

# TWINN CROP TRIAL

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*Dairy Pasture: Eire, Ireland, 2009 and 2010*

## INTRODUCTION

An independent replicated trial was performed on a dairy pasture in Ireland over two seasons in 2009 and 2010. The trial compared the performance of the standard, high input synthetic fertiliser program versus partial, or full, replacement with a compost product and TwinN. The trial also measured feed quality parameters resulting from the different programs. The results from two years show that the TwinN/compost program produced significantly better dry matter production and improved feed quality compared to the conventional fertiliser program. Use of the TwinN/compost program brings the added advantages of decreasing the carbon footprint of the production system and avoiding soil acidification and other negative effects from long term use of high levels of synthetic nitrogen fertilisers.

## KEY RESULTS

- ◆ In 2009 TwinN was not applied to the plots until halfway through the season. Before application of TwinN the Total Dry Matter (TDM) production was the second lowest in the trial, while after application the TwinN/compost plots produced the highest TDM through to the end of the season.
- ◆ In 2010 the TwinN/compost program was ahead of the conventional fertiliser program in TDM production for the entire season and was the highest producer of any program for the second half of the season.
- ◆ Leaf tissue analyses showed nitrogen (N) levels in leaves in TwinN/compost plots in 2009 were low before the delayed application of TwinN, while after the application they were the highest. This was reflected in the %N as g DM (an indicator of protein content and feed value) which was highest in the trial after TwinN was applied. In 2010 leaf tissue N analyses were similar across most treatments during the early season and, again, TwinN/compost plots were highest in %N as g DM during the second half of the season.
- ◆ Phosphorous (P) and potassium (K) uptake levels were highest in TwinN/compost plots during 2009, and in 2010 P uptake was highest in TwinN/compost plots and second highest in K uptake.
- ◆ Residual soil analysis at the end of the 2009 season showed the TwinN/compost plots had the highest residual soil nitrate levels and substantially elevated levels of available P, indicating that the TwinN/compost treatment increased the soil fertility. This is important for developing long term sustainable high productivity dairy pasture systems.
- ◆ Soil pH after the 2009 season was 0.7 units more acidic in the conventional fertiliser program, compared to the other programs, reflecting the tendency of urea to lower soil pH.
- ◆ Clover content was reported to be obviously increased in TwinN/compost plots by the end of the trial in 2010.

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## TREATMENTS

Table 1: Summary of treatments applied to plots in 2009 and 2010

Treatment & Yr	Pre-season urea (kg/ha)	Std fertiliser <sup>a</sup> (kg/ha)	Terralift compost <sup>b</sup> (T/ha)	TwinN applied
1 2009	30 (+ 60 kg urea starter)	500	0	0
1 2010	30 (+ 60 kg urea starter)	500	0	0
2 2009	30	250	2.2 (3 splits)	0
2 2010	30	250	2.2 (2 splits)	0
3 2009	30	250	4.4 (3 splits)	0
3 2010	30	250	4.2 (2 splits)	0
4 2009	30	0	6.0 (3 splits)	1
4 2010	30	0	5.0 (2 splits)	1
5 2009	30	0	0	0
5 2010	30	0	0	0

a Fertiliser blend is 27:2.5:5. It was applied in 4 weekly splits from April to September.

b Compost blend is 2.2:0.01:0.4 (P analysis is available P)

Table 2: Total applied nutrients in 2009 and 2010

Treatment	N (kg/ha)	Available P (kg/ha)	K (kg/ha)
1	176.4	12.5	25
2	130	6.5	21
3	174	6.7	29
4	146 (124 in 2010)	0.6 (0.5 in 2010)	24 (20 in 2010)
5	13.8	0	0

