DEVELOPMENT AND USAGE OF SPORTSTURF: A SURVEY OF MAJOR UTILITY AREAS WITHIN NAIROBI, KENYA

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ABSTRACT

Several major sports fields within Nairobi city offering playing grounds for soccer, golf, cricket, rugby and hockey were surveyed through direct interviews and questionnaires. The aim was to assess the status of sportsturf usage and point out the important challenges that need attention by researchers and other stakeholders in turfgrass industry. Information sought included the types of turfgrass species used, soil profile construction method, cultural practices observed, level of technical expertise, source of information for management and problems encountered. It was noted from literature and personal discussion with several turfgrass managers that documented information on turfgrass use in Kenya is largely lacking. The survey showed that only golf courses had a strict quality maintenance programme of fields as compared to other sports fields. This was largely attributed to the nature of the game that demands certain minimum standards and the more informed and serious clientele. There is a general lack of schedule of maintenance activities to match demand of expected sports events. Mere working experience and peer advice served as the main source of knowledge for maintenance of fields and not factual scientific evidence. Most managers observed that the population and variety of users of sports fields are gradually increasing, which will demand more playing fields that guarantee quality sportsturf for intense usage. It was further shown that the range of turfgrass species used was very limited, thus raising concern for need to identify new local species.

Keywords: Management, sportsfield, sportsturf, turfgrasses, utility areas.

1.0 INTRODUCTION

Worldwide, the turfgrass industry is considered to be one of the least recognised sub-sectors of horticulture, but quickly growing in importance. Historically, documented information on aspects of turfgrasses and their usage is scant and where it has been, is very brief and biased towards lawns, (Jex-Blake, 1950). In the recent past, there has been an increase in the population of people participating in athletics and other sports such as soccer, golf, rugby, hockey and cricket. Similarly, there is an increase in the number of national and international sporting events that could be hosted in Kenya. For example, in 2003, Kenya lost to South Africa in hosting an international cricket tournament mainly because of low standards of available cricket fields, even though the Kenyan cricket team was highly ranked in world standings. Despite these developments, efforts to improve the surfacing condition of the existing sports fields to internationally accepted standards are minimal. As human recreation and reclamation needs increase and evolve so too will turfgrass have to evolve (Casler and Duncan, 2002). Cancellation of important local or international matches due to poor playing quality of sportsfields translates to direct loss of revenue for the government and related organisations. Advantages of natural turf over artificial turf as a surfacing material in sports fields have been widely reported. A study commissioned by the National Football League (NFL) players association, conducted on 1,514 NFL players from 32 teams on health effects of artificial turf, showed that natural grass was safer to play on than artificial surfaces, and that artificial turf was more likely than grass to cause serious injuries that shorten careers (Brakeman, 2005).

While other horticultural commodities are routinely documented in survey, the green industry has not been included because it is rarely considered as an important component of horticulture. There exists a big gap in research on turfgrass under local Kenyan conditions, hence more attention is needed towards producing scientific information that can guide green keepers and reduce their reliance on research information produced under very different conditions. Little studies, if any, have been done to examine trends in the growth of the turfgrass industry and in particular, the type of turfgrass species utilised and the technical aspects of turfgrass management, especially sportsturf, in Kenya today. Such information would be invaluable in determining how to re-address the problems afflicting the growth and expansion of this vital industry. The aim of this survey was therefore to assess the status of sportsturf usage and point out the important challenges that need attention by decision makers, researchers and other stakeholders in turfgrass industry. This paper gives an overview of the current status of sportsturf usage in some of the major sports fields in Nairobi, Kenya.

