



Mapleton Agri Biotec Pty Ltd

PastureN™ is a microbial biofertiliser for use in pastures. Dairy and beef producers use PastureN to grow more grass with moderate rates of nitrogen fertiliser or to make better use of nitrogen fertiliser at reduced rates (increased Nitrogen Use Efficiency). PastureN is Mapleton Agri Biotec's new product for 2019 and it has been developed to help farmers produce pastures of high quality in a more profitable and sustainable way.

PastureN has three main components:

- 1. PastureN contains a glass vial of freeze-dried nitrogen fixing microbes.** This is the identical technology developed for our earlier product TwinN and, like TwinN, every batch of these microbes is tested by a NSW Government laboratory to guarantee we can supply all the microbe species at very high counts (>10¹¹ counts per ha). These microbes act via several key mechanisms:
 - A.** The microbes associate closely with the plants as endophytes - making their way into the plant. They also colonise close to, and on, the root surface. They fix nitrogen (N₂) from the atmosphere into plant available ammonium nitrogen ($\text{N}_2 + 8\text{H} \rightarrow 2\text{NH}_3 + \text{H}_2$). This is the same mechanism used by the *Rhizobium*/legume symbiosis to fix N. Pasture plants release generous amounts of carbohydrate exudates into the zone close by their root surfaces specifically to feed beneficial microbes, including those supplied in PastureN. The NH₃ produced by the microbes is supplied either right by the root surface or within the root surfaces and root tissues, so it is captured very efficiently by the pasture plants. It is also supplied directly within the grass shoots and leaves by the endophytic bacteria that colonise inside the plants.
 - B.** The microbes produce plant growth factors (especially auxins) that enhance secondary root development and this increases the proportion of any applied nitrogen, or nitrogen mineralised from the soil, that is captured by the pasture plants (increased Nitrogen Use Efficiency) – particularly important in establishing crops. The combination of nitrogen fixation and better nitrogen capture results in better nitrogen nutrition.
- 2. PastureN contains a tub of Bacillus microbes.** These are the same Bacillus that are included in the MAB inoculum, NitroGuard. The Bacillus species are valuable to help promote a healthy balanced soil microflora. Numerous studies have shown that different Bacillus species produce a range of compounds that inhibit the growth of pathogenic fungi and bacterial species. The Bacillus also produce beneficial plant growth factors and these add to the effect of the freeze-dried microbes in promoting strong root growth. They also stimulate Rhizobium nodulation in pasture legumes, enhancing their ability to fix nitrogen. This is of benefit to pasture if legumes are present and assists in maintaining legume persistence in mixed pastures.
- 3. PastureN contains an alfoil bag of amino acids.** These are plant based amino acids which are widely used for their benefits as crop growth stimulants. Our trials show that they enhance the uptake of nitrogen fixing bacteria in pastures. Their inclusion in PastureN has allowed us to recommend application into a moist/wet grass sward as opposed to the standard application into the root zone, recommended for TwinN and NitroGuard. Amino acids are used as chelates, to assist plant stress recovery, and we have found they have good synergies with the microbial components of PastureN.

PastureN is used on a wide range of pasture types including Kikuyu, Italian ryegrass, lucerne crops and high quality fodder crops.

PastureN trial in ryegrass pasture, Pyree, NSW, 2019

PastureN was applied to the left half of an Italian ryegrass pasture and the right side was used for comparison. The picture below shows the demonstration site on 7th Oct 2019 with the treated left side observably greener. In previous measurements in 2018 the pasture yields from the left side of the paddock were lower than on the right so any biases in the 2019 demonstration were against the PastureN side. The whole paddock received the same grazing and urea application rates. PastureN was applied to the left side block on 31st July 2019 midway through the grazing cycle. 80 kg urea was applied after each grazing cycle except after grazing on October 13th (leaving the grass in the last cycle to grow on residual N and N supplied by PastureN).

There were two more grazing and urea application cycles following PastureN application on 31st July. Pasture readings were taken on 7th October before grazing on 13th October and again on 15th October after grazing to measure the amount of residual pasture on each side. This allowed the amount of grass grown and grazed on each block to be measured. A final set of pre-grazing pasture meter readings were taken on 28th October. These pasture meter readings are shown below. Each of the 7 pasture readings listed pre-grazing and 10 listed post-grazing is an average of 30 individual pasture plate readings.



