

**Animals exploited and killed for food in Germany
per person, per year
&
Projected life-saving effects of vegan activists**

Version 3.0 (abstract)

01 Nov. 19

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1. Introduction

Animals that are killed for their flesh or are exploited for their procreation and secretions are often considered as an anonymous bulk. This makes it easy for people to lose connection and even though they are empathic and animal lovers they do not question that abuse. So one of the most interesting questions is, how many individuals per species are exploited and killed indirectly through consumption by an average person.

For land animals there are federal statistics on the total number of slaughter per species. However, those statistics include slaughter for exports. On the other hand live animals, meat, dairy products and eggs are imported in large numbers. In addition there is a considerable mortality rate of each species during breeding ranging from 3% for ducks to 21% for pigs. So, what are the real numbers per average consumer in Germany? This is even more difficult to answer for marine animals which are only measured in tonnes in most studies.

This analysis tries to find the most accurate numbers for Germany. It considers the direct killing of animals, the exploitation for dairy and eggs and some quantifiable animal suffering caused by optimized factory farming processes.

In the analysis, the adjusted annual values from various official studies are broken down to an average German consumer. Based on historical data, past cumulated killings can be calculated on individual level.

In a future projection potential savings of animal lives can be projected.

Using a parameter of individual change rates in individual consumption and a linear recurrence system it can be calculated how many lives would be saved for a conservative scenario in which at the average every 5 years each vegan inspires another person to go vegan (for calculation details see no. 23 in the final chapter).

This analysis only considers the effects of cutting out meat of most consumed species and dairy and eggs from an average person's diet (not rabbits, horses, deer, goats, etc.). It does not include considerations of all other animal exploitations and killings, e.g. for leather, fur, down, wool, animal testing, zoos, circuses, hunting.

Not considered either are the negative effects on the environment (CO₂, methan and N₂O emissions, rainforest deforestation, land usage, water consumption, soil degradation, use of pesticides, ocean dead zones, etc.), negative effects on people's health and negative effects on people especially in the third world (rising crop prices, drought, flooding, hurricanes, lack of water, etc.).

All sources and the main calculation methods are listed in the final chapter.

2. Results

2.1. Animals killed for eating

Animals killed for eating				
Land animals	pp per year ¹	in past 20 years ²³	in future 20 years ²⁴	Exponential effect ²⁵
Chickens	10,60	171	192	689
Pigs	0,65	14	12	42
Turkeys	0,63	10	11	41
Ducks	0,43	8	8	28
Lambs	0,08	2	1	5
Cows	0,06	2	1	4
Totals	12,5	207	225	810
Freshwater and marine animals	pp per year ^{2,3,4}	in past 20 years ²³	in future 20 years ²⁴	Exponential effect ²⁵
Food fish (Salmon, Herring, Tuna ...) incl. bycatch	23	445	411	1.476
Small fish for fishmeal and oil (avg. 42g)	208	4.069	3.760	13.504
Crustaceans, shells, molluscs (avg. 20g)	103	2.010	1.858	6.672
Totals	333	6.524	6.029	21.652

2.2. Animals killed and exploited for cheese, butter, milk and eggs

Animals killed and exploited for cheese, butter, milk and eggs				
Eggs	pp per year ^{5,6,7}	in past 20 years ²³	in future 20 years ²⁴	Exponential effect ²⁵
Male chicks shredded	0,85	16	15	56
Eggs consumed	256	4.779	4.633	16.637
Laying hens used to death	0,57	11	10	37
Milk	pp per year ^{8,9,10,11,12}	in past 20 years ²³	in future 20 years ²⁴	Exponential effect ²⁵
Milk (l) consumed (mainly cheese and butter)	358	7.104	6.478	23.264
Milk cows used permanently per person	0,05			
Milk cows consumed to death	0,02	0,37	0,33	1
Milk cows artificially inseminated	0,05		0,8	3
Calves taken from their mothers	0,05	0,91	0,83	3

