

Evaluation report 2008

Evaluation of Skogforsk's Framework Programme 2005–2008



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Preface

Formas shall promote outstanding research in support of a sustainable societal development. The research funded should be relevant to environmental protection, agriculture, forestry, construction and spatial planning.

Forests and forestry are of utmost importance for Sweden's economy, population and ecosystem services. Research is decisive to the sustainability of the strong national and international position of the Swedish forest sector.

Under the spending budget of the Ministry of Agriculture, Formas has earmarked money for research co-funded by the private sector. In the field of forestry research, Formas has an agreement for the years 2005–2008 with private forest owners and companies to fund equally 50 per cent, i.e. 28.8 MSEK each, the framework program of Skogforsk (The Swedish Forestry Research Institute).

Part of Formas' responsibility is to evaluate the research funded by the council. According to the agreement between Formas and the forest sector, the research under the present framework program period should be assessed prior to the negotiations for the coming period. The purpose of the evaluation presented here was to scrutinize the scientific quality and relevance of the research activities.

Dr. Ann-Britt Edfast at the forest company Sveaskog and Professor Bo Jellesmark Thorsen at Copenhagen University were appointed to conduct the evaluation. On behalf of Formas and the Forest Sector we express our sincere thanks to the evaluators for their skilful work and truly important contribution. We are convinced that Skogforsk will, in the best possible way, seriously consider the wise recommendations put forward by this evaluation.

Rolf Annerberg
General Director
Formas

Jan-Åke Lundén
Chairman of Board
Skogforsk



Rolf Annerberg
Director General
Formas



Jan-Åke Lundén
Chairman of Board
Skogforsk

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Summary

The forests of Sweden contribute in numerous ways to the prosperity and welfare of the Swedish people. Much is still to be learned and told about the sustainable management of forests, which raises the need for research and efficient dissemination of new knowledge. In Sweden, Skogforsk plays a special and important role in satisfying this need, and is for this purpose supported by the forestry-based sector and the Swedish government through a Framework Programme.

In 2008, a team was formed to evaluate the performance of Skogforsk relative to this Framework Programme and Skogforsk's role in the Swedish forestry sector. This report presents the analyses, interpretations, conclusion and recommendations of this evaluation team. The main emphasis has been on the quality, quantity and relevance of Skogforsk's scientific work and dissemination and extension efforts.

The Framework Programme of Skogforsk is financed to 50 per cent by the Swedish government (via Formas) and to 50 per cent by some 100 forestry sector members of Skogforsk. Overall, the forestry sector finances about 70 per cent and government or other public funds about 30 per cent of Skogforsk's activities. This financial set-up is rather unique for a research institute, compared with similar institutions in other countries. It is important to understand that this has direct implications for the way Skogforsk works; the set-up reflects the demands from the stakeholders and explicitly defines Skogforsk's role and the expectations it must meet.

The evaluation team is clear in its conclusion that Skogforsk fulfils an important role in the Swedish forestry sector and highlights two important core products of Skogforsk:

- Through its research efforts, Skogforsk supplies an important public good to the forestry sector and the Swedish society; the tree improvement programmes being the most prominent of the overall public good functions.

- Through its highly skilled and efficient dissemination and extension efforts, Skogforsk makes a large contribution to the efficiency and sustainability of the Swedish forestry sector and hence society as such.

Skogforsk has in general met the goals set out in the Framework Programme 2005–2008, taking into account that the period is still ongoing. In spite of its size, Skogforsk is an internationally well-reputed organisation, and Skogforsk has managed to maintain and in some areas increase its level of international cooperation during the period.

The evaluation team notes that Skogforsk is experiencing a growth in external funding, which now consistently constitutes more than 50 per cent of the turnover. The strong contribution by the forestry sector is something that Skogforsk can be proud of. Nevertheless, combined with the relative decrease in public funding of the Framework Programme, this trend could threaten the maintenance and development of the long-term public goods in Skogforsk's core areas. Thus, while acknowledging that the following recommendation is on the margin of the scope of this evaluation, we feel it needs to be stated:

The evaluation team strongly recommends that the real value of the Formas' contribution is restored to at least the 2005 level and not reduced below this real value in the future.

The team has evaluated the ability of Skogforsk's programmes to undertake scientific work and its performance in doing so. The evaluation team has deliberately abstained from evaluating the more specific choices of research issues and approaches.

Concerning the area of Forest Production, the evaluation team has concluded that the four programmes in this area have demonstrated scientific competencies ranging from adequate to excellent. Within this area Skogforsk faces a challenge in securing funds for the traditionally rather large monitoring and measurement activities that underpin the empirically based long-term research.

The evaluation team recommends that Skogforsk assess this challenge during the coming Framework Programme and review options for increasing the economic/statistical efficiency of and funding for the monitoring and measurement efforts.

Skogforsk hosts one of the largest research groups in Europe within forest operations. Within the area of Wood Supply, researchers have demonstrated the ability to publish in forest research literature and hence shown an adequate level of research competence. However, given the large availability of data in this area:

The evaluation team would like to encourage and recommend further pursuit of research co-operation that contributes on a more basic level to operational analysis research.

It is hoped that this will be a cost-effective way of bringing home new forefront competencies and in the medium to long run increase the competitive edge needed to obtain research funds.

Concerning the quantitative level of scientific production, the evaluation team finds recent developments somewhat less convincing and less impressive. The evaluation team has scrutinised the annual reporting of Skogforsk over the years 2003–2007 and evaluated productivity in terms of peer-reviewed papers per PhD staff member. The evaluation team concludes that productivity at the beginning of the period was in the lower range of what should be expected, but more importantly that the productivity in 2006 and 2007 was surprisingly low. This productivity was considerably lower than the stated publication goals, which leads to two recommendations:

The evaluation team recommends that measures be taken to reverse the trend towards decreasing scientific publication. A prerequisite for this is more precise reporting and increased management attention to this goal.

The evaluation team further recommends that Skogforsk returns to a productivity that is at least at the 2003–2004 level, and in the longer run closer to its stated goal of approximately one publication per PhD staff member and year.

The team has evaluated the ability of Skogforsk to solicit external research funding, and has concluded that Skogforsk has a success rate in application writing that is comparatively high by any international standards. However, this success appears to be quite unevenly distributed and for all programmes there is a rather large group of projects with

limited funds behind them. The evaluation team makes the following recommendation, while acknowledging that this is no easy task:

In searching for ways to increase the efficiency of fund-raising, the evaluation team recommends that Skogforsk consider ways of increasing the mean project size and hence scope of research.



Skogforsk puts great emphasis on being able to meet the demands for knowledge within the Swedish forestry sector and on efficient dissemination and extension of information directed towards the sector. To evaluate success in these areas, the evaluation team repeated the survey used by the previous evaluation panel. A questionnaire (Appendix F) concerning Skogforsk's dissemination and extension effort and the perceived relevance of its work was distributed to two groups. The first group contained members of the management board and the advisory groups, and the second consisted of 'field personnel' in Skogforsk's member organisations.

Based on the results, the evaluation team concludes that the main stakeholder groups consider Skogforsk's work to be carried out within relevant research areas and find the way Skogforsk is organised and financed to be a good and cost-efficient solution. A fairly low percentage of field personnel believe that stakeholders are able to influence the work of Skogforsk, and most respondents think there is a potential to implement more of Skogforsk's work. This leads the evaluation team to propose the following:

The evaluation team recommends that the current focus on implementation is maintained, and that Skogforsk considers ways to improve the link between the advisory groups and the sector at large.

Skogforsk publishes several Swedish serial publications that target the Swedish forestry sector; this is a core activity that is of great value to the sector. Overall, the evaluation team commends Skogforsk for its determined effort to communicate research-based knowledge in brief easy-access publications aimed at the sector in general. Skogforsk has met its targets and documented its capability and high international standard in research communication. However, there is one aspect of the current publication goals that the evaluation team recommends revised:

Specifically with respect to the series 'Arbetsrapporter', the evaluation team recommends that the series not be used beyond the needs generated by Skogforsk activities in general. Resources should be directed instead towards direct communication and publication in relevant channels such as 'Resultat', 'Plantaktuellt' and/or in peer-reviewed scientific journals.

Skogforsk is very active in setting up platforms for meeting end-users, and in presenting and discussing research results and potential. The evaluation team is impressed by the professional handling of these efforts at Skogforsk, and considers them to be commendable and well scaled.

The Internet and other electronic media are growing channels of information also for forestry sector professionals. Skogforsk has established itself firmly on the Internet and developed tailored web and other electronic information and knowledge-based tools for specialists and users in general. The evaluation team considers the efforts of Skogforsk in this area commendable, professional, and well scaled.



Evaluation process

Objectives

The main objective was to evaluate the Skogforsk's research, development and dissemination activities during the first three years (2005–2007) of the ongoing framework programme, with appropriate retrospective links to the previous period. The evaluation was to examine both the scientific quality, and the relevance and benefits for the forest sector. Skogforsk's overall mission, research strategy and organisation were not to be a matter for in-depth consideration. A more detailed description of the terms of reference is presented in Appendix A.



*Dr Ann-Britt Edfast
Head of Research and
Development at Sveaskog*

Evaluators

Dr Ann-Britt Edfast is Head of Research and Development at the Swedish forest company Sveaskog. She has a MSc in forestry and received her PhD in Forest plant physiology at SLU in 1996. She has worked as project leader at the forest company AssiDomän Corporate R & D, as Consultant in Information Management at Sigma Isoft, and as Raw-material Manager at Assidomän NordTrä AB. She came to Sveaskog in 2003.



*Dr Bo Jellesmark Thorsen
Research Director at Forest and
Landscape, University of Copenhagen*

Dr Bo Jellesmark Thorsen is a Professor of Applied Economics of Forest and Landscape. He holds a PhD (1999) in the Economics of Forest and Natural Resources and in 2007 he also received a DSc degree with a dissertation on Stochastic Decision Problems in Resource Economics, both degrees from the University of Copenhagen. In 2001, he became a Research Director at Danish Centre for Forest & Landscape Research under the Ministry of Environment. Since 2004, he has been Research Director for the Division of Economics, Policy and Management Planning at Forest & Landscape, University of Copenhagen.

Process

The evaluators had their first meeting at Skogforsk in Uppsala on 23 January 2008. Skogforsk's Managing Director Jan Fryk, as well as Hans-Örjan Nohrstedt and Jan Svensson



from Formas, also attended. The mission and activities of Skogforsk and Formas were presented and the terms of reference and *modus operandi* for the evaluation were discussed and finally agreed upon. Jan Fryk provided the evaluators with all written material and statistics needed for the evaluation.

On 25 February the evaluators had in-depth interviews and discussions with the Vice Managing Director Kaj Rosén, the two Research Directors Ola Rosvall and Lennart Rådström, the Head of Information Malin von Essen, and finally all eight program leaders: Lars Wilhelmsson, Magnus Thor, Gert Andersson (by telephone), Rolf Björheden, Bengt Andersson, Bo Karlsson, Lars-Göran Sundblad and Jan Weslien.

A final meeting took place at Skogforsk on 17–18 March. On the first day the two evaluators revised their preliminary report and agreed upon conclusions and recommendations. These were presented the next day for Skogforsk (Jan Fryk, Kaj Rosén and Lennart Rådström) and Formas (Hans-Örjan Nohrstedt and Jan Svensson).

In addition to these meetings, a survey was conducted on stakeholders' opinions via a questionnaire, which was sent to board members, members of advisory groups, and to representatives of forestry field staff in a number of companies and organisations. Conclusions concerning the relevance and dissemination of research were based partly on this survey.





Overview of Skogforsk

Introduction

The forests of Sweden are one of the most prominent features of the country and also one of its most valuable assets. The forests contribute in numerous ways to the prosperity and welfare of the Swedish people. The forests have long had an important role as a sustainable source of wood-based products. Throughout the history of Sweden, forests have also provided numerous social, aesthetic, and recreational benefits, as well as a large cultural value. Finally, the forests of Sweden directly provide key environmental and ecosystem services, including water protection, biodiversity conservation, and climate change mitigation.

Much is known about forest ecosystems and sustainable forest management, but even more is still to be learned to ensure and improve the basis for continuous sustainable use and management of the multiple functions of the forests. Decision-makers and forest policies at all levels as well as forest managers rely on sound research and knowledge to support decisions. The need for research and the efficient dissemination of new knowledge to decision-makers is growing due to the constantly evolving preferences of society and, in recent decades, the risk and increasing uncertainty about the effects of significant climate change.

In many countries the need for research is satisfied through the funding of research activities at universities or research institutes or, as in most cases, a mix of these types of institutions. This is also true for Sweden, where Skogforsk as a research institute is one of several entities undertaking research of relevance to the forestry sector. These include the Swedish University of Agricultural Sciences (SLU) and some smaller environments at other Swedish universities, as well as large research institutions such as STFI-Packforsk, which focuses on the use of wood-based products. Skogforsk, however, occupies a distinct and important niche in Sweden.

Skogforsk's background and current status

Skogforsk was formed in 1992 as a merger of the 'Skogsarbeten' and 'Skogsförbättring' institutions, and while new research areas have been developed, the original focus areas of these former institutions (forest operations and tree improvement) are still prominent parts of the Skogforsk profile. Today Skogforsk organises its work in two research areas: 'Forest Production' and 'Wood Supply'. Within each research area, there are a number of programmes, in total 7–8 over the period considered here. It is important, however, to understand that researchers at Skogforsk may work in more than one programme.

