The Bramhall Golf Club

Autumn Advisory Report on the Golf Course incorporating the STRI Programme

Report Date: 1st October 2015
Consultant: Kath Bentley

CONFIDENTIAL

Date of Visit:	22nd September 2015
Visit Objective:	To assess the golf course and undertake STRI Programme measurements to three indicator greens at the 2nd, 4th and 10th to provide informed recommendations for continued improvement.
Present:	Mr Mel Ince – Club Captain
	Mrs Jacquie Thomas – Lady Captain
	Mr Richard Smith – Chairman of Green
	Mr David Joyce – Greens Committee
	Mr Les Adshead – Head Greenkeeper
	Mrs Kath Bentley – Turfgrass Agronomist, STRI Ltd
Weather:	Overcast with sunny intervals and temperatures of around 15 °C. Rain had fallen during the previous 24 hour period and in the morning prior to the commencement of the visit.

Contents

Executive Summary

- The previous STRI visit was completed on 16th March when the putting surfaces were all found to be in a favourable shape for the early stage of the year. Subsequently spring renovation work was completed with all surfaces being deep scarified to 10mm in conjunction with 13mm solid tining and an application of Chelford 45 sand. Unfortunately the recovery from this work was slow due to the persistent cold spring weather, despite inputs of nitrogen being made. This effect was seen at the majority of golf courses this year due to the cold, wet and windy conditions experienced through May, exacerbated by cool night time temperatures and occasional air frost into early June.

- Consistent growth was finally achieved in mid-June, unfortunately slightly too late for Captain's weekend. As a consequence surfaces became more uniform and a greater level of sward refinement could be undertaken to influence the playing qualities. The acquisition of the turf iron at this time contributed enormously to the flexibility with which both smoothness and pace could be improved. It has also proved enormously worthwhile in minimising stress levels within the sward through the course of the summer months and this was reflected in the health of the putting surfaces as the time of this most recent inspection with very little disease, particularly anthracnose evident across the course.

- In a change to previous years, end of season renovation was brought forward to mid-August with the aim of optimising overseeding and subsequent recovery. This work was undertaken as planned with all putting surfaces being deep scarified to 11mm and subsequently hollow cored with 10mm tines prior to being dressed with 60 tonnes of rootzone. In addition to the sand dressing applied in spring and over the course of the summer, this ensured that the aim of achieving 100 tonnes of top dressing was exceeded. Surfaces were also overseeded at renovation using the Vredo dedicated overseeder with three bags of pure bent seed being incorporated into the upper profile of the greens. Subsequently germination has been successfully achieved and seedlings continue to develop well given the change in maintenance that has taken place since renovation was completed.

- As a consequence of the early renovation work the usual STRI visit was delayed until mid-September to allow time for putting surfaces to recover. At this time STRI programme measurements were undertaken at the three indicator greens (namely 2nd, 4th and 10th greens). The volumetric water content of the upper profile was very similar compared to the results achieved in 2014. As a consequence of overnight rain, the average volumetric water content of the surfaces varied between 36-39%, slightly above the upper end of our target range of 30%. Despite this, surface firmness readings were good at 87-93 gravities and well within the target range of 80-110 gravities. This was a significant improvement at both the 4th and 10th surfaces compared with the results achieved in August last year.

- Results for smoothness were marginally above the upper end of our target of 25mm/m deviation but not significantly different from the results achieved in 2014, despite renovation work having been completed. The effect of the work was more significant on trueness readings with average figures significantly above target and with a higher level of deviation compared with the figures achieved in 2014. This could be attributed to the current height of cut and the presence of scarification tracks and overseeding lines as well as a reduced level of verticutting undertaken in recent weeks. A pass with the roller in dry conditions would make a significant difference.

- Further samples were taken to determine the change in organic matter and nutrient status of the upper profile since testing was completed earlier in the year. There has been a minor increase in organic matter in the top 0-10 mm of the profile at both the 2nd and 10th greens but this may simply be associated with minor variations in the sampling/testing process as the change is within

1 %. It may in part be as a consequence of the strong growing conditions this year, certainly since consistent growth was established in June. As the 4th green is weaker this would not be affected in the same way. Deeper in the profile levels remain stable or have reduced. Organic matter levels now sit comfortably in the target range through the depths 10-40 mm.

- The key focus in the coming weeks must be to keep the greens in top condition for as long as possible. Disease scarring must be prevented through appropriate cultural control methods and well-timed applications of fungicide. As discussed all surfaces should also be deep decompacted using the Air2G2 machine to get air into the profile and improve conditions for rooting going into the winter. This work will serve to compliment that already undertaken and should ensure that the surfaces perform well through the winter period and come into the spring in as strong a condition as possible.

- Renovation work had already commenced at the tees and approaches, although further operations are left to complete to ensure their condition is optimised prior to the onset of winter conditions. Works should now commence to the fairways with all areas being scarified whilst growth remains strong. These areas should subsequently be verti-drained whilst ground conditions remain favourable to maximise fracturing and fissuring to depth to aid rooting and infiltration rates going into the winter period.

- Winter project work will concentrate on the improvement of traffic management/movement, and in particular improving ground conditions around greens to provide more consistent lies for next season.

Key Observations

A summary table showing the results of the STRI Programme measurements is given in figure 1 of appendix 1. Graphs illustrating the results and comparing them with those achieved in 2014 are shown in figures 2 to 6 of the same appendix.

All putting surfaces visited during the inspection were providing uniform cover of dense healthy grass with very little weakness noted and no disease infections identified other than a very occasional small patch of red leaf spot. This was identified as affecting the bentgrass populations in such greens as the 4th and can be attributed to low phosphate levels.

Surfaces had recovered well following renovation in mid-August when deep scarification was undertaken to 11mm followed by hollow coring using 10mm tines prior to top dressing with approximately 60 tonnes of an 80:20 rootzone. Some minor evidence of the scarification tracks remained running along the length of greens and this was picked up by the STRI Trueness Meter™ during testing. As a consequence the results for trueness were significantly higher than those achieved in 2014 when the visit was completed prior to renovation work being undertaken. The presence of seedling lines (see Photo 1), as a consequence of the recent overseeding operation were exacerbating the effect on ball roll as was the presence of etiolated tiller syndrome and some coarse straggly bentgrass due to the recent reduction in verticutting.

