Comparison of composted woodchip from the demonstration farms

Report 5

Woodchip for Livestock Bedding Project

November 2007

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MEAT PROMOTION WALES

The Woodchip for Livestock Bedding Project delivered by Hybu Cig Cymru, is match funded by the Forestry Commission, Environment Agency Wales and the Welsh Assembly Government as part of Farming Connect.

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.

After housing animals on woodchip at each of the demonstration farms the farmers were given advice on how to deal with the material post housing. The used woodchip bedding was composted for 6-9 months and samples were analysed to determine the nutrient and pathogen status.
The following summary is a comparison of the analyses of the woodchip composts from seven of the Demonstration farms which are then compared with straw based manures. The straw based manures are those from the demonstrations carried out at ADAS-Pwllpeiran and IGER-Aberystwyth as part of the Woodchip for Livestock Bedding Project (Report 2).

Table 1: Farm data – summary of key analyses

Holding	% Dry Matter	Total N % w/w	Total P g/kg	Total K g/kg	pH	Salmonella spp	E Coli
Blaenglowon Fawr	42.5	0.90	2.19	19.3	8.53	Negative	<10 cfu/g
Cae Coch	28.9	1.09	3.13	15.1	8.22	Negative	<10 cfu/g
Blaencwm	25.2	1.47	2.48	10.7	7.78	Negative	<10 cfu/g
Hendre Arddwyfaen	45.5	1.23	2.84	13.7	7.54	Negative	<10 cfu/g
Cilgryman Fawr, Whitland	34.8	0.77	2.20	6.17	8.52	Negative	29 cfu/g
Gilfach, Neath	40.0	0.73	1.66	7.60	8.26	Negative	50 cfu/g
Bodgaeaf Isaf	33.9	2.28	2.48	20.1	8.11	Positive	<10 cfu/g
MEAN	**35.8**	**1.21**	**2.43**	**13.2**	**8.14**		

Table 2: Trial data – shows corresponding straw bedding data from ADAS and IGER trials.

Holding/livestock/feed/bed	% Dry Matter	Total N % w/w	Total P g/kg	Total K g/kg	pH	Salmonella spp	E Coli
ADAS Sheep Silage Straw	61.0	ND	4.46	14.6	8.81	PAS 100	PAS 100
ADAS Cattle Silage Straw	43.7	ND	5.92	15.7	8.16	PAS 100	PAS 100
IGER Sheep Silage Straw	59.2	1.72	4.77	8.18	9.05	PAS 100	PAS 100
IGER Sheep Hay Straw	47.2	1.16	4.41	10.7	7.67	PAS 100	PAS 100
IGER Cattle Silage Straw	42.2	1.49	6.05	7.80	9.06	PAS 100	PAS 100
IGER Cattle Hay Straw	32.0	1.16	5.29	7.47	8.33	PAS 100	PAS 100
MEAN	**47.6**	**1.38**	**5.15**	**10.7**	**8.51**	Temperature sanitized	

Percentage Dry Matter (DM)

Overall, the farm woodchip composts are wetter (less %DM) but mostly within the general range found on the original Pwllpeiran and IGER trials. The increased wetness could be due to a number of possible reasons;

- the straw is drier than woodchip to start with - straw's pre-bedding moisture content is about 10%.
- in addition, the straw's physical tubular shape and greater surface area, it's able to absorb/trap liquid excrement more readily than wood.
- and straw's less complex cell structure is more labile (easier to breakdown).

The product of these points results in higher microbial temperatures, volatilizing more liquid from the straw/manure in the early stages of composting.

However, we can only speculate as to the real reasons for the differences, as they may relate to the ages of the composts at testing or the compost storage and management protocols at each farm; it is entirely possible, given the wet summer we had, that the high water content in 'Cae Coch' and 'Blaencwm' composts were because they were stored outside. In addition, the 'Trial data' shows that livestock type and dietary input also have some influence on the compost's %DM.

Total N % w/w

Comparing Total N data for straw and woodchip is deceptive, because not only is the N in wood released very slowly over 3yrs approx, verses 1yr for straw, but during decomposition most of the N in the woodchip compost becomes immobilized (i.e. not readily plant available). This is because the microbes use all the available N to compensate for the wood's inherently high C:N ratio, which means it has a low initial N content. (C:N ratio of wood is 200-500:1).

Total P g/kg

There will be a number of contributing factors resulting in the higher concentrations of P found in the straw bedding as opposed to the woodchip based treatments. The most significant of which is that straw intrinsically contains more P than wood. However, because the farm trials were not conducted under a standardised scientific protocol, it is not possible to interpret with any certainty, the magnitude of influence other variables have had on these results.
In addition, the trials at Glynllifon College (data not shown), which analysed differences in hard and softwood types, showed that hardwoods had a mean total phosphorus content of 2.5g/kg (similar to straw!) verses <1g/kg in softwood.

Total K g/kg

The farm composts contained typical levels of available K and the large variations in K values are common to both bedding types, but mean values remain similar. This is probably due to variable amounts of available K in the soil where the bedding material and feed crops were grown, as well as a reflection of different bedding densities and composting conditions.

pH

Concerns were raised by farmers during the open days, that the woodchip compost would be very acidic and need lime adding. However, the results have shown that although the pre-bedding (un-soiled) woodchip was acidic; pH was dramatically increased to levels similar to straw, with the addition of manure during housing.

Pathogens

'Bodgaeaf Isaf's' positive reading for Salmonella is mostly likely due to the compost not reaching the PAS100 required 65^{O}C for long enough to sanitize the woodchip, or after sanitization the heap became re-inoculated as it stood in the yard – all it would take is a small amount of fresh manure (or even wild bird faeces) being added to the heap after temperatures had reduced. Interestingly the analysis found less than 10 colony forming units of E. coli / gram; this would suggest the compost HAD reached a sufficiently high temperature, but perhaps not for long enough because Salmonella is a tough little beast (covered with a hard polysaccharide shell) it may have survived, if the compost didn't get hot and stay hot for at least 7 days. Alternatively, if the composts weren't turned during early composting (first 6wks), not all the material would have been exposed to sanitizing temperatures and therefore refuges of Salmonella will have persisted to re-colonize the heap after peak metabolic temperatures dropped off. That said; the overall low pathogen levels in the demo farm composts are very encouraging.

Summary

Overall, there is a reasonable consistency between the results from all the farms, presumably due to the standardising economic pressures on bedding and feed costs, resulting in farmers adopting more or less the same input and management techniques. However, proportional variations do exist, due to the non-standardised woodchip stock, housing, management and feeding protocols, and therefore it is not possible to give a definitive comparison for each analysis. Nevertheless, I hope this brief synopsis has been of interest.

Guidelines for using composted woodchip on your farm

1. Compost the used woodchip bedding in heaps for as long as possible and certainly not less than 18 months if you plan to spread it straight on to your land. Turn the heaps every 4 weeks for the first 4 months and every other month for the next 4 months.

2. Woodchip that has not been composted for more than 12 months will impair crop/grass growth when applied to land.

3. Re-use composted woodchip as bedding if it has dried out enough. Wetter material can be further dried by spreading out indoors where space allows.