Productivity of woodchip compost

Report 7

Woodchip for Livestock Bedding Project

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HYBU CIG CYMRU
MEAT PROMOTION WALES

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Mae'r Prosiect Sglodion Pren ar gyfer Sarnau Da Byw a gyflenwir gan Hybu Cig Cymru yn derbyn arian cyfatebol gan y Comisiwn Coedwigaeth, Asiantaeth yr Amgylchedd Cymru a Llywodraeth Cynulliad Cymru fel rhan o Cyswllt Ffermio.

INTRODUCTION

This study follows on from the earlier assessment of woodchip compost that was undertaken as part of the Woodchip for Livestock Bedding Project (Report 4). The assessment of woodchip compost detailed the nutrient dynamics which occur during the composting of woodchip/manure (WM) that has previously been used for animal bedding. This report describes the work which was undertaken to investigate the subsequent agronomic benefit of WM compost in a range of agricultural contexts. The overall aim of this work was to establish best practice guidelines to farmers to enable its effective end-use. The regulatory framework governing a broad range of possible end uses can be found in Report 6.

NATURE OF THE TRIALS

Three greenhouse-based trials were carried out to address two key objectives, namely:

1. To determine the optimum storage time for woodchip-derived compost and to assess its value as an organic fertiliser.

2. To establish the relative agronomic benefit of the ‘fine’ and ‘coarse’ fraction of the woodchip-derived compost to determine whether sieving the compost represents a worthwhile option for farmers to increase its fertiliser value.

To address the first objective, a grass trial was established to compare the relative agronomic performance of 1 and 3 year old WM-derived composts. For comparison, the trial included two control treatments; the addition of a conventional N-P-K inorganic fertiliser at a rate of 150-57-79 kg/ha and a ‘zero-addition’ treatment which received no fertiliser.

To address the second objective, two spring barley trials were carried out to establish whether there was any agronomic benefit to be gained from sieving the WM compost to extract the fine, well decomposed fraction that was thought to contain the most nutrients. This trial was carried out due to worries that the coarse woody fraction in the compost may lock up soil nitrogen when applied to the land and which subsequently may reduce crop yields. To simulate commercial compost screening machines, we used an 8 mm sieve mesh to separate the fine and coarse fractions. The fraction smaller than 8mm (< 8 mm) was mostly comprised of decomposed manure and hay or silage feed with a small amount of decomposed woodchip. In contrast, the fraction greater than 8mm (> 8 mm) was almost entirely made up of intact woodchips which showed few signs of biodegradation. Two trials were carried out with each compost size fraction, one with a conventional application rate of 10 t/ha and another applied at rates of 100 t/ha. Throughout this report, these two trials will be referred to as B10 and B100, respectively.

PLANT GROWTH TRIALS

1. Grassland Growth Trial

The grassland trial was conducted under glasshouse conditions at Bangor University's Penn-y-Ffridd Field Station between 26th November, 2007 and 11th April, 2008. The trial consisted of 7 individual treatments with 4 replicates of each treatment as shown in Table 1. Topsoil with no addition was used as the control treatment, whilst conventional N-P-K fertiliser applied at a rate equivalent to 150-57-79 kg/ha. The woodchip compost treatments included the use of two cattle-woodchip derived composts obtained from ADAS-Pwllpeiran (ADAS) which differed in the initial moisture content of the chips when purchased (34 and 55% moisture respectively prior to use as animal bedding). In addition, the trial also included one cattle-derived woodchip compost obtained from IGER-Aberystwyth (IGER) where the woodchips were collected from under cattle fed on silage. All three of these woodchip composts were one year old. For comparison, two woodchip composts obtained from Glynllifon College and the Pontbren Group were used, which had been composted and then stored outside for three years to further their biological breakdown.

Table 1: List of the seven treatments used in the grassland growth trial

Treatments	**Abbreviation**
1. Topsoil only	Soil only
2. NPK fertiliser (app. rate 150-57-79 kg/ha)	N-P-K
3. ADAS Cattle woodchip (34 % moisture)	ADAS C34
4. ADAS Cattle woodchip (55 % moisture)	ADAS C55
5. IGER Cattle fed silage on woodchip	IGER CSC
6. Pontbren 3 year old woodchip	Pb 3 yr
7. Glynllifon 3 year old woodchip	Glyn 3 yr

The composts were mixed with a low nutrient, clayey, organic agricultural topsoil and placed into 1.5 litre plastic pots. The composts were applied at a rate of 10 t/ha to reflect typical application rates. The pots were then sown with mixed meadow grass at a rate of 40 kg/ha and the pots placed in a randomised block design in the greenhouse. After 20 weeks the pots were harvested to measure the amount of grass growth.

