WEEK 3: WHAT IS THE FOOD PROBLEM?
F-2007

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I. The Crops that Feed the World

A. Major World Food Crops (FAO data)
   - **Grains:** corn/maize, rice, wheat, sorghum, millet
   - **Tubers:** potato, cassava, sweet potato, yam
   - **Legumes:** soybeans, groundnuts/peanuts, beans, cowpeas
     *(Note: Importance in diet varies by region/country)*

B. The Diffusion of the World’s Major Crops
   1. Where Did These Crops Originate?
      *Today’s crops grown far from "centers of origin" (Origins)*
      - **C. America/Mexico:** corn, tomato, cotton, cacao
      - **South America:** cassava, potato, peanuts
      - **Africa:** millet, sorghum, coffee, cowpea, yam
      - **Europe:** oats, rye
      - **Near East:** wheat, barley, apples
      - **Asia:** rice, soybean
2. How were these crops diffused?
   - Explorers
   - Migrants
   - Systematic introductions
     - Rice: US, 1700s
     - Soybeans: Brazil, 1940s

3. Why have these crops been adopted throughout the world?
   **Met preferences of:**
   - Consumers:
     - Taste/variety
     - Cheaper source of calories
   - Farmers:
     - Market potential (e.g., soybeans in Brazil)
     - Growing advantage (e.g., cassava in Africa)

4. Why are the “centers of origin” important to us? (maize, beans)

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II. What Factors Affect World Food Demand?

A. What Factors Cause Food Demand To Change?
   1. 
   2. 
   3. 

B. What Factors Determine Consumers’ Tastes & Preferences?
   1. Price
   3. Income/changes in income
      **Engel's law** (mid-1800s):
      - As Y increases, families spend smaller % on food;
      - As Y increases, individual’s food preferences change
Examples:
- Old Europe: rye & wheat > meat, fruits, vegetables
- China today: wheat & rice > pork

3. **Income elasticity** (e) of demand show impact of income change
   - **Def.:** change in demand (%) associated with 1% change in income (Y)
   - Y elasticity of a commodity varies between countries, due to cultural & income differences
   - (Table 3.2)

Examples
- Rich countries
  - High? Low?
- Poor countries
  - High? Low?

C. How Can Countries **Predict** Future National Demand?

Future food demand = Pop. Change (%) + [(Y Change (%) x (e))]

**Examples**

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>Y</th>
<th>e</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor LDC</td>
<td>3.5%</td>
<td>2%</td>
<td>0.8</td>
<td>5.1%</td>
</tr>
<tr>
<td>Mid-income LDC</td>
<td>2.0%</td>
<td>2%</td>
<td>0.4</td>
<td>2.8%</td>
</tr>
<tr>
<td>Wealthy DC</td>
<td>1.0%</td>
<td>2%</td>
<td>0.1</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

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III. **How “Food Secure” Is the World?**

A. The “right to food”
   - A traditional right (ancient Israel, Sierra Leone, Indonesia) (Photo)
   - Guaranteeing the “right to be free of hunger” is considered a human right, an **obligation** of governments (UDHR, 1948)

B. **Types** of Food Security
   - **Def.:** all citizens have enough food to meet their nutritional needs

   1. How is food insecurity/hunger measured?

   2. National vs. household food security
      - **National:** (Photo)
      - **Household:** (Photo)
      - How do nations/households achieve food security? (Figure)

   **Note:** national food security doesn’t insure HH food security! **Why?**
C. **Degrees** of food insecurity (chronic hunger vs acute hunger)

1. “Chronic” food insecurity (hunger that leads to malnutrition)
   **Def.:** a deficit of 100-400 kilocalories/day (2,100 recommended)
   - Extent (>800 million people in LDCs, little progress in 1990s)
   - Growing at 4 million/year
   - Regions most affected: (Figure)
     - Most people? (64%)
     - Highest incidence? (35%, +20% in 1990s)
   - Most vulnerable groups?
     (25%)
   - Consequences?
     - Reduces kids intellectual development (PEM)
     - Reduces adults’ ability to work
     - Increases everyone’s vulnerability to diseases/mortality
     - Slows economic growth/development

   - Underlying Causes (complex of interrelated human ills)?
     - Poverty (1.3 million earn < $1/day) (Figure)
     - .
     - .
     - .
     - .
     - .

