

A food systems paradigm shift from food at any cost to food within a One Health framework

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- Paul Wood, Robyn Alders, Liz Redmond
- BVPA – Kannan Ganapathy

“I think it could be plausibly argued that changes in diet are more important than changes of dynasty or even of religion”

George Orwell, *The Road to Wigan Pier* (1937)

“I don’t want to brag but we have a chicken for Sunday lunch this week”

a friend’s uncle in the 1960s

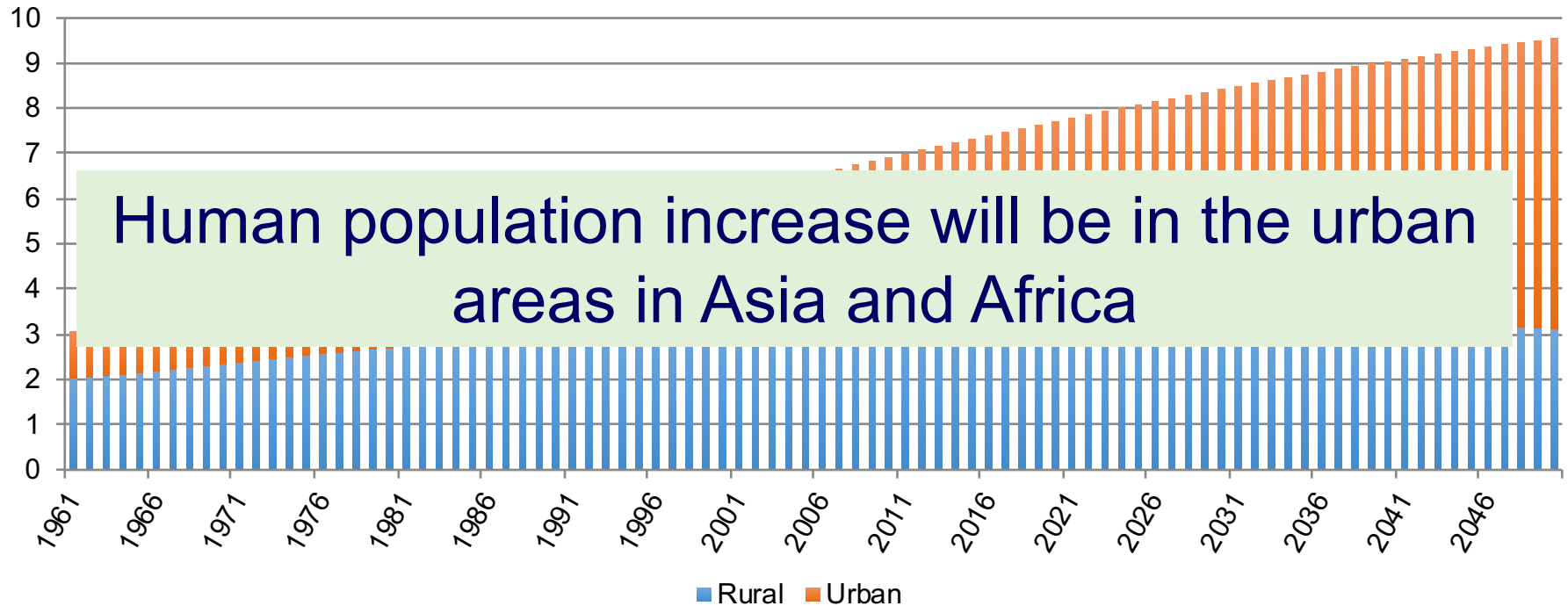
“Every dollar spent on food in the United States produces two dollars of negative impact on public health and the environment.”

Rushton et al 2021

Premise of the presentation

- Food systems produce food, culture, employment and business opportunities that are the basis for the health and wellbeing of people in societies across the world
- They also are capable of generating negative externalities
 - Public health
 - Environment
- The negative externalities have become a major focus in the recent years with pressure for behavioural change
- Yet systemic failure in the food system cannot be overcome with behavioural change alone

Context - the human population



Collapse of the human population in the Americas

European colonization of the Americas killed 10 percent of world population and caused global cooling

The Conversation

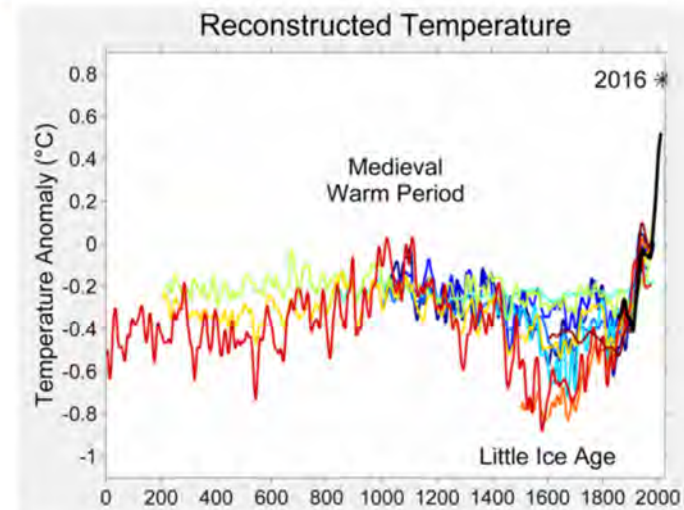
January 31, 2019 · 11:15 AM EST

By **Alexander Koch**

Chris Brierley

Mark Maslin

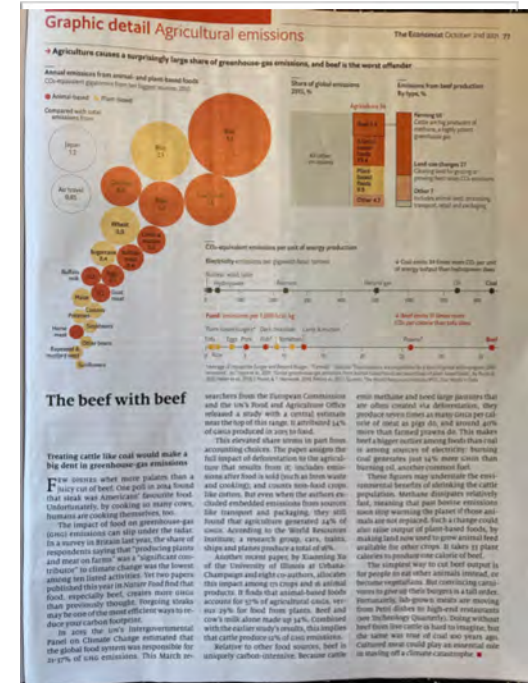
Simon Lewis



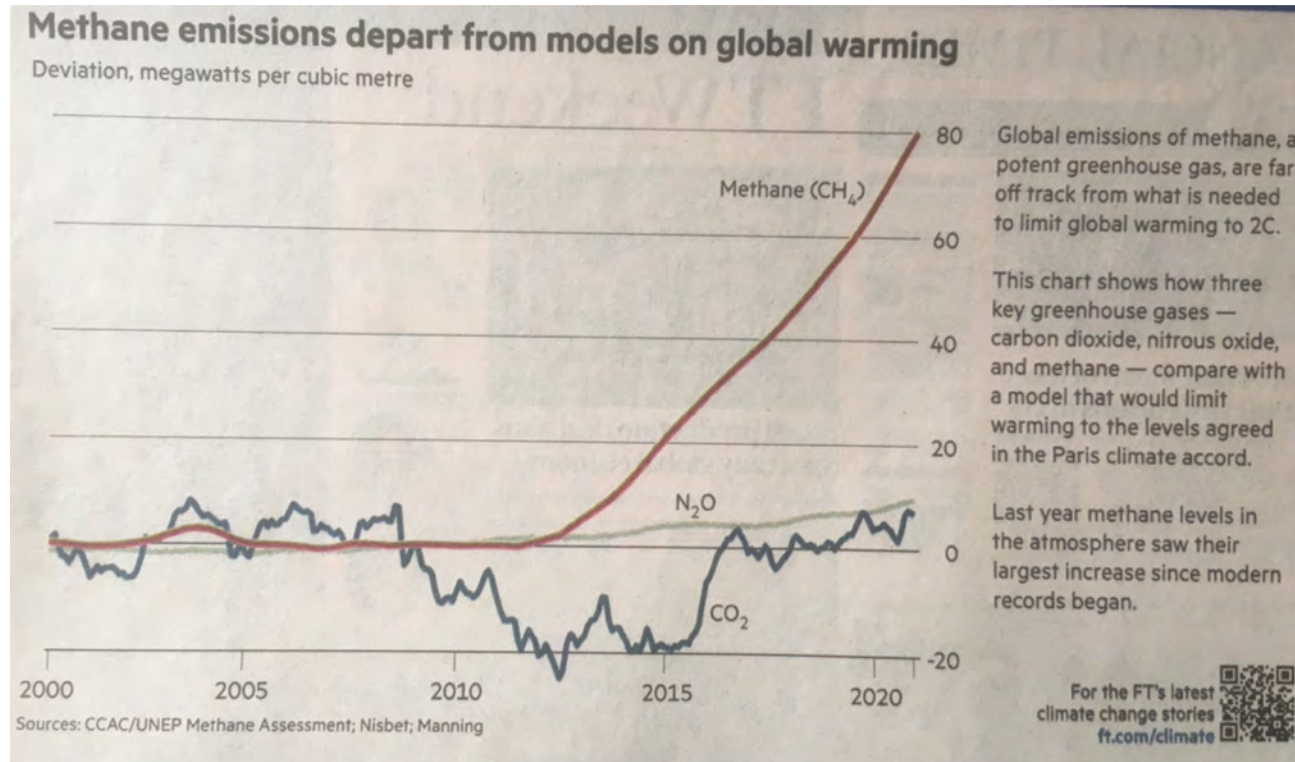
Global temperatures dipped at the same time as the Great Dying in the Americas.

