

Moving Beyond Market Volatility Towards Agri-food System Resilience

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Introduction

- Little question that volatility has increased in agriculture in last decade
 - Both at production level and in terms of market prices
- How to move agrifood system to be more resilient in face of increased volatility, at all levels of agrifood system?
 - Farm production
 - Transportation/logistics
 - Processing sector
 - Domestic market
 - World market
- This includes
 - (a) technical innovations, management changes, especially at farm level
 - (b) private supply chain efficiencies, between farm and consumer, and
 - (c) policy and institutional reforms, largely at market levels

Objective and Framework for Analysis

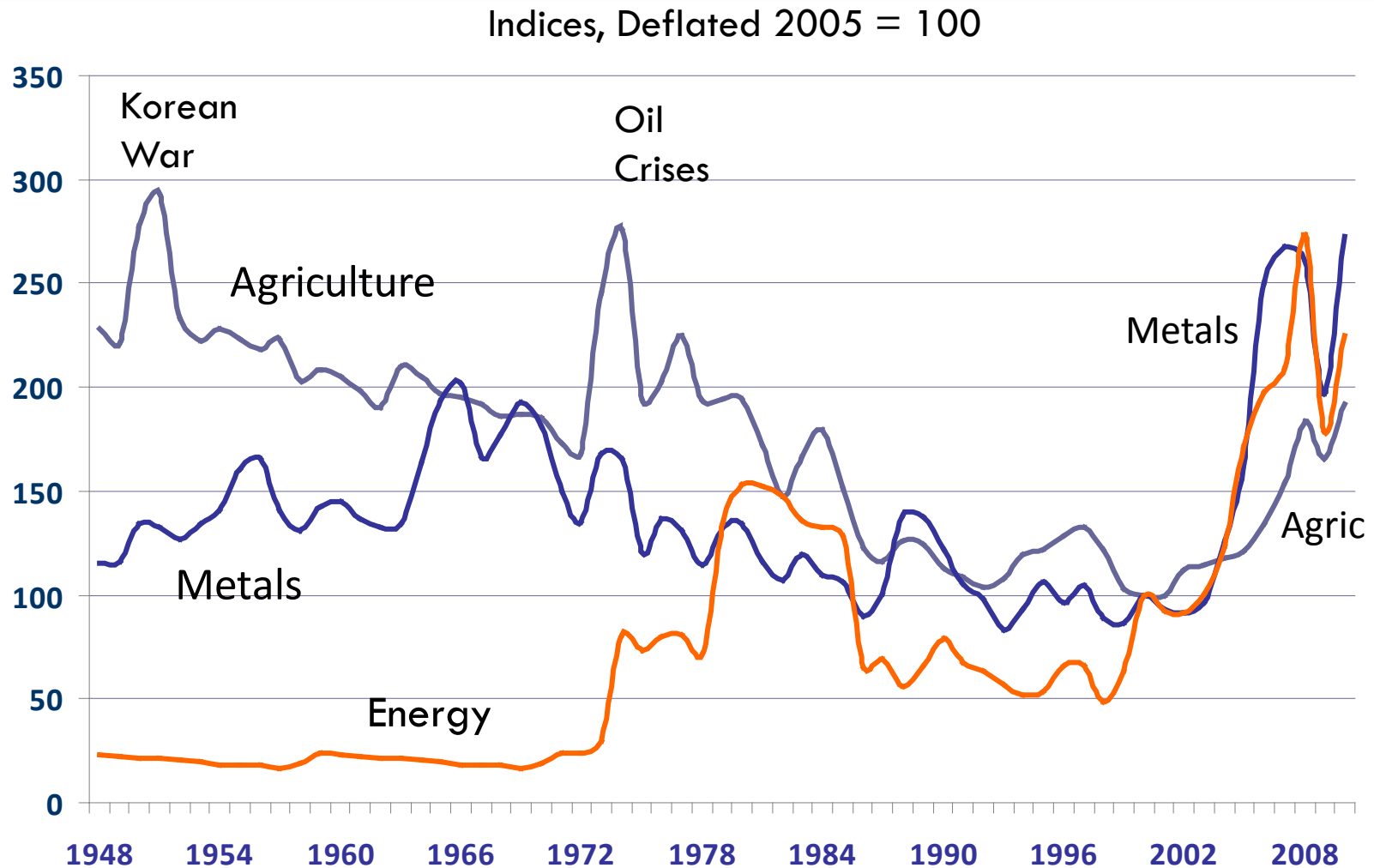
- Objective of this paper is to identify options to add resilience to agric-food system
 - Illustrate variety of approaches and organize them around themes that lend themselves to policies
- 1. Options to *reduce* volatility
- 2. Options to *adapt to* increased volatility
- 3. Add resilience by increasing net incomes (efficiency gains) in system to accommodate increased volatility more easily
- Caution: Need to handle economic options artfully
 - Measures to increase incomes can be done efficiently or inefficiently
 - Certain institutional designs can be managed well or poorly
 - Underlines need to take local empirical situation into account and shy away from generic prescriptions that can be misleading

