UNEA – 4

SUSTAINABLE CONSUMPTION AND PRODUCTION

Sustainable food systems, food security and halting biodiversity loss

Food and farming: the need for an innovative approach

"the view has emerged that humankind will not be able to feed itself unless current industrial modes of agriculture are expanded and intensified. This approach is wrong and counterproductive and will only serve to exacerbate the problems experienced by the current mode of agriculture ... there is a need to encourage a major shift from current industrial agriculture to transformative activities such as conservation agriculture (agroecology)"

Hilal Elver, UN Special Rapporteur on the right to food[i]

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"Our inefficient food system is threatening human health and environmental sustainability …

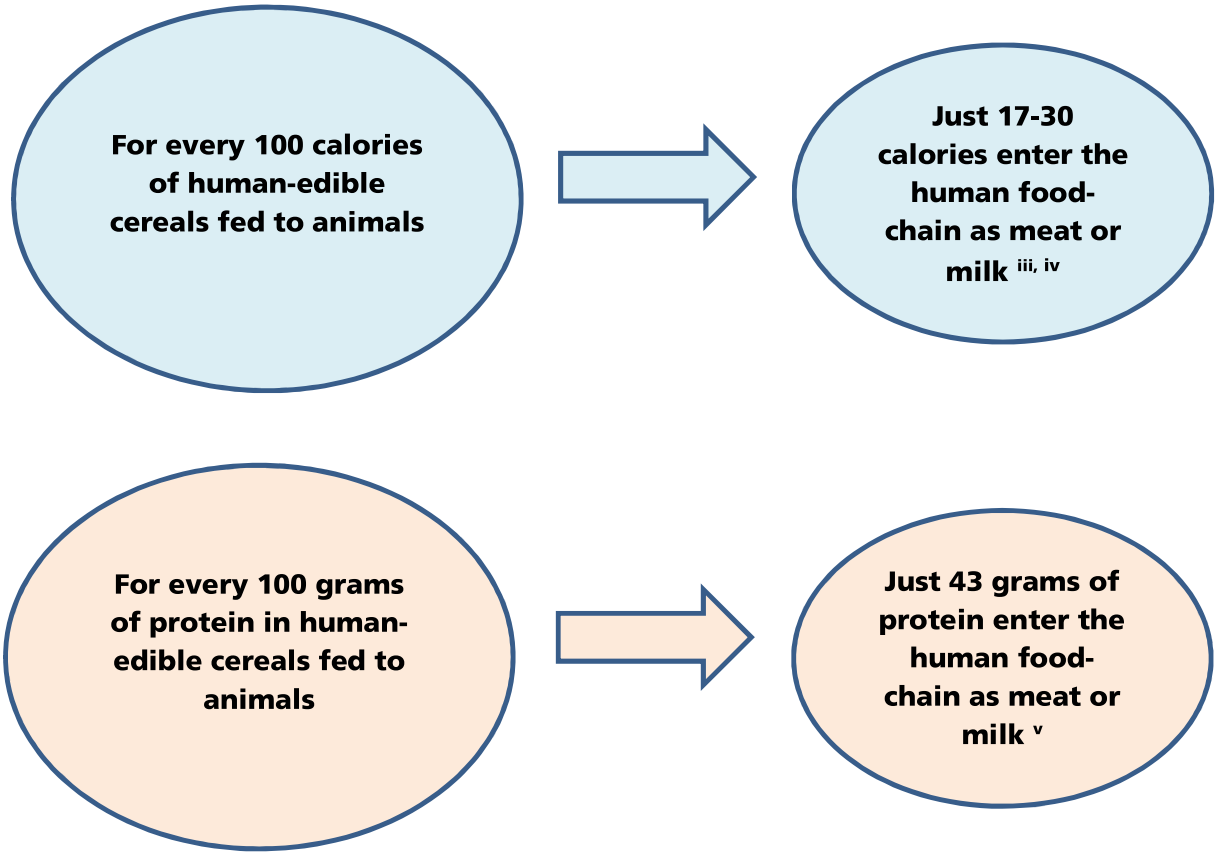
The current agribusiness model benefits the few at the expense of the many: small-scale farmers, the essence of rural livelihoods and backbone of food production for millennia, are under immense stress from land degradation, insecure tenure, and a globalized food system that favors concentrated, large-scale, and highly mechanized farms." [ii]

