

Internal Project Information Note 38/08 - Extended summary
Woodfuel production from a mixed Scots and Corsican pine clearfell

A trial was undertaken to investigate the cutting of woodfuel from a mechanised pine clearfell in Cannock forest; the crop characteristics are summarised below.

| Species | Yield class | Basal area (m ² /ha) | Mean dbh (cm) | Mean tree volume (m ³) | Density stems (n /ha) |
|--------------------|-------------|---------------------------------|---------------|------------------------------------|-----------------------|
| Scots pine (SP) | 16 | 17.3 | 29 | 0.644 | 315 |
| Corsican pine (CP) | 20 | 18.1 | 34 | 0.878 | 245 |

Machinery

The felling was carried out using a Timberjack 1470A harvester (2001 – 14000hrs) and the extraction with a Ponsse Buffalo (2007 – 1100hrs) forwarder. Both machines were owned and operated by contractors and the trial site was part of a large standing sales contract with West Midlands Forest District.

Trial specifications

Study data were collected from two trial areas:

- Trial area 1 - harvesting and forwarding sawlog, fencing and chipwood products ('conventional' specification)
- Trial area 2 - harvesting and forwarding sawlog, fencing and woodfuel products ('conventional' and woodfuel specifications)

| Product | Species | Length (m) | Minimum top diameter (cm) | Mean volume per piece (OB m ³) |
|---------------|---------|------------|---------------------------|--|
| Sawlogs | CP | 4.9 | 18 | 0.237 |
| | SP | | | 0.269 |
| Fencing logs | CP | 2.8 | 30 | 0.272 |
| | SP | 2.5 | 18 | 0.120 |
| Short sawlogs | CP | 1.6 | 22 | 0.106 |
| Chipwood | CP | 2.8 | 6.0 | 0.092 |
| | SP | | | 0.089 |
| Woodfuel | CP | 4.0 | No minimum diameter | 0.118 |
| | SP | | | 0.082 |

The terrain classification was similar in both areas, and there was no significant difference (95% confidence with 5% interval) between stem diameter distributions from the two study areas.



Harvesting and forwarding operations

Results

| | Harvesting | | | Extraction | | | Total cost |
|------------------------------------|--|-------------------|--------------------------|--|--------------------|---|-------------|
| | Output (m ³ /shr ¹) | Hourly cost (£/h) | Cost (£/m ³) | Output ² (m ³ /shr ³ /100 m extraction) | Machine cost (£/h) | Cost of extraction (£/m ³ /100 m extraction) | |
| Conventional products | 15.00 | 52.66 | 3.51 | 11.07 | 53.07 | 4.79 | 8.30 |
| Conventional and woodfuel products | 18.11 | 52.66 | 2.91 | | | | 7.70 |

- The harvesting outputs are at the high end of the range previously observed in thinnings. (c. 7 to 12 m³ OB/shr and costs c. £3.00 to £5.50/m³), which is most probably due to the smaller size/poorer shape of trees and lower harvesting density in thinnings.
- The harvesting output for the conventional mix is less than for the woodfuel mix, however detailed analysis suggested that this apparent increase in productivity is linked to the sawlog element, but that cutting of the actual woodfuel element was slightly less productive than for the chipwood component of the conventional mix.
- Because of long extraction distances and the number of products specified, the forwarder had to extract loads of mixed products to maximise efficiency, hence making the comparison of the two specifications impossible.
- The forwarding outputs are lower than those previously observed (c. 9 to 20 m³ OB/100m/shr and costs £2.10 to £7.70/m³/100m), mostly due to the long extraction distance (c.880m) and to the mixed loads that required important handling by the forwarder.

Conclusions and recommendations

- Woodfuel is a product where stem quality is not as important as for most other timber products, however poor tree form can affect the processing of the upper part of the stems and have a detrimental influence on harvesting outputs compared to conventional products harvesting.
- In this study the recovery of stem wood below 7 cm diameter for woodfuel meant that there was less material available for the formation of brush mats. This can be an issue on sites with low ground bearing capacity
- On sites with many products cut and long extraction distances, maximising the capacity of each load extracted is critical to maintain operational efficiency. However regardless of the nature of the products cut, a greater range of products might have an adverse effect on forwarding outputs and costs.

These elements all show that the relationship between additional volume recovery and improved costs and outputs might not be obvious, and that increased volume recovery should be balanced against operational, economic and site impact aspects prior to deciding how and to which specification woodfuel should be harvested.

The work summarised here is part of an ongoing programme of research funded by the Forestry Commission aimed at improving the efficiency with which fuel is produced from sustainably managed forests in the UK. For further information on this project and related work:

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Clearfell site with different products laid out before extraction

¹ A standard allowance of 18% for rest and 20% for other work has been included

² Due to site constraints, mixed loads had to be extracted – as a result forwarder outputs could not be established separately for the two trial areas

³ A standard allowance of 15% for rest and 17% for other work has been included