Selection in harsh environments: Stakes and strategies for what results?

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Diet
Agriculture
Environment

INRA

Selection in harsh environments

Key points for success

Experiments

Strategy

Stakes

Stakes (1/3)

- Major climatic and biotic constraints
  - high ambient temperatures, high humidity, and erratic and/or low rainfall.
  - concomitant effects on quality and quantity of feeds, a wide variety of diseases and low levels of animal husbandry

Stakes (2/3)

- The future human food demand

  To increase animal productivity while assuring sustainability of breeding systems.

- Climate changes

  To go back to more extensive production systems make these tropical objectives acute for temperate areas as well.

Stakes (3/3)

- Take adaptation into account for sustainable livestock production improvement

  Natural adaptation of local breeds

  And/or adaptation traits into breeding objectives

Strategies (1/5)

- Adaptation = Ability to face harsh environments

  By adjusting different levels of the organism

  To maintain welfare and ensure survival

- Continuous exposure to environmental stress

  Increased tolerance → genetic adaptation

  by natural selection of favourable gene combinations in the population.

Strategies (2/5)

- Definition of breeding objectives
  - Adaptation *vs* production traits
- Building of genetic progress
  - Intra breed selection *vs* crossbreeding
- Choice of breeding organization for progress diffusion
  - Nucleus flock / commercial flock / national organization

Breeding objectives (3/5)

Adaptation improvement get under :

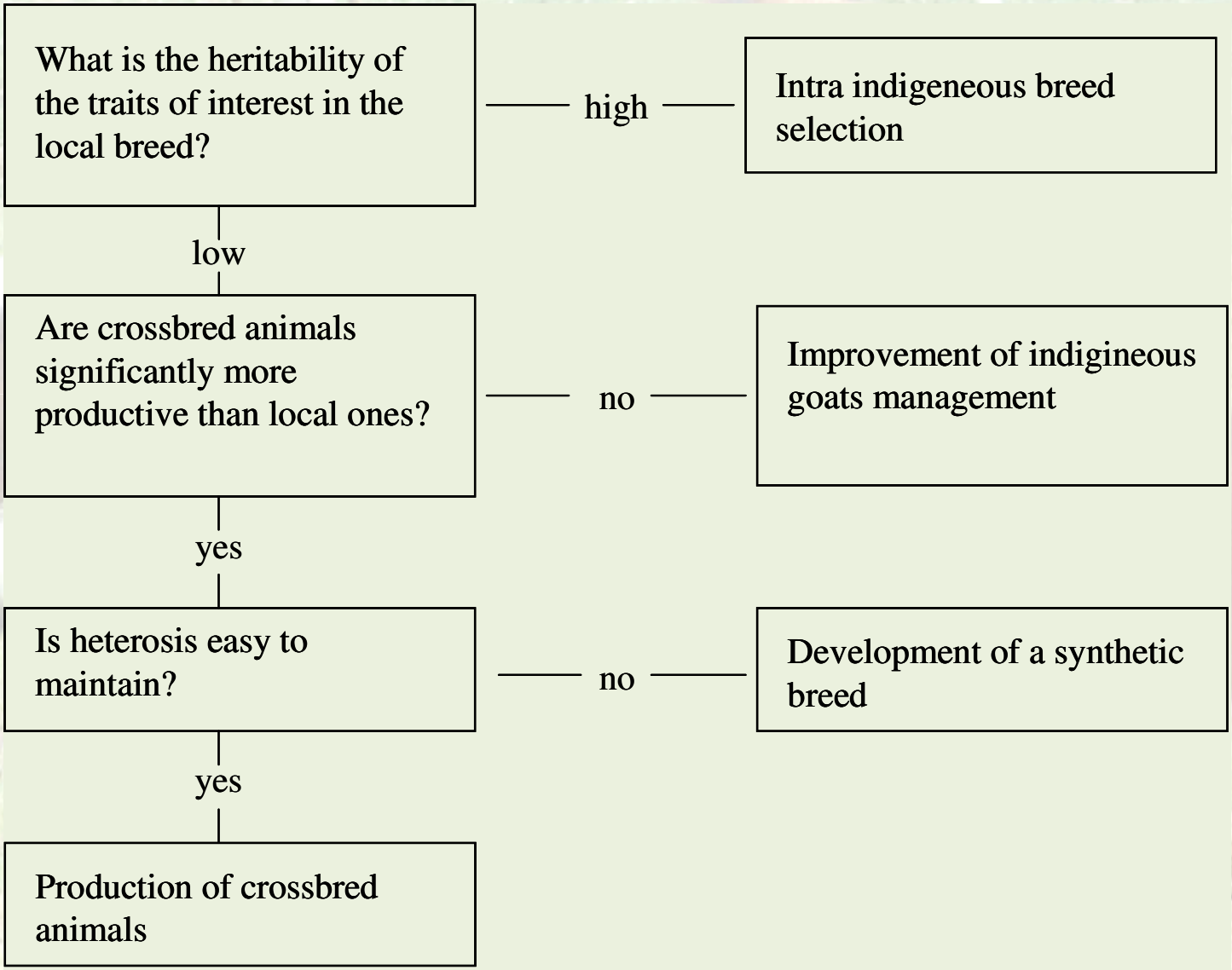
- Natural selection (global approach)