Evidence of Volatility: Production

- Number and intensity of storm events, and droughts, appear to have increased, likely as result of warmer climate
 - Increased flooding, increased water scarcity, lower water quality
 - Increased soil erosion
- Increased temperature variation
- Pests and diseases surviving more moderate winters, more invasive species
 - more weed growth, disease, and pest outbreaks
- Environmental degradation coupled with tighter environmental regulations (not so much climate-induced)
 - Decreased herbicide and pesticide efficiency



LR Commodity Real Prices, Levels and Spikes, 1948-2010

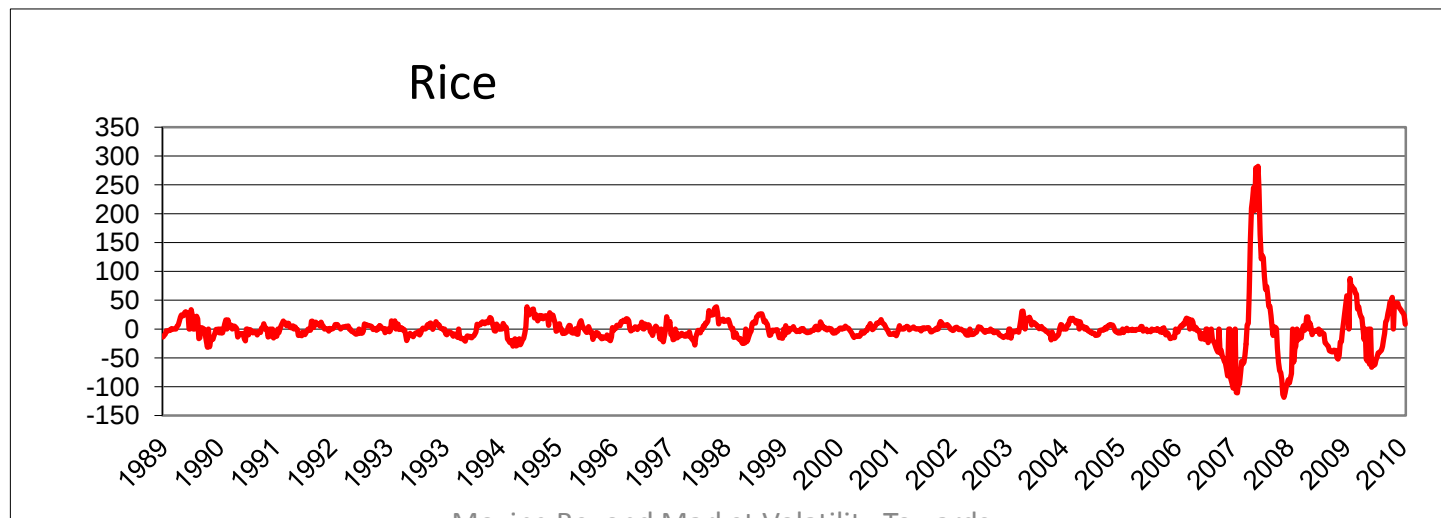
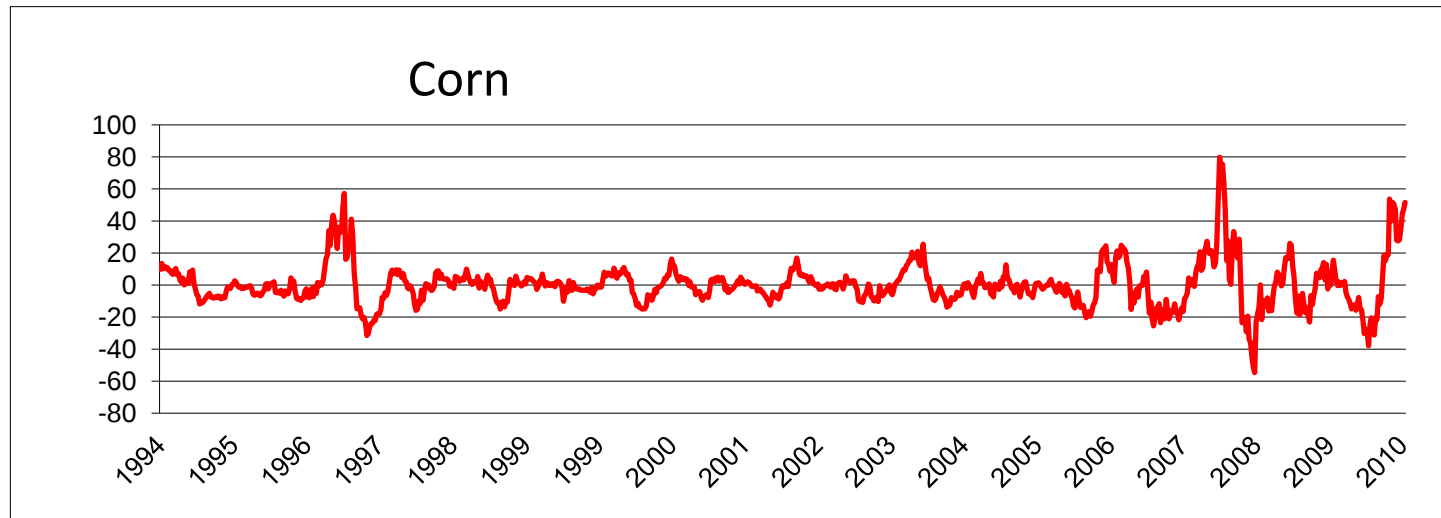


