



EAT WHAT YOU WANT

Climate Change and Food Security: Minimal Impact?

To GWPF London, April 2025

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President of Klimarealisme – the Danish Society of Climate Realists

Former President, Dansk Akvakultur

Former Chairman of Copenhagen Institute of Future Studies

The Birth of a Climate Realist, AIT 1997



- *The material conditions of life will continue to get better for most people, in most countries, most of the time, indefinitely. Within a century or two, all nations and most of humanity will be at or above today's Western living standards.*
- *I also speculate, however, that many people will continue to think and say, that the conditions of life are getting worse*
- Julian L. Simon

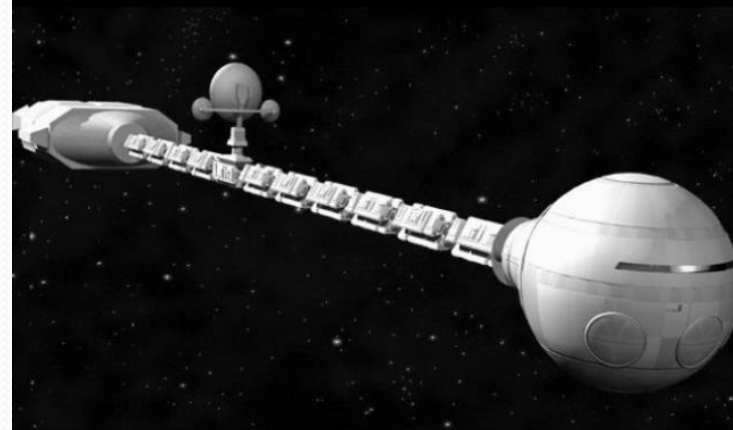
AIT 1997-99 - Growth Unlimited

Global Climate
Change: The CO₂
Thermometer?
*Nguyen Thi Kim
Oanh*

“It is evident that
the proposed
cure of excessive
CO₂ emission
reductions may
well be far more
costly than the
disease of global
warming”

Population and
Food: Why India
is Prospering
Instead of
Starving
Gajendra Singh

Growth Unlimited



Amrit Bart
Karl Iver Dahl-Madsen
Nguyen Thi Kim Oanh
Vilas M. Salokhe
Gajendra Singh
Willi Zimmermann

*School of Environment, Resources & Development
Asian Institute of Technology*

Climate Change and Human Development

Indicators for Climate Change and Global Welfare		Year		
Climate change	Unit	1920	1999	2020
Temperature	Degrees C	13,5	14,2	14,5
Water level	cm	0	24	30
Development of wealth and welfare				
Population	Billion	1,9	6,0	7,7
Infant mortality	Percentage of children under 5 years of age (from 1950)	22%	8%	4%
Life Expectancy	Years	35	66	72
Wealth	GDP/Cap USD (PPP, 2011)	2.000	9.000	16.000
Poverty	Percent below poverty line	70%	30%	10%
Education	Literacy	32%	80%	88%
Raw materials	Simons Abundancy Index (from 1980)	100	440	700
Energy	Percentage without access to electricity(from 1990)	30%	25%	10%
Yield farming	Wheat, tonnes/ha (from 1960)	1	2,8	3,5
Malnutrition	% malnutrition in the world (from 1950)	65%	15%	7%

The Minimal Impact Perspective

Food availability is rising:
Unimpacted by climate change

Primary Driver: Increasing demand for food due to population growth and rising wealth.

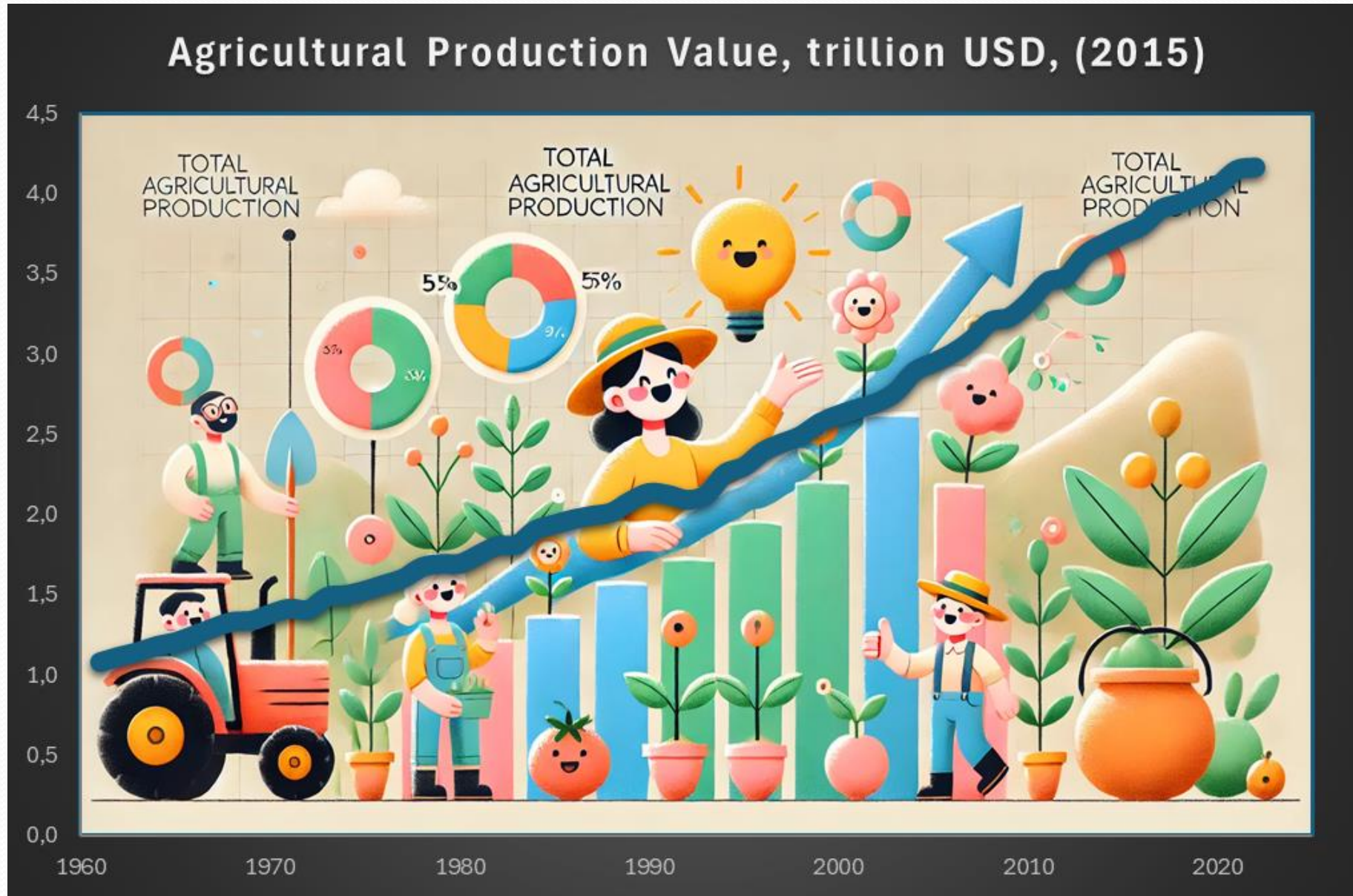
Efficiency and cost: Yields are rising and cost are falling caused by knowledge and technology

Climate Change Impact: Marginal compared to technology

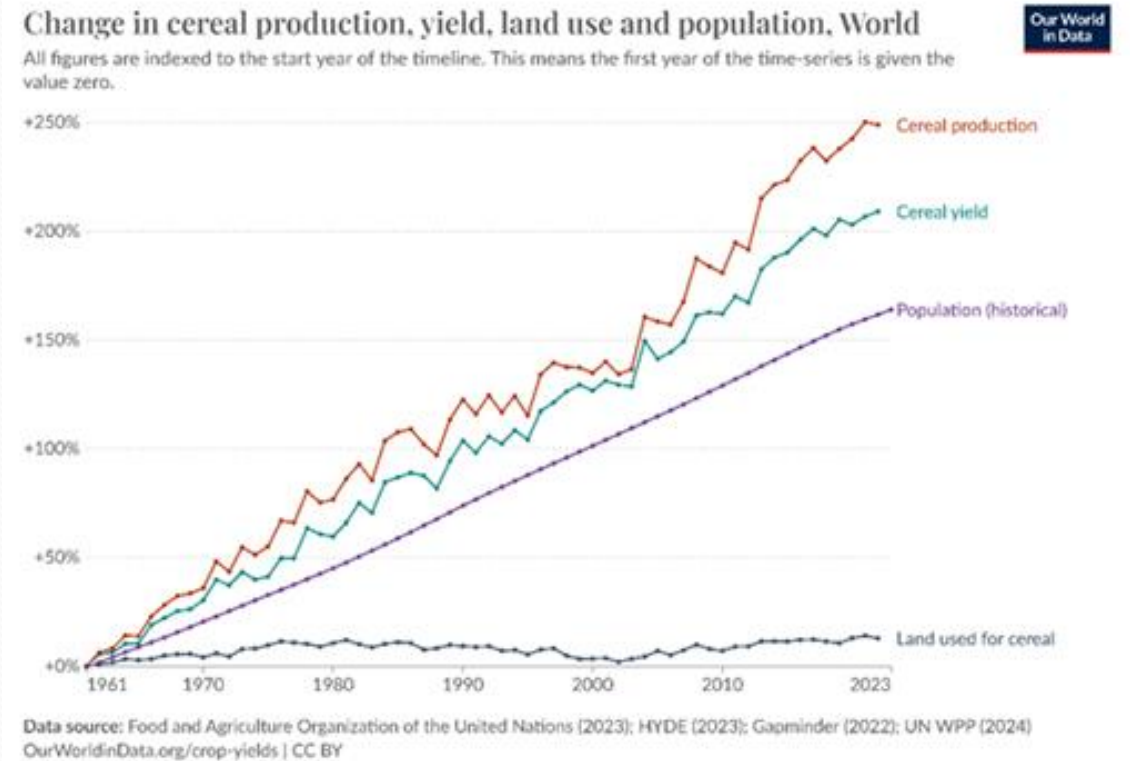
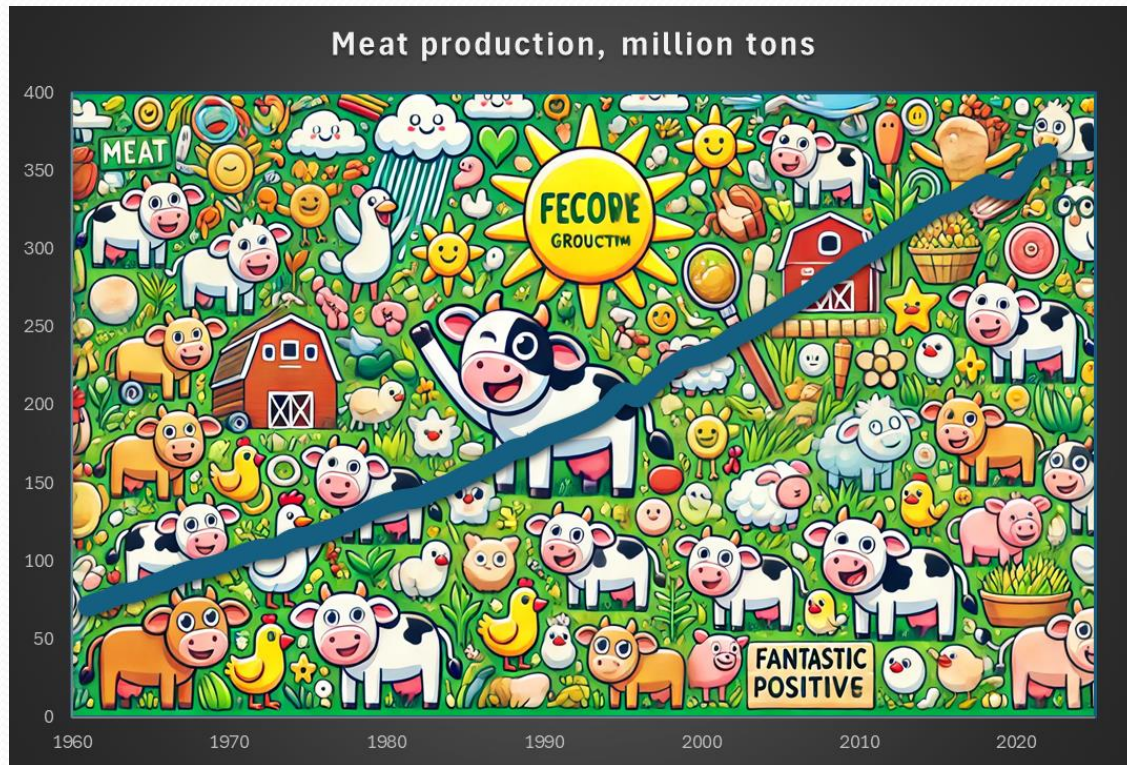
Future Food: Affordable high quality food, including meat, for all. With a steadily decreasing footprint



