



Forest Stewardship Council®
FSC® Sweden

FSC Pesticides Policy in Sweden

2014





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Photo page 2-3: Glue is applied on seedlings to fix the sand, as part of the Conniflex coating process (Photo: Per Wichmann).



Summary

The implementation of the FSC Pesticide Policy in Sweden has proven to be successful both in decreasing the use of pesticides and consequently in promoting the development of environmentally friendly mechanical protection techniques. Over the past four years, FSC Sweden's certificate holders have made significant efforts towards eliminating chemical pesticides from certified forest management units. The developments we are witnessing presently are the result of a long, demanding process that was initiated by the labor union and the environmental chamber but initially faced with reluctance by the forest industry. Indeed, some certificate holders have had remarkable success during the last few years by almost entirely eliminating pesticides during forest regeneration already by 2014. Predictions indicate that pesticide applications will cease completely in many certified units in the near future. However, there are still challenges that forest owners and managers need to overcome. Geographically related intensities of insect pest outbreaks, demand vs supply issues of mechanically treated seedlings, forest owners' attitudes and perceptions, costs and time concerns are some of the issues delaying the complete abandonment of chemical treatments in forest regeneration. Although the development of mechanical protection techniques has been remarkable, there is still a need for further research and development for more efficient and cost-effective protection techniques that meet an ever-growing demand. FSC Sweden will continue facilitating stakeholder consultations and support certificate holders in their transition towards a chemical-free forest management.



Dealing with forest insect pests in Sweden

The large pine weevil (*Hylobius abietis* L.) is a destructive insect pest across Europe, and in Sweden, causing large losses of newly planted seedlings in regeneration of coniferous forests [1]. The pine weevil became a major pest during the 19th century when forests began to be intensively managed. Current practices where coniferous forests are predominantly managed by clear-felling create a highly favorable environment for pine weevil reproduction as the insect is attracted to clear-cut areas where stump roots are used as a breeding substrate [2]. The insect then attacks freshly planted conifer seedlings by feeding on the stem bark thus killing millions of plants every year.

Traditionally, in forest regions that suffer from pine weevil attacks, seedlings have been treated with insecticides both in nurseries and in the field. Although effective for deterring pine weevil, chemical pesticides used in Sweden have long caused great concerns about their harmful effects on forest ecosystems, the wider environment and workers health [1, 3]. Such pesticides have been proven to be highly toxic for aquatic organisms [4] and have raised concerns about their negative health impacts on forest workers planting treated seedlings [1].

Forest managers can opt for other, safer and more environmentally friendly control methods based on mechanical seedling protection, also known as physical or feeding bar-

riers against pine weevil attacks. Feeding barriers can be either a protective shield around the seedling, or different coatings of protective layers around the stem [1]. Protective layers can be made out of wax; paraffin liquid coating applied on the lower part of the plant [see e.g. 5, 6] or sand; a coating of sand and glue on the stem [see e.g. 1]. Such coating techniques have been welcomed as some of the most environmentally friendly techniques for dealing with pine weevils without actually killing the insect or polluting the environment with harmful chemicals.

Pesticide use in Swedish forest management has been one of the most important and controversial issues on FSC Sweden's agenda ever since the establishment of the national office in 1994. By the end of the nineties the European Commission had raised efforts to enforce legislation on pesticides [7] and the Swedish Chemical Agency [8] announced intentions to prohibit pesticide applications. However, new pesticides composed of other chemical substances were developed and the use of pesticides continued. Eliminating pesticides from forest management in Sweden was part of the standard revision. Initially, this initiative was driven by the labor union and the environmental chamber, but was faced with reluctance by the forest industry. When standard negotiations failed, a dispute resolution committee was called for according to the statutes of FSC Sweden



Different types of protective layers around the seedlings:

Left: Glue is applied on seedlings to fix the sand, as part of the Conniflex coating process (Photo: Per Wichmann)

Right: Protective layer of Conniflex (sand) (Photo: Claes Hellqvist, SLU).

but the suggested solution was soon rejected by the forest industry. The director general of FSC at the time visited Sweden to help solve the conflict. The director's suggestion was to unite around a signed resolution, where the aim to minimize and in time phase out the use of pesticides would be clear. The resolution was decided by the Swedish board of directors in December 2007 and was valid until 2010.

In practice, the major obstacle was that the FSC certified forest companies were not sufficiently prepared to phase out the use of harmful chemicals from their planting operations. Insufficient resources had been invested in research and development of reliable alternative protection methods. Eventually the forest industry agreed to fund research and development of alternative protection means but this initiative did not yield the expected results.