At the 10th Global Forum on Food and Agriculture in 2018 the Director General of the UN Food and Agriculture Organization said:

"*FAO estimates that more than half of the world's rural poor are livestock farmers and pastoralists … **We need to make sure that smallholders and pastoralists will not be pushed aside by large capital-intensive operations**."* [1]

INDUSTRIAL LIVESTOCK PRODUCTION IS UNSUSTAINABLE

It is dependent on feeding human-edible cereals and soy to animals – who convert them very inefficiently into meat and milk. Globally 36-40% of crop calories are used as animal feed. [2] [3]



Studies highlight the inefficiency of feeding human-edible crops to animals

"Staggeringly inefficient": Chatham House [vi]

"a very inefficient use of land to produce food": Bajželj *et al,* 2014 [vii]

"use of highly productive croplands to produce animal feedstuffs… represents a net drain on the world's potential food supply": European Commission Joint Research Centre, 2018 [viii]

FOOD SECURITY

Undermining food security:
The UN Food and Agriculture Organization warns that further use of cereals as animal feed could threaten food security by reducing the grain available for human consumption.[4]

Boosting food security:
UNEP calculates that if the cereals that, on a business-as-usual basis, will be fed to animals by 2050 were instead used for direct human consumption, *an extra 3.5 billion people could be fed annually*.[5] If the use of cereals as animal feed were halved, an extra 1.75 billion people could be fed.

Pasture-fed cattle in South Africa

FOOD SECURITY: FEEDING THE GROWING WORLD POPULATION

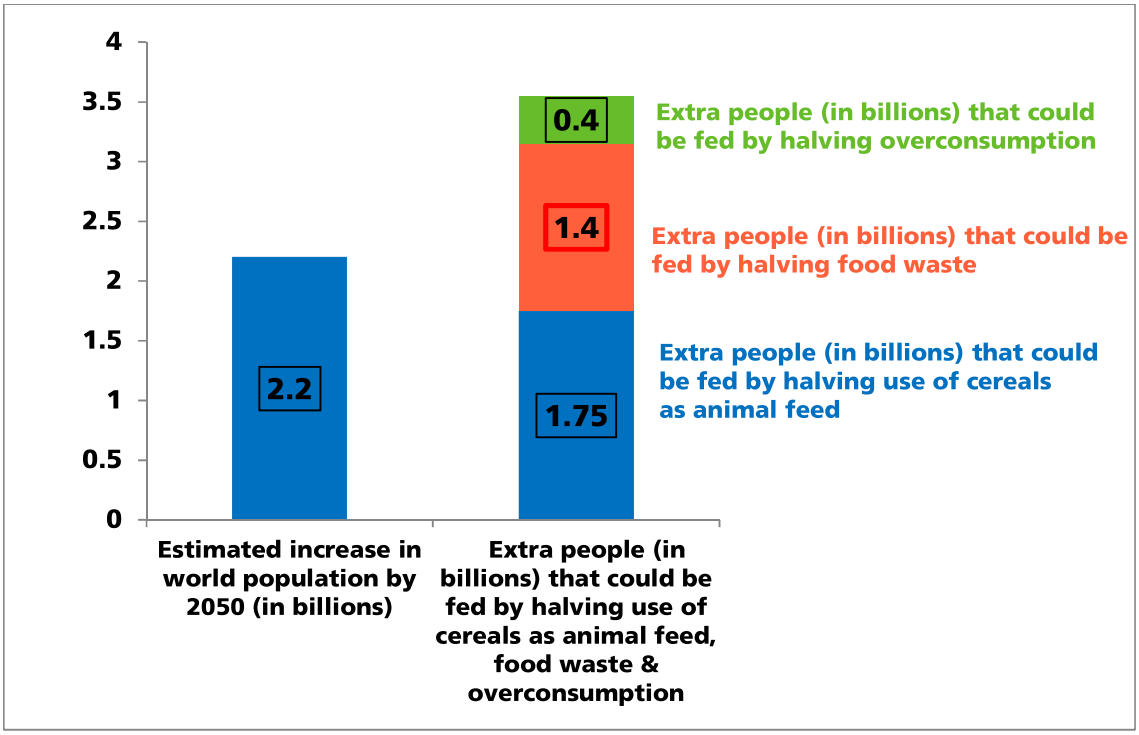
Estimates of the number of people that could be fed from current food production vary from 11.5 billion to nearly 16 billion. [6] [7] [8] We produce sufficient food; the problem is that over half is lost or wasted in various ways.

