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A Sustainable Food Policy for Europe

Towards a sustainable, nourishing and humane food policy for Europe and globally

Introduction

The creation of a resource-efficient Europe is one of seven flagship initiatives established in 2010 by the *Europe 2020 strategy* aiming to deliver smart, sustainable and inclusive growth.[1]

In 2011 the European Commission built on this by publishing a Communication entitled *Roadmap to a Resource Efficient Europe*.[2] This stressed that in industrialized countries nutrition, housing and mobility are typically responsible for 70-80% of all environmental impacts.

In light of this the Communication identified food as a key sector in advancing resource efficiency. It stated our consumption patterns have global impacts "in particular related to the consumption of animal proteins". It established the following Milestone: "By 2020, incentives to healthier and more sustainable food production and consumption will be widespread and will have driven a 20% reduction in the food chain's resource inputs".

In particular the Communication said that the Commission would by 2013 produce a Communication on sustainable food to "assess how best to limit waste throughout the food supply chain, and consider ways to lower the environmental impact of food production and consumption patterns".

The Commission has to date failed to publish its Communication on sustainable food. In light of the crucial importance of food policy for human health, nutrition, food security, the environment and animal welfare, Compassion in World Farming has tried to partially fill the gap created by the Commission's failure to publish by producing this report. In our view it is what the Commission's Communication should be saying.

This report primarily focuses on the role of livestock in the food system. It mainly looks at the EU but it also considers the global situation and the role the EU should play in shaping food policy at the global level, particularly during the formulation of the post-2015 Sustainable Development Goals.

Section 1: Food policy needs to satisfy a range of criteria

Food policy sometimes gives excessive weight to the assumption that food security inevitably necessitates substantially increased production. Food policy should not be dominated by a productionist paradigm but should instead seek to fulfil a number of objectives including:

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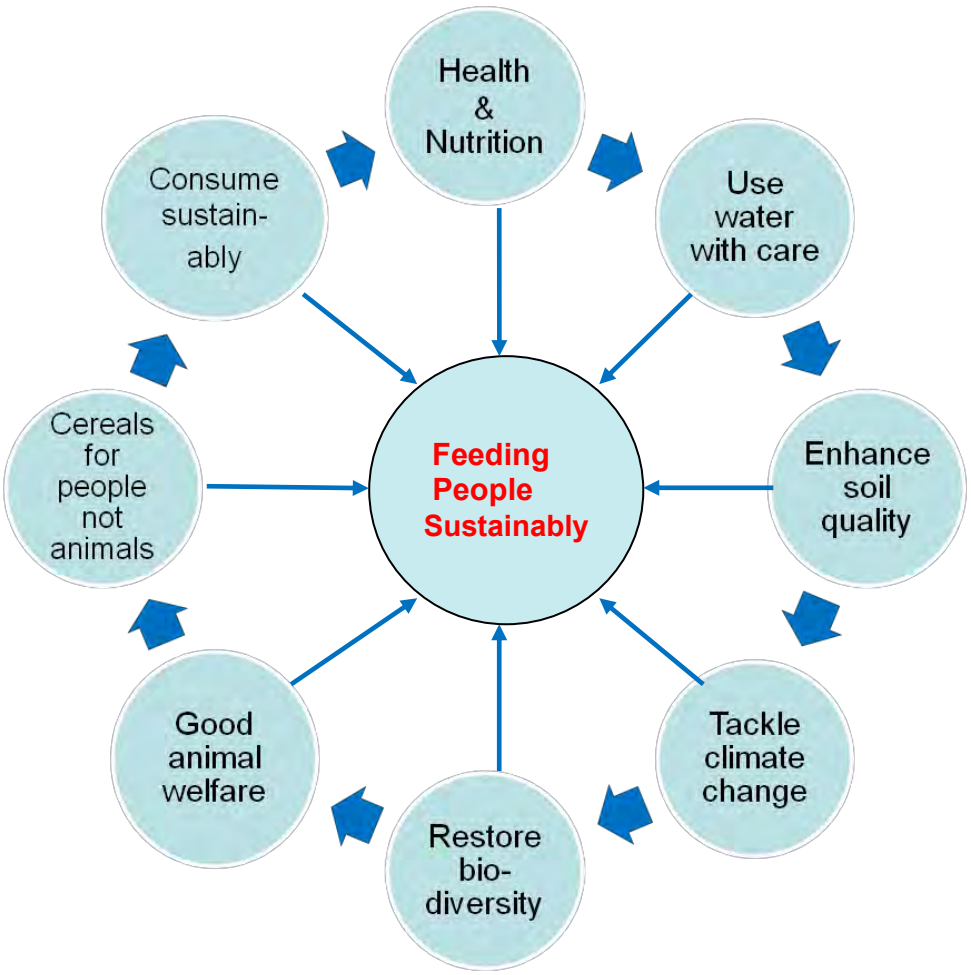
[1] Europe 2020: A strategy for smart, sustainable and inclusive growth. Communication from the Commission, 3.3.2010, COM(2010) 2020 final http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF

[2] Roadmap to a Resource Efficient Europe: Communication from the Commission, 20.9.2010, COM(2011) 571 final http://ec.europa.eu/environment/resource_efficiency/pdf/com2011_571.pdf

- Food security: ensuring that all people have access to sufficient food
- Provision of food of high nutritional quality
- Promotion of diets that support good health
- Resource efficiency: efficient use of food and the resources used to produce it
- Enhancement of soil quality and judicious use of arable land
- Use water sparingly without polluting it
- Restore biodiversity and ecosystem services
- Minimise food-related greenhouse gas emissions
- Sustainable consumption
- Good standards of animal welfare

Figure 1 illustrates the wide range of factors that contribute to the core objective which may be described as *Feeding people sustainably*. Food policy needs to take an integrated approach, ensuring that one objective is not achieved at the expense of another. It must strive to satisfy all these criteria; synergies should be maximised and trade-offs avoided as far as possible. Identifying and addressing interlinkages between the different facets of food policy is necessary to avoid working in silos and to ensure balanced progress.

Figure 1
Feeding People Sustainably:
Resource Efficiency - Environmental Health - Human Health Nexus



Section 2: Reducing food waste; enhancing food security

The Commission's *Roadmap to a resource-efficient Europe* points out that in the EU we waste 90 million tonnes of food every year or 180 kg per person. This inevitably means that

huge amounts of the resources used in food production are used in vain. Reducing food waste would enable many more people to be fed.

The Commission's proposal on food waste in July 2014 is welcome; the Commission proposes that Member States should develop national food-waste prevention strategies and endeavour to ensure that food waste in the manufacturing, retail/distribution, food service/hospitality sectors and households is reduced by at least 30 % by 2025.[3]

Reduction of this element of food waste is a vital component of a sustainable food policy. There are, however, other forms of food waste that undermine food security: the use of human-edible crops to feed animals and as biofuels.

The inefficiency of feeding human-edible cereals to animals

60% of EU cereals are fed to farm animals. Feeding cereals to animals is inefficient. Studies, including a UNEP report, show that for every 100 calories that we feed to animals in the form of human-edible crops, we receive on average just 17-30 calories in the form of meat and milk.[4] [5]

A 2013 University of Minnesota paper indicates that the efficiency rates may be even lower for some animal products. It reports that for every 100 calories of grain that we feed to animals, we get only about 40 new calories of milk, 22 calories of eggs, 12 of chicken, 10 of pork, or 3 of beef.[6]

As indicated earlier, the Commission says that every year in the EU we waste 180 kg of food per person; this primarily refers to food not used by retailers and consumers. However, we waste more – at least 234 kg per person per year - by using human-edible cereals as animal feed. This figure does not refer to the total cereals fed to animals; it is the amount that is *wasted* due to several plant-derived calories being needed to produce one calorie of meat.

The calculation that we waste 234 kg per person per year by using human edible cereals as animal feed is as follows:

- Commission data show that each year on average 167.5 million metric tonnes of cereals are used as animal feed in the EU[7]
- As indicated above, for every 100 calories that we feed to animals in the form of human-edible crops, we receive on average just 17-30 calories in the form of meat and milk. Even taking the higher figure of 30%, this means that 70% of the cereals fed to animals are wasted
- 70% of the 167.5 million metric tonnes of cereals used annually in the EU as animal feed is 117.25 million metric tonnes (i.e.117, 250 million kg)
- The EU population is 500 million
- As overall 117, 250 million kg of cereals are wasted each year, the waste per person per year in the EU is 234.5 kg of cereals annually.

[3] Towards a circular economy: A zero waste programme for Europe. Communication from the Commission, 2.7.2014, COM(2014) 398 final http://eur-lex.europa.eu/resource.html?uri=cellar:50edd1fd-01ec-11e4-831f-01aa75ed71a1.0001.01/DOC_1&format=PDF

[4] Lundqvist, J., de Fraiture, C. Molden, D., 2008. Saving Water: From Field to Fork – Curbing Losses and Wastage in the Food Chain. SIWI Policy Brief. SIWI. http://www.siwi.org/documents/Resources/Policy_Briefs/PB_From_Filed_to_Fork_2008.pdf

[5] Nellemann, C., MacDevette, M., Manders, et al. (2009) *The environmental food crisis – The environment's role in averting future food crises*. A UNEP rapid response assessment. United Nations Environment Programme, GRID-Arendal, www.unep.org/pdf/foodcrisis_lores.pdf

[6] Cassidy E.M *et al*, 2013. Redefining agricultural yields: from tonnes to people nourished per hectare. University of Minnesota. Environ. Res. Lett. 8 (2013) 034015

[7] http://ec.europa.eu/agriculture/cereals/balance-sheets/cereals/overview_en.pdf

Figure 2: Food waste in the EU at (i) distribution & consumer levels and (ii) by feeding human-edible crops to animals

Note (*) This does not refer to the total cereals fed to animals; it is the amount that is *wasted* due to several plant-derived calories being needed to produce one calorie of meat.

The global picture

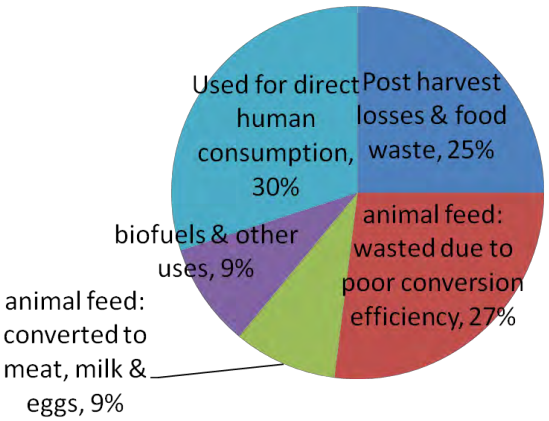
Globally 25% of calories are lost or wasted post-harvest or at the retail or consumer level.[8] In addition, globally 36% of cereals are used as animal feed.[9] However, as indicated earlier, only 17-30% of these calories are returned for human consumption as meat or milk. The effect of this is that 70-83% of the 36% of the world's crop calories that are used as animal feed are wasted; they produce no food for humans. This means that 25-30% (70-83% of 36%) of the world's crop calories are being wasted by being fed to animals. Figure 3 shows how the world's crop calories are used.

