

Forestry Commission Project Report 044 - Extended summary
Energy Forestry Operational Research in Scotland

Summary

Work carried out by Technical Development during 2009-2011 on Short Rotation Forestry (SRF) establishment operations in Scotland. Operational trials into SRF establishment were carried out in the north (Sibster Farm, Caithness) and west (Aros, Isle of Mull) of Scotland, allowing output comparisons with previous work at the East Grange site. These trials studied mechanised planting, single furrow ploughing cultivation, mechanised herbicide spraying, and excavator mounding ground preparation.

Ploughing outputs of 0.18 ha/shr (£178.22 /ha), planting outputs of 0.41 ha/shr (£74.56 /ha) and spraying outputs of 2 and 2.66 ha/shr (£32.68 /ha and £43.46 /ha) were achieved. Ground preparation in Aros achieved a mounding density of 3,400 mounds per hectare in some areas for a target of 3,500.

Operations description and study method

At Sibster, ground preparation was carried out using an agricultural single furrow plough. Mechanised planting was carried out with a Keen Planter, with a target stocking density of 2,500 plans per hectare. Mechanised herbicide application following planting was carried out by ATC-trailed herbicide sprayer, using propyzamide sprayed with a 1m wide swathe.

Excavator mounding was carried out at Aros using a Daewoo 255 LCV 25 tonne excavator fitted with a 24 inch bucket. The operator used the trench mounding method, aiming to create 3500 mounds per hectare. The excavator was observed working on terrain of c. 25 % slope, and the operator initially had difficulties to space mounds accurately, but improved as work progressed.

Keen planter



Tree planted by Keen planter



Single furrow ploughing



ATC-based herbicide sprayer



Excavator mounding



Mounding



Results

Planting

Hourly cost (£/h)	Output (ha/shr ¹)	Cost (£/ha)
32.08	0.18	178.22

This output was comparable with those recorded at the East Grange site, which ranged from 0.13 ha/shr to 0.34 ha/shr (Ireland 2009). It is at the lower end of the range as the mixed species planting required the operator to organise and plant at the same time, and the forward speed of the tractor had to be reduced to give him sufficient time to do so. Stone obstacles close to the soil surface also caught on the trencher of the planting machine, disrupting the planting.

The average recorded number of tree per 0.01 ha plot was 24.1, corresponding to a 2,410 trees/ha density.

Ploughing

Hourly cost (£/h)	Output (ha/shr ¹)	Cost (£/ha)
30.57	0.41	74.56

The single furrow ground preparation resulted in soil deposition on one side of the plough furrow, compared to the furrow formed by the mechanised planter; this could potentially impede access for subsequent mechanised operations such as herbicide spraying by ATC.

Herbicide spraying

	Hourly cost (£/h)	Output (ha/shr ¹)	Cost (£/ha)
Study 1	86.92	2.66	32.68
Study 2		2.00	43.46

Ground preparation

Only stocking density data was available from Aros; the target density of 3,500 was high compared to conventional stocking density, however a density of 3,400 was achieved on half of the site, showing that the target could be achievable with careful technique.

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¹ Outputs are shown per standard hour (shr) including allowances for rest and other work