As indicated above, if the use of cereals for animal feed was halved, an extra 1.75 billion people could be fed. Worldwide 25% of food calories are lost or wasted post-harvest or by being discarded by consumers or food businesses. If such loss and waste could be halved an extra 1.4 billion people could be fed.[9]

Alexander *et al* (2017) calculate that 2.9 EJ (exajoules) are lost each year through overconsumption i.e. consumption in excess of nutritional requirements.[10] An extra 400 million people could be fed if such overconsumption was halved.

If all these steps were taken, an extra 3.55 billion people could be fed; this is more than the anticipated 2.2 billion increase in world population by 2050[11] (see Figure 1). We do not need to produce large amounts of extra food; we simply need to use our food more wisely. This said, increased production is needed in certain regions such as sub-Saharan Africa and South Asia but this must be achieved in a genuinely sustainable manner.

Figure 1: Feeding the 2.2 billion extra people anticipated by 2050

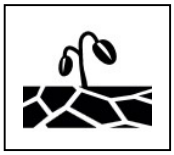


Based on data from: UNEP, 2009; High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, 2014 & Alexander *et al*, 2017

INDUSTRIAL LIVESTOCK PRODUCTION UNDERMINES THE CORE NATURAL RESOURCES ON WHICH THE FUTURE HEALTH OF FARMING DEPENDS

A UNCCD report stresses that intensification has "*accelerated land and soil degradation, water shortages, and pollution*".[12]

Industrial livestock's huge demand for cereals has fuelled ***the intensification of crop production***. This, with its use of monocultures & agro-chemicals, has led to:



Soil degradation [ix, x]

Overuse and pollution of water [xi]

Biodiversity loss [xii]

WATER:

Industrial livestock production generally uses and pollutes more surface- and ground-water than grazing systems.[13] This is in part due to industrial systems' dependence on grain-based feed.[14] Huge quantities of nitrogen fertilisers are used to grow this feed. However, only 30-60% of this nitrogen is taken up by feed crops.[15] Also, the feed given to industrial livestock has high levels of nitrogen. Pigs and poultry assimilate less than half of the nitrogen in their feed; most is excreted in their manure. The nitrogen that is not absorbed by the crops or the animals runs off or leaches to pollute rivers, lakes, groundwater and marine ecosystems.

> *"Intensive livestock production is probably the largest sector-specific source of water pollution"*
>
> UN World economic and social survey [xiii]

SOILS:

Intensive agriculture, in seeking to maximize yields, has degraded soils to the point where poor soil quality is constraining productivity. [16] [17] Intensive farming with its chemical pesticides and herbicides has undermined soil biodiversity; without rich biodiversity soil quality declines.

> **The UN Food and Agriculture Organization has calculated that soils are now so degraded that we have only about 60 years of harvests left.** [xiv]

BIODIVERSITY: The UNCCD states that livestock production is *"perhaps the single largest driver of biodiversity loss"*.[18]

A major study shows that globally vertebrate wildlife populations have declined by 60% between 1970 and 2014. [19]

Intensive crop production, often driven by industrial livestock's huge demand for feed, uses large amounts of pesticides. These have decimated the insects on which farmland birds depend for food.

