



Instituto Nacional de Investigación Agropecuaria
U R U G U A Y

Enhance beef production with recording system

Beef cattle genetic evaluations in South America



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Outline

- South America and beef production
 - Argentina, Brazil, Colombia and Uruguay
- Breeds and genetic evaluations
- Traits included in genetic evaluations & economic indices
- Genomic selection and training populations
- Final comments



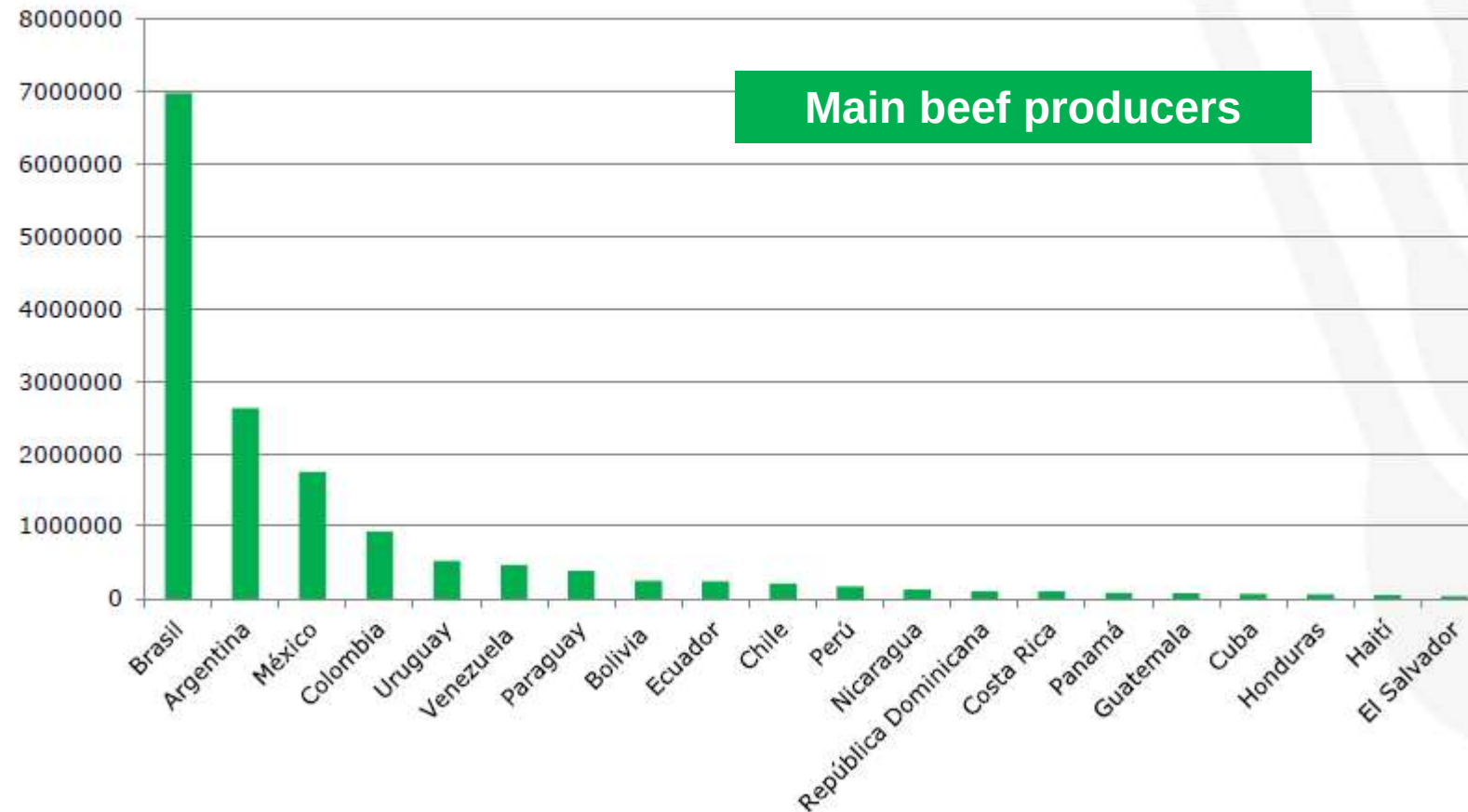


