PRIFYSGOL BANGOR UNIVERSITY

Closing the gap between research and extension: mathematical tools for sustainable dairy farming

ANDREAS D. SOTERIADES[1], K. ROWLAND[2], D.J. ROBERTS[3] and A.W. STOTT[4]

[1] Bangor University, a.d.soteriades@bangor.ac.uk

[2] Kingshay Farming & Conservation Ltd., Somerset

[3] Scotland's Rural College, Dumfries

[4] Scotland's Rural College, Edinburgh

The challenge

PRIFYSGOL BANGOR UNIVERSITY

To harness the increasing volume of farm data that farm advisors are currently sourcing, in order to obtain invaluable insights into ways of improving farm economic and environmental performance, and to translate these insights into practice

The common approach: benchmarking

PRIFYSGOL BANGOR UNIVERSITY

How does my performance compare to that of my neighbours?

- Key Performance Indicators (e.g. efficiency ratios)
- Top, Medium and Bottom tiers (e.g. ‘Top-10%’ dairy farms)
- Farm management classes (e.g. ‘Cows at grass’ *v* ‘High-output cows’)

The common approach: benchmarking

PRIFYSGOL BANGOR UNIVERSITY

How does my performance compare to that of my neighbours?

- Key Performance Indicators (e.g. efficiency ratios)
- Top, Medium and Bottom tiers (e.g. ‘Top-10%’ dairy farms)
- Farm management classes (e.g. ‘Cows at grass’ *v* ‘High-output cows’)

Diagnostic data and trends: am I on the right track?

The common approach: benchmarking

PRIFYSGOL BANGOR UNIVERSITY

How does my performance compare to that of my neighbours?

- Key Performance Indicators (e.g. efficiency ratios)
- Top, Medium and Bottom tiers (e.g. ‘Top-10%’ dairy farms)
- Farm management classes (e.g. ‘Cows at grass’ *v* ‘High-output cows’)

Diagnostic data and trends: am I on the right track?

Dairy Manager (Kingshay)

Milkbench+ (AHDB Dairy)

FBS Benchmarking (Farm Business Survey)

SI Benchmarking Tool (SIP Platform)

