Global Food Trade: Food Crisis Price Shocks and Developing Country Impacts

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Mandela Washington Fellowship Institute
June, 2017
Ag Trade, Development and Risk

- Why International trade? Borders matter
- Food crisis and global price risk
  - Why border price spikes?
  - Developing country responses
- Risk management in Agriculture
  - Public interventions – stocks and trade
  - Private risk tools- futures and options, insurance, credit
- Assessing border risk
  - Supply-utilization balances
  - Price Transmission
- Afghanistan as a case study
Why International Trade?

- **Trade dependence**
  - Some countries rely on imports for food supply (Morocco)
  - Some are normally self-sufficient but meet shortfalls with imports (Kenya)
  - Some export food to balance domestic markets and earn foreign exchange (India, Vietnam)

- **Trade as an engine of growth**
  - Aid initiatives – Exports to foster growth
  - Hunger is fundamentally a poverty issue, economic growth cures poverty

- **Agricultural policy**
  - Trade regime is an integral part of a country’s food and agricultural policy – borders matter!
  - Aid initiatives – agricultural development, food aid/safety nets, budget support for policy measures
  - Trade may be used to stabilize domestic agricultural markets

- **External shocks – 2007-08 Food Crisis**
  - High international commodity prices brought “food inflation”
  - Higher prices could result in greater poverty and malnutrition
  - Countries used policy to isolate local markets from effects of 2007-08 Food Crisis
Borders Matter to Agricultural development policy, outcomes: Mozambique versus South Africa

- Differences:
  - Irrigation
  - Roads
  - Yields

- Untapped potential
  - Land grabs

- Maputu to Moamba to Komatipoort to Kreuger park

Source: IMF world commodity price data
Why the high international Prices?

- **Weather**, production shortfalls, and tight stocks
  - U.S. drought in 2011, 2012 especially
  - Russian drought in 2011
  - Normal weather in 2008!!

- Two big and **persistent demand shocks**:
  - Biofuels
  - Chinese soybean demand

- **Market inelasticity**
  - Tightness of land supply and limited reallocation possibilities
  - Biofuels policy constraints
  - Higher livestock prices contributing to persistent feed demands
  - Grain stocks and futures prices (speculation), and
  - **Trade policies that isolate national markets**

- International Macroeconomics
  - Exchange rates
  - World economic growth, recessions
How developing countries responded

- **Trade policy responses to global price spikes**
  - Reduced tariffs
  - Export taxes, bans
- **Also Domestic subsidies and tax cuts**
  - Fertilizer subsidies prevalent in Africa

- **Isolationist policies**
  - Kept world market price spikes out of domestic markets
  - Protecting urban consumers
    - Rather than more prevalent rural poverty
  - Would diminish supply response?
    - Countered with price guarantees and input subsidies
  - Reflected persisting stabilization preferences
Policy responses by local governments to 2007-08 Food Crisis

Trade based policy measures commonly adopted worldwide (as of 1 December 2008)

<table>
<thead>
<tr>
<th>Countries surveyed</th>
<th>Africa</th>
<th>Asia</th>
<th>Latin America</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>26</td>
<td>22</td>
<td>81</td>
<td></td>
</tr>
</tbody>
</table>

**Market Interventions**

**Trade policy**

- *Reduction of tariffs and customs fees on imports*
  - 18
  - 13
  - 12
  - 43

- *Restricted or banned export*
  - 8
  - 13
  - 4
  - 25

**Domestic market measures**

- *Suspension/reduction of VAT or other taxes*
  - 14
  - 5
  - 4
  - 23

- *Released stocks at subsidized prices*
  - 13
  - 15
  - 7
  - 35

- *Administered prices*
  - 10
  - 6
  - 5
  - 21

**Production Support**

- *Production Support*
  - 12
  - 11
  - 12
  - 35

- *Production Safety Nets*
  - 6
  - 4
  - 5
  - 15

- *Fertilizer and Seed Programs*
  - 4
  - 2
  - 3
  - 9

- *Market Interventions*
  - 4
  - 9
  - 2
  - 15

**Consumer Safety Nets**

- *Cash transfers*
  - 6
  - 8
  - 9
  - 23

- *Increase Disposable Income*
  - 4
  - 8
  - 4
  - 16

Source: adapted from Demeke, Pangrazio and Maetz, 2008.
Impacts on Developing Countries: Macroeconomics or Poverty and Hunger?

