**Web Appendix: Assumptions and methods used to estimate greenhouse gas emissions from producing foods for UK consumers**

**Beef**

Values for beef varied 4-fold according to the production system, with the value for Brazilian beef reflecting transport emissions. Values from DEFRA[[1]](#endnote-1) were as follows:

 UK Intensive Dairy 10 kg CO2-e/kg hung carcass

 UK Extensive Suckler 30 kg CO2-e/kg hung carcass

 UK Organic Suckler 32 kg CO2-e/kg hung carcass

 Brazil Suckler 40 kg CO2-e/kg hung carcass

The UK has 80% self sufficiency in beef production,[[2]](#endnote-2) with equal quantities of UK beef coming from dairy and suckler herds.[[3]](#endnote-3),[[4]](#endnote-4) Consumption of organic beef is negligible, at around 1%.[[5]](#endnote-5) This was therefore ignored, particularly since emissions were similar to those for suckler cattle. 65% of beef imports to the UK come from Ireland and other EU countries, which were assumed to have the UK average value of 20 kg CO2-e/kg hung carcass. A further 21% of UK beef comes from South America, for which the Brazil value was assumed, and the final 14% from ‘other’ countries, for which the average of UK and Brazilian beef was assumed (30 kg CO2-e/kg hung carcass). 1 kg of hung carcass produces 0.7 kg bone-free meat.[[6]](#endnote-6) According to this information, a weighted average CO2-e value was calculated to be 30 kg CO2-e/kg, using the following equation:

((0.40 x 10) + (0.40 x 30) + (0.13 x 20) + (0.042 x 40) + (0.028 x 30)) / 0.7 = 30 kg CO2-e/kg

**Lamb**

Values for UK-consumed lamb were obtained from DEFRA,i as follows:

 UK Intensive Lowland 28 kg CO2-e/kg hung carcass

 UK Extensive Upland 39 kg CO2-e/kg hung carcass

 UK Organic Lowland 27 kg CO2-e/kg hung carcass

 New Zealand 33 kg CO2-e/kg hung carcass

The UK is 85% self-sufficient in lamb production,iv with around 70% of this being upland lamb and the remaining 30% lowland.iii As for beef, organic was assumed to be negligible. 90% of UK imports originate from New Zealand, Australia or South America, for which the New Zealand value was assumed. The remaining 10% originate from Ireland or other EU countries, for which the UK average of 36 kg CO2-e/kg was assumed. 1 kg of hung carcass produces 0.7 kg bone-free meat (personal communication with EBLEX). A weighted average value for lamb was therefore calculated to be 50 kg CO2-e/kg:

((0.60 x 39) + (0.25 x 28) + (0.135 x 33) + (0.015 x 36)) / 0.7 = 50 kg CO2-e/kg

**Pork**

GHG emissions from pork produced under different systems were obtained from DEFRA:i

 UK Intensive Indoor 5.5 kg CO2-e/kg hung carcass

 UK Extensive Outdoor 8.9 kg CO2-e/kg hung carcass

 UK Organic Outdoor 9.9 kg CO2-e/kg hung carcass

The UK is 47% self-sufficient in pork production, with 70% being indoor reared.[[7]](#endnote-7) As above, organic production was assumed as negligible. Imports to the UK come entirely from the EU. This production was assumed to be intensive and the figure for UK intensive production was adopted and rounded to 6 to allow a small amount for road transport. 1 kg hung pork carcass produces 0.6 kg bone-free meat.vi A weighted average for pork was calculated as 10 kg CO2-e/kg: ((0.33 x 5.5) + (0.14 x 8.9) + (0.53 x 6)) / 0.6 = 10 kg CO2-e/kg

**Chicken**

Values for chicken were obtained from DEFRA:i

 UK Intensive Indoor 3.1 kg CO2-e/kg hung carcass

 UK Extensive Outdoor 3.7 kg CO2-e/kg hung carcass

 UK Organic Outdoor 4.1 kg CO2-e/kg hung carcass

The UK is 90% self sufficient in chicken production, with 20% being outdoor or organically reared.[[8]](#endnote-8) As the value for organic production was close to that for outdoor, the value for outdoor was used for both. Imports to the UK are mainly from the EU, Brazil and Thailand, with much being shipped frozen from the non-EU countries. The UK intensive value was rounded to 3.5 to reflect road and ship transport. 1 kg hung carcass produces 0.77 kg bone-free meat.vi A weighted average was calculated as 4 kg CO2-e/kg:

((0.72 x 3.1) + (0.18 x 3.7) + (0.10 x 3.5)) / 0.77 = 4 kg CO2-e/kg

This value was also applied to turkey, for which no data existed, and to game birds such as pheasant and quail.

**Duck**

The same edible proportion was assumed as for chicken (0.77 kg/kg hung carcass). Therefore, the GHG emissions per kg edible portion was calculated as 5.32 kg CO2-e/kg from the DEFRAi figure for hung carcass: 4.1 / 0.77 = 5.32 kg CO2-e/kg. This figure was also applied to goose.

**Egg**

The DEFRAi value for a dozen eggs was 1.8 kg CO2-e. The shell-free weight of 1 average egg is 50 g, therefore 12 eggs weigh 0.6 kg, and the value for 1 kg egg was calculated as 3.0 kg CO2-e/kg.

**Tomato**

The following values for tomatoes were given by DEFRA:i

 Oil heated UK 2.3 kg CO2-e/kg

 Waste heated UK 0.39 kg CO2-e/kg

 Spanish 1.8 kg CO2-e/kg

The average of oil-heated UK and Spanish was calculated, then lowered slightly to represent a small proportion from waste heated production, to give a value of 2 kg CO2-e/kg.

**Mineral water and alcoholic beverages**

In the absence of any data, the value for soft beverages was applied on the assumption that much of the impact would be due to bottling, packaging and transport, common to all of these.

**Miscellaneous**

In the absence of any data or knowledge of food group, the average of all non-meat foods (excluding beverages) was calculated as 1.85 kg CO2-e/kg and applied to the proportion of foods classified as miscellaneous due to lack of information about the food or the GHG emissions.

1. Department for Environment Food and Rural Affairs. Scenario building to test and inform the development of a BSI method for assessing GHG emissions from food.  Research project final report FO0404. London: DEFRA; 2009. [↑](#endnote-ref-1)
2. House of Commons. Note SN/SC-01363. 2009. [↑](#endnote-ref-2)
3. EBLEX. Change in the air: The English beef and sheep production roadmap. Kenilworth: EBLEX; 2009. [↑](#endnote-ref-3)
4. Spedding A. RuSource Briefing 814: Feeding Britain - beef and sheep meat. London: Arthur Rank Centre; 2009. [↑](#endnote-ref-4)
5. Red Meat Industry Forum. Introduction to beef production in UK. RMIF; 2007. [↑](#endnote-ref-5)
6. Cederberg C, Meyer D, Flysjo A. Life cycle inventory of greenhouse gas emissions and use of land and energy in Brazilian beef production. Sweden: SIK; 2009. [↑](#endnote-ref-6)
7. Spedding A. RuSource Briefing 815: Feeding Britain - pig meat. London; 2009. [↑](#endnote-ref-7)
8. Spedding A. RuSource Briefing 650: Poultry production. London: Arthur Rank Centre; 2008. [↑](#endnote-ref-8)