Towards the 20000 litre cow: how dairy farmers use technology

Professor Toby Mottram
Royal Agricultural University
Cirencester
Toby.mottram@rau.ac.uk

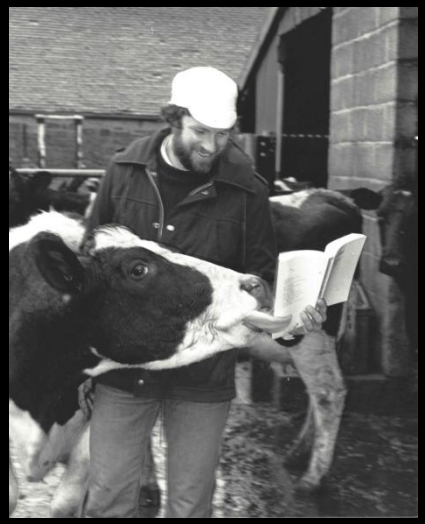
Overview

Royal Agricultural University Cirencester

- Introduction: My life in Farming & Agricultural issues
- Scientific Background
- Why go for high yields ?
- Technology for dairy farmers
  - Case Study 1: rumen pH boluses
  - Case Study 2: mobility scoring
- Why do farmers use technology ?

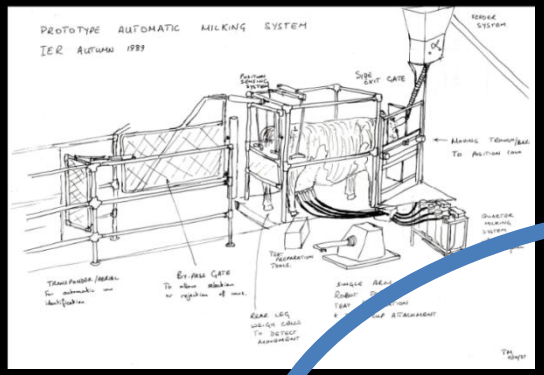
A life in dairying

Royal Agricultural University Cirencester



An OU engineering degree while managing 140 cows

Robotic Milking



Robots

BBSRC
20 Years of Pioneering
Great British Bioscience

Biosensors

Wireless sensors

Scottish Enterprise

Innovate UK
Technology Strategy Board

Royal Agricultural University
Cirencester

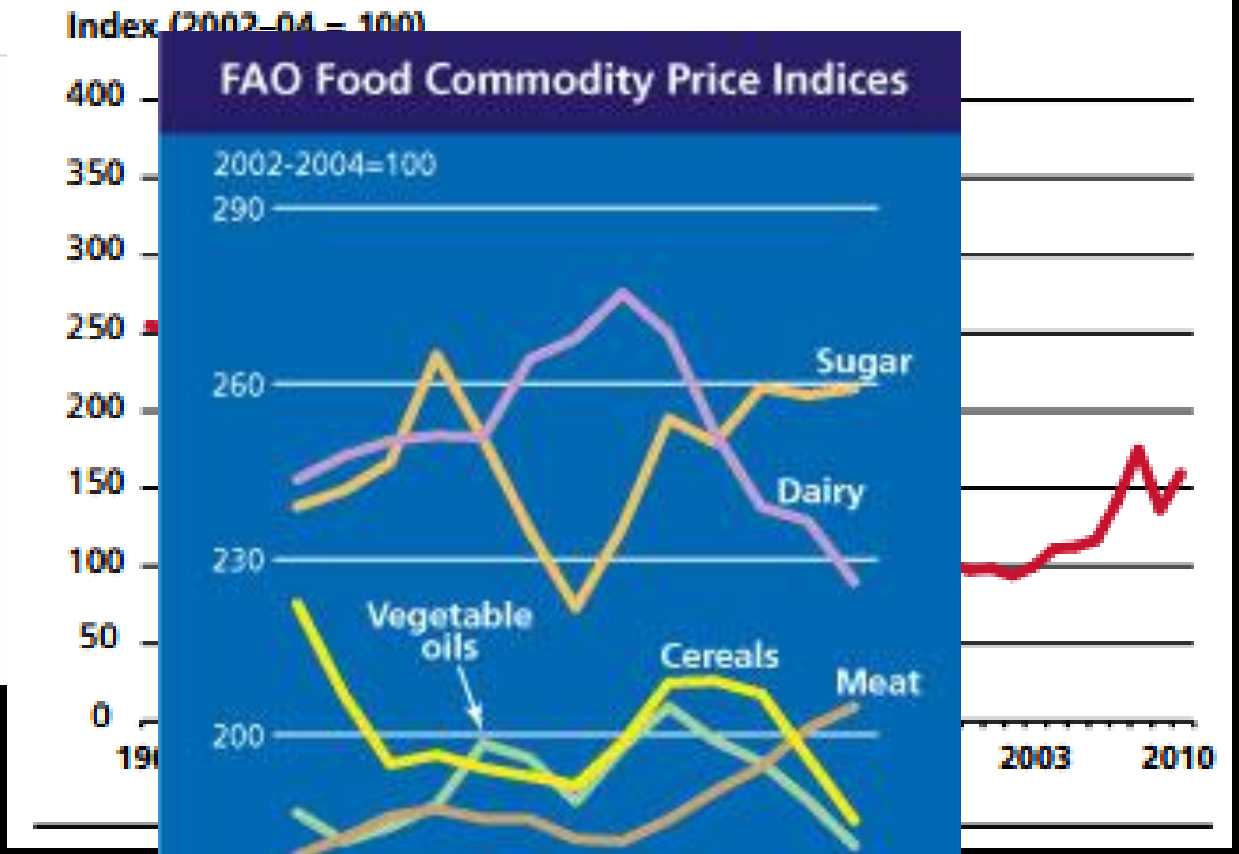
Agriculture is important
(or is it just a bad news story?)

