

# Meat, maladies and the macrocosm:

## Why curtailing meat consumption is essential for global population health and the environment

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Excessive food consumption has repercussions for the climate, global ecosystems and human health, the last evidenced by increased incidence of obesity and non-communicable diseases including, cancer, diabetes and cardiovascular disease. Dietary studies show that every income bracket is affected by inadequate intake of appropriate nutrients and in many countries both malnourishment and obesity are prevalent. Escalation in meat consumption in recent decades – a symptom of cultural shifts, population growth and globalisation – is part of the problem.

We investigated the health benefits of reduced meat consumption through a synthesis of current literature. Reducing – but not

necessarily eliminating – the consumption of red and processed meat has health benefits. Studies suggest a diet comprising no more than 300g of cooked red meat per week can help reduce the risk of developing colorectal cancer. A balanced diet high in non-starchy vegetables and fruits can reduce the risk of developing chronic diseases including cancers of the digestive tract, lung and liver. Substituting one serving of red meat per day with nuts was associated with a 30% reduction in the risk of developing coronary heart disease.

Reducing industrial-scale meat production could bring huge environmental benefits. Livestock farming produces 14.5% of all

anthropogenic greenhouse gas emissions. Decreasing the meat content of a typical western diet by 30% could lower those agricultural emissions by 14%, and begin to address habitat loss, aquatic and airborne pollution, the misuse of antibiotics and disease transmission.

Large-scale epidemiological studies demonstrate the benefits of diets high in fruits, vegetables, pulses, nuts and tubers and low in processed foods and meat. One of the greatest challenges will be to change entrenched consumer behaviour. A powerful tool to overcome the inertia will be clear communication of scientific evidence for the health and environmental advantages of plant-based diets to encourage positive choices.

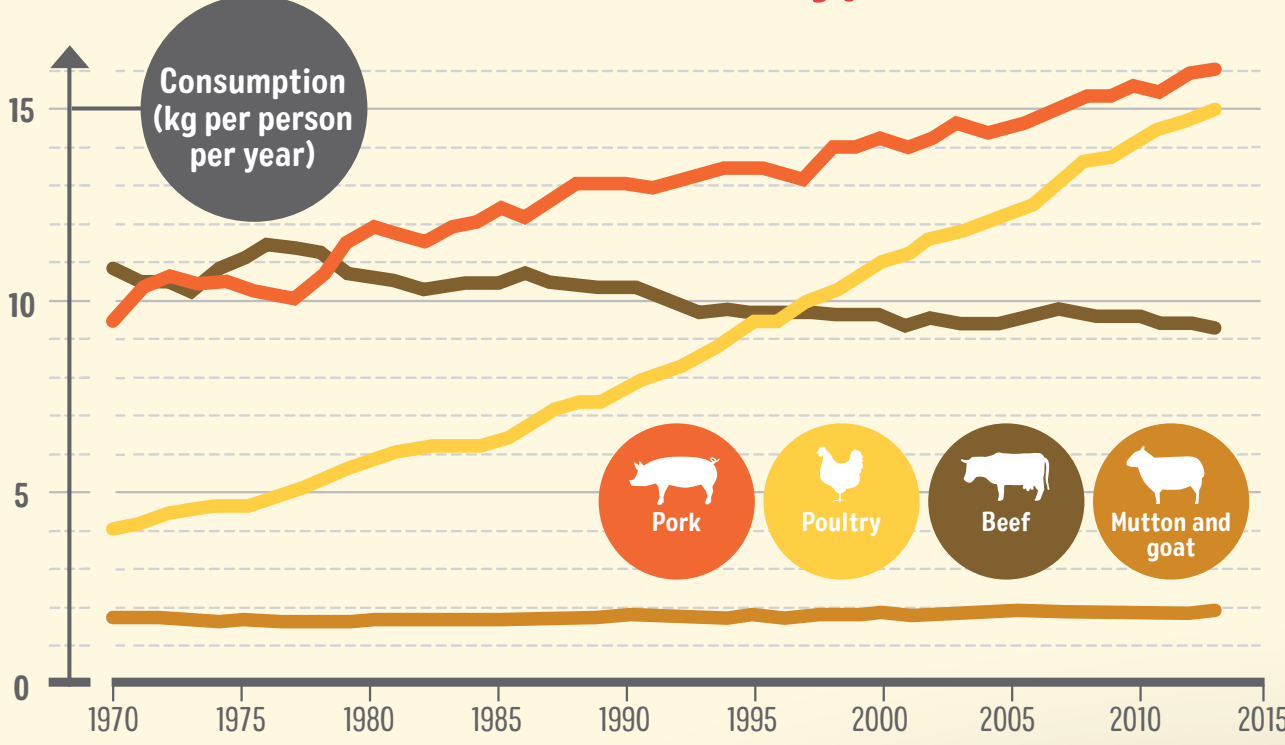
## The current situation in livestock and grain production and consumption

