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THE TEST VALLEY PILOT DEMONSTRATOR PROJECT 2024

Test Valley Borough Council

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CONTENTS

INTRODUCTION

In early 2024, Test Valley Borough Council, in partnership with The IncuHive Group, launched a Net Zero Pilot Demonstrator programme to trial innovative agricultural practices with the potential to:

- Reduce energy consumption
- Manage nutrient use more effectively
- Minimise overall carbon footprints

These practices are essential not only for achieving environmental goals but also for establishing sustainable models for others in the agricultural community to learn from.

The programme was funded through the UK Shared Prosperity Fund (UKSPF)[1]. It offered funding to local farms to trial sustainable practices that could lower their carbon footprint, and enhance environmental resilience. It garnered strong interest from the local farming community, with eight farms applying to participate. Two successful applicants received funding to trial methods to improve nitrogen usage efficiency.

The main trials were conducted during 2024, although work is ongoing. This report is to share the results to date.

[1] The UK Shared Prosperity Fund aims to improve pride in place and increase life chances across the UK investing in communities and place, supporting local business, and people and skills. For more information, visit https://www.gov.uk/government/publications/uk-shared-prosperity-fund-prospectus

SPOTLIGHT

MICHELMERSH MANOR FARM

Michelmersh Manor Farm is a family-run enterprise focusing on mixed arable, dairy and sheep production. It sought to enhance nutrient management by directly fertilising the leaves of silage crops to improve efficiency while minimising nitrate leaching.

“I am more than happy to fully endorse the foliar feed trials which have been a success for Michelmersh Manor Farm Ltd. We have substantially reduced our prilled nitrogen requirements and increased our volume of consumable forages”

John ~ Michelmersh Manor Farm

SPOTLIGHT

GODDARDS FARM

Goddards Farm is a dairy farm in Nether Wallop that grows maize under contract to Apsley Farms in Picket Piece, Andover, for anaerobic digestion. In this project, Goddards Farm worked with Apsley Farm to trial a novel organic soil treatment to improve nutrient usage in maize crops.

APSLEY FARMS

“It’s very much in all our interests to reduce the level of nitrogen used and from what I have seen in this trial, this is potentially one way of achieving it, without detrimental effect to my yields. The product used claims to have an effect for up to 5 years, and whilst still early days, we can already see a difference in the follow up grass crop”

Mark ~ Goddards Farm

MICHELMERSH MANOR FARM
SILAGE TRIAL

SUMMARY

This study compared the farm's standard applied granular ammonium nitrate applied to the soil with a foliar fertiliser (Humi-Cert) containing a solution of controlled release nitrogen and humates which was applied to the leaf of the grass as a liquid spray. At harvest, the yield and feed quality of the grass silage were compared.

The results showed that the applied nitrogen was reduced by over 70% for the foliar treatment compared with the conventional granular ammonium nitrate, illustrating the markedly increased efficiency of the foliar nitrogen application. There was slightly more total dry matter yield and energy content using the farm's standard fertilisation practices, however the protein yield was higher in the grass which had received the foliar treatment.

The foliar treatment has significant environmental benefits with the potential to reduce damaging nitrogen losses from soil run off, soil leaching and losses into the air. Currently the foliar product is around 20% more expensive than the conventional ammonium nitrate granules, although the environmental benefits may translate to cost reductions as farms seek to comply with environmental regulations.

Michelmersh Farm fully endorsed the trial and will continue to use the foliar feeds potentially on maize as well as grass – they applied some product to maize and reported well above average yields as a result.