Production traits selected in the constraint environment → easy to implement but...

- Artificial selection (analytic approach)

Main adaptation traits and production put together into the objective goals

Building genetic progress (4/5)



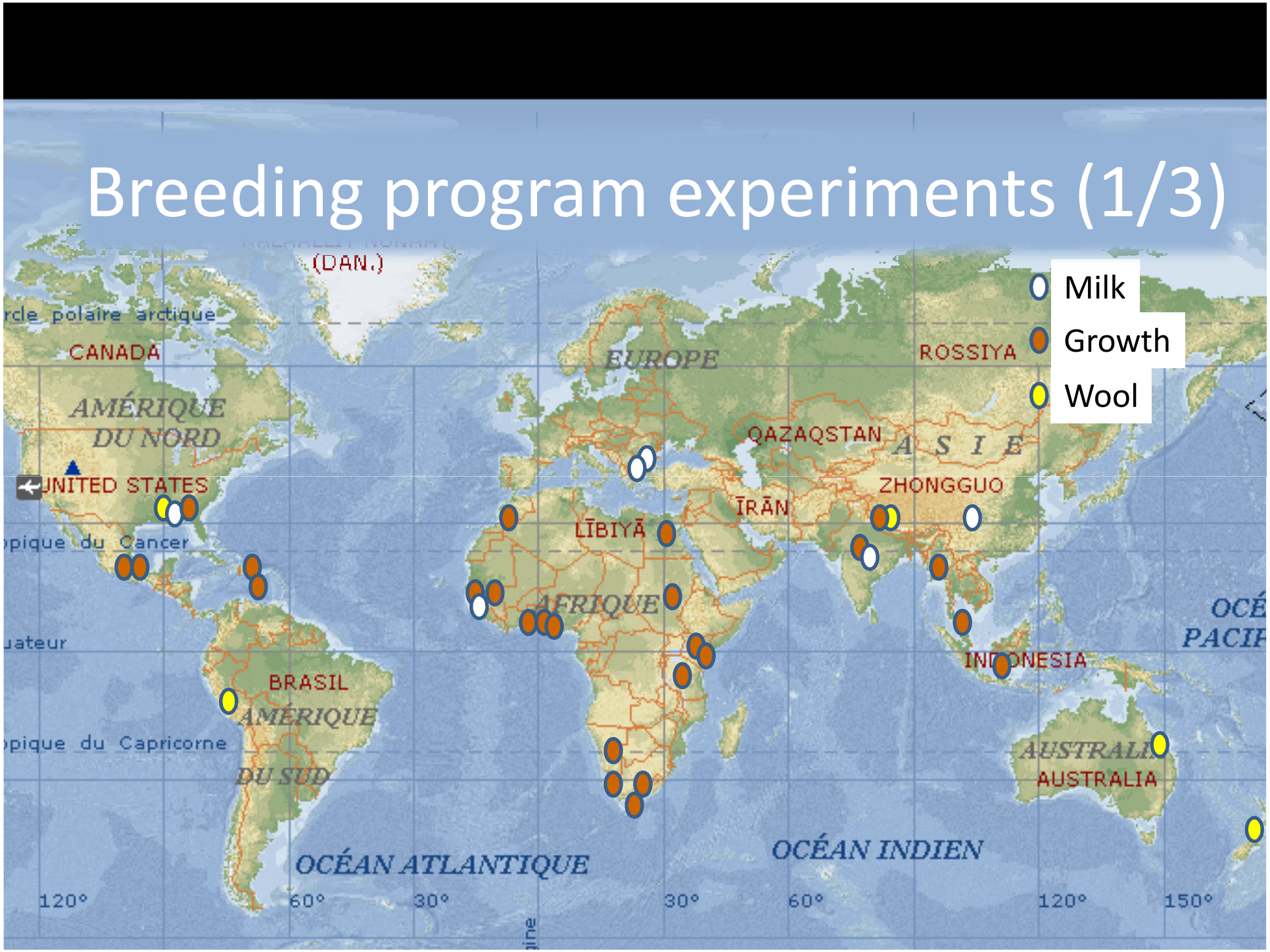
Diffusion of genetic progress (5/5)

