

Internal Project Information Note 30/07 - Extended summary  
**Woodfuel production from a thinning operation in Sitka Spruce**

Woodfuel production trials were carried out in Wales in 2007 to compare the outputs and costs achieved when thinning Sitka Spruce to produce conventional and unconventional (woodfuel) specification.

The trial stand was composed of 23 year old Sitka Spruce, with a density of 2344 stems/ha, an average dbh of 13cm, average tree volume 0.073 m<sup>3</sup> and average volume 171 m<sup>3</sup>/ha.

Harvesting was carried out using a John Deere 1270D Eco 3 harvester with a 758 HD harvesting head; and forwarded using a John Deere 1110 D. Both machines were operated by experienced Wales Harvesting and Marketing (WHaM) operators.

The operation was a first thinning in a second rotation crop. One line was removed every 20m to create access racks for the machinery and a selective thinning carried out on both sides of the racks. The two specifications studied were as follows:

| Conventional specification |            |                                |                                | Woodfuel specification |            |                                |                                |
|----------------------------|------------|--------------------------------|--------------------------------|------------------------|------------|--------------------------------|--------------------------------|
| Product                    | Length (m) | Minimum diameter (mm overbark) | Maximum diameter (mm overbark) | Product                | Length (m) | Minimum diameter (mm overbark) | Maximum diameter (mm overbark) |
| Logs                       | 3.7        | 190                            | 320                            | Logs                   | 3.7        | 190                            | 320                            |
| Bars                       | 2.4        | 140                            | 225                            | Bars                   | 2.4        | 140                            | 225                            |
| Stakes                     | 1.7        | 70                             | 130                            | Woodfuel               | 3.0        | No minimum or maximum diameter |                                |
| Chip wood                  | 2.8        | No minimum or maximum diameter |                                |                        |            |                                |                                |



Forwarder loading

## Results

- The total production costs (harvesting and extraction) were £28.43/m<sup>3</sup> for the conventional specification and £25.13/m<sup>3</sup> for the woodfuel specification; or £27.74/fresh tonne for the conventional specification, and £24.52/fresh tonne for the woodfuel specification (for a fresh moisture content wet basis (MC) of 60 %.)

| Outputs and Costs                                  | Conventional specification | Woodfuel specification |
|--|----------------------------|------------------------|
| Harvesting output (m <sup>3</sup> /shr)            | 2.44                       | 2.91                   |
| Harvesting hourly cost (£/hr)                      | 58.48                      |                        |
| <b>Harvesting cost (£/m<sup>3</sup>)</b>           | <b>23.97</b>               | <b>20.10</b>           |
| Extraction output per 100m (m <sup>3</sup> /shr)   | 13.19                      | 12.06                  |
| Extraction hourly costs (£/hr)                     | 43.64                      |                        |
| Extraction costs (£/m <sup>3</sup> /100m)          | 3.31                       | 3.62                   |
| <b>Extraction costs (£/m<sup>3</sup>) for site</b> | <b>4.46</b>                | <b>5.03</b>            |
| <b>Total costs to roadside (£/m<sup>3</sup>)</b>   | <b>28.43</b>               | <b>25.13</b>           |
| Equivalent costs to roadside (£/tonne) at 60% MC   | <u>27.74</u>               | <u>24.52</u>           |

- Difficulties were encountered in processing sections of stems below 5 cm in diameter, as the configuration of the feed rollers on the harvesting head did not allow a good grip. Some potential woodfuel material was therefore placed into the brush mat and this reduced the total quantity of woodfuel recovered.
- The physical size of the head also prevented the operator from thinning selectively more than 2 rows either side of the access racks, limiting the area thinned and the volume removed to c.6% (woodfuel specification study) and 9% (conventional specification study) of the standing volume. A smaller capacity head fitted to a specialised base unit would have been more appropriate both for the conventional and woodfuel harvesting

## Conclusions

These results show that it is feasible to produce woodfuel as part of conventional thinning operations in conifer stands using standard harvesting machinery. However the choice of harvesting head can significantly affect out-turn

The choice of cutting specification will be greatly influenced by current market prices for products, and local market prices at the time of the trial were c. £40/m<sup>3</sup> (c. £39/tonne at 60% MC) for stakes specification, £32/m<sup>3</sup> (c. £31/tonne at 60%MC) for logs and £20/m<sup>3</sup> to £25/m<sup>3</sup> (c. £19.5 to £24/tonne at 60%MC) for woodfuel. This suggests that woodfuel production would be more appropriate in crops with poor form, i.e. not suitable for logs and stakes.

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## Other related work

Trials comparing harvesting of products with 'conventional specifications' with harvesting of products including a woodfuel specification have also been carried out in clearfells of Sitka Spruce and Pine. Trials in thinnings of Pine, sweet Chestnut coppice, undermanaged woodland and continuous cover forestry stands are also planned for 2008/2009 and 2009/2010.