LOW INPUT SEMINAR
on turfgrass management

Written by Agnar Kvalbein, NIBIO Turfgrass Research Group
More than 60 turf people from eleven countries visited Copenhagen in the first week of October for a STERF and R&D seminar on red fescue on golf courses.

‘Low input’ has become a new term within the turf industry. It is all about reducing the input of irrigation water, energy, pesticides and fertilizers. Golf courses must be managed in a way that is friendlier to the environment, and golf course owners must bring the economy in balance. The turf industry in the US also shows interest for ‘low input’.

Authorities in most European countries are now developing action plans for reduced use of pesticide. Water is another limited and vulnerable resource that creates conflicts on many golf courses, and the European Water Directorate emphasizes the risk for local pollution.

‘Low input’ is about more sustainable management of all grass species. Yet, the seminar in Copenhagen focused on red fescue, and red fescue enthusiasts were in majority among the participants. The Scandinavian Turfgrass and Environment Research Foundation (STERF) is about to finish a research project about optimal management of red fescue greens, and the results were presented at the seminar. The participants were also updated with practical examples from greenkeepers who want to increase the amount of red fescue on their golf courses.

Here follows a short resume of the presentations. For those of you who are interested in more details, PDF files of all presentations can be downloaded by clicking on ‘Events - past events’ at www.sterf.org.
Visit to Elisefram Golf Course, Sweden

The seminar started at Elisefram golf course, located east of Malmö. Lars and Inger Ingesson were about to build a conference center with the golf course as a main element. They had chosen red fescue as the predominant grass species. The golf course was designed by the Scottish golf course architect Hawtree Ltd.

The Links Initiative

David Colley is assisting greenkeeper at Rosslare Golf Club in Ireland. Rosslare GC is a links course that has experienced a big change from annual meadow grass to red fescue over a period of 10 years. David represented a special interest group called “the Irish Links Initiative”. They have regular meetings in order to learn how links courses can be managed in order to return to the grass species that were originally there.

David told about how verti-cutting, irrigation, hollow-coring, abundant fertilizer applications and preventative spraying against fusarium and anthracnose (up to 15 fungicide applications per year) had changed his golf course into an annual meadow grass dominated nightmare.

- We realized that the strategy had to be changed. It cost a lot, but now the golf course appears attractive, he said.

The following table shows changes and savings due to the change from annual meadow grass dominance in 2005 to red fescue dominance in 2014 at Rosslare GC:

Inputs Before and after

<table>
<thead>
<tr>
<th>Inputs</th>
<th>2005</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditure</td>
<td>€265,000</td>
<td>€180,000</td>
</tr>
<tr>
<td>Staff</td>
<td>8-10</td>
<td>6-9</td>
</tr>
<tr>
<td>Grass Species</td>
<td>80% Poa, 20% Bent</td>
<td>70% Fescue 20% Bent 10% Poa</td>
</tr>
<tr>
<td>Annual Rainfall 800-1200mm</td>
<td>853mm</td>
<td>1154mm</td>
</tr>
<tr>
<td>Player Numbers</td>
<td>30,000 rounds</td>
<td>30,000 rounds</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>255 kg/ha</td>
<td>30 kg/ha</td>
</tr>
<tr>
<td>Seed</td>
<td>800 kg</td>
<td>1500 kg</td>
</tr>
<tr>
<td>Irrigation (moisture contents)</td>
<td>20-30%</td>
<td>12-15%</td>
</tr>
<tr>
<td>Fungicides (Litres) (Applications)</td>
<td>267 litres 15 applications</td>
<td>20 litres 1 application</td>
</tr>
<tr>
<td>Top-dressing</td>
<td>350 tonnes</td>
<td>250 tonnes</td>
</tr>
<tr>
<td>Mowing Heights</td>
<td>3-5mm</td>
<td>4-6mm</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>5.3%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>
Playing quality and grass species

Conor Nolan, representing Sports Turf Research Institute in England (STRI), showed how the playing quality on greens depends on the predominant grass species. STRI had collected data from around 2000 greens in UK and Ireland from 2010 to 2014. The data showed that the average green speed of parkland courses was 8.5” vs. 9.2” on links courses. Also smoothness (if the ball rolls smoothly or "jumps" up and down) and trueness (if the ball keeps a smooth putting line or diverges sideways) was better on the links courses.