Using a synthesis of the published literature, we investigated the impact of meat production and consumption on global population health and the environment.

- Increased consumption of pork and particularly poultry is because of growing populations and incomes in developing countries (Henchion et al., 2014).

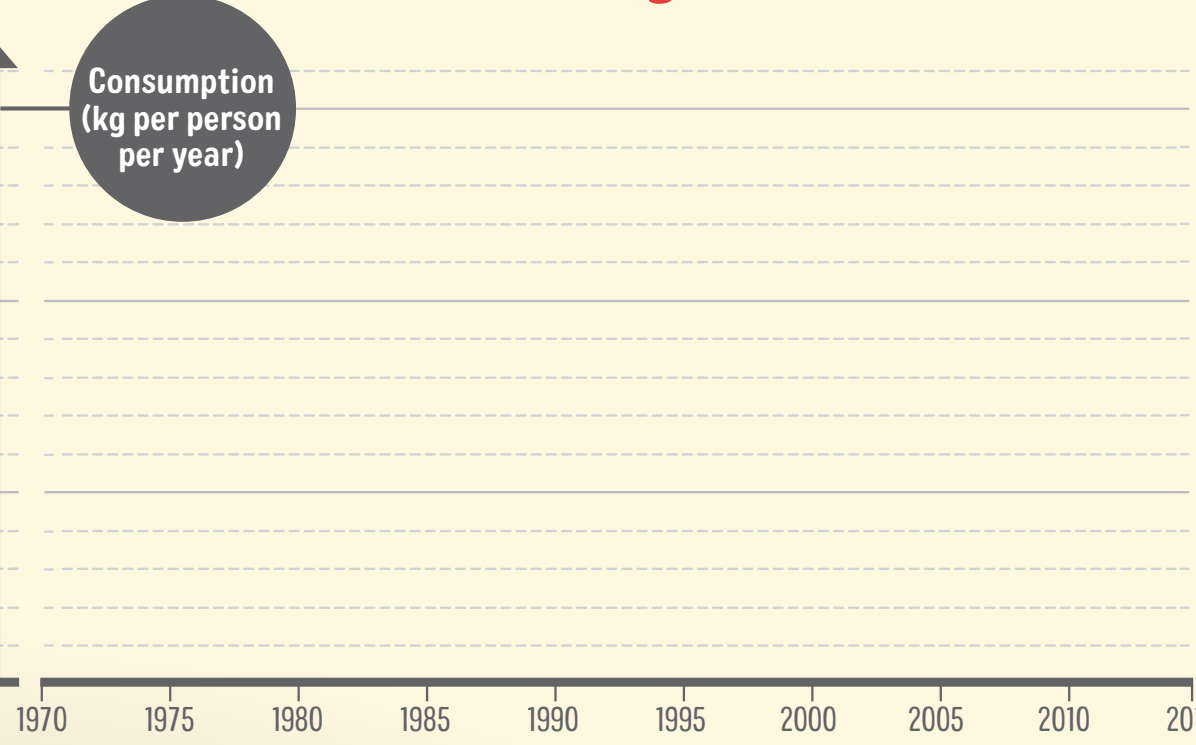
- Global meat consumption is increasing, but remains low in Asia and Africa and is declining in Western Europe. Population increase, economic growth, cultural shifts and urbanisation have driven demand for foods of animal origin (Koo et al., 1997; Tilman & Clark, 2014).