- Price increases drove **food inflation**, 
  - *Where high world prices cross borders, food inflation, poverty and hunger may result*
  - so also general **inflation**

- Mitigating measures (tariff and tax cuts, subsidies) costly
  - **Government revenue** falls – “fiscal space reduced”
    - Some governments willing to pay those costs for stability, others borrowed from World Bank

- **Balance of payments**
  - Food imports costly, also crude oil imports
  - Commodity boom, oil imports ➔ mix of consequences depending on trade status
  - **Exchange rates depreciate** when BOP worsens, all imports more costly
Impact Estimates on Poverty, Hunger and Malnutrition

- World Bank initially estimated 2007-08 crisis moved an additional **110 million people into extreme poverty**
  - Normally, about 1 billion people earned less than $1/day – the WB extreme poverty threshold
  - High prices in 2010-11 added **44 million** people to poverty headcount

- FAO and USDA initially estimated an additional **75-110 million** people experienced **hunger** due to the 2008 food crisis
  - Before crisis, about 800 million suffered from malnutrition

- IMF – High Food prices impacted poverty, whereas high energy prices affected macroeconomic performance

- Initial modeling predictions were recognized as **overestimates**. Key to these impacts were the extent to which the High world food prices crossed borders

- Better estimates of poverty and hunger impacts need **households surveys**, actual **price changes** faced, and **net seller status** of rural households
  - Poverty, hunger estimates from models, “evidence on the ground” harder to find
Grain Import Bills in 2007-08 Food Crisis: Doubled (up $56 billion) in 2008

Total Grain Import Value and Quantity: Trends and Deviations after 2006

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>57.18</td>
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<td>24.74</td>
<td>56.37</td>
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<tr>
<td>China</td>
<td>2.51</td>
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<td>-0.45</td>
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<tr>
<td>India</td>
<td>0.61</td>
<td></td>
<td>0.22</td>
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<td>Brazil</td>
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<td>1.45</td>
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<td>North Africa &amp; Middle East</td>
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<td>7.23</td>
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<td>2.54</td>
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<td>0.86</td>
<td>4.17</td>
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<tr>
<td>East &amp; Southeast Asia²</td>
<td>11.59</td>
<td></td>
<td>3.92</td>
<td>10.16</td>
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<tr>
<td>Latin America³</td>
<td>8.88</td>
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<td>3.29</td>
<td>8.61</td>
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<tr>
<td>Net Food Importing Developing¹</td>
<td>10.90</td>
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<td>4.29</td>
<td>11.07</td>
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<td>Low Income Food Deficit</td>
<td>17.63</td>
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<td>5.47</td>
<td>9.93</td>
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<tr>
<td>Least Developed</td>
<td>4.75</td>
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<td>0.64</td>
<td>2.95</td>
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</tbody>
</table>
## Import Volume in 2007-08 Food Crisis: Insensitive to higher prices?

<table>
<thead>
<tr>
<th>Region</th>
<th>Net Import Quantity in mmt</th>
<th>Additional Grain Imports: Quantity (above linear trend) in mmt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2006 Trend Forecast</td>
<td>2007</td>
</tr>
<tr>
<td>World</td>
<td>249.2</td>
<td>16.4</td>
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<tr>
<td>China</td>
<td>-3.8</td>
<td>-0.6</td>
</tr>
<tr>
<td>India</td>
<td>-4.7</td>
<td>-3.6</td>
</tr>
<tr>
<td>Brazil</td>
<td>1.3</td>
<td>-1.9</td>
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<tr>
<td>Developing Countries$^2$</td>
<td>136.2</td>
<td>-0.8</td>
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<tr>
<td>Sub-Saharan Africa</td>
<td>21.9</td>
<td>-5.5</td>
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<tr>
<td>South Asia</td>
<td>-2.4</td>
<td>-2.5</td>
</tr>
<tr>
<td>East &amp; Southeast Asia$^2$</td>
<td>25.6</td>
<td>-1.9</td>
</tr>
<tr>
<td>Latin America$^3$</td>
<td>34.1</td>
<td>0.3</td>
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</table>
Crude oil, hence fertilizer prices also spiked, and more so than food prices.

Fertilizer prices remained high after the food crisis.
Fertilizer Import Costs also Spiked, Followed High Oil Prices

<table>
<thead>
<tr>
<th>Region</th>
<th>Fertilizer Import Value (in $billions)</th>
<th>Additional Fertilizer Imports: Value (above linear trend) in $billions</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2006 Trend Forecast</td>
<td>2007</td>
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<tr>
<td>World</td>
<td>34.31</td>
<td>19.90</td>
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<td>China</td>
<td>2.89</td>
<td>0.01</td>
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<tr>
<td>India</td>
<td>2.03</td>
<td>2.10</td>
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<tr>
<td>Argentina</td>
<td>0.50</td>
<td>0.55</td>
</tr>
<tr>
<td>Brazil</td>
<td>2.65</td>
<td>13.39</td>
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<tr>
<td>Sub-Saharan Africa</td>
<td>1.69</td>
<td>0.14</td>
</tr>
<tr>
<td>North Africa &amp; Middle East</td>
<td>1.46</td>
<td>0.02</td>
</tr>
<tr>
<td>South Asia</td>
<td>3.21</td>
<td>1.75</td>
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<tr>
<td>East &amp; Southeast Asia</td>
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<tr>
<td>Net Food Importing Developing</td>
<td>2.80</td>
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<tr>
<td>Low Income Food Deficit</td>
<td>8.65</td>
<td>2.04</td>
</tr>
<tr>
<td>Least Developed</td>
<td>1.04</td>
<td>-0.09</td>
</tr>
</tbody>
</table>
“Best practices” Risk management advice -- before versus after food crisis

