

GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN



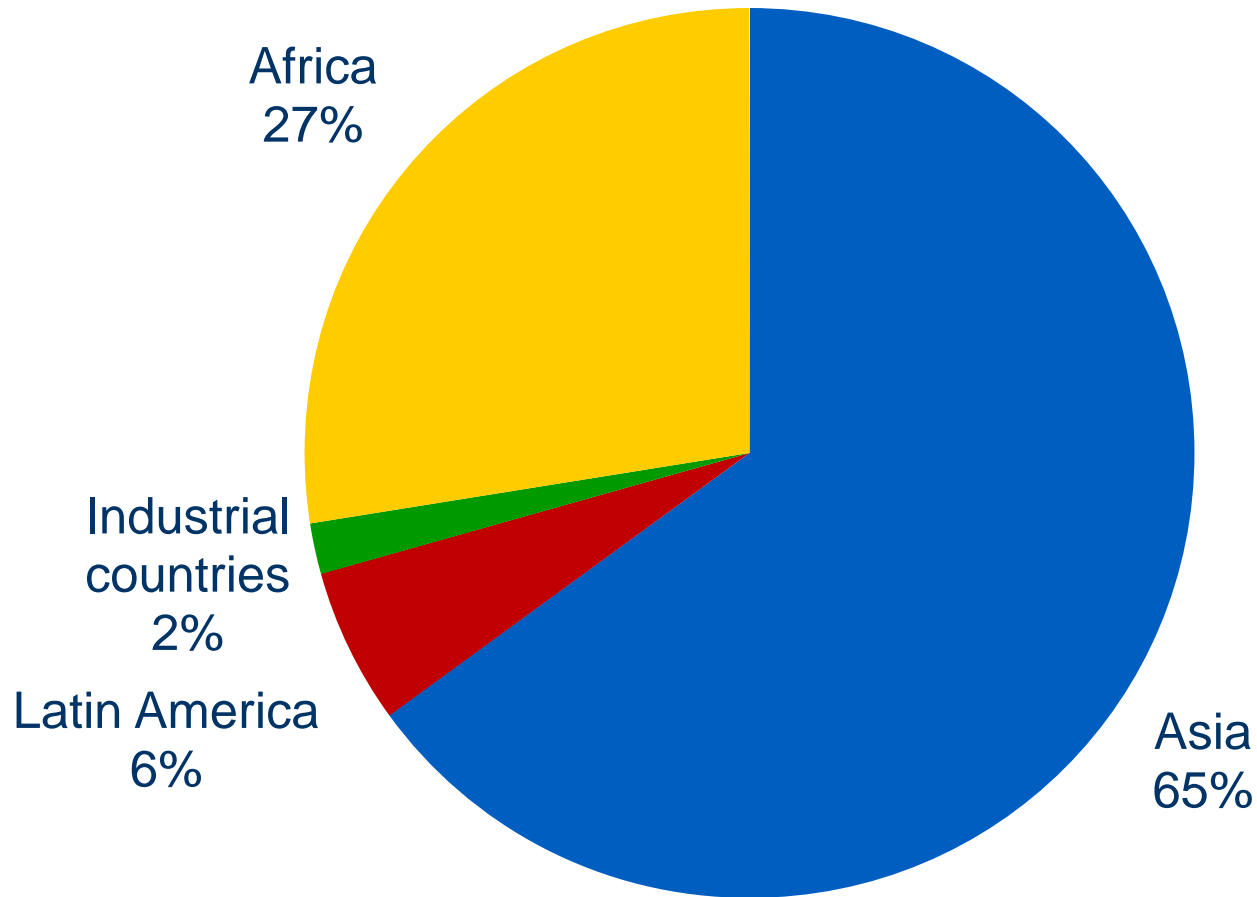
Global food security and natural resource scarcities: what are sustainable strategies?

Matin Qaim

Dept. of Agricultural Economics and Rural Development

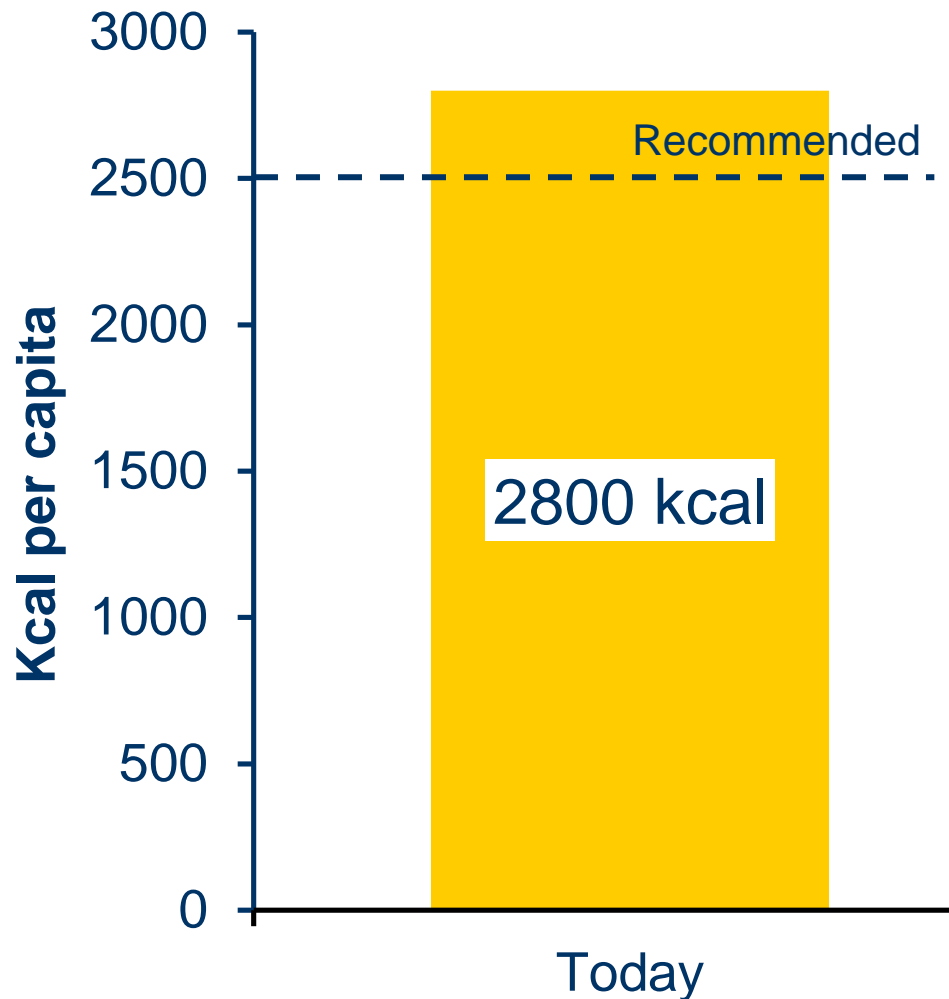
Draft presentation for Winter School of Volkswagen Foundation
“Limits to Growth Revisited”, November 2012

870 m people are undernourished



Source: FAO (2012).

