

The Changing Geopolitics of Agriculture

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Definitions of Geopolitics

- The way in which geography, demography, economics and the distribution of resources interrelate with the politics of nations and the relationships among nations.
- The study of the effects of geography (human and physical) on international politics and international relations.
- A method for studying foreign policy to understand, explain and predict international political behavior through geographical variables.

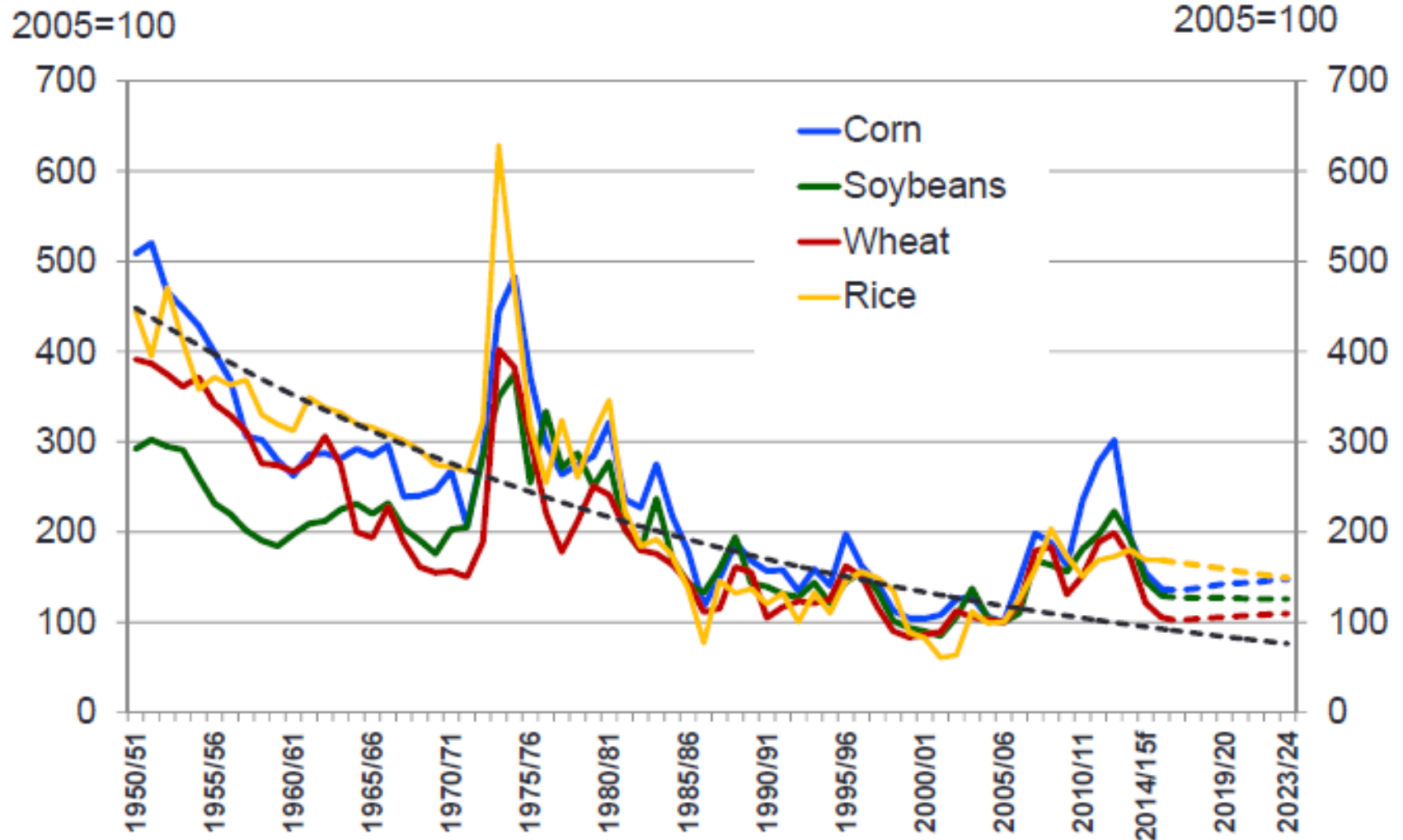
Outline

- Changing geopolitics is nothing new in global agriculture—a brief historical review
- Shifting demand dynamics
- Resource constraints, technological change and production potential
- Climate change—a game changer?
- Prospects for the future

1970s

- High-yielding wheat varieties (Green Revolution) ended famine in South Asia.
- U.S. dollar devaluations reestablished export competitiveness of U.S. agriculture
 - but export embargoes raised questions about U.S. commitment to being a reliable supplier.
- Brazil created EMBRAPA and developed sugarcane-based ethanol industry.
- EU began transition from being a large agricultural importer to a large ag exporter.
- Crop failure & policy change in 1973-74 in Soviet Union turned USSR into major grain importer.

Real commodity prices



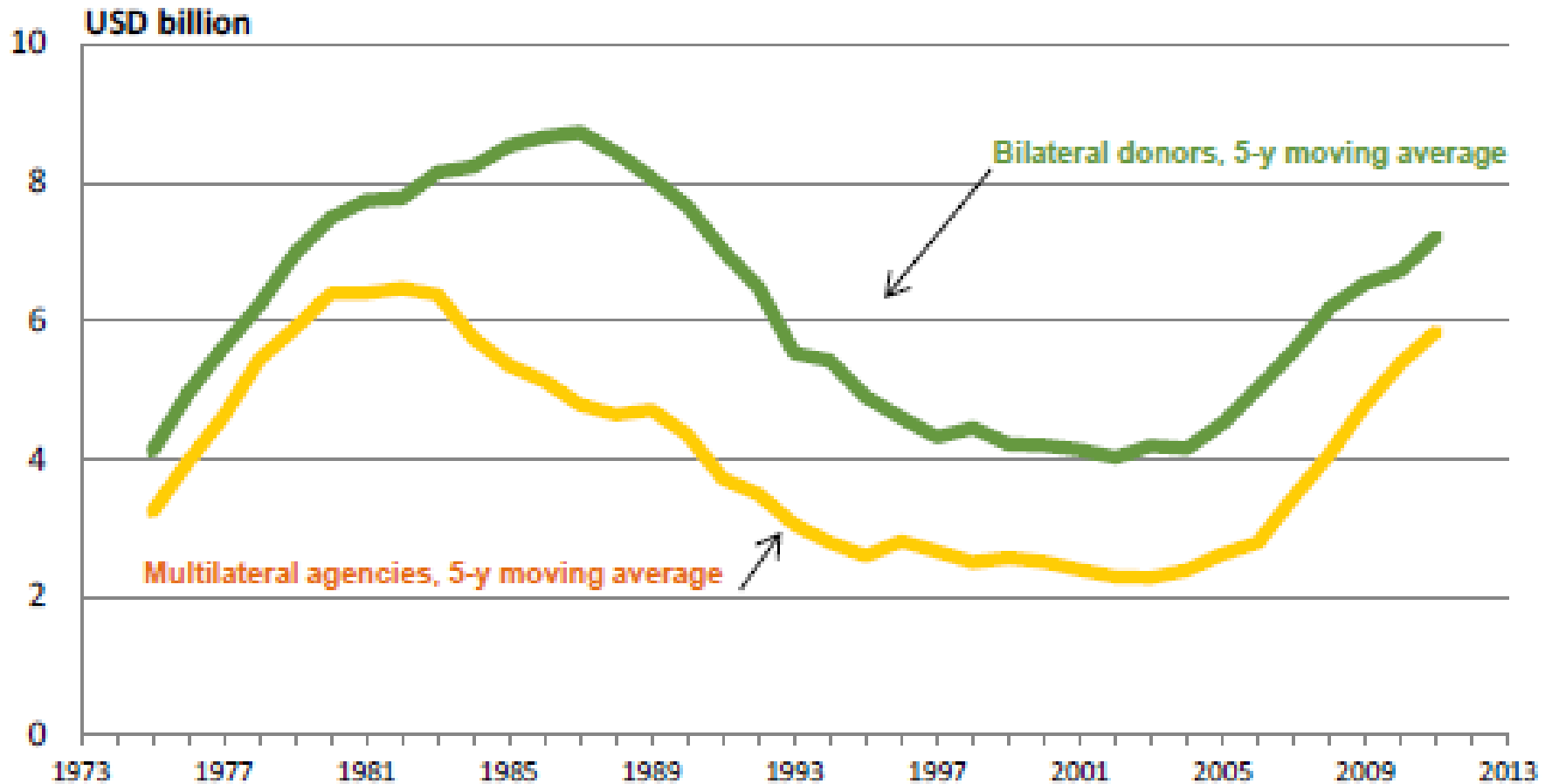
Source: USDA Agricultural Projections to 2023 and OCE, February 2014

