

Challenges for Reducing Food Losses and Waste

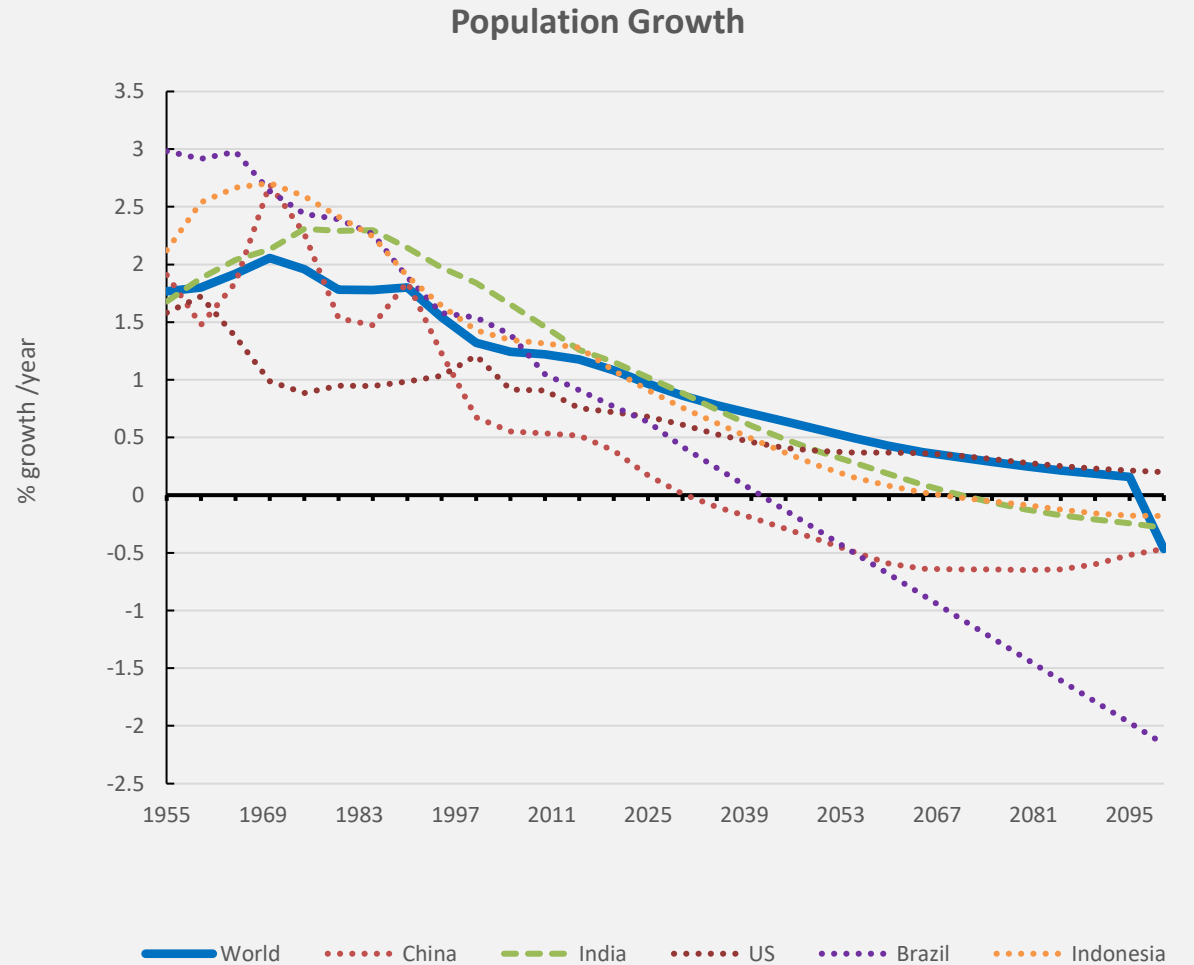
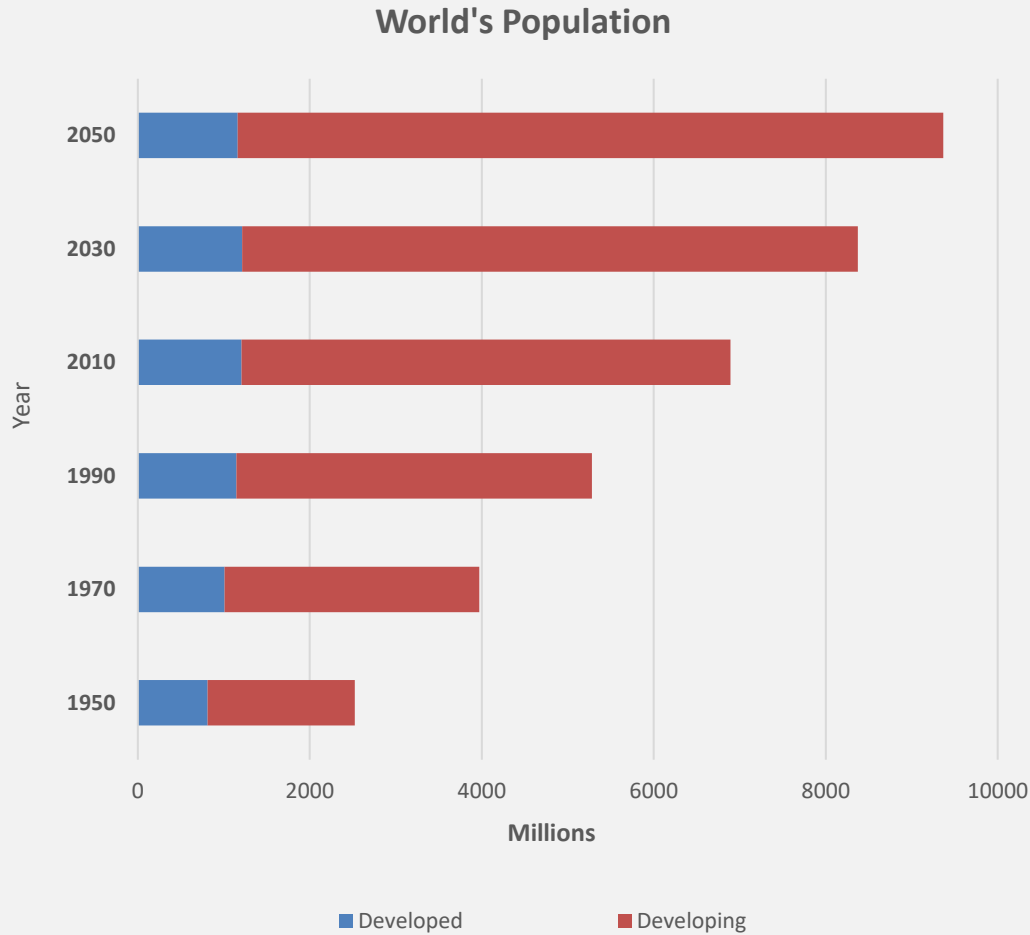
Walter Belik

Institute of Economics – Unicamp, Brazil



January 2021

World's Population Trends



Source: UN Population Division

Malthus Revisited ?

The Washington Post

WONK! SUDOKU wpGAMES DAILY Crossword

Wonkblog

This terrifying chart shows we're not growing enough food to feed the world

By Brad Plumer July 1, 2013

It's a question that keeps crop scientists up at night: How are we possibly going to feed the world over the next few decades?

After all, consider what we're up against: The global population is expected to swell from 7 billion today to 9.6 billion by 2050. The rising middle class in China and India is eating more meat than ever. And this is all happening at a time when we're setting aside a greater slice of farmland for biofuels *and* trying not to cut down any more forests (which exacerbates climate change). Doing this in a sustainable manner is tricky.

The Economist

Population projections

Don't panic

A UN study sparks fears of a population explosion. The alarm is misplaced

Sep 24th 2014 | International



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An unrecognisable world: Global population of 9 billion will compete for food supplies in 2050

By DAILY MAIL REPORTER
UPDATED: 12:36 GMT, 22 February 2011

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- Mankind will need to produce as much food in the next 40 years as in the last 8,000

The earth's population could top nine billion by 2050, leading to an 'unrecognisable' world as people compete for scarcer resources a U.S. science conference heard yesterday.

The American Association for the Advancement of Science (AAAS) heard how the world's population's will increase rapidly in poorer countries resulting in the need to produce the same amount of food in a 40 year period as had been produced in the previous 8,000 years.

Population growth is expected to be highest in African and South Asian states, while incomes are also expected to rise in these countries by up to four times.



The New York Times

Don't Ask How to Feed the 9 Billion

Mark Bittman NOV. 11, 2014

At dinner with a friend the other night, I mentioned that I was giving a talk this week debunking the idea that we need to grow more food on a large scale so we can "feed the nine billion" — the anticipated global population by 2050.

She looked at me, horrified, and said, "But how are you going to produce enough food to feed the hungry?"

I responded to her in this way: "But yourself in the present place you see

USA TODAY

U.N.: World population to reach 8.1B in 2025

AP 6:24 p.m. EDT June 13, 2013

Among the fastest-growing countries is Nigeria, whose population is expected to surpass the U.S. population by mid-century and could rival China as the second-most populous country by century's end.



UNITED NATIONS (AP) — The United Nations forecast Thursday that the world's population will increase from 7.2 billion today to 8.1 billion in 2025, with most growth in developing countries and more than half in Africa. By 2050, it will reach 9.6 billion.

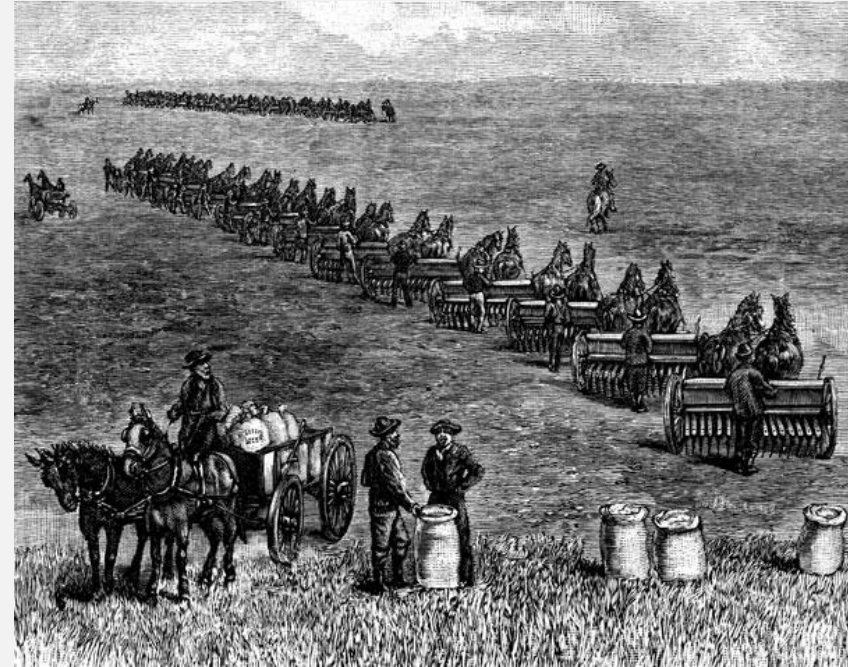
India's population is expected to surpass China's around 2028 when both countries will have populations of around 1.45 billion, according to the report on "World Population Prospects." While India's population is forecast to grow to around 1.6 billion and then slowly decline to 1.5 billion in 2100, China's is expected to start decreasing after 2030, possibly falling to 1.1 billion in 2100, it said.

The report found global fertility rates are falling rapidly, though not nearly fast enough to avert a

Malthus Revisited ?

