

International Turfgrass

The Newsletter of the International Turfgrass Society

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Australia Sports Turf and Golf Management Conference 2026

by Nadeem Zreikat, Marketing Manager at Colin Campbell Chemicals

Here in Australia we just had an annual conference which was held in Melbourne. The conference is run by the Australian Sports Turf Managers Association (ASTMA). There were approximately 2800 people attending the conference and trade exhibition during the week. This year's conference was a combined meeting with general managers of golf courses as well.

Speakers and topics throughout the week ranged from agronomic topics through to culture and team management. The ITS very own board member Dr Doug Soldat was the keynote speaker for the week. In fact, all Australia and New Zealand ITS board members presented with Dr Brett Morris (R&A), Will Bowden (PGG Wrightson Turf) and myself, Nadeem Zreikat (Colin Campbell Chemicals), on various topics.



The week starts with the national Awards dinner and this year ITS member Dr Percy Wong was bestowed the Distinguished Service Award which is the highest honor for those in the Australian Turf industry. The award recognises those who have contributed to the industry with research or service to the industry. Being the first conference after Peter McMaugh's passing the ASTMA introduced the inaugural Peter McMaugh AM scholarship. The winners were Tom North from Royal Hobart Golf Club and Jake Carloaw from the Australian Turf Club.

The conference has grown significantly over the past 5 years, and I encourage any member to attend at Brisbane next year. A full report of the conference will be made available through the ASTMA over the next few weeks.

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The Argentina Golf Association held the 36th Technical and Commercial Meeting on Golf Course Maintenance

by Dr. María Alejandra Blanco, Technical Director of Grass & Horses

The 36th Technical and Commercial Meeting on Golf Course Maintenance was successfully held at San Nicolás Golf Club and Hotel Colonial San Nicolás from May 5 to 7.



The technical talks were given by Dr. Fred Yelverton, from North Carolina State University, who spoke about alternative treatments to methyl bromide and the control of *Poa annua*; Dr. Marco Schiavon, from the University of Florida, who addressed bermudagrass green management and soil wetting agents; Dr. Beth Guertal, from Kansas State University, who spoke about soil fertility; Dr. Alejandra Blanco, who presented on the International Turfgrass Research Congress 2033 and equestrian surfaces topics; and finally, Ronnie Damm, Superintendent of Olivos Golf Club, who shared the bunker renovation works carried out at the club.

The commercial exhibition reached a record level of participation, with 25 stands and 7 additional companies participating without a stand.

Finally, during the dinner hosted by the Argentine Golf Association, the Agronomists' Meeting Award was presented to Agricultural Engineer Ricardo de Udaeta "in recognition of his valuable work toward the improvement of golf courses in the Argentine Republic."



Seminar "Innovation and Sustainability: New Frontiers in Turfgrass Maintenance"

by Dr. Alessandro De Luca, Chief Agronomist for Italian Golf Federation

On 14 April 2026, the Golf Club della Montecchia – a club that has distinguished itself for years through its many initiatives in support of sustainability, research and innovation – hosted a technical meeting entitled "Innovation and Sustainability: New Frontiers in Turfgrass Maintenance", organised by Golfimpresa under the patronage of the Italian Golf Federation, the Italian Association of Golf Course Technicians and the European Turfgrass Society.

The event was attended by more than 70 industry professionals, drawn not only from the world of golf but also from football, turfgrass production, public green-space management and research. The initiative thus brought together a highly qualified audience, including students, all keenly interested in the sector's most recent technological innovations.



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The proceedings were moderated by Prof. Stefano Macolino of the University of Padua and Dr Alessandro De Luca, agronomist of the Green Section of the Italian Golf Federation.

Opening of the proceedings

The seminar opened with a presentation by Prof. Mike Richardson (University of Arkansas), who outlined the growing role of artificial intelligence in the management of professional turfgrass.

Drawing on a range of examples, he showed how AI has now become a tangible support tool in day-to-day management, able to simplify and optimise numerous operational tasks: from determining material dosages and volumes, to managing nutritional inputs, through to scheduling interventions and producing reports, technical communications and documentation for members and governing bodies.