Global Food Production, the Big Picture

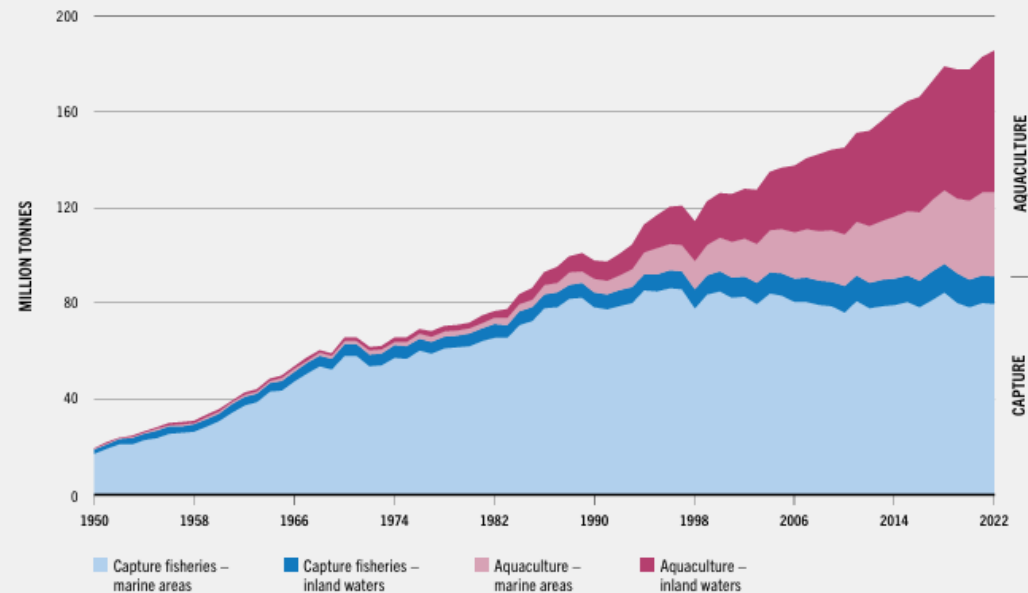


Production Quantities



Fisheries & Aquaculture

FIGURE 1 WORLD FISHERIES AND AQUACULTURE PRODUCTION OF AQUATIC ANIMALS



NOTES: Aquatic animals excluding aquatic mammals, crocodiles, alligators, caimans, aquatic products (corals, pearls, shells and sponges) and algae. Data expressed in live weight equivalent.

SOURCE: FAO. 2024. FishStat: Global production by production source 1950–2022. [Accessed on 29 March 2024]. In: FishStat.J. Available at: www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Total Value:

• 0.47 trillion

Fisheries

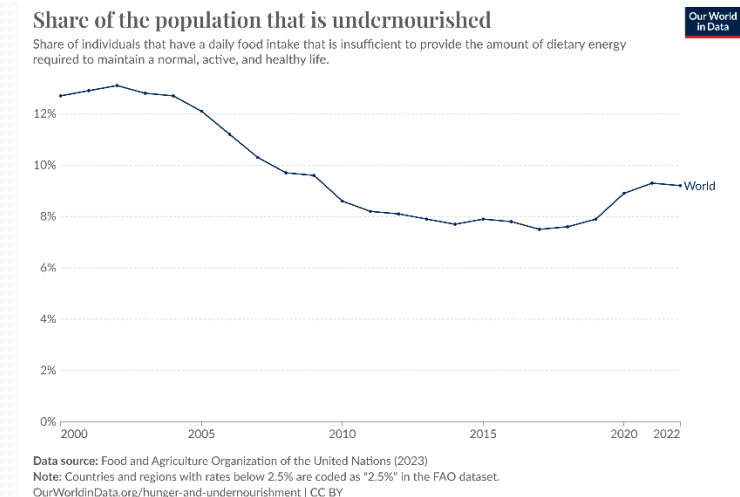
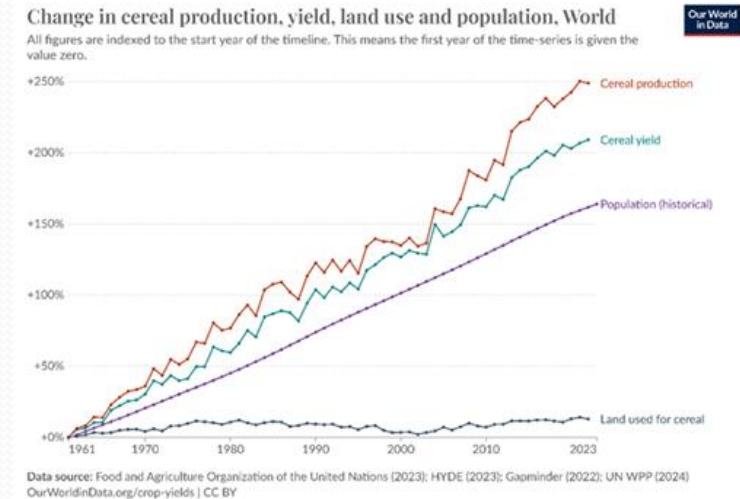
• 0.16 trillion

Aquaculture

• 0.31 trillion

We Are Getting Well-Fed

- No excuse for hunger
 - *Findes der sult og nød, skyldes det sving, Nordahl Grieg*
- Endless Whining
 - The false prophets: From Malthus, via Ehrlich to Lester Brown:
Failed forecasts makes you rich and famous
- The Real World
 - Tripling of food production since 1960
- Still nearly 800 mio. malnourished
 - Caused by bad governance



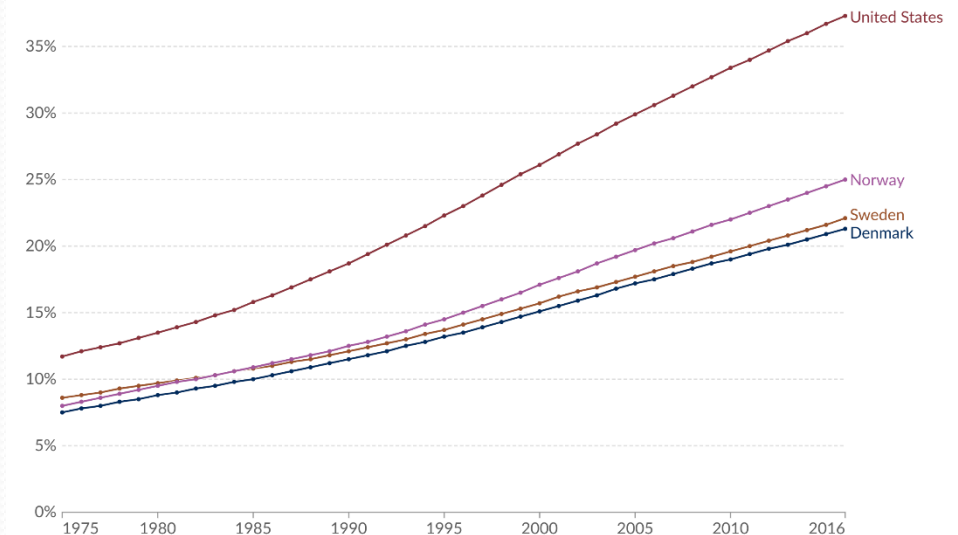
Obesity is Surpassing Malnutrition



Obesity in adults, 1975 to 2016

Our World
in Data

Estimated prevalence of obesity¹, based on general population surveys and statistical modeling. Obesity is a risk factor² for chronic complications, including cardiovascular disease, and premature death.



Data source: World Health Organization - Global Health Observatory (2024)

OurWorldinData.org/obesity | CC BY

1. Obesity: Obesity is defined as having a body-mass index (BMI) above 30. A person's BMI is calculated as their weight (in kilograms) divided by their height (in meters) squared. For example, someone measuring 1.60 meters and weighing 64 kilograms has a BMI of $64 / 1.6^2 = 25$. Obesity increases the mortality risk of many conditions, including cardiovascular disease, gastrointestinal disorders, type 2 diabetes, joint and muscular disorders, respiratory problems, and psychological issues.