Skogforsk currently employs about 100 permanent staff members, of which some 65 are research staff. In addition, another 5–10 temporary scientific staff members are employed. The staff is based at three locations: Uppsala (Head Office), Ekebo and Sävar. Skogforsk has a Managing Director, a Deputy Director with special responsibilities towards international research cooperation, and two Research Directors. A Management Board of 13 persons represents Swedish forestry, the forest products industry and the Swedish government. Two Advisory Groups serve as another important platform for interaction with stakeholders; they are associated with the two main research areas and have 12–15 members each.

The Skogforsk Framework Programme is financed to 50 per cent by the Swedish government (via Formas) and to 50 per cent by some 100 members of Skogforsk that constitute most main forest enterprises, associations and forestry sector businesses. In addition to the Framework Programme, Skogforsk attracts a considerable amount of external funds for research projects and contract work for specific customers. Overall, the forestry sector finances about 70 per cent and the government or other sources of public funding about 30 per cent of Skogforsk's activities. This financial set-up is rather unique for a research institute, compared with similar institutions in other countries. It is important to understand that this has direct implications for the way Skogforsk works; the set-up reflects the demands of stakeholders and explicitly defines Skogforsk's role and the expectations it must meet.

Skogforsk is a research institute with a strong emphasis on applied research and a very strong emphasis on dissemination

of research knowledge, as well as on enhancing the application of research-based knowledge and innovations in the forestry sector. Unlike the universities, Skogforsk has no formal educational responsibilities, and unlike similar institutes in other countries Skogforsk has only limited obligations towards and assignments from the different sector ministries. Skogforsk is also an internationally active research institute and often plays a role in European projects relevant to the scientific strongholds of Skogforsk. The special role of Skogforsk is reflected in its mission and vision statements.

Mission and vision of Skogforsk

Skogforsk's mission is to furnish the forestry sector in Sweden with the knowledge and products that will contribute towards:

- profitable and ecologically sustainable multiple-use forestry
- an internationally competitive forest products industry and
- the prosperity of the country as a whole.

Skogforsk's vision is to be the central driving force behind forestry developments in Sweden and thus an indispensable asset to both the forestry sector and the country as a whole.

The Framework Programme 2005–2008

The Framework Programme 2005–2008 is described in Appendix B. The Framework Programmes are drafted by Skogforsk in close dialogue and cooperation with its Board, Advisory Groups, members, and other stakeholders, and finally agreed upon together with the Swedish state (Formas). Framework Programmes are subject to external review during their final year, and the evaluation is part of the basis for the subsequent Framework Programme. The Framework Programme 2005–2008 presents some general considerations for the work to be undertaken, but also identifies a number of more specific options to be explored and pursued, goals to reach and activities to undertake. These are specified under six different thematic areas in two research fields. In section 2, we evaluate in qualitative terms the progress made relative to the ambitions of the Framework Programme. However, as the Framework Programme is a large and integral part of Skogforsk's work as whole, the evaluation also reflects Skogforsk's efforts and results as a whole. In section 3, we evaluate Skogforsk's performance as revealed by a number of quantitative indicators made available to the evaluation team.





Qualitative assessment of the development 2005–2007

Introduction

As a basis for this report the evaluation team was provided with a considerable amount of written material from Skogforsk's management team. In addition, the evaluation team met for interviews with the research directors as well as several of the programme leaders or representatives. This information forms the basis for this section, where a qualitative assessment of the performance under the current Framework Programme is made.

Research activities

Forest production

Within the area of Forest production, work is organised in four programmes. Two of these constitute Skogforsk's research in forest genetics and tree breeding (Tree Improvement, north and south), one covers Silviculture and the fourth programme is Environment, which focuses on environmental issues related to forest management.

Skogforsk's Tree Improvement programmes are of an internationally very high standard, as is the research conducted. This is reflected in the fact that the researchers are able to publish in fairly high-ranking genetic journals as well as in journals within the field of forest research. The research provides the basis for significant benefits for the Swedish forestry sector, as reflected in the level of contracting undertaken for forest owners. Publication and dissemination of the research results of these programmes also constitute a significant public good for the Swedish society as such, in particular as more forest health and stability parameters have entered the selection criteria of the breeding programmes. Over the last Framework Programme, the work in this area has largely met or surpassed its goals. A few important highlights include the quick establishment of third generation seed orchards jointly with the forest owners, and the start-up of the new international database and analysis project with an Australian partner and the EU-project Noveltree. These two programmes face some challenges, however. Perhaps most importantly it will remain a continuous struggle to raise the finances for

monitoring and measuring the tree improvement trials as well as to increase the efficiency of these activities; a similar trend is seen in other countries. Also, Skogforsk should consider long-term recruitment to these programmes, since many staff members are over the age of 50 years. For these reasons, the recently established research school is timely, and Skogforsk should work with quantitative genetics to maintain the status of its research in this area.

The Silviculture programme strives to undertake applied research in forest management from seed to harvestable tree. Several other Swedish research environments address this sort of work, yet it seems that Skogforsk has to some extent managed to successfully specialise in regeneration and nursery interaction. This seems a natural extension of its strength within tree improvement research. Skogforsk also participates in other forest management issues, such as thinning, but often in cooperation with other research groups, e.g. within the Heureka project. The scientific quality of this programme is adequate and thus results can be published in relevant forest research journals. It will remain a challenge for the Silviculture programme to contribute with frequency and on an adequate level throughout the entire span from seed to harvestable tree. Therefore, it seems that a focus on regeneration and forest-nursery interactions would secure Skogforsk's ability to occupy an important niche as well as a critical mass.

The Environment programme focuses on the relation between forest management measures and numerous environmental issues, notably soil, water, carbon and biodiversity. In spite of its limited size, the programme has been rather successful in terms of raising external funds – usually in cooperation with other institutions. The group has documented its ability to publish in general forest research literature, but also in ecology, conservation biology and environmental management journals. As such the level of research is adequate. Within the past framework programme, this group contributed new and applicable knowledge about the interaction between forest management, water quality, and biodiversity. The large degree of external cooperation and external funding will remain necessary prerequisites for the success of this programme.

The evaluation team concludes that all four programmes in this area have demonstrated scientific competencies ranging from adequate to excellent. Within this area, the Tree Improvement programmes represent key public goods and strategic research efforts for the Swedish forestry and society. There is a need to secure the economic/statistical efficiency of and funding for the monitoring efforts that support these programmes. For all four groups, the ability to solicit external funds and undertake external research collaboration appears to be increasingly important for future performance.

Wood supply

Within the area of Wood supply, work is organised in four programmes: Wood utilisation, Technology, Logistics, and Efficient forest fuel systems. The latter was formed very recently as a new, large and externally funded activity in co-operation with several others; the evaluation team will not provide further comments on this here, apart from acknowledging the establishment of this programme as a timely breakthrough for which Skogforsk and the area of Wood supply is to be commended. The area of Wood supply is generally characterised by very close cooperation with the forestry sector, and by a strong focus on research to improve the functioning and performance of the sector in general and wood supply systems in particular. Skogforsk hosts one of the larger forest operations research groups in Northern Europe.

Within the area of Wood utilisation, focus has been on improved systems for information collection and knowledge-based harvesting and cutting, taking into account stem and even fibre properties. The storm Gudrun in 2005 brought attention to the work of the group and generated a large demand for its assistance and advice. The programme contributes to the growing stock of software programmes and optimisation routines that Skogforsk offers to the Swedish forestry sector.

During the last Framework Programme, the focus of the Technology programme included investigations into new forest machinery, improved conditions for road transport and some promising studies on energy efficiency in forest operations and transport systems. During the period, this programme has been involved in a number of larger international cooperation

projects, including EFORWOOD, and is pursuing the options for a more focused forest operations project under EU's FP7.

The Logistics programme has focused on the application of advanced ICT and operations research methods for transport and delivery optimisation. Programme cooperation with research groups from other disciplines has proven fruitful in enhancing the scope and quality of work. The programme offers several software applications for the Swedish forestry sector and makes a considerable effort to support their implementation. The software is often developed as part of more strategic R&D.

Over the period, Wood Supply as such has largely met its stated goals. However, a main challenge for all four programmes has been the large staff turnover. The competencies required of staff working in this field seem to be in high demand in the forestry sector and elsewhere. The steps taken towards a joint research school with other institutions are adequate as a long-term response to this challenge. In all programmes, Skogforsk is experiencing pressures from the forestry sector to offer support, e.g. in conjunction with the adoption of new operational routines or software, while it is also experiencing difficulty in its ability to finance these services.

All three programmes have demonstrated the ability to publish in forest research literature, and hence an adequate level of research competence. However, given the large availability of data in this area, the evaluation team would like to encourage further pursuit of research that contributes at a more basic level to operations analysis research, for example. Such an ambition can be achieved in cooperation with other research environments, such as transport research. One example of such cooperation is within the Logistics programme. This benefits Skogforsk and its members by providing a cost-effective way of bringing home new forefront competencies, and in the medium to long run increases its ability to compete successfully for research grants. The evaluation team feels that the large emphasis on the development of a growing stock of software should perhaps be reconsidered. While some of these have been developed as part of R&D efforts, it is not certain that all the software marketed to the sector will be used, especially because it is not commercial. Will Skogforsk or others be able to secure the implementation and

support of all these software programmes? Could efforts within Wood Supply be reallocated to focus on products that are most likely to be adopted in the forest or transport sector and/or those that are most innovative from an R&D perspective?

Sector relevance, dissemination and extension

An important feature of Skogforsk in terms of securing the sector relevance of its work is the composition of its management board. It is dominated by key representatives of Skogforsk's stakeholders and the end-users of its work. The purpose of this organisation is to achieve close and efficient cooperation between Skogforsk, its stakeholders, and closely related organisations. Furthermore, since 2005, Skogforsk has had two separate advisory boards, one for each research area (Wood supply and Forest production). Each advisory group of 12–15 persons represents stakeholders. The main tasks of the advisory boards is to advise and support the operational work of Skogforsk, take the initiative to research and development activities, review and assess the executed research, and to function as a support forum for Skogforsk activities in the forestry sector.

The present qualitative evaluation of sector relevance and Skogforsk's dissemination and extension efforts was done on the basis of information from three different sources:

1. Interviews with the Deputy Director, the Director of communication, the two Research directors and several Programme leaders. Discussions with and information obtained from the Managing Director are also included.
2. Along the line of the previous evaluation, two different questionnaires were sent out: One for the managing board and advisory groups (a total of 49 persons, 76 per cent response rate) and another for staff members in the forestry field organisations (a total of 85 persons, 59 per cent response rate).
3. Furthermore, the development of the framework programmes matched against the questionnaire results and the evaluation done in 2004.

Sector Relevance

Interviews

Generally, the persons interviewed considered the Skogforsk research to be focused on relevant research and development areas. The advice and help from the advisory groups are much appreciated and are considered to have a direct influence on the direction of Skogforsk's activities and plans.

Questionnaires

The overall response rate was somewhat lower than for the previous evaluation, due possibly to the shorter time period for response.

An overwhelming majority of the managing board, advisory group and field personnel are of the opinion that research at Skogforsk is cost-efficient for the forestry sector and is of high scientific quality. A majority (65 per cent) consider that Skogforsk, to a reasonable degree, carries out research in relevant fields of interest; a smaller percentage of respondents consider all research done by Skogforsk to be sector-relevant, and it is worth noting that this group has increased since the last evaluation in 2004.

There is, however, a discrepancy between the two groups regarding the influence of Swedish forestry on the direction of Skogforsk. Among members of the managing board and advisory groups, 75 per cent are of the opinion that stakeholders have a great influence on the direction of Skogforsk's work. The corresponding figure for field personnel is only 27 per cent, while the majority (65 per cent) believe that the forestry sector only to some extent influences the direction of Skogforsk.

In addition, there is also a divergence between the groups regarding the reliability of Skogforsk results. Among members of the managing board and advisory groups, 57 per cent believe that Skogforsk's results can always be trusted, while the corresponding figure for field personnel is only 25 per cent. It should be emphasised, however, that almost all other respondents answered that results can usually be trusted. Thus, the answers seem to reflect a healthy scepticism towards strong generalisations.

Dissemination and extension

Interviews

Both Programme leaders and Research directors consider it extremely important to rapidly transform new knowledge into practical applications. Today all research programmes work with implementation. However, several of the interviewees pointed out that the conditions for implementation and extension in the forestry sector have changed during the last years reflected in an increasing proportion of entrepreneurs, smaller field organisations, reduced administrative staff, as well as an increased complexity of research, and policy issues.

An important problem identified is the lack of direct feedback from some potential user groups, e.g. entrepreneurs. Instead, contact is mainly with customer users, which adds to the challenge and complexity of implementation and extension. In order to achieve a fast and efficient transfer of results from Skogforsk to the users, structural and informative changes are needed, and such steps are currently under consideration.

As a follow-up to the last evaluation, Skogforsk launched in 2005 a project to improve the implementation of research results. The project was carried out in the research area Wood supply and consisted of two parts: a system for multi-tree handling in thinning operations and a decision support for system for transport planning. The results of this project will be used in future implementation projects and Skogforsk's strategy is to run at least one implementation project in every research programme each year.

