Global Food Security
Short and Long-Term Perspectives and Challenges
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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Related resources:
See the Training Path Policy Learning Programme 2009 for other related resources. Download the Programme Summary for background information and the Overview of the Programme Modules and Sessions for a complete list of resources developed for the Policy Learning Programme 2009.

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EASYPol is a multilingual repository of freely downloadable resources for policy making in agriculture, rural development and food security. The resources are the results of research and field work by policy experts at FAO. The site is maintained by FAO’s Policy Assistance Support Service, Policy and Programme Development Support Division, FAO.
Main messages

- Hunger in the world is increasing
- Crises exacerbate the situation dramatically
- Important challenges to agriculture as a source of food and livelihoods
- Need to take advantage of emerging consensus to reduce hunger and improve food security governance
Trends in world hunger

Number of Hungry: Millions


Number of Hungry: 1.02 billion

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Hunger and the “Food Crisis”

- 1968-71: 878
- 1975-76: 853
- 1990-92: 845
- 1995-97: 825
- 2000-02: 873
- 2004-06: 915
- 2008: 945

Click for notes
Economic crisis and hunger

- Several unique characteristics of the current crisis
  - At the heel of the previous price crisis
  - Vulnerable households find themselves with depleted coping mechanisms
  - Global rather than local or regional
  - Greater developing country integration in world economy / markets
Hunger reduction against target

Source: FAO 2009
First set of conclusions

- Crises Exacerbate Longer term trends
- Hunger increasing in a context of high and low prices and weak or strong global economic growth
- Hunger on the rise despite commitments
- Failure of global food Security Governance
Food and Agriculture in 2050

HOW TO FEED THE WORLD 2050

click for notes
Feeding the world in 2050... drivers and challenges

- Main drivers of demand for food:
  - Population to reach 9.1 bn. by 2050
  - Majority of additional people in the urban areas of Developing Countries
  - Global economic growth of 2.9% per annum between 2005 and 2050
  - Developing Countries to grow by 5.2%
  - Poverty rate to fall to (range 0.5% to 12% in 2050)
Population growth

Source: UN Population Division, from van der Mensbrugghe et al. 2009
**Income growth**

Source: Simulation results with World Bank’s ENVISAGE model, from van der Mensbrugghe et al. 2009
Demand for food: Effective Versus Notional

- **Effective demand for food to increase by 70% between between 2005/2007 and 2050**
- 370 million people estimated to be hungry in 2050 (4.8% prevalence)
- How will we meet effective demand
- How do we make sure that all demand is effective?
**How much more needs to be produced by 2050?**

**Absolute increments in percent**

<table>
<thead>
<tr>
<th>Region</th>
<th>Past 1961/63 to 2005/07</th>
<th>Future 2005/07 to 2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>148</td>
<td>70</td>
</tr>
<tr>
<td>Developed</td>
<td>63</td>
<td>23</td>
</tr>
<tr>
<td>Developing</td>
<td>255</td>
<td>9</td>
</tr>
</tbody>
</table>

The past period is defined as 1961/63 to 2005/07, while the future period is defined as 2005/07 to 2050.
Sources of growth in crop production (2005/07 to 2050)

- Arable land expansion
- Increases in cropping intensity
- Yield increases

**World**
- Arable land expansion: 77%
- Increases in cropping intensity: 8%
- Yield increases: 14%

**Developing countries**
- Arable land expansion: 71%
- Increases in cropping intensity: 6%
- Yield increases: 21%

**Latin America**
- Arable land expansion: 52%
- Increases in cropping intensity: 18%
- Yield increases: 30%

**sub-Saharan Africa**
- Arable land expansion: 69%
- Increases in cropping intensity: 6%
- Yield increases: 25%

**South Asia**
- Arable land expansion: 87%
- Increases in cropping intensity: 8%
- Yield increases: 8%

**East Asia**
- Arable land expansion: 86%
- Increases in cropping intensity: 12%
- Yield increases: 2%

**Near East / North Africa**
- Arable land expansion: 90%
- Increases in cropping intensity: 17%
- Yield increases: 7%
Scope for land expansion

- Area expansion
  - 1.6 billion hectares currently used for crop production,
  - 70 million more hectares to be brought to production (+ 4.5%)
  - +120 million in D.ing -50 million in Industrialized
  - 2.7 billion with production potential, mostly in SSA and LAC
  - economic feasibility, but that is changing with prices
  - but concerns about biodiversity loss, carbon emissions, erosion
Is there enough land to go around??