Source: World Bank, DECPG

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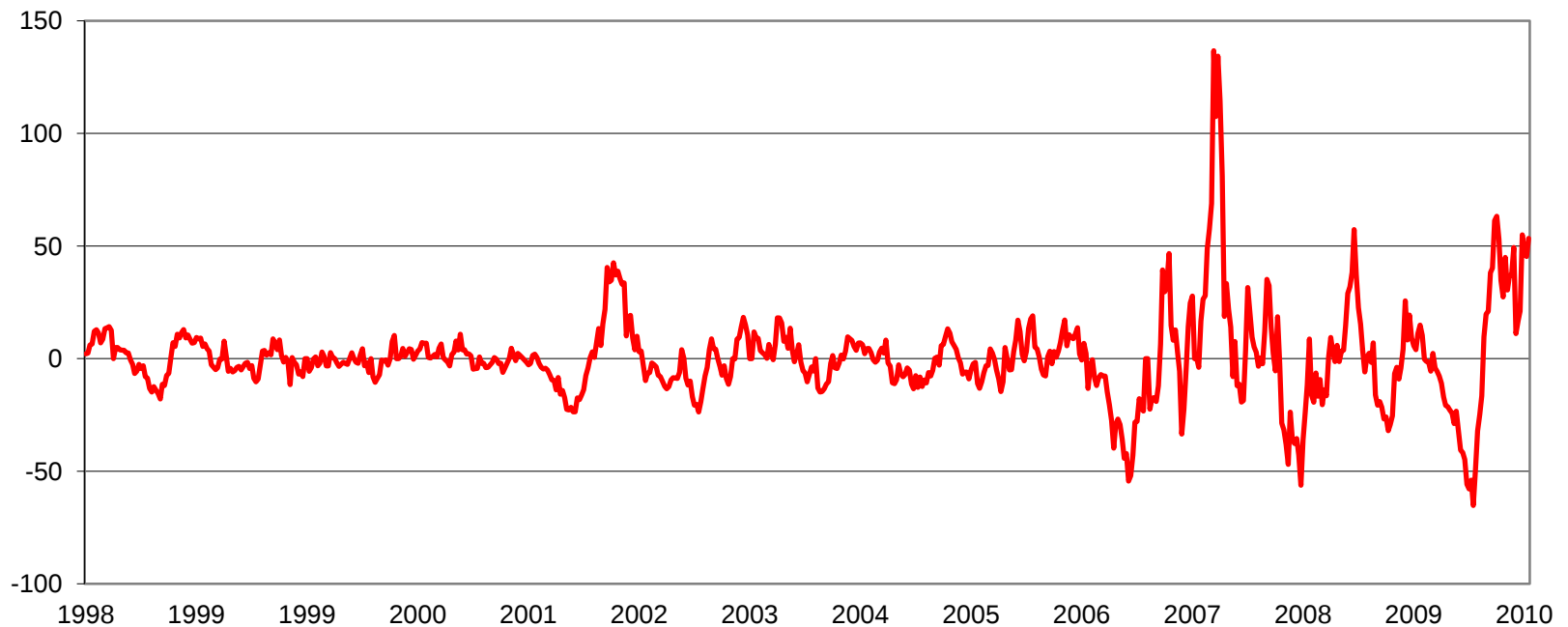
But also recent increased price volatility:

Corn, Rice Weekly Prices less 12 month moving average



Source: Pinstrup-Andersen, IFPRI
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Wheat Weekly Price – 12 Month Moving Average



Source: Pinstруп-Andersen, IFPRI

Diagnostics of situation, Priorities

- If we know sources of price level/volatility problems, we can
- Look at strategies, policies to reduce severity/remove those sources
 - These are “options to reduce volatility”
 - At farm level, supply shocks due to
 - Weather
 - Pests and diseases
 - Input scarcity (water)
 - At supply chain
 - Infrastructure bottlenecks
 - Misallocation in value chain, including distribution system
 - At market level
 - Trade policies like export restrictions, NTMs
 - Stocks policies
 - Other policy and institutional reforms

Overview of Diagnostics, Priorities 2

- If we cannot change the volatility or uncertainty; must find efficient adaptations, become less vulnerable to volatility
 - These are “Options to Adapt to Increased Volatility”
 - Farm Level:
 - Diversification
 - Add value to move away from raw product (reduces variance, incr inc)
 - Use hedging and insurance tools
 - Improve agricultural research to adapt to more variable temp's, water
 - Supply Chain
 - Add value by moving up value chain
 - Food research (e.g., better substitutes for more scarce, volatile inputs)
 - Invest in better infrastructure to deal with supply shocks
 - New distribution methods
 - containers instead of bulk
 - networked distribution instead of hub and spoke
 - Policies/Markets
 - Hedging options, price pooling, institutional adaptation, water pricing

Reducing Volatility: Farm Level

- Numerous sources of increasing production instability:
 - Higher Temperatures
 - Temps above 30C for >8hrs can reverse vernalization
 - Droughts/Floods, particularly water scarcity
 - Lack of water reduces flowering, pollination, grain filling
 - Excess moisture causes water-logging, increased risk of fungal infection
 - Infectious diseases, pest outbreaks, invasive species
 - Unlike above one-off events that generate a poor yield that year, these events can have longer term yield-reducing consequences
- Production research to generate less volatility
 - Especially production responses to climate changes
 - Allocate research resources using risk-based tools to assess
 - Source of risk, likelihood of shock, and severity or cost of consequences of shock
 - Influence or control risk, or must we accept and adapt to it?
 - Cluster seeding (Northeast China), using different varieties to deal with rainfall/temp variation. Yields up 15-25%, variability down

Farm Level: Water

- Incidence of water stresses appears to be rising worldwide, likely due both to warmer climate and systematic undervaluation of water
- Serious water scarcity in important agric regions in China, India, Mexico, Australia, Africa, and US
 - Likely to increase due to competition across sectors, increasing demand, constant or shrinking supplies
- Undervaluation even more problematic with scarcity, due to overuse, depletion, degradation, and poor water pricing
- **Better water management, governance:** Insights to be gained from Israel and Australia, International Water Management Institute
 - including more serious efforts at pricing water for all users
- **Research:** Important area for increased crop-related research into drought-resistant varieties, saline or brackish water-resistant crops and varieties
- Similarly, value of more research into water systems that supply more water at lower cost, deliver water with less waste, and allow tailoring water use to temporal, spatial and varietal needs (Negev research, Israel)

Reducing Volatility: Supply Chain

- Food processing less vulnerable to weather shocks, except having to respond to variation in production, possibly more disease and food safety issues, and increased price volatility
- Like rest of agriculture, likely a trade-off between least cost plant design assuming constant production levels, and a technology that is higher cost at a given output level but less costly when production levels vary
- Resilience likely more important in **logistics and transport**
- Infrastructure bottlenecks from climate events, or yield variability
 - Consider recent events that hit distribution system (Hurricane Katrina, or non-climate related such as Aceh and Japanese tsunamis) with great dislocation, disruption
 - Would networked distribution be more resilient than hub-spoke model? Likely trade-offs again

