

US consumption of animal products and associated GHG emissions and quantities of concentrate feed, human-edible grain and crude protein fed to animals

Table 1: US consumption of animal products (carcass weight equivalent and edible fraction), 2007

Food	US total consumption/year (million lbs) ¹	US total consumption/day (lbs)	US total consumption/year (million kg) ²	US total consumption/day (kg)	Edible fraction % ³	Edible quantity – US total consumption/day (kg)
Beef	28 141	77 098 630	12 764	34 969 863	50	17 484 932
Pork	19 767	54 156 164	8 966	24 564 384	60	14 738 630
Other red meat (mostly lamb/mutton)	528	1 446 575	239	654 795	50	327 398
Chicken	29 909	81 942 466	13 566	37 167 123	60	22 300 274
Turkey	5 300	14 520 548	2 404	6 586 301	60	3 951 781
Other poultry	339	928 767	154	421 918	60	253 151
All meat	83 984	230 093 151	38 094	104 367 123	-	59 056 166
Dairy	182 500	500 000 000	82 780	226 794 521	95	215 454 795
Eggs ⁴	9 828	26 926 027	4 458	12 213 699	95	11 603 014
All animal products	276 312	757 019 178	125 332	343 375 343	-	286 113 975

¹ 2007 total US domestic consumption (carcass weight equivalent) from WASDE-464, 11 Nov 08, USDA

² Converted from lbs on the basis that 1 lb = 453.59 g

³ From Flachowsky (2002) Efficiency of energy and nutrient use in the production of edible protein of animal origin. *Journal of Applied Animal Research* **22**: 1-24. Except lamb/mutton: From Flachowsky (2007) Protein – Population – Politics: How protein can be supplied sustainably in the 21st century. *Lohmann Information* **42**: 2-9.

⁴ 6297.2 million dozen eggs = 75566.4 million eggs x average US egg weight (from FAOstat) 59g = 4 458 million kg (and converted to lbs on the basis that 1 lb = 453.59 g)

NB. Totals may not equal sum of columns due to rounding

Table 2: US consumption of animal products and associated quantities of concentrate feed and human-edible grain fed to animals

Food	US total consumption/day (kg) ¹	kg concentrate feed fed to animal per product ²	Concentrate feed required for total US daily consumption of animal products (kg)	kg human-edible grain fed to animal per kg product ²	Human-edible grain required for total US daily consumption of animal products (kg)
Beef	34 969 863	3.68	128 689 096	2.61	91 271 342
Pork	24 564 384	5.17	126 997 865	3.67	90 151 289
Other red meat (mostly lamb/mutton)	654 795	1.10	720 275	0.78	510 740
Chicken	37 167 123	3.03	112 616 383	2.15	79 909 314
Turkey	6 586 301	3.03	19 956 492	2.15	14 160 547
Other poultry	421 918	3.03	1 278 412	2.15	907 124
All meat	104 367 123	-	390 258 523	-	276 910 356
Dairy	226 794 521	0.46	104 325 480	0.33	74 842 192
Eggs ⁵	12 213 699	3.08	37 618 193	2.18	26 625 864
All animal products	343 375 343	-	532 202 196	-	378 378 412

¹ From Table 1

² From Council for Agricultural Science and Technology (CAST) (1999) *Animal Agriculture and Global Food Supply*.

Grain analogies

Human-edible grain fed to animals for daily US meat consumption = 276 902 556 kg

Amount of meat (edible quantity) consumed by Americans in a single day = 59 056 166 kg

276 910 356 – 59 056 166 = 217 854 190. So, if replace meat with same quantity of plant-based foods, 218 million kg of food saved.

Grain has around 3.5 calories/g and calories for food aid purposes are generally calculated in grain equivalent.

The UN estimates that up to 2 million people are now displaced and in urgent need of food assistance as a result of the fighting in the Democratic Republic of Congo.

Assume around 2100 calories needed per person per day (the minimum daily caloric intake recommended by the FAO).

218 million kg / 2 million people = 109 000 g/person. $109\ 000 \times 3.5 = 381\ 500$ calories/person. $381\ 500 / 2100 = 182$ days.

So, the food saved if all Americans cut meat out of their diet for a single day (and replaced it with foods from plant sources) would be enough to feed all of the estimated 2 million displaced people currently in urgent need of food aid in the Democratic Republic of Congo for at least 6 months.

$218 \times 52 = 11\ 336$ million kg food saved if Americans cut out meat 1 day a week.

Médecins Sans Frontières reports that worldwide 150 million children under 5 in developing countries are underweight.

Assume around 1200 calories per day needed on average for a child under 5 (estimate based on several sources).

$11\ 336$ million kg / 150 million children = 75 573 g/child. $75\ 573 \times 3.5 = 264\ 506$ calories/child. $269\ 360 / 365 = 725$ calories/child/day (over half of 1200)

So, the food saved if all Americans cut meat out of their diet for just one day each week (and replaced it with foods from plant sources) would be enough to provide more than half of the food requirements every day for all of the 150 million underweight children under 5 in developing countries worldwide.