A more viable initiative towards resolving this issue was initiated by Sveaskog (Sweden's largest forest owner) and its subsidiary company Svenska skogsplantor (a national specialist in seedling production and forest regeneration). In 2005 the two partners acquired the protective coating technique called *Conniflex* (technique developed by Henrik Nordenhem and Göran Nordlander from SLU Department of Ecology in Uppsala). Only then were the first mechanical coating techniques further developed, tested and made available on the national market thus setting an example for others to follow. Other coating techniques have since been developed and are used nowadays in planting operations.

The present report looks at solicitations for derogation from the FSC Pesticide Policy sent to FSC Sweden by certificate holders. The overall aim of this report is to show how the use of pesticides in certified management units in Sweden has changed over the past four years (2010- 2014). The reasons behind forest owners' and managers' decisions for employing or ceasing pesticide application are explored using information from the derogation applications sent in to FSC Sweden. A case-study of the Church of Sweden, complemented with an interview with Jens Brorsson (forest manager at Västerås Diocese) is presented. Finally we discuss some of the challenges that managers are faced with and explore available alternatives for further minimizing the use of pesticides in Sweden's forests.



Different types of protective shields around the seedlings:

Left: MultiPro cardboard sleeve

Right: protective plastic tube (Photos: Claes Hellqvist, SLU).



Adult pine weevil feeding on the stem bark of a newly planted seedling (Photo: Claes Hellqvist, SLU).

Facts about the Pine Weevil

The pine weevil attacks newly planted seedlings in regeneration of coniferous forests costing Swedish forestry an estimated SEK 100 million annually.

In Scandinavia there are four species of the genus *Hylobius*, three of which attack conifers. The most common species is the large pine weevil (*Hylobius abietis*). The other two, less common, species are: *Hylobius pinastri* and *Hyloboius excavates*.

Increased pine weevil attacks are a result of current practices in forestry where coniferous forests are predominantly managed by clear-felling with subsequent planting. Hence, pine weevil populations are involuntarily kept at high levels.

The insect is attracted to clear-cut areas where stump roots are used as a breeding substrate and the newly planted seedlings serve as a feeding source. The pine weevil feeds on the bark on different parts of the newly planted seedlings: trunk, roots and branches. Hence, the seedlings often die after being severely debarked.

The larvae develop in the roots of the stumps and can vary with geographical location: from just over a year in southern Sweden (young insects emerge during the second autumn after harvesting) to more than three years in northern Sweden. Hence, damages to the seedlings can appear several years after harvesting.

The risk of pine weevil attacks is greatest in the southern and eastern parts of Sweden.

Source: www2.ekol.slu.se/snyttagge

The FSC Pesticide Policy and its application in Sweden

The FSC Pesticide Policy [9] was designed to implement relevant requirements of the FSC Principles and Criteria for Forest Stewardship [10]. The policy builds on three main elements: (i) identification and avoidance of “highly hazardous” pesticides; (ii) promotion of ‘non-chemical’ methods of pest management as an element of an integrated pest and vegetation management strategy; (iii) appropriate use of the pesticides that are used [11].

The Swedish FSC Standard for Forest Certification particularly, includes recommendations on the use of chemical pesticides in its Principle 6 “Environmental impact”, criterions 6.6 and 6.7. Hence, the Swedish FSC Standard encourages management systems to promote the development and adoption of environmentally friendly non-chemical methods of pest management and to avoid using chemical pesticides [12]. FSC Sweden has one of the strictest pesticide policy implementations and urges certificate holders to entirely eliminate chemical pesticides from FSC certified forest management units in Sweden.

Although “highly hazardous” pesticides are prohibited in FSC certified forest management units, the FSC board of directors may approve “temporary derogations” for use of such pesticides in a defined geographical area (i.e. national or subnational). Derogations will normally be issued for a five-year period and can be extended.

FSC Sweden can only grant derogation for the use of chemical biocides that are not included on the FSC’s “List of Highly Hazardous Pesticides” [13]. The FSC Sweden board grants derogations based on a resolution adopted in October 2011 which lists assessment criteria according to which derogation solicitations are reviewed by board members. Every year, certificate holders are requested to report the exact numbers of saplings treated chemically (with pesticides), mechanically (i.e., protected by shields or coated with wax or sand) or simply left untreated. Management units are expected to explicitly justify the use of pesticides, provide provisions to prevent, minimize or mitigate their negative impacts, and have in place adequate programs to deliver alternatives. The derogation is valid for one year at the time.



