					
FPA 60	1,827	3,647	5,284	6,129	8,419	18,345					
	Total Cumulative growth per treatment (kgDM/ha) at 20%DM										
	7/12/17	9/02/18	28/02/18	3/04/18	2/05/18	12/06/18					
FPA 30	19,699	21,490	22,016	25,965	28,091	30,225					
G 30	16,090	17,546	17,928	20,724	22,262	24,023					
с	12,478	14,049	14,347	16,624	17,714	19,456					
G 60	19,272	21,239	21,748	25,440	27,355	29,351					
FPA 60	22,021	24,383	25,244	30,054	32,096	34,077					

In the final analysis, FPA60 has grown the most in total and G30 the least. This was to be expected. On a cumulative basis, FPA30 grew 2.98% more than G60. FPA 30 grew 25.8% more than G30, while FPA60 grew 16.1% more than G60.

#### **Economic analysis**

FPA grown over granular	G30	F30	G60	F60
kg Urea/ha	30	30	60	60
Average Cumulative kgDM grown/ha to date	8008	10075	9784	11359
Cumulative kgDM grown/ha to date less cumulative Control growth	1522	3590	3299	4874
KgDM/ha grown from applied N	1522	3590	3299	4874
Total Units N applied (kgN/ha)	165.6	165.6	331.2	331.2
Response ratio kgDM/kg N	9.2	21.7	10.0	14.7
Total Spreading Cost \$/ha 12 applications	\$120	\$355	\$151	\$451
Cost of Urea \$/ha @\$476/ton	\$171.36	\$171.36	\$342.72	\$342.72
Total Cost of urea + application/ha applied (\$/ha)	\$291.36	\$526.20	\$493.56	\$793.56
Total Cost \$/kgDM grown	\$0.191	\$0.147	<b>\$0.150</b>	\$0.163
Cost of <b>Nitrogen</b> /ha (\$N/ha)	\$171.36	\$171.36	\$342.72	\$342.72
Nitrogen Cost \$/kgDM grown	\$0.113	<b>\$0.048</b>	<b>\$0.104</b>	\$0.070

The economics analysis of the demonstration shows significant benefits to using FPA applications when it comes to response rates, with FPA30 achieving the best response rates at 21.7kgDM/kgN for the whole season, including severe low growth conditions during the summer. The cost per kgDM grown indicates that FPA30 has a significantly lower cost than the **G30 treatments by** 23% at \$0.147/kgDM grown. F30 is lower than the cost of G60 cost/kgDM grown at 2% less. F60 treatment cost to date is 7.9% more costly than its G60 equivalent treatment but grew 16.1% more pasture DM net of Control. When comparing the costs per treatment type based on cost of N/kgDM grown, then F30's advantage in cost is significant at 57.5% less than its G30 equivalent. The results clearly indicate that F30 can produce at least the same quantity of total DM as G60., if not slightly more, then F30's advantage is still 53.8% less than G60 \$ cost of N/kgDM grown.

#### **Growth Rates analysis**

		26	5/04/17	1/	1/06/17		10/08/17		7/09/17		0/17	10/11/17
Days/period			28		36	70		28		33		31
FPA 30			22		14	7		8		20		99
G 30			21		10	5		6		14		80
С			19		7		4		5		)	59
G 60			23		10		7		8		9	99
FPA 60			22	17		8		10		23		107
7/12/17	9/02/1	18	28/02/	18	3/04/	18	2/05	/18	12/0	6/18 <b>Ave</b>		erages
27	64		18		34	-	29	9	4	1		37
37	9		10		39	)	24	1	17		26	
33	8		7		27	'	18		14		20	
32	8		6		22		13	3 1		4		16
38	10		9		36	;	22	2	16		25	
45	12		16		47	,	23	3	1	6	29	

# Average daily growth rates (kgDM/ha)



#### **Response Rates analysis**

Table of response rates to N applications in kgDM/kgN													
			6/04/17	1/06/17		10	10/08/17		7/09/17		0/17	10/11/17	
FPA 30			8		18	15		7		27		89	
G 30			6	7		8		3		14		48	
G 60			5	5		7		2		13		44	
FPA 60			3	13		10			5		7	53	
7/12/17	9/02/1	.8	28/02/	18	3/04/	18	2/05	/18 12/0		6/18	Ave	Averages	
11	11		6		40	)	25	5		)		22	
3	0		2		13		11		0		9		
6	5		3		17	,	10	)	3		10		
13	14		7		31	-	12	2	3		15		







Bags from each plot containing fresh cut pasture after weighing and recording weights



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



Covers brought in from the demo plot covers being swept to recover the fine particles weighing to confirm the calibration of the truck application.



Confirming the calibration of the FPA spreading truck



Fertilizer following FPA application



Mowing each plot and collecting the respective plots' pasture grown to be weighed.



Photo showing the uniformity of spread of fertiliser under the FPA system.



FPA 30 plot Autumn 2018 Compare the FPA 30 plot with the G 30 plot adjacent to each other and note the difference in pasture density of the FPA 30 as well as the lack of weeds due to high levels of competition through significantly higher growth rates.



G 30 plot Autumn 2018



FPA 60 plot Autumn 2018

Compare the FPA 60 plot with the G 60 plot adjacent to each other and note the difference in pasture density of the FPA 60 (lodging) as well as the lack of weeds due to high levels of competition through significantly higher growth rates.



G 60 plot Autumn 2018