

Working in Harvesting Teams

work environment | quality | production

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Working in Harvesting Teams, part 1 Basic Knowledge.

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Part 1 **Basic Knowledge**

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Chapter 1: WORK SAFETY

Keeping work safety in mind creates safety margins

Regardless of how carefully and well you plan your work it is always possible that an incident may occur that may hurt someone. However, if you act wisely you can create safety margins, and avoid hurting yourself even in potentially risky situations. This also reduces risks for people who happen to be close to any forest machine you are operating. Therefore, always apply appropriate safety rules for work of any kind.

Remember that your approach to work safety affects others as well as yourself. Inappropriate behavior may also seriously affect your colleagues or family.

The most common accidents and near-accidents

Many things can lead to accidents. The most common causes of personal injury are not machines tipping over or incidents like that.

Instead they usually occur when the machine operator is moving around on his machine, stepping down from it, or driving to or from work.

Safety when moving around on the machine

Be careful when you “climb around” on the machine. Always use the “three point method” when you do this. In other words, always have two feet and a hand or two hands and a foot firmly planted on the machine. Then you will only move one hand or one foot at a time, and remain secure!

- Do not jump down from the machine! Remember that after some time in the cabin you are not warmed up. Therefore you should not carry out gymnastic exercises!

When moving around on the machine, the “three point method” should always be used.



Minimum requirements when working alone in the forest

The Work Environment Department has published a pamphlet entitled "Minimum Requirements when Working Alone", directed at people working in the forest. The rules covering the work of a machine operator are as follows.

- Always tell someone, such as a supervisor or family member, where in the forest you are working so they can "keep tabs" on you during the workday.
- Mark on a map the location of your work site, and show how to get there and back home. Make sure that the person who is keeping tabs on you knows how to read the map and where you will be working, then give them the map.
- Review the emergency routine with the person who will keep tabs on you.
- Establish a communication system, based on communication radios, mobile telephones, personal alarms or personal contacts.
- Make contact with the person keeping tabs on you at least every three hours and when you stop working to go home. This per-

son should check that you get home from work. Make sure your phone/communication system really works on the site. If the person keeping tabs on you does not hear from you when expected, he must sound the alarm and ensure that a search for you is initiated immediately.

Create routines

When an accident happens you may face a completely unfamiliar situation. Because you lack experience of such situations, you will probably feel stressed and uncomfortable. This can result in very inappropriate actions.

Try to create some kind of routine for handling an accident. Discuss with your supervisor and colleagues different kinds of accidents that may occur and how members of the team should respond. Developing some kind of plan, and being mentally prepared for accidents, can positively impact the outcome.

Safety through good communication

As in many other situations, safety is improved by communication between team members. Always make sure you are in contact with the harvester operator when you approach his machine. The following points are important:

Strict discipline and routines are needed whenever working alone.



Chapter 2: THE WORK ENVIRONMENT

RESPONSIBILITY FOR THE WORK ENVIRONMENT

The employer has the main responsibility for the work environment

The pamphlet "Responsibility and Authority in the Work Environment", published by the Swedish Work Environment Department, includes the following statement: The employer is always primarily responsible for ensuring that work is carried out with no ill health effects or accidents. This means that the employer must ensure that workers have received sufficient instruction and knowledge to perform tasks assigned to them. The workers not only have to know the risks involved, but also how to avoid them.

This text clearly establishes that the employer is legally responsible for the work environment.

The employee also has some responsibility for the work environment

The employer ultimately has legal responsibility for the work environment. However, as a machine operator you also have some responsibility for it and its impact on your health. You know how you feel and what you would like to be done to improve your work environment.

If you discover a problem in your work environment or have an idea about how to improve it, it is your responsibility to contact your supervisor or employer and state your opinions or requirements. It is important for you to maintain good health and avoid any work site accidents. Your health is also important to the enterprise since it is clearly important that you are present on the work site and can work. To be able to work you have to be in good health and have no injuries.

You can improve your work environment and reduce injury risks in several simple ways. One is to drive the machine at an appropriate speed for the terrain. Then the cab will shake less. The amount of shaking in the cab can also be reduced by "floating" the crane as smoothly as possible. Ultimately, your actions are the main factors determining whether the machine will roll over or not.

People differ

An important factor to take into account when assessing the work environment is that people are different. They have different abilities to manage the work and handle associated challenges. This means that conditions that are good for one person may be impossible for another to cope with.

As a machine operator it is your responsibility to identify what suits you and makes you feel comfortable. For instance, your fingers may become inflamed if you have to sit and cross them to operate the extension because of the joystick's design. In such situations you must discuss the issue with your employer before it becomes a real problem!

THE OPERATOR'S ENVIRONMENT

A machine operator's work environment is strongly linked to the environment in the cab. The cab environment is separate from other factors that impact the overall work environment, and is called here the "operator environment".

The conditions and operations in the cab are the aspects of the work environment that most specifically affect a machine operator. In very short timeframes you cannot adjust everything that affects your environment. However, you can adjust your cab conditions and ways you perform



Sit straight in the chair

The driver may turn his body for a number of reasons while working, but unfortunately he is much more sensitive to movements of the machine when his body is twisted. An example of this, which frequently occurs, is that after obtaining a full load a driver may turn his head to keep an eye on the load while driving forward. Although it is important to watch your load, and entirely proper to glance over your shoulder while traveling short distances, this kind of driving style should be minimized and

only used when obstacles are negotiated at low speed. Try to learn alternative methods, especially if the load needs to be watched while traveling longer distances in the terrain. Use mirrors (preferably large), turn the cab to the side if possible, otherways turn the chair sideways, or rotate it, so that you sit up straight facing backwards.



