

RESEARCH & DEVELOPMENT
PROGRAMME WITHIN

MULTIFUNCTIONAL GOLF COURSES



Sterk



SUMMARY AND CONCLUSIONS

In this programme we describe the current position and present the need for research, development and communication so that golf courses can be transformed into more multifunctional facilities. Through the programme, we also want to demonstrate the potential of the golf sector to contribute to the achievement of important international and national environmental quality objectives, to improving people's health and quality of life, and to implementation of the European Landscape Convention. In addition, we want to show that a multifunctional approach can be profitable for individual golf courses.

Multifunctional golf courses are currently an underutilised resource. If golf courses were to be used to supply a number of functions, this would provide a range of important services that are in demand by society. In addition to offering a high quality arena for golf, golf facilities could also contribute e.g. to improving biological diversity, conserving natural and cultural environments and providing recreation areas that are open to the public and outdoor activities.

Many golf courses are currently experiencing economic problems and are attempting to find new ways of supporting and expanding their operations. Multifunctionality can provide opportunities for alternative income, anchorage within the local community through work on the environment and sustainable development, better cooperation and in many cases cost sharing with the authorities, environmental and outdoor recreation organisations and other sports associations, a better public profile and stronger political support.

The aim of the R&D programme is to create the conditions for development of greater numbers of multifunctional golf courses. In order for this to be achieved, greater competence is needed at all levels within the golf sector and among other parties in society that are interested in the land used for golf courses. The following questions must be answered:

- How can golf courses contribute to the production of biological diversity, the conservation of natural and cultural environments and the retention and expansion of ecosystem services in periurban environments and the cultivated landscape?
- How can the societal benefit of golf courses be improved through increasing accessibility and participation, thereby improving the conditions for good quality of life and better mental and physical health for more groups in society, e.g. through providing a broader active outdoor life, experiences of nature and better climate adaptation in the everyday landscape?
- How can the business advantages of multifunctional activities be identified and expanded for different types of golf facilities?

STERF has identified four central research and development areas in order to answer the questions above:

1. The everyday landscape and periurban nature.
2. Nature and culture.
3. Dialogue and cooperation.
4. Business promotion.



MULTIFUNCTIONAL GOLF COURSES

Earlier work in the Nordic countries

During 2010 and 2011, the Scandinavian Turfgrass and Environment Research Foundation (STERF), the joint research body of the Nordic golf associations, carried out a pilot project entitled '*Multifunctional golf courses – an unutilised resource*' with support from the Nordic Council of Ministers (Strandberg et al., 2011). The project identified and described examples of multifunctional activities at seven Nordic and one Dutch golf course. These examples show that a multifunctional golf course can provide opportunities to develop a range of services that are in demand by society, for example increasing biological diversity, conserving nature and culture values and making them available to the public, and creating areas for recreation and outdoor activities for a number of groups other than golf players. The study also showed that cooperation is a critical factor for multifunctionality. Some examples show that multifunctional activities can be profitable for golf courses while also strengthening their place in society through work on the environment and sustainable development (Nordiska Ministerrådet, 2008; Colding & Folke, 2009; Colding et al., 2009; Wernersson, 2009; Sörensson, 2010; Strandberg et al., 2011).

Hypotheses

Based on experiences from the pilot project '*Multifunctional golf courses – an unutilised resource*', STERF has formulated the following hypotheses:

- that multifunctional golf courses view their operations from a holistic perspective in which efficient use of green areas and public interest in nature and recreation is central. In addition to offering a high quality arena for golf, these facilities can contribute to the achievement of important international and national environmental quality objectives and to improving people's health and quality of life. The potential for this is particularly great in periurban environments and in the cultivated landscape, where a large number of golf courses are located and where competition for land is high.
- that golf courses can make a concrete contribution to implementation of the European Landscape Convention and promote cooperation on landscape issues. In and around major city areas, the land available to the public is limited. Multifunctional golf courses can be very significant in terms of varied uses and readily accessible recreation opportunities for many people in such areas. These golf courses can be a potential meeting place for outdoor activities, nature and sport and can promote democracy and integration in this active and efficient way. By developing procedures and methods for achieving this, golf courses can become practically applicable models and good examples of cooperation on landscape issues and assist in implementing the European Landscape Convention.
- that a multifunctional approach can be profitable for golf courses. It can provide opportunities for alternative streams of income, a better foundation in the local community through work in the environment and sustainable development, better cooperation and in many cases cost sharing with authorities, environmental and outdoor recreation organisations and other sports associations, a better public profile and stronger political support. More efficient use of land through multifunctionality can also be a necessary condition for extension of leases and securing land use for golf.