- **Domestic production variability** was the more important source of risk than international price variability

- **Long run agricultural development**: greater self-sufficiency, drought tolerant crops

- **Safety nets**: cash transfers, food aid

- **Private market solutions to risk** (crop insurance, futures markets)

- **Liberal Trade regimes**

- Developing country food price responses and some post crisis criticism reject these best practices, particularly liberal trade

- Risk management institutional development has been slow, difficult – World Bank project
  - Changing recommendations: First futures markets, then crop insurance
  - Little successful adoption over 15 years
  - Local Futures market only in large countries (China, India, South Africa)
Stocks or Trade as part of the strategy?

- Theory: Trade for well integrated countries
  Stocks for isolated, poorly integrated domestic markets
  - But Holding stocks for long periods is costly
  - Trade requires adequate foreign exchange (IMF, EU trade lending facilities seldom used)
  - Variable levies, Price Bands are WTO illegal, if cost effective
  - But most countries use both trade policy and stocks

- Inter-seasonal, short term stocks
  - Imperfect information on upcoming harvest
  - Import delivery lags
  - Seasonal price dynamics and storage
    - Depends on maturity of marketing institutions
    - Avoiding price spikes before harvest
Stabilizing Policy Mechanisms

- **Variable levies** – Tariff (T) adjusts to stabilize domestic price
- **Price bands** – Intervene only at extreme external prices
- **Marketing boards** – Variable quota adjusts to stabilize domestic consumption, hence price
- **Public Stocks**
  - Open, small country case – Pd determined by Pw, stocks only change M (trade volume)
  - Stabilized or imperfectly integrated markets – stocks changes affect domestic prices

  Trade can limit the extent to which food security stockpiles can function
Conventional wisdom advocated by World Bank and Donors prior to crisis was to emphasize private market solutions over public intervention

- Futures, options and forward contracting
- Crop insurance
- Safety nets – food aid or cash transfers?
- PPPs still emphasized
Anton’s Risk Management Framework

- 3 Layers -- Holistic policy approach
  - Farmer’s own actions: crop choice, diversification,…
  - Private institutions: Insurance, Futures and options
  - Market Failure → Government intervention

- Developing countries: Deeper market failure layer
  - Stabilization policy to address market failure
    - Useful when private institutions are inadequate
    - Intervention when market extremes faced
  - Depends crucially on institutional development (market information, storage, credit, insurance,…)

Risks faces by farmers

- **Production shortfalls** – drought, pests, floods, etc. affecting area planted and yield
- **Price** – Domestic price and world price (to the extent it influences domestic price)
  - Surpluses and price collapse
  - Seasonality and credit
- **Revenue** – Price times production
  - Inadequate supply and low farm income are both risks – policy must worry about both low and high prices, contingent on production
  - “Market Risk” and “Production Risk” in World Bank guide
- **Policy (enabling) environment** – rules governing price determination or risk strategies can change
## Variability and Covariance of Maize Production in Africa, 1995-2004

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>CV of Maize Production, Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>12.6</td>
</tr>
<tr>
<td>Kenya</td>
<td>8.9</td>
</tr>
<tr>
<td>Tanzania</td>
<td>11.2</td>
</tr>
<tr>
<td>Uganda</td>
<td>8.2</td>
</tr>
<tr>
<td>East Africa</td>
<td>5.8</td>
</tr>
<tr>
<td>Malawi</td>
<td>21.6</td>
</tr>
<tr>
<td>Mozambique</td>
<td>4.9</td>
</tr>
<tr>
<td>South Africa</td>
<td>20.3</td>
</tr>
<tr>
<td>Zambia</td>
<td>30.6</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>40.9</td>
</tr>
<tr>
<td>Southern Africa</td>
<td>17.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Zimbabwe</th>
<th>Zambia</th>
<th>Malawi</th>
<th>South Africa</th>
<th>Mozambique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimbabwe</td>
<td>1.00</td>
<td>0.42</td>
<td>0.12</td>
<td>0.44</td>
<td>-0.31</td>
</tr>
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<td>Zambia</td>
<td>1.00</td>
<td>0.09</td>
<td>0.38</td>
<td>0.11</td>
<td>0.24</td>
</tr>
<tr>
<td>Malawi</td>
<td>1.00</td>
<td>0.17</td>
<td>0.24</td>
<td>0.41</td>
<td>1.00</td>
</tr>
<tr>
<td>South Africa</td>
<td>1.00</td>
<td>0.41</td>
<td>0.24</td>
<td>1.00</td>
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</tr>
</tbody>
</table>

Source: Calculated from FAOSTAT.

