Tutor: Prof. Andrea Contin

Titolo: Modelli descrittivi causali per valutare il rischio legato al cambiamento indiretto dell’uso del suolo correlato alla produzione di prodotti biobased

Titolo (EN): Causal-descriptive models to evaluate the risk of indirect land use change related to biobased production

Research Project

Specific Objectives

The research grant is part of the STAR-ProBio project, funded by the European Commission’s H2020 program. The research aims at implementing a causal descriptive model in order to isolate and study the variables underpinning economic models used to study and predict indirect land use change such as demand and supply elasticity, effect of trade, crop yields in the baseline, yield improvements and land management strategies. These variables should be modelled as a risk factor, i.e. connecting their magnitude to the risk of additional land required to sustain a related increased volume of a given biobased product. The combined effect of these factors can worsen or mitigate ILUC effects. If some specific factors and conditions are crucial, risk indicators can be defined: the higher the value of the indicator, the higher the ILUC risk. An application to case studies is expected. A further objective is to distill lessons from the application to case studies in order to formulate recommendations to improve national government policies and foreign direct investment, as well as policies at an international level.

Methods and tools

The cause-effects described in the model are represented through stock and flow diagrams through the system dynamics methodology. This methodology was developed by Jay Forrester in 1961 and has its roots in control engineering, cybernetics, and general systems science—which, in turn, have their roots in early systems science in biology and physics. The output of bio-based products is connected to land transformation and to the related econometric and biophysical factors. All stocks will be represented by difference form (Euler form) of the differential equation that results from formulating a law of balance in instantaneous form, augmented by the initial value of the accumulating quantity. The model can be compared to the state of the art of models used to assess the trade of agricultural commodities to verify that all cause-effect links are caught.

Software tools will be used to represent and mathematically provide solution to stock and flow diagrams. Among them the following tools will be used: Simantics System Dynamics; Vensim; Stella. Other pieces of software will be used functional to this methodology.
Activities

In the framework of the project Star-ProBio the grantee is expected to take part to the following activities:

1. the collaborator will implement a causal descriptive model responding to the objectives above indicated; in particular the collaborator will continue the work conducted so far in accordance to the above described methods;

2. active participation to project activities including assembly and technical meetings of the project and all communication activities related to the object of the activity; preparation of the project deliverables; participation to other activities such as the review of project management reports concerning the specific topic;

3. writing of papers and scientific reports related to the topic;

4. participation to activities of the research group (EMRG-CIRSA) related to land use, land use management and environmental assessment of biomass treatment which can be functional to attain the described objectives; this may include also assistance to students for PhD thesis, master and bachelor thesis.