Intensive agriculture has also played a major role in the decline in pollinators such as bees through its use of insecticides and herbicides.[20] [21] Moreover, its monocultures lead to loss of abundance and diversity of the wild flowers on which pollinators feed.

Bees are key pollinators

Habitat loss is one of the main threats to biodiversity. The growing demand for land:

- as pasture for cattle, and
- to produce soy and cereals for the increasing number of industrially farmed animals

leads to ***expansion of farmland*** into forests and savannahs with massive loss of wildlife habitats & biodiversity and release of stored carbon into the atmosphere.

The UN Food and Agriculture Organization states that agriculture is the most significant driver of global deforestation.[22] Large-scale commercial agriculture accounted for almost 70% of deforestation in Latin America between 2000 and 2010. The need to eliminate deforestation from agricultural commodity chains such as soy and beef is widely recognised.[23]

Brazil's jaguar population is in decline as deforestation – mainly driven by soy production for animal feed & expanding cattle pastures – results in habitat loss and fragmentation

INNOVATIVE SOLUTIONS FOR SUSTAINABLE CONSUMPTION AND PRODUCTION

SUSTAINABLE LIVESTOCK PRODUCTION

Studies show that livestock only make an efficient contribution to food production when they are converting materials we cannot consume into food that we can eat.[24] [25] So the following are efficient ways of feeding animals:

- **Rearing animals extensively on pasture or other grasslands** – Extensively-reared ruminants 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.
- **Use of by-products** e.g. brewers grain, citrus pulp
- **Use of unavoidable food waste** – but it must be properly treated
- **Use of crop residues**
- **Rotational integrated crop-livestock systems**
  The link between animals and the land should be restored through mixed rotational farming where animals are fed on crop residues, grass and forage crops (e.g. cassava and turnips) and their manure, rather than being a pollutant, fertilises the land. Rotational systems enable soil quality to be improved through the use of legumes, animal manure and green manure.

Classic seven-year rotation

Year 1: Wheat

Year 2: Barley

Year 3: Oats

Years 4-7: Grazing

Rotational grazing in the USA

This farm uses a multi-species rotational grazing system. It has pasture-fed cows, pigs, chickens, turkeys, sheep and rabbits under rotational grazing, as well as a 5-acre organic vegetable farm growing over 40 kinds of vegetables.

By eliminating pesticides and fertilisers (instead using homemade compost), the soil matter is growing, which sequesters huge amounts of carbon every year.

Photo © White Oak Pastures

AGRO-FORESTRY

> ***"Agriculture and forestry can no longer be treated in isolation. Linking the two is imperative for socioeconomic development in the 21st century".***
>
> Dr Evelyn Nguleka, President of the World Farmers' Organisation, quoted by the FAO in *State of the World's Forests 2016* [xv]

Silvopastoral systems for cattle in South America with feed at 3 levels

Alongside pasture at ground level, these systems also provide shrubs (preferably leguminous) and trees with edible leaves and shoots.[26] Such systems do not need synthetic fertilisers (due to the leguminous shrubs), produce more biomass than conventional pasture and so result in increased meat and milk production. This approach and other forms of agro-forestry can reduce the competition between agriculture and forests.[27]

Cattle browsing Leucaena in a silvopastoral system, Caribe, Colombia

Photo ©Walter Galindo, CIPAV

Integrated crop-livestock-forestry systems

These systems can increase organic matter in the soil which boosts soil fertility and crop yields.[28] Enhanced carbon stocks in the soils and the inclusion of trees that act as a sink for atmospheric CO_2 result in reduced GHG emissions.[29] [30] Compared to systems where livestock and crops are produced separately, these integrated systems have reduced environmental impact.[31]

INNOVATIVE PRODUCTION: AGROECOLOGY

The International Panel of Experts on Sustainable Food Systems highlights the need to transition to agroecological systems. They stress:

"This transition is viable and necessary whether the starting point is highly specialized industrial agriculture or forms of subsistence farming in poor developing countries".