Source: FAOSTAT.
Coefficients of Variation in Grain Prices

Table 3.1 Variability in World Prices of Major Grains, 1971-2003

<table>
<thead>
<tr>
<th></th>
<th>Rice</th>
<th>Wheat</th>
<th>Yellow Maize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient of variation (CV) 1971–2003 (%)</td>
<td>33</td>
<td>29</td>
<td>23</td>
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<tr>
<td>Regression t-statistic for:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price trend</td>
<td>-7.5</td>
<td>-7.2</td>
<td>-9.7</td>
</tr>
<tr>
<td>5-year moving standard deviation</td>
<td>-7.5</td>
<td>-4.6</td>
<td>-4.5</td>
</tr>
<tr>
<td>5-year moving CV</td>
<td>-4.5</td>
<td>0.0</td>
<td>-0.2</td>
</tr>
</tbody>
</table>

Note: All regressions are linear trends over the period 1971–2003. The CV is the standard deviation of detrended price divided by mean of actual (not detrended) price.

Figure 3.1 Coefficient of Variation of Wheat Producer Prices, 1971–2002

Figure 3.2 Coefficient of Variation of Maize Producer Prices, 1971–2002

African maize producers

Bolivia
Brazil
Honduras
Mexico
Morocco
Syria
Botswana
Ethiopia
Kenya
Malawi
Mali
Namibia
Nigeria
Niger
Nigeria
Rwanda
Tanzania
Uganda
Zambia
## Disaggregation of Variance Components in Producer Prices for Maize, Selected African Countries (%)

<table>
<thead>
<tr>
<th>Country</th>
<th>Period of Analysis</th>
<th>Variance of Border Prices</th>
<th>Variance of Domestic Production</th>
<th>Covariance and Unexplained</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botswana</td>
<td>1974–1995</td>
<td></td>
<td>49</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>1971–2002</td>
<td>1</td>
<td>22</td>
<td>77</td>
<td>100</td>
</tr>
<tr>
<td>Malawi</td>
<td>1980–2002</td>
<td>8</td>
<td>1</td>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>Mali</td>
<td>1988–2002</td>
<td>2</td>
<td>28</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Mozambique</td>
<td>1985–2002</td>
<td>25</td>
<td>2</td>
<td>73</td>
<td>100</td>
</tr>
<tr>
<td>Namibia</td>
<td>1980–2002</td>
<td>3</td>
<td>11</td>
<td>86</td>
<td>100</td>
</tr>
<tr>
<td>Niger</td>
<td>1971–1995</td>
<td>5</td>
<td>57</td>
<td>38</td>
<td>100</td>
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<tr>
<td>Nigeria</td>
<td>1971–2002</td>
<td>12</td>
<td>26</td>
<td>62</td>
<td>100</td>
</tr>
<tr>
<td>Rwanda</td>
<td>1971–2002</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>Tanzania</td>
<td>1971–1995</td>
<td>19</td>
<td>15</td>
<td>66</td>
<td>100</td>
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<td>Uganda</td>
<td>1980–1995</td>
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<td>Zambia</td>
<td>1985–1995</td>
<td>37</td>
<td>5</td>
<td>58</td>
<td>100</td>
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</table>

*Note: Figures in parentheses are for post-reform periods beginning 1991.*
Risk Layering – Mitigation, (Technology) Transfer (Insurance) and Coping (credit)
Private Solutions – Risk management

- **Technology** - crop diversification, breeding/selection for drought or pest tolerance, GMOs
  - Safety first strategies

- **Futures, options and forward contracting**
  - World bank risk management project

- **Crop insurance**

- **Finance** – credit, warehouse receipts
## Table 7.1 Market-based Risk Management Instruments and Their Potential Users

<table>
<thead>
<tr>
<th>Potential User</th>
<th>Credit Markets</th>
<th>Warehouse Receipts</th>
<th>Futures and Options</th>
<th>Weather-index Insurance</th>
<th>Commodity-linked Finance</th>
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</thead>
<tbody>
<tr>
<td>Small-scale farmer or processor</td>
<td>High potential</td>
<td>High potential</td>
<td>Low potential</td>
<td>Moderate potential</td>
<td>Low potential</td>
</tr>
<tr>
<td>Larger-scale farmer</td>
<td>High potential</td>
<td>High potential</td>
<td>Low potential</td>
<td>Low potential</td>
<td>Low potential</td>
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<tr>
<td>Larger-scale trader or processor</td>
<td>High potential</td>
<td>High potential</td>
<td>Moderate potential</td>
<td>High potential</td>
<td>Low potential</td>
</tr>
<tr>
<td>Consuming households</td>
<td>High potential</td>
<td>High potential</td>
<td>High potential</td>
<td>Low potential</td>
<td>Moderate potential</td>
</tr>
<tr>
<td>Public food/strategic reserve agency</td>
<td>High potential</td>
<td>Low potential</td>
<td>Low potential</td>
<td>Low potential</td>
<td>Low potential</td>
</tr>
</tbody>
</table>

