

Clear-cut free forestry among private forest owners in southern Sweden

Louice Wemmer



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Supervisor: Isak Lodin, SLU, Southern Swedish Forest Research Centre
Assistant supervisor: Vilis Brukas, SLU, Southern Swedish Forest Research Centre
Examiner: Urban Nilsson, SLU, Southern Swedish Forest Research Centre

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Swedish University of Agricultural Sciences
Faculty of Forest Sciences
Southern Swedish Forest Research Centre

Abstract

Swedish forestry is dominated by the clear-cutting system. The use of alternative methods such as clear-cut free forestry is becoming of greater interest. The Swedish forest agency have a wish for a more varied forestry management and are currently working with programs to promote these kind of management methods. Although the interest is increasing there are so far few forest owners who manage their forest in this way, and the knowledge about their motivations and practice is scarce. To get a better understanding about these forest owners this study aims to answer the following questions; (I) What is clear-cut free forestry from the owners perception? (II) What motive explains private owners' interest in clear-cut free forestry? (III) Information and advice – What is accessible and where, and how do the FOs' perceive it? The study is based on qualitative interviews analyzed with thematic analysis. In total 9 private forest owners in the south of Sweden were interviewed. These forest owners were all managing or planning to manage all or parts of their forest clear-cut free. This study shows that there seems to be an inconsistency when it comes to the terminology describing the management method; many of the forest owners seem to not know exactly what terminology to use, or if everyone they talk to will understand what the terminology means. One of the main motives for using clear-cut free methods is tradition; the forest has been managed in this way for a long time. Other important factors are economy, recreation and avoiding clear-cuts. The challenges for these forest owners are mainly the skepticism they perceive when seeking counselling, and also the machine operators lack of knowledge and understanding. In order to continue increasing the interest and use of clear-cut free forestry this could be important focus areas.

Key words: Clear-cut free forestry, CCF, private forest owners

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1. Introduction

1.1 Clear-cut free forestry in Sweden

Swedish forestry is dominated by the use of clearcutting system, and has been so for decades (Lundmark et.al 2013). The management practices are oriented towards producing timber and pulpwood of the native conifers, Scots pine and Norway spruce. This is a method the foresters of Sweden have a lot of knowledge and experience in, and is also considered to give a high profit (Lundmark et.al 2013).

There has been an ongoing debate about the best forestry practice in Sweden since the 19th century. In the mid-19th century the most dominant forestry management was selective felling or dimensions felling (Lundmark et. al, 2013). That meant all trees above a certain size were cut, leaving only small trees. This was carried out without consideration to the regeneration, which left the forests in a worse condition than it was before (Axelsson & Angelstam, 2011). In the early 20th century the interest in forestry and biology increased as the forest industry increased and a larger need for wood developed. The question about a need for a sustainable forestry practice was raised (Lundmark et.al, 2013). The two main practices discussed was the clear cut system and the clear-cut free systems and they were used in parallel. In the years after WW1 the markets need for timber was most prominent and as clear cuts often also provide a fairly large amount of pulp wood the use of clear-cut systems decreased. The WW2 increased the pressure on the forest industry again and clear cut systems once again became more popular. The clear cut system became clearly dominant in the 1950s, as the forest industry expanded and intensified even more (Lundmark et al. 2013).

During the 1970s, the environmental discussions became stronger and a lot of critic was directed to the management methods used in Swedish forestry. The use of selective cuttings or as it started to be called; continuous cover forestry (CCF), was discussed also at this time (Stens et al. 2019). The use of CCF was argued to be better for biodiversity and the environment. But instead of increasing CCF the focus shifted towards using methods preserving high natural values simultaneously as clear cutting, as for example green tree retention (Stens et al. 2019). The scepticism towards CCF increased, as it did not seem to go together with the goal of production and guarantee a sustainable regeneration of the forest (Stens et al. 2019).

In 1979. the Swedish forestry act stated final harvest should be carried through as "...clearfelling with or without shelterwood or seed trees." (SKSFS 1979:3, p. 26). This prohibited further use of CCF, and the scepticism grew even deeper within the forestry sector. In the 1980s, the environmental movement grew even bigger and the issue about biodiversity loss was raised (Stens et.al, 2019). This led to the Forestry act in 1993 that stated that production and environmental goals should be equally important (Bush, 2010). This is also when the expression "freedom with responsibility" was

acknowledged. Freedom with responsibility was planned to promote and allow different types of management methods, including both clear cuts and different types of CCF practices. Although this was in 1993, 25 years later CCF is only practised to a very limited extend (Bjerkersjö & Karlsson, 2018).

