HANDS-ON GUIDELINES FOR PRIVATE WOODLOT OWNERS IN SLOVENIA, LATVIA, ESTONIA, SWEDEN AND SPAIN

Introduction

This publication compiles English summaries of (and internet links to) guidelines aimed at non-industrial private forest owners (NIPFs) in Estonia, Latvia, Slovenia, Spain, and Sweden.

These guidelines are written/published in national languages, and provide practical knowledge that can help private forest owners to increase the economic and ecological sustainability of their forest/woodlot ownership. The knowledge concerns a broad array of themes: from drone use and log classification, to wildfire prevention and reducing ground impact during forest operations.

These topics were previously explored in a Net4Forest handbook named "The pathway for efficient operations in private forests". That handbook presented the private forest owner context in the participating countries through insight into the countries' NIPF sectors and their main innovation needs.

Fully implemented, this knowledge will help increase the sustainability of forestry on privately owned, European forestland/forest estates.

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Content

Methods of measurement of dimensions and qualitative classification of round timber

SLOVENIA

This handbook aims to provide guidelines for the evaluation of forest wood assortments. The information may be helpful for forest owners, who aim to increase the utilization of wood from their forests by using the quality criteria for the round-wood assortments.

Slovenia's geographical region in the moderate climate zone enables the cultivation and production of timber products of high quality. Due to its natural resources it is therefore not sensible to strive for mass production of wood, but rather for directed cultivation and production of assortments of higher quality which are consequently classified in a higher price-range (Lipoglavšek, 1996). Poor knowledge or round wood classification according to quality classes can completely devalue the quality of timber and work achieved through tending in the long-term process silviculture.

In the first chapter, guidelines for the correct measurement of dimensions and the rules for calculating the volume of round wood are presented. Typical values of the bark thickness are given for each tree species, which is not considered when calculating the diameter. Furthermore, round wood quality classes for the most common soft- and hard-woods in Slovenia are presented. In the case of soft- and hard-wood species, we emphasise the quality measures for spruce, fir and beech respectively.

The guidelines for measuring dimensions, the rules for calculating the volume and the quality classification of logs are based on the standards and rules that apply to the wider European area. Thus, European standards (SIST EN 1309) and "Rules of good practice" as given by German Forestry and Wood processing industry council (RVR, 2015) were used as the basic literature. Both standards define four quality classes of logs (A, B, C, D).

In the past the Slovenian standards of classifying round wood defined assortments according to the purpose of use. In our case, however, the standards define only the quality from the best (A) to the low-quality logs (D), without a specific purpose. It is then left to the wood users to choose the most suitable class according to their need. Traditional Slovenian classification rules also define dimensional requirements for an individual quality class, while in case of European or German quality grading dimension classes are completely separate. In the article we also included indicative dimensional requirements for each quality class, so we did not completely break the link between the Slovenian traditional classification and European rules.

At the end of each chapter the timber defects for all quality classes of individual tree species are presented in a table, along with a defect influence for each quality class. They serve as a convenient and transparent summary of the presented classification regulations. Bucking of round wood is enabled by these specific tables, which can also be used to define and classify quality classes of already manufactured assortments before their delivery to the customer.

Whole chapter about Methods of measurement of dimensions and qualitative classification of round timber, in Slovenian language, is available here.

Merjenje in sortimentacija

Wood defects

SLOVENIA

Individual forest timber products are categorized according to their its dimensions and quality characteristics. Quality is usually determined by stating the maximum number and size of permissible defects that an assortment may still have in order to achieve a certain quality class. Wood defects spoil some of its properties and thus reduce its usefulness. Wood defects have different origins. They are formed due to the unfavourable influence of the natural site on the development of the tree or due to mechanical damage during the process of wood production (Turk, cutting).

In the case of wood defects, it is important that we know how to properly identify and define them. To determine its size, it is necessary to know the agreed method of measuring the defect. Last but not least, it is also necessary to determine the degree of defect influence for each defect, which consequently affects the classification of the assortment into a certain quality class (Lipoglavšek, 1996).