*Source: Authors.*
<table>
<thead>
<tr>
<th>Risk</th>
<th>Mitigation</th>
<th>Transfer</th>
<th>Coping</th>
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<td>Drought</td>
<td>Drought-tolerant varieties</td>
<td>Insurance</td>
<td>Food reserves</td>
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<td></td>
<td>Water harvesting and irrigation</td>
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<td>Food imports</td>
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<tr>
<td></td>
<td>Improving early warning systems</td>
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<td>Social safety net programs</td>
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<td></td>
<td>Reforestation and afforestation</td>
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<td>Risk financing</td>
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<td>Land and water management</td>
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<tr>
<td></td>
<td>Agronomic practices for on-farm drought management</td>
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<tr>
<td></td>
<td>Crop diversification</td>
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<tr>
<td>Price volatility</td>
<td>Managing food stocks</td>
<td>Hedging</td>
<td>Imports</td>
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<tr>
<td></td>
<td>Reform maize trade policy</td>
<td></td>
<td>Trade policies</td>
</tr>
<tr>
<td></td>
<td>Increased domestic processing</td>
<td></td>
<td>Social safety net programs</td>
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<tr>
<td></td>
<td>Improved quality to access stable niche markets</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Improved market information systems and transparency</td>
<td></td>
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<td></td>
<td>Contract farming</td>
<td></td>
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<td></td>
<td>Improved storage facilities</td>
<td></td>
<td></td>
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<td></td>
<td>Infrastructure development</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Foster competition in markets</td>
<td></td>
<td></td>
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<tr>
<td>Diseases</td>
<td>Scale-up disease-tolerant varieties</td>
<td></td>
<td>Quarantine measures</td>
</tr>
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<td></td>
<td>On-farm agronomic practices</td>
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<td>On-farm agronomic practices</td>
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<td></td>
<td>Early warning systems</td>
<td></td>
<td>Integrated pest management</td>
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<td>Integrated pest management</td>
<td></td>
<td>(IPM)</td>
</tr>
<tr>
<td></td>
<td>Quarantines measures</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Improved phytosanitary laboratory systems</td>
<td></td>
<td></td>
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<td></td>
<td>Improved extension services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pests</td>
<td>On-farm agronomic practices</td>
<td></td>
<td>Quarantine measures</td>
</tr>
<tr>
<td></td>
<td>Early warning systems</td>
<td></td>
<td>On-farm agronomic practices</td>
</tr>
<tr>
<td></td>
<td>Integrated pest management</td>
<td></td>
<td>Integrated pest management</td>
</tr>
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<td></td>
<td>Quarantines measures</td>
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<td></td>
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<td></td>
<td>Improved phytosanitary laboratory systems</td>
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<td></td>
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<tr>
<td></td>
<td>Improved extension services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory risks</td>
<td>Improved efficacy of commodity councils</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Promote proactive rather than reactive policies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Develop long-term commodities policies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved transparency in policy decision making</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Short list of solutions that followed:

- **Technology**
  - Highly drought- (pest-) tolerant seeds
  - Good agricultural practices to address drought, pests and diseases

- **Policy**
  - Balanced maize trade policy
  - Risk management strategies for key export crops with high price volatility (in principle, coffee and cotton)

- **Insurance** (not on list?)
Financial markets

- Futures markets, Options
  - Better designed for intermediaries,
  - Large scale contracts problematic for farmers
  - Basis risk
  - World Bank Risk project, Nigeria exchange

- Forward contracts
  - Backed by futures market transactions
  - Although forwards are potentially more flexible and useful than futures contracts for small-scale farmers and traders, futures contracts are low-cost, highly liquid, and easily transferable financial instruments that do not incur default risk. In many developing countries the inability to enforce forward contracts, especially for staple food crops, means that default risks are too high to support viable forward markets without some form of guarantee on performance.
Where are futures and options markets?

<table>
<thead>
<tr>
<th>Location</th>
<th>Market</th>
<th>Main Food Crop Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA, Chicago</td>
<td>Chicago Board of Trade</td>
<td>Yellow maize, wheat, rice</td>
</tr>
<tr>
<td>USA, Kansas City</td>
<td>Kansas City Board of Trade</td>
<td>Wheat</td>
</tr>
<tr>
<td>USA, Minneapolis</td>
<td>Minneapolis Grain Exchange</td>
<td>Yellow maize, wheat</td>
</tr>
<tr>
<td>Canada, Winnipeg</td>
<td>Winnipeg Commodity Exchange</td>
<td>Wheat</td>
</tr>
<tr>
<td>Europe</td>
<td>Euronext</td>
<td>White and yellow maize, wheat, potatoes</td>
</tr>
<tr>
<td>Argentina</td>
<td>Rosario Futures Exchange</td>
<td>Maize, wheat</td>
</tr>
<tr>
<td>Brazil</td>
<td>Bolsa de Mercadorias &amp; Futuros</td>
<td>Maize</td>
</tr>
<tr>
<td>Japan, Tokyo</td>
<td>Tokyo Grain Exchange</td>
<td>Maize, rice</td>
</tr>
<tr>
<td>China, Dalian</td>
<td>Dalian Commodity Exchange</td>
<td>Maize, rice, beans</td>
</tr>
<tr>
<td>China, Zhengzhou</td>
<td>Zhengzhou Commodity Exchange</td>
<td>Wheat</td>
</tr>
<tr>
<td>India</td>
<td>National Commodity and Derivatives Exchange</td>
<td>Maize, rice</td>
</tr>
<tr>
<td>South Africa, Pretoria</td>
<td>South African Futures Exchange</td>
<td>White and yellow maize, wheat</td>
</tr>
</tbody>
</table>

