



# Steep slope working in forestry



- 24 As a general rule swathe width will reduce with steepness of slope for harvesters on a fixed base, ie those without tilting base mechanisms.
- 25 All harvester operators should be aware of weight transfer when slewing larger trees at any distance from the machine. Operating technique should be modified according to the conditions, for example drawing the tree in towards the machine or felling at 45° to the slope.
- 26 The harvester may be able to work where a forwarder cannot, so material must be placed where it can be safely reached by the forwarder. Other methods of extraction may need to be considered, for example using a cable crane to extract timber.
- 27 Correct brash mat construction is essential to working safely on slopes:
  - Use residue to fill natural hollows and plough furrows.
  - Place oversize and twisted residue in the timber zone.
  - Avoid laying long, slippery (debarked) lengths of material in the brash mat.
  - Cut stumps as low as possible and avoid wheels or tracks running over stumps where possible.
  - Consider felling to left and right of the harvester to produce an even depth of brash mat.
  - Reduce the stepped effect of obstacles by using brash to create a uniform surface.
  - Note that brash mats can be disturbed by machine travel, exposing other hazards such as rock, shale and rutting from wheel/traction aid digging.
  - Brash mats and machines can slip on soils with a pronounced humus layer, ie peaty gleys.

## Forwarders

- 28 A circular extraction route may be required to access the steep ground when descending with a load.
- 29 It is essential to plan loads and moderate load size according to slope and ground conditions.
- 30 Operators should use the loader to draw material to the machine before lifting.
- 31 Avoid reversing up steep slopes when loaded and vision is obscured. Use other methods to retain the load on the bunk.

## Other machinery

- 32 For other operations the same principles of site planning and machine stability apply.

## Further reading

<i>Extraction by cable crane</i>	AFAG504
<i>Mechanical harvesting</i>	AFAG603
<i>Mechanical roadside processing</i>	AFAG605
<i>Excavators in tree work</i>	AFAG704
<i>Emergency planning</i>	AFAG802
<i>Electricity at work: Forestry and arboriculture</i>	AFAG804
<i>Training and certification</i>	AFAG805
<i>First aid at work: Your questions answered</i>	INDG214
<i>Managing health and safety in forestry</i>	INDG294
<i>PUWER 98: How the Regulations apply to agriculture and forestry</i>	
<i>Managing public safety on harvesting sites</i>	AIS27 0 7176 2671 7

These publications are available from HSE Books - see 'Further information'.

## Notes

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## Further information

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**This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.**

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## Introduction

This leaflet covers the safe work practices to be followed when harvesting and extracting trees on steep or difficult ground. It must be used in conjunction with AFAG leaflets 501 *Tractor units in tree work*, 503 *Extraction by forwarder*, 504 *Extraction by cable crane*, 603 *Mechanical harvesting* and leaflet INDG294 *Managing health and safety in forestry*.

You can use this leaflet, along with the manufacturer's handbook, as part of the risk assessment process to help identify the controls to put in place when operating machinery on steep or difficult ground in the forest.

The guidance also applies to other mechanised operations (eg ground preparation) in the same steep or difficult conditions.

All operators must have had appropriate training in how to operate the machinery and how to carry out the tasks required (see AFAG leaflet 805 *Training and certification*).

## Risk assessment

- 1 The risk assessment process will be similar to any conventional harvesting site, but the increase in slope will mean that there will be more effort needed while planning how the work will be carried out including:
  - choosing which machine to use;
  - who should operate the machines; and
  - deciding how to supervise the work and take account of changing conditions.
- 2 To work safely on steep ground you will need to think about the entire harvesting operation and not just the forwarder or harvester alone. This will mean that everyone involved in the work will need to be in regular contact with each other. Record how you plan to do this in your risk assessment and site safety rules.
- 3 Every operation will be different and you will need to assess the specific site and the weather conditions when using this leaflet.
- 4 Everyone operating machinery on steep ground must have received the appropriate training and be competent to carry out this type of work.