Biostimulants and turfgrass physiology

This was followed by a presentation from Dr Alessandro Aquino (Syngenta) on the use of biostimulants in turfgrass. He highlighted the growing interest in these solutions for improving nutrient uptake, stimulating root development and increasing the turf's overall resistance to environmental stress. He also described the process of developing a biostimulant, from the selection of biological matrices, to extraction, to the study of physiological and phenological effects, through to field trials and subsequent practical application.

Monitoring technologies and irrigation management

Next, the Spanish agronomist Eugenio Rezola presented TurfRad technology, recently acquired by TORO, which is based on sensors mounted on mowing machines that continuously measure soil moisture in the top 10 cm during maintenance operations.

The data collected makes it possible to generate colour-coded maps that highlight areas with differing irrigation needs. The system can communicate directly with irrigation installations, enabling automated and highly precise management, down to the control of individual irrigation sections. This technology allows for a significant optimisation of water use, while at the same time ensuring optimal physiological conditions for the turf.

UV-C research and plant protection

Dr Massimo Mocioni, agronomist of the Green Section of the Italian Golf Federation, then took the floor to present the results of a project funded by The R&A and developed in collaboration with the University of Turin, focused on the use of UV-C radiation in the control and prevention of turfgrass diseases.

He outlined the current state of this technology, which is still under development, with particular attention to the definition of application protocols (treatment frequency, light intensity, height of the light sources, travel speed and other operating parameters).

The trials carried out, in line with further research conducted by the University of Pisa, the University of Osnabrück and the Norwegian research centre NIBIO, demonstrated good efficacy of UV-C, particularly in the early stages of infection, with no evidence of phytotoxicity on the plant.

Dr Corrado Puppo of UV Boosting also presented a new machine for UV-C treatments – a technology already used successfully in viticulture and currently being adapted for use on sports turf.

Robotics and automated mowing

The session concluded with a presentation by Prof. Marco Volterrani (Research Centre for Sports Turfgrass – CerteS, University of Pisa), who presented the current state of the art in robotic mowing.

He highlighted the physiological benefits of frequent, consistent mowing, the economic and environmental advantages of the technology and the progressive improvements in the operational quality of the machines. Reference was also made to the numerous studies conducted at the research centre and to field applications, including those carried out at the Golf Club della Montecchia.

A number of open challenges were also highlighted, which call for further technological development and in-depth study on the part of manufacturers.

Field demonstration

In the afternoon, following lunch at the club restaurant, participants attended a field

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demonstration session in which the machines and technologies described during the morning were presented in action.

Among these, a new machine for the automated collection of driving-range balls (Wayrobo) attracted particular interest, thanks to its high operational capacity and its ability to work in a variety of ground conditions.

Despite less-than-ideal weather conditions, all participants were able to engage directly with technicians, manufacturers and distributors, gaining concrete, hands-on insight into the various solutions on display.

Conclusions

The high technical standard of the presentations and the strong turnout made the seminar an important opportunity for professional development and exchange across the entire turfgrass sector. The topics addressed showed how technological innovation, sustainability and scientific research are taking on an increasingly central role in the management of sports and ornamental grass surfaces. The presence of professionals from a range of fields, together with the contribution of international experts, fostered a fruitful exchange of knowledge and experience.

The event also confirmed the importance of gatherings of this kind for the turfgrass community in Italy, offering a tangible opportunity for training, professional development and the transfer of innovation – all essential to meeting the sector's future technical, environmental and economic challenges.