2.3. Animal suffering due to optimized factory farming processes and mass demand

Animal suffering due to optimized factory farming processes and mass demand				
Piglets	pp per year^{13,14}	in past 20 years²³	in future 20 years²⁴	Exponential effect²⁵
Piglets castrated without anesthesia	0,2		3,6	13
Tails cut off from piglets without anesthesia	0,5		9	32
Cross-border live animal transports (only imports)	pp per year^{15,16,17,18}	in past 20 years²³	in future 20 years²⁴	Exponential effect²⁵
Poultry	3,2		59	211
Piglets	0,1		2,2	8
Pigs	0,04		0,7	3
Cows	0,002		0,0	0,2
Livestock	per person in every moment^{19,20,21,22}			
Fattened chickens, turkeys, ducks	1,75			
Laying hens	1,21			
Pigs	0,24			
Cows	0,19			

3. Calculation methods and sources

<p>¹ (Overall number of slaughter in Germany in 2017) MINUS (export surplus) ENHANCED BY (mortality) DIVIDED BY (number of German citizens MINUS vegetarians and vegans)</p> <p>- Overall number of slaughter: www.destatis.de/DE/ZahlenFakten/Wirtschaftsbereiche/LandForstwirtschaftFischerei/TiereundtierischeErzeugung/Tabellen/GewerbSchlachtungJahr.html</p> <p>- For poultry each category was calculated by the ratio given in "Fleischatlas": https://www.boell.de/de/2014/01/07/fleischatlas-2014</p> <p>- Overall meat export surplus in Germany in 2017: 1.154.941 tons, see https://www-genesis.destatis.de and screenshot; share of export surplus to meat production: 14.1%</p> <p>- Meat export surplus in Germany in 2016 per species: see https://www-genesis.destatis.de and screenshot</p> <p>- Mortality of poultry: https://www.boell.de/de/2014/10/15/fleischkonsum-abfall-verschwendung</p> <p>- Mortality of lambs: https://edoc.ub.uni-muenchen.de/18754/1/Frohmayer_Sieglinde.pdf</p> <p>- Mortality of calves in Bavaria (assumed to be similar in the whole of Germany): https://www.lfl.bayern.de/mam/cms07/publikationen/daten/schriftenreihe/p_19795.pdf</p> <p>- Mortality of pigs: https://www.tiho-hannover.de/de/aktuelles-presse/pressemitteilungen/pressemitteilungen-2017/pressemitteilungen-2017/article/untersuchungen-an-verendeteng/</p> <p>- number of German citizens in 2017: https://de.wikipedia.org/wiki/Deutschland; number of vegetarians and vegans in 2016: https://vebu.de/veggie-fakten/entwicklung-in-zahlen/anzahl-veganer-und-vegetarier-in-deutschland/</p>
<p>² (Overall consumption of saltwater and freshwater fish in Germany in 2014 in kg round weight per German citizen corrected by vegans and vegetarians) CATEGORIZED BY (18 most consumed fish species) DIVIDED BY (average weight of each species) ENHANCED BY (worldwide bycatch ratio of 27%) and SUMMED UP</p> <p>https://www.weltagraberbericht.de/fileadmin/files/weltagraberbericht/Weltagraberbericht/04Fleisch/DFV_GB2014_Fleischverzehr.pdf https://www.fischinfo.de/images/broschueren/pdf/FIZ_DF_2016.pdf http://fishcount.org.uk/published/std/fishcountstudy.pdf</p>
<p>³ (Worldwide ratio of fish for fishmeal and fishoil to round weight caught) MULTIPLIED BY (overall consumption of saltwater and freshwater fish in Germany in 2014 in kg per German citizen corrected by vegans and vegetarians PLUS fish for fishmeal and fishoil) DIVIDED BY (worldwide average weight of caught fish) ENHANCED BY (worldwide bycatch ratio of 27%)</p> <p>https://www.weltagraberbericht.de/fileadmin/files/weltagraberbericht/Weltagraberbericht/04Fleisch/DFV_GB2014_Fleischverzehr.pdf http://fishcount.org.uk/published/std/fishcountstudy.pdf</p>
<p>⁴ (Overall consumption of crustaceans, molluscs, shells in Germany in 2014 in kg round weight per German citizen corrected by vegans and vegetarians) DIVIDED BY (average weight of crustaceans, molluscs, shells)</p> <p>https://www.weltagraberbericht.de/fileadmin/files/weltagraberbericht/Weltagraberbericht/04Fleisch/DFV_GB2014_Fleischverzehr.pdf http://fishcount.org.uk/published/std/fishcountstudy.pdf https://www.fischinfo.de/images/broschueren/pdf/FIZ_DF_2016.pdf https://albert-schweitzer-stiftung.de/fische-krebstiere/krebstiere</p>
<p>⁵ (Total number of shredded male chicks) DIVIDED BY (consumption rate of domestic egg production (66%) i.e. considering the egg import) DIVIDED BY (number of German citizens MINUS vegans)</p> <p>https://www.destatis.de/DE/ZahlenFakten/Wirtschaftsbereiche/LandForstwirtschaftFischerei/TiereundtierischeErzeugung/Tabellen/GeschluepfteKueken.html</p>
<p>⁶ (Total numbers of eggs produced in Germany in 2013) PLUS (import surplus) DIVIDED BY (number of German citizens MINUS vegans)</p> <p>https://www.bmel.de/DE/Tier/Nutztierhaltung/Gefluegel/gefluegel_node.html</p>
<p>⁷ (Number of eggs consumed per person) DIVIDED BY (number of eggs a hen can produce until slaughter)</p> <p>https://de.wikipedia.org/wiki/Legehenne</p>