- Village/community Nucleus flock
  - Only a small part of the population is controlled and improved
  - Works like a cooperative
  - Slow but no risk genetic progress

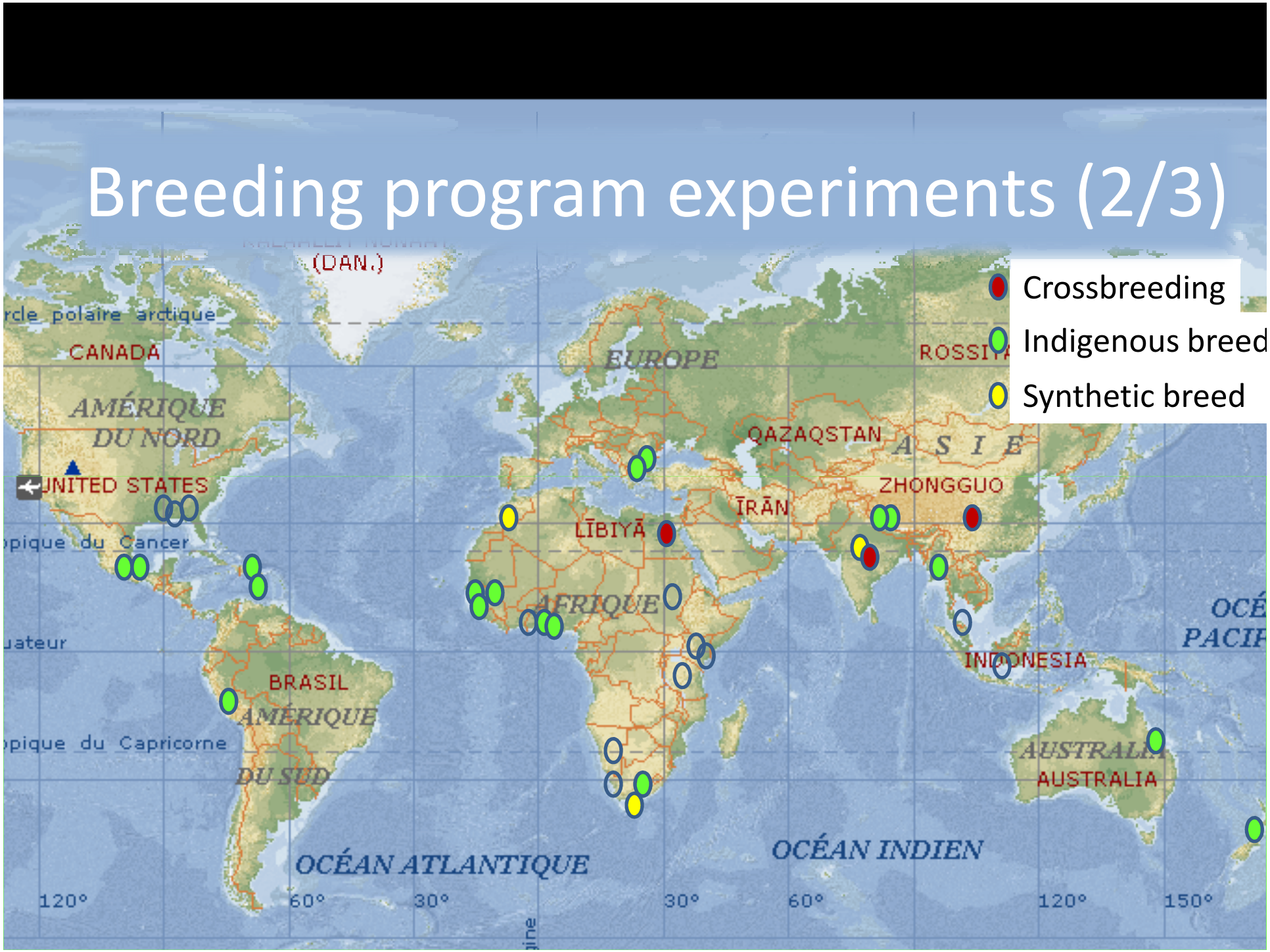
Diffusion of genetic progress (5/5)