2.0 MATERIALS AND METHODS

The surveyed sports fields included Muthaiga Golf Club, Windsor Golf club, Royal Golf Club, Kiambu Golf club, Moi International Sports Centre, Kasarani , Nyayo Stadium, Parklands Club and Nairobi Gymkhana. The location, distance from Nairobi city centre and kind of sport in the surveyed fields are shown in Table 1. The surveyed sports fields were randomly sampled. In addition, consideration was given to those sports fields which historically are known to offer playing grounds for major sporting events in the country, and which were assumed to have some serious management practice. Information on the following aspects of sportsturf was obtained through administering a semi-structured questionnaire and personal communication to managers or superintendents of the respective sportsfields; (i) types of grass species used (ii) soil profile construction (iii) drainage measures (iv) method of installation (v) irrigation, mowing and fertilization practices (vi) intensity of use (vii) level of technical expertise (viii) source of management information and research or experimental activities (ix) problems encountered, and, (x) opinion and comments about the future.

The questions presented aimed at capturing the actual situation and operations on the ground in the major sportsfields. The selection gives a good representation of the main sports in Kenya and the main sportsfields where they are held. Information obtained was tabulated in to different categories according to the kind and nature of the sport for comparative analysis. Comparisons were done between the actual practices recorded in the survey and those recommended by the Sports Turf Research Institute (STRI) of the United Kingdom and those set by the United States Golf Association (USGA), (Adams and Gibbs, 1994). The information was further categorised according to scores as allocated by respondents. This data was statistically analysed using SAS software and mean differences tested using t-test.

3.0 RESULTS

3.1 Turfgrass Species and Profile Construction

The type of turfgrass species used for surfacing the major golf and non-golf sports fields within the city of Nairobi were only about five. About 75% of the golf courses used only two species of turfgrasses, of which one is a local species (Table 2). Golf greens demand special playability, hence the features of turf grasses selected must be appropriate and for these uses *Cynodon dactylon* (Bermuda grass) has been the traditional choice, while *Pennisetum clandestinum* (Kikuyu grass) was commonly used to surface in the tees, fairways and the roughs of golf courses. However, new species that are fine textured to ensure uniform grass cover, fast roll, true and firm surfaces were being sought, as observed in the introduction of *Agrostis stolonifera* (Bent grass) in Muthaiga golf greens. In non-golf sports, *Pennisetum clandestinum* (Kikuyu grass) was the main turfgrass used in the fields, others being *Axonopus compressus* (carpet grass), *Cynodon transvaalensis* (Royal cape) and even *Digitaria dactyloides* (couch grass) (Table 3). No native grass species to Kenya

was identified by any of the green keepers that could be suitable candidate for use in the sports fields. Evaluation of native grasses for their potential as turf grasses is important as indicated by the studies of Mintenko (2002). Native grasses may have more benefits such as bioremediation of disturbed lands, eradication of invasive species and re-creation of natural habitats, for example *Buchloe dactyloides* (Buffalo grass) domesticated for turf usage in North America (Riordan and Browning, 2002).

Profile construction is one of the major activities in creating quality turfgrass playing surfaces. The methods were varied, but could be largely divided into three groups according to materials used: (i) all soil system (ii) soil/sand system, and, (iii) all sand system. Table 4 shows the type of construction materials used in the surveyed golf courses. Only two golf courses, Muthaiga and Windsor, complied with USGA specifications for profile construction, while the Royal and Kiambu golf courses differed especially in the rootzone material used. The method chosen will normally determine the quality of the field in terms of drainage and playability of the turfgrass.

3.2 Routine Management Practices and Information Sources

Management practices are meant to maintain turfgrass at good playing quality at all times. Some of the important routine management practices carried out in the surveyed sports fields are shown in Table 5. Irrigation and mowing were the most important practices observed in golf courses and cricket sports fields. Fertilization rates differed among the different golf courses depending on type of rootzone material used. For sand-based system of rootzone such as in Muthaiga and Windsor golf courses, the frequency of fertilization was higher and consistent as compared to soil / sand-based systems at Royal golf and Kiambu golf courses. In the non-golf sports fields, mowing and irrigation were given more attention as compared to fertilization. The application of fertilizers in the non-golf sport fields was infrequent and the fertilizer formulations varied widely. Topdressing in most fields was done using the existing rootzone material and in some cases, local materials such as the longonot volcanic sand was incorporated, as it was believed to benefit turfgrass growth.