CHALLENGES AND OPPORTUNITIES FOR GOLF

Golf is an acreage-demanding sport which in the Nordic countries occupies more than 60 000 ha. The Nordic golf associations have more than 900 000 members, who play golf on over 900 golf courses. The corresponding figures for Europe are approximately 6 900 golf courses and 6 million registered golf players. An 18-hole golf course occupies on average 65-70 ha, of which approximately 20 ha are intensively managed and used playing surfaces such as tees, fairways and greens. The remaining area, 40-70%, is extensively managed natural land.

Nordic golf is facing a number of major environmental and societal challenges. Examples of these are: climate change, new regulations and restrictions, limited access to natural resources and weak interest and support from authorities, politicians and the public. In order to deal with these challenges, there is a need for new knowledge in a number of areas together with structured, efficient work on the environment and sustainable development. In order to secure this essential new knowledge, the golf sector is investing in research and development through STERF, which is the joint research body of the Nordic golf associations (see Appendix 1). STERF's complete research programme and information on its approximately 20 on-going research projects can be found at <http://sterf.golf.se>.

Since 2006, the number of registered golf players has consistently decreased. Many golf courses are therefore experiencing financial problems and are trying to find new ways of supporting and developing their operations. Around 40-70% of golf course land consists of areas that are not directly used for the game of golf. Many golf courses have a clubhouse with good facilities that are not being utilised to the optimum. If

parts of the course and the clubhouse can be used for activities other than golf, the golf club can attract a broader target group and the facility can be used more efficiently, which can generate alternative income or shared costs.

There are indications of great unused potential for multiple uses of golf courses, whether on playing surfaces, on other areas or in the clubhouse (Strandberg et al., 2011; Thulin, 2011). In order to exploit this potential and stimulate cooperation, STERF wants to increase research and development in order to take responsibility for:

- ensuring that golf courses have access to information and tools for developing multifunctional activities
- identifying and developing the business advantages of multifunctional activities in both the short and long term
- creating supporting data for discussions and information material that golf courses can use in dialogue and cooperation with local and regional authorities and organisations
- drawing up regulations and recommendations for how golf courses can be designed or adapted to support safer and broader outdoor recreation activities within their facilities
- determining the attitude of golf players to their course becoming more multifunctional and beginning to focus on new target groups through activities other than the game of golf.

OPPORTUNITIES AND RESPONSIBILITIES OF SOCIETY

The European Landscape Convention

The European Landscape Convention is the first international agreement to specifically present the landscape as a resource for multiple uses and an important precondition for sustainable development. Landscape changes must be able to occur in a way that enhances and develops the diversity and qualities of the landscape. The Landscape Convention also emphasises that the landscape is important for people's wellbeing and for their sense of belonging and feeling for a place. Upkeep, management and above all planning of the landscape is something positive that should involve local residents and others with links to the area (Sarlöv Herlin, 2012).

The European Landscape Convention provides us with a joint framework for the work of landscape development. It points out that the landscape is a shared asset and a shared responsibility, and that the work of conserving, planning and managing the landscape brings with it both responsibilities and entitlements for all. The development of multifunctional golf courses can comprise establishment or conversion of facilities and functions, with the aim of contributing to society's many different values, whether cultural, ecological, aesthetic, social or economic (European Landscape Convention 2012).

Environmental quality objectives

The environmental action programme drawn up by the Nordic Council of Ministers (NMR) contains two themes that can be clearly related to golf courses. These are: (1) Biological diversity and (2) landscape, natural and cultural environments and outdoor activities (Nordiska Ministerrådet, 2008).