1.2 Clear-cut free forestry and the Swedish Forest Agency

The Swedish Forest Agency (hereafter SFA) has been given the mission to try to increase the popularity and use of CCF. It has been a long going project that started in 2005 to examine the possible management alternatives for keeping biodiversity while still manage the forest for production (Bjerkersjö & Karlsson, 2018). From there the project has evolved towards increasing the use of CCF in production forests among private forest owners (Bjerkersjö & Karlsson, 2018). In this project “clear cut free forestry” as a term started being used instead of continuous cover forestry. According to Stens et.al (2019), this might have been an attempt to reinvent the management method and thereby give CCF a fresh start and an opportunity to get rid of the scepticism that was still prominent in the forestry sector.

SFA has tried to increase the use and the popularity mainly by increasing the knowledge about clear cut free methods among different actors within forestry in Sweden, e.g. private forest owners, forestry officials and forest machine operators (Bjerkersjö & Karlsson, 2018). The focus has been on arranging excursions or meetings where knowledge can be shared, on developing research and demonstration areas and also on increasing the knowledge of SFA-employees to be able to provide sufficient advisory skills. This has led to an increased knowledge especially among private forest owners, but if the actions has led to an actual increase of the area clear-cut free managed forest is difficult to assess. The main reasons it is difficult to assess is that forest owners do not have to report selective cuttings to the SFA as they have to when clear cutting and since the terminology is still confusing it is even more difficult to assess how much forest is actually managed clear cut free (Bjerkersjö & Karlsson, 2018).

1.3 Clear-cut free forestry terminology

Clear cut free forestry includes many different management methods and there is no clear and generally accepted definition. Therefore, it is very difficult to assess how much of Sweden’s forest that is managed with these methods, and also difficult to assess if the efforts by SFA has been successful. There have been multiple attempts to agree on a definition for clear cut free forestry, but so far there is no definition that is accepted by the whole forest sector. The SFA has formulated this definition (Skogsstyrelsen, 2018):

“Methods to manage the forest without clear cuts (includes selection system, shelterwood systems, patch regeneration). Common for all methods is that the land is always covered with forest and no big clear cut areas are existing”

The state owned company Sveaskog has their own definition (Hannerz et. al, 2017): *The trees in the overstory must be >2m and if harvest is made in patches a new patch cannot be cut unless the surrounding trees are >2m. The stocking levels cannot at any point go below §5 in the forestry act, that is the limit of regeneration obligation and patches cannot be >0.5 ha.*

The problem of the definition is when actors (private owners, forest companies, forest associations) are asked how much forest is managed clear cut free, and they all answer by their own/preferred definition. If SFA is asking with their own definition in mind, and Sveaskog is answering according to their definition, the results will be different. To be able to determine how much forest in Sweden is managed with clear cut free forestry, and in the prolongation make reliable research a clear and generally accepted definition is needed. As it is now the definition is stated by the one answering, and might differ due to their own goals, perception and intention. In this study we investigate the question about what clear cut free management is according to some private Swedish forest owners. This is to better understand what perception Swedish forest owners have and what they themselves use.

1.4 Forestry advice

The Swedish forest agency has been working towards the goal to increase the awareness and use of clear cut free forestry. Private forest owners normally rely on forestry advisors for management support, potentially giving them a large influence over forest management. The forestry advisors also play a big role in the implementation of forest policy, since information and advice are the main instruments for Swedish forest policy today (Appelstrand, 2012). Since SFA has allocated less time to such face-to-face consultations with forest owners, their main way to reach out with the information has been through information meetings and excursions (Lidskog & Löfmarck, 2016). Although this is a good method to reach many and seems to have increased the level of knowledge among private owners (Stens et.al, 2019), the industrial advisors and the recommendations they provide may counteract the intention of SFA. The advisors today are often working within the forest industry in private companies or associations, often in a combined role as advisor and wood buyer. These advisors are often specialists at clear cut management. These actors are also responsible for policy implementation, together with the governmental authorities (Beland Lindahl et al., 2017). Therefor it is interesting to investigate how forest owners who are working with clear cut free methods find information and how they perceive the advice and information that is accessible to them.

The clear cut management method has for a long time been said to be the best method in order to provide a high profit for the forest owner. According to studies about forest owner typologies far from all private forest owners say economy is the main goal of their forest, there are also groups of owners who instead emphasis non-timber objectives (Ficko et. al, 2019). These objectives could potentially be achieved

with clear-cut free methods. Forest owner typologies seldom investigate how well the forest owners goals matches their actual management (Dhubain et. al, 2007). Therefore it is interesting to investigate the motivation and goals of the few private forest owners who uses clear-cut free forestry.

1.5 The aim of the study

With this background, this qualitative study tries to investigate the use of clear cut free forestry among Swedish private forest owners. Forest owners, who are managing or plan to manage their forest clear-cut free, are interviewed in order to answer the following questions:

- What is clear-cut free forestry from the forest owners perception?
- What motive explains private-owners interest in clear-cut free forestry?
- What information and advice are accessible and where, and how do the forest owners perceive it?