- Commercial flock
  - Ranches in peri-urban areas
  - Private investment /exotic breeds
  - Financial gains expected
- National organization
  - Example of F.W.I. (French performance record organization, extension service infrastructures…)

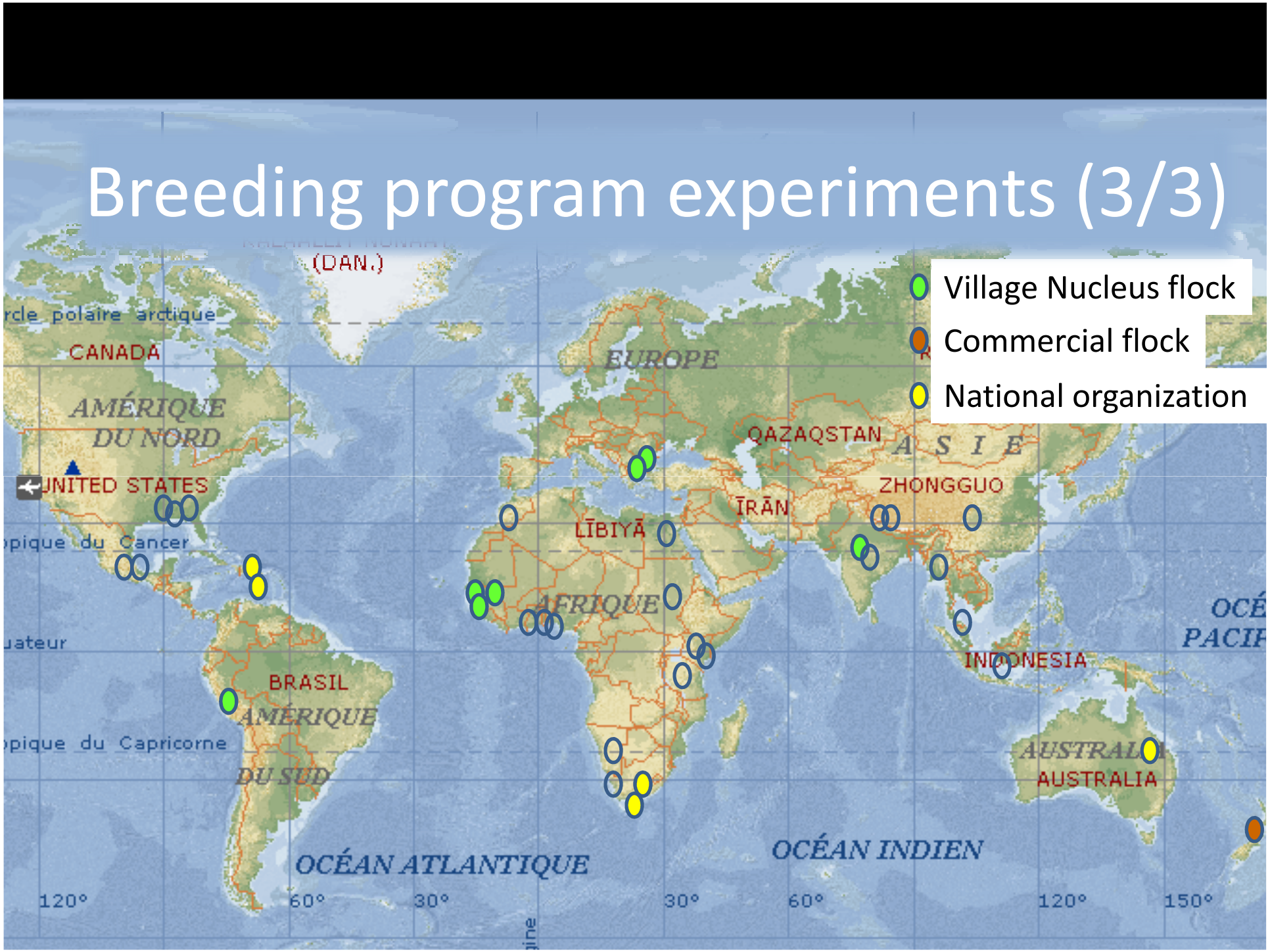
Breeding program experiments (1/3)