3.3 Problems and Challenges

Most of the problems identified relate mainly to ignorance leading to poor managerial methods and lack of necessary inputs due to financial limitation. Table 6 shows that most of the problems and challenges were considered serious according to the low mean scores given by respondents. Activities were not scheduled on time and therefore actions were spontaneous and hurriedly done to meet the immediate needs before lapsing into inactivity. Poor servicing of equipment and lack or late delivery of necessary inputs resulted to fields being unattended for long periods of time, aggravating an already bad situation. Weeds such as *Trifolium repens* (white clover), *Polygonium aviculare* (knot grass) and *Taraxacum officinale* (dandelion) were common in most sports fields, which greatly lowered the playing quality of sportsturf.

In some locations such as was the case at Windsor Golf Club, which has cool climate and fertilization programme was regular, algal growth and patchiness was a common problem on the field. Poor water quality for irrigation, especially that from boreholes was reported and manifested itself in differential coloration of the turfgrass leaves, perhaps as a result of salt levels. Another major challenge identified was the small optional number of turfgrass species available for use. Level of technical expertise to manage the greens was low as most green keepers had no formal technical training in turfgrass management. A low mean score of 1.1 for level of technical expertise was recorded (Table 6). The eleven variables considered in the survey were compared between the golf and non-golf sports fields. A t-test analysis done on paired mean score values of golf and non-golf sporting fields to determine whether the means were actually different showed that at $t = 0.05$, the means were significantly different with that of golf sporting fields being higher than that of non-golf sporting fields (Table 6).

4.0 DISCUSSION AND CONCLUSIONS

The status of some of the major sports fields mostly located within Nairobi area was shown using information collected from the field survey. The following variables were noted for scoring low mean scores; turfgrass suitability, time taken before renovation of sports field, source of maintenance information, existence of research programs, level of technical expertise and issues affecting performance (Table 6). It was further shown that most golf courses had a strict quality maintenance programme of fields as compared to other sports fields, which was largely attributed to the nature of the game that demands certain minimum standards and the better informed clientele. On the contrary, non-golf sports fields need more attention if they are to improve and maintain quality playing surfaces. No local species of grass was identified being used as turf and there was over-dependence on imported and a few localised species. Apart from a few number of the golf courses, the soil profile construction methods were not designed to recommended standards as defined by USGA or STRI, thereby lowering their playability and increasing costs both for maintenance and opportunity lost for hosting games. Statistical test further showed that there was high significant difference between values of mean scores for the variables of golf and non-golf sports fields. These observations underscore the gravity of the problems and challenges facing the turfgrass industry in Kenya. According to Casler and Duncan (2002), all local turfgrasses were derived from 'wild' species, largely forage and pasture grasses. Even natural variation in a grass feature has been documented as often being sufficient for humans to recognise the turf potential of a species. Therefore, research should focus on screening of native grasses with potential for use as turf, turf improvement through breeding and evaluation of different cultural practices. Experimentation using locally available materials, as demonstrated by McNitt and Landschoot (2003), could

help in lowering construction and management costs. New technologies such as marker assisted selection or transgenic technology have been shown to be useful for selection of quantitative traits in native grasses (Sticklen and Kenna, 1998). The endeavour should involve agronomists, plant scientists and drainage designers among other specialists.

However, against these challenges, majority of the games, except hockey, were evaluated by all respondents for a high potential for growth in the number of users and frequency of games in a season. If the Kenyan economic situation improves as projected, there will be increased leisure time and disposable income, which would allow more citizens to enjoy green industry products not only from lawns and parks, but also from sports fields. Government and industry based-support for research and implementation of results would go a long way in helping to improve the quality standards of sporting fields. Further research on the trends in growth of the industry is important and should be extended to other regions of the country.

