

INFORMATION NOTE

ODW 9.04



Forest Research

An agency of the Forestry Commission

TECHNICAL DEVELOPMENT BRANCH

ATC TIMBER SULKY

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 ATC Timber Sulky comprises any 4WD ATC and a purpose built timber sulky with winch. The system is capable of extracting timber on sites where access is limited. It is especially suited to pole length material and logs, but will cope with most timber sizes within the limits of the system (max winch load $\approx 0.35 \text{ m}^3$, max skidding load $\approx 0.5 \text{ m}^3$).

Information collected during a case study (1998) on another site (Table 1) has been used in the calculation of outputs and costs (Table 2).

Usually 2 or 3 winch loads are required per skidding load. Load size is dependant on terrain and access. On level sites with access along unsurfaced tracks and into the wood along racks load sizes up to 0.5 m^3 should be attainable. Extracting over a distance of 100 m output should be above $1.4 \text{ m}^3/\text{shr}$. This gives an extraction

cost of c. $\text{£}8.20/\text{m}^3$, and when felling is included the total



system cost is $\text{£}17.20/\text{m}^3$ assuming a felling output of $1.0 \text{ m}^3/\text{shr}$. Use of marginal costs could reduce the extraction cost to $\text{£}1.20/\text{m}^3$.

The system has the following attributes:

- The ergonomics of this system are excellent. Loading and unloading is easy. Manual handling is minimised.
- Uses a standard ATC.
- Only key access routes need to be identified and prepared; steep, rough or soft ground is not a problem as material can be winched to the sulky.

Costing Options

There are various options for costing operating systems (Table 2) but it is possible to get combinations of these costings.

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

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

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

Table 1

Case Study: Site and Crop Characteristics

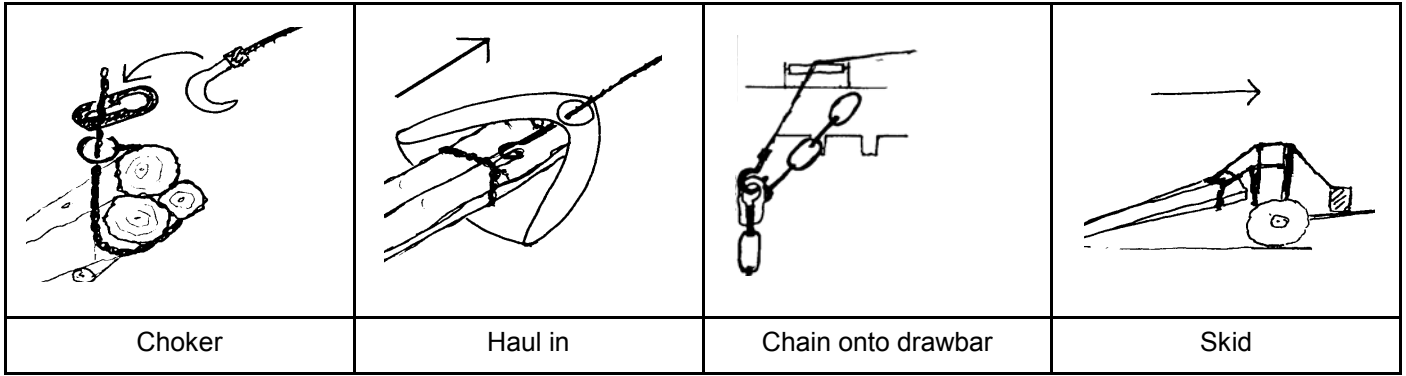
| | | | | | |
|------------|--|--|--|----------|---------|
| Soil | Free draining clay loam over shale. Depth to 200 cm plus. | Species | Syc/Ash/some Be/Oak | Age(yrs) | 10 - 60 |
| Vegetation | Well developed herb layer with sporadic bramble, shrub layer in places and some regen | Form | Some good 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) | | 0.048 | |