IPES Food, 2016[xvi]

Agroecology seeks to enhance productivity by supporting and harnessing natural processes such as beneficial biological interactions and synergies among the components of the agroecosystem. The integration of crops and animals is a core principle of agroecology.

Agroecology can deliver substantial and enduring productivity gains. One study examined the impact of 286 projects in 57 poor countries.[32] The projects included integrated pest and nutrient management, conservation tillage, agro-forestry and rain water harvesting. These projects increased productivity on 12.6 million farms while improving critical environmental services. The average crop yield increase was 79%, while the African projects showed a 116% increase in crop yields. All crops showed water use efficiency gains. 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.[33] The projects included crop improvements, agro-forestry and soil conservation, conservation agriculture, integrated pest management, horticulture, livestock and fodder crops. Crop yields more than doubled on average over a period of 3-10 years.

Circular agriculture

Industrial agriculture is linear in its structure. It uses high levels of external inputs, a large proportion of which are not converted into edible products but instead result in wasteful and environmentally damaging outputs.

Circular agriculture, however, strives to obtain inputs such as nutrients through the farm's own activities, for example through the use of nitrogen-fixing legumes, rotations and animal manure. It works in harmony with nature. Circular agriculture is regenerative; it builds soil quality and restores biodiversity. It ensures that its wastes are recycled into productive agricultural use rather than being allowed to escape and pollute the environment. It recognises the ethical imperative of farming to the highest standards of animal welfare.

Water harvesting in Ethiopia: Improving the lives of people & farm animals

- In the dry season, there is no rain for around 6 months
- Farmers often had to sell their livestock as they could not afford to feed them and needed the money from the sales to buy food for their families
- A few years ago the Government helped farmers with the cost of water harvesters
- Water harvester is a large, deep hole dug into the soil – lined with a geo-membrane to stop leakage. It stores rainwater for reuse
- Livestock no longer have to be sold during the dry season as year-round availability of water has boosted crop yields up to ten-fold. It has also improved food security, nutrition and farm animal welfare and reduced poverty in small-scale farming in the highlands of Ethiopia.

Case study: https://www.ciwf.org.uk/media/3819837/ethiopia-case-study.pdf

Water-harvesting structure slightly filled following the beginnings of the rainy season

Agroecology Tanzania: Morogoro case study

- Since agroecology was introduced they have produced improved yields, better nutrition and good livelihoods
- Soil health and fertility have been built by composts and crop residues
- Terracing of steep land to prevent soil erosion
- Use of beneficial insects and intercropping to repel insect pests
- Retain water in soil through mulches; water use has been reduced by 59%
- Reduced use of agro-chemicals e.g. pesticides to almost zero
- They use inputs that are produced on the farm rather than relying on inputs brought in from far away
- Have revived and regenerated degraded land

TACKLING SEVERAL SUSTAINABILITY CHALLENGES AT ONCE: ENVIRONMENT, CLIMATE, RESOURCE EFFICIENCY & ANIMAL WELFARE

The egg farm of the future

The Dutch **Kipster** farm for egg-laying hens:

Carbon neutral: uses no fossil fuels – its energy needs are met by over 1000 solar panels in its roof

Uses no human-edible feed – the hens are fed on by-products such as sunflower meal and left-over bakery products

Usually the male chicks in egg farms are slaughtered shortly after birth as it's assumed they cannot provide worthwhile meat. *Kipster* has overturned this assumption – the ***males are reared till the age of 15-17 weeks*** when they are slaughtered for various meat products including chicken burgers and nuggets

Sustainable egg box – made from potato starch, cellulose fiber and water. The CO_2 footprint of the egg box is 90% smaller than a standard egg box

First-rate animal welfare – the barn provides a natural wooded environment with plenty of variety, daylight and fresh air