2. Risk factor: A risk factor is a condition or behavior that increases the likelihood of developing a given disease or injury, or an outcome such as death. The impact of a risk factor is estimated in different ways. For example, a common approach is to estimate the number of deaths that would occur if the risk factor was absent. Risk factors are not mutually exclusive: people can be exposed to multiple risk factors, which contribute to their disease or death. Because of this, the number of deaths caused by each risk factor is typically estimated separately. [Read more: How do researchers estimate the death toll caused by each risk factor, whether it's smoking, obesity or air pollution?](#) [Read more: Why isn't it possible to sum up the death toll from different risk factors?](#)

Staple Food is a Necessity



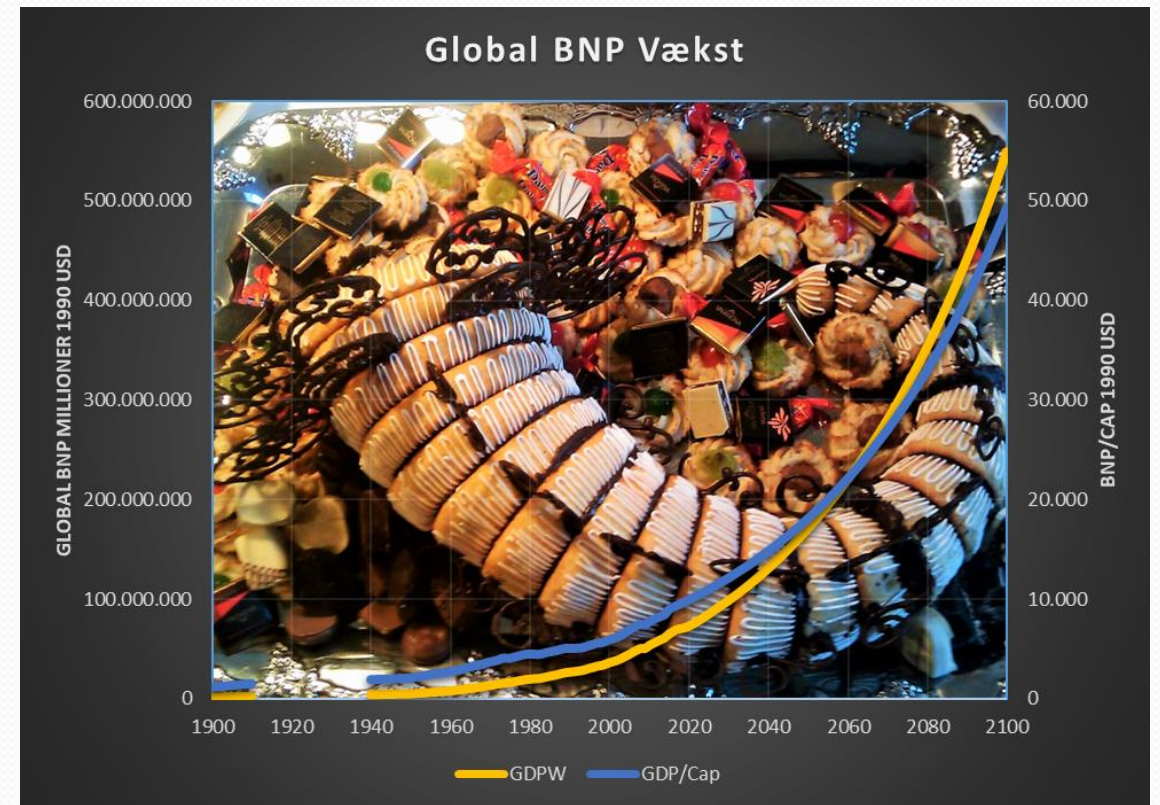
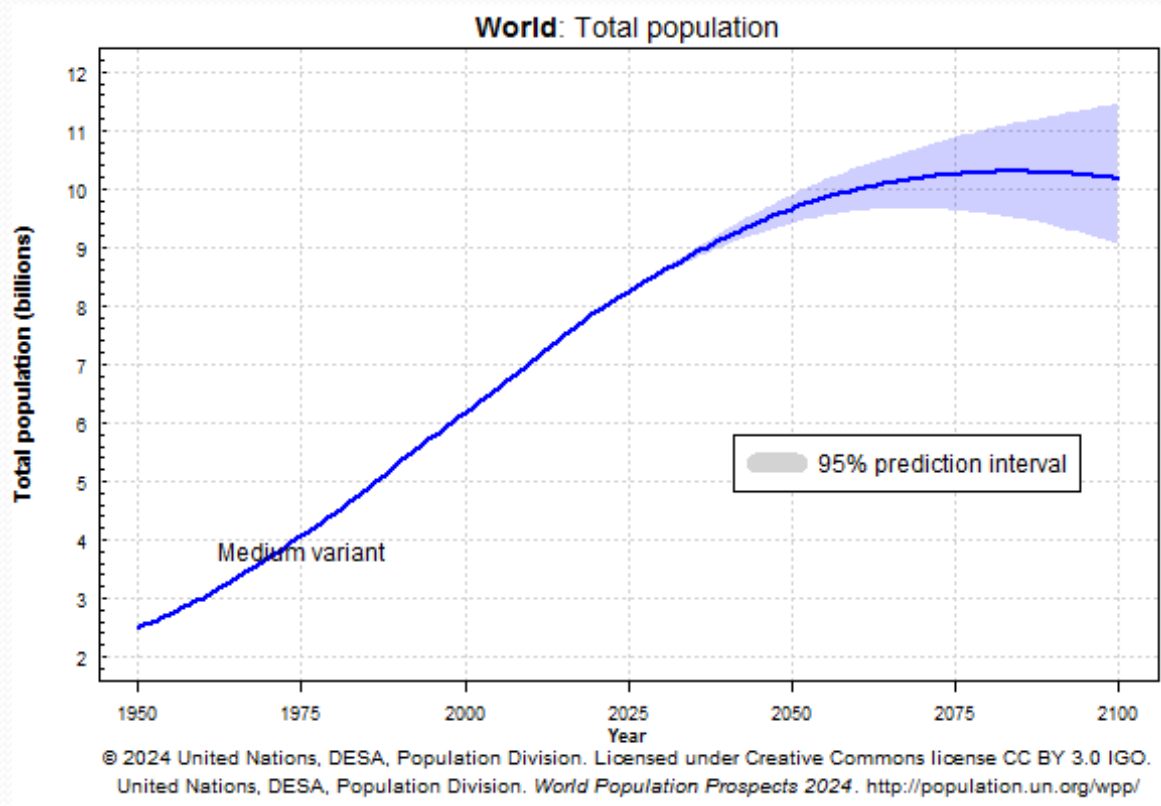
Rice etc. is price inelastic



Organic strawberries, not so much

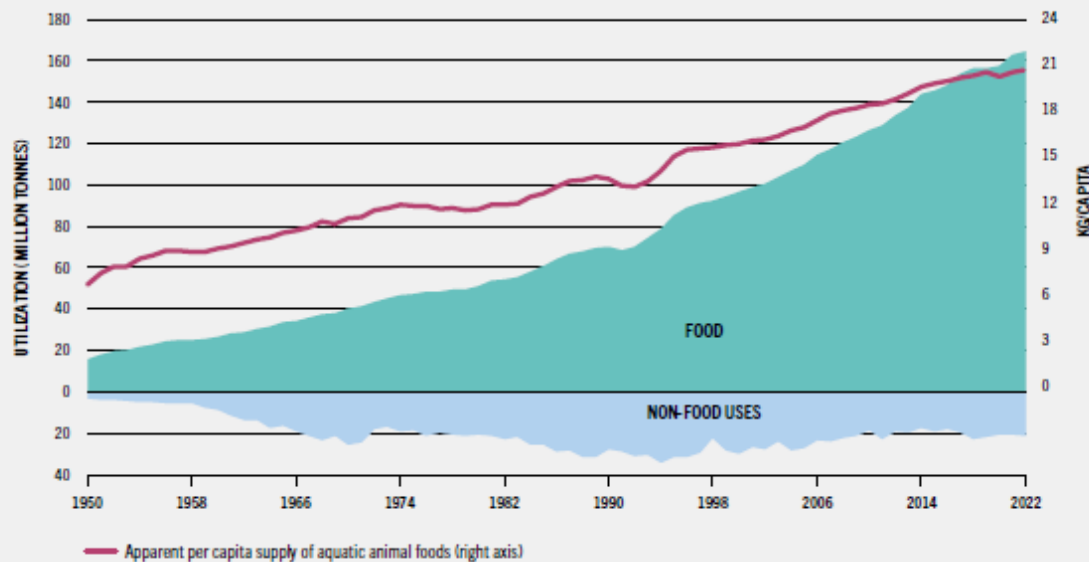


The Primary Driver is Demand



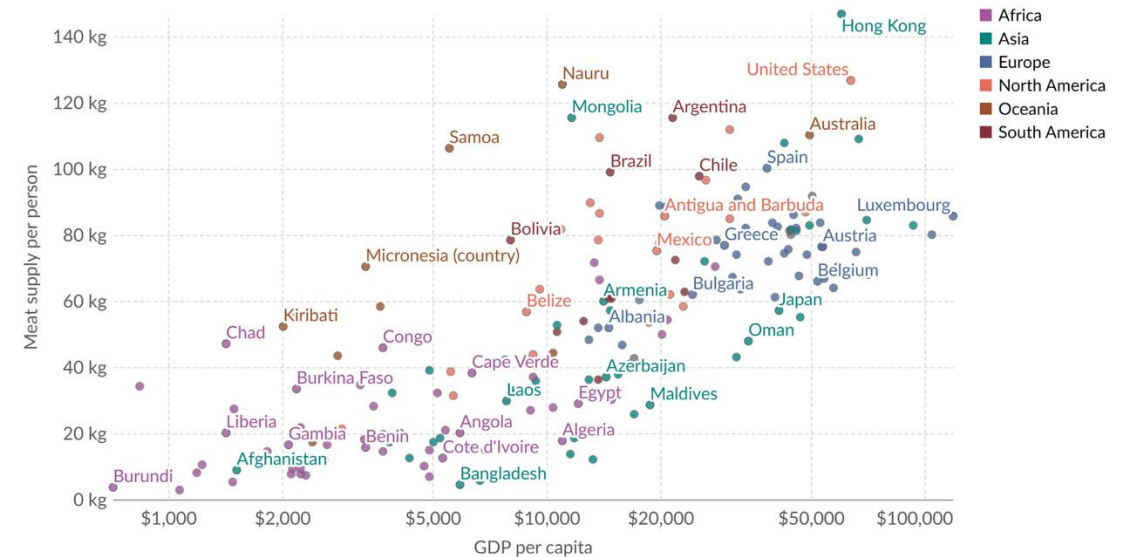
High Quality Food like Meat is in Demand

FIGURE 2 UTILIZATION OF WORLD FISHERIES AND AQUACULTURE PRODUCTION OF AQUATIC ANIMALS



Meat supply vs. GDP per capita, 2021

Average meat supply per capita, measured in kilograms per year versus gross domestic product (GDP) per capita measured in constant international-\$. International-\$ corrects for price differences across countries. Figures do not include fish or seafood.