2. B100 Barley Growth Trial

The B100 trial was conducted under glasshouse conditions at the Penn-y-Ffridd Field Station between 17th July and 13th November, 2007. The trial consisted of 16 treatments each with 4 replicates. The list of individual treatments used in the barley growth trial are shown in Table 2. These included a zero addition (soil only; Treatment 1) control and a conventional NPK fertiliser treatment (Treatment 2) as used in the grassland trial except that N-P-K fertiliser was added at a rate equivalent to 221-84-116 kg/ha. The composts included both sheep and cattle derived woodchip composts which were 1 year-old (Treatments 3-11) as well as the older woodchip composts obtained from Glynllifon and Pontbren (Treatments 15-16). For comparison, three straw-based composts were also used (1 year old, Treatments 12-14). The 1 year old woodchip composts were mechanically separated into two size fractions (< 8 mm and > 8 mm) to represent the 'fine' and 'coarse' fractions. Pots were filled with soil and compost as described in the grassland trial with the exception that compost was added at a rate of 100 t/ha. Each of the pots were then sown with four spring barley (cultivar variety '*Optic*') seeds and the plants left to grow for 18 weeks until the crop had fully matured. The grain's '1000 grain weight' was 48.7 g and was sown at a density of 4 grains / pot which is equivalent to an input weight of 0.14 t/ha.

Table 2: List of the 16 treatments used in the B100 barley growth trial

Treatments	Abbreviation
1. Topsoil only	Soil only
2. NPK (app. rate 221-84-116 kg/ha)	N-P-K
3. ADAS Cattle woodchip (55 %)	ADAS C55
4. IGER Sheep fed hay on woodchip	IGER SHC
5. IGER Cattle fed silage on woodchip	IGER CSC
6. ADAS Cattle woodchip (55 %) (> 8 mm)	ADAS C55 > 8
7. IGER Sheep fed hay on woodchip (> 8 mm)	IGER SHC > 8
8. IGER Cattle fed silage on woodchip (> 8 mm)	IGER CSC > 8
9. ADAS Cattle woodchip (55 %) (< 8 mm)	ADAS C55 < 8
10. IGER Sheep fed hay on woodchip (< 8 mm)	IGER SHC < 8
11. IGER Cattle fed silage on woodchip (< 8 mm)	IGER CSC < 8
12. ADAS Sheep straw	ADAS SS
13. ADAS Cattle straw	ADAS CS
14. IGER Sheep fed hay on straw	IGER SHS
15. Pontbren 3 year old woodchip	Pb 3 yr
16. Glynllifon 3 year old woodchip	Glyn 3 yr

3. B10 Barley Growth Trial

The B10 trial was conducted under glasshouse conditions as described above the Penn-y-Ffridd Field Station from 30th November, 2007 to 28th March, 2008 and consisted of 16 individual treatments each with 4 replicates. The design of the trial was essentially the same as that used in the B100 trial with the exception that the rate of compost application was lower (10 t/ha) and the N-P-K fertiliser addition was slightly lower at 150-57-79 kg/ha. In addition, the barley used in this trial was 2nd generation grain, harvested from the three straw treatments in B100 trial, with a '1000 grain weight' of 47.7 g and sown at a density of 4 grains / pot, is equivalent to an input weight of 0.14 t/ha. A summary of the sixteen treatments is shown in Table 3 below.

Table 3: List of the 16 treatments used in the B10 barley growth trial

Treatments	Abbreviation
1. Topsoil only	Soil only
2. N-P-K (app. rate 150-57-79 kg/ha)	N-P-K
3. ADAS Cattle woodchip (34 %)	ADAS C34
4. ADAS Cattle woodchip (55 %)	ADAS C55
5. IGER Cattle fed silage on woodchip	IGER CSC
6. ADAS Cattle woodchip (34 %) (> 8 mm)	ADAS C34 > 8
7. ADAS Cattle woodchip (55 %) (> 8 mm)	ADAS C55 > 8
8. IGER Cattle fed silage on woodchip (> 8 mm)	IGER CSC > 8
9. ADAS Cattle woodchip (34 %) (< 8 mm)	ADAS C34 < 8
10. ADAS Cattle woodchip (55 %) (< 8 mm)	ADAS C55 < 8
11. IGER Cattle fed silage on woodchip (< 8 mm)	IGER CSC < 8
12. ADAS Sheep straw	ADAS SS
13. ADAS Cattle straw	ADAS CS
14. IGER Cattle fed hay on straw	IGER CHS
15. Pontbren 3 year old woodchip	Pb 3 yr
16. Glynllifon 3 year old woodchip	Glyn 3 yr

ANALYSES

1. SPAD Chlorophyll Readings

A Minolta SPAD 502 meter was used to measure the chlorophyll content in the top leaf of each plant. Research has shown that leaf chlorophyll content is closely correlated to levels of nitrogen in the plant and consequently SPAD measurements provide a good indicator of plant-available N in the soil. The method provides a quick and cost-effective apparatus to determine when fertiliser is needed without damaging the crop.

