

### **13. World Supply and Demand for Food: An Historical Perspective and Future Prospects**

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#### **Abstract/Summary**

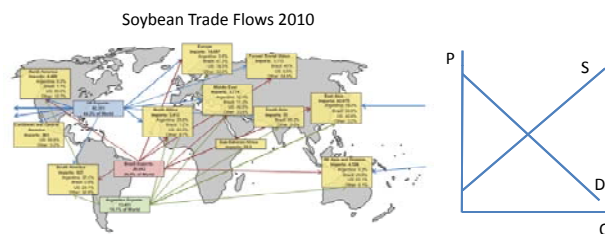
*Global agricultural productivity growth is slowing while the world population is likely to increase from 7 billion to 9 billion by 2050. Meanwhile, meat demand will continue increasing due to rapid economic growth in China and India. In this session, we will examine some of these major trends in world supply and demand for food. We will also place these future prospects in perspective by looking at world supply and demand from 1960-2000, a period where world population doubled from 3 billion to 6 billion and yet supply actually increased faster than demand. An understanding of these global trends in agricultural markets is an important perspective for producers and agribusiness leaders as they make long-run decisions.*

## World Supply and Demand for Food: An Historical Perspective and Future Prospects

Nathan P. Hendricks  
2013 Risk and Profit Conference

## Motivation

- Why think about world supply and demand?



- What will be the price of agricultural commodities in 15-30 years?

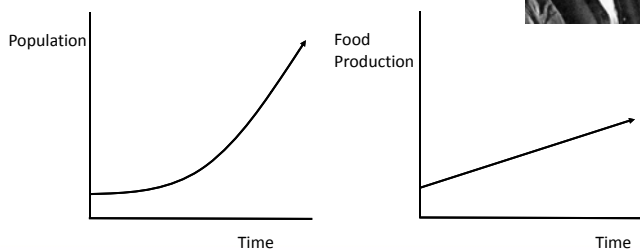
## Motivation

- Bad question: "Can we feed the world by 2050?"
- Better question: "What will be the price of food in 2050 and will everybody be able to afford it?"

## HISTORICAL PERSPECTIVE

## Thomas Malthus (1798)

- Predicted population growth would exceed ability of land to produce



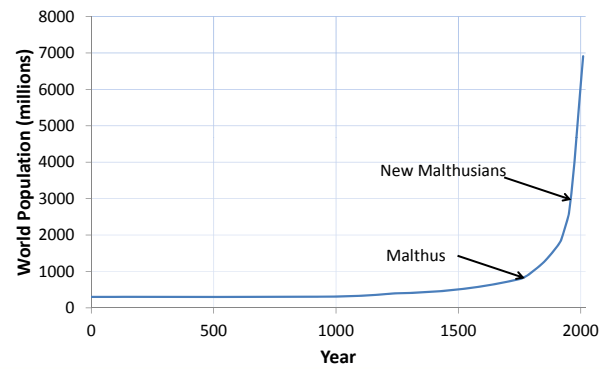
## Renewed Malthusian Fears

- Late 1960s early 1970s
- Proposals for population control
- Calls to not give food aid
- Predictions of massive famines

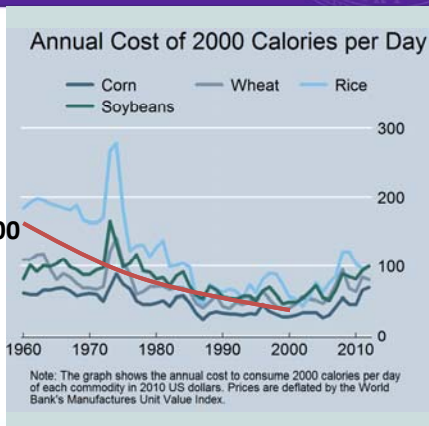


# What happened?

## Population (0-2010)



Trend  
1960-2000



# Why were Malthusians wrong?

## The Green Revolution

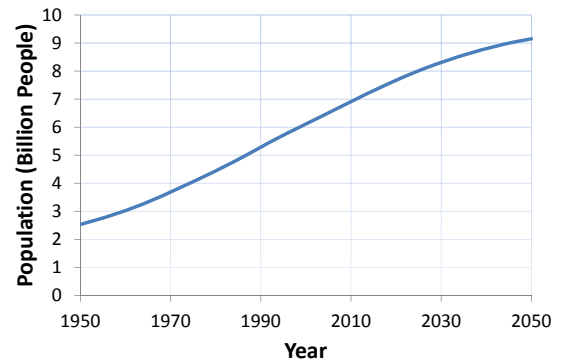
- High-yielding varieties of rice and wheat introduced in Asia and Latin America
- Ex. India



## FUTURE PROSPECTS

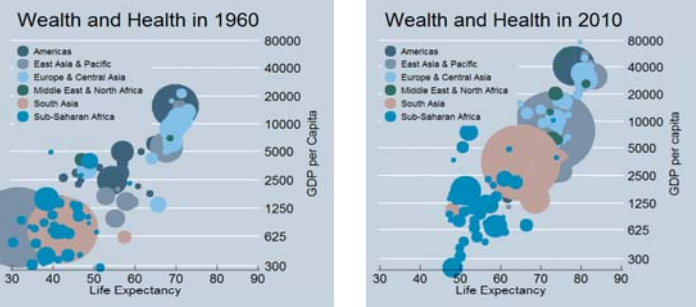
# Demand

## Population of the World (1950-2050)



## Population

- 1960-2000: 3 billion to 6 billion
- 2011-2050: 7 billion to 9.5 billion
- Population growth is slowing, but still a large increase is expected