Wood defects that affect the quality of wood are the most important when it comes to defining assortments. When bucking, we estimate those defects of the wood that are noticeable on the circumferential surface and on the cross section of the trunk. Based on these, we also conclude on the quality of the wood inside the trunk.

Knowing wood defects is important in direct trunk bucking. Knowledge of how to eliminate the defect, how to reduce the impact of the defect, where to make demarcations between assortments of different quality and where to cut is a key element of bucking. In this way, we influence the quality and directly the value of an individual assortment (Furlan, 2006). For conifers, there is lengthwise bucking. The arrangement of defects and the quality of the assortments is more or less uniform with the length of the trunk from the tree stump to the top. In deciduous trees, however, bucking is done by quality or defect. It is important to point out that the defects and therefore the quality of assortments are not arranged according to a certain rule, which is why bucking deciduous trees is a very demanding process. The assortment of poorer quality is followed by an assortment of the best quality, and an assortment of poor quality can follow afterwards. There are therefore combinations of assortments of different qualities in a single piece of round wood (Furlan, 2006). In this case, knowledge of wood defects proves to be crucial as in this way we make the right decision between the appropriate demarcations between quality classes.

In this chapter, the forest owner will learn about the qualitative and quantitative features for grading softwood and hardwood timber (round-wood). All wood defects that are very common in a tree species such as beech, spruce, and fir are presented. Each wood defect is presented descriptively, and the most common site of occurrence on round wood is also added. For easier identification, graphic descriptions are added to the descriptive part, on which the monitored defects are purposely emphasized. For every quantitative feature, a calculation formula is added to help calculate the defect influence. For an easier use of the formulas for calculating the defect influence, the graphical representations of individual defects are equipped with the correct way of measuring certain variables, which represent the key input data in the calculation formula.

Whole chapter about Wood defects, in Slovenian language, is available here.

Napake lesa

Continues Cover Forestry

SWEDEN

During the past ten years, scientific research in the Nordic countries has shown that continuous-cover forestry (CCF, also known as Dauerwald) can be better than clearcutting in optimizing the forest's economic, ecological and social values. In Sweden, CCF generally entails partial cutting and can include logging methods (silvicultural systems) like: selection cutting (Plenterwald) including single tree selection and group selection; patch (gap) cutting; shelterwood cutting and seed-tree methods; diameter-limit cutting; close-to-nature forestry; and the Lübeck model.

Particularly interesting for Swedish private forest owners (non-industrial private forest owners) is the research that shows that CCF can be more profitable (generating higher net present values) than clearcutting during the following circumstances: on land with low site indices; when silvicultural costs are high; when the risk of forest damage is high; when the profitability of forestry is low; and when interest rates are high.

Ecologists have long shown that the biodiversity and ecological resiliency of Nordic forests increases when foresters practice both CCF and clearcutting within a forest landscape. Thus, because clearcutting is the absolutely dominating silvicultural system in Sweden, more CCF helps to increase the ecological values of Nordic forests. The fact that people in general do not like clearcuts has also long been common knowledge. Thus, CCF helps to increase the recreational values and esthetics (social values) of Nordic forests. Swedish forests in which CCF is practiced today include the following: the high altitude forests close to the Scandes; Sveaskog's forests around Tiveden National Park; Vätteskogen just east of the town of Skinnskatteberg; urban forests in and around the cities of Göteborg, Örebro, Borås among others; and the noble hardwood (chiefly Fagus sylvatica) forests of southern Sweden.

Accordingly, it is important that the Swedish forestry industry continues to develop knowledge of and research on CCF, so that it can become a common and widely accepted forest management method in Sweden's forests.

Whole chapter about continues cover forestry, in Swedish language, is available here.

Hyggesfritt skogsbruk

Low Ground Impact Harvesting

SWEDEN

Ground-based forest harvesting means that heavy transportation has to be done on the forest ground. The total mass of logs and machines that passes on main logging trails roads from the harvesting site to the roadside is several thousand tons during an ordinary harvesting operation. When forest soil is burdened beyond its bearing capacity, it will become compacted and rutted.