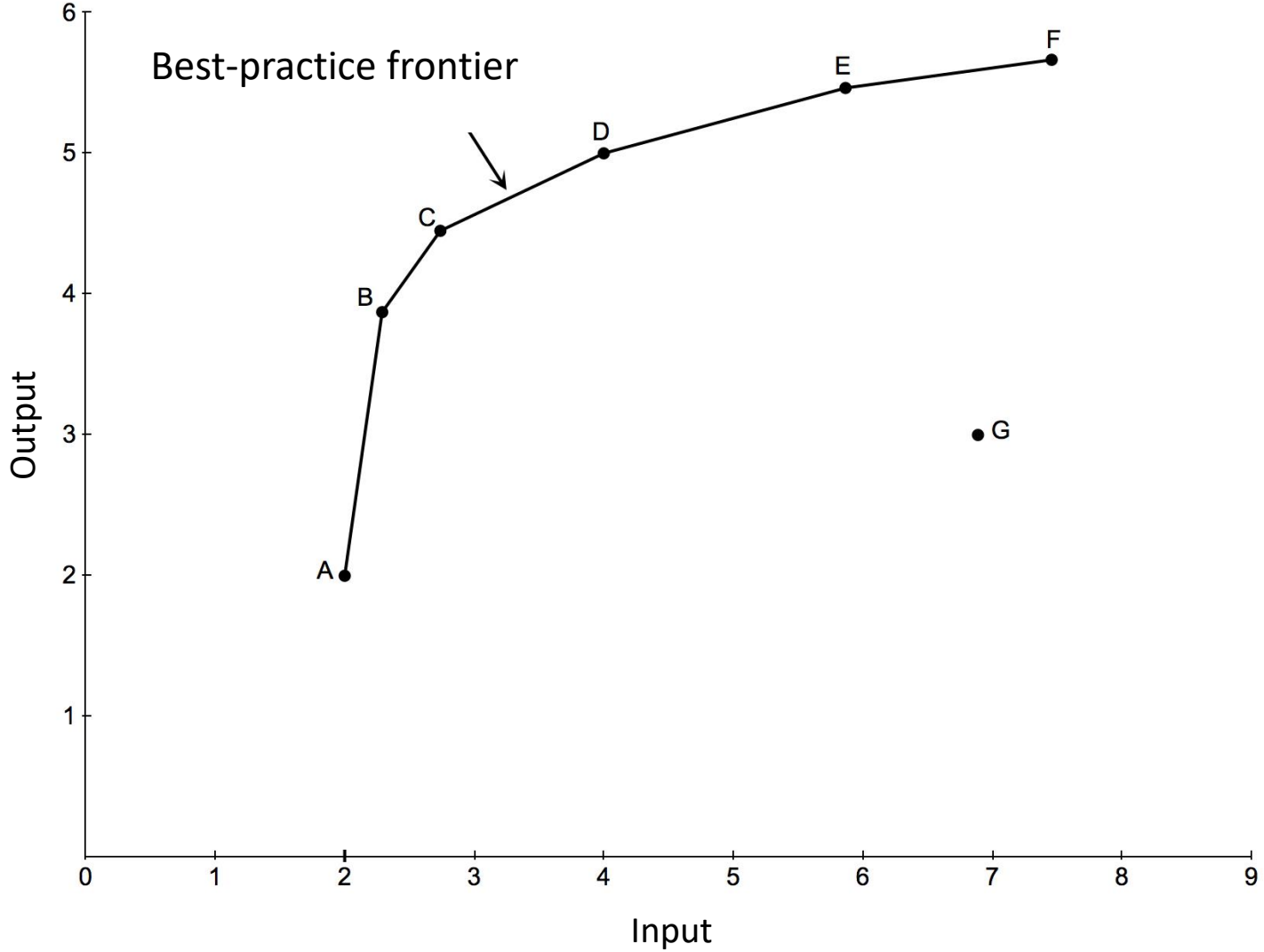
The problem

Numerous interrelated multifactorial processes & KPIs

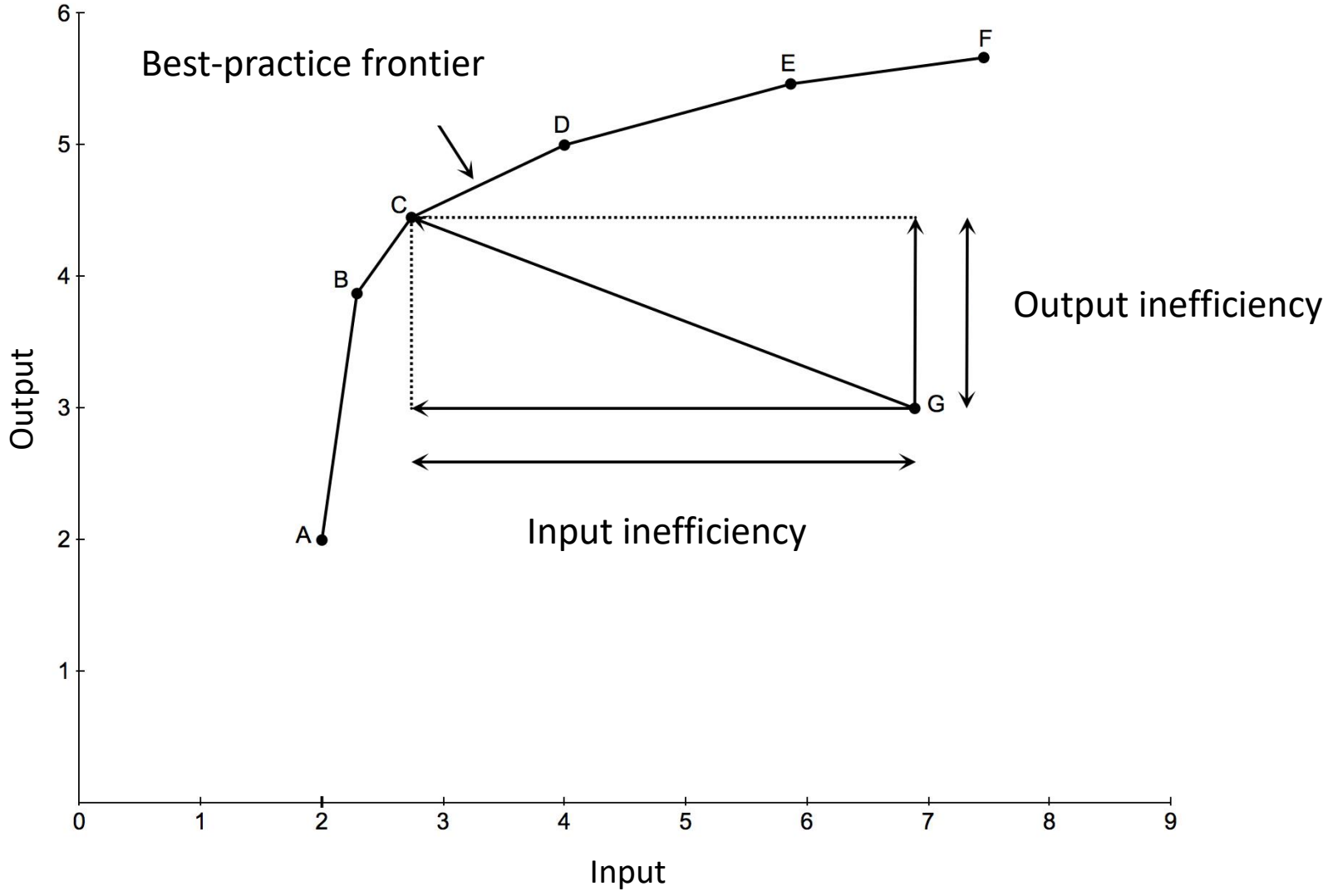
Public good dimensions

The proposed solution: Data Envelopment Analysis (DEA)

PRIFYSGOL BANGOR UNIVERSITY



The proposed solution: Data Envelopment Analysis (DEA)