1980s

- China: unprecedented rate of poverty reduction & agricultural productivity growth
- Emerging/growing voice of environmental organizations in ag policy formulation
- U.S. & EU shifted means of supporting agriculture away from government purchase and accumulation of stocks.
- Competitive export subsidization by EU and U.S. drove down world ag commodity prices.
- Support for agricultural and rural development (especially for agricultural research) in low income countries dropped precipitously.

Chart 1. Trends on aid to ARD

1973-2013, 5-year moving average ODA commitments, constant 2013 prices



*ARD = Agriculture and rural development

Source: OECD DAC.

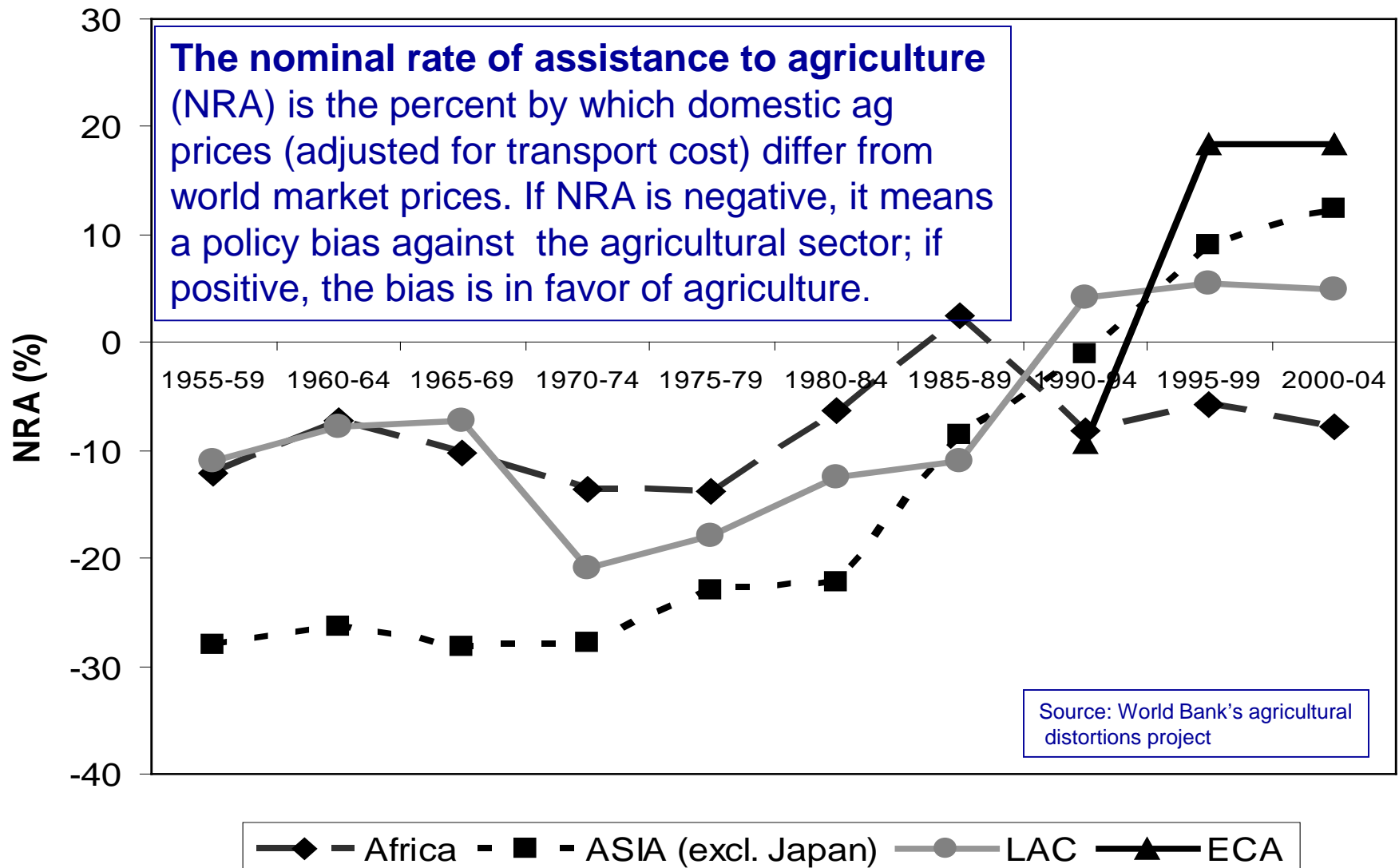
Agriculture Fell /Squeezed Off the Global Development Agenda

- Low world commodity prices, in part due to OECD ag production & export subsidies, including easy access to food aid in LDCs.
- Crowded out by hot new donor issues, e.g. environment, gender, HIV/AIDS, etc.
- Lack of political clout of rural relative to urban areas in low income countries
- Ag development projects seen as riskier
- Transnational NGO activism against modern agriculture

1990s

- Completion of Uruguay Round of multilateral trade negotiations established rules for international ag trade for first time.
- Expansion of cultivated area in Brazil and emergence of Brazil as major ag exporter
- China relaxes its food self-sufficiency policy & becomes major soybean importer
- Declining public support for ag research and emergence of large private sector role.
- Most developing countries shifted from net taxation to net subsidization of agriculture