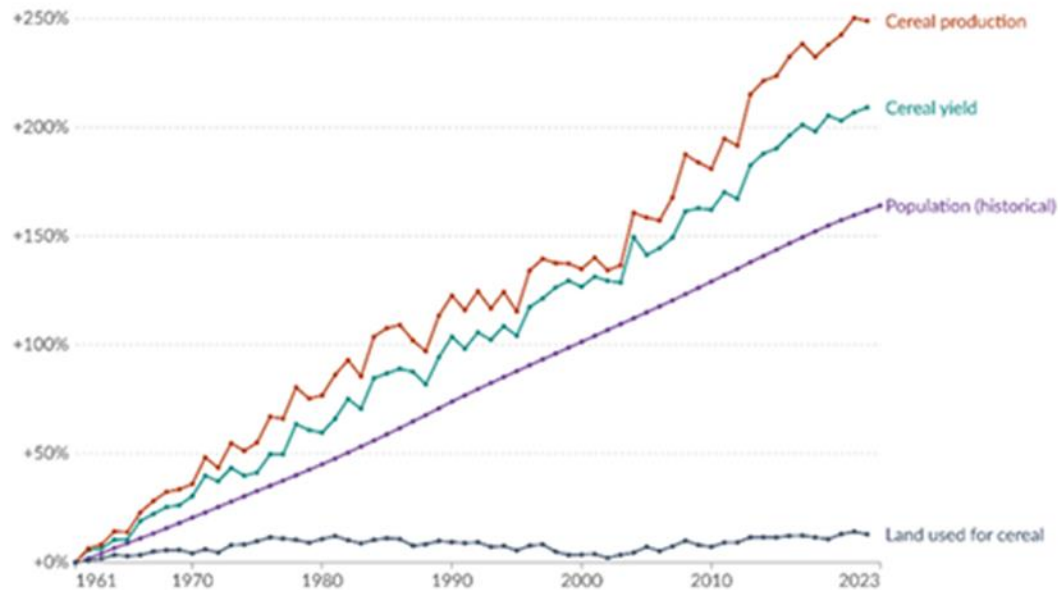


Data source: Food and Agriculture Organization of the United Nations (2023); World Bank (2023)
OurWorldinData.org/meat-production | CC BY

Increasing Efficiency & Decreasing Costs

Change in cereal production, yield, land use and population, World

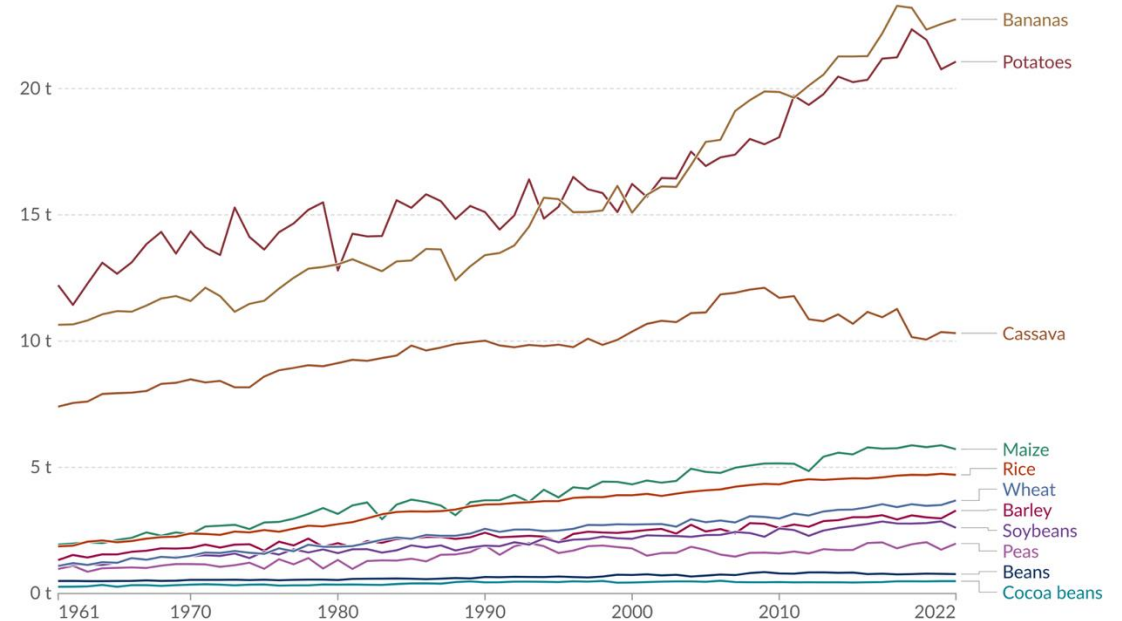
All figures are indexed to the start year of the timeline. This means the first year of the time-series is given the value zero.



Data source: Food and Agriculture Organization of the United Nations (2023); HYDE (2023); Gapminder (2022); UN WPP (2024)
OurWorldinData.org/crop-yields | CC BY

Crop yields, World, 1961 to 2022

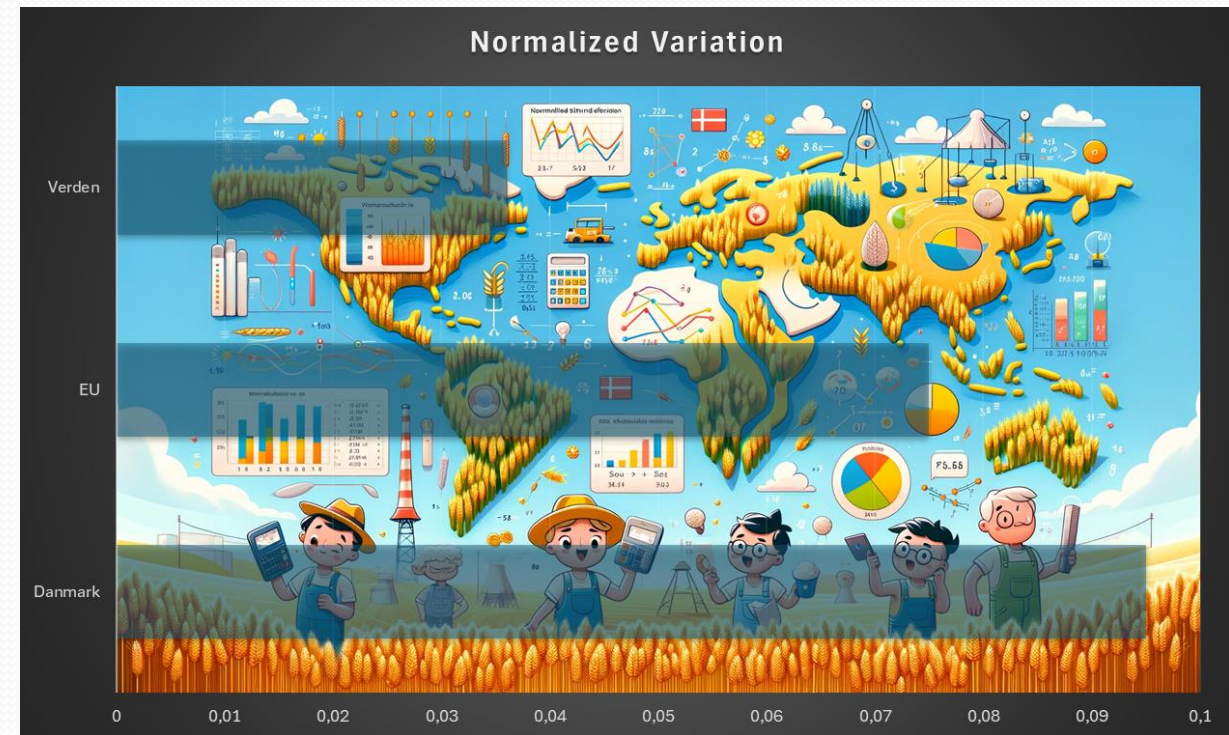
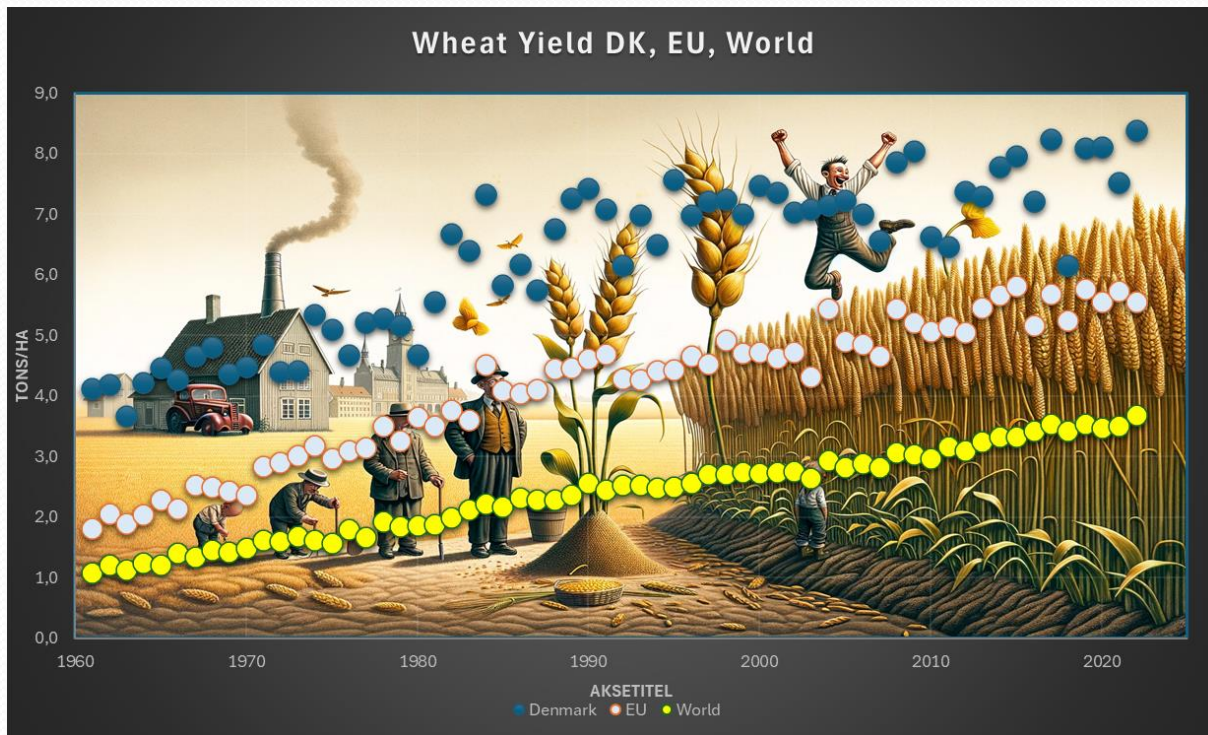
Yields are measured in tonnes per hectare.