[8] Food losses and waste in the context of sustainable food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2014. http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-8_EN.pdf

[9] Cassidy E.M *et al*, 2013. Redefining agricultural yields: from tonnes to people nourished per hectare. University of Minnesota. Environ. Res. Lett. 8 (2013) 034015

Figure 3: Use - and waste - of calories produced by world's crops

52% of global crop calories are wasted: lost, thrown away or fed to animals without being returned as meat, milk or eggs



Based on data from UNEP, 2009; Lundqvist et al, 2008; HLPE report 8, 2014; & Cassidy et al, 2013

Commenting on the use of cereals as animal feed the UN Food and Agriculture Organisation (FAO) states "When livestock are raised in intensive systems, they convert carbohydrates and protein that might otherwise be eaten directly by humans and use them to produce a smaller quantity of energy and protein. In these situations, livestock can be said to reduce the food balance".[10]

It is often said that to feed the anticipated world population in 2050 of 9.6 billion, food production must increase by around 70%. And on the basis of this, policy makers pronounce that further intensification of agriculture is essential. However, as we will see in section 8 of this report, if food waste - including the feeding of human-edible cereals to animals - were just halved, an extra 2.75 billion people could be fed i.e. more than the expected increase in world population. Increased production is needed, particularly in the developing world, but the required increase is very much lower than 70%.

Conclusions and Recommendations on food waste:

- 60% of EU cereals are fed to farm animals
- Due to the poor efficiency with which animals convert human-edible crops to animal products, 117.25 million metric tonnes of EU cereal production are wasted annually by being fed to animals. This is greater than the amount of food lost in the conventional sense of food waste i.e. at retailer and consumer levels
- The Commission should encourage a 33% reduction by 2025 – and a 50% reduction by 2035 – in the use of human-edible crops to feed farm animals as this is a resource-inefficient way of feeding people
- 25% of global calories are lost or wasted post-harvest or at the retail or consumer level. A further 25-30% of global calories are lost or wasted by being used as animal feed
- The Commission should press for the post-2015 Sustainable Development Goals to include a target to limit the proportion of human-edible crops used as animal feed.

[10] World Livestock 2011: livestock in food security. UN Food and Agriculture Organization

Section 3: Environmental implications of industrial livestock production

Using cereals as animal feed is a wasteful use not just of these crops but of the scarce land, water and energy used to grow them. Much more arable land, water and energy are needed to produce a unit of nutrition for human consumption from industrially produced meat than from meat derived from animals that are fed little or no human-edible crops. These include grazing animals or animals fed on crop residues (the part of the crop that is inedible for people) in integrated crop-livestock farms.

A 2014 report by the High Level Panel of Experts on Food Security and Nutrition states that worldwide 25% of food calories are lost or wasted post harvest or at the distribution/retail and consumer levels.[11] The High Level Panel points out that food loss and waste entails a needless use of resources and in particular it refers to studies that show that:

- The carbon footprint of global food loss and waste, not including greenhouse gas (GHG) emissions from land-use change, is 6-10% of anthropogenic GHG emissions;
- Food loss and waste is also water waste. The global blue water footprint of food wastage (i.e. the consumption of surface and groundwater during food production) is about 250 km^3 per year;
- Food loss and waste accounts for more than 300 million barrels of oil per year;
- Globally 1.4 billion hectares of land are used to produce food which is lost or wasted.

Similar quantities of land, water and energy are wasted in growing the 25-30% of global crop calories that are fed to livestock but produce no food for humans.

Pollution and use of water

Recent research has examined the water footprint of both food production and food consumption. That research has helpfully developed the proposition that the water footprint of a product consists of three colour-coded components: the green, blue and grey water footprint. The blue water footprint refers to the volume of surface and groundwater consumed as a result of the production of the product; the green water footprint refers to the rainwater consumed. The grey water footprint refers to the volume of freshwater that is required to assimilate the load of pollutants generated by the production of the product.

A key study analysed the water footprint of food production.[12] It concluded that:

- Animal products from industrial systems generally consume and pollute more ground- and surface-water resources than animal products from grazing or mixed systems;
- The anticipated further intensification of animal production systems globally will result in increasing blue and grey water footprints per unit of animal product; the authors state that this is due to the larger dependence on concentrate feed in industrial systems;
- The water footprint of any animal product is larger than the water footprint of crop products with equivalent nutritional value;
- It is more water-efficient to obtain calories, protein and fat through crop products than animal products.

The first two of the above points can be seen in Table 1:

[11] HLPE, 2014. Food losses and waste in the context of sustainable food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2014.
[12] Mekonnen M and Hoekstra A, 2012. A global assessment of the water footprint of farm animal products. Ecosystems.: DOI: 10.1007/s10021-011-9517-8

Table 1: Blue and grey water footprint of beef, pigmeat, milk & cheese

Animal product	Farming system	Blue & grey water footprint (m^3/ton)
Beef	Grazing	708
	Mixed	909
	Industrial	1,395
Pigmeat	Grazing	1,063
	Mixed	1,017
	Industrial	1,174
Milk	Grazing	105
	Mixed	166
	Industrial	180
Cheese	Grazing	534
	Mixed	840
	Industrial	906

Source: Mekonnen & Hoekstra, 2012

It is clear from this study that a switch from industrial livestock production to grazing and mixed systems would reduce the blue and grey water footprints of EU livestock production. This is because the lower the proportion of concentrate feed in animals' diet, the lower the blue and grey water footprints are likely to be.

The above study focused on the water footprint of food production. A 2013 paper has investigated the EU consumption-related water footprint of four different diets: the current diet, a healthy diet (based on recommendations of the Deutsche Gesellschaft für Ernährung [German Society for Nutrition]), a vegetarian diet and a combined diet (a diet between the healthy and vegetarian diets).[13]

The study points out that by far the largest proportion of the EU total consumption-related water footprint derives from to the consumption of edible agricultural goods (84%). The researchers conclude that:

- It is especially the consumption of animal products that accounts for high water footprints;
- The three alternative diets result in a substantial reduction of the consumption-related water footprint for agricultural products as compared with the current diet. The lower water footprints of the alternative diets are shown in Table 2.

[13] Vanham D, Mekonnen M and Hoekstra A, 2013. *The water footprint of the EU for different diets.* Ecological indicators 32, 1-8

Table 2: Consumption-related water footprint of four diets

Diet	Green, blue & grey water footprint (litres/capita/ day)	% reduction as compared with current diet	Blue & grey water footprint (litres/capita/ day)	% reduction as compared with current diet
Current diet	4265		693	
Healthy diet	3291	23%	557	20%
Combined diet	2973	30%	512	26%
Vegetarian diet	2654	38%	467	33%

Source: Vanham, Mekonnen and Hoekstra, 2013

The healthy diet described in the above study involves a reduction in meat consumption of 45% but a slight increase in the consumption of milk and milk products. A switch from the current diet to the healthy diet would reduce the blue and grey water footprints of food consumption in the EU by 136 litres per person per day which is 49,640 litres per person per year (49,640 litres equates to 49.64m^3). To put the potential saving of 136 litres per person per day in context, London household use averaged 161 litres per person per day in the period 2004-2009.[14]

The EU has a population of 500 million. A switch from the current diet to the healthy diet would reduce the blue and grey water footprints of food consumption in the EU by 24,820 million m^3 of water per year. This is equivalent to 9,928,000 Olympic size swimming pools (such a pool comprises 2,500 m^3).

Wasteful use of arable land and detrimental impact on soil quality

The Commission stresses that "animal protein production is much less efficient than that of vegetable protein".[15] It points out that "to produce one kilogram of protein from cereals requires the use of 20 m^2 of land; for poultry meat and milk this is 35 m^2, for pork 60 m^2 and for beef over 100 m^2".[16]

From these figures it is clear that the production of animal protein is more costly in its use of land than vegetable protein. The land required for the production of poultry meat and pork and for intensively produced beef and dairy products is not primarily the land required to house the animals but the land needed to grow the crops used to feed the animals. This is likely to be mainly arable land that could be used more efficiently to grow crops for direct human consumption.

[14] http://www.environment-agency.gov.uk/research/library/publications/41051.aspx
[15] European Commission consultation paper: options for resource efficiency indicators http://ec.europa.eu/environment/consultations/pdf/consultation_resource.pdf
[16] *Ibid*

The 2014 Executive Summary of a report by the UN Economic Commission for Europe (UNECE) concluded that reducing meat and dairy consumption would free up large areas of agricultural land in the EU providing new opportunities of how to manage this land.[17] A 2014 paper used as supporting material for the UNECE study found that halving the consumption of meat, dairy products and eggs in the EU would result in 23% per capita less use of cropland for food production.[18]

Clear benefits would arise if a proportion of the arable land used to grow feed crops for livestock were instead used to grow crops for direct human consumption. Firstly, a greater number of people could be fed from the same area of land. This could enable the EU to boost its export earnings and to play a greater role in feeding the growing world population. This said, it is essential that such exports do not undermine smallholder farmers in the developing world.

Secondly, arable land could be farmed less intensively with reduced use of monocultures, chemical fertilisers and pesticides. This would enable the EU to gradually rebuild the quality of its agricultural soils. This is a pressing challenge as the Commission points out that "45% of European soils face problems of soil quality, evidenced by low levels of organic matter".[19] If the pressure to farm arable land intensively was eased, soil fertility and quality could be restored by methods such as the use of rotations, legumes, green manure and animal manure.

As indicated above research on water footprint distinguishes between green, blue and grey water. It would be helpful if studies on agricultural land use were to regularly distinguish between different kinds of land, for example between:

- pasture land that could not readily be used for other farming purposes,
- arable land
- pasture land that could be used for other farming purposes.

The Commission figures quoted above indicate that more land is needed to produce one kilogram of protein from beef than from poultry meat or pork. However, this does not necessarily mean that beef production is less efficient than other forms of meat. If beef cattle are raised on pasture with little or no use of human-edible crops in their diet, they may well use a large area of pasture land but that land is generally unlikely to be suitable for other forms of food production. If, however, beef cattle are farmed intensively, indoors or in feedlots, their feed will include a significant proportion of human-edible crops grown on arable land.

Commission data show that 57 million hectares of land are used in the EU to grow cereals.[20] The Commission states that nearly two thirds of EU cereals are used as animal feed.[21] This means that around 35 million hectares of land in the EU are used to grow cereals for animal feed. If just 15% of industrial livestock production (with its high use of cereals) and consumption were shifted into livestock production in grazing or mixed systems and/or replaced by crop production for direct human consumption around 5.25 million hectares of arable land could be saved. A 2014 paper calculates that a 50% decrease in EU meat and dairy production could result in 14.5 million hectares of arable land no longer being needed

[17] Westhoek H *et al*, 2014. Nitrogen on the table: the influence of food choices on nitrogen emissions and the European environment. ENA Special Report on nitrogen and food

[18] Westhoek H *et al*, 2014. Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. Global Environmental Change, Vol 26, May 2014 p196-205. http://www.sciencedirect.com/science/article/pii/S0959378014000338

[19] Communication from the Commission on the European Innovation Partnership 'Agricultural Productivity and Sustainability'. 29.2.2012. http://ec.europa.eu/agriculture/eip/pdf/com2012-79_en.pdf

[20] http://ec.europa.eu/agriculture/cereals/presentations/cereals-oilseeds/forecasts_en.pdf accessed 8 February 2014

[21] http://ec.europa.eu/agriculture/cereals/index_en.htm accessed 8 February 2014

to be used to feed European livestock.[22] A proportion of this land would be needed to grow additional crops for direct human consumption but (as the Commission figures referred to above indicate) much less land is needed to produce a unit of protein from cereals than from meat.

