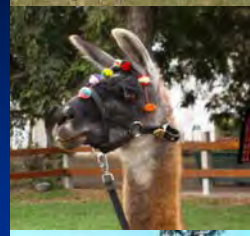










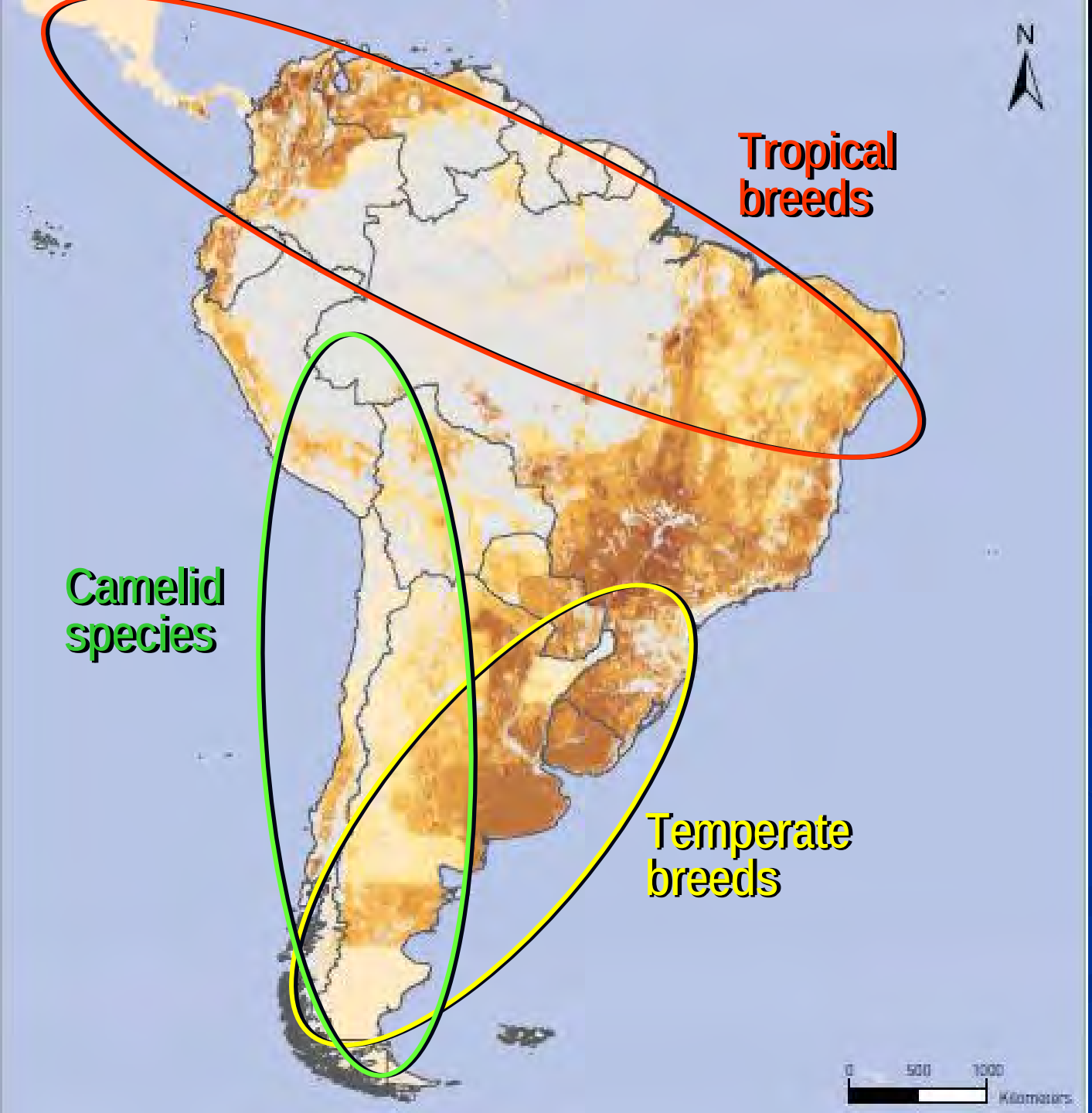



ANIMAL GENETIC RESOURCES IN LATIN AMERICA AND THE CARIBBEAN: UTILIZATION OF BIOTECHNOLOGIES

Arthur da Silva Mariante
EMBRAPA Genetic Resources and Biotechnology
Brasilia, DF - BRAZIL

Introduction

- ✓ **Livestock species were introduced in Latin America and the Caribbean by European settlers, right after the discovery of America;**
- ✓ **The exception were Camelids and Guinea pigs, domesticated by the people living in the Andes;**
- ✓ **Periodic introductions of livestock resulted in a wide range of genetic diversity, known as Criollo breeds that in its majority are now in danger of extinction**



Distribution of breeds and species in LAC

Source: Gridded Livestock of the World, 2007

Number of local breeds reported in Latin America and their share of the World.

