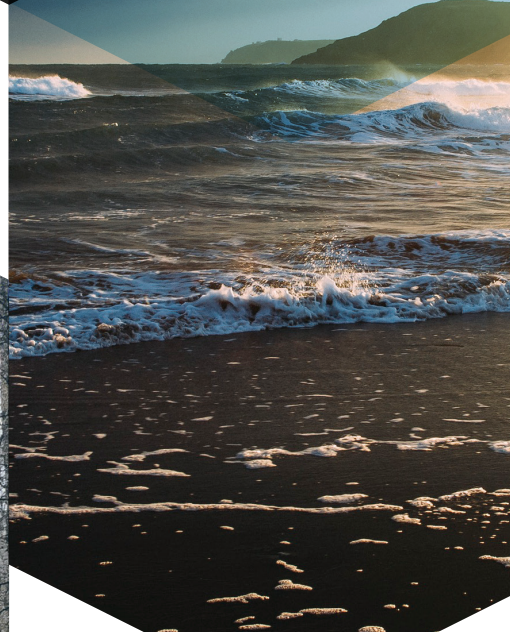


THE ENVIRONMENTAL IMPACT OF ANIMAL-BASED FOODS



The Environmental Impact of Animal-Based Foods

Experts say global trends in eating habits are detrimental both to the environment and to human health, and that a significant shift in consumption practices among high consuming populations is needed. Livestock* rearing, for meat and dairy products, carries a particularly high environmental cost. At the same time, these eating patterns, alongside other lifestyle factors, are putting an unsustainable burden on health services around the world.

Water Pollution

~70% of the global dietary phosphorus footprint (1961-2007) is linked to animal foods

(Metson et al 2012)

Each year Livestock produce 7-9 times more manure output than humans do

(Schipanski & Bennet, 2012)

The production of livestock can be linked to ~60% nitrogen pollution released to the environment

(Pelletier & Tyedmers, 2012)

Biodiversity Loss

Livestock production is a major driver of biodiversity loss globally, linked by one study to ~30% of human caused losses

(Westhoek et al, 2011)

In many places, encroachment upon ecosystems by agricultural expansion puts livestock producers in conflict with carnivores, making them vulnerable to extinction

(Ripple et al, 2014)

Food security

~1/3 of global crops are fed to animals

(Cassidy et al, 2013)

On average, 4 calories of crop-based feed roughly equals 1 calorie of animal products

(Pradhan et al, 2013)

Less than 20% of the protein in feed fed to animals becomes meat

(WRI, 2013)



Climate Change

Studies show, that to stop global temperatures rising beyond the dangerous 2°C level of climate change, demand for livestock products must be reduced

(Hedenous et al 2014; Bajželj et al, 2014; Pelletier & Tyedmers, 2010; Davidson, 2012; Tilman & Clark 2014)

The raising and feeding of livestock produces ~14.5% (7.1 GtCO₂eq) of global greenhouse gas emissions

(UNFAO 2013)

Between 1961-2010 emissions from livestock rose by ~51%

(Caro et al, 2013)

Land Competition

Some livestock rearing can be considered resource efficient, by using land unsuitable for crops or forests, or by consuming crop residues. But only ~30% of current production could be reared this way

(Bajželj et al, 2014)

Livestock are linked to ~70% of historic deforestation in the Brazilian Amazon

(Nepstad et al, 2014)

Water Stress

Livestock production uses ~17% of the freshwater extracted globally for agriculture

Of this ~12% is for the irrigation of crops fed to animals

(Mekonnen and Hoekstra, 2010)

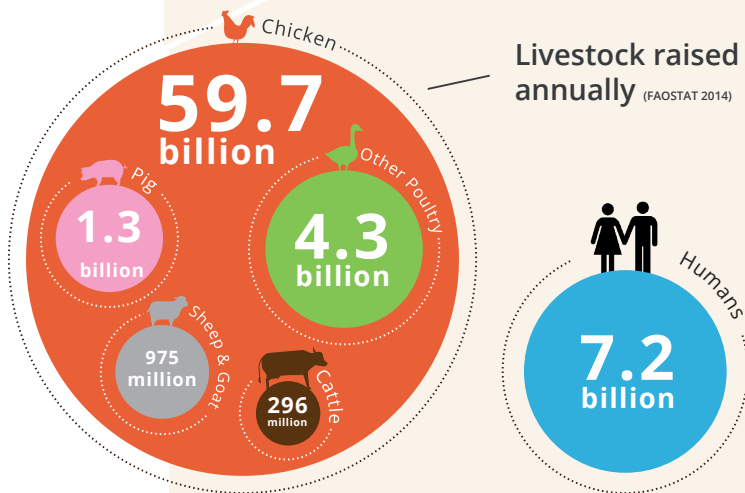
Around 1 billion people rely on livestock for their sustenance and livelihoods, and farm animal production can be important for agricultural nutrient recycling, and in some cases maintaining traditional ecosystems and biodiversity. However the sheer scale of livestock production today is unsustainable. It places disproportionate pressure on environmental, food and increasingly health systems. It also contributes significantly to climate change, takes up finite land, contributes to deforestation and land degradation, and wastes natural resources. In industrialised countries and among high consuming individuals across the world, excessive animal food consumption is linked to a range of chronic diseases. This nexus of issues, when considered together, paints a strong case for acting to reduce consumption of animal-based foods, both individually and collectively.