Source: Authors.
Crop insurance in the US

- Federal crop insurance began in 1938
- Little used by farmers until farm bill in 1994
  - Greater subsidies and requirement to participate in farm programs
  - Greater role for private insurers – government subsidizes farm premiums and reinsurance risk of private insurers, covering any large losses as well as administrative costs
- Revenue insurance introduced in 1994, now dominates
- Enabled by county extension offices, long history of data collection
Figure 1. Federal Crop Insurance Program

Farmers
- 1.2 million policies in 2014
- 294 million acres insured
- $110 billion in loss coverage (total liability)

Farmers pay a portion of total premium to insurance companies, who forward funds to FCIC. Within approximately 30 days of loss, indemnity is paid to farmer by FCIC through insurance companies’ claims adjustment and payment process.

19 Private Insurance Companies
- sell crop insurance policies through 12,500 agents
- collect and forward premiums to FCIC
- determine individual crop losses through 5,000 adjusters
- pay claims with funds from FCIC
- share gains/losses with federal government

FCIC pays A&O expense reimbursement to each company for delivery costs (subsidy to farmer). In an annual settlement for each company, FCIC determines and pays (receives) the company portion of any underwriting gain (loss).

Federal Crop Insurance Corporation (FCIC)
- sets standards and premium rates
- approves new products
- subsidizes farmer premiums (62% on average)
- pays 100% of delivery costs through Administrative and Operation (A&O) reimbursement to companies
- shares gains/losses with private companies
- reinsures insurance company losses
- USDA’s Risk Management Agency operates the program (employees: 68 in DC Headquarters and 399 in field offices)

Source: CRS, adapted from U.S. Department of Agriculture and industry sources.
Figure 2. Insured Acres by Crop Year

Million acres

- Other
- Pasture, Rangeland, & Forage
- Cotton
- Wheat
- Soybeans
- Corn

U.S. Department of Agriculture, Risk Management Agency
Figure 1
Growth in the Federal crop insurance program, 1990-2015

Total and farmer paid premiums

Figure 2
Federal crop insurance program acres insured, yield vs. revenue policies, 1990-2014

Revenues policies outpace yield policies.
Table 1. Crop Insurance Premium Subsidies
(government-paid portion of premium as a percent of total premium)

<table>
<thead>
<tr>
<th>Coverage Level (%)</th>
<th>CAT</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
<th>80</th>
<th>85</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium subsidy (%) for most policies (including those using basic and optional units)</td>
<td>100</td>
<td>67</td>
<td>64</td>
<td>64</td>
<td>59</td>
<td>59</td>
<td>55</td>
<td>48</td>
<td>38</td>
</tr>
<tr>
<td>Premium subsidy (%) for enterprise units</td>
<td>n/a</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>77</td>
<td>68</td>
<td>53</td>
</tr>
<tr>
<td>Premium subsidy (%) for area plans (yield)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>59</td>
<td>59</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>Premium subsidy (%) for area plans (revenue)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>59</td>
<td>55</td>
<td>55</td>
<td>49</td>
</tr>
<tr>
<td>Premium subsidy (%) for whole farm units</td>
<td>n/a</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>71</td>
<td>56</td>
</tr>
</tbody>
</table>


Notes: n/a = not applicable. Deductible equals 100% - coverage level percentage. A basic unit covers land in one county with the same tenant/landlord. An optional unit is a basic unit divided into smaller units by township section. An enterprise unit covers all land of a single crop in a county for a producer, regardless of tenant/landlord structure. A whole farm unit covers more than one crop. For CAT, a loss beyond 50% is indemnified at 55% of the expected price. For coverage level of 50%, a loss beyond that percentage is indemnified at a higher percentage of price (selected by the purchaser) within a minimum and maximum range set by RMA. Whole farm subsidy is for farms with three or more commodities; if commodity count is less than three, coverage is not available at 80% and 85%.
Figure 6. Estimated Average Crop Insurance Premium Subsidy Per Farm in 2013

Source: CRS calculation using average premium subsidy of 62% from USDA’s Risk Management Agency (RMA)
Figure 10. Government Cost of Federal Crop Insurance

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Total Gov. Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2007</td>
<td>$3.9 bil.</td>
</tr>
<tr>
<td>FY2008</td>
<td>$5.7 bil.</td>
</tr>
<tr>
<td>FY2009</td>
<td>$7.3 bil.</td>
</tr>
<tr>
<td>FY2010</td>
<td>$3.7 bil.</td>
</tr>
<tr>
<td>FY2011</td>
<td>$11.3 bil.</td>
</tr>
<tr>
<td>FY2012</td>
<td>$14.1 bil.</td>
</tr>
<tr>
<td>FY2013</td>
<td>$6.0 bil.</td>
</tr>
<tr>
<td>FY2014</td>
<td>$8.7 bil.</td>
</tr>
</tbody>
</table>

