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SUPPLEMENTARY INFORMATION

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Global agriculture and nitrous oxide emissions

Figure 1

Values were obtained from US EPA (2011)[10] and represent a draft version of the report that has already undergone expert review but remain open to public review and comment prior to publication of the final version. Global emissions in units of Tg N_2O-N yr^{-1} were derived from those presented as Mt CO_2e in US EPA (2011)[10]. Note: values were re-calculated using a 100-yr time horizon Global Warming Potential (GWP) value for N_2O of 298[3], rather than the value of 310 as used in US EPA (2011)[10]. 'Agricultural soils' includes direct and indirect emissions from commercial synthetic fertiliser application and incorporation of crop residues. 'Manure management' includes both direct emissions (pasture, range and paddock, and all applied manure) and indirect emissions. 'Other agricultural sources' here includes field burning of agricultural residues, prescribed burning of savannas and open burning from forest clearing. 'Human sewage' emissions were estimated by multiplying activity data (i.e. protein consumption, population) by the default Tier I IPCC factor for the fraction of protein as nitrogen (F_{NPR}) and the N_2O emission factor for human sewage.

Figure 2

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Global population data were obtained from US Census Bureau (2011)[27]. Per capita consumption data were obtained from OECD & UN FAO (2011)[29]:

http://stats.oecd.org/

Annual change is normalised to year 2006 values, where year 2006 = 100.

Note that per capita intake here represents the global average.

Figure 3

Per capita poultry meat consumption for developed world, Japan, and developing world between 2006 and 2020 were obtained from OECD & UN FAO (2011)[29].

The 'convergence' scenario assumed that per capita poultry consumption in the developed world converged with that of Japan between 2012 and 2020 at a constant rate, reaching a level identical to that of Japan by 2020.

Global poultry meat consumption was derived by multiplying estimated human population in the developed and developing world by their associated per capita poultry meat intake. Estimates of human population in the developed and developing world between 2006 and 2020 were obtained from the US Census Bureau (2011)[27].

Global N_2O emissions arising from poultry meat consumption were then estimated assuming an emission factor for poultry meat production of 6.3 kg N_2O-N per metric tonne, following Williams et al. (2006)[77].

Global N_2O emissions from pig and sheep meat consumption

Per capita consumption, human population, and global consumption between 2006 and 2020 were derived for pig and sheep meat as discussed previously for poultry

meat. Global N_2O emissions arsing from pig and sheep meat consumptions were estimated using a production emission factor of 6.4 and 9 6.3 kg N_2O-N per metric tonne respectively[77].

Figure 4

The following production-phase N_2O emissions factors were applied to the 5 food types examined, following Williams et al. (2006)[77]:

Milk (10,000 litres): 7.1kg N_2O-N

Poultry meat (metric tonne): 6.3 kg N_2O-N

Sheep meat (metric tonne): 9 kg N_2O-N

Pig meat (metric tonne): 6.4 kg N_2O-N

Potatoes (metric tonne): 0.9 kg N_2O-N

Note: To estimate the production-phase N_2O emissions arising from milk wastage, the N_2O emission factor was converted from emissions per 10,000 litres of raw milk to emissions per metric tonne of raw milk, assuming a density of 1,020kg per 1,000 litres. Mass of wastage for the 5 food types and the proportion designated as 'avoidable' were obtained from WRAP (2009)[81].

Figure 5

Food 'loss and wastage' is here defined as the mass of a food directed for human consumption that is lost or wasted in the supply chain. It excludes animal feeds and

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inedible products. Food 'losses' refer to a decrease in the edible food mass at the production, post-harvest and processing phases. Food 'wastage' refers to a decrease in the edible food mass in the retail and consumer phase. Global loss and wastage for the 5 food types was estimated using a global average. This average was derived from the regional estimates provided in UNFAO (2011)[80] and represents the overall proportion of food loss and wastage reported along the food supply chain from production phase to consumer phase. Production-phase N_2O emissions for the lost and wasted food was estimated using the N_2O emission factor cited above for each food type[77]. Note: these emission factors arise from a study of UK food production and may under or overestimate production of these food types in other countries.