2. Method

The study questions are of that kind that the results should be described, with words about feelings and experiences rather than measured. This will allow a deeper understanding of the complexity of the issues. The method chosen to answer the research questions in this study was therefore qualitative interviews. The interviews were semi-structured with open-ended questions. In this way the forest owners are able to freely explain and express their own thoughts and experiences concerning clear-cut free forestry.

Before searching for the right informants some criteria were formulated. The main criteria for the chosen forest owners was that; it was a private owner, and the management method for parts or all their production forest (not including set-aside areas) was clear cut free or CCF, not including shelterwood systems. This made it possible to find a sufficient amount of forest owners with experience to be able to discuss the topics.

Different procedures were carried out to find suitable forest owners for the qualitative interviews. Some forest owners were found through social media, in groups related to private forest owners. Some were found with the help from the Swedish forest agency in Skåne and Kronoberg. The company Södra also helped finding a few forest owners. The snowballing technique was also used to find forest owners. This means that the forest owners were asked during their interview if they knew anyone else who were using clear-cut free forestry and who could contribute to the study (Gilbert, 1993). Since there are some, but not many forest owners using CCF or clear cut free methods, many of the suggestions led to the same persons.

After contacting the forest owners and giving them the choice to join the study nine different forest owners were interviewed. The interviews were semi structured, meaning questions were predefined, but there was also room for the interviewees to discuss topics of their own choice that might come up during the interview. The questions were asked in an open form giving the interviewees the opportunity to reflect and reason on their own. Prior to the interview, all interviewees received an information letter. The letter explained the aim of the study and the method. It was stated that the interview was completely voluntary, anonymous and that the interviewees had the right to withdraw their contribution at any time. Contact information to the responsible student and supervisors were also included. A summary of the topics discussed can be seen in table 1. As seen the topics are divided following the research questions.

Table 1. A summary of the topics discussed during the interviews with forest owners who practices clear-cut free forestry

General information	Who are you? History of the forest Goals for the forest Importance of economy from the forest, Amount of work in the forest
What is clear-cut free forestry? Owners perspective	The methods and practices carried out Definitions of clear-cut free forestry and clear cut forestry Needs to succeed with clear-cut free forestry
Why those few who adopt clear-cut free forestry choose to do so?	How they started using clear-cut free forestry and why Their thoughts about their forest today Positive and negative aspects
Role of information and advice	Accessible information Valuable sources of information Experiences with advisors

The interviews were carried out during spring 2019. A field tour on the forest owners' property was carried out, with focus on visiting the areas managed with clear-cut free methods. This gave the forest owner a chance to explain their method while at the same time show some examples and special attributes of the forestry practice. This gave the interviewer a better understanding of the applied management practices. The interview including the visit in the forest took approximately 2-3 hours. The interviews were after approval from the interviewee recorded, and thereafter they were all transcribed.

The data was analysed using thematic analysis. By principle this means all data is read and re-read multiple times, the data is thereafter coded using different codes describing an event, a feeling, or expression. From the codes some themes are extracted (Braun & Clarke, 2006). The analysis was conducted with an inductive approach, which signifies the data controlled which codes and themes would derive (Braun & Clarke, 2006). In this study, the themes extracted were divided from the study questions. In between codes and themes connections could be seen or drawn, and from there conclusions can be made.

3. Results

3.1 General information about the forest owners

In total nine interviews were conducted. Five forest owners (FO) were men and 3 were women (Table 2). In one interview both a man and a woman contributed at the same time (husband and wife). In other cases, the forest could be owned by more than one person even though only one of them participated in the interview. Hereafter, they will be referred to as one forest owner, since they are the one contributing to the interview. four forest owners were in the younger age category, 30-60 years of age, and the other six forest owners were in the older age category, >60 years. The size of clear-cut free forestry areas varies between 4.2ha up to 120ha, with a slight domination towards smaller areas (Table 2). These numbers refer to areas being managed by clear-cut free forestry today or are in transition towards, or planned to be clear-cut free managed.

Table 2. General information about the FOs and their clear-cut free managed forest

<i>Forest owner</i>	<i>Gender</i>	<i>Nr. of interviewees</i>	<i>Clear-cut free forestry area</i>	<i>Age category</i>
FO1901	Male	1	4.2ha	>60
FO1902	Female	1	14ha	30-60
FO1903	Male	1	120ha	30-60
FO1904	Male	1	13ha	>60
FO1905	Female	1	10ha	>60
FO1906	Male and Female	2	14ha	>60
FO1907	Female	1	8ha	30-60
FO1908	Male	1	50ha	30-60
FO1909	Male	1	30ha	>60

3.2 How do the forest owners manage their own forest?

The FOs all describes their own clear-cut free management practice including aspects considered at cutting, e.g. which trees will be cut and when. They also shared some of their overall management principles. Some principles many have in common is that they have a quite large target diameter; at least 40 cm at dbh (diameter at breast height) (Table 3). The majority of them also mentions they prioritize injured or sick trees at harvesting to promote the healthy and potentially high-quality trees. The most prominent difference between some of the owners is the choice of main production species. FO1903, FO1908 and FO1909 clearly states that spruce is the main production species at the moment, even though they also manage other species if opportunity shows. FO1904 targets both oak and spruce, and other owners says they manage a mixed forest where large trees of any species could be favoured (Table 3).