Annual global average consumption of different meat types



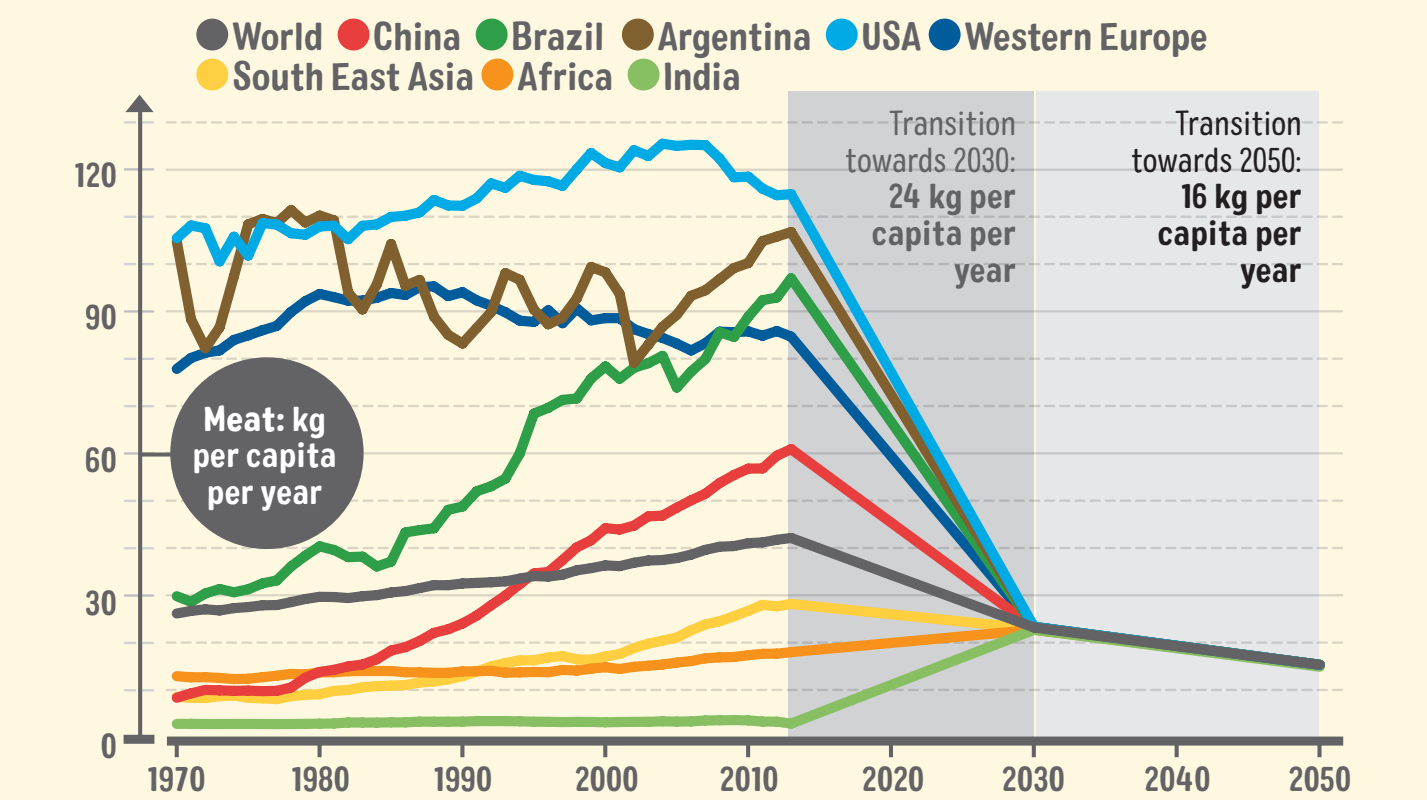
Global average consumption of different meat types from 1970 to 2013. These products were the major meat types consumed in kg of product per person per year (carcass weight, meaning raw unprocessed products at the point of retail sale). Data from FAOSTAT (2018)