Pine seedlings (Photo: Mats Bildström/SKOGENbild).



Certificate holders are expected to report clear decrease in the use of pesticides compared to previous years. Any deviations from the previous years' granted exemption must be clearly justified. Certificate holders owning private nurseries have to demonstrate a well-defined strategy for excluding chemical treatments and present future investment strategies for mechanical plant protection methods either by their own means or by collaborating with external suppliers. Major forest owners and group certificate holders are expected to demonstrate efforts towards research and development for eliminating chemical pesticides. As workers' rights are of great concern, certificate holders must demonstrate that their decision for using chemical pesticides complies with applicable collective agreements and health and safety legislation for workers handling harmful chemical substances. There is an opening for a more flexible assessment of applications from smaller landowners or new certificate holders.

FSC Sweden certificate holders (both Group certificate and Forest Management single certificate holders) have had remarkable success in decreasing the amount of pesticides used in planting operations across Sweden. As a result, we are witnessing a strong development and national-wide distribution of commercially available mechanical protection means.



*Spruce seedling planted after soil scarification.
(Photo: BillerudKorsnäs).*

Pesticide use by FSC Sweden members 2010-2014

This section highlights the trends of pesticide use as indicated by the solicitations for derogation sent in by FSC Sweden certificate holders during the last four years. Each year certificate holders are requested to provide predictions concerning long-term plans to eliminate pesticides from their management units. These predictions (starting from year 2014) are also presented in the following analysis.

Planting operations usually employ chemically treated seedlings, mechanically treated seedlings or seedlings left untreated. The proportion of each type of seedling can vary greatly between planting units as it is dependent on various factors (i.e., cost-related factors, local conditions etc.). Looking at how the proportion of different types of seedlings used in forest regeneration in FSC Sweden certified management units has changed during the past four years, it is clear that chemical treatments have decreased (Figure 1).

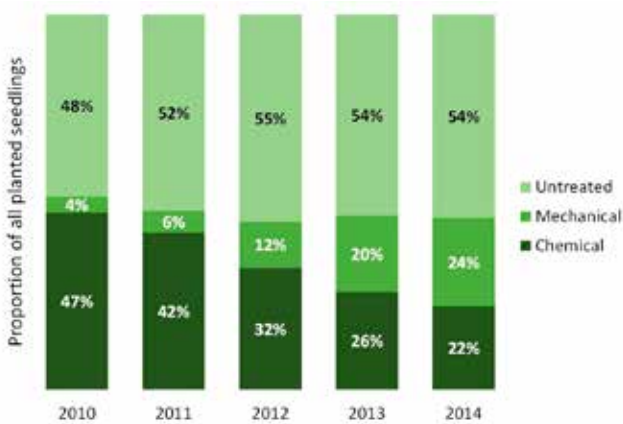


Figure 1. The proportion of all types of seedlings (Untreated, Chemically treated and Mechanically treated) used in regeneration by certificate holders during the past four years.

Predictions for 2014 indicate that, from the total number of seedlings used in planting operations, 54% will remain untreated, 24 % will be mechanically treated while only 22% will be treated with chemicals.

Data shows that pesticide applications have been clearly decreasing from the total proportion of treated plants (Figure 2). Some certificate holders have vowed to end pesticide application by as early as 2015 while others have set this goal later in time. Nevertheless, according to predictions, all certificate holders (both Group Certificate holders and

Forest Management single certificate holders) are expected to completely cease pesticide application by 2019 at the latest.

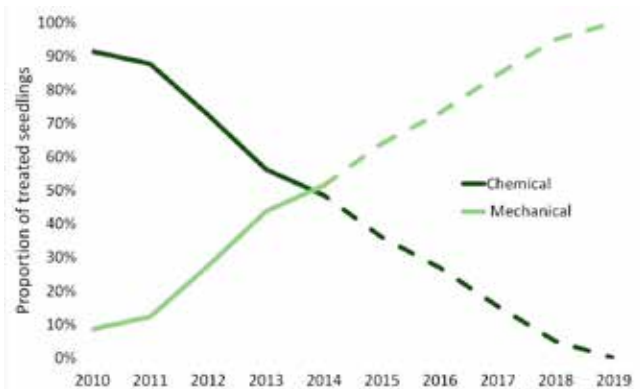


Figure 2. Proportion of chemical treatment vs. mechanical treatment for all certificate holders. Dashed lines show predictions. Note that untreated plants are not included in the calculation.

