April 2016

An HSI Fact Sheet: Diet and the Environment

"In recent decades, livestock production has increased rapidly, particularly in the developing world. This expansion of the livestock sector is exerting mounting pressure on the world's natural resources: grazing land is threatened by degradation; deforestation is occurring to grow animal feed; water resources are becoming scarce; air, soil and water pollution are increasing; and locally adapted animal genetic resources are being lost." (*Food and Agriculture Organization of the United Nations)*[1]

Land animals raised for food per year[2]……..**77,088,744,301**

Expected increase in poultry production (2005/07 to 2050)…….**121%**

Expected increase in beef production (2005/07 to 2050)……**66%**

Expected increase in egg production (2005/07 to 2050)……..……**65%**

Expected increase in milk production (2005/07 to 2050)……...**62%**

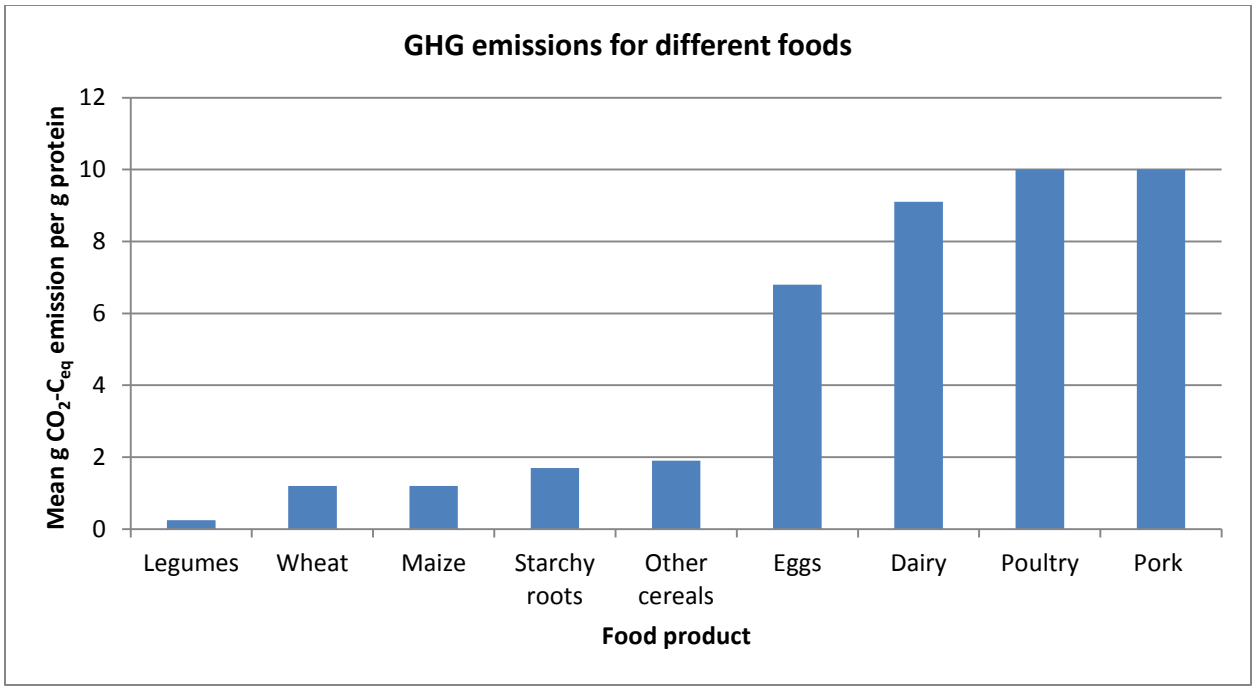
Expected increase in pig meat production (2005/07 to 2050)[3]…...**43%**

Meat, dairy and egg production involves more than raising and slaughtering animals. It also uses feed grain production, requiring substantial water, energy and chemicals. Feed, live animals and processed food must also be transported. All of this comes at a substantial cost to the environment. Mitigating the animal agriculture sector's significant yet underappreciated role in climate change and environmental problems is vital for the health and sustainability of the planet. Individually, reducing meat, milk and egg consumption can reduce our environmental impact, which is becoming increasingly important.

