Improving Grass Silage Quality - Quality, Quantity, Variability and factors affecting them

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We are all told to move forward we need to think outside the box!

Where silage is concerned I believe we need to think inside the box more
Because its bigger
On the inside

Have a target

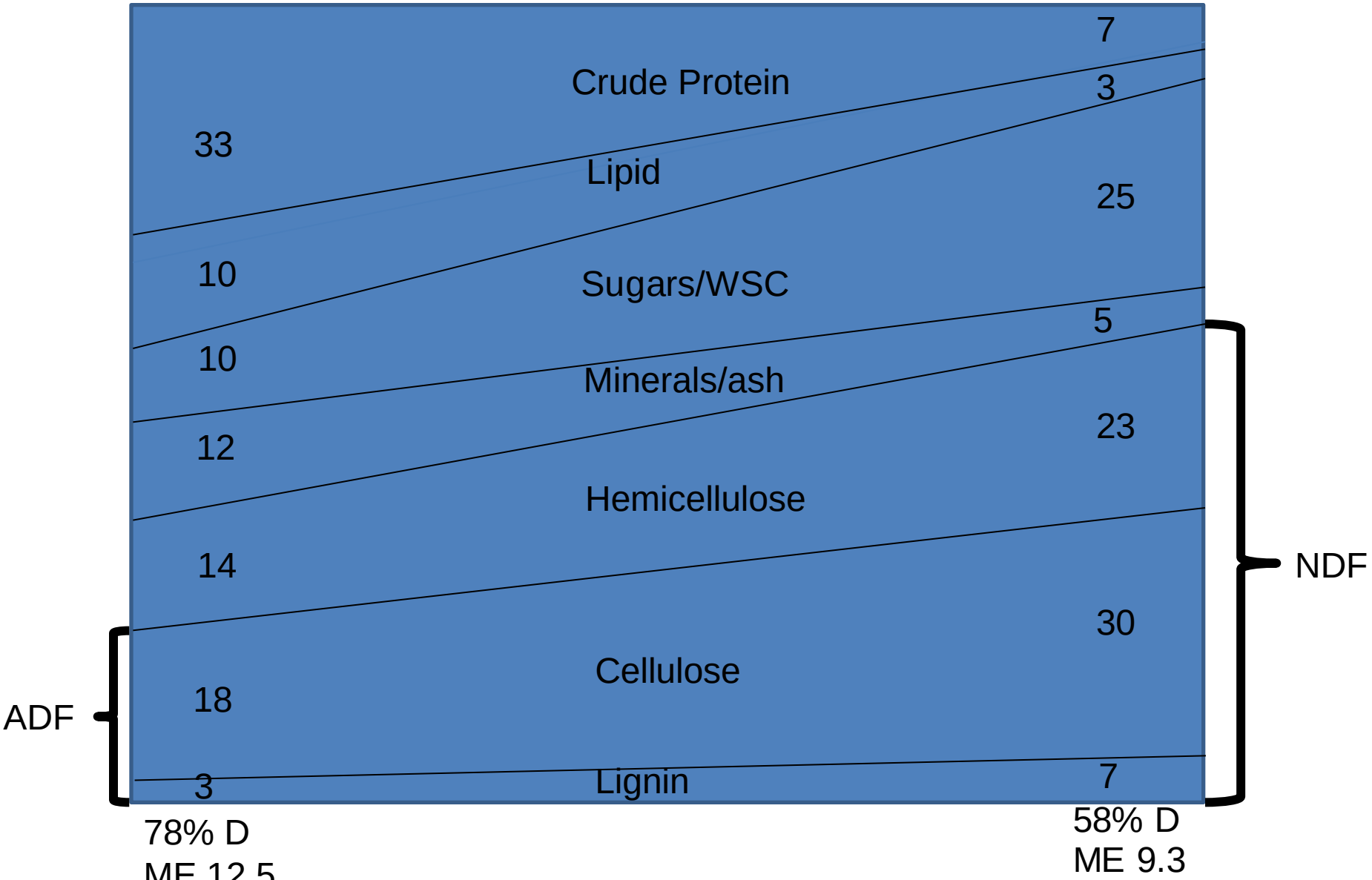
- Quality
  - What stock is intended for
  - What are their nutrient requirements
  - What happens if I maximise their nutrient requirements from Silage
- Quantity
  - Inputs
- Timings

Fertilizer

- Nitrogen
  - Yield of 5 T DM/Ha
  - Crude Protein Target 160 g/Kg DM
  - 25.6 g/kg DM of Nitrogen (CP/6.25 = TN)
  - 128 kg N/Ha removed. (TN/kg*DM Yield)
- Nitrate N at cutting should be less than 0.15% FM
- Sulphur
  - N:S ratio 12:1 is not sulphur limiting
  - So in the above eg 10.67 kg S/Ha removed

Box 1- The Constituents of Fresh Grass in the field - changes due to maturity

(Adapted from Beever *et al. 2000)*



‘One cannot emphasise too strongly the importance of cutting herbage young for silage’

A.J. and F.H. Hosier 1951.
Hosiers Farming System,
Lockwood, London

Effect of Early Cutting on Silage Quality

	Early Cutting		Conventional cutting	
	First Cut	Second Cut	First Cut	Second Cut
ME (MJ/Kg DM)	11.8	11.4	11.1	11.3
Yield (T DM/Ha)	4.2	4.1	5.5	2.5
Total Yield (T DM/Ha)	8.3		8.0	
Energy Yield (MJ	96,300		89,300	
Potential Milk Yield (l	18,519		17,173	
Contracting costs/l. (@ £131/ha)	0.70 p		0.76 p	

Thomas *et al* 1998

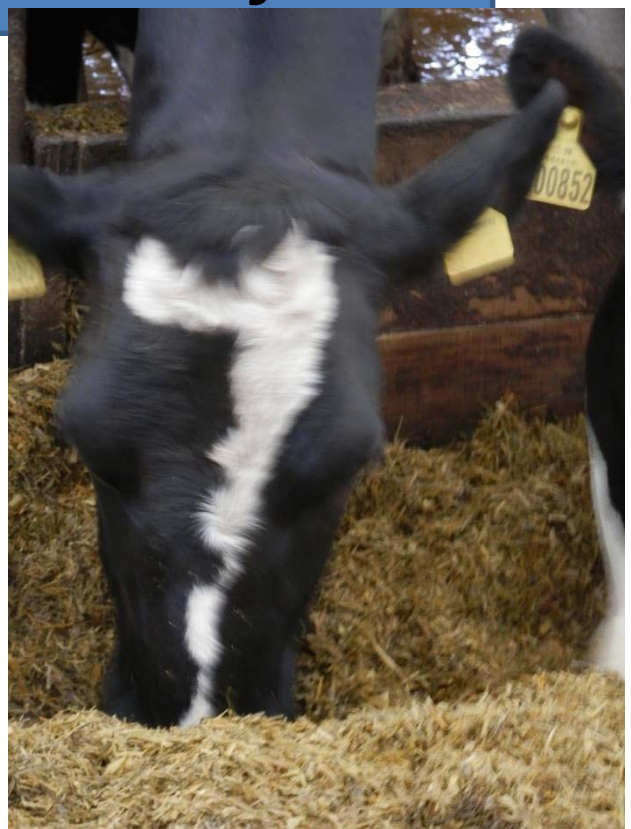
A Week's Delay in cutting First Cut

- **Consequences:**
  - DM yield ↑ 10%
  - Digestibility ↓ 3.5% units
  - ME ↓ 0.6 MJ/kg DM
  - Higher field losses due to heavier crop
  - Slower regrowth – Lower annual yield

A Week's Delay

- **Due to: EXCUSES!**
  - Wet weather
  - Mach
  - Dad says…..,
  - Agronomist says……,

What does the cow say?



The value of high quality forage

1000 t FW @ 30% DM = 300 t DM

Increasing from 10.5 to 11.5 = 300,000 MJ extra

That's ~60,000 litres

@ 26ppl that's £15,600

BOX 2 Ideal %DM
Effect of DM on preservation losses

What is the financial cost of DM losses in silage?

Taking the cost of 1 tonne of silage to be £100 on a DM basis. How do DM losses affect the cost of 1 tonne of feedable silage?

This can be found by using the following formula:

$$\text{New Cost per Tonne DM} = \frac{\text{Old cost per tonne DM}}{(100 - \%\ \text{DM losses})} * 100$$