Demonstration site: PastureN block is to the left of the pasture meter and a slight but definite improvement in colour can be seen.

Pasture N Block (kg DM/ha)			Standard Block (kg DM/ha)		
7 Oct Pre-graze	15 Oct Post-graze	28 Oct Pre-graze	7 Oct Pre-graze	15 Oct Post-graze	28 Oct Pre-graze
4202	3033	3728	3412	2938	3033
4329	2591	3855	3728	3002	3728
4234	2433	3223	3507	2654	2875
4139	2717	3160	3254	2686	2938
4708	2496	2970	3697	2148	2749
4424	2749	3412	3918	3065	3096
4171	2875	3254	3697	2875	3254
	2812	3191		2496	2780
	3033	3760		2622	2907
	2717	3665		2717	3191
Average 4315	Average 2746	Average 3422	Average 3602	Average 2720	Average 3055

1. **Amount of additional kg DM/ha grown on PastureN block versus Standard block at 7th Oct**

Additional 713 kg DM/ha. On 7th Oct the PastureN block had 4315 kg DM/ha versus the Standard block with 3602 kg DM/ha
(High statistical significance, T test, p=0.00004)

2. **Additional kg DM/ha grazed from PastureN block versus Standard block by 15th Oct**

PastureN: 4315 – 2746 = **1569 kg DM/ha grazed**. **Standard:** 3602 – 2720 = **882 kg DM/ha grazed**. This shows an additional 78% more grass was produced and grazed from the PastureN block compared to the Standard block. This difference was highly statistically significant.

3. **Additional kg DM/ha grown on PastureN block versus Standard block between 15th and 28th Oct**

An additional 367 kg DM/ha was grown on the PastureN block. PastureN: 3422 – 2746 = 676 kg DM/ha grown. Standard: 3055 – 2720 = 335 DM/ha grown. This difference was statistically significant (p= 0.013). The overall growth was lower in both blocks because no urea was applied for the last growth cycle and the ryegrass had commenced flowering, but the PastureN block greatly out-performed the Standard block again.

The PastureN block substantially out-performed the Standard block, producing high quality grass feed in quantities normally requiring much higher urea rates. PastureN can be used to increase pasture production substantially without the added cost of high urea rates.

Feed quality

Pooled grass samples were taken on 10th October from the PastureN and Standard blocks and analysed by Agrifood Technology. Feed tests results are presented below. PastureN grass had lower Neutral Detergent Fibre (40.8 v 44.0%) which increased digestibility of grass. It also increased Est. ME (12.9 v 12.7MJ/kg DM). Nitrate concentrations in PastureN and Standard grass were both low at 120 and 96 mg/kg DM. This is of significance because the PastureN block was able to produce large amounts of good quality grass that would normally only be obtained by high rates of urea which can result in excess nitrate levels. This result confirms that benefit which has been recorded in other previous trials.

Standard Results



FEEDTEST

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Feed Analysis Report

Final Report

Job No: J1910-0952
Date Issued: 21-Oct-2019
Report Number: 13135

Attention: Michael Evans

Purchase Order: None
Date Sampled: 10-Oct-2019
Date Received: 14-Oct-2019

The following sample was analysed:

Sample ID	Your Reference	Right Side
S2019-51532		
	Sample Type	Pasture Fresh

Analysis of this sample conducted between 14-Oct-2019 and 16-Oct-2019

Analysis Results

Determinant	Result Value
NIR Package (FT003)	
S2019-51532 Dry Matter	15.2 %
S2019-51532 Moisture	84.8 %
S2019-51532 Crude Protein	25.0 % of dry matter
S2019-51532 Acid Detergent Fibre	18.6 % of dry matter
S2019-51532 Neutral Detergent Fibre	44.0 % of dry matter
S2019-51532 Digestibility (DMD)	83.2 % of dry matter
S2019-51532 Digestibility (DOMD) (Calculated)	77.3 % of dry matter
S2019-51532 Est. Metabolisable Energy (Calculated)	12.7 MJ/kg DM
S2019-51532 Fat	4.1 % of dry matter
S2019-51532 Ash	14.0 % of dry matter
Nitrate (FT009)	
S2019-51532 Nitrate	96 mg/kg of dry matter

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory
Nitrate	FT/008	Quality and Milling Laboratory

Note: This report is not to be reproduced except in full.

