

**5. Harvesting operations**  
**5.2 Harvesting methods**

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**5.2 Harvesting methods**

**5.2.1 Operational equipment**

**Principles**

- ◆ use only equipment which is in good order and has been tested for the purpose.

**Operational equipment**

**Felling and Logging**

◆ <b>Machines:</b>	◆ <b>Implements and tools</b>	◆ <b>Safety/first aid:</b>
<b>Power saw</b> with the following minimal demands: ◆ chain brake ◆ chain catcher ◆ hand guard ◆ throttle safety lock ◆ spike bumper	◆ felling aids ◆ rolling measuring tape ◆ chalk ◆ prehauling tools (if necessary)	◆ personal safety equipment ◆ sanitary material ◆ danger signals ◆ marking ribbons

**Skidding**

◆ <b>Machines:</b>	◆ <b>Implements and tools</b>	◆ <b>Safety/first aid:</b>
<b>Skidders, agricultural tractors</b> with forestry equipment: ◆ safety cabin or frame ◆ rear protective grating ◆ butt plate ◆ front blade (tiltable) ◆ remote control winch ◆ forestry tyres	◆ towing ropes ◆ choker ropes ◆ anchorage belts ◆ pulleys ◆ sappies ◆ repair material and spare parts	◆ personal safety equipment ◆ sanitary material ◆ danger signals ◆ marking ribbons

### 5.2.2 Choice of working methods

#### Principles

The circumstances of acute forest damage will vary. There is therefore no one standard solution for dealing with it but working methods have been developed for most situations.

The normal working methods will often not be applicable or they may need to be adapted to the new conditions.

The overriding principle in choosing appropriate working methods is the safety of operators and other forest users:

**SAFETY**

**has priority over**

**saving time,**

**increasing earnings or**

**reducing the loss of timber!**

**Over-estimation of one`s own capacities,**

**indifference,**

**habit or thoughtlessness**

**may cost lives!**

**Therefore**

**always work with care and consideration!**

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#### Harvesting methods

Always use acknowledged and tested safety equipment, machines and implements.

Where trees are up-rooted the root plate must be secured before severing the stem and then made safe.

Machine movement should be confined to defined routes, using brush mats wherever possible, to avoid soil damage.

Clear instructions, preferably written should be given to all forest workers in the following format.

#### Instruction

1. Who	-	labourer(s)
2. Wy	-	working purpose (effect)
3. What	-	operation
4. Which way	-	method or system
5. Whereby	-	operational instruments
6. Which quantity	-	output
7. Which quality	-	quality of work
8. Where	-	working site
9. Which duration	-	length of time
10. When	-	date or deadline

Always give instructions clearly, politely, and precisely, remembering the special circumstances following acute forest damage.

#### Example:

<b>Who</b>	:	machine operator; forest worker
<b>Why</b>	:	dealing with windthrow of a 100 year old pine stand
<b>What</b>	:	harvesting/processing of timber and industrial wood, length 3 and 7m
<b>Which way</b>	:	logging crosswise to the entangled trees - using special lines with brush layer - separating the assortments
<b>Whereby</b>	:	two-grip harvester; chainsaw
<b>Which quantity</b>	:	whole amount of timber
<b>Which quality</b>	:	- toleration of the length $\pm 10\%$ - brush layer on the strip road
<b>Where</b>	:	district Nr. 117
<b>Which duration</b>	:	two weeks
<b>When</b>	:	February 1st to 14th

### **General proceedings**

Written instructions may be supplemented by an operational sketch or map especially for extensive areas or difficult working.

### **General proceedings concerning working methods**

The choice of the working method depends on the size of the area, the requirements of the site, whether damage is scattered or concentrated, topography, species and size of timber, product mix, and the availability of manpower and machinery.

Machine requirements can be estimated using the likely hourly outputs in different situations and the total volume to be harvested in each situation. Due allowance must be made for down time and whether multi-shift systems are used.

Measuring can be time consuming. Therefore it should be as simple as possible (eg Swedish measuring method for stacks or layers, measuring at the mill or conversion site). Where possible combining processing and measuring by machine is best. The extraction of different assortments to different places can also be helpful.

Chapter 5.2.3 describes different tested working methods in dealing with acute forest damage. The table at the bottom gives information about the respective operational possibilities.

In manual work of entangled trees machine-separation and extraction to the processing zone should where ever possible used. Absence machine-separation should be the exeption!

### **5.2.3. Working methods**

#### **Operation area**

The next table characterizes the operation area for the working methods A to G, described on the following pages.

The parts, working method, and operation area should be seen as an open system.

It allows a continous updating of methods dependent on the technical development and moreover an adaptation to the special conditions of different countries.

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### **A Processing of entangled trees without separation**

The cutting off of the trees and the processing (delimiting, measuring, cross-cutting) in the entanglement is done by one-man-work within a bigger working group, Standard lengths (up to 7 m) are processed in the scope of small-sized timber.

Assortment hauling will be realized in another way.

According to safety rules this method should be employed only as an exception

#### **Advantages:**

- ◆ simple technique
- ◆ simple organization
- ◆ full utilization to capacity of hauling machinery

#### **Disadvantages:**

- ◆ high physical strain
- ◆ high risk of accidents
- ◆ time-consumation

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### **B Processing, separation of entangled trees by skidder (remote control winch) (standard method)**

Dependent on the size of timber separation and afterwards prehauling/extraction is done by skidders or agricultural tractors with forest equipment - but always with a **remote control winch**.

In the entanglement the forest worker cuts down the trees with the support of a skidder. As a result of the very dangerous cutting off (severing) of trees in tension workers should use job rotation.