* for the purposes of this document, livestock refers to land animals raised for produce goods for people

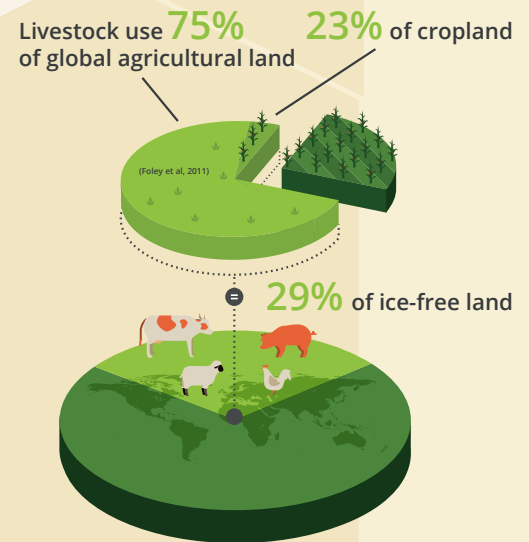
How big is livestock production?

The other "population bomb"

Raising **70 billion** animals annually adds up to large impacts



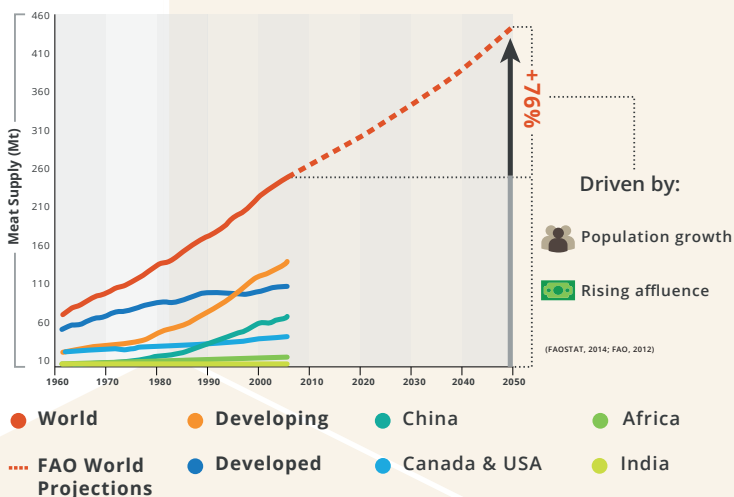
Livestock dominate land use



The collective weight of all livestock is **twice that** of all humans, as well as all large wild animals on earth, combined (Barnosky, 2008)

What does the future look like?*

Demand is set to grow considerably



By 2050, consumption of **meat** and **dairy** products is expected to have **risen 76 % and 65%** respectively against a 2005-07 baseline (FAO, 2012)

75% of the global increase in livestock production up to 2030, is expected to come from industrialised production methods; mostly in developing countries (Bruinsma, 2003)

If the entire world were to eat the average North American diet, this would result in a **320% increase in the global consumption of animal protein** and a **doubling in the area of global cropland** (Sutton et al, 2013; Kastner et al, 2012)

If current global dietary trends continue*

Global agricultural emissions in 2050 could be up to **80% greater** than in 2009, and total global **cropland and pasture area** could have **expanded by up to 43% and 13%** respectively (Bajzelj et al, 2014)

By 2050, over more crops could be being fed to livestock than to humans (Pradhan et al, 2013)

