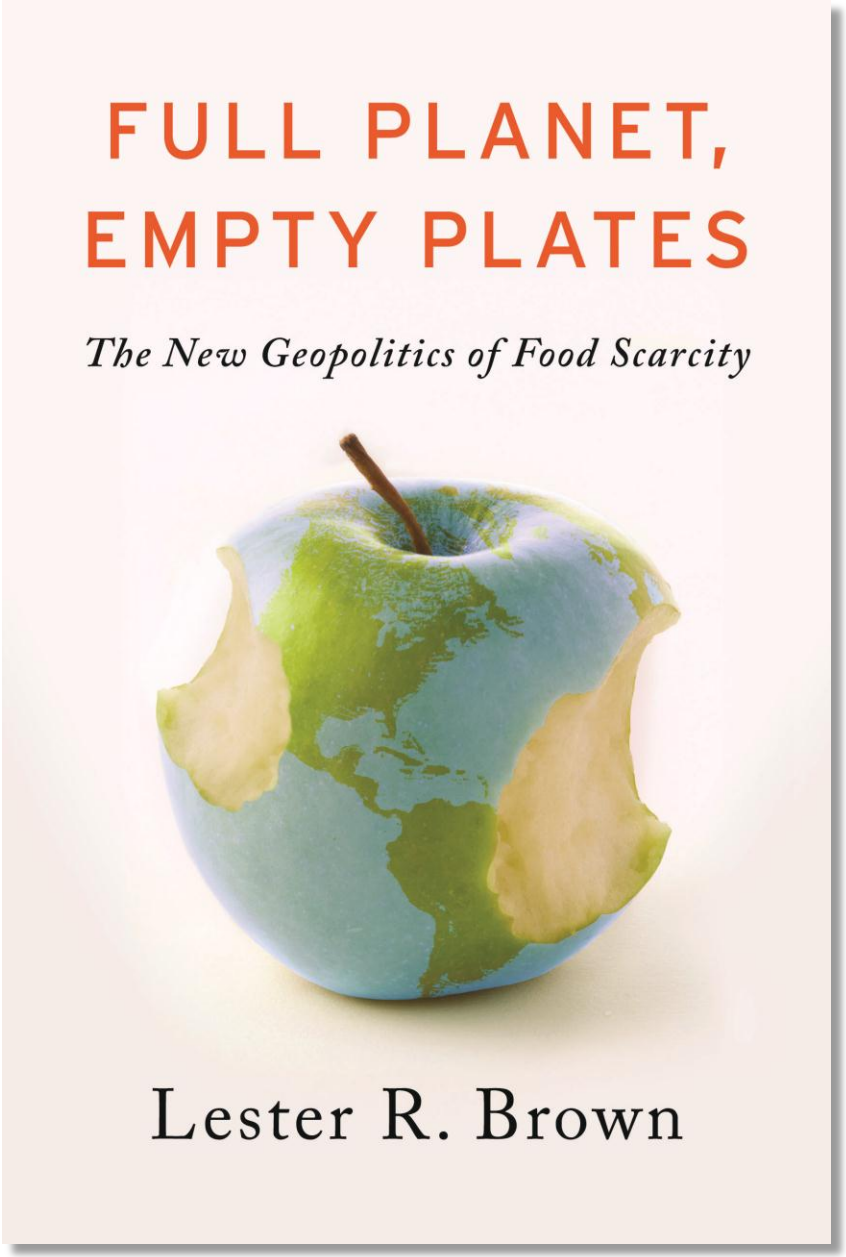
An overview presentation for

Full Planet, Empty Plates:
The New Geopolitics of Food Scarcity

A book by

Lester R. Brown

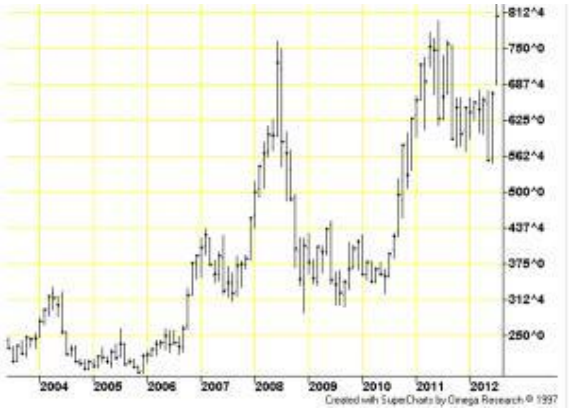
EARTH POLICY INSTITUTE



An Era of Rising Food Prices

- 2007-08: Grain and soybean prices more than doubled, leading to food riots and unrest in some 60 countries
- Prices eased somewhat with global recession
- 2010-11: Another price spike helped fuel the Arab Spring
- 2012: Prices again approaching or setting records