2. Plant Biomass

In this study, plant biomass represents the total weight of the above-ground plant material produced throughout the growth trial. To determine this, the vegetation in each pot was harvested at soil level, put in individually marked paper bags and dried in the oven at 80°C for a minimum of 48 hours, after which the crop weight per pot was recorded and the average dry weight for each treatment determined.

3. Grain Yield (Barley trials only)

After measuring the biomass in each pot, the grain was harvested and weighed to give total grain yield per pot. Subsequently, 50 grains for each treatment were weighed to establish '1000 grain weights'. This measurement is used to gauge the quantity required to re-sow the following year. In the B10 barley growth experiment the seeds came from those harvested from the three straw treatments in the B100 growth trial.

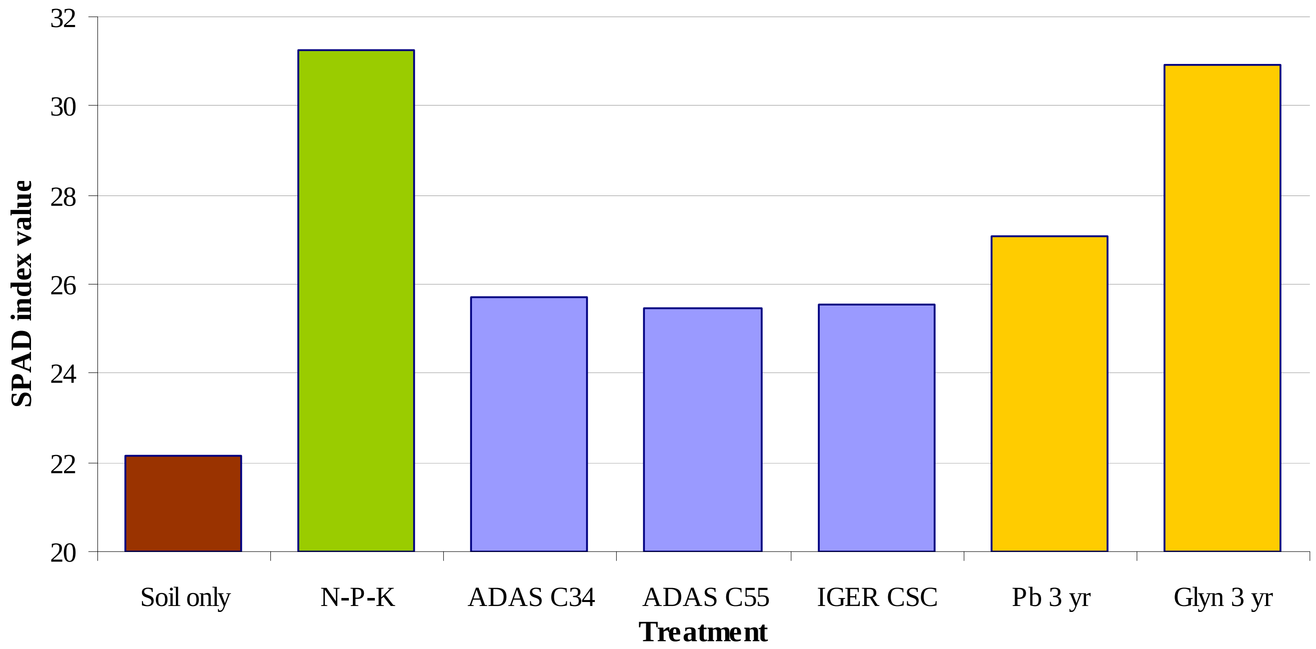
RESULTS

1. Grass Trial

During seed formation, the plant draws all available nutrients to the top of the stem to give the seeds the strongest possible start, after which the parent plant dies off. Hence top leaf SPAD index values peak just before the grass goes to seed. At harvest, the grass in the NPK treatment (photograph below) was still chlorophyll rich, but stunted in height. In contrast, the 3 year old woodchip treatments had gone to seed and consequently their SPAD index values had started to fall.