Another way to spread research results is through targeted and thematic conferences. At these conferences, focus is on a specific area of interest that is thoroughly discussed and analysed in a dialogue between researchers and participants from the forestry sector. The intention is to ensure that participants have enough time for discussions and to exchange experiences. Overall, participants have been very pleased with Skogforsk's effort in this area.

In order to further increase implementation, Skogforsk is reconsidering the possibility of allowing researchers from Skogforsk to work as temporary project leaders in forestry companies. Increased demands for this kind of service have been observed in the forestry sector, since many companies are decreasing their own staff.

Questionnaires

Almost 100 per cent of the respondents have read one or more publications from Skogforsk during the last year. Skogforsk is, by both stakeholder groups, regarded as very active in communicating and publishing its results. Both groups also agree that the publications are of high quality, although the members of the managing board and advisory groups tend to be more positive about these publications than field personnel.

In both groups more than 90 per cent believe that results from Skogforsk can be implemented, but only 67 per cent believe that it is done. The managing board and the advisory group largely (81 per cent) believe that Skogforsk makes an adequate effort to implement results, whereas among the field personnel only 51 per cent believe that this is true. When the question is reversed to reflect the efforts taken by the forest sector to implement Skogforsk results, 65 per cent of the managing board and advisory group consider the forest sector efforts to be adequate, while the corresponding figure for field personnel is 46 per cent. Ninety per cent of the respondents believe that more cooperation between Skogforsk and the forestry sector would improve the implementation of the results.

An overwhelming majority (more than 90 per cent) regard Skogforsk to be excellent in organising dissemination activities in the form of courses, conferences, and excursions. These are considered price-worthy and from comments made by respondents it can be concluded that there is room for more of these activities. While the overall attendance at these activities has not decreased over the framework programme period, we note that among the respondents, the proportion that had participated in these activities had decreased by 50 per cent compared with the 2004 questionnaire.

Summarising main observations between 2004 and 2008 surveys

There is generally a large degree of agreement between the surveys conducted in 2004 and 2008, respectively. However, there are a few differences and observations worth mentioning:

- The percentage of interviewed persons who think that Skogforsk is working only with appropriate research questions has increased (from 13 per cent in 2004 to 27 per cent in 2008).

- The 50 per cent decrease in the percentage of respondents who had participated in activities organised by Skogforsk is curious. While few members of the board and advisory group had participated in conferences and excursions over the years, the relatively large participation by field personnel in courses had decreased by 50 per cent. This is probably a coincidence, as the general attendance has in fact been good.
- The percentage in both groups who think that more work is needed on implementation is almost identical across the 2004 and 2008 questionnaires (in 2004 it was 68 per cent and in 2008 65 per cent).

Conclusion

Based on this qualitative evaluation of the sector-relevance of Skogforsk's work and its dissemination and extension efforts, the evaluation team concludes that:

- *The main stakeholder groups consider Skogforsk's work to be carried out within relevant research areas.*
- *Stakeholders consider the Skogforsk way of conducting applied research for the Swedish forestry sector to be generally good and cost-efficient.*
- *The fairly low percentage of field personnel who believe that stakeholders can influence the work of Skogforsk suggests that additional efforts should be made to secure the connection between, for example, advisory groups and the sector at large.*
- *In general, respondents think there is a potential to implement more of Skogforsk's work. Thus, the current and planned focus on implementation should be maintained, and a moderate increase in thematic conferences might be considered, given acceptable attendance rates.*

Follow-up on last evaluation

Skogforsk has responded to the recommendations by the previous panel, and we comment briefly on these.

Skogforsk has decided not to place an emphasis on the non-commercial and quality of life benefits of forestry in its programmes. This evaluation team agrees that these topics can be dealt with by more suitable research institutions, and

that Skogforsk should instead put more emphasis on climate change issues related to tree breeding and silviculture, on soil/water issues, and on the functionality of conservation measures.

Skogforsk has carefully considered its organisational structure, and moved from three to two research areas. The previous panel questioned whether this would result in more appropriate work, but the current evaluation team agrees that this was a sound move that is beneficial to administration and management as well as to research efficiency due to larger and better integrated research programmes.

Publication targets have been reviewed and one publication series was terminated after a customer and market analysis. While the previous panel suggested that more articles be published in international journals this has not happened. Also, the number of issues of at least one internal series (cf. below) could be reduced.

The previous panel pointed to a risk that medium-term and more strategic research would be downgraded to the benefit of short-term applied research. This evaluation team finds that an appropriate balance has been maintained so far, but emphasises the need to participate in the education of new PhDs to secure future recruitment and the need to maintain focus on scientific publication targets (cf. below).

It was recommended that Skogforsk find ways to further improve the well-functioning customer relations and, in co-operation with the forestry sector, to develop ways of shortening lead times to the practical implementation of research findings. These suggestions have been taken seriously and resulted in, for example, a sector-funded project that addresses the implementation of R&D results.





Quantitative assessment of the development 2005–2007

Introduction

Skogforsk publishes an annual report (www.skogforsk.se; Appendix C) on its progress, financial result, and a number of its publication activities. These reports and the underlying material, supplemented by more detailed material on external funding sources, media coverage, and web statistics, were made available to the evaluation team. This data enabled an evaluation of the changes over recent years, including the Framework Programme period, and to some extent also relative to performance measures of similar institutions.

Staff and human resources

Prior to the current Framework Programme, Skogforsk was forced to reduce its staff from about 120 to less than 100 permanent staff members due to a decrease in research funding. During the Framework Programme, the number of permanent staff members has slowly increased again (cf. Appendix D). During this period there have been some changes in staff and 18 new staff members have been employed, eight of whom are women. The educational background of the R&D staff has remained stable over the period, dominated by an MSc in Forestry, but people with other types of engineering or natural science education are also employed.

With a strong focus on applied research and dissemination, and promoting the application of research in the forestry sector, Skogforsk has a conscious mix in the R&D staff, about half of whom hold a scientific degree. Accordingly, the number (32) of PhDs among temporary and permanent R&D staff members has remained stable over the Framework Programme period. Skogforsk is a key player in the Forest Genetics and Breeding Research School and also in the emergent research school FIRST: Forest Industry Research School for Technology. There are currently eight active graduate students associated with Skogforsk. There are also several associate professors and senior lecturers among the senior R&D staff members.

In conclusion, Skogforsk has maintained its target size of permanent staff, maintained its target share of PhDs among the staff and increased the proportion of women among its permanent R&D staff. The evaluation team finds the increase in the number of active PhD students a wise and foresighted investment in future R&D staff.

Research

The basis of Skogforsk's work is the ability to undertake new and innovative applied research. A precondition for this are the human resources mentioned above, but increasingly the ability to solicit external research funds. Being able to publish research results of the highest international quality is a continuous and critical test of the research competence of any research institution. A vital reason to publish in international scientific journals is that it guarantees an open, critical, and independent quality control of research. It documents that the research undertaken is indeed new, of the highest quality, and not merely reproducing known results. For the same reason, a good publication record is increasingly indispensable when competing for research funds.

Raising Research Funds

Overall, Skogforsk is experiencing a growth in external funding (Appendix E), which consistently constitutes more than 50 per cent of the turnover. Quite a large part of the external funding comes from sources outside the R&D projects, e.g. through dissemination services. We see a considerable difference in the two R&D programmes, as slightly more than 50 per cent of the funding for the 'Forest Production' area is external funding¹, whereas the average proportion of external funding for 'Wood Supply' is about 30 per cent. Internationally, neither this level of external funding nor the trend towards increased external funding is unusual for an institution of this type; furthermore, continued growth in the relative level of external R&D funds is likely to be a premise for maintaining and increasing the volume and quality of R&D work at Skogforsk. Writing grant applications and searching for funds are key activities for the R&D staff and it is important that this is done efficiently. This means having a reasonably high success rate in competitive calls,

¹ In particular the Tree Improvement programmes benefits from the substantial research funds allotted by Föreningen Skogsträdsförädling (Swedish Forest Tree Breeding Association).

and formulating and winning projects of a reasonable size. In general, the smaller the budget for an R&D project, the more likely it is that the project cannot be completed within budget, and may often require framework programme funding too, to secure completion. Because of the limited size of these projects, they are less likely to generate novel results useful for arguing the next project.

A sample of externally funded R&D projects active in the Framework Programme period was presented to the evaluation team. Table 1 is based on this sample. While not all programmes were able to provide such a list and thus not all projects are represented, this table reveals some interesting patterns.

Table 1: Sample statistics on externally funded R&D projects (grants) at Skogforsk. This is a sample only as not all programmes were able to produce the list. Legend: a: number of projects/ grants, and b: 1,000 SEK.

	Tree Improvement North	Tree Improvement South	Environment	Wood utilisation	Technology	Logistics
Sample size ^a	37	39	38	17	14	6
Mean project size ^b	783	501	878	313	975	470
Median project size ^b	504	340	383	238	582	424
Standard deviation ^b	871	452	988	211	1027	290

Table 1 reveals that while the mean project size is reasonable – though not impressive – for several of the programmes, the mean projects are somewhat smaller in some of the Wood supply programmes. The typical projects are, however, usually much smaller for all programmes, as indicated by the median project size and standard deviation. The lists of projects indicate that the same funding institution finances 50,000 SEK projects as well as projects of over 2,000,000 SEK.

In searching for increased efficiency in fund raising, the evaluation team suggests that Skogforsk consider ways of increasing the mean project size and hence the scope. This is particularly relevant for the programmes in ‘Wood Supply’, but also for ‘Environment’. We acknowledge that this is not an easy task.

Turning to the success rate in competitive calls, material was made available from three funding institutions: Formas, STEM, and Föreningen Skogsträdsförädling. With respect

to the latter it is not surprising to see that Skogforsk is a dominant applicant and has had a success rate of more than 60 per cent. More impressive is the high hit rate at STEM (12 of 14 applications granted) and in particular it is noteworthy that even with Formas' competitive calls, Skogforsk has had a success rate of 27 per cent in the recent programme period, to be compared with an overall success rate of 19.6 per cent over the years 2003–2007. It is primarily the 'Forest Production' area that has won the competitive calls at Formas.

The evaluation team concludes that Skogforsk has a success rate in application writing, which is comparatively high by any international standards.

This is true even when Skogforsk brings its special fields of competence into a broader range of competitions. Thus, in some of its specialised fields Skogforsk will continue to have a competitive edge when seeking research grants.

Research publications

The evaluation team was presented with complete publication lists per programme and summary tables, as well as the annual reports. The research publications are evaluated here, and dissemination efforts will be discussed below. Skogforsk has a goal to publish an average of 39 peer-reviewed articles annually, which corresponds to slightly more than one per PhD R&D staff member. However, there is some duplication in the publication lists, tables and annual reports for the different programmes. Among peer-reviewed publications there is an unfortunate tendency to count publications twice over the years². The evaluation team scrutinised the lists and has chosen to focus on peer-reviewed papers published in international journals. Publications in such journals are an acid test of scientific excellence and productivity, and often a key prerequisite for success in competitive calls for research grants. In Table 2 we present the results of separating these publications from publication lists and eliminating all double counting. We note that the distribution across programmes is not entirely representative. In Table 2, we also report the number of PhDs among the R&D staff members and calculate a productivity measure in the form of papers published per PhD.

² In several cases publications are listed when 'accepted', 'in press' and in a few cases in 2007 even when 'submitted', and then listed again when finally published.

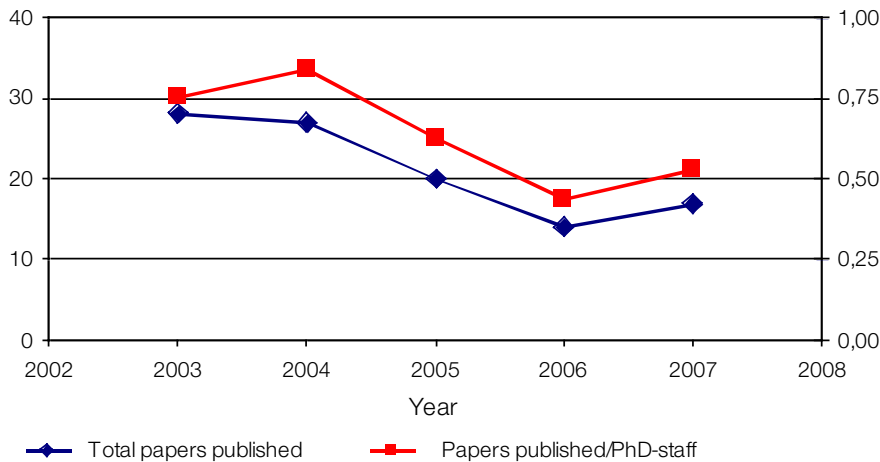
Table 2: Production of peer-reviewed papers in international journals from Skogforsk programmes over the years 2003–2007.
Productivity per PhD in R&D staff is calculated.

