Precision dairy cattle nutrition: statistics of rumen pH in commercial cattle.

What is the effect of husbandry system on rumen pH ?

Professor Toby Mottram
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Survey of rumen pH

- Background to the study
- How data was collected and filtered
- Results and conclusions
- Is there a correlation between level of milk yield and rumen pH ?

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What do we know about rumen pH ?

- Low pH is strongly correlated to energy density and high digestibility
- Higher yielding cows are thought to be at risk of SARA
- So we would expect high yielding herds to have lower mean pHs and more time below a threshold

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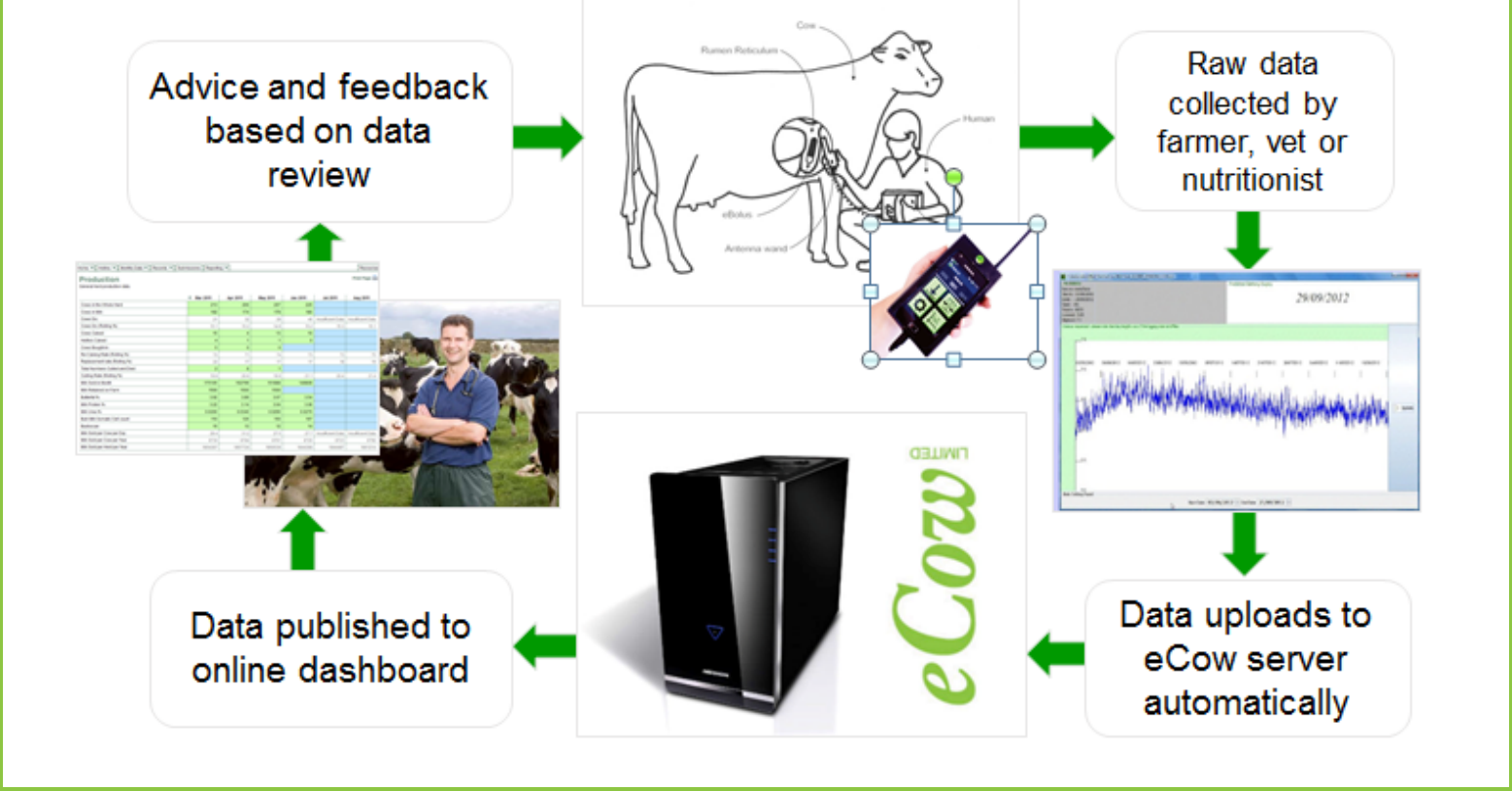
Rumen pH Bolus