Table 3. Overview of the forest owners own clear-cut free management method.

FO1901	<ul style="list-style-type: none"> -Cut trees with dbh >45cm -Remove sick or injured trees -Mixed forest -No PCT
FO1902	<ul style="list-style-type: none"> -Remove sick or injured trees -Promote large trees with straight stems -Mixed forest (different species, age classes and sizes) -The forest manage itself -Establish a fine road network
FO1903	<ul style="list-style-type: none"> -Selection system -Cut mature trees, dbh-50cm -Remove sick or injured trees -Spruce is main species for production -Multiple layers -Closed canopy -No PCT
FO1904	<ul style="list-style-type: none"> -Oak management x close-to-nature -Target diameter for spruce: >40cm -Manage oaks on individual level -Nature manage itself -Maintain undergrowth
FO1905	<ul style="list-style-type: none"> -Selection system -Cut the mature trees, 40cm -The forest manage itself -Create open patches for regeneration -Allow self-thinning
FO1906	<ul style="list-style-type: none"> -Manage the good trees – open up for them -Prune good trees -Mixed forest (species composition and size classes) -Create open patches to allow regeneration
FO1907	<ul style="list-style-type: none"> -“Old-school-forestry” - Cut large trees -Avoid clear cuts
FO1908	<ul style="list-style-type: none"> -Selection system -Manage 1/10th of the forest every year -Remove sick or injured trees -Cut mature trees, dbh: 40-50cm -Spruce is main species, but promote oak and pine if possible -Natural regeneration -PCT -Create open patches for regeneration
FO1909	<ul style="list-style-type: none"> -Selection system -Single stem management -Create open patches for regeneration -Spruce is main production species -Mixed forest -Cut the largest trees as they mature -Cuttings every 10th year

3.3 Words and definitions

The terms were discussed with the FOs. They were asked to describe their perception of these words and what they use themselves to describe their type of forestry.

The terms continuous cover forestry and clear-cut free forestry was familiar to all FOs. The majority of them states that these two words are synonyms, that they are umbrella expressions covering more specific types of managements. Some also thinks that continuous cover forestry was used earlier, and clear-cut-free forestry is a term that has come up later to make the word easier to understand. FO1903 says:

*"I don't think I ever understood the difference between continuous cover forestry and clear-cut-free. I see both as a sort of umbrella expression. I think it started because they wanted an easy term. Continuous cover forestry can be confused with continuous forests with is an expression to define forests that have never been managed."*FO1903

Four FOs uses the term selection system (in Swedish; blädning) to describe their own management method (Table 3). They seem to all agree that selection system is a more specific management method than either continuous cover forestry or clear-cut free forestry. The selection system described by FO1905 is in some ways different compared to the methods others have described as selection system. FO1905 wants the forest to manage itself to a larger extent, for example by allowing the forest to self-thin. She also mentions that selection system is the term used by neighbours who have lived in the area around her forest for longer than she has managed it, she says the term might be a regionally used word.

FO1905 also mentions that when she speaks to non-forest practitioners they very seldom understand the term selection system, she then have to explain the meaning to be understood. Two other FOs says that even the expression clear cut free has to be explained sometimes. FO1906 says:

*"Which word we use depends on whom we talk to, if they understand it or not. It is clear-cut-free, but what do we say when they don't understand..? Mixed forest I think, it is not clear cut management."*FO1906

What these forest owners (FO1906) hereby means by "mixed forest" is a forest separated from a monoculture in both meanings of species mixture and age class distribution. Which term would be the most suitable in such situations seems to be difficult to judge. Other words or expressions that have been mentioned during the interviews are; "Old-fashioned forestry", "close to nature forestry", "target diameter harvesting" and "selection cutting".

The difference and separation between clear-cut free forestry and clear-cut forestry was also discussed during the interviews. The FOs often mention that a clear-cut free forest is uneven-aged, multi layered and also that there will be no clear cuts in a clear-cut free forest. But after reasoning for a while most of them also ask themselves the question what a clear cut is and what a patch is. Many of them cut patches to allow regeneration, and these patches could be seen as small clear-cuts. Shelterwood systems is also a difficult expression, and could include different management practices. One FO claims shelterwood systems are a form of clear-cut free forestry while others claims it is not. The opinions are divided and the majority find these expressions difficult to define.

