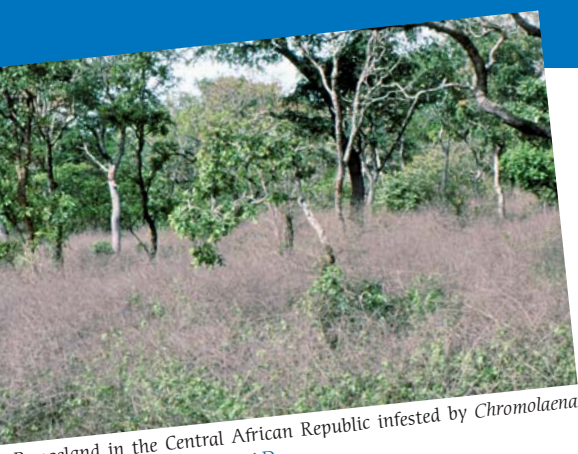


Reconciling fodder production and environmental protection in the humid tropics

Sustainable development of forage systems

The humid tropics have seen a considerable expansion in ruminant farming since the 1970s and are currently home to almost a quarter of the world's ruminant stock. This situation is often criticized for its negative environmental effects: deforestation, loss of biodiversity, scrub invasion of the environment, greenhouse gas production, etc. CIRAD is involved in research to reconcile the development of ruminant farming in these regions to meet the food and economic needs of the populations, and the need to protect the environment.



Rangeland in the Central African Republic infested by *Chromolaena odorata*. © J. Huguenin, CIRAD

Controlling pasture degradation

Pastures established after deforestation are fragile environments which are rapidly invaded by scrub. As their restoration is delicate, they are often abandoned and replaced by other grasslands established on newly deforested areas. In order to limit deforestation, CIRAD has developed

management conditions for grasslands that prevent scrub invasion processes. The recommendations are intended to ensure rapid and dense soil cover. Grasslands have to be exploited regularly (high stocking rate, grazing rotation) in order to maintain a dense and uniform cover capable of limiting the germination and subsequent development of weeds. In this way, controlling grassland degradation indirectly helps to slow down further deforestation for new grasslands.

Agro-ecological management of forage environments

Forage ecosystems in the humid tropics can be sustainably managed. It calls for precise and interactive organization of grassland and herd management to reconcile animal productivity, the lifespan of grasslands, and environmental services.

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Plant growth is very rapid in the humid tropics but the nutritional optimum of the vegetation is short-lived. In addition, seasonal effects can also be a constraint for fodder production (cold season, dry season, excessively wet season).

For intensive and agro-ecological grassland management, several measures have to be taken into account:

- maintaining dense plant cover by adjusting the structure of plant covers through animal stocking (2 to 4 head per hectare) and rotation rates (3 to 6 weeks),
- diversifying plant species to take into account seasonal effects and promote nutritional complementarity. For example, oats maintain a fodder supply during a cold season in certain humid tropical zones; grass-legume combinations, such as *Panicum maximum* and *Stylosanthes hamata* balance nutritional contributions,
- choosing complementary fodder resources: forage gardens where the vegetation is cut and brought to the animals in addition to their pasture, fodder trees such as *Leucaena*, either browsed or exploited by pruning.

These agro-ecological fodder intensification measures lead to greater productivity while preserving the environment and limiting further expansion of areas.

Offer of ecological services



Rangeland invasion by *Jatropha gossypifolia* in New Caledonia.
© V. Blanfort, CIRAD



Flight over the Transamazonian zone, Para State, Brazil.
© J. Huguenin, CIRAD

storage and high active organic matter content; soil aluminium toxicity diminishes.

- Maintaining biodiversity: rotations with high animal stocking help to control scrub invasion by preventing the development of invasive plants, which cause a severe reduction in biodiversity, including in forest areas next to grazing lands.



A Brahman zebu browsing *Brachiaria humidicola* grassland in French Guiana.
© J. Huguenin, CIRAD

CIRAD is studying biological dynamics that are conducive to restoring ecological balances in environments disrupted by herbivore production. The aim is to strengthen the stability of rearing units while attenuating their negative environmental impacts by more effectively providing certain ecosystemic services:

- Limiting greenhouse effect gases: ruminant production contributes to greenhouse gas emissions, but grassland agrosystems compensate for those emissions by sequestering carbon in the soil (1 to 2 tonnes per hectare per year). In temperate zones, the carbon stock in soils under grassland can reach 65 tonnes per hectare.
- Protecting soils: continuous cover grasslands offer major protection against soil erosion; soil fertility under grasslands displays a drop in acidity, an increase in nutrient

Partners

- EMBRAPA, Brazilian Agricultural Research Centre
- Federal University of Para State, Brazil
- INRA, Institut national de la recherche agronomique, France
- Montpellier SupAgro, France
- Coopérative des éleveurs de bovins, French Guiana
- Sica Lait and Sica Revia, La Réunion
- Institut agronomique calédonien, New Caledonia
- Agence nationale de développement de l'élevage, Central African Republic
- FOFIFA, National Centre of Applied Research and Rural Development, Madagascar
- FIFAMANOR, Centre de développement rural et de recherche appliquée, Madagascar
- National Institute of Animal Science, Vietnam