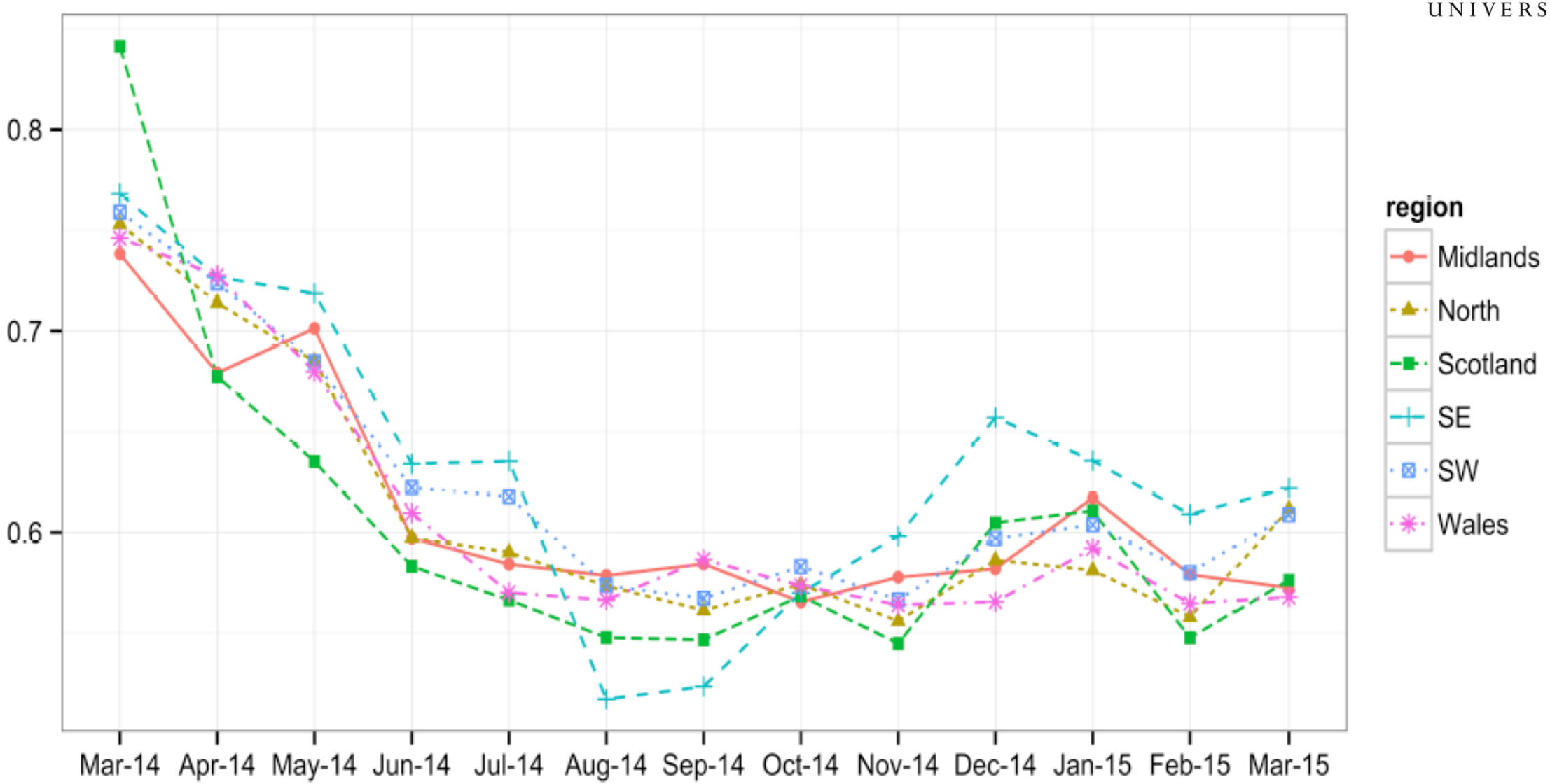
Applications* - Data

PRIFYSGOL BANGOR UNIVERSITY

1. Kingshay Farming & Conservation Ltd.: 675 UK dairy farms from 2014–2015.
2. Six DEA inputs: cows in herd (numbers); forage area (ha); replacements (numbers); purchased feed (kg dry matter); somatic cell count (SCC; '000s/mL); and bacterial count (BC; '000s/mL).
3. Three DEA outputs: milk yield (L); butterfat yield (kg); and protein yield (kg).

* Soteriades et al. (2018). *International Journal of Agricultural Management* 7(1):16–29

