

Use of robotic mowers on golf courses



Robotic mowing was compared with reel mowing on fairway and rotary mowing on semi-rough. Photo: Karin J. Hesselsøe.

Introduction

This fact sheet will guide you through the newest knowledge on the use of small lightweight robotic mowers on golf course fairways and semi-roughs. As mowing accounts for around 25% of the energy used on a golf course, of which around 75% is spent on fairways and roughs, switching to small lightweight robotic mowers powered

by electricity can become a way of reducing greenhouse gas emissions from golf courses. But how does switching from traditional reel and rotary mowing to robotic mowing influence turfgrass quality, weeds, and diseases, and does it change the fertilization requirements?

Summary

Recommendations in this fact sheet are based on results from the ROBO-GOLF project 2020-2023 where Husqvarna 550 robotic mowers, working at random within boundary cables, were compared with traditional fairway and rough mowers at five Nordic golf courses (Jönköping, Sweden; Bærheim, Norway; Ness, Iceland; Grenå, Denmark and Hirsala, Finland) and at NIBIO Landvik, Norway. Main conclusions showed that mowing quality of the robots was comparable to reel mowing or sometimes even better and that less broadleaved weeds (white clover) and diseases was found on robotic mown fairway.

In the trials at the golf courses robotic mowing was superior on roughs, but higher coverage of white clover was found with robotic mowing at the research station. Surveys completed at the golf courses showed that golfers' perception of robotic mowing is that the grass is denser and more uniform.

Detailed results from the project can be found at www.sterf.org.



Daily dew removal by the robot could explain the lower disease incidence found on robotic mown fairway.
Photo: Karin J. Hesselsøe.

Robotic mowing in pure species and mixtures on fairway

At NIBIO-Landvik robotic mowing was tested at fairway mowing height (15 mm) in pure stands of red fescue (*Festuca rubra*), Kentucky bluegrass (*Poa pratensis*) and colonial bentgrass (*Agrostis capillaris*), and in a mixture of the three species.

Outbreak of antracnose (*Colletotrichum cereale*) in colonial bentgrass was lower with robotic mowing which could be explained by the daily dew removal by the robots.

Encroachment of broadleaved weeds – especially white clover (*Trifolium repens*) was observed in both robotic and reel mown fairway, but the spread of white clover was lower with robotic mowing. Robotic mowing reduced the spread of clover in colonial bentgrass and Kentucky bluegrass by 30 % and in red fescue by almost 60 % compared to reel mowing.

In the mixed stand higher turfgrass quality was found with robotic mowing



Assessment of coverage of white clover in fairway plot at NIBIO Landvik.
Photo: Karin J. Hesselsøe.

regardless of fertilizer level from 0 to 120 kg N/ha/year. A N rate of 60 kg N/ha/year was sufficient to produce acceptable turfgrass quality with robotic mowing, but additional N was required to suppress white clover. The lower N-rates of 30 kg N/ha/year did not benefit robotic mowing, and at zero N application the coverage of white clover was higher with robotic than with reel mowing.

In the trials on the golf courses the fairways were of mixtures of red fescue, colonial bentgrass, annual bluegrass (*Poa annua*) and Kentucky bluegrass. Both greenkeepers and golfers recorded a high turfgrass quality with robotic mowing due to a more uniform and consistent turf (same quality every day), dew removal and almost no clippings.



Robotic mown fairway to the left, traditional reel mown fairway to the right. The spread of white clover in late June was lower with daily robotic mowing compared to reel mowing three times pr. week (both at 15 mm). Photo: Karin J. Hesselsøe

Robotic mowing in pure species and mixtures in semi-rough



Robotic mown semi-rough (from the left) in row 1, 3 and 5, traditional rotary mowing in row 2, 4 and 6. Note the spread of white clover (dark green patches) in some of the plots, and most in robotic-mown perennial ryegrass (upper plot in row 1, middle plot in row 2 and lower plot in row 3). Photo: Karin J. Hesselsøe.



Robotic mowing on the fairway at Jönköping GC. Photos: Markus Rehnström.

At NIBIO-Landvik robotic mowing was tested at semi-rough mowing height (35 mm) in pure stands of red fescue, Kentucky bluegrass and perennial ryegrass (*Lolium perenne*). Plants of white clover spread both with robotic and rotary mowing, but opposite to the results on fairway encroachment of white clover was higher with daily robotic mowing compared to rotary mowing twice a week. The spread of white clover was highest in perennial ryegrass, which had a low shoot density compared to

Kentucky bluegrass and red fescue, but the higher coverage of white clover was seen with robotic mowing in all three species. These results agree with Italian research comparing robotic and rotary mowing on lawns. The difference can be explained by the fact that daily robotic mowing is less destructive to the white clover plants compared to the traditional heavy rotary mower removing a higher proportion of the leaf area when mowing twice a week.

Higher coverage of broadleaved weeds in semi-rough with robotic mowing was not observed in the trials at the five golf courses. Here the course managers observed that the turfgrass quality was superior on robotic mown rough, especially in periods with heavy rain and high growth rates. Golfers responded that they were happy that they did not have to wait for greenkeepers to complete mowing with big machines.

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Future perspectives on robotic mowing on golf courses



Robotic mowing on the fairway at Jönköping GC. Photos: Markus Rehnström.

It seems that robotic mowing on fairway is a good strategy to avoid the spread of white clover. Managing fairways without herbicides often results in the spread of broadleaved weeds. In mid-summer when the white clover is flowering course managers often lower mowing height on fairway to remove leaves and flower heads. Lower mowing height can be a challenge to the turfgrass at that time of the year, especially in dry periods. Here robotic mowing with a constant mowing height can be a better strategy.

Among the species tested red fescue benefitted the most from robotic mowing in terms of competition against white clover. In the fairway mixed stand of 50 % red fescue, 35 % colonial bentgrass and 15 % Kentucky bluegrass, the fertilizer rate should not be lower than 60 kg N/ha/year to suppress the white clover.

At the same time robotic mowing can result in less diseases on fairway. Frequent mowing with robotic mowers could become part of an integrated management program on fairways to reduce dollar spot or other diseases. Further investigations should clarify the relationship between robotic mowing, dew removal, disease incidence, mowing height, fertilizer level and weed encroachment to find the most sustainable way of mowing fairways and roughs.

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Read more

Hesselsoe, K. J., Borchert, A. F., Pettersen, T., Hetland, O., Jørgensen, L. and Aamlid, T. S. (2022): ROBO-GOLF: Robotic mowers for better turf quality on golf course fairways and semi-roughs. Results from 2021. NIBIO Report, vol. 8, nr. 48, 45 pages <https://hdl.handle.net/11250/2986564>



Above: Robotic mowing on fairway and semi-rough at Grenå GC. Photo: Karin J. Hesselsoe.



Right: Robotic mowing on semi-rough Hirsala GC. Photo: Janne Lehto