

MITIGATING CLIMATE CHANGE THROUGH FOOD POLICY: The Livestock Connection and Solution

Introduction

It is now widely acknowledged that climate change is already a planetary emergency. The Intergovernmental Panel on Climate Change Fourth Assessment Report reviewed and analysed a large body of scientific evidence that has put the truth of human-induced climate change beyond any doubt. Numerous researches published after the deadline for this last assessment reveal that global warming is in reality happening much faster, stronger and sooner than IPCC 2007 forecast (WWF 2008). According to the Chairman of the panel, Dr Rajendra Pachauri, *“If there is no action before 2012, it is too late. What we do now in the next 2-3 years will determine our future. This is the defining moment.”*

This proven acceleration of climate change calls for even more rapid and ambitious mitigation and adaptation responses. However, there is one crucial piece to the puzzle that has received less than its due share of attention from the scientific and political world. This paper summarises some major research works that evidence the undeniably close connection of livestock production to climate change, as well as to some other global issues.

The purpose of this paper is to highlight the collective and mounting evidence on livestock's damaging impact on our planet and our health, with the hope that your invaluable input will help to inform the public about the full impact of meat production and also to help influence Government strategy as a priority, at a national and international level.

1. Greenhouse Gas Emissions

The UK Cabinet paper, Food Matters, states that the food chain, particularly farming is a large contributor to global GHG emissions. In NZ, about 50% of GHG emissions are related to food production and consumption. Most of these emissions come from farms, mainly in the form of methane and nitrous oxide.

When talking about greenhouse gas emissions, emphasis has mainly been put on carbon dioxide. Rightly so, given that it is the most abundant greenhouse gas in the atmosphere. However, methane, the second most important greenhouse gas, has shown some disproportionately rapid increase in recent human history: global methane has risen by 148 percent over 255 years from 1750, while carbon dioxide emissions have increased by 35 percent over the same period of time (IPCC 4th Assessment). Taking into account that methane is a much more potent greenhouse gas, especially within a shorter timescale – 25 times the global warming potential (GWP) of carbon dioxide over a 100-year period, and 72 times GWP of carbon dioxide over 20 years (IPCC 4th Assessment) – its sharp increase could have a devastating impact on this planet.

Research has shown that the melting of the permafrost and subsequent release of methane is a "ticking time bomb". Frozen bubbles in Siberian lakes are releasing methane at rates that appear to be “five times higher than previously estimated.” The release of methane could create an uncontrollable feedback effect, dramatically

warming the atmosphere, which would in turn warm the land, lakes and seabed, further melting the permafrost and releasing more methane. Once that threshold is reached, there will be nothing humans can do. (Walter et al 2007). Research by scientists at the University of Alaska, USA has shown that a two to three-degree rise in air temperatures could cause the Arctic tundra to change to an area of carbon source as opposed to one of carbon sink releasing into the atmosphere carbon dioxide, methane and other gases. (Ping et al 2008).

The fast release of methane into the Earth's atmosphere 55 million years ago caused rapid warming and mass extinction of species, disrupting the climate for more than 100,000 years. Another catastrophe, 251 million years ago, came close to destroying nearly all life on Earth due to the release of methane (Atcheson 2004).

The very quality of methane that makes it so damaging also points to a quick and effective way to halt global warming – by significantly reducing anthropogenic methane. However powerful it is, with a net life cycle of 8.4 years in the atmosphere and a reduced global warming potential in longer time frames, any reduction in methane could quickly translate into alleviation of the warming effect.

It has been established that the livestock industry is the single largest producer of methane, responsible for 37 percent of global anthropogenic methane emissions. It is also by far the largest emitter of Nitrous Oxide (65 percent), the third most important GHG with 296 times GWP of carbon dioxide over 100 years, or 275 times GWP of carbon dioxide over 20 years (FAO 2006).

The whole livestock production chain also contributes to 9 percent of anthropogenic carbon dioxide emissions, primarily due to land use changes for feed and animal production and fossil fuel use during animal, feed and fertiliser production (FAO 2006).

Overall, the greenhouse gases produced by the livestock sector account for about 80 percent of the emissions from agriculture and nearly one fifth (18 percent) of total greenhouse gas emissions from human activities (FAO 2006). This is calculated over a 100-year period and the figure does not take into account transportation, refrigeration in transport or the amount of energy used at home for storing meat.