The driver turns his body when looking over his shoulder to see how the load is inclined, assesses the risk of the load tipping, and adjusts his speed accordingly. Since his right foot must be in contact with the accelerator he twists his whole body. Thus, he is more sensitive to movements of the machine and such twisting of the body should be avoided. Instead get used to using the mirrors. A good option is to flip the seat back when the main focus must be on the load and the risk of it rolling over. This is the most natural method when the loader also has to be used as a counterweight.

Chapter 3: THE MACHINE OPERATOR

– THE COMPANY'S FACE

The machine operator has a huge responsibility in his professional role since he is the 'face' of the company that is seen by the world, including both landowners and the general public. In your capacity as machine operator it is you and the results of your work that are visible in the forest. A professional harvesting team that presents a good face to the public is highly valuable in both small- and large-scale operations.

THE BUYER'S PERSPECTIVE

An example of how important it is that the harvesting team has a good reputation is that the landowner sees how the harvesting is done from an overall perspective (not just the financial outcome, but also the effects on his stands and land).

A business-oriented landowner will evaluate the total picture of the work the harvesting team has done on his property. He will consider not only the price of the work, but also the treatment and competence of both the planner of the operation and the crew who did the work. Thus, the harvesting cost must be assessed in relation to the quality of the work done.

A wise landowner values correct treatment and work that has been done well. It can be very difficult for him to assess the quality of the work in a final harvest. However, the quality of the work in stand improvement (thinning) operations is easier to evaluate. The consequences of a poorly executed planning and harvesting operation will be visible for many years to come.

The purchaser's work can be substantially facilitated, if (for example) a thinning crew does good work and maintains good contact with the landowner.

A well done job and good reputation (the ideal outcome) result in better financial returns for everybody. The harvesting team has looked after the landowner's property, so he is happy. Thus, the purchaser can easily purchase more wood from the same landowner in the future. Furthermore, his next door neighbor may well hire the same harvesting team. The purchaser then has a chance to increase the volumes of wood he handles, and pay the harvesting team more for the work done (as already mentioned, a perfect outcome).

One basic rule always applies: It may take years to build a good reputation, but it can be easily destroyed much faster!

ACT APPROPRIATELY WHEN DRIVING ACROSS SOMEBODY ELSE'S PROPERTY

Disputes may arise

Despite good intentions not to disturb anyone during your work, it may easily happen. During your work you may very well irritate somebody who owns land adjacent to your worksite, if either you or a colleague makes a mistake for instance, or the planner did not do his work correctly. Sometimes, however, a conflict may arise because someone is easily offended and unhelpful.

In some cases you can drive on somebody else's property

A dispute can often arise when you drive on somebody else's property or you use their property to pile wood products. However, in many instances you have a right to do so. It would be just as absurd for all neighbors to prevent





The profession includes showing respect for members of the general public, who have the "right to roam".



and use somebody else's land for piling wood products along a road. Even if you have the law on your side, disputes may arise. This is very undesirable and should be avoided whenever possible. As already pointed out, it means that the wood can be more difficult and more costly for the client to acquire. A dispute may also result in substantial amounts of compensation. Furthermore, in both long and short terms time and effort are required to resolve a dispute, which could be used for doing something more constructive.

Thus, disputes can cost your company a lot of money and in the long term often reduce profitability for all involved. Moreover, it is much more pleasant to be friends with all the people you are dealing with!

Avoid conflict

As already stated, you will probably have the law on your side when disputes arise. This is most valuable for you when compensation demands are presented or disputes are considered in a court of law. **However, always try to avoid conflict!** Furthermore, always try to

avoid exercising your legal rights if this leads to discord and there are other options. In the long run avoiding conflicts will give the best results! Therefore, in your daily work you should consider the following points when you are harvesting on privately owned forest land.

Basic rule Number One: Make Contact!

Before you drive your machine over somebody else's land, park equipment, cars or a rest cabin, or decide where to pile wood, you should ask yourself: Has the landowner allowed your operations? If the supervisor has forgotten to procure agreement it does not excuse use of someone else's land without permission. Therefore always check with the supervisor to see if permission has been granted!

You are a guest on somebody else's land

If you visited someone in his home, you would not put dirty boots on his dining room table. Instead you would take your boots off at the entrance and try to avoid causing any trouble for your host. You should think and act in the same way when you are driving across or piling wood products on somebody else's pro-

Chapter. 4: RESPONSIBILITY, SOCIAL COMPETENCE AND TEAM SPIRIT

RESPONSIBILITY FOR WORK DONE

A harvesting and forwarding team is given site directives and a price list. There is also some oral communication with the harvesting supervisor, but the team works independently to a high degree.

The task of the harvesting team is to produce well-prepared wood products, properly piled along a truck road. Furthermore, the work must be done within an agreed timeframe. Many aspects of the activities can be usefully compared to other kinds of operations.

Comparison of quality in forestry and other tasks

Let us compare the task of a harvesting team with the production of roof trusses ordered by a buyer. In this situation the buyer and producer first agree on measurements, quality, tolerance and a price for the trusses. This is often done in the form of a tender. The manufacturer produces the roof trusses based on the provided design, using wood of the kind and quality requested. The measurements are kept within agreed tolerances for the final product. The roof trusses are then properly packed and delivered at the agreed time.

