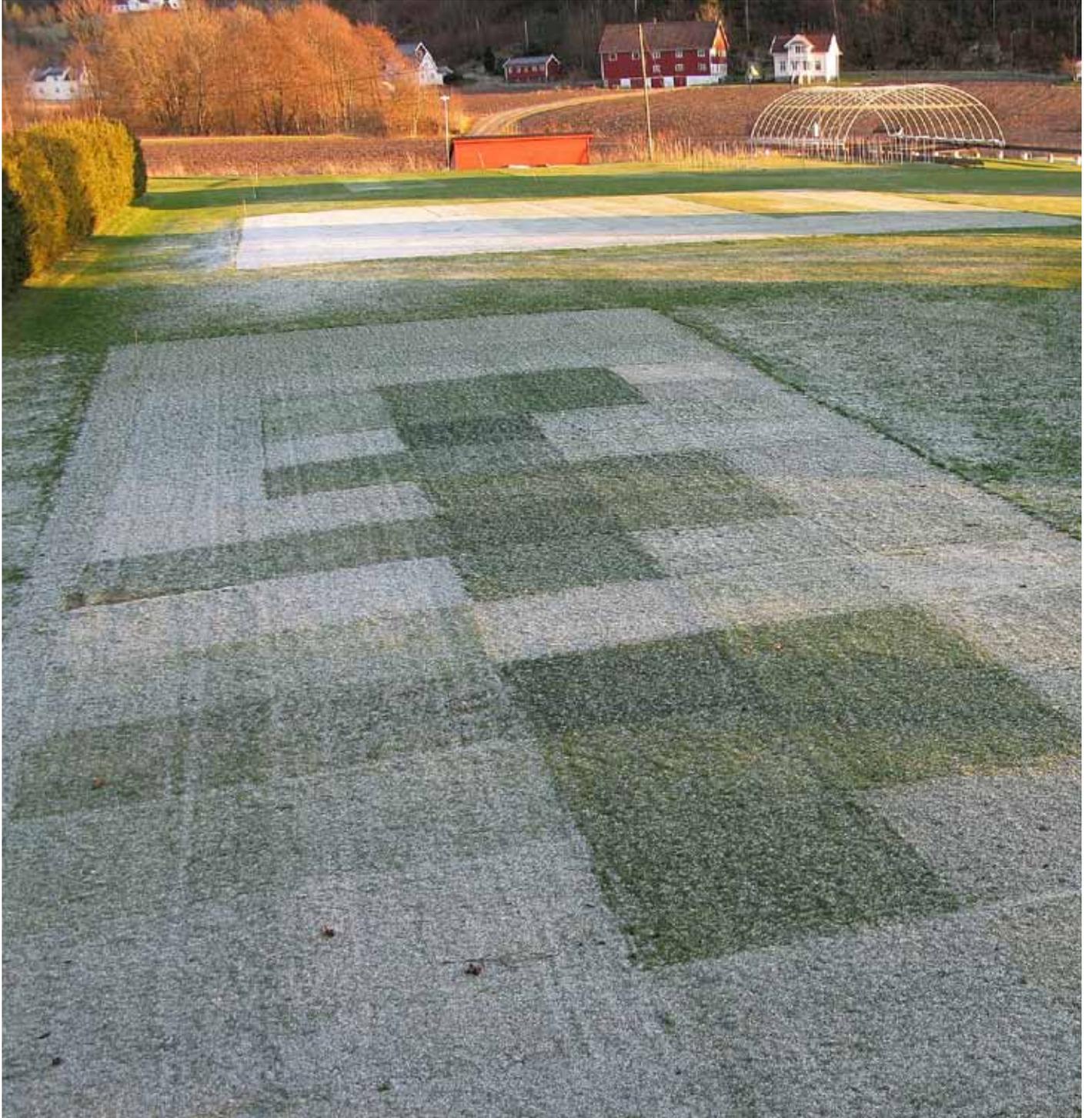


RESEARCH PROGRAMME



Sterk

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RESEARCH PROGRAMME

STERF is an independent research foundation that supports existing and future R&D efforts and delivers 'ready-to-use' research results that benefit the golf and turfgrass sector. STERF was set up in 2006 by the golf federations in Sweden, Denmark, Norway, Finland, Iceland and the Nordic Greenkeepers' Associations. Research financed by STERF should be carried out at universities or research institutes (or equivalent) where most relevant research capacity is concentrated. STERF helps to strengthen research capacity by encouraging and supporting networks and collaborating actively with international key organisations in the field of turfgrass management. STERF receives funding from participating golf associations, which can be complemented by funding from other sources.