## RESULTS

Figure 1: Dry matter produced over time for 2009

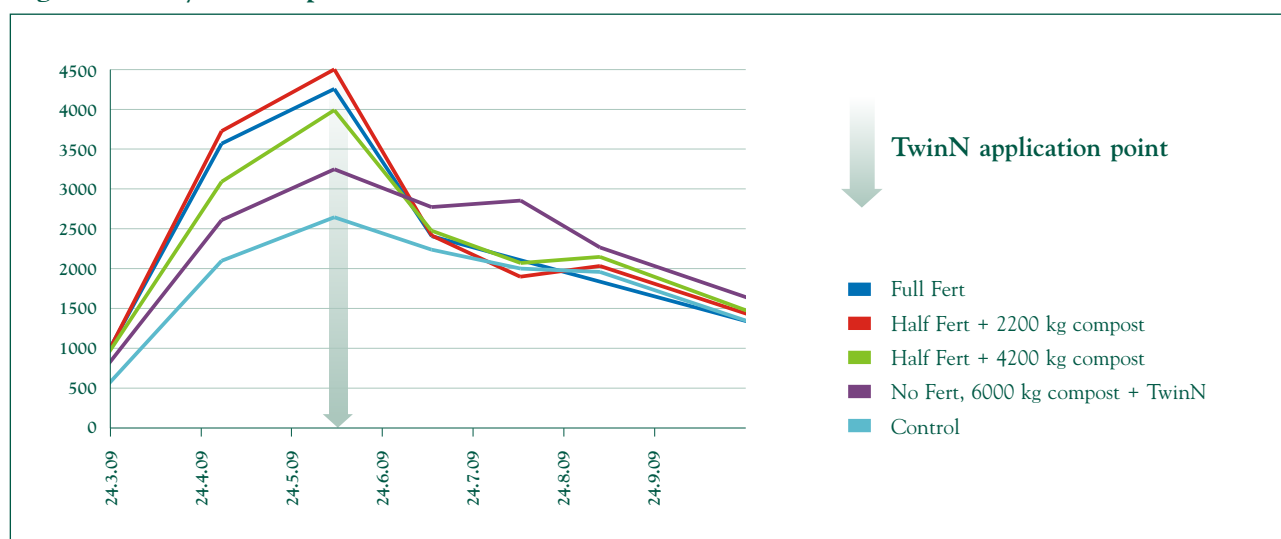