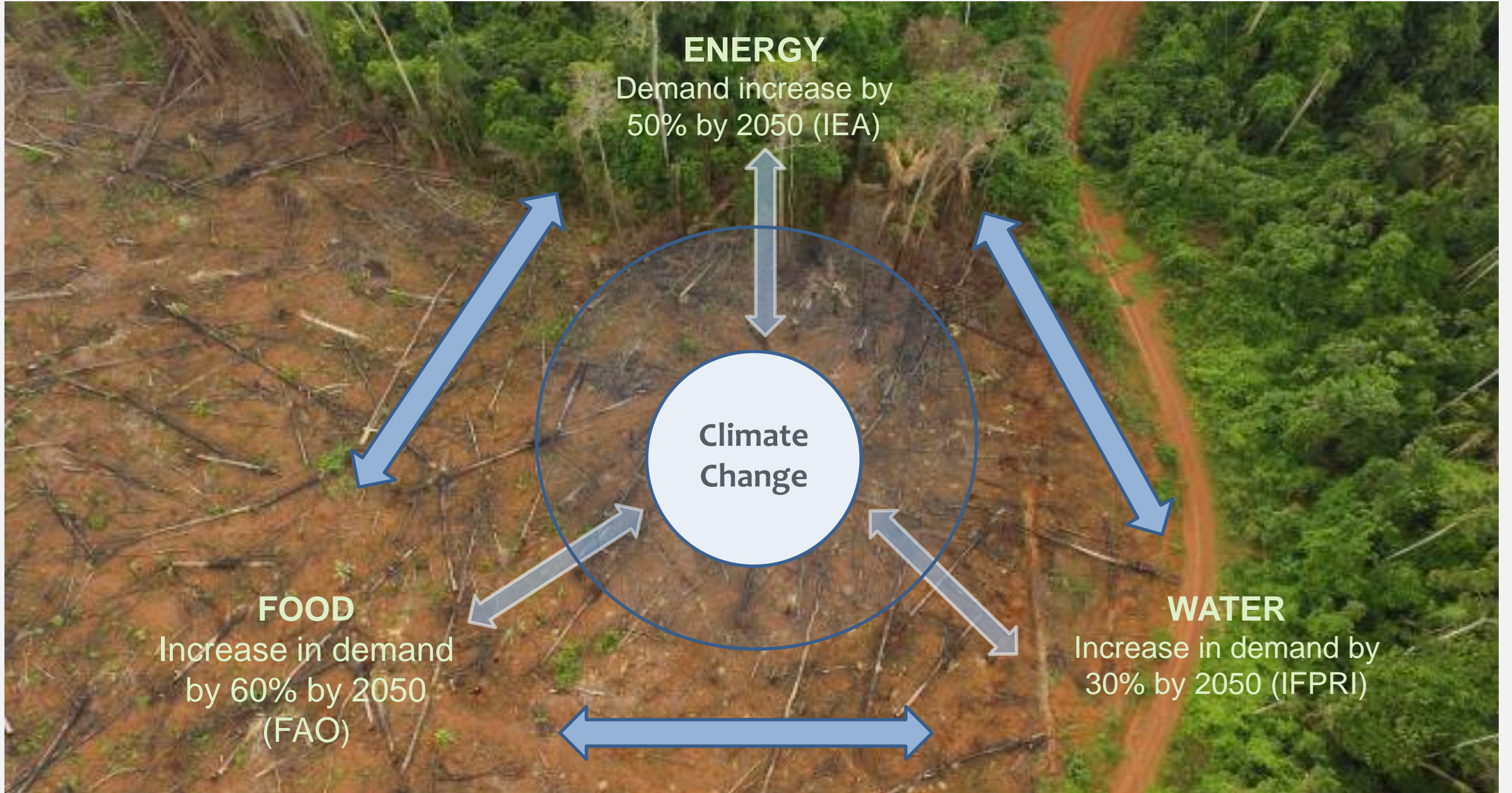


**Thomas
R. Malthus**
1766-1834



“The power of population is so superior to the power of the Earth to produce subsistence for man, that premature death must in some shape or other visit the human race.”

The "Perfect World"



Forecast for 2050

- Food production will have to grow 60% - 70% by 2050;
- The consumption of meat is expected to rise from 32 to 52 kg / capita / year;
- Food *versus* fuel dispute raw materials (bioenergy demand is expected to increase 100% by 2050);
- Climate change brings new challenges for production;
- Land scarcity (prices skyrocketing) and water (+ 100%) (currently 36% of world population is living in areas without water availability)

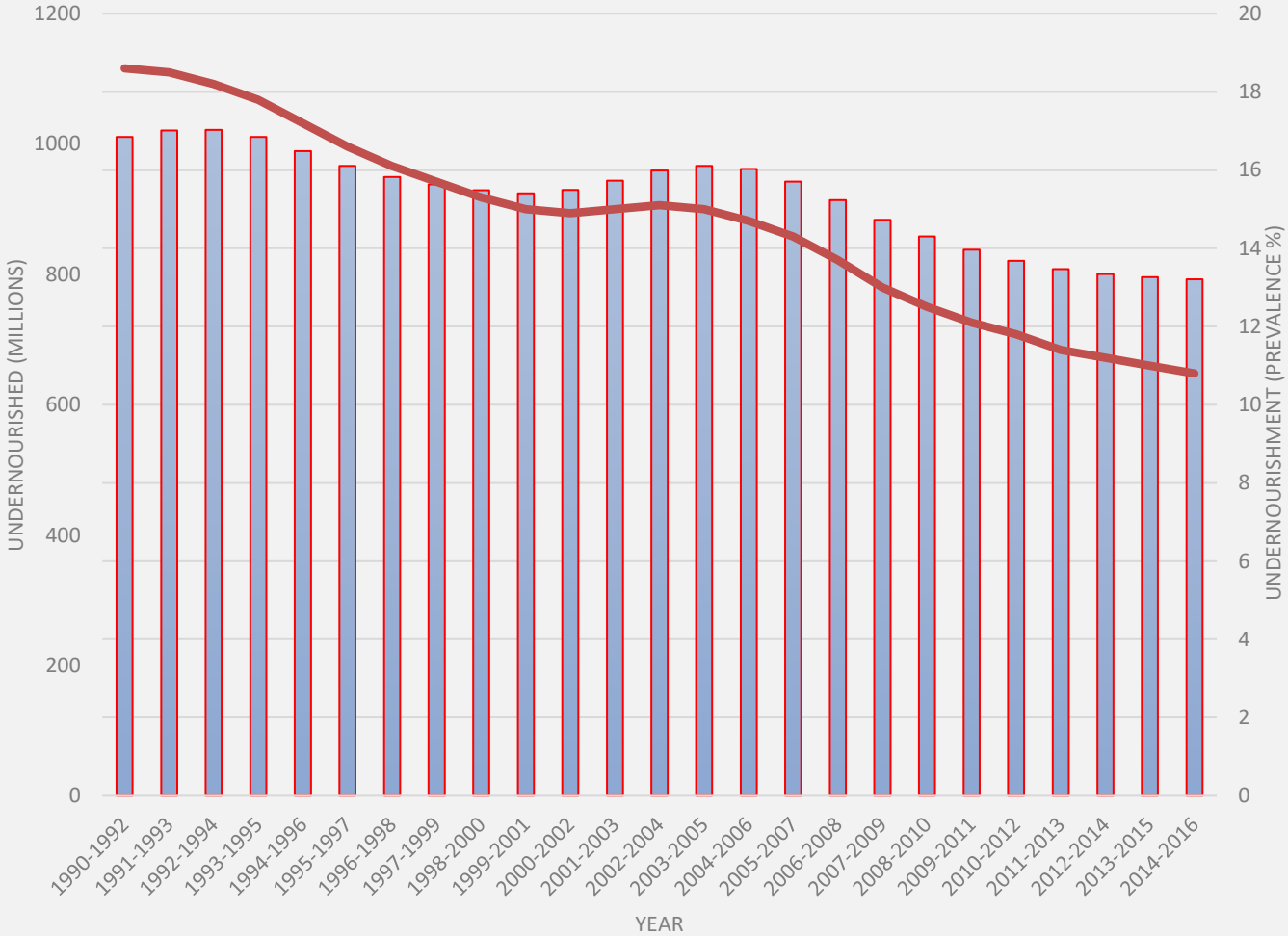
Commitments for 2030

- Rio + 20
- Zero Hunger Challenge
- COP 21
- SDG 2030 (2015)

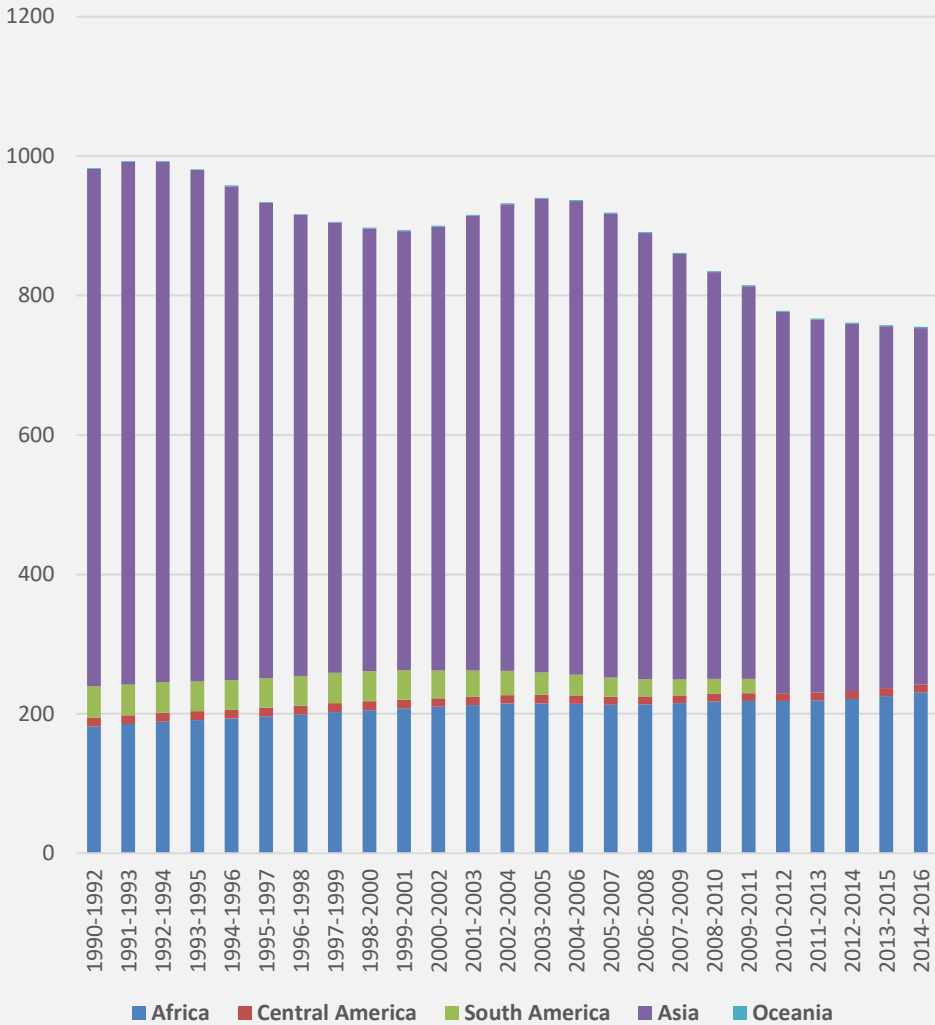


Undernourishment

World: People Undernourished (Number and Prevalence)



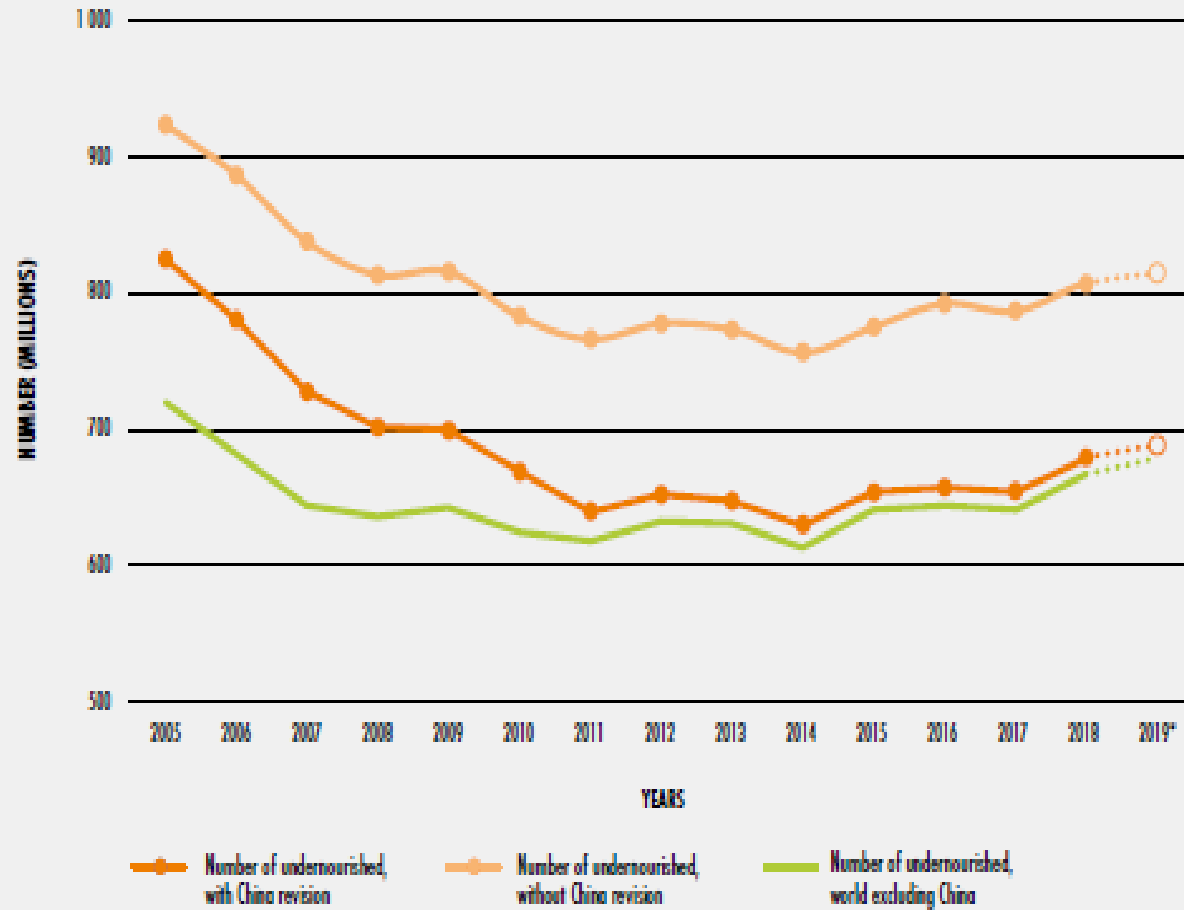
Undernourishment (millions)



