Resilient Pasture-based Dairy Production Systems

Dr. Brendan Horan

Animal & Grassland Research and Innovation Centre
Teagasc, Moorepark, Fermoy, Co Cork.

web: http://www.agresearch.teagasc.ie/moorepark/

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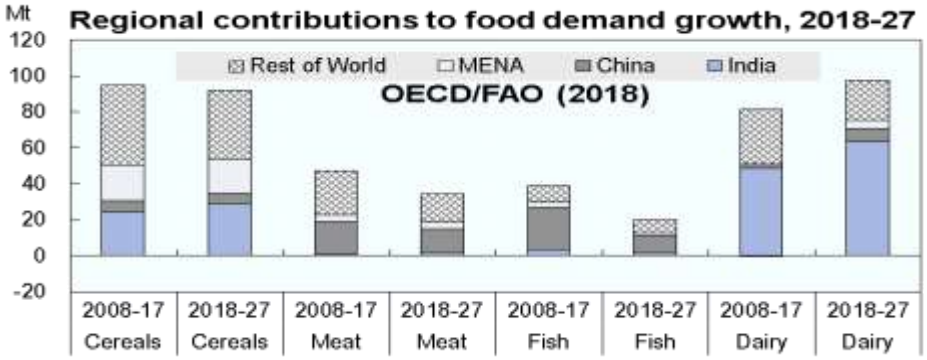
Presentation Overview

- The global & local contexts for grazing systems
- A strategy for resilient dairying
- Resilient grazing systems characteristics
- Future improvements
- Conclusions

Is this the best time ever for Grazing Systems?

The world is rapidly changing..

- Growing incomes / urbanisation/ extended life expectency
- Consumption of animal protein > supply



- Engaged consumers - farm systems as part of the supply chain
- Increasing recognition of grasslands multi-functional benefits

Increasing capacity to produce food

- Widespread use of newer, high-yielding varieties/ breeds
- Precision technologies/ Smart data

Volatile and Unpredictable Commodity Price Environment

- **Historical comparative farm gate milk prices 1999 – 2018 (CLAL, 2018)**

- **Principle distortive impacts on annual farm profitability quantified**

Year	2008	2009	2010	2011	2012	2013	2014
Co-op price (c/litre)	34.6	23.7	31.1	36.0	33.1	40.5	39.8
Net farm profit (€/ha)	**1,076**	**397**	**983**	**1,317**	**998**	**1,289**	**1,392**

(Ramsbottom et al. 2018)

The Sustainable Intensification Challenge

Only one Earth..

Climate change & inclement events – food security
Local pollution, biodiversity loss, soil erosion
Food and feed competition

Increasing societal pressures, food security plus…

non-food products (climate change mitigation, natural resource conservation, agro-ecology, biodiversity, improved animal welfare, etc.)

The sustainable intensification challenge is to..

produce more food with increased efficiency based on feeds which are non-recoverable by humans and using fewer chemical/antibiotic interventions

Well implemented pasture-based production systems have many advantages

R&D must respond…Resilience

Resilience is the capacity of any system to deal with change and uncertainty and maintain essential function and outcomes in the long term

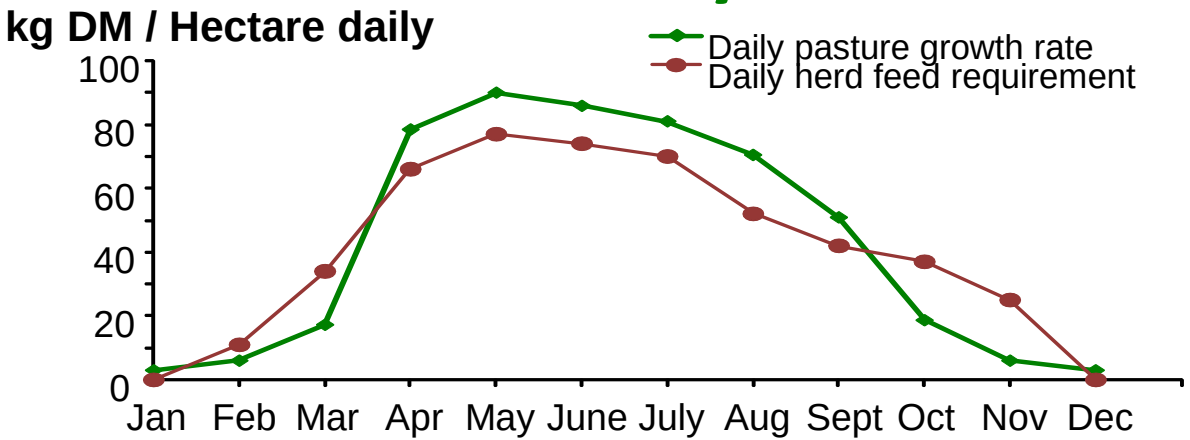
- Complex challenges requiring simple solutions within multi-functional systems