	2003	2004	2005	2006	2007
Tree improvement North S	9	5	3	1	5
Tree improvement South S	4	5	3	3	4
Silviculture	5	2	4	2	2
Environment	8	8	6	2	3
Wood utilisation	0	2	1	3	0
Technology	2	1	2	1	1
Logistics	0	4	1	2	2
Efficient forest fuel systems	-	-	-	-	-
Total papers published	28	27	20	14	17
Perm. R&D staff with PhD	32	29	30	30	29
Temp. R&D staff with PhD	5	3	2	2	3
Papers published/PhD-staff	0,76	0,84	0,63	0,44	0,53

The evaluation team acknowledges that publishing peer-reviewed scientific papers in high-ranking international journals is not the key performance criterion for an institution such as Skogforsk. Skogforsk is primarily concerned with applied research and in particular the dissemination and enhanced application of research-based knowledge within the Swedish forestry sector. Nevertheless, applied research results of a high international standard are part of the goodwill that the Swedish society expects by supporting Skogforsk. Furthermore, other core activities at Skogforsk depend to varying degrees on Skogforsk's continued ability to undertake novel applied research, including the ability to solicit funds for such research. A sound publication record which documents the international standard of Skogforsk's work is a prerequisite in the medium to long term for continued competitiveness.

In this light the evaluation committee feels that the tendency revealed in Table 2 and shown graphically in Figure 1 is of some concern. We see that the overall number of published papers has decreased rather consistently over these five years, as has the productivity measure – in both cases by more than 30 per cent. We note that there may be several reasons for the decrease. A reduction in the overall staff may have caused a delay in the total number of papers published, but cannot explain the decrease in productivity. The extraordinary activities following the storm Gudrun in 2005 may have caused a delay in publishing efforts, which could explain some of the drop in 2006 and 2007, but to a lesser degree than in 2005.

Figure 1 Production and productivity of peer-reviewed papers in international journals from Skogforsk over the years 2003–2007.



The overall level of productivity at the beginning of the period is not very different from that found in similar research institutes elsewhere, though somewhat in the lower range of what should be expected given the fact that Skogforsk is primarily active within the natural and engineering sciences. The productivity in 2006 and 2007, however, is surprisingly lower than would be expected. Note that in calculating the productivity measure, only about half of the R&D staff members are included, namely the R&D-staff with a research education (PhD-degree). The remaining staff cannot be expected to contribute directly to scientific publication efforts, but are important to reach the many other objectives of Skogforsk.

The evaluation team recommends that measures be taken to reverse the decreasing trend in scientific publication. The evaluation team recommends that Skogforsk returns to a level of productivity at least at the 2003–2004 level, and preferably closer to its stated goal of approximately one publication per PhD staff member and year.

The main reason for these recommendations is concern that the development may in the longer run damage the competitiveness of Skogforsk, in particular when it comes to research funds and recruitment of new personnel. It seems to be no coincidence that the programmes publishing the most are also those with the larger externally funded research projects and high success rates in competitive calls (cf. Tables 1 and 2).

National and international cooperation in research

Skogforsk is an active partner in several national and international research projects, networks and organisations. Numerous projects involve research colleagues at SLU and other Swedish research institutions. Skogforsk is a main driver in the Research school on Forest genetics and Tree Breeding and the upcoming research school FIRST: Forest Industry Research School for Technology. Skogforsk has been a key player in setting up the National Research Agenda as part of the pan-European efforts in the Forest-Based Sector Technology Platform. Furthermore, Skogforsk has taken the initiative to set up a cooperation agreement with SLU, which has so far led to the establishment of a 'Forest Researcher Hotline' and also to a major joint application aimed at MISTRA concerning the future of Swedish forests in light of uncertainty and risks associated with climate change.



International cooperation is difficult to measure, but we note that about 10 per cent of the externally funded projects seem to involve international partners from Europe, Canada, Australia and even Asia (Vietnam). Given that the majority of projects are rather small and domestically oriented, this measure is not insignificant. In particular, Skogforsk's role in large-scale projects and networks such as EFORWOOD, NOVELTREE, TREEBREDEX, EUROFIBER, 'Environmental and efficient forest technology 2020' and Oscar are noted and commended. Similarly, the publication lists reveal that international publications are frequently co-authored with research colleagues outside Skogforsk and outside Sweden, the measure varying between 15 per cent and 30 per cent over the years considered.

The evaluation committee concludes that Skogforsk is internationally active to an extent somewhat larger than most similar sized institutions, and devotes more than average attention and efforts to this.

This is no doubt caused by the special niches that Skogforsk covers and fulfils in Swedish research as well as by an efficient management structure.

Dissemination and extension

Disseminating, communicating, and various ways of enhancing the application of new research results to the Swedish forestry sector is perhaps the most important part of Skogforsk's role.

The quality and relevance of Skogforsk’s research and dissemination activities is revealed by the demand from Skogforsk’s end-customers.

Contracting work

Skogforsk puts great emphasis on being able to meet the knowledge demands of the Swedish forestry sector. A direct and measurable parameter for the ability to achieve this goal is the level of contract work undertaken by the different programmes and the type and size of projects. Contract work is financed by private and public companies and institutions with a direct interest in Skogforsk’s competence. Over the Framework Programme period, it is the impression of the evaluation team that contract work has increased slightly, e.g. through the 3rd generation seed orchard campaign. However, the type and size of projects again vary quite considerably across programmes, as revealed in Table 3.

The material available indicates that the relative importance of contract work is higher for the programmes under Wood Supply (cf. Table 3) as they comprise a rather large number of projects. The differences between programmes are less pronounced when it comes to mean sizes of projects, though ‘Wood Supply’ projects still tend to be smaller. For all programmes, the majority of contract work projects are, however, fairly small, and this is likely to be inherent to the type of work undertaken on a contract basis.

Table 3: Some sample statistics on contract work projects undertaken by Skogforsk within the Framework Programme period. This is a sample only as not all programmes were able to produce the list. Legend: a: number of projects/contracts, and b: 1,000 SEK.

	Tree Impr. N	Tree Impr. S	Silvi- culture	Environ. Nature	Wood util.	Tech.	Logistics Fuels	Eff.
Sample size ^a	30	35	29	19	37	41	39	17
Mean ^b	517	200	530	519	182	218	166	397
Median ^b	346	127	150	250	158	150	66	150
Stand. dev. ^b	414	223	1296	671	138	225	303	602

The evaluation team concludes that, overall, the large amount of contract work is a clear statement of the high relevance and application value of Skogforsk’s work.

Popular publications

Skogforsk produces a number of Swedish publication series aimed at the Swedish forestry sector, which are generally offered on a subscription basis. Skogforsk routinely monitors the potential core customer groups for these products and seeks to reach as many as possible. Currently it is assessed that 70–80 per cent are reached. Skogforsk has explicit publication targets for these series: 25 issues of 'Resultat', five issues of the English version 'Results', four issues of 'Plantaktuellt' and 30 different 'Arbetsrapporter'. Looking into the publication statistics over the years 2003–2007, and trying to take into account some degree of double counting over programmes and years, we conclude that with regard to 'Resultat', 'Results' and 'Plantaktuellt' the targets have more or less been met over the five years.

With respect to 'Arbetsrapporter', the target has not been entirely met as it seems that some 25 issues have on average been published over the five years. We note that in the publication target statement (formulated at the beginning of the current Framework Programme), the research directors and management of Skogforsk have stressed that they would like to see this publication series increase and to at least 30 issues a year. Looking across the published 'Arbetsrapporter', the evaluation team notes a very large variation in size and type of content: From brief technical notes to larger reports concluding projects and proceedings from conferences and workshops. The evaluation team recognises that a channel like this is needed and useful at a diverse institution like Skogforsk. However, the evaluation team does not see the rationale for stressing the need of increasing this type of 'mixed' publication series, and questions the overall value of the series as a dissemination vehicle directed to end-users. Rather, the evaluation team regards the series to be an internal working document as well as a useful series for reports directed towards project funding institutions and companies.

Overall, the evaluation team commends Skogforsk for its determined effort to communicate research-based knowledge in short easy-access publications aimed at the sector in general. Skogforsk has met its targets and documented its ability.

Specifically with respect to the series 'Arbetsrapporter', the evaluation team suggests that the series is not used beyond

the need generated by Skogforsk activities in general, e.g. for end-of-project reports, proceedings, etc. No additional effort needs to be undertaken with the sole aim to increase the number of issues in the series. Resources should be directed instead towards direct communication and publication in 'Resultat', 'Plantaktuellt' and/or in peer-reviewed scientific journals – as relevant.

Courses, conferences and excursions

Skogforsk not only undertakes written dissemination to its end-users, but also is very active in setting up platforms for meeting these end-users and presenting and discussing research results and potentials. The evaluation team has been presented with lists of such events undertaken during 2004–2007, including the number of attendants. The number varies between 700 and 1,700 – with a peak every second year when arranging the 'Utvecklingskonferens'. The number of attendants varies from quite low (5–10) at some types of events to over 300 in others. The occurrence of several events in low demand also suggests that it is not simple to successfully expand this effort.

The evaluation team considers the effort of Skogforsk in this activity commendable and well scaled.

Demand on the web and in media

The Internet is a growing source of information for professionals as well as for the general public. Skogforsk has established itself firmly on the net and developed tailored, web-adapted forms of information and knowledge-based tools for specialists and users in general. Therefore, it is not surprising to see that Skogforsk is enjoying a steady increase in visits to its web-site (likely to exceed 300,000 in 2008), but also to its more specialised knowledge platform called 'Kunskap Direkt' (likely to exceed 100,000 in 2008). Skogforsk also develops other forms of electronic dissemination, training etc. and in 2004 won several prizes for these efforts. Skogforsk possesses knowledge in great demand also by the popular media, and consistently meets its goal of more than 500 appearances in the printed press annually.

The evaluation team considers the effort of Skogforsk in this activity commendable, very professional, and well scaled.

Main conclusions and recommendations

Throughout this evaluation report, the evaluation team has stated several points, drawn conclusions and made recommendations. In this final chapter, we will summarise the main conclusions and recommendations, and refer to the previous chapters for the details and additional area or programme-specific conclusions.

Overall on Skogforsk

The evaluation team feels that the single most important fact to bear in mind when evaluating Skogforsk and hence reading this report is the unique financial and stakeholder set-up that characterises Skogforsk. Overall, the forestry sector finances about 70 per cent and government or other public funds about 30 per cent of Skogforsk's activities. This set-up is rather unique internationally and has direct implications for the way Skogforsk works; it explicitly defines Skogforsk's role and the expectations it must meet. It also implies that an evaluation like the present will inevitably address more or less all the activities of Skogforsk.

The evaluation team is clear in its conclusion that Skogforsk fulfils an important role in the Swedish forestry sector and innovation sector and that it is an indispensable institution as such. Skogforsk fulfils several needs and we highlight two important core products of Skogforsk here:

- Through its research efforts, Skogforsk maintains and delivers an important public good to the forestry sector and the Swedish society as such; the tree improvement programmes perhaps being the most prominent of the overall public good functions.
- Through its highly skilled and efficient dissemination and extension efforts, Skogforsk makes a large contribution to the efficiency and sustainability of the Swedish forestry sector and hence society as such.

Skogforsk has in general met the goals set out in the Framework Programme 2005–2008, taking into account that the period is still ongoing. Over the period, Skogforsk has maintained its staff size, but also been able to renew it to some extent through staff turnover and recruitment. This resource stability provides the basis for the more specific performance evaluated below. More specifically, the evaluation team finds the increase in the number of active PhD students a wise and foresighted investment in future R&D staff.

During the period, Skogforsk has managed to maintain and in some areas increase its level of international cooperation and several initiatives appear promising. The evaluation team concludes that Skogforsk is internationally active to an extent somewhat larger than most similar sized institutions, and devotes more than average attention and efforts to this.

The evaluation team concludes that both the forestry sector and the Swedish society (through Formas and others) receive good value-for-money at Skogforsk. Skogforsk is experiencing a growth in external funding, which now consistently constitutes more than 50 per cent of the turnover. Neither this level of external funding nor the trend is unusual internationally for an institution of this type, and continued growth in external R&D funding is likely to be a premise for securing R&D volume and quality. Nevertheless, the strong element of forestry sector funding relative to public funding could imply a challenge for maintaining the main public good elements of Skogforsk's work in the future. The Formas funding gives the institute some independence, credibility and authority as a scientific organisation. However, the evaluation team finds that the current level and share of base government funding could be dangerously low. Over the years, the relative value of the Formas contribution has been decreasing. Further decreases will be a threat to the scientific quality of Skogforsk's work in its core areas and in particular to its ability to maintain and develop the long-term public good founded on Skogforsk's core areas. Thus, while acknowledging that the following conclusion is on the margin of the evaluation team's remit, we feel it needs to be stated:

The evaluation team strongly recommends that the real value of the Formas contribution is restored to at least the level in 2005 and not reduced below this real value in the future.

Research at Skogforsk

The evaluation team has evaluated the ability of Skogforsk's programmes to undertake scientific work and its performance in doing so. The evaluation team has, however, deliberately abstained from evaluating the more specific choices of research issues and approaches.

Within the area of Forest Production, the Tree Improvement programmes are of an internationally very high standard, but also the other programmes show scientific competence. Overall the researchers in this area have demonstrated the ability to publish in standard forest research journals as well as in more general discipline-oriented journals. The evaluation team concludes that all four programmes in this area have demonstrated scientific competencies ranging from adequate to excellent. Within this area Skogforsk will, however, face a challenge in securing funds for the traditionally rather large monitoring and measurement activities that underpin empirically-based, long-term, and strategically important research.

The evaluation committee recommends that Skogforsk assess this challenge during the coming Framework Programme and review options for increasing the economic/statistical efficiency of and funding for the monitoring and measurement efforts.

