

Labosport Group

ScorePlay™ : a new way
to measure performance
of natural grass & hybrid
sports fields

Nationaal Sportvelden Congres
KNVB campus – Zeist
December 1st 2016



Content

- 1. The dilemma with natural grass**

- 2. ScorePlay™ : what is it ?**

- 3. Findings to date**

The dilemma : how can we measure performance of natural grass / hybrid sports fields?

- ✓ Agronomy is a science, so is civil engineering
- ✓ Yet, it is impossible to « standardize » nature



A natural soil condition can drastically change overnight and impact surface performance

...still, a perfect field must provide the same surface quality everywhere on the planet (almost !)

Generalism vs Particularism

1. We all want a safe, even surface...but
2. « Top quality » Ray Grass is not the same for Bermuda or KBG
3. What is needed in a temperate climate is not what is needed for a tropical monsoon climate



...and we want to avoid this

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So what is ScorePlay™ ?



Key ideas behind the service

- **Innovation** can support agronomy
 - Part 1 : Performance Testing
 - Part 2: Agronomy
- How do we deal with the **natural variability** ?
 - Mappings
 - Regular monitoring
- How do we solve **Generalism vs Particularism**?
 - We use a scoring tool, but the agronomist has a final say
 - We acquire a large database on natural grass fields

1st Part : Performance measurement



Innovation

LABOSPORT



SCOREPLAY™

Up to 25 parameters can be measured, aggregated in an overall score on 100%

Labosport ScorePlay™



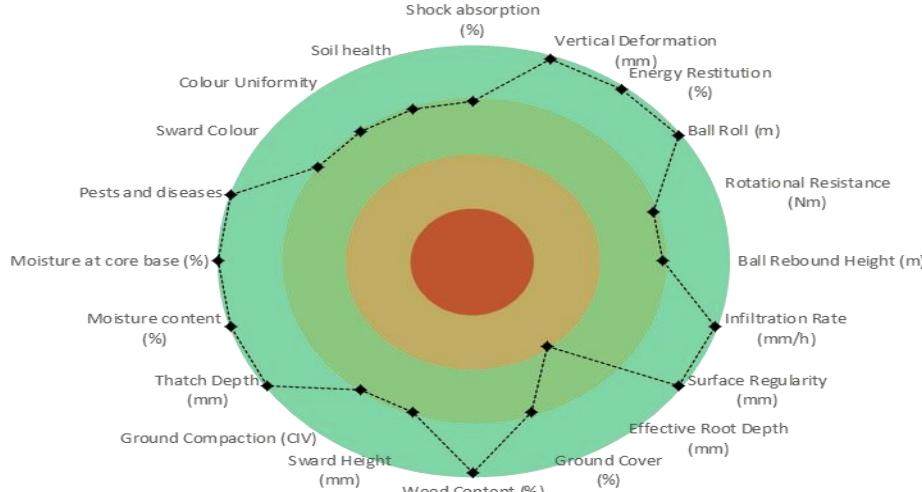
PSD AGRONOMY LABOSPORT GROUP

LABOSPORT



Venue Name / Location	0
Report Number	151515
Client	0
Surface Type	Natural turf
Surface Construction	0
Primary Sport(s)	Football
Category	Stadium
Date of Test	13/05/2015

Overall Score_{/%} - 84%



The radar chart displays the overall score of 84% in the center, surrounded by concentric circles representing different ranges of performance. The outermost ring is light green, the middle ring is medium green, and the innermost ring is orange. Dashed lines connect the center point to various parameters listed around the perimeter:

- Shock absorption (%)
- Vertical Deformation (mm)
- Energy Restitution (%)
- Ball Roll (m)
- Rotational Resistance (Nm)
- Ball Rebound Height (m)
- Infiltration Rate (mm/h)
- Surface Regularity (mm)
- Effective Root Depth (mm)
- Ground Cover (%)
- Weed Content (%)
- Sward Height (mm)
- Ground Compaction (CIV)
- Thatch Depth (mm)
- Moisture content (%)
- Moisture at core base (%)
- Pests and diseases
- Sward Colour
- Colour Uniformity
- Soil health
- Shock absorption (%)



Rating Category

84%	Improvements needed
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Stadium	Acceptable	> 90 %	Target	> 95 %
Training Venue	Acceptable	> 80 %	Target	> 85 %

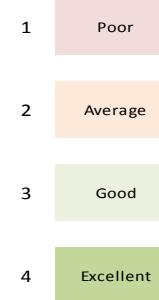
Note: any individual score 2 or below is inadequate and requires

Each score reflects performance

measurement + Labosport experience

Results - AGRONOMY

Location \ Property	Effective Root Depth (mm)	Ground Cover (%)	Weed Content (%)	Sward Height (mm)	Ground Compaction (CIV)	Thatch Depth (mm)	Moisture content (%)	Moisture at core base (%)
1	-	-	-	-	80	-	15	-
2	-	-	-	-	81	-	15	-
3	-	-	-	-	82	-	15	-
4	-	-	-	-	83	-	20	-
5	60	95	5	22	70	5	15	18
6	-	-	-	-	85	-	15	-
7	65	100	10	24	84	0	15	17
8	-	-	-	-	89	-	20	-
9	-	-	-	-	80	-	15	-
10	80	95	0	22	80	0	20	22
11	60	70	2	23	85	5	25	25
12	-	-	-	-	85	-	20	-
13	65	100	0	22	82	0	15	15
14	-	-	-	-	86	-	15	-
15	-	-	-	-	87	-	15	-
16	-	-	-	-	89	-	20	-
17	-	-	-	-	79	-	15	-
18	-	-	-	-	80	-	15	-
19	-	-	-	-	90	-	15	-
20	-	-	-	-	78	-	20	-
21	-	-	-	-	85	-	15	-
22	-	-	-	-	86	-	15	-
23	-	-	-	-	85	-	15	-
24	65	65	0	21	84	0	20	25
Average	66	88	3	22	83	2	17	20
ScorePlay™ Rank	2	3	4	3	3	4	4	4



Ball – Surface interaction

Ball Surface interaction

- Ball Roll (EN 12234:2013): length and regularity

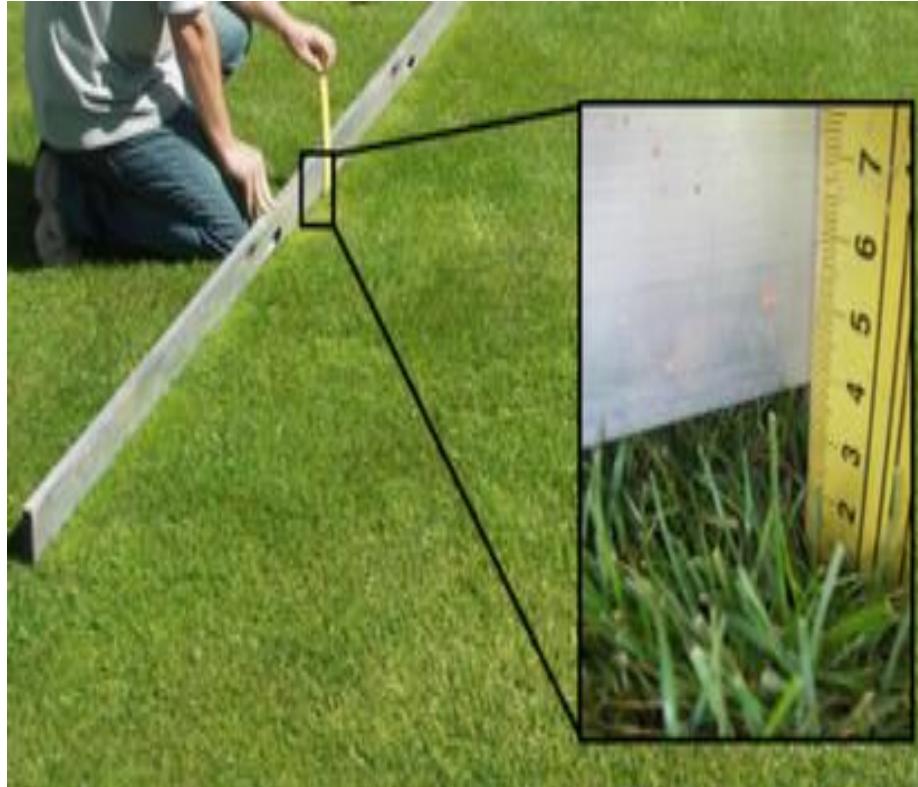


- Vertical ball rebound (EN 12235:2013)



