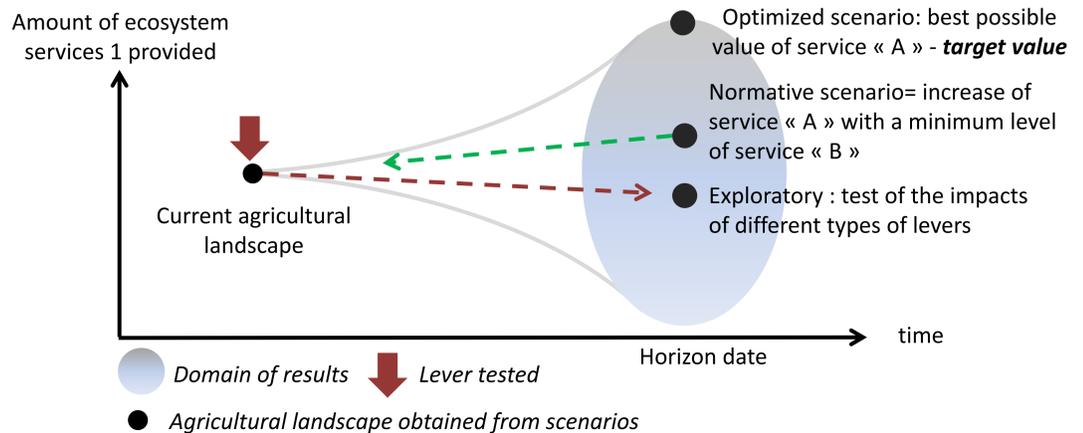


Introduction

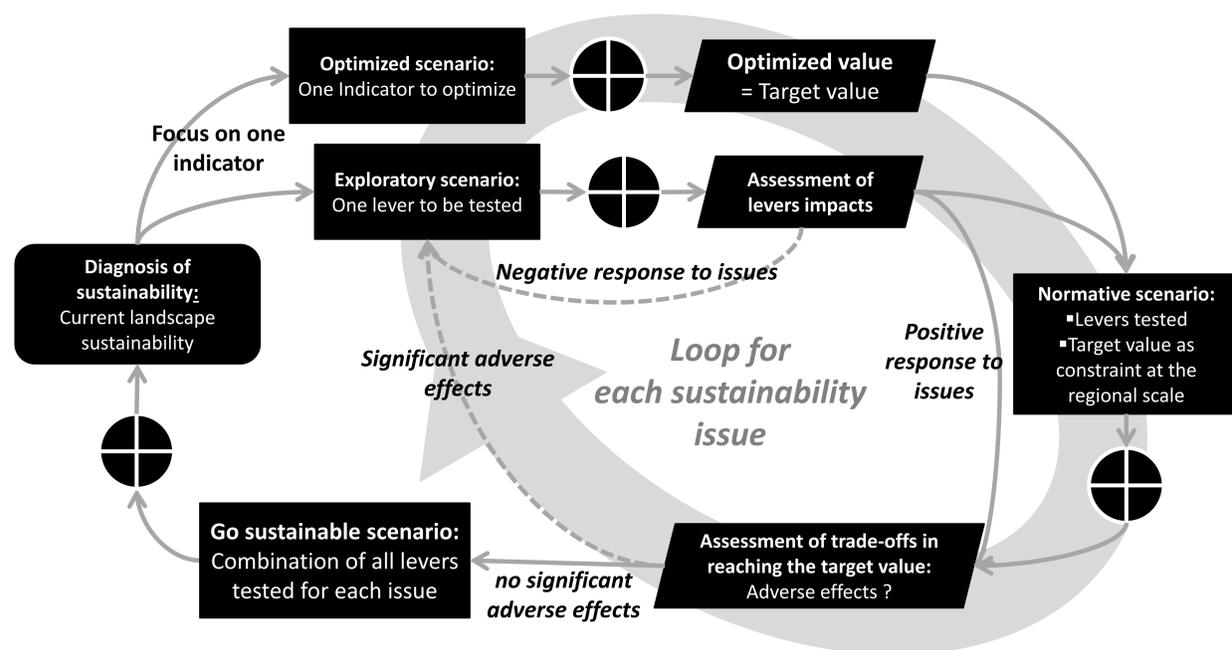
In order to ascertain whether a combination of levers of change of local agriculture can drive agriculture towards sustainability, we designed a modeling framework, to explore successive steps of scenario development and assessment with indicators. To this end we introduce an approach based on several types of scenarios.