Photo 1: Overseeding lines indicated by arrows

Despite moisture levels being slightly elevated at 36-39% average volumetric water content (VWC) (marginally above the upper end of our target of 30%) the results for firmness were very good with all three indicator greens having an average firmness within our target range of 80-110 gravities (87-93 gravities). The additional top dressing and the higher level of sand used in 2015 has no doubt made a significant difference here and we would hope to see further improvements in firmness as a greater level of sand is incorporated into the upper profile of these greens.

The results for green speeds were also very pleasing despite surfaces being measured following a wet cut and without any rolling having taken place, especially when considering the current height of cut of 4.5mm and the recent renovation works undertaken. All greens were in target with an average pace returned of 9ft (4th green) to 10ft 1in (10th green). The greater pace obtained at the 10th green could be associated with the slopes on this surface.

Beneath the surfaces conditions were generally favourable, although rooting was somewhat variable. Rooting was good at the 2nd and 10th greens with roots extending in excess of 100mm. Rooting remained shallow at the 4th green however and here the soil profile seemed wetter to depth. As a consequence we discussed the possible improvement of sunlight to the eastern and southern horizons through the reduction of the canopy height of the trees to the back and the removal of two conifer specimens.

Photo 2: Shallow rooting at the 4th green accompanied by 'mottling' indicating poor water movement into lower rootzone

Organic Matter Results

Further samples were taken from the indicator greens to establish any changes in the organic matter of the upper profile. The results of this analysis are given in the table below and compared against those results achieved earlier in the year. Graphical representations of the progress made to date are given in figures 7 to 10 in appendix 1.

Organic Matter Content 2015						
	Loss on Ignition (%)					
	Green 2 March	Green 2 Sept	Green 4 March	Green 4 Sept	Green 10 March	Green 10 Sept
0-10 mm	6.1	6.4	6.2	6.0	6.1	6.6
10-20 mm	4.1	4.1	4.2	3.5	4.3	4.1
20-30 mm	3.1	3.1	3.7	2.6	3.6	3.4
30-40 mm	3.1	2.4	3.2	1.8	3.7	2.8

There has been a minor increase in organic matter at both the 2nd and 10th greens since they were tested in March. Given the very small increment of this change it may simply be due to minor variations within the testing/sampling process exacerbated by the strong growing conditions experienced through the summer months. Levels remain marginally above the upper end of our target of 6 %.

Organic matter levels have remained static or reduced deeper in the profile. Levels now sit comfortably in target between 10-40 mm.

Chemical Analysis Results

Soil samples were taken to determine the nutrient status of the upper profile. The results of this analysis are given in the table below.

Soil Chemical Analysis			
	pH	P_2O_5 (mg/l)	K_2O (mg/l)
2	5	2	48
4	5.1	3	41
10	4.9	2	43

PH levels have dropped markedly since the testing carried out in March. The greens now have a pH of between 4.9 and 5.1. Although this is satisfactory it is likely to decline further over the winter. A further application of the TruCal product will serve to maintain levels to ensure healthy plant growth and the availability of key nutrients.

Phosphate levels have also dropped despite the continued inclusion of this nutrient within your fertiliser programme. As discussed aim to include an application of phosphate within the autumn granular feed (C-Complex 5:2:10) and supplement with inputs of liquid feed during the winter period using a product of analysis 12:4:6 (Greenmaster) or 6:2:18 (Microflow), Tru-Green Organic 8:8:7 (Terralift, Aitkens) or similar. Furthermore, look to make a change to your early season fertiliser for 2016, using a product of analysis 3:10:5 or similar instead of the usual lawn sand in early March.

Potassium levels are also on the low side and you should ensure that regular applications of this nutrient are applied through the winter to keep the sward hardened against disease infection.

Tees

In general the tees were in a good condition having recently been renovated. Worm casting was detracting from their overall quality but it is understood that a recent application of Ringer has been made to reduce the level of casting in the coming weeks.

Approaches

At the time of the visit approaches had recently been hollow cored and as a consequence were slightly muddy in appearance exacerbated again by the presence of significant worm casting. It is understood that further work is planned here with all areas due to be dressed and overseeded. It was also agreed that the sward will be verticut prior to this work being undertaken to reduce the influence of ryegrass patches within these areas and to give a better target for the top dressing.

Key Recommendations

The routine maintenance programme in place at The Bramhall Golf Club is providing satisfactory results and does not require any major changes. The following points were discussed during the meeting and it is hoped they will be incorporated in the management programme through the coming months.

- An application of autumn feed should be made to the putting surfaces to maintain sward health and promote further recovery following recent renovation works. Given the results of the most recent soil chemical analysis the C-Complex product of analysis 5:2:10 would be appropriate to ensure enough phosphate is available for healthy plant growth. It will not make any significant alteration to available phosphate within the soil. Subsequently maintain sward health through the late autumn and winter period using a liquid product containing phosphate such as the 12:4:6 Greenmaster Liquid, 6:2:18 Microflow liquid, Tru-Green Organic 8:8:7 or similar. Apply during suitable weather conditions as required and within a water volume that will allow the product to be taken in by the leaf (250-400 l/ha). This should serve to keep the grass plants ticking over through the winter months ensuring that they are able to develop growth as early as possible in spring.

- Continue to make applications of seaweed and iron through the winter period to keep the sward hardened against disease infections, to minimise stress. Use a chelated iron to minimise the impact of soil pH.

- Aim to decompact the putting surfaces using the Air2G2 pedestrian aerator. Aim to penetrate no less than 300mm (12in) into the upper profile to fracture and fissure the soil to depth and provide favourable conditions for rooting whilst also maximising infiltration rates.

- Take an integrated approach to disease control to prevent any scarring occurring on these putting surfaces that will detract from their early season quality in 2016. An application of Instrata has recently been made which should provide protection from infections of fusarium patch disease for approximately three to four weeks. Once this period has elapsed, remain vigilant for the early signs of disease development ensuring that surfaces are kept as dry as possible through appropriate brushing/switching. Further application of fungicide should be made at the first sign of disease using a chemical appropriate to the conditions at that time.