Hunger is a distribution problem

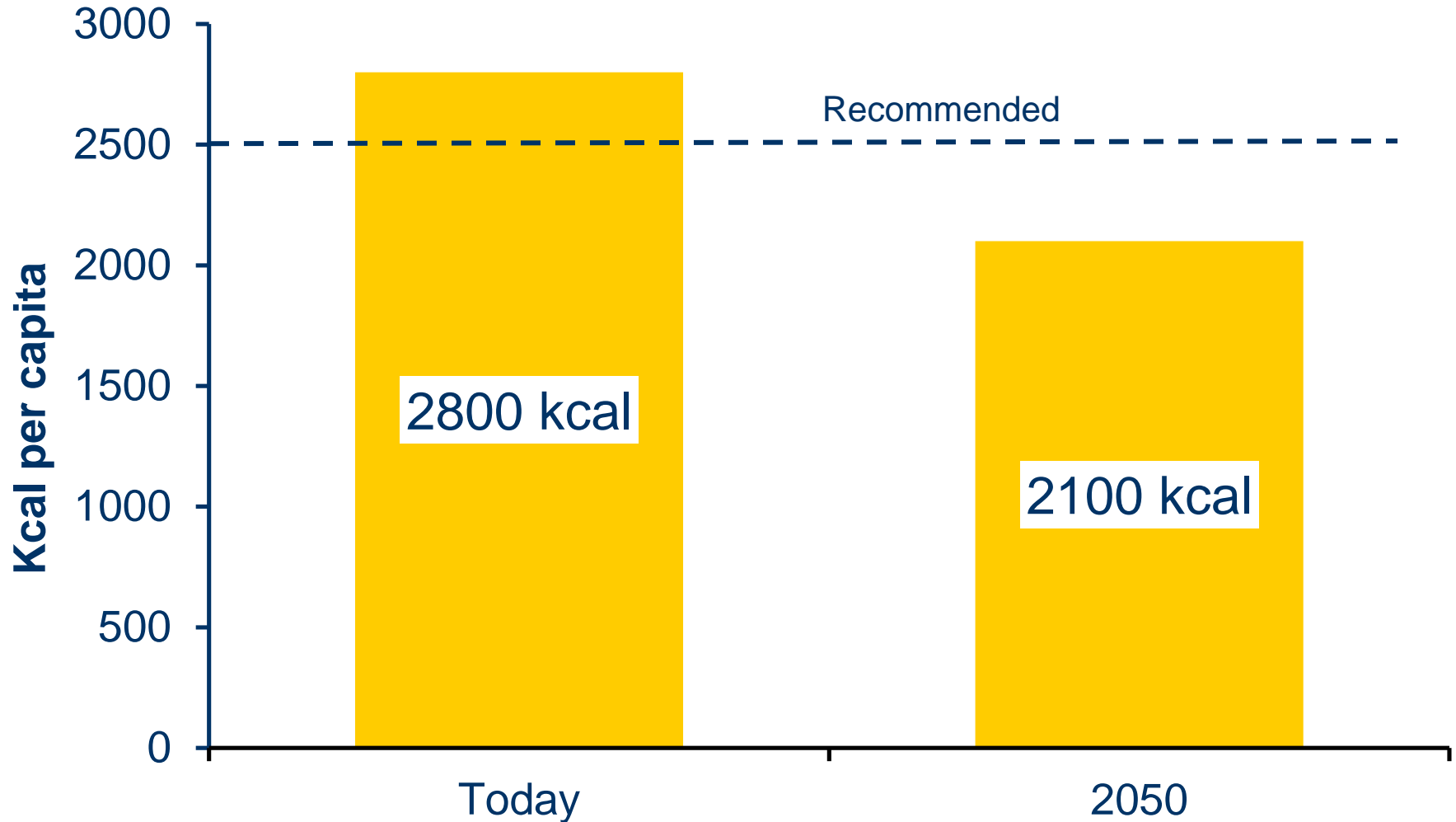


About 1 billion are overnourished worldwide.

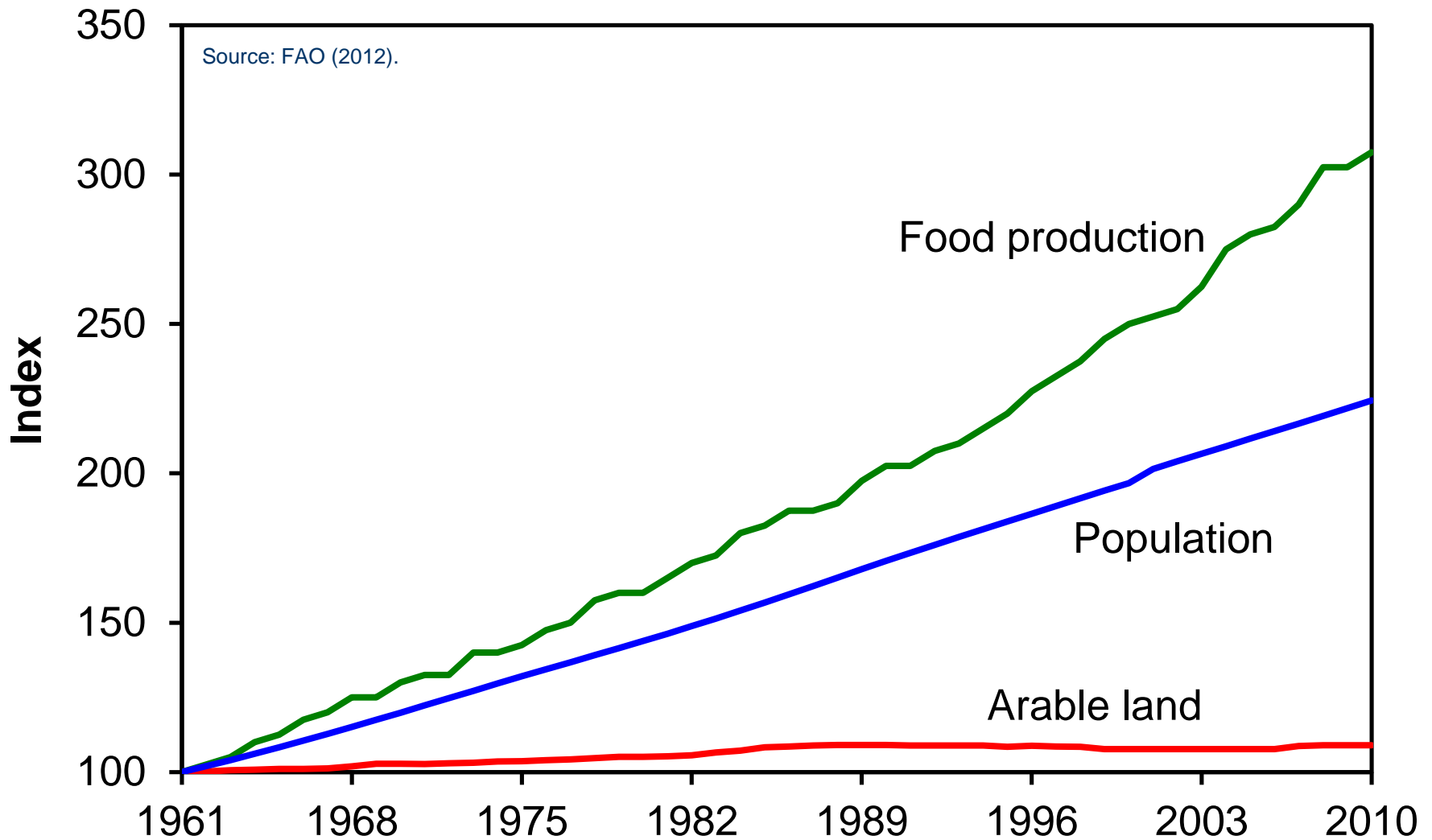
Measures to reduce poverty:

- Economic growth
- Education
- Infrastructure
- Social security
- Good governance
- Avoid strong food price increases

