

ATC LOADING ARCH TRAILER

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 broadleaf 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 equipment and method trials 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.

The System

The system comprises a 4WD ATC, preferably above 350 cc, with a purpose built ATC forwarding trailer incorporating loading arch and winch. The trailer/winch combination is very versatile, allowing material to be winched in, loaded onto the trailer and forwarded. A wide range of site types and ground conditions can be worked, including steep and wet sites. The system is suitable for extraction of shortwood timber up to 3.6 m in length (max volume per piece 0.2 m³).

The system has the following attributes:

- A standard ATC is used.
- Manual handling is minimised.



- It is a simple idea which may be used to increase the versatility of ATC forwarding systems.
- The ATC and forwarding trailer need not be solely dedicated to timber extraction. The winch can be used independently.

The method of working is shown in Figure 1.

Costing Options

Three options for costing the system (1998) are shown in Table 1.

The highest cost (option A) assumes all equipment has been purchased new and all labour has been fully charged to the operation.

The intermediate cost (option B) assumes that some equipment has been purchased second hand and all labour has been fully charged to the operation.

The lowest cost (option C) assumes that certain elements of the cost eg labour may not be charged.

Table 1

Case Study: Machine Description and Costing

Item	Specification	Capital Cost* (£)	Hourly Cost (£/hr)		
			A	B	C
<i>(A=Full, B=Intermediate, C=Marginal)</i>					
ATC	Yamaha YFM 600FW Grizzly. 600 cc, 37HP 4 stroke petrol engine. On command 4WD with high and low ratio automatic gear boxes giving 10 forward and 2 reverse gears. Equipped with wheel chains and Garp hitch .	5 000 (new) 2 000 (used)	2.24	1.48	0.50
Forwarding trailer	TFM Engineering. Low ground pressure tyres on twin wheel bogie axle. Fitted overrun, hand operated and parking brakes. Approx 0.5 tonne capacity. Drop down bolsters. Fitted with loading arch.	1 600 (new)	0.60	0.60	0.60
Winch	Kolpe portable winch 55 cc 2 stroke petrol, 0.5 tonne capacity, 35 metres of 4 mm wire rope.	800 (new)	0.84	0.84	0.84
Operator	£64.00/day on 8 hr day	-----	8.00	8.00	----
* Costs estimated in 1998		Total cost	11.68	10.92	1.94

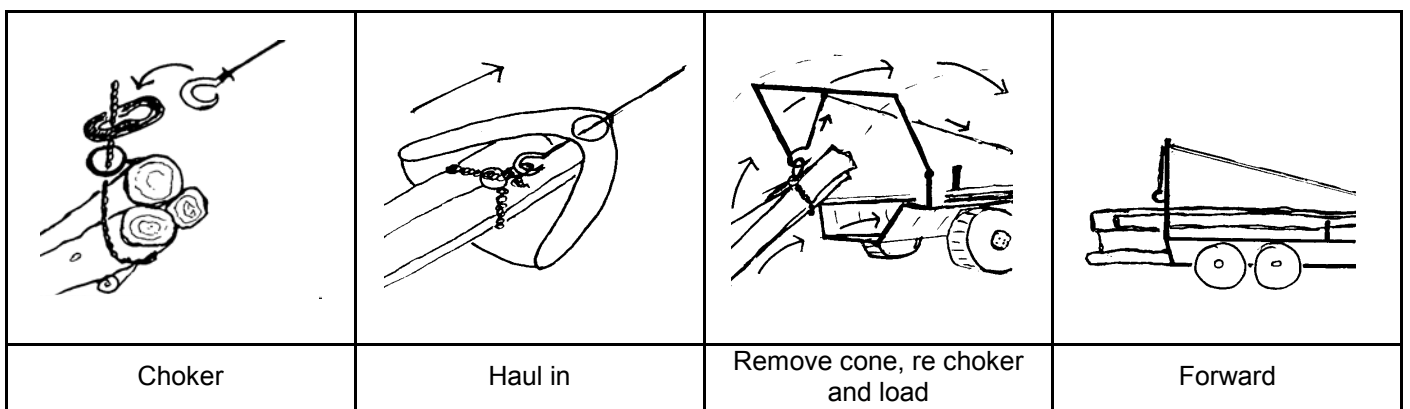
Table 2

Case Study: Site and Crop Characteristics

Soil	Free draining clay loam over shale. Depth to 200 cm plus.	Species	Syc/Ash/some Be/Oak	Age(yrs)	10 - 60
Vegetation	Well developed herb layer with sporadic bramble, shrub layer in places and some regen.	Form	Some good stems, but generally poor, squirrel damage.		
Terrain	Slope 15% – 45% with occasional steep snap falling to a level area adjacent to a stream.	Thinning volume (m ³ /ha)		50	
Access	Loosely metalled farm tracks running up/down hill on either side of wood. Roughly surfaced track in upper wood. Unsurfaced narrow track in lower wood.	Average tree (m ³) (thinned)		0.113	
		Average piece (m ³)		0.045	

Figure 1

System Working Method



Output and Cost

Information collected during a case study on another site (Table 2) has been used in the calculation of outputs and costs.

All outputs are based on the extraction of 2.3 m shortwood over a distance of 100 m. Data have been modelled to represent varying access and slope conditions.

Access will effect travel speed. To some degree it will also affect load size, especially during periods of heavy rain when routes may become slippery. The data shown below have been used to represent various access conditions:

- Good - access along unsurfaced tracks and into the wood along firm rides.
- Moderate - access along firm rides, and into the wood along racks.
- Poor - access directly into the wood along cut routes containing stumps and obstacles.

The degree of slope along the extraction route and in the wood will usually be the main factor which affects load size. It may also affect travel speed. Estimated load sizes for various access levels and extraction slopes are shown in Table 3.