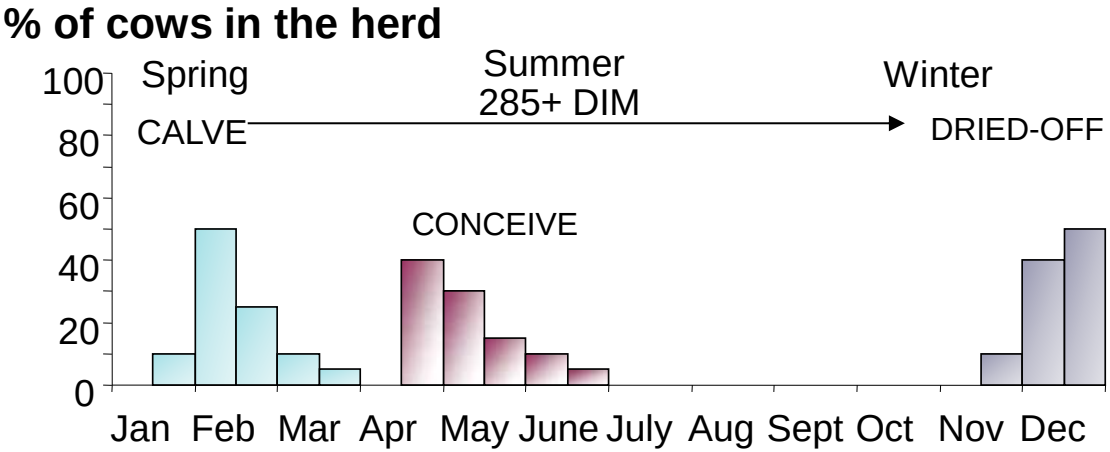
- The goals of resilient systems are to:
  - improve the livelihoods of farmers – consistent profits insulated from price & climate
  - Simple & labour efficient with minimal interventions
  - improve products and reduce environmental and animal welfare pressures

First Principles of Pasture-based Systems…

Alignment of Grass Supply & Animal Requirements

Compact calving, high fertility status dairy herd

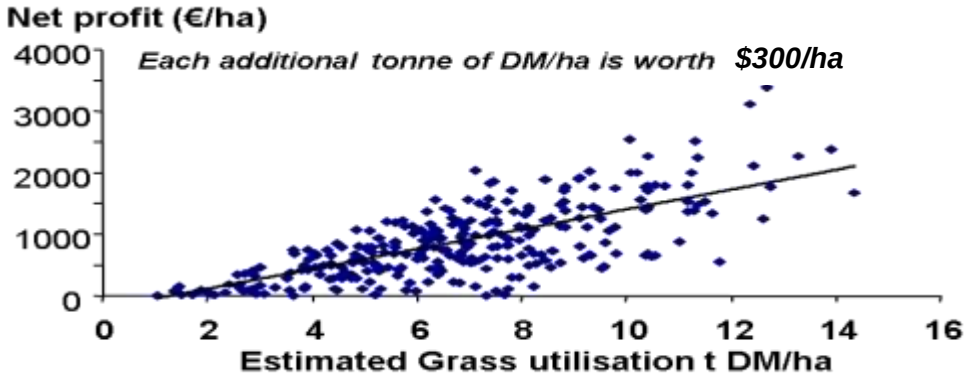




"Simplicity is the ultimate sophistication" – Leonardo da Vinci.