The strength of the soil is largely determined by the soil type (particle size of the mineral soil) and its water content. Soils with a high proportion of gravel or sand and/or very rocky soils have good bearing capacities even at high water contents. Fine-grained soils with a high proportion of fine particles are strongly dependent on the water content for their bearing capacity. A volumetric water content (VWC) of about 40% seems to be an approximate threshold value when it comes to soil bearing capacity.

The stress that a forest machine exerts on the ground depends on the machine's mass and how it is transmitted to the ground. The mass that loads a single wheel affects the depth of the ground compaction. High wheel loads compact the ground deeper than lower wheel loads. The trend over the past many years has been that forwarders' wheel loads have increased.

Ground pressure is strongly linked to rutting. The size of the contact surface depends on the following: diameter, width, and tire pressure of the wheel; the magnitude of the wheel load; the deflection of the tire caused by the wheel load; and the plasticity of the ground. The larger the diameter and width of a tire, the lower the ground pressure. The lower the tire pressure, the lower the ground pressure.

Any development of tires that are larger than today's tires would encounter practical limitations. One such limitation would be that the machine become so large that it cannot be transported on public roads. Another limitation would be that very large tires on a forwarder reduce the space available for cargo. Hence, the only remaining practical solution for reducing ground pressure is to reduce the wheel load.

The use of bogie tracks increases the contact area between the machine and the ground, thereby reducing ground pressure. Measurements of ground pressure shows that the bogie tracks' effect is more about the wheels becoming wider than about the contact surface between the bogie wheels becoming longer. Indeed, it is at the wheel's centerline that the pressure on the ground becomes greatest. This is because the tracks have no support between the bogie wheels. Rut depth is largely affected by the same variables as compaction. A high soil water content causes greater rut depth than if the water content is low. A fine-grained soil type leads to deeper ruts than a coarse grained soil type. The rut depth also increases with increasing number of crossings.

To reduce soil damage as much as possible, the following basic recommendations should be adhered to:

- Determine the soil type of the harvesting site and main logging trails (and if possible also the variation in soil type within the area).
- Once the soil type has been determined, assess also the soil moisture content. Classifying the bearing capacity of forest soils for forwarders is done on the basis of these two variables.
- Plan the forwarding so that the most frequently used trails are located where the bearing capacity is the highest. Beyond this factor, try to find as short total extraction distances as possible.
- Use bogie tracks, especially on the forwarder's rear bogie or if the ground has poor bearing capacity. Many studies have shown that rut depth decreases if tracks are used.
- Reinforce the ground, especially at sensitive areas or where many crossings will take place.
- If sufficient amounts of logging residues are not available or if a terrain section has very poor bearing capacity, logs (generally low-value/pulpwood logs) can also be used to drive on.
- There are also specially made "ground protectors" that can be laid out when frequently passing over shorter sections with very poor bearing capacity. Such ground protectors can also be used to build temporary crossings over ditches or very small streams.

Whole chapter about low ground impact harvesting, in Swedish language, is available here.

Skogsavverkning och markskador

Drones in forestry

ESTONIA

Drones are handy for surveillance of forestry works - for example checking if the clear cut, thinning, pre-commercial thinning, soil preparation or planting was finished and the quality of the work. When the worker of forest association takes the photo or video of the property then the forest owner can get the overview of his/her forest situation. Based on filmed material there can be discussions about the forestry work outcome. Forest owner can share the ideas with the worker by the visuals - where and how the forest should be managed.

Using drones for remote sensing has a range of benefits such as reduced costs, flexibility in time and space, high accuracy data and no human risks. It is important to mention that natural disasters monitoring and management was one of the first field in forestry that showed the importance of using drones in forestry. If heavy winds have hit the forest owner's property it is hard to tell from the edge of the property how many cubic meters or hectares have been torn down. Climbing over the fallen trees can be time consuming and physically hard. Drone usage saves time and helps to get bigger picture of the damage. They are also useful when it comes to finding beaver dams.

Using a drone to check conformity with different forest management certificates is one of many possibilities. Monitoring FSC® or PEFC™ certified forests is part of owning a certificate. Certificate owner has to prove that properties are systematically monitored. The easiest way to prove is to show the video of the visited forest.