- Retained in Reticulo-rumen
- Raw data (pH & T) downloaded to handset
- Handset Uploads to internet
- Bolus lasts over 100 days before sensor fails
- Accurate +/- 0.1 pH per 30 days
- Used >3 per group

Rumen pH data flow



_eCow now has thousands of daily pH profiles on our server

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The problem of accurate metadata

Annual Average Milk Yield

System descriptions

- Total Mixed Rations + Concentrate
- Grass, Silage Cake
- Robotic Milking (subset of TC)
- Silage and Cake

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Bolus files selected for metadata

Ten farms from over 30 users in SW England

No research farms

Yield categories spreading from 7 to 12 k

Clear classification of husbandry

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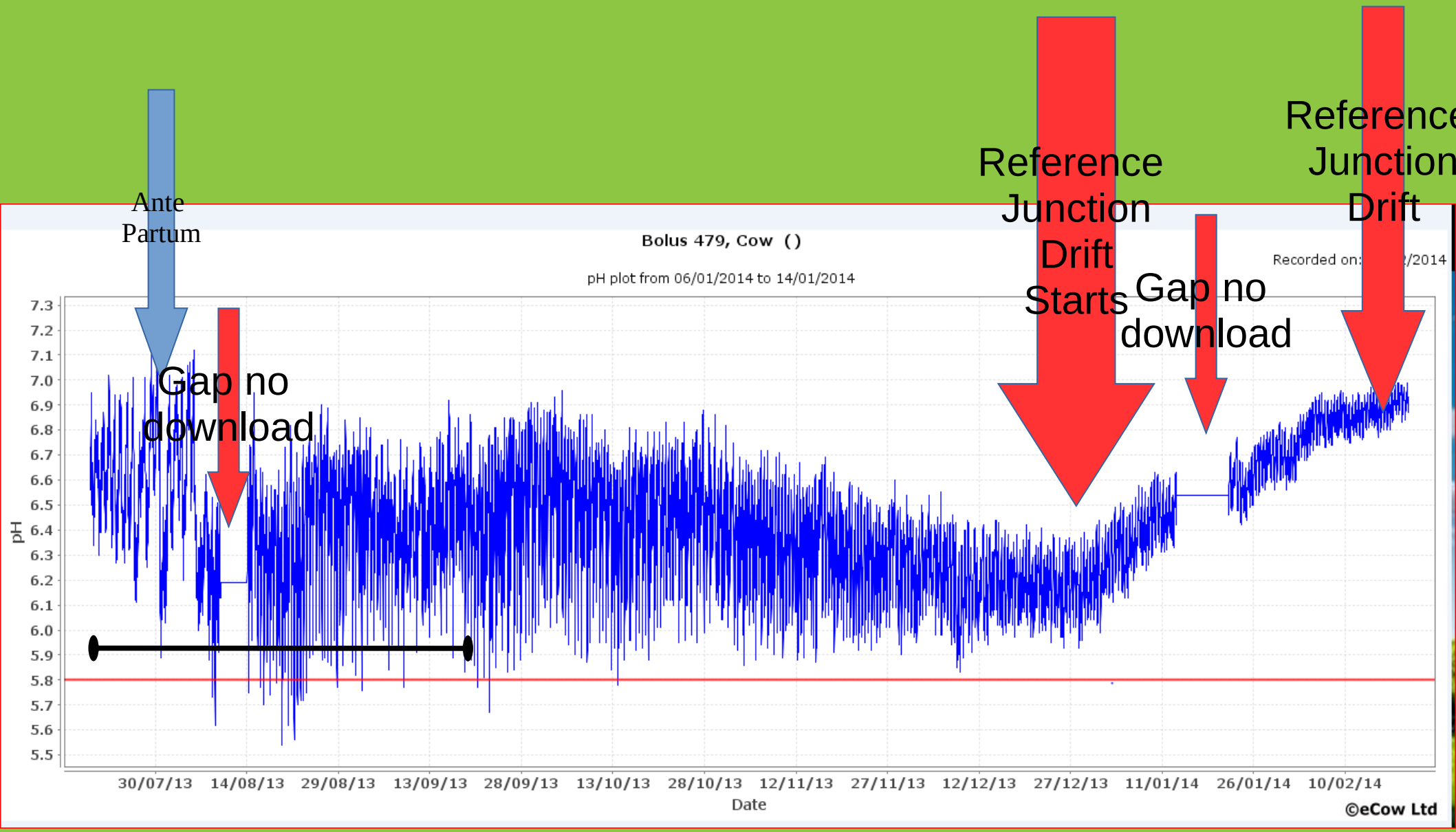
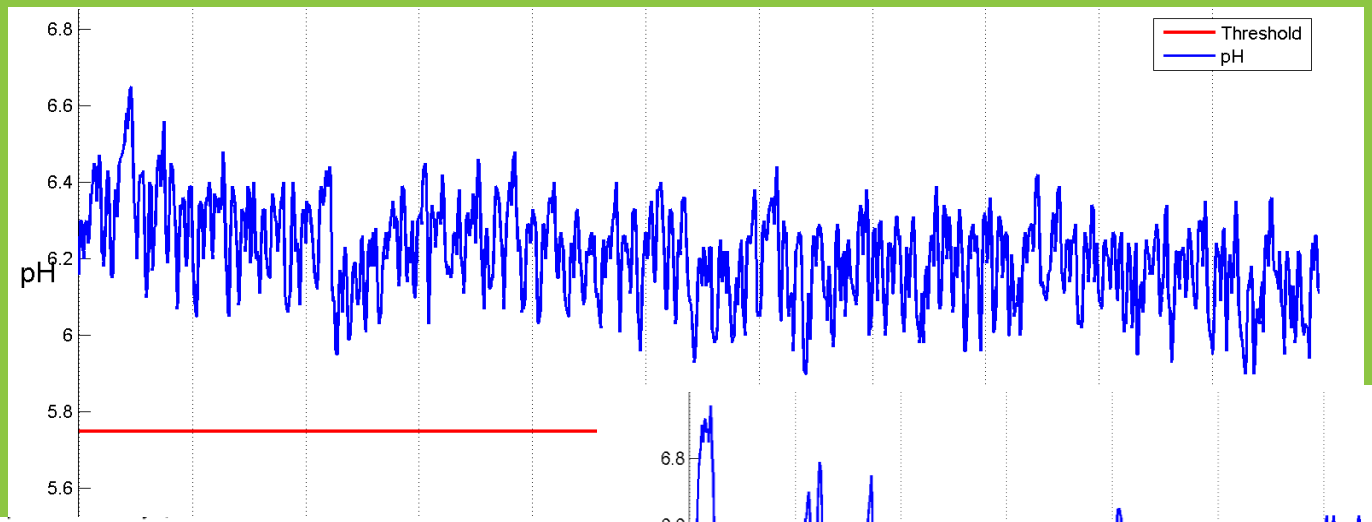
Data Selected for this study