Crisis: what crisis

Royal Agricultural University Cirencester

FIGURE 3. Long-term trends in average per capita food supply.

From the following article:
Agricultural sustainability and intensive production practices
David Tilman, Kenneth G. Cassman, Pamela A. Matson, Rosamond Naylor and Stephen Polasky
Nature **418**, 671-677(8 August 2002)
doi:10.1038/nature01014



Environmental Issues

Royal Agricultural University Cirencester

Greenhouse Gases ?

Greenhouse gas fear over increased levels of meat eating

COMMENTS (738)

By Roger Harrabin
BBC environment analyst

Nitrate Pollution ?

Animals and human food

Royal Agricultural University Cirencester

Animal agriculture uses things humans cannot eat

Concentrate feeds are made up of by-products

Product	Concentrated Food (kg/kg)	Feed Conversion Ratio Edible Energy (MJ/MJ)	Feed Conversion Ratio Edible Protein
Milk (6500 l/cow)	0.1	0.47	0.71
Grass fed Beef	2.2	3.2	1.6
'Cereal' Beef	4.1	6.2	3.0
lamb	1.4	2.5	1.1
Pork/Bacon	2.3	6.3	2.6
Poultry	2.3	6.3	2.6
Eggs	1.7	3.6	2.3

Wilkinson (2011) Re-defining efficiency of feed use by livestock, Animal, 5:7 pp 1014-1022

UK Dairy Farming 1983-2013

Royal Agricultural University Cirencester

- Dodington Farm: 1983
- 130 Frisian Cows
- Yard & Parlour
- Yield 6500 l/a
- Cubicles
- TMR/Complete Diet/grazing
- AI with CI 380 days
- Cell count 220k
- Farm computer

- UK Farm: 2013
- 128 Holstein Cows
- Yard & Parlour
- Yield 6,939 l/a
- Cubicles or straw beds
- TMR/carted silage/grazing
- AI with CI 420 days
- Cell count 240k
- Farm computer

Why High Yields: Welfare

Royal Agricultural University Cirencester

- Singer (1975 Animal Rights) assumed all domesticated animals suffered short brutal lives
- So fewer animals is better for welfare

AND

- Higher production = high welfare standards
- Professionalisation of the herd management
- Social benefit of employment in rural areas
  - Grooming and tending cows
  - Technology use and development

Why high yields: Pollution & Efficiency

Royal Agricultural University Cirencester

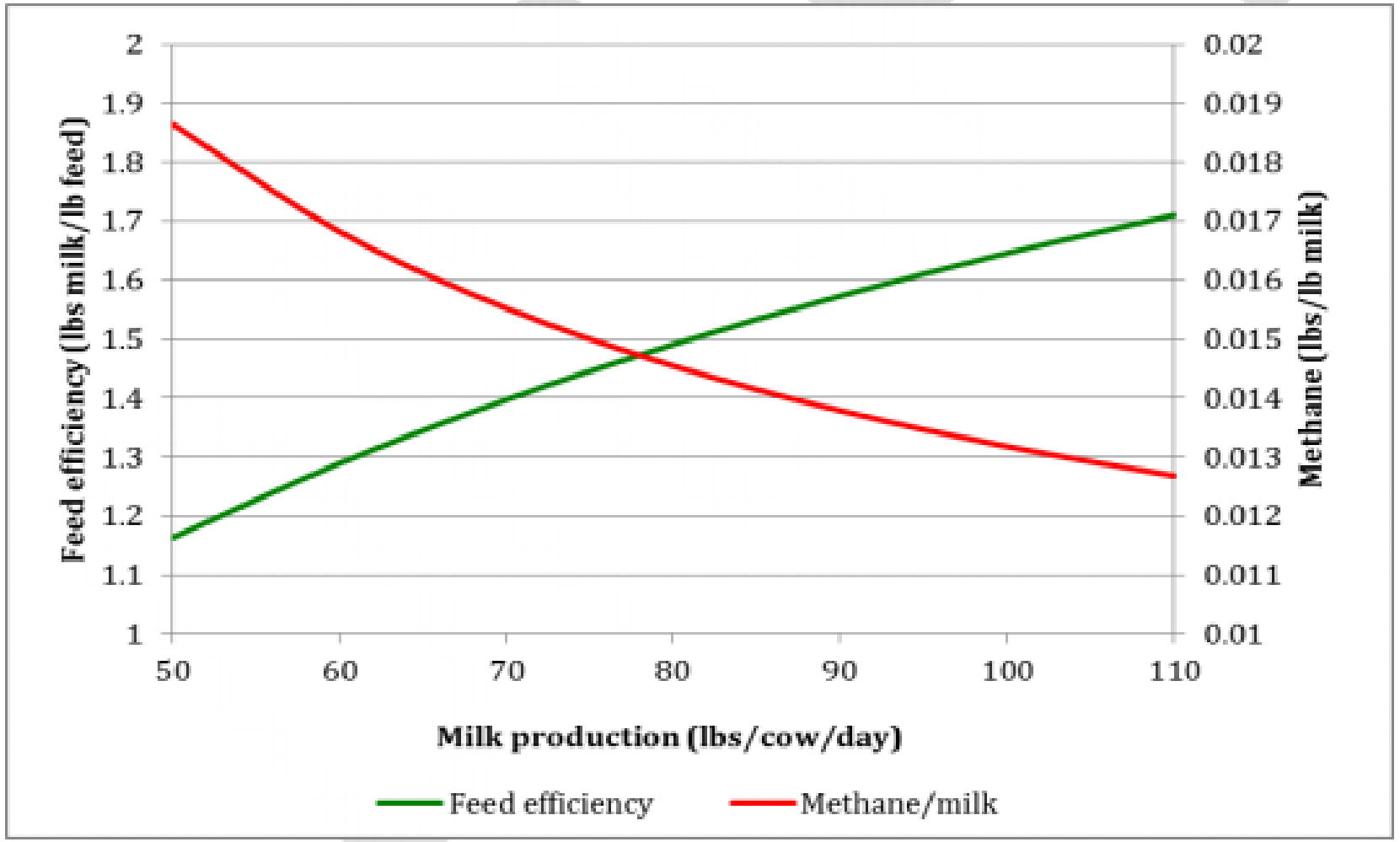


Figure 6. Incremental improvements in feed efficiency (lbs. energy-corrected milk/lb. feed) lead to corresponding reductions in methane emissions (lb/lb milk). Currently in the U.S., on average cows produce 72 lbs. energy-corrected milk/day while consuming 50.1 lbs. feed, with a feed efficiency of 1.44.

