



National Farmers'
FEDERATION

2010 National Congress

The Grand Hyatt Melbourne • 5-7 September 2010

Modern Farmers



Responding and adapting to change

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Livestock: Practical Abatement & Mitigation

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CEO, Beef CRC



Global drivers of livestock production

- ❖ Increasing population (from 7b in 2011, possibly up to 11.4 b. by 2060)
- ❖ Global food security – livestock critically important
- ❖ Climate change → decreased agricultural land
- ❖ Need *far more* from less!
- ❖ Conflicting messages



livestock's long shadow

environmental issues and options

GoVeg.com

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Fight Climate Change with Diet Change

Global warming has been called humankind's "greatest challenge" and the world's most dire environmental threat, and science shows that one of the most effective ways to fight global warming is to go vegetarian.

Stars such as **Paul McCartney** and Chinese Hindu are lending their voices to share what science has already proven—that the meat industry is one of the leading sources of greenhouse gases that lead to global warming.

When asked what personal change people could make to help the environment, McCartney replied, "I think the biggest change anyone could make in their own lifestyle would be to become vegetarian." To read the [complete interview with Sir Paul McCartney](#), visit [PETA's blog The PETA Files](#).

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News + National Rural News + Agribusiness and General + General + Go veg to save the world, says UN

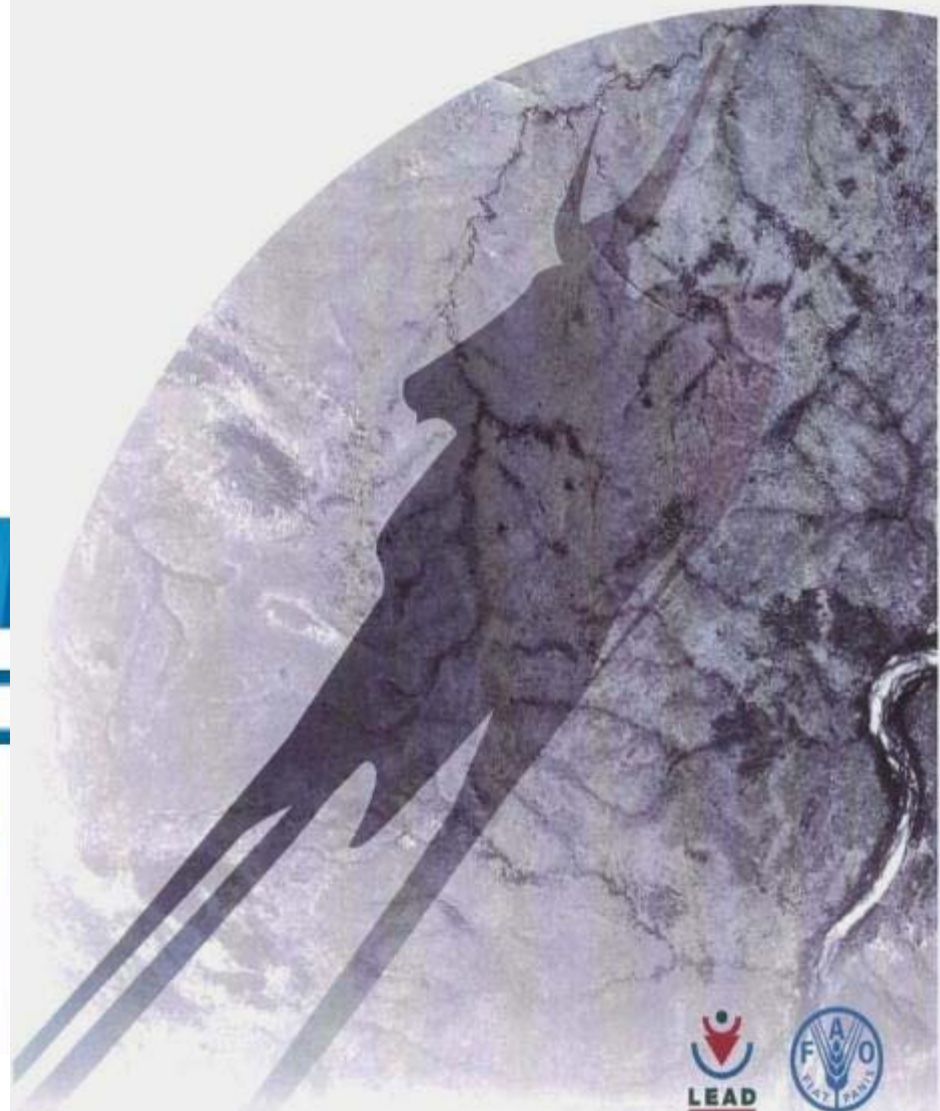
Go veg to save the world, says UN

ROD SMITH
14 Jun, 2010 16:52 #4

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ANOTHER UN agency has again reached the conclusion that the world should move away from dairy and meat consumption and toward a more grain- and



FAO's (2006) report

- ❖ All-encompassing life-cycle analysis for livestock - but not other industries (e.g. deforestation included in calculations for livestock only)
- ❖ Did not account for impact of modern, high-technology, large-scale production systems in developed countries
