The macroeconomic environment for agriculture and rural areas to develop over the next 50 years

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THE WORLD BANK

EXPERT MEETING ON
“How to Feed the World in 2050”
FAO, ROME
JUNE 24-26, 2009
Unlike earlier booms, the current boom involved all commodity groups.

Real MUV-deflated, 2000=100

Source: World Bank
All commodity prices have declined sharply since the mid-2008

Nominal price indices (2000=100)

Source: World Bank
Prices in domestic currencies of developing countries rose much less than world prices

Percent change 2000-07

- **Energy**
  - Dollar (MUV-deflated)
  - Domestic currency (CPI-deflated)

- **Metals**
  - Dollar (MUV-deflated)
  - Domestic currency (CPI-deflated)

- **Food**
  - Dollar (MUV-deflated)
  - Domestic currency (CPI-deflated)

Source: World Bank
Directional comovement of 28 commodities

No comovement = 0 / perfect comovement = 1, 12-month moving average

Source: World Bank
Wheat Price volatility, 1960-2009

Month/month absolute %-change, 12-month moving average

Source: World Bank
Key factors behind the recent boom and the “perfect storm”

- Sustained economic growth especially in developing countries
- Underinvestment in extractive commodities
- Weak dollar, fiscal expansion, and low cost of capital
- Increased investment fund activity
- Weather-related supply disruptions (in agriculture) and strikes (in metals and oil)
- Policies that (i) encouraged production of biofuels and (ii) restricted exports during 2008
- Yet, the 2008 rally may have involved an element of bubble of psychology!
But, there have been several exaggerations and misrepresentations

- Increased income and dietary changes in some developing countries (especially China and India) was a key factor behind food price increases
- Excessive speculation caused prices to skyrocket
- The world is running out of extractive resources, especially crude oil
- The world is running out of food because of yield declines
Production of most commodities expands less quickly than income but faster than population.

Average annual growth rate, 1965-2006

Source: World Bank
Technological progress increases the efficiency of commodity use

Source: World Bank
Grain consumption by China and India (rice, maize, wheat)

Source: World Bank calculations based on FAPRI data
Income elasticity for grains is small even at low income levels

<table>
<thead>
<tr>
<th></th>
<th>Low Income</th>
<th>Lower/Middle Income</th>
<th>Upper/Middle Income</th>
<th>High Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains</td>
<td>0.15</td>
<td>0.10</td>
<td>0.05</td>
<td>-0.01</td>
</tr>
<tr>
<td>Vegetable oils</td>
<td>0.50</td>
<td>0.65</td>
<td>0.78</td>
<td>0.41</td>
</tr>
<tr>
<td>Meats</td>
<td>0.31</td>
<td>0.51</td>
<td>0.68</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Source: World Bank
Yield growth has fallen for most agricultural commodities

Average annual percent change in yields

Source: World Bank calculations based on USDA data
Most of production growth is due to yield increases

Average annual percent change in area and yields, 1960-2007

Source: World Bank calculations based on USDA data
What factors will shape the long term outlook of commodity markets?

In addition to policies and technological change, the following factors will shape commodity markets:

- **Increased link** between energy and non-energy commodity prices;
- **Biofuel mandates and subsidies** are likely to play a key role in food markets;
- **Investment fund activity** is likely to stay (or even intensify) implying that increased price volatility for most commodities will be the norm;
- **Economic growth** prospects in developing countries where consumption of extractive and industrial commodities grows faster;
- **Changing weather patterns** due to global warming will affect production and trade patterns of agricultural commodities.
Land used for US ethanol from corn

Source: World Bank calculations based on FAPRI data
Share of biofuels on world land use

Biofuels as a share (%) of global grain and oilseed area

Source: World Bank calculations based on FAPRI data
Long run price transmission elasticities from energy to non-energy commodities

Based on OLS estimates, 1960-2008 period

Source: World Bank
“Speculation” and commodity markets

“Speculators”

**Speculators in futures exchanges**
- Important entities for the functioning of the futures market as they undertake risk

**Speculators who “corner” markets**
- Isolated cases such as the cornering of the copper and silver markets

**Hedge funds and short term trading**
- Short term profit seeking, often associated with short term price volatility

**Stockholding activity by speculators**
- Hoarding of commodities expecting that price increases will generate profits

**Investment, pension, and wealth funds**
- Fund managers invest in long term futures contracts to diversify their portfolio

Source: World Bank
Forward looking scenarios

- **Key assumptions**
  - Population and labor force
  - Savings/investment
  - Productivity by sector (agriculture, manufacturing, services)
  - Natural resources
  - Non-homothetic demand (especially for food)

- **New features**
  - CO2, N2O, CH4,F-gases & climate module
  - Climate induced agricultural ‘damages’
  - 1st and 2nd generation biofuels
Population history and projection

Source: Simulation results with World Bank’s ENVISAGE model.
Land under cultivation and potentially suitable

Billion hectares

<table>
<thead>
<tr>
<th>Region</th>
<th>Current</th>
<th>Potentially suitable</th>
</tr>
</thead>
<tbody>
<tr>
<td>High income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Asia</td>
<td></td>
<td></td>
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<tr>
<td>Europe &amp; Central Asia</td>
<td></td>
<td></td>
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<tr>
<td>Middle East &amp; North Africa</td>
<td></td>
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</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td></td>
<td></td>
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<tr>
<td>Latin America &amp; Caribbean</td>
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</tbody>
</table>

Source: FAO.
World agricultural prices are sensitive to productivity assumptions.

Source: Simulation results with World Bank’s ENVISAGE model.
Net agricultural trade could change substantially for some regions

Source: Simulation results with World Bank’s ENVISAGE model.
<table>
<thead>
<tr>
<th>Losses</th>
<th>Gains</th>
</tr>
</thead>
<tbody>
<tr>
<td>25+ %</td>
<td>25+ %</td>
</tr>
<tr>
<td>15-25%</td>
<td>15-25%</td>
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<tr>
<td>5-15%</td>
<td>5-15%</td>
</tr>
<tr>
<td>0-5%</td>
<td>0-5%</td>
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</tbody>
</table>

Source: Cline 2007.
Concentration and temperature in baseline

Source: Simulation results with World Bank’s ENVISAGE model.
Potential impact of climate change

Real income, percent difference from baseline with no damage in 2030

Source: Simulations with World Bank’s ENVISAGE model.
Take-away messages

- Should be able to feed 9 billion in 2050, but...
  - What will be the environmental externalities (e.g. land use)?
  - Declining food self-sufficiency could lead to rising trade stress

- Emerging challenges increase downside risks
  - Biofuels could compete for land and raise food prices
  - Rising temperatures could lead to rising agricultural stress particularly for vulnerable regions
  - Lack of spending in R & D and infrastructure could affect reference productivity rates