One research comprehensively evaluated the effect of greenhouse gas emissions of three types of diet: an omnivorous diet including meat, dairy and plant foods, a vegetarian diet containing dairy and plant foods, and a vegan diet containing only plant-based foods (Foodwatch 2008).

Agriculture as Climate Killer

Greenhouse effect from different kinds of eating habits, per capita and per annum, presented in car kilometers*

Veganism



Vegetarianism



Diet includes Meat



*equivalent to the CO₂ emissions of a BMW 118d with 119 g CO₂/km

Source: Foodwatch

DER SPIEGEL

The study shows striking differences between the three diet categories in terms of their contribution to greenhouse gas emissions. It is also interesting to note that even an organic meat-based diet creates seven times the emissions of a non-organic vegan diet.

Another paper shows that adopting a meat-free diet for just one day a week in the UK would save 13 megatons of carbon dioxide emissions. This is a greater carbon saving than taking 5 million cars off the roads in the UK (10.4 megatons of carbon dioxide), and almost equivalent to replacing one billion light bulbs with low-energy ones (van Beukering et al 2008).

2. Energy consumption

Meat production is very energy intensive. It is estimated that producing one calorie of animal protein requires more than 10 times as much fossil fuel input as does one calorie of plant protein (Pimentel and Pimentel 2003). The production of just 1 kg of beef consumes 40 mega calories of energy, and emits greenhouse gases with a warming potential of 36.4 kg of carbon dioxide, equivalent to the amount of CO₂ emitted by an average European car running every 250 km. Over two-thirds of the energy goes towards producing and transporting the animals' feed (Ogino et al 2007).

3. Deforestation

Every year, 17 million hectares of tropical rainforest is destroyed (RIC). Seventy percent of the Amazon's deforestation is due to making pasture land for cattle, and a large part of the remainder is used for feed crops (FAO 2006).

Forests play a key role in mitigating climate change. Apart from storing carbon, they store water, generate rainfall, act as a climate buffer, stabilise the soil, maintain biodiversity and much more (GCP). Decimating them for pasture has a very high environmental cost. Every year about 2.4 billion tons of carbon dioxide is released

into the atmosphere as a result of deforestation for the purpose of livestock maintenance (FAO 2006). And it doesn't stop there, by year 2010 cattle are projected to be grazing on some 24 million hectares of neo-tropical land that was forest in 2000 (FAO 2006). Hence, the declaration signed by 300 climate experts at the 2007 United Nations Conference in Bali says: *"If we lose the forests, we lose the fight against climate change."*

4. Loss of Biodiversity

In 306 of the 825 terrestrial eco-regions identified by the Worldwide Fund for Nature, livestock are identified as "a current threat", while 23 of Conservation International's 35 "global hotspots for biodiversity" - characterized by serious levels of habitat loss - are affected by livestock production. The International Union for Conservation of Nature (IUCN) estimates that species loss today is 1,000 to 10,000 times higher than the expected natural extinction rate. Livestock production is a major culprit, contributing to all the most important direct drivers of biodiversity loss, such as habitat change, climate change, invasive alien species, and pollution (FAO 2006).

Tropical forests hold half of the world's species and many have become or are becoming extinct at an alarming rate due to deforestation that are largely driven by meat production. A few species of animal raised for meat and milk now account for about 20 percent of the total terrestrial animal biomass, and the population of these few species is still growing 'invasively'. *"The sheer quantity of animals being raised for human consumption is a threat to the Earth's biodiversity"* (FAO 2006).

Raising animals for the production of meat is also responsible for 64 percent of global Ammonia emissions (FAO 2006), contributing to acid rain and affecting biodiversity.

The current rapid loss of biodiversity is a cause of grave concern. The IUCN has warned that life on Earth is disappearing fast and will continue to do so unless urgent action is taken.

5. Land and Water Use

Much of the world is running out of water. Over 1 billion people worldwide do not have access to clean water. More than 2 billion people do not have proper sanitation. The UN Food and Agriculture Organization (FAO) estimates that by 2025 there will be 1.8 billion people living with absolute water scarcity and 2/3 of the world's population could be living under water-stressed conditions (FAO 2006).

Meat production, particularly the production of feed, consumes large amounts of critically important water resources (FAO 2006). A report presented to the UN in May 2008, 'Saving Water: From Field to Fork' shows that 70 percent of global fresh water is used in agriculture, and the rest is split between household (10 percent) and industry (20 percent) (SIWI and IWHI 2008).

