Determination of the Cost Effectiveness of Amended Rootzones: Playing Quality and Cost Implications.

S.A.G. Prinn. MSc. W. Gray. BSc. Askham Bryan College

Introduction

Many large stadia are no longer only used for the sport for which they are designed and many grounds staff are faced with the problems of a multi use arena, while still having to produce a playing surface which meets the demands of the modern game. It is essential then, the rootzone can sustain the grass plant through all the demands which are being placed on it.

New constructions methods have been developed or adapted in an attempt to produce a higher quality surface which can sustain greater play. There have been a large variety of synthetic materials tested since the 70's all with the aim of improving the stability of the surface (Gibbs, 2002). These synthetic materials are often marketed for their ability to reinforce and extend the wear tolerance of the natural turf surface. As use of synthetic amendments to the rootzones have increased, so has an understanding of the side effects of these amendments, the effects of traction, firmness / hardness and resilience of the surface, all need to be considered.

Gibbs (2002) also states that the stabilisation of sand rootzones by synthetic materials provides a means of maintaining playing quality when turfgrass roots alone are unable to fulfil this. The fundamental purpose of the synthetic material is to prevent the shear and subsequent removal of the turf grass rather than directly improving the wear tolerance of the turf plant.

Individual reinforced rootzones have different synthetic materials in their structure and they also require different construction processes. Reynolds (2008) found that not only can it be expensive to install the reinforced rootzone; they acquire different techniques and costs of maintenance. The synthetic materials produce different standards of playing quality dependent on the product, as found by research previously carried out; Springer and Baker (2006), Gibbs (2002), Rodgers *et al* (1998) and Baker *et al* (2001).
There has however, been little research carried out to attempt to find out if the most expensive reinforced rootzones are more effective than cheaper alternatives.

Methodology

Test plots were established at the Askham Bryan College campus. Five varying reinforced rootzones were randomly allocated 3 plots each within the test site.

With the control (natural sandy loam, rootzone) taking up the remaining plots. The amendments included in the study were:

- Fibre-sand
- Fibre-elastic
- Crown III Rubber crumb (new surface)
- Crown III Rubber crumb (applied to an existing surface)
- A Rubber fibre System

Tests were carried out as far as possible using standard testing procedures as laid down by the IOG (Institute Of Groundsmanship) and benchmarked against the IOG, Playing Quality Standards (PQS), for football.

Wear was applied to the plots and the effects of this were measured. Playability tests were conducted over a 6 month period (September 2010 – February 2011) on the 5 differing reinforced rootzone systems. Tests were conducted for:

- Rebound Resilience
- Compaction - Clegg Impact Hammer
- Traction
- Sward Cover

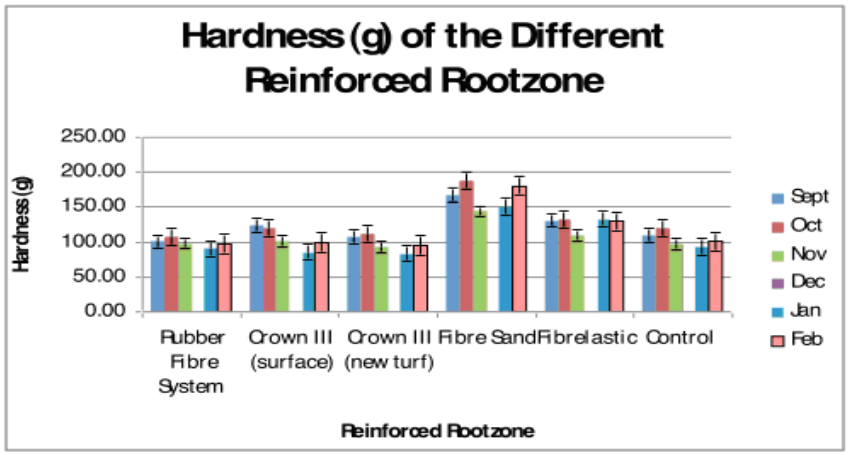

Figure 1: Showing the hardness (g) of the tested rootzones

The cost effectiveness of the rootzones was also analysed to determine the relationship between the construction costs and the playing quality of the surface. This was determined using a ratio and ranking system.