STERF's vision is to be the leading international centre of expertise in sustainable golf course management.

To achieve the vision STERF will focus on:

- Ensuring Nordic turfgrass research and development focuses on internationally important areas where concerted research and industrial effort is required. These include the pressures from government demands for greater environmental regulation, the increasing pressure on natural resources (notably water, energy and land), the emerging role of turf management in supporting ecosystem services and enhancing biodiversity, the continued need to promote integrated pest management, and the looming challenges posed by a changing climate, and urgent need to adapt.
- Establishing a successful international research and development collaboration, including research facilities and expertise in all five Nordic countries. STERF will continue to initiate inter and multi-disciplinary research and support collaboration in Europe, Canada,

USA and China, involving both researchers and stakeholders interested in land used for managed turfgrass areas.

- Developing and expanding the STERF industrial scientific partner programme by collaborating with leading international companies within the sector to further strengthen the strategy that research and development should be integrated from producer to end-user. The STERF industrial scientific programme can be found on: <http://sterf.golf.se>
- Taking a lead in making research results and new knowledge easily accessible to end-users and to provide support to implement changes, a prerequisite for achieving improvements in the sustainable management of golf courses and other turfgrass areas.
- Making the turfgrass industry in the Nordic countries a role-model regarding responsibility for sustainable societal development, i.e. to produce managed turfgrass areas of a high standard while at the same time ensuring the sustainable use of natural resources and contributing to functioning ecosystems.

This programme is created in collaboration with the golf and turfgrass industry. STERF also arranges innovation workshops to help identify the golf and turfgrass industry's future research needs, where researchers and industry representatives contribute to the planning process.



BACKGROUND

Managed turfgrass areas such as golf courses, sport fields, landscaped amenity areas and public parks all provide an important social, environmental and economic resource for both urban and rural communities. These areas serve a multifunctional purpose by offering valuable open spaces for recreation, helping to improve the health and quality of life for individuals and, when designed and managed appropriately, enhancing biodiversity and supporting regulatory targets for environmental protection. Conversely, where turfgrass management practices are inadequate or inappropriate, their services to society are reduced, and their impacts on the natural environment can be damaging and costly.

The challenges for the future of turfgrass and golf course management are many and diverse, and focus on increasing demands on natural resources (notably land use, water resources and energy) driven by economic development and population growth, coupled with government demands for greater environmental protection are creating conflicts at the interface between land management (including turfgrass) and the environment. The situation is particularly acute in peri-urban areas where the majority of managed turfgrass facilities are concentrated. Population growth, migration and climate change will exacerbate the current situation, by increasing the competition for resources between individual sectors, including agriculture, urban development, tourism and the environment.

Many golf courses, sport facilities and stadia are under pressure due to the financial crisis of recent years. For example, in many countries there has been a decrease in the number of registered golf players. It is common for golf courses to base their financial stability based on a constant inflow of members rather than a static membership. However, they are now facing the challenge of balancing this approach against the new concept of members and new conditions in a more variable and more competitive market.

The key for golf course and turfgrass management will be to increase resource use efficiency, reduce maintenance costs

and minimize the environmental impact. In this context, the protection and enhancement of ecosystem services will need to be fully integrated into the planning, design, construction and management of all golf and turfgrass facilities.

The Nordic golf federations have approx. 900 000 members, playing golf on more than 900 courses that cover a total area of more than 58 000 ha. Any societal activity as significant as golf must take responsibility for building knowledge through research and development (R&D). There are several important reasons why Nordic R&D is necessary. In Central Scandinavia, Oslo, Stockholm and Helsinki lie at the same latitude as the southern tip of Greenland (~60°N). This provides a unique climate resulting from a combination of factors such as light, temperature and precipitation during the playing season and particularly during the winter season. The Nordic climate creates conditions for plant growth and the construction and management of golf courses, sport fields etc. that are not found anywhere else in the world.

R&D is, and will continue to be, a necessary and strategically important investment for the Nordic golf sector in achieving economically and environmentally sustainable golf facilities of a high standard and in establishing the credibility of golf as an environmentally friendly sport. Golf facilities that are already using new knowledge are achieving cost savings through more efficient management strategies, while also enhancing the golf course, raising the profile of the golf facility and improving the environment.