Arable land and land under permanent crops: past and future
Is there enough land to go around??

Developing countries with the highest (gross) land balance

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Water resources

- Story Similar to Land Situation
  - Global abundance of water
  - Country/local shortages reaching alarming rates
  - Regions without potential for land and water expansion (NENA, S. Asia)
  - Harvested irrigated land to expand by 17%, water withdrawals by 11%.
Feeding the world in 2050...

- Global Baseline Scenario on Food Availability: Optimistic i.e. Effective demand can be met from some expansion and better exploitation of available resources

- Scenario assumes long-standing forces will continue in the long run (e.g. population, diet shifts, urbanization)

- Scenario assumes that yield gaps can be bridged and new varieties will further improve the ability of the world to feed itself.

IS IT ALL FINE THEN ???
THE ANSWER IS "No"

- Global scenario masks the plight of at least 27 countries with undernourishment above 5% even in 2050
- 370 million people in developing countries will be still hungry (4.7% of developing country situation)
- Several countries seem to have reached the limits of agro-ecological potential to expand agriculture
5 Challenges for food and agriculture

- The yields/technology challenge
- The Climate Change Challenge
- The Biofuels Challenge
- Hunger Reduction and Agricultural Transformation
- Reforming the System of Global Food Security Governance
Yields: Retrospect and prospects

Wheat yields (kg/ha)

- East Asia
- All developing countries
- South Asia

Equation: \( y = 49.796x - 96584 \)

\( R^2 = 0.9796 \)
The challenge of increasing yields

- Yield increases have accounted for the majority of production growth in recent decades
- The future: yields and intensification 90% of the growth in crop production (world)
- Yield Growth for major grains:
  - Decline from 1.9 to 0.7 Annual Growth rate 1961-2007 vs 2005-2050
    - Reduction in growth of aggregate demand/declining prices
    - Inappropriate incentives to adopt technology
    - Under-investment in agriculture
    - Under-investment in R and D
  - However potential for closing the “yield gap” is high and achievable
The technology challenge

- Study after study: Enormous returns to R&D: 40-50%
- Baseline projections assume a steady growth in yields...however
- Global Public R & D spending
  - 1981-2000 : 2.1%
  - 1991-2000 1.1 % (Dev.ing 1.9%, Indust. 0.5%)
  - Huge disparities: India (6.2%, China 3.9%)
Annual growth rates in agricultural R&D, by geographic area

- Sub-Saharan Africa
- Asia & Pacific
- Latin America & Caribbean
- West Asia & North Africa
- Developing countries
- High-income countries

Annual growth rate (percentage)

1976-81
1981-91
1991-2000
The technology challenge

- R and D adaptation for the needs of small farmers, marginal areas and orphan crops.
- Incentive structure and resource mobilization for ensure the right technologies now for problems of the future.
- Private-public partnerships for agricultural R&D.
- Developing gender-balanced systems for spreading knowledge, skills and technology (dissemination).
Impacts of Climate Change 1

- Impacts of climate change on crop production are
  - vary significantly overtime
  - geographically very unevenly distributed
  - wide variability in estimates

- Aggregate impacts of projected climate change on the global food system are relatively small. The global balance of food demand and supply is not likely to be challenged until middle of the century.

- Autonomous adaptation (planting dates, cultivar changes, moisture conservation tillage, deploying irrigation where economical, switching crops) will offset some (gradual) warming (temperate climate +3-5°C, tropics +0-2°C).
Impacts of Climate Change 2

- Atmospheric changes (CO2 fertilization) may initially increase productivity of current agricultural land. CO2 fertilization assumptions make the difference between projected short-term and long term effects of CC.

- Climate change, with and without CO2 fertilization will have a clearly negative impact in the second half of this century.

- CC impacts on land vary: Land suitability down in Africa and Latin America but up (initially) elsewhere.

- Changes in frequencies of extreme events (droughts, heat waves, severe storms) are more troublesome in the near term than gradual changes in average conditions.

- Impacts of climate change on increasing net irrigation water demand could be as large as changes projected due to socio-economic development in 2000-2080.