Looking at Group Certificate holders and the protection methods employed in their planting units, it becomes clear that pesticide application has been gradually eliminated from plantings during the last four years, and is expected to be significantly reduced in the near future (Figure 3). Mechanical treatments are expected to surpass chemical applications later this year, 2014.

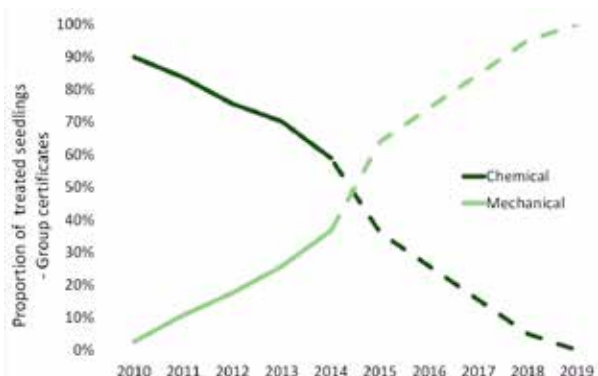


Figure 3. Group Certificate holder's application of chemical treatment vs mechanical treatment. Dashed lines show predictions. Note that untreated plants are not included in the calculation.

Similar trends are visible for Forest Management single certificate holders. It is noteworthy that these certificate holders have succeeded already by 2012 to surpass chemical applications with mechanical treatments in their planting operations. Reaching the goal of completely eliminating pesticide by Forest Management single certificate holders is expected within a few years, as 60% of members have committed to completely eliminate chemicals already by 2015 (Figure 4).

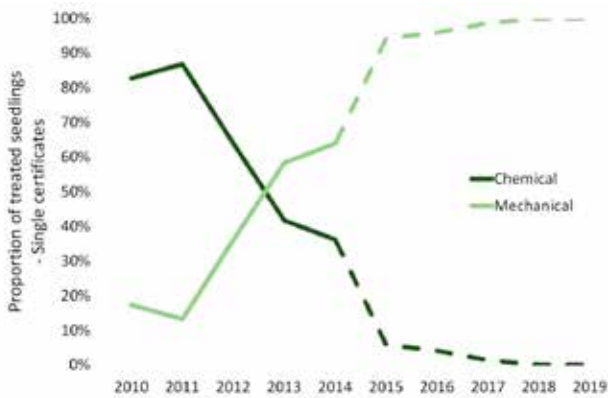


Figure 4. Forest Management certificate holder's application of chemical treatment vs mechanical treatment. Dashed lines show predictions. Note that untreated plants are not included in the calculation.



Forest worker planting seedlings (Photo: FSC Sweden).



What are the challenges that certificate holders face?

There are still some challenges that forest owners and managers face in order to completely eliminate chemical pesticides from their planting operations. By looking at the main arguments that derogation solicitations mention for continuing pesticide applications, the following aspects emerge:

Geographical location - perhaps one of the most important factors influencing owners' and managers' decision for pesticide application is the geographical position of their forest land. Certificate holders mention increasing populations of pine weevil in southern and central Sweden as compared to the northern part of the country. Hence, owners in southern and central Sweden advocate the need for more effective mechanical protection measures capable to counteract increased weevil attacks.

Demand vs supply issues - the demand for coated saplings (with wax or sand) has been rising during the last years and producers (nurseries) offering such services cannot fully satisfy the growing demand. Hence, group certificate holders cannot always provide their forest owners with enough mechanically treated saplings to cover regeneration projects entirely. Thus, remaining saplings are treated chemically. Some certificate holders are concerned with not meeting the demands on regeneration set by the Swedish Forestry Act (Skogsvårdslag 1979:429). Owners fear that in the absence of sufficient effective protection methods, saplings will fail to meet the requirements stipulated by the Forestry Act. Another problem seems to be the (lacking) *availability of alternative treatments* for other types of plants (i.e., bare-rooted saplings) or against other types of local pests (such as the black spruce beetle *Hylastes cunicularius*).

Private owner's perceptions/knowledge - group certificate holders have made efforts to raise awareness among forest owners about pesticide use and have shared information on available alternative treatments. However, uncertainty around the efficiency of mechanical treatments seems to persist among owners, many of whom are reluctant to switch to other protection methods. Reasons behind owners' uncertainty are usually the (perceived) increased costs or economic loss and skepticism around the effectiveness of mechanical protection methods.