If the manufacturer does not deliver products that meet agreed specifications the buyer does not need to pay for them. He has not ordered the product supplied, because it has not been made in the agreed manner. The seller may even be forced to pay compensation for breach of contract.

As in the roof truss example, the harvesting team has a defined task that must be properly

performed. The team cannot simply dash into the forest and crudely harvest anything in sight, heave out the timber and put it in heaps rather than proper piles, mixing timber however they like. Neither should the team start to think about nature and culture conservation measures that should be applied, or protecting roads or culverts, after harvesting an area. These can all be expensive mistakes.

The task of the harvesting team is to prepare specified products, as in the roof trusses example above. This means that the team has to prepare and stack wood in proper piles of agreed assortments, species and qualities (an assortment can consist of wood of several qualities). No fee at all is often paid for a sawlog or pulpwood log that has been incorrectly sorted ("ended up in the wrong pile").

Like the roof trusses in the above example, assortments should be "properly packed". For you this means that the different assortments should be piled at the right places and in the right way. Remember that the trucking companies who pick up wood you forward do not have the time, and cannot afford, to sort out poorly constructed and/or poorly sorted piles. They will not receive a single cent more for sorting out mistakes or handling badly constructed piles.

A harvesting team annually handles material with huge economic value. Therefore, doing the work well is extremely important and highly appreciated. Some teams harvest nearly 100,000 m³ solid wood under bark, worth around 60 dollars per m³ at roadside, and thus about 6 million dollars per year. So, for example, losing just one percent (a hundredth) of



Chapter 5: COMMUNICATION

INSUFFICIENT COMMUNICATION RESULTS IN ECONOMIC LOSSES

Communicating may appear to be very simple. Often it may just mean talking to each other. However, there are often shortcomings in communication between people at different levels or different types of organizations. These communication problems can often have bad consequences, varying from someone feeling misunderstood to substantial losses. Ultimately, however, the consequences of deficiencies in the communication chain are always the same: Worse results of joint efforts!

Communication problems (misunderstandings) can have several negative outcomes, which in turn result in loss of money. For example, communication problems can cause the following:

- Poor maintenance of a machine.
- Wood incorrectly cross-cut, i.e. not optimally, perhaps because a computer has been incorrectly programmed or the wrong price list has been used.
- Wood incorrectly sorted. This may happen because the forwarder operator has misunderstood either his instructions or something the harvester operator told him.
- Natural or cultural conservation measures being done incorrectly or neglected. This may be due to poor and/or misunderstood marking.
- Wood left behind on the harvesting site. This may happen because somebody forgets to tell the machine operator he is supposed to pick up some wood located behind a small hill or something like that.

- Unnecessarily getting stuck. Everyone working on a harvesting site should know if some parts of it have low carrying capacity, peatland for instance.

- Damage to roadsides/roads or culverts.

COMMUNICATION — A RESPONSIBILITY FOR ALL INVOLVED

Communication basically involves at least two people: one transferring a message to someone else, who tries to interpret and understand the message.



The desire to understand each other

When there is a positive approach to communication the person conveying the message tries to make sure it is understood and the other tries hard to understand it correctly. Misunderstandings very seldom occur when they seriously try to cooperate and understand each other. Under these circumstances communication is usually very good.

The importance of “speaking the same language”

People who are used to communicating about subjects well known to them can easily understand each other. They are “talking the same language”. If two people have a similar education and background they are very likely to understand each other without spending too much time and energy.

Communication between people with different backgrounds and experience is less straightforward. This may be because the experienced person has too high expectations of the inexperienced person, i.e., think that he should have enough knowledge to understand the message. However, the inexperienced person may easily



On a tree with green branches the flagging tape is this visible during full daylight. The marking has not been planned well, because it can only be easily seen if the machine comes from the "right direction", i.e. the direction the planner had in mind.



The flagging tape will be this visible from a couple of meters away when it is placed on the other side of the green-branched tree.



The flagging tape will be this visible when the marking has been properly done.

At a distance of 20 meters, the same tape is this visible.



Chapter 6: CARE OF THE MACHINE

GOOD CARE OF THE MACHINE YIELDS GOOD FINANCIAL RETURNS

A forestry machine has huge economic value and provides substantial income over a long period of time. However, to best preserve the value of the machine and allow it to work well for the time originally planned it needs proper maintenance. Poor maintenance can never be defended and is usually financially devastating for the enterprise.

“One-step-ahead” machine care

Caring for the machine may seem boring. There are no immediate financial returns for good maintenance (in fact there are losses during the downtime), and poor maintenance may not immediately affect the machine.

However, in the long run, regular, preventive maintenance following an established schedule is essential. The target is not merely for the machine to work well continuously this week, or even to work well for 1,000 hours. Instead, the intention is for the machine to work well for several thousand hours without costly repairs.

Carelessness today may not affect functions before 1,000 hours of operation, but professional handling and good maintenance may result in the machine continuing to generate income well after 20,000 hours of use!

THE MAINTENANCE REQUIRED DEPENDS ON THE TYPE OF MACHINE

Every machine has a manual and recommended maintenance schedule

Every machine has specific maintenance re-

quirements. For this reason, there is a manual and recommended maintenance schedule for every type of machine. The contents of these manuals can vary substantially from machine to machine, depending on their design. So, it is important for operators to be familiar with the manuals for any machines they use.