Field Properties

- Surface regularity and evenness
- 3m straightedge



Player – Surface interaction : football

The AAA (advanced artificial athlete EN-TS 16717), a mechanical simulation of a 1.80m, 80kg running athlete



The torque (EN 15301-1:2007) simulates the grip provided by the surface during a player's change of direction



Player – Surface interaction : rugby

The HIC (Head Impact Criterion) or Determination of Critical Fall Height (CFH) acc. to EN-1177, a mechanical simulation of head impact, coming from the automotive industry (safety)



Rotational resistance not picking up weak rootzone for rugby (scrummaging)

Example: turf laid few weeks prior to an international rugby game with not enough time to grow roots

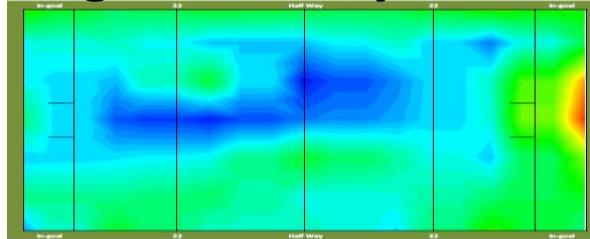
Good rotational resistance but...



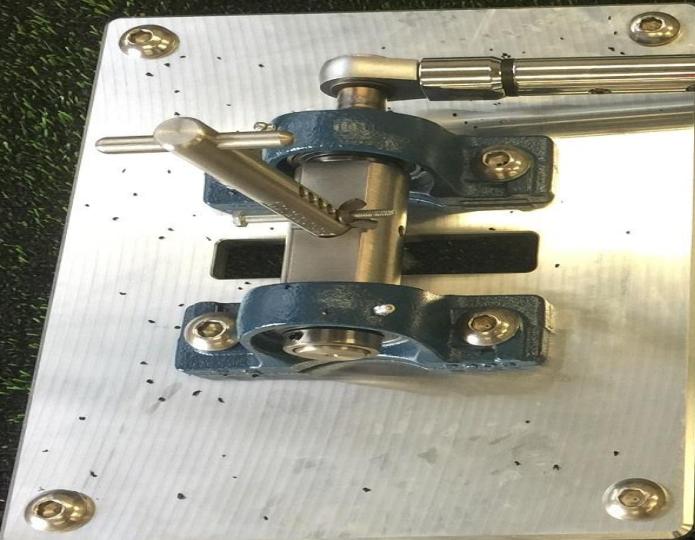
Limited root length



High humidity levels



We developed a new test, to measure rootzone resistance



Shear tester

- Developed in 2015-2016 with Loughborough university
- Starting point: forces at scrummage
- Measures a new property that helps identify potential problems with shear failures

2nd part : the agronomy diagnosis



Soil Profile Analysis:
Hybrid System

A large range of tests can be made

Sward

- Composition
- Cover
- Colour
- Uniformity
- Height
- Weed Content
- Thatch Depth
- Pest and Disease

Moisture Content

- At surface
- At depth



Soil/rootzone condition

- Soil/Rootzone pH
- Effective Rooting Depth
- Roots density
- Salinity
- Black layer
- Chemical analysis - nutrient status (if required)

Infiltration Rate

- Additional characteristics:
- PSD, bulk density,
- Compaction level...

Sward height, Cover, Pests & diseases

Sward height

- Either measured using a prism or EN 12233:2003



- Inspection of quality of cut
- Some leagues setting requirements for cutting heights

Ground Cover (EN 12231:2003)

- Using 100 square quadrat



- Pest and diseases: score 1-4
- Turfgrass species and weed content



Example : variable grass quality
in 2 areas



Grass Health & Cover using NDVI

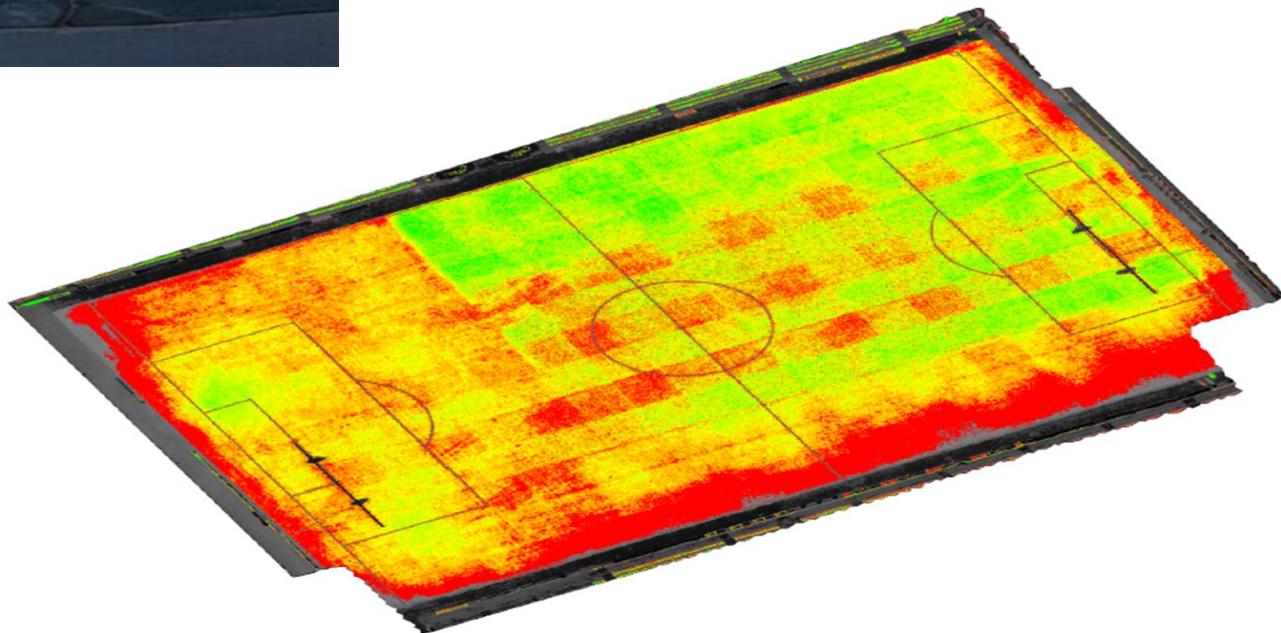
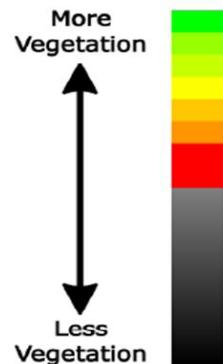


Poor coverage & health



Good coverage & health

Example: Shade effect



Infiltration rate - permeability

- 3 double ring infiltrometers in one location (EN 12616:2013)
- If a permeability problem is identified, the core sampling may provide explanations or Particle Size Distribution
- Ponding method also used elsewhere as required



Soil/rootzone profiles

- Effective rooting depth and density
- General condition and structure of topsoil/rootzone
- Aerobic/anaerobic
- Thatch depth (EN 12232:2003)



