



EIPWALES

Cydweithio er ffyniant gwledig
Collaborating for rural success



Foliar Feed for Grassland

The issue

Most nitrogen (N) fertilisers are applied to grassland systems in solid (prill) form. The nutrients are washed into the topsoil by rain and subsequently taken up by the roots of the plants. A host of factors such as soil compaction, drainage, bio-activity, soil temperature, dry or wet weather can affect the nutrient release and uptake by the grass with this method.

There is another, more direct, method of getting nitrogen into the grass which is through the pores in the leaves. Previous trials have proven that foliar feeding, applied as a spray, can decrease the amount of total nitrogen applied while maintaining dry matter yields and minimising nitrogen losses through runoff.

The project

This EIP Wales project looks at the extent to which using a foliar feed, based on urea and humic acid, can reduce the application of conventional N fertiliser to the soil while maintaining dry matter (DM) yield. Four farmers in Pembrokeshire and Ceredigion are taking part in the trial. They have each split one large field into three sections of equal size with the following treatments

- Standard prilled nitrogen (N) application (125 kg/Ha of product)
- Foliar feed, at three-week intervals during the grazing season (20 kg/Ha of product)
- Control of no nitrogen

The dry matter yield and the N content of fresh grass was measured using a plate meter during the grazing season (March – October). At the end of each season, the costs of N application will be calculated, per tonne of DM, for each of the three treatments. Clover assessments at the beginning and end of the project will allow us to assess the impact on species composition of the sward.

2019 results

- The foliar feed plots grew 0.5 – 1.0 tonnes dry matter more than the conventional paddocks up to the end of April, indicating faster early growth.
- By the end of the season, the conventional paddocks had overtaken the foliar feed paddocks, growing 1-2 tonnes more. This was expected as by early August, up to 75% more nutrient had been applied onto conventional paddocks.
- All 4 sites showed the same pattern (Figure 1). Yield was highest in conventional paddocks, lowest in the 'No fertiliser' plots and approximately midway between the two on the foliar feed paddocks.
- The overall difference in dry matter yields also reflects the difference in site location with sites going from 100 feet and south facing to 900 feet and north facing

- While yield was highest in conventional plots, increase in DM yield (compared to no fertiliser) *per Kg of additional N applied* was more than double in foliar feed compared to conventional fertiliser paddocks (Table 1), suggesting that while yields are lower in foliar feed paddocks, N usage is at least 100% more efficient.

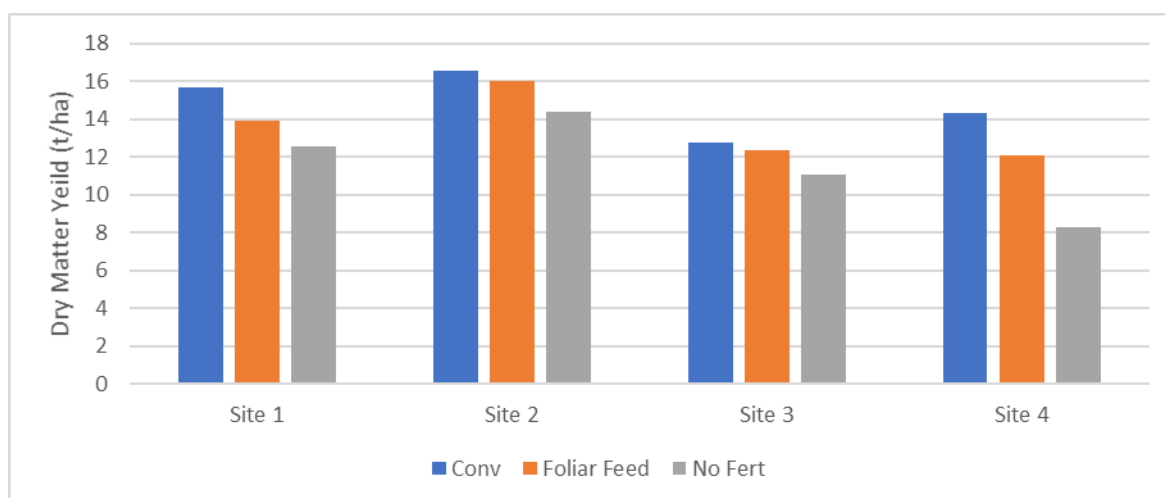


Figure 1: Dry matter yields 2019

Site	Conventional plots			Foliar feed plots		
	Total N applied (Kg/Ha)	Additional Yield (Kg/Ha)	Additional yield per Kg of N applied (Kg DM/Kg N)	Total N applied (Kg/Ha)	Additional Yield (Kg/Ha)	Additional yield per Kg of N applied (Kg DM/Kg N)
1	250	3100	12.4	46	1300	28.3
2	250	2200	8.8	64	1600	25.0
3	212	1700	8.0	72	1300	18.1
4	268	6000	22.4	72	3800	52.8