New Open Access Grass Research Paper

by Dr. Stefano Macolino, Associate Professor, University of Padova

The increasing adoption of warm-season turfgrasses in Mediterranean Europe is driven by the demand for more drought- and heat-resistant turf systems. However, data on the adaptation and performance of the latest bermudagrass cultivars across diverse Mediterranean environments remain limited. A recent study by the University of Padova (Italy) and the Polytechnic University of Valencia (Spain) assessed three seeded bermudagrass cultivars, Arden 15, Princess 77, and Sultan, under various fertilization and biostimulant treatments. Findings

indicated that bermudagrass performance is strongly influenced by local climatic conditions, with temperature significantly affecting winter dormancy, spring green-up, and carbohydrate reserves. Responses varied notably between sites: Princess 77 performed better in the warmer Spanish climate, while Arden 15 and Sultan exhibited greater stability across different environments. The amino acid-based biostimulant Hicure provided limited benefits, mainly yielding modest improvements for Arden 15 in Spain. Overall, the study confirmed that the primary factor influencing bermudagrass performance is its adaptation to specific environmental conditions, with biostimulants offering only partial enhancement of turf quality and seasonal transitions.

Utilising Rhizoboxes and faRIA to objectively measure turfgrass root systems

by Will Bowden BSc (AppSc) Turf Agronomist & Product Development Manager PGGWTurf/DLF Oceania

Abstract

This project aimed to develop a reliable and objective protocol for characterising root system traits across a range of turfgrass species grown under controlled environmental conditions, without disturbing the root profile. The methodology was intended to support early-stage screening of germplasm evaluated within PGGW Turf/DLF's in-house turf trials. A primary requirement of the protocol was that it be repeatable, high-throughput, resource-efficient, and compatible with facilities available at the Kimihia Research Centre. We refined an existing rhizobox approach and integrated the fully automated root image analysis tool faRIA to expand the scope and accuracy of measurable root metrics. The resulting workflow provides a robust platform for routine root phenotyping within turfgrass evaluation programmes.

Introduction

In 2023, a preliminary system was developed to quantify average root depth and growth rate of turfgrass species over time using custom-built rhizoboxes (Fig. 1) in combination with a digital image analysis (DIA) tool (Turf Analyser). This early approach provided objective measurements of root depth and visual assessments of root proliferation; however, the range of quantifiable architectural traits remained limited.

In 2025, a second-generation rhizobox (rhizobox

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v.2) was produced. Modifications included reinforced side panels to prevent perspex warping, improved covers, and a more efficient storage system, resulting in greater consistency across experimental replicates. Rhizoboxes were positioned at a 45° angle (Fig. 2) to promote root growth toward the observation surface and facilitate high-quality imaging. The black vinyl covers excluded light from reaching the roots and mitigated the associated discolouration that it is associated with. Avoiding this yellowing optimises the contrast of the root material against the background of the growing medium.

To expand the range of measurable traits and improve analytical accuracy, we incorporated the Fully Automated Root Image Analysis tool (faRIA v0.1), developed at the Institute for Information Processing (TNT), Leibniz University Hannover, with support from the German Plant Phenotyping Network (Narisetti et al., n.d.). The open-source tool uses a U-Net deep-learning architecture to segment root structures from background material (Fig. 3), allowing extraction of advanced root metrics such as root surface area, width, and tip count.



Figure 1. Rhizobox (v.2)



Figure 2. Rhizoboxes aligned at 45° and covered.

The rack angle of 45° encouraged roots to orient towards the lower side of the perspex to allow for analysis and observation.

The two key metrics of root growth that we were able to measure in the first rhizobox iteration were: 1) the stages of root growth, and 2) the overall root depth at various stages of an experiment. Through a desire to broaden the scope of data captured through these demonstrations, along with enhancing the accuracy and objectivity of measurements, we researched a methodology called ‘Fully-automated root image analysis’ (faRIA v0.1) that had been developed in Germany at the Institute for Information Processing (TNT) at Leibniz University Hannover which is funded by the German Federal Ministry of Education and Research (Narisetti et al., n.d.). A direct link to the open tool developed by Narisetti et al. can be found at <https://ag-ba.ipk-gatersleben.de/faria.html>.

Figure 3 provides an example of the graphical user interface of the faRIA model. The green colour pixels represent root regions automatically segmented. Further calibration of this image enhances the level of segmentation achieved, along with the range of desired metrics.

