Organisational Model

For Beef Recording & Genetic Evaluation In Australasia, The Americas & Southern Africa

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Organisations focused on Beef Cattle Production Goals of:

- Improving the quantity and quality of performance recording.
- Use of sound genetic evaluations and subsequent genetic improvement, and
- Where appropriate, international collaboration in promoting these goals.

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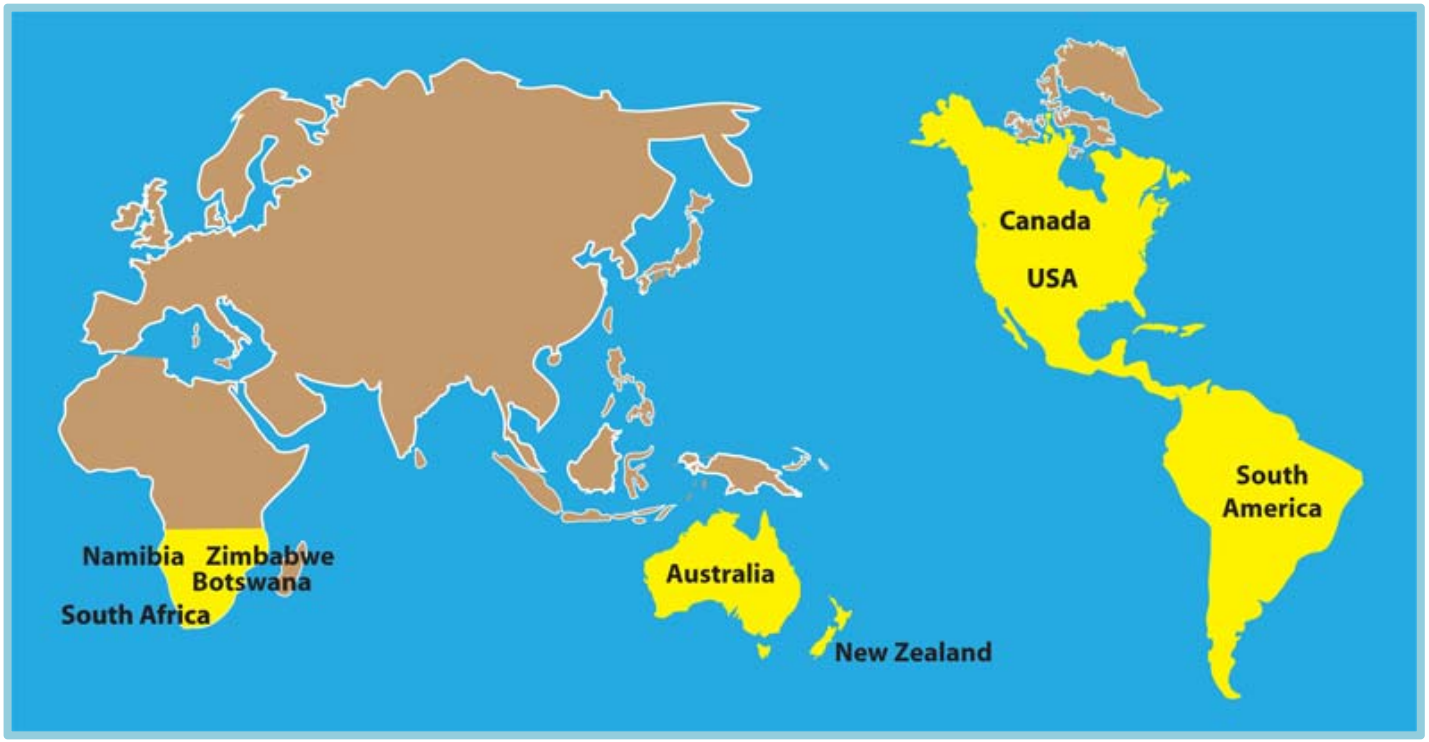
Beef Breeding in the Territory



- 566M head of cattle (40% of world population).
- Commercial beef production is largely unsubsidised.
- 90% breeding in commercial herds by natural service.

- Over 60 breeds have recording services.
- Recording of pedigrees, performance and genomics testing is undertaken predominantly by breed associations.

Genetic Evaluation Services in the Territory

In most cases provided by specialised service providers on sub-contract to breed associations. The form of analysis is flexible and may include:

Within breed within country evaluations
Across breed within country evaluations
Within breed across country evaluations
Across breed across country evaluations

- Most breeds require genetic evaluations several times per year.
- Across country genetic evaluations have been common for over two decades.
- Genomic information being introduced progressively to evaluations.