Less grazing = better environment: even in NZ

Royal Agricultural University Cirencester

THE PRESS
press.co.nz

Stuff Home | The Press | News

Christchurch Earthquake 2011 | City Centre | North+West | Sou

West Coast | North Canterbury | Mid Canterbury Selwyn | Cens

Dairy farming harming wat

RACHEL YOUNG

Last updated 09:38 21/11/2013

65 Like 251

LATEST: Calls to limit
wake of a new report
waterways.

The Parliamentary Co
released a report on
country is facing a "cl
dilemma".

The report highlights
nutrients on land as t
concentrations in wat

ENVIRONMENTALIST

Parliamentary Commissioner for the Environment
Te Kaitiaki Taiao a Te Whare Pāremata

Current work | Media

You are here: Home > Publications > All publications > Water quality in New Zealand: Land use and nutrient pollution

Publications

» All publications
» Submissions and Advice
» Search publications

Stay updated

RSS
pce.parliament.nz/rss

SHARE

Water quality in New Zealand: Land use and nutrient pollution

Note: If you have trouble downloading the Water Quality report, please use another browser such as Chrome, Firefox or Internet Explorer 11.

I still think of Canterbury as home. For a hundred years, farmers grew crops and ran sheep on the patchwork plains. But over the last twenty years, water has transformed much of this long-familiar landscape into bright green pasture grazed by dairy cows. Often the first sign of such change has been the felling of macrocarpa shelter belts to make way

A grazed cow has higher emissions of methane per litre and less control of nitrate pollution (including N2O)

Sixty Years of Technology Change

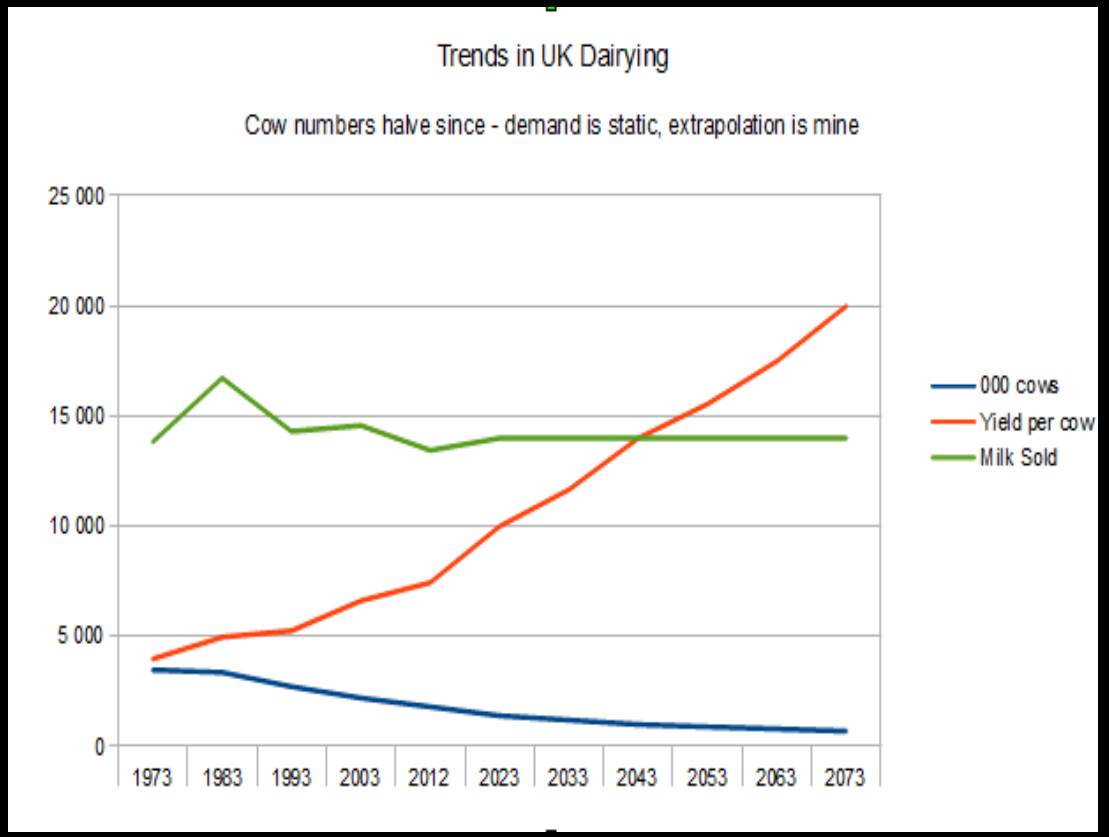
Royal Agricultural University Cirencester

New Technologies

- Loose Housing
- AI and Genetic Improvements
- Silage replaced Hay
- Milking Machines and Parlours
- Maize
- Improved grass varieties
- Computers for feed evaluation
- Bulk tankage

New Challenges

- Water Pollution
- Animal Welfare
- Lameness
- Reduced Labour availability
- Greenhouse Gas Emissions
- Animal Diseases