1. Biological diversity

The loss of biological diversity is one of our greatest and most obvious environmental problems. Species and community restoration is a slow process and today species are disappearing to a much greater extent than

is natural. A combination of conservation, sustainable use and adaptation to new conditions should be the starting point for the work of achieving the objective of preventing the loss of biological diversity (Nordiska Ministerrådet, 2008; European Union, 2011). The Swedish Environmental Protection Agency's proposed action plan to build functional green infrastructure contains several areas in which multifunctional golf courses could be an important component in creating and maintaining green infrastructure in periurban environments and the agricultural landscape (Naturvårdsverket, 2011).

Examples of concrete environmental quality objectives that can be promoted by the development of multifunctional golf courses include (Regeringskansliet, 2011):

- Rich plant and animal life
- A rich cultivated landscape
- Living lakes and rivers

2. Landscape, natural and cultural environments and outdoor activities

It is important that natural and cultural values are utilised and developed and that outdoor recreation becomes an integral part of societal development. Access to nature areas, cultural environments and periurban outdoor activities are important for people's wellbeing and health (Kaplan et al., 1998; Lisberg-Jensen, 2008). In addition to good quality of life and better health, outdoor activities lead to increased environmental awareness and understanding of the importance of sustainable management of natural and cultural resources. It is important to reach out to the public with these values (Nordiska Ministerrådet, 2008).

- Examples of concrete environmental quality objectives and targets for good quality of life and better health that can be promoted by the development of multifunctional golf courses are (Regeringskansliet, 2011):

- A good built environment
- A rich cultivated landscape
- Living lakes and rivers
- Fresh air

Opportunities and responsibilities

It is important that various interests in society such as municipalities, official authorities, NGOs, land owners, residents, businesses and others better acknowledge the potential of the golf sector to contribute to implementation of the European Landscape Convention and to the achievement of national and international environmental quality objectives. It is therefore important that new knowledge is developed and good examples of multifunctional golf courses documented, and that these are communicated to societal interests.

It is also important that R&D activities relating to multifunctional golf courses are accommodated and prioritised by national and international authorities, for example those with responsibility for human health and quality of life, environmental quality objectives and implementation of the European Landscape Convention, and by other interests in society.

The social significance of golf courses as a meeting place for outdoor activities, nature, culture and sport and as a contributor to good health and a richer living environment for many different interests should be exploited and enhanced. The ambition should also be to protect and positively develop the environment on and around golf courses. It is important that this occurs in a way that strengthens local conditions and makes a positive contribution to the overall regional and local strategies within the environment, nature and leisure. Close cooperation is needed between authorities, organisations, associations, businesses and individuals so that the diversity of values in golf courses and the surrounding landscape are managed in a sustainable way.

Through the development of competences based on research and development on multifunctionality,

STERF together with the golf sector and other interests in society can:

- Help golf courses become a hub and an engine in implementation of the European Landscape Convention.
- Help maintain the value of ecosystem services, climate mitigation and high biological diversity in and around golf courses. Examples of this are cooperation on conservation measures to save threatened species and ecosystems, on making golf courses part of a network of ecological corridors, on providing functional green infrastructure and on collecting and purifying water from the surroundings.
- Take responsibility for presenting selected landscapes with multifunctional golf courses as good examples of shared responsibilities and good, efficient cooperation between many interests in society, for example authorities, institutions, associations and private individuals, where all parties stand to gain.
- Take responsibility for increasing knowledge and developing tools to demonstrate the importance of landscape and cultural heritage for good quality of life, stimulating environmentally friendly outdoor activities for new and old user groups and as a meeting place for integration, to demonstrate and document the link between outdoor activities and health.
- Increase local knowledge and sense of responsibility for nature, the environment and outdoor activities and thereby create new social meeting places.
- Create international cooperation to implement and disseminate the concept of the multifunctional golf course as a potential development of the landscape.



