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## Willow coppice PAS 100 compost fertiliser trial

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# 2nd Progress Report April 2009



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**Written by:** Mike Palmer BSc MSc & Dr Robin Davies BSc PhD CSci



**Soil Environment Services**



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**Front cover photography:** [second year short rotation willow coppice on trial site at Cockle Park Farm, Northumberland.]

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# Executive summary

This interim report provides details of progress from January to April 2009, in accordance with the terms of the research contract between WRAP and Soil Environment Services.

- All treatments (sewage sludge cake, green waste compost and food waste amended green waste compost) were applied according to the agreed specifications between March 30<sup>th</sup> and April 2<sup>nd</sup>, 2009.
- Baseline plant samples were collected on 2<sup>nd</sup> April 2009. Results are included.
- Due to later than scheduled fertiliser application, baseline soil samples will now be collected at the start of May to allow sufficient time for fertiliser nutrient release prior to treatment comparison.
- Due to the slow development of the crop (in the absence of organic amendments) the decision was made to delay coppicing until spring 2010. This decision does not adversely affect the trial.

The report also includes a work plan for the next 3 months (up to the next interim report in August 2009).

# Contents

- 1 SUMMARY OF PROGRESS TO JANUARY 2009 (PREVIOUS REPORT).....3
- 2 PROGRESS REPORT JANUARY-APRIL 2009.....4
- 3 WORK PLAN FOR THE NEXT 3 MONTHS .....6

**Appendices**

- Appendix 4: Results of baseline plant sample.....1

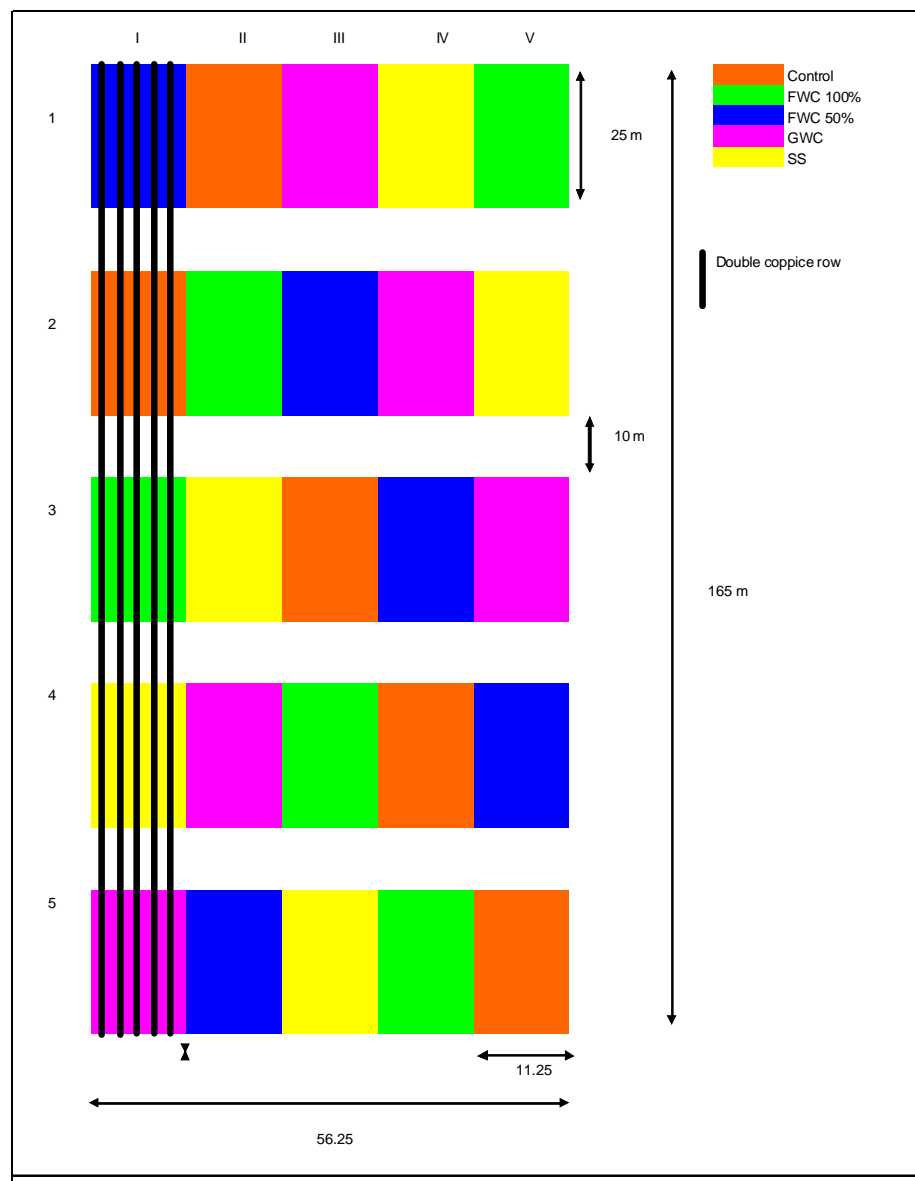
# 1 Summary of progress to January 2009 (previous report)

The trial was established on reclaimed opencast land owned by Newcastle University's Cockle Park experimental farm. The trial utilised an area of approximately 1 hectare of a 4 hectare commercial (mixed variety) willow coppice plantation planted in June 2008.