How to achieve high yields

Royal Agricultural University Cirencester

Better Management:-

- Nutrition
- Fertility
- Housing
- Silage and better use of grass

Case Study: Rumen pH Bolus

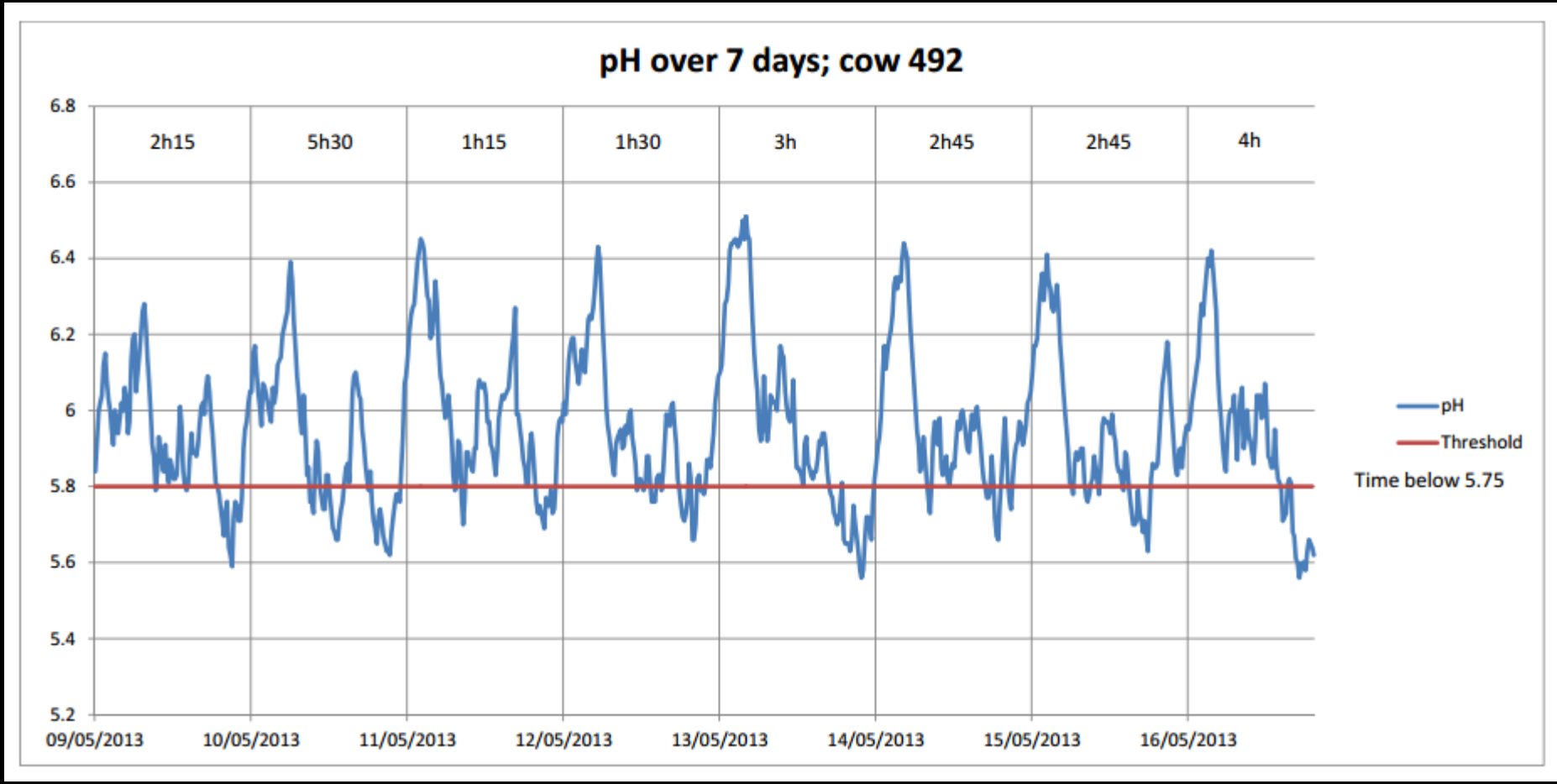
Royal Agricultural University Cirencester

- Inserted by mouth
- Retained in Reticulo-rumen
- Data downloaded by radio
- Uploaded to internet
- Analysed and interpreted