Table 1: Increase in yield per Kg N applied compared to control of no fertiliser

The results from 2020

For 2020 the project included a silage plot on site 4 in addition to the 4 grazing plots. This was set up to investigate any effects foliar feeding would have on silage growth.

A similar pattern to the 2019 results was observed on site 3 and 4, with the conventional plots yielding 1.2 and 3.0 tonnes more than the foliar feed plots. On the remaining two, the foliar feed plots had higher yields (2.5t more at site 2 and 0.8t more at site 1). The reasons for this are likely to be different at the two sites.

- The spring of 2020 was exceptionally dry. Without sufficient soil moisture, the uptake from the conventional fertiliser would have been greatly reduced. 240 Kg/Ha of nitrogen was applied resulting in an increased yield of just 1.1t compared to the no fertiliser plots. The application of foliar feed bypasses the need for nutrients to be taken up through the roots, and therefore there is no need for high soil moisture content. This means the N applied by this route was assimilated into plant tissue to a much greater degree.
- The same may have been true at site 1, but probably to a lesser degree because this farm is at a higher altitude than site 2 and tends to receive higher rainfall. Increased clover in the pasture of the foliar feed plots may also have contributed to higher yields.

At site 4 the results followed a similar pattern under both management regimes (grazing and silage). Conventional plots had a substantially higher yield than the foliar feed, although the relative difference was greater in the grazed plots. The DM yield of the silage plots was higher in conventional (26%) and foliar feed (33%) plots - due in part to the **higher N application** on the silage plots (180% more on conventional plot and 280% more N applied to foliar feed silage plot) compared to grazed plots.