Crop insurance in Africa, Developing countries

- Expanding, but still quite limited in scope
- Basis risk, weak institutions, poor historical data have led to index based weather insurance
- 104 countries offered some form of crop insurance in 2008, half were low income
  - Often under public-private partnerships (PPP)
  - Over 90% of premiums in highly developed countries
  - “Penetration” extremely small, even in middle income countries – few farmers buy products
<table>
<thead>
<tr>
<th>Development Status</th>
<th>Number of Countries</th>
<th>Estimated Crop Premiums ($ million)</th>
<th>Estimated Livestock Premiums ($ million)</th>
<th>Estimated Agricultural Premiums ($ million)</th>
<th>Percentage of Global Agricultural Premiums</th>
<th>Agriculture Insurance Penetration (Premiums as a Percentage of 2007 Agricultural GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Income</td>
<td>21</td>
<td>11,869.0</td>
<td>1,192.3</td>
<td>13,061.3</td>
<td>86.5</td>
<td>2.3</td>
</tr>
<tr>
<td>Upper</td>
<td>18</td>
<td>872.6</td>
<td>40.1</td>
<td>912.7</td>
<td>6.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Middle-Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>20</td>
<td>789.3</td>
<td>334.1</td>
<td>1,123.5</td>
<td>7.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Middle-Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-Income</td>
<td>6</td>
<td>0.2</td>
<td>4.8</td>
<td>5.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>All Countries</td>
<td>65</td>
<td>13,531.1</td>
<td>1,571.4</td>
<td>15,102.4</td>
<td>100.0</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Figure 3 Government Subsidies as Percentage of 2007 Premium Paid by Producers in Selected Countries
Credit markets are coping mechanisms: They do not reduce risks per se, but help individuals or firms mitigate the consequences of negative shocks after they have occurred. Access to credit markets facilitates borrowing to maintain consumption levels when incomes fall; makes critical investments possible; and also reduces or delays distress sales of assets, which are often detrimental to long-run productivity and growth (Rozensweig and Wolpin...
Limitations to implementing “best practices”

- World price volatility **now** more important?
- Institutional development immature – marketing
  - Domestic stockholding, market information, infrastructure, insurance and credit
- Safety nets
  - Conditional cash transfers need a commitment to real not nominal income levels – Ethiopia case
- Governance key to successful interventions
  - Credible, transparent, predictable interventions
A few Key concepts

- Basis risk
  - Price and insurance payout
  - Index based weather insurance

- Actuarially fair premiums
  - Administrative and operational costs
  - Risk aversion
  - Risk Pooling
  - Premium subsidies

- Reinsurance, systemic risk

- Catastrophic coverage, shallow loss
Supply-Utilization balances show trade dependence, adjustment mechanisms

- Production + Imports + Carry-in stocks
  = Feed use + Food Use + Exports
  + Carry-out stocks

\[ Q + M + S_{t-1} = C_{\text{feed}} + C_{\text{food}} + E + S_t \]

- Ending stocks (carry-out) last year = Beginning stocks (carry-in) this year

- Adjustments to a production shortfall:
  - Cut use, import, release stocks
Self-sufficient, occasionally trade dependent countries: Kenya, Mozambique

Mozambique Coarse grains

Kenya - Coarse grains
Isolating or Stabilizing Countries: China, Morocco
Net Exporters: Vietnam, India

**India - Rice**

- **Beginning Stocks**
- **Milled Production**
- **MY Imports**
- **MY Exports**
- **Consumption and Residual**
- **Ending Stocks**

**Vietnam - Rice**

- **Beginning Stocks**
- **Milled Production**
- **MY Imports**
- **MY Exports**
- **Consumption and Residual**
- **Ending Stocks**
Price Transmission – Are domestic and world food markets linked?

- Exchange rate changes and border price transmission determine domestic prices
  - Urban-rural price transmission determines farmgate prices

- Two causes of imperfect price transmission
  - (Isolationist) Stabilization policy responses
  - Weak market integration (high transactions costs, imperfect markets)
    - With world markets and between urban and rural (remote)areas
    - Implicitly stabilizes

- Food inflation follows home goods prices, less impacted than traded grain prices

- Highly variable domestic price impacts observed
  - Import dependence (rice), home good status (millet) determine
    - which countries most severely impacted,
    - which commodities within countries see biggest price changes
Imperfect Market Integration

- Law of one price ➔ domestic prices should follow world prices
- **Poorly integrated markets** – domestic and world prices are independent
  - $\Delta P_d = \varepsilon \Delta (e P_w)$  \hspace{1cm} $\varepsilon < 1$ ➔ imperfect integration
  - Intermediate cases typical  \hspace{1cm} $\varepsilon = 0$ independent markets
  - Can look at border or urban-rural linkage
- Judging market integration versus trade policy
  - Are tariff changes large enough to account for differences in changes in domestic versus world market prices, or were effective quotas in place?
  - Price transmission methods used sometimes to assess policy impacts, sometimes to measure market integration
Lags in Price transmission

- Policy and imperfect market integration may mean in the short run world price changes do not impact domestic prices.