eCow LIMITED

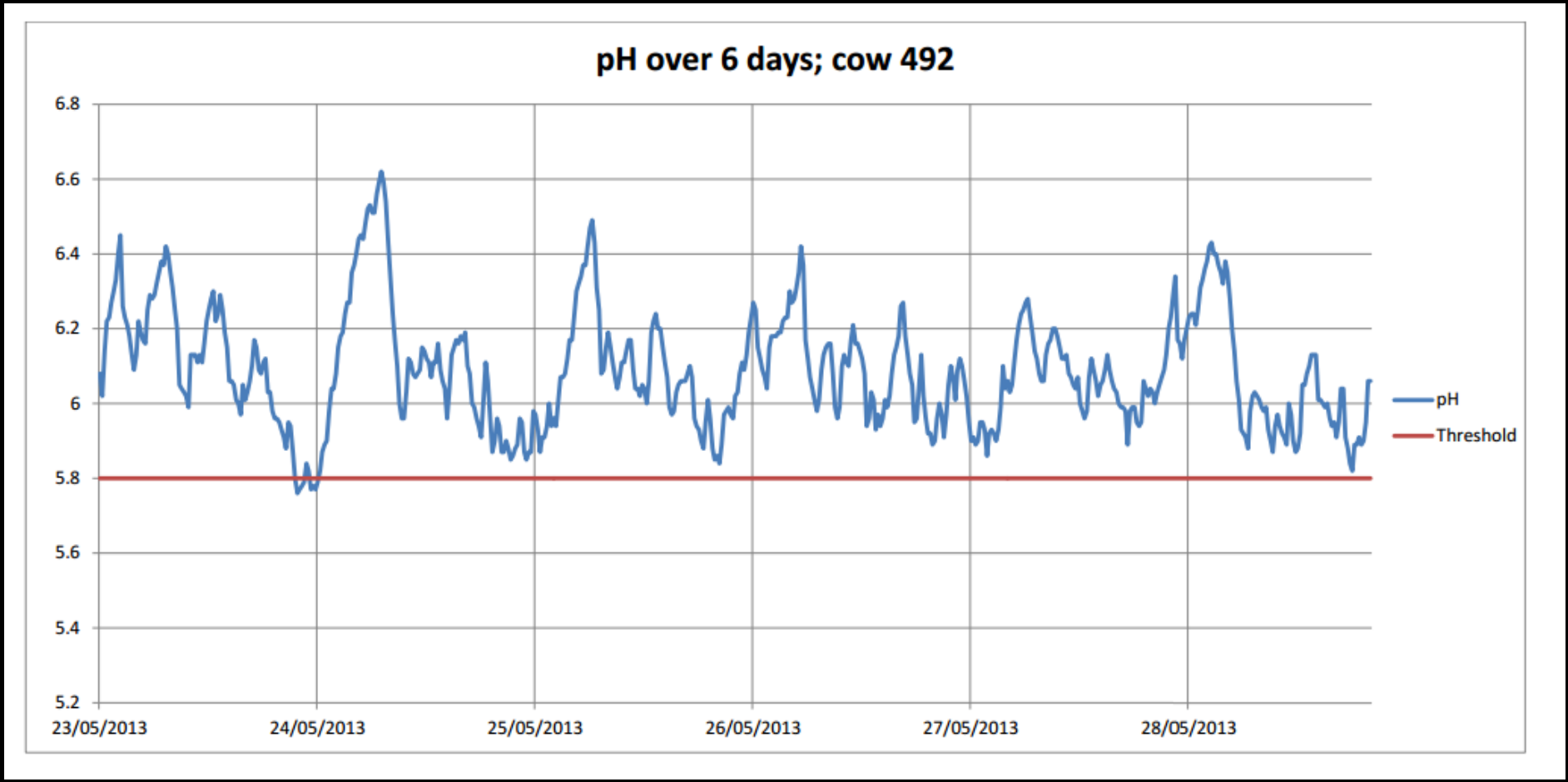
Detect Acidosis

Royal Agricultural University Cirencester



Reduce the digestible energy

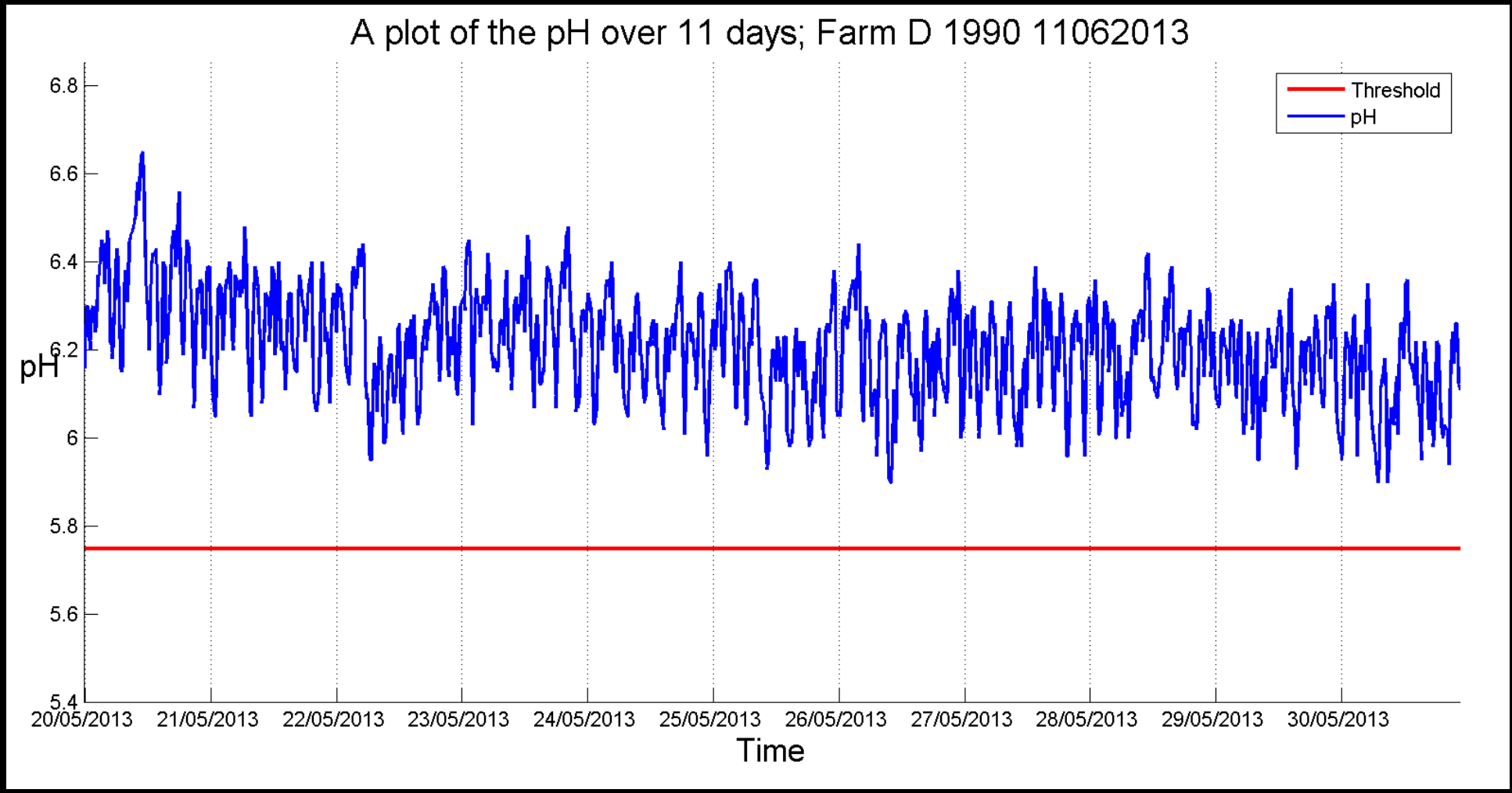
Royal Agricultural University Cirencester