Organisation of Recording & Genetic Evaluation Services in the Territory

Country/ Region	Est. Cattle Population M head	Estimated Annual Beef Cattle Seedstock Recorded	Who Provides Recording/ Registration Software	Who Provides Genetic Evaluation Software
Latin America	404	880,000	Breed Associations Commercial agencies	Commercial agencies Universities, BREEDPLAN Government agencies
United States Of America	94	865,000	Breed Associations Commercial agencies ILR	Angus Genetics Inc American Simmental Assoc. GPS, BREEDPLAN Universities
Australia	30	190,000	ILR	BREEDPLAN
Southern Africa (South Africa, Namibia & Zimbabwe)	21	173,000	ILR Logix	BREEDPLAN Logix
Canada	13	146,420	ILR Commercial agencies	BREEDPLAN US agencies Canadian agencies
New Zealand (Beef Cattle Only)	4	36,000	ILR	BREEDPLAN Commercial agencies
TOTAL	**566M**	**2,290,420**		

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Breed Associations Provide a Range of Services Including:

- Maintenance of membership and the herd book,
- Breed promotion,
- Provision of internet-based information services,
- Support for sale and export of cattle,
- Graphic design services,
- Research services,
- Technical extension services,
- Progeny tests,
- Genetic evaluation services,
- Development of genomic services, and
- Marketing of branded products.

Estimates of Income of Breed Associations in the Territory

Estimated Seedstock calves recorded pa in the Territory 'M	Income per calf recorded USD	Estimate of Gross Annual Income of beef associations in the Territory Million USD
2.3	50	115
2.3	60	138
2.3	70	161

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With an aggregate income of in excess of $100M per annum breed associations have the capacity to invest substantial sums in genetic evaluation services and genomics

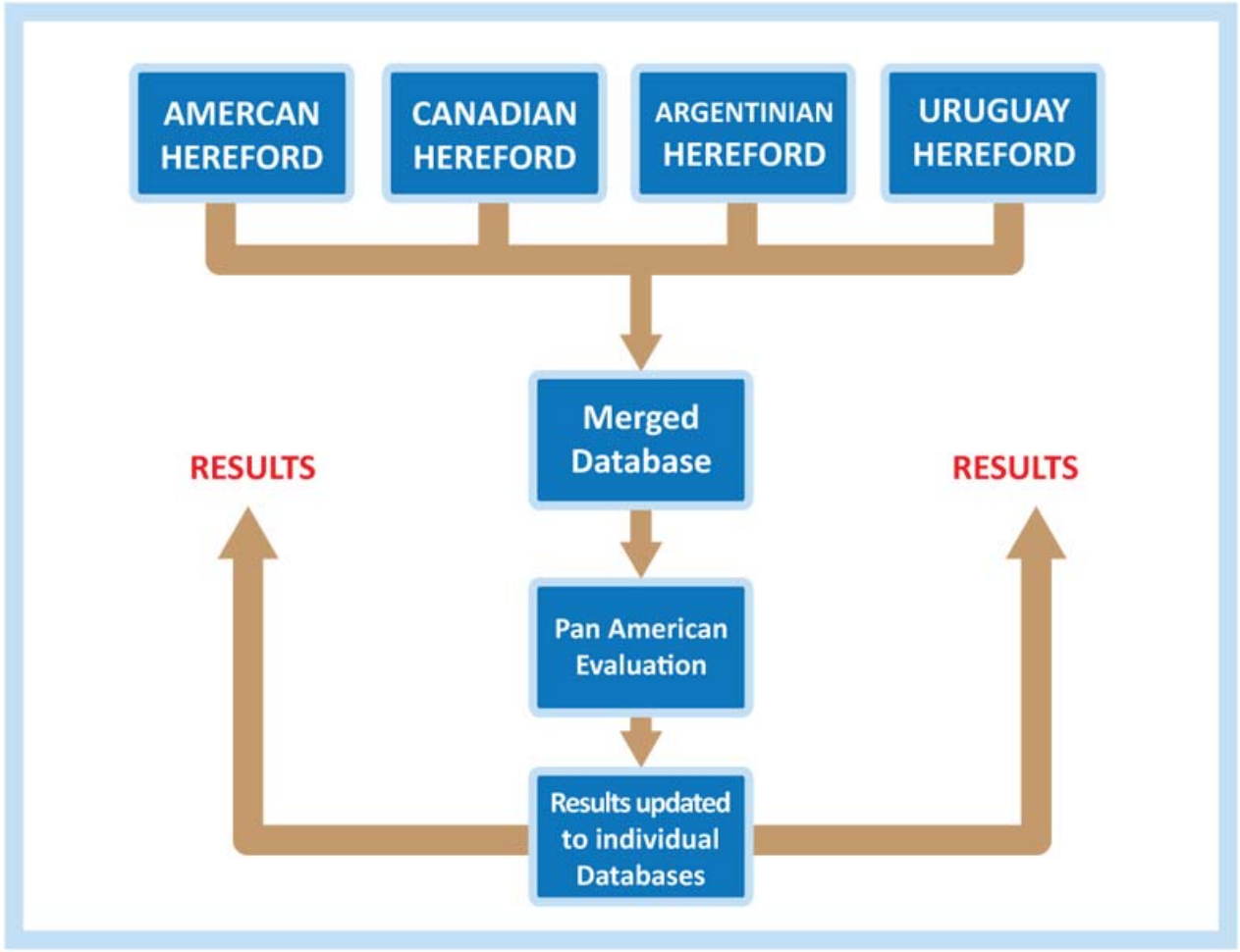
Investment Models Include:

- Investment by an association in its own genetic evaluation technology.
- Co-investment with other breed associations to address needs for industry-wide improvements, or
- Co-investment with other breed associations and industry funding agencies to address needs for industry-wide improvements.*

** The rationale for private/public sector co-funding is given later*

A Case Study of International Genetic Evaluation for Hereford

Pan American Evaluation for Hereford



R&D Phase of Pan American Genetic Evaluation for Hereford

- Complete re-estimation of adjustment factors and genetic parameters for all 4 countries.
- Matching of all common animals, a huge task as almost 6 million animals are included in the joint analysis.
- Revising analytical software to handle country-specific trait definitions, adjustment factors and heritabilities.

Conducted over a 4-year period

Data Set for Pan American Genetic Evaluation of Hereford

TRAIT	TOTAL RECORDS
Birth Weight*	3.0M
Weaning Weight*	3.8M
Yearling Weight*	1.7M
Final Weight	178,000
Scrotal Size	146,000
Scan REA-FAT-IMF	173,000 (x3)
Carcase (HCW, REA, FAT, MARB)	3,100 (x4)

*Direct and maternal.

- 5.7M animals (4.3M with a record/s)
- 240,000 sires.
- 1,870,000 dams

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Pan American Evaluation Provides EPDs for 12 Traits

Birth Weight	**Scrotal Size**
Weaning Weight	Carcass EMA
Yearling Weight	Carcass Rib Fat
Final Weight	Carcass Marble Score
Mature Cow Weight	Calving Ease Direct
Maternal Weaning Weight (Milk)	Calving Ease Daughters

- During 2012, genomic-enhanced EPDs will be produced as a result of collaborative work between Australian and American Scientists.
- The costs of R&D and operation of this large evaluation are met entirely by participating breed societies.

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Rationale for public Investment in Genetic Improvement

Estimates of proportions of benefit captured (Zhao et al, 2002)

Sector	Producer (seedstock & commercial)	Feedlotter	Processor	Retailer	Consumer
Share of benefit	27-33%	1%	1%	5%	60-66%

* In Australia, seedstock and commercial producers share benefits in roughly equal proportions

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Consequence of the Distribution of Benefits

- It is argued that as consumers (the community) receive such a significant portion of overall benefits, the development of genetic improvement technology can reasonably be funded predominantly by the tax payer.
- Typically beef supply chains have a very inefficient flow of price signals from consumer back to breeders. Hence breeders have little direct price-based incentive to invest in recording traits that primarily benefit other sectors eg. Eating quality.

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R&D Funding of Australia's Beef and Sheep Industries

- Producer charged a levy per head sold (cattle) and ad valorem (sheep).
- Industry levies are matched to specified limits by the Commonwealth.

This has allowed investment of about A$12M pa for R&D into beef genetic improvement (2001-2011).

There are limitations in this approach because generic R&D does not automatically lead to changes in recording and selection in the breeding section.

The Funding Needs Are Changing

- Larger recorded populations (3000 - 5000 recorded animals) required to generate data required to calibrate DNA tests.
- For maximum usefulness data needs to be collected on hard-to-measure traits eg. Eating quality.

This is being addressed in Australia by establishing Information Nucleus Herds in which young sires are progeny tested for a comprehensive range of traits.

Funding models are being developed in which contributions from various sectors are in proportions to the proportions of benefit received.

R&D Components for Sustained Genetic Improvement

- performance recording, including standards
- parameter estimation, including genomic analysis
- genetic evaluation
- investment in recording hard-to-measure traits, and whether international sharing of data enhances accuracy of genomic predictions
- optimizing genotyping within and across countries.

It will be important for ICAR to explore the full range of ways in which international dialogue and collaborative activity could be beneficial.

As computer power increases the limits on genetic improvement will be capturing appropriate amounts of data on the right traits and optimising the application of genotyping a selection thereafter.