Matching genetic resources and breeding objectives with the constraints in tropical farming systems

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Dissatisfaction in animal products coverage in the tropics

Net exports —meat

Source: FAOSTAT.
Which ways to increase livestock productivity in the tropics?

- **Import of exotic breeds:** Some success stories (in large population) ... in which local breeds conservation is part of the program

  - Promoting/organising crossbreeding between Holstein and Jersey bulls and Gir Zebus and Jaffarabadi Buffalo cows

- Promoting crossbreeding of N’Dama cattle with exotic dairy breeds
Which way to increase livestock productivity in the tropics?

- **Import of exotic breeds:** ... and a lot of bad experiences without any analysis of failures

**Situation of local and regional breeds (FAO, 2008)**

- 48% of local and regional breeds are present in Asia + Pacific, Africa + Near East, Latin America + Caribbean (among 5599 mammals and 2017 avians)

- Risk status is generally unknown (40% to 70% according to the region)
  - Crosses and substitutions with transboundary breeds threaten these endogenous resources
Which ways to increase livestock productivity in the tropics?

- **Preservation and improvement of local breeds**
  
  In small populations,
  – Favour sustainability through balanced abilities
  – Take into account multipurpose functions of animals and systems

▷ Identify the brakes of stakeholders’ attachment to their local breeds and adapt the speech
An experiment in West Africa: The Djallonké open nucleus breeding program

**National improvement program** emphasizing on smallholders since 1983 in Côte d’Ivoire

- **Goal:** improvement of growth performances with a focus on the utilization and conservation of the local Djallonké breed

- **Structure:**
  - central performance evaluation station for rams (the nucleus)
  - farmer flocks of breeding ewes only (the base population)

- **Constraints taken indirectly into account**
An experiment in the caribbeans: The Guadeloupean Creole goat

A participative action between:
The farmer cooperative
The extension services
INRA researchers

A public extension policy favouring exotic imports
A 4-point approach

1. **Characterization** of farming systems and farmers' expectations in field surveys (Gau et al, 2000; Gunia, et al 2010)

2. **Identification** of the base population & **estimation** of genetic variability available (Gunia, et al 2011)

3. **Design** of the breeding goal (Gunia, et al 2013a)

4. **Optimization** of the scheme and estimation of genetic progress (Gunia, et al 2013b)

Specific evaluation tools were developed (Standard grid, standardised evaluation design for growth, resistance and resilience traits)
A balanced animal for diverse breeding systems

An original production/adaptation breeding goal

Annual genetic progress (% of mean of the trait)

- Fertility
- Live weight
- PCV
- Dressing percent.
- FEC
NUCLEUS SELECTION FLOCKS

Creole bucks (Recognized breeder) → Creole kids

Creole does (Recognized breeder) → Creole kids

Creole kids → Non selected Creole kids (50%) → BUTCHER

Creole kids → Selected Creole kids (50%) → Turn over (upper x%)

Boers bucks

Creole does (recognized breeder) → Improved Creole bucks → Creole kids

Kids Industrial crossbreeding

Fattening

Creole kids → Fattening → BUTCHER

Non identified meat

Creole meat label
In the future: prospects of genomic tools

• **GT will help characterisation of local genetic resources** (selection signature, adaptation markers or genes and adaptation mechanisms)
  - but *need global international projects* to a comprehensive evaluation of available genetic resources

• **GT may favour genetic improvement** (identification of QTL, genomic selection for diverse traits, less dependant on pedigree structure)
  - but *depends on availability of informative data* on local populations and cheaper tools

• **At the moment, GT are unaffordable for most tropical countries** (lack of technical and financial resources)
  - and may *represent an additional threat*, by increasing commercial aggressiveness of exotic breeds
Conclusions

• Participative actions
• Supported by an holistic research approach (genetics, systemic, socio-economy, vet. scie...)
  – > to really match genetic resources and breeding objectives with the constraints,
  – > and increase livestock productivity and multifunctionality in tropical farming systems

Ayalew et al (2003), Berthouly et al (2012)....
Thank you for your attention!