Data source: Food and Agriculture Organization of the United Nations (2023)

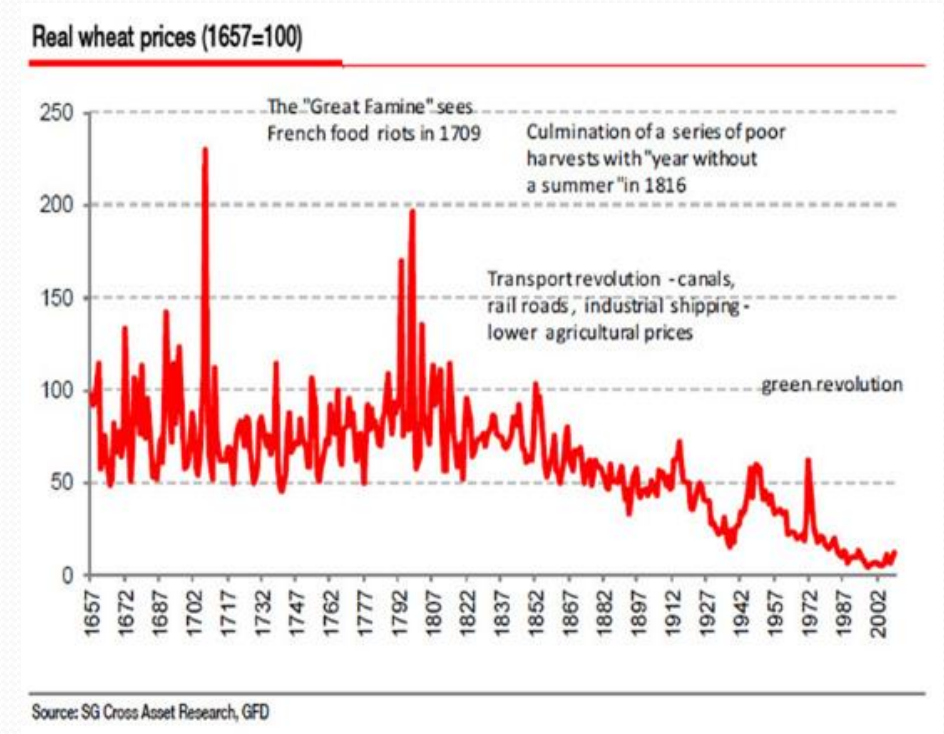
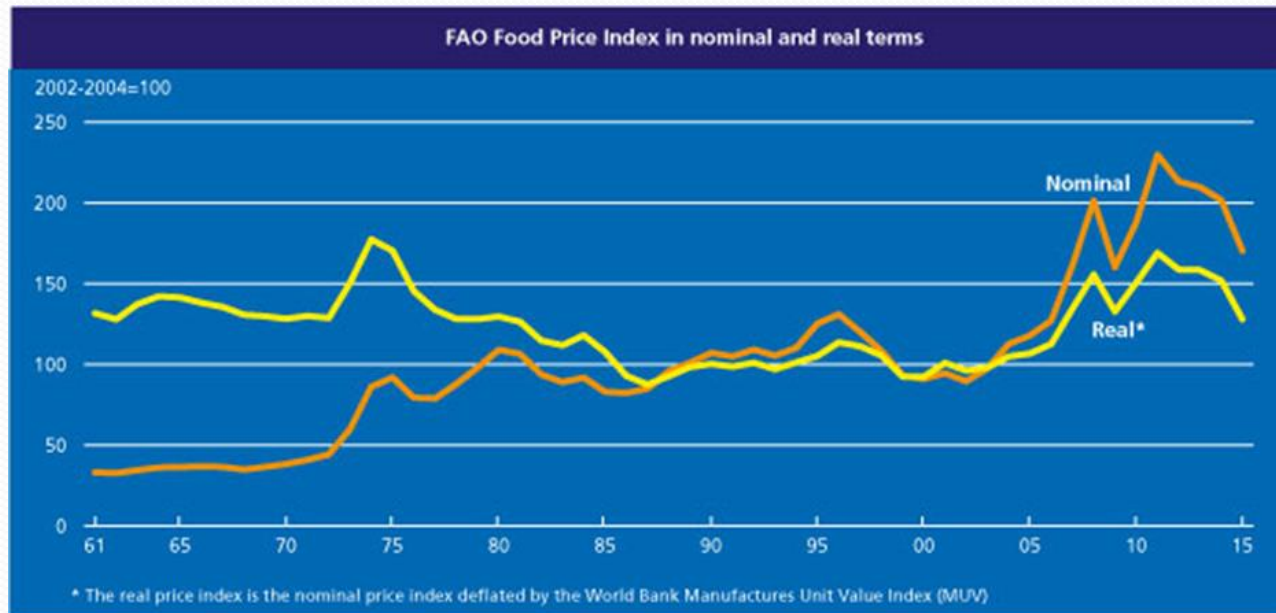
OurWorldinData.org/crop-yields | CC BY

Wheat Yield, Denmark Compared



Globalization Enhances Food Security

Real Food Prices do not Increase



- The long-term trend is decreasing real prices

Man does much better than Nature

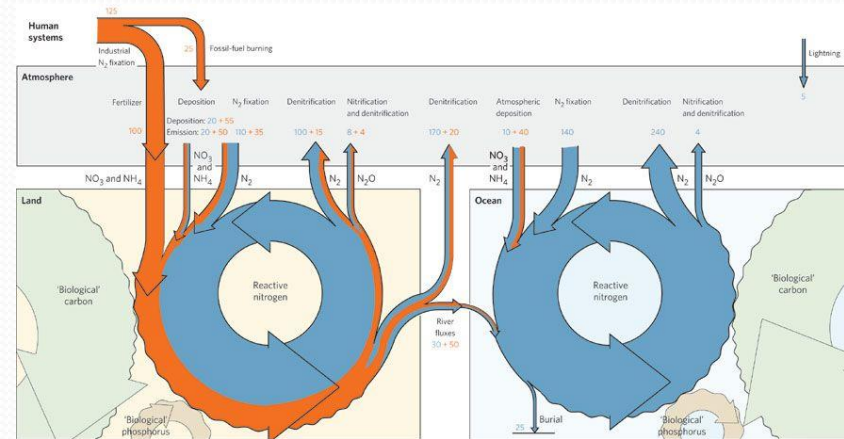
Appropriating Primary Production

- PP is not constant

Increasing N Cycle

Yield

- $< < 1$ ton /ha: Slash-and-burn
- 1-2 ton/ha: Backbreaking labour
- 4 ton/ha: Global average
- 10 ton/ha: Modern farmer
- 30 ton/ha: Iowas best
- 100 ton/ha: GMO/Crispr/Seaweed
- >1.000 ton/ha: Lighted greenhouses



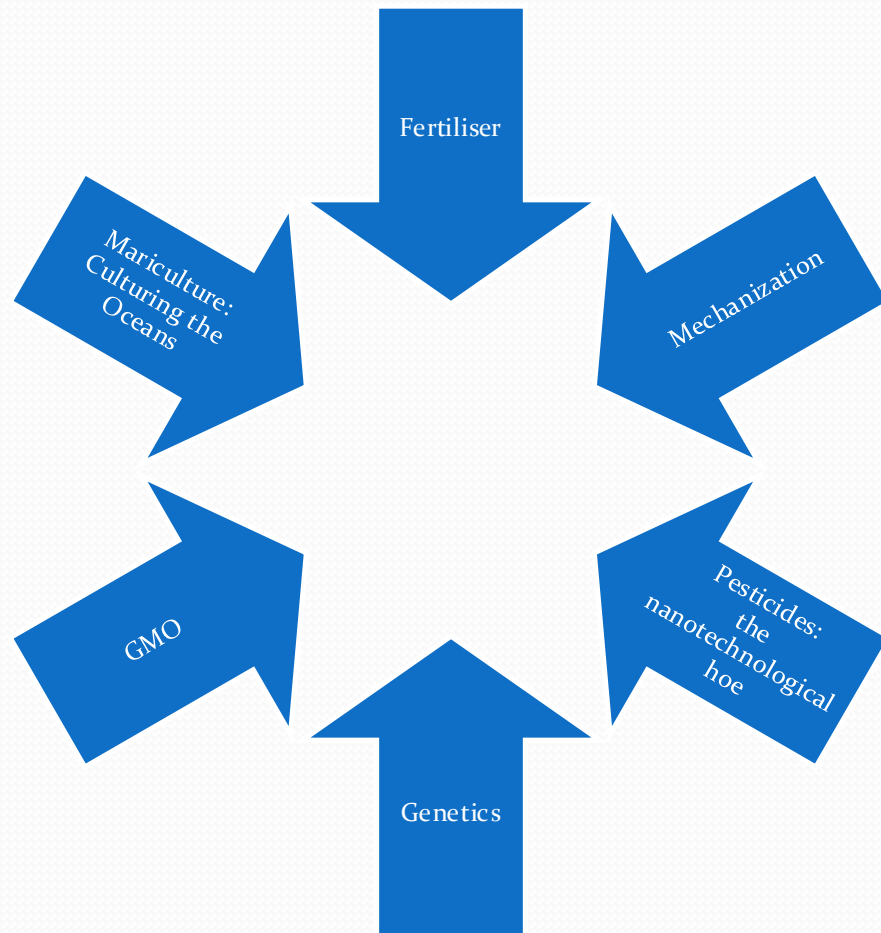


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ONE EXCEPTION,
POVERTY THE ROOT
ALL EVIL™

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Proven Food Production Technologies



Organic Farming is Harmful Retrotech



Peak Agricultural Land

The world has passed peak agricultural land

While sources disagree on how much land we use for agriculture, many suggest that the world has passed the peak. This is due to a reduction in global land used for pasture*. Global cropland use continues to increase.

Our World
in Data

Global agricultural land use (croplands plus pasture for livestock)

5 billion hectares

4 billion hectares

3 billion hectares

2 billion hectares

1 billion hectares

0 hectares

1000

1200

1400

1600

1800

1900

2000

Agricultural land use increased rapidly from the year 1700. By 1960, it had more than quadrupled.

Peaks in 2000

Peaks in 1990

HYDE 3.2 – Goldewijk et al. (2017)

- Measured from national census data, combined with gridded data of population density and land modelling
- Estimates global agricultural land use peaked around 2000

UN Food and Agriculture Organization (FAO)

- Measured from national census data; country reports; and expert estimates
- Global agricultural land use peaked around 2000

Taylor and Rising (2021)

- Measured from national census data, combined with gridded data of population density and land modelling
- Global agricultural land use peaked in the 1990s

*A peak in global pasture land does not mean that it has peaked everywhere. In tropical regions, it continues to increase, often at the expense of carbon-rich habitats.