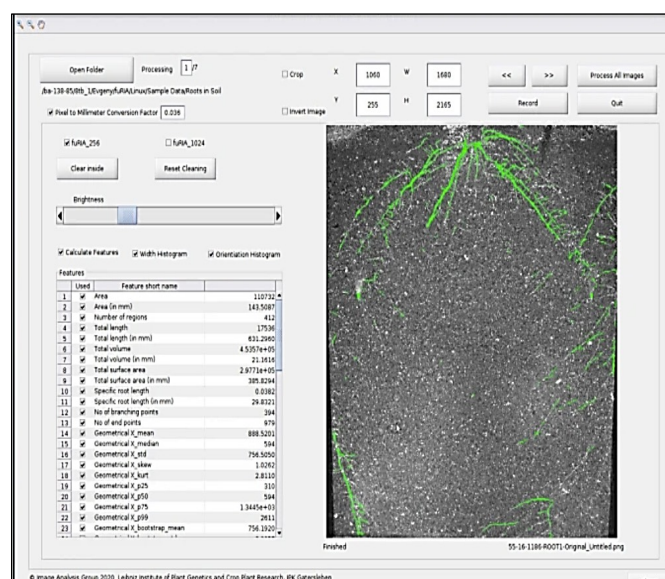


Figure 3. An example of the faRIA interface. The green colour pixels represent root regions automatically segmented by the U-Net model (source: Narisetti et al., n.d.).

Methodology

Six rhizoboxes (three *Lolium perenne* and three *Lolium multiflorum* cultivars) were prepared. Each

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rhizobox measured 500 mm deep and 10 mm wide and was filled incrementally with USGA-compliant sand. During backfilling, irrigation was applied to ensure uniform settlement of the sand profile.

Seed was weighed at 1.2 g per replicate and distributed evenly along the upper sand surface before being covered with a 2 mm sand layer and lightly consolidated. Rhizoboxes were enclosed in custom-made black vinyl covers and placed at a 45° angle in a purpose-built rack within controlled-environment facilities (Fig. 2).

Controlled Environment Conditions

Two environmental regimes were employed:

Cool growth experiment:

Conducted in the Kimihia cool store (4°C; controlled humidity), utilising a broad-spectrum UV growth light programmed for a 12 h light / 12 h dark cycle via an automated timer. The rhizoboxes were enclosed in a purpose-built box to avoid potential movement or light interference during the experiment. Irrigation was applied via a fine mist applicator as and when required to a) initiate germination and b) sustain growth through the first four weeks of establishment.

Heat simulation experiment:

Conducted in a tunnel house with a controlled temperature range of 25–35°C.

All boxes were irrigated regularly following the best practice rate for cool-season turf establishment, ensuring adequate moisture for germination and early root development.

Image Capture and Processing

After one month of growth, the rhizoboxes were removed, and high-definition images of the transparent observation panel were captured. Special care was taken to eliminate surface reflections, which reduce segmentation accuracy.

To enhance root system contrast between roots and sand, brightness and contrast were adjusted before processing. Original images (2000 × 2000 pixels) were downsampled to 495 × 495 pixels to optimise processing speed in faRIA.

Figure 4 illustrates the qualitative differences between outputs generated using DIA and faRIA. DIA provided basic binary segmentation, whereas faRIA delivered highly refined segmentation and quantifiable architectural metrics (Fig. 5).

Comparison of Analytical Tools

Table 1 summarises the differences in analytical capability between the traditional DIA approach and faRIA. The expanded metrics enabled by faRIA provide a comprehensive assessment of root architecture, supporting quantitative comparisons among cultivars.

Figure 4 compares the final analysis image generated by DIA and faRIA.