3.4 Why choose clear-cut free forestry?

The FOs choice of clear-cut free forestry often reflects certain pronounced values, or resulted from experiences gained from key events. Most of the FOs mentions that clear-cut free forestry enables them to use the forest in a productive way and still keep the forest feeling. They can still use the forest for recreational purposes, they can pick berries and mushrooms, and the forest will still feel like their forest. But they will also get income from it. The emotional attachment to their own forest is one factor many forest owners mention. FO1907 expresses:

“I like this place so much, I like this forest, it means something, I have a relation to it.”
FO1907

Even though the FOs generally have a low dependency of the income from the forest, it is made clear that the forest cannot have a negative income. Clear-cut free forestry is therefore a way to keep the forest, the feeling and the extra services it provides while also maintaining an income from it.

The interviewed forest owners have started to practice clear-cut free forestry in different time periods, but some similarities in the reasons can be found. Many of them have inherited the forest and also the knowledge and practical skills in clear-cut free forestry. Those who have inherited might have bought it from their siblings and also have a wish that their children one day will continue the forestry practices. These owners express a feeling of responsibility. A responsibility towards the previous generations, who made it possible for them to harvest these large trees today, a responsibility towards their siblings who also grew up with this forest, and a responsibility to leave something nice for the coming generations, where they can benefit the same way as they have from this forest. Forest owner 1903 says:

“If we would make clear cuts here, in 25 years when my children take over there will only be regeneration areas, since almost all forest is mature today. Then they won’t have anything to cut, and I would like to provide that for them. That is why I consider it optimal for us small forest owners, were we have a continuous ownership within the

family, to continue to manage the forest the way it looks without disrupting and waiting for 30-40years.” FO1903

There are also forest owners who have bought forest outside of their family, and this forest has previously managed clear-cut free methods. The forest owner has therefore chosen to continue the clear-cut free practice. One of these forest owners is FO1905.

“The previous owner asked me if I wanted to buy the forest. They had heard about me and my story and thought I would be a good owner. And I wasn’t allowed to cut it down. They wanted me to preserve it as it was. They thought that if someone else would have bought it they would have cut it all down. But they really wanted it to stay the way it is, and to be able to come to visit the forest.” FO1905

This forest owner, FO1905, here also expresses the responsibility she feels to maintain the feeling in the forest, for the sake of previous generations of owners. Among the FOs there are also forest owners who themselves were the ones deciding to use clear-cut free forestry. For these forest owners life coincidences seem to have played a large part. One forest owner had a forest managed with clear cuts, but decided to try to redirect the management towards clear-cut free forestry after being inspired from articles in a newspaper and meetings with a man at the SFA who had a lot of knowledge in clear-cut free forestry. One forest owner explains that some parts of his forest used to be grazed by cattle, and at that time they would not cut or plant any trees in the grazed area, which created a forest of uneven age, where he continued with clear-cut free forestry after the cattle were gone. Both of these forest owners express a hope that they want to be able to leave a nice well-managed forest for coming generations.

The interviewed forest owners were all pleased with their clear-cut free forestry and all could mention a variety of advantages compared to a clear cut system. As already mentioned, the majority of the FOs highlight that they can cut trees, earn money, and still have the forest feeling as one of the most important benefit. It is often described as fascinating compared to the clear cut system. Other personal benefits that have been mentioned in the interviews are that it is a fun, meaningful work. Working in the forest, managing single trees, and knowing every part of their own forest is described as fulfilling, interesting and fun. One forest owner is also managing their forest for tourism purposes, which is possible thanks to clear-cut free forestry.

The majority of the forest owners conclude that forests managed clear-cut free in some ways are more secure. Compared to their neighbour’s or other clear-cut managed parts of their forests, their clear-cut free forests have endured both storms and insect attacks better, with less loss. Many of them also manage more than one tree species, which is a form of risk spreading for the future market.

A common interest among many of the FOs is the wildlife and nature values. It is clear for them that birds, mammals, mushrooms and plants like their clear-cut free managed forest. Although many explains this and are very happy and proud that they have a forest with nature values, no one mentions this as being the number one reason for their choice of method. It is instead considered as a positive outcome that management for nature and for production can be combined.

All forest owners expresses that economy is important to the degree that they cannot lose money while managing. Costs for management such as cuttings should be covered by the incomes. For some forest owners the economic benefits were the reason they started clear-cut free management and now still continue. Forest owner 1909 says

"In the beginning the economic aspects were decisive. This old forest, managed with CCF contained a lot of really large trees but also a lot of young trees. It wasn't clever to cut it down, the volume per hectare wouldn't be great and the smallest trees were not worth anything. I thought that I instead could take some of the larger trees as they would mature, then I would use the natural prerequisites on these sites. As I work a lot on my own in the forest I think it has worked out pretty good, so I have continued"
FO1909

During the time this forest owner made his decision the forest owners were obligated to move towards a clear cut system (before 1993). This forest owner decided, as he expresses it, to stay outside of the law, using clear-cut free forestry, due to the economic factors. One FO is also convinced there is good economy and has kept track of the economic revenues in his forests throughout these years. His calculations show good profits, and that is one of the main reasons he uses clear-cut free methods.