Objective:

Obtaining multi-functional landscapes with several levers tested in a logical order to improve the overall response of agriculture to sustainability issues



Modeling framework



Material & method

For adopting such framework, a regional optimization model coupled to regional indicators are needed for the sustainability assessment.

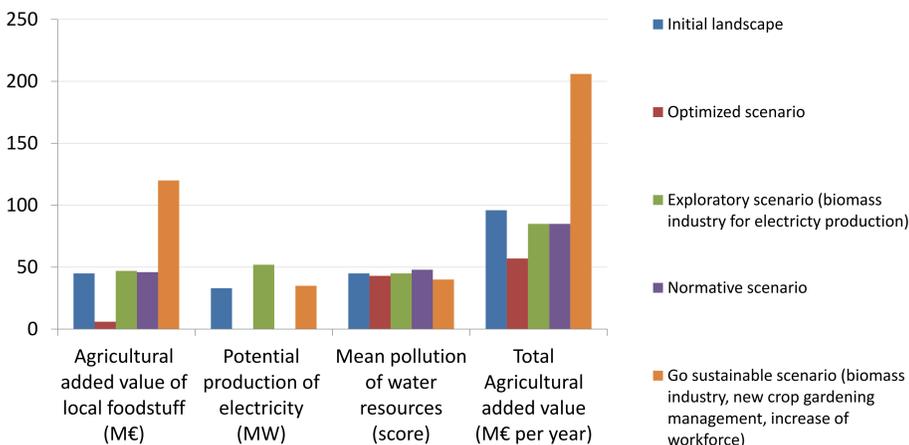
We used the **MOSAICA** model (Chopin et al., 2015) to design and assess agricultural landscapes in Guadeloupe (french island in the Caribbean). MOSAICA is a bioeconomic model that simulate farmer's decision process in term of cropping system allocation to plots through an optimization of the sum of farmers' individual utilities.

The model can be used to assess the potential of landscape to fulfill sustainability objectives by optimizing other functions (e.g. maximizing food crops production).

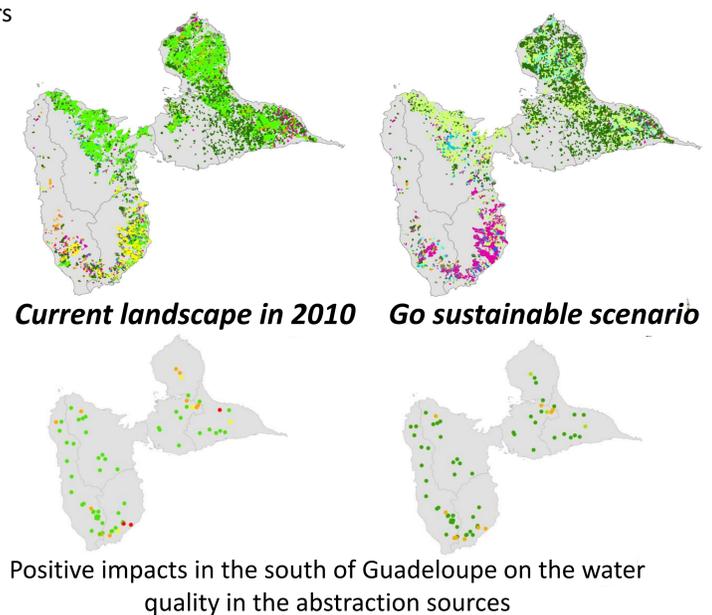
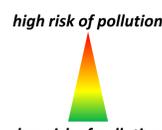
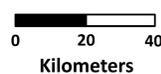
The model is used for all the steps of the framework described here. Relevant levers that could improve the response to sustainability issues while preventing from negative impacts are combined in a "Go sustainable scenario"

Results

The exploratory scenario designed to respond to the energy self sufficiency issue tested the implementation of a biomass plant production. It increased the production of energy without adverse effects on other issues. This lever was combined to other relevant levers (new horticulture cropping systems, an increase of workforce at regional scale) in a "Go sustainable scenario"



The Go sustainable scenario increased the overall sustainability of agricultural landscapes with the development of energy crops all over Guadeloupe and organic horticulture next to rivers



Discussion

The modeling framework guides the use of the regional model that could be used in other regions to help identify the most appropriate levers to increase the response of agriculture to sustainable development.

This holistic approach provides analysis of changes that occur at the regional, the farm and the field scale, and can highlight the evolution of externalities of cropping system mosaics in a quantitative and spatially explicit way.