CLIMATE CHANGE: We are facing unprecedented changes, with global warming of the atmosphere and oceans, melting ice and snow, and rising seas.[4] This has significant impacts, from water availability and non-human species migration to food production, extreme weather and poverty exacerbation.[5]

- Farm animal production accounts for 14.5% of all human-caused greenhouse gases (GHGs).[6]
- Based on expected demand, farm animal production alone is projected to emit over two-thirds of the amount of GHGs considered sustainable by 2050.[7]
- The animal agriculture sector emits large amounts of three important GHGs:[8]

Carbon Dioxide (CO_2)	Approximately 27% of the farm animal sector's emissions are CO_2, which in turn contributes approximately 5% of annual human-related CO_2 output.[9]
Methane (CH_4)	Farm animals are responsible about 44% of methane emissions globally.[10] Methane's relatively short time in the atmosphere (12.4 years)[11] makes it a better target for near-term climate mitigation than carbon dioxide.[12]
Nitrous Oxide (N_20)	Animal agriculture accounts for 53% of human-related N_2O emissions.[13] Nitrous oxide remains in the atmosphere for 121 years.[14]



Source: Tilman D and Clark M. 2014. Global diets link environmental sustainability and human health. Nature 515:518-22.

LAND USE: About 20% of the planet's grasslands and pasturelands have been degraded, mostly due to erosion, compaction and overgrazing by farm animals.[15] Farm animal production, including feed crop production, has been a "driving force" for deforestation.[16]

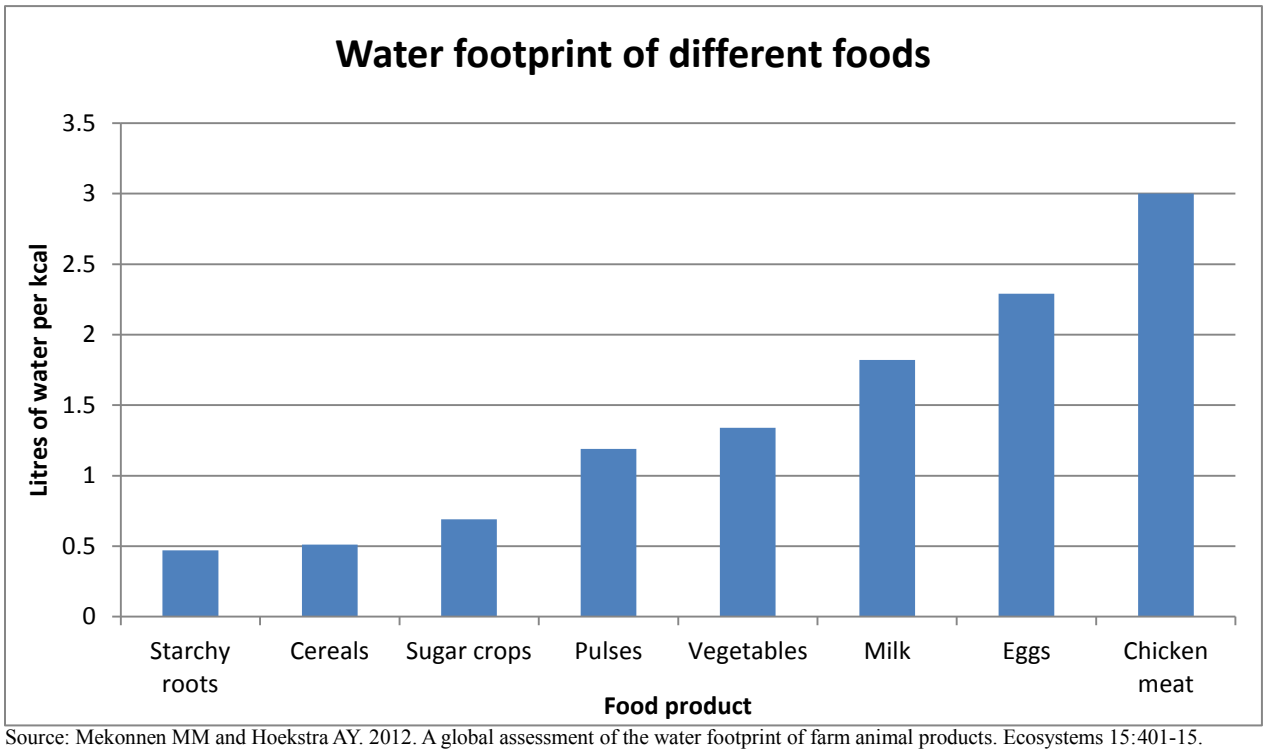
- Worldwide, we use more land to raise and feed farm animals than for any other single purpose.[17]
- Farm animal production accounts for 70% of all agricultural land and 30% of total land area.[18]
- More than 60% of corn and barley, and over 97% of soymeal, are fed to farm animals.[19]