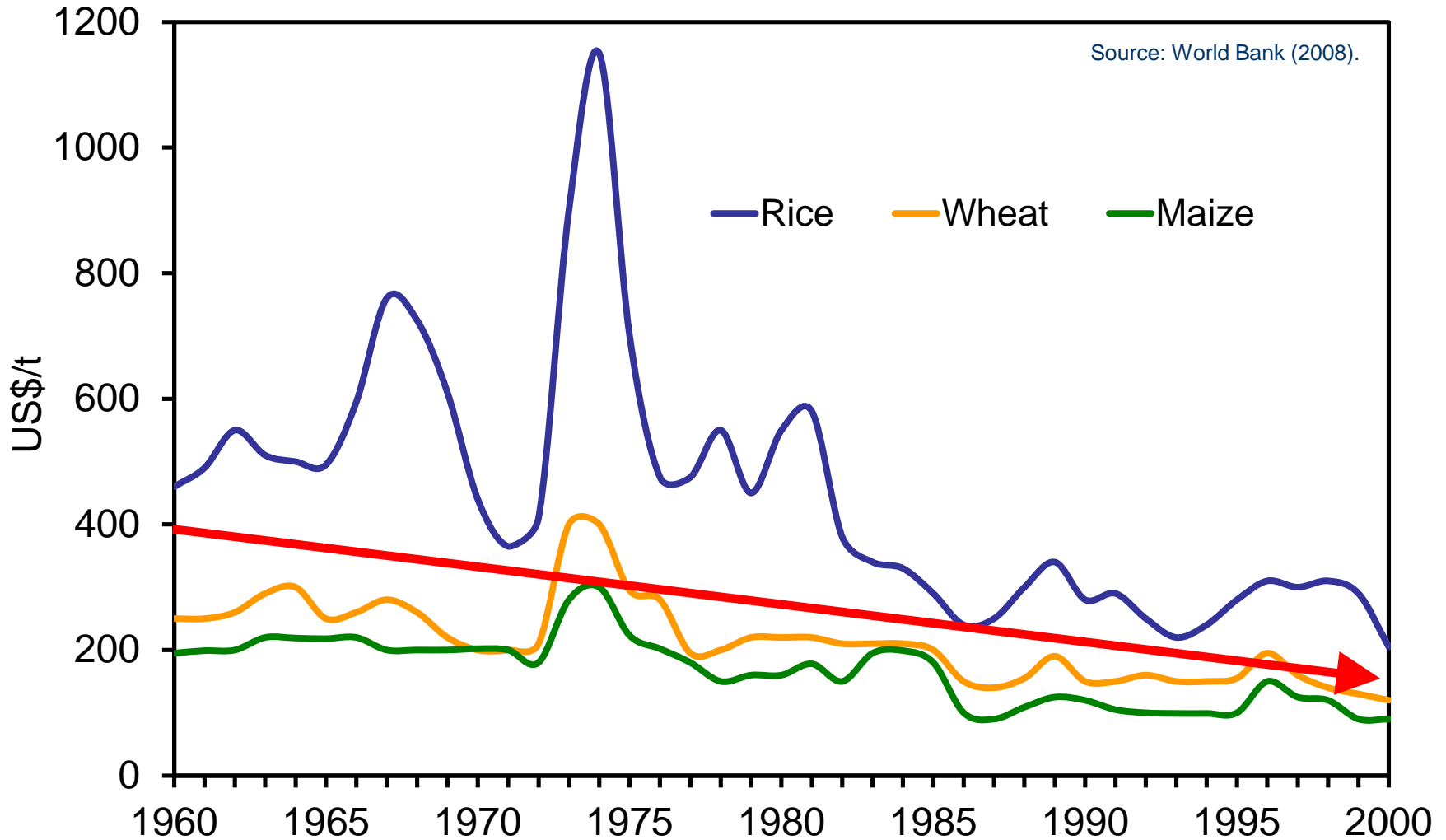
Hunger is also a production problem



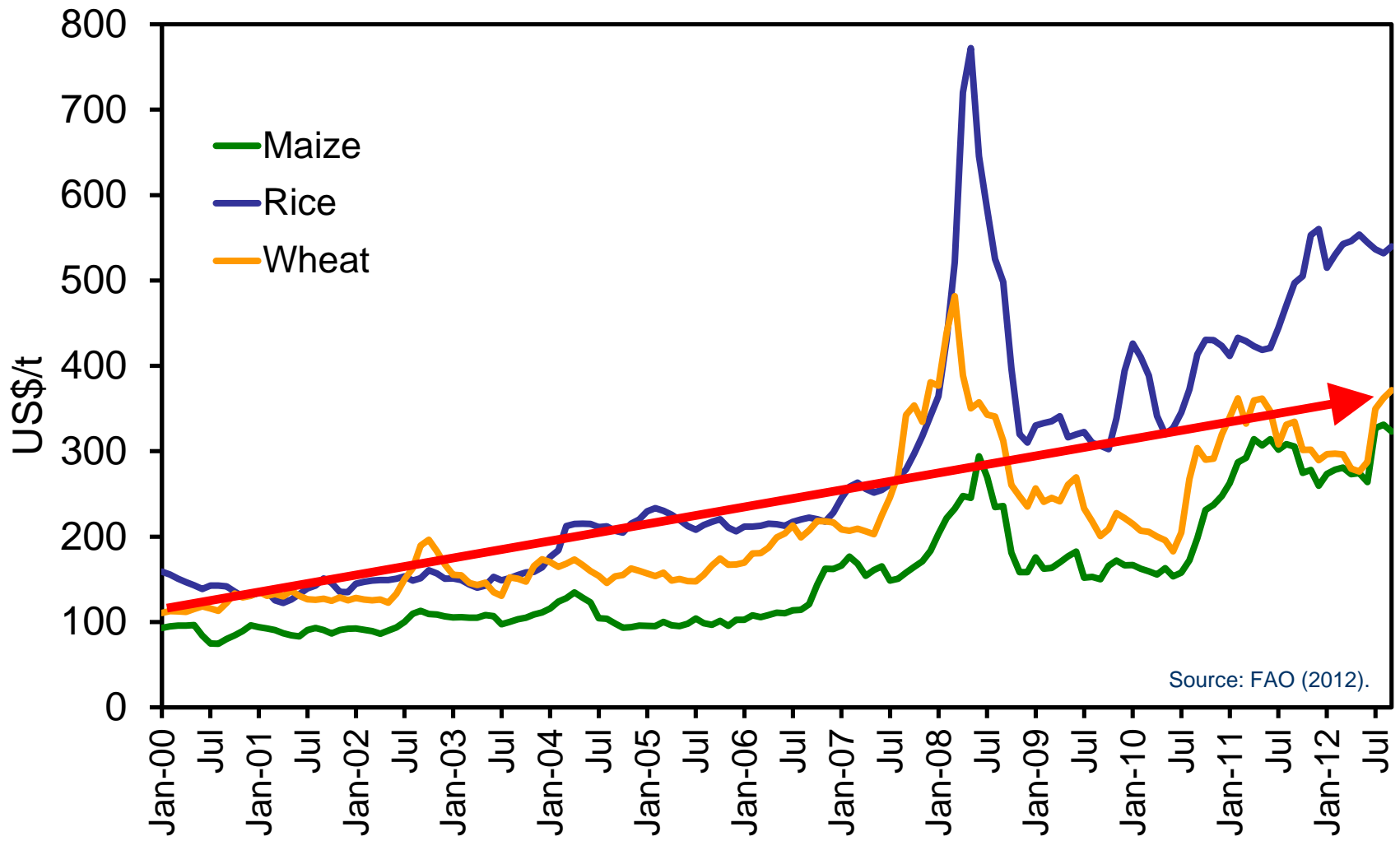
Global developments since 1960



Price developments from 1960 to 2000



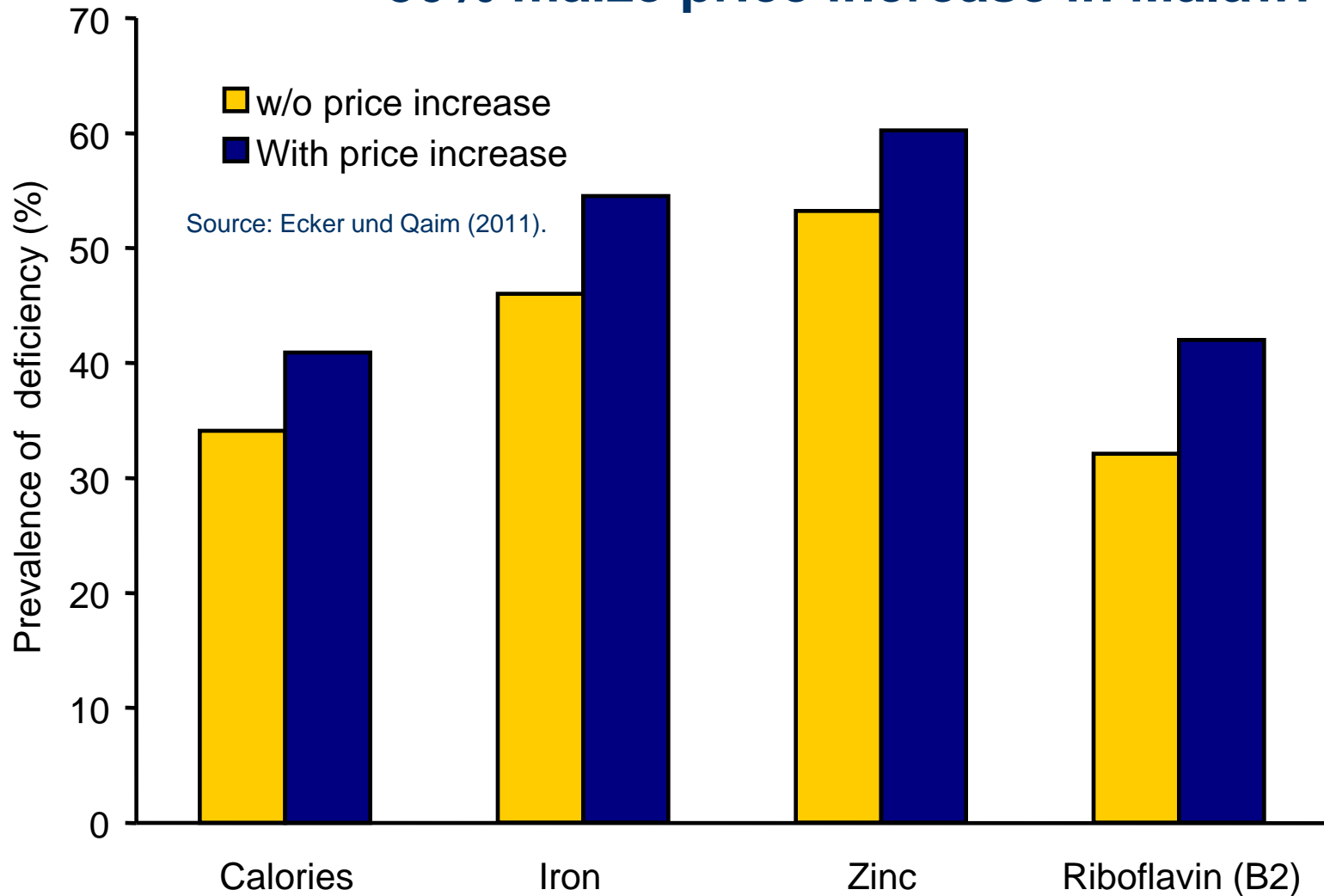
Price developments since 2000



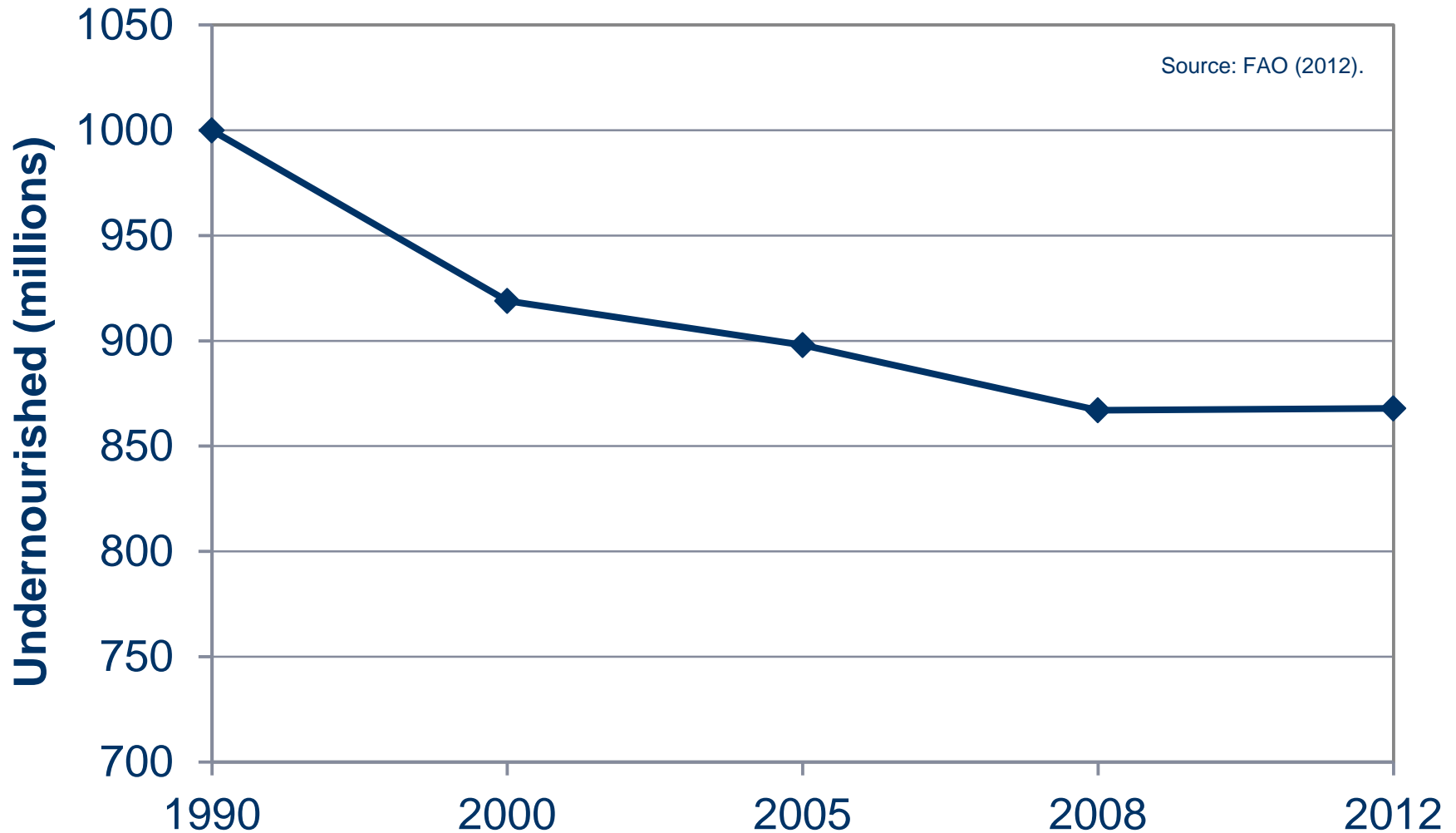
Source: FAO (2012).

Nutrition effects of price increases

50% maize price increase in Malawi



Development of FAO hunger statistics



How do future trends for food demand and supply look like?

Demand projections until 2050

Population trends

	Today	2030	2050
World population (billion)	7.0	8.3	9.3
Industrial countries (billion)	1.2	1.3	1.3
Developing countries (billion)	5.8	7.0	8.0

Income growth in developing countries:

- Per capita demand for food increases.
- More meat and other animal products are consumed.

Demand for food and feed is projected to grow by 70% until 2050.

Use of bioenergy

- Biofuels gain in importance
- Demand increases through:
 - ✓ Rising crude oil prices
 - ✓ Political support (not only in EU and USA)



Photo: F. Isermeyer

- Projection until 2020: 15% of global maize and vegetable oil, 30% of cane sugar to be used for biofuels

Until 2050, total demand for agricultural products (food, feed, fiber, and fuel) could easily double.

This would imply an annual demand growth of 1.8%.

Challenges for food supply

“In the next 50 years we will need to produce as much food as has been consumed over our entire human history.”

Megan Clark

CEO

Commonwealth Scientific and Industrial
Research Organization (CSIRO), Australia

How can global supply be increased?