- Sub-Saharan Africa will account for 40 to 50 percent of undernourished people globally by 2080, compared with about 24 percent today.
Mitigation potential from agriculture

- Cropland management
- Grazing land management
- Restore cultivated organic soils
- Restore degraded lands

Mt CO2-eq. yr⁻¹ @ 0-20 USD tCO-eq⁻¹

- Non-Annex I
- Annex I
Climate change

- Removing key constraints to adaptation
- Exploring the key synergies between food security, adaptation and mitigation (technological, institutional, financing)
- Finding coherence and mutual support between national and global agendas for adaptation, mitigation and food security
- Using payments for carbon as an important source of funding for developing country agriculture
The bioenergy challenge

- Competition for commodities and also for resources
- Higher cereal prices
- Impacts of biofuels larger in the short and medium run as second generation is developed
- Smaller progress in hunger reduction with increased biofuel production
- Opportunities for producers, but uneven access to markets, and most small producers are net buyers of food
- Increased biofuel use of cereals comes primarily (2/3) from increased production, ¼ from reduced feed use and the rest from reduced food consumption
Impacts of first-generation biofuels on agricultural prices

a) In 2020 (% change)

b) In 2030 (% change)
Biofuels

- Enabling developing countries to take advantage of opportunities offered by biofuels
- Reconsidering (support) policies in developed countries (subsidies, mandates, trade barriers)
- Achieving more coordinated policies among countries and sectors (agriculture, energy, trade, environment)
- Guidelines for sustainable bio-fuels production
## Joint impacts of climate change and bio-energy

**Climate change and biofuels: projected range of impact on agricultural prices and risk of hunger in 2030**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Food prices, percent change (Price index: 1990=100)</th>
<th>Hunger risk (Additional people at risk of hunger, in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest projection</td>
<td>Highest projection</td>
</tr>
<tr>
<td>Climate change</td>
<td>-3%</td>
<td>6%</td>
</tr>
<tr>
<td>Biofuels</td>
<td>3%</td>
<td>36%</td>
</tr>
<tr>
<td>Combined effect</td>
<td>2%</td>
<td>33%</td>
</tr>
</tbody>
</table>
Agricultural transformation and poverty reduction

- Agriculture’s role beyond food production
  - As an engine of economic growth for poverty reduction
  - As an engine of growth for the rural economy
  - Even in “transforming” countries key role of agriculture in reducing poverty

- The share of agriculture generally declines with development
  - Agro-industrialization
  - Erosion of the comparative advantage of smallholders
  - Pressure to commercialize or exit the sector
    - Challenges for smallholders who remain in agriculture
    - Challenges for those who leave the sector
Protecting and improving livelihoods during the “Agricultural Transformation”

- Investment in productivity, market access and risk management for those who remain in agriculture
- Investment in human capital to expand options for those who leave the sector
- Critical importance of broad-based economic growth to increase incomes and access to food for the poor, regardless of where they earn their livelihoods
- Re-design safety nets on the basis of lessons learned and new sources of instability
- Assist smallholders to take advantage of first and second generation biofuels
Food security governance

- The challenge is to create a system that effectively promotes, supports and sustains food security - especially for the poorest and most marginal.

- Address structural causes of food insecurity and their institutional and governance dimensions.

- Prevent crises and deal with emergencies.

- Ensure that the world agricultural system and the resources it draws upon are managed in an unsustainable manner.

- Address the long and short-term challenges posed by climate change.

- Reverse trends in investment in agriculture especially critical areas such as research, extension, infrastructure and biodiversity.

- Promote a global trading system sensitive to the needs of the poor.
Elements of global food security governance (cont..)

- Provide science-based analysis and advocacy on the food security situations, its key determinants, its possible evolution.
- Promote the coordination and strengthening of relevant international, regional and national strategies, policies, programmes for sustainable agriculture and security.
- Promote actions that foster an enabling environment for investment in agriculture, while maintaining a focus on equitable, broad-based sharing of resources.
- Pursue convergence/coherence of food security policies, in particular with related issues (climate change, environment sustainability and natural resource management).
- Monitor progress and results, including on past and present policy measures and on resource mobilization’s effectiveness and efficiency.
Elements of the reform of the CFS

- Improved (vertical, horizontal) coordination and policy cohesion
- Greater inclusiveness of all key stakeholders to better address such complex and interrelated issues more effectively.
- Ensure that commitments to end hunger are converted to concrete actions
- Ensure strong scientific support to decision-making institutions and bodies
Between challenges and hopeful signs

- Heightened attention to agriculture and food security (G8 in Aquila)
  - private interest when prices were high
  - public interest continues

- An emerging Consensus
  - Right to Food as an Organizing Framework for Global Action
  - Rights to resources frameworks arising as a result
  - Reform Global Governance
  - Increase public and private investment
    - Sound agricultural policies and strategies
  - Social protection and safety nets
  - Strengthen smallholder access to resources
  - Explore options for coordinated risk management
End notes