After reducing digestible energy, pH is higher with narrower range, cows eat more at night, no change in milk yield, farm saved £6000 within 3 weeks

Robotic Milking: cows eat little and often

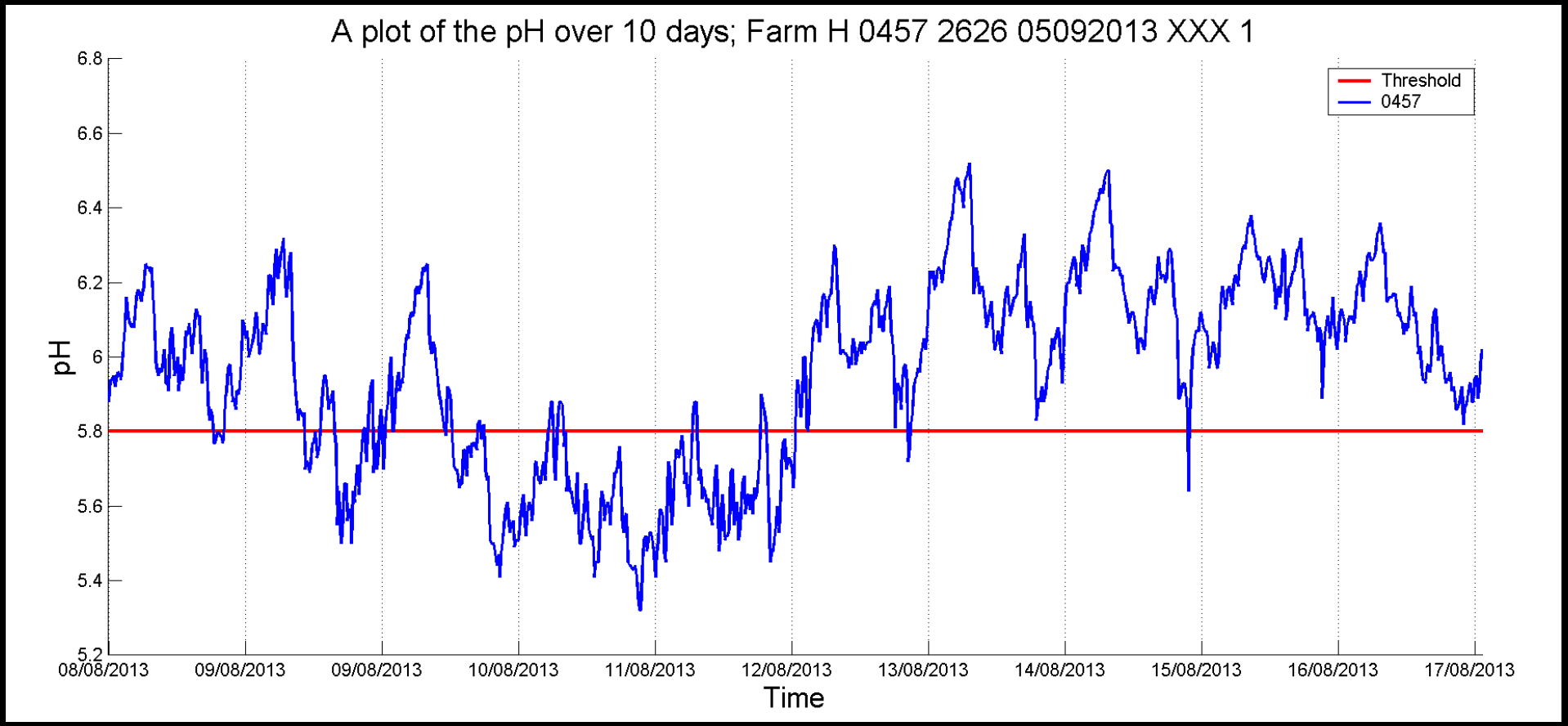
Royal Agricultural University Cirencester