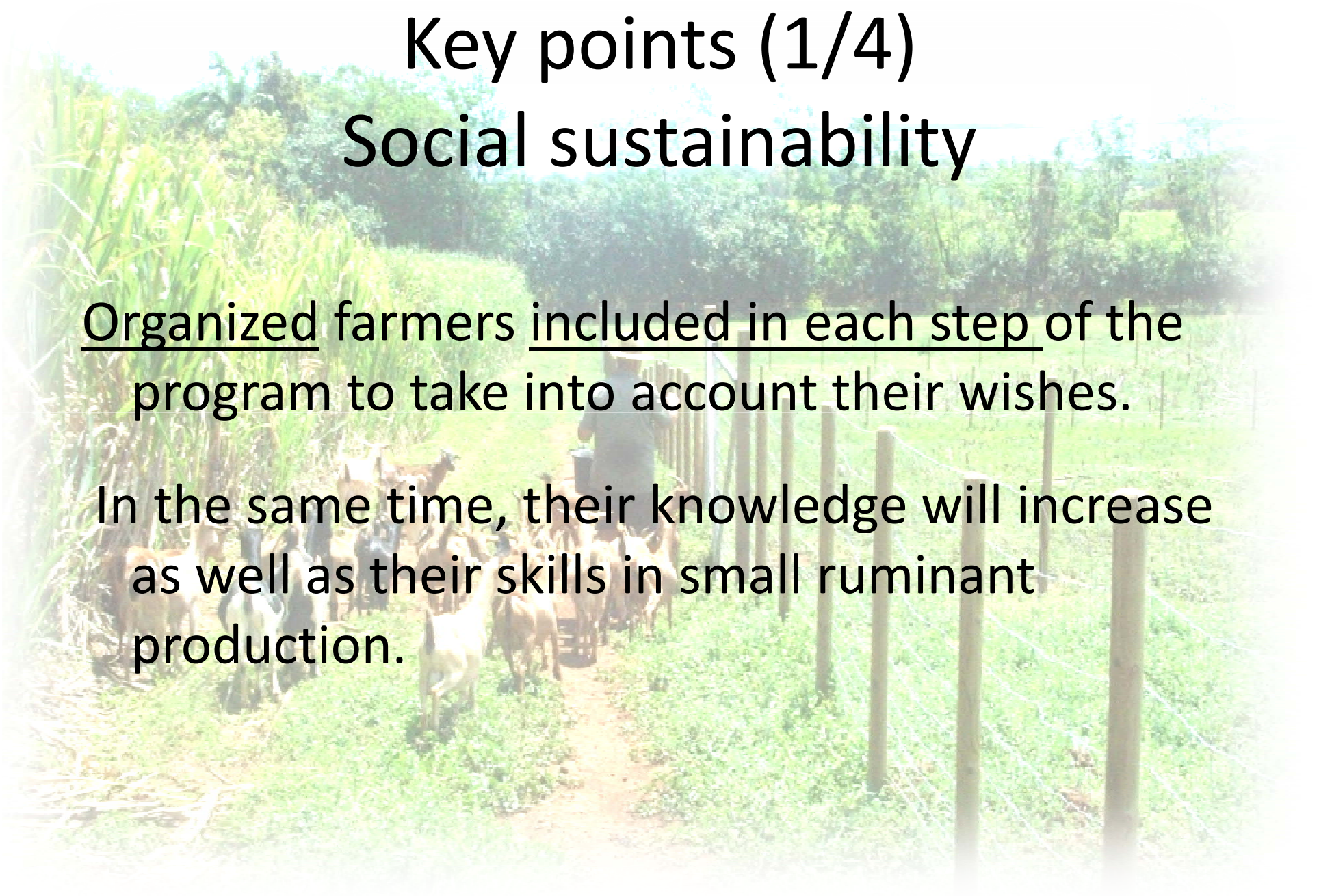
Breeding program experiments (2/3)



Breeding program experiments (3/3)