The cable can compensate the tension of the trees only in one direction, but it increases the safety for the worker severing the trees. The cable will also be used for leading back the root plate in order to save the health of the workers.

#### **There are two different methods for processing the separated trees:**

1. prehauling to the processing zone for delimiting and extraction to the landing for classification, cross cutting and measuring

or

2. complete processing at the processing zone and extraction of the classified timber afterwards

One skidder or tractor in a group of 3 or 4 forest workers is bringing this system to capacity-balance.

According work safety this method should be considered as the standard method in dealing with windthrow; machine-supported separation as often as possible.

#### **Advantages:**

- ◆ moderate accident risk
- ◆ no limitations in sorting

#### **Disadvantages:**

- ◆ high expenditure in organisation (capacity tuning)



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### **C Processing, separation of trees by excavators with tracks (working cross the direction of the fallen trees)**

Excavators with tracks could be used for pulling the trees apart. The machine should be equipped with solid gripping tongs or logging tongs, having a weight of about 15 to 20 ton. The machines should be equipped with engine power of at least 60 kW.

One tree-length (ca. 25 m) serves as the diameter of the working site. Driving frequency of the area is somewhat decreased.

Trees are severed in the entanglement by the support of the excavator with a high security standard for the workers.

An excavator is able to bar the tension of the trees better than a cable-skidder. Also the securing and leading back of the root plate can be done in a simple way.

The severed and separated trees are stacked on supports over the turntable (180 degrees) parallel or (with exceptional long trees) 30 degrees to the direction of windthrow. These supports permit processing in an favourable working height for the workers. To ensure the freedom of movement for the excavator trees should be hauled immediately.

One excavator with 4 to 8 workers are necessary to work this system to capacity-balance.

#### **Advantages:**

- ◆ high level of safety at work
- ◆ suitable to vulnerable soils
- ◆ skidding with clam bunk allows good performance and space saving stacking
- ◆ tops and branches are stacked laterally

#### **Disadvantages:**

- ◆ sensitive to organisation
- ◆ capacity tuning of excavator, forest worker and skidder
- ◆ skidder

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**D Processing, separation by excavators with tracks  
(working parallel to trees)**

Referring to the safety at work the crosswise technique mentioned before possesses some advantages (e.g. the relation of trees in tension can be overlooked better by the driver) and should be preferred to the technique working along the trees.

Separation of trees is taking place in a working sites of 15 to 20 m width. With that the trees are hauled 1 to 1,5 tree lengths to the rear of the processing site. Stacking is done along side of the excavator on supports.

In large-sized timber a clam bunk skidder is preferable to a cable skidder.

Advantages and Disadvantages see working method C.

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### **E Processing, separation by harvesters/processors**

The number of harvesters/processors owned by state forests often is low, so that contractors may do the work.

With processors, all trees must be severed manually in combination with the processor pulling the trees apart.

If processors are used, it may will be combined with manual felling and hauling full trees to the landing where the trees are delimbed by the processor.

Even with harvesters some of the trees should be severed by forest workers (to protect the felling/cross-cutting saw).

Separation and processing is done in one step - if possible crosswise - tops and branches give enough for a brush layer for the movement of the vehicles on lines to avoid soil damag.

Storage of the graded timber is done accurately alongside of the skidding lines, it alleviates hauling by forwarders.

Precessing by harvesters needs only one to two workers separating the trees. A working system with rotation of workers presents itself.

When tree-size exceeds 0,5 m<sup>3</sup> solid, two-grip harvesters are to be preferred to one-grip harvesters. For all-round purposes, a large two-grip harvester is the best choice.

Especially with forest damages by windthrow utilization of harvesters is almost the only method which guarantees quick processing of large amounts of timber.

Also by making use of contractors working instructions should be layed down in writing - expecially as regards quality of work.

#### **Advantages:**

- ◆ quick process of work
- ◆ working in shifts possible
- ◆ extremely good safety at work

#### **Disadvantages:**

- ◆ high requirements to organisation
- ◆ dependent on weather conditions

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## **F Processing, separation by yarders and one-grip processors (conifers only)**

In impassable terrain but also on labil, watersoaked soils yarders are an appropriate machinery to avoid soil damage. As regards the selection of a yarder, the size of the timber is to be considered.

Severing of the trees is done by 1 to 2 workers in the entanglement. Separation and hauling is done by the yarders. The trees are attached to the cable by one of the workers. He can communicate with the operator of the yarder by radio.

The trees deposited by the yarder can be hauled by clam bunk skidder (more effective) or cable skidder.

Delimiting and sorting of full trees by one-grip processor can be done at the processing zone or landing.

### **Advantages:**

- ◆ high carefulness
- ◆ good progress at work

### **Disadvantages:**

- ◆ high demands to organisation
- ◆ high demands to space for setting up the yarder and stacking high amount of tops and branches at the processing site



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### **G Processing, separation by yarders (broad leaves)**

Also in processing of broad leaves (beech) yarders are a good possibility of working carefully - especially in working sites containing a large amount of high-grade timber.

Downslope 1 or 2 workers are severing the trees and attach them to the towing rope. Workers communicate with the operator for the yarder by radio.

At the site of the yarder 1 worker takes over the trees and delimits partially.

A clam bunk skidder (or may be cable skidder) hauls the trees to the processing zone or landing.

There the proper processing is done by two workers (delimiting of the remaining branches, cross-cutting, measuring).

#### **Advantages:**

- ◆ high carefulness
- ◆ good safety at work
- ◆ clearing of the area not necessary

#### **Disadvantages:**

- ◆ high demand to organisation
- ◆ high demand to space in stacking
- ◆ an additional crane vehicle may be necessary at the stacking site or landing

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