A 2014 UNEP report on global land use concludes that growing demand for food and non-food biomass could lead to a gross expansion of cropland into natural eco-systems in the range of 320 to 850 million hectares by 2050.[23] This would entail expansion into grasslands, savannahs and forests in particular in tropical regions. This would have a number of detrimental effects including:

- release of stored carbon into the atmosphere as forests, grasslands and savannahs are cleared for cropland, much of it to grow animal feed
- loss of biodiversity and accompanying degradation of ecosystem services
- desertification as pastoralists are pushed into more marginal lands
- erosion of indigenous livelihoods that accompanies deforestation.

The report points out that as demand grows, the price for land and derived products will increase, with potentially negative consequences for food security. It highlights the need to halt expansion of global cropland into grasslands, savannahs and forests by 2020 and emphasises the importance of steering consumption towards levels of sustainability, particularly in high-consuming regions. As indicated above, the consumption of products from industrially farmed animals places a particularly heavy demand on arable land. The report stresses the value of programmes "promoting a healthy and balanced diet in high-consuming countries, especially as regards meat products, to help reduce obesity and land pressure".

Some argue that expansion of cropland can be avoided by intensification of existing cropland. However, increased productivity often has an adverse impact on ecosystems and soil quality. Monocultures, fertilisers and pesticides are often used to increase production; all these are regularly responsible for undermining the natural resources on which agriculture depends. In some regions, even minimal fertiliser application can pose a severe threat to biodiversity.[24] Other aspects of intensification, including soil compaction, overuse of groundwater or increasing application of pesticides, can also degrade ecosystem services and long-term ecological sustainability.

Nitrogen pollution

Writing in *Nature* lead authors of the 2011 *European Nitrogen Assessment* (ENA) state: "Clearly nitrogen is one of the major environmental challenges of the twenty-first century".[25]

Although nutrient inputs such as nitrogen are needed to grow crops, nutrient loss from agricultural areas is both wasteful of a valuable resource and a major source of pollution

The ENA identifies five key threats associated with excess reactive nitrogen (N_r) in the environment: damage to water quality, air quality (and hence human health, in particular respiratory problems and cancers), soil quality (acidification of agricultural soils and loss of soil biodiversity), the greenhouse balance and ecosystems and biodiversity.[26] It concludes that the highest societal costs are associated with loss of air quality and water quality, linked to impacts on ecosystems and especially on human health.

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[22] Westhoek H *et al*, 2014. Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. Global Environmental Change, Vol 26, May 2014 p196-205. http://www.sciencedirect.com/science/article/pii/S0959378014000338

[23] Bringezu *et al*, 2014. Assessing global land use: balancing consumption with sustainable supply. UNEP and International Resource Panel

[24] Loos J *et al*, 2014. Putting meaning back into "sustainable intensification". *Front Ecol Environ* 2014; doi:10.1890/130157

[25] Sutton M.A. *et al*. 2011. Too much of a good thing, *Nature 4*72:159-161

[26] Eds. Sutton M.A., Howard C.M., Erisman J.W., Billen G., Bleeker A., Grennfelt P., van Grinsven H. and Grizzetti B., 2011. The European Nitrogen Assessment. Cambridge University Press.

The ENA points out that although the atmospheric emissions of nitrogen oxide from traffic and industry contribute to many environmental effects, these emissions are dwarfed by the agricultural flows of N_r.

The ENA reports that 75% of industrial production of N_r in Europe is used for fertiliser (2008 figure). The primary use of N_r in crops is not directly to feed people: 80% of the N_r harvest in European crops provides feeds to support livestock (8.7 million tonnes per year plus 3.1 million tonnes per year in imported feeds, giving a total of 11.8 million tonnes per year).

The ENA estimates that environmental damage related to N_r effects from agriculture in the EU-27 is €20–€150 billion per year. A cost-benefit analysis shows that this outweighs the benefit of N-fertiliser for farmers of €10–€100 billion per year.

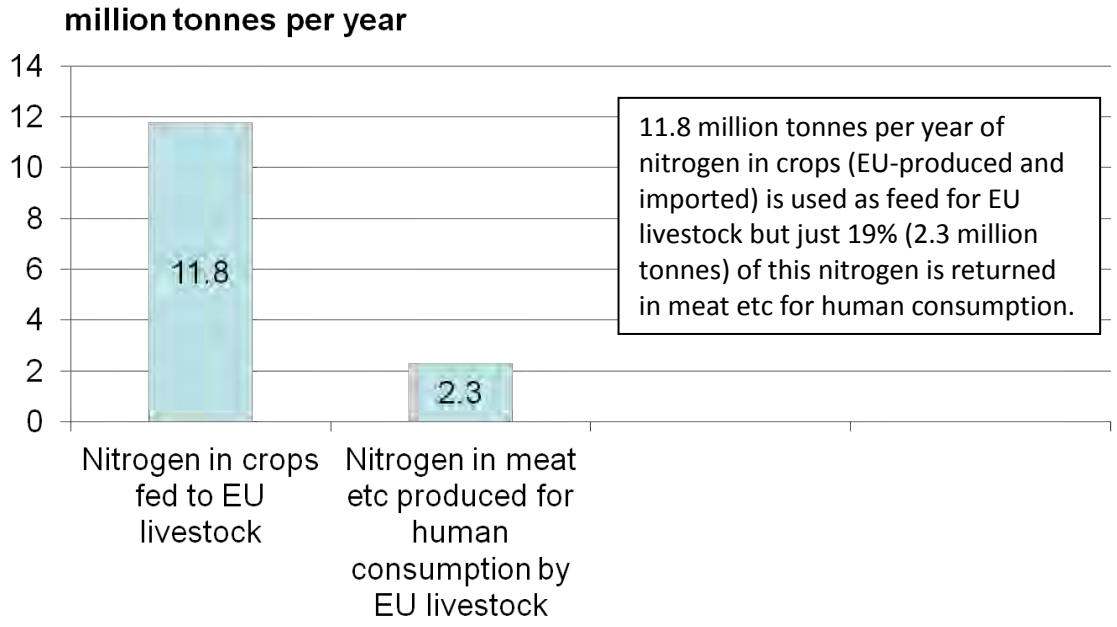
The ENA stresses that animal farming is inherently less efficient in its use of N_r than crop production. This is because livestock production involves a double burden of nitrogen losses: firstly when fertilisers are applied to feed crops and then when these crops are fed to animals.

The ENA points out that nitrogen (N) recovery (kg N taken up by a crop per kg applied N) provides a measure of N-loss to the environment in crop production. For cereals N recovery varies from 30–60% across Europe, indicating that 40–70% of the fertilizer N_r applied is lost to the atmosphere or the hydrosphere.

The concentrate feed given to industrial livestock has high levels of nitrogen. However, livestock only assimilate half or less of the nitrogen in their feed; half or more is excreted in their manure. The ENA points out that only 10–50% of N_r in feed is retained in liveweight and 5%–40% in the edible weight. Taking the additional N_r losses in feed production into account (see previous paragraph), the overall efficiency of N_r use for meat production is around half these values. The ENA concludes that “for this reason, the full chain of animal protein production generates much more losses to the environment than plant protein production”. The nitrogen that is not absorbed by feed crops and then by the animals pollutes the environment; for example, it is washed into rivers and lakes and leaches from the soil into groundwater, contaminating sources of drinking water and damaging aquatic and marine ecosystems.

The nitrogen use inefficiency of feeding crops to livestock is shown in Figure 4.

Figure 4: Nitrogen use inefficiency of feeding crops to animals



Source: European Nitrogen Assessment, 2011

The ENA states that "Human use of livestock in Europe, and the consequent need for large amounts of animal feed, is therefore the dominant human driver altering the nitrogen cycle in Europe". It is industrial livestock production that is particularly dependent on using crops as feed and accordingly it is more responsible for the loss of reactive nitrogen to the environment than extensive animal farming.

Similar findings emerged in 2014. The Executive Summary of a report entitled *Nitrogen on the Table* by the UN Economic Commission for Europe (UNECE) found that around 79-88% of the total emissions related to EU agriculture of ammonia, nitrate and nitrous oxide are related to livestock production; this includes the emissions related to feed production (as cereals and fodder crops).[27] It added that nitrogen use efficiency is low for meat and dairy products (5-30%) as compared with plant-based commodities (45-75%) [nitrogen use efficiency is defined as the input/output ratio, all the way from the fertilizer input to nitrogen in the final product].

The Executive Summary reported that a 50% reduction in livestock product consumption and production would reduce current European agricultural N_r emissions by around 40%. A 2014 paper used as supporting material for the UNECE study found that halving the consumption of meat, dairy products and eggs in the EU would increase the food system's nitrogen efficiency from the current 18% to between 41% and 47%.[28] The authors state that this is expected to result in a significant improvement in both air and water quality in the EU.

The position globally is similar to that in the EU. A major study *Our Nutrient World* found that:

- Inclusion of livestock in the food chain substantially reduces overall nutrient use efficiency, leading to large pollution releases to the environment and requiring more nitrogen (N) and phosphorus (P) to sustain the human population than would be required by plant-based foods

[27] Westhoek H *et al*, 2014. Nitrogen on the table: the influence of food choices on nitrogen emissions and the European environment. ENA Special Report on nitrogen and food

[28] Westhoek H *et al*, 2014. Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. Global Environmental Change, Vol 26, May 2014 p196-205. http://www.sciencedirect.com/science/article/pii/S0959378014000338

- Globally, the 80% of N & P in crop & grass harvests that feeds livestock ends up providing only around 20% (15-35%) of the N & P in human diets
- "like the European cycle, the global nitrogen cycle is also dominated by humanity's use of reactive nitrogen to raise livestock".[29]

Climate change

Meat and dairy products are generally responsible for a higher level of greenhouse gas (GHG) emissions per unit of nutrition produced than non-animal foods.[30] However, debate continues as to whether industrial or extensive animal production is less damaging for climate change.

The clearing of forests or savannah for cattle rearing or to grow animal feed – most of which is used for industrially farmed animals - releases huge amounts of stored carbon into the atmosphere, thereby contributing to climate change.

The feed crops needed for industrial livestock are often grown intensively with the aid of synthetic nitrogen fertiliser. The manufacture of these fertilisers uses considerable amounts of fossil fuel which results in sizeable CO_2 emissions.[31] In addition, the application of nitrogen fertiliser leads to substantial emissions of nitrous oxide, the most aggressive GHG.

Cattle and sheep emit methane. However, research shows that the carbon sequestering (storing) benefits of cattle kept on grassland can balance or even outweigh their methane emissions.[32]

A 2014 study examined the impact on GHG emissions of six different diets.[33] Its findings are shown in Figure 5. Two conclusions emerge from these data:

- a high meat diet (>100g/day) is responsible for much higher GHG emissions than a low meat diet (<50g/day)
- the production and consumption of animal-based foods is associated with higher GHG emissions than plant-based foods.

Another 2014 study found that halving the consumption of meat, dairy products and eggs in the EU would achieve a 25–40% reduction in GHG emissions.[34]

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[29] Sutton M. *et al*, 2013. *Our Nutrient World: The challenge to produce more food and energy with less pollution.* Global Overview of Nutrient Management. Centre for Ecology and Hydrology, Edinburgh on behalf of the Global Partnership on Nutrient Management and the International Nitrogen Initiative.