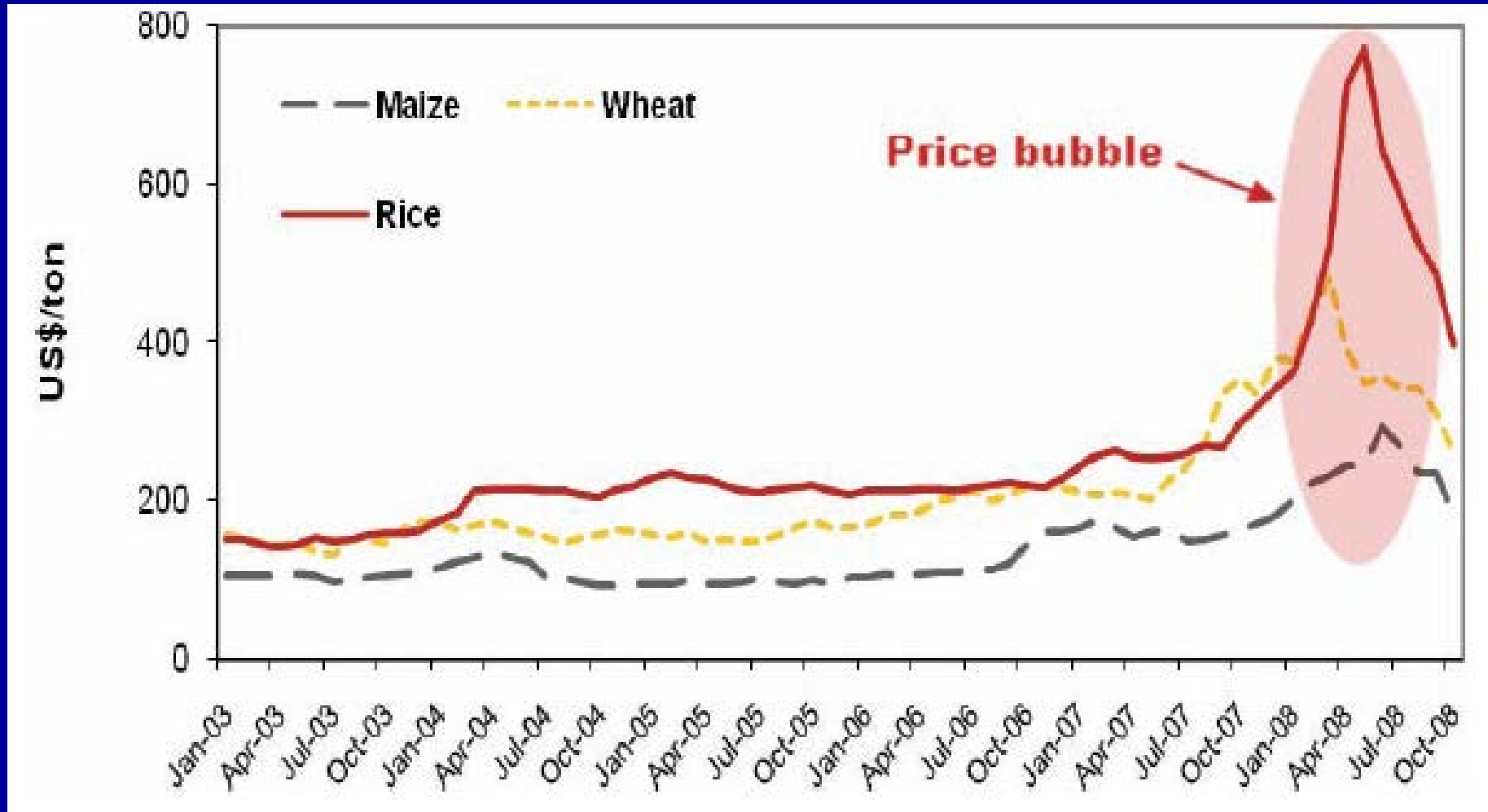
Anti-Agricultural Bias Dropped in Developing Countries -- Except in Africa (and Argentina)



2000s

- Inversion of U.S. and EU roles as advocates/opponents of more market-oriented ag policy (decoupled support from production)
- Emergence of G-20, led by Brazil, India & China, & including LDC ag exporters, as counterweight to U.S. & EU in WTO ag trade negotiations
- Exponential growth in corn-based ethanol production in the U.S.
- China, Middle East & Brazil investing in ag development of Sub-Saharan Africa
- Growth of global supply chains

2008 World Food Price Crisis Rekindled Interest in Geopolitics of Food



Source: IFPRI, based on FAO data.

2008 Food Price Spike Resulted from Cumulation of Factors

- Population of developing countries was growing rapidly (by 80 million per year).
- Unprecedented rate of poverty reduction in low income countries gave millions of people the purchasing power to include (more) animal protein in their diets.
- Underperformance of agriculture in low income countries, followed from underinvestment in ag and rural development by their governments, foreign aid programs and international banks.
- Reserve stocks were low due to change in high income country support policies.

Medium Term Developments Leading Up to 2008 Price Spike

- Accelerating growth in use of agricultural commodities as feedstocks to produce biofuels in response to massive subsidies and protection from imports, e.g. corn for ethanol and oilseeds for biodiesel in the U.S.
- Rising petroleum prices and growing concern for reducing dependence on imports of petroleum.
- Reduced crops due to adverse weather several years in Australia, Ukraine and elsewhere.

Short Term Factors in Early 2008

- In response to consumer outcry, a number of governments introduced food price controls, reduced import tariffs and other taxes, increased export taxes and in some cases, embargoes.
 - While such policies may have helped consumers in the short run, they reduced the incentive for farmers in those countries to produce more.
- Rising price of food precipitated political problems in many countries.
 - Food aid agencies with fixed budgets were not able to supply as much food.

LDC Policy Response & Media Hype Contributed to Price Rise

- Such government actions plus the associated media hype and exaggeration caused panic buying and hoarding by consumers (and likely speculative behavior by merchants as well).
- Food and ag commodity prices rose much more than necessary to equilibrate supply and demand in both developing countries' national markets, as well as in the world market.

Shifting Demand Dynamics

Projected Population Growth to 2030

(millions)

Region	2015	2030	Change	Percent
World	7,336	8,505	+ 1,169	+ 16
High Income	1,254	1,295	+ 41*	+ 3
Developing	5,144	5,910	+ 766	+ 15
Least developed	938	1,300	+ 362	+ 30

*Of the 1.2 billion additional mouths to be fed in the next 15 years, only 3.5% of them will be in the high income countries. The potential growth markets of the future are in the lower income countries.

-Of the projected 41 million increase in the population of high income countries, 38 million will be in the United States. The populations of most of the other high income countries are declining. When the aging of their populations is also considered, these are shrinking markets of the past.