RESEARCH AND DEVELOPMENT AREAS

In this programme we describe four central research and development areas that are necessary to increase competences within multifunctional use of golf courses. These areas are:

1. The everyday landscape and periurban nature.
2. Nature and culture.
3. Dialogue and cooperation.
4. Business promotion.

Within each research and development area, we describe the high priority project areas where new research and development are needed.

Within the four research areas, it is expected that existing, well-defined methods and models that may be of relevance for use and application to golf courses will be modified and utilised.

I. The everyday landscape and periurban nature

Access to green areas where motion can take place and where users can take a break from their disruptive and stressful everyday environments is highly important for physical health and mental wellbeing. Green areas for sport and motion are also effective measures in the fight against obesity and health problems resulting from an increasingly sedentary lifestyle. The positive health effects and lower risk of a range of diseases that activities in green areas (green exercise) provide benefits to society in the form of lower healthcare costs (Ottosson, 1998). Periurban nature of good quality can also act as a growth factor for the surrounding area, through stimulating house prices and local businesses (Ståhle, 2012).

The periurban landscape, with its positive health effects, is currently being attributed increasing importance (Laukkanen, 2010). A landscape that is rendered accessible with well-designed communication opportunities often feels safe. This becomes a form of 'Nature Lite', which for many people is an easy and important first contact with nature, compared with mountain and forest trails and other more geographically inaccessible and expensive activities. New lifestyles and value systems among the younger generation influence their interest in golf and nature. Geo-caching with GPS is an example of an IT-related activity that involves land and attracts young people.

Experiences of plant and animal life are valuable for recreation and for people's knowledge and understanding of nature and the environment (Nordiska Ministerrådet, 2008). Trends indicate a growing interest, not least among young people, in a sustainable lifestyle and locally produced food, for example through urban gardening (Sarlöv Herlin, 2012).

STERF wants to help ensure that more golf courses can be developed and contribute to a valuable everyday landscape and good periurban nature. In order to achieve this, methods and models based on research

and development and documentation of good examples are needed within the following project areas:

I:1 Contribution of golf courses to recreation and outdoor activities

STERF wants to create the opportunities for golf courses to make a greater contribution to green environments for recreation and outdoor activities.

In order to achieve this, new knowledge is needed within the following areas:

- **Access and design:** The potential to increase the quality of life and health by increasing the use of green environments is determined by the accessibility and design of golf courses. This means examining how a multifunctional golf course can be designed so that health aspects can be provided in a safe way for different groups simultaneously, for example golf players, the elderly, walkers and joggers.
- **User group needs:** Different age groups and societal and interest groups may have different needs as regards the design of areas for different green exercise activities. An example of a study area is to expand on how a multifunctional golf course can offer different systems of pathways, such as health trails, nature trails, school trails and disability access trails, to facilitate use of the area by different groups according to their abilities.
- **Adaptation in time:** It may not be possible for all activities on a multifunctional golf course to occur simultaneously. They may be of a seasonal nature or occur at different times of the day. It is important to study how various activities on golf courses can be adapted in time.



I:2 The golf course as a tool in education – integration

STERF wants to help allow golf courses to be developed into landscape education centres that resemble the city farms in the United Kingdom for use in teaching, for example about urban gardening, sustainability, nature and culture. These centres can also be envisaged as providing a meeting place with nature and between people and promoting integration in a tangible way. In order to achieve this, new knowledge is needed within the following areas:

- **Teaching facility:** A possible development could be to use the clubhouse function for cooperation with other interests in the surrounding community and as a centre for creativity and learning. This would require knowledge on how the facility as a whole can be designed as a teaching facility, for example for courses about nature, culture or sustainable development and how they can be made attractive to the public.
- **‘Nature Lite’:** Another possibility is to offer ‘Nature Lite’. Golf courses could act as an entry portal for those wishing to get close to nature.

This would require knowledge and inventories of areas of the course that can be adapted and used to provide a simple and important first contact with nature.

- **Teaching tools:** Parts of the golf course could be used as teaching tools in learning about nature and culture. This would require development and adaptation of outdoor teaching methods that work on golf courses.