- Continue to aerate the greens through the winter period using a combination of solid and slit tining. Undertake this work during appropriate conditions to maximise infiltration rates and stimulate rooting.

- Maintain play on the main putting surfaces whenever possible. Ideally protect the surfaces during periods of frost to give them a better chance of early season development in spring. I enclose an information leaflet outlining the circumstances in which play should be removed from the greens and the possible consequences of disregarding this advice.

- We would recommend that you make a change to your early season fertiliser application, using a granular product with a high proportion of phosphate to increase levels within the soil and ensure good early season sward development. A product of analysis 3:10:5 (Rigby Taylor), or similar could be used in place of your usual lawn sand in Marc applied at a rate of 35 g/m^2. If growth is slow due to cold weather, consider supplementing with a water soluble product of analysis 12:6:44 (Rigby Taylor) or similar, or a liquid applied as a foliar feed.

- It is understood that the Club are looking to purchase an Air2G2 pedestrian aerator and this machine should be available for the early part of 2016. With this in mind, plan to carry out the

first operation of the year in March/April when ground conditions are dry enough to allow fracturing and fissuring of the profile to depth, ideally prior to the commencement of spring renovation works. Subsequently this operation can be completed as required every six to eight weeks ensuring that the depth of tine penetration is varied.

- As discussed during the meeting aim to take a different approach to spring renovation to reduce the level of disruption to the putting surfaces early in the season. Concentrate on two to three solid tine operations in conjunction with verticutting and top dressing. This will serve to firm up the putting surfaces at the start of the year whilst also removing winter moss from the sward and promoting growth and recovery following play through the winter period. The removal of deep scarification from the programme will remove any risk of 'knocking back' the sward whilst growth remains slow. Organic matter levels must continue to be monitored to ensure that this does not result in any significant increase in the build-up of organic material at the turf base.

Tees

- All teeing platforms have recently been renovated with all areas scarified, verti-drained and overseeded in the last seven days. Ensure that an application of sand dressing is applied to the surfaces to help protect the sward through the winter period whilst also irritating the casting worms present within the upper rootzone. Aim to apply the sand at around 5kg m^2 with overall applications made on two occasions each year to dilute organic matter build-up at the turf base and protect the sward from the effects of play.

- Aim to make an application of autumn feed to the teeing platforms whilst conditions are favourable. Use a product containing around 5% nitrogen such as a 5:5:10, or similar to promote growth and recovery following renovation and to provide adequate levels of phosphate for seedling development.

Collars & Approaches

- At the time of the visit all approaches had been hollow cored in preparation for top dressing. Dressings should now be applied as soon as possible to ensure tine holes remain open to allow sand to be ameliorated into the upper profile with the aim of optimising infiltration rates going into the winter period. It is understood that a divot mix of analysis 80:20 will be used for this purpose, however, in future consider using a straight sand which will more effectively protect this area from wear and tear brought about by foot traffic and machinery whilst also increasing firmness levels in line with those found on the putting surfaces. As agreed, in preparation for this work, ensure that the sward is verticut to remove the influence of coarse ryegrass patches within the sward prior to overseeding with a bent fescue seed mix.

- We would support your plans to continue treating patches of perennial ryegrass with the graminicide Rescue with the aim of improving the uniformity of the sward to the approaches and collars to the greens. Great care should be undertaken when carrying out this work to ensure that bare patches are not left at inappropriate times of year. Overseeding with a straight fescue seed mix prior to treatment will aid the recovery process.

Fairways

- Aim to scarify the fairways as soon as possible to ensure growth remains satisfactory for subsequent recovery. If left too late the sward will remain thin and will be vulnerable to moss invasion through the winter period.
- Subsequently verti-drain all fairways with the aim of improving infiltration rates and conditions for rooting. Areas vulnerable to the loss of grass due to high traffic through the winter period should receive an application of straight sand to improve their wear tolerance. As recommended for the tees above, this should be applied at a rate of around 5-8kg m^2 and repeated on at least an annual basis. Where organic matter levels are high leaving the sward vulnerable to divots and moss, consider undertaking additional hollow coring work prior to applying sand.

Rescue

- I can confirm that the graminicide Rescue is recommended to control the weed grass Yorkshire fog. Please refer to the Greencast web site at www.greencast.co.uk for further information.

Signed

Kath Bentley
Turfgrass Agronomist
STRI Ltd

STRI is completely independent and has no alliances to commercial products, services or contractors. This ensures that our design, project management and advisory services provide the best solutions for each individual client.

The STRI Programme provides golf courses with measurements and data that help to monitor and assess golf course performance. The R&A has recently developed CourseTracker (www.coursetracker.org), a free, online business management tool for golf courses, to record, review and analyse golf club performance across many areas of your business, including the golf course. STRI believes The R&A CourseTracker combined with the STRI Programme provides the tools you need to objectively monitor and assess your golf course performance.

APPENDIX 1
PERFORMANCE DATA

Performance Data

STRI Programme Measurement Protocols

By taking measurements of the playing qualities we can accurately describe the standards being set and also compare the results against our target performance levels. Essentially, our aim is to produce a set of greens that receive approach shots correctly then provide smooth/true and well-paced surfaces for putting. It is important that the greens are performing consistently on any given day and as well as possible throughout the year.

Soil Moisture Content

The soil moisture content is measured using a Theta Probe Moisture Meter. Nine points are sampled on each green (3 x 3 grid pattern) and the average calculated. The Theta Probe measures volumetric water content (VWC) through the upper 60mm of the soil profile.

The moisture content of the soil profile has a significant impact on the playing qualities of the greens and also the health of the turf. When the soil moisture content is too high, the surfaces can become soft and the turf health can also suffer. When the soil moisture content is too low the consistency and uniformity of the turf can become compromised.

Surface Firmness/Hardness

The firmness of the greens is measured using the Clegg Impact Hammer. A 9-point sampling grid was employed to allow us to calculate an average hardness reading for each green and also determine the level of consistency within the 9 readings.