   - Success in reducing chronic hunger?
     - Greatest success: China, SE Asia, L. America (Figure)
     - Brazil—“Zero Hunger” program
     - Least success: ?????(Fig. Amt, Change)
     - Why? (Figure)
     - School feeding programs can make a big difference!!

   - Why limited success?
     - Problem is so extensive
     - Chronic hunger is not highly visible (hidden)
     - Many factors contribute to the problem
     - Lack of political will to allocate needed resources
2. Acute food insecurity (food emergencies)
   **Def.**: extreme food shortage that may cause famine
   o Extent
     ✓ Currently, 33 countries facing acute food shortages (FAO)
   o Regions most affected today?
     ✓ (parts of 33 countries)
   o Current/recent causes (triggers of acute food shortages? **Table**)
     Political/social-related
     ✓ Civil wars/refugees/displaced persons
     ✓ Government policies/economic crisis (Zimbabwe, N. Korea)
     ✓ HIV/AIDS
     Weather/nature-related
     ✓ Drought/dry weather
     ✓ Floods (Mozambique, 2000), tsunamis, earthquakes
     ✓ Pest/disease outbreaks (West Africa, esp. Niger) (Photo)
   o Success in reducing acute hunger?
     ✓ Considerable success, few deaths in recent years (Figure)
     ✓ Famines have been prevented by:
       ➢ Improved ability to predict: Global Information & Early Warning System (FAO & USAID/FEWS) http://www.fews.net/ (Figure)
       ➢ First line of defense is local, “coping strategies”
       ➢ Then, UN’s World Food Program & Western donors have provided food aid as the crisis deepened (Photo http://www.wfp.org/)
       ➢ Criticisms of international famine response system?

3. Famine
   **Def.**: Extreme/acute food shortage that if not addressed, result in acute hunger, emaciation, & death—especially affects kids (Photo)
   o Regions—Typically only affects a part/region of a country
o Causes of famine?
  ✓ Natural factors (drought, flooding, earthquakes, tsunamis, crop pests) are often the trigger/agent
  ✓ But human factors are the major cause of famine, government failure to respond magnifies the impact of the natural triggers

  Examples of acute food shortages that resulted in deaths
  o Colonial India (colonial neglect)
  o Sudan, civil war (government used food as a weapon):
  o N. Korea (govt. restricted NGO food distribution)
  o Zimbabwe (govt. prevented NGO access to some regions)

o Solutions?
  ✓ Short term: international pressure on governments (Sudan, Zimbabwe)
  ✓ Long term: peace, democracy, development
  ✓ Natural disasters: better preparation & response mechanisms

IV. Ending World Hunger?
A. Can We Meet the Food Needs Future Generations?

1. Optimist’s Arguments: past successes shows its possible!
   o More food is available worldwide that ever before
     o Food production has increased faster than population  (Figure)
     o Grain yields have doubled in past 30 years  (Figure)
     o Grain prices have declined for decades  (Figure)

   o If prices increase, farmers will grow more grain

   o New technology (esp. biotechnology) is on the horizon

   o Other?
2. **Pessimist’s Arguments:** predict massive food shortages, more malnutrition!
   - Declining rate of yield increase for cereal crops
   - Declining cropland—due to urbanization, industrialization, soil erosion—will reduce future food supply
   - Declining supply of groundwater—will reduce water for crop irrigation
   - Increasing income—will increased demand for grain & meat, world will need more grain (e.g., China)
   - Global warming—1 degree C rise will reduce grain yields 10%
   - Declining foreign aid for agriculture & agricultural research
   - Population growth & rapid urbanization—will increase demand
   - Rising energy prices—will increase cost of fertilizer, transport
   - Rising corn prices due to ethanol production
   - Other?