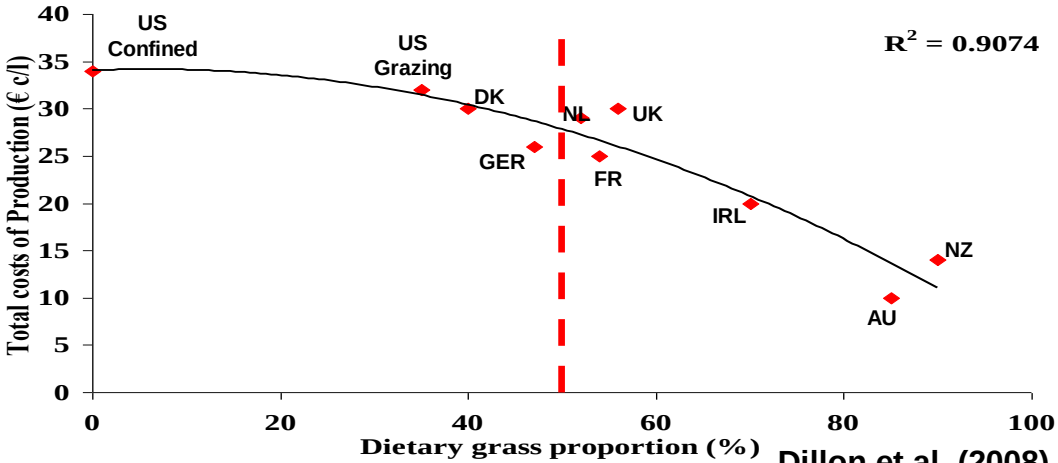
Economic Imperatives for Grassland Systems

High profitability grazing systems are based on high levels of pasture utilisation



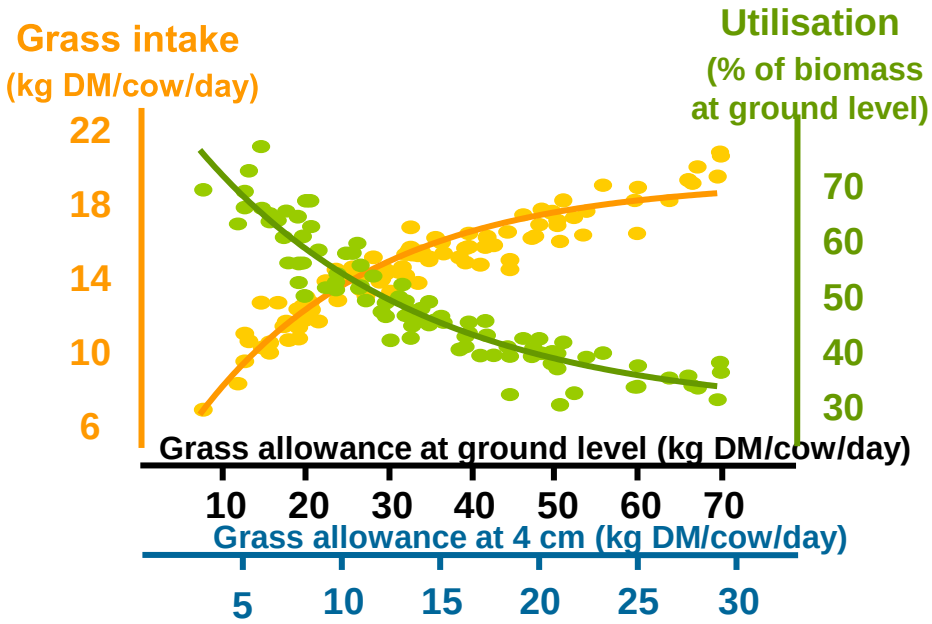
Curvilinear relationship between grass proportion in the animal diets and milk production costs

- Reduced feed related costs
- Low fixed costs



Dillon et al. (2008)