- ❖ US dairy farmers now require **21%** fewer cows, **23%** less feed, **65%** less water and **90%** less land to produce 1 billion kg of milk than in 1944 & large reductions in waste*)
- ❖ FAO has since acknowledged 'flaws in the report's reasoning' – ***but general public not hearing the message!***

* Capper *et al.* JAS, 2009, 87, 2160

On-farm climate issues impacting on livestock

- ❖ Water per unit livestock product
- ❖ Grain per unit livestock product
- ❖ Methane emissions per unit livestock product
- ❖ Adaptation of livestock to changed climates



Focus on (ruminant) livestock



Practical on-farm abatement and mitigation


- ❖ Management options (as they impact on the animal rather than the environment)
- ❖ Genetic options (using knowledge of genetics of the animal, its parasites, vectors and pathogens)
- ❖ Options now being developed



Water use per unit livestock product

- ❖ **Widely reported:** 15,000 to 100,000 litres water required to produce 1 kg beef
- ❖ **Reality:** 27 to 540 litres water per kg meat, depending on production system (*UNSW Life Cycle Assessment, 2009*)

Practical abatement

- ❖ Better-adapted animals
 - ❖ Options focused on soil nutrition, water capture etc
 - ❖ Non-genetic treatments (e.g. shade provision)
- 



- ❖ Time spent near water trough 3x longer for un-shaded cows
- ❖ Group water consumption significantly increased
- ❖ But may also have been a cooler micro-climate effect

Mader et al. (1997)

Grain use per unit livestock product

- ❖ If animals compete for grain with humans & biofuels, may need to reduce per animal grain consumption (e.g. feed more animals for shorter time)

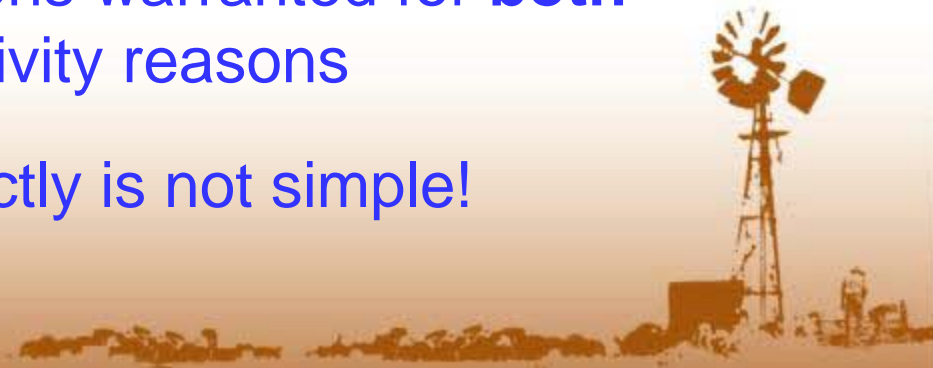
Practical abatement

- ❖ Animals bred for high productivity and product quality at pasture and on grain
- ❖ Continued R&D focus on feed efficiency, growth rate & adaptation
- ❖ New pasture varieties



Methane emissions per unit livestock product

- ❖ Livestock are agriculture's largest source of greenhouse gases (GHG)
- ❖ 11% of Australia's total GHG emissions emitted as enteric methane (DCC, 2008)
- ❖ Methane an end-product of fermentation – methane emissions represent 10-15% loss of efficiency
- ❖ Reducing methane emissions warranted for **both** environmental and productivity reasons
- ❖ But reducing methane directly is not simple!