Research indicates that to produce the same amount of food, water required for items such as meat and dairy is 10 times that of items such as grains and vegetables. For example, to produce 1 kg of beef uses 5,000-20,000 litres of water. In comparison, to produce 1 kg of wheat uses only 500-2,000 litres of water (SIWI and IWHI 2008). In the case of the United States, the contrast is even greater: producing 1kg of animal protein requires about 100 times more water than producing 1kg of grain protein (Pimentel and Pimentel 1996).

A similar situation exists with land usage. Meat production uses about 20 times more land than would be required to produce the same amount of grains and vegetables. It has been estimated that one hectare of land could produce enough potatoes to feed 22 people for a year, or enough rice to support 19 people for a year. But if used to produce lamb, the same area of land can only support 2 people for a year, or can only feed 1 person for the same period if used to produce beef (WHO and FAO 2003).

Furthermore, meat production not only uses the majority of agricultural land (70 percent), which is 30 percent of the Earth's entire land surface (in the UK, the livestock sector uses up to 65% of agricultural land [Strategy Unit 2008]), but also renders land infertile for years due to overgrazing, compaction and erosion. Seventy percent of all grazing land in dry areas is considered degraded (FAO 2006).

The livestock industry is also the largest sectoral water polluter. The main polluting agents are animal waste, antibiotics, hormones, chemicals from tanneries and pesticides used on feed crops. Animal waste plays a major role in polluting rivers and streams. More than 2 billion tons of animal manure was produced in the late 1990s. Assuming an average nitrogen content of around 5 percent, this allows 100 million tons of nitrogen finding its way into our water systems. The Livestock industry is unquestionably *"among the most damaging sectors to the Earth's scarce water resources"* (FAO 2006).

Global population is expected to reach 8.1 billion by 2030. Fourteen percent more fresh water would be required for agricultural purposes in order to keep pace with the growing demand for food (FAO News 2007). But even now, on a global basis, the amount of fresh water available per person is falling rapidly (UNEP 2002).

The livestock industry is the single largest user of land and water, and a major cause of wide-scale land degradation and water pollution (FAO 2006). Earth's limited and diminishing reserves of land and water cannot sustain the needs of a growing population. Yet, much of these two precious resources are still used for, and damaged by, the raising of 58 billion livestock every year (FAOSTAT).

6. World Hunger

According to the UN FAO, there are more than 963 million people in the world who do not have enough to eat. Hunger claims 25,000 lives every day, among them, over 17,000 children (WFP Hunger Stats). On the other hand, 760 million tons of grain are fed to animals every year (FAO Food Outlook). During 2007-2008, 36 percent of the global grain utilised was to feed animals, whilst 47 percent was used for feeding humans, and 5 percent used on bio-fuel (FAO Crop 2008). During the same period about 70 percent of the global soya consumption was in the form of animal feed whilst only 16 percent was used for humans (USDA Review 2008).

In NZ, farmed pigs and chickens are grain-fed.

Farm animals are naturally inefficient converters of plants to edible flesh because much of their food is converted into energy for movement, excreted as manure, or used for the growth of body parts not eaten by people. Statistics show that it takes more than 10 kg of grain to produce 1 kg of beef, 4 to 5.5 kg of grain to produce 1 kg of pork, and 2.1 to 3 kg of grain to produce 1 kg of poultry meat (USDA AgStats 2008). This is based on net live-weight production of meat. If measured by

consumable ready-to-cook weight, the ratio would be even higher. And cattle excrete 40 kg of manure for every kg of edible beef produced (Ottawa 1995).

“Livestock consume more edible human protein than they produce” (FAO 2006). Diverting the critically needed grain from cattle to humans could help the world’s hungry population get their share of food.

Raising animals for human consumption is one of the major causes of world hunger (EVANA).

7. Health

The onset of many meat-related diseases, which can be fatal, such as Mad Cow Disease, Blue Tongue Disease, Bird flu, Pig’s Disease (PMWS), Listeriosis, E Coli and Salmonella have been a cause of increased concern, questioning the safety of eating meat. Meat recalls around the world are becoming more frequent with millions of pounds of meat found to be contaminated. Meat contamination is a continuing challenge as is the threat of diseases transferring to humans from animals, such as the recent Swine Flu outbreak.