Other Logistics Issues

- How many infrastructure bottlenecks due to chronic under-investment vs. one-off events vs. short term weather-related disruptions vs. production variability?
- Bulk transport vs containerization? Containers allow:
 - Smaller more heterogenous product types
 - Higher cost for large regular shipments
 - But linear cost-volume relationship, easier entry (new producers), often faster shipments (21 vs 97 days, wheat example, farm to export destination)
 - Flexibility across port types, changed distribution patterns (e.g., networked patterns vs point-to-point)
 - Allows diversification and risk response, resilience
 - But even with containers, poor infrastructure and monopolized/corrupt logistics can cause serious delay cost

Policy Options to Reduce Volatility

- At *market* level we deal w/ price volatility directly, rather than focusing on production volatility
- These are policy options to reduce volatility, without calculating their costs; limited commentary also on implementation issues
- Policy/Institutional Reforms, starting at international (WTO) level
 - Impose disciplines on countries to *limit application of export quota restrictions* or taxes during high and rising price periods
 - Sister policy, to restrict export subsidies in low or declining price periods, already embraced in URAA and Doha Round negotiations
 - A related measure is to impose disciplines on importing countries to *limit hoarding* during high and rising price periods
 - Striking example of allowing this class of beggar-thy-neighbour policies is seen in the world rice market in late 2007 and first half of 2008
 - Overall policy direction here: encourage continued use of world markets and resist pursuit of domestic self-sufficiency
 - Due to water constraints alone, not all countries can feed themselves

Market Level Option 2: added reserves

- Second reform: encourage additional commodity *reserves* to provide price buffering, market confidence
- Early proposals by IFPRI and numerous others
 - Emergency reserves
 - Modest size, 5% current food aid flows, for humanitarian uses only
 - International coordinated grain reserves, Regional reserves, Country level reserves to reduce price volatility
 - As proposed, these are strategic reserves, not para-statal stocks
 - But many questions raised about what are optimal stock levels, costs, and what market uncertainty caused
 - In addition, challenging questions about how to implement and finance
 - For global reserves, need transparent governance structure that can operate to release stocks at times of market stress (only)
 - Peter Timmer: Larger national reserves may induce greater willingness to use trade, less export restriction, import hoards

Case Study: BULOG

- Reserves or stocks proposals discounted by many critics due to poor experience with commodity agreements and some parastatals who also operated reserves
 - Argument that STEs tax farmers, only look after *their* interests
- Brief focus on experience of BULOG (*Badan Urusan Logistik*), major STE in Indonesia, from 1970s to mid 1990s
 - It focused on domestic rice market
 - Indonesia was a “large country” in world rice market
 - World rice market also known for being thinly traded, with high degree of price instability, more so then than now
 - It purchased rice for reserves, explicit policy mandate to stabilize rice prices, and was monopoly state trading enterprise
 - But it also had mixed reputation, partly for corruption, partly for its market effects, and partly for its costs
 - And did it just protect rice producers or did it actually stabilize domestic rice prices?

Empirical results of examining prices

- Various sets of price data were examined to compare domestic with world market rice prices
- Time period varied with data set, author, from 1971-1996
- Coefficient of variation (next slide), shows clearly by all studies that during this period, BULOG actually did stabilize domestic rice prices
- Using similar time series and multiple price comparisons, domestic prices tracked world price levels closely
 - Jakarta prices usually within price band of two Bangkok rice qualities from 1991-1996
 - Comparing 1976-1992 trend Jakarta fob and cif prices, domestic prices were almost always within the band, usually closer to the cif p

Price Variability of domestic vs world P

- Examination of coefficients of variation

1976/77 – 1992/93 Prices	Monke, Pearson and Baulch
Price Type	Coeff of Variation
Pw: real monthly fob	0.23
Pw: real monthly cif	0.21
District wholesale level P	0.07