Grass growth in the immature 1 year old compost treatments was sparse and went to seed at varying rates, most probably due to the lack of nutrients. Nevertheless, all 3 treatments performed considerably better than the soil-only control treatment.

Figure 1: Grass trial SPAD index mean values at week 19 of the trial



Grass trial: Mixed meadow grass in topsoil + N-P-K (at 150-57-79 kg/ha), after 19 weeks


Grass trial: Mixed meadow grass in topsoil + Pontbren's 3 yr old WM compost, after 19 weeks


Grass trial: Mixed meadow grass in topsoil + Glynllifon's 3 yr old WM compost, after 19 weeks


Grass trial: Mixed meadow grass in topsoil + ADAS Cattle woodchip (55% moisture), after 19 weeks


Grass trial: Mixed meadow grass in topsoil-only, after 19 weeks

Table 4: The amount of grass biomass production in each of the different treatments. Shown is the seed input rate and the resulting biomass produced. WM compost was applied at a rate of 10 t/ha and N-P-K at 150-57-79 kg/ha.

BIOMASS	Input t/ha	Output t/ha
Soil only	0.04	0.83
N-P-K	0.04	1.95
ADAS C34	0.04	1.24
ADAS C55	0.04	1.53
IGER CSC	0.04	1.58
Pb 3 yr	0.04	2.17
Glyn 3 yr	0.04	2.77

2. B100 Barley Trial

In 14 of the 16 treatments, SPAD index values peaked in week 8 as the barley went to seed after which the parent plants gradually died off. The persistence of top leaf chlorophyll in the straw based treatments indicates that nutrients were abundant and remained available throughout the trial period, in comparison to the N-P-K treated barley which recorded the highest mean SPAD value of all the treatments in week 8, but one of the lowest by week 10. It is widely understood that organic compost, when applied consistently over a number of years, helps the soil to retain nutrients so that over time, less compost is needed to maintain soil fertility.

There was a marked difference in maturity between the 3 year old composts. The Pontbren compost had a rich loamy texture and no remaining chunks of wood, whereas the Glynllifon compost was saturated and contained many sizeable woodchips. The B100 biomass and yield responses, illustrate the importance of good WM compost management and the productive benefits of using mature WM compost; although the results were less contrasting at the lower application rates in B10.

At 100 t/ha, the < 8 mm IGER compost fractions produced greater biomass and yield than their corresponding > 8 mm treatments (see IGER's 'Sheep fed hay on woodchip' and 'Cattle fed silage on woodchip' fractions pictured below). However, it would be grossly uneconomic to apply immature WM compost to land at this rate. After 7 months composting, the fine fraction accounted for only 14% of the overall compost material. Therefore, a farmer would initially need 7,143 tons of unsieved compost to extract enough fine material to cover 10 hectares at 100 t/ha. That quantity of woodchip would be sufficient to house 14,617 cattle or 63,724 sheep, if the woodchip was first used economically as bedding and by necessity, a farm with that many livestock would probably have many hundreds of hectares to fertilize. Furthermore, at this application rate the compost would cover the ground in a layer 1.75 cm thick, which may kill the underlying crop and reduce existing soil N levels. However, to fulfil our objective, this trial application rate was necessary to magnify the small differences in amounts of plant available N between the two fractions.

Due to farm-scale practicalities of applying compost by weight and not by % N, the drier straw treatments had a nutritional, weight-based advantage over the WM compost treatments.

Figure 2: *Optic* barley (application rate 100 t/ha) comparison of top leaf SPAD readings at weeks 6, 8, 10, 12 and 14