In our case £100

Looking at DM losses of 10%

$$\text{New Cost} = \frac{£100}{(100 - 10)} * 100$$

= £111.11

Looking at DM losses of 20%

$$\text{New Cost} = \frac{£100}{(100 - 20)} * 100$$

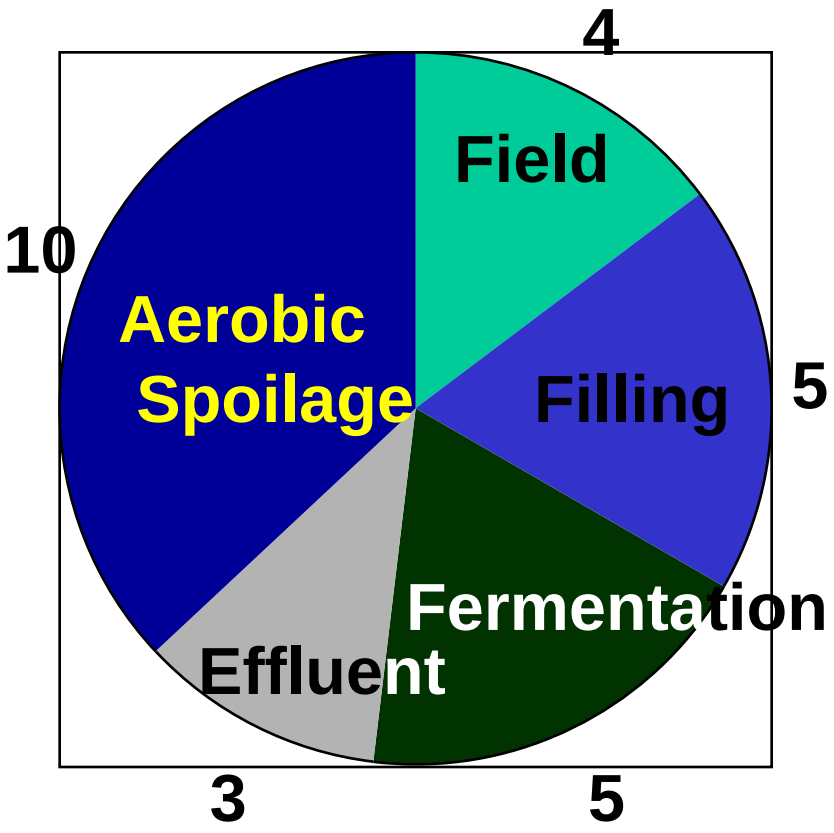
= £125

Looking at DM losses of 30%

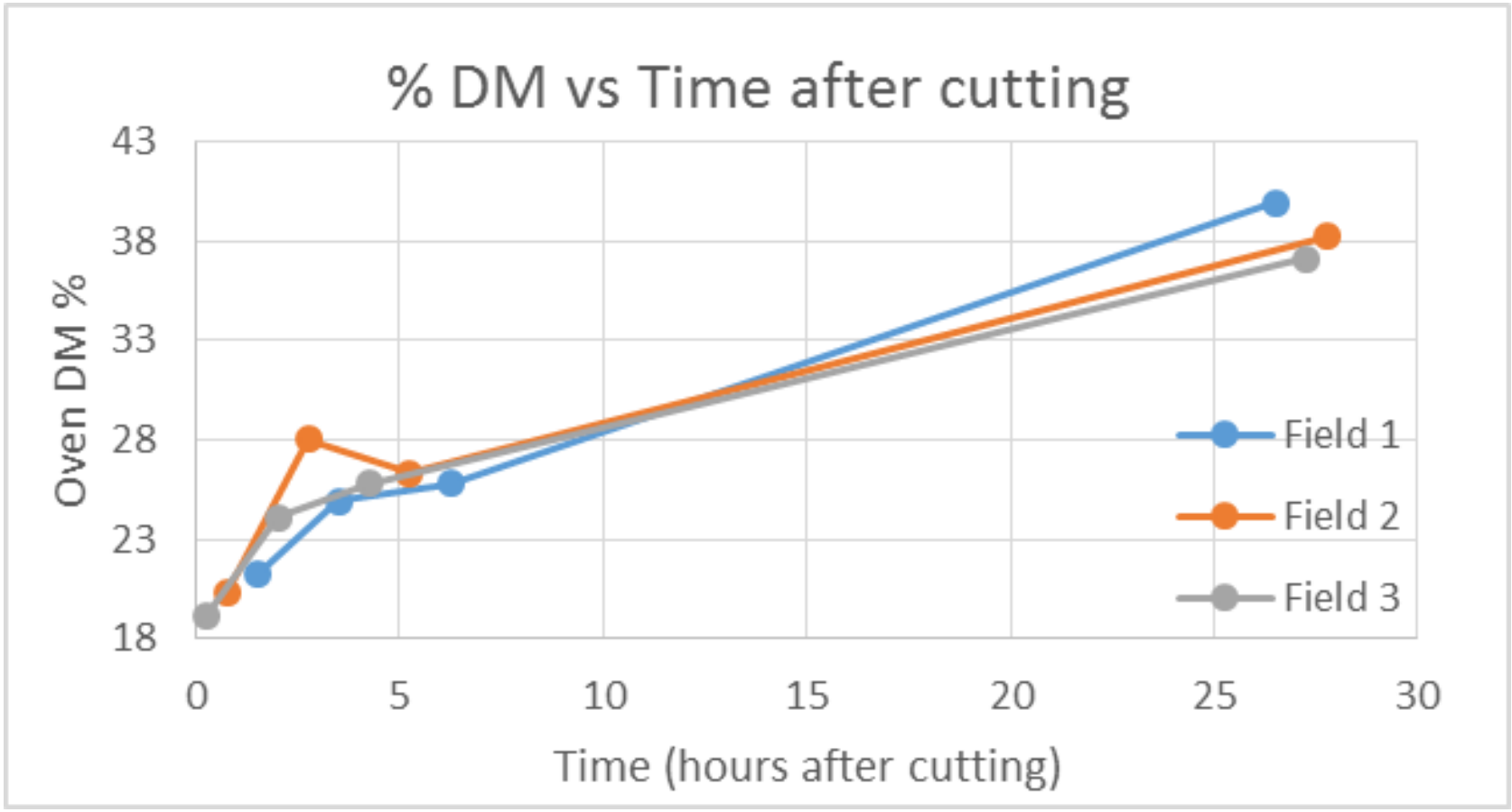
$$\text{New Cost} = \frac{£100}{(100 - 30)} * 100$$

