# GuayulSim

## Modelling guayule growth as an alternative source of natural rubber

## ABSTRACT

Today, the main challenges of guayule cultivation involves agronomic methods, genetic improvement of lines to
increase yield per hectare, and efficiency of the extraction process and rubber synthesis. Our project GuayulSim
targets the first two challenges. The project innovation–objective – is the development of a predictive model of
guayule plant growth to be used to follow and monitor case-by-case experimental guayule fields, and/or to establish
a simulation model to extrapolate the future of guayule plantations depending on abiotic conditions (growth of plant
parts, architecture of plants, content of constituents of interest such as rubber and resins).
The research interests and questions of our project are :
1/ would it be possible to model the growth of a guayule plant – by a dynamic source-sink model in interaction with
environment - by measuring pi and resin content of a part of a plant and/or of a selected population of plants ?
2/ what would be the optimum compromise between forced stress and improved growth (irrigation, fertilization) to
obtain an optimum yield of pi and resins with a high quantity of biomass.
The main results of the GuayulSim project are :
- A better understanding of guayule growth and evolution of bio-product content depending on abiotic parameters.
- A growth and biomass production model and bio-products of interest, adapted to guayule cultivation. The model takes
into consideration factors such as water availability and fertilization. It can be used for a dynamic monitoring of
population of plants, simulation of future plantation and crop yield.
- A higher technicity return for harvesting the plant. One of the problems is the model of guayule cultivation and
consequently to advise farmers when to harvest the plants.
- A rapid methodology of measurement by nondestructive NIRS – directly on the cultivated plants –of PI and resins
content.
- Transfer of research works of CIRAD researchers toward farmers, and Chamber of Agriculture. We aim to participate
in the development of a guayule commodity chain in France and Europe, and job creation in agricultural and industrial
sectors of rubber manufacturing (latex goods, tyres, leisure with wet suit brand such as Patagonia, etc..).
- Data measured during the project will be used for future industrialization on a large scale: extractor to produce latex
(SATT,FTI H2020), but also terpen fraction (resins) with potential applications in the field of biological
control (anti termite, nematicides, insects, intermediates bio-molecules), for the green chemistry, pharmaceutical industry, natural
adhesives and production of biofuels (biodiesel, ethanol, kerosene).

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**Project leader :** Loïc Bancheriau
**Project leader's institution :** CIRAD
**Project leader's RU :** BIOWOOEB

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