Projected Population Growth to 2050

(millions)

Region	2015	2050	Change	Percent
World	7,336	9,804	+2,468	+ 34
High Income	1,254	1,310	+ 56	+ 4
Low Income	6,082	8,495	+2,413	+ 40
East & S.E. Asia	2,237	2,411	+ 174	+ 8
South Central Asia	1,903	2,526	+ 623	+ 33
Sub-Saharan Africa	949	2,081	+1,132	+119
Latin America/Carib	630	776	+ 146	+ 23
N. Africa & W. Asia	479	779	+ 300	+ 63

Source: Population Reference Bureau. [2015 World Population Data Sheet](#).

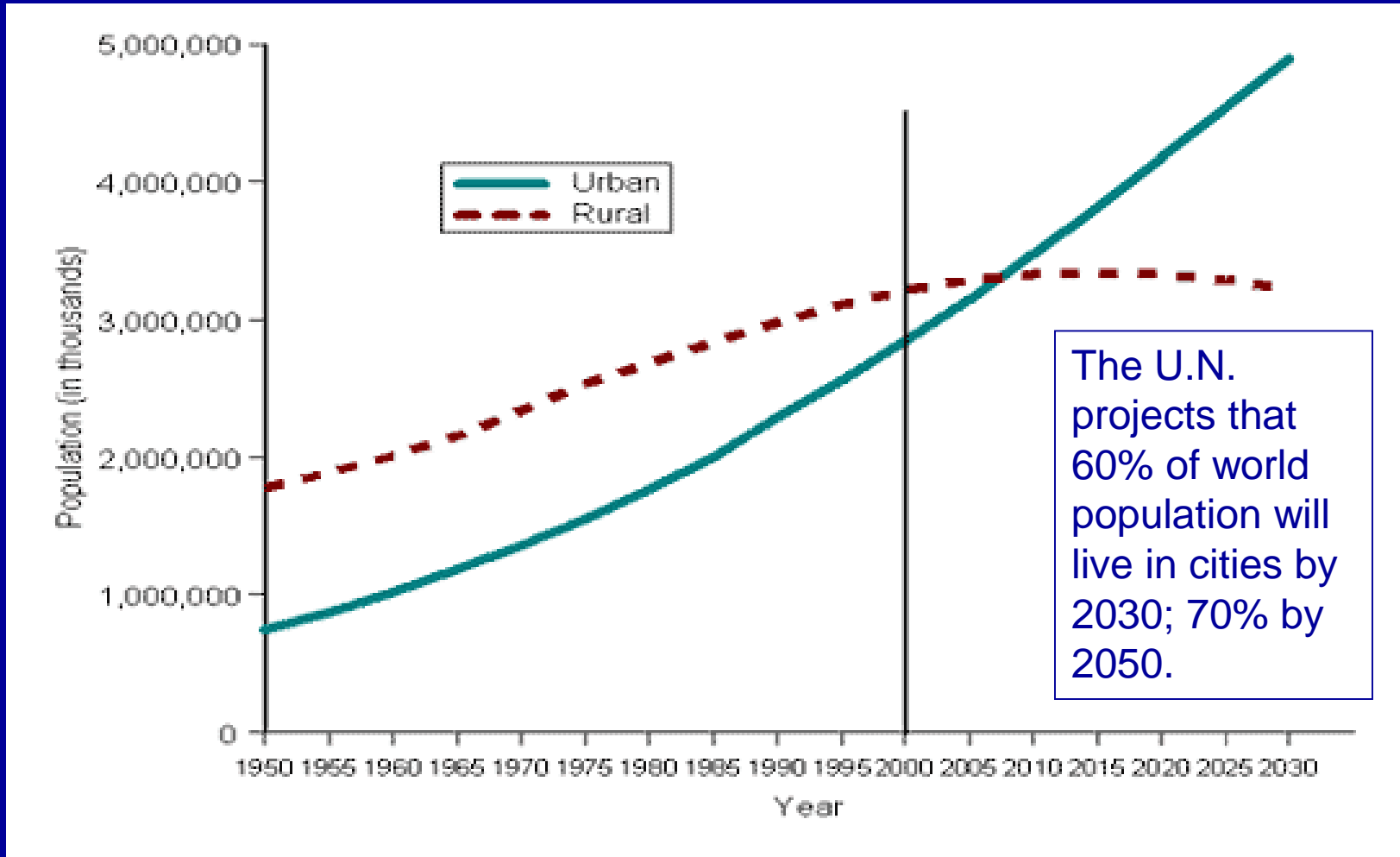
10 Largest Countries (millions)

2015

2050

1. China	1,372	1. India	1,660
2. India	1,314	2. China	1,366
3. United States	321	3. United States	398
4. Indonesia	256	4. Nigeria	397
5. Brazil	205	5. Indonesia	366
6. Pakistan	199	6. Pakistan	344
7. Nigeria	182	7. Brazil	226
8. Bangladesh	160	8. Bangladesh	202
9. Russia	144	9. Congo D.R.	194
10. Japan	127	10. Ethiopia	165

Urbanization Changes Diets: How to Provision Megacities?



Hunger & Food Insecurity Widespread

- Of the world's 7.3 billion people, 1.2 billion live on less than \$1.25 per day*.
 - 780 million people (1 out of every 9 people in the world) cannot afford even 1,800 calories per day, not enough to put in even a medium level of physical activity.
- 2.4 billion (35% of the world population) live on <\$2.00 per day*.
 - By \$2.00 per day most hunger (calorie) problems solved, but 2 billion still suffer nutritional deficiencies.
 - 2008 estimate; income corrected for differences in purchasing power across countries. Source: World Bank Povcal database.