Effect of grazing

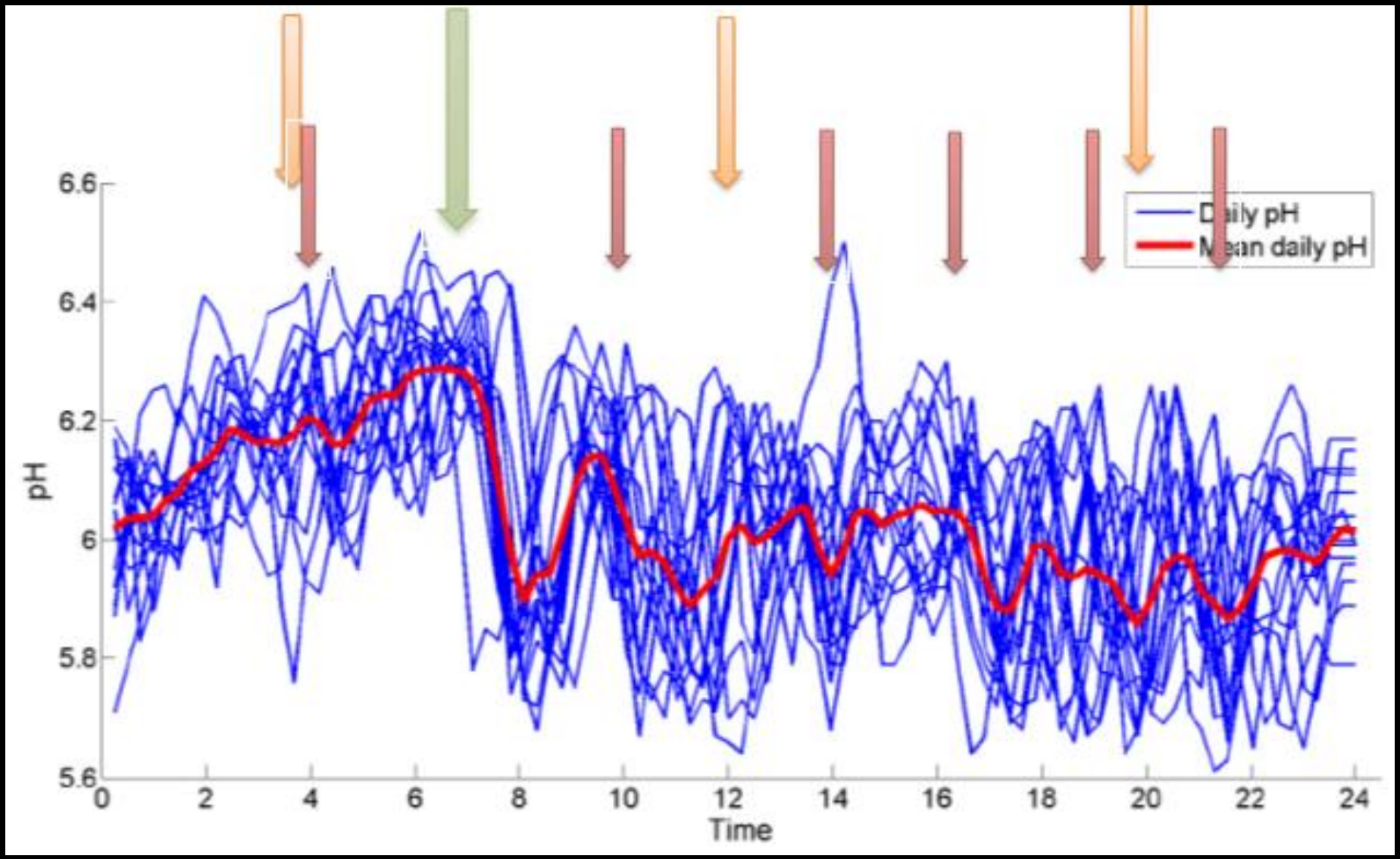
Royal Agricultural University Cirencester

- Grass is the perfect food for cows ?



