

**Trial Title:** Organic manure and crop organic carbon returns – Straw incorporation and the effects on soil quality.

**Centre:** Morley

**Trial Code:** WW16-067

**Variety:** BTS470

**Objective:** To provide an improved understanding of how organic carbon additions influence soil bio-physical and physicochemical properties.

**Mentor theme:** Long-term monitoring study

**Summary:** This report outlines the findings of Morley Educational Training and Outreach (MENTOR) research examining the interaction of crop residue returns (and incorporation) in association with differential rates of fertiliser nitrogen (N) applications. In 2015/16 the study was in sugarbeet. The maximum yield was associated with N5 treatment (100 kg/ha N). Unlike previous years major differences in soil structure and characteristics were not evident. However, improvements in crop GAI and vigour were evident between the untreated (N1) and full nitrogen dose (N6).

**Table 1. Treatments**

Treatment		First application (kg N/ha) Seedbed (post drilling)	Second application (kg N/ha) GS 10	Total (kg N/ha)
1	N1	70	0	70
2	N2	70	0	70
3	N3	70	0	70
4	N4	70	5	75
5	N5	70	30	100
6	N6	70	50	120

**Note:** N Doses revised from protocol following accidental farm application across plots

- Sugar beet (cv. BTS470) was drilled in reasonable conditions on 20<sup>th</sup> April 2016.
- Measurements of available soil N was sampled in late autumn 2016. The available nitrogen (0-60 cm profile) in the untreated (N1) was 31 kg N/ha compared to 38 kg N/ha in the full N treatment (N6).
- Due to an error in farm application the untreated (N1) and the N2 and N3 treatments all received the same N doses (70 kg N/ha). Subtle differences in crop Green Area Index (GAI) and crop vigour were also apparent (Figure 1). Treatments N1, N2 and N3, which received the same N doses showed similar GAI and vigour scores. Thereafter, GAI and vigour increased as N doses increased with each treatment, with N6 showing the greatest GAI (7.1) and highest crop vigour (8.5).
- In contrast to previous years there was very little differences in soil parameter values between untreated and 120 kg N/ha (Table 2). Although earthworm populations were lower than those observed in previous years there was a noticeably higher population in N6 (208/m<sup>2</sup>) compared to N1 (158/m<sup>2</sup>). In agreement with preceding years data that suggests that the increased crop residue returns in N6 are sustaining a higher population of earthworms from the sustained food source provided.
- Although some variation in yield between treatments can be observed (Figure 2), this variation does not follow the direct increase in yield with the increase in Nitrogen application

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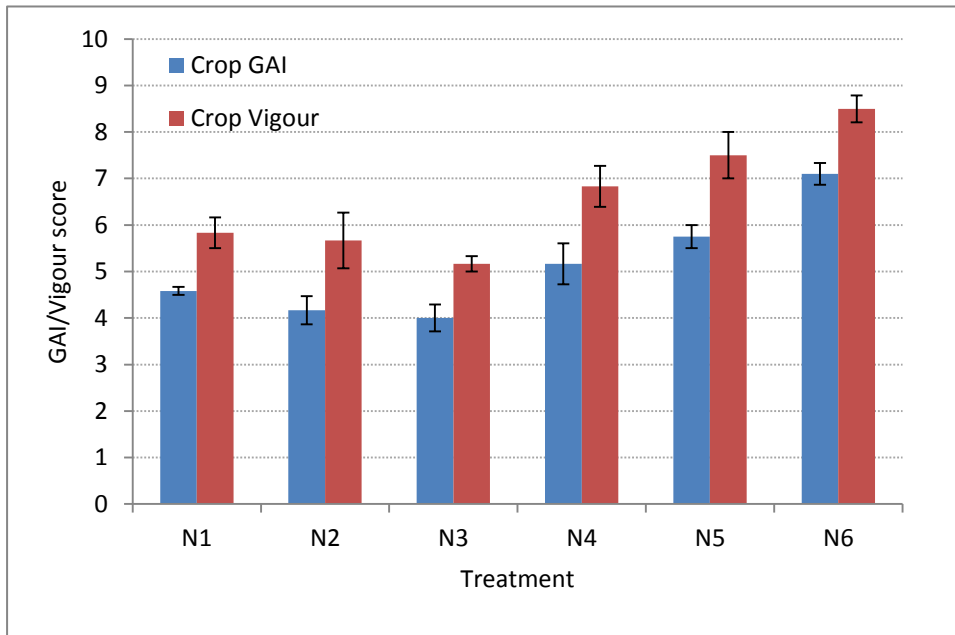
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that has previously been displayed (i.e. 2015). This could be a result of the uniform 70 kg/ha N that all treatments received during the first N application. Despite this the two highest N dose treatments N5 and N6, produced the highest yields (121.8 and 106.2 t/ha respectively).

- It is envisaged that the data gathered from this trial series will be used to build up a long term tracking of straw residue returns on soil and crop performance over coming seasons.