Context – the environment

- Concerns about livestock and the environment were emerging in the 1980s
- The publication “Livestock’s Long Shadow”(2006) estimated greenhouse gas emissions from the livestock sector
 - These estimates were found to contain errors in the assumptions and have been revised
- Ongoing debate on how to measure methane



Methane



Context - nutrition

- I grew up with school milk and my family benefited from this scheme
 - The profits made by Associated Dairies were used to establish ASDA
- Yet in the 70s concerns were being raised about red meat and butter in the diet
- The response was to turn to plant based oils and white meat, and underlying message that fat, especially animal fat, was bad

PLOS MEDICINE

RESEARCH ARTICLE

Biomarkers of dairy fat intake, incident cardiovascular disease, and all-cause mortality: A cohort study, systematic review, and meta-analysis

Kathy Trieu^{1*}, Saluj Bhat^{2*}, Zhaoli Dai^{3,4}, Karin Leander⁵, Bruna Gigante⁶, Frank Qian^{7*}, Andres V. Andersson Korat⁸, Qi Sun^{9,10}, Xiong-Fei Pan^{11,12}, Federica Leguizamo¹³, Tommy Cederholm¹⁴, Ulf de Faire¹⁵, Mai-Lis Hellénius¹⁶, Jason H. Y. Wu¹⁷, Ulf Risérus¹⁸, Matti Marklund^{19,20}

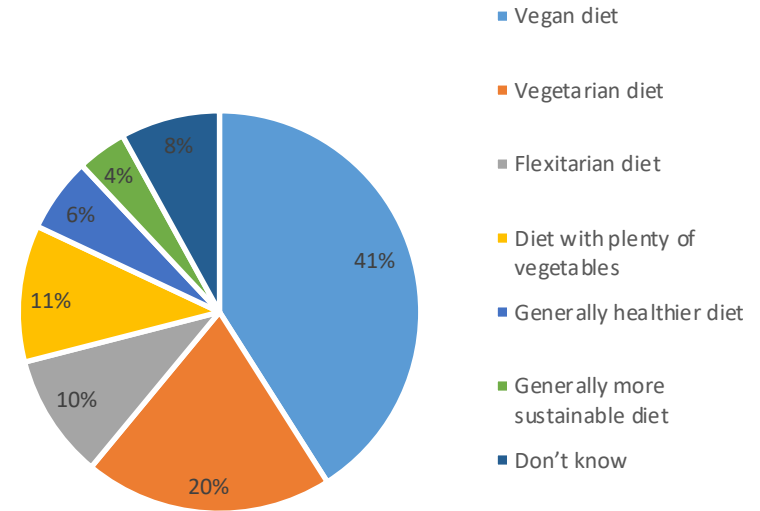
What do these findings mean?

- The findings from our study using fatty acid biomarkers suggest that higher intake of dairy fat were associated with lower CVD risk in diverse populations including Sweden (a country with high dairy intake), though more trials are needed to understand if and how dairy foods protect cardiovascular health.

Context – vegan movement

- In the last decade there has been a rise in the appeal and voice of the vegan movement
 - It matches the messaging on climate
 - It links to the need for a healthier diet
 - And it also promotes the idea of improved animal welfare
- The strength of this messaging is interesting, vegans have been with us for decades yet suddenly the messaging has become more effective

Which one, if any, of the following, best describes a "plant-based diet" to you?



BNF YouGov survey 2020

Context – food system and food companies

- Forces underlying the changes in messaging and ultimately behaviours are linked to supply and demand within the food system and the attitude to profits of food companies
- Companies in the food system are generally stock listed and therefore report and respond to the stock markets – they are primarily profit driven and these profits depend on how markets and prices are regulated



The Big Read Food & Beverage [+ Add to myFT](#)

The battle for the future of milk

Start-ups and multinationals are competing in a \$17bn plant-based drinks market that mixes science and shifting consumer tastes

Judith Evans and Emiko Terazono in London MAY 7 2021

Latest on Food & Beverage

- Wetherspoons reports record annual loss following lockdowns
- Stagflation fears intensify in signs of slowing growth
- As pubs pack out, drinks companies worry about an abstemious youth
- Soaring pea costs set to hit plant-based meat producers

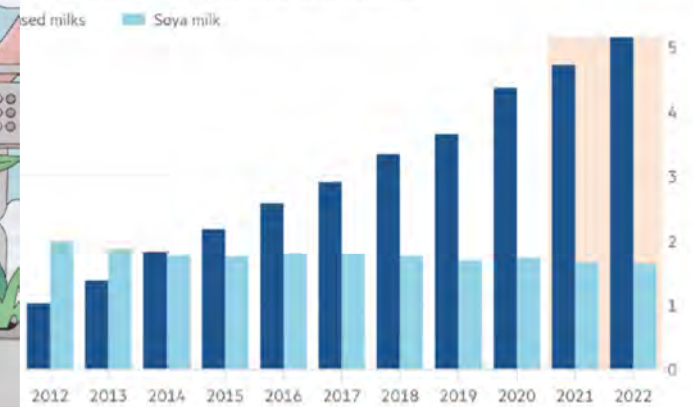
Opinion Food & Beverage

meat isn't about sustainability, it's

manufactured convincingly, those who own the IP will want you to

Lock to new ingredients for plant-based milk

Plant alternative milk sales in western markets (\$bn)



Sales for North America, western Europe and Australasia; 2021 and 2022 are forecasts
Source: Euromonitor
© FT





Opinion **Food security**

Russia's war on Ukraine threatens a global food security crisis

Our tractors should be ploughing fields and feeding the world, not towing enemy tanks

OLEG USTENKO

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Problem

- There is now clear messaging that animal source foods are bad for the environment, for health and animal welfare
- The switch to plant-based diets seems obvious, there appear to be so many wins
- Yet what will this mean and will it lead to the gains that are being presented?
- I will explore this with an overview of how I see the livestock sector and its development

Key messages

- Meat and other livestock products need to be treated as an issue of supply and demand of inputs and outputs
- The supply is complex because of the changes in the way animals are fed and raised and how they are processed
- Plant based alternatives need to be assessed for their protein and micronutrient contributions and to the problems of being overweight and obese
- Protein and micronutrient supply in the diet need to be prioritized and targeted, and the way in which the diet manages satiety at population level

Local scale grain and livestock production

The valleys of the Bolivian Andes



Pigs in the valleys of Bolivia



Food chain – pig and maize complex



Maize



Urban
Centres

Pigs



The balance between grain and meat

- When there is a surplus of maize grain and prices go down, the surplus maize is fed to the pigs
- When maize is scarce and prices go up, the maize is shipped to the urban centres as grain for human consumption
- There is a balance between the production of meat and grain, and the supply and demand for grain limits meat consumption
- This is a local example, one that would have been true to many populations 50 years ago, and to the majority a 100 years ago