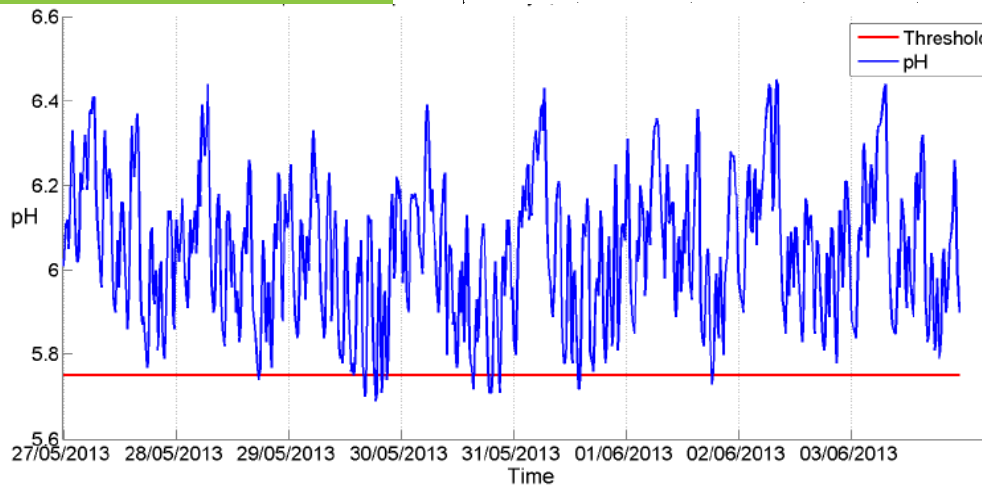
- pH inside physiological range
- First 60 days or less
  - No loss of accuracy
- No gaps in the data