Grazing…the art of compromise



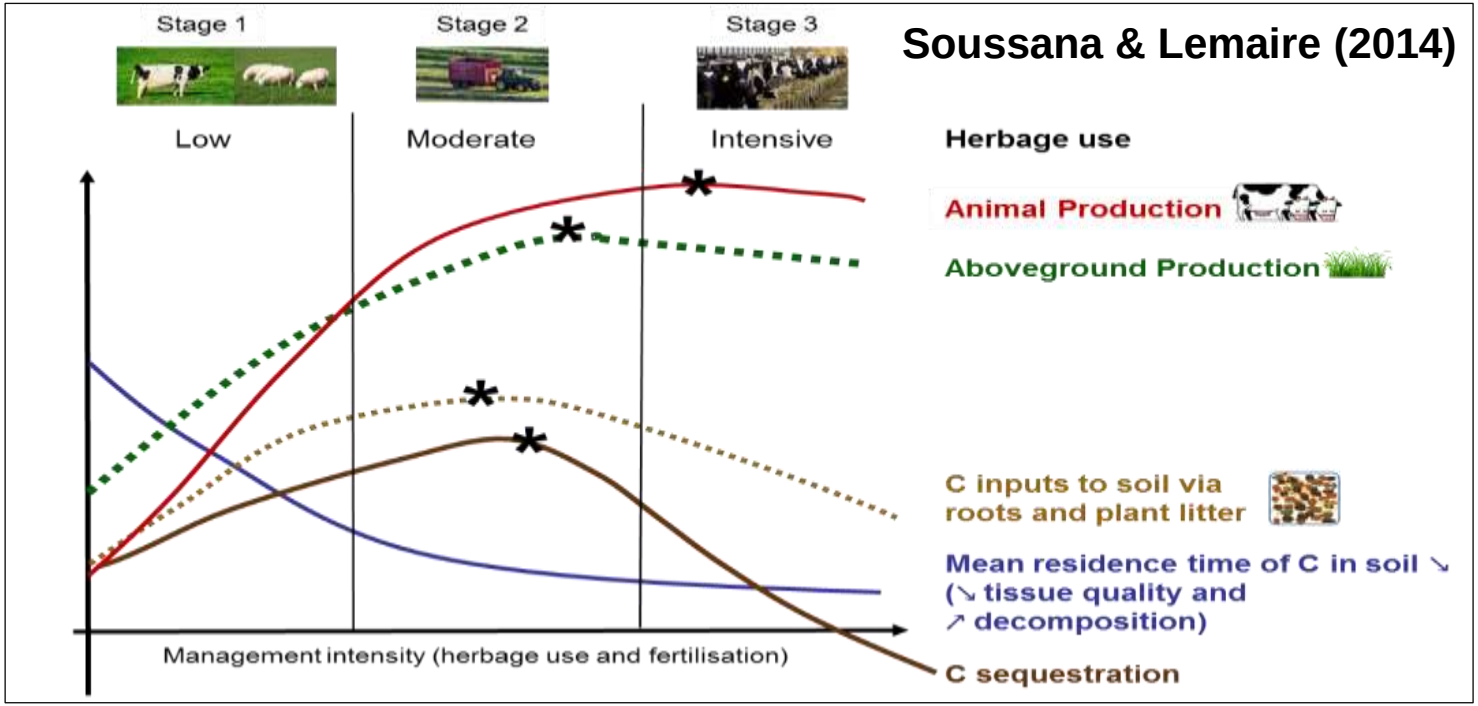
An increase of 1kg DM intake, requires 4kg DM more to be offered

Postgrazing height and refusals are increased & regrowth quality and later animal performance is impacted

Finally, the higher the daily DM intake, the lower the per ha grass intake and grass utilisation is also reduced

Well-managed grazing: A forgotten hero of conservation

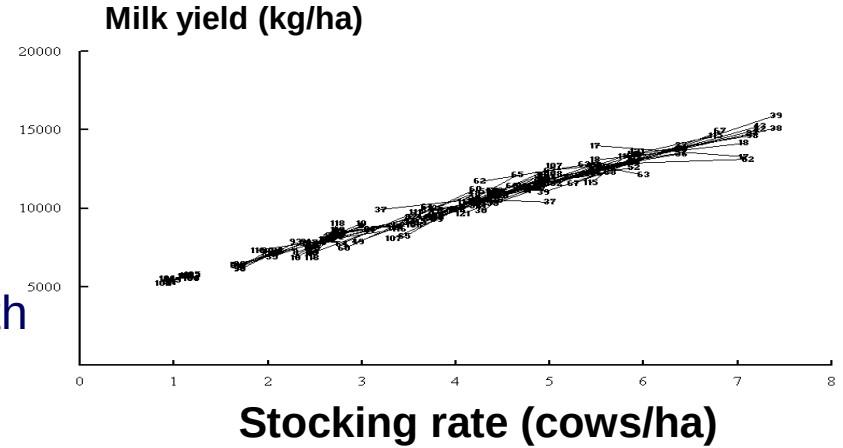
- Biological filters & Carbon sink
  - Supporting better soil conservation & enhanced biodiversity
  - Reducing chemical use/ losses
- Intensive grazing systems in context