Green Speed

The speed of the greens is measured using a Stimpmeter. The speed is expressed as the average distance rolled by 3 golf balls that are delivered from the Stimpmeter ramp on a flat area of the green and repeated in the opposite direction. The greater the distance the faster the surface is deemed to be. At least two readings are taken from each green then the results were calculated using the Brede equation to take out any slope effects.

Smoothness/Trueness

The smoothness and trueness of the selected greens is measured using the Trueness Meter™. This device measures the smoothness (vertical deviation) and trueness (lateral deviation) of the putting surfaces with the level of deviation being expressed in millimeters per meter (mm/m). With these results, lower readings indicate a smoother or truer surface.

Our aim when maintaining the greens is to produce surfaces that are smooth and true for putting for as long as possible throughout the year. We are aiming to create smooth and true surfaces for putting that do not deflect the ball from its intended path (“snaking”) or kill its momentum (“bobbling” and “chattering”). During the main playing season, our target range for smoothness is <25 mm/m of vertical deviation and for trueness <10 mm/m of lateral deflection. The lower end of these target ranges represents fantastic putting surfaces with the higher end providing really good standards for routine play. These target ranges are very challenging but we are striving to achieve the highest standards of play.

Performance Measurement Results							
Green No.	Speed (distance)	Smoothness (mm/m)	Trueness (mm/m)	Firmness Mean (gravities)	Firmness SEM (±)	Moisture Content (%)	Moisture Content SEM (±)
2	9 ft 2 in	28.9	20.6	91	2	37.8	1.0
4	9 ft 0 in	27.6	18.3	87	2	39.2	1.2
10	10 ft 1 in	26.8	17.7	93	2	36.2	1.8