Table 3

Estimated Load Size (m³)

Access	Extraction Slope		
	Level	Gentle	Moderate
Good	0.6	0.45	0.35
Moderate	0.5	0.35	0.25
Poor	0.5	0.3	0.15

Winch distances will be affected by access and terrain. Estimated distance are shown in Table 4. It has been assumed that the poorer the access and steeper the slope the longer the average winch distance will be. This may not always be the case.

Table 4

Estimated Winch Distances (m)

Access	Extraction Slope		
	Level	Moderate	Gentle
Good	5	10	15
Moderate	5	10	25
Poor	5	15	30

Typical outputs for an ATC loading arch trailer are shown in Table 5. They have been produced using the extraction and winch distances and load sizes shown in Tables 3 and 4 and by modelling time study data. Cost data based on the outputs is given in Table 6.

Table 5

Output (m³/shr)

		Extraction Slope		
		Level	Gentle (20%)	Moderate (30%)
A C C E S S	Good	1.40	1.20	0.90
	Moderate	1.35	1.10	0.70
	Poor	1.30	0.90	0.60

Outputs are for skilled and accustomed operators. shr = Standard Hour (Includes allowances of 22% for Personal Needs and Rest, and 17% for Other Work such as refuelling)

Table 6

Costs (£/m³)

Cost Option	Access	Extraction Slope		
		Level	Gentle	Moderate
A £11.68/hr	Good	8.34	9.73	12.98
	Moderate	8.65	10.62	16.69
	Poor	8.98	12.98	19.47
B £10.92/hr	Good	7.80	9.10	12.13
	Moderate	8.09	9.93	15.60
	Poor	8.40	12.13	18.20
C £1.94/hr	Good	1.39	1.62	2.16
	Moderate	1.44	1.76	2.77
	Poor	1.49	2.16	3.23

Comments on Performance

General: The Yamaha ATC was fitted with a **Garp** hitch. Weight on a standard tow hitch is distributed over the rear ATC wheels. With the Garp, tow hitch weight is moved to the centre of the machine and redistributed over all 4 wheels. The Garp hitch is designed and manufactured in Sweden only for Polaris ATCs. TDB brought the first Garp into Britain in 1997 and in conjunction with the Swedish supplier and Yamaha, had a hitch reproduced and modified by TFM Engineering to fit a Yamaha ATC. The modified hitch is a prototype for trial purposes only.

The loading arch used during the trials is a prototype based on a design manufactured by Kolpe in Sweden. It was reproduced by TFM Engineering with the permission of Kolpe.

The loading arch is a useful addition to a standard forwarding trailer. Manual handling is reduced compared to the ATC forwarder and larger material is easily loaded with little effort. However, manual loading of small roundwood is quicker by hand.

If the arch is used to supplement an ATC forwarding system where the majority of material is loaded by hand, then an electric winch may be sufficient. Electric winches have a slower line speed and tend not to hold as much rope as the Kolpe winch used during the trial. However, they are much cheaper. An electric winch manufactured by Superwinch with a 900 kg pull costs c. £170 (1998).

Timber should be presented for extraction butt first, with butts raised off the ground on bearers. A skid cone should be used in difficult conditions.

Safety: Training is essential. FASTCo Safety Guide 701 gives Health & Safety Guidance. In particular, a motor cycle helmet with peak conforming to BS 6658 Type B should be worn when operating an ATC. If combining ATC use with forest operations which require a safety helmet to be worn (with earmuffs and visor if appropriate), then the motor cycle helmet must be replaced with a safety helmet for the duration of these operations. The motor cycle helmet should be put back on before using the ATC.

The manufacturer's operating manual gives maximum permissible loading limits. For the Yamaha YFM 600FW used during this trial, the maximum load on the tow hitch should not exceed 550 kg. Additionally the Health & Safety Executive state that towing weight should not exceed 2 x the weight of the ATC for an un-braked trailer or 4 x for a trailer with brakes.

A **Risk Assessment** should be made for all forest operations. In particular, winching is a concern with the

loading arch trailer. Hand brakes on the ATC and trailer should be applied before winching commences. The operator must position himself outside the bight of the rope.

Brakes on the forwarding trailer are essential for safe and controlled downhill extraction.

Extraction routes should be planned and identified before work begins. In most circumstances routes should be brash free. This reduces the risk of brash snagging and damaging the ATC, puncturing tyres and piercing the plastic panels around the operating position. Brash will also cause loss of traction in wet or damp weather.

TDB Publications

Information from ODWs will be published by TDB. Associated publications available now are:

- Report 25/93 - The Gorge Trials - A Case Study of Small Scale Extraction Techniques.
- Technical Note 25/96, Harvesting, Extraction & Processing of Low Grade Broadleaves: Case Study.

Suppliers

Item	Supplier
Trailer - TFM Multi-Role Forestry Trailer	Fergus McFarlane, TFM Engineering Unit 1 Ghyll Mill, New Hutton Kendal, Cumbria LA8 0AJ Tel: 01539 733881
ATC - Yamaha YFM 600FW Grizzly	Yamaha Motor UK Ltd Sopwith Drive, Brooklands Weybridge, Surrey KT13 0UZ Tel: 01932 358000
Winch - Kolpe	Axel Fornander, Kolpe Maskin KB Kungsvägen 14, 680 90 Nykroppa, Sweden Tel/Fax: 0046 590 10 010
Loading arch	
Garp Hitch	Bo Karlstrand, Ytterocke Production Ytterocke 2717,830 02 Mattmar, Sweden Tel/Fax: 0046 640 45119
Electric Winch - Superwinch T1500	Agents - TFM Engineering

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