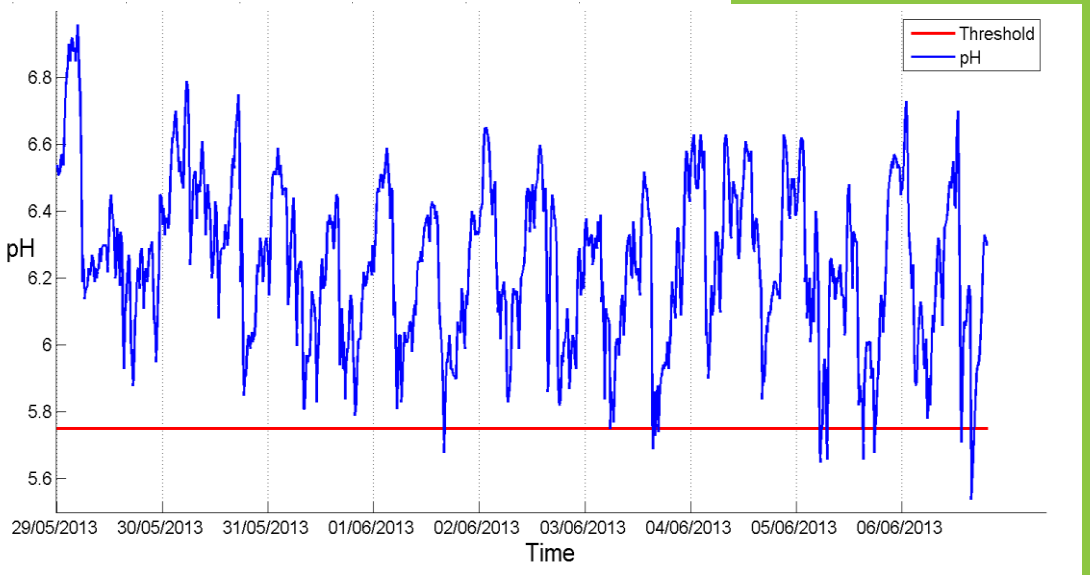
Data from a bolus over 180 days



Systems case studies show variable daily profiles







Rumen pH data features analysed

Daily Mean Values

Maximum and Minimum pH per day

Hours below 5.8 pH

= hours below 5.5 pH in ventral sac

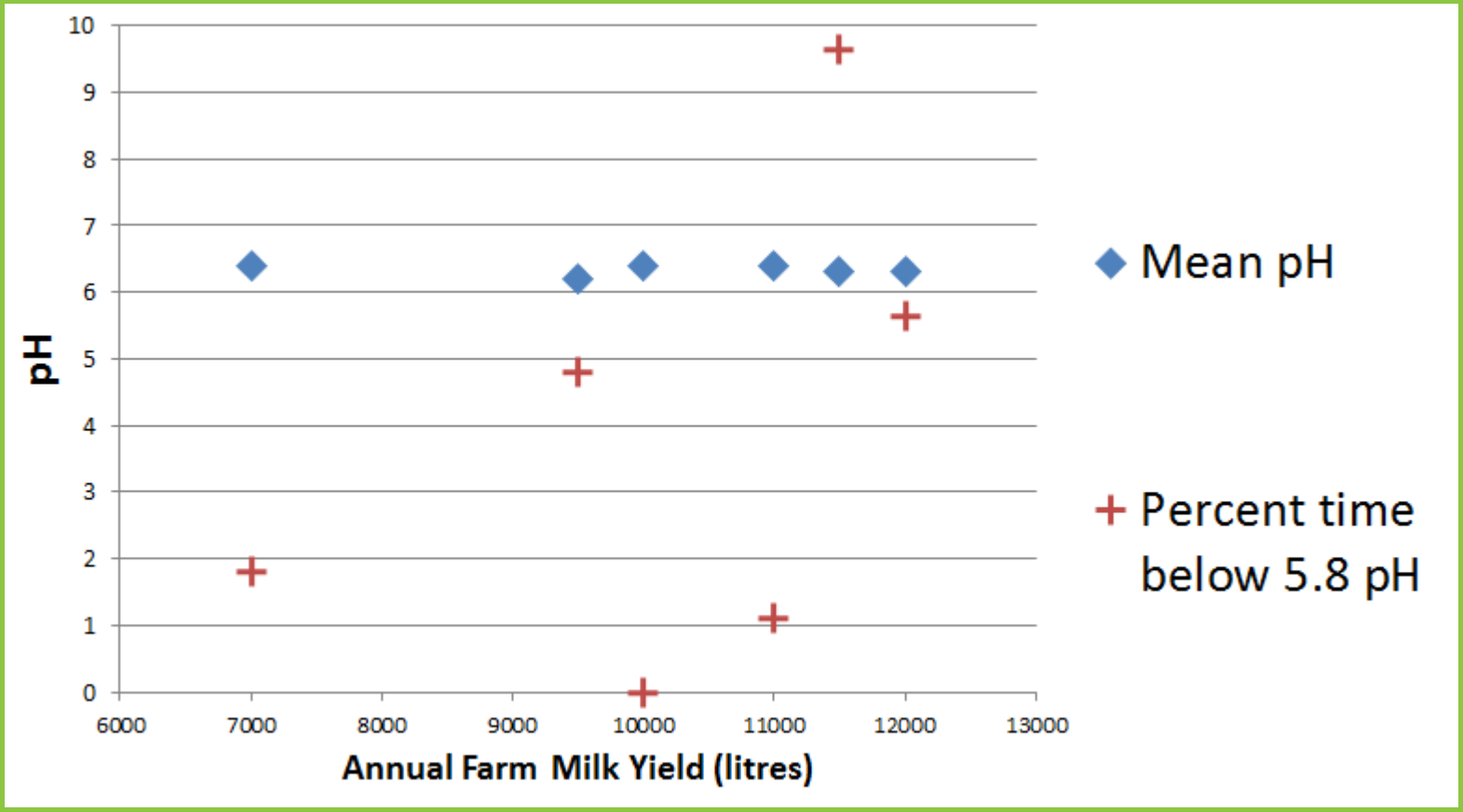
Data Tables

Yield (l/pa)	Mean pH	Percent time below 5.8 pH	n
7000	6.4	1.82	2
9500	6.2	4.79	4
10000	6.4	0	1
11000	6.4	1.12	1
11500	6.3	9.64	1
12000	6.3	5.65	1