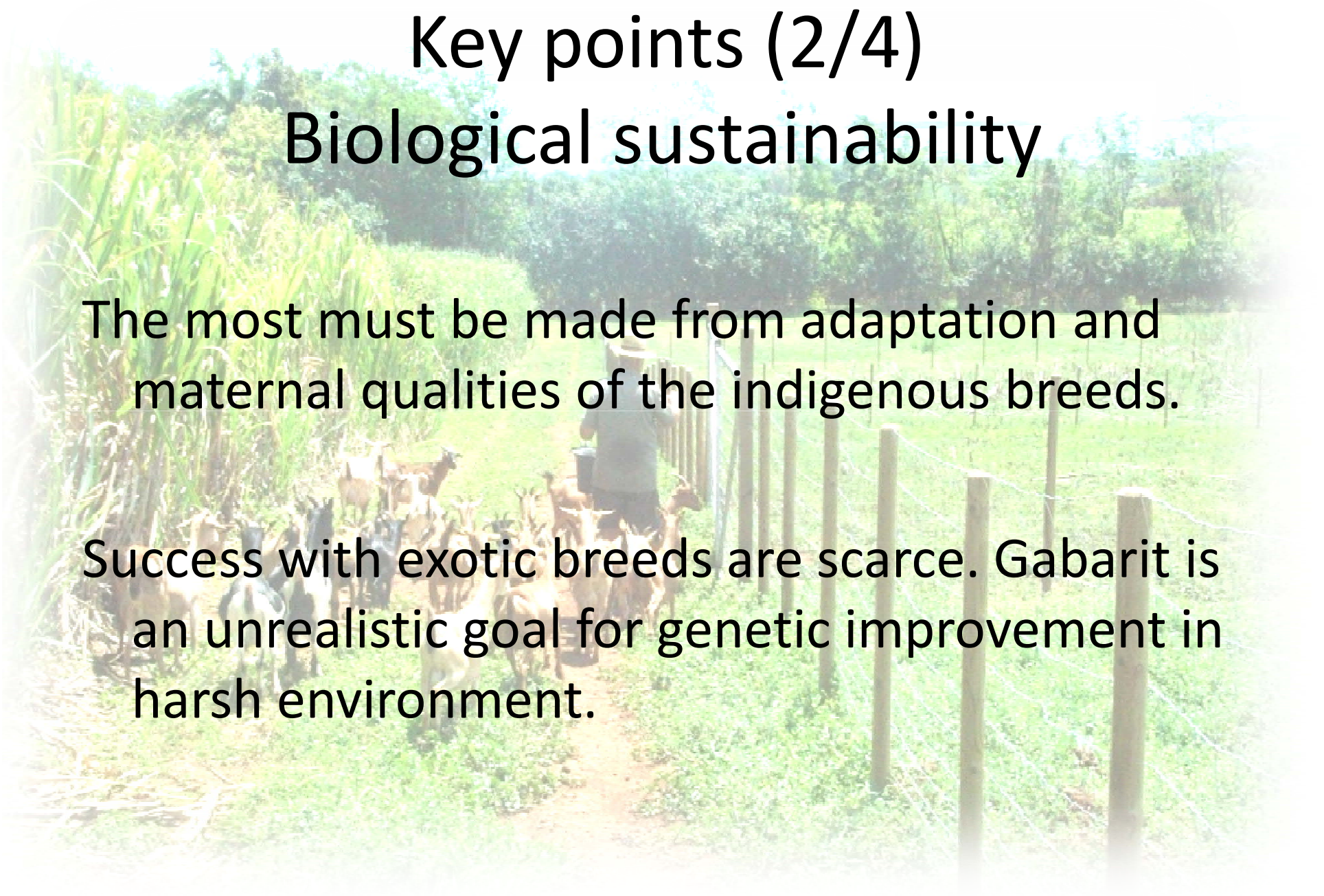
Key points (1/4)
Social sustainability



Organized farmers included in each step of the program to take into account their wishes.

In the same time, their knowledge will increase as well as their skills in small ruminant production.

Key points (2/4)
Biological sustainability



The most must be made from adaptation and maternal qualities of the indigenous breeds.

Success with exotic breeds are scarce. Gabarit is an unrealistic goal for genetic improvement in harsh environment.