Corn Futures Prices

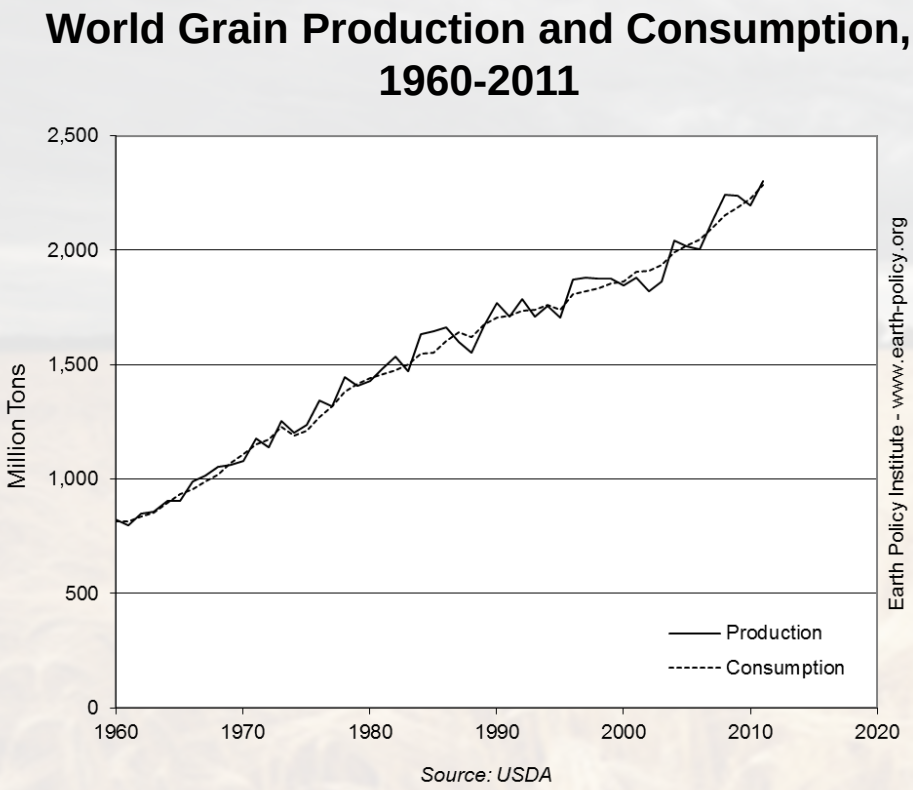


Wheat Futures Prices

Soybean Futures Prices

Source: CME Group

Precarious Global Food Situation



- Dangerously small margin between grain consumption and grain production
- Now we face long-term trends that:
  - increase food demand
  - limit food production

We are only one poor harvest away from chaos in world grain markets.

Photo Credit: iStockPhoto / Tobias Helbig

Demand Growing, Supply Strained

Demand Side

- Growing population
- People moving up the food chain
- Biofuels turning food into fuel

Supply Side

- Eroding soils
- Depleting aquifers
- Plateauing grain yields
- Rising temperature