Maintenance schedules are based on operating times

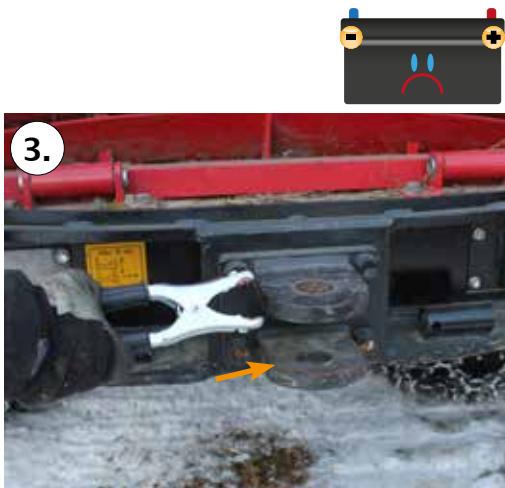
All maintenance of the machine should always be done within recommended times, regardless of when they are. Maintenance is normally linked to a certain number of operating hours (the time the engine has worked). However, it is not tied to the cubic meters harvested or days worked (since the number of hours worked per day can vary substantially, hence for instance it is not an appropriate measure for the time interval between lubrications). If the crane needs to be greased every 20 hours, you cannot delay this and do it every 30 hours!

WHO IS RESPONSIBLE FOR WHAT MAINTENANCE TASKS?

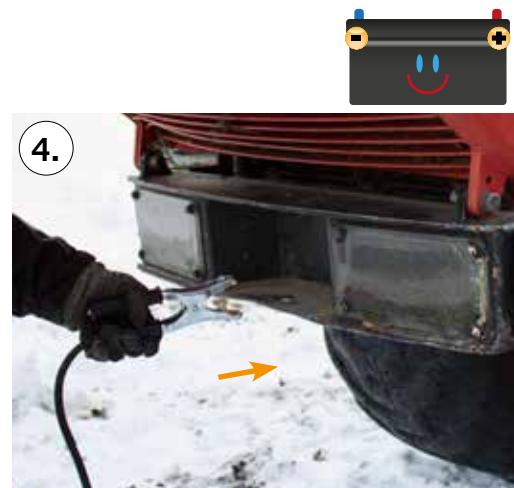
Some of the maintenance is always done by a certified mechanic. However, a fair amount of the maintenance is done by the machine operator, depending on his skills. It is important for the supervisor to clearly establish which machine operators will be responsible for each kind of maintenance, and the more operators use a machine, the more important this is.

Therefore make sure that you get clear instructions about how the machine should be maintained and serviced. These instructions should come from someone who has more experience of the machine than you. Take notes of things you need to remember! Often there are specific maintenance routines for a specific type of





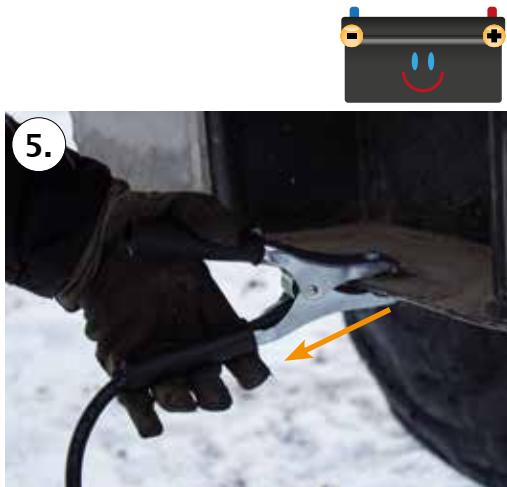
3. Connect the black cable to the chassis (with sufficient distance from the battery) on the machine with the startup problems.



4. Connect the black cable to the chassis (with enough distance from the battery) on the machine that will provide start help.

Disconnection order for jumper cables with alligator clips

Jumper cables should be removed in reverse order from the connection order. Most importantly, the black cable must be disconnected first, as illustrated in pictures 5 and 6. The clamps on the red cable can then be disconnected in any order.



5. First remove the clip from the chassis of the machine that has given start help.



6. Remove the clip from the chassis of the machine with starting problems. Then disconnect clamps on the red cable in any order.



Chapter 7: WHEN FIRE STRIKES

Your machine catching fire is not something you want to think about, but it can happen. Therefore, you must be prepared for any situation where a fire may start in the machine.

Have you got enough competence to handle a fire?

If your machine catches fire, it is very important to act quickly and correctly. Your actions during the first minute, or even the first few seconds, will decide the outcome. Read what is written in the manual about what to do in case of fire for your type of machine.

For a valid insurance claim, insurers require the machine operator to be familiar with the equipment he is handling. If there is proof he had insufficient knowledge and/or acted incorrectly this may result in less compensation for

the damage. Some insurers may reduce compensation by 20% or more.

Fire safety and protection

Insurance companies demand that each machine has an annual fire safety and sprinkler equipment inspection. If this is neglected and the machine burns, any claim by the insured party will be reduced by at least 20%.

Turn off the main power switch

One of the fire safety rules is that the main power switch should always be turned off when the machine is left with nobody on board. This also applies when the machine is parked during work for repairs and cleaning. If this is not done and the machine catches fire, the compensation can be reduced.



After a fire the insurance adjuster will check to see if the main power switch was turned off when you left the machine.



Chapter 8: WATER CONSERVATION

FIVE CHAPTERS THAT GO TOGETHER

Chapters 8 – 11 provide foundations for planning detailed elements of the work at harvesting sites. These elements are considered in an integrated fashion in Chapter 12, but each of the preceding chapters focuses on specific aspects. Two of these are ground and water conservation, which are closely linked. However, water conservation is described and discussed in a separate chapter here, because good water care is an important component of specific knowledge.