Images © Kipster https://www.kipster.farm/

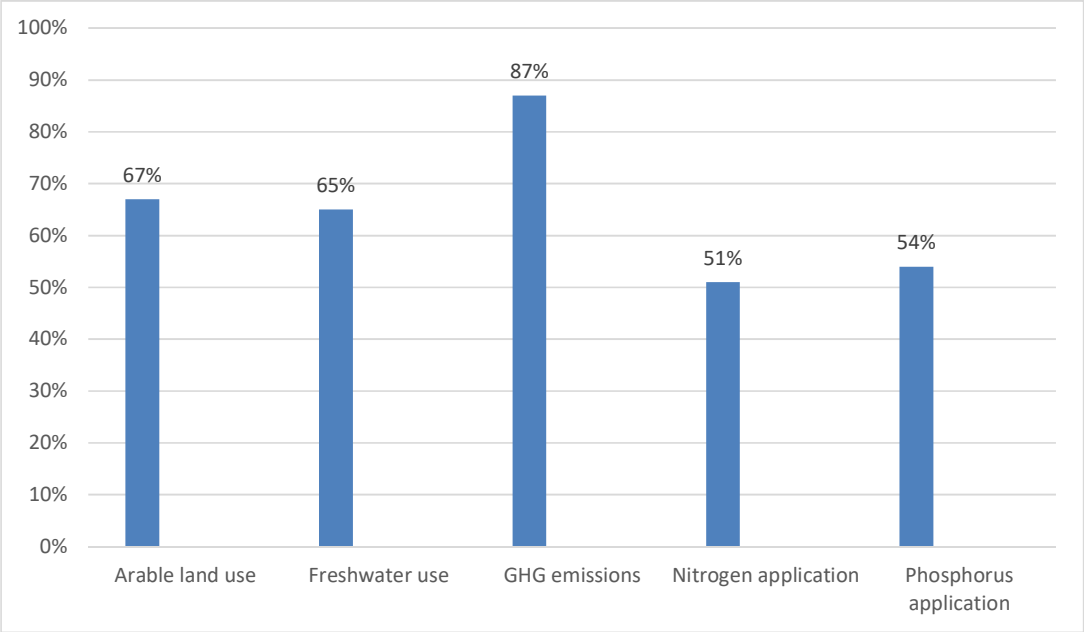
SUSTAINABLE CONSUMPTION

There is increasing recognition of the need for dietary change in the developed world and in many emerging countries – towards healthier, more plant-based diets that are in line with the evidence on healthy eating. For example, studies conclude a reduction of around 50% in consumption of livestock products in the EU would substantially reduce GHG emissions and adverse environmental impacts, reduce use of scarce cropland and water, and align current intake of animal protein and fats with WHO recommended dietary guidelines.[34] [35] [36]

A reduction in meat and dairy consumption would deliver multiple co-benefits. It would:

- **Boost food security:** it would help feed the growing world population as a much greater proportion of crops would be used for direct human consumption
- **Reduce pressures on wildlife:** habitat destruction could be reversed as less land would be needed to produce cereals and soy as animal feed and pasture for cattle
- **Enable us to meet the Paris climate targets:** see below for details
- **Allow cropland to be farmed less intensively so enabling biodiversity, soils and water quality to be restored.** Business-as-usual in the food system is projected to lead to very substantial increases in environmental pressures and resource use[37]: see Figure 2.