Annual global average consumption of six different grains



Global average consumption of different meat types from 1970 to 2013. These products were the major meat types consumed in kg of product per person per year (carcass weight, meaning raw unprocessed products at the point of retail sale). Data from FAOSTAT (2018)

Meat consumption per capita from 1970 until 2013



Average global meat consumption per person from 1970 to 2013, and in the USA, Argentina, Brazil, Western Europe, China, Southeast Asia, Africa and India (FAOSTAT, 2018, latest data for 2013, per kg of meat in carcass weight). We indicate the target values for the Greenpeace goal towards 2030 and 2050.

## Health impacts of eating meat

Convincing evidence associates high meat consumption with negative health outcomes.

- The International Agency for Research on Cancer announced in 2015 that it had classified red meat as 'probably carcinogenic to humans' and processed meat as 'carcinogenic to humans' (IARC, 2015).

- Meat-associated compounds that have been associated with non-communicable diseases include glycolylneuraminic acid, nitrates and nitrites, and heme iron (Abete et al., 2014; Bouvard et al., 2015; Samraj et al., 2015; Etemadi et al., 2017).

- Agriculture, crop and livestock production, is responsible for emissions of particulate matter that impacts global population health and contributes to premature mortality (Lelieveld et al., 2015).

- Health risks associated with the consumption of red meat in particular include:

- Increased risk of developing some cancers, including colorectal, stomach, liver, lung, bladder, pancreatic and oesophageal.

- Increased risk of cardiovascular disease and heart attack.

- A rise in the global prevalence of obesity and an increased risk of developing type II diabetes.

## Varied dietary intake

A carefully planned plant-based diet can meet nutritional needs and provides all necessary nutrients, vitamins, minerals and amino acids apart from vitamin B12 (for example, Craig & Mangels, 2009).

Limit consumption of red meat to less than 300g per week (WCRF/AICR, 2007).

### Healthy and unhealthy foods (Imamura et al., 2015)

Diet component						
Fruits (100 g/serving)	Vegetables, including legumes (100 g/serving)	Nuts/seeds (100 g/serving)	Wholegrains (50 g/serving)	Seafood (100 g/serving)	Red meat, unprocessed (100 g/serving)	Processed meat (50 g/serving)
Why 'healthy'/'unhealthy'						
<ul style="list-style-type: none"> <li>Coronary heart disease (CHD)</li> <li>oesophageal cancer</li> <li>lung cancer</li> <li>stroke</li> </ul>	<ul style="list-style-type: none"> <li>CHD</li> <li>oesophageal cancer</li> <li>stroke</li> </ul>	<ul style="list-style-type: none"> <li>CHD</li> <li>diabetes</li> </ul>	<ul style="list-style-type: none"> <li>CHD</li> <li>diabetes</li> </ul>	<ul style="list-style-type: none"> <li>CHD</li> <li>stroke</li> </ul>	<ul style="list-style-type: none"> <li>Diabetes</li> <li>colorectal cancer</li> </ul>	<ul style="list-style-type: none"> <li>CHD</li> <li>diabetes</li> <li>colorectal cancer</li> </ul>
HEALTHY				UNHEALTHY		

Foods that can have an impact on the risk of developing non-communicable diseases (CHD is an abbreviation of coronary heart disease). From: GLOPAN, 2016. Global Panel on Agriculture and Food Systems for Nutrition. 2016. Foresight report: Food systems and diets: Facing the challenges of the 21st century. London, UK. 132 pp.

## Health benefits from eating a minimal-meat, plant-based diet

Food choices have the potential to confer significant health benefits.