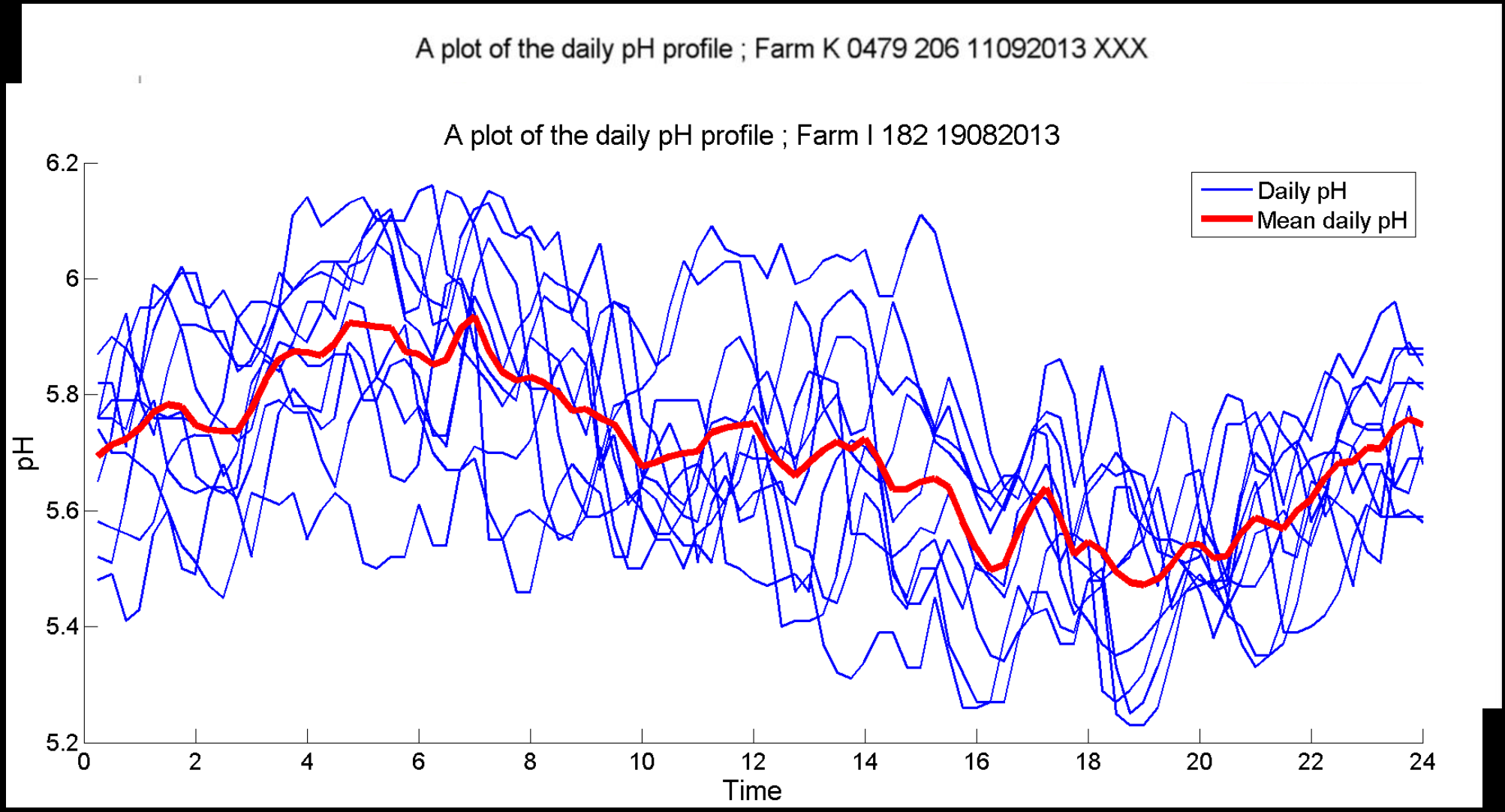
TMR and farm routine

Royal Agricultural University
Cirencester



Cows and their biome like routine

Royal Agricultural University Cirencester



Case Study: Lameness detection

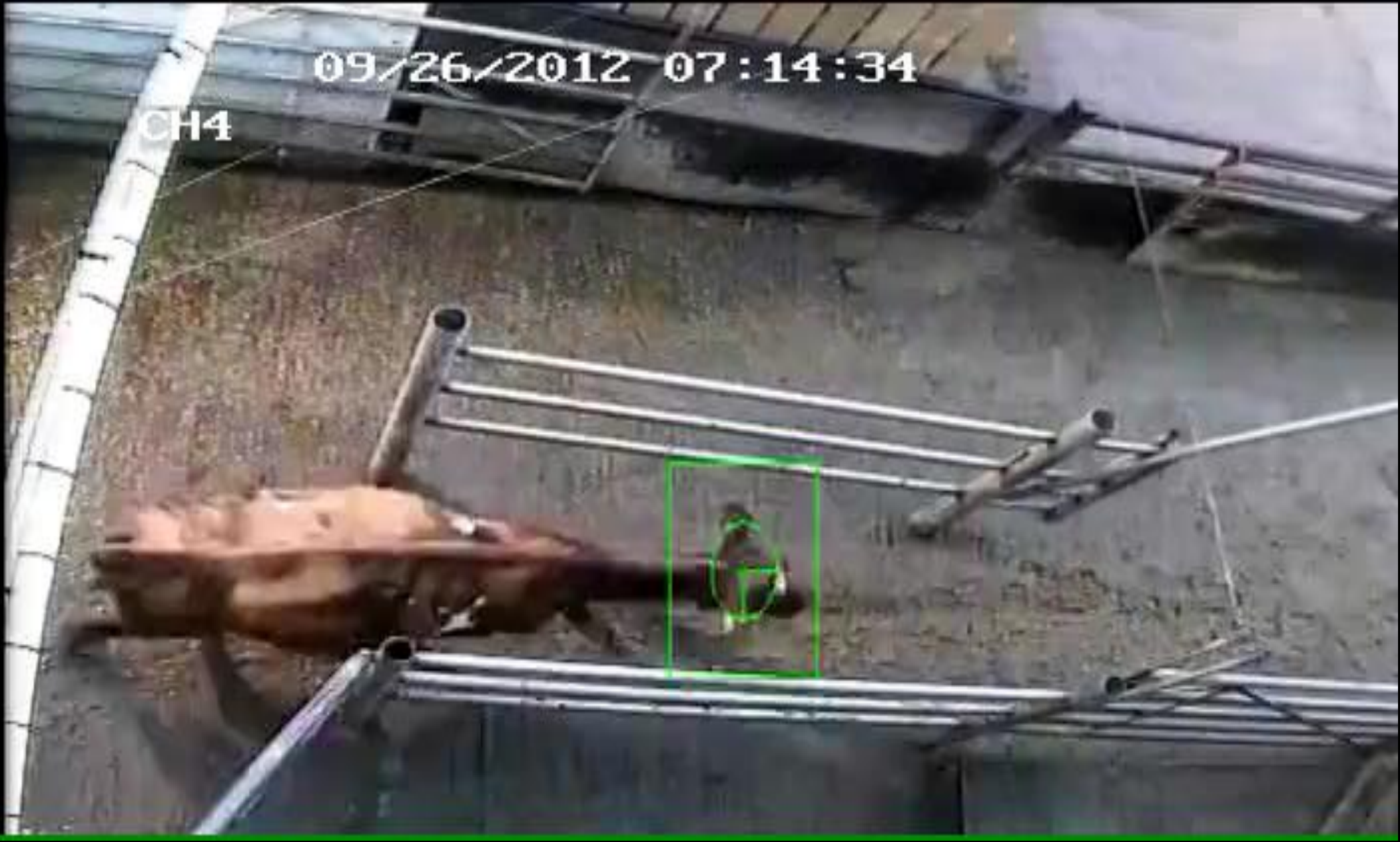
Royal Agricultural University Cirencester

Lameness is a major problem and the milk buyers want the situation improved by regular mobility scoring

Best indicator of mobility score is the time to walk at own pace between two points when not impeded

Richard Everson of Exeter University has been developing Image based mobility scoring

First spot a cow!


09/26/2012 07:14:34
CH4

Technology farmers buy voluntarily

Royal Agricultural University Cirencester

Mobile phones

Quad bikes

Genetic Products (because they love good cows)

- Sexed Semen
- Embryo Transfer

Services (veterinary, nutritional, financial)

Robotic Milking - often for social reasons

Rumen Boluses - because they get a good ROI

Technology Farmers have to buy: compliance

Royal Agricultural University Cirencester

- Quality Testing
  - SCC
  - Bactoscan
- Welfare Tests
  - lameness
- Disease Tests
  - TB
- Pollution Monitoring

Summary

Royal Agricultural University Cirencester

Dairy Cows provide more human consumable food than they eat

High yields per cow are desirable and achievable

Farmers buy technology when there is a clear benefit – not always financial

Royal Agricultural University Cirencester

Thank You For Listening

- Toby.mottram@rau.ac.uk
- For boluses contact sam@ecow.co.uk