Meat consumption is related to many prevalent diseases. Animal protein found in meat, dairy and eggs, is strongly linked to high blood cholesterol levels, which is a predictor of heart disease and many cancers. Research has shown that when the intake of plant food is increased, blood cholesterol levels go down. Cow’s milk, which is deficient in iron, has in some studies been correlated with an increase in childhood onset diabetes. Many studies have consistently shown that dairy intake is linked to prostate cancer, whilst the formation of kidney stones and osteoporosis have also been linked to diets high in animal protein (Campbell 2004). Dr Colin Campbell, chief US investigator of the China Study advises: “No chemical carcinogen is nearly so important in causing human cancer as animal protein.” The World Cancer Research Fund also recommends reducing the consumption of red and processed meats in its 2007 report, stating that they are a convincing cause of colorectal cancer (WCRF and AICR 2007). According to World Organisation for Animal Health (OIE), 60 percent of human pathogens and 75 percent of recent emerging diseases, including tuberculosis, are zoonotic (Vallat 2005).

Medical costs attributable to meat eating are substantial. The Physicians Committee for Responsible Medicine in the USA estimated that between \$29 billion and \$61 billion spent in healthcare in 1992 can be linked to meat consumption, adding that the cost would likely have been higher if stroke and other arterial disease had been studied as well (Barnard, Nicholson and Howard 1995). In the UK, around 70,000 fewer people would die prematurely each year if diets matched the nutritional guidelines on fruit and vegetable consumption, saturated fat, added sugar and salt intake (Strategy Unit 2008). Diet-related ill health costs the NHS £6 billion each year (Rayner and Scarborough 2005). Globally, the World Health Organisation has issued the following figures: *“Low intake of fruit and vegetables is estimated to cause about 31 percent of ischaemic heart disease, 11 percent of strokes worldwide and 19 percent of gastrointestinal cancers. Overall, 2.7 million deaths are attributable to low fruit and vegetable intake”* (WHO 2004).

A vegetarian diet prevents meat-related diseases and can reverse some of them. The American Dietetic Association and Dieticians of Canada have reported that vegetarians show lower blood cholesterol levels, lower blood pressure, lower rates of

hypertension, type 2 diabetes, and prostate and colon cancer. Vegetarians have been reported to have lower body mass indices than non vegetarians, as well as lower rates of death from ischaemic heart disease (ADA 2003). Research over the last 30 years has demonstrated that coronary atherosclerosis can be reversed through comprehensive lifestyle changes, including a vegetarian diet; and more recently, a randomized controlled trial showed that comprehensive lifestyle changes may stop or reverse the progression of prostate cancer (Ornish et al 1998). The American Journal of Clinical Studies has also published studies showing the benefits of a vegetarian diet in the prevention and treatment of type II diabetes as well as having a significant impact on cardiovascular disease (Jenkins et al 2003).

A vegan or vegetarian diet is appropriate for all stages of life, including during pregnancy, lactation, infancy, childhood and adolescence (ADA). Other benefits of a vegetarian diet are cited as higher levels of carbohydrates, fibre, magnesium, potassium, folate, and antioxidants such as vitamins C and E and phytochemicals. In summary, both the American Dietetic Association and Dieticians of Canada confirm that planned vegetarian diets are healthful, nutritionally adequate and provide health benefits in the prevention and treatment of certain diseases.

Reducing or eliminating animal products from our diet has major health benefits, will save billions of dollars in healthcare costs and is the quickest, most effective way to curb global warming.

8. Future Growth and Subsidies

The world's meat consumption has increased fivefold in comparison to the 1950s. By 2050, global meat consumption is expected to more than double the 1999 level – from 229 million tons to 465 million tons, while dairy output is expected to nearly double from 580 million tons in 2001 to 1,043 million tons in 2050. The number of animals slaughtered per year will increase from 60 billion to 120 billion in 2050 (FAO 2006).

The meat industry is a significant contributor to greenhouse gases and a main cause of climate change. And yet, the global livestock sector is growing faster than any other agricultural sub-sector. The expected increase in the consumption of meat and dairy highlights the grim possibility of continuing environmental devastation and the FAO warns: *“The environmental costs per unit of livestock production must be cut by one half, just to avoid the level of damage worsening beyond its present level”* (FAO 2006).

Despite the meat industry's very real threat to the planet and its inhabitants, huge subsidies are given to the industry every year: the sum of the EU's interventions and direct support to the livestock industry in 2007 was over 3.5 billion Euros. This figure does not include the financial aid given to meat producers for marketing their products (Holm and Jokkala 2007). This kind of subsidy exists in many countries, including the US.