South America and beef production

Argentina, Brazil, Colombia and Uruguay

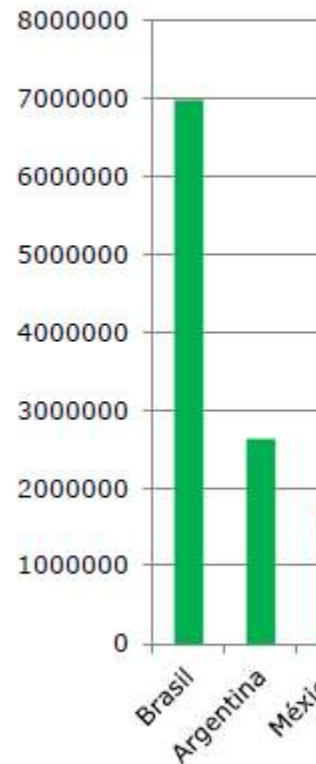


Producción de Carne Bovina por país dentro de la región (toneladas), 2010



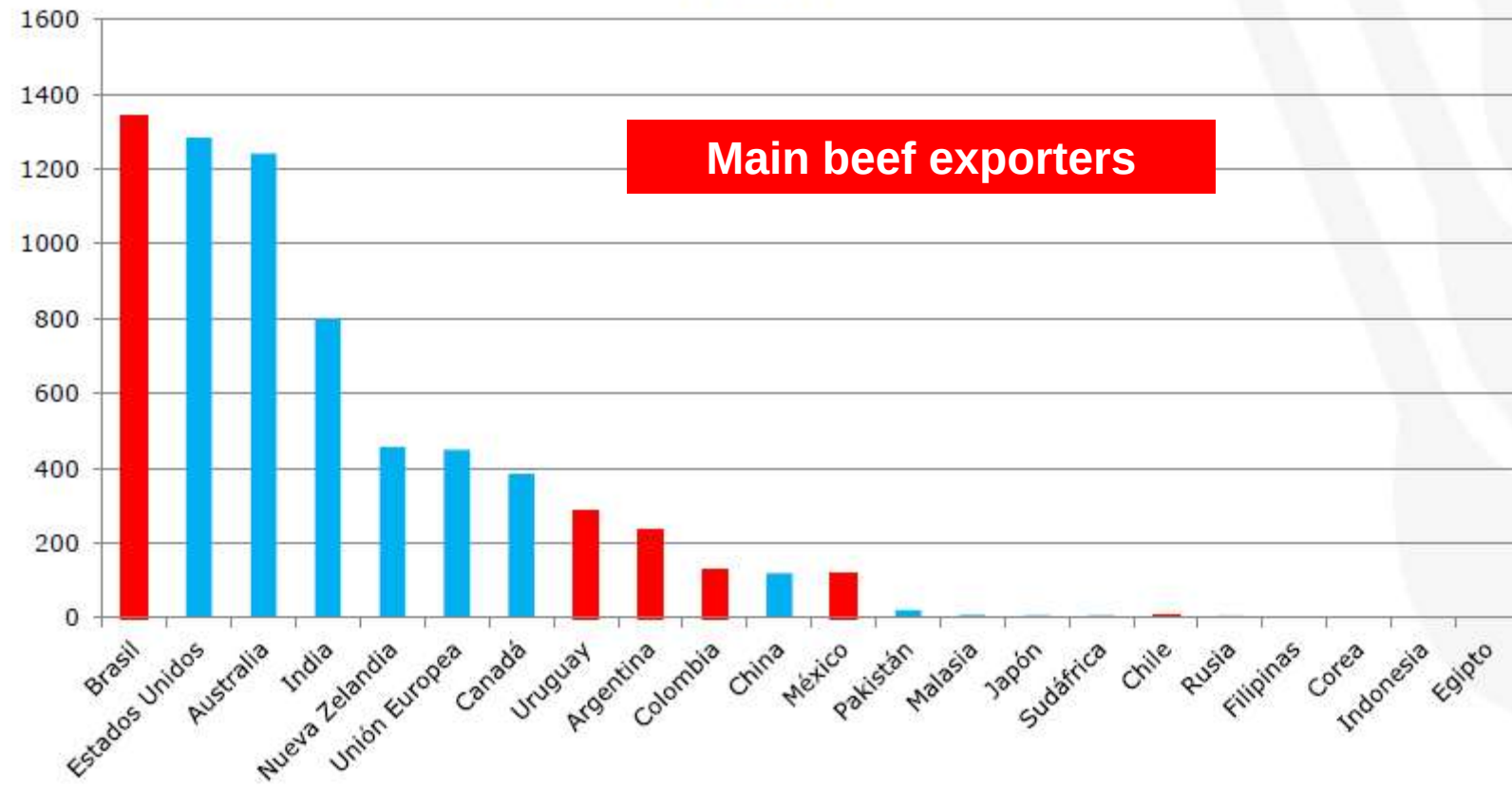


Producción de Carne Bovina por país dentro de la región (toneladas), 2010



Principales países exportadores de carne bovina a nivel mundial en 2011

Exportaciones Carne Bovina (miles de toneladas, equivalente de peso en canal), 2011