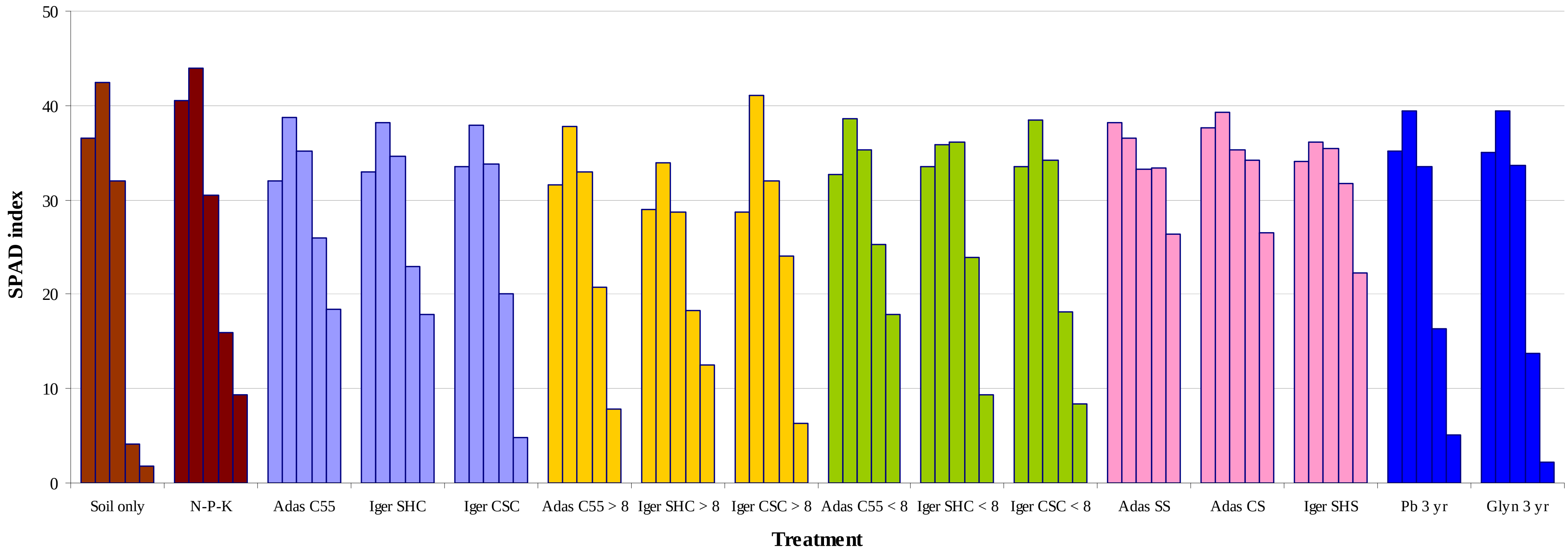


Table 5: Shows biomass (t/ha) produced from B100 treatments, in particular the unsieved composts and their corresponding coarse (> 8 mm) and fine (< 8 mm) fractions.

Treatments B100	Application rate /ha	Biomass t/ha	± se	# tillers/plant	± se
Soil only	-	3.10	0.56	1.08	0.08
N-P-K	221-84-116 kg	7.85	0.70	2.63	0.22
ADAS C55	100 t	3.26	0.70	2.08	0.08
IGER SHC	100 t	5.23	1.03	2.65	0.38
IGER CSC	100 t	3.46	0.42	1.90	0.18
ADAS C55 > 8	100 t	2.71	0.30	1.88	0.18
IGER SHC > 8	100 t	3.05	0.45	1.81	0.26
IGER CSC > 8	100 t	1.96	0.57	1.54	0.21
ADAS C55 < 8	100 t	3.21	0.39	1.75	0.14
IGER SHC < 8	100 t	7.40	1.44	2.94	0.43
IGERCSC < 8	100 t	7.46	1.10	2.65	0.39
ADAS SS	100 t	13.5	3.43	4.00	0.54
ADAS CS	100 t	19.5	2.92	5.85	0.74
IGER SHS	100 t	9.04	1.30	3.06	0.41
Pb 3 yr	100 t	10.2	0.54	3.65	0.59
Glyn 3 yr	100 t	3.87	0.56	1.67	0.26

B100 Trial: *Optic* barley in topsoil + Pontbren's 3 yr old WM compost, after 12 weeks

B100 Trial: *Optic* barley in topsoil + Glynllifon's 3 yr old WM compost, after 12 weeks

B100 Trial: *Optic* barley in topsoil + IGER SHC
< 8 compost fraction, after 15 weeks

B100 Trial: *Optic* barley in topsoil + IGER SHC
> 8 compost fraction, after 15 weeks

B100 Trial: *Optic* barley in topsoil + IGER CSC
< 8 compost fraction, after 15 weeks

B100 Trial: *Optic* barley in topsoil + IGER CSC
> 8 compost fraction, after 15 weeks

Table 6: Shows grain yield (t/ha) and straw (t/ha) produced from B100 treatments, in particular the unsieved composts and their corresponding coarse (> 8 mm) and fine (< 8 mm) fractions.