Application 1 – temporal trends



Application 2 – motivating the farmer

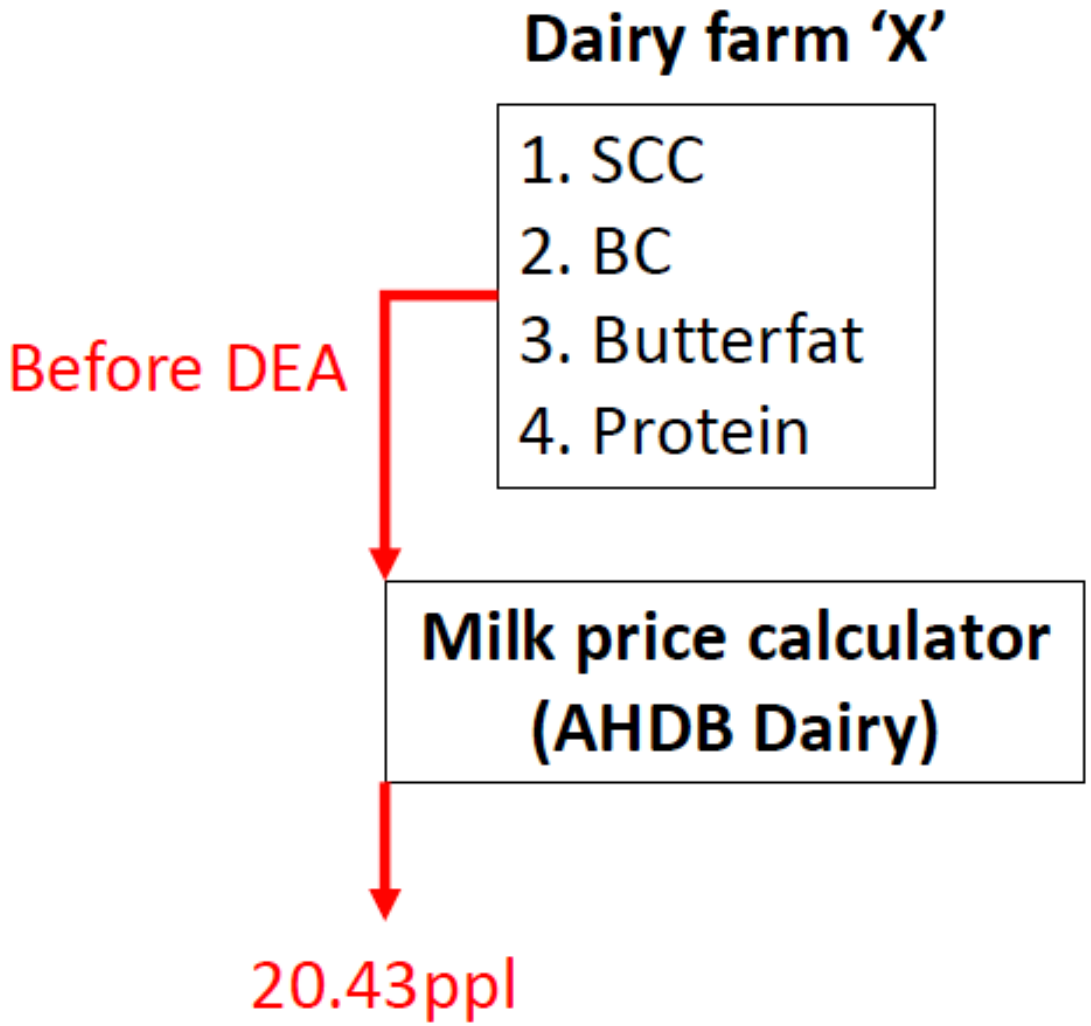
PRIFYSGOL BANGOR UNIVERSITY

Dairy farm 'X'