STRI has so far only differentiated between annual meadow grass on one hand and "fine grass" (a not very clear definition) on the other hand. Conor concluded that greens dominated by “fine grass” were dryer, harder, quicker, smoother and fairer than greens dominated by annual meadow grass. From 2015 STRI will specify the grass species more precisely when collecting data.

Visit to Copenhagen Golf Club

Head greenkeeper (and president of Danish Golf Association) Martin Nilsson showed a unique course situated in the middle of a Royal zoo. About 2000 red deer were walking about and the course had to comply with very strict environmental requirements. Martin was working consciously to promote red fescue and he succeeded to a large extent. Besides the general advantages of red fescue in terms of water, fertilizer and pesticide consumption, Martin was especially pleased with the hardness of his fescue-dominated greens, as they resisted the brutal trampling of red deer hooves.

- This shows the wear tolerance of fescue courses, he remarked.

About 2000 red deer live on Copenhagen golf course and in the surrounding forest. Martin Nilsson explained that red fescue greens tolerate the wear from trampling animal much better than annual meadow grass. Photo: Sara Calvache Gil.
Grass species for “low input”

Trygve S. Aamlid, representing NIBIO (Norwegian Institute of Bioeconomy Research), introduced a comprehensive and well documented outline of which resources various grass species need to make good playing surfaces. Not only did he emphasize pesticides, but he also informed about irrigation, mowing requirements, mechanical maintenance and re-seeding.

He concluded that red fescue is a good choice for many reasons, but he also mentioned one negative aspect: The slow recovering of red fescue after winter damage. This is because red fescue does not respond to high fertilizer levels in the same way as annual meadow grass or bent grass. Red fescue is also more susceptible to ice damage than bent grass species.

Environment and economy

Per Rasmussen from Smørum Golf Centre is one of the Scandinavian greenkeepers having most experience with red fescue. He is responsible for one of Denmark’s largest golf courses and talked about the environmental and economic benefits of red fescue. There are not many red fescue courses in France, but Stephane Rouen is responsible for an old links course in Normandie; Golf Club Degranville. Situated on a drinking water reservoir he is only allowed to fertilize 120 kg N/ha/year, and he has to apply for exemption for any use of pesticide. Stephane had realized that it was impossible to succeed under such conditions as his golf course was dominated by annual meadow grass. He was forced to change strategy and had experienced how red fescue gradually gained control over 7-8 years. Stephane has also tried sheep’s fescue (*Festuca ovina*) on fairways with good results. He ended his presentation by rephrasing a well-known Indian saying - see illustration!
Experimental results

Trygve S. Aamlid was the leader of the red fescue project. He presented results together with Sara Calvache Gil from NIBIO and visiting scientist Yajun Chen from China.

Use of compost

Root zone compositions and dressing materials were compared during a 3 year period on a USGA-green. The two root zones consisted of the same sand, but with peat or garden compost as organic amendment. Topdressing materials were either pure sand or sand amended with 10% (volume) of garden compost. The experiment showed interesting data when it came to the nutritional value of compost, leakage of phosphorus and nitrate from greens, and how mycorrhiza established better in compost than in peat. The differences became smaller as time went by, but the main conclusion was that a mature and well-defined compost can be recommended both in the root zone and in the topdress. This treatment will save considerable amounts of fertilizer the first years after establishment.

The advantages of topdress with compost were confirmed by Anne Mette Dahl Jensen presenting results from demo-trial over 3 seasons at Smørum Golf Club. In addition to a better visual quality she also found less fungus disease after applying top dress containing compost. On the negative side, the invasion of Poa annua was worse after dressing with compost. According to Anne Mette, this could be explained by a dryer surface and thus, less favourable conditions for germination of Poa annua seed after using straight sand than after using top dress with compost. See photo.

Although annual meadow grass does not like prolonged drought, it was difficult for red fescue to suppress annual meadow grass in this experiment. Photo: Agnar Kvalbein.

Irrigation and seasonal fertilizer distribution

Many greenkeepers are of the opinion that irrigation and fertilizer is important for the competition between annual meadow grass and red fescue. In an experiment at the NIBIO Turfgrass Research Centre Landvik, Norway, red fescue and annual meadow grass were seeded in the ratio 97/3. The annual fertilizer input was 110 kg N/ha in complete balanced fertilizer following three different fertilizer distribution curves: The first treatment gave most fertilizer from early May to mid-summer, the second gave equal inputs from early May to late September, and the third gave the highest inputs from mid-August to late September.