Rootzone profiles : hybrid systems

Photographies



Profils de sol



Enracinements



présence de vers de terre



coin sud ouest : ombre portée des tribunes à 15 h

Rootzone profiles : hybrid systems

Site Photographs



Etat de la surface après l'impact du AAA



Etat de la surface après l'essai de résistance en traction rotationnelle



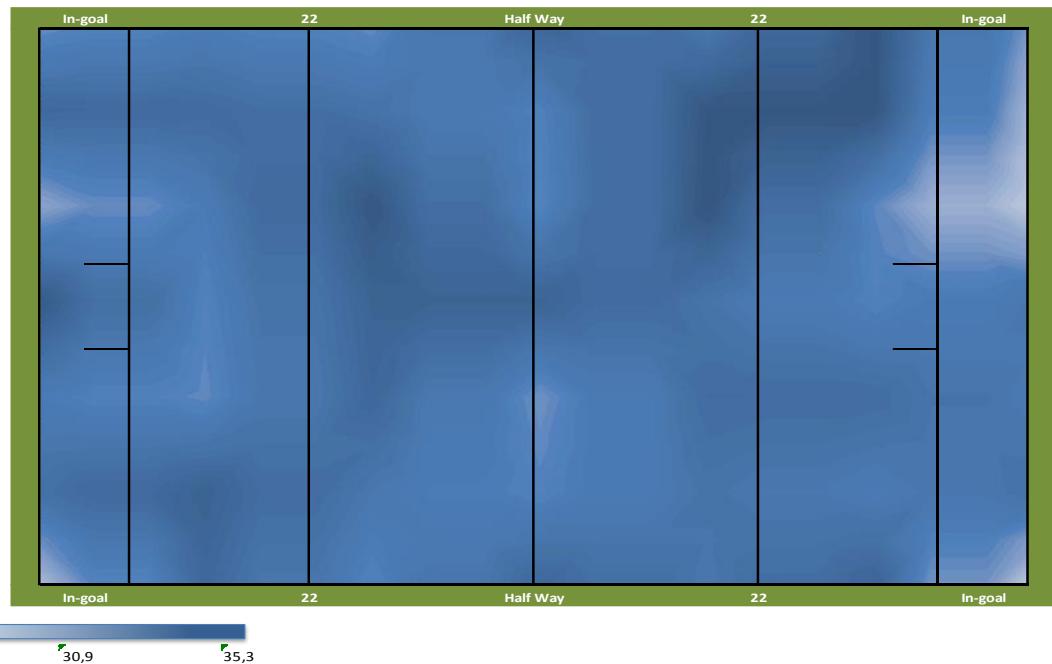
Profil de sol représentatif



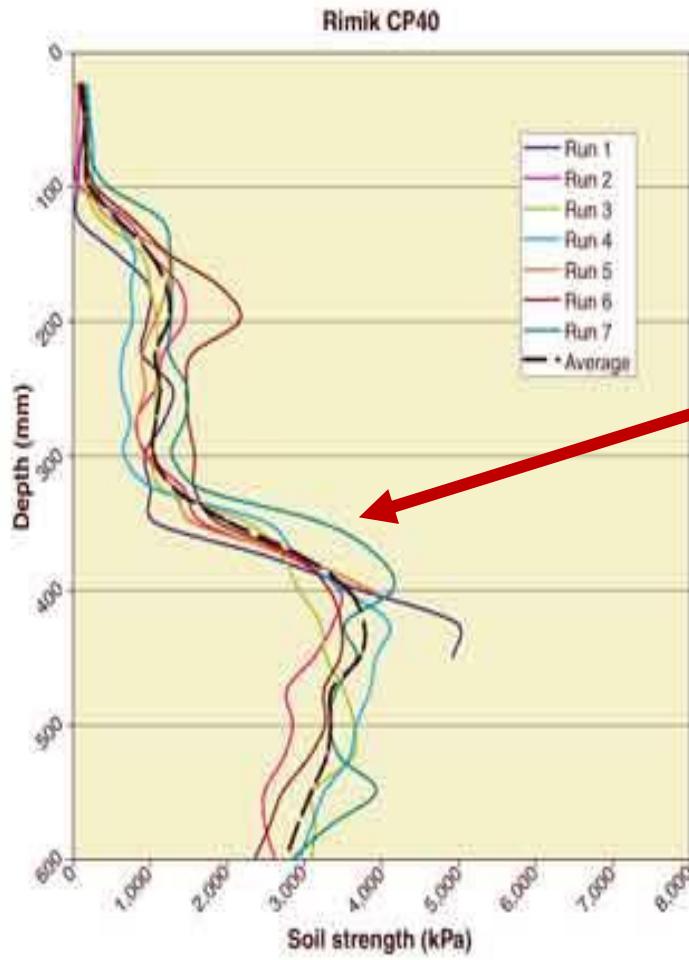
Qualité de l'enracinement

Moisture Content

- Measurements at surface and 200mm depth
- Uniformity over the pitch assessed as well



Soil compaction



Observed compaction at 350mm will hinder rootzone development below this level – or water percolation

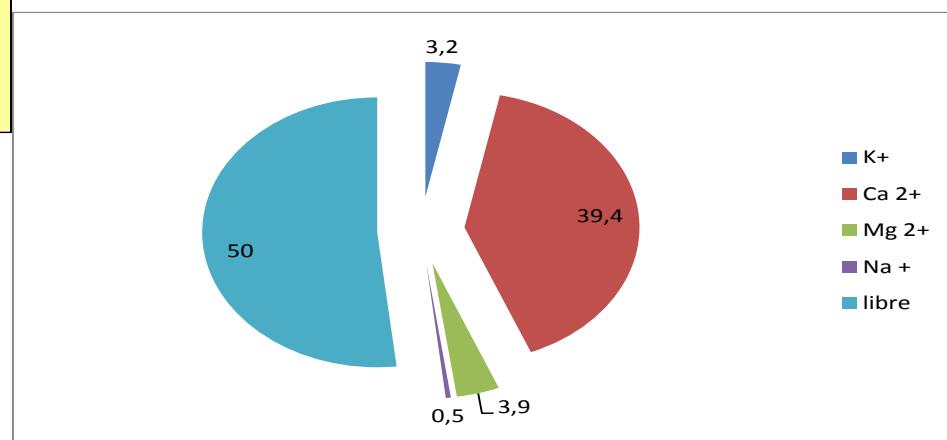
Complementary soil analysis

GRANULOMETRIE (selon NF X31-107)			TEXTURE			Calcaire Total (CaCO_3)		en g / kg		en g / kg	
	%	g/kg				NF ISO 10693	-	< 80	-		
Sables grossiers	75,72	757,20	<u>CLASSIFICATION (triangle GEPPA 1963)</u>			Sableux					
Sables fins	7,41	74,10	Comportement prévisible :								
Limons grossiers	4,42	44,20	INDICE DE BATTANCE			0,77 - Non battant					
Limons fins	7,20	72,00									
Argiles	5,25	52,50									
Refus à 2 mm	29,30	293,00									
PARAMETRES		METHODE	TENEUR	NIVEAU SOUHAITABLE	OBSERVATIONS	CAPACITE ECHANGE DE CATIONS		Teneur en meq / kg			
MACRO-ELEMENTS			en g / kg	en g / kg				K ⁺	Ca ²⁺	Mg ²⁺	
Phosphore (P_2O_5)	JH	NF X31-160	0,23	0,10 - 0,25				3,6	44,7	4,4	
Phosphore total			0,17	0,15 - 0,30						0,5	
Potassium (K_2O)		NF X31-108	1,25	-		CEC Metson		33			
Calcium (CaO)		NF X31-108	0,09	0,06 - 0,20	CaO/MgO = 14,22 K ₂ O/MgO = 1,92						
Magnésium (MgO)		NF X31-108	0,02			Taux de saturation				50%	
Sodium (Na_2O)		NF X31-108									
OLIGO-ELEMENTS			en mg / kg	en mg / kg				les valeurs en bleu correspondent aux exigences indiquées dans la NF P 90-113 les valeurs en rouge ne sont pas conformes aux exigences de la NF P 90-113			
Bore soluble		NF X31-122	3,32	-							
Cuivre EDTA (Cu)		NF X31-120	3,46	-							
Zinc EDTA (Zn)		NF X31-120	25,26	-							
Manganèse EDTA (Mn)		NF X31-120	113,69	-							
Fer EDTA (Fe)		NF X31-120	83,68	-							
Manganèse réductible											

With a CEC of 33 meq/kg, even if this is not saturated, the rootzone is not able to assimilate highly concentrated doses of fertilizers: fractionning is needed.