Skogforsk hosts one of the largest research groups in Europe within forest operations in a broad sense. Within the area of Wood Supply, researchers have demonstrated the ability to publish in forest research literature and hence an adequate level of research competence. However, given the large availability of data in this area, *the evaluation team would like to encourage and recommend further pursuit of research contributing at a more basic level to operations analysis research.* It is hoped that this will be a cost-effective way of bringing home new forefront competencies and in the medium to long run increase competitive strength for research funds.

While research ability is clearly present in most of Skogforsk's programmes, the evaluation team finds the recent development in the overall scientific production somewhat less convincing and less impressive. The evaluation team has scrutinised the annual reporting of Skogforsk over the years 2003–2007 and evaluated productivity in terms of



peer-reviewed papers per PhD staff member. The evaluation team concludes that productivity at the beginning of the period is in the lower range of what should be expected, but more importantly the evaluation team finds the productivity in 2006 and 2007, surprisingly low. The productivity is considerably lower than the stated publication goals.

The evaluation committee recommends that measures be taken to reverse the decreasing trend in scientific publication. A prerequisite for this is more precise reporting and increased management attention to this goal.

The main reason for this recommendation is concern that the development may in the longer run damage the competitiveness of Skogforsk, in particular when it comes to research funds and recruitment of new personnel. It seems to be no coincidence that the programmes publishing the most are also those with the larger externally funded research projects and high success rates in competitive calls (cf. below). To secure the long run competitiveness of Skogforsk:

The evaluation team further recommends that Skogforsk returns to a level of productivity at least at the 2003–2004 level, and in the longer run closer to its stated goal of approximately one publication per PhD staff member and year.

The evaluation committee has evaluated the ability of Skogforsk to solicit external research funding. As mentioned above, the overall level of external funding is increasing, and for some programmes, this is also true for external research funds. Based on reports from some of the main research funding institution of relevance to Skogforsk, the evaluation team has concluded that Skogforsk has a success rate in application writing, which is comparatively high by any international standards. This is true even when Skogforsk brings its special fields of competence into competitions of a broader scope. Thus, in some of its specialised fields Skogforsk has an important head start in future competition for research funds. However, this success seems quite unevenly spread across the different programmes and for all programmes there is a rather large group of small research projects. Given an apparent trend toward increased external research funding, the evaluation committee makes the following recommendation, while acknowledging that this is no easy task:

In efforts to increase the efficiency of fund-raising, the evaluation team recommends that Skogforsk consider ways of increasing the mean project size and hence scope.

Dissemination and extension at Skogforsk

The qualitative assessment of the dissemination and extension efforts at Skogforsk relies on interviews and the questionnaire. Based on this the evaluation team concludes that:

- The main stakeholder groups consider Skogforsk's work to be carried out within relevant research areas.
- Stakeholders consider the Skogforsk model that involves doing applied research for the Swedish forestry sector to be a good and cost-and efficient solution.
- The fairly low percentage of field personnel who consider stakeholders to be able to influence the work of Skogforsk suggests that additional efforts be made to secure the link between, e.g. advisory groups and the sector at large.
- In general, respondents think there is a potential to implement more of Skogforsk's work. Thus, the current and planned implementation focus should be maintained, and a moderate increase in thematic conferences might be considered provided attendance rates are acceptable.

Based on this, the evaluation team recommends that the current focus on implementation is maintained and that Skogforsk considers ways to improve the link between the advisory groups and the sector at large.

With respect to the latter part of this recommendation it is reasonable to ask whether or not the stakeholders in the sector know who represents them in the advisory groups.

The evaluation team noted that Skogforsk has identified the growing proportion of entrepreneurs in the sector as a challenge to dissemination and extension efforts. One of the main problems is the lack of direct feedback mechanisms with the entrepreneurs at large. To achieve a rapid transference of R&D to practical application, new strategies and work methods are needed in order to reach the entrepreneurs.

Overall, the competencies of Skogforsk are in high demand in the sector and the most direct sign of this is the large and growing amount of contracting work undertaken by Skogforsk. The evaluation team concludes that, overall, the large amount of contract work is a clear statement of the high relevance and application value of Skogforsk's work.

Skogforsk produces a number of Swedish publication series aimed at the Swedish forestry sector, and which are generally offered on a subscription basis. This core activity is of great value to the sector. Overall, the evaluation team commends Skogforsk for its determined effort to communicate research-based knowledge in short easy-access publications aimed at the sector in general. Skogforsk has met its targets and documented its capability and high international standard in research communication. However, there is one aspect of the current publication targets that the evaluation team recommends revised:

Specifically with respect to the series 'Arbetsrapporter', the evaluation team recommends that the series not be used beyond the needs generated by Skogforsk activities in general. Resources should be directed instead towards direct communication and publication in 'Resultat', 'Plantaktuellt' and/or in peer-reviewed scientific journals where relevant.

Skogforsk is very active in setting up platforms for meeting end-users, and presenting and discussing research results and potential. The evaluation team has been introduced to this effort and one of the team members has attended several of these events and meetings. The evaluation team is impressed by Skogforsk's professional handling of this effort, which it considers to be commendable and well scaled.

The Internet is a growing source of information also for forestry sector professionals. Skogforsk has established itself firmly on the net and developed tailored web adapted forms of information and knowledge-based tools for specialists and users in general. The result has been a steady increase in visits to the Skogforsk website, including the specialised knowledge platform called 'Kunskap Direkt'. Skogforsk has won several prizes for its efforts in developing electronic dissemination and training. Skogforsk possesses knowledge that is also in great popular demand, and consistently meets its goal of more than 500 appearances in the printed press annually. The evaluation team considers the effort of Skogforsk in this activity commendable, very professional and well scaled.



Appendices

- Appendix A. Guidelines for evaluation
- Appendix B. Framework programme 2005–2008
- Appendix C. Homepages and links
- Appendix D. Number of staff by education
- Appendix E. Annual funding by area
- Appendix F. Report on replies to questionnaires used to evaluate relevance and dissemination

Appendix A

Guidelines for evaluation

Background and Aim

According to the agreement between Formas and Skogforsk (the Swedish Forestry Research Institute) the “scientific quality” and the “relevance” of research within the present framework programme (FP; 2005–2008) should be examined before the termination of the actual FP period.

The main target of the evaluation is the research conducted during the first three years (2005–2007) of the FP, with appropriate retrospective links back into the previous FP (2003).

The research is to be evaluated from a national and international perspective according to the most suitable procedures chosen by the evaluators with respect to the issues raised in the guidelines (see below).

The actual evaluation is a “light” version of the previous one, and should be seen primarily as a control to monitor developments. Skogforsk’s overall mission, research strategy and organisation are not a matter of in-depth consideration. However, thoughts may be presented where possibilities for improvement are obvious.

Evaluators

The evaluation will be done by two experts, one of whom represents mainly the scientific perspective and the other the stakeholder perspective. The scientist should be internationally esteemed and active within relevant research fields (forestry in a broad sense). The stakeholder representative should have a central position in the sector with insight into the current research needs of end-users. The scientist should be from outside Sweden. There should be no doubt as regards the impartiality of the two evaluators in relation to Skogforsk. Serious effort should be made to appoint a male and a female expert.

Issues to be assessed by the evaluators

The choice of tools and indicators for the evaluation should be the responsibility of the appointed evaluators.

It is recommended that the scientific status, quality, trends and relevance be examined with respect, however, to the questions presented below, and that the applied nature of Skogforsk's research be considered.

- 1) In short, how has Skogforsk changed between 2003 and 2007 as regards research themes and size (volume, funding and staff)?
- 2) Have the activities of Skogforsk during 2005–2007 thematically been in accordance with the FP?
- 3) How have Skogforsk's activities in total, per thematic field and per average scientist evolved quantitatively over time from 2003 (last year with data during previous evaluation) and onwards as regards the following?
 - Scientific publication in international journals with peer review
 - International conference proceedings
 - Popular written reports in Swedish for stakeholders
 - Popular written reports in English
 - Articles and occurrences (e.g. interviews) in media (e.g. newspapers, radio, TV)
 - Documented oral dialog with stakeholders (e.g. courses, conferences, web visits)

Is the development positive and are the activities at a level that can be expected from an applied research institute of this type in an international comparison?

- 4) How has the Skogforsk staff changed from 2003 and onwards?
 - Number of persons within different categories of staff
 - Number of PhDs in total and per thematic field
 - Number of staff in graduate (PhD) studies

Are developments positive and is the composition of staff as can be expected from an applied research institute of this type in an international comparison?

5) How has Skogforsk's total external research co-operation evolved qualitatively and quantitatively from 2003 and onwards?

- National research co-operation with other institutes and universities
- International research co-operation

Is the development positive and is the external research co-operation at a level that can be expected from an applied research institute of this type in an international comparison?

6) How has Skogforsk's effectiveness (efforts and success) in obtaining external funding (Formas, STEM etc) in competition evolved from 2003 and onwards?

Is this what can be expected from an applied research institute of this type in an international comparison?

7) Are Skogforsk's customers/stakeholders satisfied with the research?

- Is Skogforsk working with the right thematic issues?
- Do Skogforsk's customers have opportunities to affect the research?
- Does Skogforsk effectively make research results available to customers?
- Do results from Skogforsk cause a real beneficial change for customers?
- If a reliable answer is possible: have things changed from 2003?

8) To what extent have the main recommendations from the previous evaluation been implemented?

9) Which are the most important recommendations to Skogforsk for the years to come? Which strengths could be better utilized? What weaknesses should be corrected?

Material supporting the evaluation

Skogforsk should produce the following material in English (language dependent on the final choice of evaluators) available for the evaluators:

- General description of Skogforsk (to facilitate question 1)
- Framework programme (to facilitate question 2)

- Annual reports 2005–2007 and/or a summary of these (to facilitate question 2)
- Tables and/or descriptions giving data about activities, staff, external co-operation and funding (to facilitate questions 3–6). Annual data should be presented in total, per thematic field and per average scientist
- Individual CV and publication list for every scientist
- A short self-evaluation by Skogforsk to facilitate questions 2–8 (max 3 pages)

Most material should be available for the evaluators by the end of January at the latest, and the self-evaluation by mid-February.

Time schedule – preliminary meetings and final report

The evaluation should start in the end of January with a one-day kick-off meeting. In the first part of this meeting representatives from Formas and Skogforsk should participate to explain and discuss the aim and framework of the evaluation, and to support with material and information. The second part of the meeting should be for the evaluators alone.

Supporting material is studied by the evaluators after the kick-off meeting and prior to the following intermediate meeting.

An intermediate one-day meeting will take place in mid-February. At this meeting the evaluators will have possibilities to meet and pose questions to Skogforsk's Executive Director, research directors and program leaders, and/or other staff members chosen by the evaluators.

From mid-February to mid-March the evaluators are to read, reflect, do the necessary stakeholder interviews, and write the preliminary report.

A final meeting (probably 2 days for the evaluators) is planned for mid-March. The first day is intended for the evaluators to complete the preliminary report and to conclude. The second day is for the evaluators to present main findings for Formas and Skogforsk, followed by a discussion to clarify any misunderstandings. The preliminary report is made available to Formas and Skogforsk at this meeting.

Appendix B

Framework programme 2005–2008

Summary

The forestry sector is one of Sweden's principal contributors to the national economy. Thanks to its renewable supply of raw materials, the country's forests provide a unique opportunity for the production of a wide range of commodities that are both beneficial to economic growth and life-enhancing, in a sustainable, cyclical society. However, this is conditional on there being continuous, knowledge-driven development and renewal, in the multi-faceted forestry sector.

Forestry in Sweden faces a number of serious challenges that encompass both problems and opportunities. These can be solved or exploited, respectively, by means of effective collaboration in practical, applied and basic research. Skogforsk has a key role to play in this work.

The complexity of goals in forestry, which are based on the pillars of economic production, the environment, and social values, must be reflected in the research and development activities that are necessary for attaining those goals.

Thus, the R&D activities incorporated in the framework programme must generate the knowledge and products needed for profitable, ecologically sustainable, multiple-use forestry, in which the assets and the benefits of the forest landscape can be used to advantage for a multitude of interests, which will benefit not only the forestry sector but also the country as a whole.

The R&D activities will focus on applied research based on synthesis and a holistic approach, and will be carried out in close collaboration with the forestry sector and other research organizations. All the activities of the framework programme shall be characterized by quality, relevance and effectiveness.

The R&D activities have two main arms:

- *Primary production* — the overriding goal of which is to generate knowledge that, when applied, and without any diminution of the profitability requirements, will lead to higher quality in silvicultural work, an increase in timber production, and improved functionality in the various forms of conservation work undertaken. Primary production is divided into three areas: Forest tree breeding and propagation; Forest management; and Conservation and the environment.
- *Secondary production* – the overriding goal of which is to provide knowledge that on *implementation* in forest operations will increase productivity, secure higher revenue, lower costs, and provide sound working conditions in the work of achieving conservation goals. Secondary production is divided into three areas: Market conditions and raw material utilization; Forest operation; and Timber procurement systems.

Research findings are of no real value until the research has been published. Skogforsk shall therefore focus closely on communicating effective quality-assured, needs-driven research findings tailored to the relevant target groups.

For sustainable high-quality activities within the programme, continual active improvement in the skills and competence of Skogforsk's personnel is vital, as is the need to create space for the development of new research and communication methods, together with business intelligence and market analysis, the testing of new ideas, future analysis, and the like.