Main beef exporters





Breeds and genetic evaluations

Number of genetic evaluations per breed and country

BREED	Argentina	Brazil	Colombia	Uruguay
Angus				
Bosmara				
Braford				
Brahman				
Brangus				
Canchin				
Caracu				
Charolais				
Devon				
GIR				
Guzera				
Hereford				
Indu-Brasil				
Limousin				
Montana				
Murray Grey				
Nelore				
Santa Gertrudis				
Senepol				
Shortorn				
Sindi-Brasil				
Tabapuã				
Total				

- 22 breeds
- Taurus
 - Indicus
 - Composites



Montana
Guzera



Sindi



Gir



Nellore



Brahman



Cachim

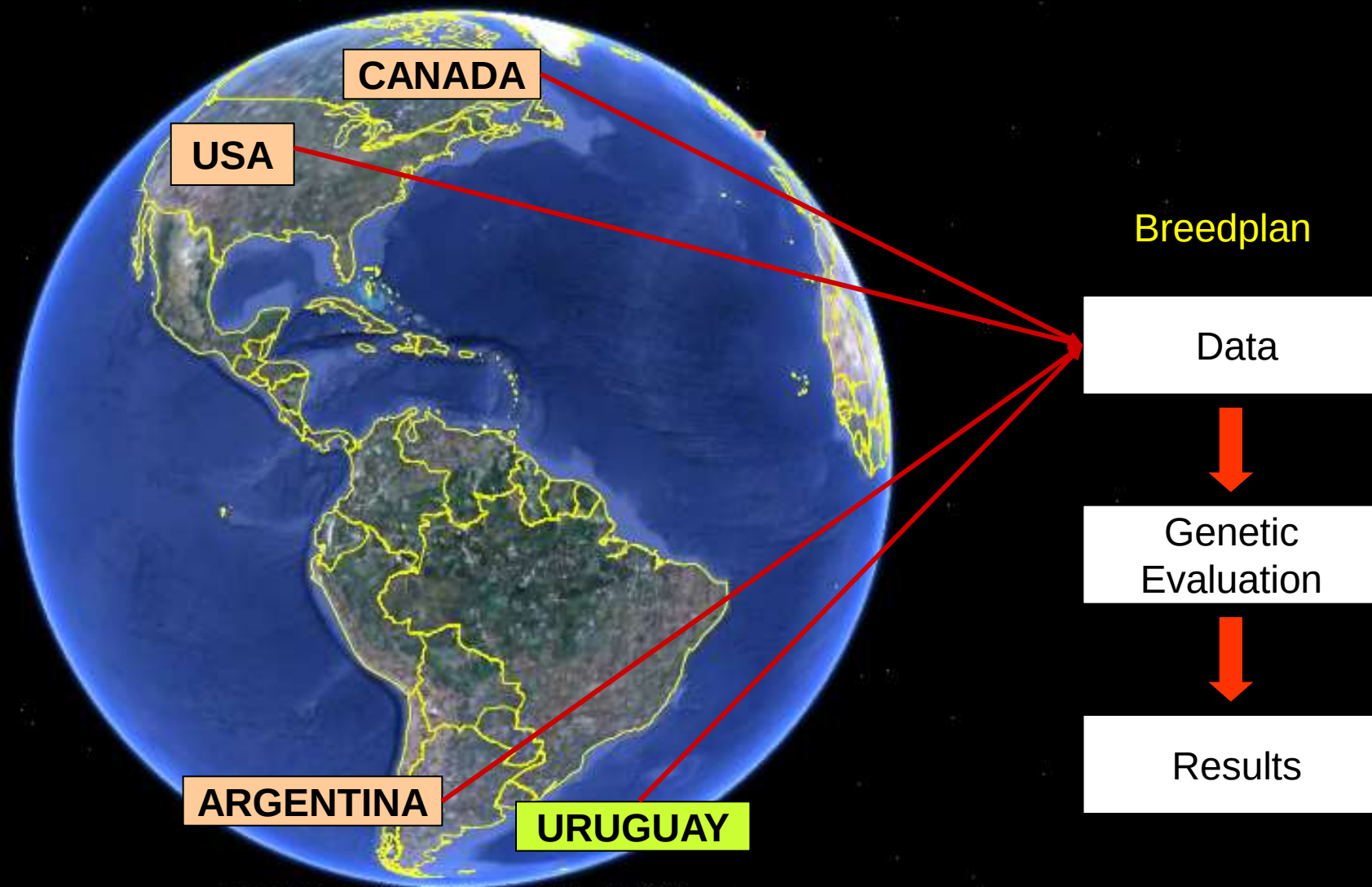


Number of genetic evaluations per breed and country

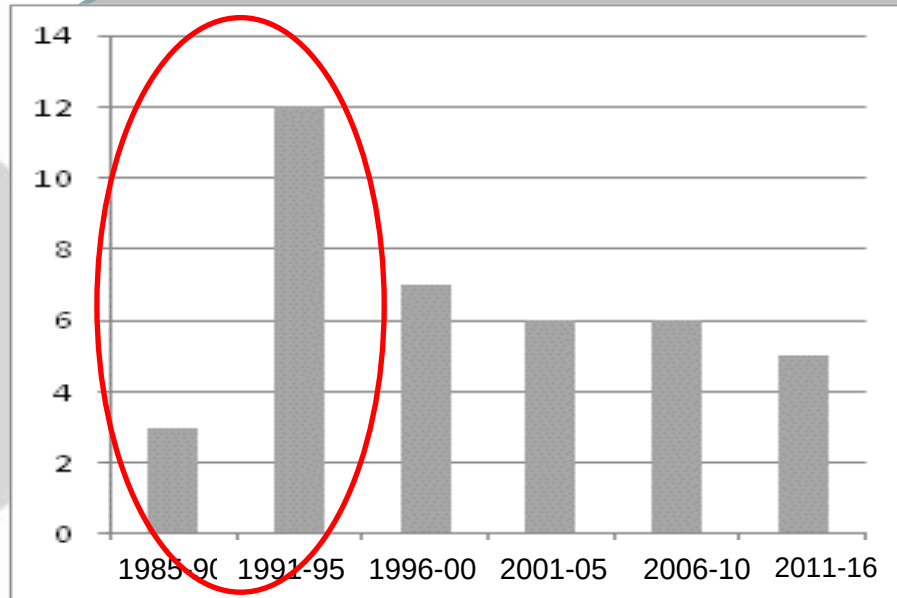
BREED	Argentina	Brazil	Colombia	Uruguay
Angus	1	1		1
Bosmara	1			
Braford	1	2		1
Brahman	1	3	1	
Brangus	1	2		
Canchin		1		
Caracu		1		
Charolais		1		
Devon		1		
GIR		1		
Guzera		3		
Hereford	1	2		1
Indu-Brasil		1		
Limousin	1	1		1
Montana		1		
Murray Grey	1			
Nelore		9		
Santa Gertrudis		1		
Senepol		1		
Shortorn	1			
Sindi-Brasil		1		
Tabapuã		2		
Total	9	35	1	4

- 22 breeds
 - Taurus
 - Indicus
 - Composites
- Same breeds with independent genetic evaluation in different countries
 - Angus, Braford, Brahman, Limousin
- Same breed with genetic evaluation in the same country but not connected
 - Nelore: 9 genetic evaluations run by different organizations
 - Brahman and Guzerá: 3 evaluations
- Hereford: genetic evaluations in Uruguay and Argentina are integrated
 - Pan-American Genetic Evaluation run by Breedplan

Panamerican Hereford Evaluation



➤ Implementation of genetics evaluations started ~ 90's in the 4 countries



▪ Genetic evaluation of main breeds in each country were initiated mid 90:

Argentina:

- Angus 500.000
- Brangus 385.000

Brazil:

- Nelore
- Several evaluations....15 millions

Colombia:

- Brahman

Uruguay:

- Angus 120.000
- Hereford 300.000

➤ Less numerous breeds and new breeds started the genetic evaluations

➤ Genetic evaluations keep growing

➤ Methodology

- Multi-trait animal model
- Some are in the process of integrating genomic information