Increasing amounts of fertilizer in late spring and early summer showed the best overall quality, but not significantly better than the ‘flat’ distribution. Increased fertilization in early summer also gave less annual meadow grass, less moss and deeper roots compared to increased fertilization in the late summer and early autumn. It was concluded that increased fertilization in the late summer and early autumn cannot be recommended even if it cau-
In addition to fertilizer distribution, four different irrigation strategies were also compared:
1) No drought stress. Irrigation to field capacity 3x per week.
2) Deficit irrigation to 60% of field capacity 3x per week,
3) Deep and infrequent irrigation to field capacity 1x per week,
4) Deficit irrigation to 60% of field capacity 1x per week.

Deficit irrigation three times per week reduced the water consumption to less than one third without reducing the visual quality or the playing quality of the green. The different irrigation strategies did not have significant effect on annual meadow grass, except from in the extreme drought treatment (no 4) which tended to reduce the coverage of this unwanted species. Moss problems increased with the irrigation frequency.

**Pure Red fescue - or mixed with bent**

A difficult but relevant question is the competition between red fescue and bents.

The most common mixture is red fescue and browntop bent (*Agrostis capillaris*), but red fescue and velvet bent (*A. canina*) has also been suggested. These two mixtures were tested in comparison with pure red fescue at different fertilization and mowing height. The competition with annual meadow grass was evaluated by measuring the diameter of annual meadow grass plugs inserted into the green.

Pure red fescue could not easily compete with annual meadow grass. In contrast, a mixture of red fescue and velvet bent competed very well. An interesting interaction between mowing height and fertilization on the competition from annual meadow grass was also discovered: The proportion of annual meadow grass increased with increasing fertilizer levels at 4 mm mowing height, but not at 5.5 mm mowing height. Stimpmeter readings, always taken 24 h after mowing, showed a strong reduction with increasing fertilizer levels, but there was also an effect of species composition as ball roll was better on pure fescue greens and with the combination of fescue and velvet bent than with the combination of fescue and browntop.

Counting of tillers also confirmed that the botanical composition was influenced by fertilizer levels. With increased fertilization, the number of browntop tillers increased, whilst the number of fescue tillers remained stable. Velvet bent suppressed red fescue at high fertilizer levels.
Greenspeed and the replacement of mowing with rolling

Experiments at Smørum Golf Centre investigated the possibility replacing mowing with rolling on a green in ordinary play. The data were difficult to analyse, but it was concluded that the mowing height could be increased from five to six mm without influencing green speed if the green was rolled four days a week.

Low input from the US

Brian Horgan from the University of Minnesota presented an overview of research into red fescue and other low input species in the United States. Most research had focused on turf with higher mowing heights and representing larger areas than golf greens. One of the experiences was that it is easier to find golf balls in high roughs if the thick stands of Kentucky blue-grass (Poa pratensis) are replaced with the more open stands of red fescue. US scientists also try to identify fescue species that tolerate golf cart traffic and that can repair divots on fairways. Another topic is how much of the herbicide glyphosate that can be tolerated by various fescue species.

New handbook is on its way

Before Steve Isaac from the R&A finished and commended the organizers on a successful seminar, it was announced that NIBIO is going to summarize the research results and experiences in a new handbook on red fescue management on golf courses. This handbook will be published on STERF’s website next spring.
The STERF project ‘Best management of red fescue (Festuca rubra) on golf greens for high sustainability and playability’ started in 2011 and is now in its final year. One of the early events in the project was the 2012 workshop which was summarized in the brochure ‘Red fescue management: Guidelines based on greenkeepers’ experiences’ (www.sterf.org).

Meanwhile, the STERF project has generated a significant amount of experimental data that – together with results from other projects and practical experiences was presented and discussed at this seminar.

**Project period:**
1 July 2011 – 1 July 2015

**Project objective:**
To develop strategies for management of red fescue greens for optimal playability and sustainability.

**Sub-goals:**
- To determine how various irrigation and seasonal fertiliser distribution regimes affect turf quality, playability and competition from annual bluegrass on red fescue greens.
- To clarify the impact of increased mowing height and to what extent mowing can be replaced by light-weight rolling on a mature golf green with a dominant cover of red fescue.
- To determine the impact of well-defined compost (Green Mix) in the rootzone or in the topdressing on fescue turf quality, disease incidence and competition from annual bluegrass.
- To actively disseminate results to the Scandinavian golf industry and create meeting places for exchange of experiences regarding red fescue management.

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