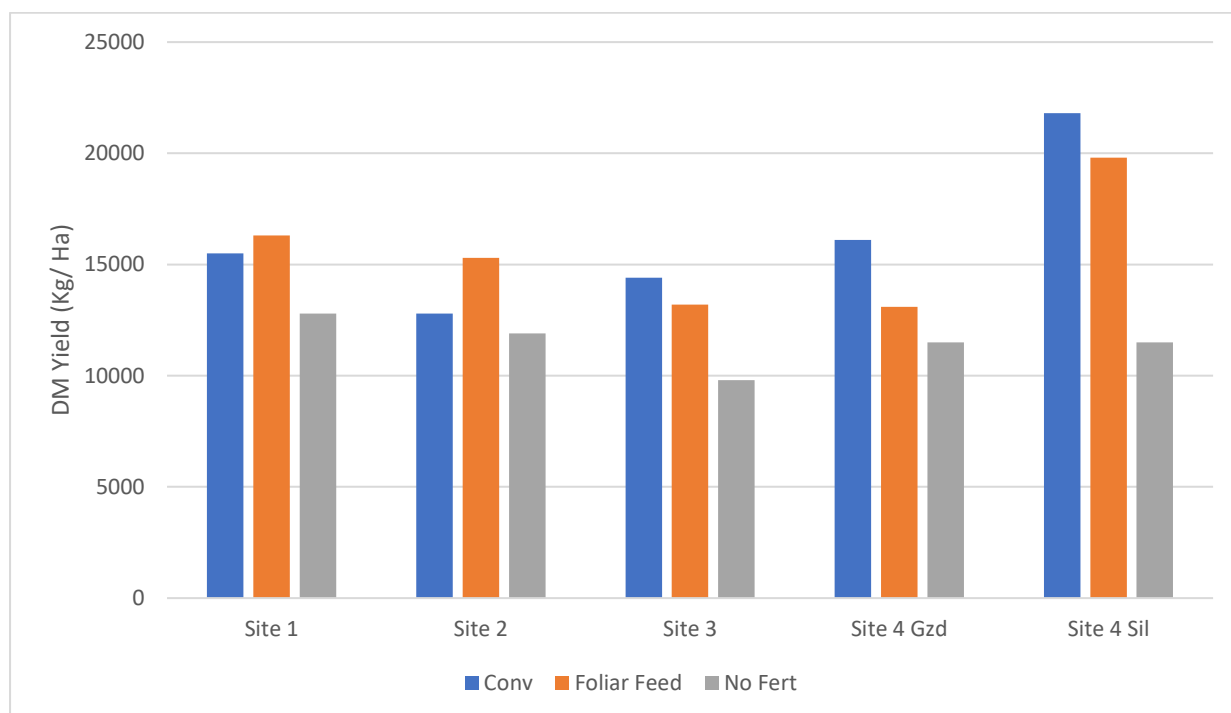


Figure 2: Dry matter yields 2020

In terms of Nitrogen Use Efficiency (NUE), the 2020 results confirm the finding in 2019 that the NUE is significantly greater in the Foliar Feed Plots.

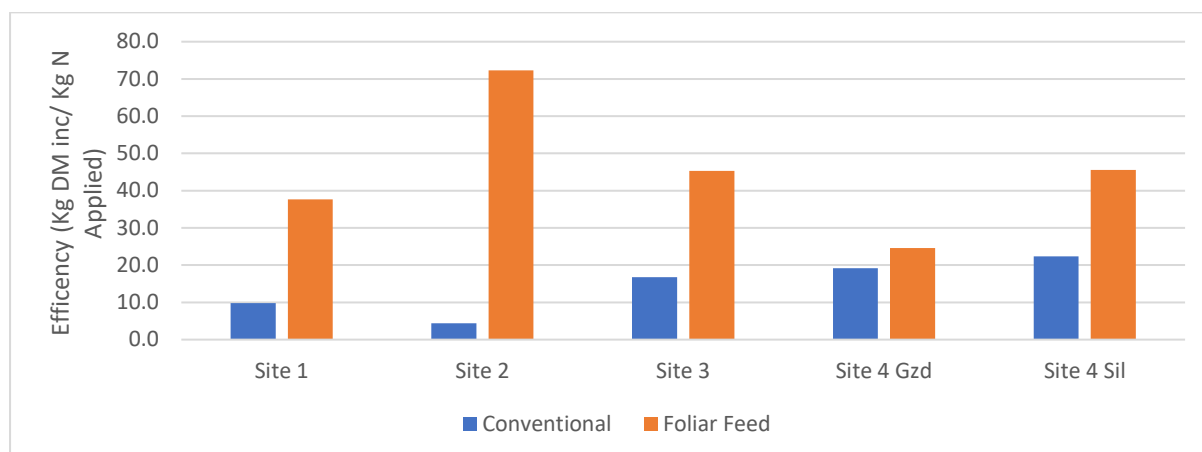


Figure 3: Nitrogen use efficiency 2020

Site	Conventional plots			Foliar Feed Plots		
	Total N applied/ (Kg/ Ha)	Additional Yield (Compared to no Fert) (Kg/ Ha)	Additional Yield/Kg N applied	Total N applied/ (Kg/ Ha)	Additional Yield (Compared to no Fert) (Kg/ Ha)	Additional Yield/Kg N applied
Site 1	275	2700	9.8	93	3500	37.6
Site 2	205	900	4.4	47	3400	72.3
Site 3	275	4600	16.7	75	3400	45.3
Site 4 (Grazed)	240	4600	19.2	65	1600	24.6
Site 4 (Silage)	460	10300	22.4	182	8300	45.6

NUE was much greater on the foliar feed compared to the conventional plots. It was 3.8 times more efficient at site 1; 16.5 times more efficient on site 2; and 2.7 times more efficient on site 3. At site 4, the foliar feed was 2 times as efficient on the silage plot but only marginally more efficient on the grazed plot.

In final year we will continue to monitor DM on each of the plots. At the end of the project we be able to look back over three years of data, and comment on the Nitrogen Use Efficiency of Foliar Feeds compared to conventional fertiliser applications. Having run the trials over a period of three year on farms at different elevations, rainfall and growing conditions, we hope to be able to make some robust conclusions from the work. Look out for updates in Autumn 2021.