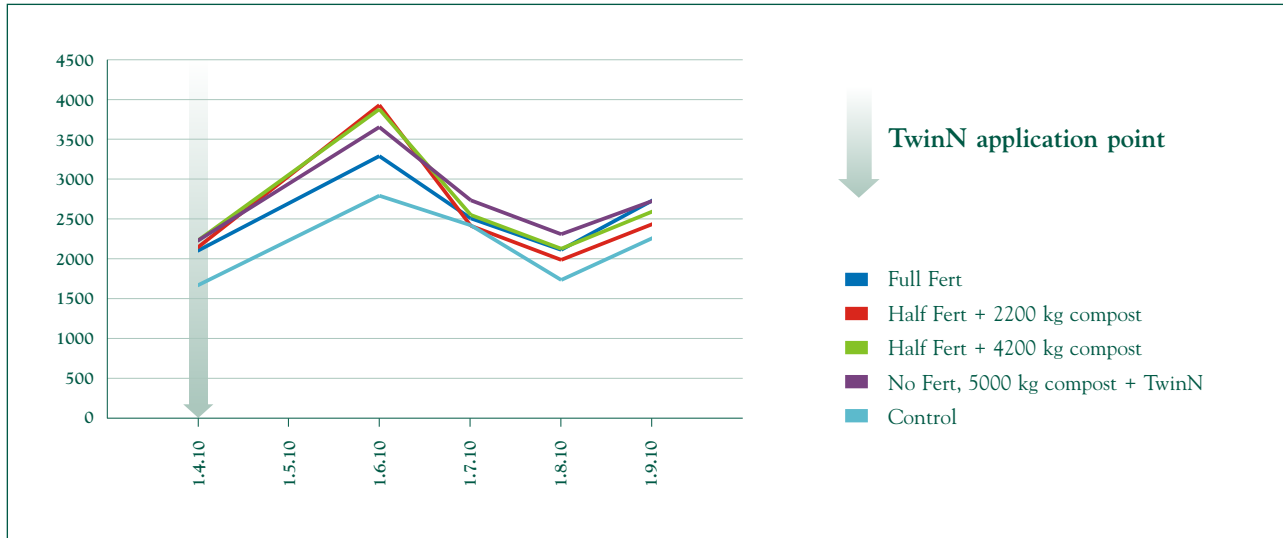
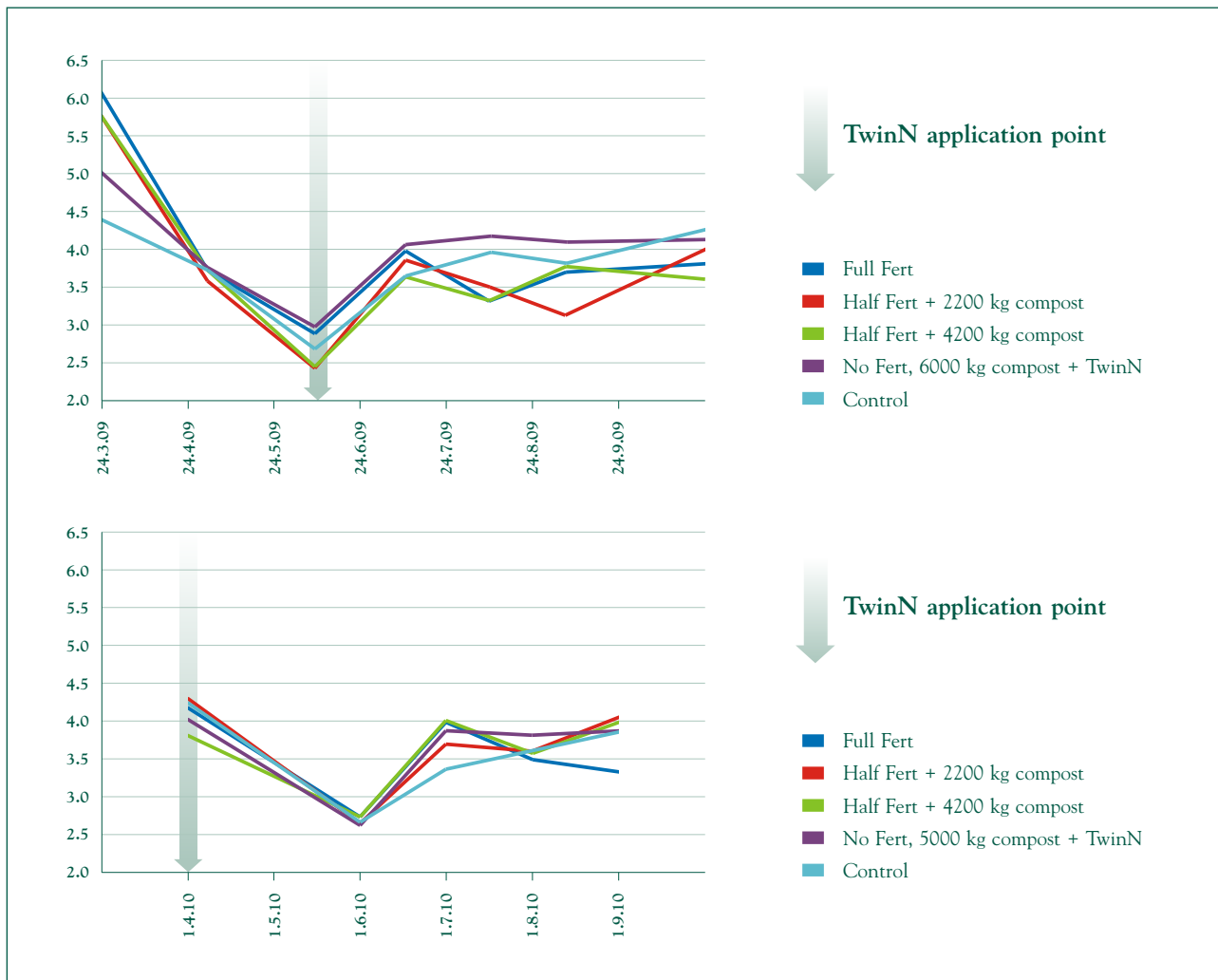


