Researchers calculate 'hidden' emissions in traded meat

November 13 2014

An uncooked rib roast. Credit: Michael C. Berch/Wikipedia

An international team of researchers has, for the first time, estimated the amount of methane (CH_4) and nitrous oxide (N_2O) that countries release into the atmosphere when producing meat from livestock, and assigned the emissions to the countries where the meat is ultimately consumed.

They found that embodied, or "hidden", emissions in beef, chicken and pork have increased by 19% over the past 20 years, and that there is currently a global instability caused by a large number of countries contributing to the production of emissions in another country.

Russia was singled out as the biggest importer of embodied emissions in meat over that period, consuming more emissions than it produced, and

receiving the majority of its emissions from Brazil and Argentina. The researchers also revealed substantial internal trade flows of emissions between European countries.

The results, which have been published today, 14 November, in IOP Publishing's journal *Environmental Research Letters*, add further weight to the idea of 'consumption-based accounting', where countries account for the emissions from the products they consume as well as the products they produce.

Lead author of the research, Dr Dario Caro, from the Carnegie Institution for Science (Stanford) and the University of Siena, said: "Our analysis of livestock emissions embodied in the international trade of meat highlights the regional variation in emissions intensities and quantifies a significant barrier to effective regional and national policies regulating livestock emissions.

"A developing country, for example, may lack specific infrastructure and therefore emit large amounts of GHGs when producing meat from livestock. These emissions can be increased when demand from more developed countries is placed on this country to produce more meat.

"At the moment, all existing policies neglect any emissions embodied in trade, so countries are not accounting for the emissions they may be causing in other countries."

Previous studies have quantified the carbon dioxide (CO2) emissions embodied in products traded internationally, but there has been limited attention paid to other greenhouse gases such as CH4 and N2O.

Global emissions of CH4 and N2O account for approximately 27.7% of total radiative forcing since the pre-industrial era, and, in 2001, livestock accounted for 25% of this. Thus, direct emissions of CH4 and N2O

from livestock worldwide represent approximately 9% of total anthropogenic GHG emissions.

CH4 is emitted into the atmosphere as a by-product of the normal digestive system of ruminant livestock, and is also produced alongside N2O when the components of manure are broken down by bacteria.

In their study, the researchers, from the Carnegie Institution for Science, the University of Siena and University of California (Irvine), analysed data from 237 countries and found that between 1990 and 2010, 36.1 Mt of CO2-equivalent (CO2-eq) emissions were related to meat produced in one country and consumed in a different country.

The largest amount of embodied emissions were from beef (26.7 Mt of CO2-eq), pork (7.3 Mt of CO2-eq) and chicken (2.1 Mt of CO2-eq) respectively.

In Europe, meat exported from France to Italy and Greece embodied 1.4 Mt and 1.2 Mt of CO2-eq emissions respectively, and Italian imports of meat from Poland, Germany and Netherlands embodied 0.7, 0.6, and 0.7 Mt of CO2-eq emissions, respectively.

Dr Caro continued: "While our study exclusively focused on the direct non-CO2 emissions released from live breeding animals, other indirect CO2 emissions embedded in the life cycle of meat products occur and were not included.

"Future advancements should therefore take into account the total production process and transportation, including CO2 emissions as well as land, water and energy use occurring in the supply chain."

More information: CH4 and N2O emissions embodied in international trade of meat, Dario Caro et al 2014 *Environ. Res. Lett.* 9

114005. iopscience.iop.org/1748-9326/9/11/114005/article