Comments: Metabolisable Energy has been calculated using the following equation:
 $ME = (0.203 \times \text{DOMD}\%) - 3.001$

The results in this report were authorised by:

Name	Title
Joanne Warnes	Team Leader, Quality, Milling & Feedtest



FEEDTEST

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Feed Analysis Report

Final Report

Job No: J1910-0952
Date Issued: 21-Oct-2019
Report Number: 13135

Attention: Michael Evans

Purchase Order: None
Date Sampled: 10-Oct-2019
Date Received: 14-Oct-2019

The following sample was analysed:

Sample ID
 S2019-51533 Your Reference Left Side
 Sample Type Pasture Fresh

Analysis of this sample conducted between 14-Oct-2019 and 16-Oct-2019

Analysis Results

Determinant	Result Value
NIR Package (FT003)	
S2019-51533 Dry Matter	15.3 %
S2019-51533 Moisture	84.7 %
S2019-51533 Crude Protein	25.1 % of dry matter
S2019-51533 Acid Detergent Fibre	18.4 % of dry matter
S2019-51533 Neutral Detergent Fibre	40.8 % of dry matter
S2019-51533 Digestibility (DMD)	84.3 % of dry matter
S2019-51533 Digestibility (DOMD) (Calculated)	78.3 % of dry matter
S2019-51533 Est. Metabolisable Energy (Calculated)	12.9 MJ/kg DM
S2019-51533 Fat	4.2 % of dry matter
S2019-51533 Ash	12.3 % of dry matter
Nitrate (FT009)	
S2019-51533 Nitrate	120 mg/kg of dry matter

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory
Nitrate	FT/008	Quality and Milling Laboratory

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Comments: Metabolisable Energy has been calculated using the following equation:
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The results in this report were authorised by:

Name **Title**
 Joanne Warnes Team Leader, Quality, Milling & Feedtest

Conclusions

- The PastureN block produced a lot more grass in each growth cycle, with 78% more grass grown and grazed in the first cycle and approximately twice as much in the last cycle, that did not have the standard urea application after the previous grazing.
- Feed quality was slightly higher in the PastureN block and the high productivity of the PastureN block was not associated with elevated leaf nitrate levels
- The ability to increase grass production without adding high rates of urea increases profitability
- The ability to increase grass production without adding high rates of urea increases sustainability via reduced nitrogen run-off and reduced negative effects of high rates of urea on soil health and structure

The instructions below are provided to show an overview of the practical aspects of using PastureN. Mix as per instructions supplied with product.

Application to the pasture

Apply PastureN with a boom sprayer with very coarse nozzles, **well into the moist grass sward**. Centre pivot delivery is also effective.

Do not apply in windy, drying conditions. Do not apply into a dry pasture. Apply in as much water as possible and practical, but a to a minimum of 100 litres/ha. Application must deliver the microbes into a moist sward or into the root zone.

Do not apply less than one week after or before grazing or cutting

Once the tank mix is fully prepared apply immediately or within 24 hours (do not allow mix to get hotter than 30°C if storing for longer than an hour).

Application schedule and Nitrogen fertilizer rates

Apply PastureN at the start of the growing season. In the autumn or winter on ryegrass, avoid application before frosts, and allow pasture at least one week to recover after a heavy frost before application.

If the grass growing season is six months or more, a mid-season application is recommended.

Through the cooler months, at day time air temperatures of around 15°C, PastureN can supply up to 15% of the Nitrogen for maximum growth. It can be relied on for much more as the day time air temperatures rise – at least 25% of the nitrogen can be supplied as daytime air temperatures rise above 20°C.

For organic pastures apply every 3 months and do not reduce any other sources of organic nutrients.

General instructions

1. Do not reduce other nutrients eg P, K, etc while reducing fertiliser N.
2. Ensure **molybdenum** levels in soils are adequate as Mo is necessary for effective N fixation by microbes.
3. Do not make cuts to N fertilizer until at least 2 weeks after application of PastureN, to allow microbes time to colonise and start N fixation. In intensive pastures keep the first application of N of the season at standard rate.
4. Make cuts to N evenly across the season if possible.

For any enquiries and individual advice contact TwinN@mabiotec.com

Phone: MAB Office 07 5445 7151 or Michael Evans 0408617479