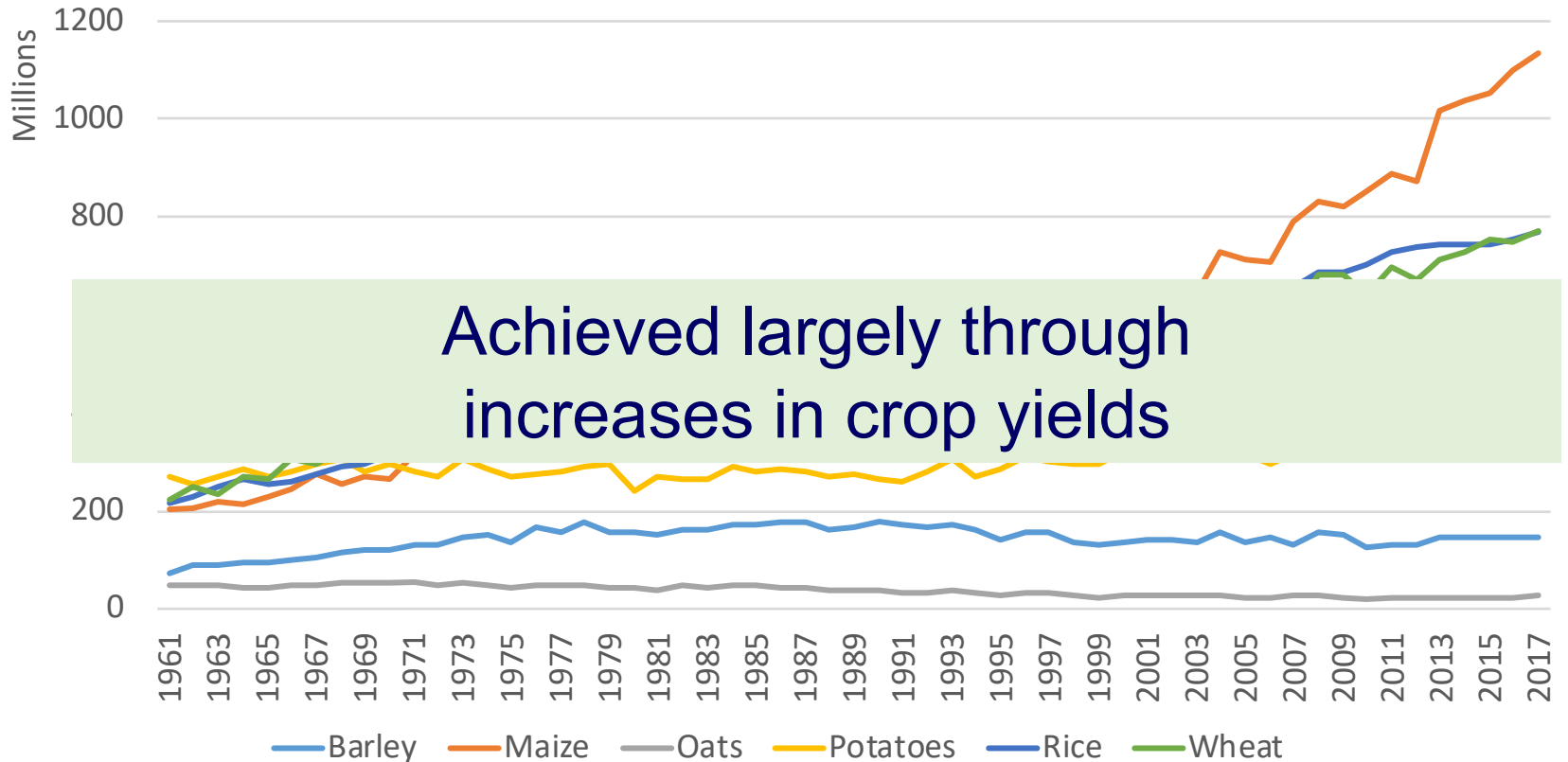
Global scale grain and livestock production

Green revolution

- The reaction to the food shortages and famines during the 1940s, 50s and 60s was a search for improved grain production
- Norman Borlaug was at the forefront of this effort
- His work transformed crop science
- Translation into production required significant agricultural policy change

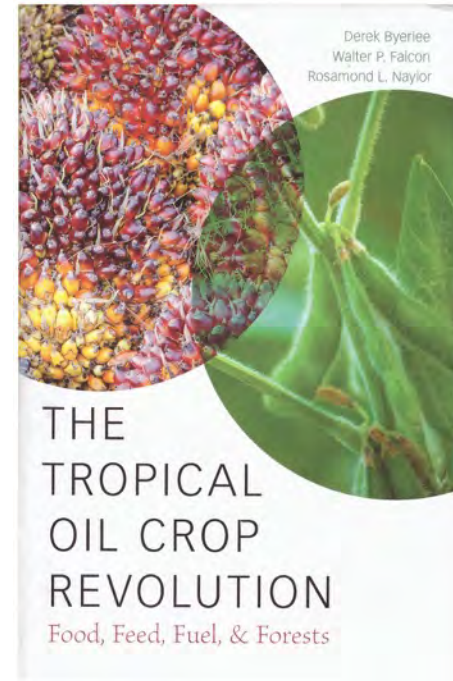


Grain crop production (tonnes)

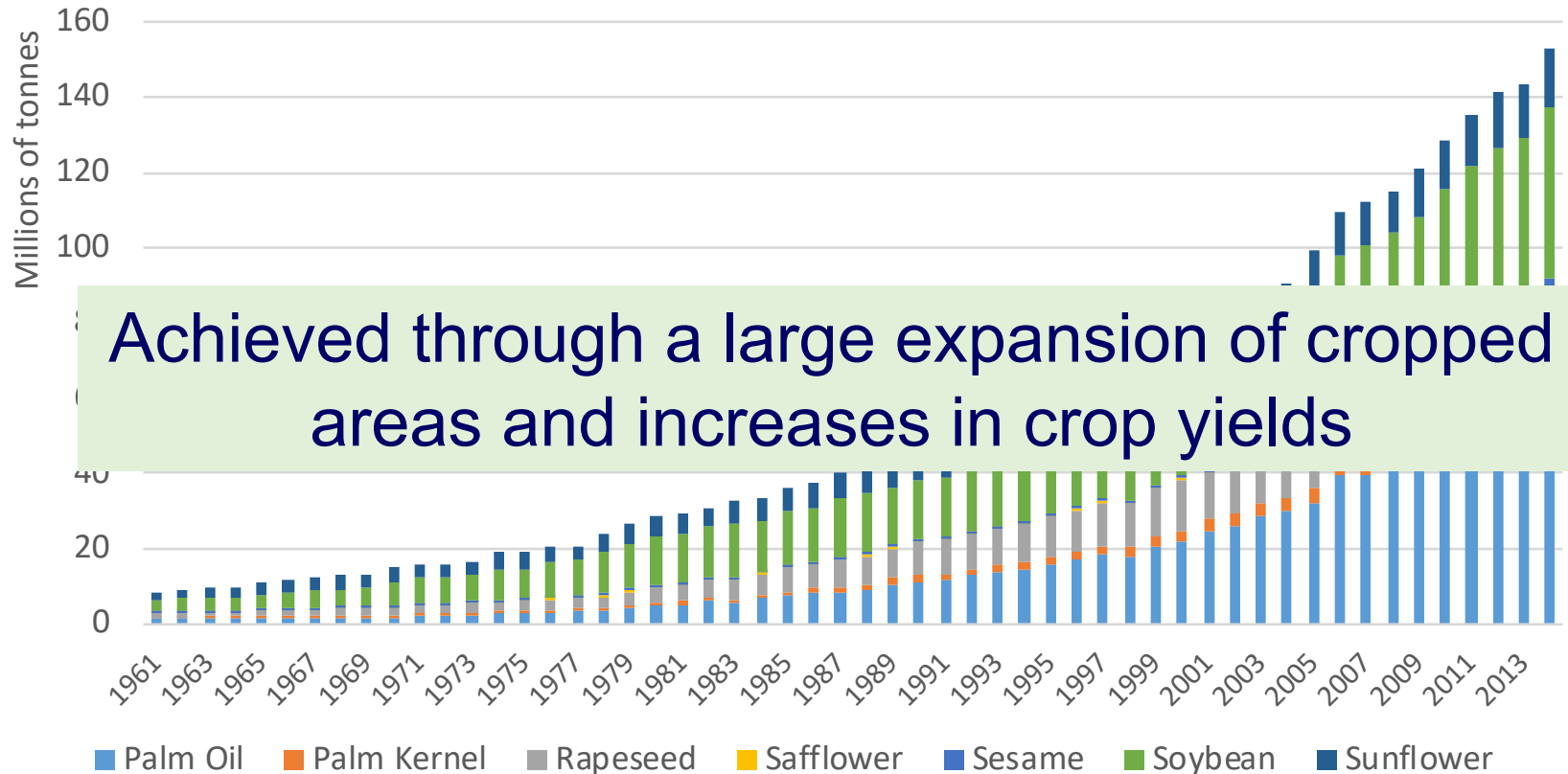


Oil crop revolution

- In the next decade, 70s, a new revolution had begun
- The expansion of the oil seed crops across the world
- These are multipurpose crops:
 - Feed for animals
 - Oil for the food industry
 - Cooking oil
 - Fuels



Vegetable Oil Production (tonnes)



The livestock revolution

- Grains are in plentiful supply
- Oil seed cakes are beginning to be made available
- The human population is increasing, becoming urbanized and getting wealthier
- A livestock revolution begins (Delgado et al, 1999)

Food, Agriculture,
and the Environment
Discussion Paper 28

Livestock to 2020 The Next Food Revolution

*Christopher Delgado
Mark Rosegrant
Henning Steinfeld
Simeon Ehusi
Claude Courbois*

