

DIET CHOICES - ETHICAL IMPACTS

FEEDING PEOPLE

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Current and Projected Agricultural Land Use - World

Current diets, projected yields and 2060 population	48,756,311	Land area required (square km)
Chinese diet, projected yield and 2060 population	50,366,004	
Current	51,490,619	
Total farmable land	66,704,913	
Current yields and diets, projected 2060 population	67,058,236	
European diet, projected yield and 2060 population	72,413,384	
American diet, projected yield and 2060 population	124,404,485	

Current and projected agricultural land use under various scenarios. Current land use is cropland, pasture, meadows, as reported in our land use exhibit from FAO. Population in 2060 is the median forecast from [World Population Prospects](#). Projected yields are an annual increase of 0.8%, based on [FAO](#). Chinese, European, and American diets are shown in [FAOSTAT](#), and the land use impacts of these diets are estimated as in our diet and land use exhibit derived from [Clark and Tilman](#) and [Froehlich et al.](#). Total farmable land is estimated as the sum of current farmed, grazed, and arable land from [The World Bank](#).

References: Food and Agriculture Organization of the United Nations. "FAOSTAT".

United Nations, Department of Economic and Social Affairs, Population Division, Population Estimates and Projections Section. "World Population Prospects: The 2017 Revision". Accessed April 18, 2019.

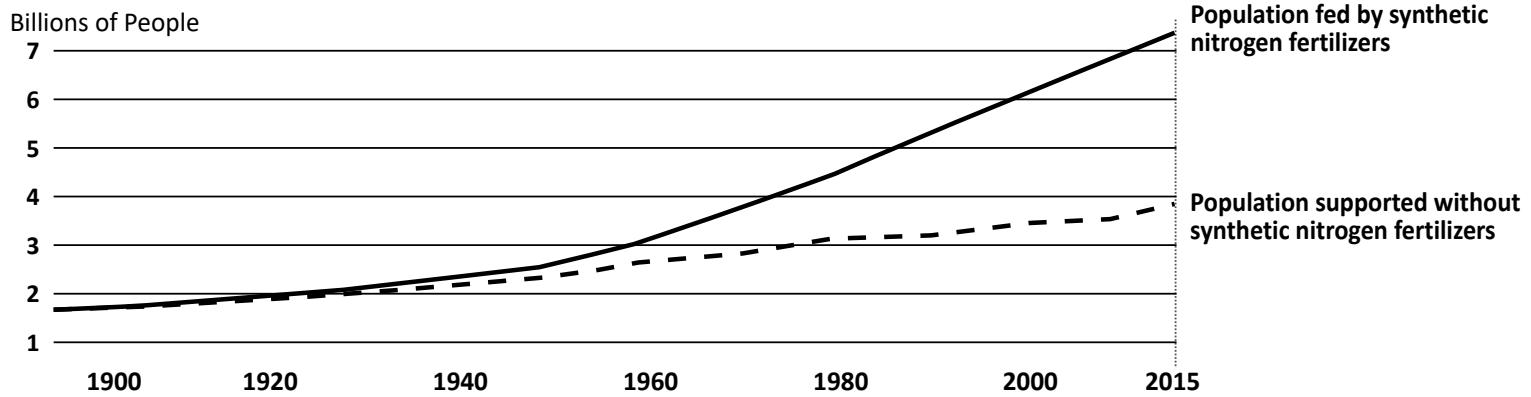
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Froehlich, H., Runge, C., Gentry, R., Gaines, S., Halpern, B. "Comparative terrestrial feed and land use of an aquaculture-dominant world". [Proceedings of the National Academy of Sciences of the United States of America](#) 115(20), pp. 5295-5300. May 2018.

Food and Agriculture Organization. "Global agriculture towards 2050". Office of the Director, Agricultural Development Economics Division. October 2009.

