

INFORMATION NOTE ODW 9.07



THE SCORPION 1205 MINI FORWARDER

Introduction

This Information Note is one of a series derived from a Technical Development Branch (TDB) Outdoor Workshop (ODW). It is produced as a guide to part of a harvesting system suitable for use in small scale broadleaved woodlands. ODWs are a TDB initiative designed to offer practical advice to practical people through presentation, demonstration and user guidance. The ODW programme will involve repeating trials and introducing new systems around Great Britain so that a wide range of sites, systems and practitioners can be included.

Information has been gathered from an equipment and method trial based at a single location. This information therefore must be taken as indicative only. Variation could be expected for other operations where factors such as terrain, crop specification, product specification, operating distances or operator efficiency differ

Mini Forwarders

Developments in technology have allowed the production of a range of mini forwarders which have the benefits of hydraulic loaders. This type of equipment is attractive because:

It is well placed to work in woodlands where low impact systems are preferred.

Its narrow width enables working in closely planted crops.

It is easily transported over short distances using a 4 wd vehicle and trailer.

It has higher outputs compared to other small scale equipment such as ATC extraction systems.

Second hand agricultural tractor based forwarders can be purchased for a similar or lesser price than a new mini forwarder.



However, these units do not have the same low impact on terrain and may not have the manoeuvring ability of purpose built mini forwarders.

TDB trials with existing mini forwarders have identified the machines capabilities, potential uses and indicative outputs and costs. This provides potential users with valuable information, allowing qualified management decisions on suitability and purchase.

Mini forwarders are well placed to operate in small woods and sensitive sites where access is restricted and ground damage needs to be minimised. Demand for work in these types of woodland is increasing. Opportunities in urban woodland have also been identified.

Machine Description

The Scorpion 1205 is an 8 wheeled forwarder, primarily designed for timber extraction and with modifications to the loader and bunk can be used to load and transport a wide range of materials. The basic construction is similar to that of a larger purpose-built machine and has a load capacity of 2.5 tonnes.

The operators cab and engine are mounted on the front chassis, which is connected by a universal joint to the rear chassis that carries the 2 section, knuckle boom loader complete with grapple and adjustable bunk.

It has hydrostatic transmission, which drives 4 wheels when in high range and 6 wheels when in low range. The rear wheels on the trailer bogie are not driven.

The bogie on the rear chassis can be hydraulically moved from its standard location at 4.7 m from the front of the machine to 5.2 m. When the rear bogie is located at the 5.2 m point the two bogies are at different distances

from the centre pivot. This means that the rear wheels will not follow in the same track as the front wheels when turning.

The machine observed was fitted with wheel chains on the rear wheels on the front bogie and front wheels on the rear bogie.

A detailed machine description is given in Table1.

Table1

Machine Specification

Engine	Lombardini 1204, 33hp diesel, water cooled
Steering	Articulated
Transmission	Hydrastatic
Travel Speed (km/hr)	High Range- 12 Low Range- 6
Front Drive	600 cc centre mounted hydraulic motor
Rear Drive	2 radial wheel motors 400 cc
Loader length (m)	4.20 - 4.80
Turning Radius	270°
Grapple capacity (m ²)	0.14
Brakes	Internal hydraulic, activated when vehicle is in neutral
Length (m)	5.95
Width (m)	1.50
Height (m)	2.05
Wheels	Steel rims, heavy duty 12 inch
Tyres	8no. 26 /12.00-12
Ground Clearance (m)	0.28
Max. load capacity (tonne)	2.50
Loader & reach (m)	Scorpion, 4.20
Manufacturer's stated weight (tonne)	2.40
Bunk length (m)	2.90 - 3.40
Cab Windows	Front; Laminated Glass Rear and Side; Margard

Supplier and Cost

This Swedish built machine can be obtained directly from the UK agent:

Woodland Environmental Services
Carn-Mhor
Glenglass Road
Evanton
Ross-Shire
IV16 9YN

Tel: 01349 831051

The price quoted (2002) is c. £26 500 (excluding VAT) for the base machine. Wheel chains and Band tracks are optional. The price quoted for wheel chains was £300 per pair but no price was obtained for band tracks.