B. What’s Needed to Insure Food Security/Reduce Hunger & Poverty?

1. Some proposed supply-related solutions:
   - Increase agricultural productivity (e.g. increase farmers’ use of new technologies to increase yields)
   - Promote sustainable natural resource use to reduce environmental degradation (e.g., soil erosion, salinization)
   - Improve rural infrastructure (dams, roads) & market access
   - Increase funding for agricultural research & extension (foreign aid for Ag R&D down 30% in ’90s)

   **Note:** Recent donor recognition of the need to invest in improving agricultural, strengthening research systems
   - Other?
2. Some proposed demand-related solutions:
   - Reduce population growth (promote family planning)
   - Enhance food access/safety nets for the most needy
   - Other?

3. Some proposed policy-related solutions (US & other DCs)
   - Provide greater debt relief to the poorest LDCs
   - Increase development assistance/foreign aid
   - Reduce agricultural subsidies in DCs ($1 billion/day) (CD)
   - Increase assistance to address the HIV/AIDS crisis
   - Support multinational efforts to resolve civil conflicts
   - Implement initiatives to reduce global warming
   - Other?

C. Do we (the global community) have the political will to end hunger?
   - Little progress since 1994 World Food Summit, when countries committed to reducing world hunger
   - Will require an additional $8 billion/year to meet Millennium Development Goal to reduce child malnutrition 50% by 2015
     - Investments (drivers) needed in: rural roads, education, clean water, agricultural research, irrigation
   - Will ending world hunger be given higher priority in the future?
   - Hunger threatens social & political stability, creates a fertile environment for anti-western hostility
V. The Food Crisis in Sub-Saharan Africa

Many interrelated causes—some generalizations

A. Today’s focus is on Africa, not Asia (1974 food crisis);

What’s the problem in huge (very diverse) Africa? (Figure)

1. Farmers face harsh growing environment (Figures)
   - 2/3 continent has low rainfall (desert or semi-arid),
     droughts occur frequently
   - Soils are very old, poor in quality (Photo)
   - Tsetse fly reduces the agricultural area (20% of land uninhabitable) & use of animal traction (Figure)
   - Hot climate results in rapid water evaporation

2. Farmers lack access to improve food crop technology (Figure)
   - Farmers grow many different crops, utilizing many types of cropping systems
   - Farms are typically small, subsistence oriented
   - Little irrigation, compared to Asia, crop production is very risky
   - Poor farmers can’t afford to buy modern inputs (improved varieties, fertilizer), since credit is seldom available
   - Farmers have limited formal education
   - Colonial governments neglected food crop research (Figure)
   - Countries have few agricultural scientists/small agricultural research budgets

3. Rapid population growth absorbs growth in food production (Figure)
   - Total food production up but per capita food production down
4. Many government have neglected agriculture
   o Limited funding for agricultural research
   o Weak extension services

5. HIV/AIDS crisis
   o Reduces resources that governments & farmer have available to invest in agriculture
   o Creates farm labor shortages

6. Several countries plagued by civil war

7. Global Warming (2080)?
   o 5% decline in food production
   o 25-40% loss of natural habitat

   No quick fix is possible

B. Africa has great potential to meet its future food needs, success stories include Ghana, Mali, Uganda & previously Zimbabwe