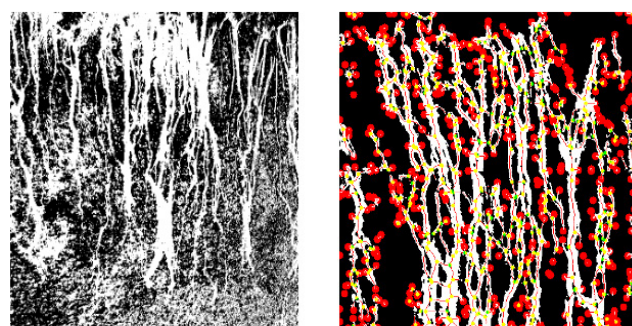


Figure 4. Comparison of outputs generated by DIA (left) and faRIA.

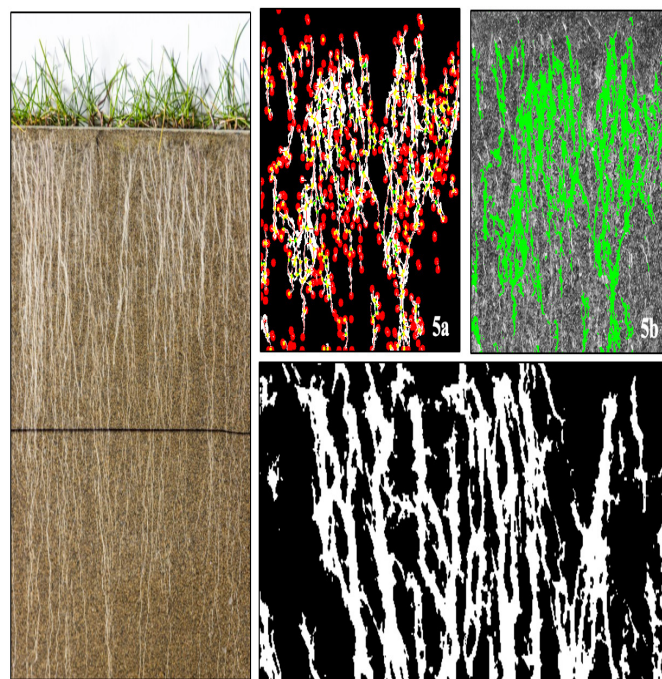


Figure 5. HD image of Rhizobox and Collage of images from the faRIA processing tool

Figure 5(a) provides an example of how the tool identifies a range of key metrics of the root system.

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Table 1. A comparison of the capabilities of DIA and faRIA tools.

Metric	DIA	faRIA
Average root depth	●	●
Rate of root growth	●	●
Root system surface area		●
Total volume of roots		●
Total length of roots	●	●
Total number of root endpoints		●
Root width (mean)		●

Based upon the faRIA model, we are now able to confidently include screening for root metrics as part of our local turf evaluation programmes.

Results

Under cool-temperature conditions (4°C), *Lolium multiflorum* exhibited notably stronger early root development than *Lolium perenne*. After one month of growth, faRIA analysis identified the following differences:

1. *L. multiflorum* had 48% greater root surface area.
2. *L. multiflorum* had 72% greater total root volume.
3. *L. multiflorum* produced 21% deeper roots.
4. *L. multiflorum* had 8% more root tips.
5. *L. multiflorum* exhibited 25% greater root system width.

These results demonstrate the capacity of faRIA to detect quantitative, cultivar-level differences in root architecture under controlled environmental stress scenarios.

Conclusion

The enhanced rhizobox design, combined with the fully automated faRIA image analysis workflow, substantially improves the accuracy, repeatability, and scope of root phenotyping achievable at the Kimihia Research Centre. While the previous DIA system provided visually compelling outputs for extension and marketing purposes, faRIA delivers high-resolution morphological data suitable for statistical analysis.

This improved methodology enables the routine incorporation of root architectural metrics into turfgrass evaluation programmes, offering increased confidence in cultivar comparisons and supporting more informed selection decisions within breeding and product development pipelines.

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References

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ITS was established in 1969 and promotes communication among international turfgrass researchers by organizing international conferences on turfgrass research and all phases of turfgrass production and use.

International Turfgrass Research Conferences (ITRC) are held at 4-year intervals and the next ITRC will be held in Canada in 2029.

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