

CONFLICTING ALIGNMENT & DISRUPTIVE CHOICES

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Health and environmental agendas are not always aligned with the current dietary recommendations. For example, in affluent countries, the recommended amount of meat consumption is significantly less than current consumption levels. People are encouraged to eat more vegetables, fruits, wholegrain, low-fat dairy products, and omega-rich seafood. However, they instead consume more hyper-processed foods containing hidden levels of sugar, sodium, transfat, and highly refined grains. The price differences between healthy and unhealthy foods are widening, which may contribute to food insecurity in certain economically depressed regions and increase health inequalities. The latter could further exacerbate social inequalities in health.

Never has food been such a global issue. Overweight and obese people sharing the planet with chronically malnourished and hungry populations represent both sides of the spectrum. All things considered, the bottom line is how to produce more food with less land, as well as reduce waste and improve equal access to wholesome food at less price volatility.

Agriculture, including livestock production, accounts for about 25 percent of all emissions. Food waste alone accounts for about 8 percent global Greenhouse Gas (GHG) emissions. Excessive crop harvest waste, food portion sizes in meals, including take-out meals, fuel consumer concerns about

excessive food waste. Reducing food waste is therefore important and, if only partially avoided, it can feed millions of people.

Carbon dioxide is emitted throughout the food supply chain from energy use by farming equipment and product transportation. Particularly meat and dairy have a significant impact on the environment and are considered high-methane foods.

Global climate change is influenced by foods such as meat, dairy, and rice that are high sources of methane. Special interest groups

Complicated Global Issues

Worldwide socioeconomic changes such as population growth, increased income in developing countries, and rapidly increasing urbanization have significantly changed dietary patterns, particularly in animal protein consumption.

The production of livestock to generate valuable animal protein represents a major environmental challenge. The consumers' love for meat might well be on a collision course with the health of the planet, which needs rebalancing



often ignore the relationship between rice and methane because it doesn't fit their agenda. Yet, significant amounts of methane are emitted from rice agriculture through enteric fermentation and rice paddy methanogenesis.

in terms of the consumption of more resource-efficient plant proteins. In other words, it is time to move actively toward a more environmentally balanced diet to reduce the consumption of energy and protein-dense less

sustainable foods like slaughtered meat and conventional dairy.

Global population growth will not be uniform and strong growth will be visible especially in sub-Saharan Africa and Asia. For these reasons, it is projected that developing countries will be responsible for more than 80 percent of the estimated increase in meat and dairy consumption, as compared to the 2024 numbers. In developing countries, the risk is real that demand will outstrip supply, not to mention inflationary price pressure.

In the coming years, urban growth will be heavily influenced by migration in countries with low and middle incomes. In addition, population in developing countries will become younger which will speed up urbanization. Hence, these factors will impact food consumption patterns:

- Increased demand for processed food.
- Increased demand for convenience “ready-to-eat” food; and
- Increased demand for “out-of-home” consumption.

The global demand for meat will force the meat industry to grow animals faster than ever before. Demand for meat is a primary growth driver especially in the developing countries. Relatively speaking, in some Southeast Asian countries, the meat consumption will rise faster than population growth.

Meat is a mainstay, as evidenced by global data on its production

from 2000 through 2024:

- 78 % increase in chicken
- 35 % increase in pork
- 13 % increase in beef

Projected Average Global Meat Consumption (2024)

- Beef 9.6 kg
- Chicken 15.5 kg
- Pork 16.3 kg

These figures are lower than the consumption in developed and affluent countries. Subsequently, these numbers illustrate that significant growth of animal protein is happening in developing countries. The total world production forecast for meat and poultry shows an increase of about 16 percent from 2018 to 2025, or from 308 million metric tons to 336 million metric tons. As world prosperity increases, so will the demand for slaughtered meat and conventional dairy. Despite the good intentions to aim for protein transitioning to plant-origin protein sources, the opposite will likely happen in developing countries.

Global chicken consumption is predicted to account for 41 percent of all meat-eating by 2030. Aside from developing and emerging markets like Africa, the Philippines and China are leading the explosive growth numbers of chicken consumption. The popularity can be clearly seen at fast food companies increasingly marketing chicken sandwiches and slowly starting the de-emphasize beef and pork options. Actually, the same trend

is happening when looking at the food served by airline companies.

