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WHAT KINDS OF ANIMAL AGRICULTURE WILL HELP US REACH THE SUSTAINABLE DEVELOPMENT GOALS?

Those that help and those that hinder

The UNCCD has said: "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."[i]

UN Convention to Combat Desertification

"Agro-industrial systems, consisting of input-intensive monocultures and industrial-scale feedlots currently dominate farming landscapes. The uniformity at the heart of these systems and their reliance on chemical fertilizers, pesticides and preventive use of antibiotics, systematically yields negative outcomes and vulnerabilities". It adds: "The environmental impacts, including water, soil and air pollution, of intensive livestock production are significant".

Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) [ii]

SDG 1: End Poverty

SDG 2: End Hunger

Industrial animal agriculture out-competes small-scale food producers, thereby undermining their livelihoods

The UN Food and Agriculture Organisation (FAO) estimates that more than half of the world's rural poor are livestock farmers and pastoralists.[1] In 2018 the then Director-General of the FAO said that small-scale livestock farmers must not be ***"pushed aside by expanding large capital-intensive operations."*** [2]

The FAO points out that industrial livestock production "may occur at the expense of diminishing the market opportunities and competitiveness of small rural producers".[3] The World Bank has recognised that intensification of livestock production carries "a significant danger that the poor are being crowded out."[4]

The High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security states that "the social benefits of agriculture can be eroded as production becomes more concentrated and intensive. Intensive agricultural systems are associated with negative effects on employment, wealth distribution, ancillary economic activity in rural areas [and] service provision in rural areas (such as schools and health facilities)."[5]

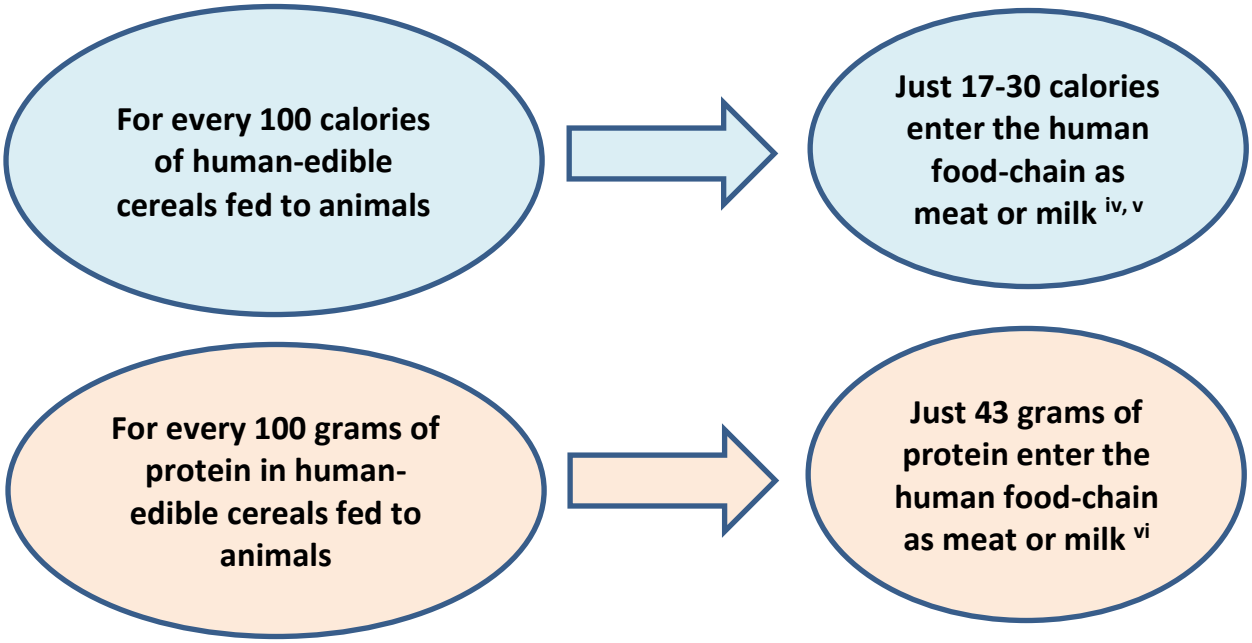
Meeting this Goal: Small-scale farmers should be helped to provide improved healthcare and nutrition for their animals through better disease prevention, the expansion of veterinary services and the cultivation of fodder crops such as legumes. Better animal health and nutrition result in increased livestock 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 healthcare.