Growth of Industrial Farm Animal Production
Industrial production involves housing large amounts of animals in fully enclosed structures.[20] These systems produce about two-thirds of the world's poultry meat and eggs, and more than half of all pork.[21] Increasing demand for animal products has propelled a shift from small-scale, extensive production to large-scale, more intensive production.[22] In terms of waste production, a single animal production facility can equal a small city.[23] Manure produced on factory farms exceeds the amount of land available to absorb it, turning manure from a valuable resource into a hazard that hurts oil, water and air quality.[24]

WATER: According to the FAO, farm animal production is probably the biggest water polluter[25] and can damage water quality by releasing pathogens and nutrients into groundwater and waterways.[26] Animal agriculture is also a major consumer of water resources.[27]

- Globally, meat and milk products account for 29% of our average consumer water footprint, compared to just 4% for household water use.[28]

- Up to 250 million worldwide people may experience water shortages by 2020.[29]



Source: Mekonnen MM and Hoekstra AY. 2012. A global assessment of the water footprint of farm animal products. Ecosystems 15:401-15.

Recent studies are detailing the benefits to the planet if we slow or stop our meat, dairy and egg intake:

Proceedings of the National Academy of Sciences (2016)[30]	With current forecasts for increases in meat, dairy and egg intake, food-related GHGs will rise 51% by 2050 over 2005/07 levels. Food-related emissions would actually decrease by 2050 if people cut out meat..
Climatic Change (2014)[31]	In the United Kingdom, the GHG emissions from a high-meat diet are 2.5 times that of one without animal products.
American Journal of Clinical Nutrition (2014)[32]	Semi-vegetarian and vegetarian diets in North America can reduce GHG emissions by 22% and 29%, respectively, compared to a non-vegetarian diet.
Global Environmental Change (2014)[33]	A 50% reduction in meat, dairy and egg consumption in the European Union could cut agricultural GHGs by 19% to 42%.
Nature Climate Change (2014)[34]	If "healthy" diets were adopted globally (mainly lowering sugars, saturated fats and animal products in some regions), GHGs would be 54% lower by 2050 as compared to current trends. Land needed for pasture would be 32% lower.
Environmental Health (2014)[35]	In the Netherlands, removing 35 grams of meat per day reduced diet-derived land use by 12%. Meat intake contributes 11% of daily calories but accounts for about 30% of diet-derived land use and GHGs.
Animal Frontiers (2012)[36]	The switch from an average meat diet to a vegetarian diet could reduce the water footprint by 1,300 litres a day, equaling 474,500 litres a year.
Agriculture, Ecosystems and Environment (2010)[37]	The production, processing, transport and preparation in India of a non-vegetarian meal including mutton collectively emitted 1.8 times the GHGs as that of a vegetarian meal without dairy products.

Humane Society International and its partner organizations together constitute one of the world's largest animal protection organizations — backed by 11 million people. For 25 years, HSI has been fighting for the protection of all animals through advocacy, education, and hands-on programs. Celebrating animals and confronting cruelty worldwide — on the web at hsi.org.