Figure 1. Crop GAI and Crop Vigour scores, July 2016



Error bars are the standard error of the mean (SEM)

Table 2. The effect of crop residue returns on soil parameters

Total N dose (Treatment)	VESS (autumn)	Bulk density (g/cm <sup>3</sup> ) 0-10 cm	Bulk density (g/cm <sup>3</sup> ) 10-20 cm	Earthworm population (worms/m <sup>2</sup> )	Earthworm biomass (g m <sup>2</sup> )
Untreated (N1)	2.4	1.43	1.41	158	69
120 kg N / ha (N6)	2.2	1.44	1.38	208	48

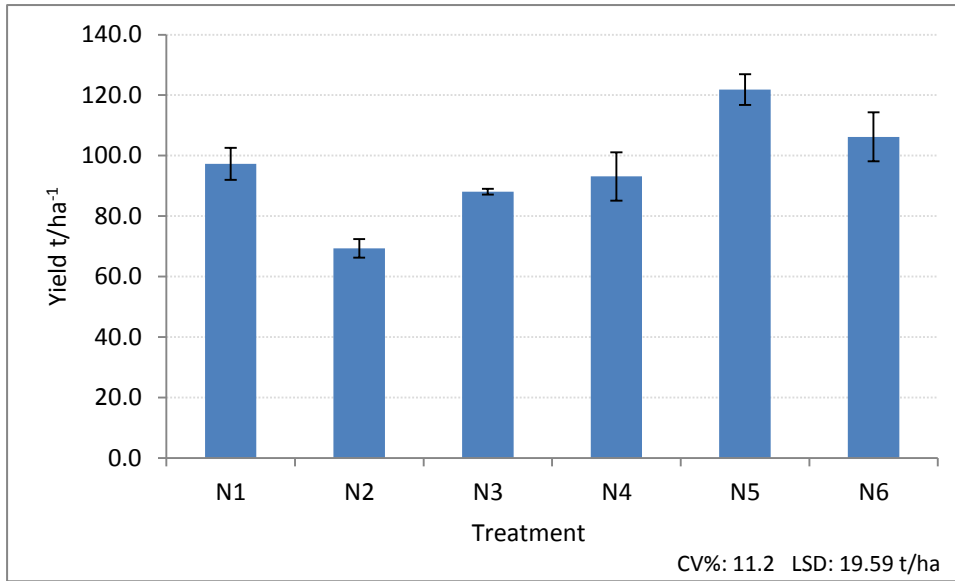
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Figure 2. Yield response to treatment



Error bars are the standard error of the mean (SEM)

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**Field details & overall applications to crop**

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<b>Crop:</b>	Sugar Beet
<b>Trial ID:</b>	WW16-067
<b>Location: Name and 6 fig grid ref</b>	Ravens Grove, Morley
<b>Variety:</b>	BTS470
<b>Seed rate:</b>	1.15 SBunit/ha
<b>Soil type:</b>	Ashley Series
<b>Soil analysis:</b>	P – 63.6 mg/l, K – 102 mg/l, Mg – 35 mg/l, pH – 7.3 (sampled 2015)
<b>Previous crop:</b>	Winter Wheat
<b>Drill date: dd/mm/yy</b>	20/04/2016
<b>Harvest date: dd/mm/yy</b>	20/10/2016
<b>Drilled plot size: m2</b>	4 x 18 m
<b>Harvested plot size: m2</b>	1 x 12 m approx
<b>Replicates:</b>	3

Input type	Product	Product rate (l, ml, kg or g/ha)	Date	
Herbicide	Rosate 360 (glyphosate)	4.0 l	09/12/2015	
	Volcan Combi (chloridazon+metamitron)	2.4 l	24/04/2016	
	Beta-Team (desmedipham+ethofumesate+phenmedipham)	1.0 l	14/05/2016	
	Goltix 70 SC (metamitron)	1.0 l	14/05/2016	
	Beta-Team (desmedipham+ethofumesate+phenmedipham)	1.0 l	27/05/2016	
	Safari Lite WSB (lenacil+triflurosulfuron methyl)	210 g	27/05/2016	
	Beta-Team (desmedipham+ethofumesate+phenmedipham)	1.5 l	04/06/2016	
	Goltix 70 SC (metamitron)	1.0 l	04/06/2016	
	Safari Lite WSB (lenacil+triflurosulfuron methyl)	210 g	28/06/2016	
	Beta-Team (desmedipham+ethofumesate+phenmedipham)	1.0 l	28/06/2016	
	Centurion Max (clethodim)	1.0 l	01/07/2016	
	Vivendi 200 (clopyralid)	1.0 l	04/07/2016	
	Fungicide	Centaur (Cyproconazole)	0.1 l	26/07/2016
		Escolta (cyproconazole+trifloxystrobin)	0.25 l	26/07/2016
Escolta (cyproconazole+trifloxystrobin)		0.25 l	01/09/2016	
Centaur (Cyproconazole)		0.1 l	01/09/2016	
Adjuvant	Companion Gold	0.5 l	09/12/2015	
	Logic	0.5 l	27/05/2016	
	Logic	1.0 l	04/06/2016	
Input type	Name of product and % of nutrient	Product rate/ha	Date	
Fertiliser	FYM	20 t/ha	12/10/2015	
	Kaimag75 35.130.200	870 kg/ha	28/09/2015	

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