If the meat industry fulfils its predicted growth, with staunch monetary support from the governments, the environmental consequences will be apocalyptic as described by some scientists.

9. Solutions

Many steps are being taken to curb climate change all over the world, such as the use of renewable energy, eco friendly cars and aeroplanes, recycling and planting trees, to name a few. Even the meat and dairy industries are moving to reduce their environmental footprint through less packaging, improving fuel efficiency, reducing water use, etc. Clearly, all of these are very important and much needed. Yet, even collectively, they are not sufficient to resolve the environmental crisis we are facing now, within a short time frame, if we continue to raise billions of animals for human consumption. Increasing scientific evidence points to the fact that animal agriculture is literally stripping our planet of its finite resources whilst emitting to the atmosphere potent greenhouse gases and pollutants; its devastating effect on many eco-systems could ultimately destroy our planet and our civilisation as we know it, if we allow the status quo to continue.

Dr Drew Schindell, Atmospheric Physicist at NASA Goddard Institute has stated: *“Control of methane emissions turns out to be a more powerful lever to control global warming than would be anticipated”* (NASA Goddard 2005). The US Environmental Protection Agency also highlighted in its report that *“The mitigation of non-carbon dioxide (Non-CO₂) greenhouse gas emissions can be a relatively inexpensive supplement to CO₂-only mitigation strategies.”* *“Methane Mitigation has the largest potential across all the Non-CO₂ Greenhouse Gases”* (EPA 2006).

Given the high percentage contribution of livestock production to global methane emissions, logically, reducing meat production and encouraging individuals to move towards a plant-based diet to reduce or eliminate meat consumption would appear to be the quickest, most effective solution. The reasons being:

- The turnover rate for ruminant animals is 1-2 years while the turnover rate for cars and power plants, etc, can be decades. Decreases in meat consumption would result in almost immediate drops in methane emissions;
- Methane cycles out of the atmosphere in about 8 years, while carbon dioxide can stay in the atmosphere for more than a century. Again, lower methane emissions will quickly translate to cooling of the Earth;
- The introduction of new techniques and further research into cutting methane emissions from livestock can take many years;
- A cut in carbon dioxide involves fighting powerful and wealthy business interests while vegetarian foods are readily available – at every meal time.

Hence, a reduction in the size of the livestock industry through reduced consumption is presented as the most effective way of reducing potent GHGs from animal agriculture (Mohr 2005).

It is also proved to be the most economical way. A more recent study found a global food transition to less meat, or even a complete switch to plant-based protein food could wipe US\$20 trillion off the cost of fighting climate change. Hence, dietary changes could play an important role in climate change mitigation policies (Stehfest et al 2009).

To achieve this mass transition, it is most important to educate the public about the health risks of eating meat and its direct link to global warming, and to impress upon

the Government the true economic and environmental costs of the meat industry and the urgency for fundamental changes. Among many practical measures, the most talked about include:

- Introduction of an environmental tax on meat;
- Diverting huge subsidies from meat production to supporting organic, plant-based agriculture (NEIC);
- Provision of vegetarian meals in schools and hospitals.

Conclusion

“Human beings and the natural world are on a collision course... Fundamental changes are urgent if we are to avoid the collision our present course will bring about.” The Union of Concerned Scientists warned us (UCS, 1992). Nearly 17 years later, we finally realise that we are under a very real threat from climate change and have only a short few years to address the crisis for which we are all responsible.

We can no longer afford to not make these fundamental and urgent changes. In addition to adopting renewable energies, reforestation programmes and other measures to cut carbon emissions, we have to use the methane lever to buy some valuable time for the carbon reduction to take effect. The food chain has huge environmental impacts. Reducing the food chain’s GHG emissions must be a priority in keeping with a policy on curbing climate change. A transition towards a largely plant-based diet shows to be a truly sustainable, effective solution, as well as being a healthy option, beneficial in many ways to the individual and to the economy. Around the world, many governments, officials, scientists, and some religious organisations are speaking out about the urgency and effectiveness of a significant reduction in meat production and consumption^{Annex 1}.

The public is largely unaware of the link between meat consumption and its full environmental devastation and detrimental health impact. They are unaware of the short time left to avoid catastrophic climate change leading to mass extinctions. At times of global emergency they look to the Government to take the lead and to advise them accordingly. The people will follow what governments propose, especially if it is good for them and necessary for planetary survival.