1. SCC
2. BC
3. Butterfat
4. Protein

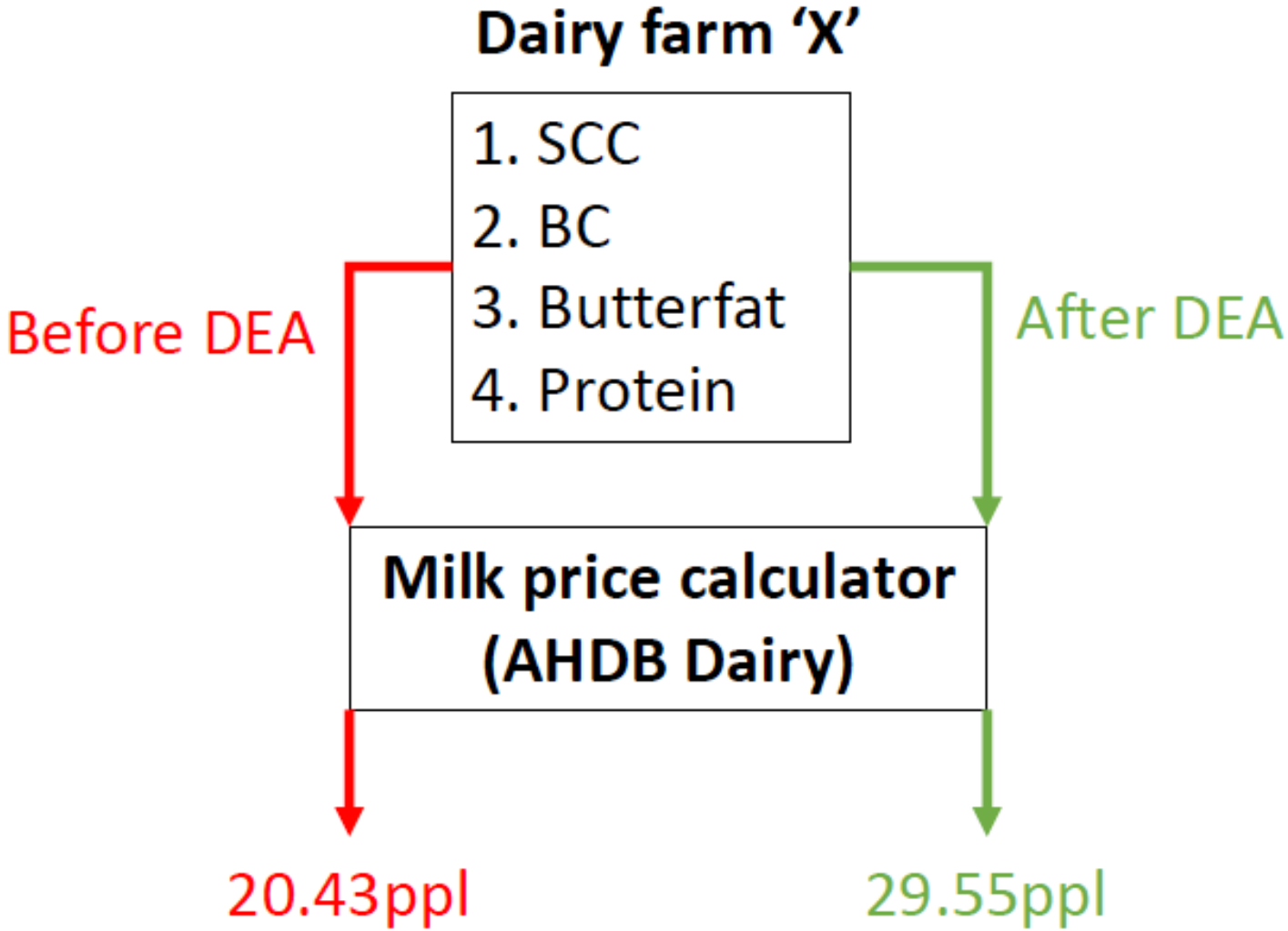
Application 2 – motivating the farmer

PRIFYSGOL BANGOR UNIVERSITY



Application 2 – motivating the farmer

PRIFYSGOL BANGOR UNIVERSITY



Thank you!

PRIFYSGOL BANGOR UNIVERSITY

Soteriades AD, Rowland K, Roberts DJ & Stott AW (2018). Identifying and prioritizing opportunities for improving efficiency on the farm: holistic metrics and benchmarking with Data Envelopment Analysis. *International Journal of Agricultural Management* 7(1):16–29

Soteriades AD (2018). The power of analytics in farm sustainability. SCI Agrisciences Group [Online] https://www.soci.org/news/general-news/the-power-of-analytics-in-farm-sustainability

Acknowledgements: Richard Simpson & Duncan Forbes, Kingshay Farming & Conservation Ltd.

LOW CARBON, ENERGY & ENVIRONMENT RESEARCH NETWORK WALES RHWYDWAITH YMCHWIL CARBON ISEL, YNNI A'R AMGYLCHEDD CYMRU

Cyngor Cyllido Addysg Uwch Cymru
Higher Education Funding Council for Wales

hefcw

The Scottish Government Riaghaltas na h-Alba

SRUC

INRA Institut National de la Recherche Agronomique

Ariennir yn Rhannol gan Lywodraeth Cymru
Part Funded by Welsh Government

THE A. G. LEVENTIS FOUNDATION