<p>⁸ (Total amount of milk produced by Germany) MINUS (export surplus) DIVIDED BY (number of German citizens MINUS vegans)</p> <p>https://ec.europa.eu/eurostat</p>
<p>⁹ (Milk consumed per person per year) DIVIDED BY (average milk production per cow per year)</p> <p>https://de.statista.com/statistik/daten/studie/153061/umfrage/durchschnittlicher-milchertrag-je-kuh-in-deutschland-seit-2000/</p>
<p>¹⁰ (Milk consumed per person per year) DIVIDED BY (total capacity of milk production per cow until slaughter, i.e. average milk production per cow per year MULTIPLIED BY 2.5 lactation periods)</p> <p>https://de.statista.com/statistik/daten/studie/153061/umfrage/durchschnittlicher-milchertrag-je-kuh-in-deutschland-seit-2000/ http://www.ml.niedersachsen.de/themen/tiergesundheit_tierschutz/tierschutz/tierschutzplan_niedersachsen/rinder/rinder-110869.html</p>
<p>¹¹ (Cows consumed for milk per person per year) MULTIPLIED BY (average number of lactation periods per cow)</p>
<p>¹² (Cows consumed for milk per person per year) MULTIPLIED BY (average number of lactation periods per cow)</p>
<p>¹³ (Median of number of piglets castrated in Germany per year) CORRECTED BY (export surplus) DIVIDED BY (number of German citizens MINUS vegetarians and vegans)</p> <p>http://www.ferkelkastration.de/</p>
<p>¹⁴ (Number of pigs consumed per person per year (see 1)) MULTIPLIED BY (portion of piglets getting tails cut off)</p> <p>http://www.tierschutzverein-rgbg.de/aktuelles/index.php?artid=220</p>
<p>^{15, 16, 17, 18} (Number of animals transported internationally (cross-boarder, only imports into Germany) CORRECTED BY export surplus) DIVIDED BY (number of German citizens MINUS vegetarians and vegans)</p> <p>https://de.wikipedia.org/wiki/Tiertransport</p>
<p>^{19, 20, 21, 22} (Number of animals kept in Germany MINUS export surplus) DIVIDED BY (number of German citizens MINUS vegetarians and vegans (depends on animal species))</p> <p>https://www.bmel.de/DE/Tier/Nutztierhaltung/Gefluegel/gefluegel_node.html 05/2018: https://www.destatis.de/DE/ZahlenFakten/Wirtschaftsbereiche/LandForstwirtschaftFischerei/TiereundtierischeErzeugung/Tabellen/Betriebe_Legehennenhaltung_Eiererzeugung_Legeleistung_nach_Haltungsformen_vorl_2018.html https://www.destatis.de/DE/ZahlenFakten/Wirtschaftsbereiche/LandForstwirtschaftFischerei/TiereundtierischeErzeugung/Tabellen/BetriebeSchweineBestand.html https://www.destatis.de/DE/ZahlenFakten/Wirtschaftsbereiche/LandForstwirtschaftFischerei/TiereundtierischeErzeugung/Tabellen/BetriebeRinderBestand.html 2016, laying & fattened hens, https://www-genesis.destatis.de</p>
<p>²³ Past years are calculated based on statistical data, depending on trends the main function is split into sub-functions. The general formula is: $IF(Period < StartPeriod, 2, ROUND((-YearlyFactor * (Period^2)) + (-YearlyFactor - 200) * Period) / 200 * NumberAnimalsConsumedRecentYear * (1 + PersonalConsumptionRate / 100), ROUND((-YearlyFactor * (EndPeriod1^2) + (-YearlyFactor - 200) * EndPeriod1) / 200 * NumberAnimalsConsumedRecentYear * (1 + PersonalConsumptionRate / 100)) + (ROUND(1 / 100 * (Period - EndPeriod1) / 2 * (YearlyFactor2 * (1 - (Period - 27)) + 2 * 2ndPeriod) * NumberAnimalsConsumedRecentYear * (1 + PersonalConsumptionRate / 100))))$</p> <p>Basis of above function is the formula for a finite arithmetic serie with first term a, common difference d and n terms: $(1/2) * n * (2 * a + (n - 1) * d)$</p>
<p>²⁴ In this scenario it is assumed that the consumption of meat, dairy and eggs decreases every year by 1 % ($d = 1$) per omnivore related to year zero, due to higher prices and more and more meat, dairy and egg substitutes (e.g. plant based and lab grown meat, dairy, eggs), i.e. in year 20 only 80% of meat, dairy and eggs are consumed per omnivore related to year zero</p>