At this time of planetary emergency, we need our governments and international institutions to legislate change, to lead the way and to be an example as individuals and as a government. Based on scientific data and facts we need our leaders and institutions to make vital policy changes and to facilitate these changes as quickly as possible in many ways. People must be made aware of the dire consequences that await all of us if fundamental changes are not made urgently.

We look to you, in a position of authority and significance to help provide the much needed impetus for individuals and policy makers to make these vital changes.

References:

- WWF 2008 “Climate Change: faster, stronger, sooner”, October 2008
http://assets.wwf.org.uk/downloads/cc_science_paper_october_2008_1.pdf
- IPCC 4th Assessment, IPCC Fourth Assessment Report – Synthesis Report 2007
<http://www.ipcc.ch/ipccreports/ar4-syr.htm>, chapter 2 <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>
- Walter K M, Zimov S A, Chanton J P, Verbyla D and Chapin III F S 2006 “Methane bubbling from Siberian thaw lakes as a positive feedback to climate warming”, *Nature* 443; 71-75, 7 Sept. 2006
http://www.alaska.edu/uaf/cem/ine/walter/publications_docs/Walter_nature05040.pdf
- Ping C, Michaelson G J, Jorgenson M T, Kimble J M, Epstein H, Romanovsky V E and Walker D A. “Arctic Soil May Contain Nearly Twice Greenhouse Gas Producing Material Than Previously Estimated”, *Science Daily*, 8 October 2008
<http://www.sciencedaily.com/releases/2008/10/081008091129.htm>
- Atcheson J 2004 “Methane Burps: Ticking Time Bomb” *Energy Bulletin*, 15 Dec. 2004,
<http://www.energybulletin.net/node/3647>
- FAO 2006, UN FAO “Livestock’s Long Shadow”, Rome 2006
<ftp://ftp.fao.org/docrep/fao/010/A0701E/A0701E00.pdf>
- Foodwatch 2008,
http://www.foodwatch.de/kampagnen_themen/klima/klimastudie_2008/ergebnisse/ernaehrungsweisen/index_ger.html
- van Beukering P, van der Leeuw K, Immerzeel D and Aiking H 2008 “Meat the Truth”. and “The contribution of meat consumption in the UK to climate change” Institute for Environmental Studies (IVM), VU University, Amsterdam, the Netherlands. HM Government (2006) *Climate Change, the UK programme 2006*
http://www.meatthetruth.nl/download/20080517_Carbon_Savings_UK.pdf
- Pimentel D and Pimentel M 2003 “Sustainability of Meat-Based and Plant-Based Diets and the Environment”, *Am. J. Clin. Nutr.* 2003 ;78(suppl): 660S-3S.
<http://www.ajcn.org/cgi/content/full/78/3/660S>
- Ogino A, Orito H, Shimada K and Hirooka H 2007 “Evaluating environmental impacts of the Japanese beef cow–calf system by the life cycle assessment method”, *Animal Science Journal*, 2007
<http://www3.interscience.wiley.com/journal/117979629/abstract?CRETRY=1&SRETRY=0>
- RIC, The Rainforest Information Centre
<http://www.rainforestinfo.org.au/background/rainfwld.htm>
- GCP, Global Canopy Programme
<http://www.globalcanopy.org/main.php?m=3&sm=11&ssm=79>
- IUCN 2007 “Species extinction”
http://cmsdata.iucn.org/downloads/species_extinction_05_2007.pdf
- Stockholm International Water Institute, International Water Management Institute, Chalmers, and Stockholm Environment Institute 2008, “Saving Water from Field to Fork”, May 2008

http://www.siwi.org/documents/Resources/Policy_Briefs/PB_From_Filed_to_Fork_2008.pdf

Pimentel D and Pimentel M 1996 "Food, energy and society". Niwot, CO: Colorado University Press.