[30] Garnett, T., 2011. *Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)?* Food Policy 36, S23-S32

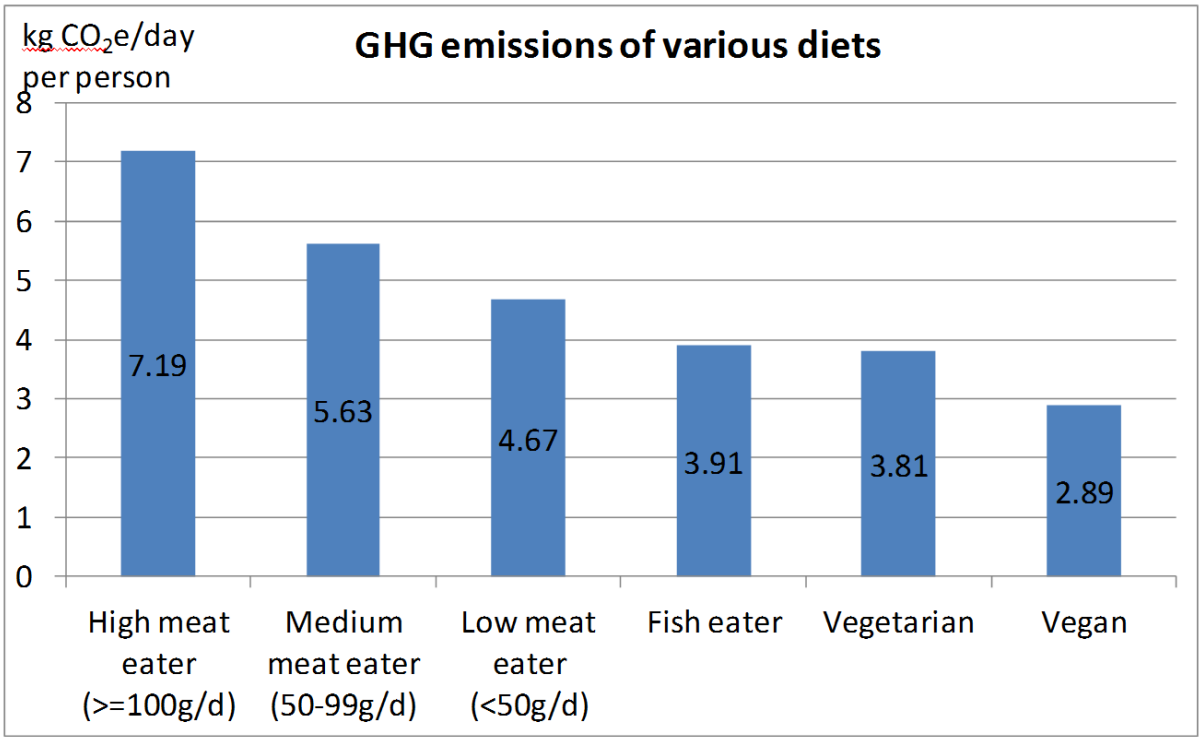
[31] Minding the stock: bringing public policy to bear on livestock sector development, 2009. World Bank. Report No. 44010-GLB

[32] Allard, V., and others, 2007. The role of grazing management for the net biome productivity and greenhouse gas budget (CO_2, N_2O and CH_4) of semi-natural grassland. Agriculture, Ecosystems and Environment 121, 47–58

[33] Scarborough P. *et al*, 2014. Dietary greenhouse gas emissions of meat-eaters, fish-eaters, vegetarians and vegans in the UK. Climatic Change (2014) 125:179–192 DOI 10.1007/s10584-014-1169-1

[34] Westhoek H *et al*, 2014. Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. Global Environmental Change, Vol 26, May 2014 p196-205. http://www.sciencedirect.com/science/article/pii/S0959378014000338

Figure 5: GHG emissions per unit of nutrition produced by different diets



Source: Scarborough *et al*, 2014

Biodiversity loss

The European Parliament has stressed that "farmland biodiversity is in continued decline" and "emphasises the importance of halting and reversing the reduction in species diversity and crop varieties, which leads to an erosion of the genetic basis on which human and animal nutrition depends".[35]

The European Environment Agency has concluded that "Biodiversity in agro-ecosystems is under considerable pressure as a result of intensified farming".[36] Intensive agriculture has played a major role in the decline in farmland birds, grassland butterflies and pollinators such as bees.[37] Only 7% of habitats linked to agro-ecosystems have a favourable conservation status, compared to 17% for habitat types not related to agro-ecosystems.[38]

The Commission states that the livestock sector may be the leading player in the reduction of global biodiversity through its demand on land.[39] The contribution of livestock farming to the present global loss of biodiversity is estimated by a Dutch study to be around 30%.[40]

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[35] European Parliament resolution of 20 April 2012 on our life insurance, our natural capital: an EU biodiversity strategy to 2020 (2011/2307(INI))
http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/EP_resolution_april2012.pdf

[36] European Environment Agency. 10 messages for 2010: Agricultural ecosystems

[37] European Environment Agency, 2010. European Environment: state and outlook 2010

[38] European Parliament Directorate-General for Internal Policies, 2011. What tools for the European agricultural policy to encourage the provision of public goods?
http://www.europarl.europa.eu/RegData/etudes/etudes/join/2011/460053/IPOL-AGRI_ET(2011)460053_EN.pdf

[39] Commission staff working paper, 2011. Analysis associated with the Roadmap to a Resource Efficient Europe Part II, SEC (2011) 1067 final

[40] Westhoek, H., Rood T., van den Berg M., Janse J., Nijdam D., Reudink M. and Stehfest E., 2011. The protein puzzle: the consumption and production of meat, dairy and fish in the European Union. PBL Netherlands Environmental Assessment Agency

Conclusions and Recommendations on adverse impact on environment

- Animal products from industrial systems generally consume and pollute more ground- and surface-water resources than animal products from grazing or mixed systems;
- The water footprint of any animal product is larger than the water footprint of crop products with equivalent nutritional value;
- A switch from the current diet to a healthier diet based on recommendations of the German Society for Nutrition (a reduction in meat consumption of 45%) would reduce the water footprint of EU food consumption by 20%;
- Halving the consumption of meat, dairy products and eggs in the EU would result in 23% per capita less use of cropland for food production;
- 45% of European soils face problems of soil quality;
- If a proportion of the arable land used to grow feed crops for livestock were instead used to grow crops for direct human consumption a greater number of people could be fed from the same area of land. Moreover, arable land could be farmed less intensively with reduced use of monocultures, chemical fertilisers and pesticides. This would enable the quality of agricultural soils to be gradually rebuilt;
- Excess reactive nitrogen (N_r) in the environment results in damage to water quality, air quality (and hence human health), soil quality, the greenhouse balance and ecosystems and biodiversity;
- Agricultural emissions of nitrogen dwarf those from traffic and industry;
- Most production of N_r in Europe is used for fertiliser to grow feed crops for animals;
- Animal farming is inherently less efficient in its use of N_r than crop production. Livestock production involves a double burden of nitrogen losses: firstly when fertilisers are applied to feed crops and then when these crops are fed to animals;
- A 50% reduction in livestock product consumption and production would reduce European agricultural N_r emissions by around 40%;
- The global nitrogen cycle is also dominated by humanity's use of N_r to raise livestock;
- A high meat diet (>100g/day) is responsible for much higher GHG emissions than a low meat diet (<50g/day)
- The production and consumption of animal-based foods is associated with higher GHG emissions than plant-based foods.
- Biodiversity in agro-ecosystems is under considerable pressure as a result of intensified farming;
- The Commission should encourage a switch from industrially produced meat to meat from grazing or mixed systems and/or a move to healthier diets with a lower proportion of meat in order to reduce the impact of EU food production and consumption on the environment and the natural resources on which agriculture depends.

Section 4: Impact of EU farming and food consumption on third countries

Agriculture was responsible for just over half (128 million hectares) of global deforestation in the period 1990-2008. 46% of agriculture's impact results from the clearing of forests for pastures to raise livestock (mainly beef cattle), 8% is due to the clearing of forests to grow crops for pig and poultry feed and 3% to clearing of forests to grow crops for ruminant feed.[41]

EU consumption, particularly its consumption of meat, makes an important contribution to global deforestation. A study carried out for the Commission reports that EU crop and livestock product use was responsible for 8.7 million hectares of global deforestation in the period 1990-2008.[42] 14% of this EU-associated deforestation was due to expansion of pastures for ruminant livestock production while 44% resulted from the expansion of cropland

[41] European Commission, 2013. The impact of EU consumption on deforestation: Comprehensive analysis of the impact of EU consumption on deforestation.
[42] *Ibid*

to grow feed crops.[43] This 44% breaks down as follows: 24% was due to the provision of feed crops for EU pigs and poultry and 20% to the provision of feed crops for EU ruminants.

Another study carried out for the Commission states that "EU imports are demanding large areas of fertile cropland in distant regions of the world and EU consumption patterns are contributing to deforestation and land use change elsewhere".[44] In addition, the EU is a net virtual water importer; EU agricultural imports result in the EU having a large water footprint in third countries.[45] [46]

Use of soy as animal feed

Commission data show that the EU imports over 30 million tonnes of soy per year, almost all of it for animal feed. The majority of EU imports – 27.4 million tonnes in 2011-2012 – come from Argentina and Brazil. In 2011-2012 Argentina and Brazil's combined production was 106.9 million tonnes;[47] 26% of this was exported to the EU.[48]

The area of soy harvested in Argentina and Brazil in 2012 was 44.3 million hectares.[49] As indicated above, 26% of this area – 11.5 million hectares - was used to produce soy for the EU market.

The massive recent increase in soy production in South America has had – and continues to have - extremely damaging impacts on climate change and biodiversity. Soy cultivation has been a major driver of deforestation in the Amazon and the Atlantic Forest (located in Brazil, eastern Paraguay and northeast Argentina) and of the conversion of the Brazilian Cerrado savannah into agricultural land. The Cerrado is a huge area of dry grassland, woodland, forests and wetlands with great bird and plant biodiversity and is also an important source of water.

The clearing of forests or savannah to grow soy or for cattle rearing releases huge amounts of stored carbon into the atmosphere, thereby contributing to climate change. Forest loss is a major contributor to climate change, responsible for up to 20% of global GHG emissions.[50] In addition, loss of tropical forests undermines a range of other ecosystem services provided by such forests including the maintenance of genetic diversity, control of soil erosion, water purification, downstream flood protection, air pollution control and pollination.

As indicated above, EU soy imports from Argentina and Brazil use about 11.5 million hectares of land in those two countries. EU soy imports from South America as a whole require around 13 million hectares of land. Indeed a study carried out for the Commission indicates that the figure may be much higher than this. This study states that "EU imports of soybeans and soybean cake used in intensive EU livestock production ... are equivalent to an area of over 20 million ha of cropland".[51]

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[43] *Ibid*

[44] European Commission, 2010. Preparatory study for the review of the thematic strategy on the sustainable use of natural resources, Bio Intelligence Services, 2010, http://ec.europa.eu/environment/natres/pdf/BIO_TSR_FinalReport.pdf

[45] Mekonnen, M. and A. Hoekstra. 2011. National Water Footprint Accounts: The Green, Blue, and Grey Water Footprint of Production and Consumption. Value of Water Research Report Series 50. New York: UNESCO-IHE.

[46] Vanham D & Bidoglio G, 2013. A review on the indicator water footprint for the EU28. Ecological Indicators 26 (2013) 61–75

[47] United States Department of Agriculture,Foreign Agricultural Service.