The financial resources allocated to R&D in each country are very limited and the number of scientists actively working within each priority R&D area is also quite limited compared with agricultural and forestry research. The financial resources and efforts of these researchers should therefore be coordinated through STERF to optimize R&D within the golf and turfgrass sector.



CHALLENGES

Over the next decade, the golf and turfgrass industry faces a number of major challenges, including providing a high quality arena for golf and other sports, and at the same time responding to increased environmental regulation, rising pressure on natural resources and rising operating costs of key inputs including labor, energy and fertilizers. The industry also needs to plan for adaptation to climate change and play a credible part in minimising factors affecting climate changes.

National and international regulations

European governments and society are seeking to achieve greater levels of environmental protection. All sectors including turfgrass management will inevitably be subject to increasing levels of environmental regulation and monitoring. As a consequence, golf and turfgrass facilities are under scrutiny to demonstrate compliance with national and international regulations, including for example, the EU Directives relating to Pesticides, Habitats, Water, Soil, Nitrates and Pollution. Although there are many examples of best practice within specific turfgrass sectors (e.g. golf), there are also well publicized examples of mal-practice, and hence significant opportunities to improve existing levels of management, knowledge and awareness across the broader

turfgrass industry. The golf and turfgrass industry should take a lead in research and development, training, knowledge transfer and dissemination of best practice, not only for existing venues and but leading innovation in the design and management of new golf- and sportsturf facilities.

High quality playing surfaces and Integrated Pest Management (IPM)

The production of healthy turf while safeguarding environmental quality and providing a toxin-free environment is a high priority within the European Union. In this context, the golf and turfgrass industry must play its part by providing high playing quality and at the same time reducing dependence on chemical plant protection products. The EU Directive has introduced an integrated approach to pest and disease management as the driving force for producing healthy turf and to reduce the use of and dependence on pesticides. The main focus of IPM is a decision making process utilizing all suitable techniques to produce high quality turf and to minimize pest damage and pesticide use below those causing economically unacceptable damages or loss. The implementation and success of IPM requires increased focus on education and development of documentation tools. In addition, research and development will be key.



Natural resources and climate change

The downward pressure on our natural resources and capital, including land, water and energy is of major global concern. Reducing resource consumption and increasing resource efficiency will be key. From a golf and turfgrass industry perspective, it also makes business sense to reduce costs and waste through efficient consumption of water, energy, materials and fertilisers. New knowledge and research results can help the sector become more efficient and hence reduce consumption of natural resources.

Changes in climate will have significant and profound implications for the turfgrass industry which relies on natural resources and co-existence with the environment. For turfgrass facilities investing in new infrastructure, many will need to factor in the costs of a changing climate, and develop appropriate adaptation strategies to cope with greater uncertainty and extremes in rainfall and temperature. Climate change will also influence turfgrass growth and agronomy, with impacts on pest and disease control, and the need for irrigation and drainage.

Ecosystem services and biodiversity

The living conditions of people are influenced by our ability to co-exist with ecosystems and utilise them without over-exploitation. To halt the loss of biodiversity and the degradation of ecosystem services, the sustainable management of both the natural environment and cultural landscape needs to be achieved. From an ecosystem management perspective, golf courses represent a promising measure for restoring and enhancing biodiversity in ecologically simplified landscapes, such as agricultural and urban lands. Golf courses could offer real potential to be designed and managed to promote critical ecosystem services, such as for pollination and natural pest control, providing an opportunity for joint collaboration between conservation, restoration and recreational interests. Golf courses could also have the potential to contribute to supporting wetland fauna, particularly in urban settings where they could contribute significantly to wetland creation.

Golf courses include large areas of land that are not used for the game of golf. Therefore there could be potential for better use of the land in order to provide new opportunities for active outdoor life for other groups in addition to golfers.