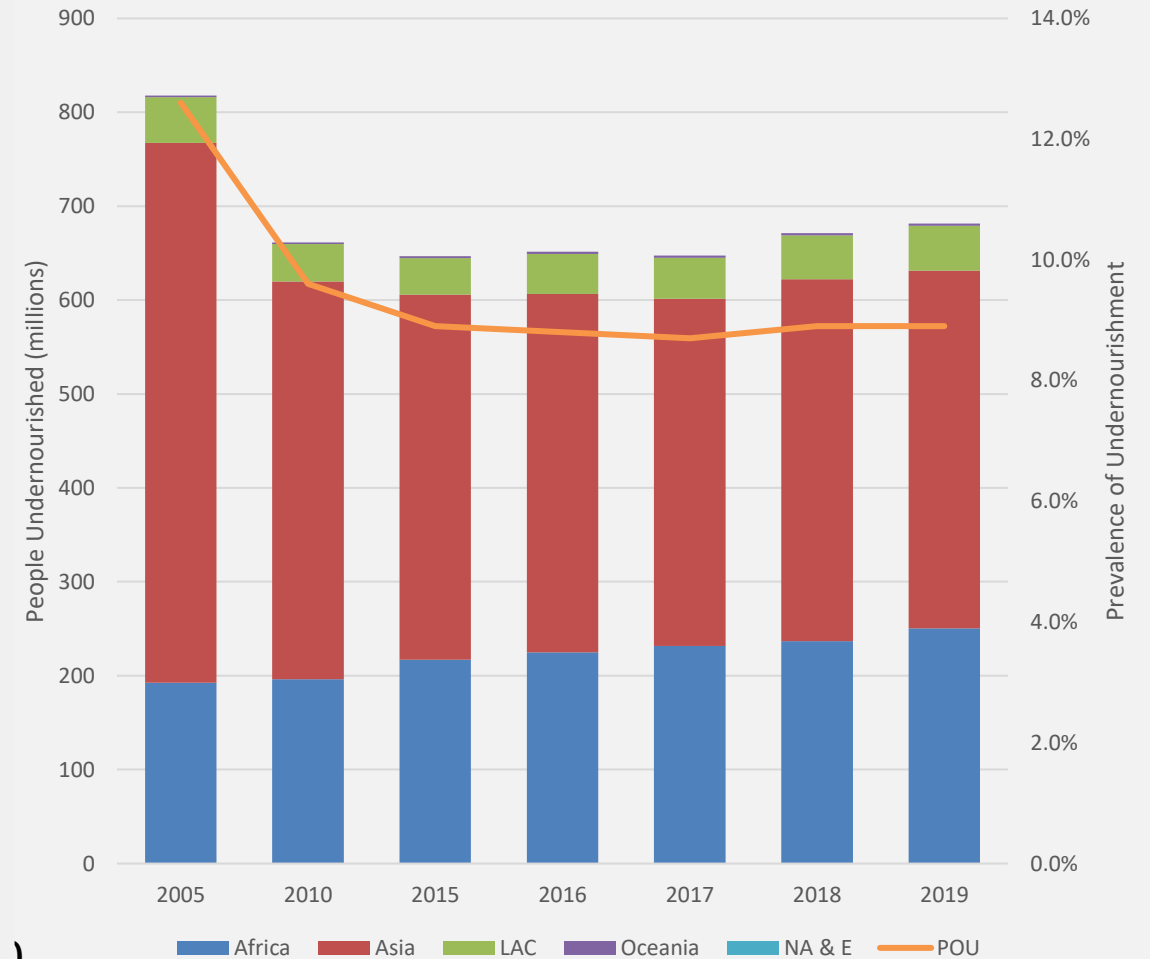
Source: FAOSTAT

Undernourishment: New FAO Estimate

A. NUMBER OF UNDERNOURISHED IN THE WORLD, WITH AND WITHOUT THE REVISION FOR CHINA

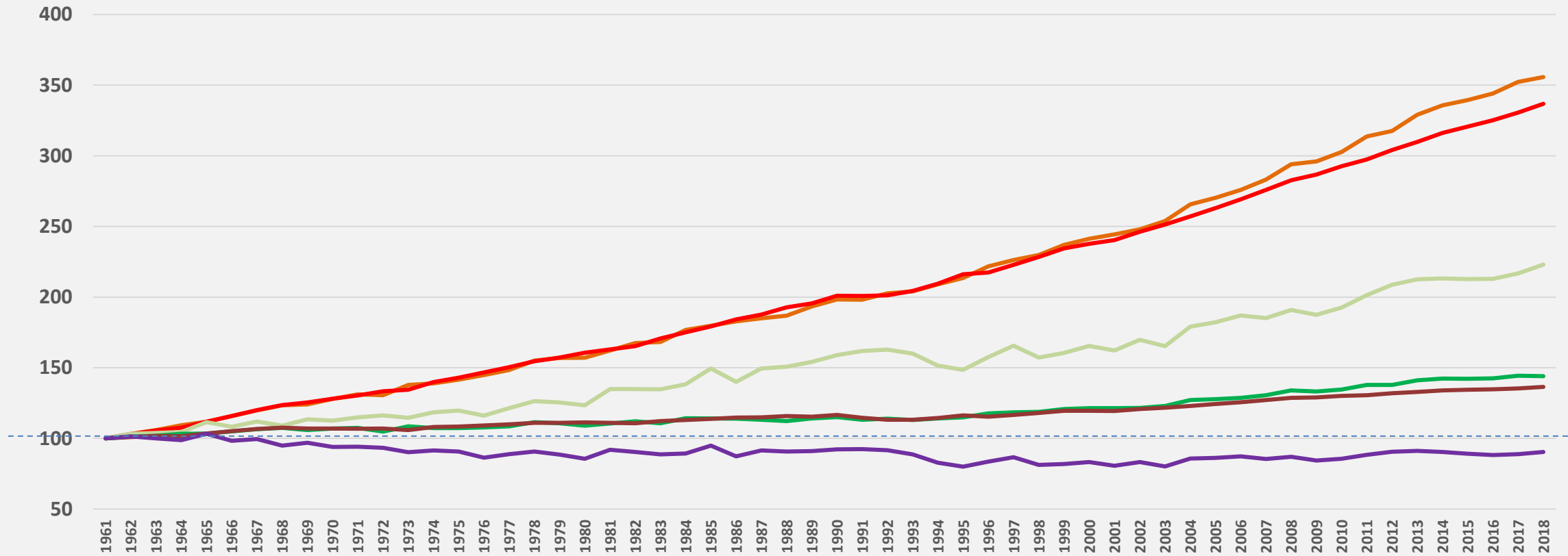


People Undernourished After FAO's Revision

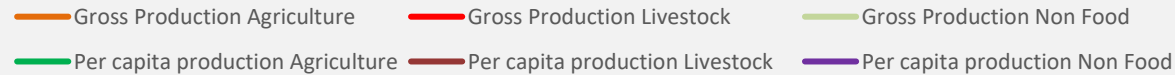


Source: SOFI 2020

World: Food and Non-Food Productions Index (1961=100)



Source: FAO



Food Supply Forecast

Yield (ton/ha) growth (% per year)

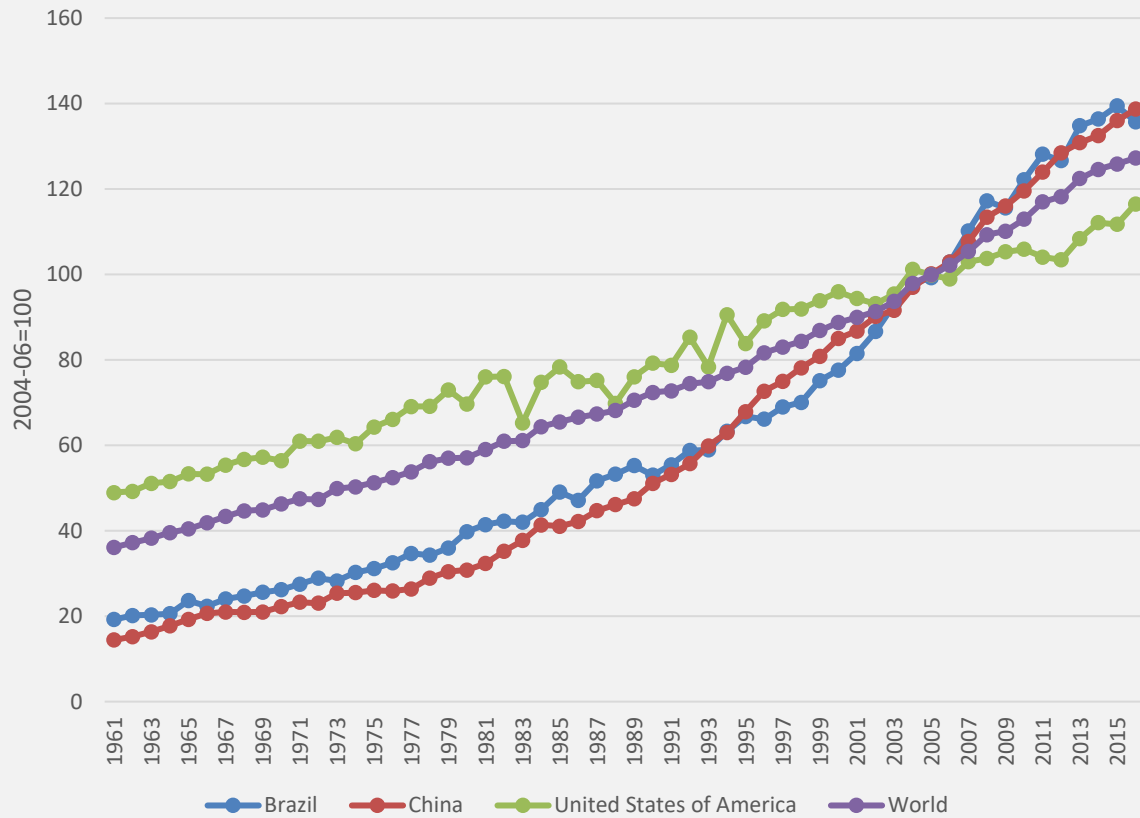
		1993-2020
Wheat	Developed	1.06
	Developing	1.30
	All Countries	1.17
Rice	Developed	0.53
	Developing	1.08
	All Countries	1.05
Maize	Developed	0.84
	Developing	1.36
	All Countries	1.03