1. The importance of the forestry sector and the scope for increased growth

The forestry sector – a cornerstone of the Swedish economy

The forestry sector is one of Sweden's most important industries. The cluster of businesses in the forestry sector, the forest products industry, and other associated activities, accounts for more than 20 per cent of the turnover and jobs in Swedish industry. A third of all Swedish industrial investment is to be found in this cluster, with this branch of industry employing some 200,000 people, many of whom live in rural areas. In 2002, the value of exports from the forest products industry amounted to SKR 110 billion (US\$18.50 billion), which is equivalent to 14 per cent of the country's

gross exports, with net exports accounting for SKR87 billion (US\$14.60 billion) or 60 per cent of the aggregate net export value.

Thus, the development of the forestry sector and the forest products industry is of the utmost importance to Sweden's ability to maintain a positive trade balance and healthy economy for the nation. With an estimated increase of about 2 per cent per year in the global demand for forest products; the EU's goal to secure a sustainable society in which there will be a doubling of the use of forest bioenergy fuel and renewable sources of energy; the intensive movement to promote wood as the dominant building material in Europe by 2010; and a growing desire in society to fully exploit the social and cultural assets and amenities of the forest landscape, there is clearly great potential for growth in the forestry sector through knowledge-driven development – which will also open the door to expansion in new areas.

Sustainable and effective production

All social development and physical production is based, above all, on the production of goods and services in the ecosystem. The productivity of the forest ecosystem is the driving force for the forestry sector. Thanks to the renewable supply of raw materials, the country's forests provide a unique opportunity for the production of a host of commodities that are beneficial to economic growth, and the enrichment of life in a sustainable, cyclical society. But the forests are also home to a string of social, amenity, aesthetic and other values. Their importance to the quality of life and the ecological balance cannot be overestimated. The future survival of the forestry sector and its development is of critical importance to the preservation of the Swedish forest landscape and its infrastructure in rural areas.

If the forestry sector is to maintain its profitability and international competitiveness, and thus continue to contribute to the growth of the economy and to national and regional development, it must operate as efficiently as possible. A profitable forestry sector is also the foundation for sustainable utilization of all the nonindustrial assets in the sector. One of the principal challenges to sustainable Swedish forestry is to combine the rational production of material benefits with the added value

from the production of nonmaterial ecosystem services. This requires continual improvement and renewal in the value chain of the forestry sector – which can only be achieved through intensive R&D.

The forestry sector in Sweden plays an important part in the global supply of commodities from the forest products industry, in which the competition is growing tougher all the time. The Swedish forestry sector comprises a dynamic cluster of small, medium and large companies. The structural and international rationalization in the forestry sector is expected to continue. But unless a strong infrastructure for innovation and R&D is put in place, there is a risk that numerous Swedish companies will move their businesses abroad. In an open global economy, businesses and future investments are attracted to the regions and countries offering the best development opportunities and the highest level of competence. The world's leading R&D establishments constitute one of the strongest draws for businesses. That is why for Sweden and the national economy it is vital that priority be given to a high level of research, particularly in the country's vital forestry sector.

2. Goals for sustainable Swedish forestry

The view of Sweden's forests as a national asset has become more complex over time, and the goals for utilizing it are multi-dimensional. Thus, the production and environmental goals of Swedish forest policy now have to be combined with those of climate policy, and the ambition to use forests as a carbon sink. Further, we have to take into account goals concerned with the care of national heritage objects, and the importance of recreational and other uses. Against this background, the goals for sustainable Swedish forestry can be summarized under three principal usage headings:

Economic production

The effective and profitable use of renewable forest raw materials through the extraction of wood, fibre, energy, and new composite materials, is fundamental to a thriving forest industry. Coupled with this is also the economic potential of regarding the growing forests as commercial carbon sinks and, similarly, in commercializing recreational and other amenities.

Environment

Safeguarding biodiversity, soil and water quality, and the nutrient balance in the forest ecosystem is vital. The production of forest bioenergy fuel can help to reduce emissions of carbon dioxide into the atmosphere and thus to slow down the greenhouse effect. The cultural and recreational value of the forest must also be safeguarded.

Social values

Forestry that has sustainable economic strength is conducive to thriving rural areas with profitable work and enterprise. In the relevant geographical areas, forestry practice must be sensitive to the Sami people and their culture, and to the interests of reindeer herding. Further, the importance of the forest to the quality of working life, recreation, and health in general must also be nurtured – which is particularly important in urban regions. Sustainable forestry also involves finding a reasonable balance between the various goals by means of a holistic and an open dynamic process, in which all the interested parties are given an opportunity to be involved. This multiple-use forestry must also be reflected in the R&D work that is vital to the achievement of the goals.

3. Forestry's challenges and opportunities

From the overview presented above, a raft of tangible challenges, which forestry will have to meet in the next few years, can be identified.

Excessively large areas, unacceptable regenerations, and a backlog of cleaning are a threat to growth and quality in future forests. Steps must therefore be taken to improve stand establishment and the cultivation of young forest. Heavy losses are incurred because of browsing and other pests, and effective methods of control need to be developed to overcome the problem.

Increased conservation requirements mean that the functionality and effectiveness of conservation work must be improved. Because of set-aside and conservation requirements, the amount of land available for commercial forestry is diminishing while, at the same time, the potential for increasing the amount of timber available for import is nonexistent. Consequently, to provide enough domestic timber to meet the demands of industry, we need to increase timber production in

those areas that have not been set aside for other purposes. What's more, it is essential to improve the utilization of our domestic timber, by adapting it to the specific needs of the different end products in the mills.

We are expecting there to be an increase in demand for the nonmaterial uses of the forest ecosystem. This means that the development and implementation of forest management and logging methods will have to take into account, to a greater degree than in the past, the recreational, aesthetic and amenity values of the forest landscape.

Increased productivity in forestry is of decisive importance to the international competitiveness of the industry. Following a number of years of stagnation, major efforts are now called for to increase productivity throughout the forest chain. The technology and methods developed must be cost-effective, energy efficient, and safe to people and the environment.

In consequence of the age structure of the forests, the volume of timber from thinnings will soon increase at the cost of final felling, which means that new cost-effective methods for thinning and harvesting of smallwood must be developed. More-efficient systems for environmentally sound harvesting of bioenergy assortments must be found, so that the rising demand for green energy can be met profitably.

The development of appropriate methods of forest management and logging systems that will meet the needs of the various interested parties is a prerequisite for multiple-use forestry.

Clearly, then, the challenges facing forestry are considerable; but so too is the potential. Every challenge incorporates both problems and opportunities that can be, respectively, solved or seized, by means of effective collaboration in practical, applied and basic research. Skogforsk has an important function to perform in such collaboration.

4. Applied R&D in the framework programme

Intensive goal orientated R&D is needed to maintain profitability in forestry and the competitiveness of the forestry sector. Applied R&D is also of key importance for integrating the production and environmental goals of the Swedish forest policy into the practical work, and also to ensure a functional and prudent use of the nonindustrial values of forestry. This is also vital in fulfilling the undertakings that

have been made by Sweden in international agreements on sustainability, the safeguarding of biodiversity, the development of rural areas, etc. Our responsibility to future generations also necessitates that we secure access to healthy, high-quality regeneration stock for tomorrow's forests.

Accordingly, the R&D work within the framework programme shall generate knowledge and products that facilitate a profitable, ecologically sustainable and multiple-use forestry, in which the different assets of the forest landscape can be used sensitively for a wide variety of interests, for the benefit not only of the forestry sector but also for society in general.

The nature of the research

Skogforsk's combined activities are shaped by the specific role that the Institute plays in the Swedish R&D system. Our limited resources force us to concentrate our own research work mainly into a number of competence fields, in which Skogforsk's functions are not principally covered by other research bodies. Three key areas can be identified: Forest tree breeding and propagation; Forest management and conservation; Forest operations. To manage this extensive work, Skogforsk's R&D activities will to a large extent need to be supplemented by external collaboration.

The teamwork under the framework programme shall be of an applied nature, based on a holistic approach, synthesis, and integration within different research areas. The contrasting conditions between large-scale forestry and family-owned forestry, and between industrial and nonindustrial forestry, must be taken into account. It is also important to note and, in R&D work, to take into account, international events of importance to the forestry sector, and when justified to participate actively in such events.

The R&D work shall be performed in close collaboration with the forestry sector and other research bodies, and for the most part be of a long-term and knowledge-collecting nature. A prerequisite of the work is that there must be a keen awareness of the needs and priorities of the forestry sector and society and, consequently, scope for subsequent flexibility and adaptation. All the work carried out under the framework programme will be distinguished by its quality, relevance and effectiveness.

International collaboration in R&D constitutes an important and natural element of the research work, and it should be pursued in those parts of the framework programme where it is both relevant and deemed to be of benefit to the Swedish forestry sector and to the country. Collaboration in the Scandinavian countries and participation in the EU research programmes are of particular importance here. Examples of this include the *"Centres of Advanced Research"* – a Nordic collaboration initiated by Skogforsk – and the joint European research-programme initiative *"EFORWOOD"*. As regards collaboration with the EU, it is essential that framework money shall be available for national matched-funding when this is clearly justified and no other sources of matched-funding are available.

The focus on applied research and the sometimes highly complex problems that need to be solved demand a competence that is both wide and deep. Skogforsk's own competence and skills must therefore be improved continually. When necessary, additional skills can be acquired through collaboration with other research bodies. Research methods and tools need to be ongoing, and adjusted to meet requirements. Likewise, continuous monitoring and analysis of events in the world at large that potentially can influence the future of the forestry sector is essential.

R&D structure

Somewhat simplified, the forestry sector operates in two main processes:

- Primary production – which involves the production of regeneration stock, the establishment of new forest, and the management of established forest. This also includes conservation work (nature and the environment) and other work related to multiple-use forestry.
- Secondary production – which involves the management of wood raw materials and the supply of timber to the mills.

Both of these processes are linked together in planning operations.

Given the close links between the framework programme and the forestry processes, it seems logical to structure the R&D work in the programme analogously with these. Thus, in the following, the research activities in the framework

programme are described from the point of departure of the *Primary production* field, the principal elements of which are *Forest tree breeding and propagation*, *Silviculture*, and *Conservation* – and the *Secondary production* field, the principal elements of which are *Market conditions and raw material utilization*, *Forest operations*, and *Timber procurement systems*. The necessary integration of these parts will take place through the appropriate organization of the operational R&D work.

In both the primary and secondary production fields, the R&D work will focus on a holistic view, whereby economics, and production and environmental assessments will constitute equally important grounds for syntheses.

5. The essence of the R&D work

Primary production

In this field of research the activities will be focused on an integration of the "green value chain", which involves the establishment of new forest and the management of established forest, with due account being taken of the multifunctionality in the utilization of the forests. The goal of the R&D work is to *generate knowledge that, when applied, without any diminution of the profitability requirements, will lead to higher quality in silvicultural work, an increase in timber production, and improved functionality in different conservation measures.*

Forest-tree breeding and propagation

The availability of genetically improved high-quality regeneration stock with optimum adaptation to different environmental conditions is of long-term strategic importance to the forestry sector and society as a whole. Forest-tree breeding is of crucial importance to the creation of conditions that are conducive to future forests having a high level of production and genetic diversity. This also coincides with the central theme of Swedish forest policy, which lays down that forest land, being a national asset, must be managed in such a way that it yields a healthy return and, at the same time, safeguards both genetic and biodiversity. At the present time, genetically improved regeneration stock provides 15–25 per cent higher growth than the best stand-derived stock. What's more, the cost per cubic metre of "genetically improved" timber is less than one krona or roughly 17 cents (US).

As the only operational institute for forest-tree breeding and propagation in the country, Skogforsk has a central role in this field. The overriding goal of this enterprise, *integrated with the long-term administration of the genetic resources of appropriate tree species, is the pursuit of sustainable breeding consistent with the central goal characteristics, and to establish preparedness for future climate and environmental changes. A secondary goal is to manage the breeding gains efficiently, and to maintain the desired diversity in the seed stock.*

Basic breeding or pre-breeding of the main tree species – Scots pine and Norway spruce – has the highest priority, with the level of ambition being long-term, sustainable breeding and dynamic gene conservation for continued natural evolution. Appropriate parts of our activities are linked to the extensive establishment of the Swedish orchard programme that was launched in 2003–04. Birch will also be included in the sustainable-breeding programme. As regards other coniferous and broadleaved species, needs-based and small-scale breeding work will be carried out intermittently. New scientific findings will be incorporated into the breeding policies and strategies on an ongoing basis.

Improvements in existing methods of mass propagation and the development of new ones are required both for rational breeding and to ensure that the breeding results can be transferred efficiently to regeneration stock for use in forestry. Of particular interest here is R&D for more-effective sexual propagation focusing on traditional orchard management and greenhouse orchards, and also measures for early and abundant flowering. R&D involving vegetative propagation has been assigned a lower priority in the framework programme. However, more-effective methods for grafting need to be developed for the establishment of new seed orchards in the orchard-expansion programme mentioned above.

Support R&D is needed for the development of effective breeding methods, test systems, and methods for evaluating different properties. The quantification of breeding effects and their sustainability, and the extension of our knowledge on the heritability and variation in the wood properties are all urgent tasks. Some applied research is also needed for the development of methods for testing, processing and sorting of seed.