Figure 2: Estimated percentage increase in environmental pressures from food system by 2050 (compared with 2010) on business-as-usual basis



Source: Springmann *et al*, 2018

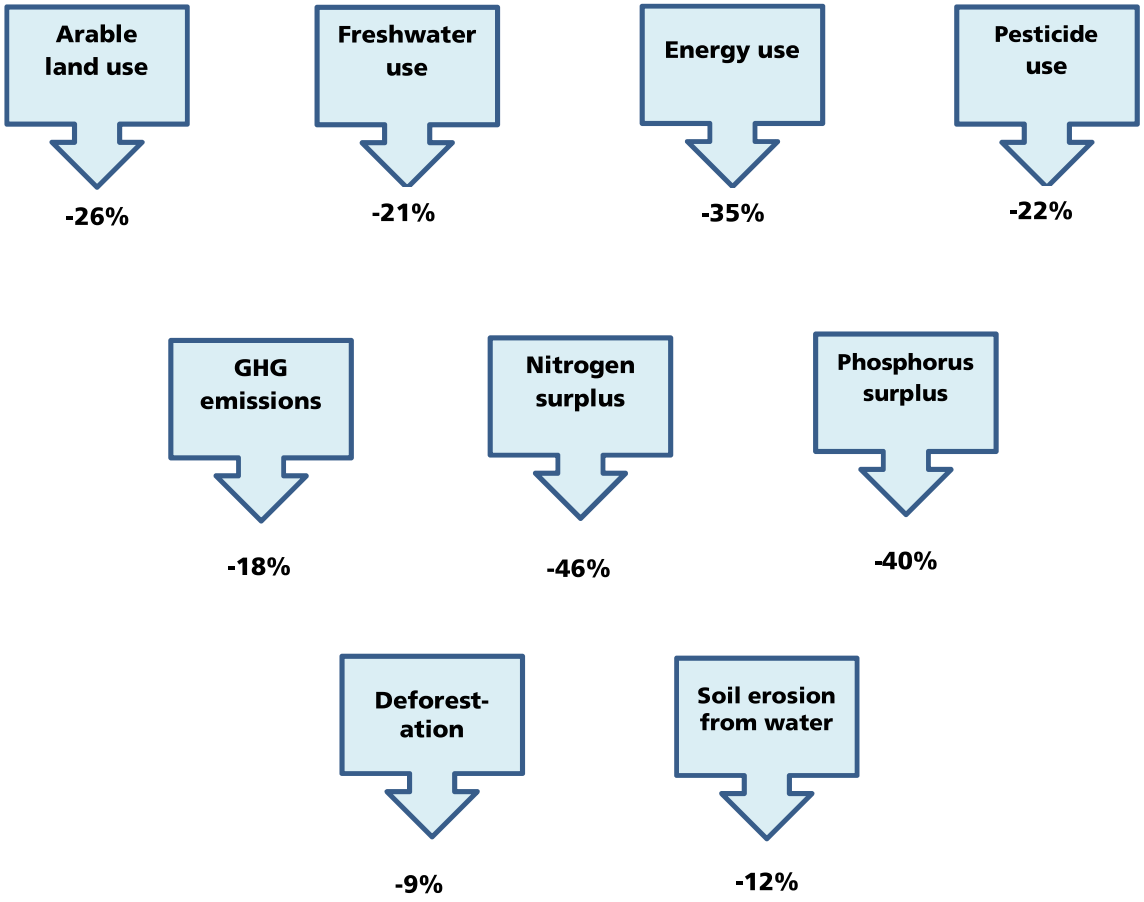
Earlier we suggested that livestock only make an efficient contribution to food production when they convert materials we cannot consume into food we can eat. A major study has looked at the effect in 2050 of adopting this approach.[38]

It would lead to a 53% reduction in the consumption of animal products compared with 2005-09 due to reduced production of these products. However, food availability does not suffer; energy supply per capita increases and protein supply per capita increases very slightly compared with 2005-09. For many people reduced meat consumption would lead to health benefits in terms of a reduced incidence of heart disease and certain cancers. But people with low consumption of meat are not expected to reduce their intake.

Only feeding animals on material we cannot eat would by 2050 produce important reductions in adverse environmental impacts and in the use of resources; see Figure 3.