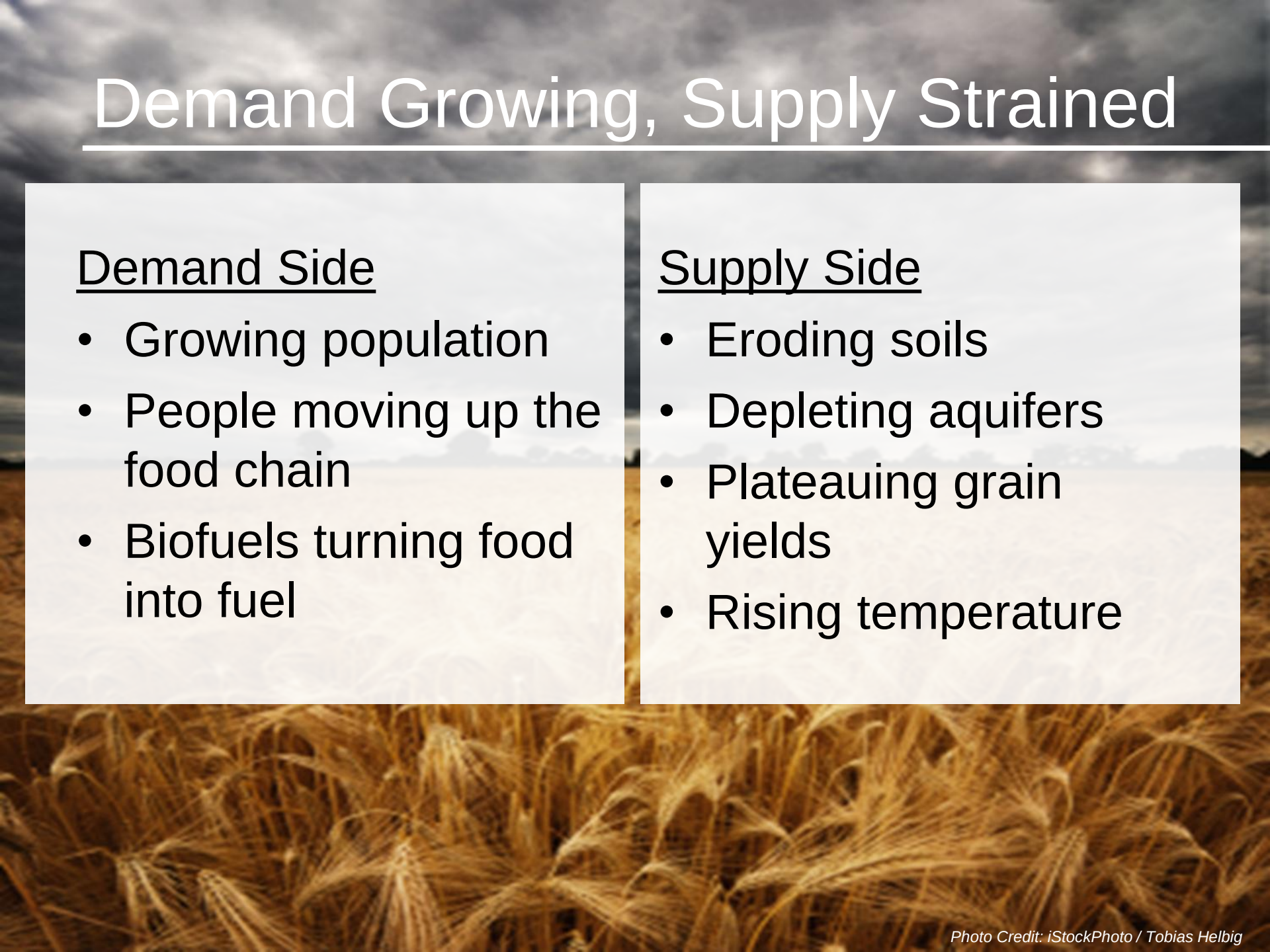
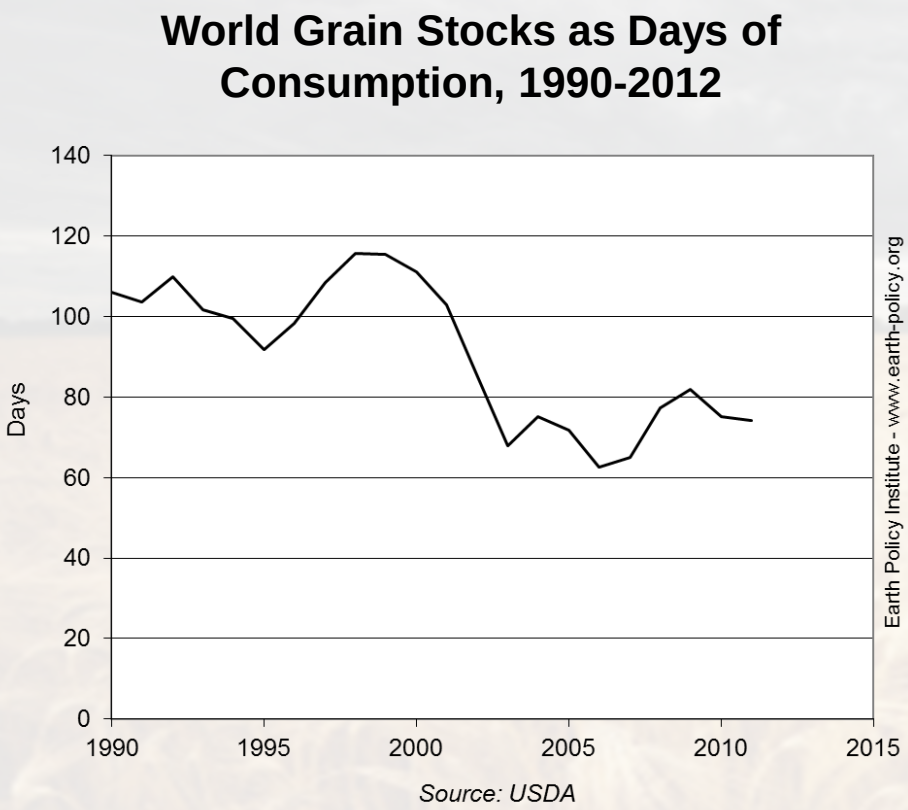