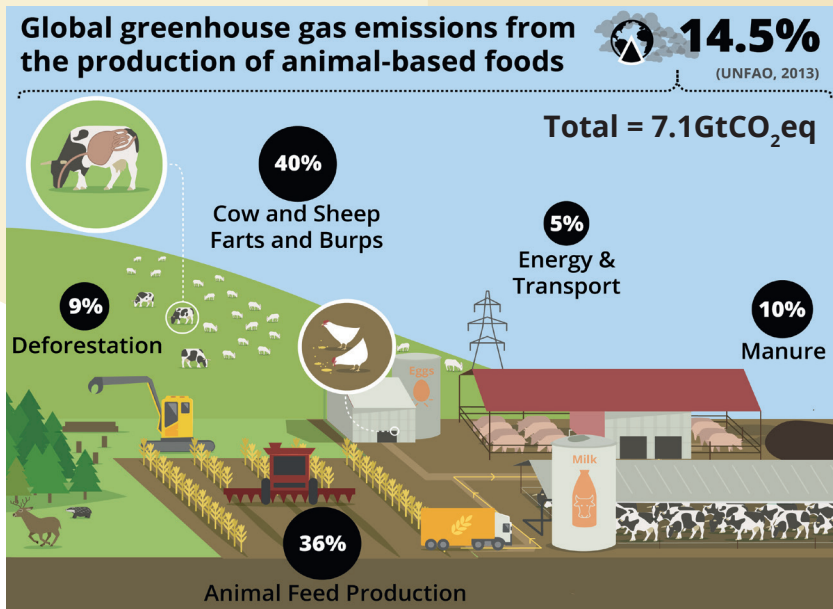
There may not be enough sustainable water resources to feed the expected population in 2050 (Jägerskog and Clausen, 2012; Springer & Duchin, 2014; Jalava et al, 2014)

By 2050 the amount of **reactive nitrogen pollution** released into the environment could **increase by 36%** on 2000 levels (Pelletier & Tyedmers, 2012)

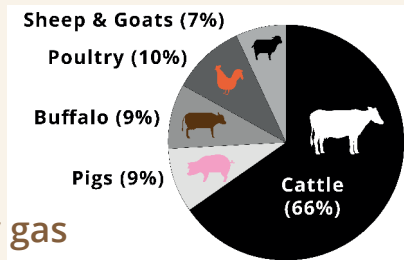
* These statements are not predictions or statements of fact. They come from modelling of alternative future worlds, and show possible futures, conditional on assumptions about future trends made by researchers.

How do livestock contribute to climate change?

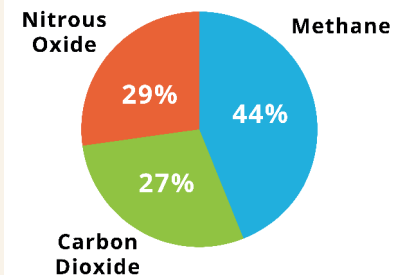
Emissions of greenhouse gases accrue along the livestock production chain



By animal



By gas



Why does this matter?

Livestock are the single largest human caused source of non-CO₂ greenhouse gases, producing **44%** and **53%** of **methane** and **nitrous oxide** emissions, respectively

(FAO, 2013)

Depending on the accounting method used, livestock produce **50-80%** of global **agricultural emissions**

(Tubiello et al, 2013; WRI 2013)

If current trends towards increasing consumption of livestock continue, and if a cap on emissions is put in place to limit warming to 2°C or less, by 2050, **70% of the cap** would be taken up by the livestock sector alone

(Pelletier & Tyedmers, 2010)

The efficiency gap

It is estimated that the livestock sector could reduce its emissions **~32%** by adopting ambitious yet achievable farming techniques, but these improvements would still be insufficient to compensate for the expected growth in future demand for livestock products

(FAO, 2013; see Fig 28)

Studies show that in order to achieve greenhouse gas reductions from the livestock sector, consistent with keeping climate change below the **dangerous 2°C level**, **reduction in demand of animal-foods will be essential.**

(Hedenous et al, 2014; Bajzelj et al, 2014; Pelletier & Tyedmers, 2010; Davidson, 2012; Tilman & Clark 2014)

How big is the opportunity?

Modelling suggests that worldwide adoption of the Harvard Healthy diet (including modest consumption of meat) could reduce **the cost of cutting emissions in the energy sector up to 2050, by 50%**, and that under a global plant-based scenario, savings could be as great as 80%.

