



WP2 Turf health and playability at high mowing height and replacement of mowing with light weight rolling

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Aim

Overall:

- Develop management strategies for red fescue for optimal playability and sustainability

WP2:

- Clarify the impact of increased mowing height and to what extent mowing can be replaced by light weigh rolling on a **mature** golf green with a predominant cover of red fescue



Low input seminar, Copenhagen 5-6th of October
Dias 2

Experimental site



- Green on the Par 3 course – Hole 2
- Pay and Play
- Established in 1993
- Growth layer – Solum Greenmix
- 240 m²
- Grass composition, Fescue 75%. Bentgrass 20% and Poa less than 5 %

Maintenance of the green/golf course

- Topdressing 4-5 times a year (Greenmix)
- Verticutting 1 time per year
- Hollowcore 2-3 times per year
- Overseeding 1-3 times per year
- Vertidrain every 3-4 years
- Fertiliser
- These maintenance operations were uniform across the experimental area

Fertilizer application

Year		N	P	K	Fe	S	Mg	Mn
2012	Kg/100 m ²	0,35	0	0,35	0,2	2,9	0,05	0,07
	Times/year	3			8	2	7	4
2013	Kg/100 m ²	0,48	0	0,52	0,25	2,2	0,05	0,08
	Times/year	2		1	8	2	6	5
2014	Kg/100 m ²	0,48	0	0,84	0,19	0,46	0,13	0,09
	Times/year	2		1	7		2	4

Experimental design

- Three factorial design – 3 replicates
 - Plot size 3 x 1,5 m – 36 plots
- Mowing height – 5 and 6 mm
- Mowing frequency – 3 and 5 times a week
- Light weight rolling frequency (0, 2 and 4 times a week)
- Experiment performed in:
 - 2012, 2013 and 2014
- Jacobsen Triplex Greensmower (1,52 cm)
- Light weight rollers – True-Surface rollers (1,52,cm)



Week plan for experiment

Mowing height 5 and 6

Mowing frequency

3 times per week: Monday, Wednesday, Friday

5 times per week Monday, Tuesday, Wednesday, Thursday, Friday

Rolling frequency

2 times per week. Tuesday and Thursday

4 times per week : Monday, Tuesday, Thursday, Friday





Plot = 3 x 1,5 m
3 replicates



Registrations from 2012 - 2014

Once per year

- Soil analyses – spring?
- Organic content – fall
- **Botanical composition – invasion of Poa, moss? – fall?**
- Thatch/mat thickness - fall
- Root development/length – fall?

Every month

- Visual quality (damages – **disease occurrence**, colour, density)
- **Ball roll**
- **Bounce and moisture**

Continuously

- Weather conditions – precipitation, temperature, snow cover
- Use of man-hours?
- Rounds of golf?



Green speed



What to expect?

Literature

Richards et al., 2008

Creeping **bentgrass green, 5 week study.**

- Rolling had a greater impact on increased ball roll distance than reducing mowing height
- Mowing frequency could be reduced without a decrease in ball roll distance



Greenspeed

Roll freq	Mow height	Mow freq	Green speed average
0	5	3	228,69
	5	5	237,14
	6	3	205,97
	6	5	208,99
2	5	3	237,85
	5	5	247,74
	6	3	222,38
	6	5	226,41
4	5	3	254,14
	5	5	261,32
	6	3	228,6
	6	5	229,64

No significant difference

Roll/height/freq	Roll/height/freq	Difference/cm
0/5/3	2/6/5	2,287
4/6/3	4/6/5	1,042
2/6/5	4/6/5	3,231
2/6/3	2/6/5	4,024
0/6/3	0/6/5	3,022
0/5/5	2/5/3	4,024
2/6/5	4/6/3	2,189
0/5/3	4/6/5	3,231
0/5/3	4/6/3	1,042

Conclusions

The cutting height can be raised from 5 to 6 mm with no compromise on green speed if greens are rolled 4 times per week

In some cases mowing frequency can be reduced and the same green speed obtained if greens are rolled as a compensation



