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Agriculture and Food

Things that may interest you

- Around 20% of world cropland is degraded by industrial-scale agricultural practices, around 75% of it moderately (an area the size of China) and 25% severely.
- On current trends, 50% of irrigated cropland will be salinated and unusable by 2050.
- Of 7,616 livestock breeds worldwide (many of them localised), 20% will go extinct by 2050, cutting future genetic diversity. One breed per month is going extinct today.
- Every week 1bn animals and 20bn fish and shellfish are killed for human consumption (FAO).
- If food waste and the agricultural inefficiencies of meat production were removed, and everyone turned vegetarian, then current food output could feed the planet twice over.
- Rice, maize and wheat make up 50% of plant-based foods, out of 7,000 plants used as food.

It is commonly argued that food production must rise by 70% above current levels to feed the world in 2050. This is largely based on today's consumption patterns and on questionable assumptions related to population and GDP growth – that growth means ever-increasing consumption of meat, sugar, coffee, tobacco, chocolate and high-end foodstuffs, each of which contribute to health issues themselves earmarked for reduction. It is assumed that health, environmental and crop-yield concerns are less important than the unrestrained freedom to eat.

But in the context of all that has been discussed in this report, will the people of 2050 have such a voracious taste for ice cream, pot noodles, burgers and steaks as people have today? Population, GDP growth and feeding the undernourished do mean there will be increased food demand, but not necessarily as much as is assumed. Lifestyle and dietary change are a key demand-side solution.

Food supply is hampered by climate change, desertification, forest and wildland loss, overfishing, soil exhaustion, species loss, soil compaction, land loss and soil degradation. We need to transition toward a sustainable future by making changes to many of our agricultural production-boosting methods – pesticide and phosphate use, crop-intensification, monoculture, irrigation and water-withdrawal, GMO production and industrial farming.

Plenty of land is available for turning into cropland when viewed from a distance but, closer up, when forest and environmental protection, location, water availability, bee and insect pollination, biodiversity, weather reliability, local conditions and real people are included, the situation is not so good. With everything factored in, even a 50% increase in food output is ambitious.

Production increases alone will not guarantee food security for everyone. Addressing inequality will help far more, since today we are faced with a shameful dichotomy of undernourishment and obesity at the same time. Worldwide, 815m people are defined as hungry, 2bn suffer micronutrient deficiencies and 1.9bn are deemed overweight. Countries needing to import food will have to develop greater self-sufficiency and food-equality to survive safely in 2050.

One critical issue is meat and dairy production. It takes 25kg of cattle feed to produce 1kg of beef, and 3.3kg of chicken feed for 1kg of poultry. Conversion rates of protein inputs into outputs is 25% for eggs and only 4% for beef. Eggs and poultry are thus more efficient than beef or pork as animal protein sources. It takes 100 times the land area to produce 1kg of beef or mutton protein

compared to 1kg of protein from pulses. So dietary conversion from beef to poultry and eggs, and from meat and dairy to plant sources makes an enormous difference. High animal-protein consumption will need to sink through dietary change to avoid food shortages.

Dietary change toward vegetarian, vegan and flexitarian diets is happening in richer countries, especially amongst younger people, and few of them would deem that they are missing much as a result. Certainly *much reduced* meat and dairy intake is needed globally. For most of history animal products have been a supplementary, not a staple food. On average, the world eats more protein than is needed, though in regions where undernourishment is common protein intake needs to rise to improve general health, though not to the high levels seen today. Two key factors determine the extent to which the world can afford continued meat consumption: 1. only about 30% of pasture can be converted to arable land, and, 2. to improve ecological and climatic conditions, at least 30-40% of pastureland (biodiversity-poor 'green desert') needs to return to forest and wildland.

Another issue is biofuel production, touted as an alternative to fossil fuels up to the time of the food-price crisis of 2007-8. It was then realised that food production, land availability and water conservation take precedence. The explosion of cheaper renewable energy sources such as solar and wind-power since 2010 has taken the pressure off, making biofuels less promising. For Brazil, Malaysia and Indonesia, biofuel exports from sugar cane and palm oil are lucrative, and in USA 40% of the maize and 23% of the soya harvest have been converted into ethanol and biodiesel, but relatively low oil prices and fracking have undermined this growth.

In 2011 the UN Food and Agriculture Organisation (FAO) and the IMF appealed to all countries to remove biofuel subsidies and the market for biofuels has now declined. There is a case for mixing biofuels with oil-based fuels to increase burn efficiency but substantial conversion to biofuels is no longer pressing. However,

biofuel-related plants do play a part in novel crop-rotation systems aimed at reducing artificial fertiliser inputs, and here a happy medium can be found.

Advocates of industrial food production conflict with agro-ecology advocates. The FAO, while arm-twisted by corporate interests, nevertheless recognises that agro-ecological methods are a priority. Governments, influenced by food-industry lobbyists, are slow to change, talking of the need to improve public health while doing the minimum to harm industry interests. The industry advocates growth of monocultural, high-input, GMO farm output. Diversified agro-ecological practices meanwhile reconcile concerns over production scales, food security, environmental protection, nutritional improvement, social equality and support for rural farming cultures.