Source: Chang & Zepeda, 2003

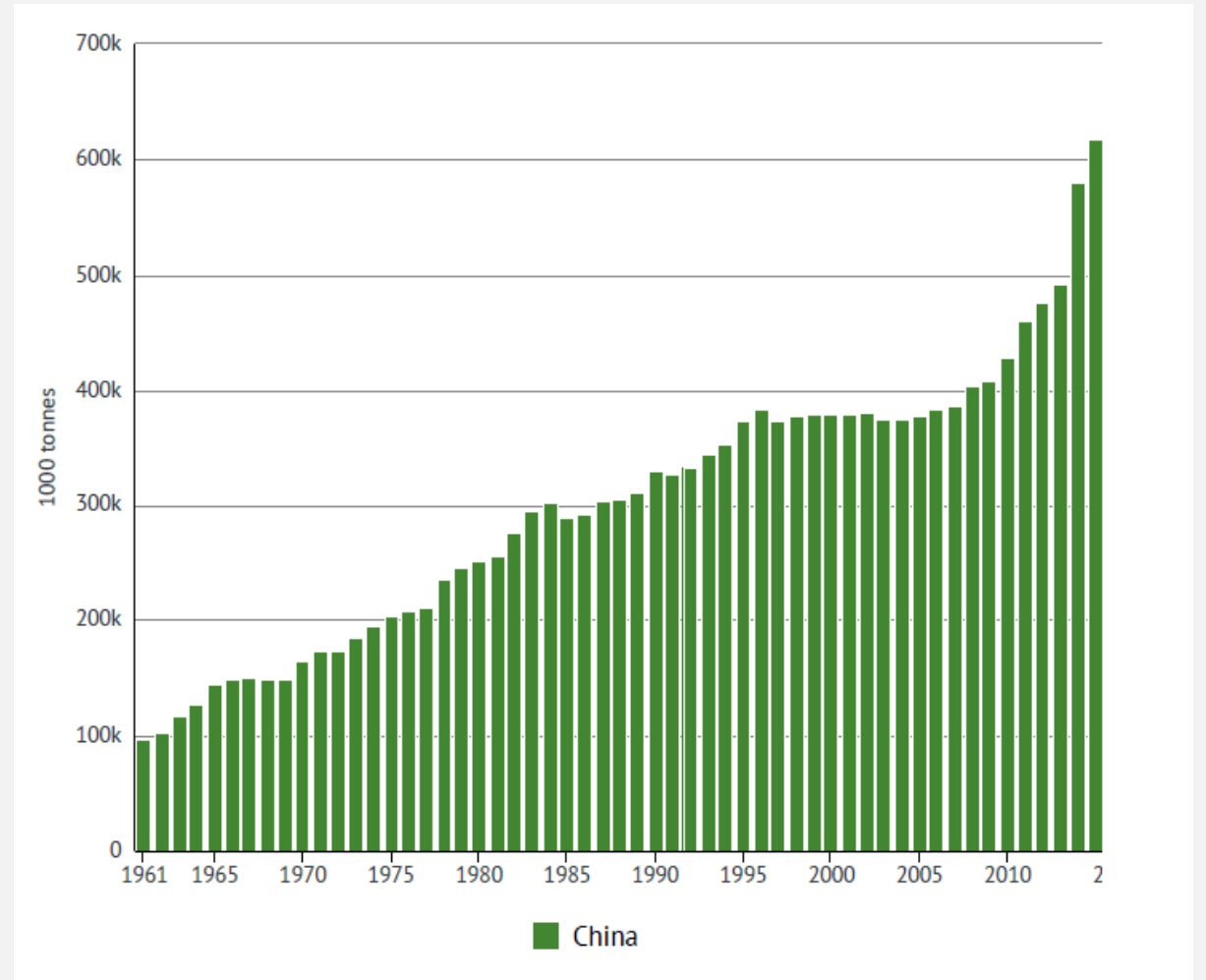
China: Growth in Agricultural Production

China: Grain Production

World: Food Supply



Source: World Bank

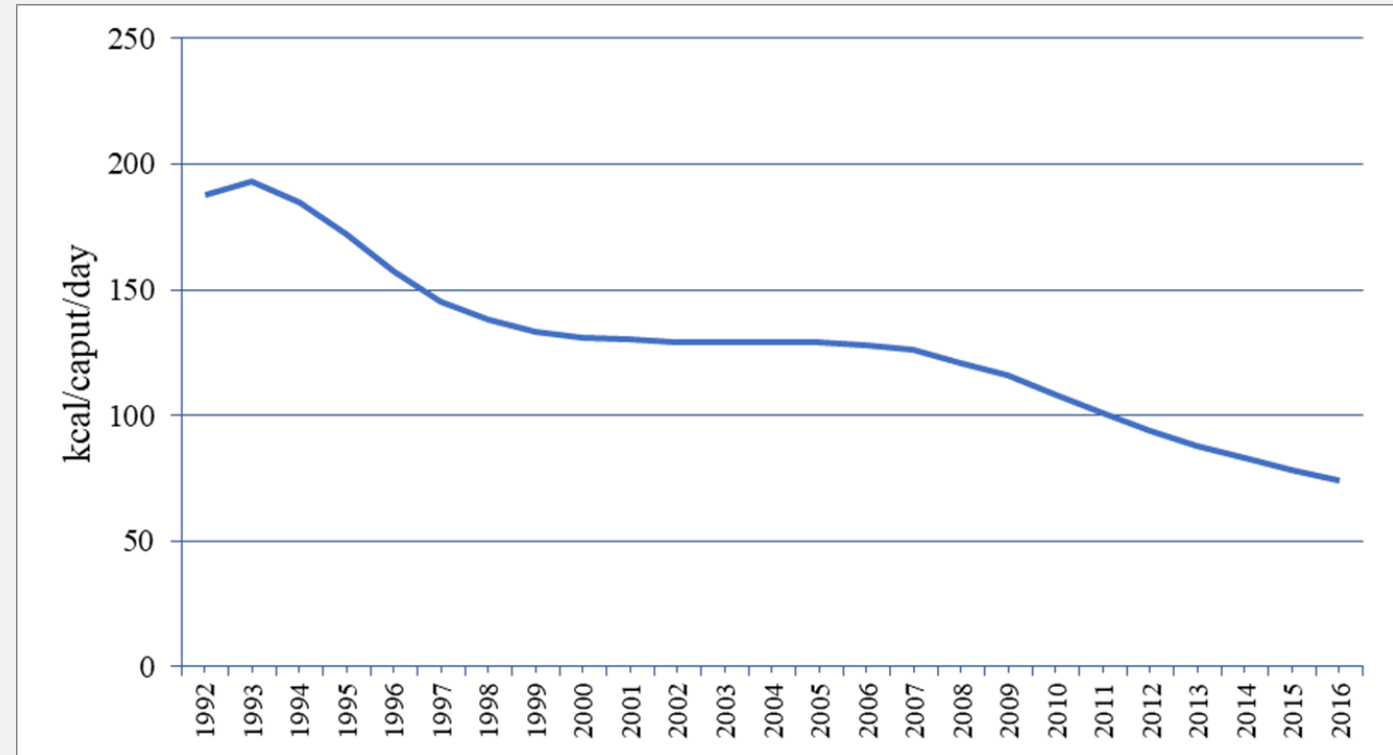


China

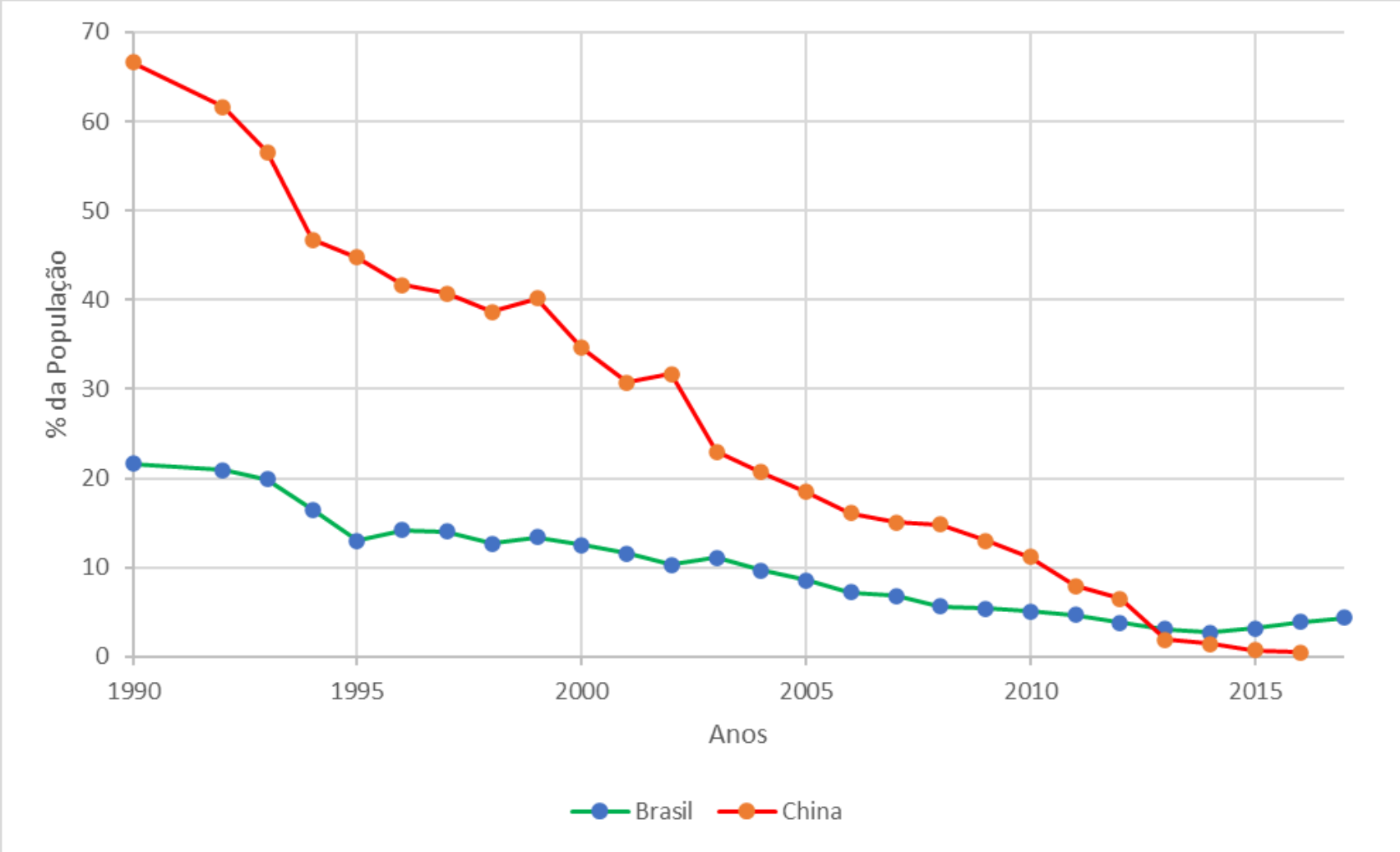
19% of World's Population
7% of World's Arable Land
6.5% of World's Water Resources
Only 50% of territory useful for agro production



China: Food Deficit (in Kcal/ capita/day)



Brazil and China: Poverty US\$1.9 day/capita PPP (%)

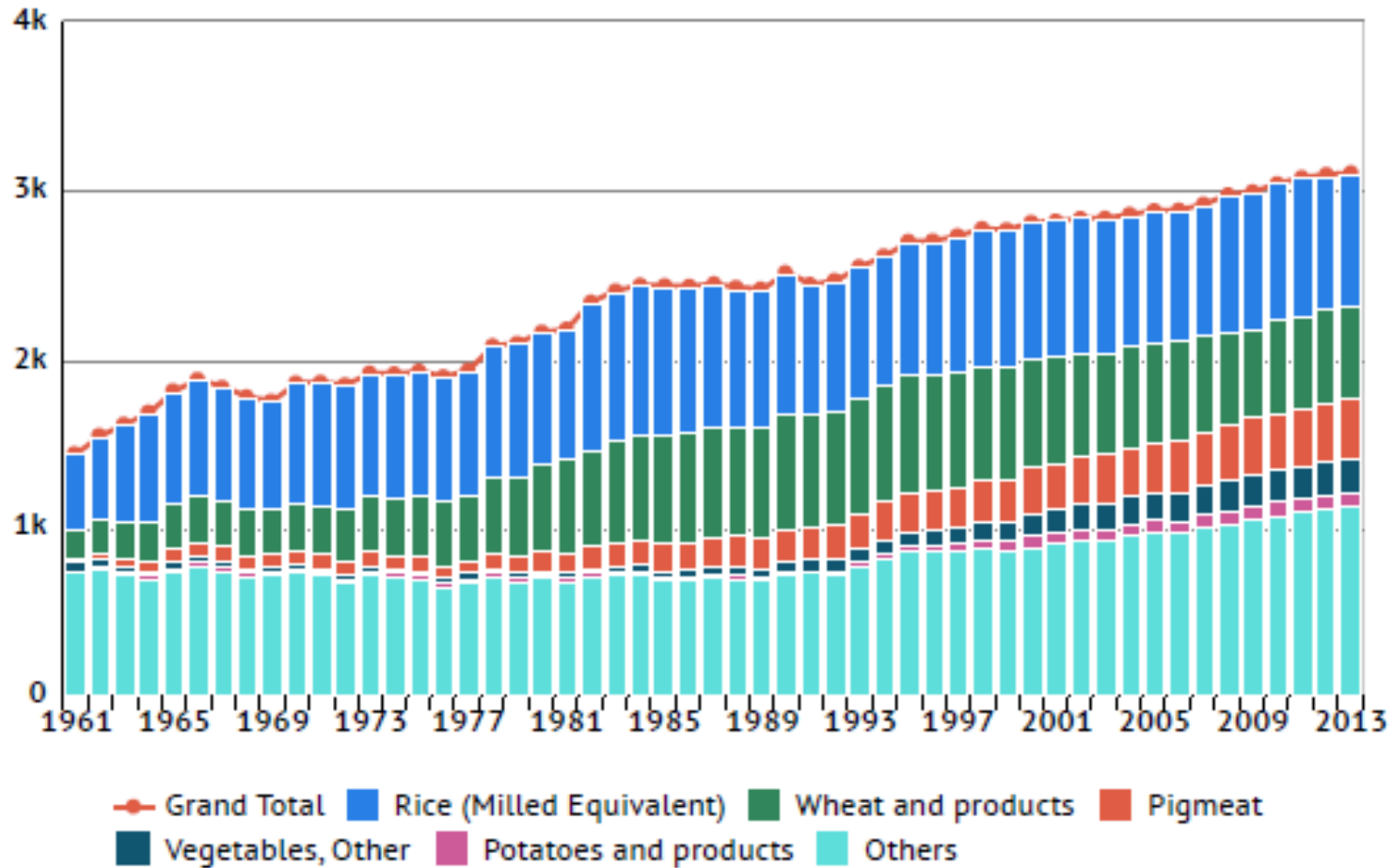


Source: World Bank

Food Consumption in China

China Composition of Daily Diet

Food supply (kcal/capita/day)