## Planning and organisation

- 5 It is the ultimate responsibility of the Forestry Work Manager (FWM) to decide how the forestry operation will be carried out on site. Managers, contractors and operators must meet before the work starts to discuss the limits of any machinery used during the operation. Specific plans should be made to regularly review how the work is being carried out throughout the operation. Reviews of how the work is being carried out should also be made as necessary whenever circumstances change on site.

- 6 Operators should not make changes to the planned system of work without agreement from the FWM. It is likely that the FWM will need to visit the site more frequently for steep ground working to supervise and monitor how the work is being carried out.
- 7 Keep records of pre-commencement meetings along with the risk assessments, which should include details of the agreed frequency of site visits.
- 8 Keep records of site visits and review the risk assessment regularly as the operation progresses.
- 9 Site safety rules should identify the person on site responsible for communications and give instructions on how the work should be carried out. They should also include details of any lone working arrangements and emergency procedures.

## The site

- 10 Slope alone is often not the controlling factor on any worksite – the soil condition, moisture content, depth and underlying material must be considered as well as the roughness of the terrain, including boulders and stump size.
- 11 When planning how the work should be carried out on a specific site, you should consider:
  - the terrain classification, eg slope measurements, soil/ground condition, ground roughness, erodable soils, boulders etc;
  - operational factors, eg size and type of tree, type of tree/brush quality, potential stump height, cutting specification;
  - environmental conditions, eg weather conditions, water on site, possibility of flash floods, siltation, pollution, visibility;
  - identifying alternative work areas;
  - recovery arrangements including dealing with oil spills;
  - the possibilities of modifying the site by constructing tracks or ramps.

## Machine selection

- 12 Before starting work, carry out an assessment to identify the suitability of the machine in relation to the site and the task to be undertaken. The equipment to be used must be fit for the purpose of harvesting timber on steep ground.
- 13 Forestry work on steep slopes will involve a risk of the machinery overturning. Therefore, all machinery used on slopes must have suitable roll-over protection structures (ROPS) fitted. Purpose-built wheeled forestry forwarders and harvesters and purpose-built tracked harvesters have ROPS. ROPS will only protect operators if they wear the seat restraint provided. Seat restraints must be provided where ROPS are fitted.

- 14 Standard excavator-based tracked machinery is unlikely to have ROPS and is not suitable for working on slopes where there is a significant risk of roll-over. Where a protective structure has been added, ask the supplier about how much protection it provides, ie will it protect the operator if the machine rolls over?
- 15 Make sure the manufacturers' recommendations are understood and followed regarding maximum slope limitations and methods of operation.
- 16 The configuration of wheels, bogies, rigid or floating tracks must be considered and must be appropriate for the conditions in which the machinery will be working.
- 17 Wheel chains and bandtracks will be needed on most steep sites and must be in good condition. Tyres must also be in good condition and inflated to the recommended pressures. Grouser heights must be suitable for slope and ground conditions.
- 18 It is also important to understand the effects of weight distribution and changes in centre of gravity when considering variations in both the steepness of slope and other ground and environmental conditions.
- 19 All machines used on steep ground must be in suitable working condition and maintained to the highest possible standard. The track condition must be inspected regularly and maintenance records kept.
- 20 Harvesters with tilting cabs allow improved operator ergonomics while working on steep ground. The operator must be aware of the overall angle of the machine, which can be difficult when working in a tilting cab. Remember that forwarders following such harvesters are unlikely to be fitted with tilting cabs, and will have a much higher centre of gravity when loaded.

## Operator selection

- 21 It is essential that managers ensure those working on steep ground sites have received the necessary training and have sufficient experience using the chosen equipment on steep slopes. Most training will be provided 'in-house' and operator's experience of working on slopes should be built up gradually.
- 22 Operators must work within their own capabilities and play a key part in communicating with those managing the operations as the site progresses. Operators should never be instructed to work on slopes that they feel are outside their capabilities or the capabilities of their machines.

## Operating methods

### Harvesters

- 23 Wherever possible the direction of harvesting will change with the slope to select the lowest gradient for the machines to operate on.