A major goal in this chapter is to give an inexperienced reader better knowledge and understanding about how damaging the ground in forestry operations can impact the quality of water in watercourses and lakes of various sizes. Thus, the presented information should provide readers with the knowledge required to avoid such damage. Particular attention is paid to ways to cross watercourses, drainage ditches and places where water is running along trails safely without causing damage.

In the text below any kind of flowing body of water is called a “watercourse”.

REPAIRING DAMAGE IS NOT THE SOLUTION

After damaging the ground surface it may seem logical and correct to repair it using equipment such as an excavator. The results can be pleasing to the eye since the surface has been repaired. However, in reality the changes are only cosmetic. Research has clearly shown that such repairs usually increase leaching of (among other substances) heavy metals. Thus, repairs can aggravate the environmental damage. Therefore, any operation that results in damage to the ground surface requiring repair has been badly planned.

LAWS, DIRECTIVES AND CERTIFICATION SYSTEMS

The environmental factors and features that must be considered during forest harvesting operations around any kind of watercourse are regulated by several laws. In Sweden, the primary requirements are contained in the Swedish Forestry Act, §30. Other relevant information is presented in the Environmental Code (MB), Chapter 2, regarding general conservation directives, and Chapters 5 and 11, regarding EU and Swedish national regulations for water conservation, respectively. It is essential for operators working in Sweden to know these regulations, and for operators working elsewhere to be aware of the relevant national and international laws.



Certification systems

The FSC and PEFC certification systems also provide rules for good environmental practices, including (of course) those related to water protection.

New norms

The EU has released new proposals, based on recent research, for environmental quality norms. If accepted in their present form, mercury levels in over 90% of Sweden's lakes will exceed recommended limits. Forestry is identified as a major cause of water quality problems in Swedish lakes, and the high mercury levels are associated with previous forestry practices. Thus, the forestry sector may have responsibility for the water quality of the lakes.

Activities that affect watercourses require a permit

Certain guidelines can easily be learned from the Environmental Code. If anyone carries out any activities that will disturb watercourses he must have enough competence to carry out the

THE HARVESTER ARRIVES FIRST

The harvester is the first machine that will face the various challenges encountered on and around the site. Often there is no forwarder on site that can transport wood and other material needed to build a crossing. However, damage can be avoided by using “spare sections” transported with the harvester. This can be done

simply, using the system illustrated in the pictures below. The system includes a hydraulic hose that is attached outside the wire loops. The outer tubes are made of rubber to prevent damage to the delimiting knives.



The spare sections are equipped with loops so a harvester can lift and carry two of them. The outer hydraulic hoses are made of rubber that will not damage either delimiting knives or feed rollers.



The spare sections are carried in the processing head to the place of use.

Spare sections positioned with the correct distance between them.

The harvester can pass without causing any damage.



Chapter 9: READING THE TERRAIN

FOCUS ON GROUND AND WATER CONSERVATION

Chapters 8 – 11 provide important foundations for descriptions and discussion in Chapter 12, regarding absolutely essential elements of planning harvests. Chapters 8 and 9 are connected because they both describe aspects of ground and water conservation, which are closely linked. “Reading the terrain” is a crucial skill for planning, conservation and efficient production. Thus, it is the focus of this chapter.

The heading

Choosing a title for this chapter was not straightforward, since it covers wide topics. However, reading the terrain here means studying it (the landforms, surface structure, soil, vegetation etc.) in accordance with the contents of this chapter to decide its potential and identify the best options for all parts of harvesting work.

AIM

The chapter supplies information intended to assist development of the art of “reading terrain”, defined as “The ability to understand the challenges associated with harvesting a site, using the available machines, from a quick examination of the terrain and vegetation”. The knowledge required for this skill is very complex and difficult to convey in a text. Therefore, the contents of this chapter should be seen as foundations for the continuous learning required to develop full competence, which takes years of experience. Good ground and water conservation is of utmost importance, thus avoiding damage to ground and watercourses is a major focus here.

In Forestry we work more smartly than this ...



Carrying capacity of tills

A major factor to consider when assessing the carrying capacity of a till is its composition, including the contents of stones and boulders. However, clay tills rarely contain substantial numbers of boulders.

TILLS ("UNSORTED" SOIL TYPES, Ti)			
Classification of soil types		Visual illustration of the carrying capacity	
Atterberg's scale	SGF's Laboratory Committee Scale, 1981	Small proportions of stones (or boulders)	Large proportions of stones (or boulders)
Grusig morän	Gravel till	T2	T1
Sandig morän	Sand till	T3	
Sandig-moig morän	Sandy till	T4	
sandig-Moig morän	Sandy silty till	T6	T5
Moig morän	Sandy silt till		
Mjälig morän	Silt till		
Leriga moräner	Clay till		

The need for an excavator

Work in terrain with abundant boulders, most common on tills, is a real challenge. Even if it is feasible at all it usually results in severe wear and risks of machine breakdowns. In these situations use of a large band excavator is recommended to create main passages and collecting trails.