MICHELMERSH MANOR FARM
SILAGE TRIAL

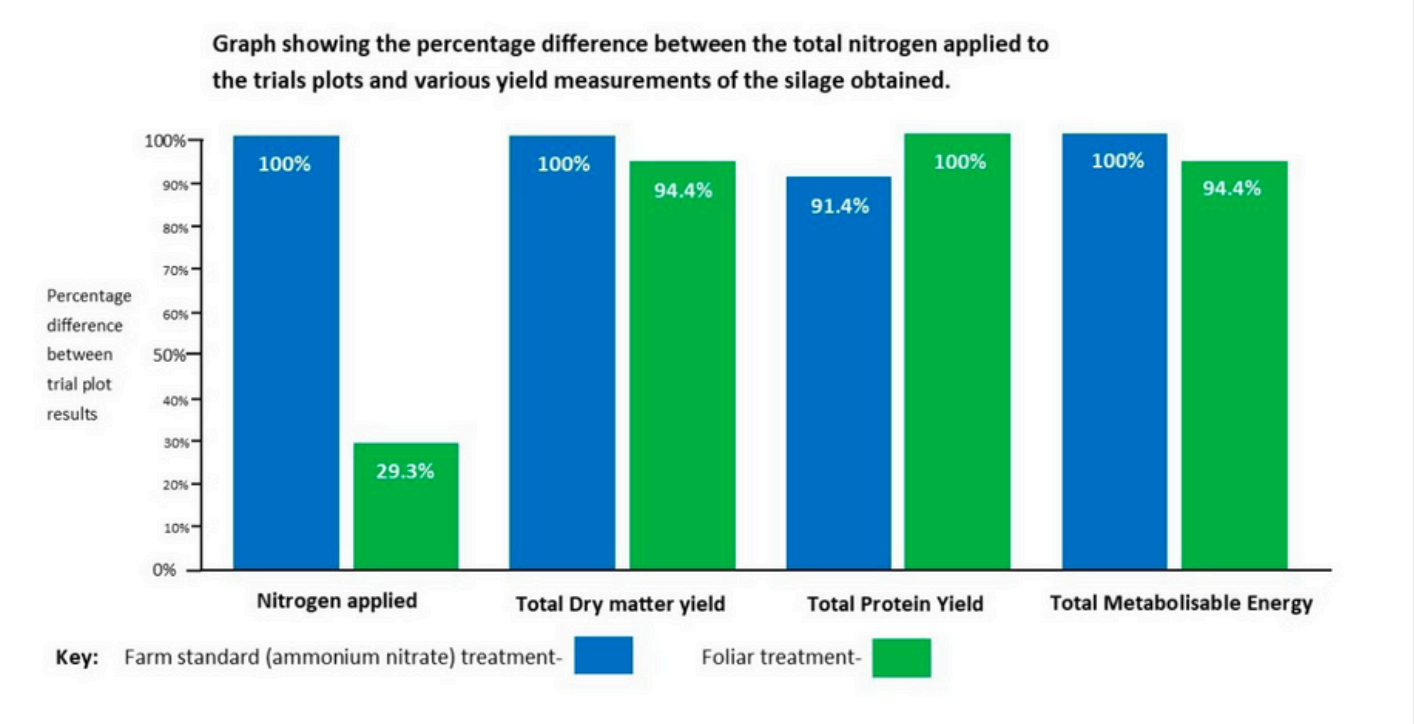
PROCESS

Two 1.5 ha plots were chosen in a uniform field of Italian rye grass. The ley was not seeded during 2024. One plot was fertilised in a conventional manner with a single application of granular ammonium nitrate at 247 kg/ha (85.22 kg nitrogen). The second received a foliar treatment – Humi Cert – a controlled release nitrogen and humate foliar fertiliser (Daleoak Ltd). It was applied at 80.5 litres/ha (25 kg nitrogen) over two applications as a liquid spray using a John Deere 7321 sprayer.

The grass was allowed to grow for three weeks before harvest.

Fresh grass samples were collected immediately before the crop was cut for silage. Samples were sent for analysis to Kingshay Dairy Consultants. The samples were analysed for forage quality and mineral content. Measurements were also taken to establish fresh cut silage yield.

RESULTS



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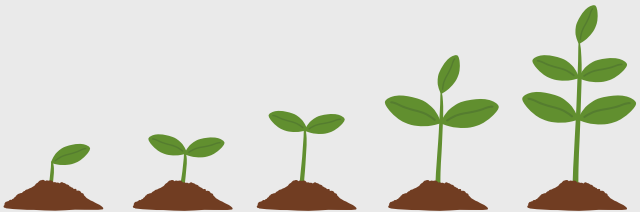


MICHELMERSH MANOR FARM
SILAGE TRIAL

CONCLUSION

Foliar fertilisation is a promising strategy for increasing sustainability in agriculture, offering a more efficient, targeted, and environmentally friendly approach to nutrient management when compared to conventional soil fertilisation methods. If foliar fertilisation enhances nitrogen use efficiency, it can reduce the carbon footprint of fertiliser applications, thus contributing to the preservation of soil health and the environment. Foliar fertilisation of grass for silage and pasture is already common-place in other international territories such as New Zealand.

The results illustrate the increased efficiency of the foliar nitrogen application which produced over three times more dry matter per unit of nitrogen than the soil-applied ammonium nitrate.

This higher efficiency and lower use rate of nitrogen has significant environmental benefits with the potential to reduce damaging nitrogen losses from soil run off, soil leaching and losses into the air. Although the farm standard application produced a slightly higher yield, there was no trade off in the quality of the grass by applying the foliar nitrogen with a small increase in protein content with the foliar application.

