in deforested grassland to the original forest where similar measurements are in progress. While the Amazonian forest has considerable potential for trapping carbon–up to 300 t per hectare in French Guiana–the estimated quantity of carbon stored in the soil of grassland is very high. Carbon accumulation in grassland ecosystems (SOC) occurs mostly below ground due to active rhizodeposition, and the residence time in organic matter depends on management practices (Fontaine *et al.*, 2007). In Amazonia, the reconstitution of C in the soil after deforestation could reach more than 100 t/ha after decades according to studies based on C stock changes under pasture (Figure 1). The sink activity of temperate grassland can reach 1 t of carbon per hectare per year (Soussana *et al.*, 2009) and need to be validated in tropical conditions.

Conclusions

Current references on GHG emissions and mitigation by soil carbon (C) sequestration need to be completed to identify indicators and management practices able to strengthen the stability of deforested areas in humid tropics while attenuating their negative environmental impacts by more effectively providing certain ecosystemic services. These results could be adapted to tropical conditions at farm level to estimate the farm GHG balance.

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Milk production in small farms in Haiti: the "Let agogo" (milk in abundance) experience

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Introduction

Every year Haiti imports more than 40 million Euros worth of milk products. Milk is no less than the second category of food imports into the country. To deal with this situation, Haitian producers organize and develop sustainable alternate strategies with support from young professionals. "Lèt Agogo" has been developed by the NGO Veterimed (Veterimed, 2007, 2010).

Veterimed is a Haitian NGO that works to support development in Haiti. It was created in 1991 by a group of Haitian professionals who wanted to contribute to national development in the rural sector. Some 700000 families of small farmers ensure around 90% of the livestock production in Haiti (Veterimed, 2010). For the most part, these producers did not receive any technical support. Veterimed's mission is to help small Haitian farmers increase their income and improve their quality of life through training, research and technical support in the areas of animal health and production. The focus consists in step-by-step improvements to traditional production issues in order to increase profitability and sustainability, and thus contribute to significant improvements in farmers' incomes. Their objective is to work with farmers to ensure sustainable alternatives in livestock development. Veterimed supports small, family farming because it creates and maintains jobs in the countryside, is more environmentally-sound and socially more equitable. Local vegetal and animal resources are used.

For about 10 years, "Lèt agogo" (milk in abundance) project has been contributing to decrease milk importation, developing local milk production based on network of small farms. The "Lèt agogo" project works to increase milk production in order to increase farmer's family income, as well as commercialization opportunities. Today "Lèt agogo" is also the brand name for the milk products (yogurt and sterilized milk) produced by a network of micro transformation units and distributed across the country with support from many youth and rural organizations.

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"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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