Chapter 10: BASIC DRIVING TECHNIQUE

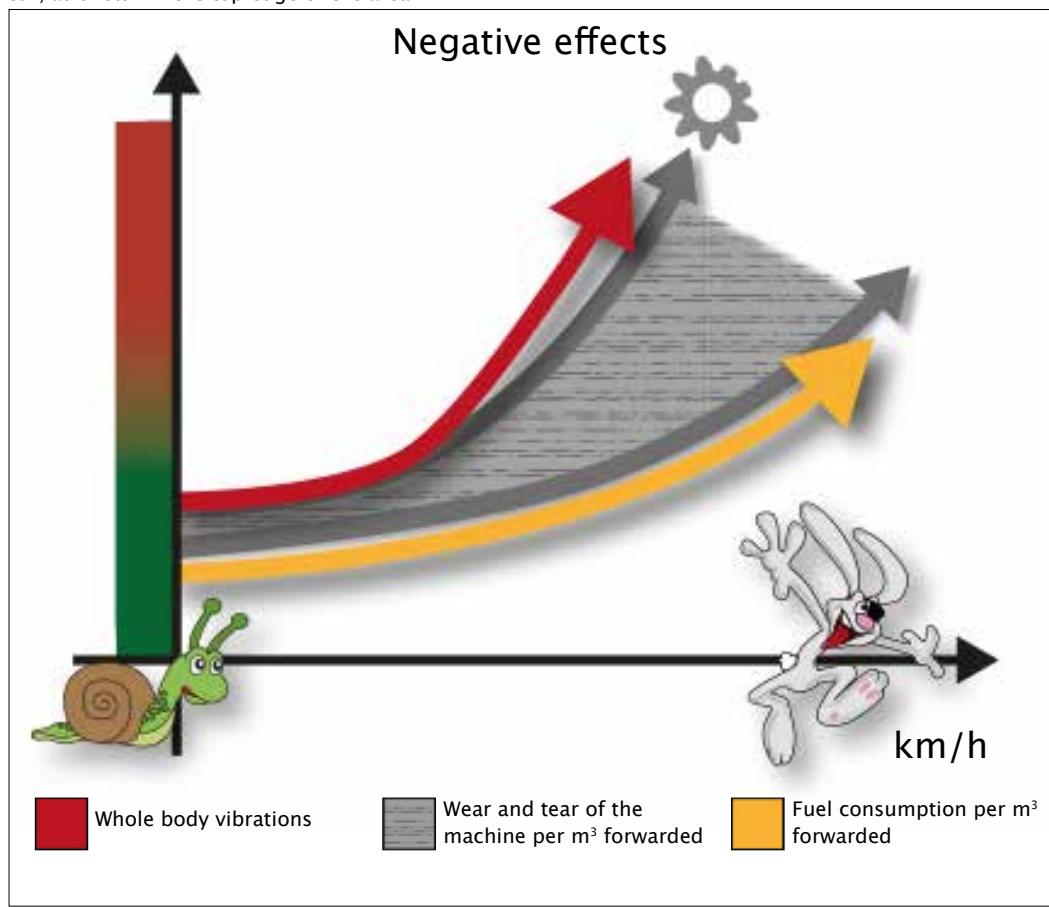
CAREFUL DRIVING

This chapter highlights the importance of using the machine sensibly and cautiously, with “machine-feeling”, i.e. understanding what it can, and cannot do (see Chapter 9). This is also the basis of good driving technique.

Create safety margins

Anyone who has not operated a forestry machine much must develop machine-feeling and good driving technique. An inexperienced person cannot possibly have enough knowledge to use the machine optimally, and while obtaining experience he is recommended to be cautious.

The diagram shows possible negative effects of driving too quickly. Even a small increase in speed can sometimes impair both the operator's environment and overall economy. The shadowed area shows that the wear of the machine dramatically increases when the driving speed becomes too high. The breadth of the area shows the great variation in general effects: high driving speed has less negative impact when driving a sensibly loaded forwarder in excellent terrain than when driving a maximally loaded machine in more difficult terrain, which will cause very rapid wear. In worst cases breakdowns with high costs will occur, as shown in the top edge of the area.





The operator processes the trees previously felled and fed towards the secondary trail. Following this procedure all the brushwood has been placed where most needed, on the secondary trail.

In this example the operator chooses to repeat the procedure. An appropriate distance between the "inserts" is 15–20 meters. The butt ends of the trees can be placed by the rear wheel of the harvester (transparent trunk) if the harvester's design allows this and the procedure is more efficient than other options or if the brushwood will be better placed.



Chapter 11: GETTING STUCK

A machine can get stuck for various reasons. For instance, it may get hung up on a large stone or stump. Alternatively, it may get stuck in the ground when driving across a section of terrain with poor carrying capacity. Most machine operators will get their machine stuck at least once in their working lives.

IT IS UP TO YOU WHETHER OR NOT YOU GET STUCK

In Chapter 9 driving a forestry machine is compared to driving a car. When a car gets stuck or ends up on the side of the road, the road or weather conditions are often blamed, but usually the real reason is that the driver did not properly adapt his driving to the conditions.

Neither a car nor a machine ends up on the side of the road/trail by itself. Both vehicles require an operator. It is therefore up to you to make the required assessments and adjustments to avoid getting stuck.

Sometimes you can claim that getting stuck was due to a mistake or perhaps bad luck, but in most cases they are due an incorrect assessment or handling of the machine.

CONSEQUENCES OF GETTING STUCK

Getting stuck has several consequences. These consequences and how you should act if you do get stuck on ground with poor carrying capacity are described in the following pages.