The farm applied some of the product to maize as well as to the grass trial plots. They reported impressive results with a yield of close to 20 tonnes per acre which is well above their average.

Currently the costs are higher for the foliar treatment at £102 per hectare compared with the farm standard method at approximately £84 per hectare. However, the farm standard ammonium nitrate application comes with higher potential costs to the environment which may increase in significance as environmental regulations tighten. Any increase in yield of course improves efficiency of land usage and offsets increased treatment costs.

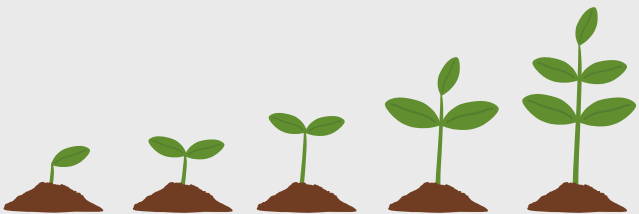
GODDARDS FARM
MAIZE TRIAL

SUMMARY

This study assessed the effects on crop growth of an organic water and nutrient-retaining granule, MAD Moisture, that absorbs 10-15 times its weight in water when applied at seed depth. Maize was planted on a control plot and two plots treated with different levels of MAD Moisture during late spring 2024. The same plots were planted with grass in November 2024 without further treatment.

Interpretation of data from the maize trial was complicated by two factors: 1) the untreated plot was planted two weeks prior to the treated plots due to operational and technical issues; and 2) the plot treated with the lower level of MAD Moisture suffered bird damage. The yield results indicate that the plot treated with the higher level of MAD Moisture was greater than that of the control, but further data is necessary given the confounding factors. The percentage nitrogen content in dry matter was also increased in the treated plots, which might indicate higher protein levels.

Soil analyses in January 2025 imply longer-lasting benefits of MAD Moisture application with higher levels of some nutrients in the treated plots. A biomass image of the grass planted in November 2024 is consistent with a longer-term benefit of MAD Moisture, showing visibly better crop growth in the treated plots. Growth on these plots will be monitored over the next few years.



GODDARDS FARM
MAIZE TRIAL

PROCESS

The trial was conducted in a 7.5 ha plot divided into three sections. Plot 1 (right hand plot as shown on the images) did not receive MAD Moisture treatment and so is termed ‘untreated’. Plot 2 (the central plot) and Plot 3 (the left hand plot) were treated with MAD Moisture (MAD To Make a Difference Ltd) applied at seed depth before drilling.

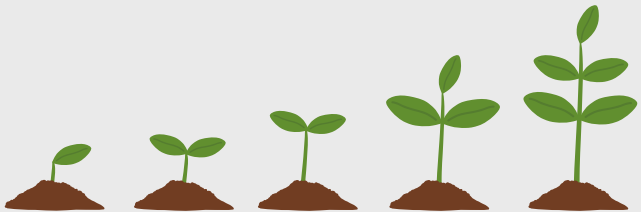
The untreated plot was planted on 24 May 2024 while the MAD plots were both treated and seeded on 4 June 2024. This was due to delays in obtaining the MAD Moisture in a granular form suitable for the available equipment, and the operational need to plant the conventional plot. All plots received conventional fertiliser at 142 kg/ha nitrogen applied as Extran (33.3% N) on 8 July 2024.

Biomass images of the three plots were taken by satellite during the growing season at approximately monthly intervals. At harvest in October, yield and dry matter were measured at 1-3 metre intervals by the forager as it harvested the field. Crop that was visibly bird-damaged at establishment was excluded. Yield data was not collected across all of the treated plots due to a technical issue with the yield mapper. Yield data were all adjusted to 32% dry matter.

During harvest, six samples of maize were taken from the trailer for dry matter, total nitrogen and ammonium N analysis.

Italian rye grass was drilled into all three plots in November 2024, and a satellite biomass image was obtained in early February 2025. There will be three cuts this year, two cuts and grazing in 2026, and in 2027 the plots will be mucked, cultivated and then planted with maize.

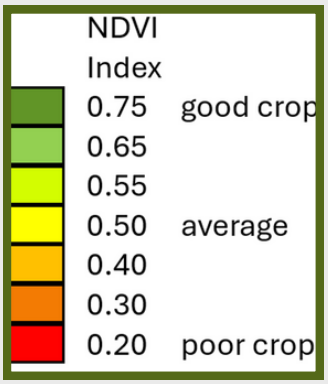
In January 2025, soil nutrient analysis, organic matter and microbial activity were analysed from a pool of 15-20 cores taken from each plot, to assess any longer-term impact of the MAD Moisture application for the following season.



