

## Internal Project Information Note 28/07 - Extended summary

### Calorific Value of Brash Bales

A trial took place in Wales in 2007 to analyse the calorific value of brash bales produced from a Sitka Spruce clearfell. The bales were produced using a John Deere 1490D brash baler, baling material from three different harvester presentation methods. The methods were:

- Bales containing branchwood and small diameter tops produced from a conventional brash mat. All of the branchwood and small diameter tops placed in the brash mat from every other bale.
- Bales containing whole small diameter tops. Half of the available tops placed in a distinct brash zone for baling.
- Bales containing delimbed small diameter tops. Half of the available tops delimbed and placed in a distinct brash zone for baling.

For each method, both green bales (baled immediately following harvesting) and brown bales (baled six months after harvesting when substantial needle fall was judged to have occurred) were sampled and analysed.



The sampled bales were chipped using a Heizohack HM8 400 drum chipper, and the woodchips produced sampled in accordance with CEN/TC 335 standards for solid biofuels. The samples were then analysed for moisture content (MC), calorific value (CV), ash content, Nitrogen and other major elements.

## Results

The results are presented in the table below.

	Branchwood and tops baled green	Tops baled green	Delimbed tops baled green	Branchwood and tops baled brown	Tops baled brown	Delimbed tops baled brown
MC %	44.05	46.08	22.63	54.15	55.05	30.58
CV dry sample (MJ/kg)	17.67	17.33	18.51	17.14	16.56	17.74

- The bales containing delimbed tops have a significantly higher calorific value than the two other treatments in both green and brown baling.
- The proportions of other major elements were lower in the bales containing delimbed tops than in those from other treatments, because these bales produced significantly less ash when burnt. No pattern in the relative proportions of nutrients could be identified when comparing green and brown baling.
- The brown bales had a higher initial moisture content than the green bales, and therefore a lower calorific value, as heavy and persistent rain during June and July 2007 saturated the brash just prior to baling in mid July. The green bales appear to have been affected less by this rainfall, probably because they were baled and stacked at roadside while the brown brash was spread across the site and in contact with the ground.

## Conclusions

These results indicate that delimbed tops should be preferred over branchwood brash for biomass fuel production, as this material:

- Allows greater outputs at the harvesting stage (see also IPIN 17/06 Presentation of brash for baling from clearfell harvesting).
- Produces bales of greater calorific value.
- Has a lesser impact on the overall nutrient capital of the site.

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## Other related work

Trials comparing different methods for brash presentation and harvesting have been carried out in 2006 (IPIN 17/06, Presentation of brash for baling from clearfell harvesting). Further work is planned to investigate the economics of brash baling in 2008/2009.