- But over longer run world price changes are expensive to resist, both for traders and governments.
  - Tariff revenue lost, subsidies may be needed to maintain differentials.
  - Lost “fiscal space” and making up lost tariff revenue top requests by governments to World Bank’s GFRP program.
Rice and wheat prices in stabilizing regimes – China and Morocco

Chinese Rice --
\[ P_{w, \text{Pw}} > P_{d, \text{Pd}} = 0.15 \]

Moroccan Wheat --
\[ P_{w, \text{Pw}} > P_{d, \text{Pd}} = 0.02 \]
Tradable versus non-tradable grain prices in Burkina Faso

Rice -- $P_{w>P_d} = 0.45$

Sorghum -- $P_{w>P_d} = 0.30$
Nigeria case study

- Rice is purchased/imported globally
  - Big margins relative to world prices
    - Large transaction's costs (shipping, port handling?)
    - Or Market power of oligopolistic traders

- Maize, millet, sorghum appear to be home goods
  - Trade is with neighbors, not global market
  - Internal commercial centers well integrated
  - Rural markets can be isolated
    - Long lags in transmission; local conditions matter
Large Rice Price spreads at Nigerian ports
Empirical Results: Imported Rice
Empirical Results: Maize
Price Transmission Lessons

- Many developing countries are **poorly integrated with world markets**
  - Even if domestic prices eventually follow world prices, **lags in adjustment** to world price shocks can be quite long – 6 months or more
  - Evidenced of market power in several cases resulting in **large margins** at borders
- Relevant **world market is often a neighbor**, not the global market
  - For Afghanistan wheat: Pakistan or Kazakhstan not the U.S.
  - For Tanzania maize: Kenya not the U.S. or even South Africa
- **Commercial centers are often well integrated**, with short lags in price adjustment,
- but **isolated rural market prices** may be poorly integrated with those commercial centers
  - Local conditions (eg production shortfalls) matter
Beggar-thy-neighbor policy

- Stabilizing a domestic market, and disconnecting from world price signals, **destabilizes world market**
  - Rice world price spike in 2008 due to export bans
  - Policy responses transmitted instability abroad, countries did not help absorb world market shocks
- Variable levies and price bands were made **WTO illegal** in 1995 Uruguay Round Agreement on Agriculture – against EU policy
- Hope is that **free trade would lead to more stable world market**, so stabilizing option for countries
  - 2007-08 crisis challenges this logic
  - WTO implemented commitments failed to resolve problems of 1970s
Conclusions

- Stability remains a policy concern in many developing countries
  - Institutions resurrected during food crisis
- Policies in 2007-08 and afterwards sought to isolate countries from world markets
  - Import demand inelastic, high foreign exchange requirements for imports
  - Mitigating measures generally costly
  - Protected urban consumers (poverty mostly rural)
- Best practices risk management advice being rethought in many countries
  - Both trade and stocks used to ensure food security
How one country was impacted?

Afghanistan

- Declining self-sufficiency in wheat
  - Rapid population growth, influx of refugees, and rapid income growth have meant rising demand for food
  - Wheat Production (the staple) has been growing slowly, also more volatile
  - Imports surged, and provided a substantial share of food by 2007

- In 2007-08, during world food crisis
  - 55% wheat production shortfall in Afghanistan
  - World wheat prices more than doubled
    - Domestic prices rose even more!
  - Pakistan, its major supplier, banned exports

- In 2009 a bumper crop meant apparent self sufficiency
  - High prices and good weather were production incentives
  - Imports persisted
Wheat supply, use and trade in Afghanistan

Non-existent stocks data make consumption data suspect
Trade in Afghanistan

- Prior to 2008, Afghanistan benefited from (free rode on) stabilization policy in Pakistan
  - In 2008 Pakistan banned exports
  - Pakistan also subsidized flour milling
- Since 2008 Afghanistan has imported wheat from Kazakhstan
  - Transactions costs much higher
  - Kazakhstan prices follow world prices
  - Kazakhstan initially sold wheat not flour
    - Lack of flour mills has led to Kazakh flour imports
- Pakistan once again cheaper import source
  - Export ban eventually lifted, but Pakistan still viewed as unreliable, so Kazakh imports persist
  - Quality better from Kazakhstan
Trade/Ag Policy in Afghanistan

- Can/should Afghanistan become more self-sufficient in wheat?
- Does it need some trade policy to cope with unreliability of Pakistani supplies?
- Should it hold stocks in anticipation of production shortfalls?

- What is the relative importance of uncertainty in world markets versus domestic production in setting agricultural policy? How can it cope with both aspects of uncertainty?