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Table 1: The name, location and kind of sports in the surveyed sports fields

Sports field	Location	Distance from city center	Kind of sport(s)	Time first constructed
Muthaiga golf club	Kiambu road, Muthaiga	5.5 km	Golf	1953
Royal club	Ngong road, Kenyatta Estate	7 km	Golf	1906
Windsor golf club	Kiambu road, Garden Estate	14 km	Golf	1992
Kiambu golf club	Kiambu road, Kiambu Town	18 km	Golf	1915
Kasarani sports center	Thika road, Kasarani	12 km	Soccer	1982
Nyayo sports center	Mombasa road, Langata	2.5 km	Soccer	1980
Parklands club	Limuru Road, Parklands	4 km	Cricket, Hockey & Soccer	1905
Nairobi Gymkhana	Forest Road, Parklands	2.5 km	Cricket, Hockey & Soccer	1980

Table 2: Type of turfgrass species used for surfacing the surveyed golf sports fields

Sports field	Golf course area			
	Greens	**Tees**	**Fairways**	**Roughs**
Muthaiga	*(i) Cynodon dactylon* (Bermudagrass) *(ii) Agrostis stolonifera* (Bentgrass)	*Pennisetum clandestinum* (Kikuyu grass)	*Pennisetum clandestinum* (Kikuyu grass)	*Pennisetum clandestinum* (Kikuyu grass)
Windsor	*(i) Cynodon dactylon* (Bermudagrass 'Tifway')	*Pennisetum clandestinum* (Kikuyu grass)	*Pennisetum clandestinum* (Kikuyu grass)	*(i) Pennisetum clandestinum* (Kikuyu grass) *(ii) Paspalum notatum etc.*
Royal Nairobi	*(i) Cynodon spp* (Bermudagrass)	*Pennisetum clandestinum* (Kikuyu grass)	*Pennisetum clandestinum* (Kikuyu grass)	*Pennisetum clandestinum* (Kikuyu grass)
Kiambu	*(i) Cynodon spp* (Bermudagrass)	*Cynodon transvaalensis* (Royal cape)	*Pennisetum clandestinum* (Kikuyu grass)	*Pennisetum clandestinum* (Kikuyu grass)

Table 3: Type of grass species used for surfacing and type of materials used in profile construction of surveyed non-golf sports fields

Sports field	Type of grass species used	Construction materials for different layers		
		Upper (Rootzone)	**Middle**	**Bottom**
1. Kasarani (Soccer)	*Pennisetum clandestinum* (Kikuyu grass)	Soil / Sand mixture	Soil / Sand mixture	Gravel / Stones
2. Nyayo stadium (Soccer)	*Pennisetum clandestinum* (Kikuyu grass)	Soil / Sand mixture	Red soil	Red soil
3. Parklands sports club (Soccer & Rugby)	Mixed grasses: *Axonopus compressus* (carpet grass), *Digitaria dactyloides* (couch grass), Kikuyu grass and Star grass	Red loams	Black cotton soil	Black cotton soil
4. Nairobi gymkhana (Cricket)	*Cynodon transvaalensis* (Royal cape), *Bouteloua gracilis* (blue grama), 'Madi river', 'Masindi',	Red loam soils	Charcoal + fine aggregate	Gravel