[48] Soy trade: ISTA Mielke, Germany (oilworld.de). 2011-12)

[49] FAOSTAT, 2013

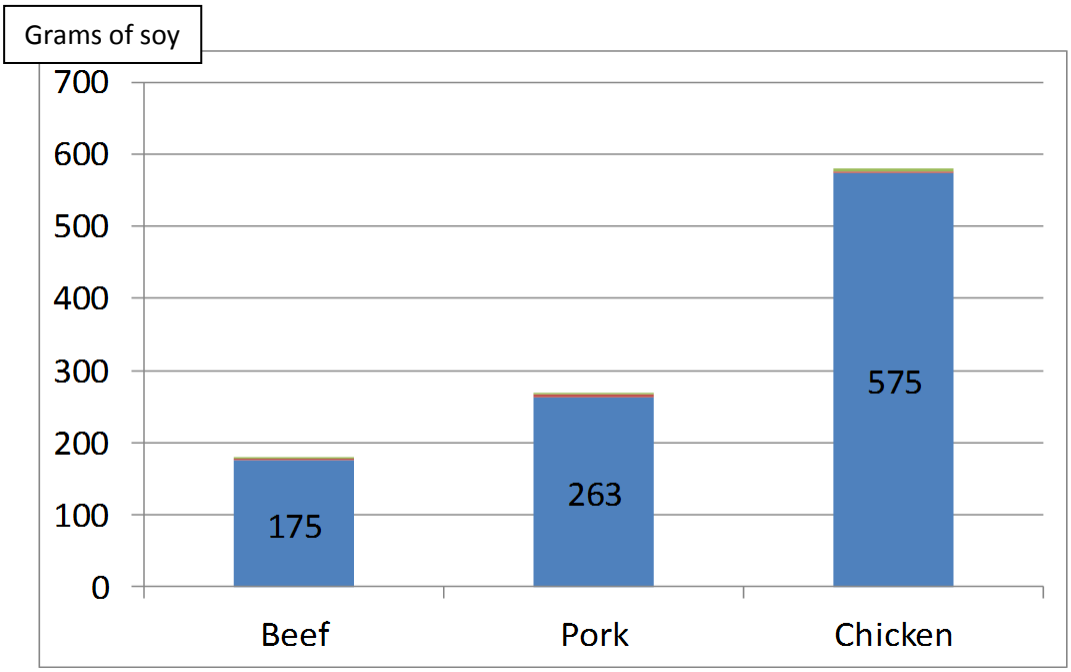
[50] Taylor, R. (ed) 2011a. *WWF Living Forests Report.* Chapter 3: Forests and Climate: Redd+ at a crossroads. wwf.panda.org/livingforests, WWF, Gland, Switzerland.

[51] European Commission, 2010. Preparatory study for the review of the thematic strategy on the sustainable use of natural resources, Bio Intelligence Services, 2010, http://ec.europa.eu/environment/natres/pdf/BIO_TSR_FinalReport.pdf

Conclusions and Recommendations regarding impact on third countries

- The EU's import of livestock products (particularly beef) and feed crops for EU livestock leads to deforestation in South America. This results in erosion of biodiversity and GHG emissions ensuing from the clearing of forests;
- The Commission should encourage steps that could reduce the EU's demand for imported soy. Such steps could include:
  - A shift away from the consumption of pig and poultry meat towards beef and sheepmeat as pig and poultry diets contain much higher proportions of soy than ruminant diets. [52] 575g of soy are needed to produce 1kg of chicken meat, 263g of soy are used to produce 1kg of pork and 175g for 1kg of beef (see Figure 6).[53]
  - Increased production in the EU of alternative protein sources including rapeseed meal, sunflower meal and legumes such as peas and beans.
  - A reduction in EU meat consumption and production. The Executive Summary of a report by the UN Economic Commission for Europe (UNECE) concludes that a 50% reduction in EU livestock consumption and production would reduce the requirement for imported soybeans for animal feed by 75%.[54]

Figure 6: proportion of soy in livestock diets



Section 5: Health implications of industrial livestock production

Non-communicable disease

The high levels of meat consumption that have been made possible by industrial farming are having an adverse impact on human health. The Commission points out that overconsumption of animal protein can lead to obesity, diabetes, heart diseases and certain cancers.[55]

[52] Van Gelder *et al*, 2008. Soy consumption for feed and fuel in the European Union https://www.milieudefensie.nl/publicaties/rapporten/soy-consumption-for-feed-and-fuel-in-the-european-union

[53] Hoste, R. and Bolhuis, J. 2010. *Sojaverbruik in Nederland*. LEI-rapport 2010-059. LEI, Wageningen, Netherlands http://edepot.wur.nl/157676

[54] Westhoek H *et al*, 2014. Nitrogen on the table: the influence of food choices on nitrogen emissions and the European environment. ENA Special Report on nitrogen and food

[55] European Commission, 2012. Consultation Paper: Options for Resource Efficiency Indicators http://ec.europa.eu/environment/consultations/pdf/consultation_resource.pdf

A report by the World Economic Forum and the Harvard School of Public Health states that 63% of all deaths worldwide currently stem from non-communicable diseases (NCDs) – chiefly cardiovascular diseases, cancers, chronic respiratory diseases and diabetes.[56] The report stresses that "NCDs have a large impact, undercutting productivity and boosting healthcare outlays". A key message from the report is that "NCDs already pose a substantial economic burden and this burden will evolve into a staggering one over the next two decades". The World Health Organisation (WHO) identifies four major risk factors for NCDs: unhealthy diet, physical inactivity, tobacco use and harmful alcohol use.[57]

Diseases of the heart and circulatory system (cardiovascular disease or CVD) are the main cause of death in the EU.[58] The European Heart Network points out that "the fat composition of western diets—with their high proportion of animal products—is such that almost any increase in total fat will result in increases in saturated fat, dietary cholesterol and energy density. Greater intakes of total fat (whether or not the fat is of a saturated kind) will also increase blood pressure and appreciably increase the risk of strokes".[59]

A study published in *The Lancet* concluded that a 30% decrease in intake of saturated fats from animal sources in the UK could reduce the total burden from ischaemic heart disease by 15% in disability-adjusted life-years (DALYs), by 16% in years of life lost, and by 17% in number of premature deaths.[60] Similarly, In São Paulo city, a 30% reduction in intake of saturated fat from animal sources could reduce the total burden from ischaemic heart disease by 16% in DALYs, by 17% in years of life lost, and by 17% in number of premature deaths. It may well that the UK figure would be similar for the EU as a whole.

Research published by the University of Cambridge in 2012 concludes that reduced consumption of red and processed meat would lead to reduced risks of heart disease, diabetes mellitus and colorectal cancer and also to reduced greenhouse gas emissions.[61] A report by the World Cancer Research Fund concludes that the evidence that consumption of red meat and processed meat are causes of colorectal cancer is convincing.[62] The report states that the term 'red meat' includes not just beef and lamb but also pork. The report points out that cancers of the colon and rectum are the third most common type worldwide.

A 2014 study examined the health implications of a 25% and also a 50% reduction in EU consumption of meat and dairy products.[63] The study examined these percentage reductions in three alternative scenarios: a reduction in just beef and dairy consumption, a reduction in just pig and poultry consumption, and a reduction in all meat and dairy consumption.

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[56] Bloom, D.E., Cafiero, E.T., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L.R., Fathima, S., Feigl, A.B., Gaziano, T., Mowafi, M., Pandya, A., Prettner, K., Rosenberg, L., Seligman, B., Stein, A.Z., & Weinstein, C. (2011).The Global Economic Burden of Noncommunicable Diseases. Geneva: World Economic Forum.

[57] World Health Organization. Global status report on non-communicable diseases 2010. Geneva: World Health Organization. http://www.who.int/nmh/publications/ncd_report_full_en.pdf

[58] European cardiovascular disease statistics, 2012 edition http://www.bhf.org.uk/publications/view-publication.aspx?ps=1002098

[59] Diet, physical activity and cardiovascular disease prevention in Europe; summary report. European Heart Network, November 2011 http://www.ehnheart.org/publications/publications/publication/521-diet-physical-activity-and-cardiovascular-disease-prevention.html

[60] Friel S., Dangour A.D., Garnett T., Lock K., Chalabi Z., Roberts I., Butler A., Butler C.D. Waage J., McMichael A.J. and Haines A., 2009. Health and Climate Change 4: Public health benefits of strategies to reduce greenhouse-gas emissions: food and agriculture. Published online November 25, 2009 DOI:10.1016/S0140-6736(09)61753-0

[61] Aston LM, Smith JN and Powles JW, 2012. Impact of a reduced red and processed meat dietary pattern on disease risks a and greenhouse gas emissions in the UK: a modelling study. BMJ Open 2012,2e001072 http://bmjopen.bmj.com/content/2/5/e001072.full.pdf+html

[62] World Cancer Research Fund / American Institute for Cancer Research. Continuous Update Project Interim Report Summary. Food, Nutrition, Physical Activity,and the Prevention of Colorectal Cancer. 2011

[63] Westhoek H *et al*, 2014. Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. Global Environmental Change, Vol 26, May 2014 p196-205. http://www.sciencedirect.com/science/article/pii/S0959378014000338

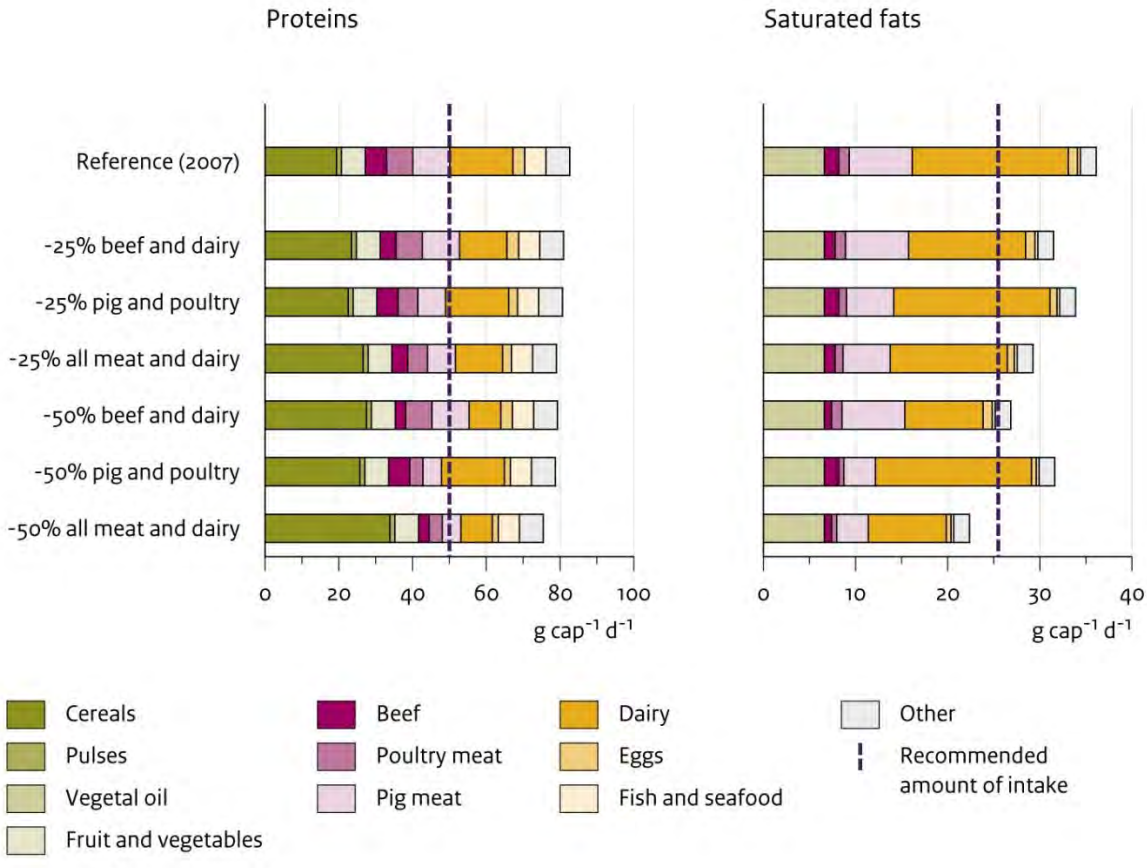
The study found that under these alternative diets, the intake of saturated fats is reduced by up to 40% which the study states would lead to a reduction in cardiovascular mortality. The largest reduction results from a 50% reduction in all meat and dairy consumption. Indeed, it was only this reduction that brought consumption of saturated fats below the recommended maximum dietary intake (RMDI) proposed for Europe by the WHO of 25.5 g per person per day.[64] Interestingly, Figure 7 (which is reproduced from the study) shows that in both the current and the alternative diets, dairy products are responsible for a much higher proportion of the saturated fat in EU diets than meat.