The reinforced rootzones were constructed on the underlying native subsoil of Askham Bryan and installed following the suppliers recommendations.

Washed turf was used for the establishment of the sward. This ensured that establishment was fast and the washed turf ensured that there was no contamination from unwanted foreign rootzones. The test plots were left to establish for 12 months before testing began.

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Results

Sward Density:

Tests for sward density showed that all the reinforced rootzones behaved in a similar way and it was found that there was no significant difference between the sward cover on the reinforced rootzones.

Rebound Resilience / Surface Hardness:

While Rebound resilience (ball bounce), also showed no significant difference between the rootzones, tests on the hardness of the surface showed that the there was significant difference between the rootzones, figure 1.

Traction:

Traction tests carried out indicated that there was also a significant difference between the rootzones, figure 2, with the fibre sand rootzone consistently scoring the highest results.

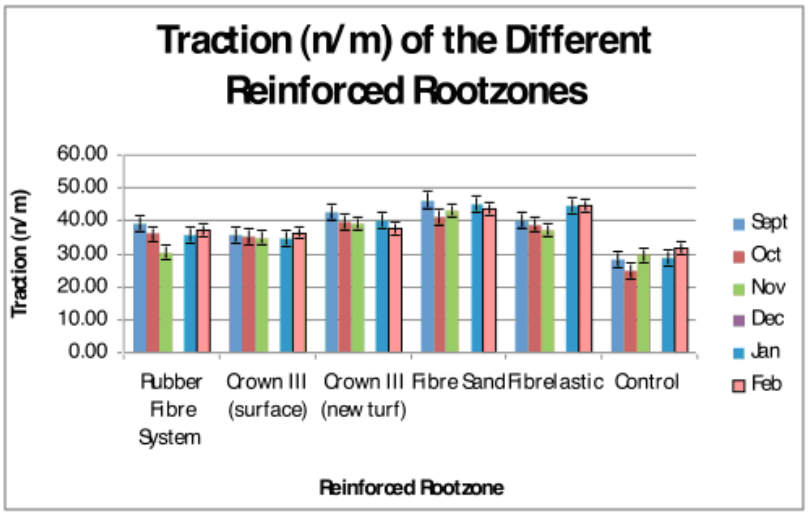

Figure 2: Showing the results for Traction for the tested rootzones

Cost Effectiveness Ratio:

Table 1, shows the cost effectiveness ratio for consistency of all the tests over the period. The table illustrates the ranking score for each rootzone amendment and the control plot. The ranking of each amendment was calculated for each test based on the results of the testing and the cost of the amendment. Lower scores indicate the most cost effective measure. The results have also been ranked showing the most cost effective rootzone at the top of the table. The prices were all based on installation of a 200mm depth of rootzone.

Conclusion

This investigation found that the Crown III applied to an existing surface was the most cost effective approach to increasing the playability of a playing surface.

The reinforced rootzone that produced the most results in the 'high' category IOG PQS bracket was the Crown III (new surface).

	Ball Bounce (Rr%)	Traction (n/m)	Hardness (g)	Sward Cover (%)	**Rank Score**
Crown III (existing surface)	1	2	3	2	**8**
Crown III (new surface)	2	4	4	3	**13**
Fibresand	4	5	1	4	**14**
Fibrelastic	6	1	6	6	**19**
Rubber fibre system	5	6	5	5	**21**

Table 1: cost effectiveness of amendments and final ranking

The statistical tests on the results suggest that there was no significant difference between sward cover on the reinforced rootzones and rebound resilience on the reinforced rootzones. However it did indicate that there was a significant difference between the traction of the reinforced rootzone and hardness of the reinforced rootzones.

For hardness the Fibre Sand results were all in the 'basic' IOG PQS category suggesting it was to hard for a playing surface, where as the Rubber Fibre System and the Crown III (new) were all in the 'high' IOG PQS category. However the Fibre Sand produced the best traction results, with all the results over the period being in the 'high' IOG PQS category bracket. The Rubber Fibre System and Crown III (surface) results were in the 'standard' IOG PQS category with the control lying in the 'basic' IOG PQS category.

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