Civilian people started to use drones in 2006. The company that sells the most drones world-wide is the Chinese company DJI. They release drones and applications targeting everyone including hobbyist, photo-, videographers and businesses. The most suitable for forestry is Mavic series from DJI brand. These drones are capable of capturing 4K (high-definition) video and have flight range of 6.9 km and flight time of 27 minutes (in an open area and with zero wind). Realistic numbers in forest are 1.5 km flight range and 22 minutes of flight duration. Flight range depends on whether to fly over broad-leaves or conifers, shorter or higher trees. Flight time is enough for a long forest day as the drone comes with three batteries, which gives altogether 60 minutes of flight time. Also, it is possible to use car charger that can extend the flight time even longer. Drone's top speed in sport mode is 65km/h and it can sense obstacles from 15 m and bypass them or brake to hover. The best conditions for flying a drone are daylight, reasonable temperature and little to no wind.

Drones can help to make forest owners' work much easier in many ways. There is an application that makes the drone usage even more beneficial and it is called e-Mets (e-Forest). At the moment E-Mets application can be used only on iOS operation system. The application connects with most of the DJI drones: Mavic Zoom, Mavic 2 Pro, Mavic Pro, Inspire, Phantom 3, 4 and Matrice series. In Estonia e-Mets is using multiple Estonian Land Board map layers as base information. These are public WMS layers: cadastral layer, ortho, forestry ortho, base map, soil map, relief map, elevation map etc.

User can choose what kind of base map is the best to use. Also, all the cadastral and subcompartment information is seen on the e-Mets app. The tablet screen is divided in two sections: one is the view of the chosen map layer with active property compartments in 2D and the other is the view from the drone camera.

Developments in drone industry are very rapid and it is impossible to predict how drones can help regular forest owners in ten or in twenty years. But to give some ideas where it might be heading, there are bigger drones already being tested to carry big plant bags to the forest sites that are hard to approach. So maybe the next step would be to attach a robotic hand to the same drone and to let it do all the planting itself. We shall see.

Whole chapter about drones in forestry, in Estonian language, is available here.

Praktiline juhend droonide kasutamisest metsanduses

Mini harvesters in forestry

ESTONIA

A forest owner who wants to manage his/her own forest is very interested in having the best possible outcome. During the forest life cycle, the stock of unmanaged and managed forest is approximately equal. However, there is a significant difference in the quality of managed and unmanaged forest timber. Timely done thinning in a young forest can ensure the growth of a good quality future forest. It is also possible to collect the wood during the thinning from the young forest and to use it for heating.

First pre-commercial (PCT) thinning usually takes place 5-12 years after planting. Second PCT takes place when the forest is 10-25 years old. During the second PCT an estimated harvesting volume is 25-50 cubic meters per hectare. PCT is usually done by brush saw operator, but due to hard and time consuming work then usually the material is left behind in the forest, but could be used as energy wood if transported to the roadside. In some cases even 3 m long logs can be harvested as some sawmills buy 8 cm diameter logs and many sawmills buy 11-12 cm diameter logs. To collect the logs from the second PCT it requires large areas where to do the PCT at the same time as the outcome of potential logs is perhaps only up to 5 m3 per hectare.

One solution for a forest owner is to use mini harvester and mini forwarder or combination of these two that is called mini combi machine. These machines are used to get the maximum benefit from the forest as they are suitable for gathering felled wood from thinning and managed stand will bring more income to a forest owner at faster rate.

Benefits of mini harvesters in comparison with big harvesters are lower operating costs and also the price of a mini machine (80 000 EUR) is much lower than the price of a big harvester (200.000-300.000 EUR). Operational costs are lower with smaller machines and higher with bigger machines. Due to their light weight mini harvesters are more suitable for first PCT and for first thinning, because they cause less damages to trees' roots comparing to bigger harvesters.

An operator of the mini machine can enjoy the safety and comfort of the cabin compared to a person working with chainsaw. The machine is steered through the computer and also all the work operations are controlled through the computer. Usewood mini machines have cooling and heating system, so they are comfortable for all the seasons. As the machine is so light (2.5 tons) and small it is convenient to transport it on a regular car trailer.