Silviculture

Sound profitability is an important requirement for sustainable forestry. This, in turn, is dependent on rational operation and a sustained high level of timber production. These conditions, combined with the striving to achieve the demanding environmental goals, and the ambition to minimize the risk of insect pests and other setbacks, calls for extensive differentiation in the form of stand establishment and management.

As mentioned earlier, the establishment and management of production forests fails to measure up to the requirements specified in the goals of the Swedish forest policy. However, there is ample scope for improvement, but this, in turn, is conditional on the availability of qualified applied research on seedling production and silviculture. Thus, the goal for the activities within the framework programme *is to contribute to the development of methods for the efficient and environmentally sound production of high-quality regeneration stock, and to develop practically applicable, ecologically and economically adapted methods for stand establishment and the tending of young stands up to the time of the first thinning. The effects of these methods shall be monitored in both the short and long terms.* Where appropriate, this shall also include hardwood forestry and the special conditions that exist there. To a large extent, the activities shall focus on synthesis and necessitate interdisciplinary efforts.

To achieve artificial regeneration that is more cost-effective and biologically sound, the criteria for seedling production are continually being adapted to newly gained knowledge and new requirements. On the basis of these criteria, new and improved methods and techniques are being developed. Thanks to the use of modern technology for measuring and analysis of the physiological properties of plants and their reaction patterns, knowledge is now available that enables improvements to be made to current methods of cultivation and seedling systems. At the same time, it is now possible to develop totally new, effective and environmentally sound systems for the production of seedlings adapted to different biological conditions and rational planting methods. However, research in this area must adopt a holistic approach to the process of stand establishment and link up with other forms of research on regeneration. Skogforsk should take on the mantle for coordinating Swedish research on seedling production.

Site preparation, direct seeding and planting are key elements in practical stand establishment. Under the framework programme, Skogforsk shall participate in the development and implementation of such methods. R&D work concerning the management of established stands shall focus on cleaning measures and first thinnings. Attention shall be paid to measures designed to prevent incursions of pests in seedlings and young stands, with the problems associated with wildlife being of a particularly serious nature.

The forest landscape offers more benefits than just biomass production. Different uses enable activities such as hunting, fishing and eco-tourism to contribute towards profitable forestry. Other benefits, such as those of a social nature – recreation, amenities and the value to people's health – are also important but do not readily translate into economic terms. With the advent of multifunctional forestry that we are now seeking, the aspect of multiple-use forestry needs to be integrated into the R&D that focuses on silviculture under the framework programme.

To be able to choose appropriate methods of silviculture and forest methods against the background of natural and other conditions, profitability requirements, and taking a host of different interests into account – all this requires a fully functional system for resource and action planning, and follow-up. During the framework period, Skogforsk will be actively involved in the development of operational planning systems to these ends, with the R&D work incorporating synthesis in order to link together the entire operational planning chain in forestry.

Conservation and environmental care

On an international comparison, Sweden is well advanced when it comes to conservation and environmental care in forestry. The principles adopted by the country have led to a breakthrough in practical operations. Considerable resources have been made available for conservation work in the forest landscape. Yet many of the activities are carried out with an inadequate knowledge base. Consequently, there is great uncertainty over the effectiveness of the work done in relation to the specified goals. Similarly, there is often insufficient knowledge on the environmental impact of forest operations.

The overriding goal of R&D in this area is therefore *to elucidate the functionality, effectiveness, and benefit of the conservation and environmental work, and to identify the impact that forestry measures have above all on soil and water.*

Analogous with the above, strategies need to be devised to bring about a high and valuable yield from forest production that is adapted to the local site conditions, together with conservation measures for biodiversity, soil and water.

Safeguarding and restoring biodiversity in the forest ecosystem is an important goal in the Swedish forest policy, which is reflected in the environmental certification systems that are now common practice in forestry. It is therefore of vital importance that the steps taken to achieve the goals have the intended outcome, and that the greatest possible benefit is achieved at the lowest possible cost. Thus, with its sustained high level of competence in this field, Skogforsk's task, within the specified parameters, is to evaluate the measures taken and, by means of its own R&D in collaboration with other research institutes, to develop and initiate the implementation of modified or new methods that will safeguard biodiversity in the forest landscape.

The impact on the environment caused by forestry measures is to a large extent water related. The EU's water directive provides an incentive and a readiness for examining other related matters. The demand for, and extraction of, bioenergy fuel is expected to rise, and it is therefore important that we maintain a sound level of knowledge on the environmental effects. The same applies to environmental issues associated with the fertilization of forest land. Skogforsk's work on environmental issues will largely be based on collaboration with those research institutes that already have a high level of competence in the field.

Skogforsk's unique bank of long-term field trials is a key resource in the Primary production field.

Secondary production

The activities in this research field will focus on the integration of the *Economic value chain* with respect to the harvesting of wood raw materials from the viewpoint of the forest owners and the market requirements, and be based on *environmental assessments* and systems analysis whereby

organization, technology and logistics will be linked together in a flow of forestry activities. The goal of the R&D work is *to generate knowledge that on implementation will increase productivity, secure higher revenue, lower costs, and provide sound working conditions in accordance with the conservation and environmental goals.*

To maintain profitability in forestry an increase in total productivity in secondary production is essential. As indicated in the following, great potential exists in the respective areas. Profitability is also important if the tough environmental goals are to be met, and to satisfy the needs of other non-material forest values.

Market conditions and raw-material utilization

A sustainable supply of raw material to the mill is based on the ability of forestry to generate a sufficient surplus from the capital invested by the forest owner. But the solvency of the mills is also under a lot of pressure. Thus, there is an urgent need, *based on a distinct market orientation and control of customer orders, to endeavour to optimize the full value of the raw material.* Logging can then become an integrated part of the industrial system, resulting in an increase in the conversion value.

It is estimated that more efficient utilization of the raw material, with adjustment as early as possible in the processing chain to the end-product requirements specified by the mills, could increase the value of the yield by some 20 per cent. Thus, in collaboration with other research institutes, and based on the knowledge of the fibre and wood properties in the trees, together with the variation in these between stands and trees, and within trees, Skogforsk will develop practical tools for predicting raw material properties, bucking simulation, and for calculating, evaluating and monitoring outcomes.

Central R&D efforts also include development of the logging machine as an information platform, which will include the development of automatic quality classification and pricing by the harvester or harwarder, together with technology for sorting and identification of the timber. Additional R&D is needed for harmonizing measuring technology in logging machines and at the mill, and for standardizing information transfer.

Forest operations

Ongoing development of technology and business development in the forest production system is absolutely vital to safeguard economic and ecologically sustainable multiple-use forestry. Unless there is an annual increase in productivity of 3–6 per cent in forestry, both the profitability and the supply of competitively priced domestic wood raw materials will be under threat, thus undermining the chances of meeting the tough environmental goals.

It is both necessary and of strategic importance that Sweden maintains its position among the world's leading forest-technology nations. Skogforsk has an important role here as both the engine and the coordinator of Sweden's R&D in the field of forest technology. Research in the field of forest operations has therefore been given high priority in the framework programme.

The overriding goal for this section of the work under the framework programme, the focus of which will be on silviculture, logging, extraction and secondary haulage, is to develop solutions to technological and methods problems, together with working methods that when applied will lead to increased productivity, minimal adverse impact on the external environment, and comfortable and safe working conditions.

Unacceptable regeneration results, the general upward movement in costs, and regional shortages of labour motivate R&D focused on achieving rational and biologically reliable technology and methods that are adapted to local conditions in site preparation, direct seeding, and planting. A growing backlog in cleaning can be solved by the development of mechanized cleaning that will supplement conventional methods in certain areas.

Special attention needs to be paid to the problem of small-wood, which is evident in the backlog of cleaning, and in many first-thinning stands. There is great potential here for the further development of multitree-handling technology, not least in conjunction with the harvesting of energy wood.

Profitable and environmentally sound harvesting of energy wood requires R&D work to design flexible technology and methods that can be integrated into roundwood logging systems.

Ongoing work to improve the effectiveness of existing thinning and final-felling technology is needed urgently, as the work could substantially reduce logging costs for a large proportion of the cut.

The development of technology for improved energy efficiency and reduced fuel consumption on logging machines and haulage vehicles can both reduce costs and the load on the environment. To minimize adverse effects on the environment, we need to develop some form of benign soil/road contact devices that can be used in both logging and secondary haulage. In addition, effective transport solutions require appropriate technology, which also applies to rational and environmentally sound road maintenance. Some of the work under the framework programme will be directed at these issues.

In our judgement, the use of modern robot technology to provide semi-automation of the functions on logging machines could achieve a 10 per cent reduction in logging costs in the near future. Further down the line, autonomous unmanned vehicles could achieve further cost reductions of a similar magnitude. Skogforsk will provide an active platform for this development, and it is likely that our advanced forest-machine simulator will be kept busy on a large scale for studies, simulations, and systems analyses.

No forest operations can function properly unless the operator possesses the necessary skills, and is able to work in an efficient organization. It is therefore important that the development of people and their role in the system be taken into account in the above R&D work of a more technical nature. Since most of the work in forest operations is performed by contractors who often have their own employees, the questions raised above should be afforded particular attention.

Timber procurement systems

To a large extent, the forest production system in its widest sense is a logistics organization, with the physical wood flow from the forest to the mill functioning as a support process. It is estimated that more-effective planning and control of the forestry sector's exceptionally extensive and complex timber procurement systems could reduce logistical costs by 10–20 per cent. To put it another way, the potential profitability of forestry over the next decade is equivalent to the

development of logging systems that took place over the past decade. A more rational timber flow would also reduce the load on the environment and the risk of road accidents.

R&D work in this field involves participating in the development of models for efficient transport planning, and the design and evaluation of information and decision support, together with strategies for rational procurement of the raw materials with a view to integration further forward in the value chain. The use of modern information and communications technology here constitutes an important platform for both R&D and practical applications. Logistics-based R&D work has been given a high priority in the framework programme and will be integrated with other parts of the programme.

R&D work is necessary for the development of decision-support models for optimizing the routing of roundwood to the right destination (mill), for identifying possible return flows in a longer planning perspective, and for route optimization in everyday haulage operations.

For the planning of rational road haulage of roundwood, we need knowledge of the road network and its current state. This calls for further development of the national road database (NVEB) for forestry applications. Skogforsk's role here is mainly that of coordinating the development work and implementation.

A comprehensive system for planning the rational procurement of raw materials also needs to include decision support for logging and delivery planning, together with road maintenance. The R&D work for decision support to a great extent must be incorporated into the development of operational planning models for other forestry activities.

A functional and rational timber procurement system is dependent on efficient communications and the fast transfer of current relevant data to the different players in the system. We therefore urgently need to create a unified digital chain the main elements of which will include standardization and coordination of the communication medium, and the development of communications support for logging machines and roundwood haulage vehicles.

6. Knowledge communication

Research findings are of no real value until the research has been published. A piece of research is not complete until the findings have been clearly communicated to the relevant target groups. Skogforsk shall therefore focus closely on communicating the needs-driven findings effectively, and with assured quality, to the relevant target groups.

The principal target groups are to be found in the Swedish forestry organizations, where a high level of decentralization makes it essential that the relevant knowledge is available not only to specialists but also to those working on the periphery of the organization – supervisors, team leaders, forestry contractors, family-forest enterprises, etc. Only then can forest policy, new technology and new methods be implemented successfully.

By actively disseminating new and established knowledge, Skogforsk shall continue to be one of the forestry sector's most important communicators of knowledge and provider of training courses, thus actively contributing to ever higher levels of competence in the companies and personnel groups in the industry.

The interest in forestry issues taken by the world at large, and the influence that it brings to bear, means that it is essential that we communicate forestry knowledge and reliable information to the general public, the media, the authorities, and other recipients outside the forestry sector. Given the importance of the reliance that the Swedish forestry sector, the research bodies, and the country as a whole have on our international relations, the information we disseminate, where relevant, should also have an international focus.

Scientific publications are an intrinsic part of our activities; for instance, in areas such as research training, and in quality assurance of our R&D work.

In communication activities as a whole, we aim to achieve the highest level of self-financing, which enhances the quality of the work and is beneficial to the needs of the customer. The successful communication of knowledge requires exhaustive work on target-group adaptation, necessitating the use of a variety of media. Alongside the work of continuous adaptation of those channels that have already been established,

we shall endeavour to pursue ongoing development and to introduce new channels, where the focus will be on communicating rather than sending functions. Internet-based interactive knowledge systems are one example of such work.

7. Skills enhancement

Sustainable high-quality work under the framework programme is conditional on active skills enhancement being available for all Skogforsk personnel, not least through needs-driven further training. One aspect of this work is to maintain and develop scientific competence. Scope must also be made available for the development and testing of new methods of research and information, and for providing the necessary technical aids.

Close collaboration between the forestry sector and the research bodies helps to promote, in a natural way, the competence of the personnel. This can be strengthened further to some extent by Skogforsk personnel acting as mentors for students and/or functioning as assistant professors at other research institutes. Attending relevant national and international conferences is one way to disseminate knowledge of one's own research but also to acquire for oneself and for Swedish forestry valuable knowledge from external sources.

An important element in successful R&D work is to discover at an early juncture new opportunities for development, the need for change, possible threats, etc. Accordingly, resources must be made available for monitoring and analysis of trends and events in both the forestry sector and the world at large, nationally and internationally. Furthermore, there should also be an opportunity alongside the routine R&D work for freer research and communication activities, the testing of ideas, future analysis, etc.