---

[1] Food and Agriculture Organization of the United Nations. 2013. Livestock and environment. http://www.fao.org/ag/againfo/themes/en/Environment.html. Accessed April 1, 2016.
[2] Food and Agriculture Organization of the United Nations. 2016. FAOStat. http://faostat3.fao.org/home/E. Accessed March 14, 2016.
[3] Alexandratos N and Bruinsma J. 2012. World agriculture towards 2030/2050: the 2012 revision. ESA Working paper No. 12-03, Food and Agriculture Organization of the United Nations. p. 131, Table 4.18. http://www.fao.org/docrep/016/ap106e/ap106e.pdf. Accessed April 14, 2016.
[4] Intergovernmental Panel on Climate Change. 2013. Summary for policymakers. In: Stocker TF, Qin D, Plattner G-K, et al. (eds.), Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (New York, NY: Cambridge University Press, pp. 4, 5, 8, 9, 11).
[5] Intergovernmental Panel on Climate Change. 2014. Summary for policymakers. In: Field CB, Barros VR, Dokken DJ, et al. (eds.), Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (New York, NY: Cambridge University Press, pp. 4-6).
[6] Gerber PJ, Steinfeld H, Henderson B, et al. 2013. Tackling climate change through livestock: a global assessment of emissions and mitigation opportunities (Rome, Italy: Food and Agriculture Organization of the United Nations). http://www.fao.org/3/a-i3437e/index.html. Accessed April 11, 2016.
[7] Pelletier N and Tyedmers P. 2010. Forecasting potential global environmental costs of livestock production 2000-2050. Proceedings of the National Academy of Sciences of the United States 107(43):18371-4.
[8] Intergovernmental Panel on Climate Change. 2013. Summary for policymakers. In: Stocker TF, Qin D, Plattner G-K, et al. (eds.), Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (New York, NY: Cambridge University Press, p. 14, Figure SPM.5).
[9] Gerber P, Steinfeld H, Henderson B, et al. 2013. Tackling climate change through livestock: a global assessment of emissions and mitigation opportunities (Rome, Italy: Food and Agriculture Organization of the United Nations, p. 15). http://www.fao.org/3/a-i3437e/index.html. Accessed April 11, 2016.
[10] Gerber P, Steinfeld H, Henderson B, et al. 2013. Tackling climate change through livestock: a global assessment of emissions and mitigation opportunities (Rome, Italy: Food and Agriculture Organization of the United Nations, p. 15). http://www.fao.org/3/a-i3437e/index.html. Accessed April 11, 2016.
[11] Victor DG, Zhou D, Ahmed EHM, et al. 2014. Introductory chapter. In: Edenhofer O, Pichs-Madruga R, Sokona Y, et al. (eds.), Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovermental Panel on Climate Change (New York, NY: Cambridge University Press, p. 124 Table 1.1).
[12] Moore FC and MacCracken MC.2009. Lifetime-leveraging: an approach to achieving international agreement and effective climate protection using mitigation of short-lived greenhouse gases. International Journal of Climate Change Strategies and Management 1(1):42-62.
[13] Gerber P, Steinfeld H, Henderson B, et al. 2013. Tackling climate change through livestock: a global assessment of emissions and mitigation opportunities (Rome, Italy: Food and Agriculture Organization of the United Nations, p. 15). http://www.fao.org/3/a-i3437e/index.html. Accessed April 11, 2016.
[14] Victor DG, Zhou D, Ahmed EHM, et al. 2014. Introductory chapter. In: Edenhofer O, Pichs-Madruga R, Sokona Y, et al. (eds.), Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovermental Panel on Climate Change (New York, NY: Cambridge University Press, p. 124 Table 1.1).
[15] Food and Agriculture Organization of the United Nations. 2013. Livestock and environment. http://www.fao.org/ag/againfo/themes/en/Environment.html. Accessed April 1, 2016.
[16] Food and Agriculture Organization of the United Nations. 2013. Livestock and environment. http://www.fao.org/ag/againfo/themes/en/Environment.html. Accessed April 1, 2016.
[17] Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, and de Haan C. 2006. Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations, p xxi. http://www.fao.org/docrep/010/a0701e/a0701e00.HTM. Accessed April 11, 2016.
[18] Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, and de Haan C. 2006. Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations, p xxi. http://www.fao.org/docrep/010/a0701e/a0701e00.HTM. Accessed April 11, 2016.
[19] Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, and de Haan C. 2006. Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations, pp. 39, 43. http://www.fao.org/docrep/010/a0701e/a0701e00.HTM. Accessed April 11, 2016.
[20] Gerber PJ, Steinfeld H, Henderson B, et al. 2013. Tackling climate change through livestock: a global assessment of emissions and mitigation opportunities (Rome, Italy: Food and Agriculture Organization of the United Nations). http://www.fao.org/3/a-i3437e/index.html. Accessed April 11, 2016.