2020
VISION

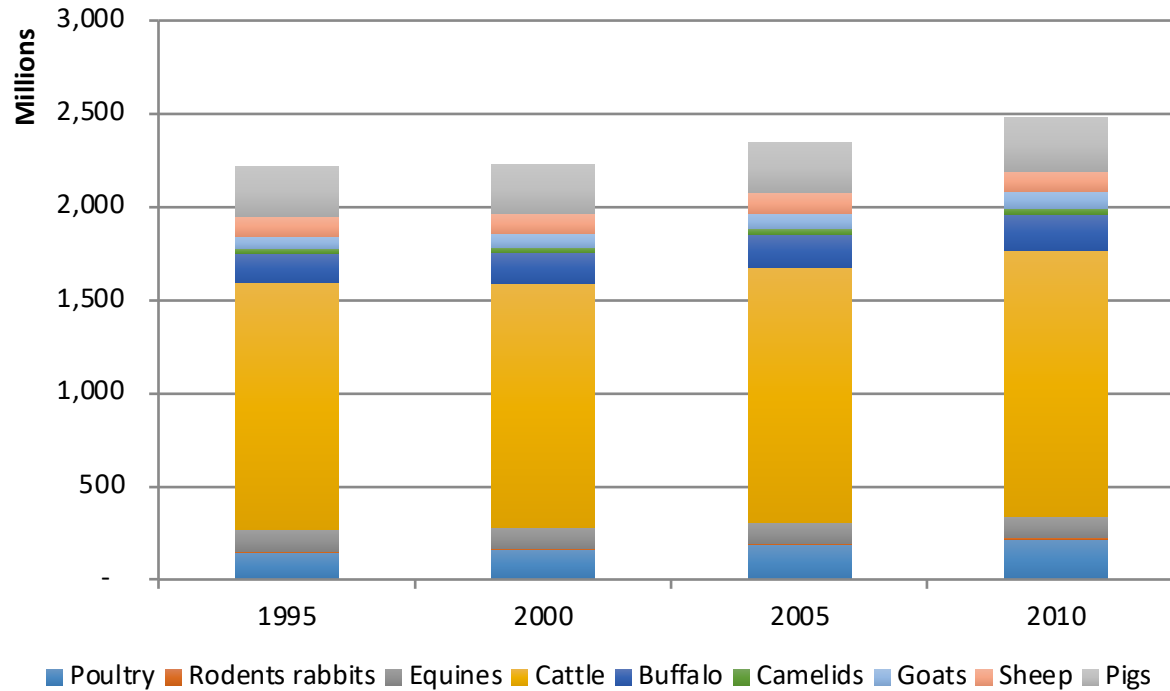
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ORGANIZATION
OF THE
UNITED NATIONS

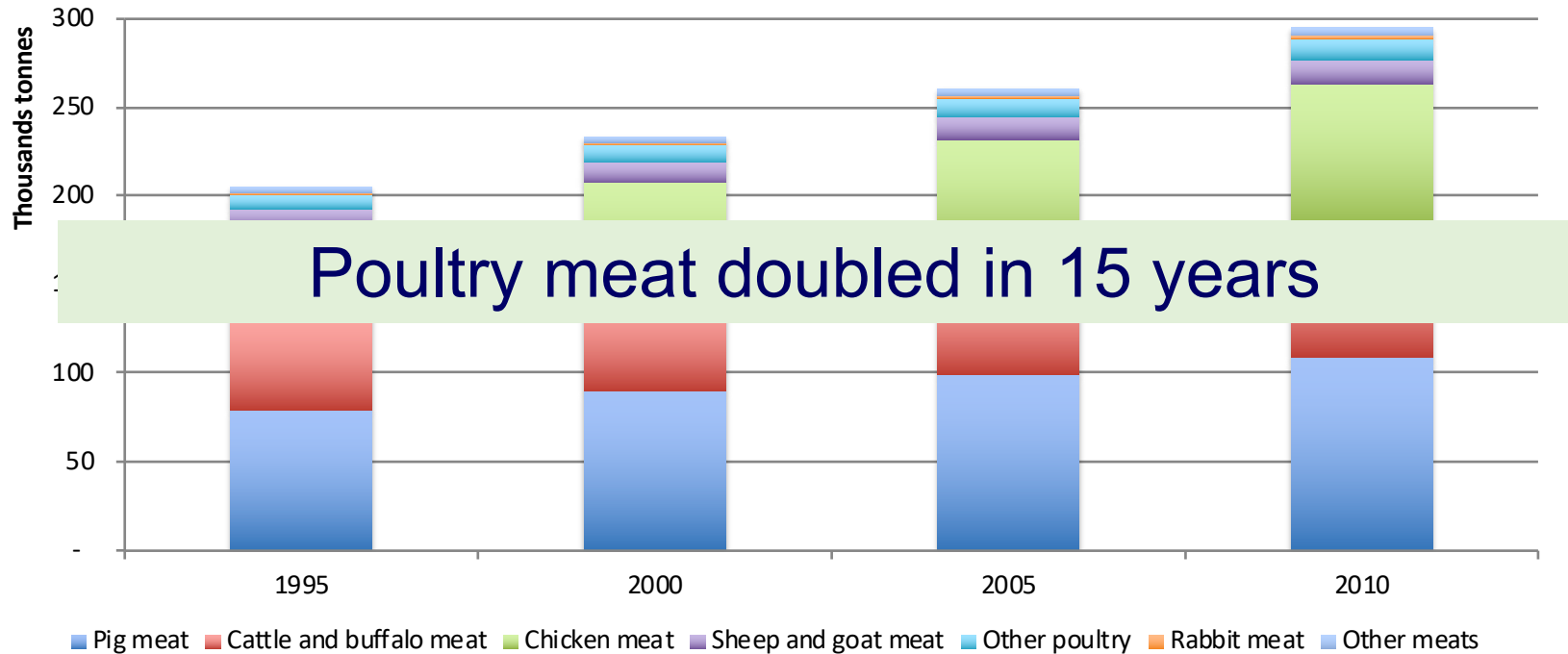
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Screenshot

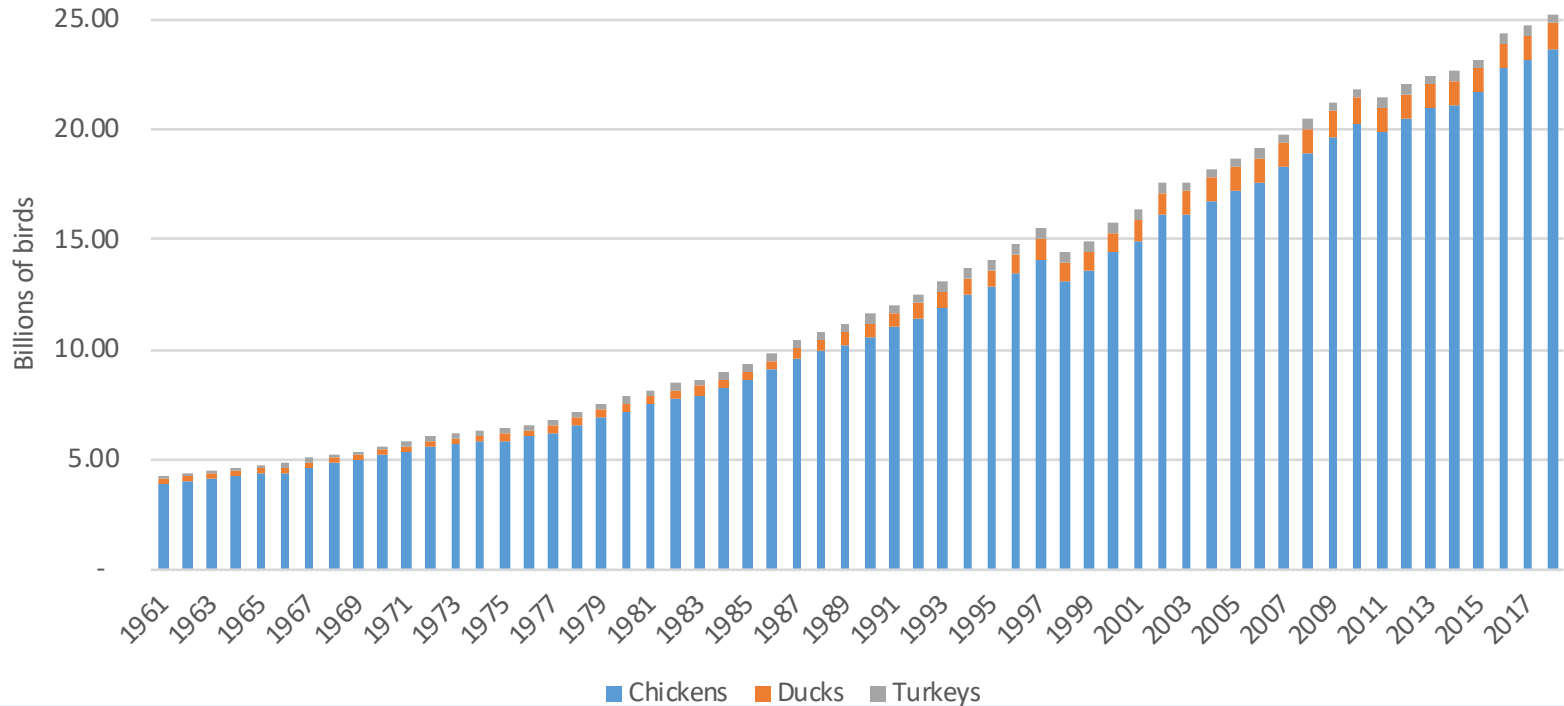
Global livestock population (livestock units)