There is no toxicity linked to a deficit or an excess

C/N is slightly high. Rectification is possible through addition of organic matter



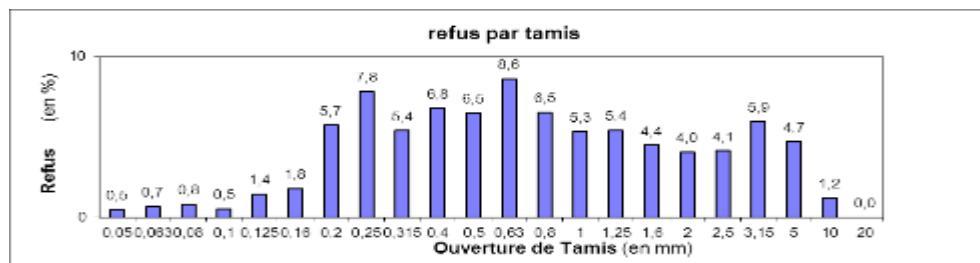
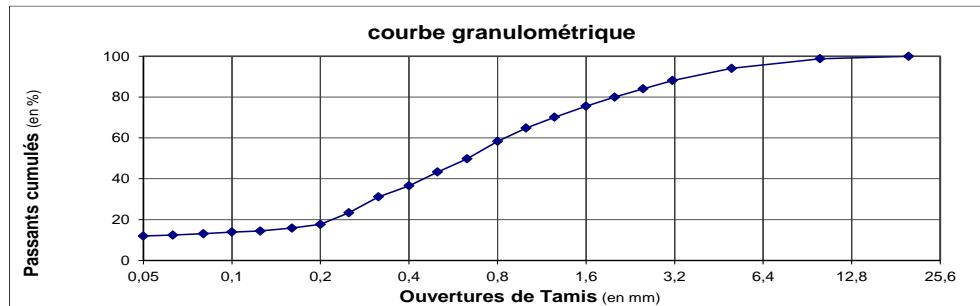
Complementary soil analysis

analyse granulométrique par tamisage à sec (NF EN 933-1)														
Ouverture des tamis	(mm)	0,050	0,063	0,080	0,100	0,125	0,16	0,20	0,25	0,32	0,40	0,50	0,63	0,80
Passants cumulés	(%)	11,9	12,4	13,1	13,9	14,4	15,8	17,6	23,3	31,1	36,5	43,3	49,8	58,3
<i>Refus cumulés</i>	(%)	88,1	87,6	86,9	86,1	85,6	84,2	82,4	76,7	68,9	63,5	56,7	50,2	41,7
<i>Refus par tamis</i>	(%)	0,5	0,7	0,8	0,5	1,4	1,8	5,7	7,8	5,4	6,8	6,5	8,6	6,5
Ouverture des tamis	(mm)	1,00	1,25	1,60	2,00	2,50	3,15	5	10	20				
Passants cumulés	(%)	64,8	70,2	75,6	80,0	84,0	88,2	94,1	98,8	100,0				
<i>Refus cumulés</i>	(%)	35,2	29,8	24,4	20,0	16,0	11,8	5,9	1,2	0,0				
<i>Refus par tamis</i>	(%)	5,3	5,4	4,4	4,0	4,1	5,9	4,7	1,2	0,0				

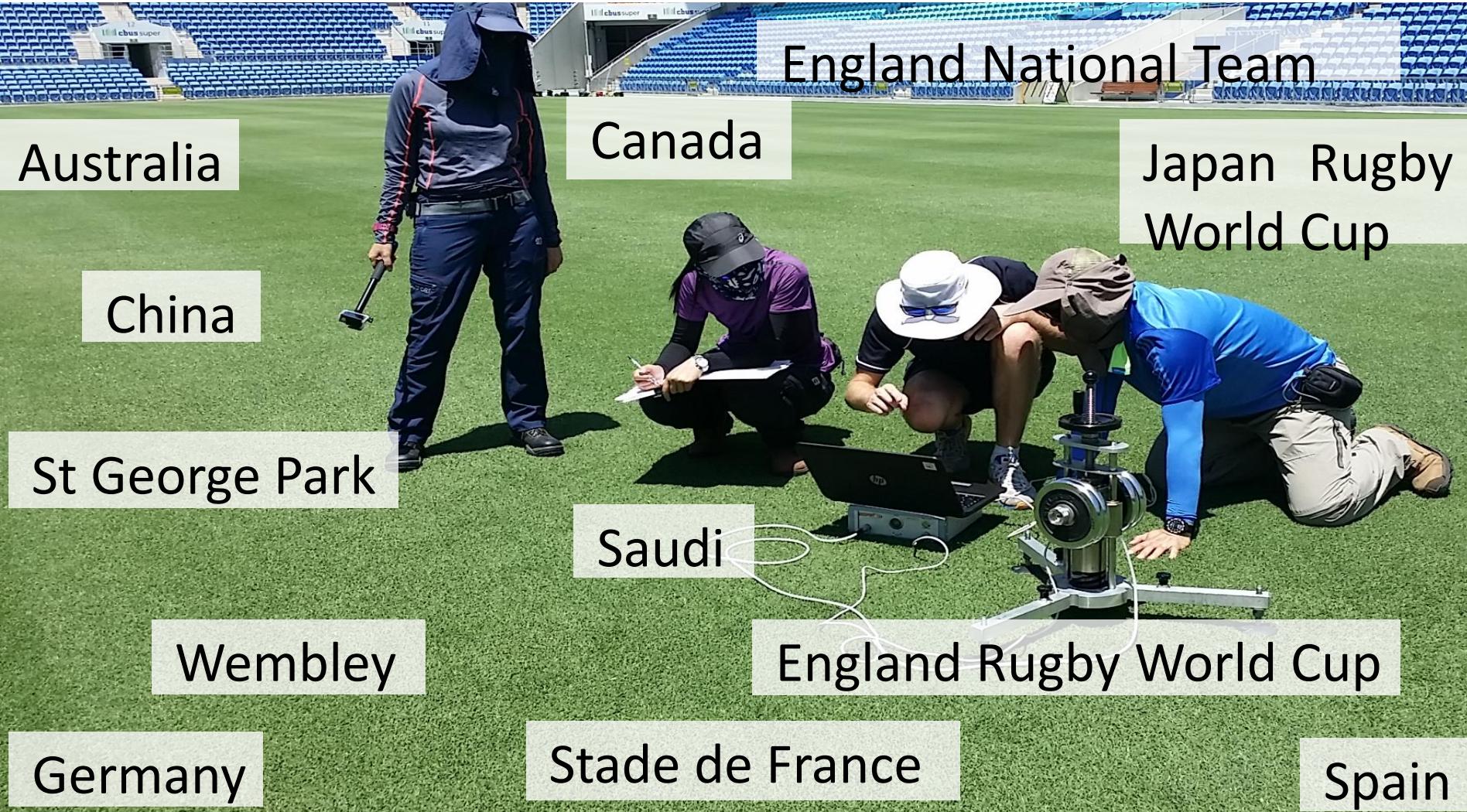
The fraction <250 µm cis lose to 25 %, the Coarse sand fraction (particles between 200 µm and 2 mm) is quite spread, there is no dominant granularity class.

This rootzone will therefore tend to easily compact and agglomerate. The risk of loosing air circulation and, therefore, permeability is high. This can possibly lead to the developpement of a black-layer.

It will be necessary to be particularly careful on maintenance works and to only undertake them if moisture conditions are satisfactory. It is crucial not to work, or not to step on the grass when wet or humid.