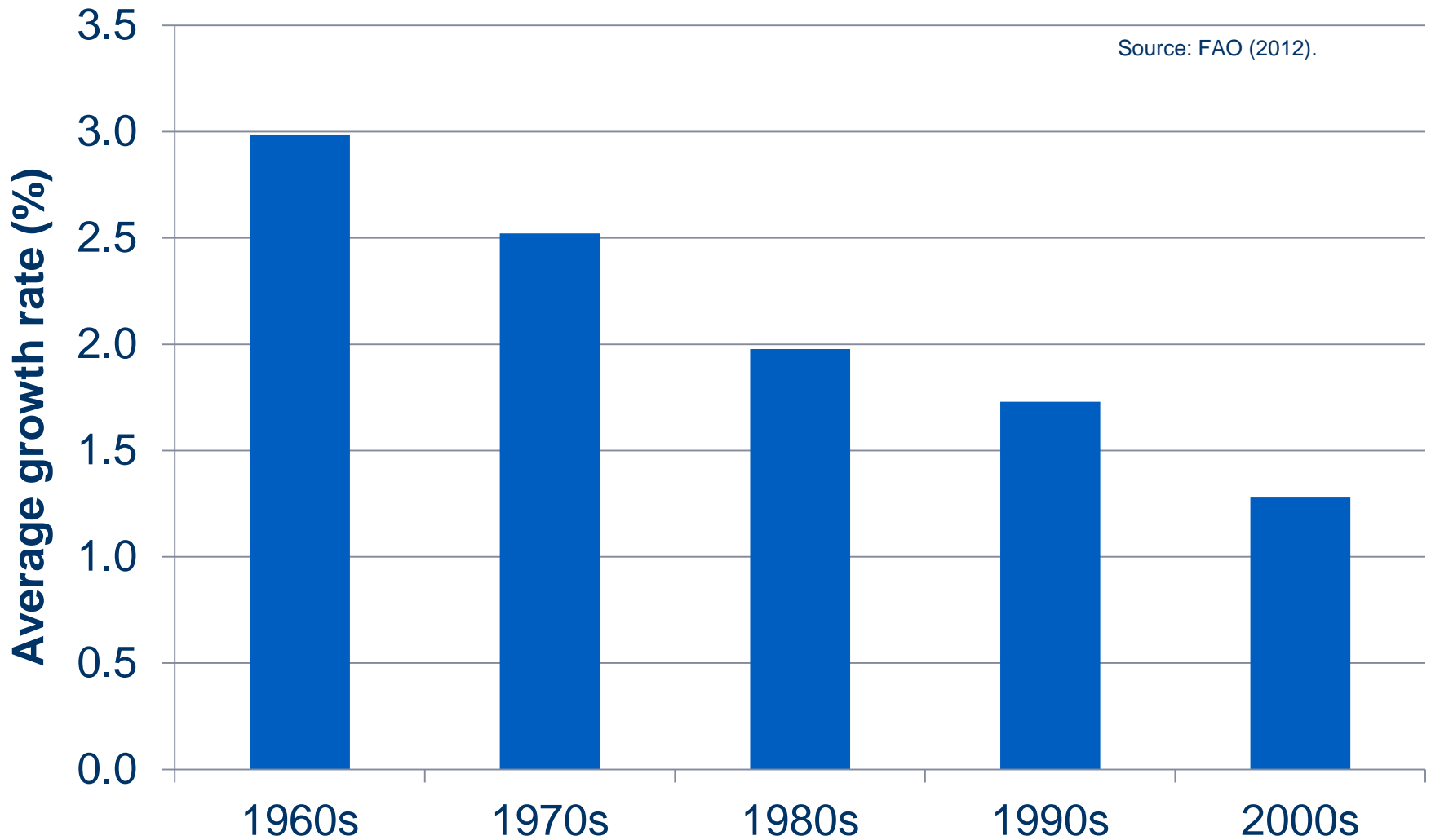
Global production

$$\text{Arable land} \times \text{Yield} = \text{Global production}$$

- Limited potential still available
- But increasing environmental costs

- Irrigation
- Chemical inputs
- Technical progress

Growth rates in worldwide cereal yields

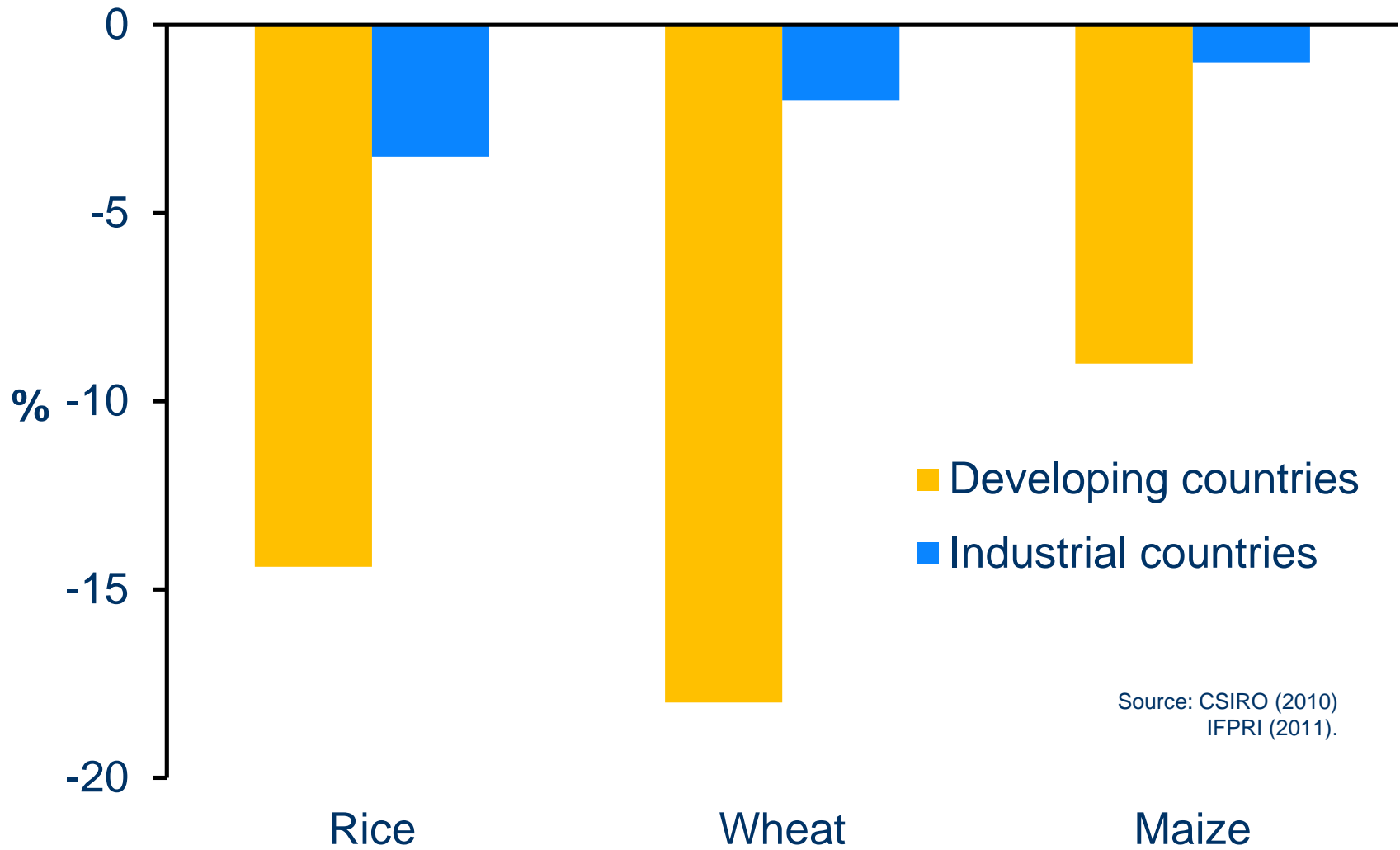


Shortcomings in agricultural research

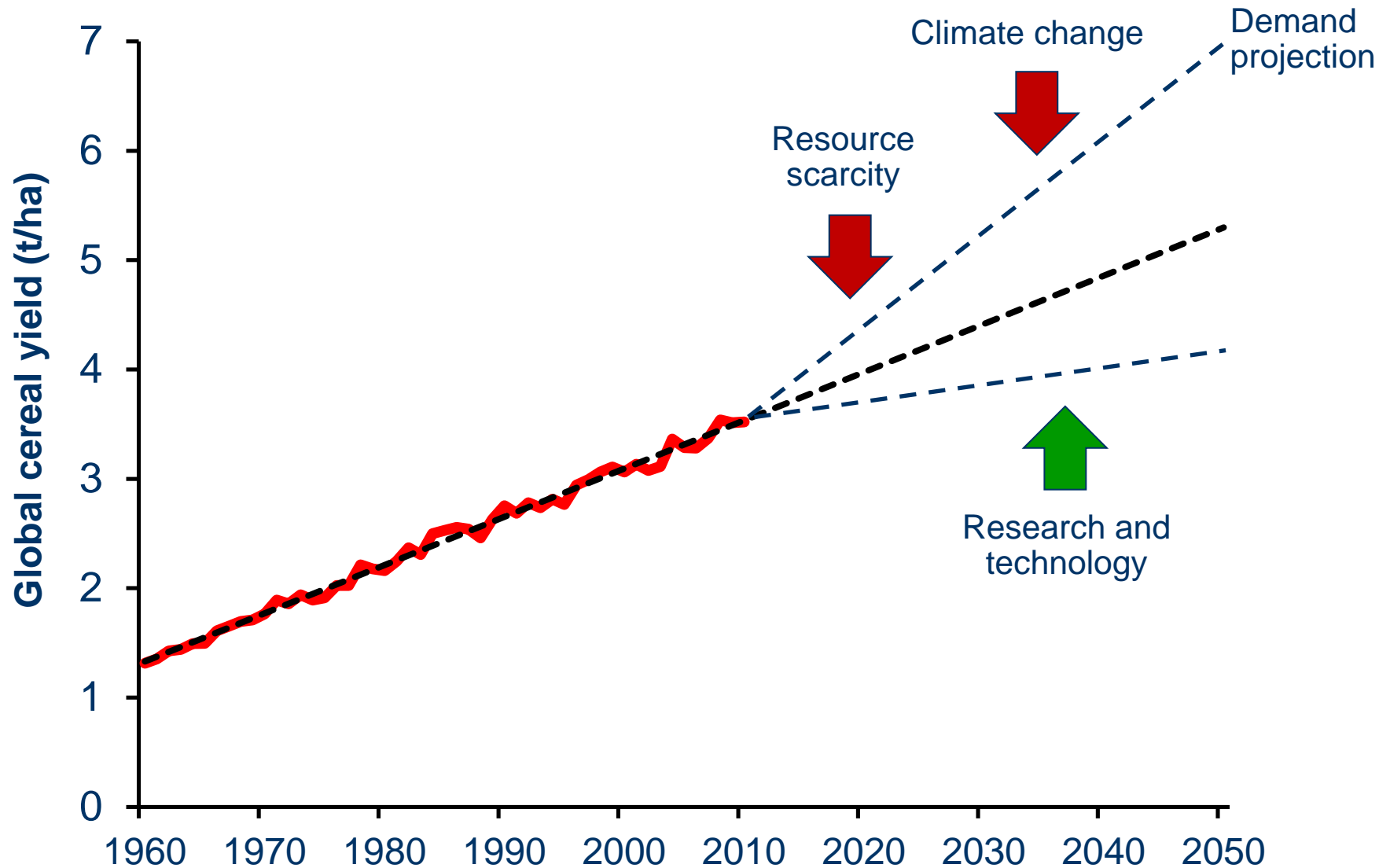
Growth in worldwide agricultural research investments has been declining since the mid-1990s.