Appendix C

Homepages and links

Homepage	URL:	Link:
The board (Eng)	http://www.skogforsk.se	About Skogforsk, Organisation
The board (Swe)	http://www.skogforsk.se	About Skogforsk, Organisation
The Advisory groups (only in Swedish)	http://www.skogforsk.se	Cooperation, Advisory groups
Annual report (Eng)	http://www.skogforsk.se	About Skogforsk
Annual report (Swe)	http://www.skogforsk.se	About Skogforsk, Operations

Appendix D

Number off staff by education

Number of staff by education at year end

	2007	2006	2005	2004	2003
R&D					
MSc Forestry	38	39	38	37	39
BSc Forestry	6	6	7	5	7
MSc Engineering	6	6	6	6	6
MSc Nat. Sciences	7	6	6	5	5
Technicians	8	7	6	5	5
Sum R&D staff	65	64	63	58	62
Admin & communications					
MSc Forestry	4	5	6	6	6
MSc other disciplines	7	6	6	6	7
Other	8	8	8	9	12
Sum Admin & communications	19	19	20	21	25
Field staff	17	15	15	17	22
Sum total permanent staff	101	98	98	96	109
Temporary R&D staff	10	9	8	9	8
PhD:s in R&D perm. staff					
Forestry	23	23	23	22	25
Other nat. sciences	5	6	6	5	6
Engineering	1	1	1	2	1
Sum R&D	29	30	30	29	32
Admin & communications	2	2	2	2	1
Temp. R&D-staff	3	2	2	3	5
Sum total PhD	34	34	34	34	38
Of above:					
Professors	5	4	4	5	4
Lecturers	6	4	4	4	4
Staff in PhD studies	8	5	5	4	2

Appendix E

Annual funding by area

Annual funding by area, SEK 1,000
FWP = Framework program, Ext = External, Tot = Total

	2003			2004			2005			2006			2007		
Area	FWP	Ext	Tot	FWP	Ext	Tot	FWP	Ext	Tot	FWP	Ext	Tot	FWP	EXT	Tot
R&D Forest	25188	24835	50023	24792	25646	50438	22717	26101	48818	23633	29410	53043	21200	35925	57125
Production															
R&D Wood	18218	14921	33139	21363	8190	29553	23792	9174	32966	24435	10809	35244	26199	13021	39220
Supply															
Competence	3325	693	4018	3144	675	3819	5715	194	5909	4944	1	4945	3524	888	4412
development															
Communications	3326	7837	11163	3742	8277	12019	3192	6378	9570	4243	8716	12959	3137	7309	10446
Other	2994	5606*	8600	1663	9689*	11352	2184	17091*	19275	345	16588*	16933	3540	14267*	17807
Total	53051	53892	106943	54704	52477	107181	57600	58938	116538	57600	65524	123124	57600	64162	129010

* Incl. reserved forest sector grants

Appendix F (in Swedish only)

Report on replies to questionnaires used to evaluate relevance and dissemination

Enkät till styrelse och rådgivande grupper

1. Enkäten kommer att behandlas konfidentiellt. Jag godkänner att mina svar registreras i databasen.

Ja	100 %
Nej	0 %
Totalt	37 svar

2. Jag är med i

Skogforsks styrelse	43,2 %
RG Skogsproduktion	35,1 %
RG Virkesförsörjning	21,6 %
Totalt	37 svar

3. Är det en kostnadseffektiv lösning att Skogforsk bedriver tillämpad forskning för hela det svenska skogsbrukets räkning?

Ja, mycket	75,7 %
Ja, till viss del	18,9 %
Nej, inte särskilt	0 %
Nej, inte alls	0 %
Vet ej	5,4 %
Totalt	37 svar

4. Arbetar Skogforsk med rätt forskningsuppgifter?

Ja, helt rätt	32,4 %
Ja, till viss del	64,9 %
Nej, sällan	0 %
Nej, inte alls	0 %
Vet ej	2,7 %
Totalt	37 svar

5. Påverkar skogsbruket inriktningen på Skogforsks arbete?

Ja, mycket	75 %
Ja, till viss del	25 %
Nej, inte särskilt	0 %
Nej, inte alls	0 %
Vet ej	0 %
Totalt	36 svar

6. Bedrivs Skogforsks verksamhet kostnadseffektivt?

Ja, mycket	32,4 %
Ja, till viss del	40,5 %
Nej, inte särskilt	0 %
Nej, inte alls	0 %
Vet ej	27 %
Totalt	37 svar

7. Får skogsbruket valuta för de pengar man satsar i Skogforsk?

Ja, mycket	40,5 %
Ja, till viss del	51,4 %
Nej, sällan	0 %
Nej, inte alls	0 %
Vet ej	8,1 %
Totalt	37 svar

8. Anstränger sig Skogforsk tillräckligt för att publicera sina forskningsresultat?

Ja, alltid	78,4 %
Ja, till viss del	21,6 %
Nej, sällan	0 %
Nej, inte alls	0 %
Vet ej	0 %
Totalt	37 svar

9. Vilka typer av publikationer från Skogforsk har du tagit del av det senaste året?

Nytt	25,4 %
Resultat	25,4 %
Redogörelser	19,7 %
Plantaktuellt	11,3 %
Handböcker	3,5 %
Kunskap direkt (hemsidan)	14,1 %
Filmer	0,7 %
Inte någon	0 %
Totalt	37 svar

10. Är Skogforsks publikationer bra?

Ja, mycket	78,4 %
Ja, till viss del	21,6 %
Nej, inte särskilt	0 %
Nej, inte alls	0 %
Vet ej	0 %
Totalt	37 svar

11. Vilka typer av aktiviteter i Skogforsks regi (förutom styrelse- och RG-möten) har du varit med på under det senaste året?

Kurser	6,8 %
Konferenser	34,1 %
Exkursioner	11,4 %
Övrigt	6,8 %
Inte någon	40,9 %
Totalt	37 svar

12. Är Skogforsk bra på att anordna kurser, konferenser och exkursioner?

Ja, mycket	73 %
Ja, till viss del	21,6 %
Nej, inte särskilt	0 %
Nej, inte alls	0 %
Vet ej	5,4 %
Totalt	37 svar

13. Är Skogforsks kurser och konferenser prisvärda?

Ja, alltid	21,6 %
Ja, till viss del	54,1 %
Nej, sällan	13,5 %
Nej, inte alls	0 %
Vet ej	10,8 %
Totalt	37 svar

14. Kan man alltid lita på forskningsresultat från Skogforsk?

Ja, alltid	56,8 %
Ja, till viss del	43,2 %
Nej, sällan	0 %
Nej, inte alls	0 %
Vet ej	0 %
Totalt	37 svar

15. Går det att tillämpa Skogforsks forskningsresultat?

Ja, alltid	8,3 %
Ja, till viss del	86,1 %
Nej, sällan	0 %
Nej, inte alls	0 %
Vet ej	5,6 %
Totalt	36 svar

16. Tillämpas Skogforsks resultat tillräckligt i skogsbruket?

Ja, mycket	5,4 %
Ja, till viss del	62,2 %
Nej, sällan	13,5 %
Nej, inte alls	5,4 %
Vet ej	13,5 %
Totalt	37 svar

17. Anstränger sig Skogforsk tillräckligt för att deras forskningsresultat ska tillämpas i skogsbruket?

Ja, alltid	18,9 %
Ja, till viss del	62,2 %
Nej, sällan	8,1 %
Nej, inte alls	0 %
Vet ej	10,8 %
Totalt	37 svar

18. Anstränger sig skogsbruket tillräckligt för att tillgodogöra sig och tillämpa forskningsresultaten från Skogforsk?

Ja, alltid	0 %
Ja, till viss del	64,9 %
Nej, sällan	21,6 %
Nej, inte alls	2,7 %
Vet ej	10,8 %
Totalt	37 svar

19. Skulle en större samverkan mellan Skogforsk och skogsbruket medföra att resultaten tillämpas ytterligare?

Ja, säkert	51,4 %
Ja, till viss del	40,5 %
Nej, inte troligt	0 %
Nej, inte alls	0 %
Vet ej	8,7 %
Totalt	37 svar

Enkät till fältpersonal

1. Enkäten kommer att behandlas konfidentiellt. Jag godkänner att mina svar registreras i databasen.

Ja	98 %
Nej	2 %
Totalt	50 svar

2. Jag arbetar huvudsakligen med

Skogsodling/Föryngring	2 %
Skogsvård/ Skogsskötsel	32,7 %
Avverkning/ Virke	30,6 %
Transport/Vägar	10,2 %
Natur/Miljö	4,1 %
Annat	20,4 %
Totalt	49 svar

3. Jag arbetar på

Stab	32,7 %
Region	32,7 %
Distrikt	32,7 %
Övrigt	2 %
Totalt	49 svar

4. Är det bra att Skogforsk bedriver tillämpad forskning för hela det svenska skogsbrukets räkning?

Ja, mycket	81,6 %
Ja, till viss del	16,3 %
Nej, inte särskilt	0 %
Nej, inte alls	0%
Vet ej	2 %
Totalt	49 svar

5. Arbetar Skogforsk med rätt forskningsuppgifter?

Ja, helt rätt	26,5 %
Ja, till viss del	65,3 %
Nej, sällan	0 %
Nej, inte alls	0 %
Vet ej	8,2 %
Totalt	49 svar

6. Påverkar skogsbruket inriktningen på Skogforsks arbete?

Ja, mycket	18,4 %
Ja, till viss del	61,2 %
Nej, inte särskilt	6,1 %
Nej, inte alls	0 %
Vet ej	14,3 %
Totalt	49 svar

7. Anstränger sig Skogforsk tillräckligt för att publicera sina forskningsresultat?

Ja, alltid	42,9 %
Ja, till viss del	46,9 %
Nej, sällan	2 %
Nej, inte alls	0 %
Vet ej	8,2 %
Totalt	49 svar

8. Vilka typer av publikationer från Skogforsk har du tagit del av senaste året?

Nytt	25,2 %
Resultat	29,6 %
Redogörelser	15,7 %
Plantaktuellt	7,5 %
Handböcker	8,2 %
Kunskap direkt (hemsidan)	11,3 %
Filmer	1,9 %
Inte någon	0,6 %
Totalt	49 svar

9. Är Skogforsks publikationer bra?

Ja, mycket	49 %
Ja, till viss del	49 %
Nej, inte särskilt	0 %
Nej, inte alls	0 %
Vet ej	2 %
Totalt	49 svar

10. Vilka typer av aktiviteter i Skogforsks regi har du varit med på under det senaste året?

Kurser	6,9 %
Konferenser	44,8 %
Exkursioner	8,6 %
Övrigt	3,4 %
Inte någon	36,2 %
Totalt	49 svar

11. Är Skogforsk bra på att anordna kurser, konferenser och exkursioner?

Ja, mycket	51 %
Ja, till viss del	36,7 %
Nej, inte särskilt	0 %
Nej, inte alls	0 %
Vet ej	12,2 %
Totalt	49 svar

12. Är Skogforsks kurser och konferenser prisvärda?

Ja, alltid	12,2 %
Ja, till viss del	63,3 %
Nej, sällan	8,2 %
Nej, inte alls	0 %
Vet ej	16,3 %
Totalt	49 svar

13. Kan man alltid lita på forskningsresultat från Skogforsk?

Ja, alltid	24,5 %
Ja, till viss del	69,4 %
Nej, sällan	0 %
Nej, inte alls	0 %
Vet ej	6,1 %
Totalt	49 svar

14. Går det att tillämpa Skogforsks forskningsresultat?

Ja, alltid	0 %
Ja, till viss del	91,8 %
Nej, sällan	4,1 %
Nej, inte alls	0 %
Vet ej	4,1 %
Totalt	49 svar

15. Tillämpas Skogforsks resultat tillräckligt i skogsbruket?

Ja, mycket	2 %
Ja, till viss del	63,3 %
Nej, sällan	16,3 %
Nej, inte alls	0 %
Vet ej	18,4 %
Totalt	49 svar

16. Anstränger sig Skogforsk tillräckligt för att deras forskningsresultat ska tillämpas i skogsbruket?

Ja, alltid	6,1 %
Ja, till viss del	44,9 %
Nej, sällan	24,5 %
Nej, inte alls	0 %
Vet ej	24,5 %
Totalt	49 svar

17. Anstränger sig skogsbruket tillräckligt för att tillgodogöra sig och tillämpa forskningsresultaten från Skogforsk?

Ja, alltid	2 %
Ja, till viss del	44,9 %
Nej, sällan	36,7 %
Nej, inte alls	0 %
Vet ej	16,3 %
Totalt	49 svar

18. Skulle en större samverkan mellan Skogforsk och skogsbruket medföra att resultaten tillämpas ytterligare?

Ja, säkert	75,5 %
Ja, till viss del	20,4 %
Nej, inte troligt	0 %
Nej, inte alls	0 %
Vet ej	4,1 %
Totalt	49 svar

Formas, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, is a governmental research-funding agency. Formas encourages and supports scientifically significant research related to sustainable development.



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*The Swedish Research Council for Environment, Agricultural Sciences and
 Spatial Planning*

P.O. Box 1206, SE-111 82 Stockholm, Sweden. Visitors: Kungsbron 21
 Phone: +46 (0)8 775 40 00, Fax: +46 (0)8 775 40 10
 E-mail: info@formas.se, www.formas.se