= £142.86

SILAGE DM LOSSES – Each Step of the Process



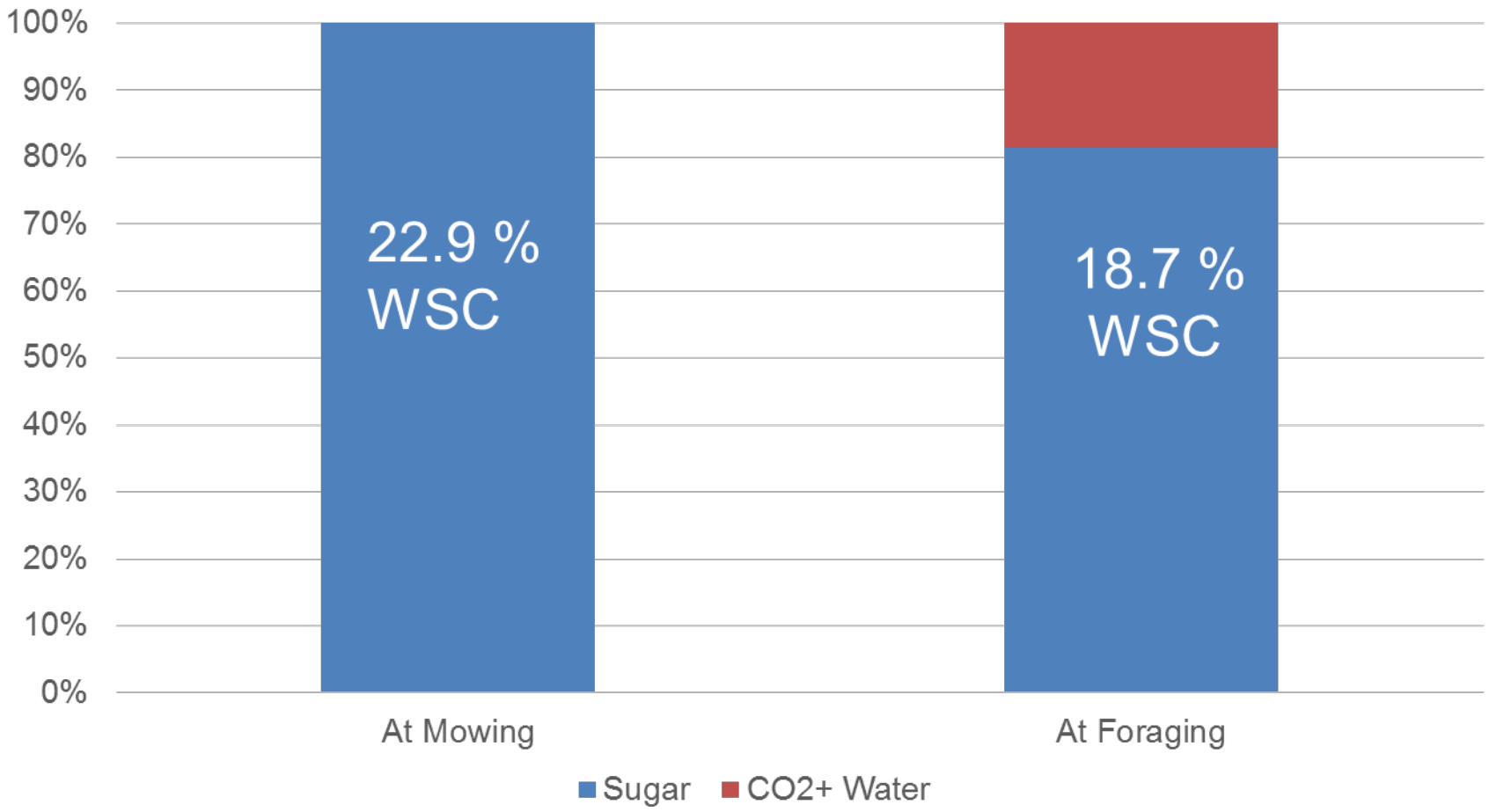
Wilting effects on DM



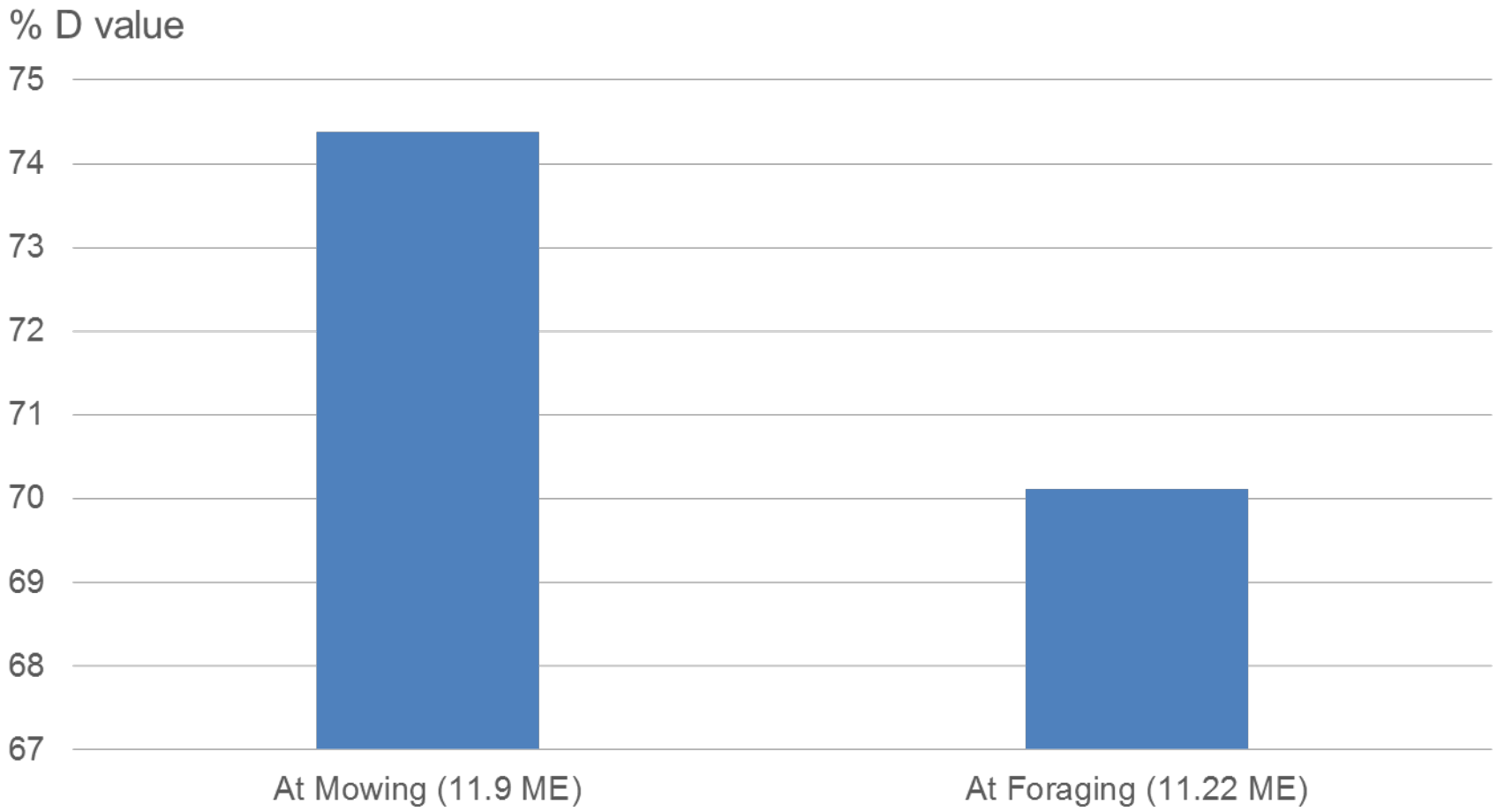
Respiration in the Field

Sugar $\longrightarrow$ $CO_2 + H_2O$

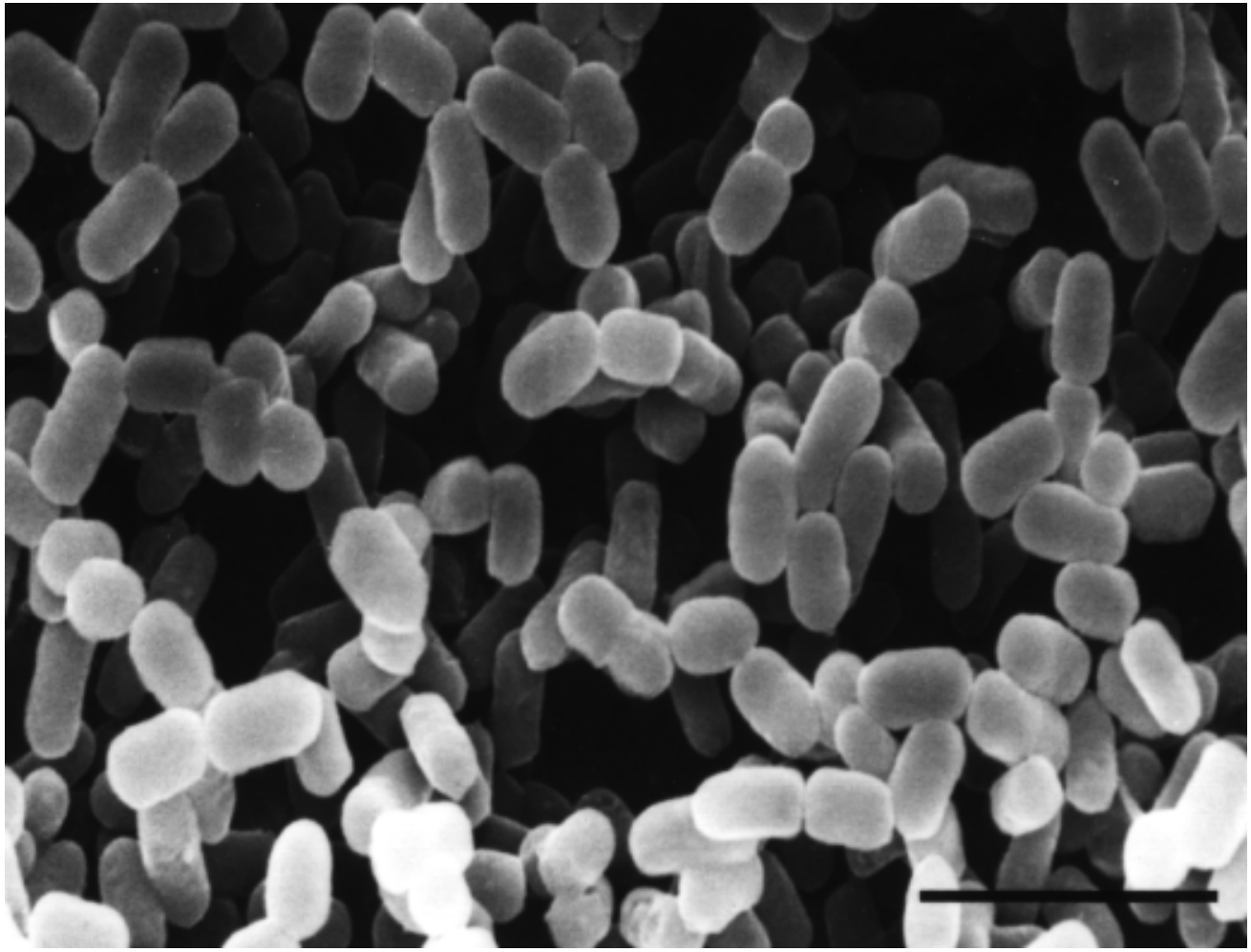
Sugar Loss between Mowing and harvesting



Impact on D value



Silage Additives



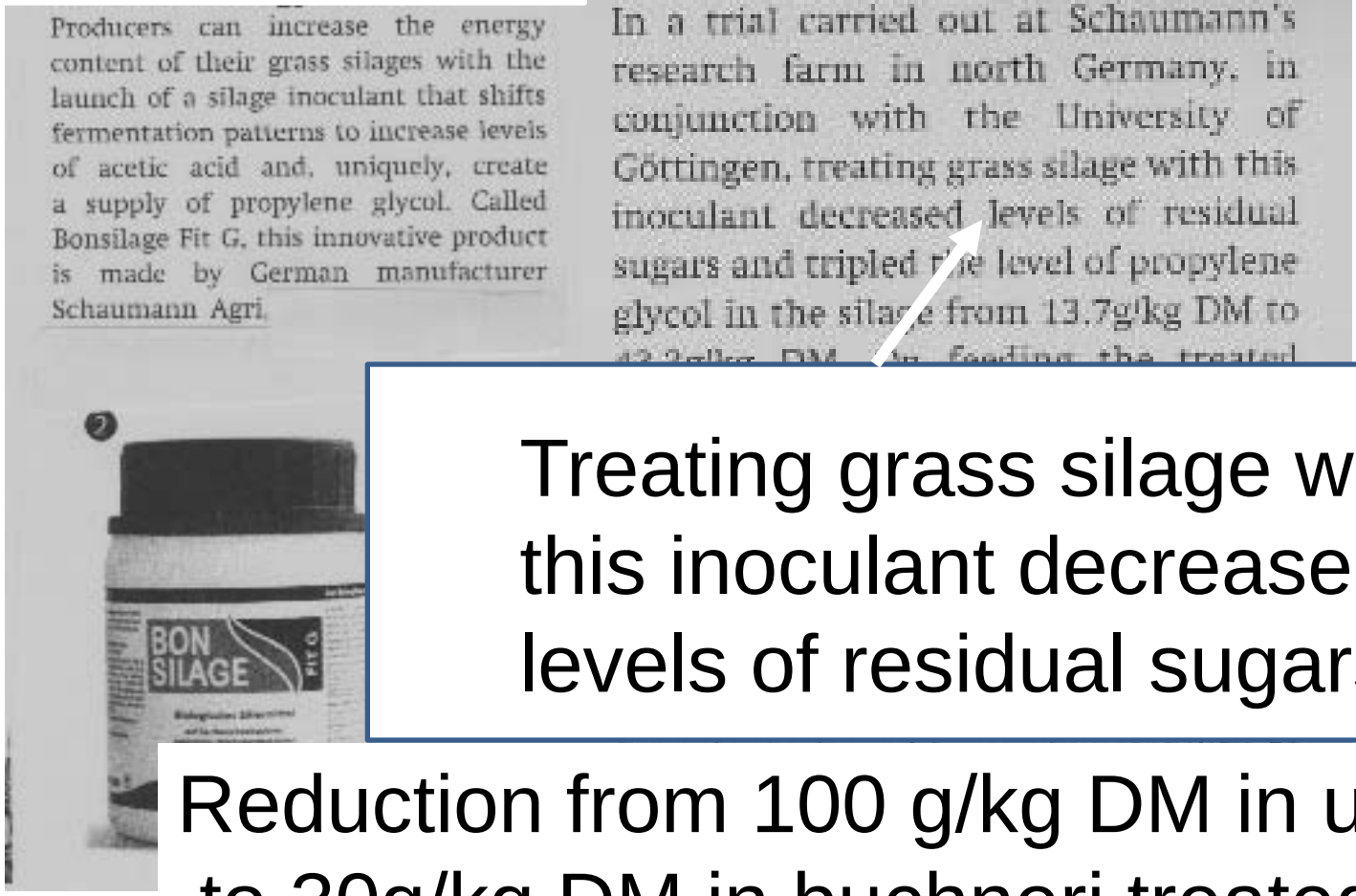
At Last The Truth

Using *L. buchneri* in your silage additive reduces silage quality to try and improve aerobic stability

New Schaumann Silage Inoculant

Producers can increase the energy content of their grass silages with the launch of a silage inoculant that shifts fermentation patterns to increase levels of acetic acid and, uniquely, create a supply of propylene glycol. Called Bonsilage Fit G, this innovative product is made by German manufacturer Schaumann Agri.

In a trial carried out at Schaumann's research farm in north Germany, in conjunction with the University of Göttingen, treating grass silage with this inoculant decreased levels of residual sugars and tripled the level of propylene glycol in the silage from 13.7g/kg DM to



Treating grass silage with this inoculant decreased levels of residual sugars

Reduction from 100 g/kg DM in untreated to 30g/kg DM in buchneri treated!