Another forest owner brings up the question about economy and clear-cut free forestry. This forest owner has just started managing a forest clear-cut free, she has tried to gather information and knowledge about it by talking to other forest owners, advisors and wood buyers. FO1902 explains that it is often stated that there is no economy in clear-cut free forestry:

"This about the economy, that there is no economy in clear-cut free forestry, well, there has to be. I mean, there are so many trees here, you can't compare it to any other forest, or at least few forests today. In some way there has to be economy in it, then you have to choose how much economy there should be. But it felt like they decided [forestry advisor], or we didn't get to decide what was economic for us" FO1902

What she is saying here is that there is economy in clear-cut free forestry, maybe it is not the most profitable management method, but if it is enough for her or not, is only

up to her to decide. She feels like that is not discussed very often, instead it is decided for her that the most profitable way would be the only good solution

3.5 The history of the interest in clear-cut free forestry

To understand why things are the way they are today, we can often get some information by looking at what has happened in the history. One reason many of these forest owners are working with clear-cut free forestry today is because they have continued with a management tradition that prevailed on the property during a longer period. Before 1993, when clear-cut free forestry was illegal and as some forest owners express it; the state carried out huge actions to make forest owners cut all their mature forest and replant it, preferably with spruce. Some of the FOs were forest owners themselves at this period of time and explains that they kept their management methods a secret and could even feel ashamed over it. Forest owner 1909 shares a story when his brother in law was taken to court because he managed his forest clear cut free. Other FOs explain that their clear cut free forests were twice as large before these actions took place but they were forced to cut down and replant large areas. Today some of them manage that part of the forest as clear cut forest, and some are trying to restore and bring back the management from older days, but that is a mission that will take long time.

Many of the FOs now say they can see a change. Not only is it legal nowadays, but the overall interest has increased. Today they write about clear-cut free forestry in forest magazines and these practices are now sometimes considered as role models. FO1908 reflects:

“Yes, that trend has been clear. 50 years ago CCF or clear cut free forestry was basically forbidden. The forest owner was threatened with fines. This was for my grandfather. My father happened to meet some grumpy foresters who wanted to be in charge, but he managed to delay the decisions and actions so he managed to do mostly what he wanted anyway. Both those generations had to give in and it cost us approximately half of the forest. But they still had most of it left as clear-cut free forestry. Today this is seen as a good example and is used by researchers to prove there is profit in this management method, which is fun. That journey has been long.”
FO1908

3.6 Sources of information

“It is like with every form of information, it is not something you get, it is something you acquire” FO1906

This quotation was from a discussion with FO1906 about the access to information. FO1906 explain that there is a lot of information out there, in magazines, online or

provided in excursion-days. But the information will not come to you, you have to be interested and engaged in the subject to get the information. Similar thoughts are also shared by other FOs.

FO1902 on the other hand shares a different perception. This forest owner had limited knowledge about clear-cut free management before she was given the opportunity to buy an estate that had been left unmanaged for some years, although it was previously managed clear-cut free. She therefore wanted to gather lot of information before deciding on management actions. She used the internet, magazines, excursions and different forestry advisors. Her perception was that there was not much information that was easily accessible, she had to put a lot of effort into finding the information she needed. Although, after almost a year, she now thinks she knows what the first steps will be. The forest owner also shares the story of when she first met with an advisor from the forest owner association Södra, and explains how this meeting left them feeling disappointed.

“We thought we were very clear that clear cut was not an option for us, but afterwards when we got a sort of protocol from the meeting their suggested actions were clear cuts on these 14ha where we certainly did not want to have a clear cut. I must say we were very disappointed and felt like they were more interested in the value inside the forest rather than what we actually wanted.” FO1902

After the meeting with this advisor she met with two other advisors; one representing a forest company, Skogssällskapet and one representing the SFA. Both these advisors could provide more suitable suggestions and the forest owner thinks these meetings gave her valuable knowledge. She and her husband found the suggestions from the SFA to be especially suitable for the type of management they wanted. Four other FO mention that the SFA has been an important resource of information and help concerning their clear-cut free forest.

Other FOs also describe situations where they have had contacts with advisors from forest companies and associations and felt disappointed in one way or the other. FO1907 wanted help with a forest management plan, and also contacted Södra for advice. The man she then met was negative towards her thoughts about clear-cut free forestry and told her it was only a new modern thing with no economy. She felt like he did not understand her wishes at all. After this meeting, she contacted SFA and there she was able to get help that she was pleased with.