Summary

Around 230 million lbs of meat is consumed by Americans every day. Around 860 million lbs of concentrate feed (in addition to forage) is fed to livestock and poultry to produce the meat consumed by Americans each day. Over 600 million lbs of this is food that could be eaten directly by humans. If all Americans cut meat out of their diet for just a single day (and replaced it with foods from plant sources) around 480 million lbs of food would be saved. That amount of food could feed all of the estimated 2 million displaced people currently in urgent need of food aid in the Democratic Republic of Congo for at least 6 months. If all Americans cut meat out of their diet for just one day each week (and replaced it with foods from plant sources) the amount of food saved could provide more than half of the food requirements every day for all of the 150 million underweight children under 5 in developing countries worldwide.

Table 3: US consumption of protein from animal products and associated quantities of crude protein fed to animals

Food	Edible quantity – US total consumption/day (kg) ¹	Protein content in edible fraction % ²	Animal protein – US total consumption/day (kg)	kg crude animal fed to edible protein in product ²	Crude protein fed to animals for total US consumption/day (kg)
Beef	17 484 932	19.0	3 322 137	9.0	29 899 233
Pork	14 738 630	15.0	2 210 795	6.0	13 264 770
Other red meat (mostly lamb/mutton)	327 398	20.0	65 480	*9.0	589 320
Chicken	22 300 274	20.0	4 460 055	3.0	13 380 165
Turkey	3 951 781	*20.0	790 356	*3.0	2 371 068
Other poultry	253 151	*20.0	50 630	*3.0	151 890
All meat	55 056 166	-	10 899 453	-	59 656 446
Dairy	215 454 795	3.2	6 894 553	3.4	23 441 480
Eggs ⁵	11 603 014	12.0	1 392 362	3.5	4 873 267
All animal products	286 113 975	-	19 186 368	-	87 971 193

¹ From Table 1

² From Flachowsky (2002) Efficiency of energy and nutrient use in the production of edible protein of animal origin. *Journal of Applied Animal Research* **22**: 1-24. Based on daily yields of 30 kg milk, 1000 g liveweight gain for beef cattle, 700 g gain for pigs, 40 g gain for chickens and laying performance of 80%.

* Assuming turkey and other poultry are similar to chicken, and other red meat (mostly lamb/mutton) is similar to beef.

Protein analogy

87 971 193 – 19 186 368 = 68 784 825 kg of protein wasted every day in conversion to animal protein for US consumption

19 186 368 kg total animal protein consumed/day / population 305 500 000 = 62.8 g animal protein consumed/capita/day. This is more than the total daily protein needed from all sources. However, allowing for the same quantity of protein to be consumed from plant sources (in addition to other protein from plant sources already consumed in the American diet) 68 784 825 kg of protein would be saved if Americans cut animal products out of their diet for a single day.

68 784 825 kg x 52 = 3 576 810 900 kg protein saved if all Americans cut animal products out of their diet one day a week.

Assume 45 g/person/day would be sufficient on average to meet protein requirements (adults require around 0.75g / kg lean body mass so on average around 50 g/person/day is adequate for an average adult; children require a little more per kg but have a lower body mass so overall this would lower the average requirement).

Médecins Sans Frontières reports that worldwide 850 million people suffer from hunger.

$3\,576\,810\,900\text{ kg} / 850\,000\,000\text{ people} = 4208\text{ g/person}$. $4208 / 365 = 11.5\text{ g/person/day}$ (a little over a quarter of 45)

So, the amount of protein saved if all Americans cut animal products out of their diet for just one day a week would be enough to provide around a quarter of the protein requirements every day for all of the 850 million people worldwide who suffer from hunger because they do not have access to sufficient food.

GHG emissions from US consumption of animal products

According to researchers at the Institute for Environmental Studies, VU University, Amsterdam, the average American would save 2.3 tonnes of CO₂-equivalent emissions in a year by cutting meat out of their diet (and replacing with foods from plant sources).

$2.3 \times \text{US population } 305\,500\,000 = 702\,650\,000\text{ tonnes CO}_2\text{-equivalent for whole US population/year}$

$702\,650\,000 / 365 = 1\,925\,068\text{ tonnes CO}_2\text{-equivalent for whole US population/day}$

So, if all Americans cut meat out of their diet for a single day (and replaced it with foods from plant sources) 1.93 million tonnes of CO₂-equivalent emissions would be saved.

According to the World Business Council for Sustainable Development, long haul air freight is responsible for an estimated 800 g CO₂ per tonne-km.

Flight distance from Washington DC to the Congo = 10 258 km. $218\,000\text{ tonnes of grain} \times 10\,258\text{ km} = 2\,236\,244\,000\text{ tonne-km}$.
 $2\,236\,244\,000 \times 800\text{ g/tonne-km} = 1.79\text{ million tonnes of CO}_2$.

So, if all Americans cut meat out of their diet for just a single day (and replaced it with foods from plant sources) it would save over 200 000 metric tonnes of food (human-edible grain) and nearly 2 million metric tonnes of CO₂-equivalent emissions. That amount of food could feed all of the estimated 2 million displaced people currently in urgent need of food aid in the Democratic Republic of Congo for at least 6 months, and the carbon emissions saved would be more than enough to cancel out the emissions from flying all of that food from the US to the Congo.