System	mean pH	% below	n
SC	6.212	2.68	1
GSC	6.526	0.82	1
Robot	6.205	4.79	4
TC	6.348	5.08	4

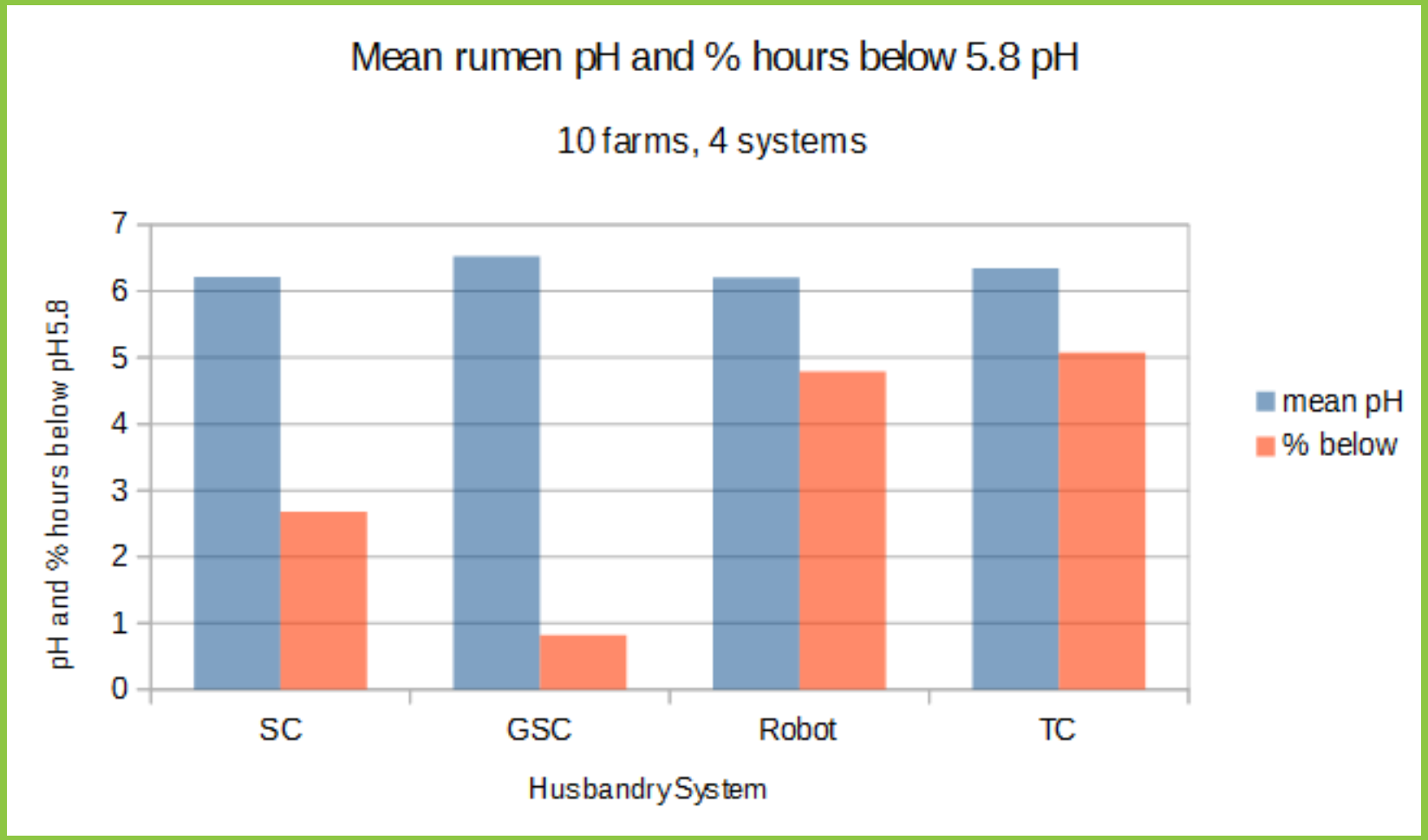
A complete data set will be posted on ResearchGate.net after the conference

Rumen pH and % hours below 5.8 v Milk Yield



This doesn't look well correlated ! R^2 of 0.25 & 0.46

System effect on mean pH & time below 5.8 pH



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Summary of data

- Mean pH is hardly correlated to yield varies between 6.3 pH at 12000 l

  and 6.4 pH at 7000 l

- Differences between systems were less than differences between farms with the same system

- Hours below threshold was a better correlation but still highly variable

- Where is SARA ?