With sufficient access to veterinary services and with improved management regarding animal health and animal welfare, global animal production could, according to the OIE, be increased by around 20%.[iii] This would enable small-scale producers to increase their productivity without industrialisation.

SDG 2: Achieve food security

Industrial animal agriculture undermines food security by using human-edible crops as animal feed

Industrial livestock production is dependent on feeding human-edible cereals and soy to animals who convert them very inefficiently into meat and milk. Globally 40% of crop calories are used as animal feed.[6]



Further use of cereals as animal feed could threaten food security by reducing the grain available for human consumption
UN Food and Agriculture Organization, 2014[7]

If the cereals that will be fed to animals in 2050 on a business-as-usual basis were used instead for direct human consumption, an extra 3.5 billion people could be fed annually
United Nations Environment Programme, 2009[8]

Most feed grain – 69% - is used in the pig and poultry sectors which in many countries are highly industrialised.[9] Pigs and poultry also use much more soy than cattle. The soybean meal used per unit of meat produced is 232, 648 and 967 g/kg for beef, pork and poultry, respectively.[10]

Meeting this Goal: We should aim for a 50% reduction in the use of human-edible crops as animal feed: livestock's primary role in food production should become the conversion of materials that we cannot consume – grass, by-products, food waste, crop residues - into food we can eat.

A cluster of SDGs focus on the environment

Sustainable food production systems

Prevent nutrient pollution

Reduce pollution; restore water-related ecosystems

Restore degraded soil; halt deforestation & biodiversity loss

Livestock's huge demand for feed and land drives both the expansion of cropland and pastures and the intensification of crop production

Intensification: Industrial livestock's massive demand for feed has fuelled the intensification of crop production. This, with its use of monocultures and chemical fertilisers and pesticides, has led to overuse and pollution of ground- and surface-water,[11] soil degradation,[12] [13] biodiversity loss,[14] and air pollution[15]. In short, industrial animal agriculture undermines the key resources on which long-term productive farming depends.

Expansion: Increasing demand for land:

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

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

Degraded Soils

Intensive agriculture, in seeking to maximize yields, has caused compaction and loss of soil organic carbon. [vii] This has degraded soils to the point where poor soil quality is constraining productivity.[viii] Synthetic nitrogen fertilisers, while boosting yields in the short term, lead to a decline in the amount of humus – the organic matter – in soils so causing long-term damage to soil health and quality. Monocultures which year after year draw the same nutrients from the soil in time rob soils of their fertility. Intensive farming with its chemical pesticides and herbicides has reduced soil biodiversity; without rich biodiversity soil fertility declines.[ix]

The UN FAO calculates that soils are now so degraded that we have only about 60 years of harvests left. [x]

Water: Industrial livestock production generally uses and pollutes more surface- and ground-water than grazing systems.[xi] This is largely due to industrial systems' dependence on grain-based feed.[xii] Huge quantities of nitrogen fertilisers are used to grow this feed. However, only 30-60% of this nitrogen is taken up by feed crops.[xiii] 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 and groundwater.

Dead zones: In marine ecosystems the excess nitrogen leads to a surge in plant growth. When these die their decomposition consumes oxygen, leaving areas largely depleted of oxygen. The body of water can no longer support fish and other life and becomes a 'dead zone', destroying the livelihoods of fisherfolk. [xiv]

Mammals, birds, insects – all declining

Population and species extinctions are proceeding rapidly and a sixth mass extinction may already be underway.[16] Globally vertebrate wildlife populations have declined by 60% between 1970 and 2014.[17] A UN report states that "biodiversity loss is occurring at an alarming rate" and that habitat loss from unsustainable agriculture is among "the primary drivers of this assault on biodiversity".[18] A 2019 FAO report states that many key components of biodiversity that support agriculture are in decline and that the drivers for this include the overuse of harmful external inputs and the intensification of agriculture.[19]