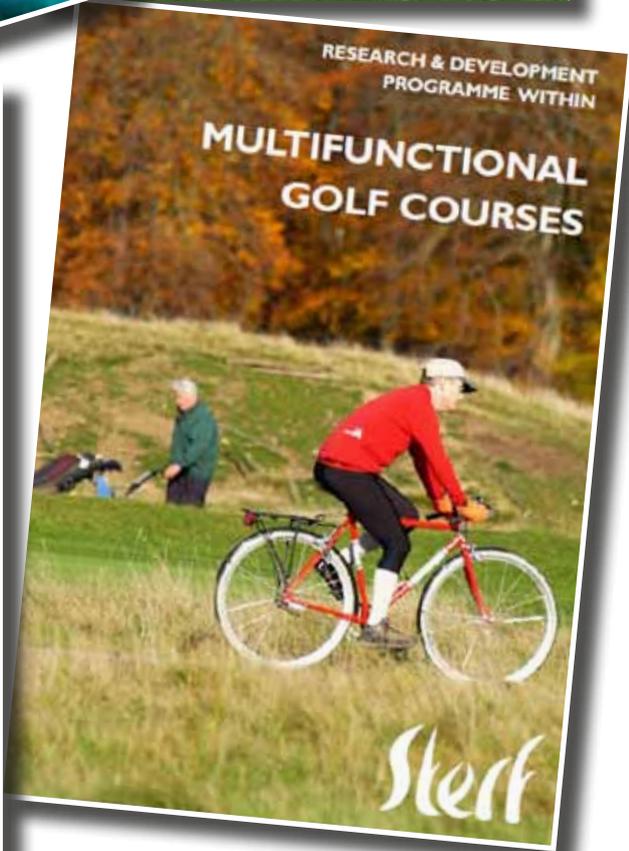
THE NORDIC GOLF SECTOR'S VISION

The Nordic golf sector's vision with respect to golf course quality and the environment is:

To promote high-quality golf courses, whilst guaranteeing that ecosystem protection and enhancement are fully integrated into golf facility planning, design, construction and management.

The aim of STERF is to support R&D that can help the golf sector fulfil this vision. The activities of STERF are intended to lead to improvements in golf course quality, as well as economic and environmental gains. The strategic objectives for STERF funded R&D activities include:

- The design, construction, management and administration of golf courses to provide optimal conditions for playing quality, degree of utilisation of the course and management inputs.
- The design, construction, management and administration of golf courses is economically and environmentally sustainable, for example with respect to plant nutrient requirements, water and energy use, drainage and control of weeds and plant diseases.
- Golf courses contribute to production of biological diversity, the conservation of natural and cultural environments and the retention and expansion of ecosystem services, and to improving the conditions for good quality of life and health e.g. through providing a broader active outdoor life, experiences of nature and better climate adaptation in the everyday landscape.



R&D SUB-PROGRAMMES

It is apparent that the golf and turfgrass industry faces a number of local and international challenges, all of which will need concerted and collective solutions, underpinned by robust, applied science. To meet the challenges the sector has to face STERF has created four international and trans-disciplinary R&D sub-programmes, including:

- Integrated pest management;
- Sustainable water management;
- Turfgrass winter stress management, and;
- Multifunctional use of golf facilities.

Progress in these programme areas will collectively lead to improvements in the quality of managed turfgrass areas as well as economic and environmental gains for the industry. The key objectives of the programmes are to coordinate design and running of R&D activities, and to manage the effective dissemination of outputs (new knowledge) through channels and formats which are easily accessible to end-users. STERF shall play a key role expanding the programmes on an international level.

Integrated pest management

New regulations at national, and international levels related to the turfgrass industry are becoming more demanding. A good example is the EU Directive on sustainable use of pesticides including strategies for integrated pest management. STERF together with the Nordic park and golf sector, universities, research institutions and authorities takes responsibility for ensuring that R&D activities that are important for integrated pest management are coordinated and executed and that new knowledge is delivered.

Sustainable water management

Water is essential to secure the future of the turf industry and the livelihoods of many rural communities that depend upon it. Working with industry and leading research institutes, STERF's goal is to provide science-based information to practitioners and stakeholders on integrated water management in turf. This will improve management practices relating to both irrigation and drainage systems; help protect environmental water quality and support the industry to adapt to future changes in rainfall and climate variability on water resources.

Turfgrass winter stress management

Winter damage is the foremost reason for dead grass, reducing the aesthetic and functional value of turf. UN-IPCC climate scenarios predict that due to high precipitation and unstable temperature, ice and water damage will become the most important cause of winter damage in the future. This is a complex but high priority area for STERF, as it has been estimated that about 70% of Nordic golf courses suffer from winter damage each year, and that the associated average annual costs per golf course are €35 000-40 000. STERF will take responsibility for developing strategic expertise and new knowledge to avoid and manage such damage.