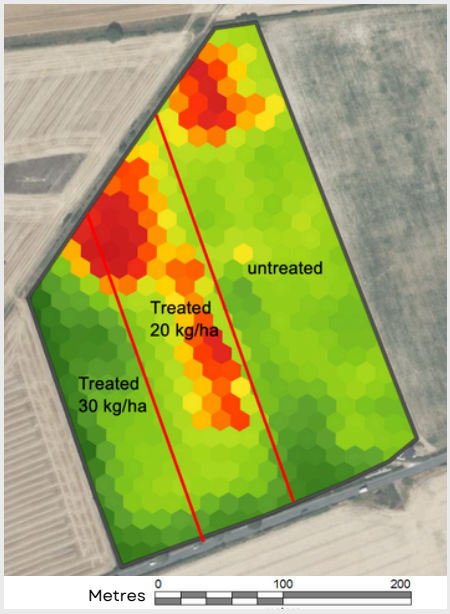
GODDARDS FARM
MAIZE TRIAL

RESULTS

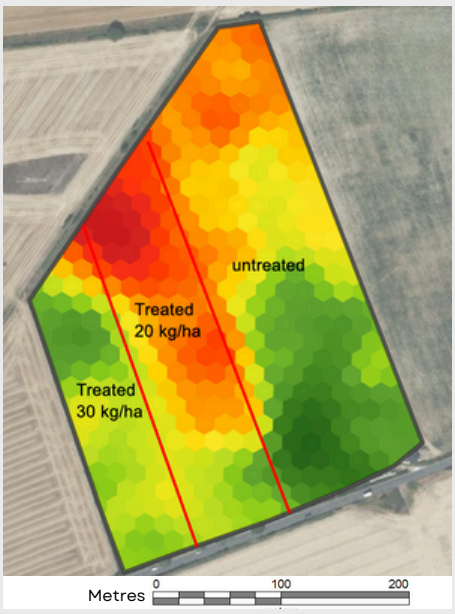
The biomass images showed significant variations within the plots. The central plot had visibly the lowest biomass, with the untreated and 30 kg/ha MAD-treated plots appearing similar by the third timepoint.



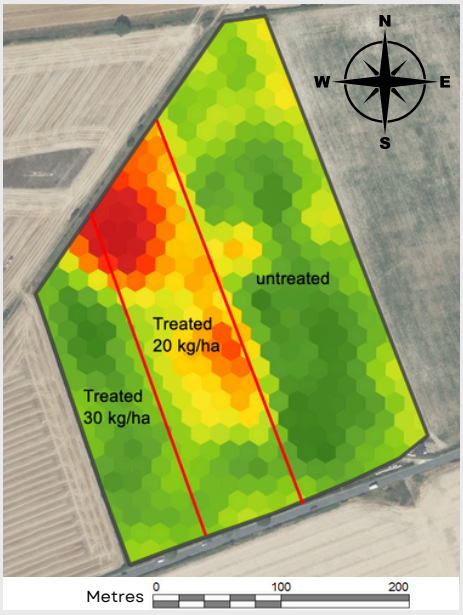
Satellite image on 29 June 2024



Satellite image on 30 July 2024



Satellite image on 23 August 2024



	Average Yield T/ha	No. of readings
Untreated	32.7	2164
20kg/ha	26.1	849
30kg/ha	35.7	432

Yield

The yield data obtained at harvest were consistent with the images, with the 20 kg/ha plot significantly the lowest, and the 30 kg/ha plot above that of the control plot when corrected to 32% dry matter.

The data showed higher average dry matter for the untreated plot (36.4%) and similar dry matter for the 20 kg/ha and 30 kg/ha plots (31.5% and 31 % respectively) consistent with the earlier planting time of the untreated plot.

Nitrogen Levels

Nitrogen levels are elevated in the dry matter obtained from the treated plots.