The UNCCD states that livestock production is "perhaps the single largest driver of biodiversity loss" [xv]

Ever more forests and savannahs are being destroyed to grow soy and cereals for industrially farmed animals. This is eating into wildlife habitats driving many species – including elephants and jaguars – towards extinction.[20] Agricultural intensification – in particular the high use of pesticides and monocultures and habitat loss - is the main driver of population declines in birds, pollinators and other insects.[21]

Dramatic rates of loss may lead to the extinction of 40% of the world's insect species over the next few decades.[22] This would be a disaster as insects are of "paramount importance to the overall functioning and stability of ecosystems worldwide".[23] They provide pollination, natural pest control, nutrient recycling (so building soil quality) and decomposition services. Loss of insects leads to declines in birds, frogs and lizards as they depend on insects for their food.

Breaching planetary boundaries

Research has established nine planetary boundaries which, if crossed, could generate irreversible environmental changes and drive the planet into a much less hospitable state.[24] In two cases – (i) biodiversity loss and (ii) nitrogen and phosphorus flows – we have not only crossed the boundary but have entered a high-risk zone. Industrial livestock production has played a major part in this. Nitrogen and phosphorus are primarily used in fertilisers much of which are used to grow animal feed crops.[25] [26] [27] The demand for huge quantities of feed has led to biodiversity loss through the intensification and the expansion of arable production.[28]

A third boundary – that for land-use change – has been crossed and we are close to entering the high-risk zone. Livestock are responsible for 65% of agriculture's contribution to land-use change.[29]

Deforestation
The UN states that deforestation is "primarily due to the conversion of forest to agricultural land, which is responsible for an estimated 73% of forest loss in tropical and subtropical regions".[30] The demand for soy to feed industrially farmed chickens, pigs and cattle is a key driver of deforestation in South America.[31]

Meeting the Environment-related Goals: We need to move to forms of farming that do not just reduce the harm caused by industrial agriculture but that positively benefit the environment by enhancing soil structure, restoring biodiversity, preserving water and storing carbon. We need approaches that increase the productivity of small-scale farmers while avoiding industrialisation as this undermines such farmers and natural resources.

Moving to Nature-Positive Farming will help us meet SDGs 1,2,6,12,13,14 & 15

"High-input, resource-intensive farming systems, which have caused massive deforestation, water scarcities, soil depletion and high levels of greenhouse gas emissions, cannot deliver sustainable food and agricultural production. Needed are innovative systems that protect and enhance the natural resource base, while increasing productivity. Needed is a transformative process towards 'holistic' approaches, such as agroecology, agro-forestry ... and conservation agriculture, which also build upon indigenous and traditional knowledge."

UN Food and Agriculture Organization, 2017[xvi]

Regenerative agriculture such as agroecology, agroforestry and organic farming can minimise the use of pesticides and chemical fertilisers while often enhancing productivity in poorer countries. It does this by supporting and harnessing natural processes such as beneficial interactions between different plants and animal species. Olivier De Schutter, former UN Special Rapporteur on the right to food, states that agroecology mimics nature instead of industry.[32] Diversity is a core principle of agroecology. Moreover diverse foods are at the heart of nutritious diets.

Regenerative agriculture increases yields in developing countries
Studies show that resource-conserving agriculture can deliver substantial productivity gains. One study examined the impact of 286 projects in 57 poor countries.[33] The projects included integrated pest and nutrient management, conservation tillage, agro-forestry and rainwater harvesting. These projects increased productivity on 12.6 million farms. 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.[34] The projects included agro-forestry, conservation agriculture, integrated pest management, livestock and fodder crops. Crop yields more than doubled on average over a period of 3-10 years.