Number of breeds evaluated per organization

Organizations	Argentina	Brazil	Colombia	Uruguay
INTA-Castelar	2			
UBA – FA	4			
Sudafrica	1			
Breedplan	2			
ANCP		4		
CFM		1		
Compania de melhoramento		1		
DeltaGen Nelore		1		
Geneplus-Embrapa		2		
Pampa-plus		2		
Nelore Qualitas		1		
Promebo		6		
PAINT		1		
PMGZ		7		
Programa Montana		1		
Asocebu			1	
INIA + Breeders (+University)				4

➤ **Most of the genetic evaluations are run by national organizations**

➤ Breeders + Academic partners

- Argentina
- Uruguay
- Geneplus-Embrapa in Brazil

➤ National Companies in Brazil

- But all in collaboration with academic institutions

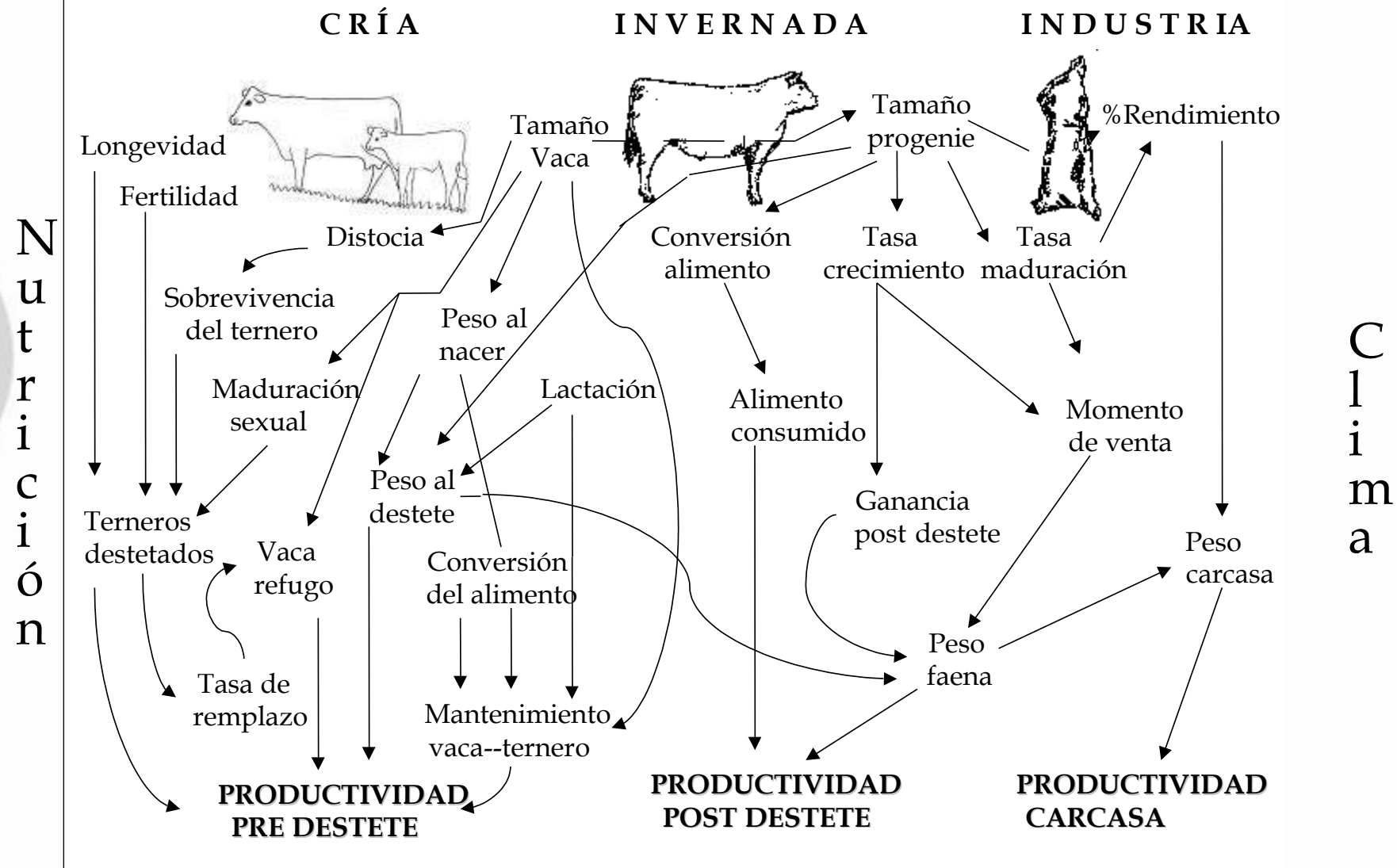
➤ **International organizations**

- Breedplan
- With other countries (ie Argentinean Bosmara with South Africa)
- Brangus: genetic evaluation run by University in Argentina includes data of 5 South American countries (Bolivia, Colombia, Paraguay, Uruguay & 3 breeders of Brazil)