Some Examples of Undesirable Silage Fermentations

Heterofermentative Lactic acid bacteria eg

L. buchneri

1 Glucose $\longrightarrow$ 1 Lactic acid + 1 Acetic acid + H_2O + CO_2

Enterobacteria

2 Glucose $\longrightarrow$ 2 lactate + 1 acetic acid + 1 ethanol + 2 CO_2

Saccharolytic Clostridia

1 Glucose $\longrightarrow$ 1 Butyric acid + 2 CO_2 + 2H_2O

or 2 lactic acid

DM and ME at Different Stages

	Grass/Legume		Maize	
	DM		DM	
	kg		kg	
At cutting	1000		1000	
At ensiling	950		980	
At feed-out	855		882	
At feed trough	787		794	

Wilkinson 2016

DM and ME at Different Stages

	Grass		Maize	
	DM	ME	DM	ME
	kg	MJ/kg DM	kg	MJ/kg DM
At cutting	1000	11.5	1000	11.5
At ensiling	950		980	
At feed-out	855		882	
At feed trough	787	10.9	794	11.2

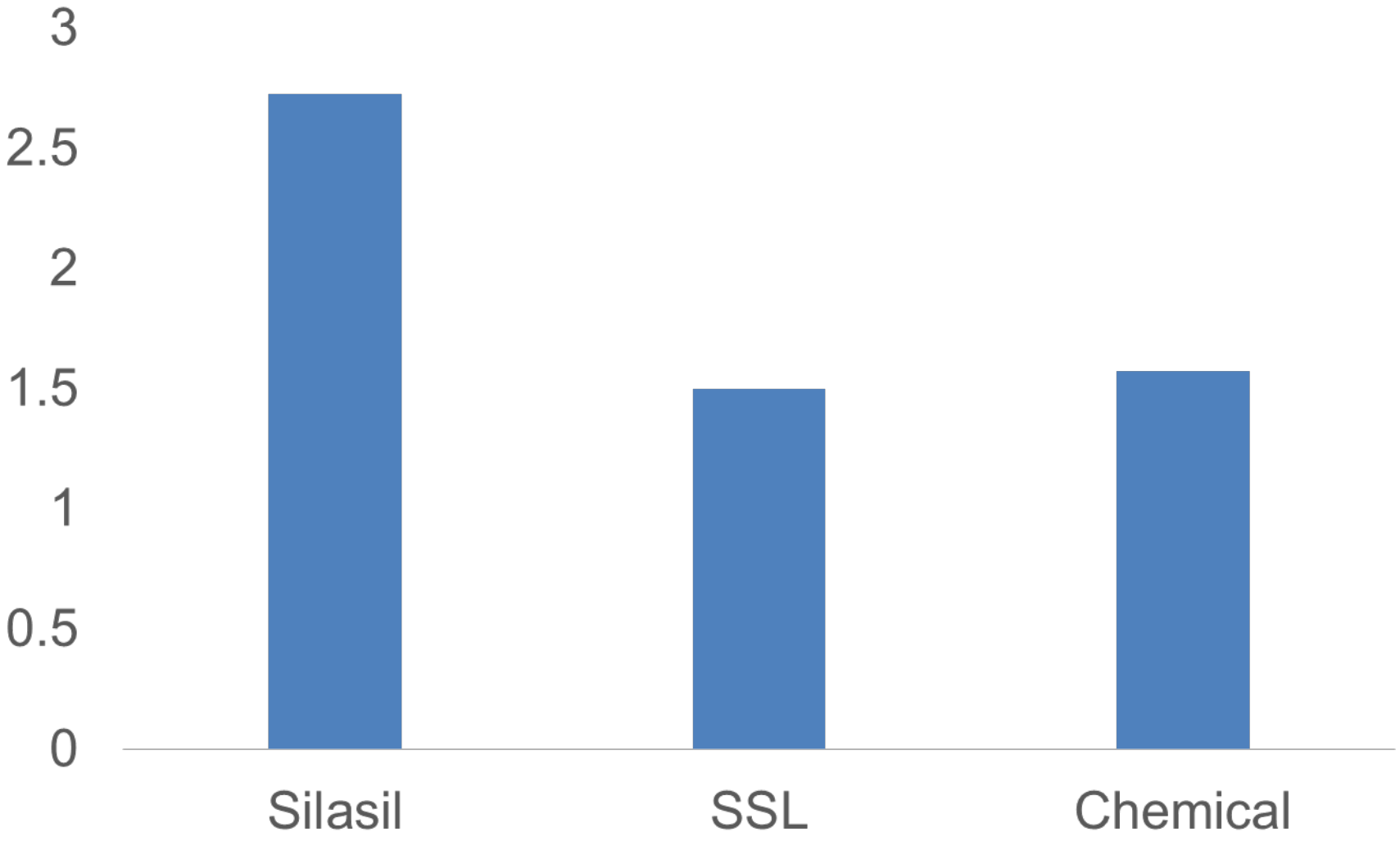
Wilkinson 2016

Silage Experiment

- Small scale lab silos
- 3 treatments
  - Schaumann Silasil Mixed Homo/Hetero Inoculant
  - Single strain *L. plantarum* Inoculant (SSL)
  - Chemical salts
- Chemical analysis at opening after 90 d

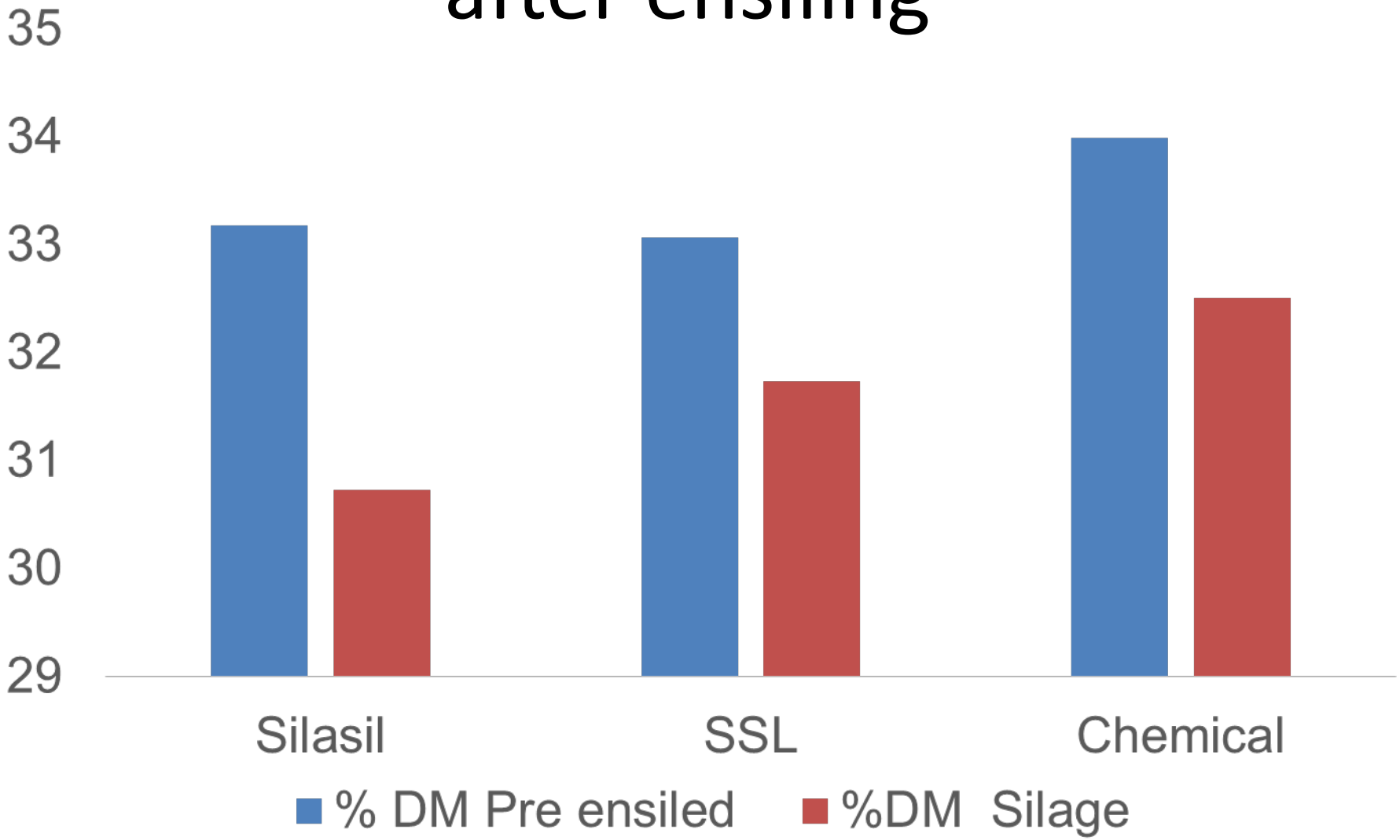
DR Davies Unpub

% DM losses



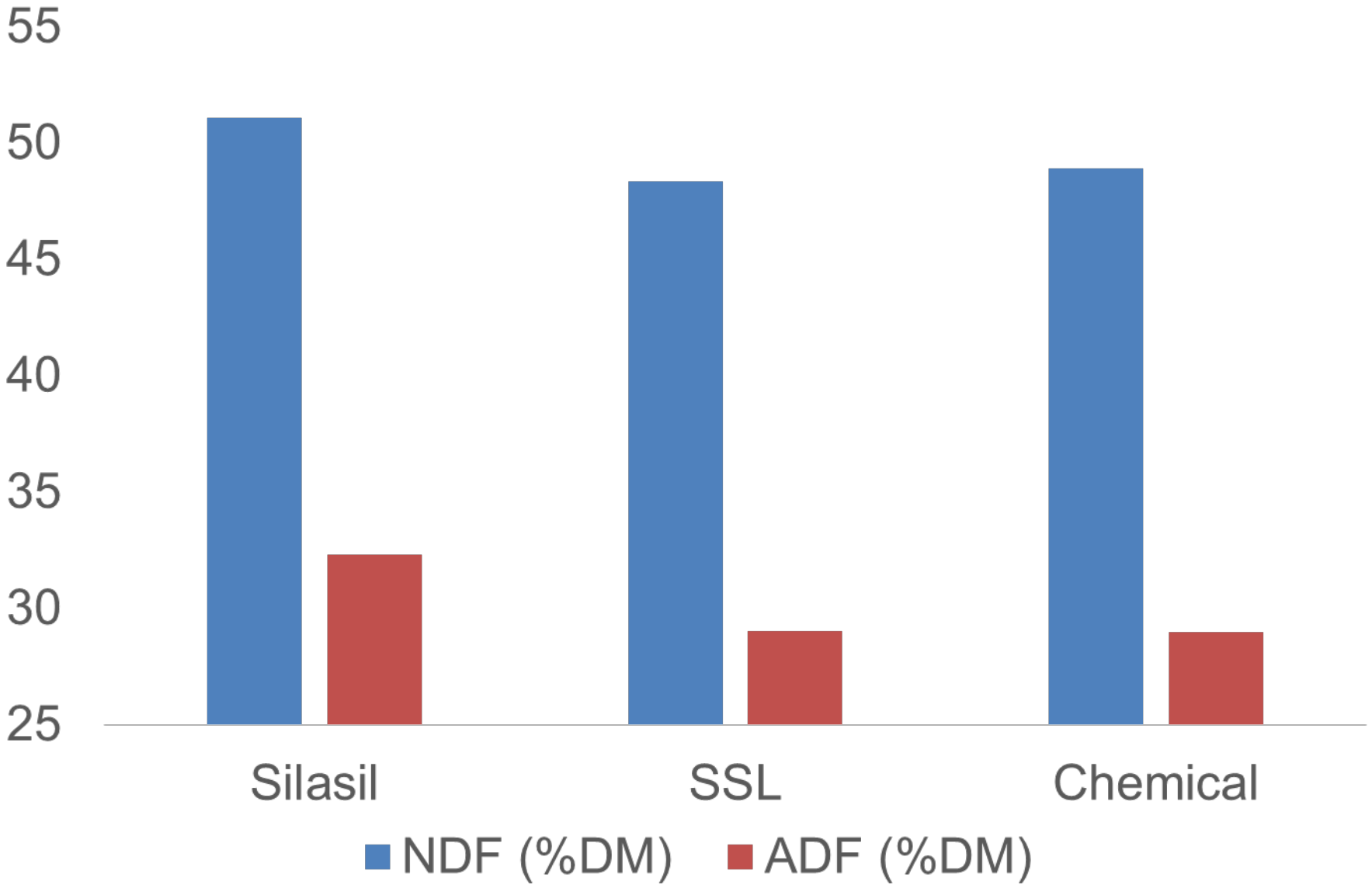
DR Davies Unpub

Change in % DM from before and after ensiling



DR Davies Unpub

Effect on NDF and ADF



DR Davies Unpub

Dry Matter Loss as Influenced by Silage Density: Adapted from Ruppel et al. (1995)