WHO and FAO 2003 "Diet, Nutrition and prevention of Chronic Diseases", (3.4, P 21)
<http://www.fao.org/DOCREP/005/AC911E/ac911e05.htm#bm05.4>

FAO News, 22 March 2007
<http://www.fao.org/newsroom/en/news/2007/1000520/index.html>

United Nations Environment Programme (2002) Global Environment Outlook GEO-4
http://www.unep.org/geo/geo4/report/GEO-4_Report_Full_en.pdf

FAOSTAT <http://faostat.fao.org/site/569/DesktopDefault.aspx?PageID=569#ancor>,

World Food Programme Hunger Stats <http://beta.wfp.org/hunger-stats>

FAO 2008 "Food Outlook" <http://www.fao.org/docrep/011/ai474e/ai474e01.htm>

FAO 2008 "Crop Prospects and Food Situation"
<http://www.fao.org/docrep/010/ai465e/ai465e04.htm> (calculated from the data therein)

US Department of Agriculture, 2008 "Oil Crops Year in Review"
<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1289>
(based on data therein)

USDA 2008 Agricultural Statistics "Grain and Feed"
http://www.nass.usda.gov/Publications/Ag_Statistics/2008/index.asp (extrapolated from the data therein)

Ottawa: Environment Canada, 1995 "Connections: Canadian Lifestyle Choices and the Environment" A State of the Environment fact sheet. No 95-1, P7
<http://www.ec.gc.ca/soer-ree/English/products/factsheets/95-1.cfm>

EVANA Petition Food vs Feed to the UN <http://un.evana.org/>

Campbell T C 2004 "China Study", the most comprehensive research on diet, lifestyle and disease over the past 100 years, conducted collaboratively by Cornell University, Oxford University, and the Chinese Academy of Preventative Medicine

World Cancer Research Fund and the American Institute for Cancer Research 2007 "Food, Nutrition, Physical Activity, and the Prevention of Cancer: a global perspective"
<http://www.dietandcancerreport.org/>

Vallat B 2005 "International animal health response" at OIE Meeting on avian influenza and human pandemic influenza, Geneva, November 2005
http://www.who.int/mediacentre/events/2005/avian_influenza_meeting_presentations/en/index.html Perspectives from OIE [pdf 239kb]

Barnard N D, Nicholson A, and Howard J L 1995 "The medical costs attributable to meat consumption", Preventive Medicine, November 1995
http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WPG-45R89SB-H&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=80ba4d089f9f176bd494e695eea4f075

The Strategy Unit (UK) 2008 "Food Matters: Towards a Strategy for the 21st Century"
http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters_es.pdf

Rayner M and Scarborough P 2005 "The burden of food related ill health in the UK",
Journal of Epidemiology and Community
<http://jech.bmj.com/cgi/content/abstract/59/12/1054>

WHO Global Strategy on diet, Physical activity and health 2004
http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf

American Dietetic Association position paper on vegetarian diets
http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/advocacy_933_ENU_HTML.htm

Ornish D et al. 1998 "Intensive lifestyle changes for reversal of coronary heart disease: Five-year follow-up of the Lifestyle Heart Trial", Journal of the American Medical Association. 1998; 280: 2001-2007 <http://jama.ama-assn.org/cgi/content/full/280/23/2001>
<http://www.webmd.com/dean-ornish-md>

Jenkins D J A et al. 2003 "Type II diabetes and the vegetarian diet", AJCN, Vol 78, September 2003, <http://www.ajcn.org/cgi/content/full/78/3/610S>

Holm J and Jokkala T 2007 "The livestock industry and climate – EU makes bad worse", Parliamentary Group (pp17-18) www.guengl.eu/upload/backup/meat_climate_report.pdf

NASA Goddard Space Flight Center 2005 "Methane's Impacts on Climate Change May Be Twice Previous Estimates"
<http://www.nasa.gov/centers/goddard/news/topstory/2005/methane.html>

US Environmental Protection Agency (EPA) 2006 "Global Mitigation of Non-CO2 Greenhouse Gases" EPA 430-R-06-005
<http://www.epa.gov/climatechange/economics/downloads/GlobalMitigationFullReport.pdf>

Mohr N 2005 "A New Global Warming Strategy", EarthSave International, August 2005
<http://www.earthsave.org/globalwarming.htm>

Stehfest E et al. 2009 "Climate benefits of changing diet", Climatic Change (DOI 10.1007/s10584-008-9534-6) <http://www.springerlink.com/content/053gx71816jq2648/>,
<http://www.newscientist.com/article/dn16573-eating-less-meat-could-cut-climate-costs.html>

The Nutrition Ecology International Centre (NEIC) "Stop EU Subsidies to Livestock Industry" http://www.nutritionecology.org/news/stop_subsidies.html

The Union of Concerned Scientists (UCS) "1992 World Scientists' Warning to Humanity"
<http://www.ucsusa.org/about/1992-world-scientists.html>

Reducing Meat Consumption as a Way to Curb Global Warming

IPCC, Dr Rajendra Pachauri, Chairman

“Please eat less meat; meat is a very carbon-intensive commodity... This is something the IPCC was afraid to say earlier, but now we have said it.”