Day to day variation

	24 Sep	25 Sep	26 Sep	27 Sep	28 Sep	Range dif.
0/5/3	231	238	238	244	241	13
0/5/5	241	262	239	260	251	23
0/6/3	222	231	219	224	222	12
0/6/5	226	246	226	244	230	20
2/5/3	233	259	232	259	244	27
2/5/5	247	276	253	273	256	29
2/6/3	230	251	232	247	237	21
2/6/5	230	260	240	251	239	30
4/5/3	267	280	263	270	279	17
4/5/5	274	290	266	279	278	24
4/6/3	244	264	238	250	251	26
4/6/5	247	262	244	252	256	18

Economy

Estimate made by Per Rasmussen Smørum

No rolling – 5 mm 3 times a week compared to 4 times rolling –
6 mm 3 times a week

Rolling one green: 5 min

Driving between greens: 3 min

Rolling (or mowing) 18 holes: 2 hours and 10 minutes

Extra hours per week: 8 hours and 40 minutes

Are you OK with that if greens becomes more healthy?

Health

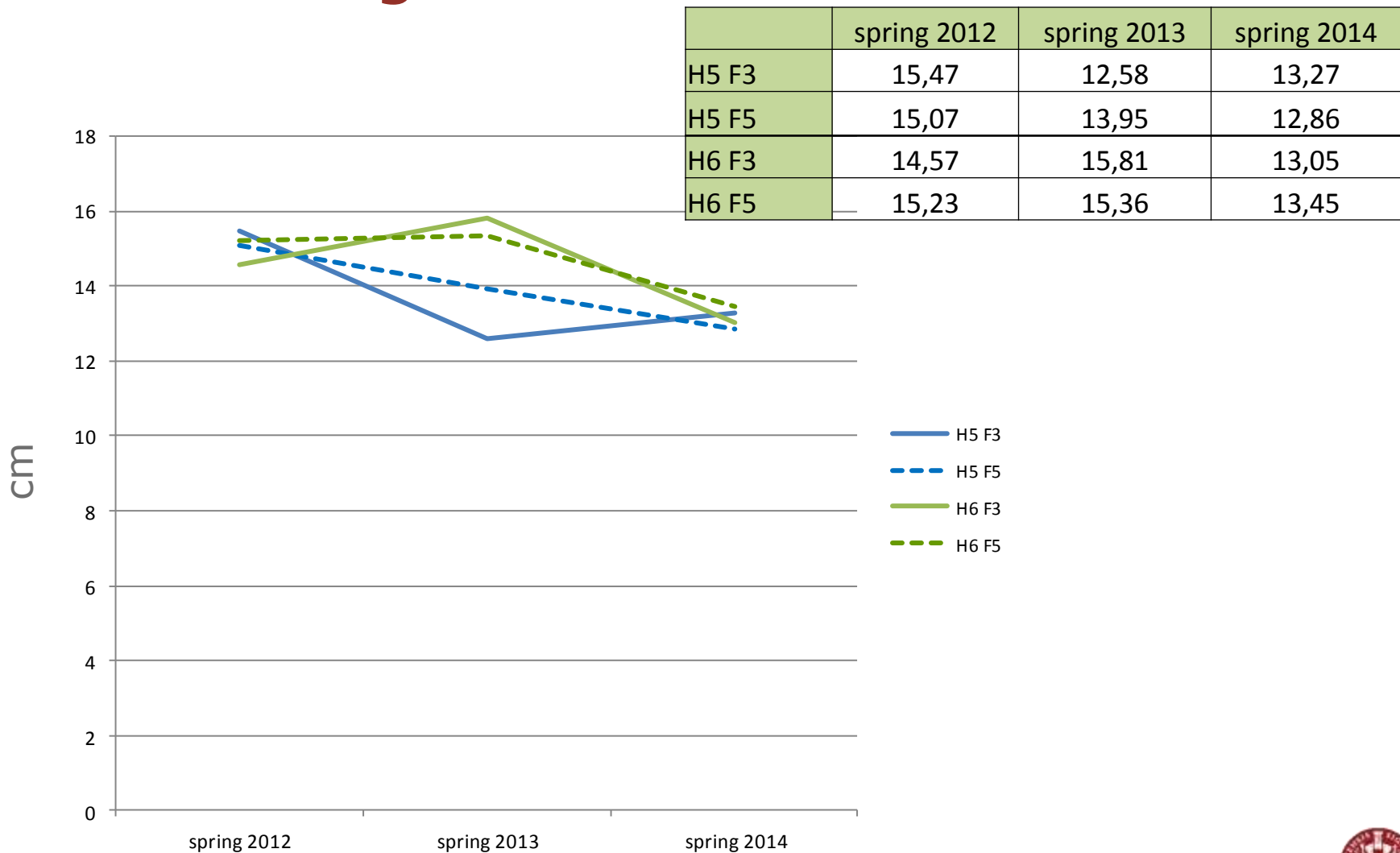
Is the area mowed at 6 mm more healthy?