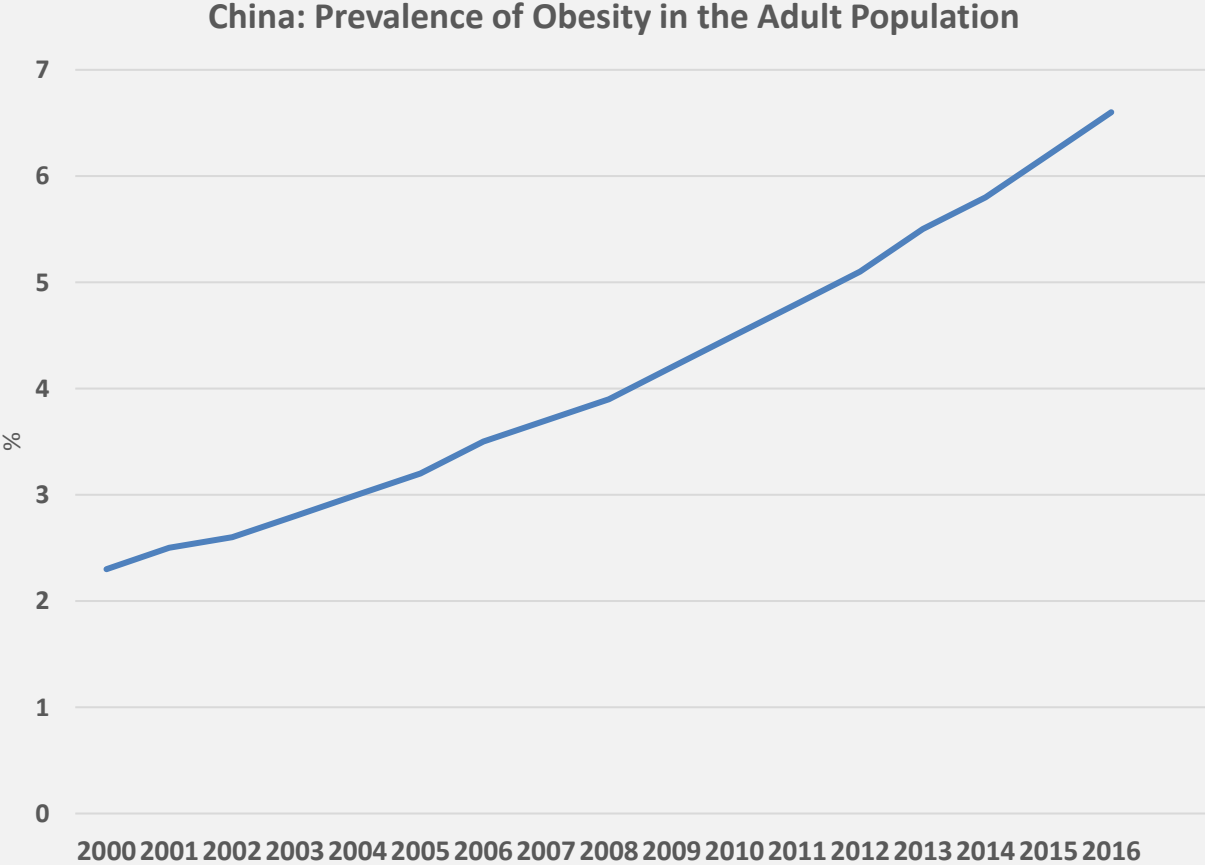
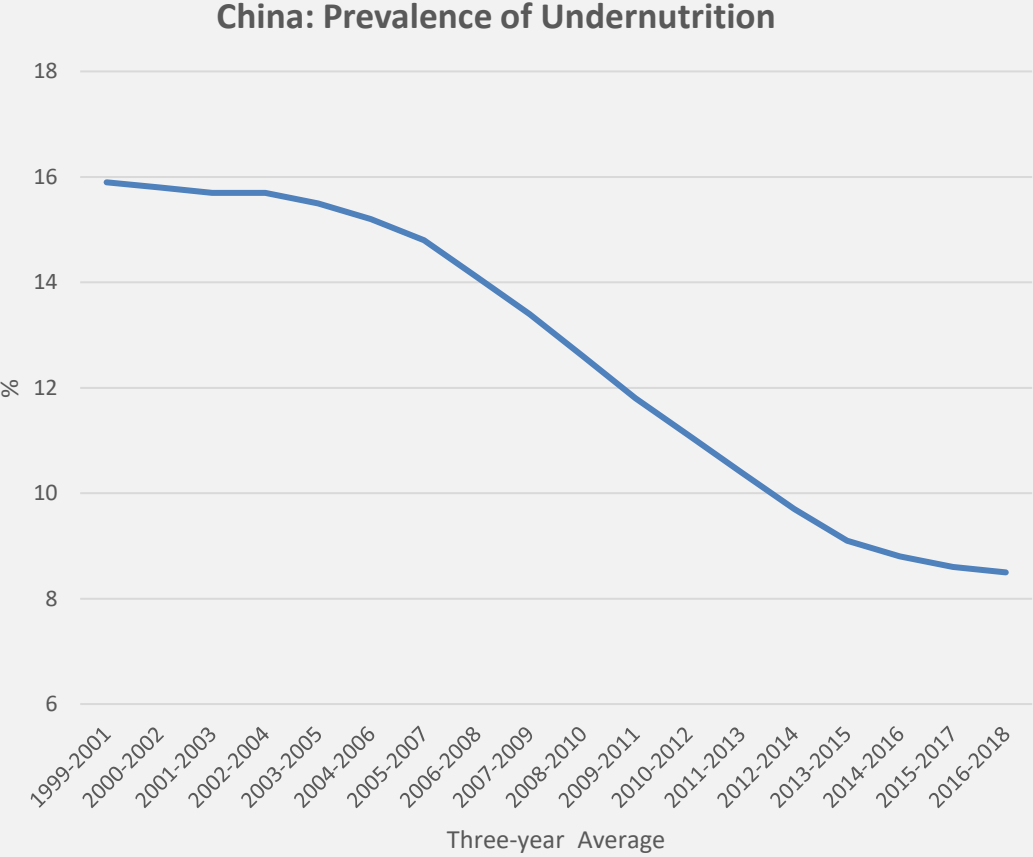
Source: Food Balance Sheets

Domestic Supply , 2018

Wheat domestic supply	139,090 thousand tonnes
Maize domestic supply	268,816 thousand tonnes
Barley domestic supply	4,196 thousand tonnes
Rice domestic supply	215,825 thousand tonnes
Vegetable oils domestic supply	33,113 thousand tonnes
Meat domestic supply	92,145 thousand tonnes
Bovine meat domestic supply	8,696 thousand tonnes
Pigmeat domestic supply	57,464 thousand tonnes
Poultry meat domestic supply	19,245 thousand tonnes
Fish and seafood domestic supply	66,872 thousand tonnes
Eggs domestic supply	36,920 thousand tonnes
Milk domestic supply	37,887 thousand tonnes
Vegetables domestic supply	641,341 thousand tonnes
Starchy roots domestic supply	213,836 thousand tonnes
Sugarcrops domestic supply	123,774 thousand tonnes
Fruits domestic supply	123,774 thousand tonnes

