A global stocktake of energy use in food systems

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Food systems rely heavily on the exploitation of natural resources, ultimately resulting in a wide variety of environmental impacts. For instance, global food systems are responsible for between 15 and 20% of total energy use (1-2% is used in fertilizer alone). Different forms of energy are used through the life cycle stages of food. For instance, diesel serves as a fuel in agricultural machinery and transportation activities, natural gas is a key input in the production of fertilizers, electricity is critical in refrigeration etc. Likewise, energy consumption is connected to several impacts, notably climate change.

The food system is facing many deep and global pressures. At root much of this is driven by dietary transitions and growing populations/affluence. Increasing consumption volumes from population increases often requires either the development of new arable land (requiring further energy input) or increasing yields (also often resulting in increased fertilizers and energy inputs). Significant changes in dietary composition is driven by rising affluence, a process commonly termed the nutrition transition. The increased emphasis on animal products and proceed foods through this transition increases dependence on energy inputs as they are generally less efficient than plant-based alternatives. These trends have driven, and will continue to drive, large developments in food system energy use; both trends (increasing energy use through scale and composition effects) are predicted to increase for the foreseeable future.

Here we provide a global production and consumption-based stocktake of energy use in the global food system. Previous studies have focused on narrower set of products and activities, often with greenhouse gases in mind rather than energy. We use the global MRIO EXIOBASE in combination with newly constructed energy extensions to investigate energy use in the food system. We place specific attention on fuels which are harder to decarbonise. For instance, we assume that anything that is already electrified will be easier to transition to low-carbon energy whereas diesel for heavy machinery and natural gas for fertilizer may be more challenging. I will describe how the energy extensions were constructed for EXIOBASE, how these were linked with EXIOBASE food sectors, and how we accounted for direct energy use for food preparation at home. I will present the preliminary results of our work and their implications from a production and consumption-based perspective.