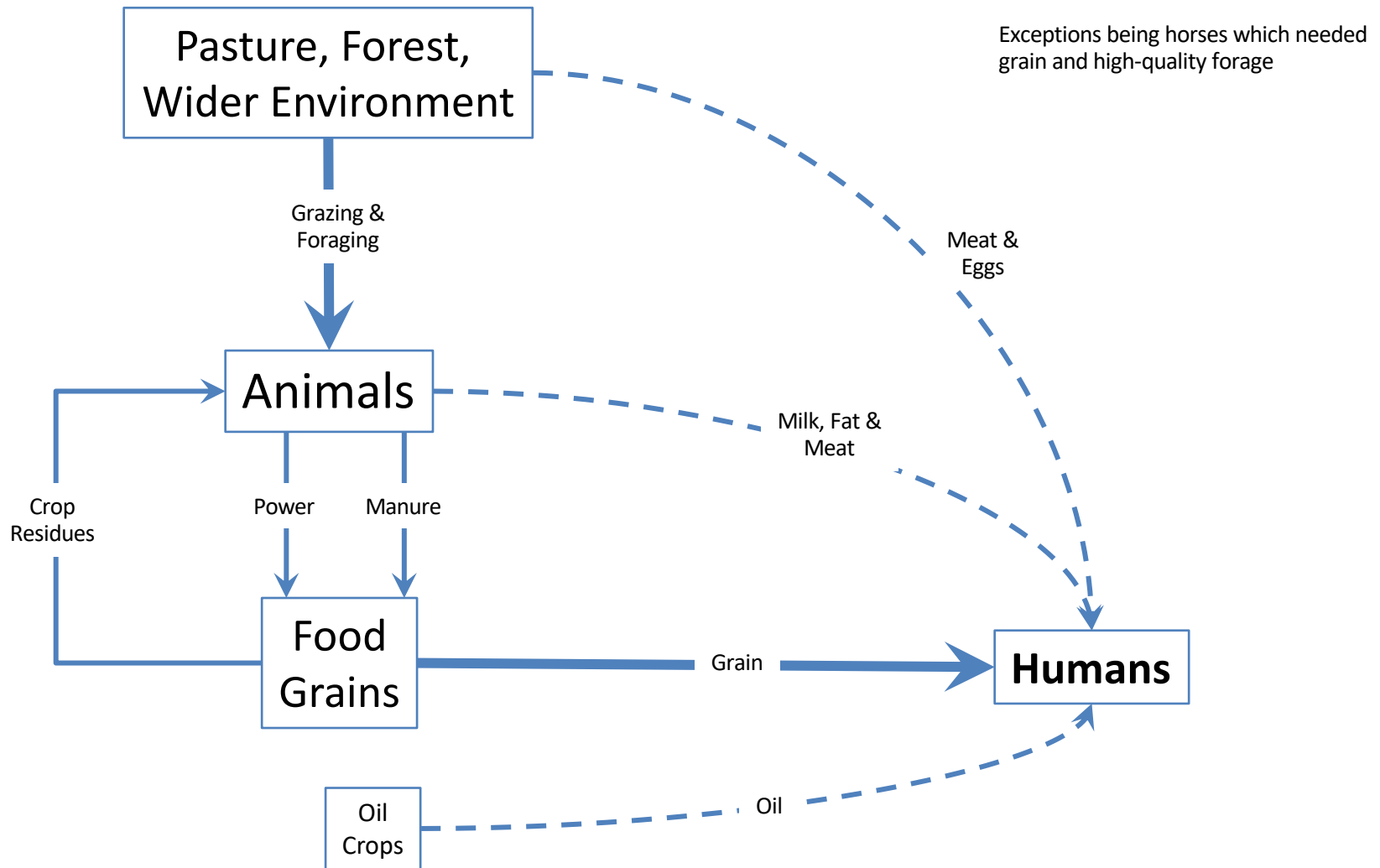


Global meat production by species (based on FAOSTAT)



Increasing livestock populations – *global poultry population*





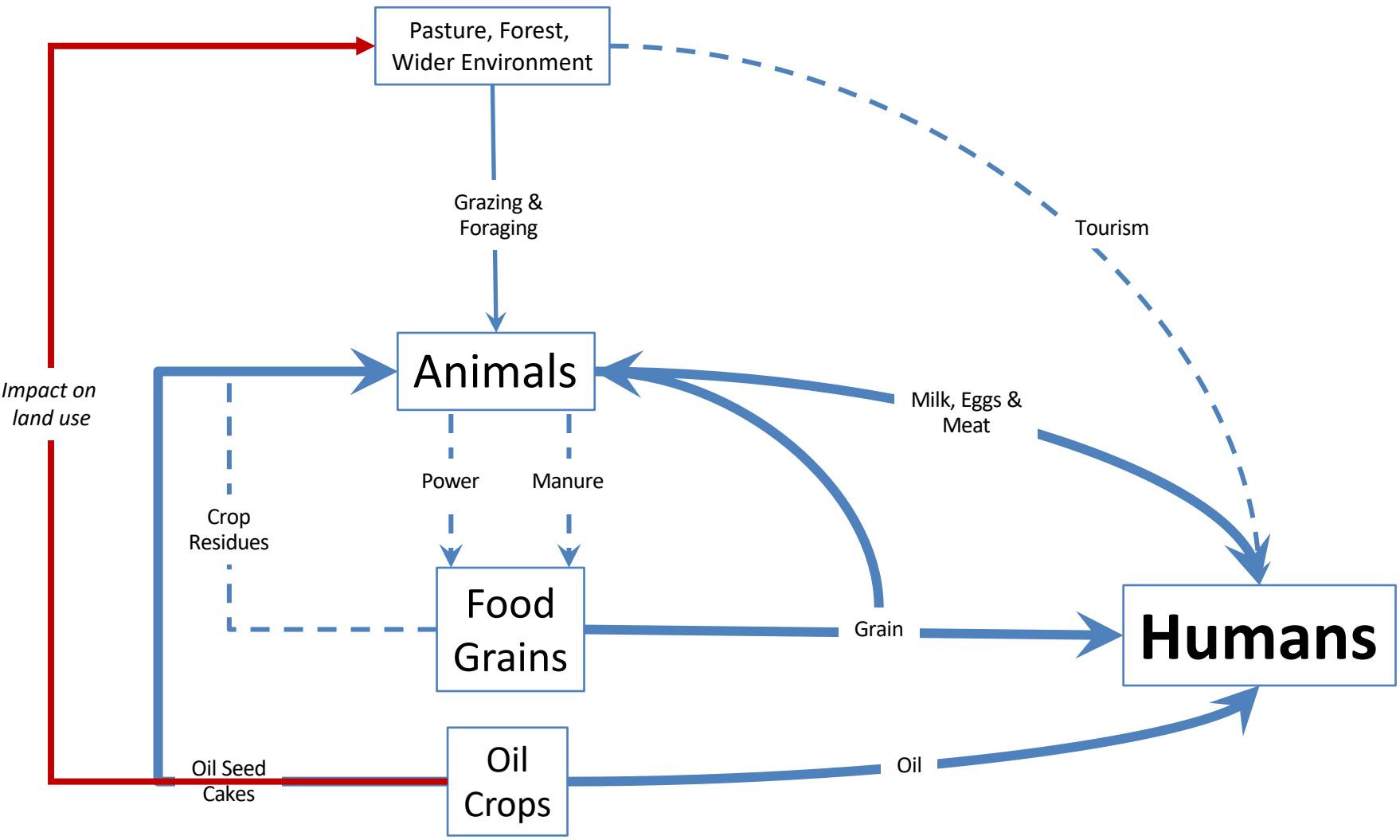
What has changed?