The study reports that a 50% reduction in meat consumption would lead to a reduction in average EU red meat consumption from the current 89 g per person per day to 46 g. This would bring diets in line with maximum intake levels advised by the World Cancer Research Fund (WCRF).

The current average per capita protein intake in the EU is about 70% higher than is required under WHO recommendations. The study shows that all the alternative diets involving various reductions in meat and dairy consumption would provide protein intakes that, while lower than under current diets, are higher than those required under WHO recommendations (see Figure 6). Even with a 50% reduction in all animal products, the mean EU intake of proteins would still be at least 50% higher than required by WHO recommendations.

Figure 7: Effects of dietary changes on average daily per capita intake of proteins and saturated fats

a. Population average daily protein intake for the EU27 in g day from the various food commodity groups in the reference (2007) situation and in the case of the six alternative diets in which meat and dairy consumption is reduced. b. idem, for saturated fats.



Source: Westhoek *et al*, 2014

[64] *Ibid*

The above study is cited as supporting material by the Executive Summary of a report by the UN Economic Commission for Europe (UNECE). The UNECE Executive Summary states that the meat and dairy reduction scenarios considered by the study lead to "food consumption patterns that are better aligned with international dietary recommendations".[65] It adds that "based on the current WHO and WCRF dietary recommendations, the results are clear: the reduced intake of red meat and saturated fats in these reduction scenarios means that public health risks would be reduced".

Comparison of nutritional quality of meat from animals reared industrially and extensively

The FAO points out that the modern western diet lacks nutrient quality and highlights the need to integrate the dimension of nutritional quality into food policy.[66] Modern western diets tend to contain too much fat. In addition, they are often deficient in the beneficial omega-3 fatty acids and have excessive amounts of omega-6 fatty acids relative to omega-3. Insufficient omega-3, and an imbalance of the ratio of omega-6 to omega-3, promotes a number of serious diseases, including cardiovascular disease, cancer, osteoporosis, and inflammatory and autoimmune diseases.[67]

Research shows that free range animals – that consume fresh forage and have higher activity levels - often provide meat of higher nutritional quality than animals that are reared industrially. For example, meat from free range chickens contains substantially less fat and generally a higher proportion of the beneficial omega-3 fatty acids than meat from chickens reared industrially.[68] Similarly, pasture-fed beef has less fat and higher proportions of omega-3 fatty acids than grain-fed beef.

Industrial livestock production's contribution to antimicrobial-resistance

The excessive recourse to antimicrobials in human medicine is the major cause of antimicrobial resistance. However, a substantial body of evidence indicates that the overuse of antimicrobials in intensive animal production also contributes significantly to the emergence of bacteria that are resistant to antimicrobials used in human medicine.

The problem has been summarised by the European Medicines Agency which has said "In animal production systems with high density of animals or poor biosecurity, development and spread of infectious diseases is favoured, which leads more frequently to antimicrobial treatment and prevention of those diseases. This provides favourable conditions for selection, spread and persistence of antimicrobial-resistant bacteria. Some of these bacteria are capable of causing infections in animals and if zoonotic also in humans. Bacteria of animal origin can also be a source for transmission of resistance genes to human and animal pathogens".[69]

The link between intensive farming and high levels of antimicrobials use is highlighted by the fact that the Veterinary Medicines Directorate's data show that around 90% of all UK farm antibiotic sales are for pigs and poultry, the two most intensively farmed species.[70]

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[65] Westhoek H *et al*, 2014. Nitrogen on the table: the influence of food choices on nitrogen emissions and the European environment. ENA Special Report on nitrogen and food

[66] Sustainable diets and biodiversity, 2012. UN Food and Agriculture Organisation, 2012

[67] Simopoulos, A. P. (2008) The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. *Experimental Biology and Medicine*, 233: 674-688.

[68] Research reviewed in Nutritional benefits of higher welfare animal products, 2012. Compassion in World Farming. http://www.ciwf.org.uk/includes/documents/cm_docs/2012/n/nutritional_benefits_of_higher_welfare_animal_products_report_june2012.pdf

[69] CVMP (2006) Reflection paper on the use of fluoroquinolones in food-producing animals in the European Union: development of resistance and impact on human and animal health. EMEA http://www.ema.europa.eu/docs/en_GB/document_library/Other/2009/10/WC500005155.pdf

[70] VMD (2009) Sales of antimicrobial products authorised for use as veterinary medicines, antiprotozoals, antifungals and coccidiostats, in the UK in 2008, VMD. http://www.vmd.defra.gov.uk/pdf/salesanti09.pdf

The Commission reports that a subset of drug-resistant bacteria is responsible for about 25,000 human deaths annually. In addition to avoidable death, this also translates into annual extra healthcare costs and productivity losses of at least €1.5 billion.[71]

Conclusions and Recommendations regarding human health

- The high levels of meat consumption that have been made possible by industrial farming are having an adverse impact on human health. Overconsumption of animal protein can lead to obesity, diabetes, heart diseases and certain cancers;
- A 50% reduction in EU meat and dairy consumption would bring consumption of saturated fats below the recommended maximum dietary intake proposed for Europe by the World Health Organisation (WHO);
- A 50% reduction in meat consumption would lead to a reduction in average EU red meat consumption from the current 89 g per person per day to 46 g. This would bring diets in line with maximum intake levels advised by the World Cancer Research Fund;
- A 50% reduction in EU meat and dairy consumption would still leave EU citizens consuming 50% more protein than is required under WHO recommendations;
- Free range animals often provide meat of higher nutritional quality than animals reared industrially;
- Excessive use of antimicrobials in intensive animal production contributes significantly to antimicrobial resistance;
- The Commission should encourage a transition to healthier diets of higher nutritional quality.
- Many of the world's poor would benefit from increased meat consumption. However, the developing world should aim for a balanced intake of animal-source foods and should not adopt western diets as these have an adverse impact on health.

Section 6: Animal welfare

The EU has prohibited the three iconic symbols of factory farming: veal crates, barren battery cages and sow stalls (although, regrettably sow stalls continue to be permitted for use in the first four weeks of pregnancy). However, the majority of pigs, poultry and rabbits and many dairy cows continue to be farmed industrially. They are kept indoors throughout their lives, crammed into overcrowded, often barren, sheds or confined in cages or crates.

Animals' health is often seriously impaired by the practice of genetic selection for fast growth or high yields. The European Food Safety Authority (EFSA) has concluded that "long term genetic selection for high milk yield is the major factor causing poor welfare, in particular health problems, in dairy cows".[72] EFSA has also concluded that genetic selection of pigs for rapid growth has led to leg disorders and cardiovascular malfunction.[73] The high productivity of the modern laying hen causes osteoporosis and so creates a substantial risk of fractures both during the laying period and at depopulation at the end of lay.[74] A large-scale UK study into leg disorders in broilers found that 27.6% of the chickens had gait scores of 3 or more, i.e. lameness that is likely to be painful and that fast growth rates are the primary risk factors for these problems.[75]

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[71] Communication from European Commission. Action plan against the rising threats from Antimicrobial Resistance. 15.11.2011. COM (2011) 748
http://ec.europa.eu/dgs/health_consumer/docs/communication_amr_2011_748_en.pdf

[72] Scientific Opinion of the Panel on Animal Health and Welfare on a request from European Commission on the overall effects of farming systems on dairy cow welfare and disease. *The EFSA Journal* (2009) 1143, 1-38
http://www.efsa.europa.eu/en/efsajournal/doc/1143.pdf

[73] Scientific Opinion of the Panel on Animal Health and Welfare on a request from the Commission on Animal health and welfare in fattening pigs in relation to housing and husbandry. *The EFSA Journal* (2007) 564, 1-14

[74] Laywell: Welfare implications of changes in production systems for laying hens: Deliverable 7.1

[75] Knowles, T. G., Kestin, S. C., Haslam, S. M., Brown, S. N., Green, L. E., Butterworth, A., Pope, S. J., Pfeiffer, D. and Nicol, C. J., 2008. Leg disorders in broiler chickens: prevalence, risk factors and prevention. Plos one 3 (2): e1545. doi: 10.1371/journal.pone.0001545.

Each year millions of farm animals are mutilated. Piglets and lambs are castrated and tail-docked with many hens and turkeys being beak-trimmed.

The EU Strategy on animal welfare acknowledges that lack of enforcement of EU welfare legislation is common in a number of areas.[76]

Article 13 of the Treaty on the Functioning of the EU (TFEU) provides that in "formulating and implementing the Union's agriculture, fisheries, transport, internal market, research and technological development and space policies, the Union and the Member States shall, since animals are sentient beings, pay full regard to the welfare requirements of animals". The Commission and many Member States have failed to respect Article 13 in several areas including the CAP, the welfare of dairy cows and farmed fish, animal transport and enforcement of the legislation on the welfare of pigs.

The EU wastes 90 million tonnes of food a year; this includes the meat equivalent of almost two billion animals. This is morally repugnant as most of these animals will have been put through the suffering of factory farming only for their meat to be thrown away

Conclusions and Recommendations regarding animal welfare

- Cages and crates should be phased out as they thwart many of animals' basic instincts: to roam, to forage, to explore;
- Animals should be kept in outdoor systems or, if they are housed, they should be kept in large barns with ample space, plenty of straw, natural light and effective ventilation;
- Husbandry systems must enable animals to express their natural behaviours;
- Genetic selection for fast growth or high yields should be avoided where this results in compromised welfare;
- Systems should not be used if they require routine mutilations;
- The meat of almost two billion animals is thrown away each year in the EU; this practice must be ended;
- The EU and the Member States must produce an action plan designed to ensure respect for TFEU, Article 13;
- In areas where there is no species-specific EU legislation, the EU and the Member States must enforce:
  - the General Farm Animals Directive (98/58) and in particular Article 3 which provides that farmers must "take all reasonable steps to ensure the welfare of animals under their care"
  - the Recommendations of the Council of Europe which the Commission recognises as forming a binding part of EU law.

Section 7: What should future EU food and farming policy look like?

Current EU food and farming policy – with its emphasis on farming animals industrially and its high level of meat and dairy consumption – is resource-inefficient, damaging to the natural resources on which our future ability to feed ourselves depends and harmful to human health.

The EU needs to develop a new model of food and farming. One that uses resources more efficiently and that rather than damaging the environment, enhances soil quality, makes judicious use of arable land, uses water sparingly without polluting it and restores biodiversity and ecosystems.