There is room for both, but a new emphasis needs to be made to support smaller farmers, who are best geared to local markets and better overall production practices, while industrial farmers are better geared to export and large-scale production. The debate is disproportionately influenced by big food and agribusiness firms whose profit margins come first, excluding or even covering up other important issues, and whose lobbyists are persuasive and effective. But industrial farming needs an operational transformation in reducing fertiliser and pesticide use, environmental damage, land, water and ecosystem degradation, greenhouse gas emissions, biodiversity loss and choice of crops. And rural economies need to be kept alive.

Bee and insect extinction, thanks to pesticides and land use change, threatens 35% of global crops dependent on pollination. The economic value of bee and insect pollination amounts to 10% of the total value of all global food production, and robot bees won't replace them. Pests, viruses, fungi, bacteria and weeds have been adapting to chemical pest management faster than management

techniques can develop – 210 species of new herbicide-resistant weeds now exist.

Since the 1960s industrial farming has produced big increases in crop yield but, over time, yields in maize, rice, wheat and soybeans have stagnated or collapsed in up to 39% of production zones. So the argument concerns corporate profits versus food system sustainability, and while the latter is important regarding environmental and social priorities, the former has more money and lobbying power, delivering food in large quantities, suitable to supermarket chains' demand needs.

One of the key drivers of the industrialisation of farming is the rising costs of farm labour and the decline of family-run farms. Many farmers are growing old, and new entrants are constrained by economic issues. Modern farmers are preoccupied with engineering, marketing and business more than with farming and land management. Loss of farm labour leads to a loss of local farming and ecosystem knowledge – longterm, this is unproductive.

Another driver of industrial farming has been the growth of exports from developing countries, involving on average about 23% of all their farm output and concentrated in some areas. But industrialisation tends to cut local food supplies by destroying local food markets, centralising food buying and driving small farmers out of business since few can meet modern commercial food standards. This means growing undernourishment in some countries as a result. Africa has changed from a net food exporter in 1970 to a net food importer today because so many small farmers have given up the farming life. The resulting urbanisation leads to major food security issues.

That industrial agriculture raised crop yields was once a given fact, but now it has come into question. Research reporting high industrial yields focuses on short term yield growth and small research samples of specific crops. When industrial and organic

agriculture are compared longterm and over a wider spread of products it has been found that, while in the developed world organic yields are 8% lower, in the developing world they are 80% higher than industrial farming yields.

In the developed world farming is machine-dependent and large scale while in the developing world it is more labour intensive and eco-sensitive, better for rural jobs and supporting local rural cultures. In addition, organic crops are found to be more resistant to drought and extreme weather events – maize and soy yields in normal years are equal, but in drought years they are 30% higher on organic than on industrial farms and 13% higher than on farms using GMO cropping.

Agriculture is an area where disagreements over humanity's future can be at their sharpest. There is a big challenge to feed the world, and the conventional view is that further farm industrialisation, with ever more sophisticated precision farming, pesticide, GMO and fertiliser use, will solve the problem of food insecurity. But, to quote the International Panel of Experts on Sustainable Food Systems (IPES), *“On the basis of the evidence gathered, there may be no greater risk than sticking with industrial agriculture and the systematic problems it generates”*.

IPES concedes that tweaking industrial practices can resolve some specific problems, but it will not provide longterm solutions to the multiple problems industrial farming brings. Viewed in isolation and in the short term, industrial farming shows up well. But viewed in the longterm and in the round, reckoning in climate change, soil fertility, biodiversity, pollution, food quality and food security, as well as farm livelihoods and rural regeneration, sustainable agro-ecological practices show up significantly better.

The consumption side is important – food waste, quantities consumed, types of food eaten and public health standards are all relevant. The need to raise food production by 70% is thus

inaccurate. Food production will need to increase by at least 30% to meet population growth, ensuring food security for all. But food security is best guaranteed by tackling the problem more widely and roundly. An organisation called IAASTD reckons that, if the current food harvest were used entirely for food and as effectively as possible, it could feed 12-14 billion people. At present, with cereal production, 43% is used for food, 36% for animal feed and 21% for fuel and industrial products, and approaching half of the 43% for food goes on overconsumption and food waste.

This concerns inequality, the need for big consumers to reduce consumption and for poorer people to be guaranteed better, cheaper, more secure supplies. It concerns a dietary shift toward plant-based foods and the nutritional value of food, including micronutrients. Food futures, a form of speculation, were a cause of the 2007 food-price crisis, and they need to be taken out of the equation. The food industry and its lobbying power need constraining. All-round rural regeneration, support for small farmers, farming education, sustainable efficiency and bioproductivity measures, organic and low-chemical production, all need to be encouraged. Then everyone can be fed, and problems associated with urbanisation and the flight from the land can be reduced.

Useful links

How to Feed the World in 2050, FAO, 2012.

[http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How to Feed the World in 2050.pdf](http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf)

Meat and Seafood Production and Consumption, Our World in Data, Max Roser. <https://ourworldindata.org/meat-and-seafood-production-consumption>

Global Agriculture (*resource website*). <https://www.globalagriculture.org>

Agriculture at the Crossroads, IAASTD,

2009. <https://www.globalagriculture.org/fileadmin/files/weltagrabericht/IAASTDBerichte/GlobaIReport.pdf>

From Uniformity to Diversity – industrial agriculture and diversified agro-ecological systems, IPES, 2016. http://www.db.zs-intern.de/uploads/1464931452-UniformityToDiversity_FullReport.pdf