I:3 Contribution of golf courses to the everyday landscape

STERF wants to help allow golf courses to be used in a more varied way by local residents. In order to achieve this, new knowledge will be needed within the following areas:

- **Local residents:** Further knowledge is needed on how golf courses can be employed in more varied use of land by local residents. For example, is it possible to create allotment gardens, playgrounds, pushchair cafés, dog exercise yards, riding schools or outdoor gyms on and around golf courses?



- **Holistic view:** Many golf courses already have a restaurant as part of their facilities. Through increased knowledge of how the links between food, land and landscape can be demonstrated in different ways, these can be used to promote a holistic view.
- **New periurban nature:** Knowledge and development work is needed on how the establishment of simple golf courses can help create good periurban nature in conjunction with conversion of, for example, former industrial areas to green and outdoor recreation areas.
- **Accessibility:** In towns and cities surrounded by agricultural land, there is often a scarcity of land open to the public close to residential areas. In certain areas this scarcity has been alleviated through the creation of accessible footpaths, so-called 'greenways' on agricultural land. Such greenways can be designed from the perspective of nature experiences or cultural heritage values. There is a need for good examples and knowledge on how similar greenways can be established on golf courses.





2. Nature and culture

Many golf courses are situated in an ancient pastoral landscape. A varied natural environment with elements of cultural history is greatly appreciated by Sunday walkers, schoolchildren, orienteers and golfers. The link between past and present is important for people's understanding and interest in the landscape, but also for preserving our history for the future (Strandberg et al., 2011; Vattenriket, 2012).

Ecosystem services are the functions in ecosystems that in some way assist mankind, in other words maintain or improve human wellbeing. There are services provided 'for free' by nature, such as climate mitigation, pollinating insects, water purification via wetlands or mussels, natural pest control and creation of soil fertility. Ecosystem services can be divided into four different categories: provisioning, regulating, cultural and supporting. The Convention on Biological Diversity (CBD) includes green infrastructure as one of the six sub-objectives for the strategy. This sub-objective focuses on maintaining and developing ecosystem services and restoring degraded ecosystems through integrating green infrastructure into physical planning.

STERF wants to help ensure that more golf courses are built, managed and used in ways that increase biological diversity, conserve nature and culture values, and maintain or increase ecosystem services. In order to achieve this, there is a need for advice and recommendations based on research and development within the following project areas:

2:1 Ecosystem services and green infrastructure

On many golf courses there are areas and structures that could be developed so that they have particular significance for important ecosystem services. STERF wants to help in developing golf courses into a resource for ecosystem services. In order to achieve this, new knowledge will be needed within the following areas:

- **Ecosystem services:** There is a need for documentation of existing ecosystem services on golf courses and knowledge of how these can be further improved.
- **Green infrastructure:** Golf courses could play an important role in linking together important structures and ecosystem services in the landscape. There is a need for new knowledge on how the role of golf courses can be increased in the work of creating the conditions for long-term conservation and better contact between valuable areas and structures. Here we need to produce advice and guidelines for different ecosystems/natural elements and for landscape conservation/management.



2:2 Biotopes and biological diversity

On a golf course there can be a mosaic of different environments and biotopes that create the conditions for rich plant and animal life and a varied recreation space. Forest and water environments are often interspersed among open environments of a meadow character, bare sand and sunny verges (Vattenriket 2012). STERF wants to help ensure that golf courses are built, managed and used in such a way that they become a resource for conserving and developing rich plant and animal life. In order to achieve this, there is a need for new knowledge, new advice and recommendations based on research and development within the following project areas:

- **Conservation and development:** There is a need for more knowledge and documentation of verified experiences on how golf courses can be used and improved as a resource in the work on biological diversity. Advice and recommendations on construction, maintenance and use need to be developed for natural elements such as wetlands, ponds, meadows, forest edges and deciduous trees. In addition, methods are needed to monitor and evaluate biotope improvement measures on golf courses.

- **New nature:** Methods are needed for providing information about new biotopes and creating these on golf courses.

2:3 Natural and cultural history

STERF wants to help develop golf courses to a higher degree into arenas for displaying the historical traces of human activity in the landscape. These traces show how people lived and worked long ago, which is important for us today in understanding the landscape and linking it to our history.

