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

Centre: Morley **Trial Code:** WW17-067 **Variety:** Campus (Peas)

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 2016/17 the study was in combinable peas (cv. Campus) therefore no N applications where applied. As a result of this there were very little differences between treatments in all measures. Little difference in soil physical conditions were noted and crop yields showed very little variation.

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	0	0	0
2	N2	0	0	0
3	N3	0	0	0
4	N4	0	0	0
5	N5	0	0	0
6	N6	0	0	0

Table 2. Soil Nutrient Status

Total N dose (Treatment)	Soil pH	Available P (mg/l)	Available K (mg/l)	Available Mg (mg/l)	Organic matter (%) 0-10cm	Organic matter (%) 10-20cm
Untreated (N1)	7.4	56.2	85	51	2.2	2.3
250 kg/ha N (N6)	7.2	59.4	76	37	2.5	2.6

- Combinable peas (cv Campus) were drilled in reasonable conditions on the 29th March 2017 at a seed rate of 230 kg/ha. All crop inputs were as the Morley farm crop (as detailed in the Field Details). Peas are used as a leguminous break crop therefore no N was applied throughout the season. All plots received a 1kg/ha dose of Manifol (Manganese fertiliser) on the 27th of April 2017.

- Measurement of available soil N was sampled In late spring and showed no differences between the untreated (N1) and full nitrogen treatment (N6) both measuring 24 kg N/ha (0-90cm). There was little recorded influence from crop residue returns on soil nutrient levels (P,K and Mg) as shown in Table 2, with slightly higher levels of Mg in the Untreated. In line with previous years data there is a suggestion of a small increase in total soil organic

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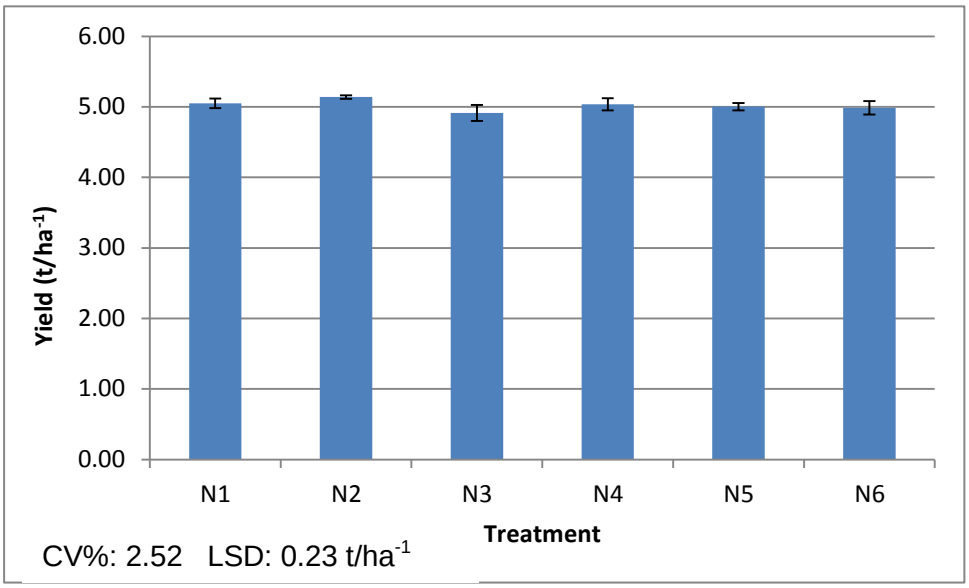
matter (SOM), with an average of 2.3% in the untreated and 2.6% in the full nitrogen treatment.

Table 3. Soil Physical Structure

Treatment	VESS (late spring)	VSA (late spring)	Bulk density (g/cm^3) 0-10 cm	Bulk density (g/cm^3) 0-20 cm
N1	1.70	1.65	1.19	1.13
N6	1.69	1.55	1.15	1.08

- Assessments of the Visual Evaluation of Soil Structure (VESS), drop shatter test (VSA) and soil bulk density were carried out as an indication of soil physical structure. For VESS, soil condition is ranked by assessing the appearance and feel of the block of soil dug out with a spade. The block is then given an overall score based on visual scoring. Scores range from 1 to 5; as scores tend toward 5 they indicate a poorer structure, with scores under 3 generally being considered reasonable Assessments showed no noticeable differences between treatments with the VESS scores of around 1.7 (good) and the VSA also showed no major differences. Bulk density readings where only very slightly higher at both depths in treatment N1, with differences unlikely to impact root growth.

Figure 1. Combinable pea yield (t/ha^{-1}) for all treatments obtained using a plot combine and oven drying samples to determine dry matter



- Crop yield (t/ha) was harvested using a Sampo plot combine with samples retained to obtain dry matter content (%) (Figure 1). There was no difference in crop yield with the lowest yield recorded in N3 (4.91 t/ha) and the highest N2 (5.14 t/ha).

- 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. This is particularly prominent as we are approaching 25 years since the stubble burning ban.

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Field details & overall applications to crop

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Trial Name	Mentor-Straw Incorporation and effects on soil quality
Crop:	Combinable Peas
Trial ID:	WW17-067
Location: Name and 6 fig grid ref	Morley
Variety:	Campus
Seed rate:	230 kg/ha
Soil type:	Medium (Ashley series)
Soil analysis:	P – 57 mg/l, K – 85 mg/l, Mg – 51 mg/l, pH – 7.4
Previous crop:	Sbeet
Drill date: dd/mm/yy	29/03/17
Harvest date: dd/mm/yy	01/08/17
Drilled plot size: m2	4m X 18m
Harvested plot size: m2	1 x 15 m approx
Replicates:	3

Input type	**Product**	**Product rate**	**Date**
Herbicide	Nirvana	3 l/ha	29/04/17
	Linzone	2 l/ha	29/04/17
	Tropotox	4.4 l/ha	25/05/17
PGR:	-	-	-
Insecticide:	Colt 10 CS	0.075 l/ha	27/04/17
	Colt 10 CS	0.15 l/ha	16/06/17
	Aphox	0.25 kg/ha	16/06/17
Fungicide:	Amistar	0.5 l/ha	16/06/17
Molluscicide:	-	-	-
Adjuvant:	Remix	0.4 l/ha	29/04/17
Input type	**Name of product and % of nutrient**	**Nutrient rate/ha**	**Date**
Fertiliser:	Manifol (Mn)	1 kg/ha	27/04/17

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