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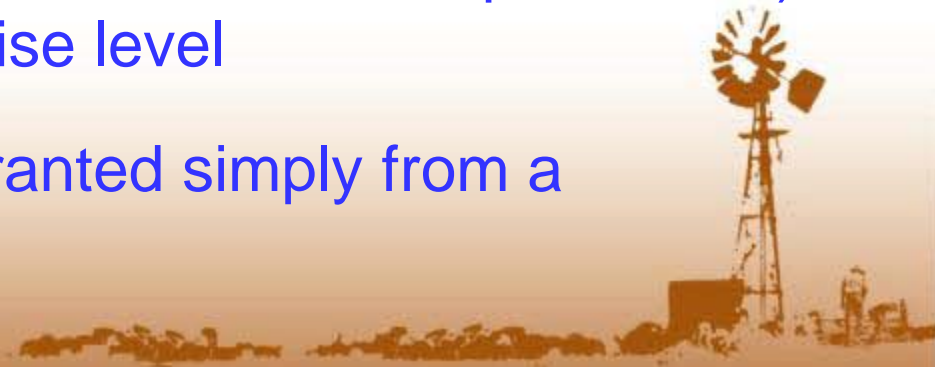
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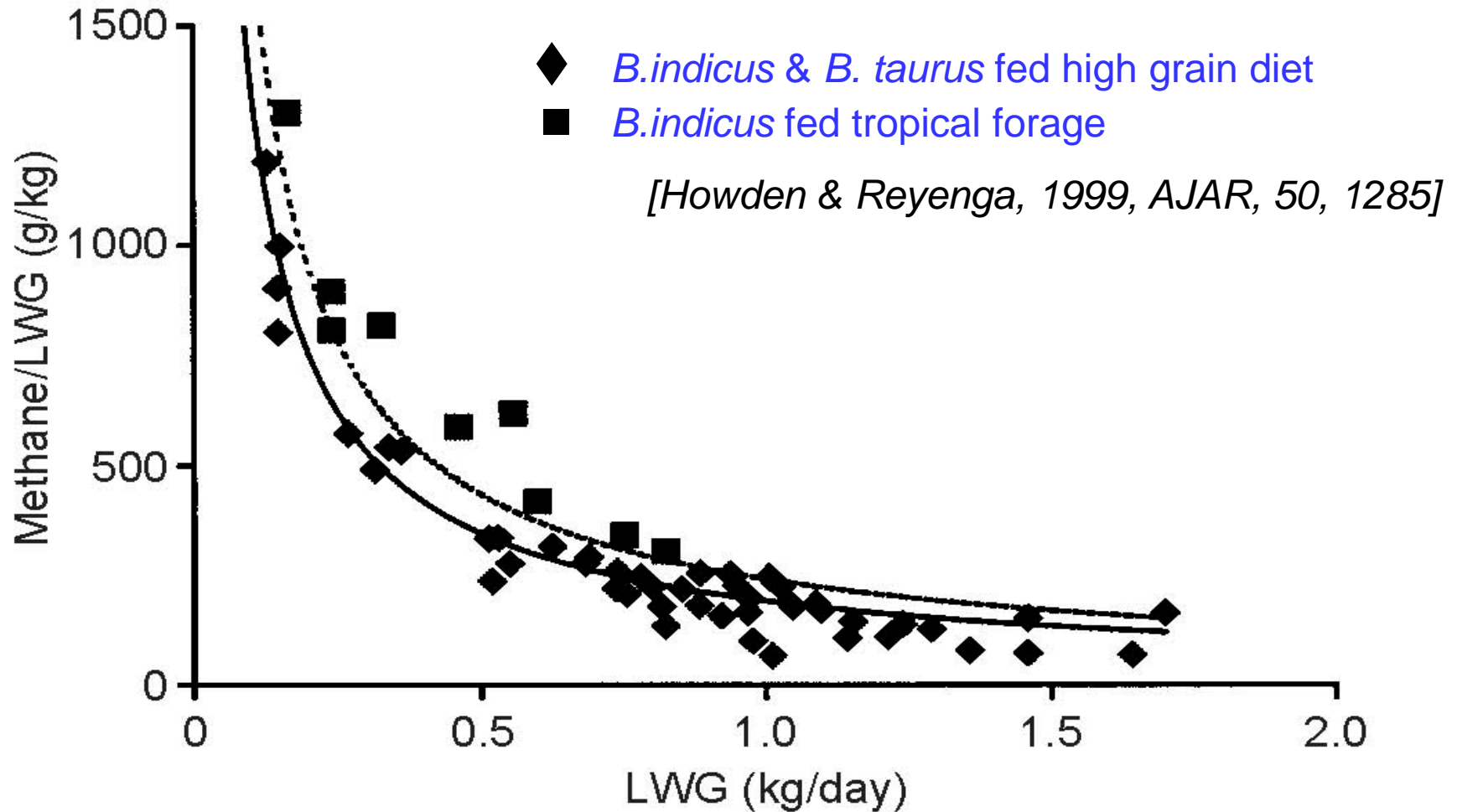
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Methane emissions – systems modelling