Photo Credit: iStockPhoto / Tobias Helbig

From Surplus to Scarcity

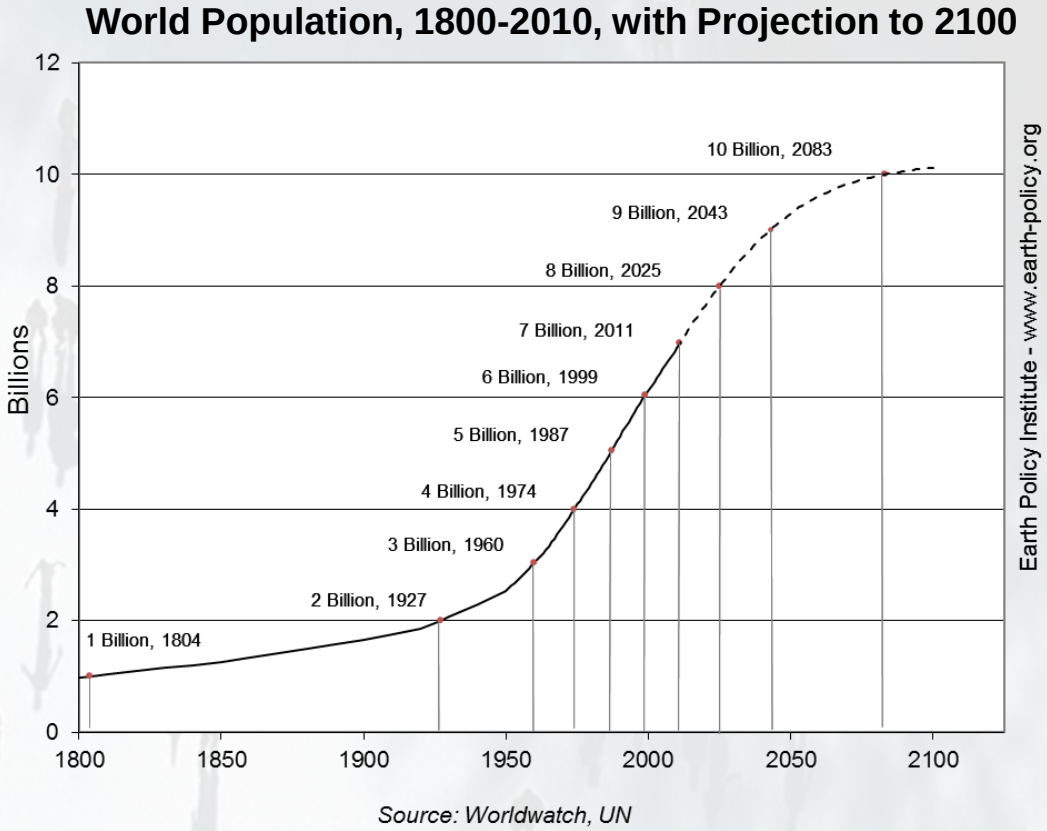


- In the past, world had two safety cushions in case of harvest shortfall:
  - idled U.S. cropland
  - large stocks of grain
- Now, we have lost those two safety cushions
  - U.S. abandoned cropland set aside programs
  - grain stocks have fallen dangerously low

Photo Credit: iStockPhoto / Tobias Helbig

Population Pressures

- 7 billion people on the planet
- Each year, nearly 80 million people added
- Some 215 million women who want to plan their families lack access to family planning services
- Large families trap people in poverty



We are fast outgrowing the earth's capacity to sustain our increasing numbers.

Photo Credit: Yann Arthus-Bertrand

System Overload

- ***Overfishing*:** 80% of oceanic fisheries are being fished at or beyond their sustainable yield
- ***Overgrazing***: The global grazing livestock population grew by 1.2 billion animals since 1960
- ***Overcutting***: The world's forests lose a net 5.6 million hectares—an area the size of Costa Rica—each year
- ***Overplowing***: In parts of Africa, Asia, and the Middle East, productive cropland is turning into wasteland
- ***Overpumping***: Half the world's population lives in countries that are extracting groundwater from aquifers faster than it is replenished

Photo Credit: USDA/ Stephen Ausmus; Yann Arthus-Bertrand

More Meat, More Feed

- World meat demand grew fivefold since 1950
- As incomes rise, some 3 billion people in the developing world desire to eat more meat, milk, and eggs
- This requires more grain and soybeans for animal feed

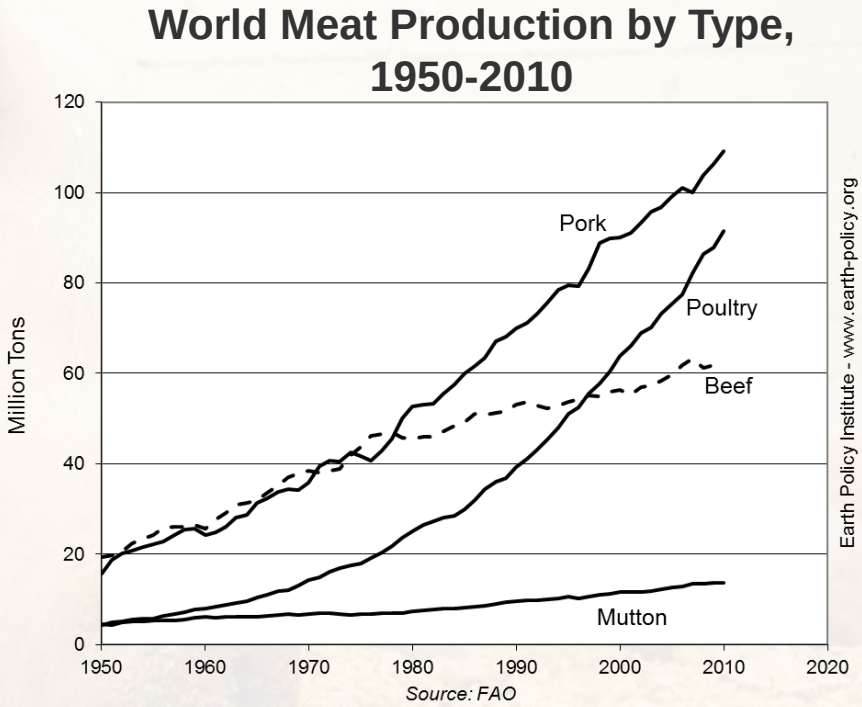
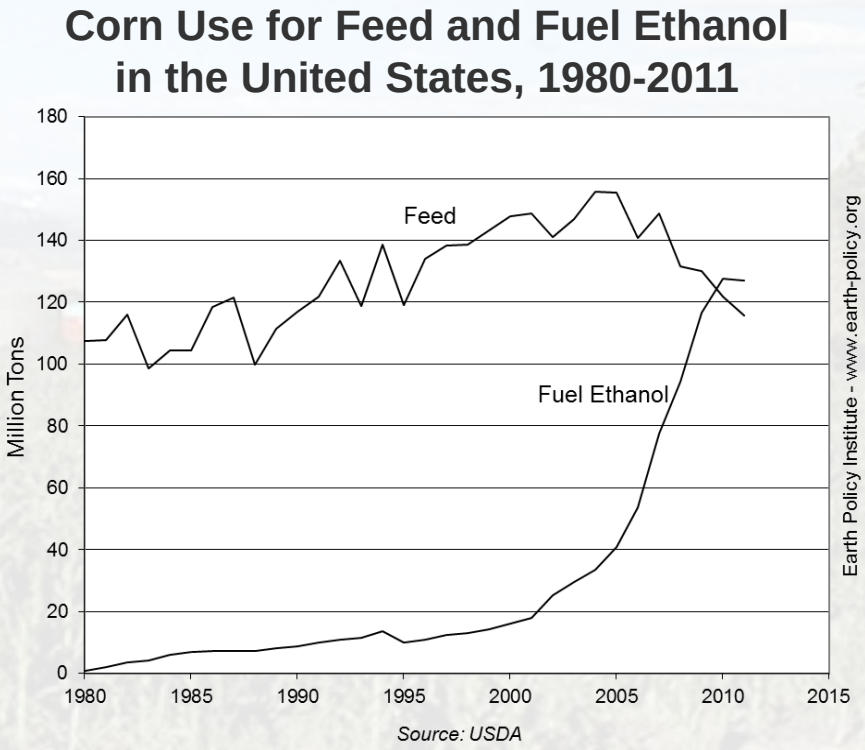