- **There is a need for knowledge** on how golf courses can be used as arenas for developing links between natural and cultural history and biological diversity, for example how knowledge of cultural history on golf courses can be used for enhancing local identity and as a ‘tool’ to foster public engagement.

3. Dialogue and Cooperation

In order to secure sustainable development with its starting point in the European Landscape Convention, it can often be fruitful to include a participatory phase where the parties involved are invited in to create good dialogue. Here, there is a need to focus on a number of groups and, for example, involve existing and prospective users and the relevant authorities. A good participatory phase can help identify possible areas of conflict between user groups and other interests. In order to create a constructive process, the methods used should be tried and tested and able to help create a positive result (Rösjökilssamverkan, 2009; Sarlöv Herlin, 2012).

Communication is the key to success. When the work is well underway and producing results, it is important to continually release information on the work to the parties concerned and the media (Rösjökilssamverkan, 2009).

To succeed in the work of creating a multifunctional golf course, there is a need for good, efficient cooperation where all parties stand to gain. STERF wants to support golf courses in their dialogue and cooperation with local and regional interests through research and development within the following project areas:

Cooperating with a number of actors

With the focus on multiple use of golf courses, STERF wants to document and communicate methods and reference examples of cooperation between the authorities and other interests in society within the following areas:

- **Dialogue and cooperation:** There is a need for good examples of forms of working and methods to create dialogue, involve and cooperate with a greater number of actors and interests. In order to ensure a fruitful exchange for the parties involved, good examples are needed of how to harmonise expectations ahead of planning and during the course of the process. Such results and examples would facilitate the work of the new constellations that arise in the drive towards increased multifunctionality.
- **Conflicts and misunderstandings:** A move towards increased multifunctionality on a conventional golf course may create uncertainty and resistance among the existing users and those living near the course. Good examples are also needed of methods that can be employed to avoid or resolve conflicts and misunderstandings.



4. Business promotion

Many golf courses are under pressure due to the financial crisis of recent years. In many countries there has been a decrease in the number of registered golf players. It is usual for golf courses to have an economic system based on a constant inflow of members and a rather static membership. They are now facing the challenge of balancing this against the new behaviour of members and the new conditions in a more variable and more competitive market.

One measure that can contribute in the long term to retaining existing members and recruiting new members is for the golf course to create new products and activities. This includes products for those who already play golf and those who do not, e.g. people living in the immediate area or friends of club members.

STERF wants to help more golf courses to develop multifunctional activities. In order to achieve this, there is a need for documented experience and new knowledge within the following project areas:

4:1 Value of multifunctional activities

STERF wants to motivate and help more golf courses to develop multifunctional activities. It can be difficult for them to decide which measures and activities they should aim for, the financial implications of these, the advantages they bring to the golf course and how they should be handled in purely practical terms. New knowledge and good examples are needed within the following areas:

- **Income and costs:** There is a need to develop methods and document examples of cost-income analyses in relation to multifunctionality. For a golf course to be inspired to begin working with multifunctionality, it is important for it to be able to transform its ideas into financial calculations. At present there are no key data available on the value of creating multifunctionality on golf courses. Therefore it is important to develop a method that can describe the value of members, the benefits created etc. in relation to the costs arising in conjunction with multifunctionality.

- **Shared costs:** Opportunities for additional income and cost sharing through cooperation with other actors must be identified and tested in practice. These include for example shared use of clubhouse and land, production of bioenergy, food for the club restaurant or other local restaurants.

4:2 Evaluation methods and tools

Development of greater multifunctionality may require investment and greater expenses during an establishment phase, but the target is to increase the profitability of the course, for example by attracting more users to the course.

- **Evaluation:** In order to evaluate the added value of the newly initiated changes, methods are needed to determine the financial, recreational and environmental effects.

4:3 Designs for multifunctionality

Certain multifunctional measures on a golf course require changes to the course design and to the surrounding landscape.