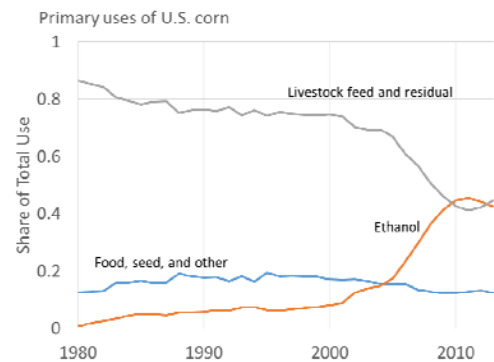


Source: World Bank and Penn World Table

## Incomes

- Incomes are converging
- Asia is increasing meat consumption -> substantial increase in demand for grain

## Biofuels?



Source: USDA, Economic Research Service

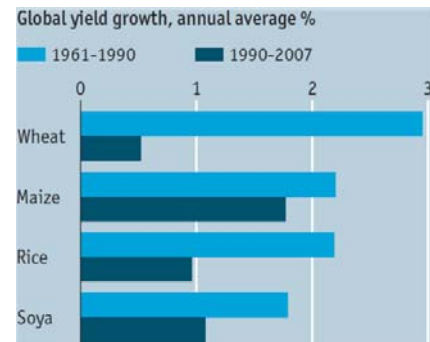
Demand Expected to Increase **70% by 2050**

Supply

Worrying Signs about Productivity

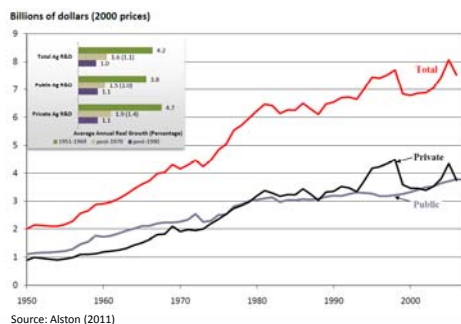
1. Growth of **yields** are slowing
2. Growth in **R&D expenditures** are slowing

Yield Growth is Slowing



Source: *The Economist*

Growth in R&D Expenditures is slowing  
Agricultural R&D Expenditures, 1950-2007

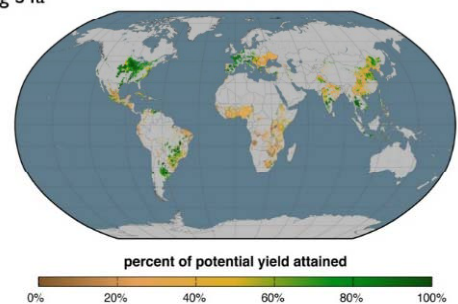


Source: Alston (2011)

The "Yield Gap"

Fig S4a

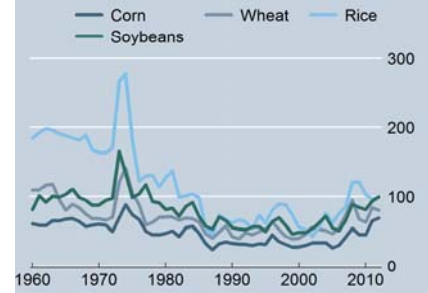
maize yield attainment



Source: Foley, J.A. et al. 2011. "Solutions for a Cultivated Planet." *Nature*

## RECENTLY HIGH PRICES IN PERSPECTIVE

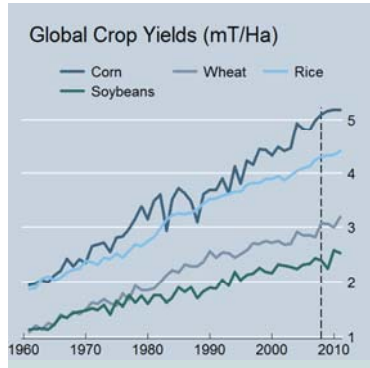
Annual Cost of 2000 Calories per Day



Note: The graph shows the annual cost to consume 2000 calories per day of each commodity in 2010 US dollars. Prices are deflated by the World Bank's Manufactures Unit Value Index.

## What was the main cause?

- Weather



## What was the main cause?

- Weather
- Consumption in China and India
- Index funds creating a bubble

No strong evidence to suggest these were major causes

- Biofuels?

Role of biofuels widely debated

## Often Overlooked Factors

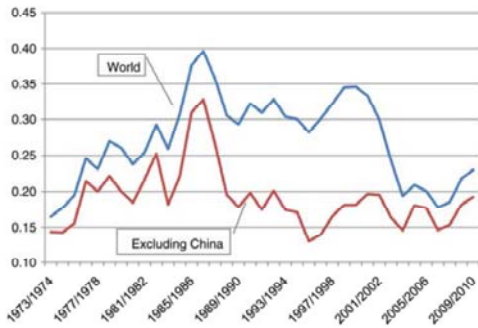
1. Lack of grain in **storage**
2. Changes in **trade barriers**

## Storage

- Shock absorbers of the market
- Traders sell-off stocks if prices are high
- Stocks have been very low since 2007



## Ending Stocks to Use Ratio of Calories from the Major Grains



Source: Wright (2011)

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## Changes in Trade Barriers

- In response to rising food prices
  - Food-exporting countries imposed export restrictions
  - Food-importing countries reduced import tariffs
- Primarily developing countries
  - India banned rice and wheat exports
  - Russia 40% export tax on wheat



Source: Anderson and Nelgen (2012)

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## Conclusion

- Strong demand growth to 2050
- Concerns that supply growth is slowing
- Lots of uncertainty
- Current market movements may not reflect long-run prospects

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