(Stehfest et al, 2009)

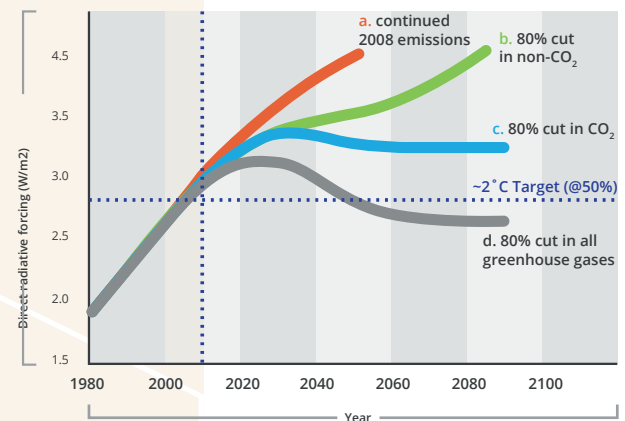
A recent review of mitigation opportunities in agriculture up to 2030, compared the Harvard Healthy diet scenario to actions in other sectors, and found it to have higher potential than any other option

(Dickie et al, 2013)

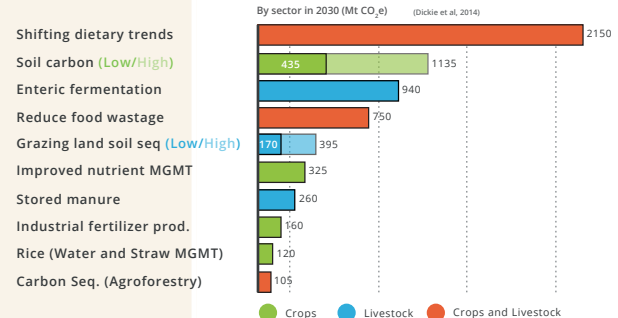
In its latest report, the IPCC (2014) has stated "changes in diet, reductions of losses in the food supply chain, and other measures could have a significant impact on GHG emissions from food production (0.76-8.55 GtCO₂eq/yr by 2050)"

Non-CO₂ gas reductions are essential to achieving global climate targets

(Ripple et al, 2014; Popp et al, 2010; Davidson, 2012)



Mitigation opportunities in agriculture



What if we shifted our consumption to.....?

Grass-fed beef?

Grass-fed beef can produce 60-70% more emissions and can require almost 80% more land

(Capper, 2012)

Wild fish?

In 2009, 30% of marine stocks were over exploited, and another 57% were fully exploited, with only 13% exploited at less than their potential

(FAO 2012)

Lab meat?

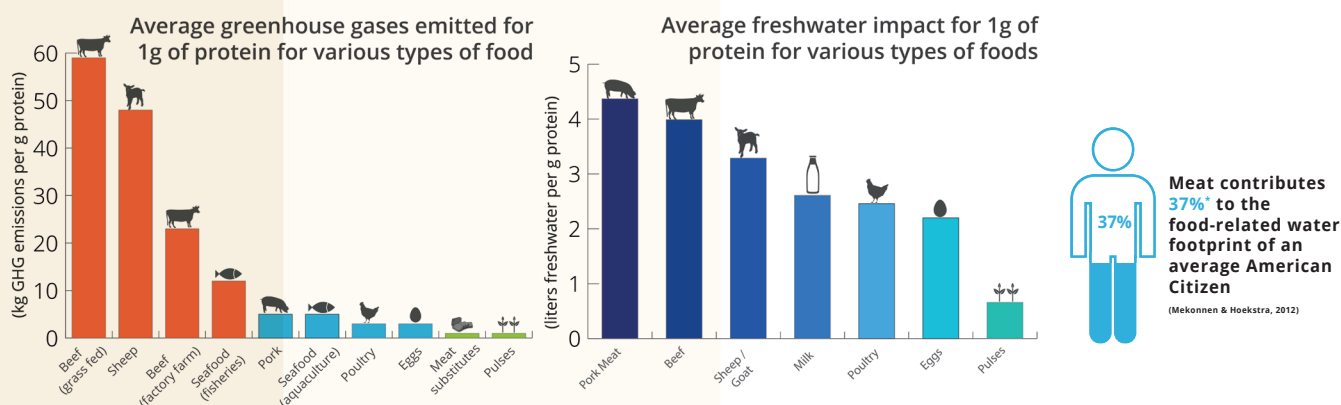
Meat or milk engineered in a lab is not a 'silver bullet'. It may be an option in 10-20 years, and would likely have significantly less environmental impact, should people accept it

(Tuomisto & Mattos, 2011)

How can dietary change have an impact?

On average, for the same amount of protein, plant-based foods have a lower climate footprint and water footprint than animal foods

(Ripple et al, 2014; Nijdam et al, 2012; Mekonnen & Hoekstra, 2012)



Plant-based diets can have half the climate footprint of the typical US or UK diet

(Scarborough et al, 2014; Heller and Keolian, 2014)



Approximately 1 GtCO₂e worth of animal-foods are wasted along supply chains globally each year, equalling roughly 1/5 of the world's agricultural land. In developed countries, most of this waste occurs after purchasing.

(UNFAO 2011)

* water footprint statistics that include both freshwater abstraction (blue water) and the volume of rainwater (greenwater) used in the production of food