- *agricultural technology*

- There have been two **crop revolutions** (Byerlee et al, 2017)
 - green revolution and the oil crop revolution
- Animals have become less relevant as a source of power replaced by the **combustion engine** and non-renewable fossil fuels with CO2

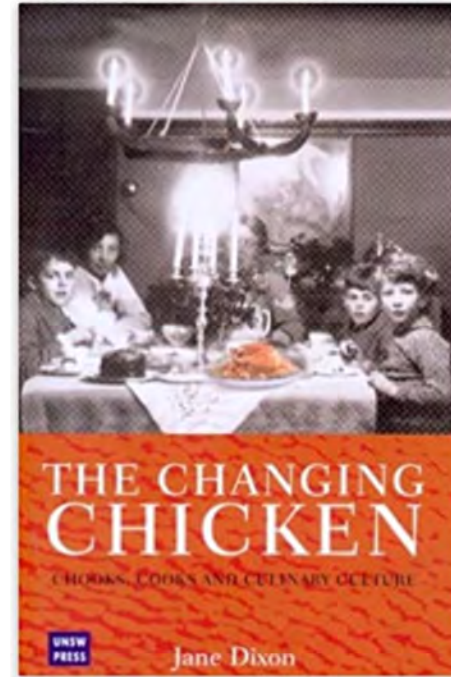
Cheap food and feed grains

- Different soil types coming under crop management
- More land coming under cultivation
- Less dependency on **animal manure** which has largely been **replaced** by **chemical fertiliser**



Food processing

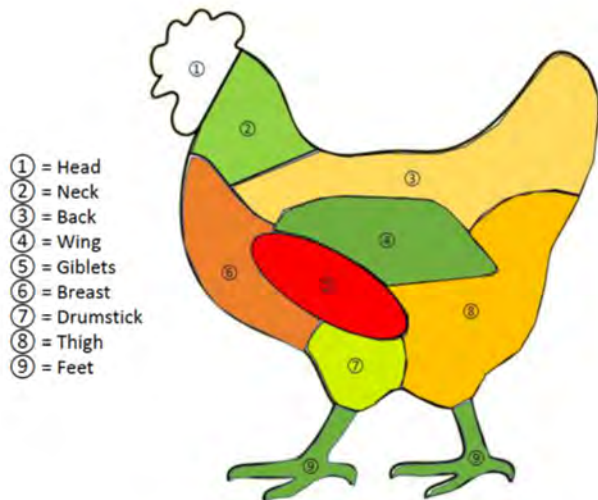
- Alongside these dramatic changes in animal production and nutrition there has been a total transformation in food processing (Dixon, 2003)
- Much of the preparation and cooking is done outside the home
- Processed food dominates the British diet



Food processing



Nutrient distribution in chicken carcasses



Distribution of **iron**
amongst a whole
chicken carcass

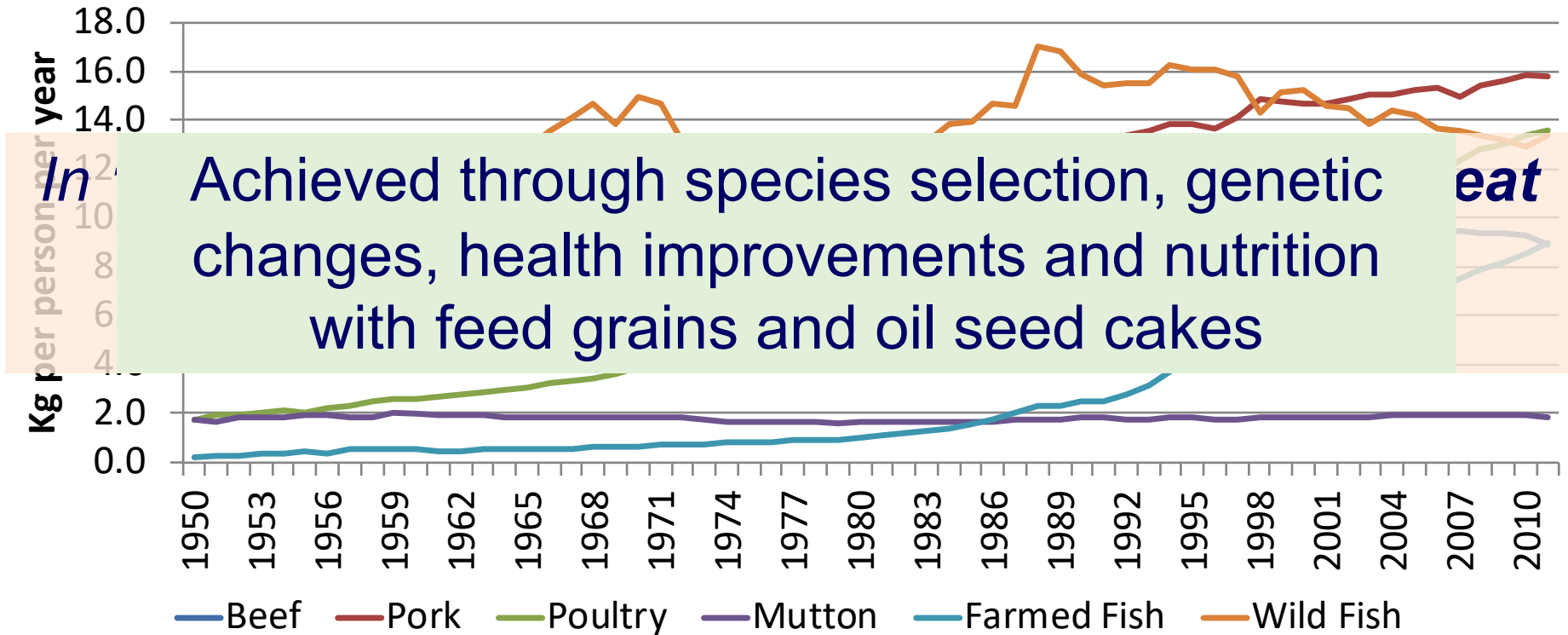
Distribution of nutrients across a chicken carcass								
	Fe (mg)	Zn (mg)	Vitamin B12 (ug)	Vitamin A (IU)	Folate (ug)	Thiamine (mg)	Protein (g)	Energy (kj)
Back	10.7	11.5	2.9	5.0	2.5	9.2	9.3	18.5
Breast	20.1	17.4	9.4	4.0	4.0	27.1	33.1	23.9
Drumstick	9.1	19.2	7.0	1.0	1.4	17.0	13.6	10.6
Thigh	12.7	19.4	11.8	2.6	2.1	21.6	18.1	21.1
Wing	5.0	10.5	2.7	0.6	2.8	10.2	11.7	11.9
Neck	6.0	4.7	0.8	1.2	0.6	2.3	2.6	4.8
Giblet	31.7	14.4	62.9	84.7	69.6	7.5	5.7	3.4
Feet	4.8	2.9	2.5	0.9	16.8	5.0	6.0	5.8

Chan, et al. 2017. What's in a Chicken? Comparing the nutrient value, potential to meet nutrient requirements and health-cost effectiveness of whole and frozen chickens. BVSc Honours Dissertation, University of Sydney.

Thanks to Robyn Alders

Availability and consumption of meat?

Global meat and fish supply



http://www.earth-policy.org/data_center/C24

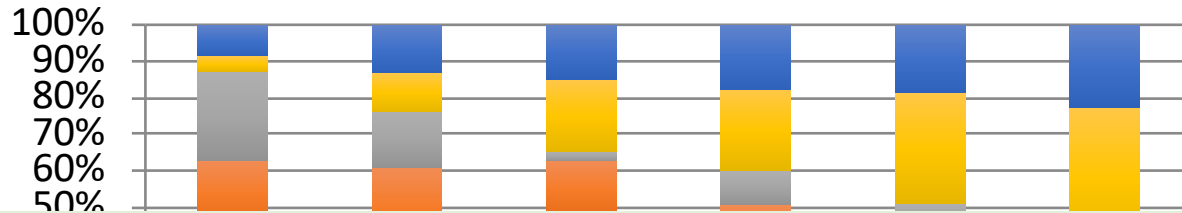
<https://www.liverpool.ac.uk/centre-for-sustainable-food-systems/>



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Centre of Excellence for Sustainable Food Systems

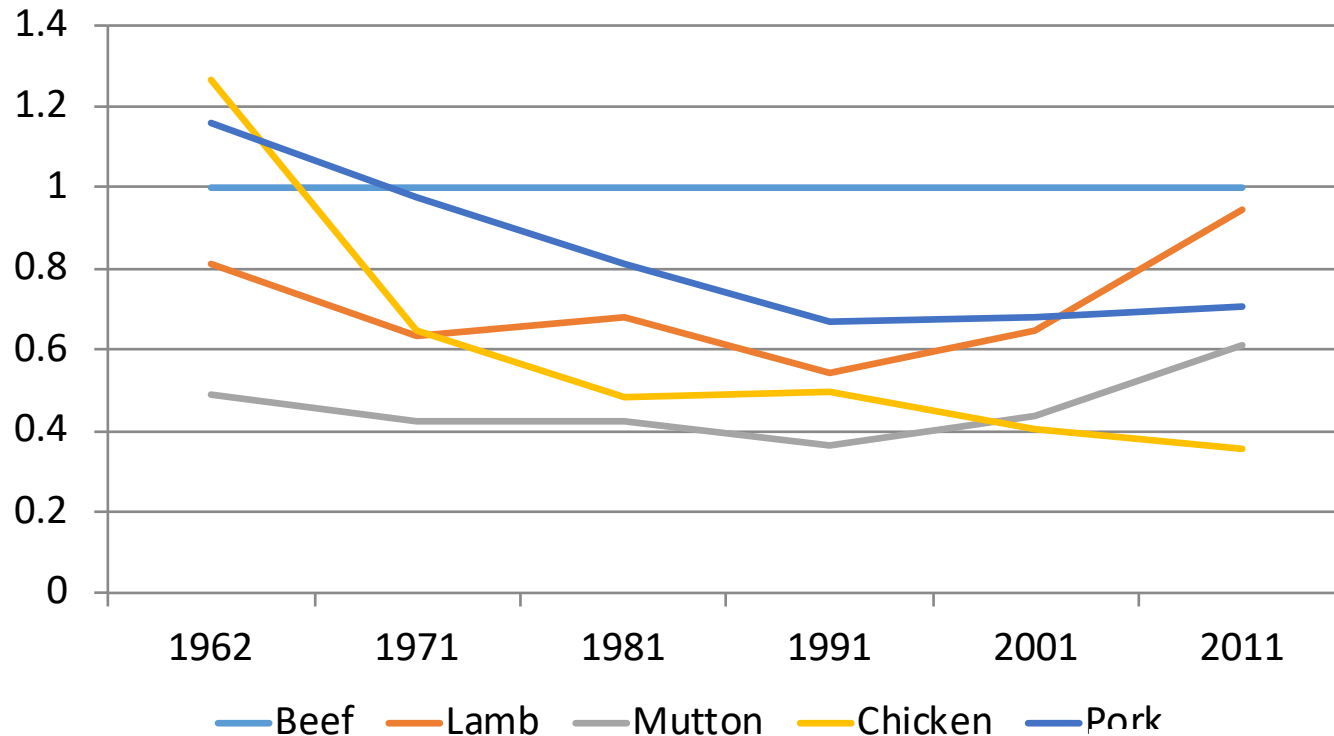
Meat consumption in Australia 1962-2011 (Wong et al, 2013)