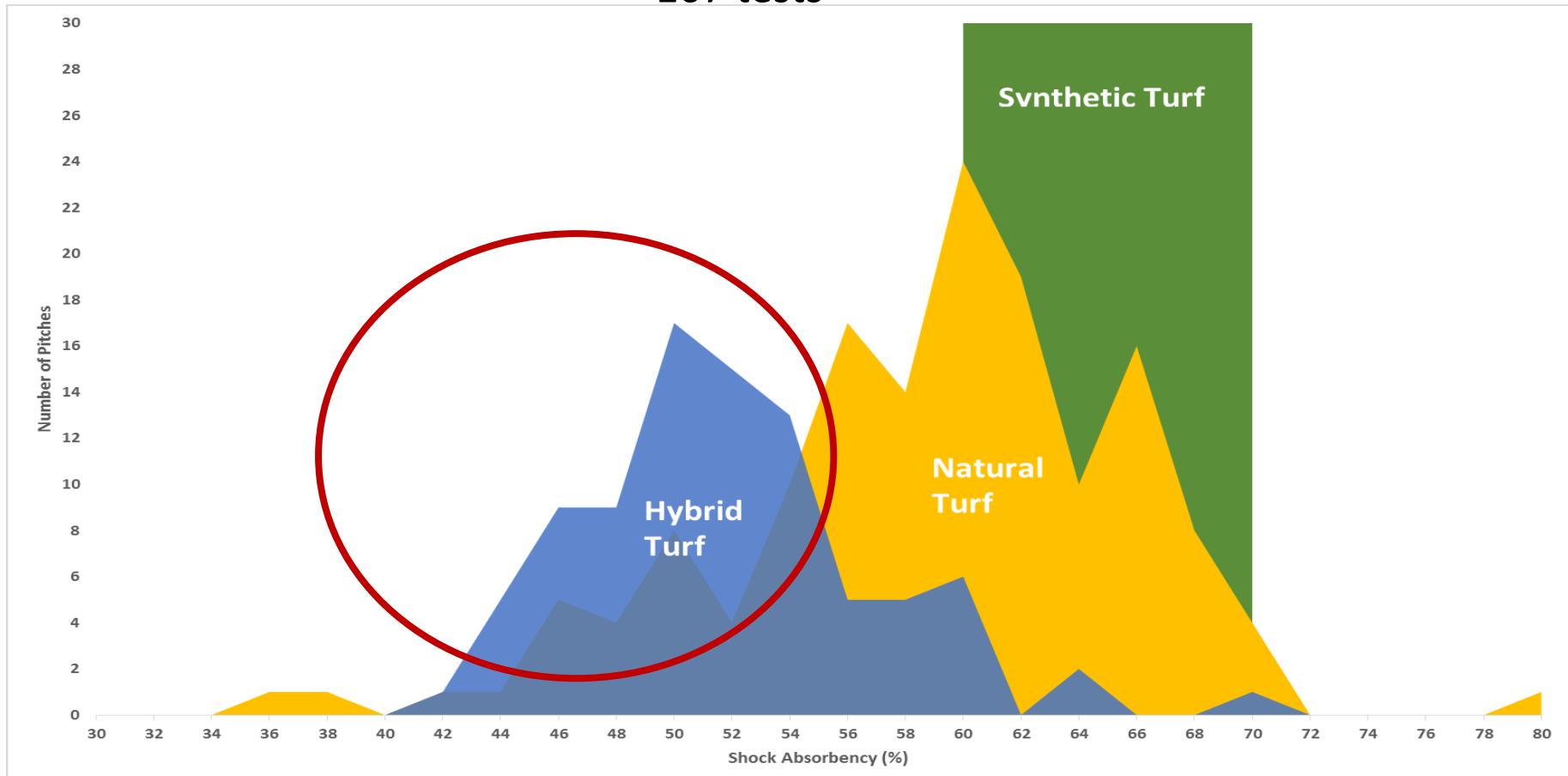


We performed 160+ ScorePlay to date



Some interesting findings

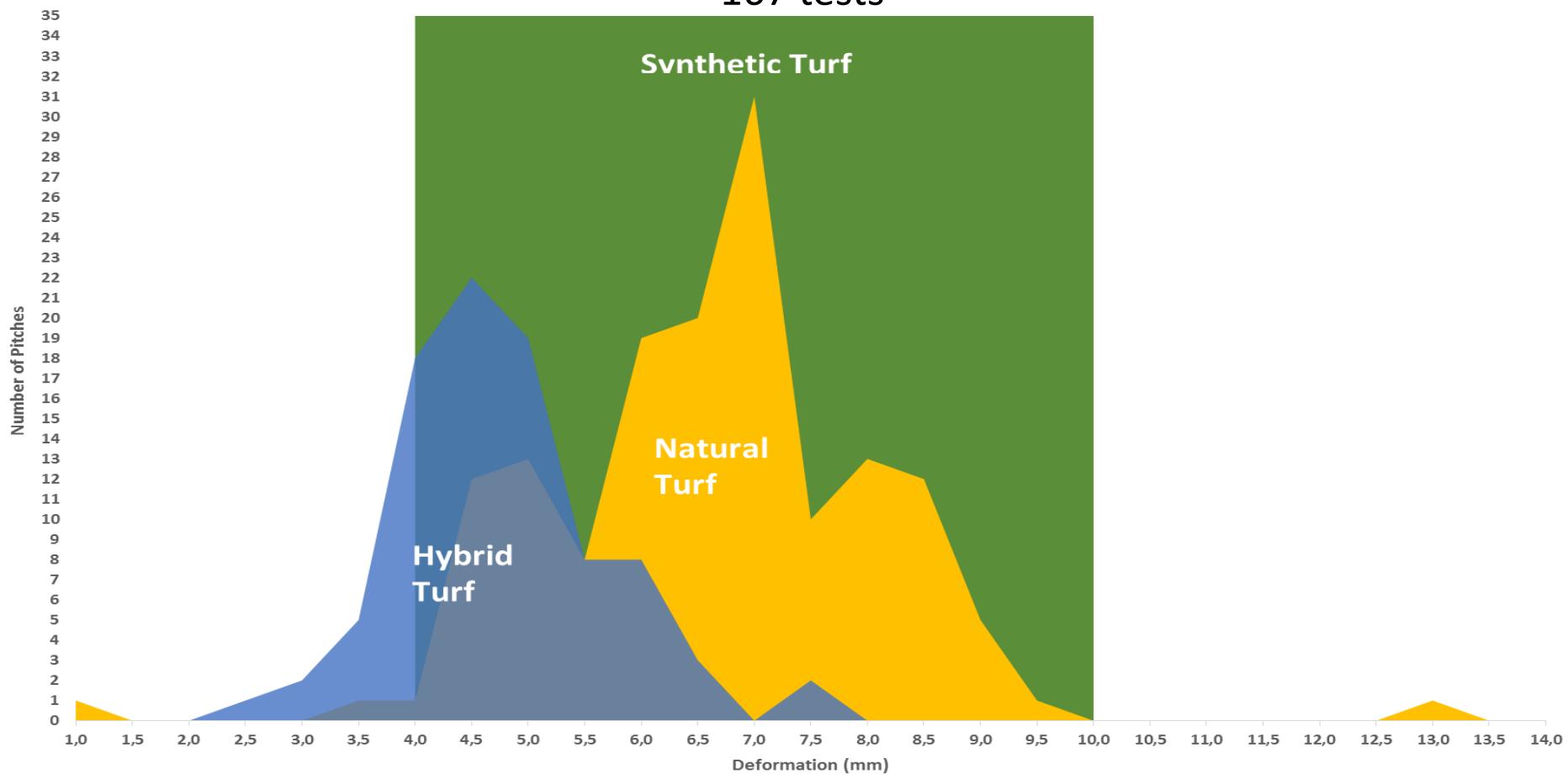
Football - Shock Absorption -167 tests-



Some interesting findings

Football – Deformation/stability

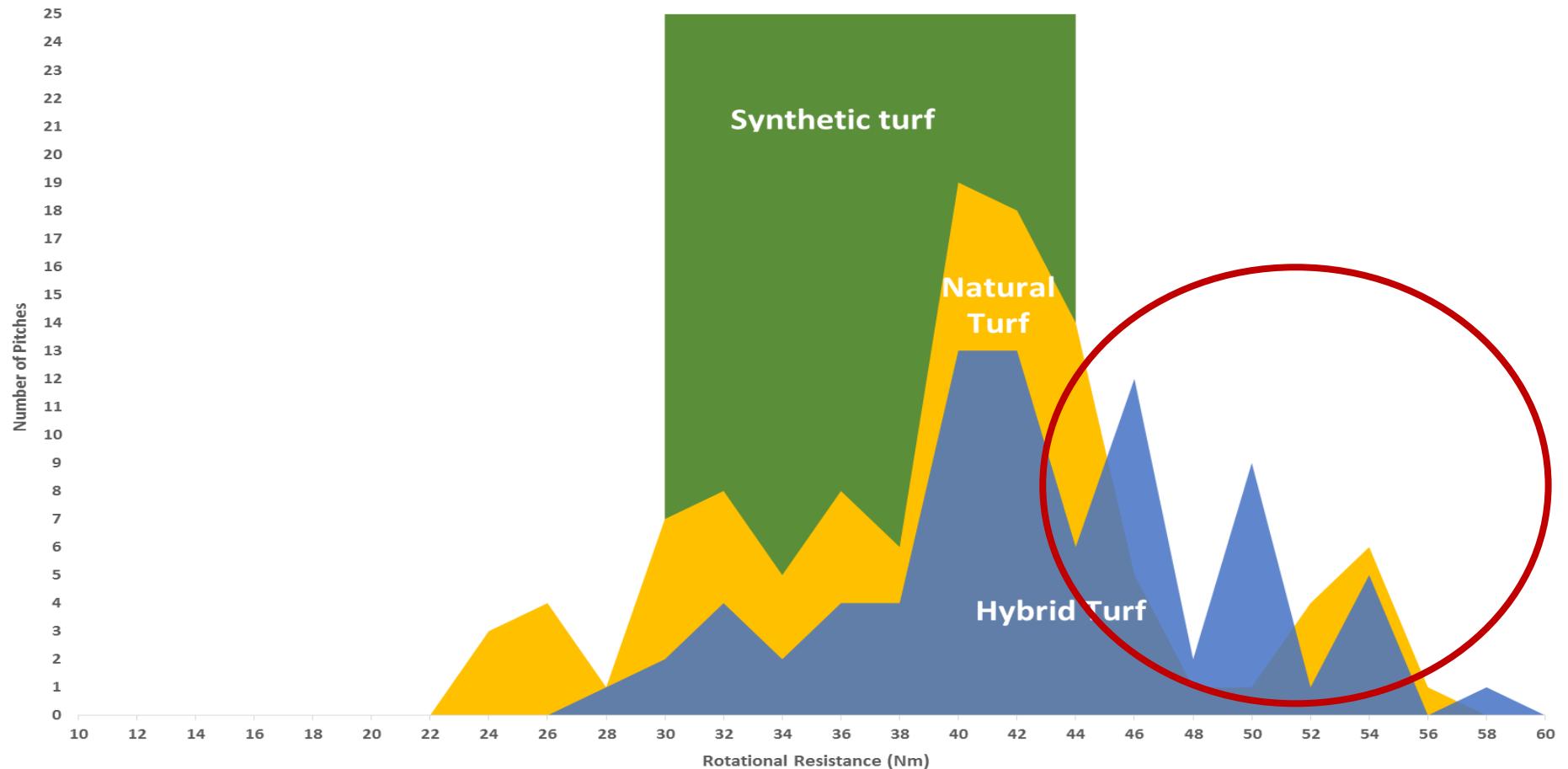
-167 tests-