Density, kg of DM per m^3	DM loss at 180 days, % of the DM ensiled
160	20
192	18
224	16
256	14
288	12
320	10

Respiration

Sugar $\longrightarrow$ CO_2 + H_2O + No ACID

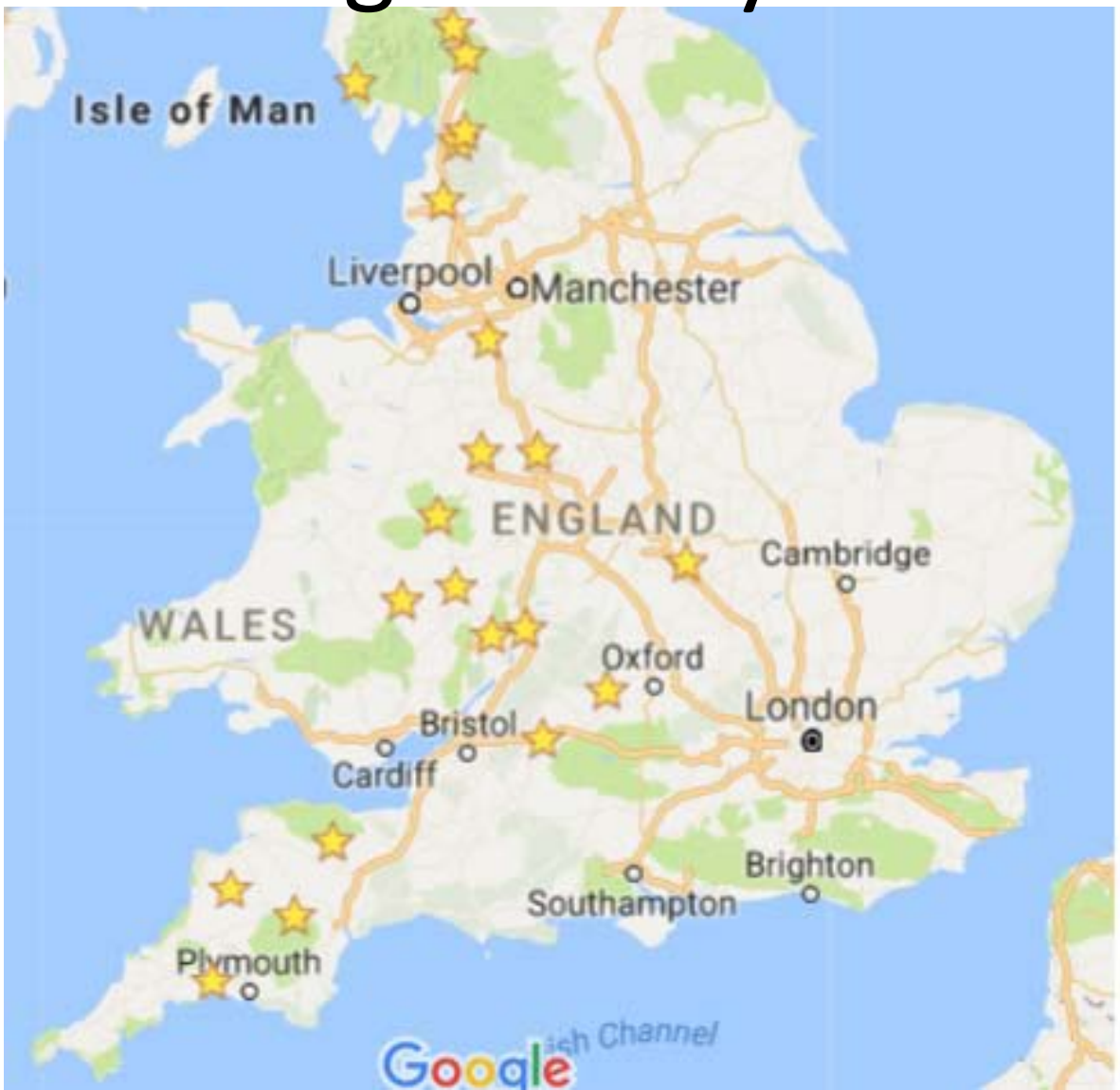
Measuring Silage Density

Target 750kg/m^3 FM or 250kg/m^3 DM

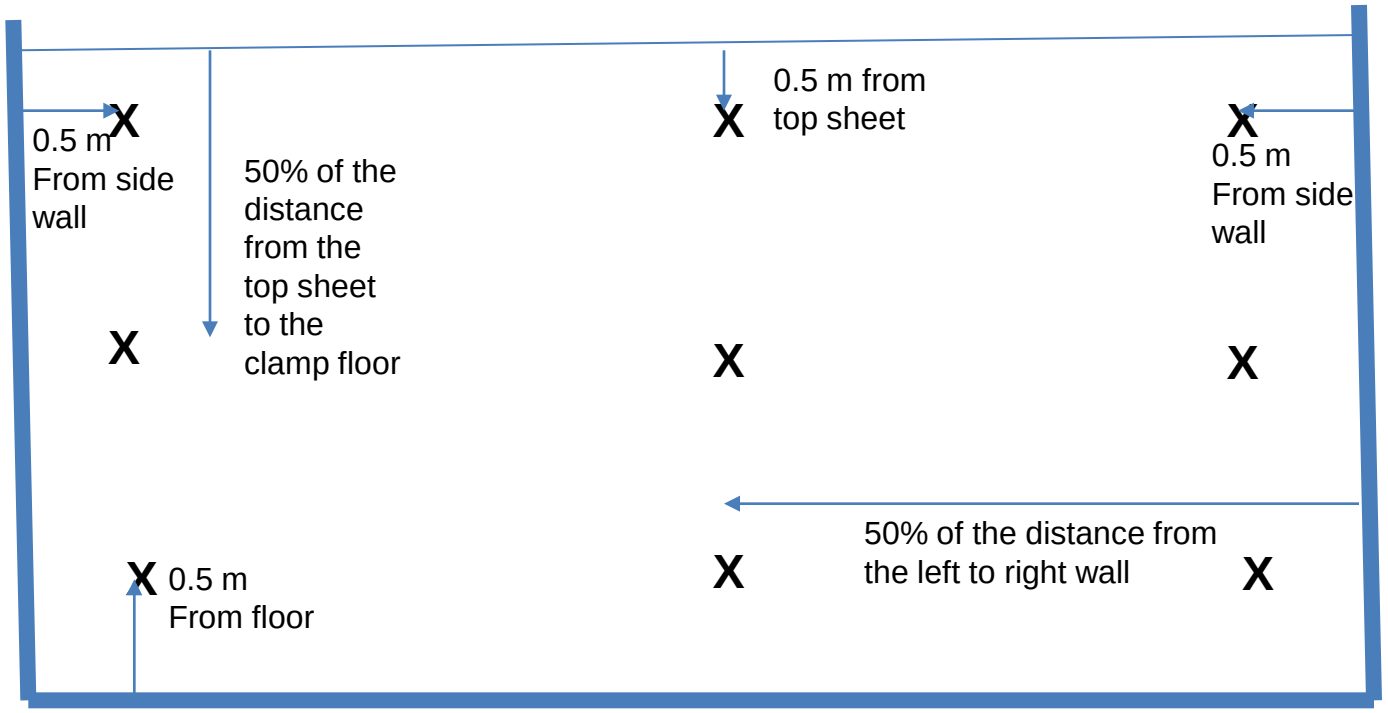
Density = Weight/Volume (kg/m^3)

$$= \frac{\text{Weight of Silage out of the Corer (kg)}}{\pi \times (\text{Radius of corer})^2(\text{m}) \times \text{Depth of hole(m)}}$$

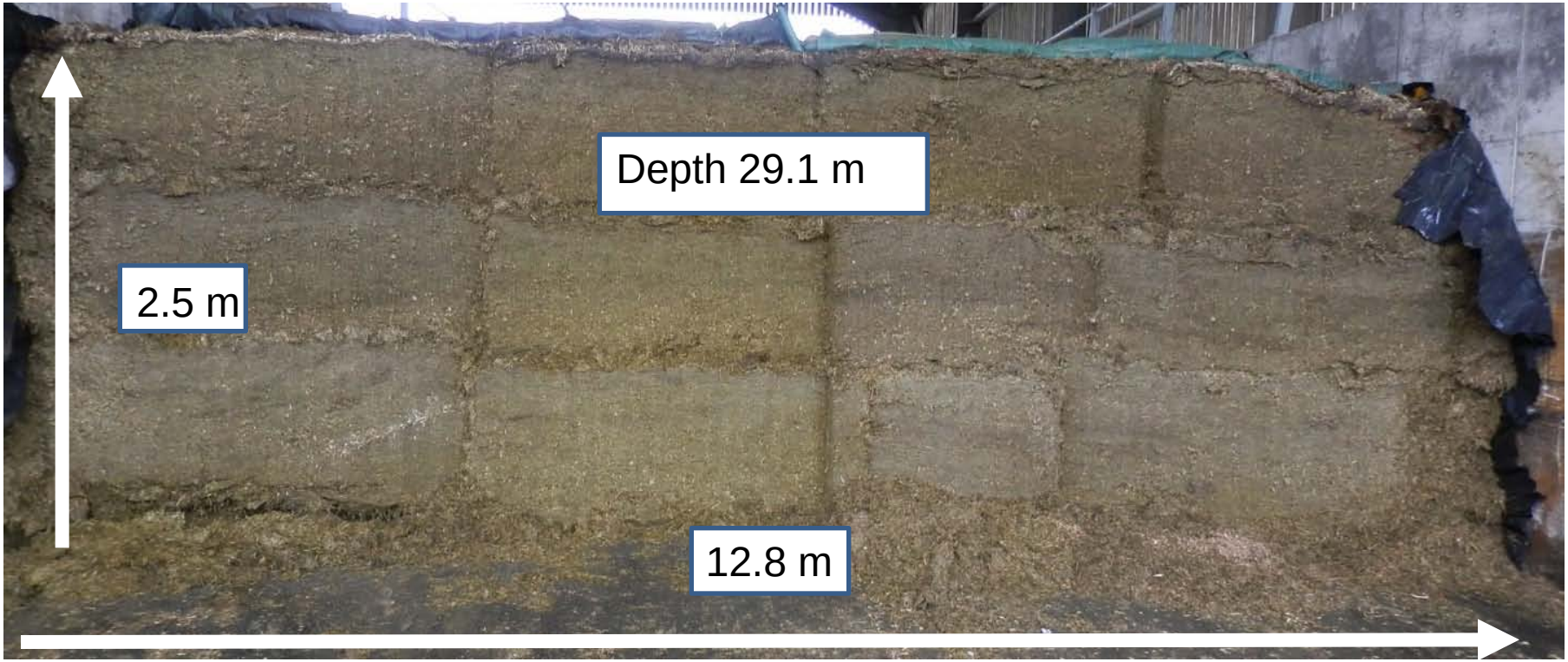
AHDB Beef And Lamb Silage Survey – 20 farms