Photo Credit: USDA / Keith Weller

Feeding Cars Instead of People

- U.S. corn is largest crop of any grain worldwide, critical to world supplies
- Close to 1/3 of U.S. grain now going to ethanol
- Grain used to fuel U.S. cars in 2011 could otherwise have fed 400 million people
- U.S. ethanol euphoria beginning in 2005 helped raise food prices worldwide



The grain needed to fill an SUV's 25-gallon tank with ethanol once could feed one person for a year.

Photo Credit: USDA / Scott Bauer

Worsening Soil Erosion

- Overplowing, overgrazing, and deforestation make soil vulnerable to wind and water erosion
- Roughly 1/3 of the world's cropland is now losing topsoil faster than it can be re-formed
- Topsoil loss reduces productivity, eventually leading farmers and herders to abandon their land
- Countries such as Lesotho, Haiti, Mongolia, and North Korea are losing the ability to feed themselves

Photo Credit: iStockPhoto / Steven Allan

Dust Bowls Today

- Now overgrazing in northwestern China and western Mongolia is leading to the merging of deserts and the formation of dust storms that sweep across the continent, sometimes even as far as North America

- Population and livestock pressure in the African Sahel has destroyed soils; dust storms carrying 2–3 billion tons of soil leave Africa each year

These two newer dust bowls dwarf anything the world has seen before. We have yet to see their full effects.

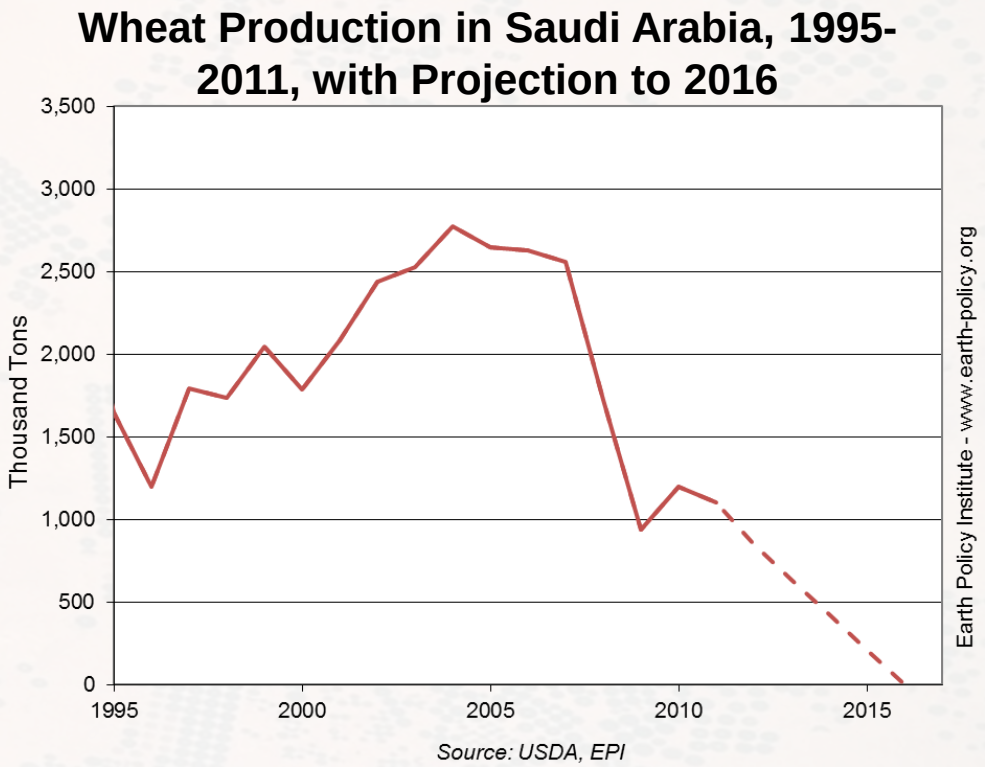
Photo Credit: NASA Earth Observatory

Coming Water Shortages

- Overpumping produces food bubbles that burst when water supplies dry up
- 175 million people in India and 130 million people in China eat grain produced by overpumping
- In the Arab Middle East, a collision between population growth and water supply is reducing regional grain harvests

