



FAIRWAYS4FUTURE

- a new STERF-project on sustainable management of golf course fairways

By Karin Juul Hesselsøe, Anne F. Borchert, Michael Bekken, and Trygve S. Aamlid, NIBIO Turfgrass Research Group, NIBIO Landvik (Norway); Daniel Hahn, Hahn Turf Agronomy and Wolfgang Prämaßing, Hochschule Osnabrück (both Germany).

FAIRWAYS4FUTURE - a new STERF-project on sustainable management of golf course fairways



Photo 1: Collection of soil samples at Bærheim GC to investigate soil properties after 3-4 years with robotic versus traditional mowing. Photo: Anne F. Borchert.

The objective of the new project FAIRWAYS4FUTURE is to compare soil compaction, weed encroachment, playing quality, and greenhouse gas emissions of GPS guided robotic mowing to traditional mowing on golf course fairways and semi-roughs. FAIRWAYS4FUTURE builds on the results and experiences of the recently finished ROBO-GOLF project.

The ROBO-GOLF project compared small lightweight robotic mowers (Husqvarna 550), which mow in a random pattern, to traditional mowing of golf course fairways and semi-roughs. Turfgrass quality, coverage of weeds and diseases, and fertilizer rates were

compared between the two mowing systems.

In the new project FAIRWAYS4FUTURE we will investigate long-term effects on soil compaction on some of the golf courses that were involved in ROBO-GOLF. In the new project we will also use the larger GPS guided robotic mower (Husqvarna Ceora) to investigate white clover (*Trifolium repens*) encroachment on fairways and roughs mown by the Ceora and traditional mowers. Demonstration trials for golfers will be established at golf courses in Scandinavia and in Germany comparing turfgrass and playing quality between robotic and traditionally mown fairways.

WP 1: Soil compaction

Results from the ROBO-GOLF project showed lower soil compaction in robotic mown semi-rough plots at Landvik, but no differences were found on the fairway plots. Golf course managers from Bærheim (Norway) and Hirsala (Finland) found that robotic mowing appeared to reduce compaction and improved drainage on fairways and semi-rough during the three years project period. In this work package we will investigate if robotic mowing reduced soil compaction on the golf courses in a statistically significant manner.

In September 2023 we started collecting soil samples to determine soil density, texture, and carbon content of the ROBO-GOLF trial fairways at Bærheim GC in Norway. We also did penetrometer measurements to determine soil compaction, while at the same time taking soil moisture measurements. Clegg-Hammer measurements were conducted to compare fairway hardness. In addition, the greenkeeper at Bærheim GC will carry out water infiltration measurements. Next year a comparable sampling and measurement setup will be performed at Grenå GC (Denmark) and at Hirsala GC (Finland) as well.

WP 2: Impact of mowing system on turfgrass quality and weed encroachment in semi-rough.

In this work package we will compare GPS guided robotic mowing with Ceora and traditional rotary mowing at 30 and 45 mm on trial plots at NIBIO Landvik. Plugs of fairway-type white clover will be planted into the trial with different combinations of mowing height and mowing system.

Based on the results from ROBO-GOLF (Hesselsøe et al., 2023) our hypothesis is, that robotic mowing will increase weed encroachment at these mowing heights.

WP 3: Impact of mowing height and fertilizer level on visual quality, playing quality and weed encroachment on robotic-mown fairways.

The same Ceora robotic mower as used in WP 2 will be programmed to mow different plots at the two mowing heights 10 and 15 mm in factorial combination with three fertilizer levels (0, 60 and 120 kg N/ha/yr). Plugs of white clover, daisies (*Bellis perennis*) and other broadleaved weeds will be transplanted into subplots to

study the combined effect of different mowing heights and fertilizer levels on encroachment of the different weed species.

WP 4: Impact of mowing system and fertilizer rate on visual and playing quality (demonstration trials on golf courses)

Demonstration trials will be established in 2024 at five golf courses: Hills near Gothenburg in Sweden, Hirsala near Helsinki in Finland, Brøndby near Copenhagen in Denmark, Haus Bey near Düsseldorf and St. Eurach near Munich in Germany. At each golf course, a Ceora robotic mower will be installed on a designated area including both fairway and semi-rough.

Traditionally mown neighbor fairways and semi-roughs of similar soil type will serve as control treatments. On the fairways the fertilizer level will be split into two: 'Common practice' (100%) and reduced (50%).

In Germany the course managers in collaboration with turfgrass agronomist Daniel Hahn and turfgrass scientist Wolfgang Prämaßing will be responsible for the trials. The golf playing quality of the turf will also be assessed by Daniel Hahn.



Photo 2: Ceora mowing at Brøndby GC. Photo: Gediminas Rudokas.



Photo 3: Photo from St. Eurach, Germany.

References

Hesselsøe, K. J., Borchert, A. F. & Aamlid, T. S (2023): 'ROBO-GOLF - final experiences and results'. <http://www.sterf.org/sv/about-sterf/news-archive/robo-golf-final-results>

Project	FAIRWAYS4FUTURE: Managing high quality golf course fairways and semi roughs without herbicides and less emission of greenhouse gases.
Period	2023-2026
Objective	To investigate management strategies for fairways and semi-roughs (robotic vs. traditional mowing, mowing height, and fertilizer level) that results in the highest turfgrass and playing quality with the lowest input of energy and fertilizer.
Contact	Project leader: Karin J. Hesselsøe. Collaborators: Anne Friederike Borchert, Michael Bekken and Trygve S. Aamlid, NIBIO Landvik, Norway. Daniel Hahn, Hahn Turf Agronomy and Wolfgang Prämaßing, Hochschule Osnabrück, Germany. Golf courses (course managers) involved: St. Eurach and Haus Bey, Germany; Brøndby GC (Gediminas Rudokas) and Grenå GC (Lasse Nielsen), Denmark; Hirsala GC (Janne Lehto), Finland; Hills GC, Sweden; and Bærheim GC (Atle R. Hansen), Norway.
Funding	Husqvarna, STERF and in-kind contributions from the involved golf courses.