- **Design:** Knowledge is needed on how to adjust golf course design to multifunctionality with regard to safety and contributions to the surrounding landscape. These can include new trails, benches, control stations for orienteering, etc. How can this be achieved on a golf course while still retaining its distinctiveness? What safety aspects are important to consider in the design phase and how can they be implemented with respect to the landscape?



COMMUNICATION AND IMPLEMENTATION OF NEW KNOWLEDGE

STERF delivers knowledge, based on research and development, that is ready to use. Communication of research results and new knowledge is one of STERF's high priority focus areas. Important target groups for the results delivered within this programme are: golf courses, municipalities, authorities and associations at local, regional and national level and international golf organisations, authorities and associations.

STERF can contribute to the development of competence in multifunctionality by taking responsibility, together with the Nordic golf sector, for:

- Producing handbooks and fact sheets containing practical advice and recommendations that can be used by golf courses, municipalities, authorities and other interests.
 - Producing information material and supporting data that golf courses can use in dialogue and cooperation with local and regional authorities and relevant associations.
 - Increasing awareness in the media about the concept of multifunctionality and about new research results and experiences.
 - Presenting good examples of golf courses that have implemented the concept of multifunctionality.
 - Raising awareness among international golf organisations and societal interests about the concept of multifunctionality and about new research results and experiences.
- Creating a section on multifunctional golf courses on the STERF website, where ongoing projects and results are described. The material can be used for training, courses and seminars, and in practical advisory work.
 - Arranging conferences, seminars and workshops with the focus on multifunctionality, thereby enabling frequent meetings between the golf sector and societal interests.

SCHEDULE

We regard the programme period to be max. 5 years. The programme will be continuously developed and refined in relation to the needs of society and the golf sector.

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APPENDIX I

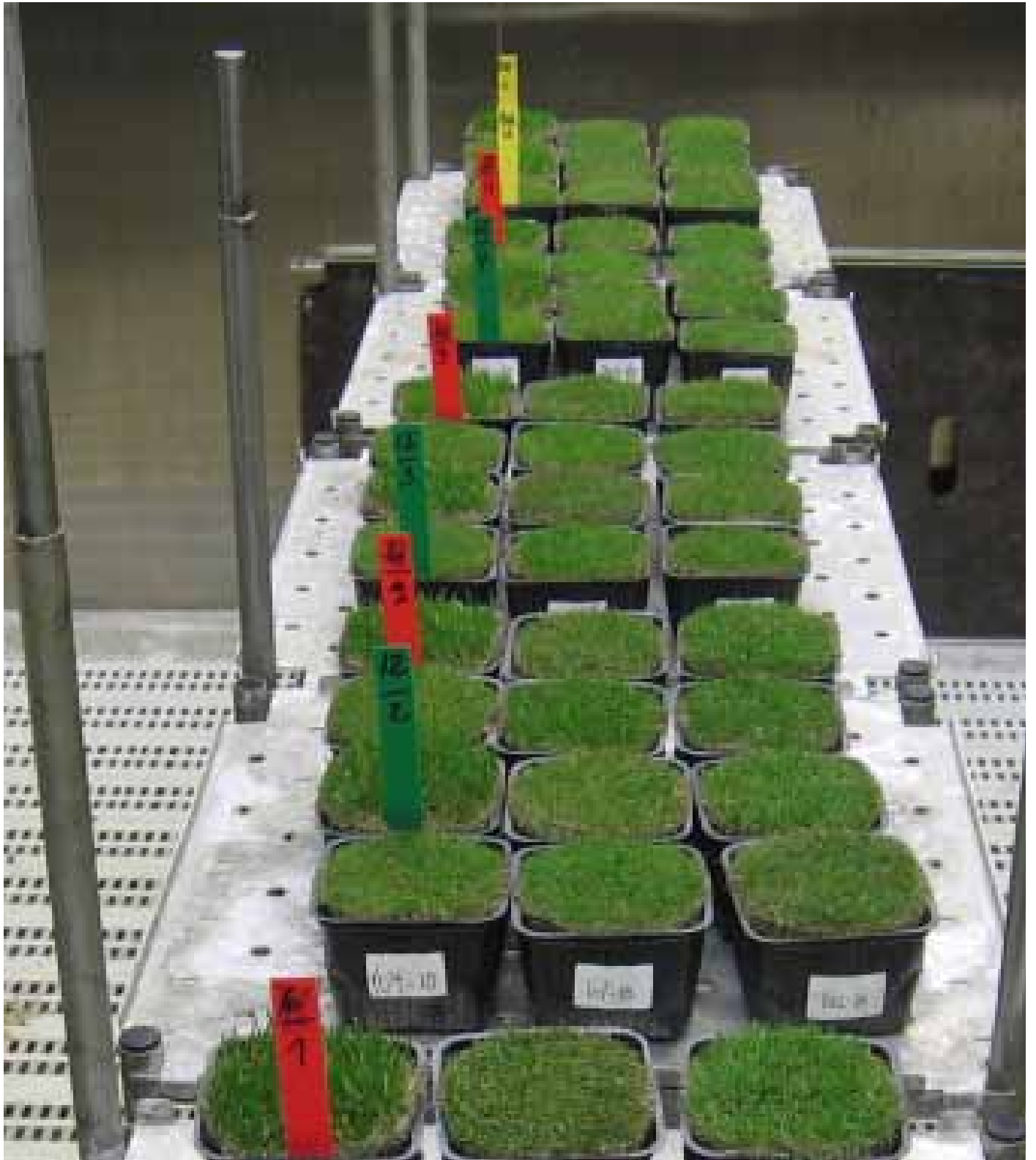
STERF - Scandinavian Turfgrass and Environment Research Foundation