Agroecology in Tanzania: Morogoro case study

- Since agroecology was introduced the farmers have produced improved yields, better nutrition and good livelihoods
- Soil health and fertility have been built by composts and crop residues
- Steep land has been terraced to prevent soil erosion

  Beneficial insects and intercropping are used to repel insect pests
- Water is retained in the soil through mulches; water use has been reduced by 59%
- Use of agro-chemicals has been reduced 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

Restoring the link between animals and the land

In well-managed grassland systems the animals do not need to be given any grain; they are fed on grass, by-products, crop residues, unavoidable food waste and root crops grown on the farm.[35] Nor are any chemical fertilisers needed. Soil fertility is built through animal manure, the inclusion among the grass of legumes such as clover, and the ability of the roots of grasses to collect minerals from deep in the soil. Independent audits of farms in the US and South Africa show that well-managed grazing of cattle on pasture can sequester substantial amounts of carbon.[36] [37]

Silvo-pastoral systems for cattle in South America with feed at three levels

Alongside pasture at ground level, these systems also provide shrubs (preferably leguminous) and trees with edible leaves and shoots.[38]

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. The World Bank reports that conversion to silvo-pastoral systems in Colombia has boosted milk productivity by an average of 36.2%.[39]

Cattle browsing Leucaena in a silvopastoral system, Caribe, Colombia. Photo ©Walter Galindo, CIPAV

Soil quality should be enhanced through rotations, legumes and fallow periods and by increasing soil organic matter (SOM) by the use of composts, green manure and animal manure. SOM builds fertility and stores carbon so mitigating climate change. The organisms in SOM (e.g. earthworms) decompose plant residues, turn them into humus, and distribute this fertility-giving substance throughout the soil.[40] Soil with plentiful SOM is able to retain water so mitigating droughts and preventing flooding. Such soils are less vulnerable to erosion and minimise the leaching of nutrients into groundwater and rivers.

The use of chemical pesticides can be minimised by **Integrated Pest Management.** This primarily relies on nature's own processes to control pests. These include allowing the natural enemies of pest species to thrive (whereas pesticides tend to kill pests' predators), and the development of healthy soil as this promotes strong healthy crops which are better able to withstand disease and pest attacks. Rotational systems can also reduce the use of pesticides. Rotations impede the build-up of pathogens and pests that often occurs when one plant is continuously cropped.

The high levels of consumption of red and processed meat that have been made possible in the developed world and certain emerging economies by industrial animal agriculture contribute to heart disease, obesity, diabetes and certain cancers[41, 42, 43]

"WHO and other health agencies are advising populations to reduce meat consumption as part of an overall healthy diet."
World Health Organization, 2017[44]

Generating disease: Industrial livestock production plays an important part in the emergence, spread and amplification of pathogens, some of which can be transmitted to people.[45] [46] The last pandemic before COVID-19 was the 2009 swine flu pandemic which killed between 151,700 and 575,400 people worldwide.[47] The report *Preventing the next pandemic* by UNEP and ILRI identifies unsustainable agricultural intensification and increasing demand for animal protein as major drivers of zoonotic disease emergence.

The expansion of farmland into forests and other wildlife habitats - driven in large part by industrial animal agriculture's needs for soy and cereals as feed - leads to ecosystem disruption. This increases the risk of pathogen spillover and can result in viruses being transmitted from wild animals to people.[48] [49]

Antimicrobial resistance: Industrial livestock production tends to rely on routine use of antimicrobials to prevent the diseases that are inevitable when animals are confined in overcrowded, stressful conditions.[50] Overuse of antimicrobials in industrial animal production contributes significantly to antimicrobial resistance in humans.[51]

Nutritional quality: Free-range animals – that consume fresh forage and have higher activity levels – often provide meat of better nutritional quality than industrially reared animals. Pasture-fed beef has less fat and higher proportions of the beneficial omega-3 fatty acids than grain-fed beef. [52]

Meat from free-range chickens contains much less fat and generally a higher proportion of omega-3 fatty acids than meat from chickens reared industrially. The fast growth rates of today's chickens have a detrimental impact on the nutritional quality of the breast meat with increased fat content and less and lower quality protein.[53]

Free-range eggs have a better nutritional quality than cage eggs.[54] This arises from the diet of free-range hens which are able to consume seeds, green plants, insects and worms. Compared with cage eggs, free-range eggs have higher levels of vitamin E and omega-3 fatty acids as well as a healthier ratio of omega 3 to omega 6 fatty acids.[55] [56]

Meeting this Goal: Consumption of less but better meat and dairy products in the developed world and certain emerging economies should be encouraged. However, people with low consumption of animal-derived foods are not expected to reduce their intake. 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.