Multifunctional use of golf facilities

Multifunctional golf courses can contribute to the achievement of international and national environmental targets and help improve people's health and quality of life by providing facilities for active outdoor recreation. Through STERF's R&D programme within multifunctional facilities, the Nordic area can become a model region as regards multifunctional golf courses and collaborations between different interests in society. Four central research and development areas has been identified; (1) the everyday landscape and peri-urban nature, (2) nature and culture, (3) dialogue and cooperation, and (4) business promotion.

Programme coordinators

Programme coordinators appointed by STERF are, together with STERF board and director, responsible for developing STERF R&D-programmes.

Overarching duties to be fulfilled by the programme coordinators are:

- to be a 'Champion' or nominal lead for their programme;
- to make sure that the programme has a suitable mix of activities, not only research but other industry-linked initiatives too, including for example meetings, workshops, and media outputs;
- to help share programme workload, and;
- to take 'ownership' of the activities/initiatives that need to be developed over the next 3 years.

The full R&D programmes and presentation of programme coordinators can be found on <http://sterf.golf.se>



COMMUNICATION

STERF's ambition is to take a proactive lead in making new research results and knowledge easy accessible to end-users and to provide support to implement changes, which is a prerequisite for achieving improvement in the sustainable management of golf courses and other turfgrass. This places great demands on effective communication of R&D activities and the results these produce. STERF ensures that R&D projects result in the formulation of practically useful programmes of measures and recommendations. Research findings obtained within projects funded by the STERF are made available to all interested parties.

An effective dialogue between researchers and practitioners is necessary to identify research priorities in new fields and to ensure that newfound knowledge is transferred into practice. Seminars, workshops and conferences are arranged by STERF to facilitate this dialogue. To guarantee continuous implementation of new knowledge, managers of STERF-funded project must appoint, when applicable, a reference group of scientists, experienced practitioners and agronomists from at least two of the Nordic countries for each project or research area.

Results from ongoing STERF-funded research projects are continuously presented in scientific publications, handbooks and fact sheets with practical advice and recommendations, popular scientific articles, newsletters, and made available on the STERF website. These results are updated at least annually and also presented in the STERF yearbook. Demonstration trials could play a vital part in making research findings easily available to interested parties. Demonstration trials could be the last stage of a project or a group of projects.

Each Nordic golf federation, together with the leaders of STERF-funded projects, are responsible for the dissemination of STERF research results and new knowledge and STERF's R&D programmes. Each national golf federation is responsible for setting up and revising a two-year communication plan and establishing routes for communication and dissemination. Some R&D seminars must be arranged by the golf federations every year. The golf federations are responsible for translating STERF's practical handbooks and fact sheets to the relevant Nordic language.



INTERNATIONAL COLLABORATION

Research is an international endeavour. STERF's involvement in international R&D partnerships aims to promote and foster international contacts, so that we can exchange new ideas and recent advances in knowledge. STERF will also take an active role in arranging and supporting international R&D conferences, for example the ITRC 2021. Arranging and participating in these international exchanges and R&D networks enables STERF to continue to guarantee that our own R&D maintains a high international standard.

The STERF research programmes should continue to focus on issues and research areas with high priority for the Nordic countries, even when co-operating with international golf and sport federations.

In addition to this international R&D network at the administrative level, individual researchers should be encouraged to develop international contacts that could benefit their own project, as well as STERF in general.

ORGANISATION AND OPERATION

STERF Board, Advisory committee and Director

The Board is the governing body for STERF and has representatives from all five Nordic golf federations, two scientific representatives not representing any particular country and one representative of the Nordic greenkeepers' organisations.

The Advisory committee and the committee sub-groups are responsible for evaluating and prioritizing research proposals for funding. The Committee includes representative researchers, agronomists and practitioners, including one representative from each of the national greenkeepers' organisations. The Board appoints the Committee members every year.

The Director participates in all meetings of the STERF Board and chairs the Advisory Committee.

Details on the STERF board, advisory committee and director can be found on sterf.golf.se

FUNDING RESEARCH

Information relating to calls for proposals, procedures for evaluation and decisions on project proposals and funding of R&D projects can be found at sterf.golf.se

CONTACT INFORMATION

If you have any questions about STERF R&D-programme, please contact:

Maria Strandberg, STERF Director

E-mail: maria.strandberg@golf.se

Telephone: + 46 70 620 17 87

Bruno Hedlund, STERF Board, Chair

E-mail: Bruno.hedlund@sik.se

Telephone: + 46 704 20 56 34



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