Validation of NDVI/LAI empirical model to force a pasture growth model
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Evaluating the available forage biomass on a territory is nowadays becoming compulsory for a good farm management, furthermore on an island context with multiple constraints. On the one hand, the import of forage or food supplements represents an additional cost due to the distance of the production and supply centres. On the other hand, an increase in local production is hardly possible because of the impossibility of extending agricultural land.

From all these aspects, Reunion Island represents a particularly interesting “laboratory”. Its location, its volcanic origin and its rugged terrain lead to a multitude of microclimates on a very small territory (2 500 km²). In general, we can observe a tropical climate on the coast and a temperate one in altitude. It is also these distinctive features that bring Reunion Island as a study site rather complex to analyse.

In order to better understand the grass growth on Reunion Island pastures within this climatic diversity, different versions of a grass growth model¹ have been developed at CIRAD, remaining perfectible regarding the tropical grass. As on other models it uses a variable named Leaf Area Index (LAI), expressed by the leaf area (m²) per m² on the ground.

The objective of our study is to establish an empirical model between the LAI and NDVI (Normalized Difference Vegetation Index) for our study sites. If proved, this result will be used in future work in order to force the existing growth models so the predictions would be improved.

The LAI measurements are carried out on the ground thanks to a ceptometer which measures the solar radiation received on and under the canopy. They are carried out every five days so the delay between the measurement and the SPOT5 satellite images’ acquisition is very short. Thanks to the SPOT5Take5 program, we have been able to know the exact date of a satellite pass and therefore coordinate the field measurements with the images: in average, we got a maximum of three-day delay between the measurements and the images. Furthermore, the high frequency of image acquisition allowed us to take an important number of measurements (430) in a short period of time. Several plots have been selected on the island (9) in order to cover the two types of climate and then to be able to elaborate a model for plots with temperate grass species in highlands and plots with tropical grass species in lowlands.

From the SPOT5Take5 temporal series’ advantages, we can confirm the correlation between the LAI and NDVI on our study sites. This correlation is even strong on the exponential model as we obtain a coefficient of 0.87 (RMSE = 0.82) for temperate grass and 0.92 (RMSE = 0.81) for tropical grass.

¹ C. Detaille, 2013 - Creation of a new grassland growth module for the Global Assessment Model for Evaluating the sustainability of Dairy Enterprises
J. Vayssières, F. Guerrin, J.M. Paillat, P. Lecompte GAMEDE: A global activity model for evaluating the sustainability of dairy enterprises Part I - Whole-farm dynamic model