Species	No. of breeds	Share of the World (%)
Buffaloes	11	9.0
Cattle	129	14.4
Goats	26	5.0
Sheep	47	4.7
Pigs	67	12.4
Donkeys	140	15.0
Horses	65	11.4

Utilization of Biotechnologies in LAC

- ✓ **The extent to which technologies are utilized varies greatly from country to country and between sub-regions of LAC**
- ✓ **Reproductive biotechnologies are widely used in LAC, followed by Molecular Markers**
- ✓ **AI is the cheapest and the most popular reproductive biotechnology in the region**

Utilization of Biotechnologies in LAC

State of the World's AnGR

Artificial Insemination

- ✓ **Twenty-one out of 22 Country Reports indicate the use of Artificial Insemination:**
  - **21 in Cattle**
  - **13 in Pigs**
  - **8 in Sheep**
  - **8 in Goats**
  - **5 in Horses**
  - **1 in Rabbits**
  - **1 in Buffaloes**
  - **1 in Donkeys**
  - **1 in Llamas and Alpacas**
  - **1 in Turkeys**

Artificial Insemination

- The main objective of AI is to increase the genetic merit of livestock populations, using semen of exotic breeds
- Even though it is known since the 30's, some developing countries still do not have the necessary infrastructure and capability
- The inappropriate use of AI may decrease the genetic diversity and cause the disappearance of local breeds

Origin of Semen used for AI in LAC

Species	Origin of Semen	
	Exotic breeds	Local breeds
Cattle	13 countries	4 countries
Sheep	5 countries	1 country
Pigs	9 countries	1 country

Embryo Transfer

- ET is more expensive and needs more infrastructure than AI, but has the advantage of allowing to restore a breed
- Twelve out of 14 CRs that mentioned the use of ET, indicated the species this technology is used in:
  - 12 in Cattle
  - 3 in Horses
  - 2 in Goats
  - 2 in Sheep
  - 1 in Donkeys
  - 1 in Llamas
  - 1 in Alpacas
- Transplanted embryos largely come from exotic breeds

Cryopreservation

- ✓ Cryopreservation allowed the broadening of AI, by the storage of genetic material for later use
- ✓ It is extremely important for the conservation of endangered breeds (Gene banks)
- ✓ Can be used for gametes, embryos, DNA, cells

Gene Banks

- ✓ Countries that already have Gene Banks: Argentina, Brazil, Colombia, Cuba and Peru
- ✓ Small countries do not have the necessary infrastructure or even access to Liquid N2
- ✓ Can be used for gametes, embryos, DNA, cells
- ✓ In 1989, FAO launched a process to establish RGBs, but health problems would difficult the movement of germplasm

Other Reproductive Biotechnologies

- ✓ **Brazil and Chile mentioned private sector organizations involved in the provision of reproductive biotechnologies.**
- ✓ **Two CRs indicated some commercial use of *in vitro* fertilization**
- ✓ **One CR mentioned the development of embryo sexing and cloning technologies.**

Molecular Techniques

- ✓ Eleven countries of LAC indicated some use of molecular techniques.
- ✓ Several of them indicated that locally adapted breeds have been included in molecular studies.
- ✓ Few CRs indicated that molecular technologies have been incorporated in breeding programs.
- ✓ With regard to molecular characterization studies, 9 CRs provided information on the species involved:

  - ❖ 7 in Cattle
  - ❖ 3 in Sheep
  - ❖ 3 in Pigs
  - ❖ 2 in Horses
  - ❖ 2 in Chickens
  - ❖ 1 in Goats
  - ❖ 1 in Buffaloes
  - ❖ 1 in Llamas
  - ❖ 1 in Alpacas
  - ❖ 1 in Vicuñas
  - ❖ 1 in Guanacos

Resistance to Diseases

- ✓ There are evidences for variation within and between breeds in terms of susceptibility to many important diseases.
- ✓ Research into the genetics of resistance/ tolerance to livestock, however, are very limited in the region;
- ✓ Disease resistance qualities may contribute to improve animal health and productivity
- ✓ Resistant/tolerant traits have to be identified before the breeds become extinct

Resistance to Diseases

Country	Breed	Resistant/Tolerant to:
Colombia	Romosinuano cattle	Tick-burden
Brazil	Santa Ines sheep	*Haemonchus contortus*
Brazil	Cr. Lanado sheep Morada Nova sheep	Internal parasites
Brazil	Pantaneiro horse	Equine Infectious Anemia

CONCLUSIONS

- ✓ As in other regions, there is a large gap among countries, in terms of utilization of biotechnologies in the management and development of AnGR.
- ✓ The focus, particularly in the case of reproductive biotechnologies, is on cattle
- ✓ The application of biotechnologies in the use, and conservation of locally adapted breeds is generally limited.
- ✓ There is a lack of financial, human and technical resources to use these biotechnologies