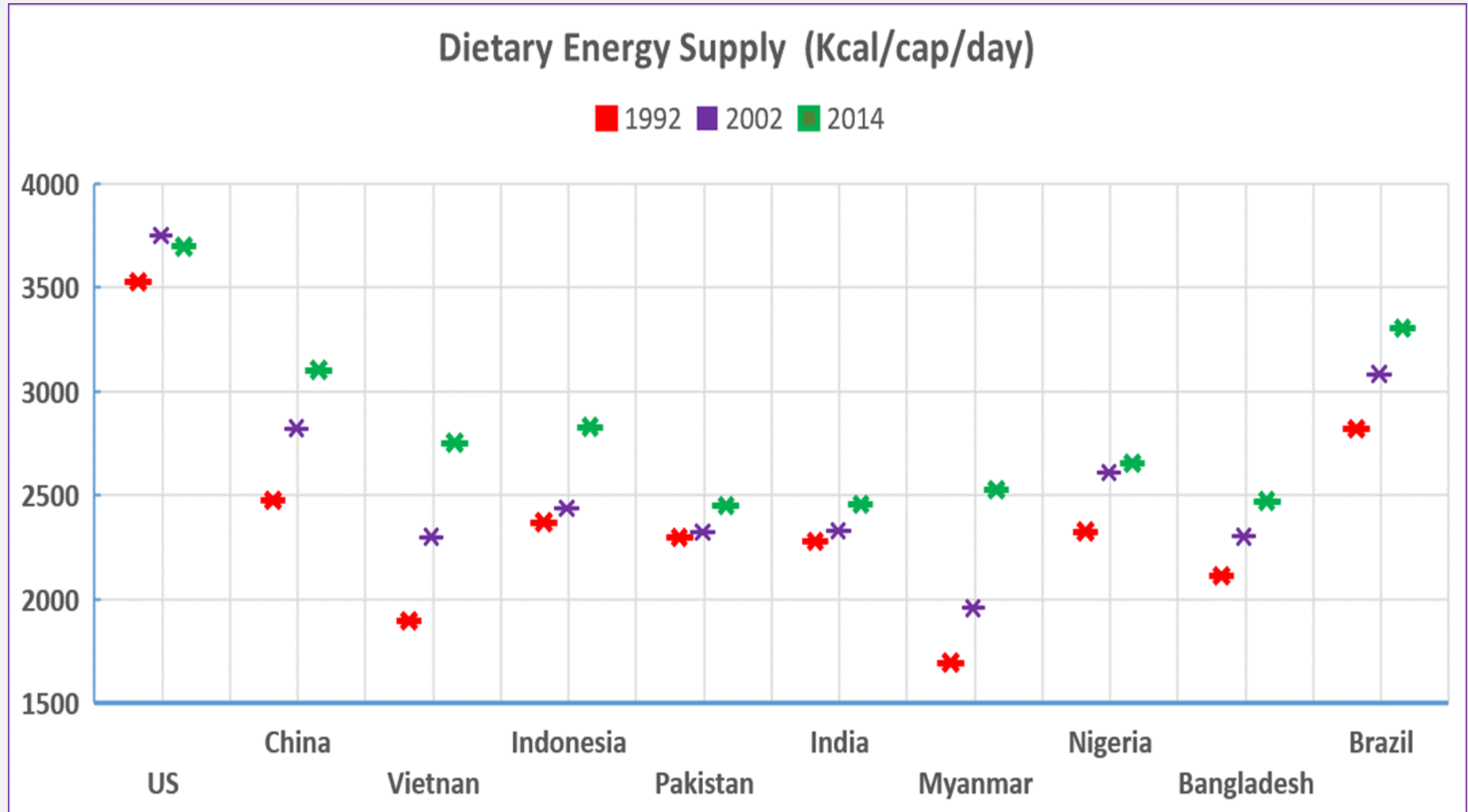
China: Nutrition Indicators

Seesaw effect



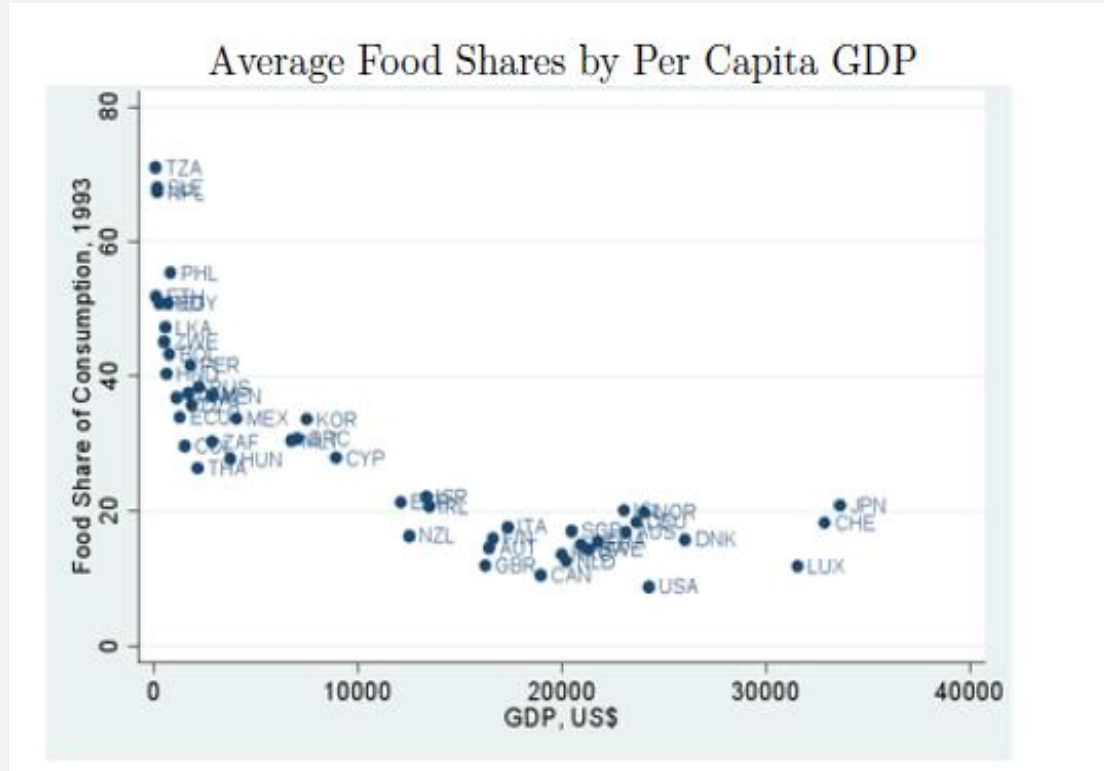
Increase in Income Levels and Change in Consumption Habits

Per capita consumption in developing countries with more than 100 million inhabitants 1992-2004



Western consumption habits are not limited only to the intake of food, but the whole process of acquisition, processing and consumption, reproducing the effects downstream of waste in supermarkets, packaging and portions, without regarding the distances covered for transporting food from the outside of the producing regions

Food Consumption Transition



Source: Food Prices and the Welfare of Poor Consumers - Ethan Ligon
Giannini Foundation, University of California, Berkeley, October 10, 2008



Forecast of Demand for Food 2050

Let's produce more! More with Less!

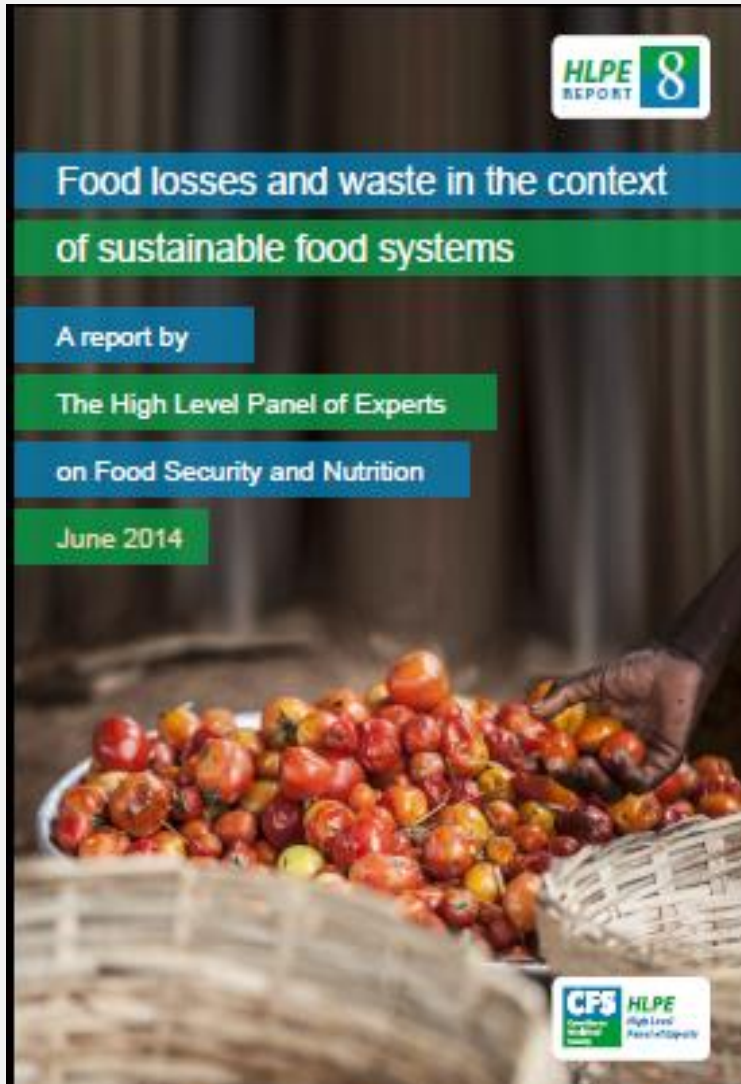
- Dissemination of new technologies (biotechnologies, nanotechnologies, GMO etc.);
- Investment in technology and education;
- Intensification of land use;
- New areas with potential for farming;
- Food 2.0.

Food Supply Forecast to 2050

Let's reduce the Food Losses and Waste ! Less is More!

- **Whereas the losses and waste account for 30% of everything that is produced for human consumption, 50% reduction in waste would solve 25% of the supply problem for 2050;**
- Agriculture accounts for 12-14% of greenhouse gas emissions, reaching 30% if we consider the whole chain of agribusiness and the conversion of new areas for production;
- The emissions produced by world's FLW corresponds to all gas emissions produced in the United States today;
- The annual consumption of clean water to produce what is wasted represent 230 km³ or equivalent to all the water that runs annually by the Volga River
- The area required for the production of what is lost or wasted is 1.4 billion ha or 30% of the arable land;
- The direct annual cost of FLW (excluding fishing) is \$ 750 billion (approx. 20% of Germany's GDP).

Committee on World Food Security



<http://www.fao.org/3/a-i3901e.pdf>

Definitions

Food Losses

Weight loss or nutritional value losses in primary products intended for human consumption.

Occurs in the initial phase of production (in the field), in transport or storage.

Is due to problems in the production process or any price changes

unintentional

Food Waste

Appropriate food for human consumption that is discarded.

Occurs during marketing, catering or household consumption.

Is due to poor planning or sales forecast (expiration date) or even the lack of consumer awareness

intentional ?!

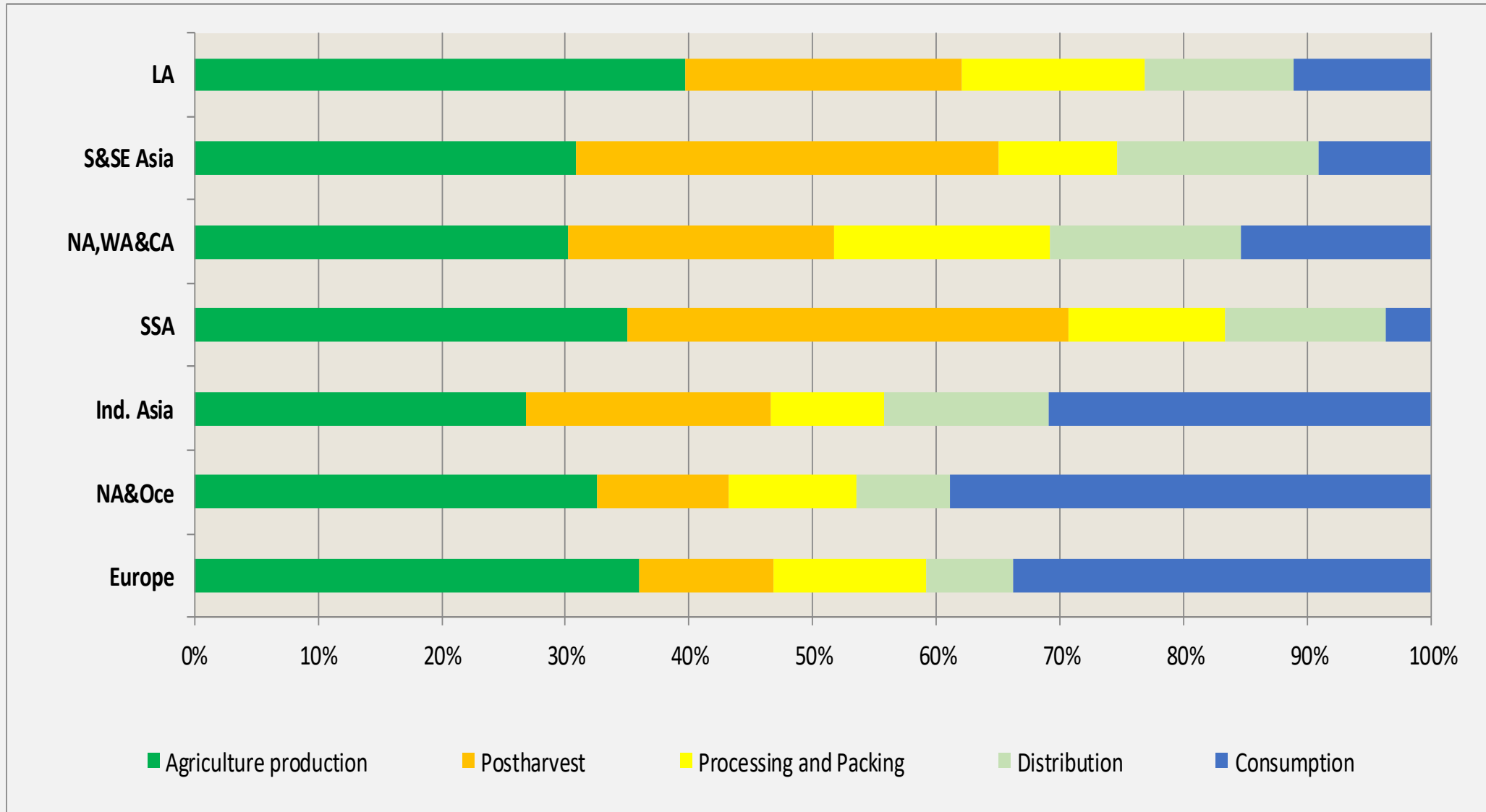
Methodological Problems

- Losses: “normal” versus “abnormal”;
- Year of data selection (mostly in 2009)
- Conversion from weight to energy
- Quality: Conversion loss of the product price to energy
- Edible parts ?

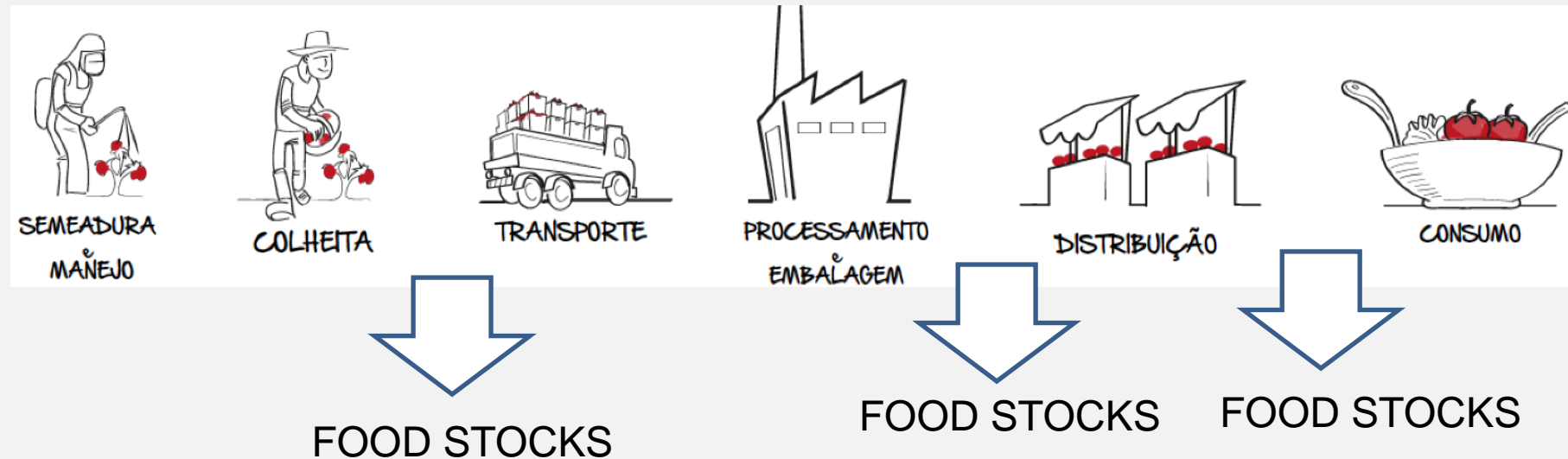
Researchers' Bias:

- Comparison of different production systems
- Different Food Crops
- Most references based on case studies
- Old literature
- Discard based on weight

FLW by Region and Value Chain Link



Traditional Approach on Food Supply Chain

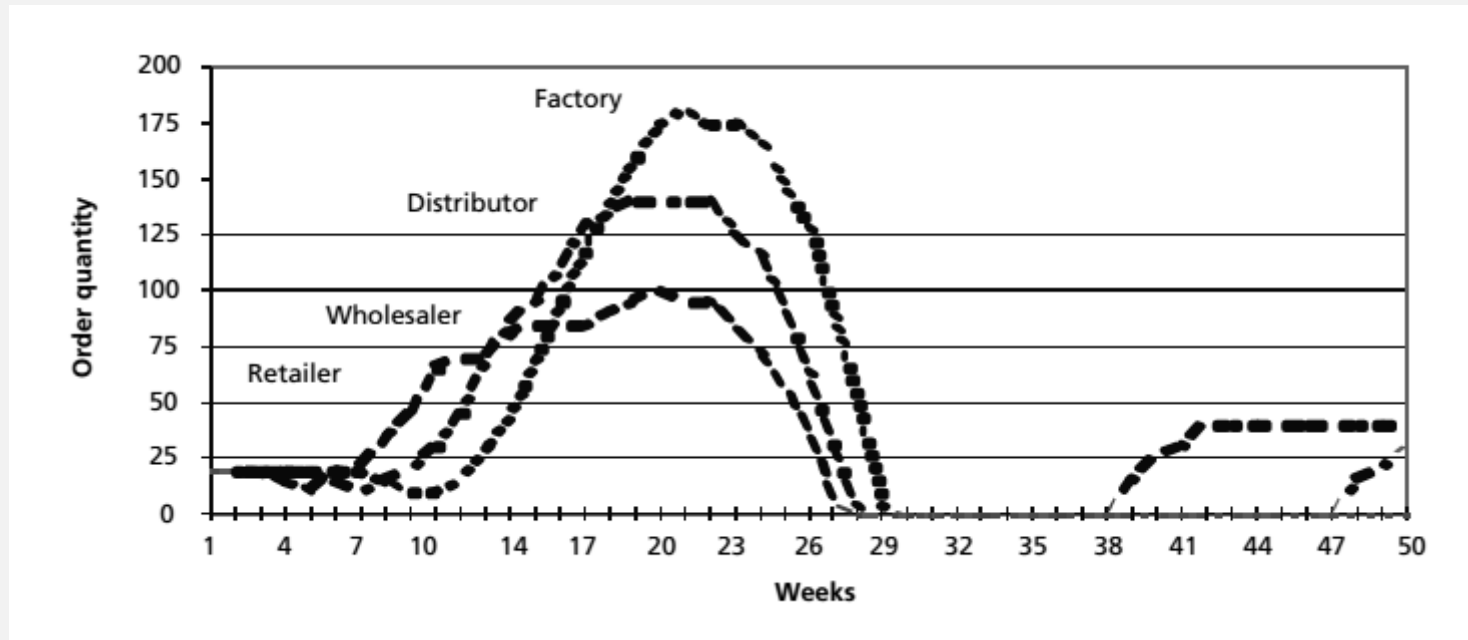


“Beer Distribution Game”

- Starts with small passing stocks
- Local information but no general consumption information
- Purchase orders cannot be canceled
- 2 weeks for processing an order + 2 weeks for delivery

“Beer Distribution Game”

Purchase Orders over 50 weeks



Results:

Oscillation and amplification of purchase orders, high inventories, high costs and losses

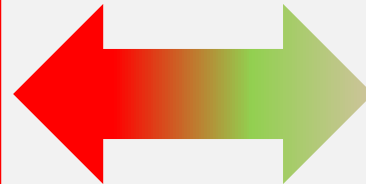
Inventory Decisions by Economic Agents

Inventory will be pushed to:

Previous links in the chain (Upstream)

When you have:

- High perishable products;
- Inaccurate information on demand;
- Demand for specialties.



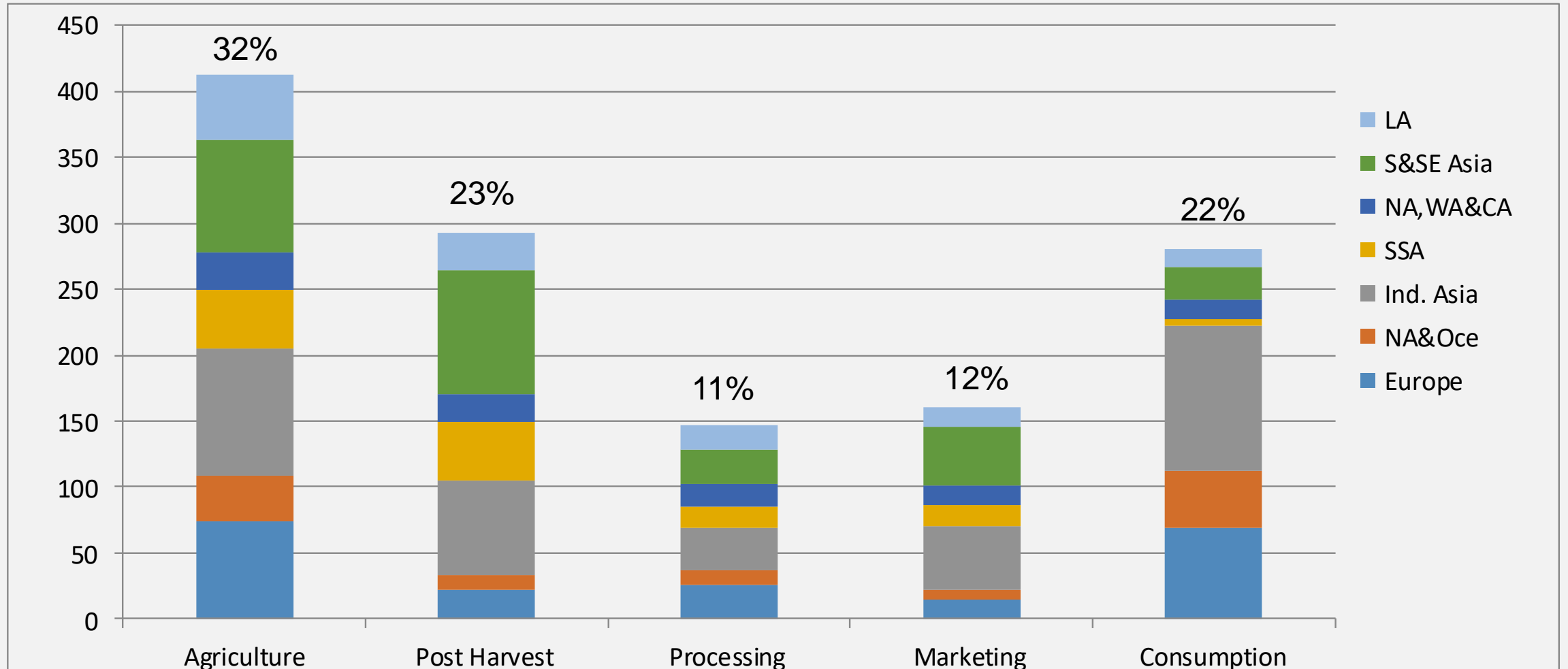
Back links in the chain (Downstream)

When you have:

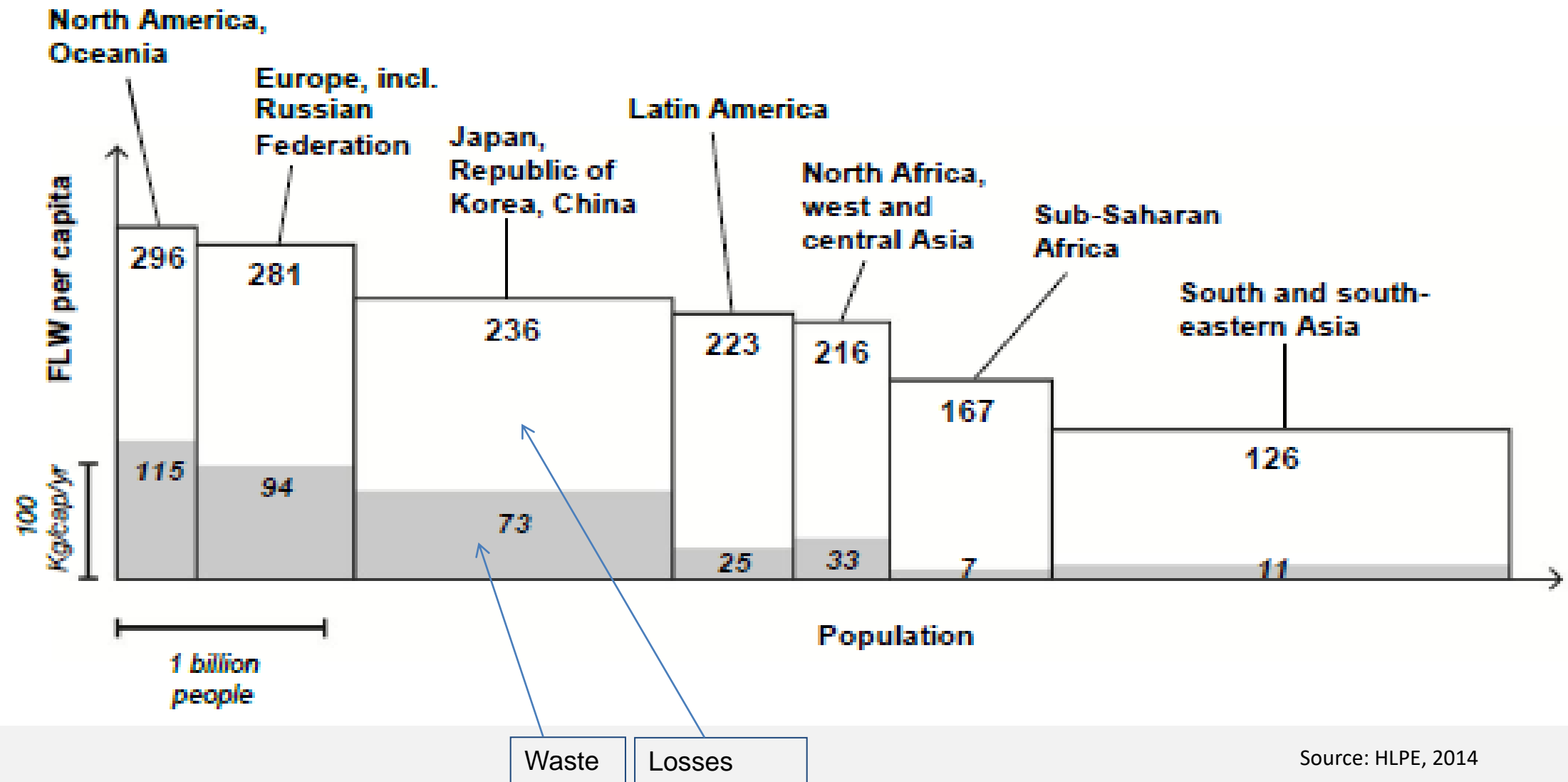
- Long-term productive process;
- Uncertainties in supply;
- Delays in purchasing decisions;
- Long transportation period.