From grass based meat to grain based meat in a generation

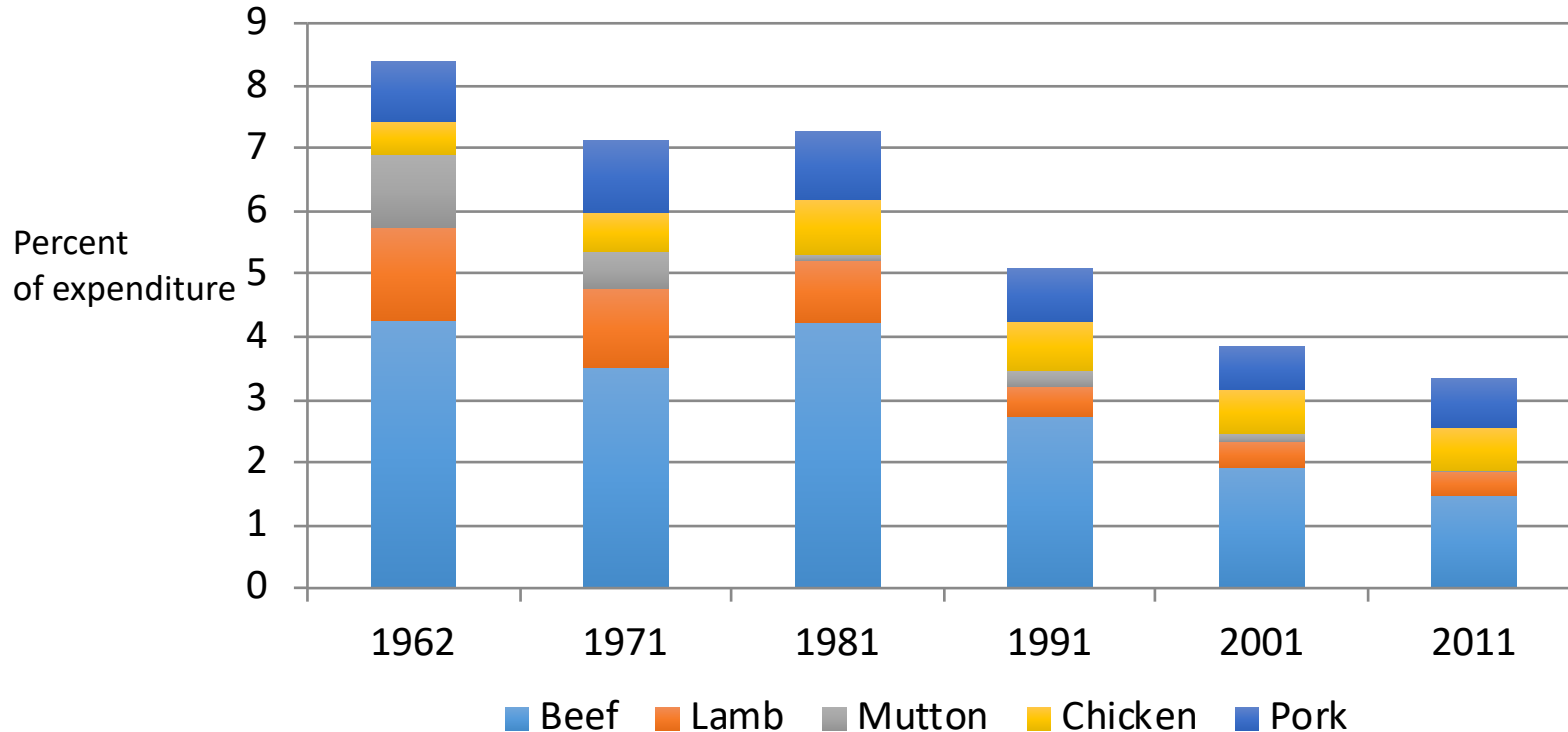
Pork	8.8	13.8	15.3	18.4	18.8	25
Chicken	4.44	11.1	20.2	23.1	30.9	43.3
Mutton	25.21	15.95	2.71	9.6	5.12	0.3
Lamb	19.3	23.14	16.49	13.2	11.75	9.2
Beef	45.3	40.3	47.6	39.5	34.5	32.8

Relative meat prices (Beef the base price)



Wong et al (2013) author analysis

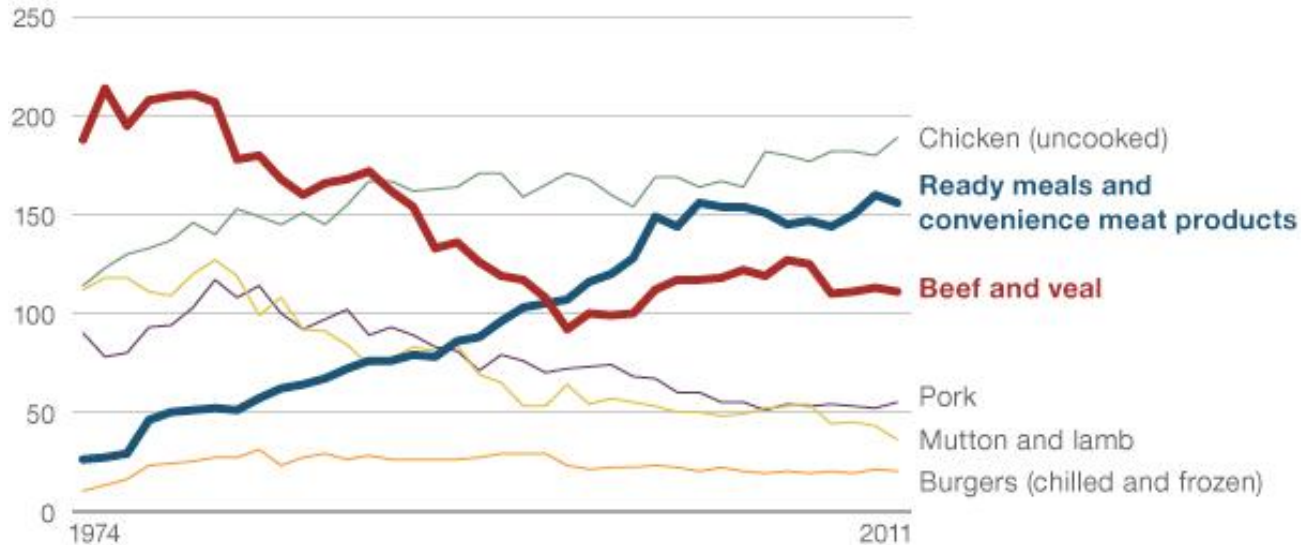
Share of meat in the Australian expenditure 1962-2011 (Wong et al, 2013)



Meat purchased in the UK per person (1974-2011)

Meat purchased in the UK (1974-2011)

UK averages per person per week, in grams*



*Food brought into the household only

Source: Defra

Is the problem the meat or the processing?