Figure 1

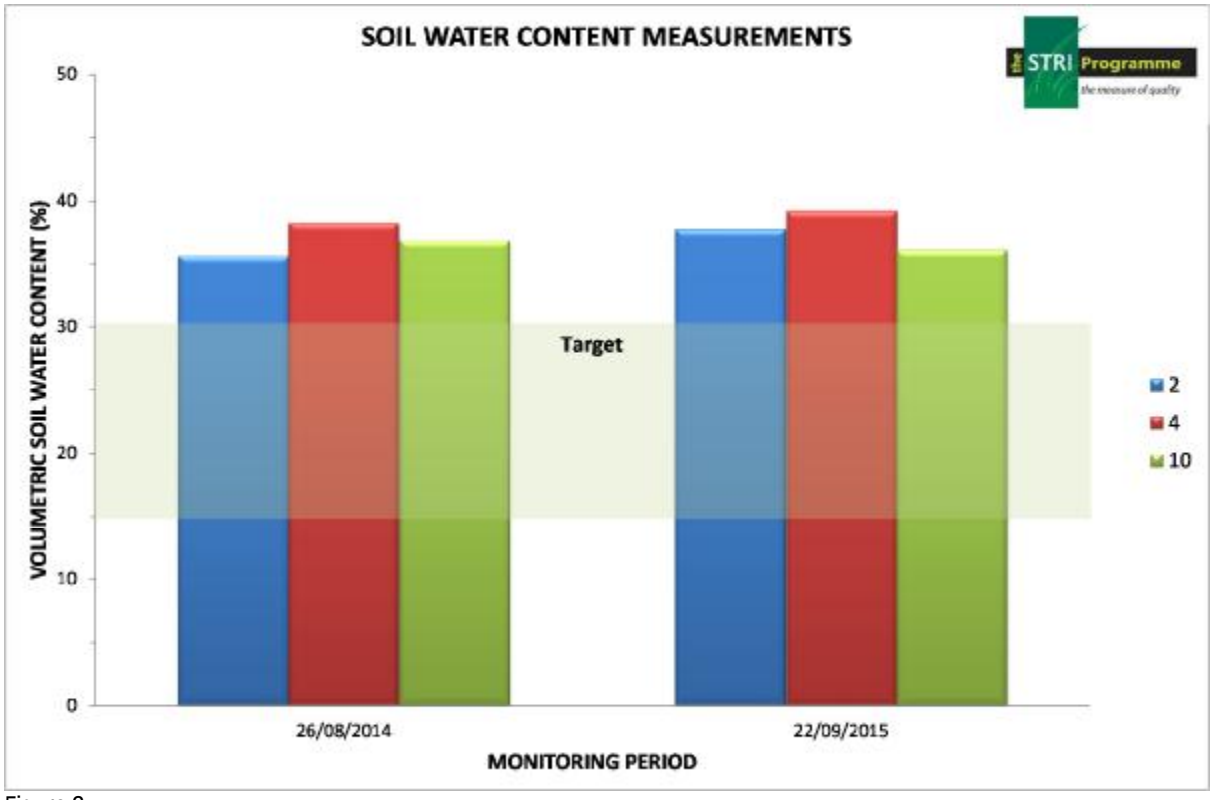

Figure 2

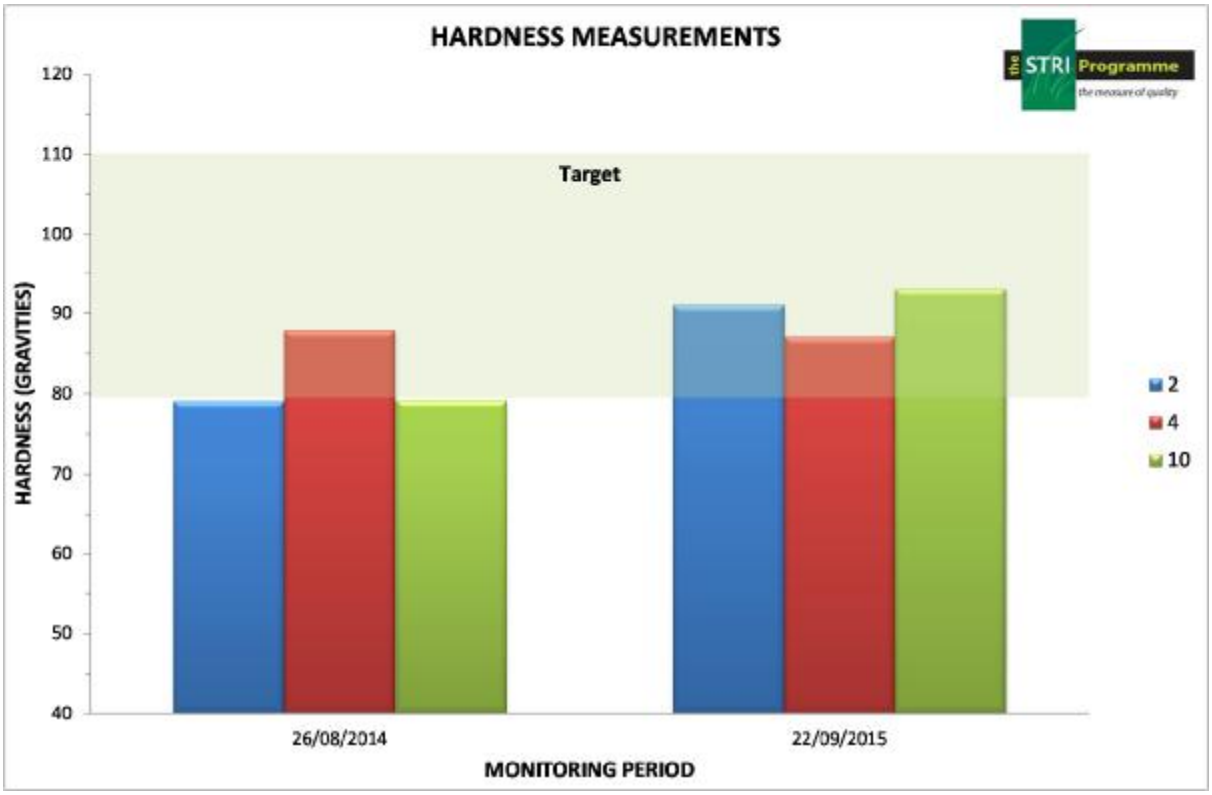

Figure 3