[Slide 4]: From 870 million in 2004-2006 to 915 million in 2008 to 1020 million in 2009. Return to slide 4

[Slide 5]: Progress in Hunger reduction is marked by 2 events: i) High Food Prices; ii) The Financial/Economic Crisis. Return to slide 5

[Slide 7]: Recent increases mean we are farther off-track than ever from meeting the World Food Summit goal of halving the number of hungry people by 2015. (The picture is slightly better in terms of MDG1 to reduce the proportion of hungry people by 2015, but there too progress has recently been reversed.) The sharp increase in the number of hungry people as a result of the two consecutive crises: food prices and economic crisis. Return to slide 7

[Slide 9]: Note expert papers are currently being finalized, and various synthesis and proceedings documents are being prepared for the High-Level Expert Forum that will take place in Rome 12-13 October 2009, which will in turn help inform the World Summit on Food Security that will take place in Rome in mid-November 2009. Return to slide 9

[Slide 10]: World Bank: global economic growth averaging 2.9%/year between 2005-2050 (1.6 for HICs and 5.2 for developing). Per-capita incomes rising 2.2%/year to 2050; assuming income elasticity of demand for food is 0.5, per-capita food demand would increase 1.1%/year; + 0.8% population growth => 1.9%/year increase in total demand for food. (Note elasticity declines with income, and is already near 0 in most HICs, but rising demand for livestock products in developing countries, plus new competition from biofuels.) WB estimates developing-country absolute poverty ($1.25 PPP/day) down from 21.9% in 2005 to 0.4 in 2050 (even in SSA, from 51.7 to 2.8) Hillebrand estimates global absolute poverty down to 12% in 2050 if non-OECD countries match growth of last 25 years; down to 2.5% if they match growth of 2003-07. Return to slide 9
[Slide 11]: WB: population grew 2.5x over past 50 years, 50% over next 50, or 0.8% per year (around 40%) (UN medium variant)—but still 3 billion more people, almost all in developing countries, most in urban areas. Return to slide 11

[Slide 12]: Progress in Hunger reduction is marked by 2 events: i) High Food Prices; ii) The Financial/Economic Crisis. Return to slide 12

[Slide 14]: FAO’s 2006 baseline projections (FAO, 2006a) show that by 2050 the world’s average daily calorie availability could rise to 3130 kcal per person, an 11 percent increase over its level in 2003. This would by 2050 still leave some 4 percent of the developing countries’ population chronically undernourished. For these projections to materialize, world agricultural production would need to increase by some 70 percent over the period from 2005/07 to 2050 (see Table 1). World population is projected to rise by some 40 percent over this period, meaning that per caput production would rise by some 22 percent. The fact that this would translate into an only 11 percent increase of per caput calorie availability is mainly due to the expected changes in diet, i.e. a shift to higher value foods of often lower calorie content (e.g. vegetables and fruits) and to livestock products which imply an inefficient conversion of calories of the crops used in livestock feeds. Meat consumption per caput for example would rise from 37 kg at present to 52 kg in 2050. Return to slide 14

[Slide 17]: Ninety percent (80 percent in developing countries) of the growth in crop production would be a result of higher yields and increased cropping intensity, with the remainder coming from land expansion. Arable land would expand by some 70 million ha (or less then 5 percent), the expansion of land in developing countries by about 120 million ha (or 12 percent) being offset by a decline of some 50 million ha (or 8 percent) in the developed countries. Almost all of the land expansion in developing countries would take place in sub-Saharan Africa and Latin America. Return to slide 17
End notes

[Slide 22]: Other challenges include: increased investment in infrastructure, dealing with crises and emergencies, dealing with biosecurity. Return to slide 22

[Slide 24]: The literature on yield gaps distinguishes two components of yield gaps, one due to agro-environmental and other non-transferable factors (these gaps cannot be narrowed), and another component due to differences in crop management practices such as sub-optimal use of inputs and other cultural practices. This second component can be narrowed provided that it makes economic sense to do so and therefore is termed the 'exploitable yield gap' or 'bridgeable gap'.

The potential to raise crop yields (even with existing technology) seems considerable. Provided the appropriate socio-economic incentives are in place, there are still ample 'bridgeable' gaps in yield (i.e. the difference between agro-ecologically attainable and actual yields) that could be exploited. Fears that yields (e.g. for rice) are reaching a plateau do not seem warranted (except in a few very special instances). Return to slide 24