Internship on complex networks study of the world agrifood trade exchanges in the context of sustainability science

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1 Agriculture trade networks of are feeding the world

The outbreak of large-scale agricultural trade networks is a turning point in history. Advances in technology during the 19th century laid the basis of a rapid growth of long-distance trade, triggered in the 1950s by agricultural mechanization, resource inputs and decreasing transportation costs. Today, about 5.1 billion people are estimated to live in a net food importing country and about 23% of total agricultural production is subject to international trade.

The study of agricultural products flows can provide insights on complex interactions between exporter and importer. Commercial partnerships between countries can be modelled using a complex network approach based on the detailed trade matrices from Food and Agriculture Organization of the United Nations (FAO) covering the period from 1986 to 2013.



Figure 1: Example of analysis done in our team: the cereals networks

2 Internship: modeling the sustainability of the agri-food networks

In the context of global warming and the globalization of the agri-food system, understanding the structure of the global trade network is relevant to addressing food security issues. The work will use the FAO database to analyse the global networks of the very many agricultural commodities. Part of the work can also be devoted to modelling the forcing that climate change and energy constraints will induce on global food security. Given these constraints, the objective is to estimate the risk of food shortage in the world and to analyse the governance pitfalls of these complex networks. The final objective of this research is to make proposals for good governance of global agriculture constrained by the energy transition and global warming.

The work will be done in an interdisciplinary team composed of physicists and social science scientists. The internship can be followed up by a PhD thesis by applying for a doctoral grant at the Physique en Île-de-France EDPIF doctoral school.