Trial and Site Description

A brief trial was carried out on a site in North Scotland, which was flat with a peaty gley soil. The crop was Lodgepole pine (P73), average tree size of 0.127 m³, planted at 1.8 m spacing on single mouldboard ploughing.

The selective thinning operation, removed 47% of the crop (YC 8) which gave an estimated volume/hectare after thinning of 25 m³.

The terrain had no ground vegetation with cut tree stumps and the occasional boulder (<0.5m) the only obstacles.

Prior to the commencement of felling the extraction routes were identified and marked. The trees on either side of the routes were brushed with the brash being placed into the routes to aid flotation. The subsequent 3 m produce was stacked on either side of the extraction routes at intervals convenient to the fellers and each stack contained an average of 10 pieces.

Machine Performance

Ground damage was minimal within the racks where brash was laid with rutting occurring where only a thin brash layer existed.

The raised stumps from felled trees did cause traction problems although the movable rear bogie assisted regaining traction. However, on two occasions the timber was required to be unloaded in the wood before travel could be continued. A contributing factor was the height of the cut stumps on the ploughed ridges due to the low ground clearance (0.28 m) of the forwarder. On this site, traction may have been improved with the use of bandtracks.

The narrow width of the machine meant that extraction could take place without the need to remove a row of trees to provide in wood access. Manoeuvrability within the wood was good with little damage to the standing trees.

Before loading, both hydraulic arms were lowered to aid stability. The bunk bolsters

moved freely and on several occasions had to be repositioned by the loader before and during loading.

During in wood driving the raised stabiliser arms fouled the spool block cover at the rear of the cab when the machine was on full lock.

The operator experienced no major difficulties during loading other than hydraulic delay when operating the outer boom of the loader. Some damage occurred to the hydraulic pipes on the rotator when loading through the standing crop as the pipes had no wrapping protection.

Safety and Ergonomics

The machine is 'CE' marked and complies with all European machinery regulations. A fully enclosed heated cab provides all weather protection. All round visibility was good.

The operators cab is certified for Roll Over Protection and Falling Objects Protection.

A purpose built, fully adjustable swivel seat complete with seat belt, arm rests and 2 mini lever controls provided a good ergonomic environment.

The small cab had restricted legroom with no storage facilities for tools, fuel spillage kit or fire extinguisher.

Outputs and Costs

The Scorpion was studied extracting over maximum in wood distances of 50 m and on road distances of 150 m carrying loads of 3 m pulpwood ranging from 1.7 m³ to 2.3 m³. An indication of outputs and costs are given in Table 2.

Table 2

Outputs and Costs

Mean Piece (m ³)	Mean Load (m ³)	Mean Ext. Distance (m)	Output per 100 m Ext. (m ³ /shr*)	Cost per 100 m Ext. (£/m ³ *)
0.048	1.93	152	4.23	4.35

* Standard outputs include an allowance of 17% for Other Work and 15% for Rest.

+ Costs are based on an estimated £9.00/hr for the operator and £9.40/hr for the machine.

General

Careful site planning and correct presentation of produce together with proper operator training are essential to optimise output of the forwarder.

Other factors affecting output include extraction distance, ground condition and steepness, load size and product specification.

In common with other small machines proper maintenance is essential for efficient performance.

Conclusions

The Scorpion manoeuvred well within a closely planted crop although the ground conditions caused some difficulties due to its low ground clearance.

During extraction there was very little damage occurred to standing trees.

The hydraulic loader performed well for the period of the trial however the hydraulic pipes on the rotator sustained some damage when loading.

Loads up to 2.3 m³ of the 3 m product were extracted on the peaty terrain.

The machine can be easily transported on a trailer towed by a 4WD vehicle.

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Technical Development Branch

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