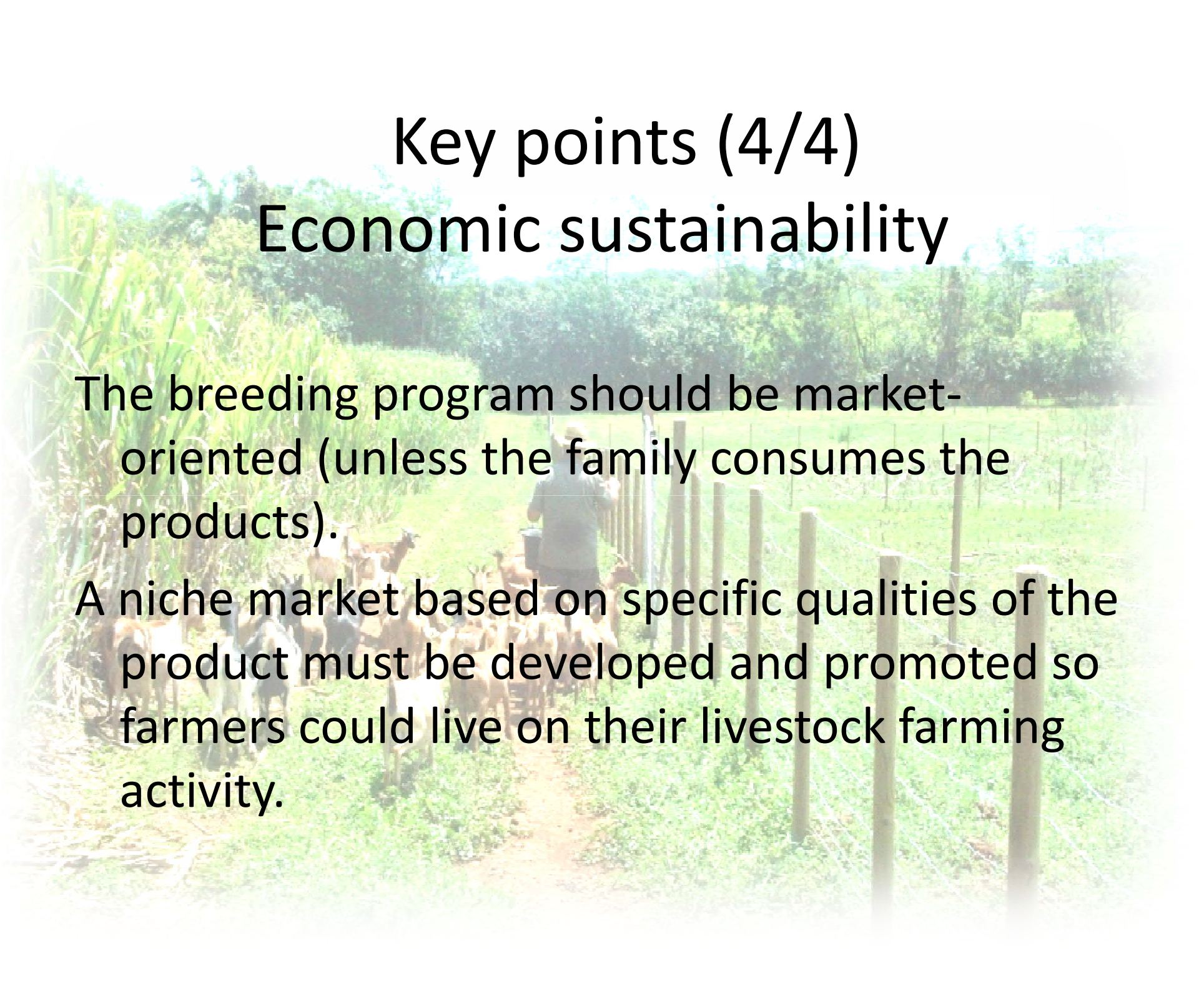
Key points (3/4)
Technical sustainability

The reliability of pedigree and performances recording is guaranteed by an institutional follow-up coming and financial support to breeders to improve their facilities.

At least low-input technical innovations are essential (Famacha®…).

Genetic is part of an holistic approach to improve the production systems.

Key points (4/4)
Economic sustainability



- The breeding program should be market-oriented (unless the family consumes the products).
- A niche market based on specific qualities of the product must be developed and promoted so farmers could live on their livestock farming activity.

Conclusions

- Large consensus emerging in the last decade
  - Include adaptation into breeding goals
  - Use indigenous breeds
  - Involve producers, integrate traditional behavior and values
- But key points still need to be emphases
  - Performance and pedigree recording
  - Sustainability of funding and organization

Perspectives

Success in breeding indigenous breeds

- A stake for the future
  - Preserve genetic diversity
  - Take animal welfare into consideration
- An ability to diffuse tropical up-graded breed
  - In others low-input systems
  - Or (why not?) in extensive temperate farming systems