Especially in industrial countries, yield growth is not the top priority in agricultural research anymore.

Yield effects of climate change until 2050



Challenges until 2050



What type of technologies?

- Technologies have to be sustainable
- Sustainability requires scarce resources to be used as efficiently as possible
- In the public „sustainable agriculture" is often misunderstood as traditional, low-input production
- Too many entrenched views (organic farming vs. GMOs etc.)
- Sustainable production systems require a smart combination of all areas of science, including new technologies

Beyond increasing supply, what about influencing demand?

For example:

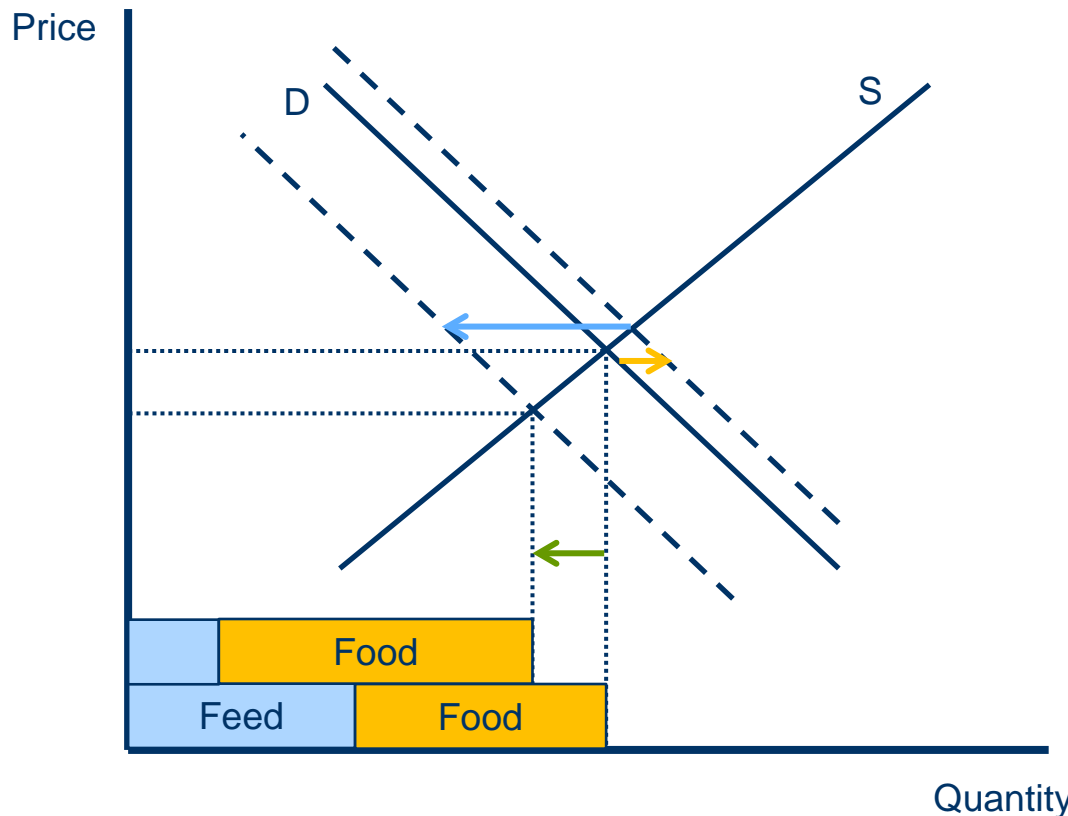
- Meat consumption
- Biofuels

We have done some very simple simulations, analyzing scenario impacts on the number of undernourished.