Saudi Arabia's Bursting Bubble

- Saudi Arabia became self-sufficient in wheat by tapping its non-replenishable aquifer to irrigate the desert
- In early 2008, the government announced the aquifer was largely depleted
- The population of nearly 30 million will be entirely dependent on imported grain by 2016

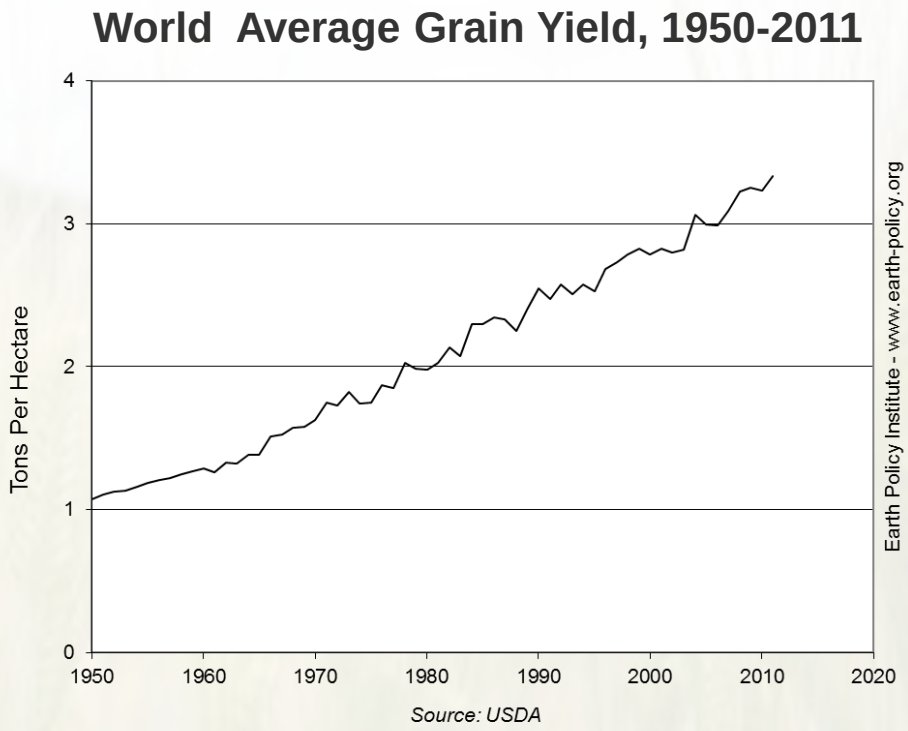


Saudi Arabia is the first country to publicly project how aquifer depletion will shrink its grain harvest.

Photo Credit: NASA

Growth in Grain Yields Slowing

- World average grain yield has tripled since 1950
- But the pace of growth is slowing
  - 1950-1990: It grew 2.2% per year
  - 1990-2011: It grew 1.3% per year



In some of the more agriculturally advanced countries, the increase in grain yields has come to an end.

Photo Credit: iStockPhoto / Simon Oxley

Where Else Will Grain Yields Stall?

- Wheat yields in France, Germany, and the United Kingdom have not increased in more than a decade
- Japan's rice yields have plateaued; China's may be leveling off as well
- With rising temperatures, farmers everywhere face new climate constraints even as they approach biological limits

Thus far, rice or wheat yields have plateaued only in medium-sized countries. What happens when grain yields plateau in some of the larger ones?

Photo Credit: iStockPhoto / Dave Hughes

Higher Temperatures, Lower Yields

- The massive burning of fossil fuels is increasing the level of carbon dioxide (CO_2) in the atmosphere, raising the earth's temperature and disrupting climate
- The Intergovernmental Panel on Climate Change projects earth's average temperature will rise up to 6.4°C (11.5°F) during this century
- Current trajectory is already outpacing projections
- For every 1°C rise in temperature above the optimum during the growing season, yields of wheat, rice, and corn can be expected to drop 10%

Photo Credit: iStockPhoto / dra_schwartz

No More "Normal"

- In the past, extreme weather events were anomalies and farmers could expect a return to normal conditions by the next harvest
- But with rising temperatures and changing climate, there is no normal to return to
- The 11,000 year period of relative climate stability in which agriculture developed is over
- Increasing world grain stocks to ~110 days of consumption is one way to create a buffer against extreme weather

With each passing year, the agricultural system is becoming more out of sync with the climate system.