<http://www.theglobeandmail.com/servlet/story/RTGAM.20080122.wcomment0123/EmailBNStory/International/home>

“Don’t eat meat, ride a bike and be a frugal shopper. That’s how you can help brake global warming.”

<http://www.abc.net.au/news/stories/2008/01/16/2139349.htm?section=world>

NASA, Dr James Hansen, Top world climatologist

“... the things that individuals can do are helpful, and one of the most helpful is actually a vegetarian diet, produces much less greenhouse gasses than a meat diet.”

<http://www.whirledpeas.com.au/this-i-get-hansens-climate-logic-and-the-vegetarian-diet/>

UN, Yvo de Boer, Executive Secretary of Framework Committee on Climate Change

“The best solution would be for us all to become vegetarians.”

<http://www.enn.com/pollution/article/34572>

UN, Henning Steinfeld, Chief of the FAO 's Livestock Information and Policy branch

“Livestock are one of the most significant contributors to today’s most serious environmental problems. Urgent action is required to remedy the situation.”

<http://www.fao.org/newsroom/en/news/2006/1000448/index.html>

Australia, Senator Andrew Bartlett

“There is no easier, cheaper and more immediate thing we can do to significantly reduce our personal contribution to greenhouse emissions than to cut the amount of meat and dairy products that we consume.”

<http://sl.farmonline.com.au/news/nationalrural/agribusiness-and-general/general/senator-bartlett-wants-no-meat-and-dairy-day/83604.aspx>

Estonia, Digestive Gases Tax

Estonia introduced a 'digestive gases tax' in 2008 to compensate for the greenhouse gas that cows produce during their life. http://www.russiatoday.ru/Art_and_Fun/2008-05-12/Estonia_cracks_down_on_cows_discharge.html

Korea, Senator Gang Gi Gap, Labour Party Leader

Democratic Labour Party leader and Senator Gang Gi-Gap has called for a switch to a plant-based diet. "In the case of the meat diet, a comparatively great deal of CO2 gas is generated from animal raising as well as the excretions of animals, and this amount is extremely serious. So, at least starting now, we humans need to make a great change in our lives." 22 September 2008

http://www.suprememastertv.com/bbs/board.php?bo_table=sos&wr_id=294&goto_url=&ca=&page=&url=

Sweden, Jens Holms, MEP

"We should abolish meat subsidies, let meat bear its own environmental costs and work to make modern vegetarian food cheaper."

<http://www.nutritionecology.org/news/personalities.html>

Taiwan

In April 2008, under the auspices of a campaign titled 'No Meat No Heat', around a million people in Taiwan - including the speaker of parliament, the environment minister, and the mayors of Taipei and Kaohsiung - vowed to never again touch flesh nor fish.

<http://www.guardian.co.uk/commentisfree/2008/jun/19/food.environment>

UK, Jonathon Porritt, Chair of the UK government's Sustainable Development Commission

"The increase in meat consumption suddenly looms as one of the biggest environmental crises that we are now facing."

http://www.ciwf.org.uk/includes/documents/cm_docs/2008/i/impact_of_livestock_farming.pdf

UK, Professor Tim Lang, City University

"We must transform ourselves from being passive consumers to active consumers. We need to lobby government for change, eat less meat and fewer dairy products, and garden more ... and we need to relearn the gardening skills we've lost as a nation."

<http://www.telegraph.co.uk/earth/earthnews/3353377/Government-advisor-eat-less-meat-to-tackle-climate-change.html>

UK, Caroline Lucas, Leader of Green Party, MEP

"It's vital that, as a society, we eat less meat, both to cut emissions and out of respect for animal rights" <http://www.vegsoc.org/environment/suggestions.html>

US, Paul Watson, Former Sierra Club Director and Greenpeace Co-founder

"You can change your light bulbs, buy a hybrid car and plant more trees till the cows come home, but nothing is as effective, available, inexpensive, quick, powerful for the individual in affecting global warming as the choice of where to stick your fork."

http://www.cincinnati-oh.gov/cmgr/downloads/cmgr_pdf18280.pdf