Mechanisms for simulations

Example: Reduction in meat consumption

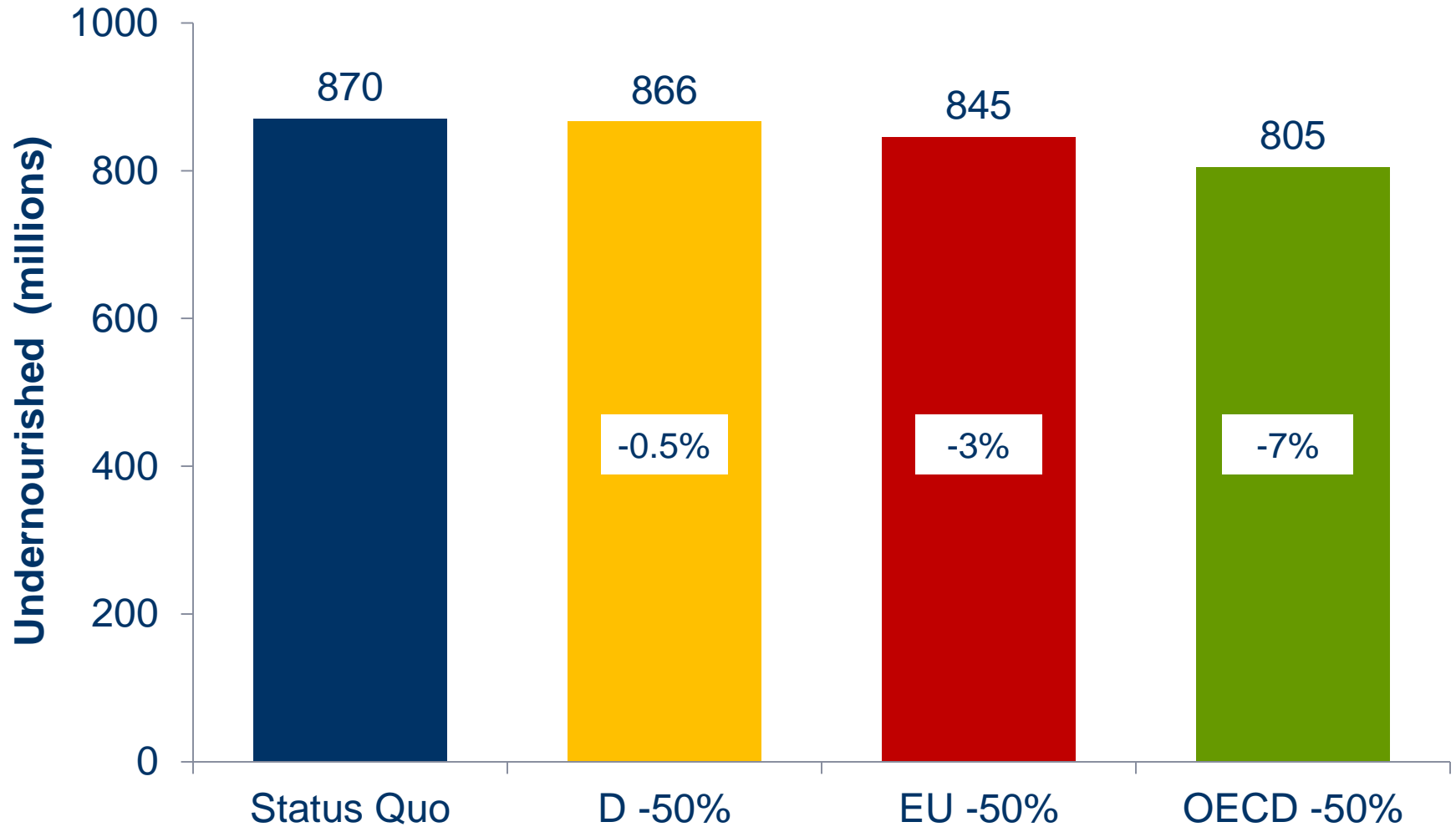
Grain market



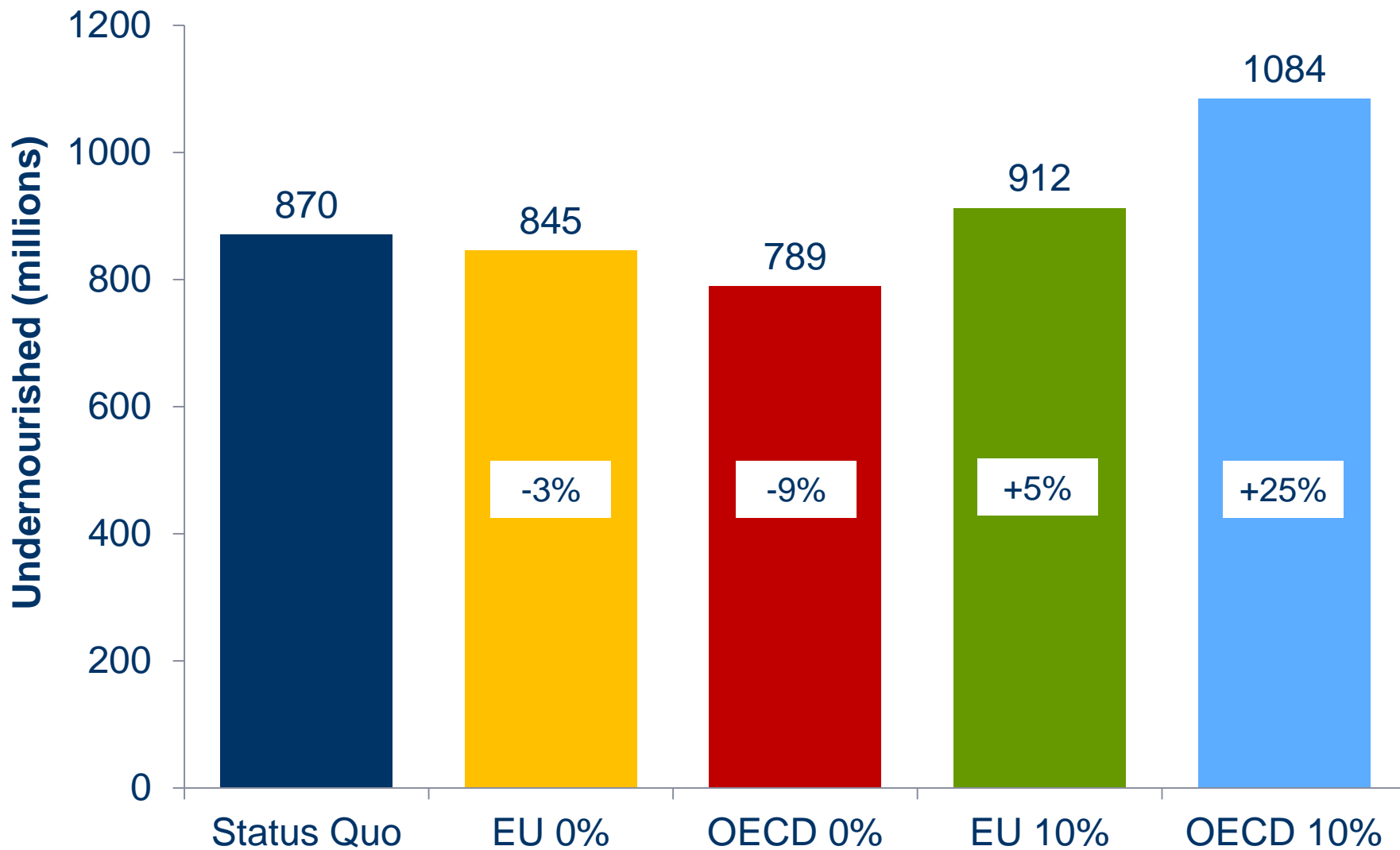
1. Grain demand for direct consumption increases
2. Demand for feed decreases
3. Lower prices, lower supply
4. Quantity available for food use increases

Results of simulations

Reduction in meat consumption



Biofuels



Nevertheless, production needs to be increased, but where?

Agricultural growth in developing countries is of particular importance, because this is where:

- almost all hungry people live,
- almost all of the population growth takes place,
- the projected negative impacts of climate change are particularly strong.

In addition, around 75% of all hungry people live in rural areas of developing countries.

Agricultural growth in the small farm sector helps to increase poor people's incomes, thus reducing poverty and inequality.

What suits the small farm sector?

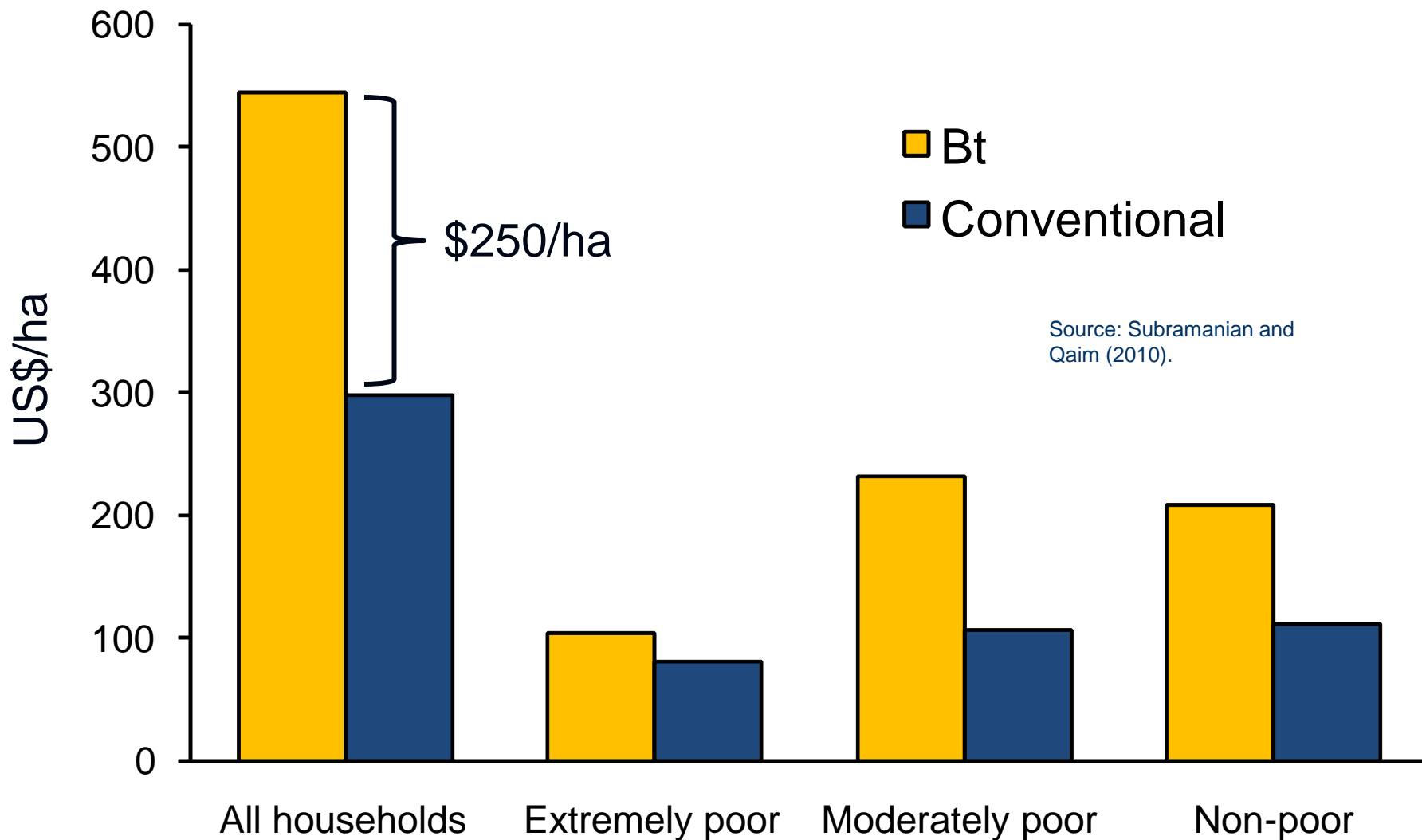
System of Rice Intensification (SRI) in Timor Leste