In order to fulfil the vision of golf 'to produce golf courses of a high standard that simultaneously ensure sustainable use of resources, contribute to functioning ecosystems and a healthy environment' and meet the challenges facing golf, the Nordic golf associations invest in research and development (R&D) through the Scandinavian Turfgrass and Environment Research Foundation (STERF). STERF is the joint research body for the Nordic golf associations.

STERF delivers the new knowledge necessary for modern course management, knowledge which is of practical value and ready to use directly, for example in golf course maintenance, in dialogue with authorities and the general public, and in trustworthy environmental protection work. STERF is now regarded as one of Europe's most important centres for research relating to the establishment and management of golf courses. STERF's complete research programme, the yearbook for 2012 and descriptions of on-going and completed research projects can be found at sterf.golf.se

STERF prioritises research, development and dissemination of results within the following strategic future areas:

- **Overwintering:** R&D on the issue of overwintering will provide golf courses with recommendations on improving quality and profitability. Approximately 70% of golf courses in the Nordic countries are affected by winter damage, resulting in loss of income and high maintenance costs.
 - **Dissemination of results:** In order for our investment in R&D to have the desired effect, the new knowledge it provides must be applied and implemented in practice. Therefore STERF aims to spread new knowledge in an attractive and easily accessible way.
- STERF works according to the following strategies:
- **Method of working:** All research funded by STERF is conducted at Nordic universities, research institutes or equivalent, where the majority of research expertise can be found. The method of working comprises benchmarking and is project-orientated.
 - **Expertise:** STERF unites scientific expertise through various networks and actively works with leading organisations within STERF's areas of activity.
 - **Application:** STERF processes and delivers research results that can be applied in various action programmes, documents and recommendations. The aim is to result in optimum playing quality and a sustainable business – financially and environmentally.
 - **Resources:** The funding model for STERF is that resources are provided annually by all participating golf associations and these funds are complemented with other available research funding from businesses and organisations.
- **Integrated crop protection:** R&D within integrated crop protection will deliver knowledge that assists the golf sector in meeting the demands set by the EU Directive on sustainable use of pesticides.
 - **Sustainable use of natural resources:** New knowledge on efficient use of natural resources, e.g. water and energy will allow golf courses to save money and improve quality, while also contributing to a better environment.
 - **Multifunctional golf courses:** A multifunctional approach is profitable for golf courses and is beneficial for society at large. New knowledge provides the ability to create and utilise the value of multifunctional activities.



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