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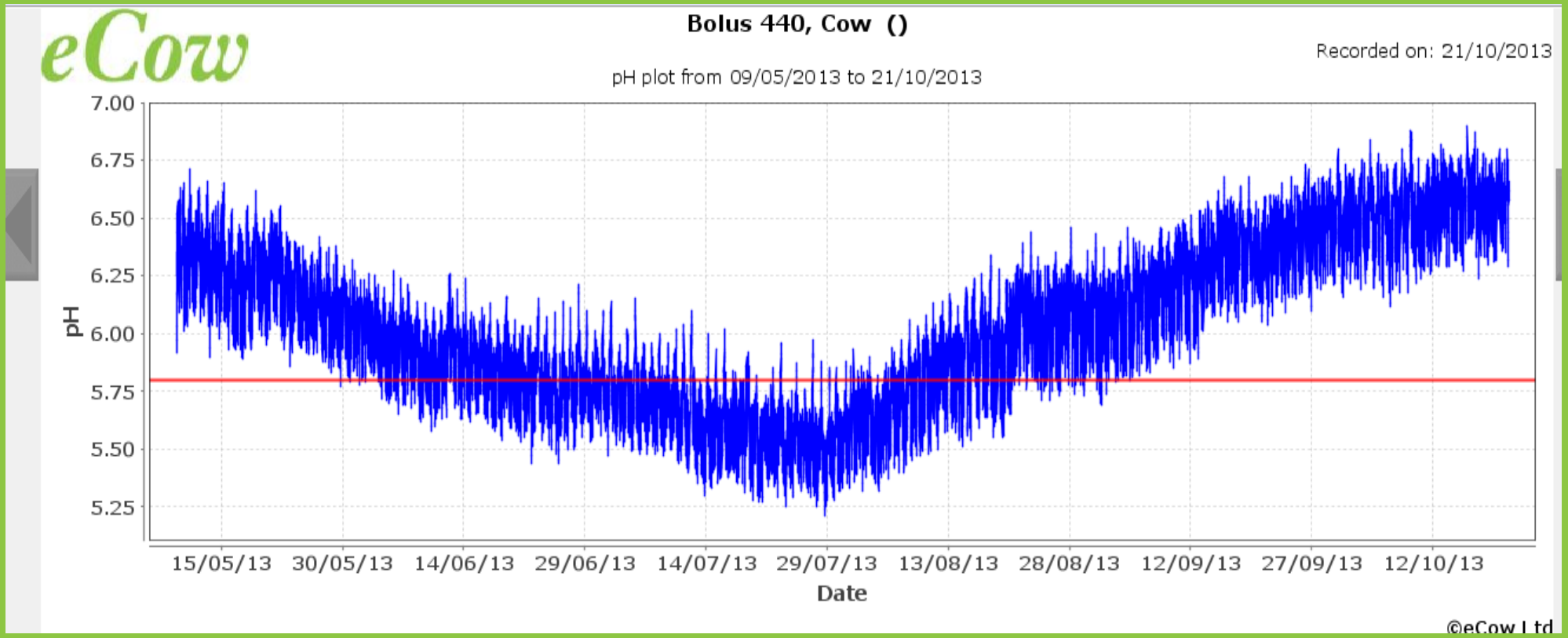
Why is this cow still alive ?