The scepticism described by both these women was also mentioned in other interviews. FO1909 explains that he thinks foresters often show a bit of scepticism towards alternative management methods, based on own interactions with foresters. He also mentions that he often get surprised about how little foresters know about biological and economic aspects of forestry, as well as their knowledge about

alternative methods. Forest owner 1904 and 1901 also says they have been met with scepticism and received clear cut advice for their clear-cut free forest.

Even though many of the FOs described negative reactions from advisors especially from the forest companies and forest associations, many of them also says that the interest and the acceptance regarding clear-cut free methods has increased among advisors the last decade. Forest owner 1905 says:

“When I bought the forest people only shook their head when I said I wouldn’t do anything with the forest, they thought I was insane. Now they wouldn’t say so, it’s even okay now. /../ I think even the SFA said I should cut it all down [when she bought the forest], I think everyone said I couldn’t have it like that.” FO1905

Both this forest owner and forest owner 1909 states that they do not care about what others have said. They know what they want anyway.

The SFA arranges excursion days for forest owners, where a predefined topic is being discussed and examples out in the forest are shown. Half of the FOs say they try to go to these meetings and claims it is one of the best sources of information. The reason these excursions contributes so much is because the forest owners meet other people with the same interests. Contact with other forest owners or foresters interested in clear-cut free methods have been stated by every FO to be one of the most important sources of information. Many of them have established these contacts during the excursions, other have contacts from work or experience within the family. Either way, contact with people who are not working as advisors seem to be common among all FOs.

3.7 The problem surrounding clear-cut free forestry and machines

Even if the forest owners have found an advisor or buyer who understands them and are willing to work with them, one of the most prominent problem seem to be the contact with the machine operator. Forest owner 1907 explains the situation like this:

“The big problem is that I can say whatever I want, but he who works in the forest, if he doesn’t do what I have said, then maybe I don’t have any clear-cut free forest left afterwards, because suddenly they have taken all the birches again. Just because I don’t do it myself.” FO1907

This forest owner manage a mixed forest with ambitions to make it clear cut free, and what she hereby means is that if one of her species is completely gone the forest will become more of a monoculture and the transition towards a clear-cut free forestry will be prolonged. Because of this dilemma several of the FOs says they choose the entrepreneur themselves even though it takes extra time. They say that they cannot rely on the company that the wood buyer has chosen. Two FOs shared stories about

occasions where they have had no opportunity to explain to the operator how the felling should be performed. They were both disappointed since the operators had not understood the goals and therefore cut down trees that were important for the next generation trees. FO1904 says:

“It was an unfortunate incident, they [big forest company] were hired to do a thinning here in a spruce plantation where I had found quite a lot of small oaks, and then they came and cut all the oaks. So I don’t hire them anymore” FO1904

Despite the problem with machines and getting through to the operators, two forest owners mention that when you do get the opportunity to talk to the operators they are often interested and find it exciting. Especially the younger operators seem to think it is interesting to do something out of the ordinary and try to do their best. The older generation operators are often the ones who are negative. Forest owner 1903 says

“The operators say that they will do what I want them to do, but they wouldn’t recommend it. So I have to take responsibility for it myself, and they are often very clear about that”

FO1903

Many of the FOs do or have done a lot of the work in the forest themselves, and have therefore not been dependent on a machine operator. One forest owner, who has not hired machines for this type of actions yet, discuss around the situation:

“In the beginning [1980s] it was very profitable to cut manually by yourself, but that has changed with the machines in the forest. It is not so profitable to do it on your own anymore. And this means you have to educate the machine operator too, so I guess that makes it a little harder” FO1909

4. Discussion

This study shows that there seems to be an inconsistency when it comes to the terminology describing the management method. Some forest owners are very sure about the specific management method, what it is called and what it means, e.g. the ones using selection system. These forest owners are also the ones whose forest have been in the family for generations and the terminology and definition have also been passed down in the generations. The study also shows that many of the forest owners seem to not know exactly what terminology to use. They call it clear cut free or continuous cover forestry when talking to others who are interested in the subject, but many have their own words or feel the need to explain the management instead of using one word when talking to non-foresters.

This indicates that there is still no clear definition concerning the terminology that has reached the general public, despite the campaigns SFA have been responsible for. Instead it seems like the situation still is as Hannerz et. al (2017) describe; that the definition and terminology vary depending on who is using them and interpreting them and their motives. Whether or not this is causing any inconvenience for the forest owners themselves, is left to be unsaid, although nothing in this study indicates it would.