Individual plots measured 25 m in length by 11.25 metres in width, and consisted of 5 double rows of coppice rods (see Figure 1). The trial compares performance of 3 organic fertilisers; PAS 100 green waste compost, PAS 100 food waste amended green waste compost and dewatered sludge cake (a widely applied organic fertiliser on biomass crops). All treatments were to be applied at the maximum permitted rate equivalent to 500 kg total nitrogen per hectare. Additionally a half rate (250 kg/ha) food waste compost treatment was included, as well as an unfertilised control. Each treatment is replicated five times in a completely randomised design (see Figure 1).

Plots were demarcated in December 2008.

Baseline soil samples were collected from each plot in December 2009 from a depth of 0-15 cm using a gouge auger and submitted for full nutrient and heavy metal analysis (results supplied in previous report).



**Figure 1: Trial layout**

FWC (food waste compost), GWC (green waste compost), SS (sewage sludge)



## 2 Progress report January-April 2009

Samples of the PAS 100 compost amendments were tested for total nitrogen content in February 2009 using a LECO 2000 nitrogen analyser. The mean values were 0.76% and 1.55% for the green waste and food waste amended composts respectively. These values were used to determine the dry weight fertiliser applications to achieve rates of 500 kg total nitrogen per hectare equivalent. Similar figures were provided by Agrivert Ltd based on previous analysis of the stockpiled sewage sludge applied to the trial.

Due to an absence of suitable work days in early spring, field operations were slightly delayed from the schedule of works agreed with WRAP. Operations however *were* carried out within a time window comparable with commercial practice.

Green waste compost and food waste amended green waste compost were spread on the 30<sup>th</sup> of March and 1<sup>st</sup> April respectively using a purpose-built plot spreader. The spreader was previously calibrated to apply the correct rate on adjoining areas of coppice plantation. This allowed an accurate and even application of organic material (see Photo 1).



**Photo 1: Applied food waste compost**

Dewatered sewage sludge cake was provided and applied free of charge by Agrivert Ltd (the contractor for Northumbria Water) on April 2<sup>nd</sup> using a commercial muckspreader (see Photo 2). The sludge cake was supplied from an overwinter stockpile on a nearby farm. Testing on coppice plantation adjacent to the trial was used to calibrate the spreader to ensure an accurate application to the plots.

1 kg samples of both composts were collected on the 1<sup>st</sup> April and preserved in a freezer for future analysis of nutrient and contaminant concentration (to be performed with May soil samples - see section 3). Full nutrient and contaminant figures for sewage sludge cake will be provided by Agrivert Ltd.

Baseline plant samples were cut from the 3 centre double rows of each plot on April 2<sup>nd</sup>. Total number of stems, stem lengths and fresh and dry weights were recorded (see Table 1). These figures will be used to remove variability in yield results (August 2009 and 2010) attributable to pre-trial differences. The results indicated no significant variability between trial blocks and a relatively low variability between individual plots. The sampled plants were labelled to allow repeated sampling of the same individuals through the growing season. Dried plant material was milled and retained for later analysis of nutrient and contaminant concentrations for comparison with samples taken at the end of the growing season (to evaluate treatment effects).



Photo 2: Sewage sludge cake application

| Variable                   | Mean  | SE Mean | Min   | Q1    | Q3    | Max   | Coefficient of Variation (%) |
|----------------------------|-------|---------|-------|-------|-------|-------|------------------------------|
| fresh weight (kg/ha)       | 227.0 | 15.4    | 100.9 | 180.2 | 257.5 | 470.8 | 33.9                         |
| dry weight (kg/ha)         | 86.3  | 6.28    | 50.1  | 69.1  | 93.9  | 199.9 | 36.4                         |
| stems per plant            | 1.8   | 0.07    | 1.3   | 1.5   | 2.0   | 2.5   | 18.9                         |
| stem length per plant (cm) | 79.1  | 4.1     | 42.5  | 67.7  | 85.6  | 147.4 | 25.9                         |
| Ave stem length (cm)       | 43.9  | 1.3     | 31.9  | 39.7  | 49.3  | 59.0  | 14.9                         |

Table 1: Baseline plant yields (full results appended)

Due to poor growth of the coppice rods in the 1<sup>st</sup> season (prior to the trial) it was decided to delay coppice cutting from spring 2009 to spring 2010 to avoid the potential for plant losses. This decision does not impact the functioning of the trial or the transferability of the trial results. Poor rates of establishment of willow coppice were also observed with an earlier plantation on the site, and support the contention that former opencast soils are degraded and will benefit from additions of bulk organic fertilisers of the type used in this trial.

Due to the delay in fertiliser application, spring soil analysis results are not included in this report and will be added to the next interim report (August 2009).

### 3 Work plan for the next 3 months

Soil samples will be collected from each plot in May and analysed for nutrient (total N, NO<sub>3</sub>, NH<sub>4</sub>, P,K, Ca, Mg, S) pH and organic carbon content.

Samples of both composts will also be submitted for the same analysis.

Plant growth measurements (number of stems, stem basal diameter, stem heights) will be recorded in May, June and July.

Plant health measurements (leaf chlorophyll, pest and disease infestations) will be recorded in May, June and July.

Weed growth measurements (% ground cover grass and herb species) will be recorded in May, June and July.



## APPENDIX 1: Results of baseline plant growth samples