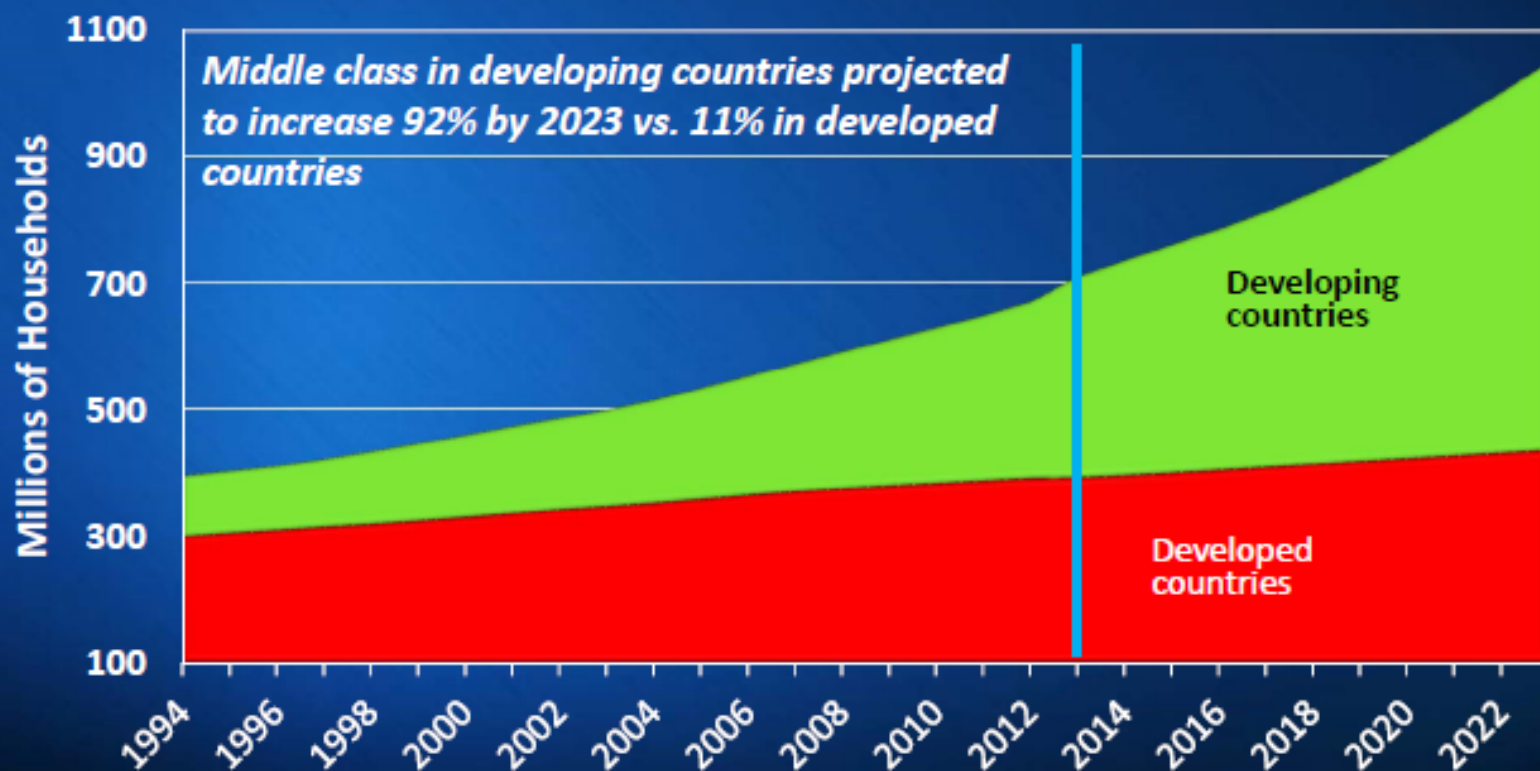
Dynamics of Food Demand Growth

- As their incomes rise from about \$2 to \$10 per day, people can afford a more balanced diet and eat more meat, dairy products, eggs, edible oils, fruits & vegetables causing rapid growth in raw agricultural commodity demand.
- After people's incomes reach about \$10/day, the small part of each increment that gets spent on food is spent on convenience, packaging, processing, variety, and luxury forms, not more raw commodities.

Global “Middle Class” is Expected to Exceed 1 Billion Households by 2023

Most of the increase will be in developing countries, particularly in Asia

Households w/real PPP incomes greater than \$20,000 a year



Source: IHS Global Consumer Markets data as analyzed by OGA

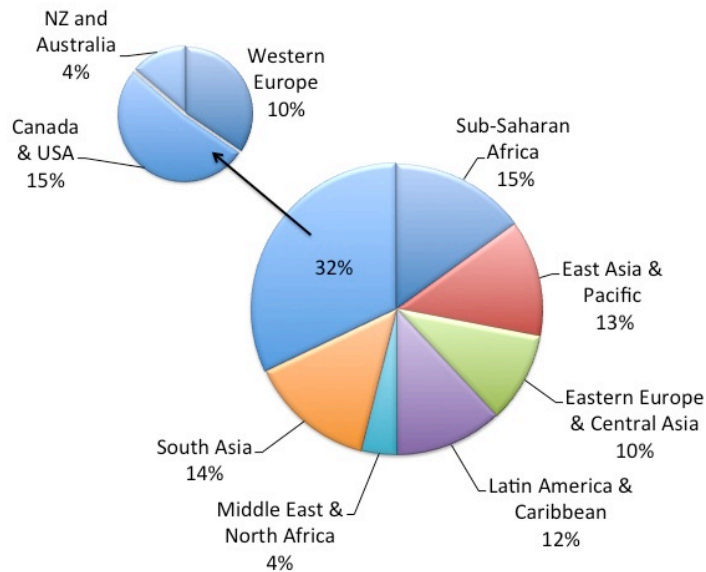
Global Policy Analysis Division
Office of Global Analysis



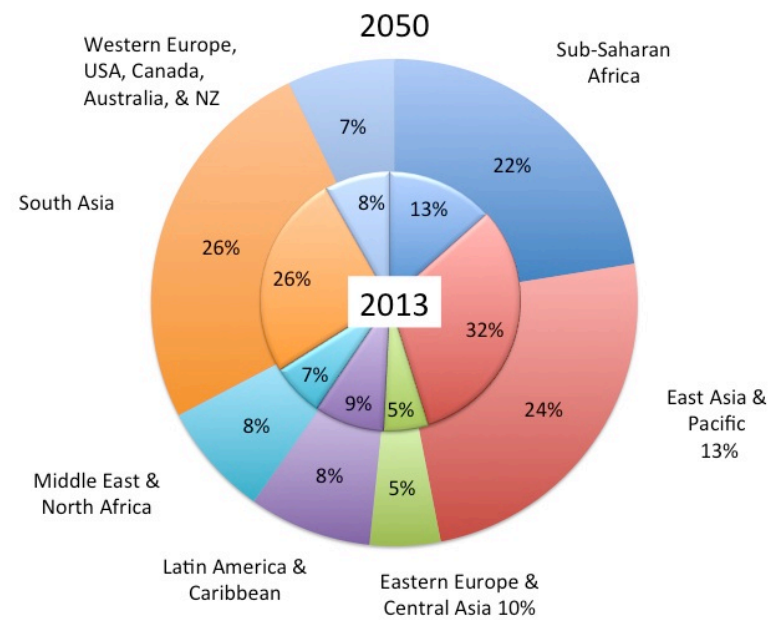
Projected World Food Demand

- World food demand is projected to grow about two-thirds between now and 2050:
 - 33% increase from world population growth – from 7.3 to 9.7 billion – almost all in developing countries
 - 33% increase from broad-based economic growth and urbanization in low income countries
- How many presently low income consumers, who spend the largest fraction of their incomes on food, escape from poverty is the *most important* uncertainty concerning future global demand for food.
- With the growing use of agricultural commodities as raw materials in the of the bio-based economy, including biofuels, world demand for grain and oilseeds could double by 2050.

The world's arable land is not distributed around the world in the same proportions as is population.