Treatments B100	Application rate /ha	Yield t/ha	Straw t/ha
Soil only	-	1.55	1.55
N-P-K	221-84-116 kg	3.35	4.50
ADAS C55	100 t	1.74	1.52
IGER SHC	100 t	2.50	2.73
IGER CSC	100 t	1.69	1.77
ADAS C55 > 8	100 t	1.42	1.29
IGER SHC > 8	100 t	1.52	1.53
IGER CSC > 8	100 t	1.08	0.88
ADAS C55 < 8	100 t	1.63	1.59
IGER SHC < 8	100 t	3.52	3.88
IGER CSC < 8	100 t	3.70	3.76
ADAS SS	100 t	5.82	7.68
ADAS CS	100 t	8.59	10.9
IGER SHS	100 t	3.28	5.76
Pb 3 yr	100 t	4.59	5.59
Glyn 3 yr	100 t	2.07	1.80

B100 Trial: *Optic* barley in topsoil + ADAS cattle straw compost, after 12 weeks

B100 Trial: *Optic* barley in topsoil + IGER CSC WM compost, after 12 weeks

3. B10 Barley Trial

The B10 SPAD readings show top leaf chlorophyll contents peaked in week 10, as opposed to week 8 seen in the B100 trial and chlorophyll levels remained high for longer across all treatments, suggesting the crop was not stressed due to a more beneficial nutrient balance at this application rate.

It is expected that the physical properties of the two WM compost fractions, as opposed to their nutritional constituents, had a greater impact on the results of this trial. The water holding capacity and aeration potential of the woodchips in the > 8 mm fractions could be responsible for producing a marginally greater biomass than the < 8 mm fractions. The IGER 'cattle fed silage on woodchip' treatments performed, as expected, but further research is needed to validate these results.

None of the compost treatments were able to match the productivity of N-P-K at this application rate, with the possible exception of the ADAS SS (Sheep on straw). Within the broad assessment of fraction sizes, a micro-study between the 2 ADAS cattle WM composts with different initial moisture contents, shows the drier woodchips performed better, giving further support to the recommendation that woodchips must be dry when first used as bedding (< 30 % is the recommended initial moisture content).

The Pontbren compost produced taller and structurally stronger plants than the corresponding Glynllifon compost, although Pontbren's biomass and yield results were similar to those produced in 1 year old WM composts. Showing that differences in the levels of plant available N, between mature and immature WM composts as well as between the coarse and fine fractions, are indistinguishable at a conventional application rate of 10 t/ha.

Figure 3: *Optic* barley (application rate 10 t/ha) comparison of top leaf SPAD readings at weeks 8, 10, 12, 14 and 16

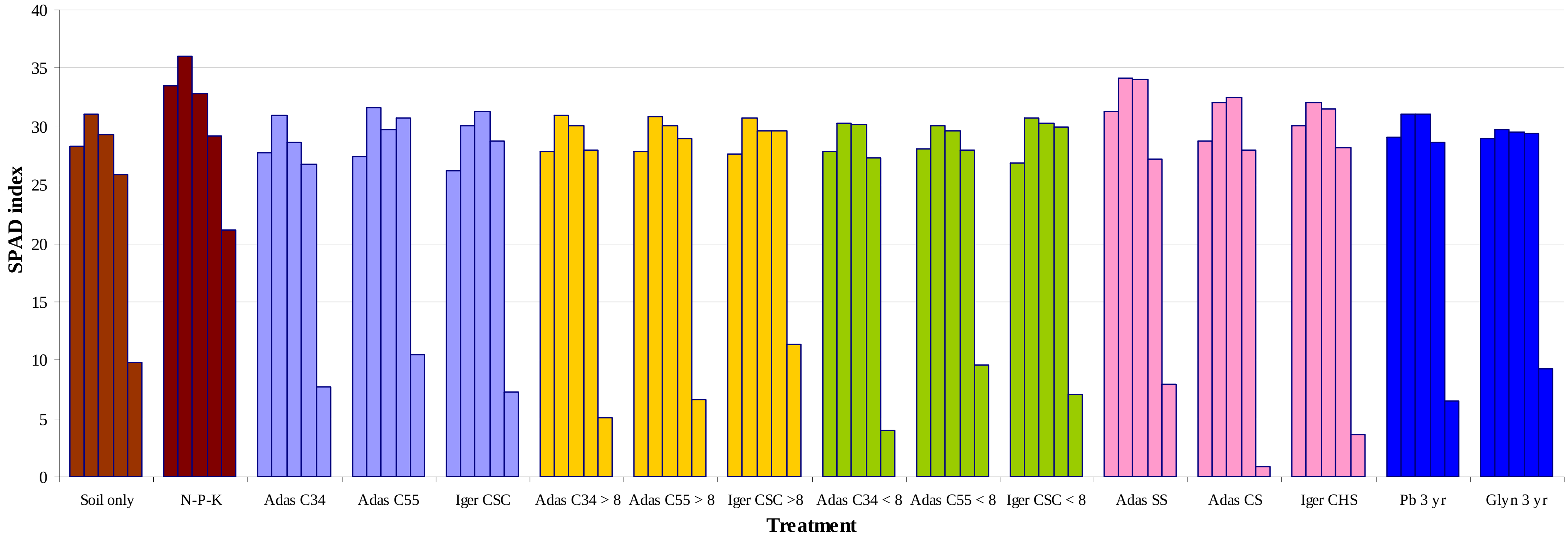


Table 7: Shows biomass (t/ha) produced from B10 treatments, in particular the unsieved composts and their corresponding coarse (> 8 mm) and fine (< 8 mm) fractions.