[21] Food and Agriculture Organization of the United Nations. 2009. The state of food and agriculture: livestock in the balance (Rome, Italy: Food and Agriculture Organization of the United Nations, p. 27). http://www.fao.org/docrep/012/i0680e/i0680e.pdf. Accessed May 19, 2010.
[22] Robinson TP, Thornton PK, Franceschini G, et al. 2011. Global livestock production systems (Rome, Italy: Food and Agriculture Organization of the United Nations and International Livestock Research Institute, p. 43). http://www.fao.org/docrep/014/i2414e/i2414e.pdf. Accessed April 11, 2016.
[23] United States Environmental Protection Agency. 2004. Risk Assessment Evaluation for Concentrated Animal Feeding Operations, p. iv. http://nepis.epa.gov/Exe/ZyPDF.cgi/901V0100.PDF?Dockey=901V0100.PDF. Accessed April 12, 2016.
[24] Gerba CP and Smith JE. 2005. Sources of pathogenic microorganisms and their fate during land application of wastes. Journal of Environmental Quality 34(1):42-8.
[25] Food and Agriculture Organization of the United Nations. 2013. Livestock and environment. http://www.fao.org/ag/againfo/themes/en/Environment.html. Accessed April 1, 2016.
[26] Food and Agriculture Organization of the United Nations. 2009. The state of food and agriculture: livestock in the balance (Rome, Italy: Food and Agriculture Organization of the United Nations, p. 27). http://www.fao.org/docrep/012/i0680e/i0680e.pdf. Accessed May 19, 2010.
[27] Mekonnen MM and Hoekstra AY. 2011. National water footprint accounts: the green, blue and grey water footprint of production and consumption. United Nations Educational, Scientific and Cultural Organization, Value of Water Research Report Series, no. 50.
[28] Mekonnen MM and Hoekstra AY. 2011. National water footprint accounts: the green, blue and grey water footprint of production and consumption. United Nations Educational, Scientific and Cultural Organization, Value of Water Research Report Series, no. 50, p. 5.
[29] Intergovernmental Panel on Climate Change. 2007. Climate change 2007: climate change impacts, adaptation and vulnerability. Working Group II Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report.
[30] Springmann M, Godfray HCJ, Rayner M, and Scarborough P. 2016. Analysis and valuation of the health and climate change cobenefits of dietary change. Proceedings of the National Academy of Sciences of the United States of America doi: 10.1073/pnas.1523119113.
[31] Scarborough P, Appleby PN, Mizdrak A, et al. 2014. Dietary greenhouse gas emissions of meat-eaters, fish-eaters, vegetarians and vegans in the UK. Climatic Change 125(2):179-92.
[32] Soret S, Mejia A, Batech M, Jaceldo-Siegl K, Harwatt H and Sabaté J. 2014. Climate change mitigation and health effects of varied dietary patterns in real-life settings throughout North America. American Journal of Clinical Nutrition 100(supp):490S-5S.
[33] Westhoek H, Lesschen JP, Rood T, et al. 2014. Food choices, health and environment: effects of cutting Europe's meat and dairy intake. Global Environmental Change 26:196-205.
[34] Bajželj B, Richards KS, Allwood JM, et al. 2014. Importance of food-demand management for climate mitigation. Nature Climate Change 4:924-9.
[35] Biesbroek S, Bueno-de-Mesquita HB, Peeters PHM, et al. 2014. Reducing our environmental footprint and improving our health: greenhouse gas emission and land use of usual diet and mortality in EPIC-NL: a prospective cohort study. Environmental Health 13:27.
[36] Hoekstra AY. 2012. The hidden water resource use behind meat and dairy. Animal Frontiers 2(2):3-8.
[37] Pathak H, Jain N, Bhatia A, Patel J, and Aggarwal PK. 2010. Carbon footprints of Indian food items. Agriculture, Ecosystems and Environment 139:66-73.