Photo Credit: USDA/Jack Dykinga

Soybeans Rise to Prominence

- Soybeans originated in China 3,000 years ago
- Since 1930, soybean meal has been mixed into livestock feed as a source of high-quality protein
- Today, the United States, Brazil, and Argentina combined account for over four fifths of the total world production of nearly 250 million tons

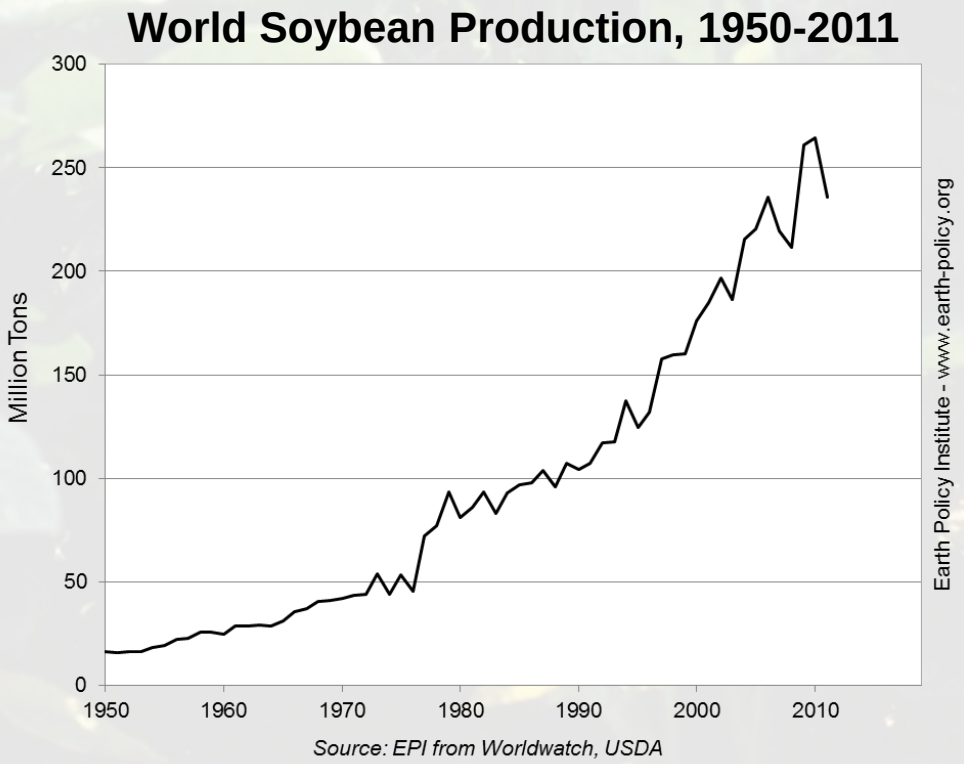
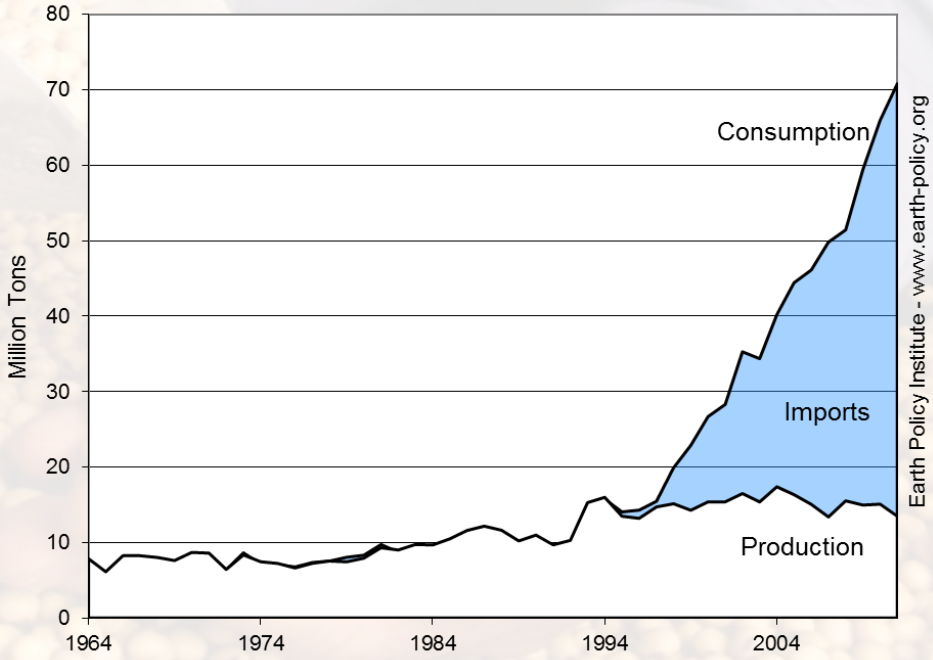


Photo Credit: USDA/ Scott Bauer

China Dominates Demand

- In 2008, China surpassed the United States as the leading soybean consumer
- 500 million pigs – half the world total – live in China, eating soybean meal mixed with grain
- China currently imports 60% of all soybeans traded internationally

Soybean Production, Consumption, and Imports in China, 1964-2011



Source: USDA

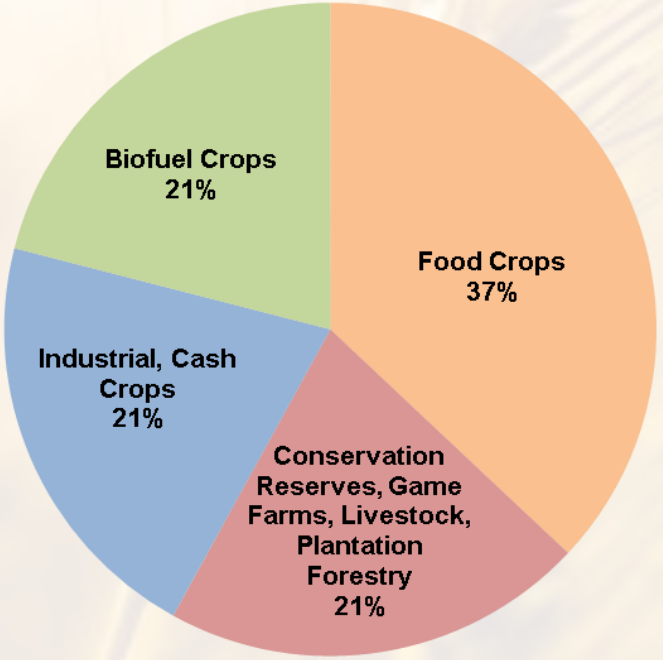
As China and other developing countries continue to move up the food chain, this demand will only increase.