Table 4: Profile construction materials used in golf courses

Sports field		Layer		
		Upper (Rootzone)	**Middle**	**Bottom**
Muthaiga	Greens	Riversand	Ballast/Aggregate	Heringbone pipe drains
	Tees	Red loams	Black cotton/Murram soils	Black cotton soil
	Fairways	Red loams	Black cotton/Murram soils	Black cotton soil
	Roughs	Black cotton soil	Black cotton/Murram soils	Black cotton soil
Windsor	Greens	Riversand	Ballast/Aggregate	Heringbone pipe drains
	Tees	Red loams	Red loams	Red loams
	Fairways	Red loams	Red loams	Red loams
	Roughs	Red loams	Red loams	Red loams
Royal	Greens	Red loams	Sand/Fine aggregate	Gravel, Pipe drains
	Tees	Red loams	Riversand	Gravel
	Fairways	Red loams	Red loams	Black cotton soil
	Roughs	Red loams	Red loams	Black cotton soil
Kiambu	Greens	Sand/Soil/Compost	Fine aggregate	Gravel, Pipe drains
	Tees	Red loams	Red loams	Red loams
	Fairways	Red loams	Red loams	Red loams
	Roughs	Red loams	Red loams	Red loams
USGA Specs	Greens	Riversand	Ballast / Aggregate, Blinding Layer	Gravel, Pipe drains
	Tees	Red loams	Red loams	Red loams
	Fairways	Red loams	Red loams	Red loams
	Roughs	Red loams	Red loams	Red loams

Table 5: Regular management practices recorded in the surveyed fields

Sports field	Irrigation	Mowing	Fertilization	Topdressings
Muthaiga golf club	Wet season: Non Dry season: 5 / Wk	1 / Day Hgt: 7 - 9 mm	1 / Wk, NPK (17:17:17)	2 / year, Sand
Windsor golf club	Wet: Non Dry: 1 / Day	1 / Day Hgt: 5- 10 mm	1 / Wk, NPK (17:17:17)	3 / Year, Sand
Royal golf club	Wet: Non Dry: 2 / Day	1 / Day Hgt: 4- 5 mm	1 / 3 Months, NPK (17:17:17)	3 / Year, Sand + Compost + Longonot sand
Kiambu golf club	Wet: Non Dry: 2 / Day	3 / Wk Hgt: 4- 5 mm	2 / Month, NPK (20:20:20)	3 / Year, Sand + Soil + Compost
Kasarani Sports Center	Wet: Non Dry: 2 / Wk	Wet: 1-2 / Wk Dry: 1 / Month, Hgt: 2"	3 / Yr. N.P.K. 1-2 bags / Application	Sand + Soil
Parklands sports club	Wet: Non Dry: 1 / 2Wks	Wet: 1 / Wk Dry: 1 / Month	None	Red loam soil
Nairobi Gymkhana	Wet: Non Dry: 1 / Day	Wet: 1 / Wk Dry: 1 / Month	1 / Wk C.A.N.	Cricket: Black cotton Hockey: Red loam soil

Code: Wk = week, Hgt = mowing height, Yr = year, NPK = Ratio of Nitrogen:Phosphorus:Potassium

[1]*Table 6: Mean scores for surveyed variables following statistical analysis*

Variable	Score range	Mean score values			Score description (Lowest to Highest)
		All sports fields	Golf sports fields[1]	Non-golf sports fields[1]	
Profile construction					
Rootzone	1 - 4	2.9	3.3	2.5	Native soil - Sand only
Middle layer	1 - 4	2.9	3.3	2.5	Soil only - Aggregate
Bottom layer	1 - 4	3.4	4	2.8	Soil only - Pipe drains
Management					
Turf suitability	1 - 3	2.0	2.3	1.8	Unsuitable - Very suitable
Field maintenance	1 - 4	2.9	3.5	2.3	Low - Very high
Renovations last 45 years	1 - 4	1.6	1.5	1.8	None - Three
Information source	1 - 4	2.1	2.3	2.0	Own experience - Professional
Problems/Challenges					
Research programs	1 - 3	1.3	1.3	1.3	None - Strong
Technical expertise	1 - 3	1.1	1.3	1.0	Not adequate - Adequate
Main Problems	1 - 3	1.4	1.3	1.5	Technical - None
Future of sport	1 - 3	2.6	3.0	2.3	Not great - Great
t-Test (0.05)**:			2.43	1.95	

Significance difference following t-Test for paired two sample for means. Calculated t-Critical = 2.23