Distribution of Arable Land



Distribution of World Population

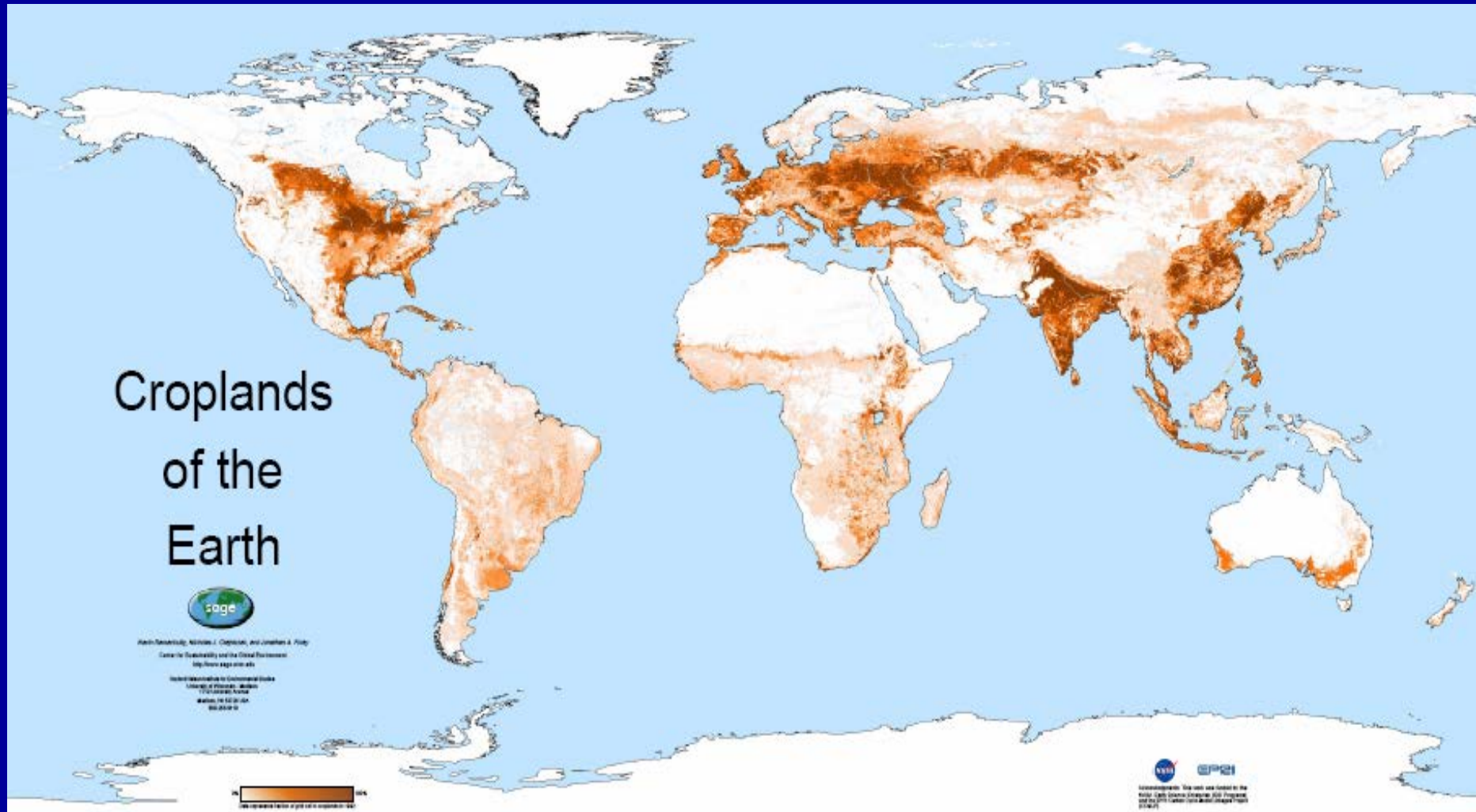
East and South Asia have more than twice as much of the world's population than of the arable land, and virtually all of their arable land is already in production. The Middle East & North Africa have land, but not water.

Growing Agricultural Trade

- With population growth, urbanization and broad-based economic development, growth in many low-income countries' food consumption will outstrip their production capacity.
- There is a huge need for investing in agricultural and rural development, but no matter how much they invest in developing their agriculture, many will become larger net importers—on either commercial or concessional terms.
- A larger fraction of world agricultural production is expected to move through world trade.

Resource Constraints, Technological Change and Production Potential

Croplands of the Earth



Interpretation: The darker the shading, the larger the percent of the land under that pixel that is in crops.
Source: Center for Sustainability and the Global Environment (SAGE), University of Wisconsin.

The Land Constraint

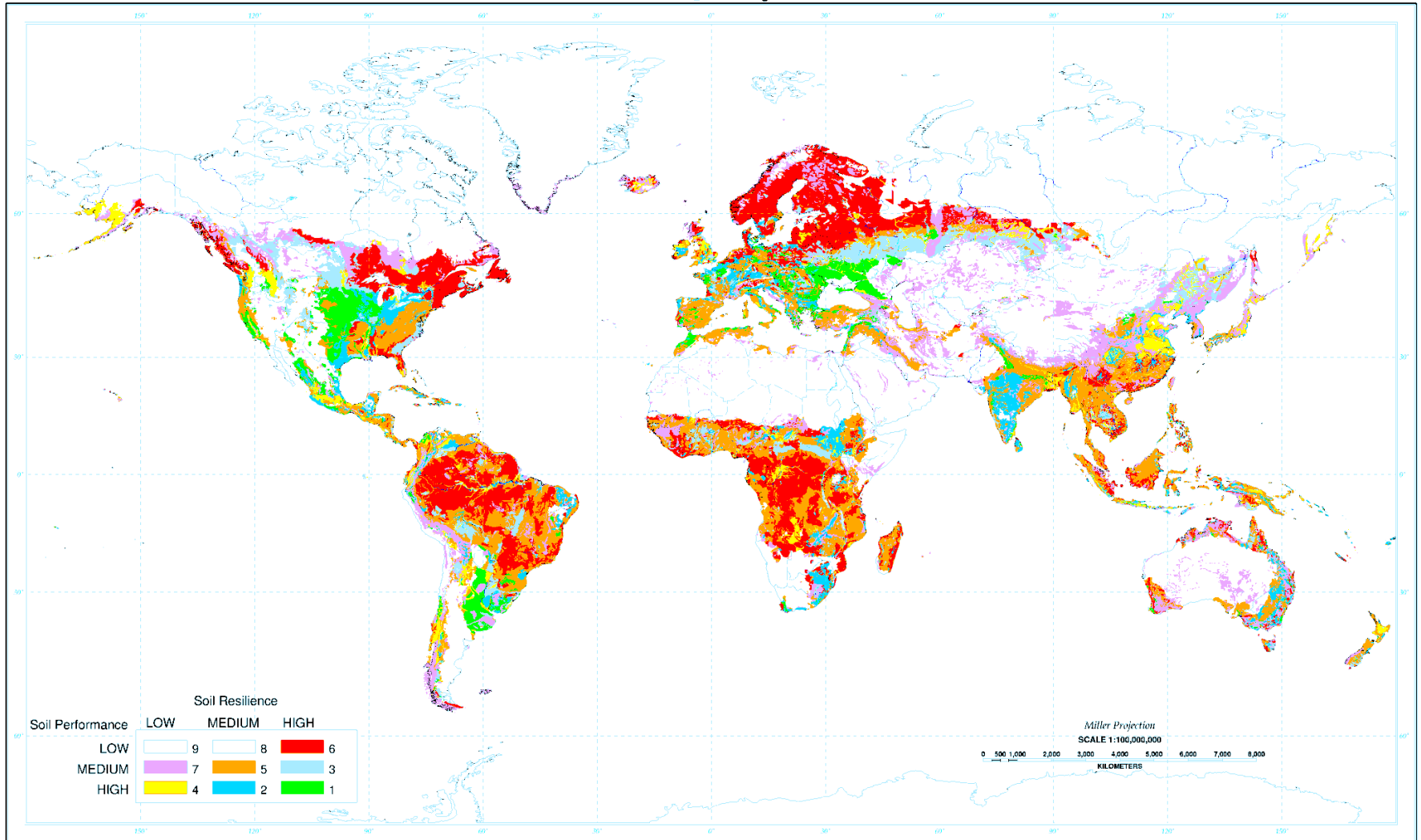
- The area of land in global farm production could be doubled...
 - But only by massive destruction of forests, with accompanying loss of wildlife habitat, biodiversity and carbon sequestration capacity.
- There is at most 12% more arable land available worldwide that isn't presently forested or subject to erosion or desertification, and...
- Loss and degradation of many soils continues:
 - Urbanization, infrastructure construction, nutrient mining, erosion, desertification, natural reserves; reforestation.