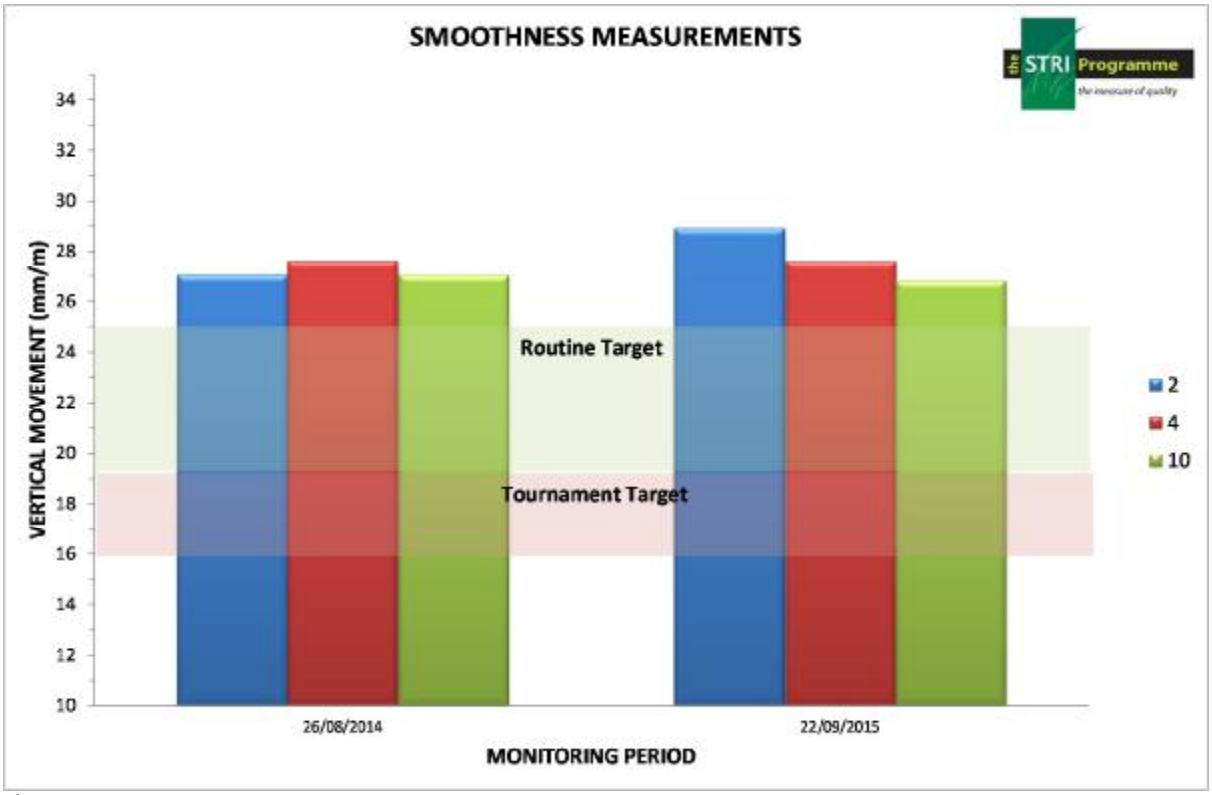

Figure 4

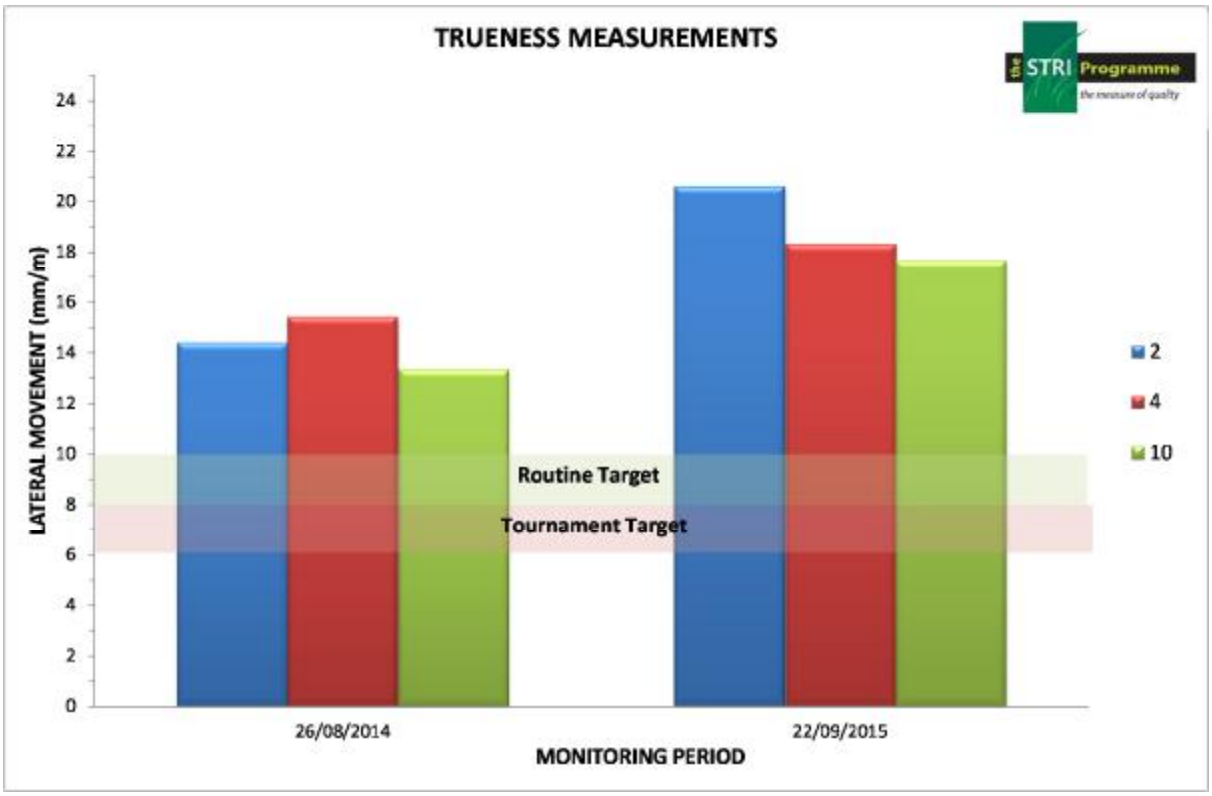

Figure 5

