

Dr Stephen Baker, Head of Soils and Sports Surface Science at the STRI, Bingley, takes a retrospective look at one hundred years of research and progress in golf course agronomy

Past masters?



Above: Sowing trials at the Bingley experimental ground in August 1929

Introduction

This is the last issue of *Greenkeeper International* of the century, therefore it is perhaps worth stepping back to consider the progress that has been made in golf course agronomy over the last hundred years. Innovation has come about through many sources. Greenkeepers have been prepared to try new materials and methods and pass their experiences on to colleagues. Universities and research institutes were able to develop a deeper understanding of the

science of soils and turf grasses and to carry out controlled studies on management methods. Similarly grass breeders, the agrochemical industry and manufacturers of maintenance machinery and irrigation systems were able to improve the materials and equipment needed for modern greenkeeping.

The aim of this article is to look at changes in golf course agronomy in Britain over the last one hundred years. I will focus particularly on developments in research as this area

is usually well documented, with information being available from old books and journals.

The modern greenkeeping era probably started during the second half of the nineteenth century as mowing equipment improved and became more widely used. Golfers were no longer reliant on sheep or rabbits to keep closely-cropped turf or on the variable effects of men with scythes. Gradually multiple mowers dragged by tractors began to be introduced, making fairway cutting comparative-

Past masters?

ly rapid and less expensive. Similarly older practices of heavy rolling were replaced by the use of top dressing to maintain surface levels.

However, there were undoubtedly problems on many courses. In parts of the country golf had expanded away from traditional, low-fertility links and heathland soils, blessed with good drainage and fine-leaved fescue and bent grasses. Instead the newer courses tended to be developed on the heavier, more fertile soils of parkland sites. Furthermore, the application of lime and over-abundant amounts of fertiliser, especially after the First World War, had left a legacy of coarse grasses, weeds and earthworm casts.

Early Research

In the USA the need for scientific investigation of greenkeeping problems had been recognised before the end of the last century. Testing and selection of fine turf grasses was carried out by J B Olcott at South Manchester, Connecticut, from 1885 to 1910, under the auspices of the Connecticut Experiment Station. In 1890 turf plots were established at the Rhode Island Agricultural Experiment Station and in 1917 Charles Piper and Russell Oakley published a pioneering book on Turf for Golf Courses, supported by the USGA.

In South Africa Dr C M Murray had carried out work at his own home and on the links of Royal Cape Golf Club from 1904 onwards and had shown that naturally acid soils or those receiving acidifying fertilisers generally favoured better quality turf with fewer weeds.

Research on greenkeeping matters began slightly later in Britain. Norman Hackett had started work on grass selection at Keighley Golf Club in West Yorkshire in the early 1920s and was to play a central role in expanding research on golf course turf. Getting started was not easy and an attempt to get up a research station in 1924 by the Green Committee of the R&A was abandoned because of the lack of financial support. However, the R&A Green Committee continued to work behind the scenes, eventually handing over the project to the Home Unions, whose Joint Advisory Committee was eventually responsible for establishing the Board of

Greenkeeping Research at Bingley in 1929. This was to be the forerunner of the Sports Turf Research Institute.

A fascinating booklet *Guide to the Experiments at St. Ives Research Station* published by the Board of Greenkeeping in the summer of 1931 gives a good indication of research and agronomic issues being addressed. At the time there were 11 main sets of trials plus a stolon nursery occupying a total area of about 350 square metres. The first cutting and rolling on pre-existing pasture turf had started in June 1929 and the first new sowings started in August 1929. A selection of trials underway in 1931 included:

- Response of different grasses to a management programme based on applications every four to six weeks in the growing season of a mixture of three parts ammonium sulphate, one part iron sulphate and 20 parts of compost at 140 grammes per square metre. A wide range of grasses was studied including hard fescue, sheep's fescue, fine leaved fescue, meadow foxtail, sweet vernal grass, wood meadow-grass, crested dogstail, annual meadow-grass and a brown-top bent from Rhode Island in the USA.

- A parallel study considered the effects of different fertiliser regimes on mixtures of these grasses. Fertiliser treatments included compost, nitrate of soda, iron sulphate, ammonium sulphate, superphosphate and lime applied at different combinations at various rates and frequencies.

- Trials on mature pasture turf to monitor species changes in relation to different fertiliser programmes. The range of fertiliser treatments was extended to include organic materials such as Peruvian guano, bone meal, rape meal, dried blood, fish meal, flue dust and sewage sludge.

- A further trial sown in 1930 examined improved strains of fescue and bent materials with Chewing's fescue and bent from New Zealand and a mixture of bentgrasses from South Germany.

- For weed control, one of the original trials from 1929 examined the effect of fertiliser treatments (ammonium sulphate, iron sulphate, superphosphate and potassium sulphate) on ribwort plantain, white clover, yarrow and broad-leaved plantain, with the range of weed species being extended in later years.

- Although there were no specific construction trials for golf, a small bowling green was laid with Cumberland sea-washed turf on a foundation of clinker, ashes and sand and this was top-dressed with either lime-rich sea sand or lime-free pit sand. Similarly, a further trial had Cumberland turf over both silty, sea-marsh soil and the local sandy loam soil.