Some interesting findings

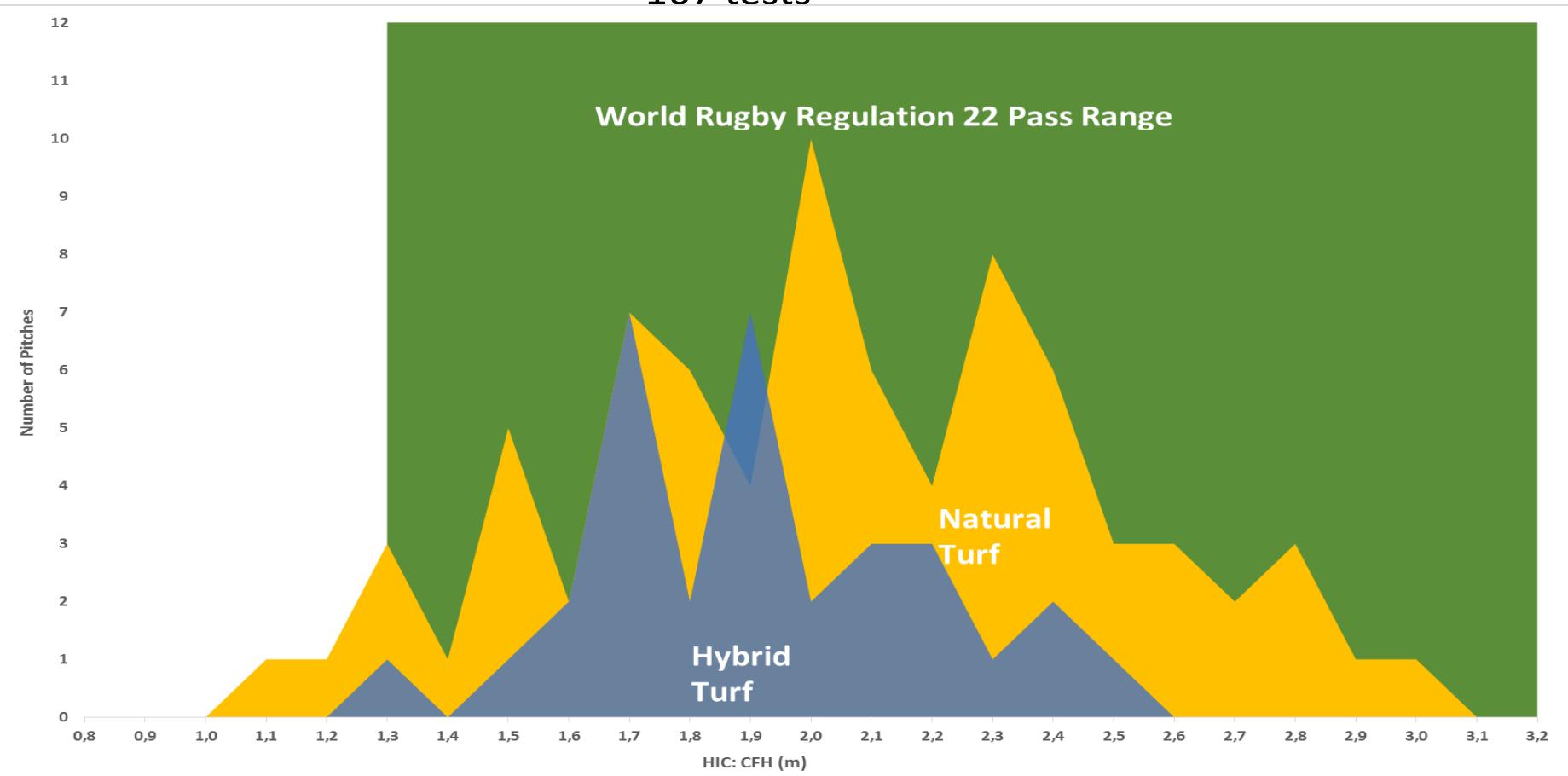
Football - Grip

-167 tests-



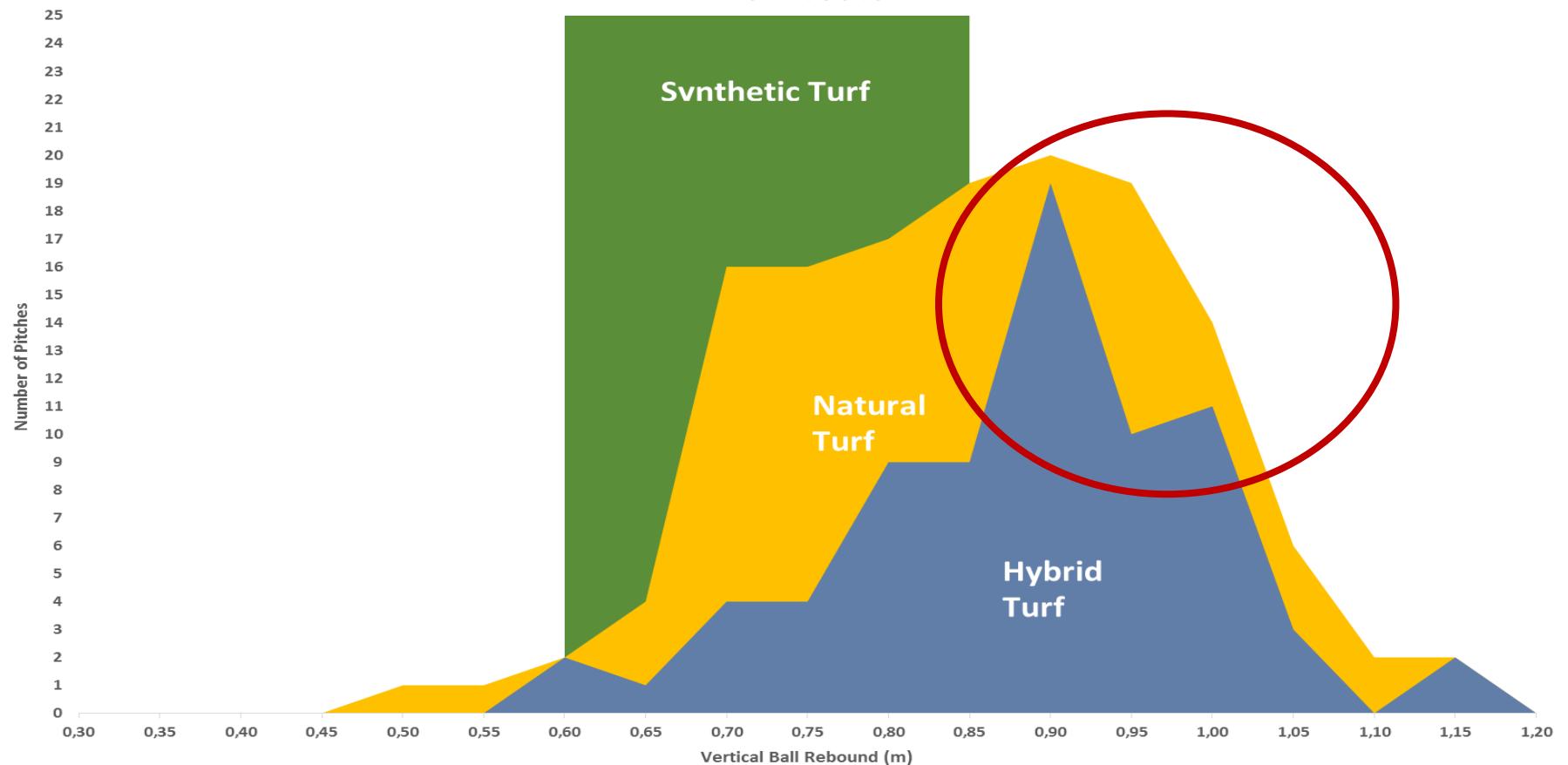
Some interesting findings

Rugby - Critical Fall Height -167 tests-



Some interesting findings

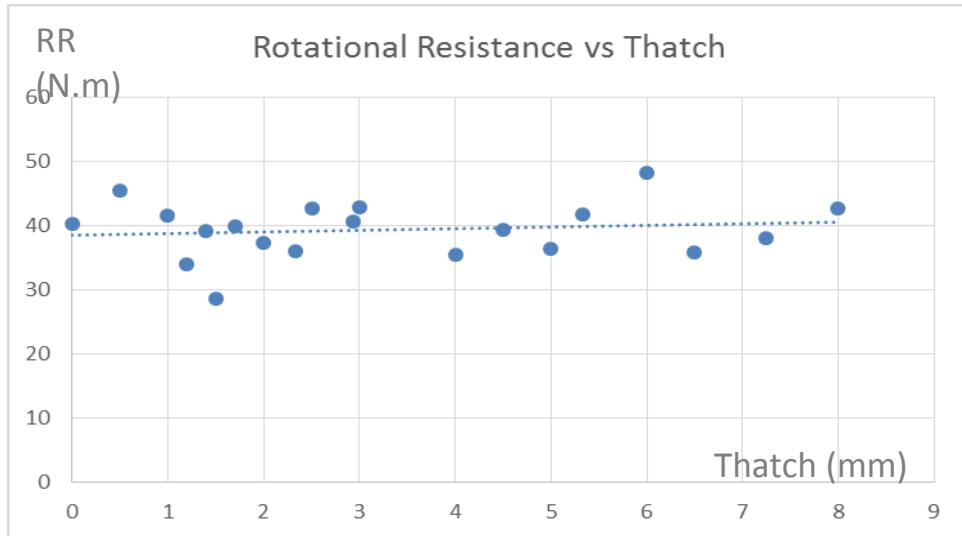
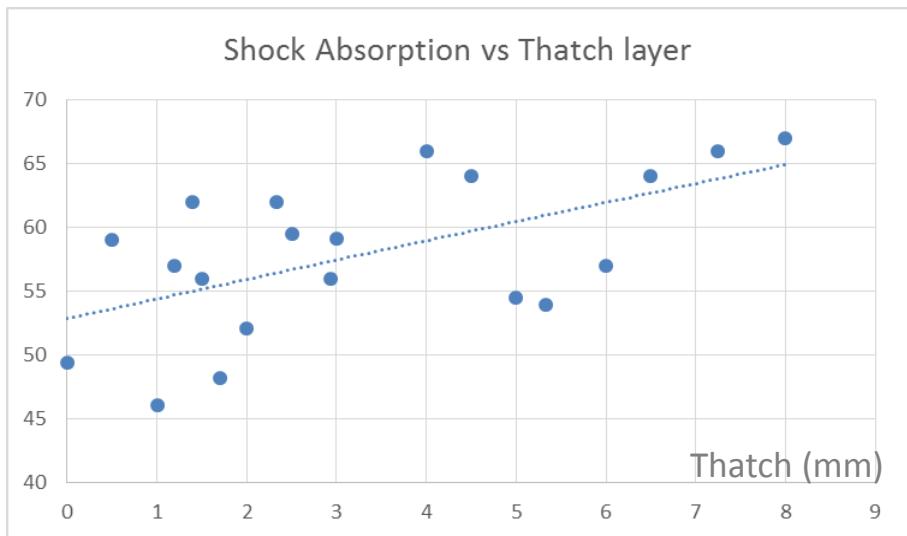