<table>
<thead>
<tr>
<th>Crop</th>
<th>Million MT</th>
<th>Percent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize (Corn)</td>
<td>638,043,432</td>
<td>19.3%</td>
<td>19.3%</td>
</tr>
<tr>
<td>Rice</td>
<td>589,125,843</td>
<td>17.9%</td>
<td>37.2%</td>
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<tr>
<td>Wheat</td>
<td>556,348,627</td>
<td>16.9%</td>
<td>54.1%</td>
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<tr>
<td>Potatoes</td>
<td>310,810,336</td>
<td>9.4%</td>
<td>63.5%</td>
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<tr>
<td>Soybeans</td>
<td>189,233,748</td>
<td>5.7%</td>
<td>69.2%</td>
</tr>
<tr>
<td>Cassava</td>
<td>189,099,633</td>
<td>5.7%</td>
<td>75.0%</td>
</tr>
<tr>
<td>Barley</td>
<td>141,503,090</td>
<td>4.3%</td>
<td>79.3%</td>
</tr>
<tr>
<td>Sweet Potatoes</td>
<td>121,852,841</td>
<td>3.7%</td>
<td>83.0%</td>
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<tr>
<td>Tomatoes</td>
<td>113,308,298</td>
<td>3.4%</td>
<td>86.4%</td>
</tr>
<tr>
<td>Bananas</td>
<td>69,286,046</td>
<td>2.1%</td>
<td>88.5%</td>
</tr>
<tr>
<td>Sorghum</td>
<td>59,584,108</td>
<td>1.8%</td>
<td>90.3%</td>
</tr>
<tr>
<td>Coconuts</td>
<td>52,940,408</td>
<td>1.6%</td>
<td>91.9%</td>
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<tr>
<td>Yams</td>
<td>39,913,347</td>
<td>1.2%</td>
<td>93.1%</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>35,658,427</td>
<td>1.1%</td>
<td>94.2%</td>
</tr>
<tr>
<td>Plantains</td>
<td>32,974,330</td>
<td>1.0%</td>
<td>95.2%</td>
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<tr>
<td>Millet</td>
<td>29,805,914</td>
<td>0.9%</td>
<td>96.1%</td>
</tr>
<tr>
<td>Sunflower Seed</td>
<td>27,740,270</td>
<td>0.8%</td>
<td>97.0%</td>
</tr>
<tr>
<td>Oats</td>
<td>25,268,713</td>
<td>0.8%</td>
<td>97.8%</td>
</tr>
<tr>
<td>Beans, Dry</td>
<td>19,038,458</td>
<td>0.6%</td>
<td>98.3%</td>
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<tr>
<td>Rye</td>
<td>14,850,509</td>
<td>0.5%</td>
<td>98.8%</td>
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<tr>
<td>Peas, Dry</td>
<td>10,248,008</td>
<td>0.3%</td>
<td>99.1%</td>
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<tr>
<td>Taro (Coco Yam)</td>
<td>8,939,083</td>
<td>0.3%</td>
<td>99.4%</td>
</tr>
<tr>
<td>Chick-Peas</td>
<td>7,122,650</td>
<td>0.2%</td>
<td>99.6%</td>
</tr>
<tr>
<td>Broad Beans, Dr.</td>
<td>4,033,346</td>
<td>0.1%</td>
<td>99.7%</td>
</tr>
<tr>
<td>Cow Peas, Dry</td>
<td>3,721,850</td>
<td>0.1%</td>
<td>99.8%</td>
</tr>
<tr>
<td>Lentils</td>
<td>3,053,230</td>
<td>0.1%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Pigeon Peas</td>
<td>3,297,598,010</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
### Table 3-2

