Which animal do farmers need for tropical mixed farming systems?

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Which animal do farmers need for tropical mixed farming systems in the Caribbean?

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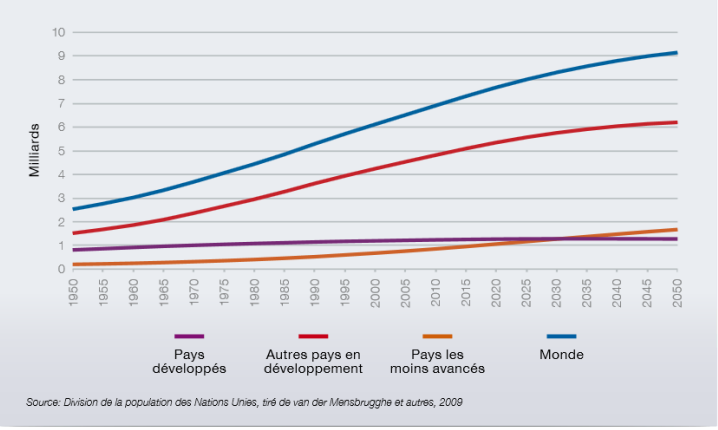
Major issues of agriculture in the Global South

- World population will reach 9billions by 2050

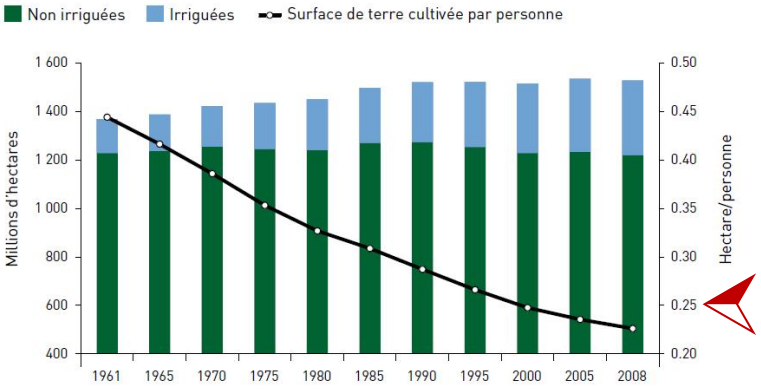
  +50% in Global South

- Limited increase of arable land surface
  - Decreased land availability for crops and livestock production /inhab

- Crucial need of increased agriculture efficiency to reach food sovereignty



Source: Division de la population des Nations Unies, tiré de van der Mensbrugghe et autres, 2009



Source: FAO (2010b)

Key role of animal in the food chain

- Importance of livestock production
  - to cover protein needs, to add value to non-usable land for crops production and to enhance the biological recycling processes
- Importance of agroecological approach
  - to meet efficiency and sustainability for food sovereignty

Three principles for efficient livestock production in the tropics

Based on the observation and evaluation of **mixed farming systems (MFS)** in the Caribbean:

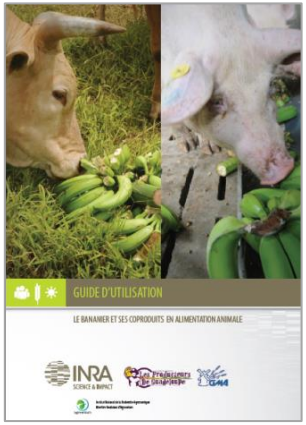
On the farm,

1. Give priority to food on feed
2. Promote the right animal at the right place
3. Favour farmers' wills and skills

Priority to food on feed

1. **Optimize a human food system** in which the animal protein is *only* one component
   - Dual food crop plants (eg bananas, sweet potatoes, cassava, cereal, peas…),
   - Recycle crops co-products as feed and energy.
2. **Choose adapted plant resources** to the agro-pedo-climatic environment of the farm
   - Evaluation of the local biodiversity (from dual food to legume fodder trees)


Traditionnal creole garden



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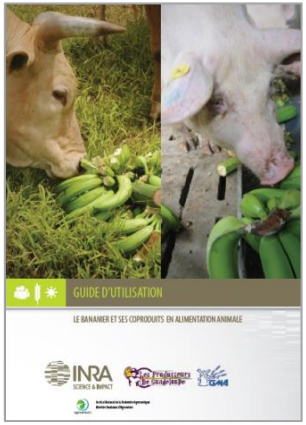
Priority to food on feed

3. **Match the animal with the plant** resources available on the farm
   - Account for differential physiological abilities between ruminants and monogastric
     - Ruminant : development of non usable lands, low feed conversion and greenhouse gaz production
     - Monogastric: efficient feed conversion, competing with human food
4. **Promote domestication of natural process** with **smart and robust technologies**
   - Single cell protein production (algae, fungi, basteria) for livestock protein supplementation
   - Methane fermentation and lactic acid fermentation to produce energy while allowing effluent depollution, mitigation of greenhouse gas, and forage preservation.

Traditionnal creole garden



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The right animal at the right place

Mixed farming INRA Gardel

Agroforestry photo credit: INRA

1. **Prioritize low-input local adapted breeds** (instead of high-input/ specialized exotic breeds)

   Constraints: Variability of amount and quality of feed, biotic and abiotic stress

   - Optimize responses laws (production and adaptation) of conventional livestock
   - Enhance the potential provided by the non-conventional animals

The right animal at the right place

Mixed farming INRA Gardel

Agroforestry photo credit: INRA

2. **Enhance diversity within the flock** (genetic, physiological status) to "empower" the existing diversity of the system
   - Associate in the flock animals with complementary requirements/potentials (feeding behaviors, pathological susceptibility) to minimize the risks, optimize the resources,
   - Develop genetic for low input systems/ balanced animals

Farmers' wills and skills

1. Design **a system consistent** with farmer's wills and skills
   - Optimisation of integration of productions in the MFS
   - Combine biotechnical and organizational innovations (smart agriculture)
   - ➢ *Raise the self-sufficiency*
   - ➢ *Raise the level and quality of life*
2. **Organize an area for hybridization** of research knowledge and traditional know-how
   - Promote co-conception and living labs
3. Adapt **public policies** and transform the consumer as **consum'actor**

Research issues for INRA at the animal and system levels

- **Adaptation**: characterize a A/S in equilibrium with the farm environment
  - Ex genetic control of adaptation in Creole breeds
- **Resilience**: define and design the animal/system able to make/allow the right compromise under stress
  - Ex: genetic control of nutrient allocation in pig under heat stress, importance of production and ecosystemic services integration in resilience of MFS
- **Efficiency**: multicriteria evaluation and optimization at the A/P/S levels
  - Ex: feeding strategies, integrated control of animal health, co-conception of MFS
  - La recherche prend ses responsabilités

Acknowledgments to the team
And
Thank you for your attention!

URZ: G.Alexandre, V.Angeon, H.Archimède, JC.Bambou, A.Fanchone, L.Fahrasmane, JL.Gourdine, T.Loyau, M.Mahieu, C.Marie-Magdeleine, M.Moutoussamy, M.Naves et al.

- **PTEA:** R.Arquet, J.Fleury, M. Giorgi et al.