Table 2

Case Study: Machine Description and Costing

| Item | Specification | Capital Cost* (£) | Hourly Cost (£/hr) | | |
|---|--|-----------------------------|--------------------|-------|-------|
| | | | A | B | C |
| (A=Full, B=Intermediate, C=Marginal) | | | | | |
| 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 on rear wheels. | 5 000 (new) 2 000 (used) | 2.24 | 1.48 | 0.50 |
| Timber Sulky | TFM Engineering. Low ground pressure tyres, notched drawbar with choker chains. | 800 (new) | 0.32 | 0.32 | 0.32 |
| Winch | Kolpe portable winch 55cc 2 stroke petrol, 0.5 tonne capacity, 35 metres of 4mm wire rope | 800 (new) | 0.84 | 0.84 | 0.84 |
| Operator | £64.00/day on 8hr day | ----- | 8.00 | 8.00 | ---- |
| Total Extraction Cost | | | 11.40 | 10.64 | 1.66 |
| Felling | Man £8.00/hr, saw £1.00/hr | ----- | 9.00 | 9.00 | 9.00 |
| * Costs estimated in 1998 | | Total System Cost | 20.40 | 19.64 | 10.66 |

Figure 1
System Layout



Output and Cost

All outputs are based on an extraction 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 effect load size, especially during periods of heavy rain when routes may become slippery. The extraction data shown below have been used to represent various access levels:

- 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 | 0.5 | 0.45 | 0.35 |
| Moderate | 0.45 | 0.35 | 0.25 |
| Poor | 0.45 | 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 | Gentle | Moderate |
| Good | 5 | 10 | 15 |
| Moderate | 5 | 10 | 25 |
| Poor | 5 | 15 | 30 |

Typical outputs for an ATC timber sulky are shown in Table 5. They have been produced using the extraction and winch distances and load sizes shown above 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%) |
| ACCESS | Good | 1.40 | 1.20 | 1.00 |
| | Moderate | 1.20 | 1.00 | 0.70 |
| | Poor | 1.10 | 0.80 | 0.50 |

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 | Good | 8.14 | 9.50 | 11.40 |
| | Moderate | 9.50 | 11.40 | 16.29 |
| | Poor | 10.3 | 14.25 | 22.80 |
| B | Good | 7.60 | 8.87 | 10.64 |
| | Moderate | 8.87 | 10.64 | 15.20 |
| | Poor | 9.65 | 13.30 | 21.28 |
| C | Good | 1.19 | 1.38 | 1.66 |
| | Moderate | 1.38 | 1.66 | 2.37 |
| | Poor | 1.51 | 2.08 | 3.32 |

Comments on Trial Performance

General: The ATC timber sulky is capable of working steep terrain so long as there is an access route. In this situation winch distance will probably be increased.

Individual pieces up to 0.25 m³ can be skidded. This size of material is too large for a manual loading system.

Timber should be presented butt first in piles with butts raised off the ground on bearers. Ideally each pile should be at least 0.2 m³ and no larger than 0.35 m³.

On a slope of 30% skidding volumes are reduced by approximately 50% compared with flat ground.

Stacking areas must be well planned. If working pole length systems, timber must be converted and stacked at intervals.

An electric winch may be suitable in certain situations, such as for the occasional user. Electric winches have a slower line speed and tend to have less rope than the petrol winch used during the trials, but they are much cheaper. An electric winch manufactured by Superwinch with a 900 kg pull costs around £170.

Safety: Training is essential. Refer to FASTCo Safety Guide 701 for 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 again using the ATC.

Refer to the manufacturer's operating manual for maximum permissible loading limits. For the Yamaha YFM 600FW used during this trial the maximum load on the tow hitch should not exceed 550 Kgf. 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 with the timber sulky winching is a concern. The hand brake on the ATC should be applied before winching commences. The operator must position himself outside the bight of the rope.

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

Associated 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 |
|--|---|
| Sulky - TFM Timber Sulky | Mr 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 |
| Electric winch - Superwinch T1500 | Agents - TFM Engineering |

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Technical Development Branch

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