FLW by Chain Link and Region

(millions of tons year)

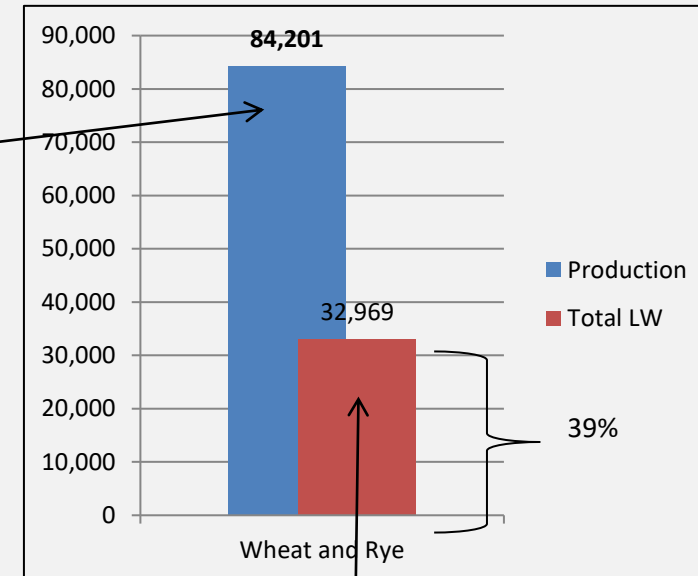
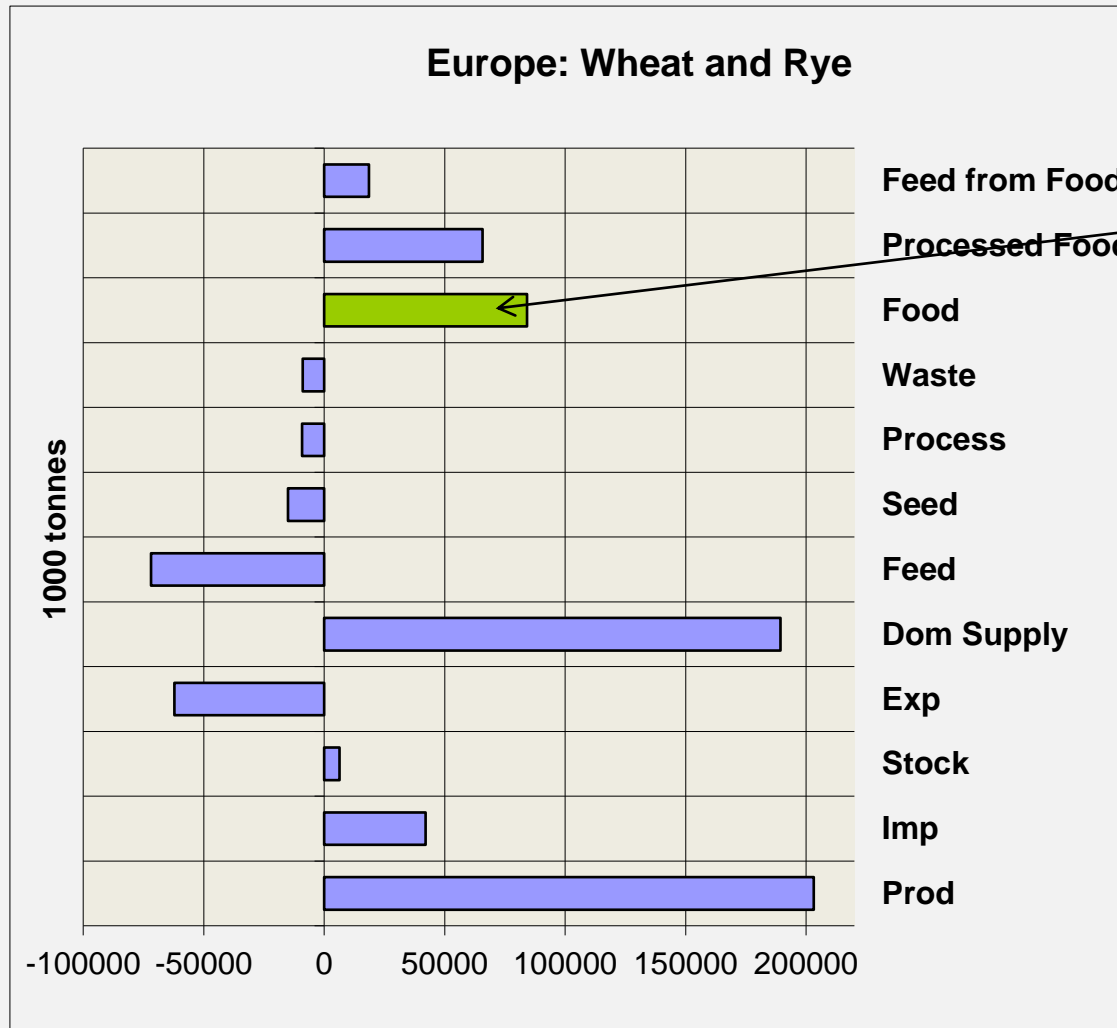


Comparing FLW



Source: HLPE, 2014

Europe: Losses and Waste in the Wheat and Rye Value Chains

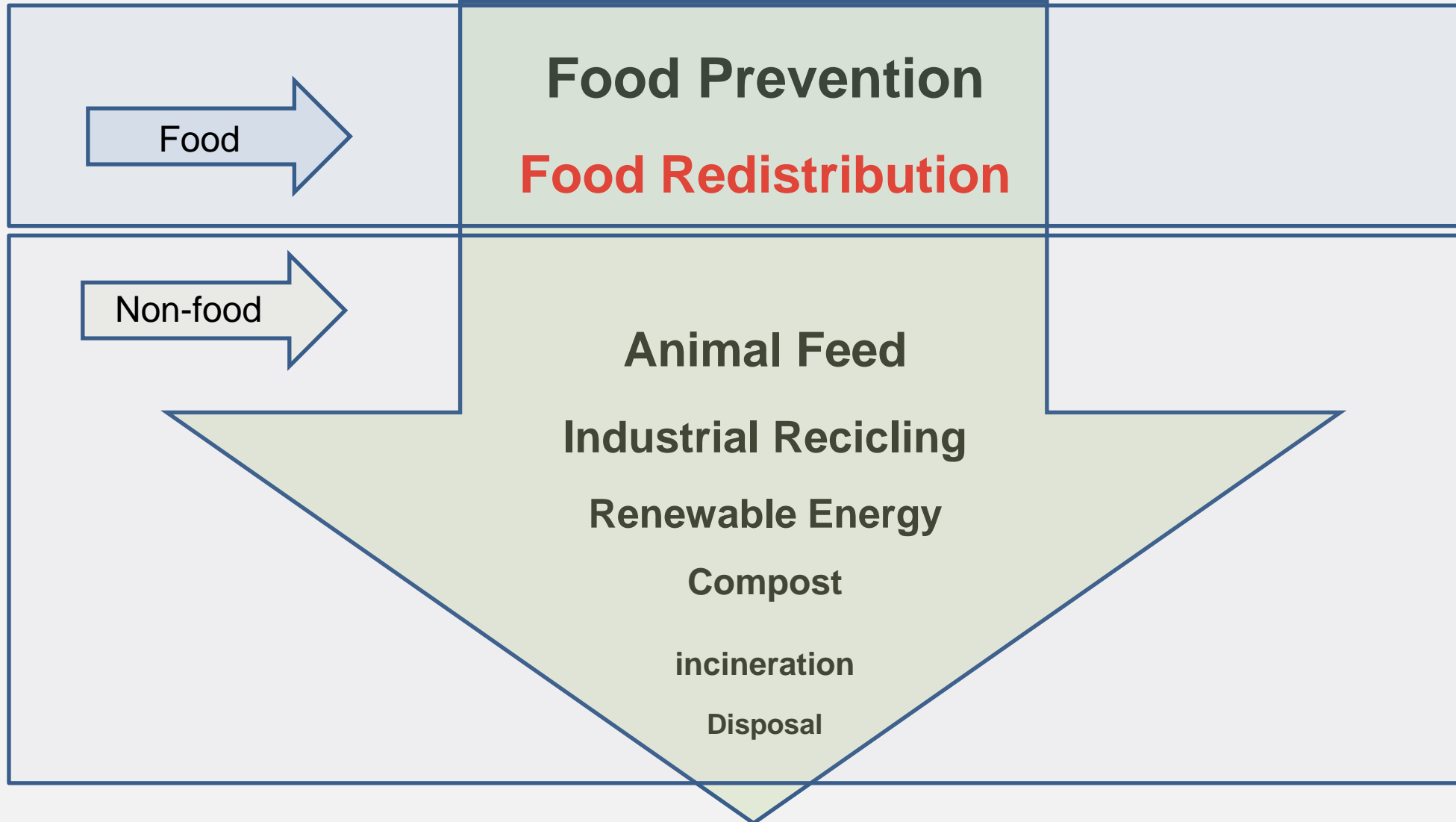


Posharvest	7.329
Milling	421
Industry	7.450
Distribution	1.341
Consumption	16.428

Source: SIK Food Balance Sheets
(Swedish Institute for Food and Biotechnology (SIK))

How to reduce FLW?

A Sustainable Way to Reduce FLW



Food Security & Global FLW

There are linkages between people in need and abundance of food, but no direct and simple solutions



Campaigns against FLW

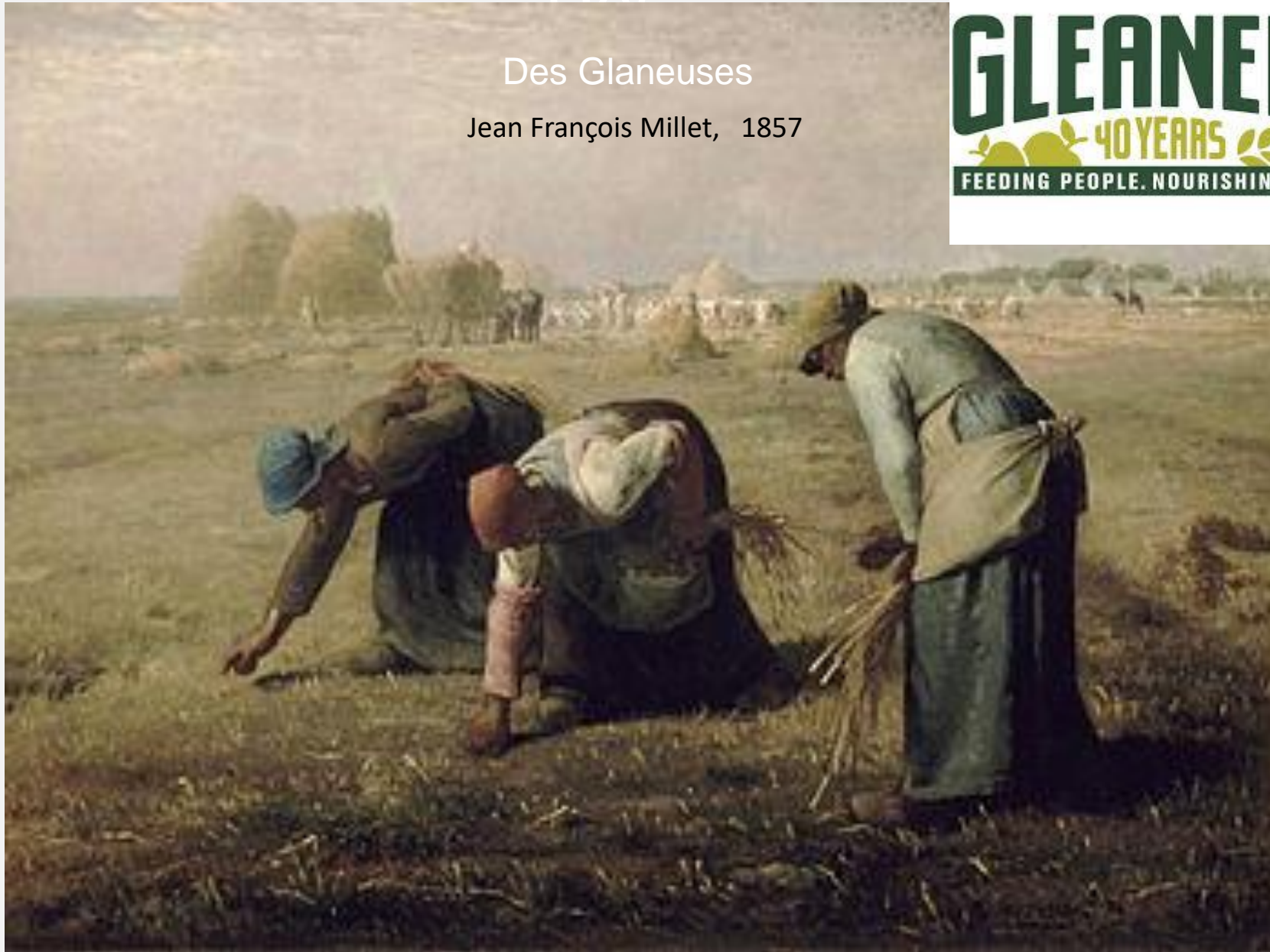


**HEALTHY PEOPLE
DEPEND ON HEALTHY
FOOD SYSTEMS**
Sustainable Food Systems for Food Security and Nutrition
World Food Day • 16 October 2013



Des Glaneuses

Jean François Millet, 1857



See also: Agnes Varda (2000) Le Gleneur et la Glaneuse
vimeo.com/37089032

Conclusions

- Considering the mean values and the methodological shortcomings of the research we don't know exactly how much are the FLW;
- The collection of food wasted is the best alternative to fight FLW in the short term and is one that does not interfere in the economic system.
- Approaching the productivity gains in different environments (resistant varieties to hydro deficiency) is the more immediate task that might increase productivity itself;
- Rural Technical Assistance, Food Technology and Nutrition, Consumer's Education will reduce FLW and improve the utilization of the food that was lost and wasted before.
- Governments and public authorities can induce these changes by altering relative prices through taxation or subsidy policies of products, financing of new technologies and capacity building.

Thanks