- ❖ Australia's livestock industry only production industry to have reduced GHG emissions since 1990
- ❖ ~11% reduction between 1990 & 2007 (transport up by 29% and energy up by 53% - UNSW LCA)
- ❖ 2009 Qld Gov't survey – under *full carbon accounting*, Queensland beef industry close to carbon neutral
- ❖ Need full accounting (i.e. emissions less sequestration), ideally at individual enterprise level
- ❖ Reduction of methane warranted simply from a production perspective



Methane emissions - practical abatement



Maximising productivity (fertility, animal health, growth rate & feed efficiency) by genetic & non-genetic means **reduces methane emissions / unit livestock product**

Adaptation of livestock to changed climates

Parasites & vectors

Endemic disease

Heat stress & humidity

Seasonally poor nutrition



Adaptation of livestock to changed climates

- ❖ Focus on genetic improvement – largely untapped opportunity in extensive livestock industries
- ❖ Australia best placed, globally, to capture this opportunity (60+ years of unmatched genetics R&D)
- ❖ However R&D capacity declining - just when the world needs this expertise most!
- ❖ Potentially, transformational opportunities exist if ongoing R&D funding can be secured
- ❖ Even using traditional genetic approaches, enormous gains in productivity



Broiler chickens

1957 Genetic Control



2001 Commercial Line



Day 43

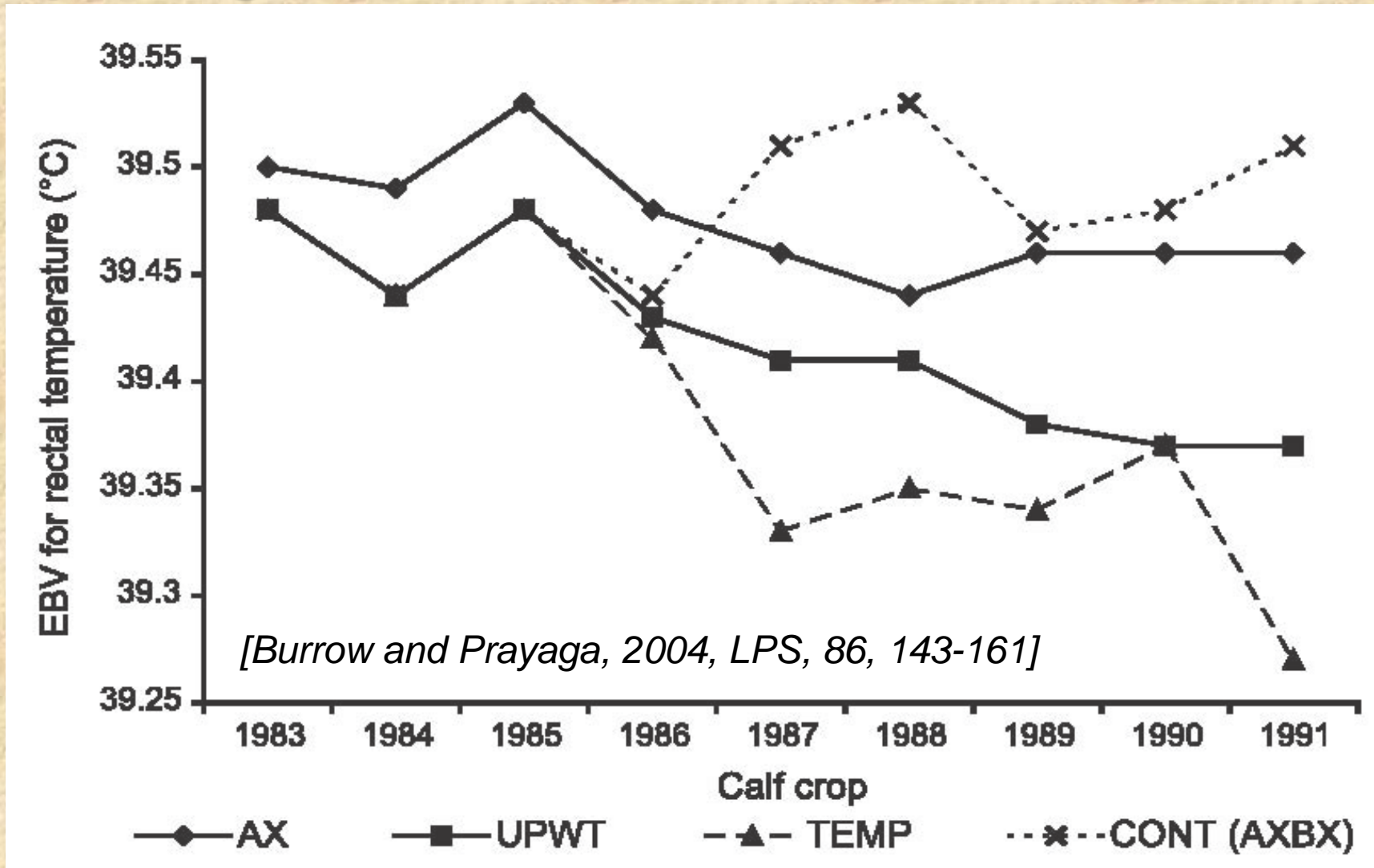
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Day 71

Day 85