- Other studies included experiments with lawn sand, work on lead arsenate for earthworm control, and establishment studies using seed and stolons.

Two other trials, established away from the main experimental ground, studied grass species and weeds on very acid moorland soils and work on grasses and weeds on heavily limed, woodland soil. Extension trials on grass selection and fertilisers were also set up on the links soils at Muirfield in Scotland and on heavy soils at Pollock Golf Club near Glasgow.

Financial support for the work of the Board of Greenkeeping Research was initially only guaranteed for five years until the end of December 1933. In the Spring of 1934 the director, R B Dawson, reported on the progress that had been made, while noting that a period of four and a half years was "almost negligible as regards the study of the subject and the experiments so far carried out cannot be regarded as having done more than scratch the surface and reveal its deeper nature below." Dawson was however able to report significant developments in many areas. For grass selection, Chewing's fescue, creeping red fescue and browntop bent had proved to be the best grasses for golf greens. Preliminary work was starting selecting British indigenous strains of the grasses with the intention of building up a stock of plants yielding seed capable of producing turf with improved density, colour, persistency and uniformity. Ultimately, this led to the slender creeping red fescue cultivar 'Dawson' which, at the end of the century, is still used on some courses.

For weed killing, trials using arsenic acid sprays had partial success but spot treatments with this acid proved entirely successful and economical. Trials on materials for earthworm control had been carried out and



Above: Installation of a trial for the R&A on construction, nutrition and irrigation of golf greens on virtually the same area (July 1988)

mowrah meal had been shown to be more effective than perchloride of mercury or copper sulphate. Trials on application rates of lead arsenate were also underway. The research station had also developed the St. Ives Leather Jacket Exterminator, an emulsion of orthodichlorobenzene blended with Jeyes' fluid, which was found to be particularly potent in bringing leatherjackets to the surface. Progress on turfgrass disease appeared to have been less successful. Work had been reported in 1931 from the Welsh Plant Breeding Station at Aberystwyth on the occurrence of *Fusarium* on golf greens in Britain, identifying the pathogens concerned. Only preliminary work on control had been carried out at Bingley with watering with iron sulphate giving partial success. Dawson suggested that the field on fungal diseases of turf remained unexplored and that the best methods of prevention and cure were not understood.

The importance of good drainage was recognised but had not been addressed by experimental work. Similarly, the need for research on mechanical treatments such as raking and hollow forking was mentioned in Dawson's report.

Results from many of the trials are reported in early volumes of the *Journal of the Board of Greenkeeping Research*, along with other papers on

such issues as irrigation of golf greens, the control of rabbits and moles, *Corticium* (red thread) disease and one strangely titled article, "The use of rubber in greenkeeping"! These pre-war studies provided a scientific underpinning of our knowledge of turfgrasses and their management and, as is the case today, advisory staff were able to pass on this information during visits to subscribing clubs.

The Post War Years

In an article of this length, it is clearly impossible to identify all areas of research affecting greenkeeping and I have therefore concentrated on developments in Britain in the first half of the century. After the Second World War the intensity of research in Britain for golf course agronomy appeared to decline, but work continued elsewhere, particularly in the United States. Through the late 1940s and early 1950s, the main issues covered in STRI research papers were the use of selective weed-killers, earthworm control, turf diseases and soil fertility and soil analysis. Especially in the 1960s, comparatively little research work was being carried out at the STRI that was specific to golf, but there were for example studies on the use of chlordane for earthworm control, slow-release fertilisers and the control

of annual meadow-grass.

So far, virtually no mention has been made of golf green construction and with relative low levels of use and less winter play, soil-based greens generally provided acceptable putting surfaces and were in many respects easier to manage. In 1960, the USGA Specification for a Method of Putting Green Construction was first published, and in the last 30 years several laboratory studies and field trials have been carried out in Britain, especially at the STRI and the University of Wales, Aberystwyth, improving our knowledge of sands and amendment materials for root-zone layers.

The move to more sand-dominated rootzones had implications for the management of golf greens. In consequence, in the late 1980s and early 1990s, the R&A funded STRI research on the nutrition of sand-dominated greens and irrigation studies.

Another main development in the last 30 years has been work on turf-grass wear and the development of techniques to evaluate the quality of new grass cultivars developed by plant breeders for use on the golf course. The annual publication of *Turfgrass Seed* by the STRI means that greenkeepers have guidance on the selection of grass cultivars for greens, tees and fairways through

detailed information on wear tolerance, freedom from disease, fineness of leaf, etc.

With improved funding, the amount of research for golf has increased substantially in the last 15 years and other more recent work has included the development of techniques to measure the playing quality of golf greens, work on dry-patch and wetting agents, and currently the R&A is supporting a major project on earthworm control on golf courses. It is perhaps ironic that research efforts should return to an issue that was being addressed in the 1920s and 1930s, but golf course agronomy must respond to many factors, in this case changes in pesticide legislation that have ruled out previously effective management techniques.

Although the amount of information available to the golf greenkeeper has increased enormously over the last 100 years, the example of earthworm control illustrates that there are always new challenges to be faced in relation to patterns of use, players' expectations, pesticide legislation, availability of irrigation water and even climatic change. Next month, we will be into the new millennium and in the January 2000 issue of *Greenkeeper International* I hope to consider current research problems and possible future trends.