Treatments B10	Application rate /ha	Biomass t/ha	± se	# tillers/plant	± se
Soil only	-	2.74	0.25	1.06	0.06
N-P-K	150-57-79 kg	8.08	0.55	1.81	0.06
ADAS C34	10 t	4.32	0.88	1.13	0.13
ADAS C55	10 t	3.65	0.32	1.06	0.06
IGER CSC	10 t	4.10	0.32	1.13	0.13
ADAS C34 > 8	10 t	4.40	1.04	1.13	0.13
ADAS C55 > 8	10 t	4.23	0.60	1.25	0.18
IGER CSC >8	10 t	4.12	0.62	1.13	0.13
ADAS C34 < 8	10 t	3.65	0.09	1.00	0.00
ADAS C55 < 8	10 t	3.53	0.06	1.00	0.00
IGER CSC < 8	10 t	4.66	0.50	1.06	0.06
ADAS SS	10 t	6.96	1.38	1.31	0.24
ADAS CS	10 t	5.23	0.17	1.06	0.06
IDAS CHS	10 t	5.47	0.64	1.19	0.12
Pb 3 yr	10 t	3.95	0.26	1.06	0.06
Glyn 3 yr	10 t	3.34	0.13	1.25	0.10

Table 8: Shows grain yield (t/ha) and straw (t/ha) produced from B10 treatments, in particular the unsieved composts and their corresponding coarse (> 8 mm) and fine (< 8 mm) fractions.

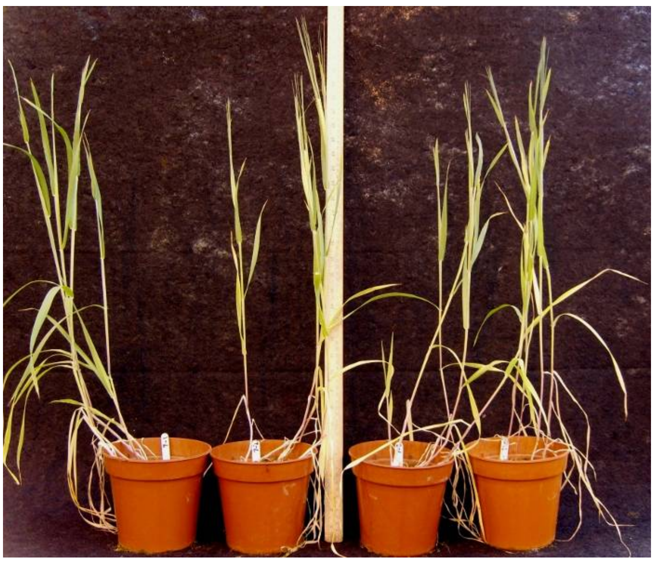
Treatments B10	Application rate /ha	Yield t/ha	Straw t/ha
Soil only	-	1.05	1.70
N-P-K	150-57-79 kg	3.42	4.67
ADAS C34	10 t	2.09	2.23
ADASC55	10 t	1.79	1.85
IGER CSC	10 t	1.94	2.16
ADAS C34 > 8	10 t	2.04	2.36
ADAS C55 > 8	10 t	2.09	2.14
IGER CSC >8	10 t	1.91	2.20
ADAS C34 < 8	10 t	1.82	1.84
ADAS C55 < 8	10 t	1.78	1.76
IGER CSC < 8	10 t	2.22	2.44
ADAS SS	10 t	3.15	3.81
ADAS CS	10 t	2.50	2.74
IGER CHS	10 t	2.46	3.02
Pb 3 yr	10 t	2.00	1.94
Glyn 3 yr	10 t	1.44	1.90

B10 Trial: *Optic* barley in topsoil + Pontbren's 3 yr old WM compost, after 12 weeks

B10 Trial: *Optic* barley in topsoil + Glynllifon's 3 yr old WM compost, after 12 weeks

B10 Trial: *Optic* barley in topsoil + ADAS Cattle woodchip (34% moisture) (> 8 mm), after 12 weeks

B10 Trial: *Optic* barley in topsoil + ADAS Cattle woodchip (34% moisture) (< 8 mm), after 12 weeks



B10 Trial: *Optic* barley in topsoil + ADAS Cattle woodchip (55% moisture) (> 8 mm), after 12 weeks

B10 Trial: *Optic* barley in topsoil + ADAS Cattle woodchip (55% moisture) (< 8 mm), after 12 weeks

4. Comparative treatment results in B10 and B100 trials

Table 9: Comparison of biomass produced by treatments common to both B10 and B100 pot trials.