Sources: Goldewijk et al. (2017). Anthropogenic land use estimates for the Holocene – HYDE 3.2; Taylor and Rising (2021). Tipping point dynamics in global land use. Food and Agriculture Organization of the United Nations.

OurWorldinData.org – Research and data to make progress against the world's largest problems.

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No sign of Climate Change on Global Food production



Follows demand,
not weather

Global Supply Chain
Locavoring is bad



Farmers Adapt

Researchers React



Huge capacity potential



Maize in DK

On what principle is it that with nothing but improvement behind us, we are to expect nothing but deterioration before us

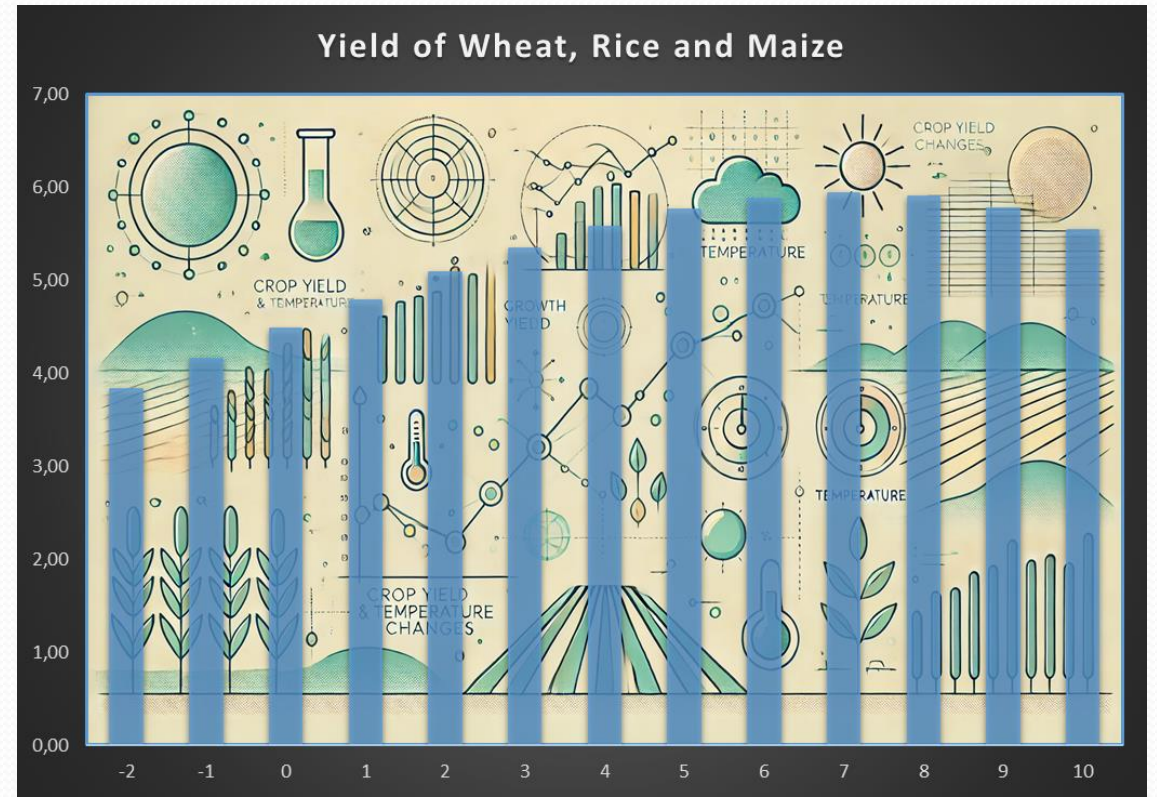
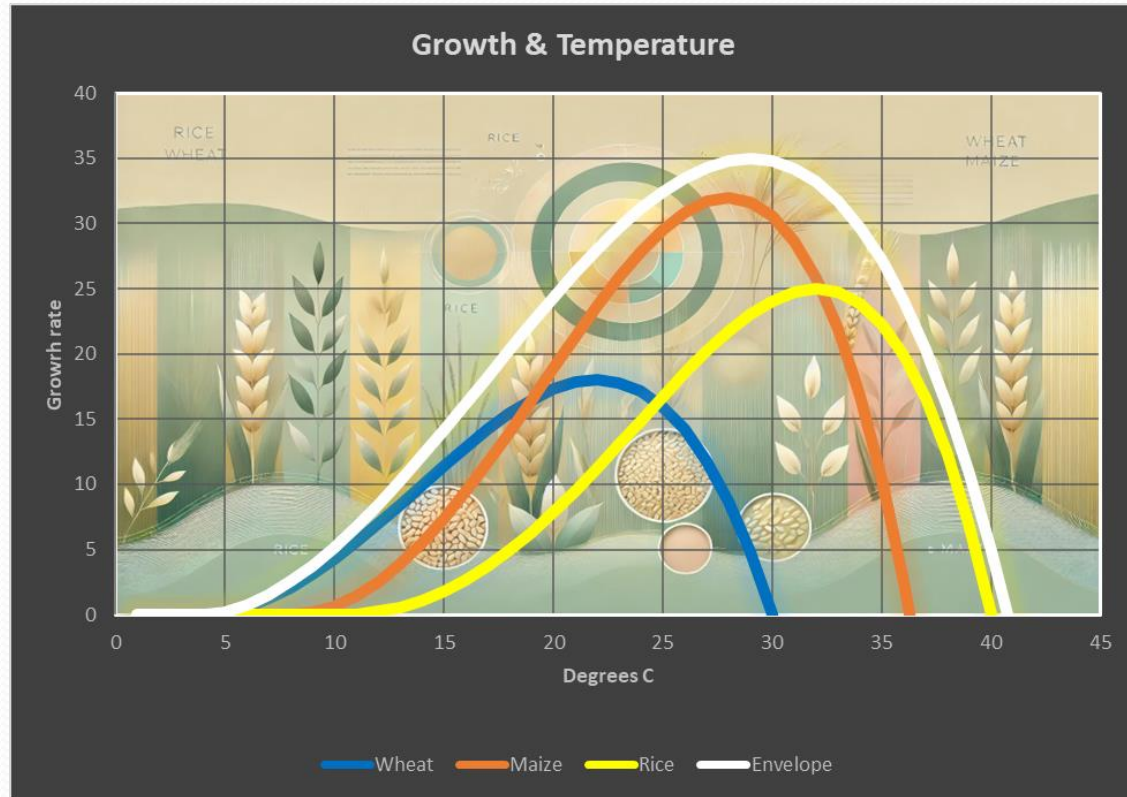
Thomas Babington Macauley, mid 1800.

Høstresultat

Enhed: Areal (1000 hektar) | Område: Hele landet | Afgrøde:



Expected Impacts, temperature



IPCC do not understand adaptation, McKittrick

Expected Impacts, Dry & Wet



Water is the primary
production factor for
plants



Drought is not
increasing according
to IPCC



Precipitation is
increasing



Not Flooding though



CO₂ Coalition



CO₂ COALITION



Increased Crop Yield per Unit Area: Rising CO₂ levels have already increased crop production by 15-30% since 1900. Studies show that this effect will continue as CO₂ levels rise.



Improved Nutrient Use Efficiency: Plants can utilize soil nutrients more effectively under elevated CO₂ levels. This is particularly important in areas with nutrient-poor soils.



Increased Water Use Efficiency: Plants lose less water through transpiration at higher CO₂ levels. This means that crops can be grown with less water, which is crucial in areas with water scarcity.



Better Stress Resilience: Rising CO₂ levels can help plants withstand various stress factors, such as drought, ozone pollution, saline soils, and pests.



Diluting Nutrients. May well be right, but the total effect on protein production is still positive

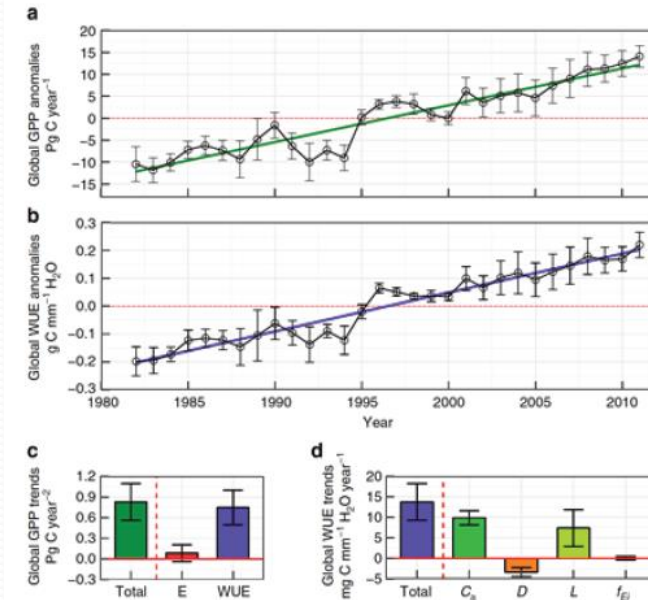


Figure 6. Estimated trends in global gross primary production (GPP) and water use efficiency (WUE) and their drivers over 1982-2011. Annual mean anomalies (with linear trend line) and associated standard deviations of (panel a) global GPP and (panel b) global WUE. (Panel c) Contribution of evapotranspiration (E) and WUE to total global trends in GPP (Total). (Panel d) Contributions of atmospheric CO₂ concentration (C_a), vapor pressure deficit (D), leaf area index (L) and fraction of canopy interception (f_{ei}) to total ecosystem water use to the total increase in global WUE (Total). Source: Cheng et al. (2017).