Treatment	Nitrogen Content (%)
Control	1.32
20kg/ha MAD	1.51
30kg/ha MAD	1.53

GODDARDS FARM
MAIZE TRIAL

RESULTS

Soil nutrient analysis, organic matter and microbial activity in January 2025

	major nutrients				
Treatment	P	K	Mg	pH	Ca
	mg/l	mg/l	mg/l		mg/l
1) Untreated	19.0	92	43	8.1	2910
2) 20 kg/ha	19.6	72	45	8.0	2967
3) 30 kg/ha	30.0	74	50	8.0	3451

	high to very high
	normal
	low
	very low
CEC	cation exchange capacity
C:N	carbon to nitrogan ratio

	minor nutrients								
									Estimated
Treatment	Na	Cu	Zn	Mn	B	SO4	Mo	Fe	CEC
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	meq/100g
1) Untreated	9.8	0.8	6.0	0.8	1.7	12.1	0.2	21	19.8
2) 20 kg/ha	8.9	0.9	7.1	0.6	2.1	13.2	0.2	20	20.1
3) 30 kg/ha	9.6	0.9	8.8	0.6	2.1	15.0	0.2	21	23.3

	% organic matter			Microbial	Carbon	Total N
Treatment	loss on ignition	Dumas	C:N ratio	activity CO_2 burst mg/kg	t/ha 25cm depth	% w/w
1) Untreated	8.5	6.8	9.6	93	94	0.41
2) 20 kg/ha	9.7	7.5	9.1	89	96	0.48
3) 30 kg/ha	10.6	8.4	9.1	78	116	0.54

P	phosphorus	Na	sodium	B	boron
K	potassium	Cu	copper	SO4	sulphate
Mg	magnesium	Zn	zinc	Mo	molybdenum
Ca	calcium	Mn	manganese	Fe	iron

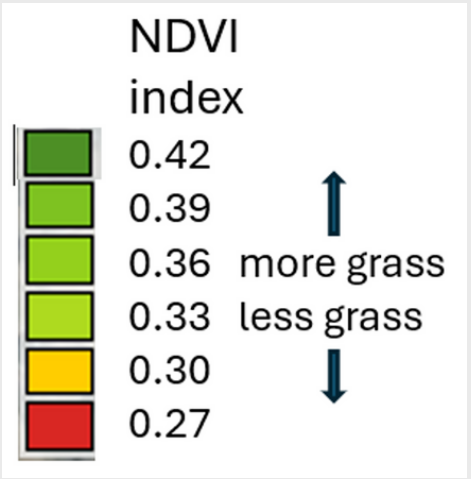
The results indicate that the treated plots have higher levels of some nutrients including phosphorus, magnesium, calcium, zinc, boron and sulphates in January around seven months after application and after one growing season. The percentage organic matter is higher but microbial activity seems lower in the treated plots.

GODDARDS FARM
MAIZE TRIAL

RESULTS

Grass plots drilled in November 2024

An image taken approximately 10 weeks after drilling grass showed crop improvement from the untreated plot to the 20 kg/ha MAD-treated plot, with further improvement in the plot treated with 30 kg/ha MAD Moisture.



GODDARDS FARM
MAIZE TRIAL

CONCLUSION

MAD Moisture is an organic water and nutrient-retaining granule that absorbs 10-15 times its weight in water and is designed to retain nutrient in the root zone. For the purposes of this trial, 2% seaweed extract was added as a source of natural growth-promoting compounds. The hypothesis was that the use of MAD Moisture would reduce requirements for water and conventional fertiliser and enhance root development and overall plant resilience. Due to the different planting times of the control and MAD-treated plots, interpretation of some results was complicated. For example, moisture content in the soil was measured but showed a negative correlation with biomass – the plants took up moisture as they grew – and it was not possible to separate out the effects caused by MAD application from effects caused by the longer growth time for the non-treated plot.

The biomass images showed the most significant differences for Plot 2. This was unexpected. However, the farmer reported extensive bird damage in this plot.

The maize yield figures appeared improved for the plot treated with 30 kg/ha MAD Moisture, however this result must be treated with caution. Given the problems with Plot 2, it was not possible to see a correlation between MAD Moisture application levels and yield, and further data is needed. The nitrogen levels were elevated in the dry matter from the treated plots, potentially indicating higher silage protein content and feed quality.

The image for the grass planted in November 2024 provides evidence of longer-term benefits of MAD Moisture that increase with MAD application levels. The plots will be observed over the coming years.

The analysis conducted in January 2025 also indicates longer-term benefits of MAD Moisture: phosphorus and zinc, which are both important for maize growth, are highest in the plot treated with 30 kg/ha MAD Moisture and lowest in the untreated plot. Not all minerals are increased, however. The organic matter levels are higher in the treated plots, which is consistent with better nutrient retention.

The cost of MAD Moisture at the trial quantities used is £11/kg. For larger-scale applications, there would be volume discounts. At this price, benefits will need to last for several years to be attractive to farmers.

ACKNOWLEDGEMENTS

We are grateful to Mark Futcher at Goddards Farm and John Drake from Michelmersh Manor Farm for making plots of land available for these trials. We are grateful to Izzie Lawrence from Apsley Farm for multiple trips to Goddards Farm.

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