Appropriate Stocking Rate (SR)

- SR is the main driver of productivity from grazing systems - herbage utilisation
  (McMeekan and Walshe, 1963; Macdonald et al., 2008; McCarthy et al., 2011)

- A 1 cow per hectare increase in SR
  - - 9% in MS/cow
  - +11% increase in MS/ha
  - - 42 day reduction in lactation length



- But…associated with negative environmental impacts
  - Increased N fertilizer and concentrate supplementation *(Treacy et al., 2008)*

Appropriate Stocking Rate (SR)

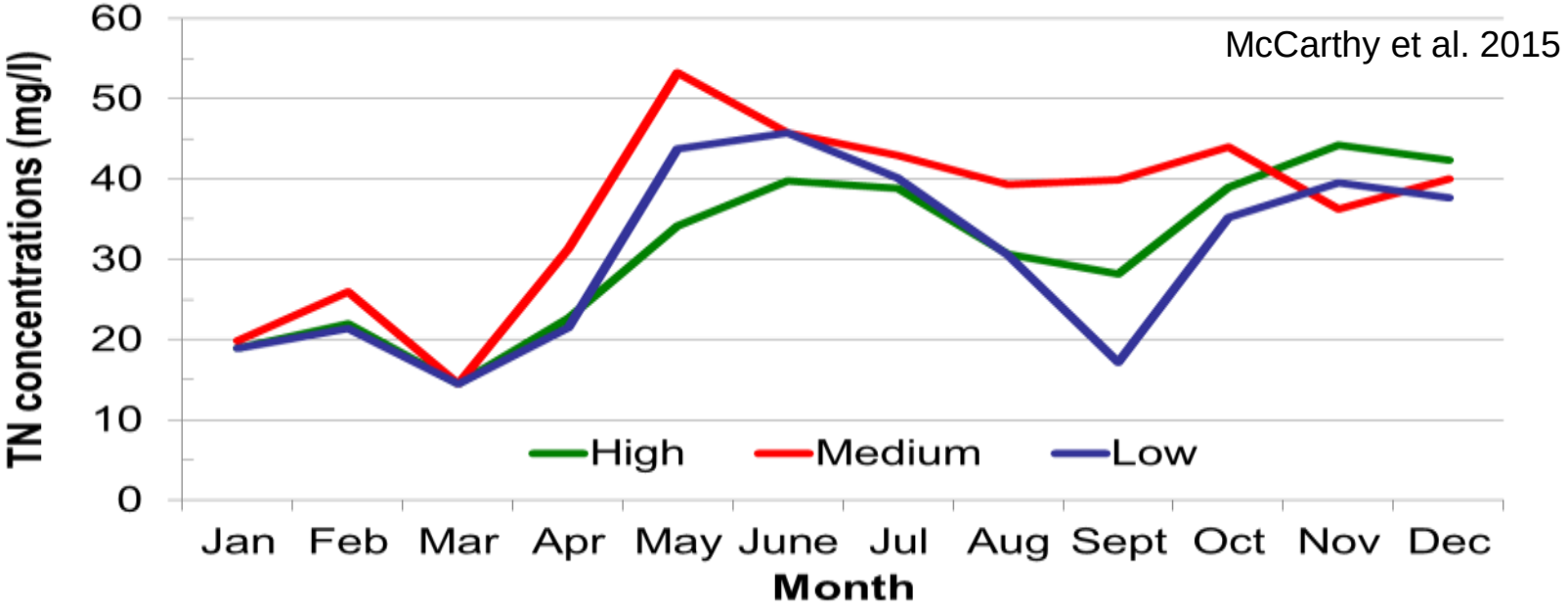
- lowest SR that maximises utilisation (CSR = 80-90 kg LW/T DM; Macdonald et al. 2008)

	Pasture grown, t			
t supplement DM/cow	10	12	14	16
0.00	1.5	2.0	2.3	2.6
0.25	1.7	2.1	2.4	2.8
0.50	**1.8**	**2.2**	**2.5**	**3.0**
0.75	1.9	2.3	2.7	3.1
1.00	2.0	2.4	2.8	3.2