Consumers in developing countries such as China, India, Vietnam, and Indonesia are especially gobbling up more meat and dairy products. It is difficult to predict trends in developing markets, though it is likely that increased disposable family income will further push the consumption of animal protein foods in uncharted territory. Yet, possible geopolitical issues and currency volatility may impact these markets.

Sustainable Livestock Farming

It is generally agreed that a sustainable production and consumption of animal-origin foods is the biggest environmental challenge. The Western world, which has been decades-long spoiled with high levels of meat availability at relatively low prices, cannot point fingers at developing countries for their appetite of premium animal protein-based foods and meat products. After all, many developing countries have always been deprived of eating quality meat and enjoying dairy foods. Even with the temporary set-back of COVID and the improving economic standards in developing countries, it can be assumed that the consumption of animal origin foods will rise exponentially until at least 2050. In fact, it is projected that the world’s meat and dairy consumption will increase by at least 50 to 70 percent, as compared to the 2010 numbers.

Nevertheless, the sharp increase in demand for dairy and meat products has raised environmental and ecological concerns. The UN estimates that livestock production is responsible for about 15 percent of global greenhouse emissions. Meat, and especially beef, is a relatively ineffective source of protein because of long animal outgrow cycles. It is argued that it would be smarter to convert agricultural crops directly into food, instead of routing the crops for feeding and raising animals. The controversy about this logic will not die anytime soon, hence, it is safe to assume that animals will remain part of the current

per calorie and uses 28 times the land, as compared to other farmed and harvested animals like pigs, poultry, and fish. Also, cattle burp major amounts of methane, a greenhouse gas that is significantly more potent than carbon dioxide. Methane is the greenhouse gas most often associated with the depletion of the ozone layer.

Cutting Back, Yet Growing

The global meat market is somewhat disrupted by animal-free protein. The traditional meat, egg, and dairy industry sees it as consumers living in affluent societies turn

or grown from fungi, yeast, or bacteria.

- **Cultivated Proteins:** Through precision fermentation technologies as well as tissue engineering and cell harvesting cultivating and growing real meat and dairy proteins, equivalent to animal proteins.

In developed countries and affluent societies, there is a subtle trend towards consumers who are cutting back on their meat consumption for health and sustainability reasons. The number of so-called “flexitarian” affluent consumers is expected to grow, which will further drive the development of formulated plant-based food, including plant milk and plant meat products. Consumers are clearly looking for innovative options to take the inherent benefits of plant nutrition into their daily lives.

China’s Protein Transition: Not Happening Yet

Even though international organizations support the reduction of meat intake, the opposite will happen. For example, it is predicted that global meat consumption will rise on an average 2.0 percent a year from 2020 over the next decade.

Collectively, protein deficiency in developing countries and poor societies remains a problem for an estimated one billion people –or some 15 percent of the world population. As income rises, meat and dairy are usually the preferred sources of protein.



agricultural infrastructure knowing that its protein quality contributes to a nutritionally sound and good-tasting healthy diet.

Beef cattle is not very efficient at converting feed to meat muscle protein for human consumption. Only one of every 25 calories cattle ingest becomes edible beef: a very inefficient feed-to-yield ratio. Beef produces five times more heat-trapping gasses

towards increased consumption of plant-based alternatives, while cell-cultivated meat also appearing on the horizon as a healthy and tasty option.

Types of conventional meat competition:

- **Plant-based:** Products that replicate the familiar taste and texture of existing animal foods like meat, milk, and cheese.
- **Fermented Proteins:** Cultivated

Mainland China imported some 60 million tons of meat in 2020, firming up the country's position as a dominant player in the global meat industry. It is also expected that by 2024, imports will make up more than 20 percent of the country's beef supply. All forms of meat are expected to continue rising in China, cementing its position as the most important meat importer in the world, importing a staggering 52 percent of the world's pork supply.