Figure 3: Estimated percentage decrease in environmental pressures from food system by 2050 (compared with business-as-usual) if animals are only fed on materials that cannot be eaten by people

Source: Schader *et al*, 2015



SUSTAINABLE ECONOMICS:
CREATING MARKETS THAT SUPPORT SUSTAINABILITY

> *"In many countries there is a worrying disconnect between the retail price of food and the true cost of its production. As a consequence, food produced at great environmental cost in the form of greenhouse gas emissions, water pollution, air pollution, and habitat destruction, can appear to be cheaper than more sustainably produced alternatives"*
>
> UN Food and Agriculture Organization, 2015[xvii]

Olivier De Schutter, former UN Special Rapporteur on the right to food, stresses: ***"any society where a healthy diet is more expensive than an unhealthy diet is a society that must mend its price system."*** [39] This applies equally to a society where environmentally damaging food is cheaper than food that respects natural resources.

We need to develop an approach to economics that helps deliver nutritious, sustainable food. The UN Standing Committee on Nutrition states that policies to make diets healthier and sustainable include economic incentives.[40] They say this could involve taxing unhealthy food and subsidising or providing economic incentives for the consumption of healthier food.

A UNDP paper examines how taxes on pesticides and fertilizers can correct certain market failures (e.g. the failure to incorporate in the price of the pesticide or fertilizer its social and environmental costs) and can forestall increases in the use of the most harmful pesticides and fertilizers.[41] Such taxes can lead to savings in health budgets and reduced expenditure in restoration of natural resources.

The UNDP paper points out that the revenue generated by such taxes could be earmarked to mitigating the environmental impacts of pesticides and fertilizers and adopting more sustainable agriculture practices. It stresses that these taxes are *"more appropriate where the objective is to facilitate a smooth transition to more sustainable practices through market mechanisms"*.

Accounting for the costs arising from the food system's adverse impact on natural resources and health will incentivise sustainable agricultural practices, facilitate rational policy making, and support retailers and consumers in making nutritious and environmentally-friendly choices.

REDUCING MEAT AND DAIRY CONSUMPTION IS ESSENTIAL IF WE ARE TO MEET THE PARIS CLIMATE TARGETS

All sectors need to reduce their emissions to meet the Paris targets but on a business-as-usual basis, the emissions from food and farming will increase substantially. [42] Supply side measures will be insufficient on their own to prevent an increase in farming's GHG emissions, let alone achieve a sufficient reduction.[43] [44] Studies show that only a move in much of the world to diets with substantially lower consumption of meat and dairy products will enable the GHG emissions from food and agriculture to be lower in 2050 than they are now.[45] [46] [47]

CONCLUSION

Industrial livestock production is unsustainable.

It is dependent on feeding human-edible cereals and soy to animals who convert them very inefficiently into meat and milk. This undermines food security and will make it much more difficult to feed the growing world population.

Industrial livestock production degrades the core natural resources on which the future health of farming depends. Its huge demand for cereals as feed has fuelled *the intensification of crop production*. This, with its use of monocultures and agro-chemicals, has led to soil degradation, biodiversity loss and overuse and pollution of ground- and surface water.

The demand for pasture for raising cattle and for cropland to grow soy and cereals for industrially farmed animals drives *the expansion of farmland* into forests and other ecosytems causing massive damage to wildlife habitats.

Far-reaching changes to food systems are needed to align them with the principle of sustainable consumption and production.

Innovations in the role of livestock and forms of agriculture: Livestock only make an efficient contribution to food production when they are converting materials we cannot consume – such as grass, by-products and crop residues – into food we can eat. We should encourage sustainable forms of agriculture that work in harmony with nature. These include agroecology, rotational integrated crop-livestock farming and agro-forestry.

Innovations in dietary patterns: There is increasing recognition of the need for dietary change in the developed world and in many emerging countries – towards healthier, more plant-based diets that are in line with the evidence on healthy eating. Reduced meat and dairy consumption would deliver many benefits including improved food security and reduced pressures on wildlife. It would also enable us to meet the Paris climate targets and allow cropland to be farmed less intensively so enabling biodiversity, soils and water quality to be restored.

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