Selected income elasticities of demand for cereals and livestock products in various countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Cereals</th>
<th>Beef</th>
<th>Pork</th>
<th>Poultry</th>
<th>Cow's milk</th>
<th>Eggs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>0.15</td>
<td>0.58</td>
<td>0.29</td>
<td>0.64</td>
<td>0.45</td>
<td>0.55</td>
</tr>
<tr>
<td>Egypt</td>
<td>0.04</td>
<td>0.80</td>
<td>0.70</td>
<td>1.30</td>
<td>1.00</td>
<td>0.70</td>
</tr>
<tr>
<td>India</td>
<td>0.25</td>
<td>1.20</td>
<td>0.80</td>
<td>1.50</td>
<td>0.80</td>
<td>1.00</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.29</td>
<td>1.50</td>
<td>0.80</td>
<td>1.50</td>
<td>0.20</td>
<td>1.20</td>
</tr>
<tr>
<td>Kenya</td>
<td>0.35</td>
<td>1.00</td>
<td>0.70</td>
<td>1.20</td>
<td>0.59</td>
<td>1.30</td>
</tr>
<tr>
<td>South Korea</td>
<td>0.09</td>
<td>0.80</td>
<td>0.73</td>
<td>1.00</td>
<td>0.49</td>
<td>0.80</td>
</tr>
<tr>
<td>Malaysia</td>
<td>0.14</td>
<td>0.49</td>
<td>0.41</td>
<td>0.87</td>
<td>0.57</td>
<td>0.73</td>
</tr>
<tr>
<td>Mexico</td>
<td>-0.10</td>
<td>0.50</td>
<td>0.49</td>
<td>0.93</td>
<td>0.63</td>
<td>0.59</td>
</tr>
<tr>
<td>Nigeria</td>
<td>0.17</td>
<td>1.20</td>
<td>1.00</td>
<td>1.00</td>
<td>1.20</td>
<td>1.20</td>
</tr>
<tr>
<td>Philippines</td>
<td>0.22</td>
<td>1.20</td>
<td>0.53</td>
<td>1.00</td>
<td>1.50</td>
<td>1.00</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.06</td>
<td>0.56</td>
<td>0.47</td>
<td>0.50</td>
<td>0.00</td>
<td>0.50</td>
</tr>
<tr>
<td>Turkey</td>
<td>-0.05</td>
<td>0.60</td>
<td>0.50</td>
<td>1.20</td>
<td>0.00</td>
<td>0.80</td>
</tr>
</tbody>
</table>

If decisive action is not taken, the number of chronically undernourished persons will be substantially the same in 15 years time. The greatest suffering will be in sub-Saharan Africa, where food output has not kept pace with population growth. Reversing these trends will require rapid and sustainable production gains as well as measures to make food accessible to those who need it.
Figure 1  Net Global Starvation Deaths, in Millions, per Decade

Figure 6.1: Changes in Food Production Per Capita Since 1980

Trends in World Cereals Yields (kg/ha)
1961-2003

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WOULD YOU BELIEVE?

The highest average rainfall would be in Western Africa.

Africa: Mean Annual Rainfall, 1900-1999

Note: 100 mm = 3.9"
Figure 1. African crop zones. Source: *News from CGIAR* 5(1), March 1985.
Foreign AID Trends, 1962-2002
(2003 dollars)

Percent of GDP
Percent of Federal Budget

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Figure 2—Hunger in the developing world

Source: FAO 2005a
Figure 3—Percent change in number of under-nourished children, 2000-2005

Source: UN/SCN 2004
COUNTRIES IN CRISIS REQUIRING EXTERNAL ASSISTANCE¹ (total 33 countries)

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
<th>Immediate Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Size</td>
<td>Description</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

¹Includes refugees, internally displaced persons, and host communities.

Forms of Malnutrition—Quantity & Quality of Food

<table>
<thead>
<tr>
<th>Form</th>
<th>Cause—Extreme/Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein-energy deficiencies</td>
<td>Diet lacks protein &amp; energy due to a deficiency in major macronutrients (e.g., carbohydrates, fats, proteins)</td>
</tr>
<tr>
<td>Micronutrient deficiencies</td>
<td>Iron—Lethargy/tiredness, impairs cognitive development</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>Swelling of the thyroid (goiter), impairs brain development</td>
</tr>
<tr>
<td>Iodine</td>
<td>Affects growth, weakens immune system, linked to higher risk of dying from diarrhea &amp; pneumonia</td>
</tr>
<tr>
<td>Zinc</td>
<td>Weakens immune system, increases risk of dying from diarrhea, measles, malaria; leading cause of child blindness</td>
</tr>
</tbody>
</table>

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