[Slide courtesy of Professor Bill Hill]

Improving resistance to heat stress – beef cattle



- ❖ Selection for growth rate under heat stress reduces rectal temperature almost as much as direct selection

Emerging opportunities (next decade or so ...)

- ❖ DNA markers and causal mutations provide new options for breeding and management


OPEN ACCESS Freely available online

 PLOS one

A Validated Genome Wide Association Study to Breed Cattle Adapted to an Environment Altered by Climate Change

Ben J. Hayes^{1*}, Phil J. Bowman¹, Amanda J. Chamberlain¹, Keith Savin¹, Curt P. van Tassell², Tad S. Sonstegard², Mike E. Goddard^{1,3}

¹ Biosciences Research Division, Department of Primary Industries Victoria, Melbourne, Victoria, Australia, ² United States Department of Agriculture, Agricultural Research Service, Bovine Functional Genomics Laboratory, Beltsville, Maryland, United States of America, ³ Faculty of Land and Food Resources, University of Melbourne, Melbourne, Victoria, Australia

- ❖ Genomic sequence of bovine and cattle tick being used to develop vaccine to control cattle tick
 - ❖ Genomic sequence of rumen micro-organisms being used to develop products to simultaneously reduce methane emissions and increase efficiency of feed utilisation
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productivity will
secure long-term
environmental
sustainability & global
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**Australia's livestock
industries have a
wonderful story to
tell!**