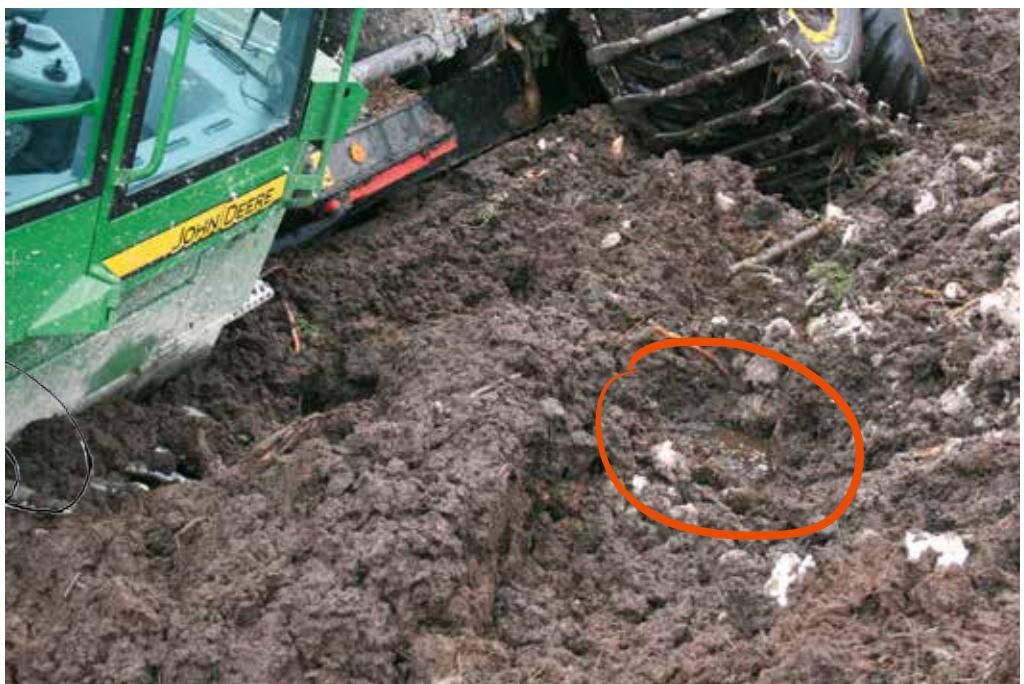


You can generally avoid getting stuck when driving a harvester by using a bit of common sense, observation and good planning. Salvage and lost income costs arising from the above incident amounted to 1000–2000 dollars.





It is advisable to call a more experienced operator when your machine starts to get into trouble.



When the machine starts getting stuck, as soon as possible you should assess the ground water level and the risk of water entering the engine housing.

Chapter 12: PLANNING A HARVESTING OPERATION

A skilled professional can assess the situation at hand and reach a realistic understanding of what needs to be done. This includes understanding when unusual steps are required, e.g. situations where large numbers of log-mats may be needed. The true professional also has the ability to see the “warning signs”, in other words, indications that the work should be done in other ways or even stop. This avoids extensive ground damage and the machinery (especially the forwarder) being used wrongly, which could cost the company a lot of money, due to breakdowns of the powertrain (engine + transmission) for example.

We could perhaps grin at the prevailing conditions and lament the bad working environment shown in the photo. However, these men might be appalled by the (lack of) planning and misuse of powerful machines sometimes shown today. It is remarkable to think that even at the time (more than 60 years ago) huge loads of wood could be transported using machines with less than 30 horse power (ca. 20 kW) engines, by using all the available knowledge, meticulous planning, and careful preparation!



Photo courtesy of Ivar Samset, Norway.

All the knowledge described in chapters 8 – 11 can be required, especially in a particularly challenging harvesting site. This chapter is intended to summarize, integrate and further emphasize the importance of this knowledge.

The pictures here and on the next page illustrate some of the complexities involved in planning a harvesting operation and the assessments needed.



Different criteria – different systems

The best system to apply when planning and implementing a harvesting operation depends on the carrying capacity of the ground, and thus on various criteria, including the following.