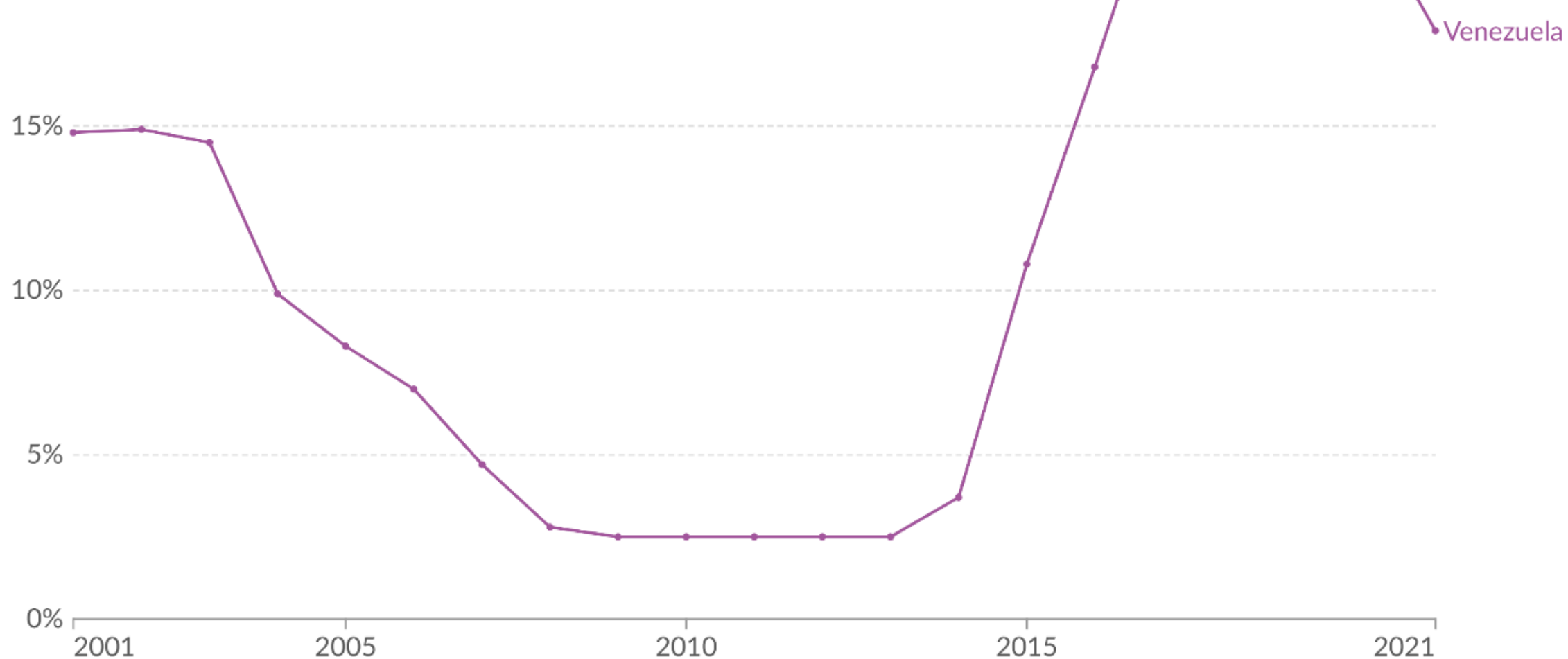
Impact from Biofuels!

The great biofuels scandal

2013-12-17, The Telegraph

Last week, the EU missed an opportunity to end the most wasteful green programme of our time – one which costs billions of pounds annually and causes at least 30 million people to go hungry every year. By failing to agree a cap on the use of biofuels, the Council of Ministers has given tacit support for a technology that is bad for both taxpayer and environment. Legislation will now be delayed until 2015. The biofuel story is a perfect example of good intentions leading to terrible outcomes. Moreover, it is a lesson on how powerful, pseudo-green vested interests can sustain a bad policy. Hopefully, it will also be a story of how reason can prevail in the divisive climate debate.





Data source: Food and Agriculture Organization of the United Nations (2023)

Note: Countries and regions with rates below 2.5% are coded as "2.5%" in the FAO dataset.

OurWorldinData.org/hunger-and-overnourishment | CC BY

Swedish famine of 1867–1869

Very cold in 1867

- 80-100.000 dead
- Emigration to US skyrocketed

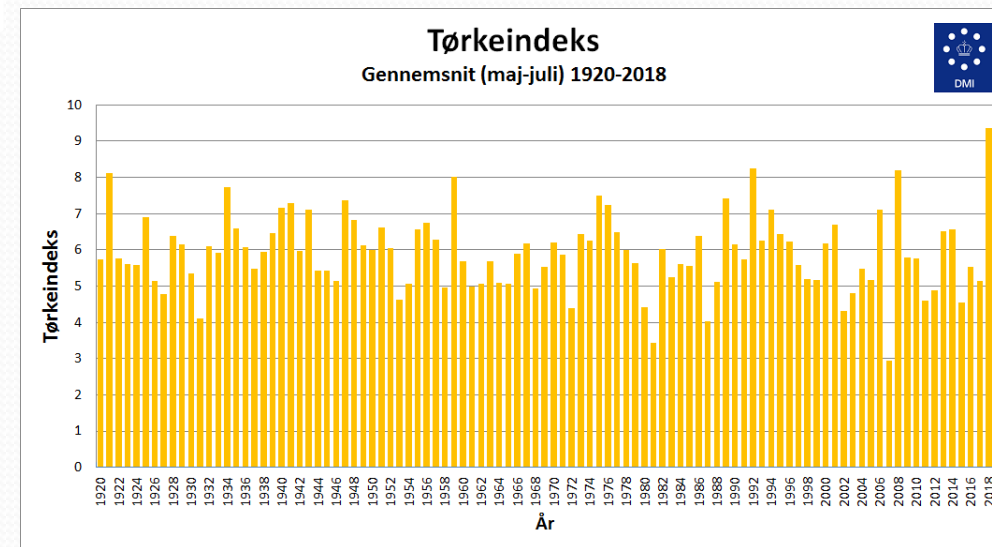


2018

1867

The Drought i DK 2018

- 23 % less grain
- Economic Loss
- Nobody died



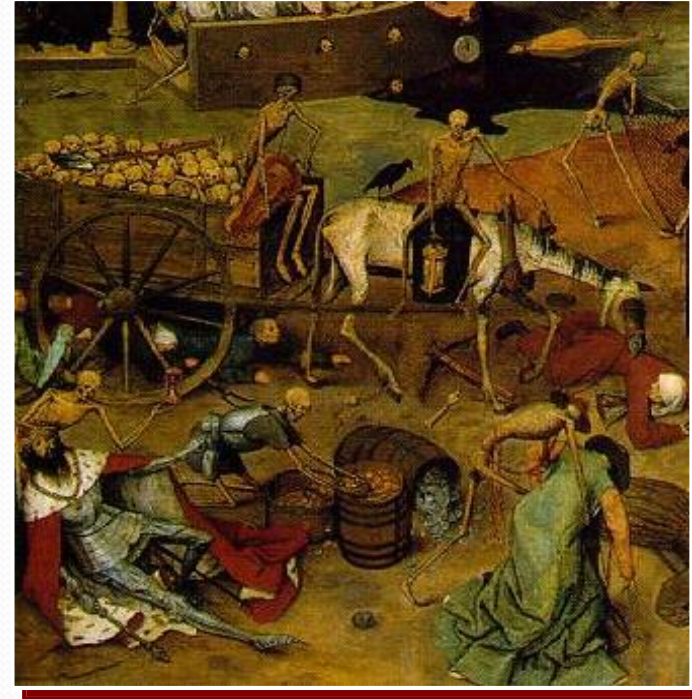
A Reservation Before the Conclusion



GEGEN DUMMHEIT KEMPfen
GÖTTER SELBST VERGEBEN:
JOHANN CHRISTIAN FRIEDRICH VON
SCHILLER



PERFECTION IS NOT NECESSARY

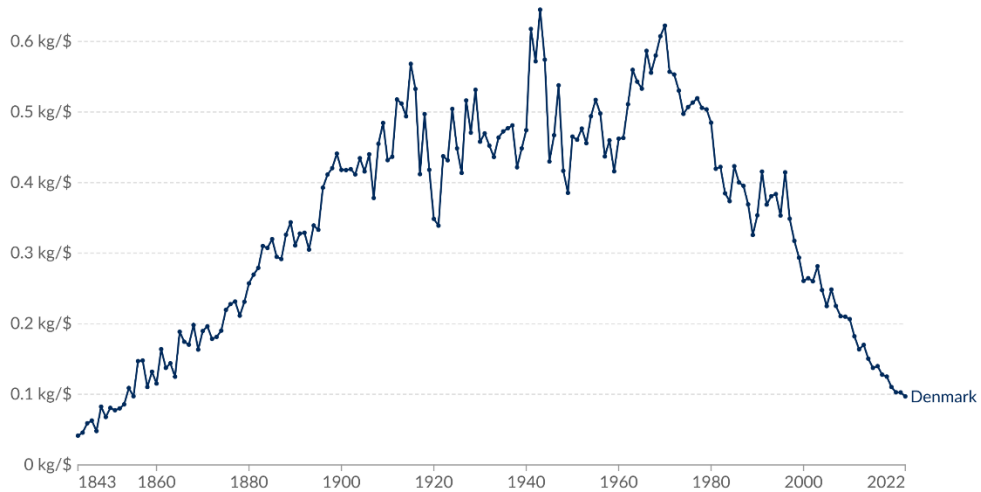


Food Future: Affordable Food for All with a Low Impact

Carbon intensity: CO₂ emissions per dollar of GDP

Kilograms of CO₂ emitted per dollar of GDP. Fossil fuel and industry emissions¹ are included. Land-use change emissions are not included. GDP data is adjusted for inflation and differences in the cost of living between countries.

Our World
in Data



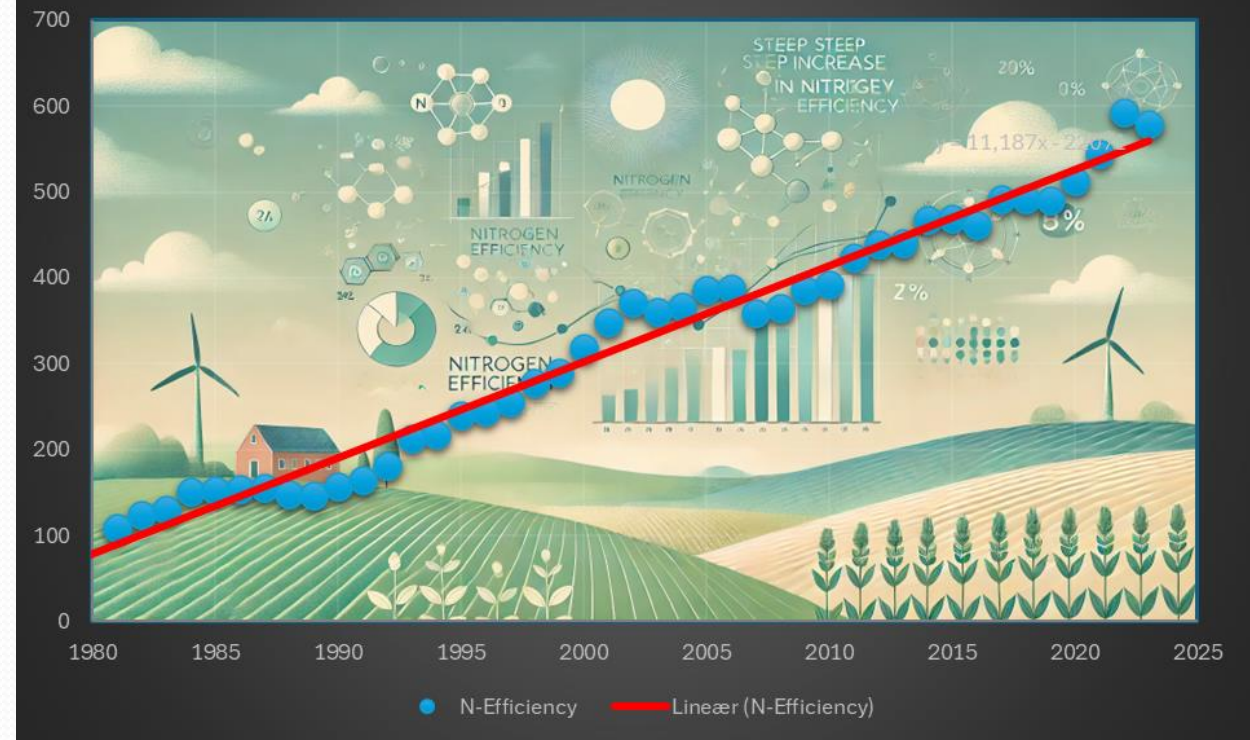
Data source: Global Carbon Budget (2023); Bolt and van Zanden - Maddison Project Database 2023

Note: GDP data is expressed in international-\$² at 2011 prices.