Sampling- Open clamp face sampling at points denoted with an X

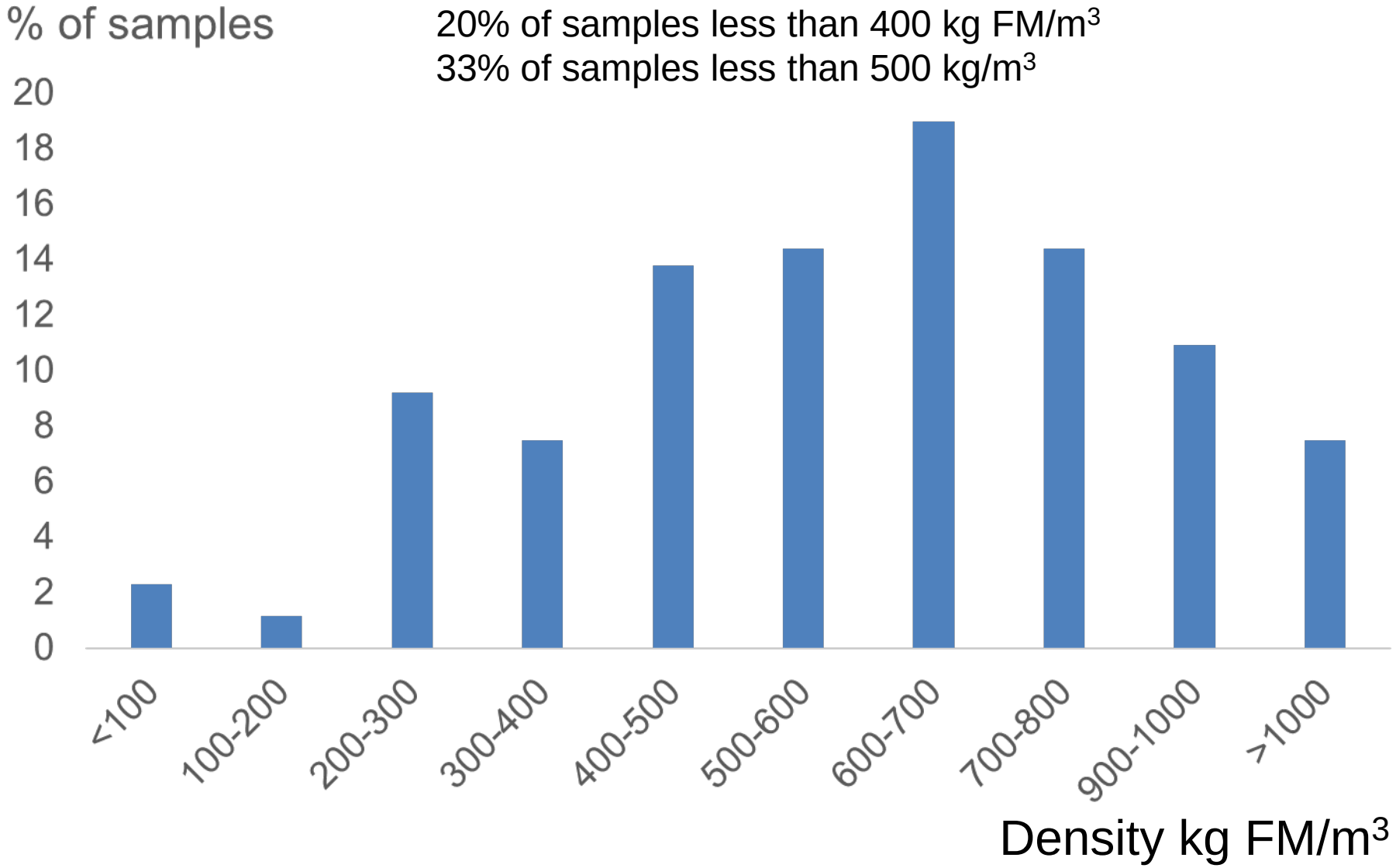


Silage Survey -20 farms
The average clamp

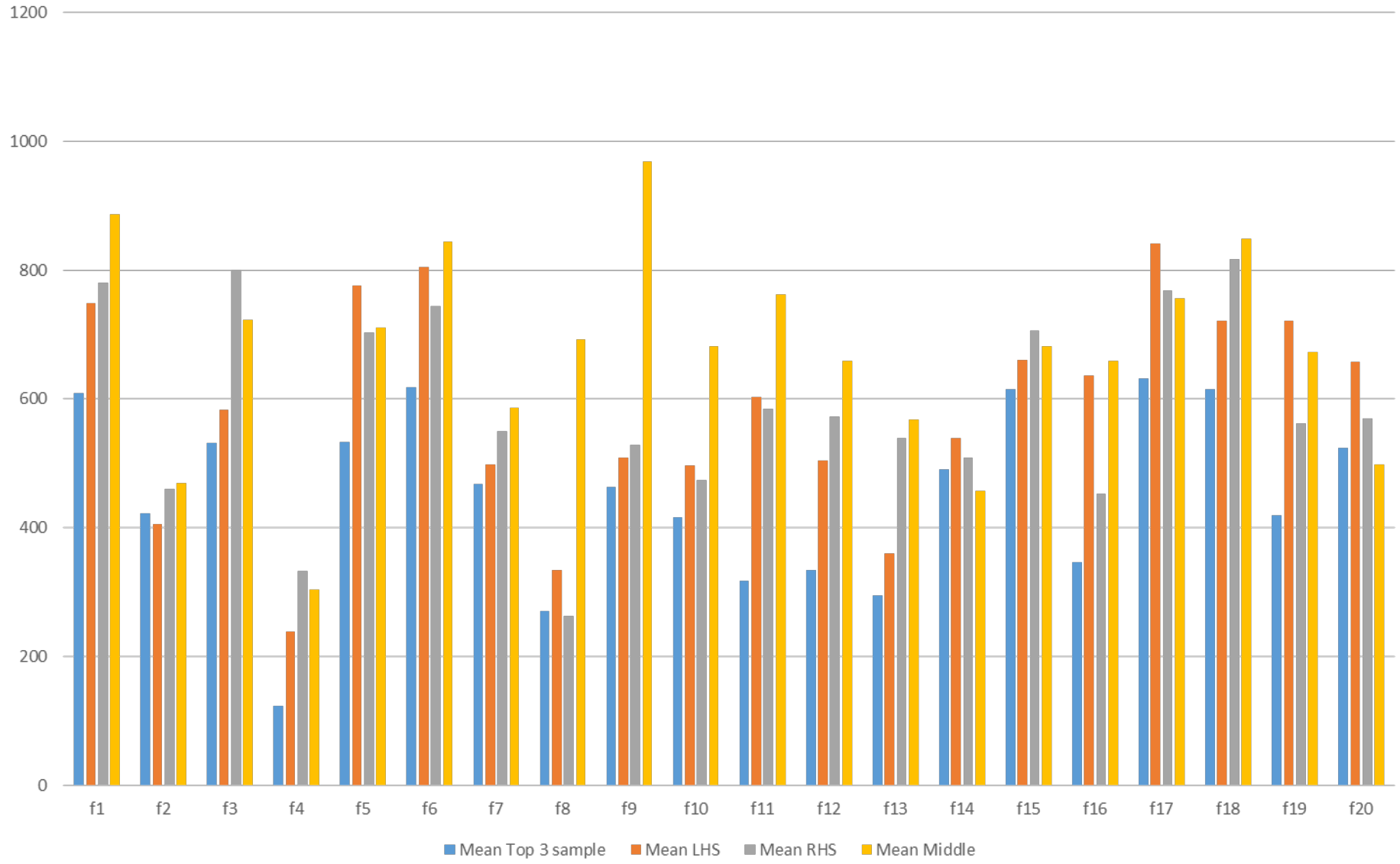


- Total Volume 935 m^3 Range 336-1872 m^3
- So How Much of the silage is within 0.5 m of a wall or the top sheet?
- 26.2%