World Population Supported by Synthetic Nitrogen Fertilizers

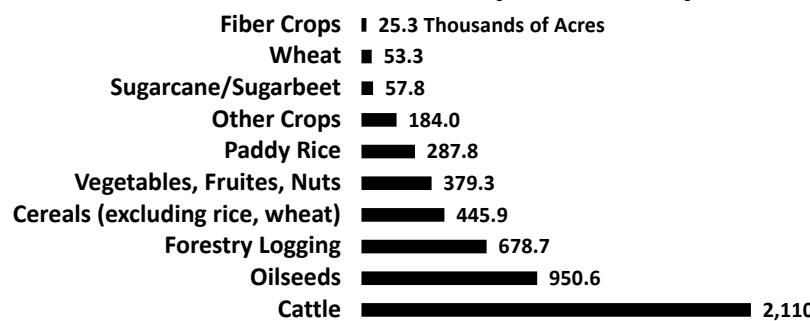


Source: Erisman, J. W., Sutton, M. A., Galloway, J., Klimont, Z., & Winiwarter, W. (2008).

[How a century of ammonia synthesis changed the world](#). [Nature Geoscience](#), 1(10), 636-639.

ALLOWING OTHERS TO LIVE

Annual Deforestation by Commodity



Research by Michael Goff, initial graphics and selection by Lee Nelson, layout and further selection by John van der Harst, and final graphics by Richard Burd, 2/24/2023

Ritchie, H. "Cutting down forests: what are the drivers of deforestation?". [Our World in Data](#). February 2021
Pendrill, F., Persson, U. M., Godar, J., Kastner, T., Moran, D., Schmidt, S., Wood, R. "Agricultural and forestry trade drives large share of tropical deforestation emissions". [Global Environmental Change](#) 56, pp. 1-10. May 2019..

DIET CHOICES - ETHICAL IMPACTS

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Animals Kept in Captivity

Captive Wild Animals (e.g. zoos, circuses)	10-100 Million (per year)
Laboratory Animals	<100
Working Animals	400
Companion Animals (mostly dogs and cats)	1,000
For Food, Pigs	1,000
For Food, Cattle	1,400
For Food, Sheep and Goats	2,000
For Food, Chickens	17,300

Animals Killed Annually

Laboratory Animals	100 Million
For Food, Cattle	300
For Food, Sheep and Goats	1,000
For Food, Rabbits	1,200
For Food, Pigs	1,400*
For Food, Chickens	50,300
Fish in Aquaculture	100,000

References: Fraser, D., MacRae, A. M. "Four Types of Activities that Affect Animals: Implications for Animal Welfare Science and Animal Ethics Philosophy". Animal Welfare 20(4), pp. 581-590. November 2011. *Pigs are sent to slaughter before they live for a complete year, so this number exceeds the number of pigs in captivity

Animals Slaughtered for Consumption

Cows

Natural Lifespan¹	20
Kept for dairy¹	5.4
Slaughtered for meat²	1.5

Bison

Natural Lifespan³	15 years
Kept for meat⁴	2.5

Pigs

Natural Lifespan¹	20.8
Kept for meat¹	1.8

Sheep

Natural Lifespan¹	22.8
Kept for wool³	5.5
Slaughtered for meat¹	5

Goats

Natural Lifespan¹	20.8
Kept for dairy¹	6

Chickens

Natural Lifespan^{6,7,8}	7
Kept for egg laying^{7,8}	1.2
Slaughtered for meat^{6,7,8}	0.1

Turkey⁹

Natural Lifespan¹⁰	3.5
Kept for meat¹⁰	0.5

Duck¹¹

Natural Lifespan^{12,13,14}	11.2
Kept for egg laying¹⁵	9
Kept for meat¹²	0.6

Geese¹⁶

Natural Lifespan¹⁷	22.5
Kept for meat¹⁸	0.3

Emu¹⁹

Natural Lifespan²⁰	15
Kept for egg laying²²	15
Kept for meat²¹	1.25

Catfish

Natural Lifespan²³	4.5
Kept for meat²⁴	2

Salmon

Natural Lifespan²⁵	10
Kept for meat²⁵	1.25

1.) Hoffman, J.M., Valencak, T.G. *A short life on the farm: aging and longevity in agricultural, large-bodied mammals*. *GeroScience* 42, 909-922 (2020). See Fig.1 for lifespan data.