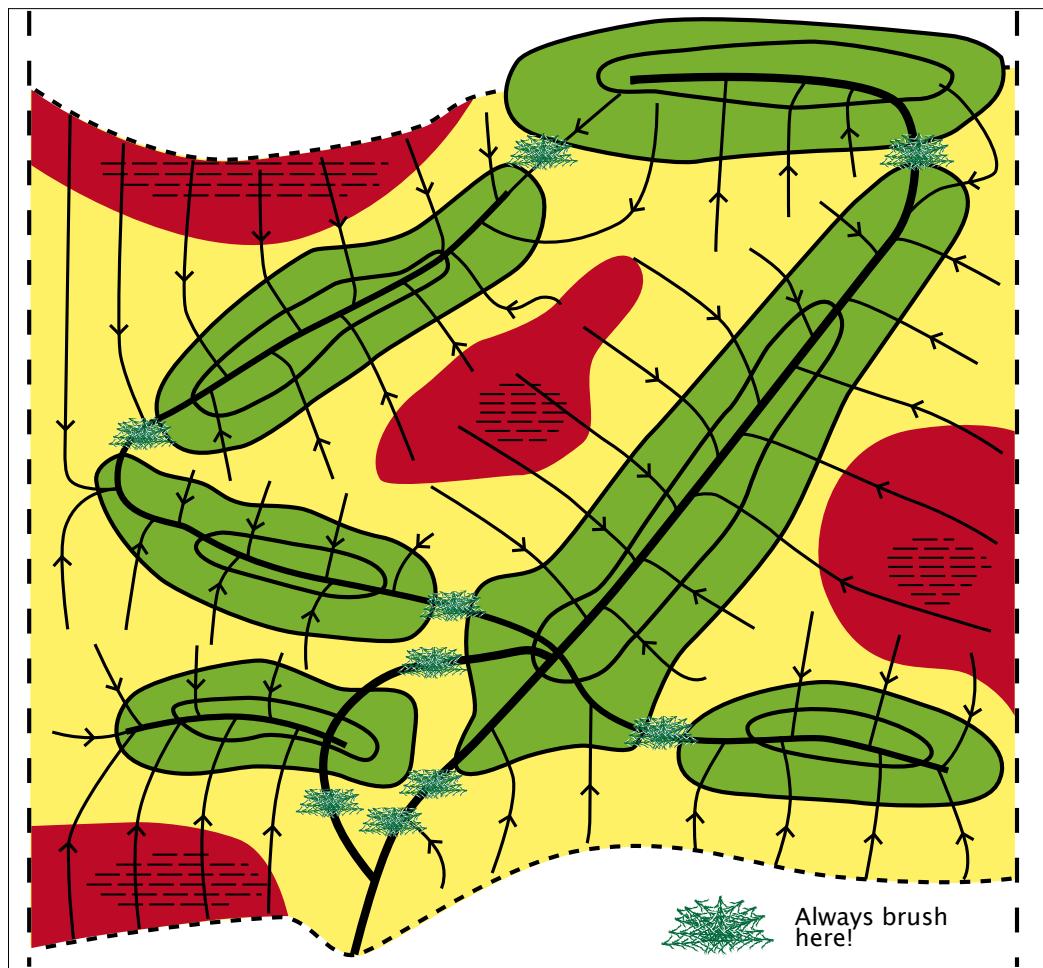
On a site where the carrying capacity varies the method below should be applied. The forwarder

should always start, with an unloaded machine, in the areas with the least carrying capacity. The forwarder reaches ground with better carrying capacity as the load increases. Where necessary, areas must be properly brushed. Cost-effectiveness must be optimized while minimizing ground damage. However, this requires good planning and systematic, competent work by the harvester operator.

Red areas: Start loading the forwarder here.

Yellow areas: The ground can only carry half-loads.

Green areas: The ground can carry full loads.



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CHAPTER 13: SCALING REGULATIONS

In many other industries there are rules and instructions that define how to carry out the work. In most instances, these are well worked out and describe work processes down to the smallest detail. For example, in the construction industry the rules are so detailed that there are even instructions describing how many screws to use to attach plasterboard. An experienced building industry worker naturally knows these rules. Within the forestry sector, however, there is no similar set of detailed rules.

REGULATIONS

- FUNDAMENTAL KNOWLEDGE

For the harvesting team, the work primarily consists of harvesting trees, transporting the logs to the road and stacking the different logs into piles, with one assortment in each pile. In this context, the scaling regulations provide a basis for the methods that should be used to do certain parts of the work. Therefore, the client has the right to expect you to be familiar with most of these rules, which provide foundations for good harvesting, sorting and piling.

Scaling the wood – a summary of the rules

There is a strict framework for scaling and reporting wood. The components of this framework are summarized below.

Scaling is regulated by law

Wood, including softwood sawlogs or pulpwood, should be scaled to provide a basis for pricing the products, in accordance (in Sweden) with the Swedish National Board of Forestry's regulations. These are the foundations for the current log scaling law. The first Swedish Timber Measurement Act came into force in 1935.

Scaling as a basis for pricing wood products is, therefore, regulated by Swedish legislation. The current law covering scaling of wood products has been in operation since 1 September 1967.

The Swedish National Board of Forestry publishes directives and supervises scaling

According to the Swedish scaling law that covers scaling used to establish prices for softwood sawlogs and pulpwood, wood should be scaled as recommended by the Swedish National Board of Forestry. Therefore, the Swedish National Board of Forestry has an important task in publishing directives for scaling wood and supervising activities such scaling. The most recent published directives are: SKSFS 1999 (with amendments in SKSFS 2001:1).

The Swedish National Board of Forestry is obliged to ensure that scaling follows the directives in practice. This scrutiny covers all scaling of softwood sawlogs and pulpwood, so it includes scaling carried out by both the scaling associations (see below) and other parties.

Most scaling is carried out by scaling associations

Almost all forest products delivered by forestry-based industries are scaled by independent scaling associations. Currently, there are three associations: VMF South, VMF Qbera and VMF North. All three are not-for-profit organizations.

These associations monitor scaling legislation and ensure that the industry adheres to it. They organize and deliver the necessary training and actively participate in the development of procedures that support the buying and selling of wood products as well as handling other types of infor-





Yield loss in butt end (most common).



Yield loss in top end (less common).

which has grown into the tree. If the stem has a diameter smaller than one-third that of the main stem, it will be treated as a branch and basically be cut off at the stem surface. If this is not done, then the log will be culled.

Volume deduction

The only volume deduction permissible is the diameter reduction applied to pine logs with certain types of defects. It results in the diameter being reduced by 1 cm.

Culling

Rejection of a log that does not meet the quality requirements of the assortment it was placed in. Culling means that it is worth much

less than the wood in the intended class. The price for culls is agreed by the partners and can even result in potential sawlogs being worth less than fuel wood.

A log is often culled because its defects cause problems for the industry that processes it.

Surface stain

See under the heading "Log blue stain".

End surface

Surface at the end of a log that has been cut at 90° to the longitudinal direction.