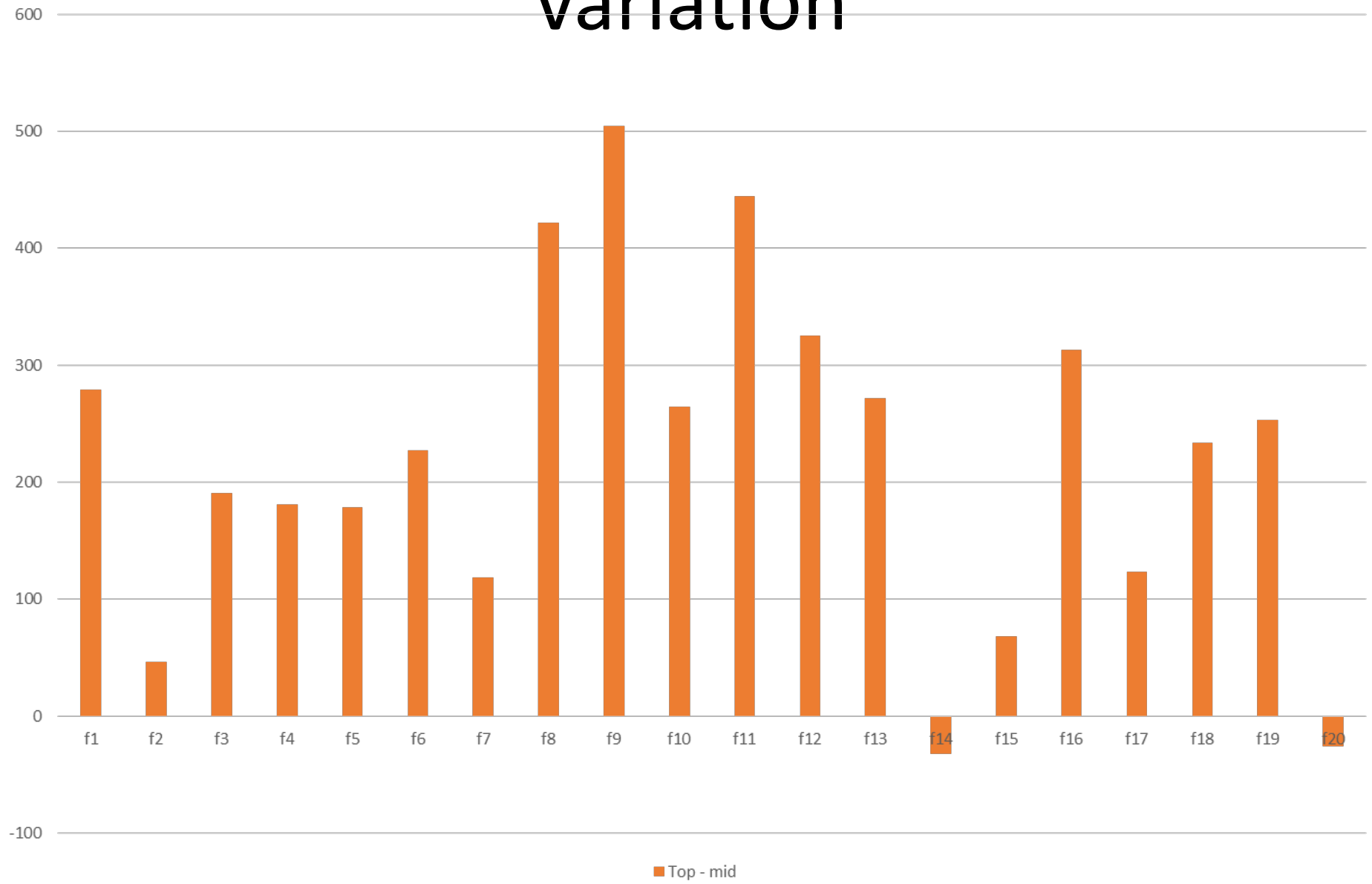
Silage Survey -20 farms
Density Variation

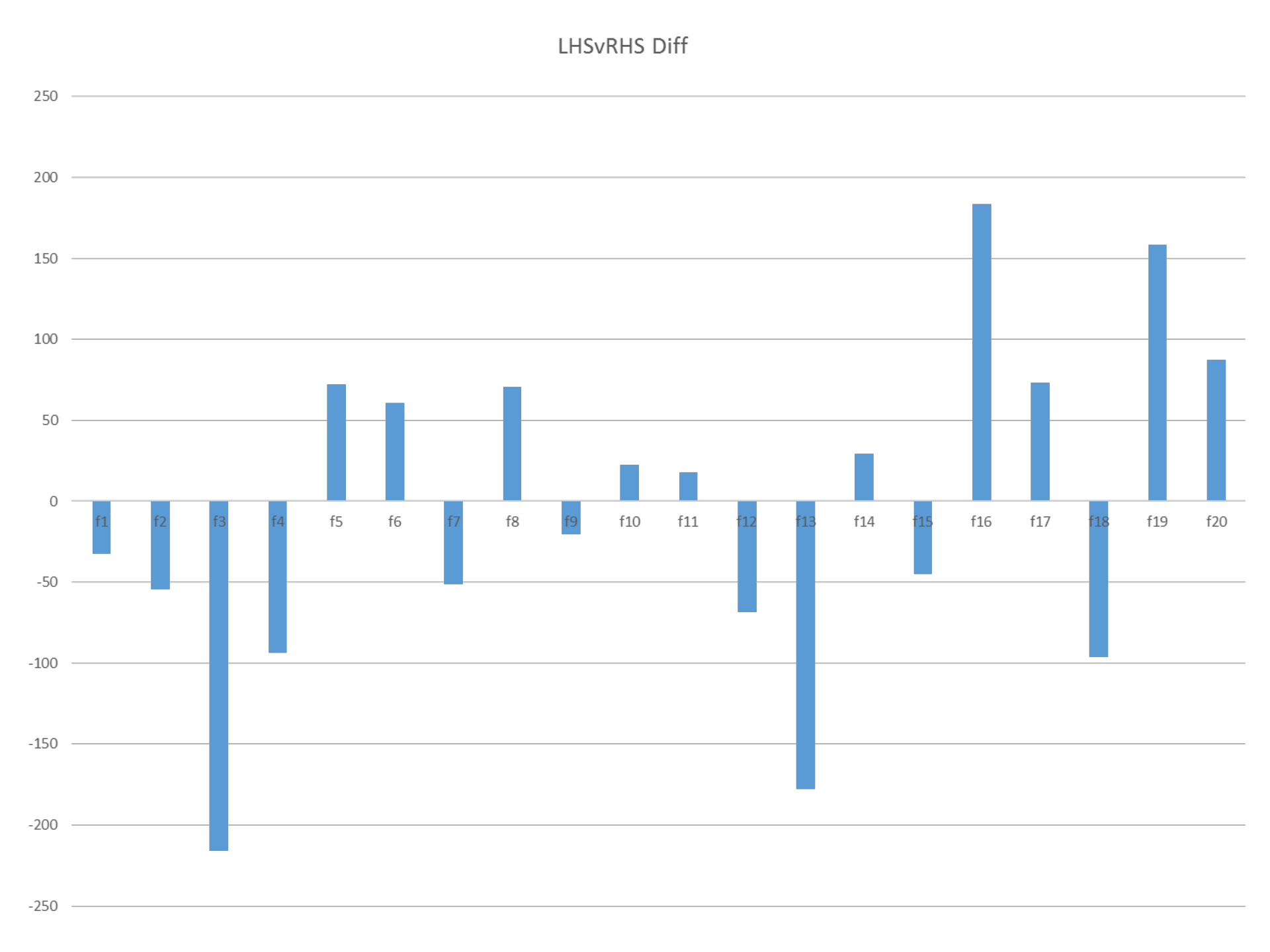


Variation in density across clamps



Diff between top and centre variation



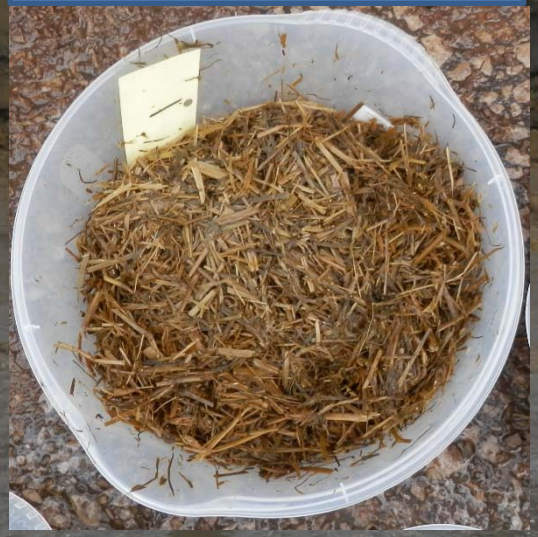

LHSvRHS Diff
250
200
150
100
50
0
-50
-100
-150
-200
-250
f1
f2
f3
f4
f5
f6
f7
f8
f9
f10
f11
f12
f13
f14
f15
f16
f17
f18
f19
f20

10th Jan 2017

Width-17.9 m, Height 2.6 m at the shoulders and 3.9 m in the centre

10th Jan 2017

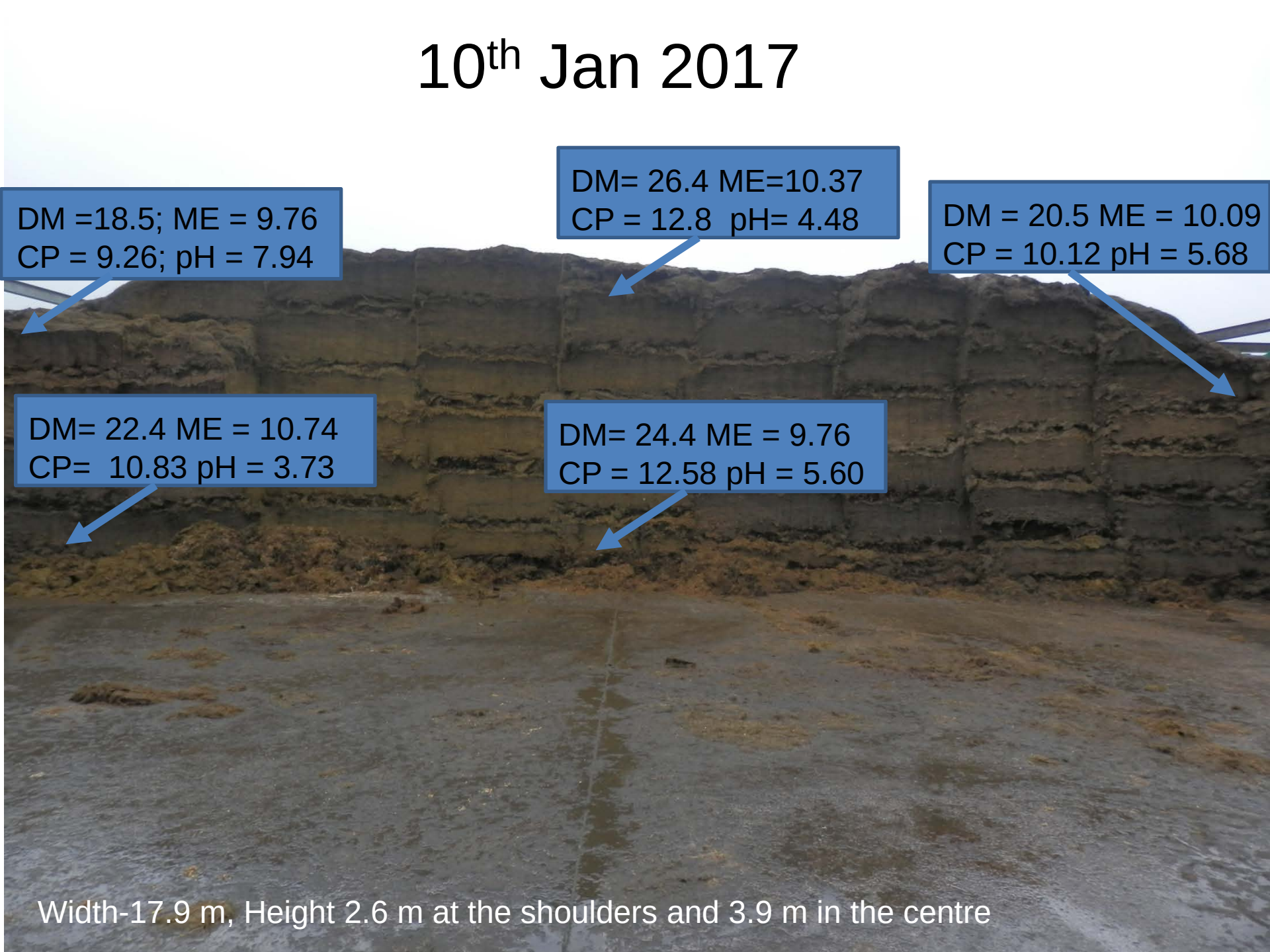
DM =18.5; ME = 9.76
CP = 9.26; pH = 7.94



Width-17.9 m, Height 2.6 m at the shoulders and 3.9 m in the centre


Top waste

10th Jan 2017



Variation in Analysis

- Same Clamp, same day
- Density
  - from 470– 927kg/m^3
- Dry Matter
  - from 18.5 – 26.4%
- Metabolisable energy
  - from 9.76 – 10.74 MJ/kgDM

- So what?