Football - Ball Rebound -167 tests-



Does thatch influence game performance ?

✓ Slight influence on Shock Absorption

✗ No influence on Rotational Resistance

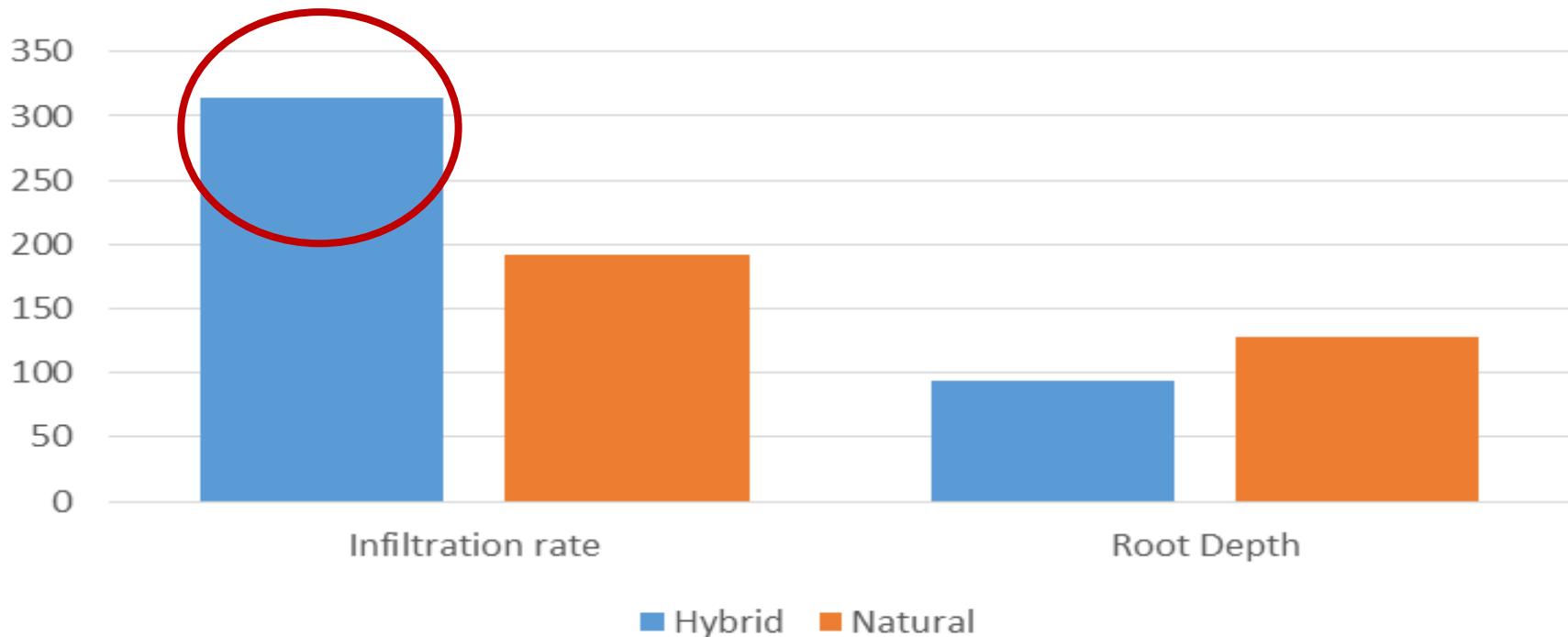


Infiltration rate and root depth

Comparison Hybrid-Natural Grass (cool season grass)

