

Quo Vadis Global Meat Industry 2050

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The Challenge

The scourges of pestilence, famine, wars, and earthquakes have come to be regarded a blessing to overcrowded nations, since they serve to prune away the luxuriant growth of the human race

Tertullian, Historian of the Roman Empire, in De Anima, AD 209

The global meat industry is under pressure. Increasingly vocal civil society groups are calling for stringent curbs on meat consumption, and advocating for vegetarian and vegan lifestyles. In the affluent parts of the world, this movement is becoming mainstream. Regulators and governments are increasingly responding to these concerns. After tobacco and sugar, meat will become the third agricultural produce, whose consumption becomes socially disreputable, legally curtailed or even banned?

The argument against meat rests on four different, and largely unrelated, themes:

1.) Today's global population is 7.5 billion people, growing to around 10 billion in

the year 2050. Even today's level of human population can only be fed with substantial deployment of chemicals and technology on the fields. Agriculture is encroaching on natural habitats on every continent, threatening biodiversity and risking irretrievable extinction of species. The Cerrado and Amazon in Brazil or the tropical island of Borneo are prominent examples. Water shortages are a threat to humans and nature in many places. There are concerns that agriculture has already overstepped the limits of what planet Earth can produce on a sustainable basis, and even stronger concerns that these limits cannot support a further 60–70% expansion, which is estimated to be demanded by 10 billion people in 2050. Since the overwhelming majority of agricultural resources are used to feed animals in the livestock sector, a seemingly easy way to reduce the agricultural footprint would be to shift dietary patterns away from meat and towards plants. In this way, the agricultural production could be channelled directly to humans, instead of taking the indirect route via an animal's stomach.

2.) Meat can only be obtained by killing and slaughtering a warm-blooded animal: the

three most important ones being cattle, pigs, and chickens. Also turkeys, goats, sheep, and camels are important livestock animals raised for slaughter. Both the industrialized conditions of raising these animals, and the slaughter of these socially highly developed and complex animals, is seen to be cruel and lacking respect for the individual animals and the species, according to some animal rights advocacy groups. Out of respect for humanitarian values, and animal rights derived from these, animals should therefore not be slaughtered for the benefit of human consumption—thus is the argumentation.

- 3.) Cattle in particular are also blamed for being a notable contributor to global warming. Their digestive system incorporates methane-producing bacteria to help them process their low-energy feed of grasses into high energy nourishment. This methane is emitted via the cattle's mouths and might contribute to the global methane budget in the atmosphere. Methane is considered a potent greenhouse gas, and thereby the global herd of about 1.4 billion cattle is seen as a factor in global warming. Reducing the intake of cattle-related products, primarily beef and dairy, would therefore be a contribution towards slowing down global warming.
- 4.) Red meat is suspected to cause colon cancer and, potentially, other diseases related to cholesterol levels. Though no causal relationships could be established so far, the World Health Organization rated the consumption of processed red meat as an IARC Group 1 health risk (meaning there would be sufficient evidence of carcinogenicity in humans, the same category in which also tobacco smoking and asbestos is listed). The consequence would be to lower the

recommended levels for consumption of red meat.

This report analyses the future of the meat industry by looking at the veracity of each of the above claims. It is presented in four parts:

- Part 1: How to Feed the World in 2050 – Four Technology and Innovation Scenarios
- Part 2: How Much Can Innovation Contribute to Improve the Efficiency and Animal Welfare of Food Protein Production?
- Part 3: The Need to Clarify the Ethics of Meat
- Part 4: Climate Change and Cancer – What the Numbers Say

The four parts will be published in the course of 2018 and 2019. The report for Part 1 can be downloaded from the following website address: foodandagribusiness.org

Summary Part 1

How to Feed the World in 2050 - Four Technology and Innovation Scenarios

Men make history and not the other way around. In periods where there is no leadership, society stands still. Progress occurs when courageous, skillful leaders seize the opportunity to change things for the better.

Harry S Truman, President of the United States of America 1945–1953

The challenge of feeding the world in the year 2050 is fourfold:

1. Already in the year 2018, the global food system does not feed its 7.5 billion people properly. 11% are hungry and every fourth child below the age of five years experiences stunting. At the same time, 39% of the global adult population is overweight and 13% is obese
2. The global population is expected to rise to around 10 billion people in the year 2050, an increase of 33% over today
3. The global population is expected to become more economically successful, which in the past has resulted in demand for more resource-intensive foods, in particular meat, dairy, and eggs
4. The global food production system may be at, or already beyond, the limits of sustainability with its current level of resource utilization in terms of land and water

Totalling these effects, prominent researchers at the Food and Agriculture Organization (FAO) calculated that about 60% more food needs to be produced in the year 2050 versus the base year of 2007. With only minor variations, this number is mostly agreed to by the scientific community.