Fungi attack



	Mow 5 mm	Mow 6 mm
Sep 2012	17,55	25,44
Nov 2013	15,83	24,44
Mar 2014	9,88	6,5
Aug 2014	7	8

Root length



Climate data

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
2012	78	27	13	45	22	105	63	33	64	64	52	53	619
2013	46	23	8	20	69	66	19	43	52	70	51	60	527
2014	57	45	23	30	71	34	41	109	51	112	36	91	700
Norm	46	30	39	39	42	52	68	64	60	56	61	56	613

Temp day mean

	Jan	Feb	Mar	Apr	Maj	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	2,1	-0,9	5,6	6,4	12,6	13,3	16,7	17,1	13,4	8,7	6,2	0,4
2013	-0,2	-0,6	-0,8	6,0	12,8	15,2	18,0	17,4	13,0	11,1	5,9	4,9
2014	1,5	3,8	5,9	9,0	12,3	15,5	20,1	16,5	14,6	12	7,8	3,0
Norm	0,1	-0,1	2,0	5,7	10,9	15,1	16,4	16,3	13,2	9,5	5,1	1,8

Bounce

Clegg hammer

- Hammer released from fixed height
- Determine the deceleration when hitting the green – measured in gravity Gm
- A measurement of stiffness – hardness of the surface
- Can predict a ball bounce
- 8 drop per parcel