Pot Trial	B 10		B 100	
Treatments	Biomass t/ha	Straw t/ha	Biomass t/ha	Straw t/ha
Topsoil only	2.74	1.70	3.10	1.55
N-P-K fertilzer	8.08	4.67	7.85	4.50
ADAS Cattle woodchip 55 % imc	3.65	1.85	3.26	1.52
IGER Cattle fed silage on woodchip	4.10	2.16	3.46	1.77
ADAS Cattle woodchip 55 % imc (> 8 mm)	4.23	2.14	2.71	1.29
IGER Cattle fed silage on woodchip (> 8 mm)	4.12	2.20	1.96	0.88
ADAS Cattle woodchip 55 % imc (< 8 mm)	3.53	1.76	3.21	1.59
IGER Cattle fed silage on woodchip (< 8 mm)	4.66	2.44	7.46	3.76
ADAS Sheep straw	6.96	3.81	13.5	7.68
ADAS Cattle straw	5.23	2.74	19.5	10.9
Pontbren 3 year old woodchip	3.95	1.94	10.2	5.59
Glynllifon 3 year old woodchip	3.34	1.90	3.87	1.80

Table 10: Comparison of yield produced by treatments common to both B10 and B100 pot trials.

Pot Trial	B 10		B 100	
Treatments	Input t/ha	Yield t/ha	Input t/ha	Yield t/ha
Topsoil only	0.13	1.05	0.14	1.55
N-P-K fertilzer	0.13	3.42	0.14	3.35
ADAS Cattle woodchip 55 % imc	0.13	1.79	0.14	1.74
IGER Cattle fed silage on woodchip	0.13	1.94	0.14	1.69
ADAS Cattle woodchip 55 % imc (> 8 mm)	0.13	2.09	0.14	1.42
IGER Cattle fed silage on woodchip (> 8 mm)	0.13	1.91	0.14	1.08
ADAS Cattle woodchip 55 % imc (< 8 mm)	0.13	1.78	0.14	1.63
IGER Cattle fed silage on woodchip (< 8 mm)	0.13	2.22	0.14	3.70
ADAS Sheep straw	0.13	3.15	0.14	5.82
ADAS Cattle straw	0.13	2.50	0.14	8.59
Pontbren 3 year old woodchip	0.13	2.00	0.14	4.59
Glynllifon 3 year old woodchip	0.13	1.44	0.14	2.07

CONCLUSIONS

On the evidence of the findings in this report, the maturity of WM-derived compost is more important than the quantity, when applying the compost to land as a fertiliser. Furthermore, there is no apparent productive benefit from sieving the WM compost to extract the well decomposed finer fraction.

The grass trial set out to establish the lifespan of WM compost as a bedding material, which is dependent on good compost management. A full list of recommended management guidelines are given in Report 4 '*Assessment of woodchip compost*'. It may be in the farmer's interest to limit the amount of decomposition between housing periods to extend the woodchips usefulness as a bedding material. However, it is advisable that the compost is managed sufficiently well to meet the UK PAS100 pathogen regulation which requires that the 'compost must reach 65°C for at least 7 days' ensuring that it has been sanitised before being re-used as a 2nd generation bedding material.

The two barley trials showed that at expected farm-scale production volumes, there was no productive or economic benefit in sieving the WM composts each year to extract the decomposed fraction. Furthermore, results showed woodchips with a lower initial moisture content produced a greater plant biomass than those with a higher initial moisture content.

None of the WM compost treatments in the B10 trial (application rate 10 t/ha) matched the productivity of N-P-K or straw based compost treatments. However, this is insufficient reason to dismiss woodchip's potential value to Welsh farming in the near future. Although this is a national project, its purpose is to assist individual farmers to make personal decisions when straw bedding prices become uneconomic. We are not suggesting that woodchip is the only, or the best, alternative to straw and would fully support, and even encourage individuals to develop innovative, cost-effective solutions for themselves, so long as the materials and methods of use conform to regulatory requirements.

RECOMMENDATIONS

1. **Re-use the composted bedding for 3 consecutive winters or until the woodchip is fully decomposed, before spreading it on the land.**

2. **There is no agronomic benefit from sieving partially-decomposed WM compost/bedding each year.**