Photo Credit: USDA/ Keith Weller

New Geopolitics of Food Scarcity

- Doubling of grain, soybean prices in 2007-08 revealed a new geopolitics of food—every country for itself:
  - Russia, Thailand, other grain exporting countries restricted or banned exports
  - Some importers turned to buying or leasing tracts of land in other countries on which to grow food
  - These land acquisitions, often called “land grabs,” multiplied quickly

Large-scale Land Acquisitions by Project Type, October 2008 – August 2009



Total Projects: 405

Source: GRAIN data compiled by Deininger and Byerlee (2011)

Photo Credit: iStockPhoto / Pawel Gaul

Ethiopia as Microcosm

- Farmers, indigenous people often find out about deals only as they are forced from their land
  - By early 2012, more than 1 million Ethiopians forcibly relocated by their government
- Informal land rights make it difficult for people to protest
- Projects using highly-mechanized, industrial agriculture; few jobs for local people
- Food produced most often shipped to investor's home country, contributing nothing to the local food supply
- Land grabs for agriculture are also necessarily water grabs

Photo Credit: iStockPhoto / BanksPhotos

Toward a More Stable Food System

Demand Side

- Stabilize population
- Eradicate poverty
- Reduce excessive meat consumption
- Eliminate biofuels mandates

Supply Side

- Conserve soil
- Increase water productivity
- Fill the yield gap
- Stabilize climate

If we tackle both sides of the food equation, we can rebuild world grain stocks, improving food security.

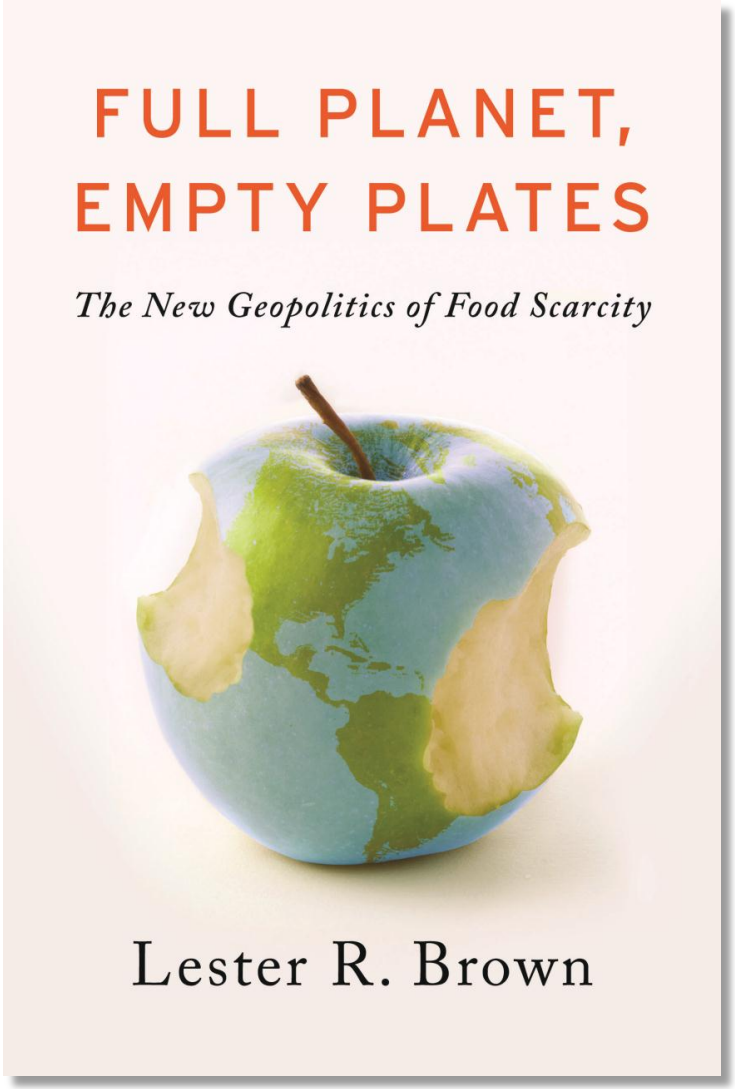
Photo Credit: iStockPhoto / Niko Vujevic

Redefining Security

- Historically, security has been defined mostly in military terms
- But today climate volatility, emerging water shortages, spreading hunger, and failing states are the new threats to survival
- Food security is not just in the hands of agricultural departments
- The challenge is to reorder fiscal priorities to match these new dangers

Photo Credit: Yann Arthus-Bertrand

To learn more about the global food situation…



read *Full Planet, Empty Plates: The New Geopolitics of Food Scarcity* by Lester R. Brown. The book and supporting data sets are available at

www.earth-policy.org

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