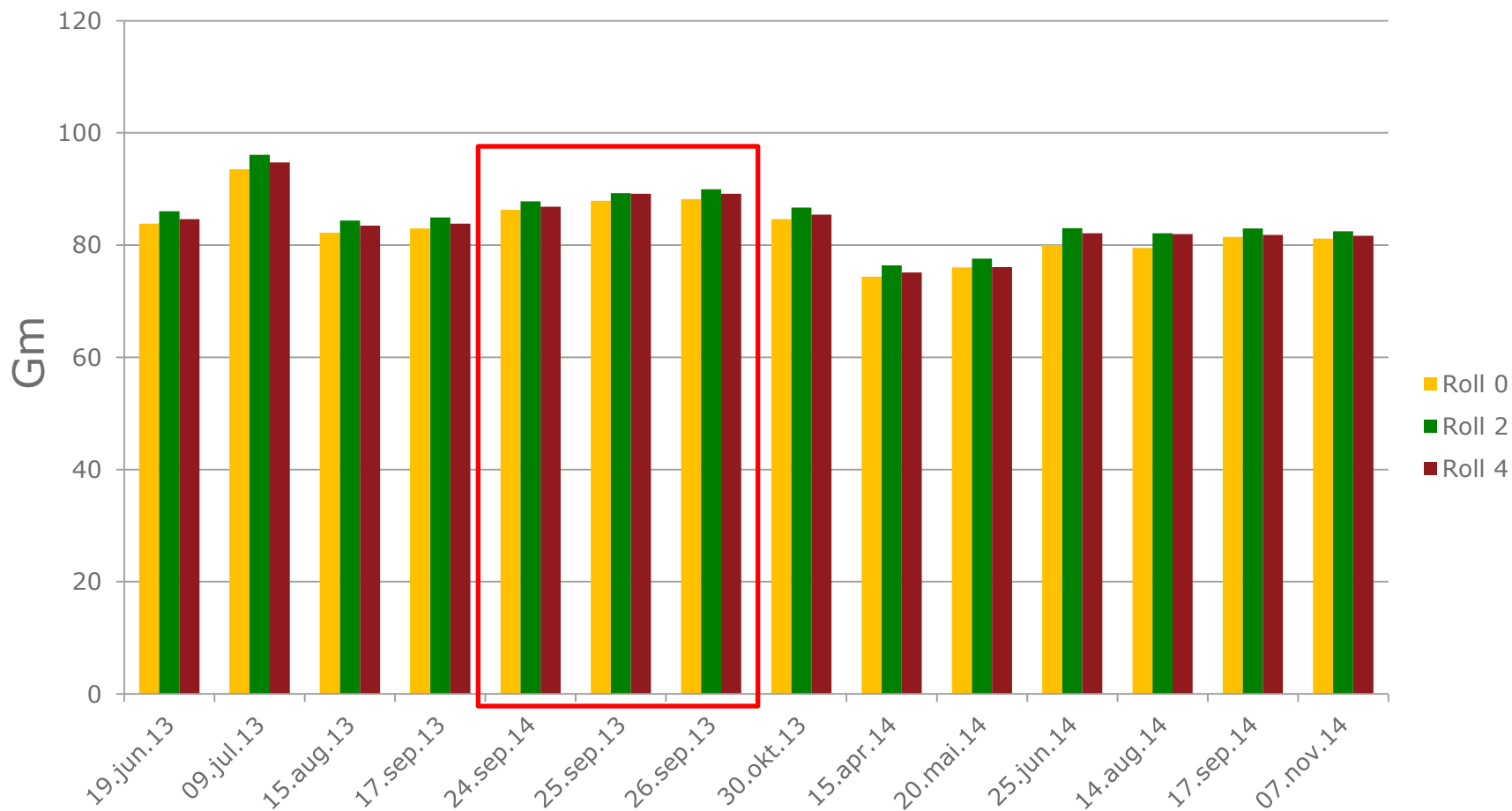


Bounce

- Does rolling have an influence on green bounce?

Roll freq	Mow hight	Mow freq	Bounce
0	5	3	83,22
	5	5	82,60
	6	3	83,01
	6	5	83,22
2	5	3	84,74
	5	5	84,94
	6	3	84,33
	6	5	86,06
4	5	3	84,03
	5	5	83,07
	6	3	83,29
	6	5	85,55