As seen earlier, the use of human-edible crops as animal feed is wasteful and environmentally damaging. Olivier De Schutter, who recently completed a six year term as UN Special Rapporteur on the right to food, highlights the importance of "reallocating cereals

[76] Communication from the Commission on the European Union Strategy for the Protection and Welfare of Animals 2012-2015, Brussels, 15.2.2012

used in animal feed to human consumption".[77] He adds that "continuing to feed cereals to growing numbers of livestock will aggravate poverty and environmental degradation".[78]

The EU should avoid the excessive use of human-edible crops in animal feed and instead put more emphasis on:

Raising animals on species-rich extensive pastures: The great strength of extensively reared cattle and sheep is that they convert grass into food that we can eat and are able to use land that is generally not suitable for other forms of food production. Extensive pastures can support biodiversity; they provide a diverse environment, rich in plants and invertebrates and beneficial to a variety of birds. In addition, they store carbon and can reduce the use of nitrogen fertilisers by the incorporation into pasture of legumes (e.g. clover) which fix atmospheric nitrogen in the soil.

Integrated crop/livestock production: The link between animals and the land should be restored through mixed rotational farming where animals are fed on crop residues and their manure fertilises the land rather than being a pollutant.

Pigs and poultry are nature's great foragers and recyclers: Most EU pigs and poultry are factory farmed. They should instead be kept outdoors where some of their diet can come from foraging, pasture, cull vegetables from local farms and unavoidable food waste. This could replace part of the cereal- and soy-based feed currently used.

EU food policy should encourage the adoption of balanced diets with a lower proportion of meat. This would deliver health benefits by reducing the incidence of heart disease, obesity and certain cancers; it would also lower greenhouse gas emissions. Although more crops would be needed for direct human consumption this would be outweighed by reduced demand for feed crops.

A move away from grain-based animal production coupled with a reduction in meat consumption would produce environmental benefits. It would allow land to be farmed less intensively with less use of artificial fertilisers, reduced degradation of water, soil and air and lower use of water, land and energy. It would also result in biodiversity gains and enable animals to be kept to higher welfare standards.

As indicated earlier, research shows that halving consumption of meat and dairy products in the EU would lead to 23% per capita less use of cropland for food production, a 40% reduction in nitrogen emissions and a 25-40% reduction in GHG emissions while the import of soymeal for animal feed would be reduced by 75%. In addition, the consumption of red meat would be brought in line with intake levels advised by the World Cancer Research Fund and the consumption of saturated fats would be brought below the recommended maximum dietary intake proposed for Europe by the WHO.

The new model should be based on the following ecological principles and actions:

- the fostering of beneficial ecosystem services such as carbon sequestration and crop pollination;
- the development of improved biodiversity at ecosystem, farm, seed and soil levels;
- improving soil fertility and quality by methods based on natural processes such as the use of rotations, legumes, green manure and animal manure
- the use of practices that conserve water and are drought-resistant e.g. techniques for improving water retention in the soil;
- using the principles of integrated pest management to control insects, plant pathogens and weeds;
- the encouragement of localised and seasonal food systems;
- the development of resilience to climate shocks and price volatility.

[77] http://www.srfood.org/images/stories/pdf/officialreports/20110308_a-hrc-16-49_agroecology_en.pdf
[78] http://www.srfood.org/images/stories/pdf/officialreports/20140310_finalreport_en.pdf

Common Agricultural Policy
In December 2013 the EU adopted the revised CAP for the period 2014-2020. It uses almost 40% of the EU's budget.

Under the Commission's proposal for the CAP 2014-2020 30% of direct payments to farmers (Pillar 1) were to be conditional on compliance with three 'greening measures': maintaining existing permanent grassland, establishing Ecological Focus Areas (EFAs) on 7% of farmed area and growing a minimum of three different crops on any farm with more than 3 hectares of arable land. This last was designed to halt the further development of monocultures.

However, these greening measures were so weakened during the negotiations on the package that they are unlikely to benefit biodiversity or to provide significant environmental improvements. The dilution of these measures was such that most farmers are exempt from establishing EFAs and the crop diversity measure.[79] The revised CAP may well continue to drive agricultural intensification in Europe while doing little to enhance the sustainability of EU farming.

CAP reform
Although 2020 sounds a long way off it is important to begin thinking about the shape of the next CAP revision. The Common Agricultural Policy's limitations begin with its name. It allows the primary focus to be placed on just one aspect of the EU's food system – farming – and leads to insufficient weight being given to other important considerations such as the public health implications of EU diets and the impact of farming on the natural resource base on which the long-term well-being of agriculture depends.

It would be helpful for the CAP to be renamed as the *Common Food and Farming Policy*. This would reflect the fact that the CAP's prime role should not be to serve the sectoral interests of the farming community but rather to address the needs and concerns of society as a whole.

The CAP should be radically reformed so that CAP funds are primarily used to support the societal, environmental and animal welfare benefits that are increasingly valued by taxpayers. The core principle that should underpin CAP reform is that farmers should be rewarded by the market for outputs, with the taxpayers' role being to provide funding for public goods that the market cannot deliver.

Support for public goods has traditionally been the preserve of Pillar 2, but should now become the central objective of the CAP as a whole. In light of this, the division of the CAP into two separate pillars should be ended as all CAP funding should have the same core objective: using public monies for public goods that are not readily supported in the market place.

Above all, the CAP should drive change in agriculture so that it enhances food security, is more environmentally sensitive and resource-efficient and provides healthier, more nutritious food. As regards livestock, the CAP should help European agriculture move away from industrial production to sustainable systems with good standards of animal welfare.

Instruments that could help move towards a new model of food and farming

Public information and education: The EU should develop programmes to increase public awareness of the implications of different livestock farming methods and consumption levels for human health, the environment, food security and animal welfare.

[79] Pe'er G *et al*, 2014. EU agricultural reform fails on biodiversity. Science, Vol 344, Issue 6188, pp 1090-1092.

Honest labelling: Consumers should be empowered to play a greater part in driving improvements in animal welfare. Mandatory labelling of meat and dairy products as to method of production would enable consumers to make informed choices when buying food.

Ethical public procurement: Public sector bodies should, when buying meat, dairy products and eggs, use their buying power to augment the market for food produced to high nutritional, environmental and animal welfare standards.

Improved legislation and enforcement: The EU should phase out factory farming systems including 'enriched' cages for hens, rabbit battery cages, farrowing crates and zero-grazing of dairy cows. Much improved enforcement of welfare legislation is crucial.

Getting prices right - internalising negative externalities: Livestock production, in particular industrial production, produces a range of costly 'negative externalities' including damage to the environment and health. These negative externalities represent a market failure as the costs associated with them are borne by third parties or society as a whole and are not included in the prices paid by consumers. Market-based instruments are needed to enable the negative externalities of livestock production (including poor animal welfare) to be included in prices thereby reflecting the true cost of using resources and their environmental impacts.

Tax measures and subsidies to reduce the cost of sustainable forms of animal farming:

- to farmers e.g. by (i) paying subsidies for positive externalities (e.g. through the Common Agricultural Policy) and (ii) reducing tax liabilities by offering generous capital allowances for investments in sustainable farming with high standards of animal welfare
- to consumers by placing, in those countries that charge VAT on food, a lower or nil rate of VAT on sustainable, high welfare food.

Develop policies that provide access to affordable, nutritious food for all: in addition, the information programmes referred to earlier should help make people aware of the options for healthy eating on a low income.

Creation of a new food culture: The current food culture gives great weight to factors such as low prices and convenience. There is no part of this culture that invites consumers to think about how low-cost meat, eggs and milk are produced. A new food culture must be created which values the nutritional quality of food and farming methods that protect the environment and animals.

Conclusions and Recommendations regarding future EU food and farming policy

- The EU needs to develop a new model of food and farming. One that produces food of high nutritional quality, uses resources more efficiently, enhances soil quality, makes judicious use of arable land, uses water sparingly without polluting it and restores biodiversity and ecosystems;
- The EU should avoid the excessive use of human-edible crops as animal feed and instead put more emphasis on raising animals on pasture; integrated crop-livestock production; and keeping pigs and poultry outdoors where some of their diet can come from foraging, pasture, cull vegetables from local farms and unavoidable food waste;
- EU food policy should encourage the adoption of balanced diets with a lower proportion of meat. This would deliver both health and environmental benefits;
- The CAP should be radically reformed so that CAP funds are primarily used to support the societal, environmental and animal welfare benefits that are increasingly valued by taxpayers. The core principle that should underpin CAP reform is that farmers should be rewarded by the market for outputs, with the taxpayers' role being to provide funding for public goods that the market cannot deliver;
- the CAP should help European agriculture move away from industrial livestock production to sustainable systems with good standards of animal welfare.

Section 8: How much additional food is needed to feed the growing world population?

It is often asserted that, in order to feed the anticipated world population in 2050 of 9.6 billion, food production is going to have to increase by around 70%. And on the basis of these figures we are told that further intensification of agricultural production is essential.

But do we really need to produce so much extra food? As we have seen, when human-edible cereals are fed to animals much more food energy is put into the animal than is returned as meat. The UN Environment Programme calculates that the cereals which, on a business-as-usual basis, are expected to be fed to livestock by 2050, could, if they were instead used to feed people directly, provide the necessary food energy for over 3.5 billion people.[80] If a target were adopted of halving the amount of cereals that, on a business-as-usual basis, would be used for feed by 2050, an extra 1.75 billion people could be fed.

A 2013 paper produces a similar figure. It calculates that shifting the crop calories used for animal feed and other uses (biofuels and other industrial uses) to direct human consumption could potentially feed an additional ~ 4 billion people.[81]

A 2014 report by the High Level Panel of Experts on Food Security and Nutrition states that worldwide 25% of food calories are lost or wasted.[82] If loss and waste could be halved an extra one billion people could be fed.

Based on figures in an interim report by the World Resources Institute[83], we calculate that an extra 310 million people could be fed if the number of people who are expected to be obese and overweight by 2050 were reduced by eliminating obesity and halving the number who are overweight.

If all the above steps were taken, an extra 3 billion could be fed, more than the anticipated 2.6 billion increase in world population (see Figure 8).

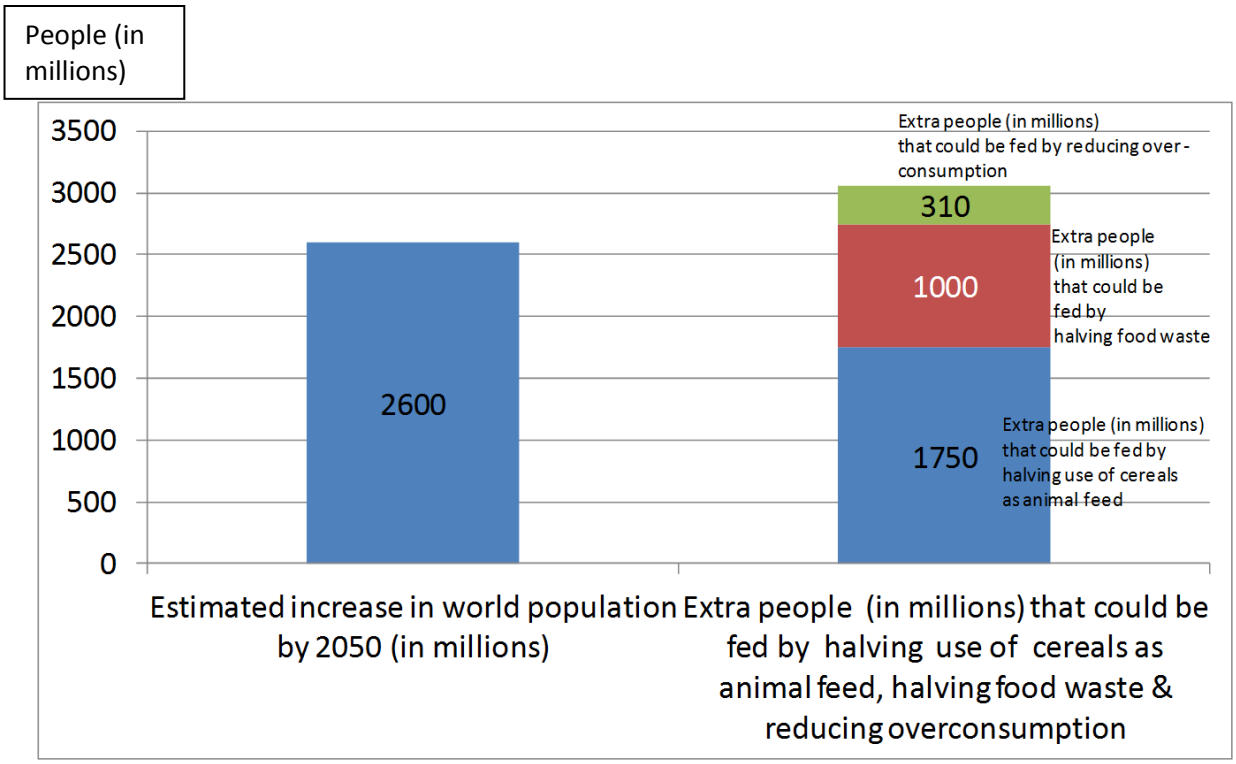
[80] Nellemann, C., MacDevette, M., Manders, et al. (2009) *The environmental food crisis – The environment's role in averting future food crises*. A UNEP rapid response assessment. United Nations Environment Programme, GRID-Arendal, www.unep.org/pdf/foodcrisis_lores.pdf