2.) McDade, Erin. *The Lifespan of a Cow Depends a Lot on Their Job*. June 18th, 2021 Wide Open Media.

3.) National Parks Service. *15 Facts About Bison*. Accessed on 8/15/2022

4.) Sergeant, Deborah. *Raising and Selling Bison*. Accessed on 8/15/2022

5.) Animal Liberation. *16 Reasons To Stop Wearing Wool*. Accessed on 8/15/2022

6.) Compassion in World Farming. *About Broiler Chickens*. Acc. on 8/15/2022

7.) The Happy Chicken Coop. *How Long Do Chickens Live: 6 Factors That Impact Life Expectancy*. Accessed on 8/15/2022

8.) Lifespans vary with breed; numbers shown are averages of the previous two sources as well as other data points

9.) Not used to produce eggs commercially; *Source*. Accessed on 8/15/2022

10.) AZ Animals. *How Long Do Turkeys Live?* Accessed on 8/15/2022

11.) The Khaki Campbell breed is most commonly used for egg laying while the Muscovy is most commonly used for meat. This often leads to confusion as the Muscovy is technically not a duck (Genus: *Anas*) but a member of the *Anatidae* family which includes ducks, geese, and swans.

12.) Khaki Campbell ducks live for 10-15 years while Muscovys live for 8-12 years. The value shown is an average of the two

13.) Backyard Poultry. *Breed Profile: Khaki Campbell Duck*. July 20, 2019. Accessed on 8/15/2022

14.) Oakvale Wildlife Park. *Muscovy Duck*. Accessed on 8/15/2022

15.) Lesley, Chris. *Khaki Campbell Duck: Care Guide, Size, Eggs, and More...* June 7, 2022. Accessed on 8/15/2022.

16.) Embden are the most common goose breed used for commercial meat production. Generally speaking, Geese aren't used for commercial egg production *Source*. Accessed on 8/15/2022

17.) Gray, Elizabeth. *Emden Goose*. Pet Keen. August 3, 2022. Accessed on 8/15/2022

18.) Metzer Farms *Production Brochure*. Accessed on 8/15/2022

19.) Emus can live up to 35 years or more in captivity (without predation) but typically live between 10 & 20 years in the wild per next source below

20.) *How Long Do Emus Live?* Bird Fact, May 11, 2022. Accessed on 8/15/2022

21.) *Emu Processing & Emu Production* American Emu Association. Accessed on 8/15/2022

22.) *About American Emus*. Sugar Maple Farm Accessed on 8/15/2022

23.) Chapman, F. 2000. "University of Florida IFAS Extension" (On-line). *Farm-raised Channel Catfish*. Accessed on 8/15/2022

24.) *Ibid*. *§Nutrition and Feeding*. Accessed on 8/15/2022

25.) *What Is Farm-Raised Salmon? Is It Bad for You and the Environment?* The Human League August 16, 2021. Accessed on 8/15/2022

Animals Slaughtered for Consumption

Milk	0.6 Number of animals slaughtered to provide 5% caloric intake for a human lifespan.
Beef	7.6
Pork	21.7
Mutton	87.5
Eggs	230.9
Goat	248.1
Turkey	340.4
Duck	892.2
Poultry	81.49
Rabbit	1,268.5

Sources:

Food and Agriculture Organization of the United Nations. "FAOSTAT". Compassion in World Farming. "The life of: dairy cows". September 2012.

Food and Agriculture Organization of the United Nations. Egg Marketing - A Guide for the Production and Sale of Eggs. ISSN 1010-1365, FAO Agricultural Services Bulletin 150, Chapter 1. 2003

Food and Agriculture Organization. "Nutritive Factors". Accessed January 7, 2020.

Number of animals that are slaughtered or that produce their product over the animal's lifetime to provide 5% of a human's lifetime nutritional needs. Animal yields are given by FAOSTAT and translated into caloric terms through the FAO's nutritive factors database. Calculations assume a one-year productive life for egg-laying hens from FAO and for years for a dairy cow as reported in *Compassion in World Farming*. We assume a 73-year human lifespan with a caloric demand of 2884 calories per day (including losses and waste) as the world average from FAO.



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