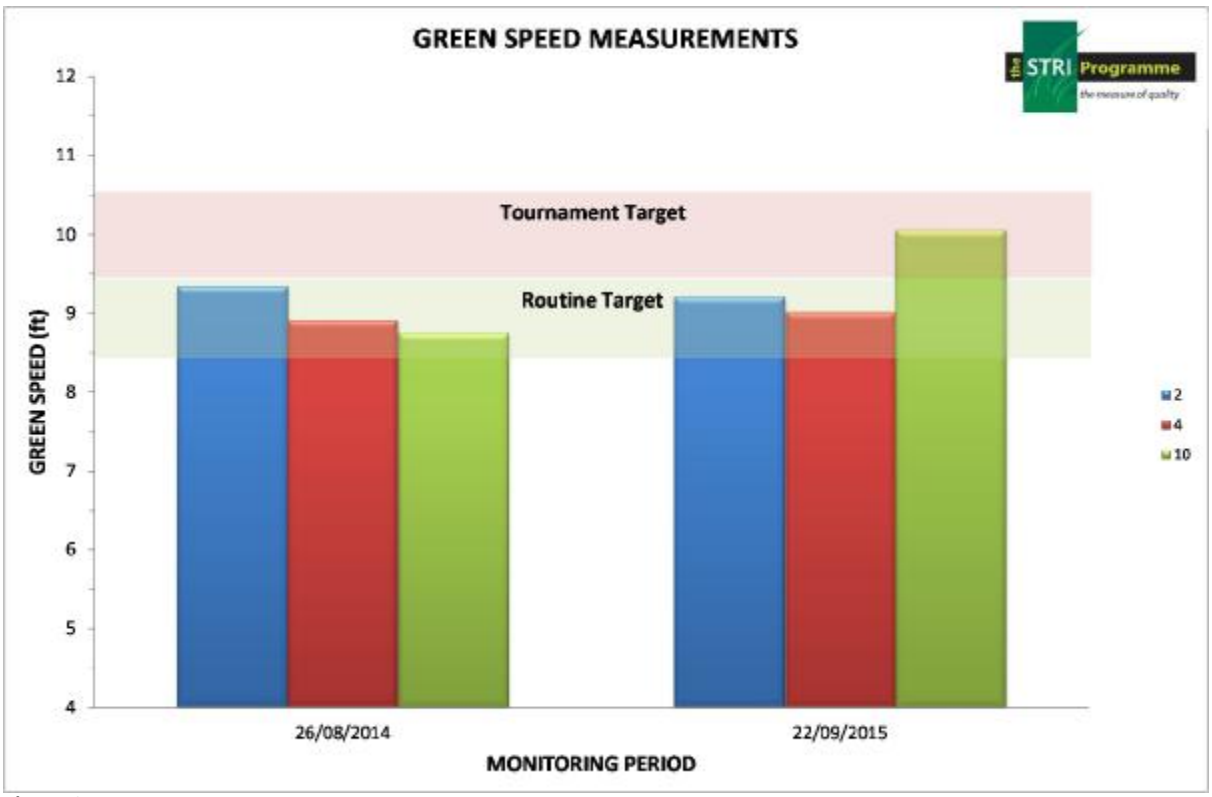

Figure 6

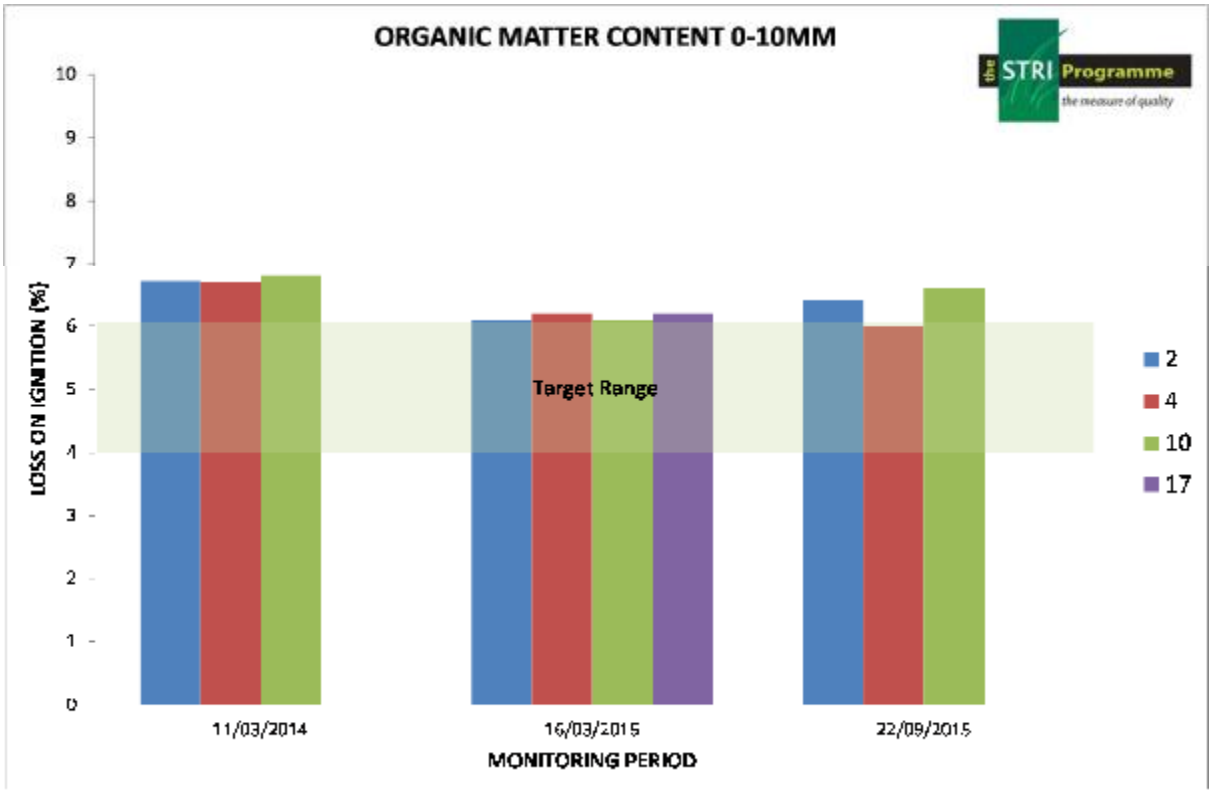

Figure 7

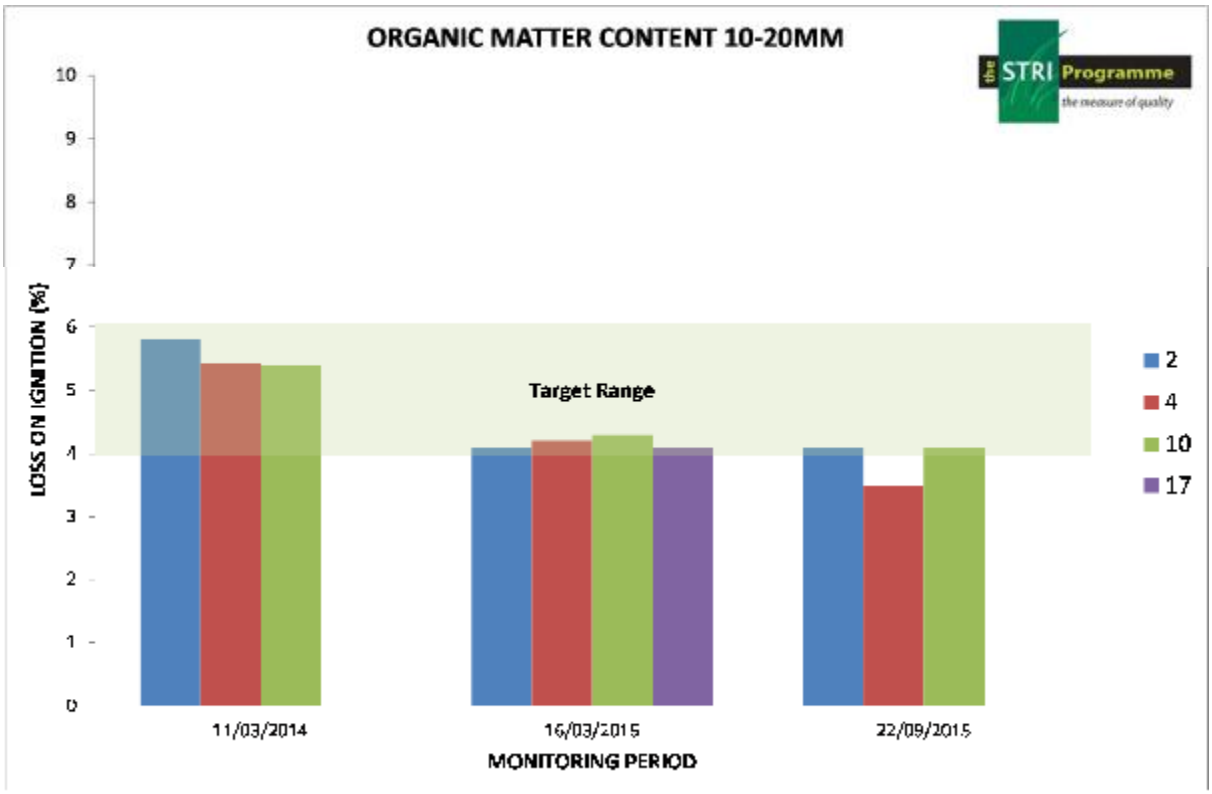