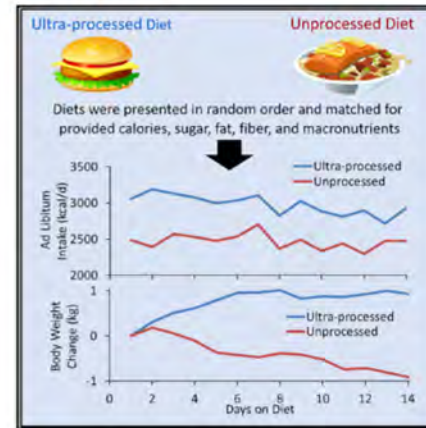
- Meat has become widely available and cheap
- It is part of the processed food diet we now depend on
- The question is whether the problem is the meat or the processing?
- Or is it a combination

Cell Metabolism

Clinical and Translational Report

Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of *Ad Libitum* Food Intake

Graphical Abstract



Authors

Kevin D. Hall, Alexis Ayuketah, Robert Brychta, ..., Peter J. Walter, Shanna Yang, Megan Zhou

Correspondence

kevinh@nih.gov

In Brief

Hall et al. investigated 20 inpatient adults who were exposed to ultra-processed versus unprocessed diets for 14 days each, in random order. The ultra-processed diet caused increased *ad libitum* energy intake and weight gain despite being matched to the unprocessed diet for presented calories, sugar, fat, sodium, fiber, and macronutrients.

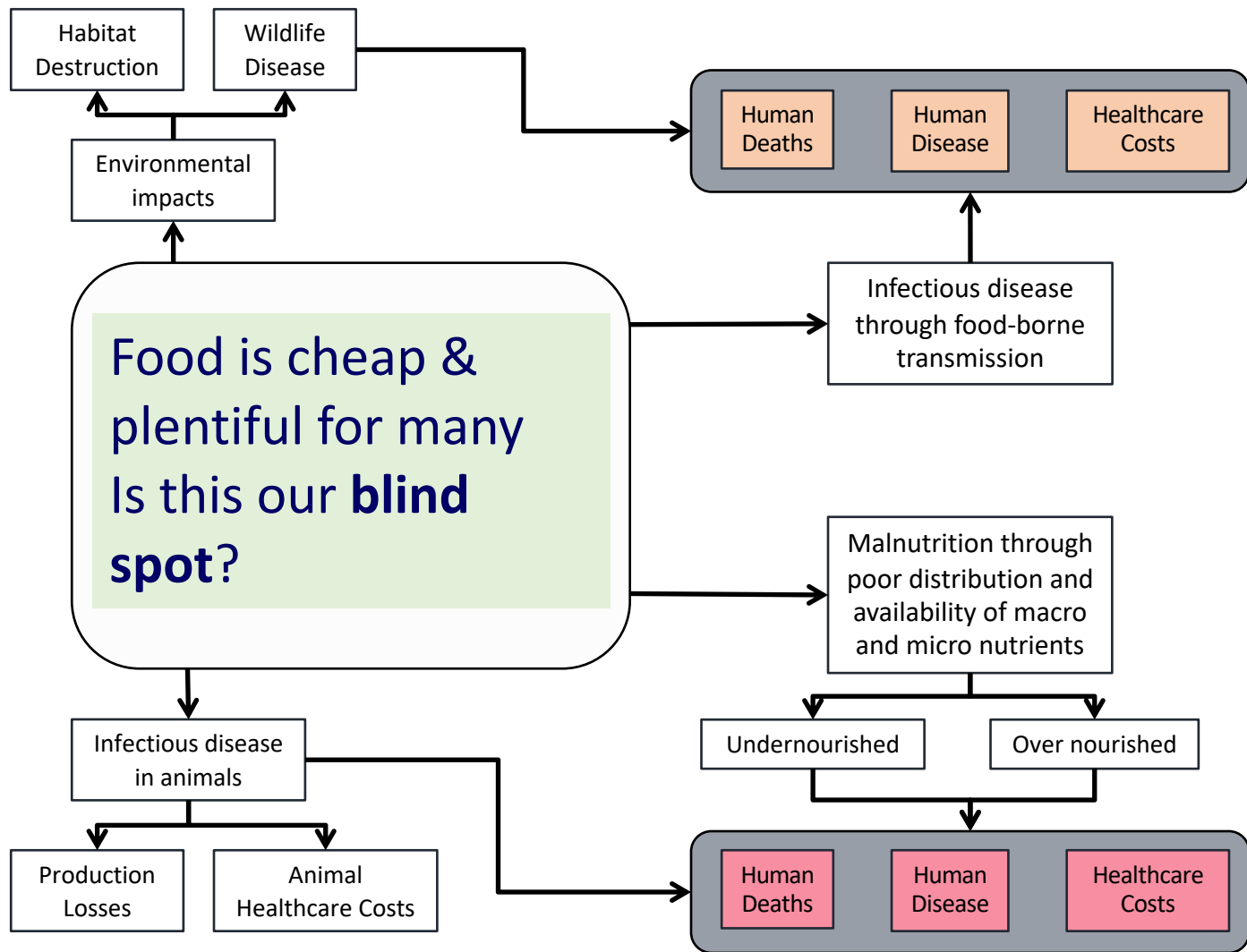
Livestock sector changes

- Through a mixture of crop productivity, animal nutrition and production changes the supply of meat and livestock products has increased
- The relative price of the livestock products has decreased relative to other goods and services in society
- The low prices have encouraged food companies to use these ingredients in their processed foods
- The increase in livestock product consumption is also associated with an increase in processed food

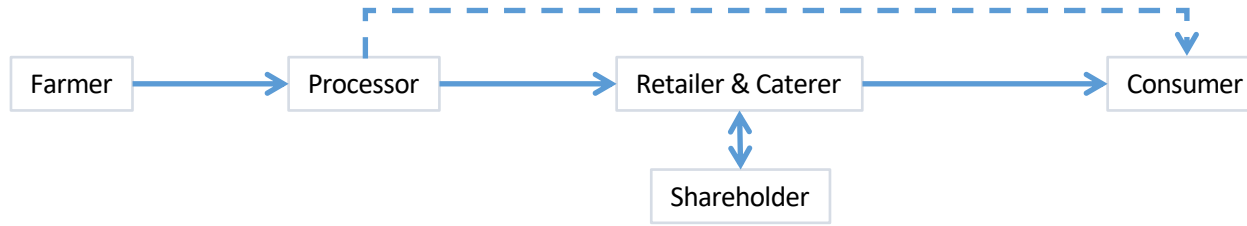
Reflections

Managing livestock in societies

- Livestock play a central role in food systems
- They use crop residues, agricultural biproducts and land areas that are difficult to use for producing food for direct human consumption
- In the past there has been a balance and a relative scarcity of livestock products for consumption
- Over the last 60 years that balance has been broken leading to greater availability of livestock products at cheaper prices
- If we are to manage the problems this creates we need to look at the systemic problems in supply and demand and behavioral change



There is an imbalance across the food system



So how healthy is the system?

Po
product

Low valued
animals

Difficulty in
managing land,
water and animal
welfare

Impoverished rural
communities
that are shrinking

Shareholder
Value

Financial
Centre
Success

heap
tiful

for many

Highly
processed food
that saves time

**Malnutrition
contributing to
overweight and
obesity**

**Nation with
increasing health
care bills**

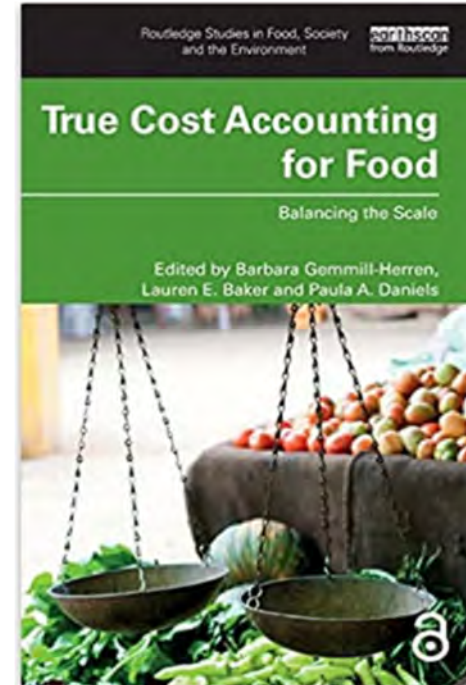
Solutions need to be at all levels

- Individual
 - We each need to **assume responsibility** for making day to day choices on where, how and what we eat
- Private sector
 - Willingness to include health and environmental outcomes from the food system in their **social charters**
- Public sector
 - **Public sector leadership** – education, research, vision, targeted and proportionate regulation
 - Better **monitoring** across the food system into health outcomes

One Health and Food System – the need to monitor and measure the externalities

- Understanding the food system, its positive and negative impacts, would allow resource allocation proportionate to the scale of the problems generated

THE GLOBAL BURDEN OF ANIMAL DISEASES BEYOND HEALTH IMPACTS



One Health and Food System – the need to have strong institutional support

- Laissez faire food policies have led to food systems being driven economic efficiency resulting in ***“food at any cost”*** that generates major negative externalities
- We need **food ministries** with monitoring systems to assess these externalities
- A **paradigm shift** is needed towards a One Health framework in order to improve the food system through a mix of behavioural and systemic changes

The **food system** needs a paradigm shift from food at any cost to a **One Health framework**

<https://animalhealthmetrics.org>