[81] Cassidy E.M *et al*, 2013. Redefining agricultural yields: from tonnes to people nourished per hectare. University of Minnesota. Environ. Res. Lett. 8 (2013) 034015

[82] HLPE, 2014. Food losses and waste in the context of sustainable food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2014.

[83] World Resources Institute, 2013. Creating a sustainable food future http://www.wri.org/sites/default/files/WRI13_Report_4c_WRR_online.pdf#

Figure 8: Feeding the 2.6 billion extra people anticipated by 2050



Source: UNEP, World Resources Institute & High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security

Despite the above figures, the view that food production must be increased by around 70% remains pervasive. However, in his final report as the UN Special Rapporteur on the right to food Olivier de Schutter challenges the strong emphasis accorded to increasing production.[84] He writes: "the food systems we have inherited from the twentieth century have failed. Of course, significant progress has been achieved in boosting agricultural production over the past fifty years. But this has hardly reduced the number of hungry people, and the nutritional outcomes remain poor".

He points out that "in high-income countries, the net health impacts of meat consumption are turning negative: at current levels, it is contributing to chronic diseases, including obesity, type 2 diabetes, cardiovascular diseases and cancer" and that "the exclusive focus on increasing agricultural production has also had severe environmental impacts".

He refers to an FAO study that estimated that annual meat production would have to reach 470 million tons to meet projected demand in 2050, an increase of about 200 million tons in comparison to the levels of 2005–2007. De Schutter states: "This is entirely unsustainable. Over one third of the world's cereals are already being used as animal feed, and if current trends continue, this will rise to 50 per cent by 2050. Demand for meat diverts food away from poor people who are unable to afford anything but cereals. ... Continuing to feed cereals to growing numbers of livestock will aggravate poverty and environmental degradation."

He stresses that the Green Revolution – with its focus on increasing production – "was an attempt to meet the challenge as it was framed at the time" and that the estimate by the FAO in 2009 that food production must increase by 70% "was widely cited to justify investments in technology-based solutions to respond to a challenge presented as a primarily quantitative one".

[84] Final report of the UN Special Rapporteru on the right to food. The transformative potential of the right to food. 24 January 2014

It is clear from the data presented earlier that the challenge of feeding 9.6 billion is not primarily a quantitative one. We already produce enough food to feed well over 9.6 billion people. Indeed some estimates suggest that we already produce enough to feed up to 14 billion people.[85] However, as indicated earlier, over 50% of global crop calories are wasted post harvest or at retail or consumer levels or by being used as animal feed or biofuels. The real challenge lies not so much in producing more but in wasting less.

Nonetheless, the (erroneous) belief that production must be very substantially increased continues to be held by many policy makers. And on this false premise governments insist that further intensification is essential. Increased production is needed, particularly in the developing world, but the required increase is very much lower than 70%. Moreover, the drive to increase production must not lead to undermining of the natural resources on which the ability of future generations to feed themselves depends.

One approach to lessening the grip of the dominant productionist paradigm is to shift the focus from yield (in tonnes per hectare) to the number of people actually fed per hectare of cropland. A 2013 study calculates that worldwide a hectare of cropland produces on average sufficient calories to feed 10.1 people but that the calories actually delivered for human consumption, after accounting for animal feed, biofuels and other uses, only feed 6 people per hectare.[86] The study indicates that countries with highly industrialised agriculture have a much poorer ratio of calories produced to calories delivered for human consumption than the global average. The U.S. produces on average sufficient calories per hectare of cropland to feed 16.1 people but only delivers enough calories to feed 5.4 people.

Conclusions and Recommendations regarding the need to substantially increase production

- It is often asserted that, to feed the anticipated world population in 2050 of 9.6 billion, food production must increase by around 70%. And on the basis of these figures we are told that further intensification of agricultural production is essential;
- However, globally enough food to feed well over 9.6 billion people is already produced but over 50% of global crop calories are wasted post harvest or at retail or consumer levels or by being used as animal feed or biofuels. The real challenge lies not so much in producing more but in wasting less;
- By halving the use of human-edible crops as animal feed, halving food losses and waste and substantially reducing obesity and overweight an extra 3 billion people could be fed, more than the anticipated 2.6 billion increase in world population;
- Increased production is needed, particularly in the developing world, but the required increase is very much lower than 70%. Moreover, the drive to increase production must not lead to undermining of the natural resources on which the ability of future generations to feed themselves depends.

Section 9: The developing world

Increasing food production will not of itself be sufficient to combat hunger if it is not combined with improved livelihoods for the poorest – particularly small-scale farmers in developing countries. Smallholder livestock farmers must be helped to increase their productivity in ways that are compatible with their circumstances. However, this should not entail the introduction of industrial livestock systems as these exclude participation of those livestock farmers living in deepest poverty. Such small-scale farmers tend to be out-competed by industrial production which provides little employment and may drive small farmers off the land.

[85] De Schutter, Nous pourrions nourrir deux fois la population mondiale, et pourtant... 2014 Le Point 09/09/2014 http://mobile.lepoint.fr/environnement/nous-pourrions-nourrir-deux-fois-la-population-mondiale-et-pourtant-09-09-2014-1861529_1927.php#xtor=CS1-31

[86] Cassidy E.M *et al*, 2013. Redefining agricultural yields: from tonnes to people nourished per hectare. University of Minnesota. Environ. Res. Lett. 8 (2013) 034015

A constructive approach would be to help small-scale farmers provide improved healthcare and nutrition for their animals by better disease management, the expansion of veterinary services and the cultivation of fodder crops such as legumes. For example, in East Africa fodder shrubs have been identified that provide cheaper and easily available protein feeds for improving milk production in smallholder farms. Around 200,000 smallholder dairy farmers (40–50% being women) have planted such fodder shrubs which contribute about US$3.8 million annually to farmers' incomes across the region.[87]

Better animal health and nutrition lead to increased productivity and longevity. This will improve smallholders' purchasing power, making them better able to buy the food that they do not produce themselves and to have money available for other essentials such as education and medicine.

De Schutter emphasises the benefits of using low external input, sustainable agriculture in poor countries (though he adds that a transition to such agriculture is needed in all regions, including industrialized countries).[88] He cites many examples of approaches which will improve productivity where it has been lagging behind and raise incomes for the poorest smallholders, while at the same time preserving ecosystems. These include:

- agroforestry where multifunctional trees are incorporated into agricultural systems;
- water harvesting in dryland areas which allows for the cultivation of abandoned and degraded lands, and improves the water productivity of crops. For example, In West Africa, stone barriers built alongside fields slow down runoff water during the rainy season, allowing an improvement of soil moisture, the replenishment of water tables, and reductions in soil erosion. The water retention capacity is multiplied five- to ten-fold, the biomass production multiplies by 10 to 15 times, and livestock can feed on the grass that grows along the stone barriers after the rains;
- the integration of livestock into farming systems as this provides protein for the family and manure to fertilise the soil.

A major study in resource-conserving agriculture examined the impact of 286 recent projects in 57 poor countries which aimed at improvements in food productivity while not having adverse effects on the environment.[89] These projects, covering 37 million hectares, have increased productivity on 12.6 million farms while improving the supply of critical environmental services. The average crop yield increase was 79%. All crops showed water use efficiency gains, with the highest improvement in rainfed crops. Potential carbon sequestered amounted to an average of 0.35 tonnes of carbon per hectare per year. Of projects with pesticide data, 77% resulted in a decline in pesticide use by 71% while yields grew by 42%.

An analysis of 40 projects in 20 African countries has been carried out.[90] The projects included crop improvements, agro-forestry and soil conservation, conservation agriculture, integrated pest management, horticulture, livestock and fodder crops. By early 2010, these projects had documented benefits for 10.39 million farmers and their families and improvements on approximately 12.75 million hectares.

Post 2015 Sustainable Development Goals

In July 2014 the Open Working Group (OWG) produced its Outcome Document. This will play an important part in shaping future discussions on the post 2015 Sustainable Development Goals (SDGs).

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[87] Jules Pretty, Camilla Toulmin & Stella Williams (2011) Sustainable intensification in African agriculture, International Journal of Agricultural Sustainability, 9:1, 5-24

[88] Report submitted by the Special Rapporteur on the right to food, Olivier De Schutter, 20 December 2010 A/HRC/16/49

[89] Jules Pretty et al., "Resource-conserving agriculture increases yields in developing countries," *Environmental Science and Technology*, 40:4, 2006, pp. 1114−1119.

[90] Jules Pretty, Camilla Toulmin & Stella Williams (2011) Sustainable intensification in African agriculture, International Journal of Agricultural Sustainability, 9:1, 5-24

Goal 2 of the OWG Outcome Document deals with food security, nutrition and sustainable agriculture. It gives undue emphasis to increasing food production and does not recognise that we already produce enough food to feed the anticipated world population of 9.6 billion. Goal 2 fails to appreciate that increased productivity often has a detrimental impact on water, soil, biodiversity and ecosystem services.

Goal 2 makes no mention of a number of the factors to which attention must be given if agriculture is to be genuinely sustainable. Some of these factors are referred to in other Goals. If Goal 2 is read in conjunction with these other Goals a fuller understanding of what constitutes sustainability emerges. It would be better if the factors that are inherent to the sustainability of agriculture were also covered in Goal 2 to avoid these interlinkages being overlooked.

Conclusions and Recommendations regarding the developing world

- Increasing food production will not of itself be sufficient to combat hunger if it is not combined with improved livelihoods for the poorest. Smallholder livestock farmers in developing countries must be helped to increase their productivity in ways which are compatible with their circumstances;
- Small-scale farmers should be helped to provide improved healthcare and nutrition for their animals by better disease management, the expansion of veterinary services and the cultivation of fodder crops such as legumes. Better animal health and nutrition lead to increased productivity and longevity. This will improve smallholders' purchasing power, making them better able to buy the food that they do not produce themselves and to have money available for other essentials such as education and medicine;
- The EU should press for the post 2015 Sustainable Development Goals not to give undue weight to increasing productivity at the expense of achieving genuine sustainability.

September 2014