The Land Constraint (cont'd.)

- The only environmentally sustainable alternative is to increase productivity on the fertile, non-erodible soils already in crop production.
- Most available cropland is in remote areas of South America and Sub-Saharan Africa where infrastructure is minimal and soils are inferior in quality to many already in production.

Inherent Land Quality

Inherent Land Quality Assessment



Water--A Growing Constraint

- Farmers account for 70% of the world's fresh water use.
- With the rapid urbanization underway, cities will outbid agriculture for available fresh water.
- The world's farmers, who are being called on to double food production, will have to do it using less fresh water than they are using today.
 - i.e., they will have to more than double the “crop per drop,” the average productivity of the water they use.
- This will require investments in research to develop water saving technologies and to increase the drought tolerance and water use efficiency of the crop varieties being grown.

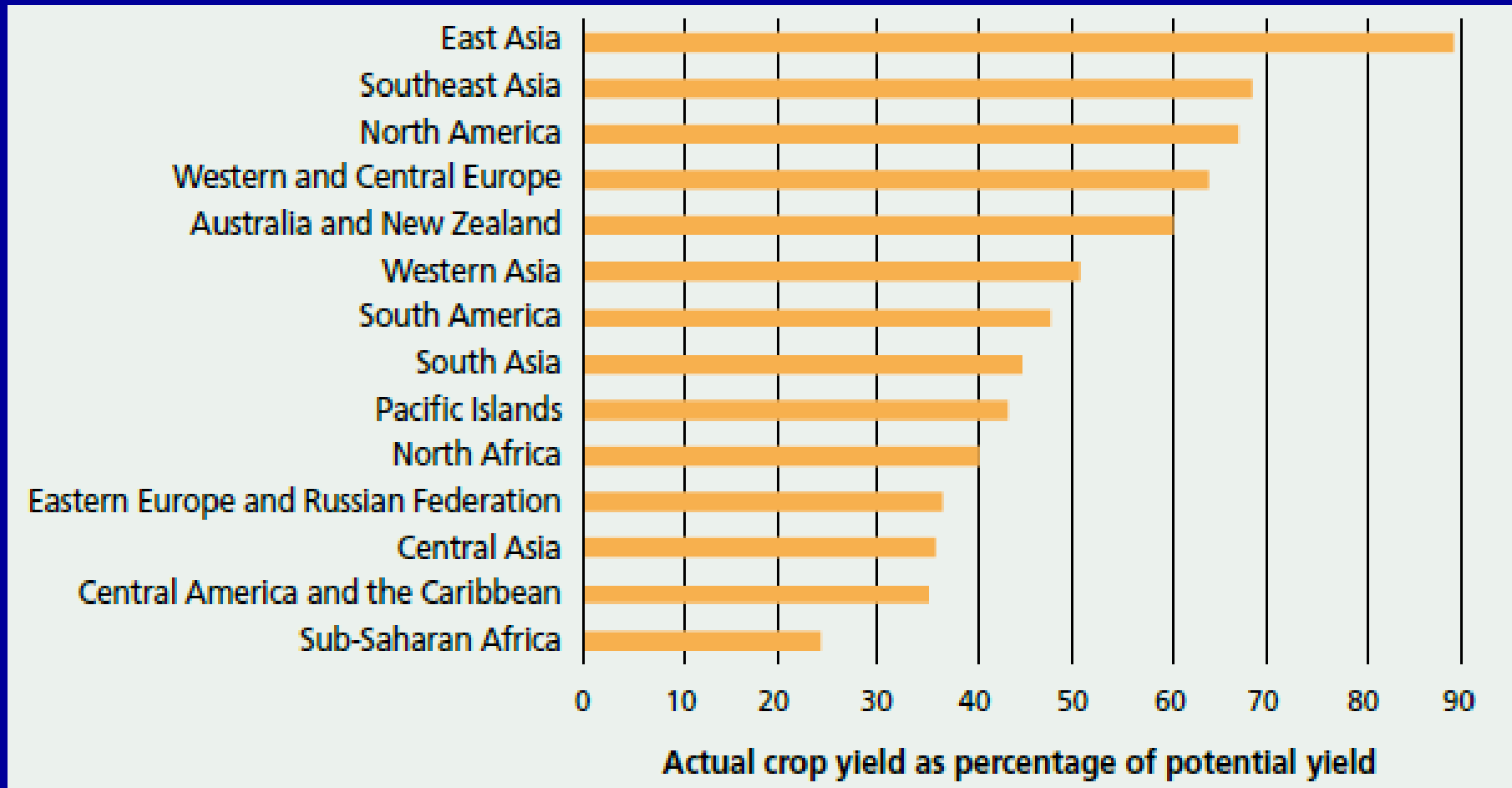
Solving the Water Constraint

- There is one source of optimism that the productivity of the water used in agriculture can be increased. Water is priced at zero to most of the world's farmers, signaling that it is much more abundant than it is in reality.
 - Anything priced at zero will be wasted.
- There are better technologies available today to increase water use efficiency than farmers are using in many parts of the world, but with water priced at zero, it doesn't pay to adopt them.
- If the politically difficult hurdle of charging farmers for water can be overcome, this would stimulate adoption of the available technologies.