A report by the Inter-American Development Bank and the International Labour Organisation estimates that moving to plant-based diets with reduced animal-source food would not only provide health and environmental benefits but would create 15 million extra jobs in Latin America and the Caribbean. [xviii]

We need to move to 'health-oriented' systems for rearing animals in which good health is inherent in the farming methods, rather than being dependent on routine use of antimicrobials.

To meet the Paris Agreement's targets, all sectors need to ***reduce*** their emissions.

However, research shows that on a business-as-usual basis emissions from food and agriculture will ***increase*** substantially and will make it very difficult to reach the Paris targets.[57] [58]

Supply side measures (e.g. improved manure management) will not on their own be able to achieve a sufficient reduction in farming's GHG emissions; indeed they may well not be able to prevent an increase.[59] [60]

Demand side: ***It is unlikely that the Paris targets can be met without a reduction in meat and dairy consumption.***[61] Research shows that a significant reduction in meat consumption in the developed world and emerging economies is essential if food-related emissions are to decrease.[62] [63] [64] [65] [66]

A study published in the journal *Science* in November 2020 concludes that even if fossil fuel emissions were immediately halted, current trends in global food systems would make it impossible to meet the 1.5°C target and difficult even to realise the 2°C target.[67]

Meeting this Goal: ***"The world's current consumption pattern of meat and dairy products is a major driver of climate change and climate change can only be effectively addressed if demand for these products is reduced"***

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

The Goal of Responsible Consumption and Production – SDG 12 - brings together many of the changes that are essential if we are to move to food and farming that can meet the SDGs

Recommendations

Responsible production

Monocultures and agro-chemicals should be replaced with nature-positive farming - such as agroecology and integrated crop-livestock systems – that can build soil fertility, restore biodiversity and conserve water by harnessing beneficial natural processes and interactions.

Redefining the role of livestock

We need to move away from industrial animal agriculture as this entails feeding soy and human-edible cereals to animals which convert them very inefficiently into meat and milk. Animals only make a positive contribution to food production when they convert materials we cannot consume – grass, by-products, crop residues and unavoidable food waste – into food we can eat. If we only raised animals that can be fed in this way, we would benefit from major reductions in GHG emissions, deforestation, soil erosion and nitrogen and phosphorus pollution as well as reduced use of cropland, freshwater, energy and pesticides.[68] Change is also needed on ethical grounds; industrial agriculture entails low animal welfare standards that fail to respect animals as sentient beings.

Responsible consumption

We need to tailor our consumption to what can be produced in a sustainable manner. Many studies now recognise that in the developed world and certain emerging economies reduced meat and dairy consumption would deliver multiple co-benefits. It would:

- help feed the growing world population as a greater proportion of crops would be used for direct human consumption which is much more resource-efficient ► SDG 2
- allow cropland to be farmed less intensively so enabling the environment to be restored and birds, pollinators and insects to thrive once again ► SDGs 2 & 15
- enable us to halt the expansion of cropland (to grow crops for animal feed) and pasture for cattle into forests and other fragile ecosystems ► SDG 15
- reduce pressures on wildlife as habitat destruction could be reversed ► SDG 15
- make it possible to meet the Paris climate targets ► SDG 13
- reduce the risk of future pandemics that could arise due to keeping animals in industrial conditions and to the expansion of pastures and cropland for animal feed into wildlife habitats which increases the risk of pathogen spillover ► SDG 3
- reduce the incidence of heart disease and certain cancers (this applies to reduced consumption of red and processed meat) ► SDG 3
- help tackle antimicrobial resistance ► SDG 3
- enable animals to be farmed extensively to high welfare standards ► Paragraph 9 of the 2030 Agenda includes in its vision a world “in which wildlife and other living creatures are protected”.

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