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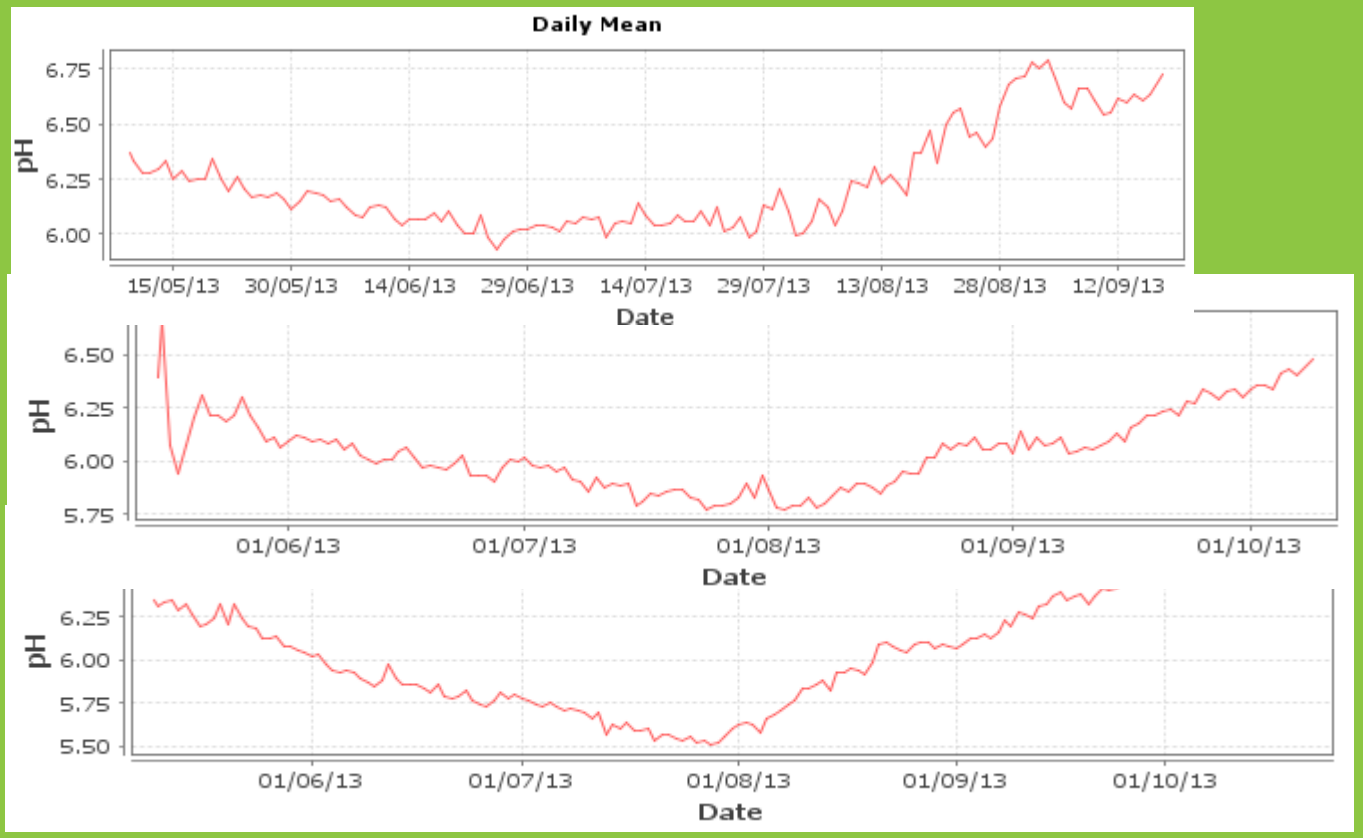
This is the profile of 3 cows in that herd



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Conclusion

- Rumen Telemetry is a powerful tool to identify nutritional problems
- There is no inevitable risk of SARA with yields to 12k per annum
- Concentrate fed to cows in robotic milking systems needs to be carefully selected and managed

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Thank you for listening

Thanks to:-

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