When comparing mini harvester with brush saw/chainsaw then the main benefit for the mini harvester operator is that the work doesn't depend on the weather. Mini harvester is used for thinning and cleaning, and can also be used to clean power line bases and the banks of irrigation ditches from thin brush. For this the harvester head is switched against brush disk.

Harvester head is traditional chainsaw head and it is for cutting trees in diameter of 1-22 cm. Harvester measures the length and thickness of timber and also measures the volume of sawed timber with a precision of cubic meters. It can measure the length of the log with an accuracy of 4 cm and diameter of the log with an accuracy of 0.5 cm. From these measurements harvester head calculates the volume of the logs cut during the day.

When using mini harvester there is also need for machine that gathers material after it. Mini forwarder is technically similar to the harvester. This keeps the operational costs lower and it is also easier to do the maintenance when two machines are similar. The maneuverability of forwarders is improved by the independently controlled rear axle, which allows the front and rear wheels the single-track movement. So, the load will be easily steered past stumps and stones. Forwarders can drive on the same track as the harvesters.

Mini combi machine acts as harvester, forwarder and brushwood cutting machine. Young forest management costs are being reduced as there are three machines in one. Mini combi machine can also be transported on a car trailer and it can transport logs that are 4 m long. Loading space has hydraulic extension so it can be shortened to decrease steering radius when harvesting and cutting brushwood. This minimizes the environmental impact as the harvesting tracks are narrower.

Whole chapter about mini harvesters in forestry, in Estonian language, is available here.

Praktiline juhend miniharvesteride kasutamisest metsanduses

Adapted prevention management of wildfires in private forests

SPAIN

Forest fires are a permanent threat in the dry regions of the Mediterranean Sea. Forest fires are increasing due to climatic factors and due to the abandonment of forestry-related uses, rapidly escalating from southern to central and northern Europe year after year. Here in Catalonia, in the last 30 years, many efforts have been made by public bodies, private associations, property owners and research centers to prevent the risk of fires and mitigate their subsequent effects. The result is a solid knowledge of prevention and mitigation in cooperation with different bodies responsible for management. Furthermore, private owners play an important role in this equation through their ownership of forest stands and their responsibility for maintaining their quality and condition to prevent large fires.

The important social, economic, and environmental impacts of large forest fires mean that forest managers, firefighters, and land-use managers must use an integrated approach to ensure that forest fires do not grow too large. In addition to having an effective extinguishing system, if the propagation capacity and vulnerability of people and their properties are not acted upon, it will not be possible to effectively reduce the risk of these large forest fires.

New knowledge about certain patterns of fire behavior, which are repeated according to the meteorology and topography of the site, allows us to more strategically identify where we should act on the vegetation and how to anticipate the movements of the fire when it occurs. In fact, promoting the consumption of agricultural products (for the maintenance of the mosaic landscape) and forestry (biomass boilers, wood, forests, pastures) is the most effective way to have landscapes adapted to fires and to "put out" fires before they begin. On the contrary, without acting on the fuel at a landscape scale and reducing the vulnerability of the houses, the capacity of extinction will be subedited to the technical means of extinction capacity, always insufficient regarding a wildfire event.

In this handbook chapter, the main strategies in Catalonia to prevent wild forest fires are tackled in a summarized way, including forestry measures, planning through simulators systems, controlled burns and policy instruments for private owners in order to manage their own forest as a key concept to avoid large forest fires. Thus, it is the responsibility of all actors to minimize the possibility of the great forest fires occurring. This must be managed at a wider scope for the forestry departments of the national governments and be supported through sustainable forestry policies aiming to prevent forest fires and their benefits for private owners and for the whole society at a general level.

Whole chapter about adapted prevention management of wildfires in private forests, in Spanish language, is available here.

Lagestión forestal adaptadaa los incendios forestales

When should the forest be harvested?