Sustainability Will Require Increased Global Food System Productivity

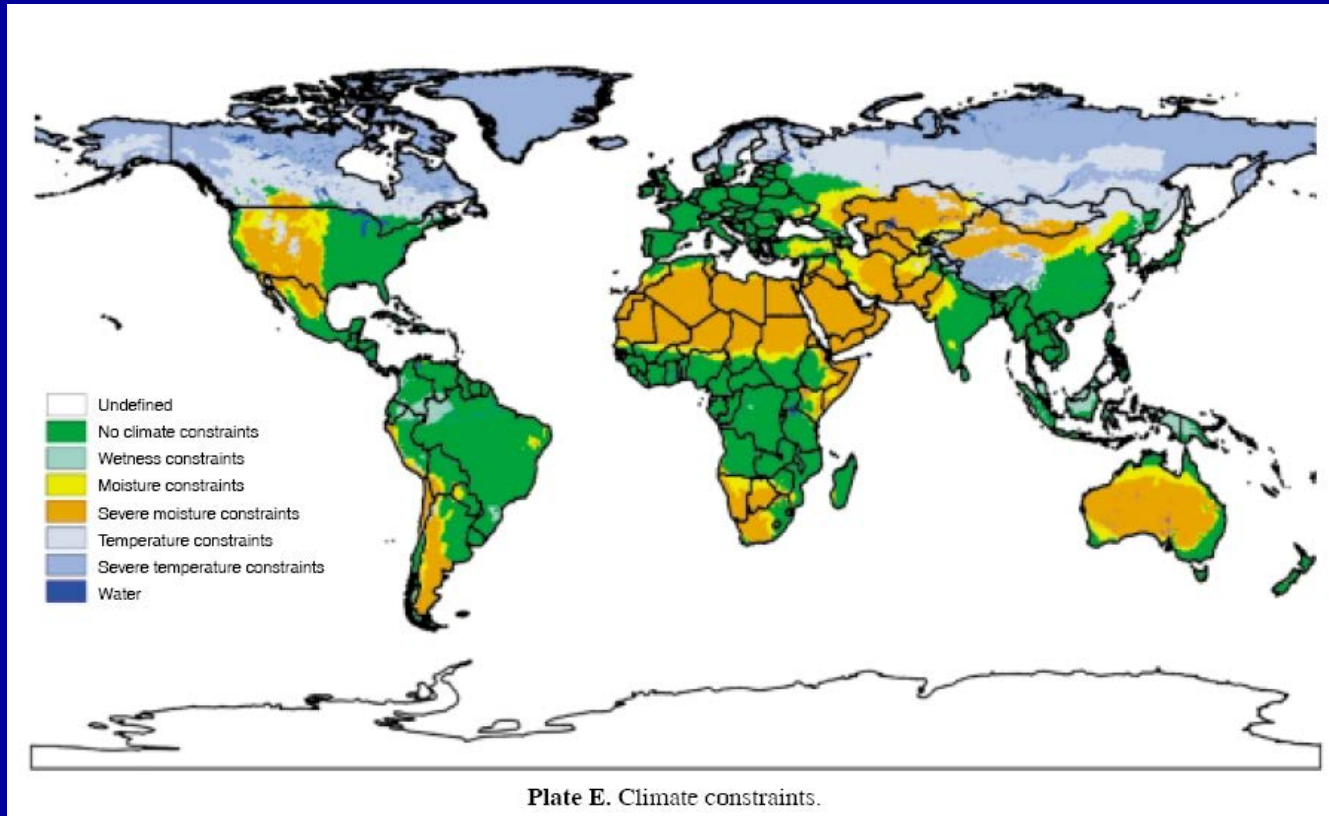
- Make presently unusable soils productive
- Increase genetic potential (of individual crops and/or farming system) (ditto for farm animals)
- Achieve as much of that potential as possible by:
 - Improving nutrition of that crop
 - Increasing water availability and control
 - Reducing competition from weeds for water, nutrients and sunlight
 - Reducing losses from disease and insects
- Reduce post-harvest losses

Crop Yield Gap Analysis Shows Large Productivity Increase Possible



Source: FAO. State of Food and Agriculture 2012, p. 106

Climate Constraints Changing



- Warming greater over land than over water and greatest at higher latitudes.
- Changing spatial distribution of precipitation
- Increased frequency of extreme climatic events

Source: International Institute for Applied Systems Analysis, Laxenburg, Austria.

Agriculturally Important Effects of Climate Change

- More carbon dioxide enhances plant growth
- Higher temperature extends growing season in high latitudes, but likely detrimental in low latitudes
- Water availability (increased need for irrigation)
- Increased risk from greater climatic variability and more frequent extreme events
- Proliferation of pests and diseases further north
- Sea-level rise causes loss of cropland
- Greater erosion and loss of soil fertility from greater surface water runoff.

Adaptations Will be Required Due to Global Climate Change

- As all agro-ecosystems shift with climate change, need larger public and private investments in adaptive plant and animal breeding just to sustain present productivity levels.
 - e.g. introduce more drought or heat tolerance.
- Change the mix of what crops are produced in a some geographic locations.
- Rely more on international trade.

Agricultural Research Potential

- There remains more productivity enhancement potential from classical plant and animal breeding, especially with modern genomics, and genetic engineering opens new frontiers:, e.g.
 - Improve nutritional content of grains, etc.
 - Increase tolerance to drought, wetness, temperature, salt, aluminum toxicity, (to increase yields and/or planted area under adverse or variable conditions)
 - Increase resistance to certain diseases; viruses
 - Reduce pesticide use, especially insecticides
 - Herbicide-resistant varieties
 - Slow down product deterioration

Frontiers of Technological Change

- Low-till agriculture
- Precision agriculture
- Sensors
- Computers/data processing (“big data”)
- Nanotechnology
- And many more

Role of the Private Sector

- The private sector will have to build the marketing & processing infrastructure.
- But this will happen only if government provides a legal environment and public policies that create a positive investment climate, such as:
 - Macroeconomic and political stability
 - Rule of law
 - Definition and timely enforcement of contract sanctity
 - Definition of property rights, including ease of registration, transfer and enforcement thereof

Essential Roles of Public Sector Investments in Rural Development

- Build (or induce others to build) rural infrastructure
 - Roads and other transportation
 - High cost transportation is a severe impediment
 - Telecommunications
 - Markets do not work well without information
 - Electricity supply
- Invest in agricultural research & education.
- Invest in people (human capital)
 - Universal primary school education
 - Quality health care

Immense Amounts of Capital Will be Required

- Capital investment requirements to provide the essential rural public goods (e.g. rural roads, agricultural research and extension, and rural education and health services) vastly exceed the capacity of most low income country governments.
- This is where foreign aid, lending by international development banks and philanthropy can play a critical role in supplementing the LDCs' own resources.

Long-Run Prospects

- Whether world market prices trend upwards, downwards or sideways in the 21st century will depend on whether agricultural land and water productivity rise faster, slower or at the same speed as world demand for food grows.
- The drop in public sector investments in agricultural development (and ag research in particular) must be reversed if there is to be any chance of avoiding an upward trend in prices, which would be devastating to low income consumers who spend a large fraction of their incomes on food.

Thank You.

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