The challenge can, in principle, be met in three different ways:

1. increase the utilization of natural resources, particularly land and water, ignoring potential sustainability limits
2. increase productivity in food production and thus make better use of the resources
3. change the composition of diets in such a way as to need less of the natural resources, in particular this means reducing the consumption of meat, which is resource-intensive

The analysis in this report captures those three options by describing four different scenarios. By numerically defining the dimension of resource utilization with the proxy of amount of global agricultural land, and the dimension of innovativeness with the proxy of yield growth, the four resulting scenarios are a) History Continues; b) Deliberate Impoverishment; c) Radical Technology Deployment; d) Zoological Gardening.

The analysis shows that in the first scenario of History Continues, it will be possible to feed 10 billion people by the year 2050 with sufficient food. However, this would require an expansion of agricultural land by 28% over today's levels. Most of this land would be converted in the tropical and subtropical belts of currently pristine nature: in the Brazilian Cerrado and Amazon, in the African central jungles, and in Indonesia. This would result in the irreversible destruction of the last remnants of large scale tropical pristine biospheres on Earth.

The second scenario of Deliberate Impoverishment aims to reduce the need for natural resources by radically curtailing the availability of red meat to the global consumer. On a global scale this would be possible. If the global average citizen can be convinced to drastically reduce consumption of red meat, then everybody would have enough to eat, with no expansion of utilization of natural resources necessary. However, the world does not consist of average citizens. 80% of the additional food required by 2050 will be needed in Africa and South Asia, which are today already net importers of food. In this scenario, by 2050, even more of the agricultural production would be occurring in South and North America, while it is needed in Africa and South Asia. It is difficult to conceive how Africa can afford the financial means to import food on such a large scale. Even for South Asia it would be a burden and

brake on its economic development. The three population groups which are most at risk are children, the elderly, and the poor. Slowing down economic growth will keep these three groups longer in poverty, and therefore at risk. Furthermore, food import dependency will make food relatively more expensive in the terms of trade for such countries, thereby exacerbating food affordability problems and making the three risk groups even more vulnerable. In sum, this scenario does not reflect economic reality. If the affluent part of the world agrees to eat less meat, this will reduce the agricultural footprint in the Americas and Europe, but it will not contribute to putting more and better food in front of undernourished children in Africa and South Asia.

The third scenario banks on Radical Technology Deployment. If all known yield and technology gaps would be closed, especially in Africa, then the world would easily produce enough food to feed 10 billion people and more. Agricultural land could be retired and returned to nature. However, there are highly complex socio-economic hurdles to overcome for the yield gaps to be closed. The aspiration is that new technologies in communication, data science and robotization can help in closing the yield gaps better than efforts in the past could achieve.

The fourth scenario of Zoological Gardening is at best reserved for the 10% most affluent population in the world, mostly residing in North America and Europe. Thanks to its already high levels of agricultural productivity and almost no expansion of food demand until 2050, these regions can afford to deliberately reduce agricultural productivity and pursue quasi-zoological practices such as organic farming methods or staging cattle on Swiss mountains for attracting tourists. Such methods can be an affordable luxury for the affluent with

aesthetic effects, but it does not contribute a solution to feeding the world at large.

The overall conclusion is that there are no easy choices. There are many serious challenges to be overcome to deploy technology on a sufficiently radical scale, to accelerate harvest yields fast enough, to be able to feed the world in the year 2050. But it is the only viable option that does not lead to tragic other circumstances. The scenario incorporating deliberate and severe reduction of global red meat consumption is not economically viable, despite first appearances. New economics and new people fitting such economics would first need to be created. The 20th century has shown several times, that attempts of large scale socio-economic engineering to change societies, people and economics, leads to tragic outcomes. On the other hand, the scenario of business as usual will destroy the last great pristine biodiversity habitats of Earth. Historically, the most successful method to solve a resource crisis has been deployment of technology. Such technologies exist, and get better by the day. What is missing is the social, political and ethical mandate to make full use of these technologies. That will be subject and consideration of Part 2 of this report.

References

**Reporting from the Frontiers of Science
Part 1: How to Feed the World in 2050
(2018)** Four Technology and Innovation
Scenarios