China is the world's largest consumer of meat, with consumption expected to grow 3-4 percent a year due to a rapidly growing middle class. Continued Chinese growth in meat demand and a willingness of consumers to spend more will further drive consumption of meat, including value-added meat products sold via fast food restaurants. As a matter of fact, premium priced beef is the fastest growing meat choice in China, ahead of poultry and pork. The Chinese beef market has grown by almost 6.0 percent from 1995 to 2023, as compared to the growth of pork (3.5 percent) and poultry (3.4 percent) over the same time frame. To be fair and balanced, sales of pork has been negatively affected due to the heavy culling caused by the African Swine Fever. Despite increasing prosperity in China, the leading government health agencies are promoting less meat consumption and boosting the dietary plant protein intake from vegetables, cereals, grains,

pulses, and potatoes. To add some color to these issues, the recommended dietary guidelines of the Chinese Nutrition Society suggest limiting annual meat consumption to a maximum of 27.4 kg per capita.

The Chinese consumption of plant foods has risen by approximately 30 percent since 1955, while meat and dairy consumption has increased by about 45 percent over the same period. Chinese food consumption is being transformed rapidly into a typical American or Western-style diet. Subsequently, it is therefore fair to conclude that the Chinese demand for meat and dairy will remain very strong in the years ahead.

Food & Living Inequality

It is estimated that the world's supply of vegetables and fruits falls 22 percent short when a nutritionally balanced diet is implemented. The shortfall is expected to worsen if more people switch to a higher inclusion level of vegetables and fruits in their daily routine diets.

Another 2 billion+ people will populate Earth by 2050, and 210,000 more mouths need to be fed every single day. The challenges ahead to manage food security are immense and very complex. Unexpected increases of basic food prices can not only stress economies all over the world but may also exacerbate hunger and spark political unrest in

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poor countries as well as affect affluent societies with growing economic inequality.

How much longer can political inaction continue if even highly affluent countries like the US the EU and the UK, have increasing numbers of people living off with food stamps or food donations received as emergency or regular food supplies from food banks? Furthermore, it is inconceivable to think of hungry children and poor young women living in affluent societies receiving free breakfast meals at school or receiving free menstrual products.

Dumping Food

Food costs must also be taken into perspective: The agricultural cost of growing food accounts for only 15 percent of the final consumer price. The balance goes to processing, packaging, marketing, transportation, and profit.

Food waste is an environmental, economic, and ethical problem of huge proportions. It is difficult to comprehend that a large part of the globe is still suffering from food shortage, while the value of food in the affluent societies is often only considered as an afterthought.

Consumers in the developed countries and affluent societies make up the largest group that dumps food, even if it is still in perfectly good condition to eat. Fruits and vegetables are the most wasted category, particularly

within households. It should be said, however, that a considerable amount fruits and vegetables do not even get past the farm gates. Apparently, one can still argue that the world can grow sufficient food for future generations and that inequality is not a matter of sufficient food but rather of shameful waste and equal sharing.

Consumers need to be made aware that reducing food waste will not only benefit the environment, climate, and human health but also reduce municipal waste. However, first and foremost, the mindset of consumers in developed countries should be reprogrammed as to which unsold food products remain available for safe redistribution. Instead of destroying food, both manufacturers and retailers should be encouraged to routinely donate food to local food banks and/or charity through organized programs.

Seen from a different angle, American consumers waste food that equals roughly 30 percent of the average daily calories. This amounts to about 150,000 tons of food or some 430 grams per person each day. These staggering food waste numbers correspond with the use of 12 million hectares of total US cropland and 15.9 trillion liters of irrigation water each year.

Simply Wasted

US Government data estimate that nearly a third of food available for consumption in the US goes

uneaten. Probably, similar numbers are true for many EU countries. Consumers don't understand the impact of food waste and most of them underestimate how much food is thrown away. Although consumers are now more attuned than ever to the purity of ingredients and prefer natural clean label foods, most of them -unfortunately- do not care about the environmental impacts of food waste.

Feeding valuable plant protein sources to animals with the objective of converting into animal protein - meat, milk, and eggs - can be considered waste to a certain extent. The world can ill-afford to continue business as usual, knowing that about 83 million more people will live on Earth every single year with no decline in sight.

To conclude: plant-based nutrition is more sustainable with less greenhouse gas emissions, less use of clean water, and increased land utilization. Gradually, plant-based foods will achieve a better standing with consumers. When that happens, the protein paradigm will shift to increased plant protein-formulated foods. Do not, however, make the mistake of ruling out meat, eggs, and dairy. These food products are not only a valuable source of high-quality protein but also a great-tasting universal favorite across most societal cultures, and they will continue to dominate preferred dietary choices for many years to come.

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