Average infiltration rate and root depth

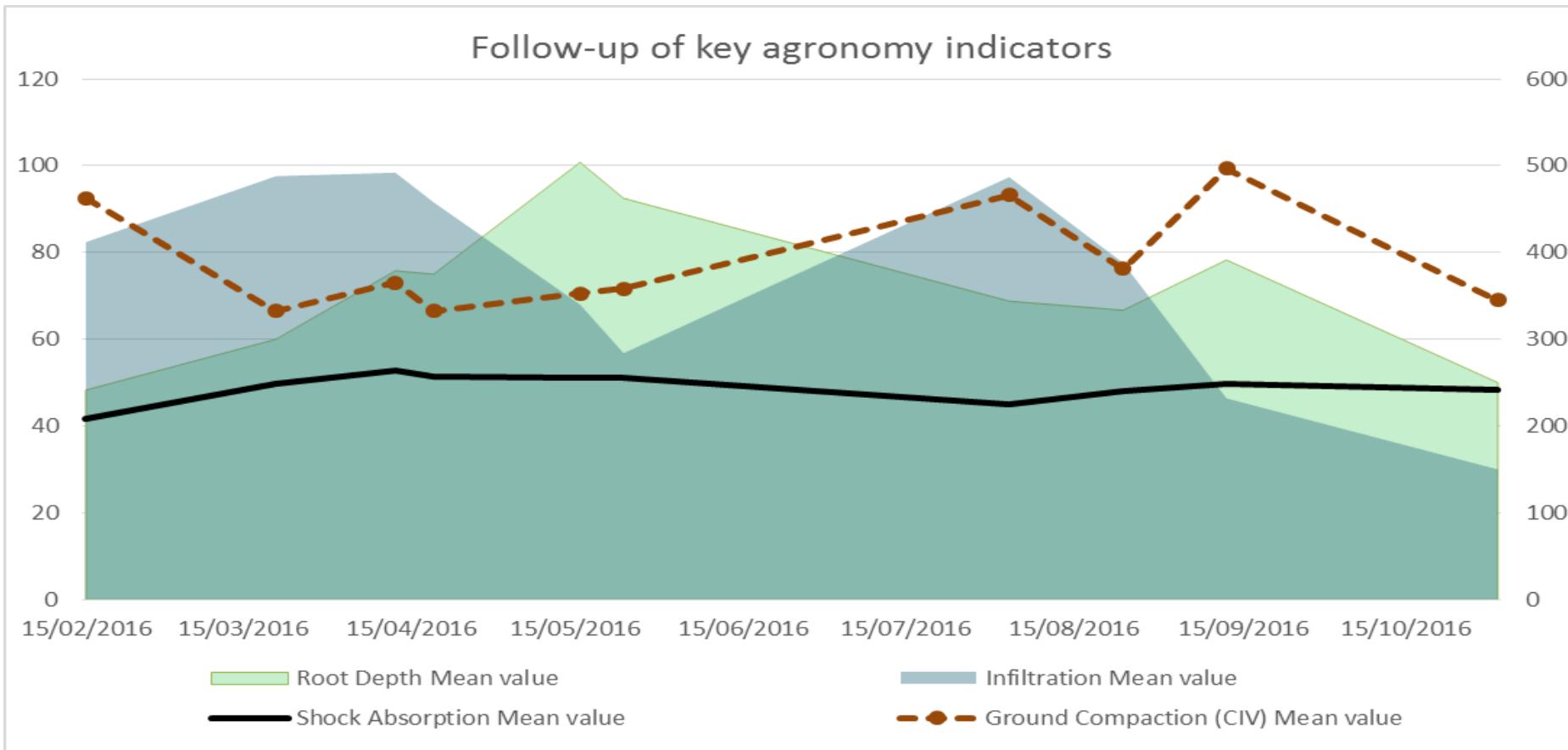
- data for 167 tests, in mm/h and mm -



Hybrid systems – excellent permeability comes with specific challenges

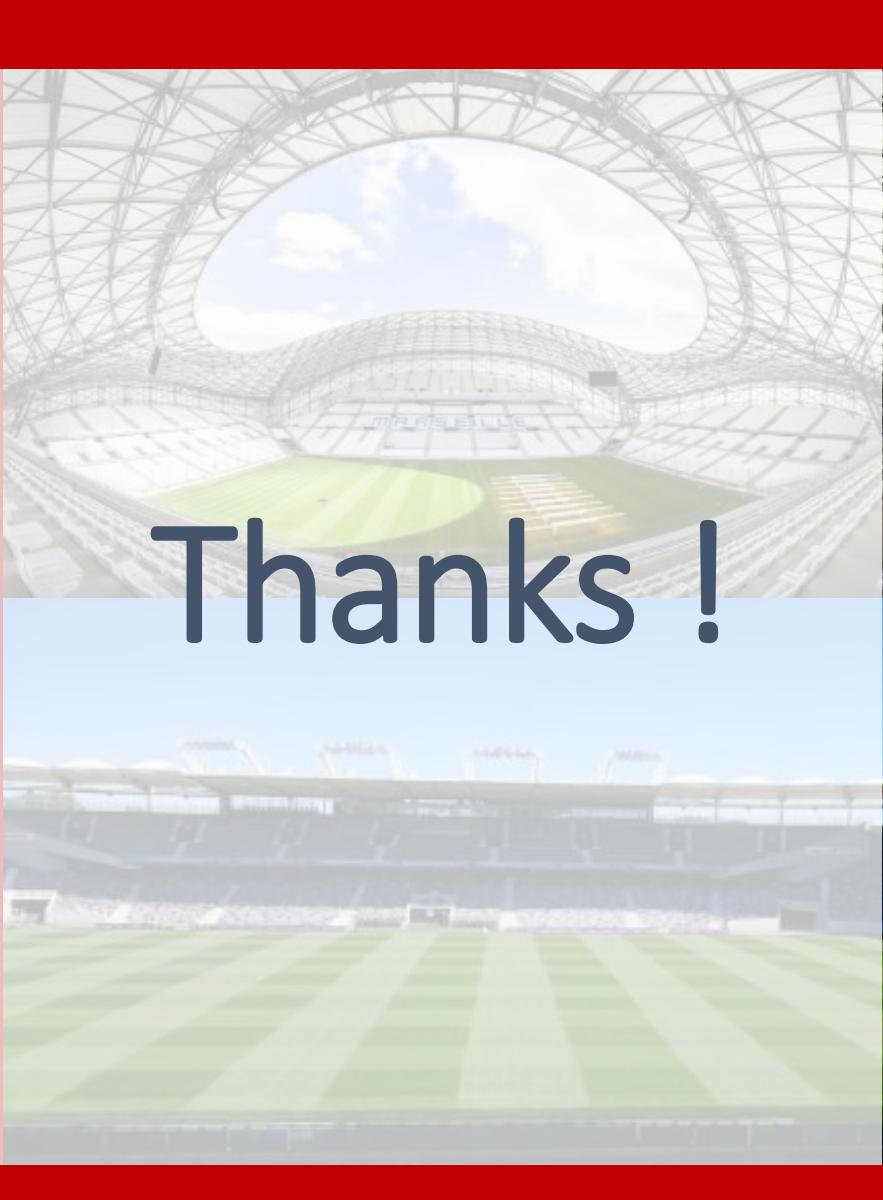
- **De-thatching/ organic debris removal is key**
 - To keep the surface from becoming hard or slippery
 - To minimize distance between sward and roots
- **Topdressing : avoid artificial fibers being buried**
- **More regular follow-up of the grass health**
 - Possibly less reserves for nutriments (=fractioning)
 - Strong permeability may mean less available water
 - Diseases can spread faster
- **Aeration of the rootzone**
 - A regular program at varying depth (hollow tines may usually not be used as they will damage the system)
- **Difficult to correct the base for defects on planarity**

Example of Wembley providing ScorePlay™ data to playing teams



Conclusion : don't look any futher!





Thanks !