Costs and time - perceived (high) costs is an issue much related to the above-presented owners' perception. Many private owners associate mechanical treatments with higher planting costs. More so, owners are concerned that mechanical barriers will fail and thus generate great economic loss. Some certificate holders argue that the long-term ban on insecticides will have major negative economic consequences as a result of ineffective mechanical protection methods against pine weevil attacks. Naturally, these two cost related reasons are discouraging private forest owners from abandoning chemical treatments. Time-wise, owners argue short periods for effectively substituting chemical treatments with mechanical protection.

Research & development - related to all the points expressed above, is the demand for further research and development of efficient, sufficient, and cost-effective mechanical protection techniques. As already mentioned, some treatments seem to lose efficiency with geographical location. Certificate holders mention that in areas with high populations of pine weevil some mechanical protection methods have proven ineffective. Furthermore, forest owners suggest that some coating techniques tend to lose their protective capacity one year after the planting. Some treatments are available only for specific types of saplings or are efficient only against a certain type of insect pest.

Challenges

- Geographical location
- Demand vs supply issues
 - Availability of alternative treatments
- Private owner's perceptions/knowledge
- Costs and time
- Research & development

A successful case-study: the Church of Sweden

The Church of Sweden (Svenska kyrkan), FSC certified since the late 90s, has had remarkable success in almost completely eliminating pesticide applications in their planting units. The Church of Sweden foundation is a forest owner in Sweden, with management units all over the country. Ten out of the thirteen dioceses (located across the country in: Västerås, Uppsala, Strängnäs, Stockholm, Visby, Lund, Linköping, Skara, Växjö and Karlstad) encompassing 400 000 ha are FSC certified forests [14].

The Church of Sweden has succeeded to surpass chemical treatments with mechanical ones already by 2011 and reductions in chemical applications have been decreasing ever since, down to approximately 7% in 2013 (Figure 5). Predictions for 2014 estimate that planting operations will entail 20% untreated seedlings, 80% mechanically treated and as little as 1% chemically treated seedlings. The Church of Sweden hopes to further reduce pesticide applications in the future.

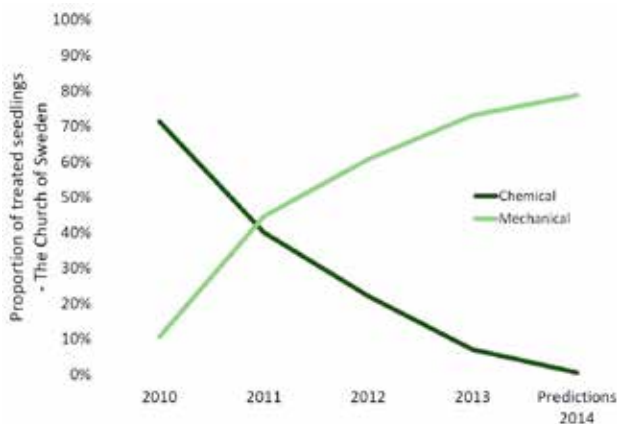


Figure 5. The Church of Sweden's chemical treatments vs mechanical treatments. Note that untreated plants are not included in the calculation.

The most commonly used regeneration methods by the Church of Sweden are soil scarification and planting. It also combines planting with natural regeneration i.e. leaving seed trees in forest stands where the risk of pine weevil attack is greater.

This strong reduction of chemical applications has been achieved through a combination of adequate integrated forest management and the development and increased application of mechanical plant protection techniques such

as wax and sand treatment of saplings. In management units situated in northern parts of the country, regeneration was made with untreated seedlings.

Initially, the Church of Sweden encountered similar problems to those found in the derogation solicitations summarized in the previous chapter. The Church holdings are spread throughout the country, both in southern, central and northern latitudes. Not only does this lead to different geographical conditions (and thus different intensities of pine weevil attacks) but it also made the Church dependent on the different suppliers (nurseries) present in these regions. The quality of products and supply capacity varied greatly among nurseries in these different regions thus challenging the Church of Sweden's capacity to supply the need for sufficient and effective mechanically treated seedlings.

This challenge could not have been overcome by the Church of Sweden alone, a small forest owner in Sweden. The general trend that the forest industry in Sweden was following, slowly shifting towards a more responsible chemical-free forest management, drove the development of alternative protection methods. This created opportunities for the Church of Sweden to get access to the required amounts of mechanically treated plants from nurseries.

