"Lèt agogo" dairies are community-based businesses that are owned by groups of young investors and farmers' associations. Their representatives sit on a Board of Directors. The let Agogo program is partly supported by the Solidarity Investment Program. It is based on individuals who believe in the program and decides to invest in the value of a cow or several cows. The investor becomes the owner of a cow that is being bred by a farmer, in exchange of his work, the first calf will be his and the second one will be owned by the investor. Such initiatives provide small farmers with an alternative to fight the perverse effects of globalization and open markets today. In 2007 the network was made up of 13 mini-dairies which transform between 3000 and 8000 liters of milk every day, by using solar energy and adapted technologies. "Lèt agogo" products are the only dairies sold nationally, despite the lack of heavy infrastructures such as electricity and roads.

"Lèt agogo" is heavily dependent on Haiti's rainfall regimen for forage production or for practical conditions in the fields. At the same time, the project tries to avoid the approach based upon intensification of system's productivity (frequently linked to milk production). To ensure that cows are properly nourished, Veterimed currently conducts seminars with peasant groups to develop stockpiling grass and foliage feed. Adapted animals are used. The Creole cow has not changed much genetically since the Spaniards set its ancestors out in the wild of Haiti centuries ago. The milk production per cow is low but the animals do not get sick easily, and have the ability to adapt, eating any little vegetal resources. "The cow has always been the bank book of the family farmers, something they could sell for money during hard times. Now it has become revenue for them. Peasants cash in on their vouchers every 15 days, and the money in turn is used to buy food, pay school fees".

Conclusions

The perspectives are (among others), i) to develop feeding strategies with local feed improving the milk production per cow and passing through the dry season; ii) to organize the herd management and reproduction (choices of males and females) through the network of the different units; iii) to improve the chain of distribution; iv) to increase the number of investors (in order to set up about hundred of dairies; v) to support the micro-enterprise systems at the territory and society levels.

"It's not the production of milk that is important here. It's accomplishing it together. The goal is to show as Haitians, there is a way to do things – a way to construct something collectively."

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Design and assessment of future livestock farming systems: integrating Global and Local stakes

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The current challenge in livestock systems is to increase productions while drastically changing the ways current systems impair global and local future development. This new paradigm is the result of some strategic errors in animal production sub-sectors related to the globalization of the economy, an increasing demand for animal products, new geopolitics of food, weak knowledge of ecosystem resilience, and societal awareness of environmental issues. The publication of "Livestock Long Shadow" (FAO, 2006) brought a major step in the long history of animal production. It concluded a 3–4 decade period marked by significant scandals at the global scale, such as BSE, growth hormones, dioxin, pollution of groundwater, lakes and rivers related to local livestock pressure, and others. In livestock production business as usual, this attitude has no real future anymore. Driven by diversified stakeholder initiatives, policymakers raise new norms and rules in food safety and the environmental impact of animal productions.

Further back, during the 3–4 last centuries, cattle ranching was an ideal vector for colonization, particularly in the Americas and Oceania. It highly facilitated the settlement on new lands at the expense of indigenous societies that have not been able to resist, writing a new step into the ancestral fighting between pastoral and sedentary societies, a global issue poorly over-lit because the lack of global information at the time.

Beyond its negative impacts, livestock production development carried on several relevant functions in the farming systems, in local societies and at the global scale. A first group is related to food security through meat and dairy products both auto-consumed in the households and marketed in villages and towns. At the same time, animals valorize natural resources and crop by-products into high added value products. As a counterpart is the use of carbon, nitrogen, phosphorus and other minerals resources, if transformation is accompanied by

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significant amounts of GHG production it leads more particularly to the transfer in the local arable land of undigested carbon, enriched in nitrogen and other nutrients. Wool, leather and skins also help to meet the needs of the farmer and provide livelihoods. Draft animals have always played a major role in tillage and other soil cultivation techniques and in the transport of goods and people. The second group of functions is economic. The sale of animal products provides income and livestock keeping is a means of savings. In many regions, especially in OECD countries, income became the main and most of the time unique function of animal production. Livestock sub-sectors contribute to the economy in the territories, from local to global scale, through several up and downstream activities out of the farm. Human dimensions of livestock are another significant group of functions. In many locations, raising animals is a great and highly recognized job. The size, nature, composition and quality of the herd and grassland areas give information about the social status of the owners. Donations of animals for baptisms, weddings, inheritances and other celebrations are still common in many societies. From an environmental point of view, animal production contributed significantly to build landscapes and manage natural resources in all the parts of the tropical, temperate and cold areas.

Facing the increasing demand on animal products linked to the current process of urbanization and middle class development, the sustainable scenarios denote the necessity to increase production but, at the same time, the high need to reduce the negative impacts. Considering past experiences, particularly along the environmental and social impacts, we can logically imagine that the models of the future will inevitably have to consider the diversity of the ecological, social and economic contexts. Rather than radically change the current local scale models, the ways toward sustainability require progressively integrating the relevant factors within ecological and human dimensions. This implies including ecological and human sciences in R&D processes in order to focus on the resilience of local societies and ecosystems and on the knowledge and capacity building needed to improve the sustainable efficiency of the systems.

Although local system management has to evolve towards a better integration of global and local stakes, research practices also have to progress. After years of pluridisciplinary approaches where several disciplines co-existed in the research process, the multidisciplinary approach has become an improving method joining several disciplines on a same research subject. Further, the interdisciplinary approach tended to integrate tools and methods. The next step is the trans-disciplinary approach where research integration is dynamic and holistic, from the definition of research subjects to the understanding of its complexity. Another requirement of this transdisciplinarity is the commitment of all the actors involved in animal production at a regional scale, including policymakers and stakeholders of the lobbies counteracting animal production.

Local approaches, the "systemic" capability developed by many researchers in both "hard" as well as in "soft" systems, offer the opportunity to effectively integrate innovant global methods such as LCA life cycle analysis in livestock value chains and beyond to investigate concepts and tools and to evaluate frontiers of sustainable efficiency.

Appropriate methods including local knowledge and co-designing of innovations are highly needed given the rising issues that have developed around systems approaches and the responses they can provide to address the complex issues raised by livestock breeding.

To accompany the livestock system changes, a challenge ahead is that of the nature and development of cognitive systems. These are fundamental to any approach in the integrative and systemic understanding of livestock systems. On these new fields, a broad collaborative partnership has to take place between global and local societies and research systems.

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Modelling crop-livestock integration systems at a farm scale in a Highland region of Madagascar: a conceptual model

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Introduction

The Malagasy Highland region of Vakinankaratra (19°51′S; 47°01′E) is the heart of the Madagascar dairy basin and generates 90% of the national dairy production. Farms are based on diverse crop rotations, where rice is the main crop, and livestock activities (dairy cows, zebus, pigs, poultry, etc.). Milk is produced by a multitude of smallholders (with on average less than five cows) usually feeding animals with crop residues and natural vegetation. This region suffers serious erosion problems and soil fertility degradation (Douzet *et al.*, 2008) which has increased with crop-cover and over-use of land for agriculture and livestock feeding. In these complex traditional farming systems, integrative and interdisciplinary modelling tools are needed to better understand crop-livestock interactions and identifying a compromise between resources allocation for livestock production and soil fertility improvement. The purpose of this work was to build a biophysical whole-farm computer model (milk and crop yields) for simulating, on a farm scale, the various flows of biomass occurring between different compartments (cattle, crops, stocks of organic plant material, soil, organic fertilizers, etc.) in these mixed farming systems.

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