LATVIA

Economically productive forestry is dependent on human assistance on a regular basis. A forestry stand should be commercially thinned when the average tree diameter has reached the commercial size; usually, it takes 15-20 years in our biogeoclimatic conditions. Thinning from below involves removing any trees behind normal growth and with low quality so that more space and light are left for the best and most fast-growing trees (just like it is done for many types of agricultural crops). Thinning allows us to control the species distribution in a targeted manner. In the context of the Latvian market, the very first thinning usually brings profit to the forest owner, returning the most of the money invested (for soil preparation, seedling purchase, planting, seedling protection, pre-commercial thinning, and commercial thinning). During subsequent thinnings, tree diameters increase, thus bringing more and more profit for the owner.

A common mistake by forest owners is to do thinning too late or skip it altogether. Prices for thinned roundwood in Latvian market rise and drop easily since we do not have our own pulp industry. In some cases, forest owners hesitate to do thinning, waiting for the price to rise, even though they are aware canopies of their forest stand have closed, and thinning should be done to ensure the vitality of the stand. As a result, tree crowns grow smaller, which reduces growth and increases the risk of storm and snow damage.

Many forest owners lack insight as to when forest stands reach economic maturity. After maturity, a decline starts in growth and quality of roundwood. Some large diameter sized-trees of certain species have smaller demand, thus lowering the price. In a macro-economic sense, it would be useful in many cases to remove low-value stands, so that they could be replaced with new, productive forest stands of good density and species distribution.

If a forest owner fails to make reasonable decisions on harvesting the forest yield, he misses not just good profit, but also decreases the market value of his forest and the estate respectively. No doubt, every forest owner is entitled to his own decisions on forest management according to his goals, yet it is important to promote such decision-making guided by relevant competence and insight.

Educational film "When should the forest be harvested?", in the Latvian language, is available here.

Kad mežā novākt ražu?

Principles of roundwood sales

LATVIA

Having decided to harvest the forest yield, a forest owner should seek for the best purchaser of the roundwood. Sales can be done in several ways. The cutting area can be sold as a growing forest on stump on the basis of the measurement results of growing trees. This approach cannot be applied reasonably to cutting areas in thinning process, as it involves different measurement risks, yet it could be used as an alternative in clear-cutting stands. The disadvantages of this method concerning measurement and quality evaluation should be noted, though. All the roundwood is given to a sole purchaser who integrates the risks of growing trees into the price. Positively, the owner is paid at the initial stage of the sale-purchase deal.

The prepared roundwood can be sold at the roadside. This allows for making more precise volume measurements and quality evaluations. Prices can be set for the actual harvested volumes. Such roundwoods mostly are sold to one purchaser, who resells them to the end-consumers.

The third method, recently gaining in popularity, because of cooperatives entering the market, consists of selling roundwoods to the end-consumer in his wood-yard or process site. The approach involves the owner giving trust credit to the purchaser, because he gets to know the end-sum, upon concluding the deal, when the measurements and paid prices by the purchaser are defined clearly. Nevertheless, the last method allows getting paid the sum as close as possible to the real value of the stand.

Roundwood is not easy to measure. When it comes to wood sales, due to lack of knowledge about several sale tricks and methods, the owner can end up getting paid less than the real value of the stand. One option is to try learning all those tricks and methods. However, another option, which requires less effort, is to find a competent and transparent cooperation partner and pay him for entering into the roundwood sale process on behalf of the forest owner.

Educational film "Principles of roundwood sales", in the Latvian language, is available here.

Koksnes tirdzniecības principi

Yield harvested – what next?

LATVIA

Now it is time to look into the options the forest owner has for reforestation. When should the clear-cut area be left to natural regeneration, and when should it be planted with new trees? What advantages and disadvantages are there for each method? We will look into different species alternatives and plant types, the preferable planting density and its measurement methods. Also, we will touch upon efficiency of soil preparation, seedling protection and the tending of the young forest stand. We will pay attention to a number of things one should take into consideration, when planning and controlling these tasks. Where can advise and support be found, if the small-scale forest owner has no access to contractors or other forestry workers?

The mistakes committed during the initial stages of forest stands are very difficult to correct. Therefore, forest owners should be aware of the consequences they will suffer in the future due to different choices they make. It would be most efficient, if those decisions by a forest owner were driven by relevant knowledge and information.

Educational film "Yield harvested – what next?" in the Latvian language is available here.

Raža novākta, ko darīt tālāk?

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