One of the main reasons forest owners choose clear cut free methods is because the methods have been used in their forest for several generations. If this wasn't the case they might not be using this methods today. It is clear that a lot of forests that was former managed clear cut free was cut down and replanted during the time when CCF was considered illegal. It is likely that this is one of the main reasons clear cut free management is uncommon today. At the same time the general perception about transforming a forest from clear cut to clear cut free, is that it takes a long time and easily could fail. The knowledge about the transition might need to increase and the attitude towards it might need to change to the positive in order increase the use of clear cut free forestry.

In order to promote the use of clear cut free management one of the FOs suggests there should be beneficial to use it, perhaps if the certification would pay extra or provide another benefit. A similar idea is presented by Bjerkersjö and Karlsson (2018). This has also proven to be an effective method to get a good response before. In the 1970s, there was a wish to increase green tree retention at clear fellings. This did not have a breakthrough until it was brought up as a demand by FSC (Stens et al. 2019), FSC have discussed the possibility to take clear cut free forestry into account in their new standard. They suggest that in addition to the 5% set-aside areas, another 5% should be set-aside or managed with alternative forestry methods (FSC, 2016). This could be a chance to increase the amount of CCF among the private forest owners, but also among the large forest owning companies, who are often certified by FSC.

The forest owners have most often been able to get the information they need, although it has not always been easy. Most forest owners are very pleased with the help they have received from the SFA. The forest owners are less pleased with the help they have received from advisors within forest companies or forest owner associations. This is problematic since the SFA is spending less time and resources on private counselling and more of that responsibility is put on other advisors. The attitude towards CCF needs to change not only among the private forest owners but also among the forest industry in general if we will see an increased amount of clear-cut free managed area. Bjerkesjö and Karlsson (2018) could also see that the efforts made by SFA have had a larger impact on private forest owners, but has not managed to influence the view among forestry workers. It is therefore important for the SFA to direct some of their efforts into educating and inspiring forest industry employees in their continuing work with CCF.

It is not only the advisors who have shown a slight resistance to clear cut free methods. It seems as though a large obstacle is the lack of understanding among the machine operators. This is in line with the findings of Puettmann et al. (2015), who investigated factors that limit the expansion of alternative forestry methods. The findings show that one of the limiting factors is the lack of information and education among foresters and forestry workers (Puettmann et al., 2015). It is not necessarily the lack of knowledge about clear cut free methods, but perhaps the lack of understanding what the forest owner actually wants. It is important that the communication between the forest owner, the wood buyer and the machine operator works properly. Yet again this situation might improve if the forest workers (e.g. advisors, wood buyers, machine operators), were to be more inspired and educated about the possibilities of CCF.

The forest owners who have been in contact with SFA and participated on the excursions and information meeting SFA has arranged are very pleased. What they appreciate the most is the contacts they establish in those meetings. These contacts have been useful for many when it comes to sharing experience and getting tips, learning more and have someone to discuss with. This indicates that a network of people involved in clear cut free forestry is very useful for forest owner who wants to start or who are working with the method. SFA have done a good job arranging these meetings, and it could be useful to continue with different activities to increase knowledge and interest in CCF.

5. Conclusion

The FOs interviewed in this study uses different expressions to explain their type of management. Expressions they use include; clear-cut free forestry, selection cutting, close-to-nature forestry and old-fashioned forestry. Despite the variety of expression their management practices are similar in some ways e.g. large clear cuts are avoided and the target diameter is >40cm. There can be many reasons for forest owners to choose clear-cut free forestry, important reasons for forest owners in the south of Sweden seems to be tradition, economy, avoiding clear-cuts and maintaining a forest with a sustained forest feeling. What is challenging on the other hand is the scepticism and lack of knowledge among Swedish foresters. The SFA has carried out actions to promote the use of clear-cut free forestry in Sweden. The actions have been successful as the forest owners are pleased with the advice, the excursions and the meetings the SFA has arranged. Table 4 shows a summary of the study questions and the results of this study.

Table 4. A summary of study questions and results.

<p>What is clear-cut forestry? Owners perception and own management</p>	<ul style="list-style-type: none"> - Large clear cuts are avoided, patches can be opened up to promote regeneration - Target diameter >40cm - The terminology can be confusing, many different words are used - Used expressions: clear-cut free forestry, selection cutting, close-to-nature forestry, old-fashioned forestry
<p>What motives explains FOs' interest in clear-cut free forestry?</p>	<ul style="list-style-type: none"> - Tradition - Responsibility towards previous owner, siblings and next generation - Less risky than clear-cut forestry, considering storms, pest-/pathogen-/beetle outbreaks, and for future market - Keeping the forest feeling while still managing it
<p>Information and advice – What is accessible and where, and how do the FOs' perceive it?</p>	<ul style="list-style-type: none"> - Meetings and excursions about clear-cut free forestry arranged by the SFA is a valuable source of information - A network of contacts with experience, knowledge and/or interest in clear-cut free forestry is valuable - FOs have been met by scepticism by foresters and machine operators - The machine operators do not always know or understand what exactly the FO wants

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