- Adopting a plant-based diet brings an approximately 40% reduction in risk of developing type II diabetes (Tilman & Clark, 2014).

- Replacing one serving of red meat per day with one serving of nuts, low-fat dairy, poultry or fish is associated with a decreased risk of developing coronary heart disease (Bernstein et al., 2010).

- There is little evidence that consumption of dairy, poultry or fish are detrimental to human health (Salter, 2013).

## Future directions for the agricultural industry

- The current trend in affluent societies and rapidly developing nations is towards increasing availability of industrially-produced meat. Reversing the trend will require behaviour change, interdisciplinary collaboration and effective science communication to encourage consumers to make informed choices. Environmental groups need to take into account different production systems, health, religious beliefs and cultural values to effectively encourage the adoption of sustainable food systems.

- The rise in non-communicable disease is not only because of diet – other factors at play include smoking, exercise and genetics.

- Industrial agriculture is pushing planetary boundaries to the limit (Steffen et al., 2015). Sustainable farming and shifting to plant-based diets could reduce land use by 70% and reduce water use by 50% (REF).

## Mass production of livestock

Intensive livestock farming practices can have implications not only on human health but also on the environment and animal welfare.

- Globally, cropland and pasture takes up around 55% of the Earth's ice-free land areas (Tilman & Clark, 2014).

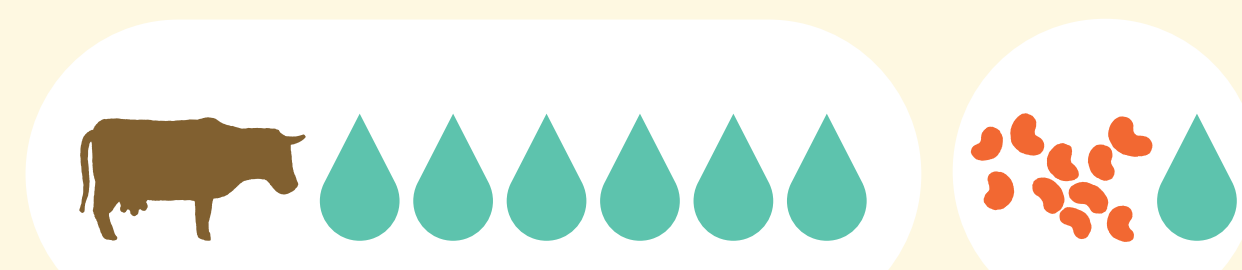
- Animal feed is a significant factor in the environmental impact of meat and dairy production. Globally, approximately 75–80% of all agricultural land is used to produce fodder for livestock (Foley et al. (2011) report 75%, Stoll-Kleemann & O'Riordan (2015) report 80%).

- Impacts of intensive livestock farming include groundwater pollution, air pollution, the release of chemical contaminants into the environment, antimicrobial resistance, zoonotic diseases, and threats to water security and biodiversity (Röös et al., 2017; Swain et al., 2018).

- According to Eshel et al. (2014) the land required for beef production is 28 times greater than dairy, pork, poultry and eggs combined.

- Direct GHG emissions from the agriculture sector account for 24% of all global emissions, and livestock emissions (including land-use change) account for 14%, which is comparable to the emissions from the whole transport sector (Smith et al., 2014).

- Between 3 and 6 MJ human-edible feed is required to produce 1 MJ energy in the form of meat (Salter, 2017).



- Per gram of protein, the water footprint of beef is six times larger than that of pulses. (Mekonnen & Hoekstra, 2012)

- Expansion of grazing and cultivation of land for livestock feed is often at the expense of native forest, grassland or savannah.



- In the 50 years from 1960 to 2011, production of animal products was responsible for 65% of global land-use change and the expansion of cultivated land. (Alexander et al. 2015)



- Around 80% of all threatened terrestrial bird and mammal species are threatened by agriculturally driven habitat loss. (Allievi et al., 2015)

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