Shifting away from chemically treated seedlings was a time consuming and costly process that took a great deal of effort. Different experiments and risk assessments were conducted in order to validate the efficiency of different mechanical protection techniques in different regions. Changing the forest owners' perceptions, and urging them to take the risk of investing in alternative protection means was also a thought-provoking process. Owners were at first skeptical about the reliability of mechanical protection and reluctant to bare the large costs for making the transition to chemical free forest regeneration.

Nevertheless, these efforts yielded positive results providing a genuine example that practices and perceptions can eventually be changed. The cornerstone of this achievement was persistency and the close cooperation at different levels: within the organization, among forest industry representatives, as well as between FSC Sweden and its members and certificate holders.



Discussion: the way forward

Eliminating chemical pesticides from forest management in Sweden has been a long and challenging process that still continues nowadays. This process exemplifies FSC's role as a platform for discussion where different actors from social, environmental and economic chambers can get together and negotiate. In fact, this platform of discussion offered members from the environmental and social chamber the possibility to bring forth their concerns related to chemical pesticides. Although the initiative was opposed by the forest industry representatives at the beginning, it was not until one member of the economic chamber started taking viable steps towards eliminating pesticides from their plantations that set a good example for the Swedish forest sector to follow.

After almost two decades of mediation, certificate holders' efforts to shift towards chemical-free protection techniques against insect pests in management units are showing positive results. In fact, we are witnessing a strong development and wide spread appliance of environmentally friendly alternatives such as mechanical barriers and an increased emphasis on integrated forest management [see e.g., 15].

Data shows that there has been a clear decline of pesticide application in plantings across FSC certified management units in Sweden. Indeed, some certificate holders such as the Church of Sweden have managed to almost entirely eliminate chemical applications by 2014. Predictions indicate that the majority of certificate holders have committed to abandon pesticides by 2015 whereas by 2019 all certified management units are expected to have pesticide-free management.

As already mentioned, there are still challenges that certificate holders face. Certain geographical regions (i.e., southern Sweden) are more likely to experience mass-propagation of insect pests, as temperature is the main determinant of the length of pine weevil's life cycle [16]. Climatic changes are a key driver behind increasing disturbances in Europe's forests [17] and changing climate may also influence insect pests' population dynamics [18, 19]. Hence, effective and environmentally-friendly protection methods need to be considered in the face of a changing climate.

Uncertainty and skepticism around the efficiency of mechanical treatments remains present among some group certificate holders (particularly among small private forest owners). The fear of economic loss and the higher planting

costs associated with mechanical treatments are main factors influencing owners' decision making. Although, forest owners' risk attitudes can be ambiguous, when larger amounts of money are at stake, owners become risk averters [20]. In fact, direct economic risks (such as price and cost changes) are seen to be more important than indirect economic risks (such as biological damage) [20]. Such (negative) perceptions and risk advertence can influence forest owners to perceive FSC certification as a barrier to profitable forestry.

Indeed, advancements in mechanical protection techniques have been admirable. Some certificate holders, such as Holmen Skog AB, have invested in their own wax-coating facilities [21]. The forest owner association Södra and the company Sveaskog have engaged in numerous collaborative experiments with the Swedish University of Agricultural Sciences (SLU) [22]. The Swedish forestry sector has made additional efforts by funding the "Swedish *Hylobius* Research Program "in collaboration with SLU together with other similar research projects currently underway [23].

However, as indicated by certificate holders, there are still some shortcomings with alternative protection techniques. In areas where leaving seedlings untreated is not an option or where silvicultural techniques alone do not suffice, mechanical protection means need to be able to cover certificate holders' and forest owners' specific needs but must also be cost effective and accessible in sufficient numbers to cover forest regeneration needs.

Conclusion

FSC Sweden's ambitions to achieve responsible forestry are showing positive results and certificate holders have proven that a pesticide free forest management can be achieved. Mechanical protection techniques are constantly developing and coated and untreated seedlings are replacing chemically treated seedlings in forest regeneration all over the country. This achievement could not have been reached without the strong cooperation between members from all three chambers: social, environmental and economic. Attitudes and perceptions towards alternative protection methods are slowly changing. Although forest owners and certificate holders still face some problems, successful study cases from certificate holders prove that making this transition is possible. This is setting an example for both forest owners in Sweden and internationally. FSC Sweden will continue focusing on facilitating stakeholder consultations and on supporting certificate holders in their transition towards a pesticide free forest management in Sweden's forests.





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Forest Stewardship Council
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