- New technology for rice
- Agronomic innovation: less water, fewer inputs, more labor
- Requires intensive training and extension
- Up to 50% higher yields in some situations

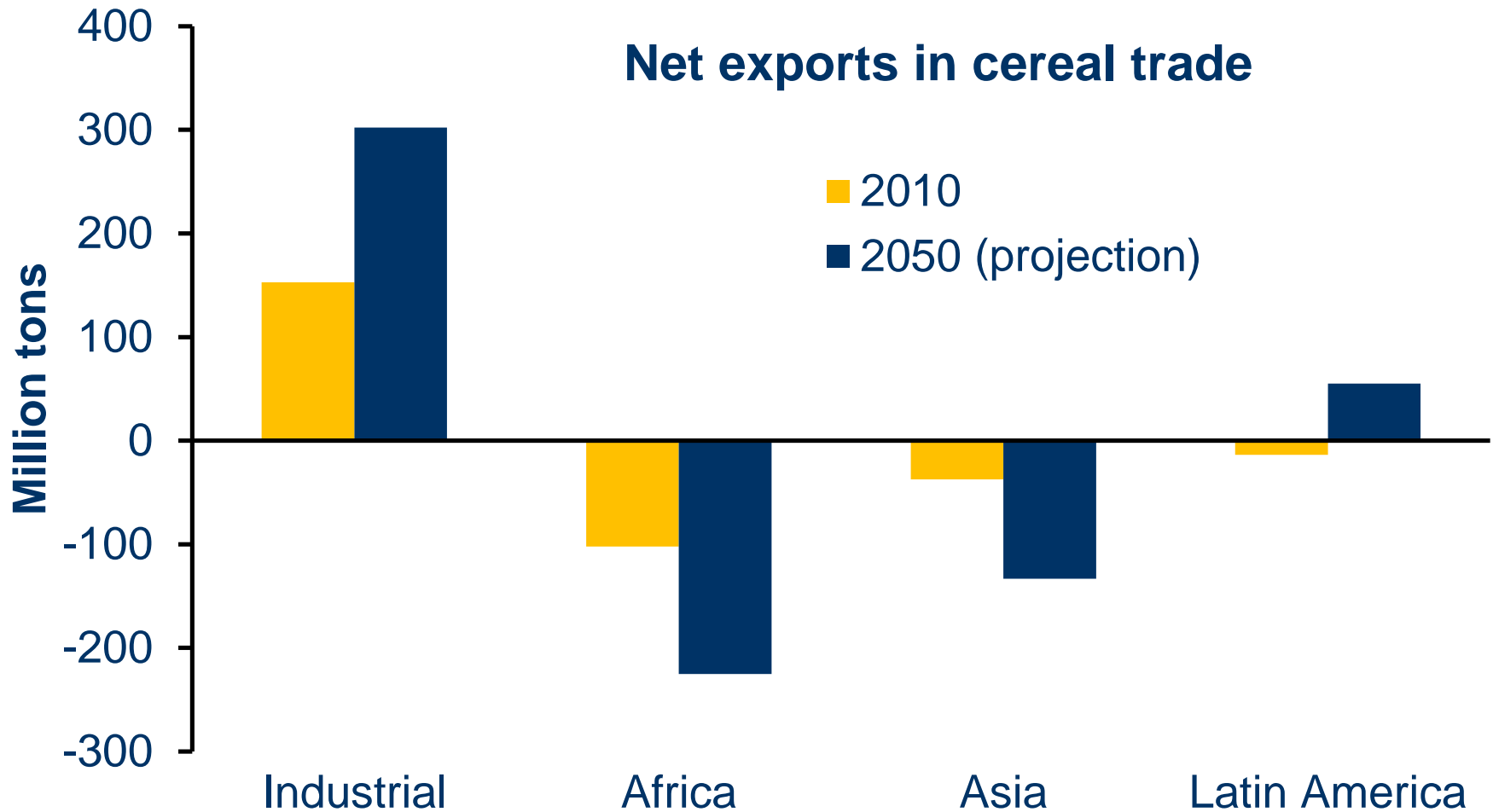
Source: Noltze, Schwarze, Qaim (2012)



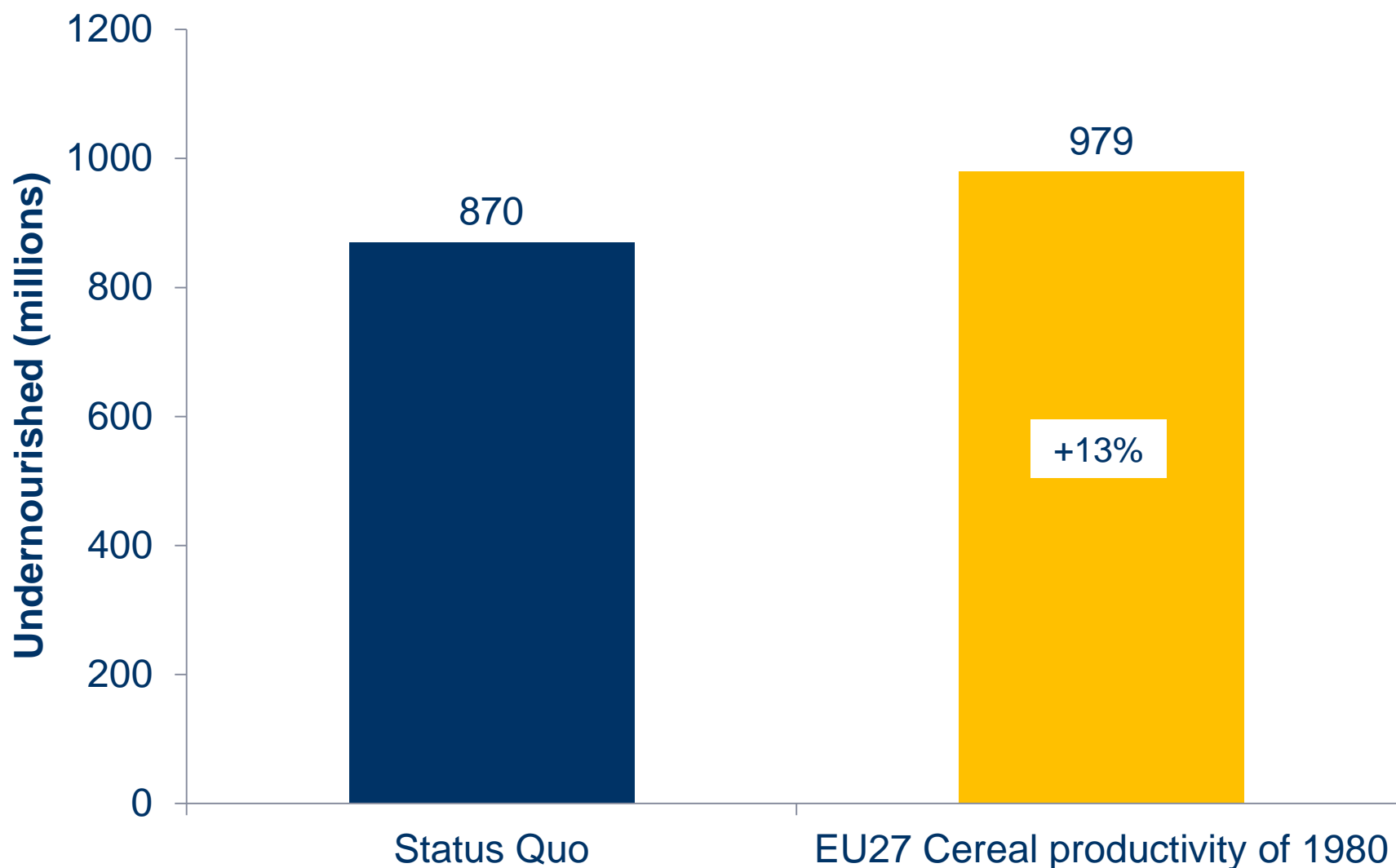
GM cotton (Bt) in India: income effects



Industrial countries have to contribute to global supplies, too



Role of productivity in EU agriculture



Conclusion

1. Hunger is still a very widespread problem, involving both issues of distribution and production.
2. Currently, food supply is growing slower than demand.
3. More sustainable consumption is important.
4. Required production increases are a huge challenge, but possible with more research, technology, and innovation.
5. Ideological barriers have to be overcome.
6. The small farm sector in developing countries needs special attention to reduce hunger and poverty.
7. But also agriculture in rich countries plays an important role. Food security and resource scarcities are global issues.