²⁵ The exponential effect is calculated based on the following conservative assumptions:

- at the average every vegan inspires one person to go vegan every 5 years ($c=5$)
- the consumption of meat, dairy and eggs decreases every year by 1 % ($d=1$) per omnivore related to year zero, due to higher prices and more and more meat, dairy and egg substitutes (e.g. plant based and lab grown meat, dairy, eggs), i.e. in year 20 only 80% of meat, dairy and eggs are consumed per omnivore related to year zero
- all vegans stay vegan, no one dies in the period considered
- the exponential effect is only considered for 20 years ($p=20$), i.e. a person having turned vegan in year 5 cuts out animal products for 15 years, a person having turned vegan in year 15 only cuts out animal products for 5 years and a person having turned vegan in year 20 cuts out animal products for 0 years
- the exponential effect is modelled using a first order linear recurrence system of this generalized form:
 $x[0]: p \cdot (201-p)/200$; $x[n]: -x[n-1] + (2^{n-1}) \cdot ((1/2) \cdot (p - (c \cdot n)) \cdot (2 \cdot (101 - p \cdot d) + (p - c \cdot n - 1) \cdot d)) / 100$; ($n=1, 2, 3, \dots, p/c$)
- the exponential effect of the above assumptions results in 16 vegans; if 50 years were considered the factor would grow to 1024