Figure 8

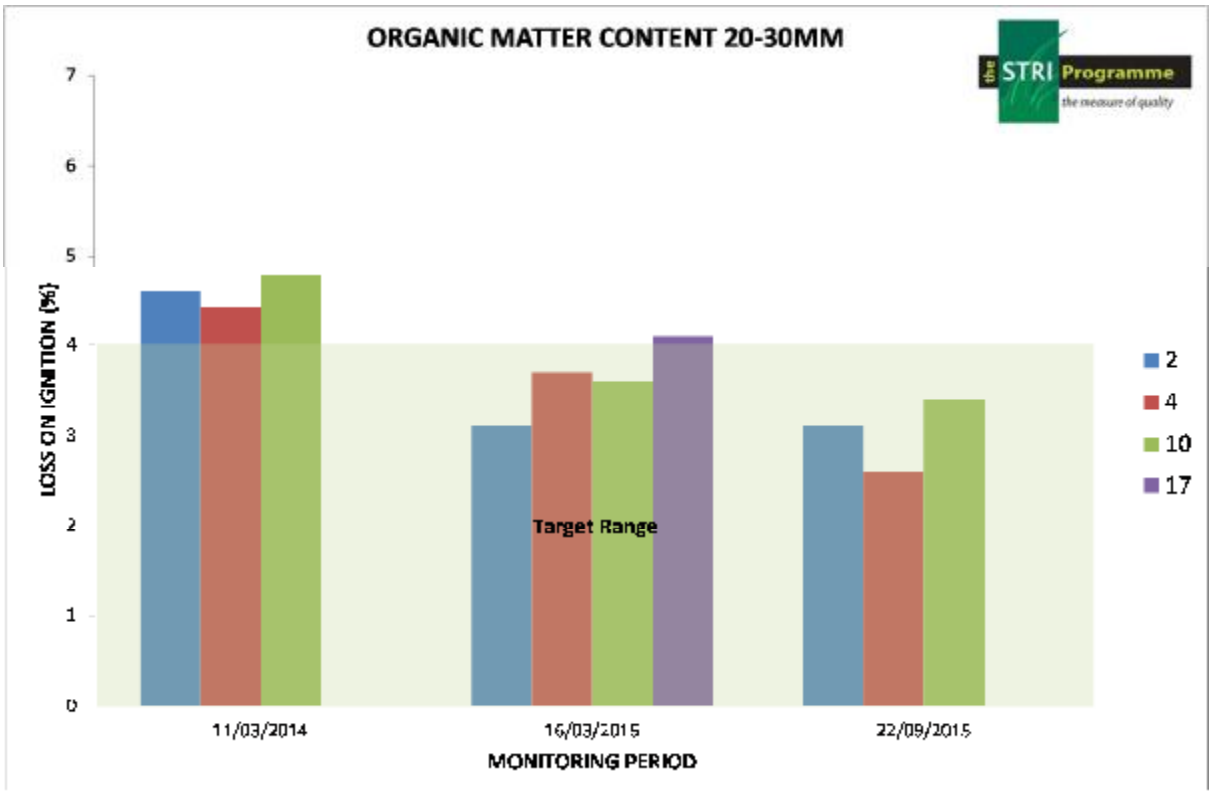

Figure 9

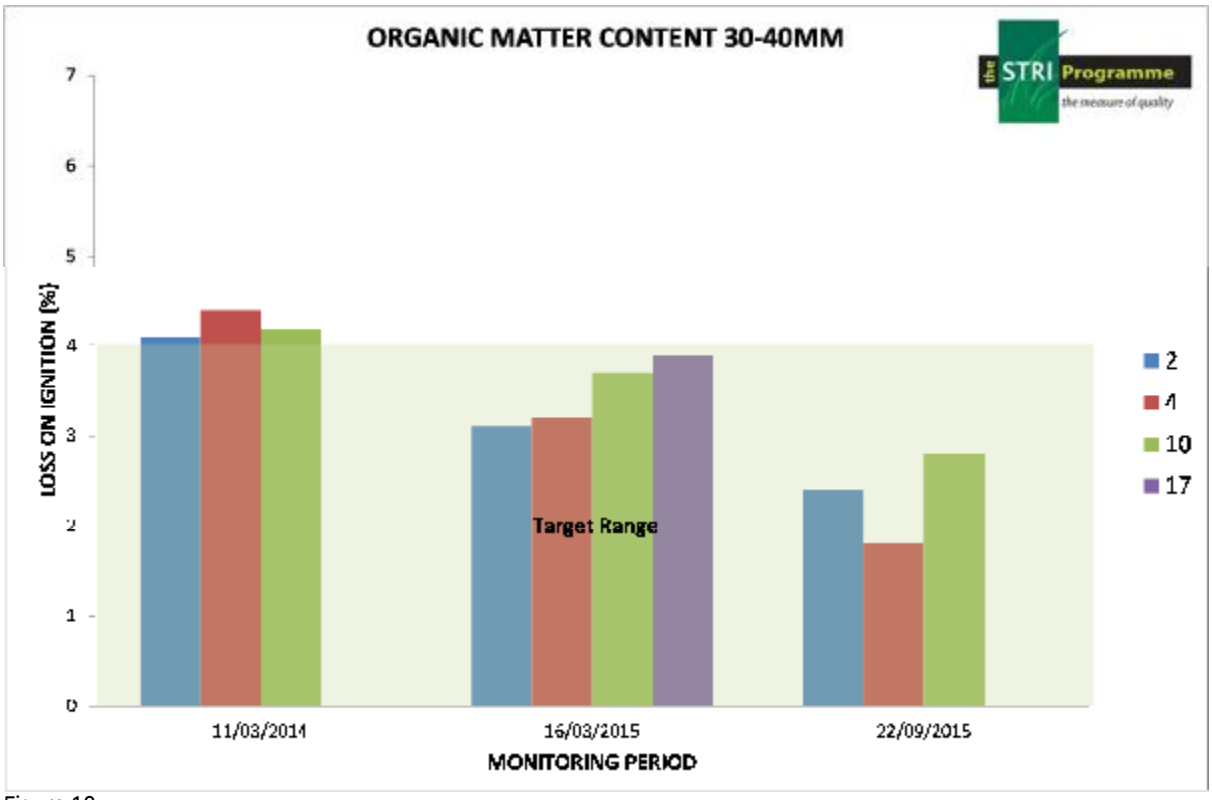

Figure 10