Traits included in genetic evaluations & economic indices

Principal components related to profitability of beef industry



Comercialización

- 45 traits and indices reported
- Traits in all genetic evaluations (across breeds and countries):
 - Weaning weight (direct and maternal)
 - Yearling weight
 - Birth weight
 - Scrotal circumference
 - Carcass traits by ultrasound (eye muscle area and fat depth; marbling)

- Female reproduction traits:
 - Very frequent: Bos Indicus and composites
 - Examples: Age at 1st calving, Days to calving, Age at 2nd parity



- Feed efficiency: Hereford (Uruguay), Nellore (Instituto Zootecnia, Brazil)



- Selection indices:
 - Cumulative productivity (Indicus breeds in Brazil)
 - Global genetic merit (Brahman in Colombia)
 - Cow-calf selection index (Hereford in Uruguay)
 - Cow-calf & terminal sire indices developed by UBA for one large breeding company
 - Cow-calf selection index (Limousin in Argentina)

**Also to be
improved in
the future**

➤ Female reproduction traits:

- Very frequent: Bos Indicus and composites
- Examples: Age at 1st calving, Days to calving, Age at 2nd parity

To be included in the near future: Uruguay and Argentina

- ❖ Uruguay database move to Total herd report
- ❖ Number of follicles by ultrasound as indicator of reproductive performance

➤ Feed efficiency: Hereford (Uruguay), Nellore (Instituto Zootecnia, Brazil)

- ❖ Several organization in Argentina are working on implementing feed efficiency trials

➤ Selection indices:

- Cumulative productivity (Indicus breeds in Brazil)
- Global genetic merit (Brahman in Colombia)
- Cow-calf selection index (Hereford in Uruguay)
- Cow-calf & terminal sire indices developed by UBA for one large breeding company
- Cow-calf selection index (Limousin in Argentina)
- ❖ Hereford (Argentina, Uruguay), Nellore, etc
- ❖ New traits, redefinition of selection indices

Complete beef traceability “from farm to fork”

Automatic records of carcass & primal cuts weights in abattoirs



- ✓ Integration of large volume of data to genetic evaluation
- ✓ Larger training population for genomic selection





Genomic selection and training populations

IMPLEMENTED

COUNTRY	BREED	TRAITS	COMMENTS
Argentina	Hereford	in genetic evaluation	In the context of the Panamerican Genetic Evaluation (600 animals)
Uruguay	Hereford	in genetic evaluation	In the context of the Panamerican Genetic Evaluation (1000 animals)
Brazil	Nellore	in genetic evaluation	ANCP program, with Zoetis

WORK IN PROGRESS

COUNTRY	BREED	TRAITS	COMMENTS
Argentina	Angus	in genetic evaluation	with Geneseek
Argentina	Bradford&Brangus	in genetic evaluation	Informative chip developed with Affymetrix (ARBOS1)
Brazil	Her & Bradford	genetic resistance to ticks	by EMPRAPA
Uruguay	Angus	in genetic evaluation	
Uruguay	Hereford	feed efficiency & carcass quality	(and research with Canada, pooling data)

➤ Methodology

- Blending in Nellore by ANCP (since 2014)
- Blending and moving to SingleStep (Pan American Hereford)
- New methodology developed by Cantet (UBA, Argentina) based on IBD

Final comments

- South American beef production is a very relevant as source of protein for the world
- Multiple production environments; multiple breeds
- The main breeds in the four countries have genetic evaluations implemented.
- Most of the genetic evaluations are carried out by national organizations
- Collaboration between private and academic sectors
- There are academic groups with the expertise and working in R&D&i
- Challenges
 - Development of selection indices that may facility the adoption of technology and contribute to the optimization of genetic improvement
 - Implementation of more difficult to measure traits and genomic selection

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