Figure 2: Dry matter produced over time for 2010



Prior to the addition of TwinN to the compost treatment in 2009, DM production was the second lowest in the trial and after TwinN application the TwinN/compost treatment produced the highest DM through the remainder of the season. During 2010 the TwinN/compost plots outperformed the standard fertiliser program and produced a strong, steady supply of feed throughout the season.

Figures 3 and 4: Leaf tissue nitrogen levels (%) over time for 2009 and 2010



TwinN/compost plots had the highest leaf N levels through most of the second part of the season in 2009 and performed well in the 2010 season.

Figures 5 and 6: Total N harvested over time (% in tissues x DM production), 2009 and 2010



A combination of high DM production in the second part of the season and high leaf N levels enabled the TwinN/compost treatment to produce higher Total N levels in harvested pasture over the second part of the 2009 season. Similarly, in 2010, the TwinN/compost plots consistently outperformed the standard fertiliser program and produced a strong finish to the season. A steady supply of high quality forage throughout the season, and particularly the capacity to maintain feed supply later in the season, is important to maintaining high productivity from dairy herds.

Table 3: Average phosphorous and potassium leaf tissue levels during 2009 and 2010<sup>a</sup>

Treatment	P (2009)	P (2010)	K (2009)	K (2010)
1	0.37	0.37	1.29	1.31
2	0.38	0.39	1.22	1.15
3	0.39	0.41	1.31	1.22
4	0.40	0.41	1.39	1.27
5	0.38	0.40	1.14	1.11

<sup>a</sup> Values are the average of six samples over the season from each of the five replicates per treatment.

P levels in the TwinN/compost leaf tissues were higher than the standard fertiliser program in 2009 and 2010. K values were higher in 2009 but not in 2010. These results do not correlate to the amounts of applied nutrients (Table 2) and may reflect improved capture of nutrients and/or nutrient availability in TwinN treated plots.

**Table 4: Residual Soil Analysis at the end of the 2009 season**

Treatment	Nitrate N	Available P	Total P	Available % of Total P	Available K	pH
1	16	15	1028	1.46	99	5.5
2	15	23	1189	1.93	72	6.3
3	22	38	1096	3.47	79	6.2
4	20	51	1214	4.20	110	6.2

Residual soil analyses are important since they indicate the long term benefits, or otherwise, of different nutritional programs. The results of analyses after the 2009 season showed higher levels of nitrate N in the TwinN/compost treatment than in the standard fertiliser program. Total P was highest in the TwinN/compost plots but this was probably likely to higher application levels of total P in the compost. Interestingly, the amount of available P was over three times as high in soil from the TwinN/compost plots compared to the standard fertiliser program and the percentage of P that was available was substantially higher.

The pH of soil from the standard fertiliser plots was considerably lower than that from other plots that received reduced synthetic fertiliser rates and this is presumed to be due to a release, in Treatments 2, 3 and 4, from the acidifying effects of the urea and synthetic nitrogen applications. Soil acidification resulting from long term use of synthetic nitrogen fertilisers has been a concern for many pasture enterprises and the capacity to avoid this problem by alternative nutritional strategies is a significant benefit.

## TRIAL SUMMARY

The trial was performed by an independent agronomist under contract from Terralift Ireland Ltd. Its design was a randomised complete block with 5 replicates of 5 treatments, carried out over two years.

## TRIAL DETAILS

**Pasture:** The pasture was a three year old perennial ryegrass/fescue/clover mix used for intensive dairy production.

**Soil:** The soil was a sandy loam.

### Soil analysis from the plot site before the 2009 season:

N	P	K	Mg	OM	CEC
0.01	1.10	0.06	0.06	5.8%	25.1

**Harvesting and analysis:** Harvesting of the trial plots was performed on 24/3/09, 30/4/09, 6/6/09, 9/7/09, 7/8/09, 2/9/09 and 17/10/09 for the 2009 season; and on 29/4/10, 2/6/10, 5/7/10, 10/8/10 and 17/9/10 for the 2010 season. Cuts were at 40 mm.

**TwinN applications:** TwinN was applied in 200 L/ha as per recommendations.

During 2009 TwinN was applied part of the way through the season as shown on the graphs, while in 2010 it was applied at the start of the season.

## CONCLUSIONS

- ◆ The trial was not designed to quantify the effects of TwinN alone but it demonstrated clearly, over two years, that a system of compost plus TwinN was able to produce more, and higher quality, feed than the conventional high input fertiliser program.
- ◆ Pasture production and quality was maintained better throughout the season than the conventional program, with good feed being produced during the second part of each season from the TwinN/compost plots.
- ◆ The residual soil measurements showed that the TwinN/compost treatment was improving soil nutrient status and pH compared to the standard fertiliser program.
- ◆ The capacity to maintain high production from the pasture while reducing applications of synthetic fertilisers provides a practical strategy to farm sustainably and profitably.