The role of energy in achieving Sustainable Development Goal 2 in Brazil: How much energy will we need to meet food demands in 2050?

Pedro Gerber Machado, IEE - USP
Phone: +5519 998204691
e-mail:pgerber@usp.br
Ivan Garcia Kerdan - Energy Institute – Imperial College London
Phone: +447867798730
Celma de Oliveira Ribeiro – Poli/USP
Phone:+5511 3091-5363
e-mail:Raquel.borges@usp.br
Dominique Mouette – EACH – USP
Phone:+5511980100199
e-mail:dominiquem@usp.br
Regis Rathmann, IEE – USP
Phone:+5512996371196
e-mail:regisrat@hotmail.com
Adam Hawkes-Energy Institute – Imperial College London
Phone + 44 (0)20 7594 9300
e-mail: a.hawkes@imperial.ac.uk
Edmilson Moutinho dos Santos - IEE - USP
Phone:+5511996145989
e-mail:edsantos@iee.usp.br

Overview

The United Nations have set important goals for sustainable development and one of them is to end hunger by 2030. Part of the Sustainable Development Goals, Goal number two is called “zero hunger”, which include ensuring access by all people, to safe, nutritious and sufficient food all year round (United Nations, 2015). In Brazil, hunger is linked to income, rather than food availability, however, projections of food demand need to take into account the evolution of consumer behaviour thorugh time, and their changes in income, as is the case of the model proposed by Bodirsky *et al.* (2015), considered in this analysis. To produce more food, Brazil will require more energy, which requires proper planning to present the best options regarding economic and environmental constrains.

Even though the agricultural sector in Brazil is responsible for only 4% of the total energy consumption, the sector shows great potential to become a producer of energy, making use of the considerable amount of residues produced by the sector (Daioglou *et al.*, 2016). Moreover, the sector is linked to several sustainable goals, besides goal 2. Clean energy (SDG 7), life on land (SDG 15), responsible production (SDG 12), which justifies it as the focus of this study.

Therefore, the objective of this study is to analyze the costs and greenhouse gases emissions arising form the energy demand by the agricultural sector in Brazil due to food demand increase and propose routs to supply such energy, including the use of residues produced by the sector.

Methods

For this study, food demand will be projected based on the modified engel curve, proposed by Bodirsky et al. (2015), which relates income with food consumption. Projections are then applied to the ModUlar energy system Simulation Environment (MUSE), which is divided into Agriculture, residential, commercial, industrial and transport sectors. MUSE has been developed at SGI (Imperial College London). Equilibrium is reached in MUSE via a market clearing algorithm, which iterates between sector modules until price and quantity of each energy commodity converge. The model is separated in the three basic sectors: Primary Supply, Conversion, and Demand (Budini, Giarola and Hawkes, 2018).

Since it is based on a modular structure, MUSE is a flexible model, where investment and activity in each sector can be independently characterized in a way that is appropriate for a specific sector. Every sector has an existing stock of technologies and a set of technologies which can be installed in the future years of the model time horizon. According to Kerdan, Giarola, & Hawkes (2018), three kinds of data are required to build MUSE: i) Service demand data, ii) Base-year calibration data, and iii) Techno-economic energy supply and process characterization data. This project, nonetheless, focuses on data requirement i) Service demand data. The latter is the focus of this analysis, which projects the service demand for the agricultural sector (food demand).

Results

Food demand projection model
Amount of food demand in 2050
Amount of energy demanded and produced
Cost of capital for the energy system
Emissions of the energy system
Price of fuels

Conclusions

Conclusions will bring the best options to supply energy for the agricultural sector, taking into account the technological options available to increase the sectors efficiency through the use of its residues, with focus on energy production.

References

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