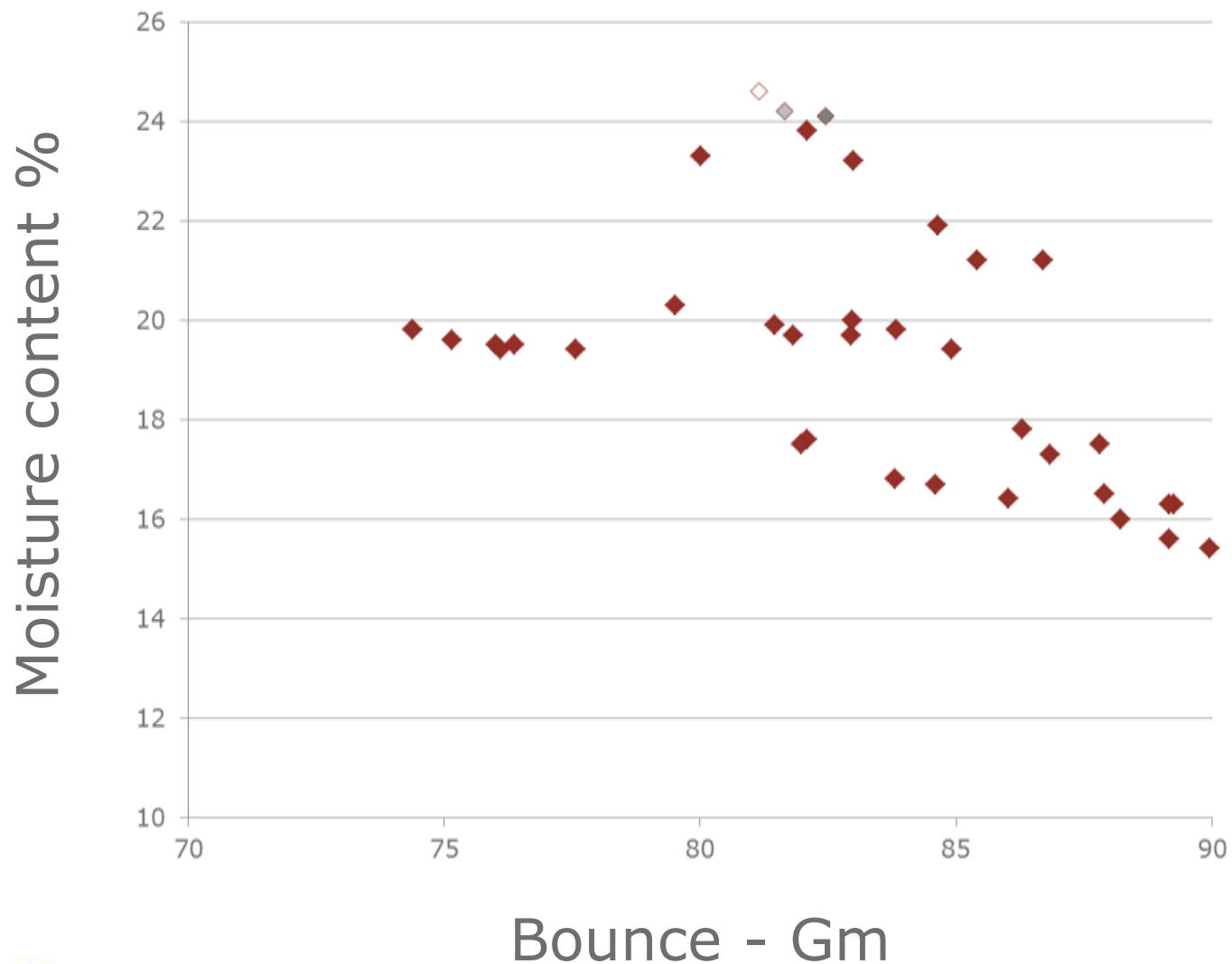
Bounce over the year



Bounce and moisture



Bounce vs moisture



Grass composition

What to expect?

Literature:

The competitive ability of red fescue in relation to annual meadow grass is improved by increasing mowing height from 5,0 – 6,0 and by reduction in mowing frequency from 5 to 3 times a week

What about Poa and Fescue in this experiment?

Grass composition overall



Climate data

Precipitation

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Temp day mean

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2012	2,1	-0,9	5,6	6,4	12,6	13,3	16,7	17,1	13,4	8,7	6,2	0,4
2013	-0,2	-0,6	-0,8	6,0	12,8	15,2	18,0	17,4	13,0	11,1	5,9	4,9
2014	1,5	3,8	5,9	9,0	12,3	15,5	20,1	16,5	14,6	12	7,8	3,0
Norm	0,1	-0,1	2,0	5,7	10,9	15,1	16,4	16,3	13,2	9,5	5,1	1,8

Grass composition

	Poa	Agrostis	Festuce	Mos and weed
maj 12 (5 mm)	1,14	13,44	85,40	0,02
maj 12 6 mm	1,15	13,89	84,84	0,12
jul 12 5 mm	0,51	30,28	69,20	0,01
jul 12 6 mm	0,29	35,50	64,21	0,01
oct 12 5 mm	0,19	11,54	88,23	0,05
oct 12 6 mm	0,21	14,69	84,89	0,21
apr 13 (5 mm)	0,15	14,25	85,44	0,16
apr 13 6 mm	0,23	15,67	83,90	0,20
jun 13 5 mm	0,59	35,56	63,85	0,00
jun 13 6 mm	0,41	44,72	54,87	0,00
oct 13 5 mm	0,21	11,81	87,94	0,05
oct 13 6 mm	0,19	15,11	84,52	0,19
apr 14 (5 mm)	0,14	14,44	85,26	4,69
apr 14 6 mm	0,26	15,83	83,71	0,41
jun 14 5 mm	0,47	17,94	81,59	0,00
jun 14 6 mm	0,26	18,33	81,41	0,00
oct 14 5 mm	0,35	17,17	76,54	5,94
oct 14 6 mm	0,34	19,83	79,42	0,41

Conclusion

- The mowing height can be raised and by rolling the grass the greens seed can be the same as no rolling at 5 mm cut.
- Is the economy in that reasonable
- A higher clipping height might give stronger grass in stressed situations.
- More statistic need to be sorted out and combined with climate data, time of year etc.

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Grass composition and mowing height