With Assistance from David Wilde

Feeding by the Grabful

- Happens a Lot!
- Density
- Grab = 1.5m x 0.75m x 0.75m
- = 0.843m^3

- At 470kg/m^3 = 396 kg fed out
- At 927kg/m^3 = 781 kg fed out

- Did the animals eat up?

With Assistance from David Wilde

Feed by weight – Dry Matter

- Target 45kg grass silage per day
  - accurately put in to the wagon
  - weigh scale is correct
- Dry Matter
  - at 20% DM = 9kg DM fed
  - at 26% DM = 11.7kg DM fed
- At 10.5 ME,
  - 2.7kg difference
  - =2.7 x 10.5 = 28.35 MJ/day
  - =over 5 litres of milk!

With Assistance from David Wilde

Feed by weight - Energy

- 45kg Fed out

	Top Left	Btm Left	Top Mid	Btm Mid	Top Right
Dry Matter %	18.5	22.4	26.4	24.4	20.5
ME MJ/kgDM	9.76	10.74	10.37	9.76	10.09
Kg DM Fed	8.325	10.08	11.88	10.98	9.225
Yield litres	0.23	5.23	8.00	5.03	2.42

With Assistance from David Wilde

20 farms within clamp variation

	DM (%)	CP (% DM)	ME (MJ/Kg DM)	D Value (% DM)	Oil (% DM)	Intake (Kg DM /Day)	Milk Yield (Kg)
Min	4.00	1.70	0.70	4.00	0.20	1.00	3.00
Max	27.90	11.30	3.60	23.00	2.20	6.10	17.00
Mean	13.62	4.60	1.74	11.00	0.75	3.29	9.45

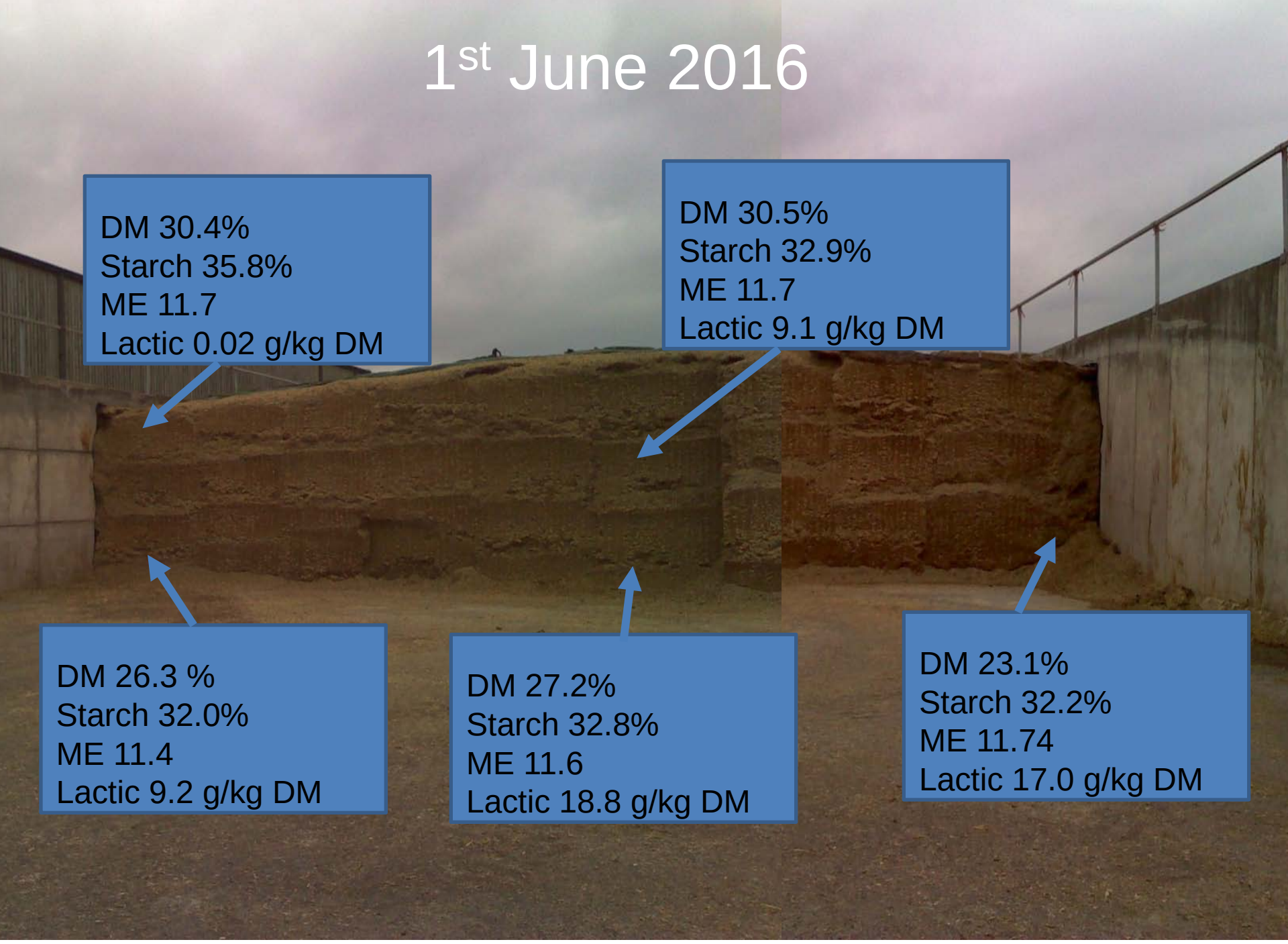
Concluding Remarks
Clamp Management

- The Walls
- The top
- Reduce Oxygen
  - Compaction to remove it ASAP
  - Sealing- Once its out Keep it out
- Crop Quality at the start
  - Harvest the quality the animal needs
  - Variability
    - Silo Management
    - Variable crops in the field – Forage Breeders

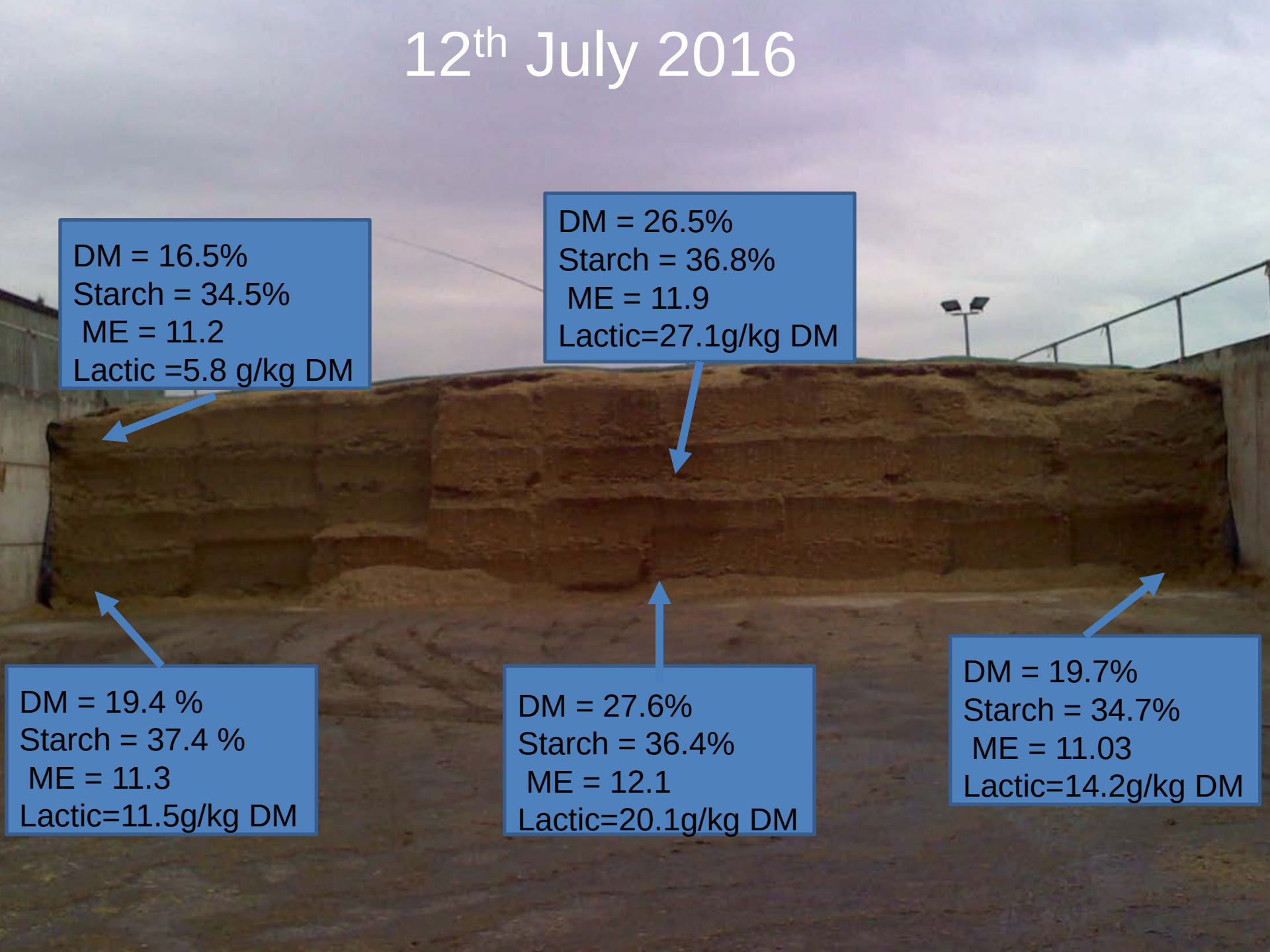
Thankyou for your attention

Questions

1st June 2016



12th July 2016



Warner's Corner