INTERNATIONAL FOOD SECURITY: THE ROLE OF SCIENCE

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VARIETIES OF FOOD INSECURITY

• Starvation (famine)

• Chronic under nutrition (long term energy deficits, micronutrient deficits, or both)

• Episodic under nutrition (temporary deficits, due to factors such as fluctuating income or food costs)
# Famine in Retreat

<table>
<thead>
<tr>
<th>Country</th>
<th>Famine Dates</th>
<th>Numbers dead</th>
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<tbody>
<tr>
<td>USSR (Ukraine)</td>
<td>1932-33 Collectivization</td>
<td>6 million</td>
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<tr>
<td>USSR (Leningrad)</td>
<td>1943 war</td>
<td>700,000</td>
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<td>Bengal</td>
<td>1943-44 war “boom”</td>
<td>3 million</td>
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<td>People’s Republic of China</td>
<td>1958-61 Great Leap</td>
<td>30 million</td>
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<tr>
<td>African Sahel</td>
<td>1972-74 drought</td>
<td>300,000</td>
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<tr>
<td>Bangladesh</td>
<td>1974 floods</td>
<td>400,000</td>
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<td>Ethiopia</td>
<td>1984-85 drought/war</td>
<td>1 million</td>
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<tr>
<td>Mozambique</td>
<td>1991-92 war</td>
<td>200,000</td>
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<tr>
<td>Somalia</td>
<td>1992 war</td>
<td>300,000</td>
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<td>Sudan</td>
<td>1998 war</td>
<td>70,000</td>
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<tr>
<td>North Korea</td>
<td>1996-99 post-cold war</td>
<td>200,000 up to 3.5 million</td>
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CHRONIC UNDERNUTRITION IN RETREAT, EXCEPT IN AFRICA

Prevalence of underweight in children 0-59 months old

- Africa: 24.8% in 2005
- Asia: 24.5% in 2005
- LAC: 5.5% in 2005
EPISODIC UNDERNUTRITION: SOME DUBIOUS CLAIMS

2007-08 International price spike  
2008-09 Recession in United States

Figure 1
U.S. households by food security status, 2008

- Food-insecure households—14.6%
- Households with low food security—8.9%
- Households with very low food security—5.7%
- Food-secure households—85.4%

CAUSES OF CHRONIC UNDERNUTRITION:
LOW PRODUCTIVITY OF LABOR IN FARMING
CAUSES OF CHRONIC UNDERNUTRITION: PHYSICAL ISOLATION FROM MARKETS
CAUSES OF CHRONIC UNDERNUTRITION: SOCIAL MARGINALIZATION
DUELING APPROACHES TO HELPING THE RURAL POOR

Green Revolution Model
- Introduce modern agricultural science
- Link the poor to private markets

Food Sovereignty Model
- Avoid modern agricultural science
- Insulate the poor from private markets
DUELING STUDIES

2008 WDR

• Places trust in agricultural R&D, markets, public goods investments, and assistance to LDCs

• Offers quantified projection of future food production needs

• Executive summary offers average of 59 quantified factual assertions per page

2008 IAASTD REPORT

• Warns of the unintended consequences of technology and celebrates “local and traditional knowledges” in addition to formal science

• Does not offer projection of future food production needs

• Synthesis report offers average of 4 quantified factual assertion per page
**IS SCIENCE-INTENSIVE FARMING SUSTAINABLE?**

**ENVIRONMENTAL PERFORMANCE OF AGRICULTURE IN OECD COUNTRIES, 1990-2004:**

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<tr>
<td><strong>VOLUME OF FOOD PRODUCTION</strong></td>
<td>+ 5 PERCENT</td>
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<tr>
<td><strong>LAND AREA IN FARMING</strong></td>
<td>- 4 PERCENT</td>
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<tr>
<td><strong>WATER USE IN IRRIGATION</strong></td>
<td>- 9 PERCENT</td>
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<tr>
<td><strong>EXCESS NITROGEN USE</strong></td>
<td>- 17 PERCENT</td>
<td></td>
</tr>
<tr>
<td><strong>PESTICIDE USE</strong></td>
<td>- 5 PERCENT</td>
<td></td>
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<tr>
<td><strong>GREENHOUSE GAS EMISSIONS FROM AGRICULTURE</strong></td>
<td>- 3 PERCENT</td>
<td></td>
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<tr>
<td><strong>INCREASE IN TOTAL ENERGY USE IN AGRICULTURE</strong></td>
<td>1/6 THE RATE OF INCREASE IN THE REST OF THE ECONOMY</td>
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WHICH SIDE HAS BEEN WINNING THE ARGUMENT?

Africa: U.S. ODA to Agriculture vs. PL-480 Food Aid (1980-2006)
RECENT SCIENTIFIC ASSESSMENTS THAT DO NOT REQUIRE DUPLICATION

• A technical projection of global food production potential compared to growing requirements, out to 2050:


• A technical projection of the impacts of climate change on global food production out to 2050:

A GAP IN THE ASSESSMENT LITERATURE: JUDGING THE PROMISE OF PRECISION FARMING

• SOURCES OF R&D, AND RATES OF INNOVATION?
  - Applications of ICT, GPS, GIS, and remote infrared sensing
  - Drip irrigation and laser-leveling
  - Precision machinery and robotics
  - Bioengineering

• PATTERNS OF UPTAKE?
  - Mechanical and ICT applications: large or highly capitalized farms only?
  - Biological applications: scale neutral, and available to the poor?

• “ORPHAN” APPLICATIONS IN NEED OF PUBLIC R&D SUPPORT?