- requires clarity & disciplined management
  - Pasture cover at calving
  - Rotation lengths
  - Grazing intensity & residuals
  - Use of supplements

Strategic

SR had no impact on nutrient loss

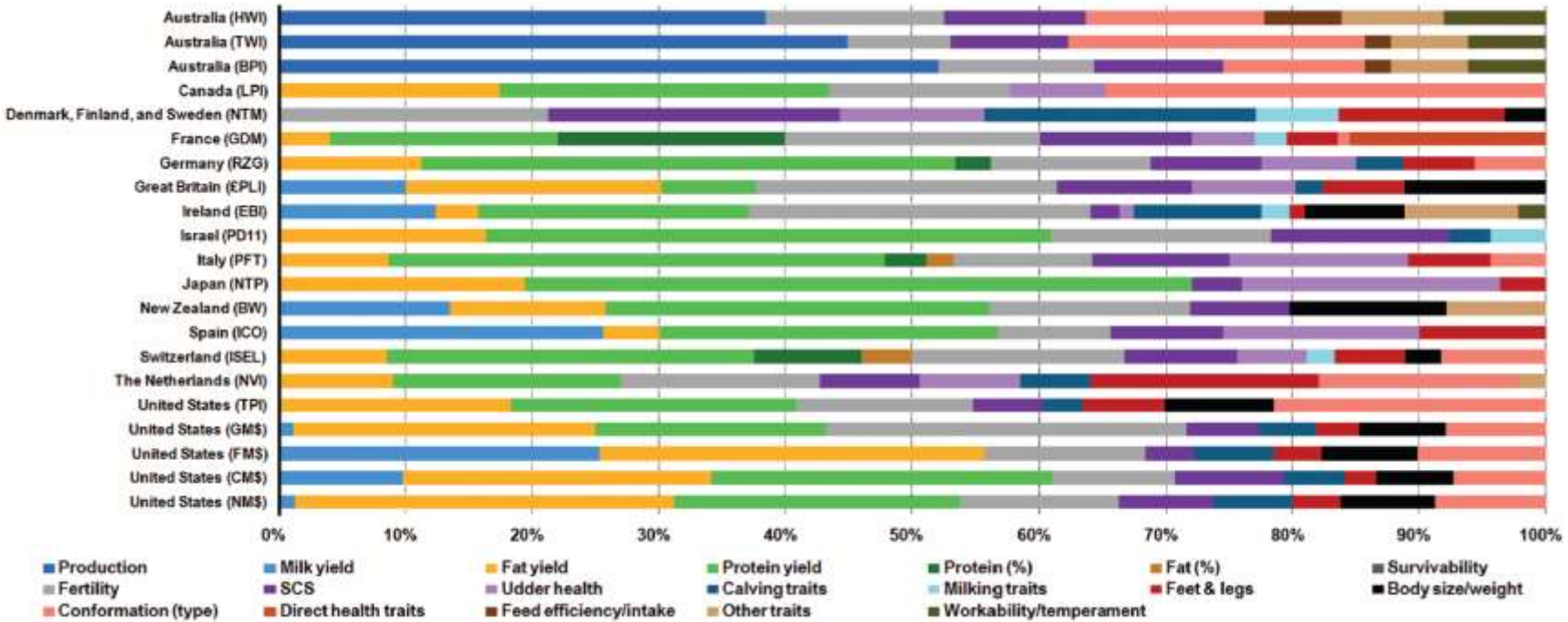


- Higher SR & increased pasture use = reduced N loss Roche et al. 2016

A revolution in animal breeding – Focus on Profit

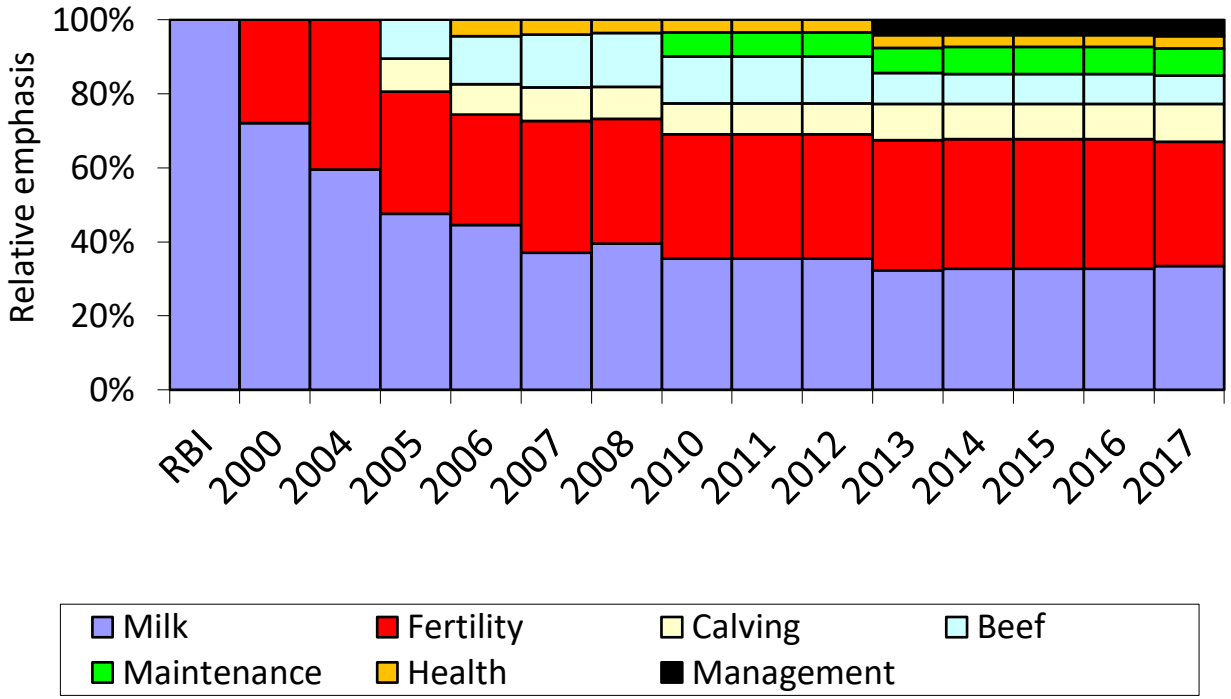
Symposium review: **Possibilities in an age of genomics: The future of selection indices**[1]

J. B. Cole[2] **and P. M. VanRaden**
Animal Genomics and Improvement Laboratory, Agricultural Research Service, USDA, Beltsville, MD 20705-2350



J. Dairy Sci. 101:3686–3701
https://doi.org/10.3168/jds.2017-13335

Evolution of EBI – Breeding for Profitability



In 2017, Irish dairy cows produced +58 kg MS & survived +174 days on farm

Resilient pasture-based systems – The Irish Case

The levers…	Average	Top 10%	Target
Dairy Economic Breeding Index (€)	86	122	150
Stocking rate (livestock units/ha)	1.9	2.3	2.9
Recalving rate (% calved in 42 days)	63	85	90
Pasture utilised (t DM/ha)	7.3	9.6	13.0

Future Improvements…

- Animal breeding & measurement capability
  - Animal health/welfare – disease resistance, lameness/mastitis, stress
  - Product quality - fatty acid content, processing ability
  - Environmental load - Feed intake, digestibility, emissions

- Grazing management systems
  - Improved productivity swards evaluated under grazing
  - Reducing chemical N reliance - mixed species/clovers, etc.
  - Improved understanding of soil/sward nutrient dynamics
  - Grassland databases & smart data

Product Differentiation from Pasture

Increased capabilities to understand impacts on animals & products

- MIR to establish animal diet & nutrition, health & wellbeing
- Product footprint, nutrient/ chemical residues, hormones, antibiotics etc.

Increased capabilities to profile products derived from grazing

- Fat and protein content and quality
- Human health impacts
- Sensory preference based on appearance, flavour and colour

Conclusions...

- Grazing systems of animal production are uniquely well positioned to meet the growing international demand for high quality foods

- Resilient pasture-based -based systems is possible
  - Genetically elite animals
  - Highly productive grazed ryegrass white clover pastures
  - Appropriate stocking rates and grazing practices

- New technologies to increasingly differentiate pasture-based products

The enduring contribution of NZ citizens…




… DairyNZ

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brendan.horan@teagasc.ie

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