OurWorldInData.org/co2-and-greenhouse-gas-emissions | CC BY

- Fossil emissions:** Fossil emissions measure the quantity of carbon dioxide (CO₂) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO₂ includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.
- International dollars:** International dollars are a hypothetical currency that is used to make meaningful comparisons of monetary indicators of living standards. Figures expressed in international dollars are adjusted for inflation within countries over time, and for differences in the cost of living between countries. The goal of such adjustments is to provide a unit whose purchasing power is held fixed over time and across countries, such that one international dollar can buy the same quantity and quality of goods and services no matter where or when it is spent. Read more in our article: What are Purchasing Power Parity adjustments and why do we need them?

N-Efficiency, Danish Agriculture



Decoupling is the way to go

Future Food Production Technologies



Ocean Farming



Precision Agriculture



Animal Cell Culture



Food Production in Space



Food Towers



Potential of the Oceans for Food production



In practical terms:
Unlimited Space

Unlimited Water

- Water is major limiting factor on land

Ample supply of
nutrients

- Artificial upwelling

Small variations in
salinity &
temperature

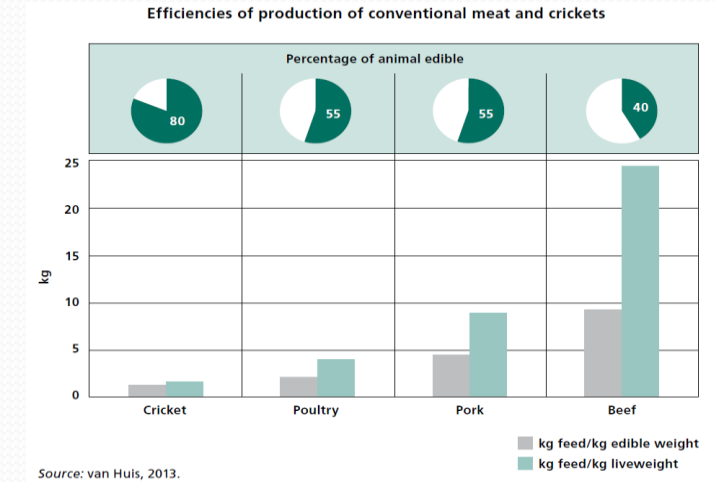
Ocean Currents –
Rivers of the Sea

The Insect Eating Craze

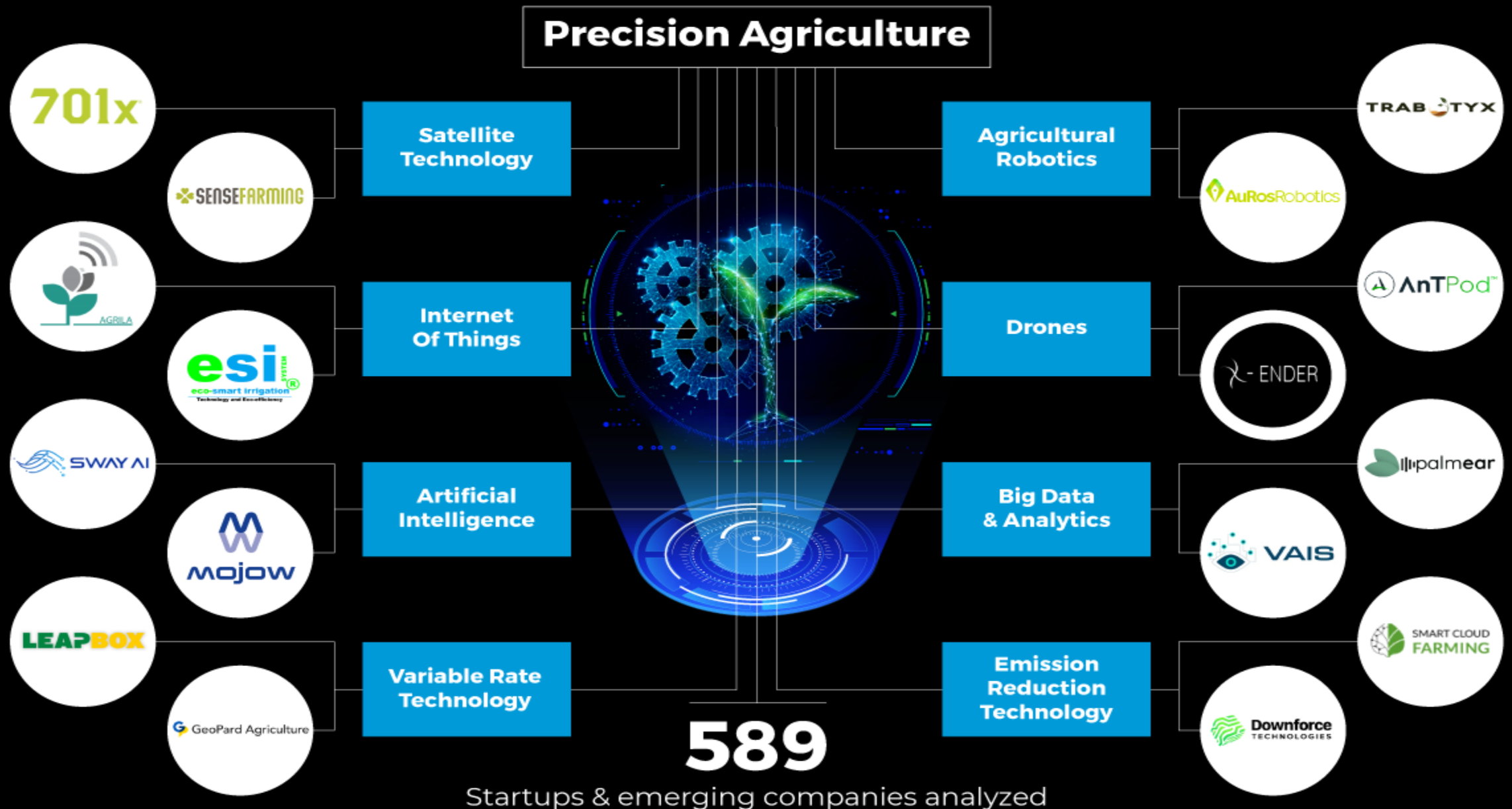
Fish & Insects have more or less the same Food Conversion

Fish are much more in Demand and valuable

What do you prefer?



8 Precision Agriculture Trends in 2025



Pigs in Space



Fish & Beef Filets ad Infinitum

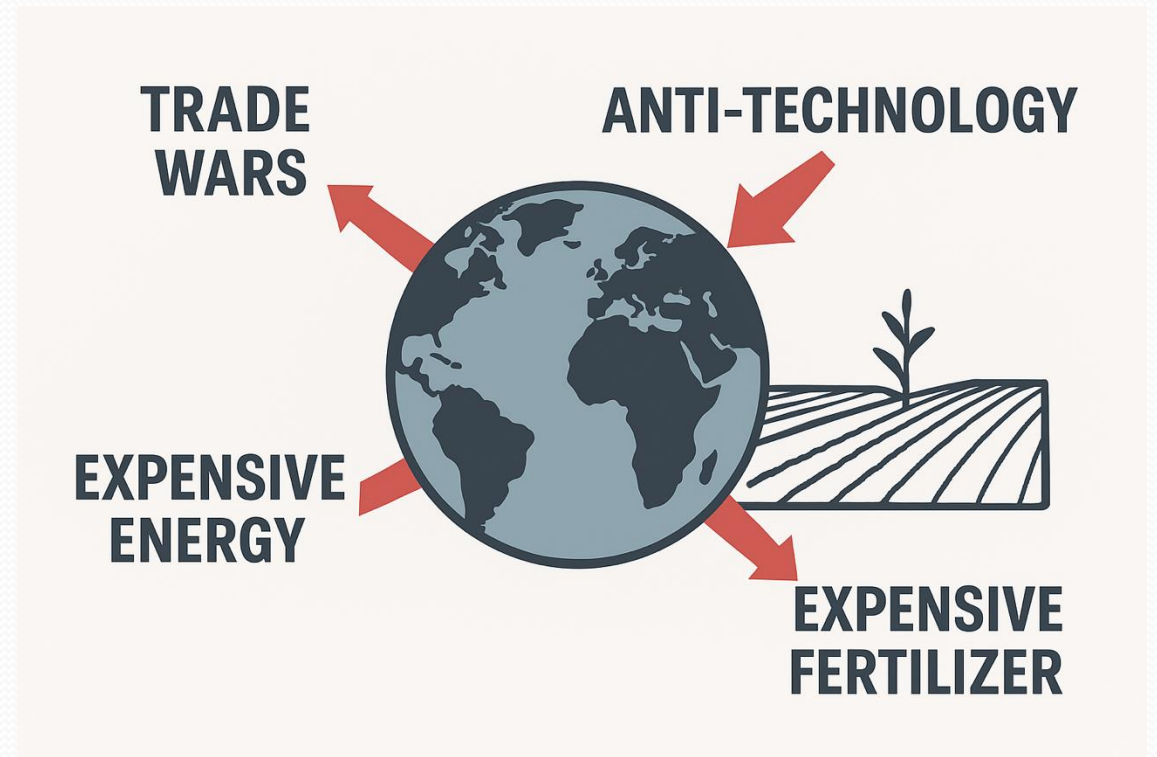


Nuclear Powered Food Towers



Discussion: Real Threats for Food Production

- Expensive Energy & Fertilizers
- Anti-GMO....
- Trade restrictions



A Sane World Will Never Run out of Food



**Unlimited
production
capacity on land &
and in the sea**



**Climate Change
will be a minor
factor**

Can move production to
other places
Increase price a bit
CO₂ is beneficial



**All impacts of
farming will
steadily decrease**





The Lady Gets the Last Word

Wine, Dine and Enjoy Life