1993-1995	Timmer 1996
World P (cif)	0.19
Domestic P	0.09

1971 to 1990	Islam and Thomas 1996
World P (cif)	0.30
Domestic wholesale P	0.10

Conclusions on BULOG performance

- Indonesian domestic prices clearly more stable than world prices, by all three sources
- Prices mostly within cif-fob price band
 - If there was any protection, it was minimal and temporary, not consistently raising price
- For 1970s-1990s period, BULOG did in fact stabilize Indonesian rice prices, and mostly did not simply protect
- *But serious caveats before suggesting wider adoption*
 - Success partly due to unusually good advice and its acceptance
 - This “success” likely did not occur in more recent years
 - No data on the cost of BULOG’s operations; it was high, and likely high relative to its stabilization benefits
 - It does show a model for how a parastatal in a lower income country *can* use stock holding to reduce volatility in domestic prices, compared to world prices, for rice
 - But its other costs, corruption, and doubtful transferability to other countries raise serious questions using it as an international model

Options to Adapt to Increased Volatility

- Farm level
 - Diversification into other enterprises, oldest risk mgmt tool
 - Virtually any farmer can add enterprises to reduce risk, but during price spikes many would stay in their commodity, preferring to capitalize on the high returns of the commodity whose price is rising
 - Can include off farm activities such as off farm employment also to reduce risk
 - Add value, shift to higher valued products (move downstream)
 - Downstream (e.g., processed) products have lower price volatility than raw commodities due to the relative stability of non-food costs in the final product and the smaller share of raw product in final good
 - Shifting downstream stabilizes farm returns, in addition to prospect of increasing farm income often provided by such products
 - Higher incomes also provide a within-family buffer with which to accommodate more easily price volatility, so *any* investment or income-earning activity will help in adapting to increased volatility

Farm Options for Adaptation

- A third option is to use insurance tools such as hedging on futures markets to reduce price risks.
 - This option is available if the commodity in question is traded on a future market, and if the farmer has sufficient size to purchase one or more contracts
 - It may also require hedges on currency futures or certain inputs to get more complete coverage
 - It also presupposes sufficient education or experience to use such risk instruments
- Fourth, a farmer could use research findings on varieties, input applications or other management procedures to deal with weather risks, pest and disease risks, and related production risks
 - This depends on such research having been done with commercially applicable findings, as noted on slide 13
 - Both the third and fourth options often place a premium on the educational skills of the farmer or family members; therefore provision of extension services to farmers may be an important part of a policy of adaptation to greater price volatility

Speculation and Futures Markets

- More than a little debate about the relationship between futures trading and cash price volatility
 - Some argue that high levels of speculation on futures markets was a cause of the 2008 price spike
 - Does futures market represent tool for greater use by all participants or should its use be more restricted by greater regulation?
- This debate has intensified due to greater market activity of institutional investors (commodity index funds) using long agricultural futures positions
- Doroudian and Vercammen (2011) find that if these institutional investors are willing to pay a premium to take long futures position, due to the added diversification to their investment portfolio, their speculative activity *increases* price volatility in those markets
- This is in contrast to the case of professional speculators who stabilize those markets

Adaptation by Supply Chain to Volatility

- Processing Firms can also adapt to price risks on their agricultural inputs by increasing value-added of their product portfolio
 - For same reasons as noted above for farmers
 - Well established business strategy for increasing profits but it can also reduce risks
- Food manufacturing research to find substitutes for more scarce, price-volatile inputs; find new formulations to reduce cost squeeze of higher P
 - The research could be undertaken privately by the firm and/or by public or external research organizations
- Invest in better infrastructure and/or new distribution methods (previously discussed) to deal with supply shocks
 - These investments, private or public, if efficient will generate higher incomes within the supply chain, making the firms within the chain better able to accommodate price volatility
- Hedging and other insurance tools allow off-loading of price risk as for farmers

Adapting Policies/Institutions to Volatility

- Price pooling: averaging prices across time period or spatial sales to contribute stabilizing effect on price variability
 - Used in many institutions such as marketing boards, coops
- Safety Net policies
 - Can take form of crop insurance, revenue insurance programs
 - Triggered to make payments when output, price or net income falls below some target level
 - Compared to price supports, generally much more flexible, can be less commodity-specific so not as trade distorting, and less costly if not slung too high
 - Trade-off: low slung safety net = resource neutral, less trade-distorting. But lack of producer support leads to higher subsidy levels, making it resource and trade distorting, more costly
 - Considerable Canadian program development in revenue and net income insurance programs
- Safety net policies can be expensive; may not be an option for most developing countries (like several options discussed)

Other Policy Options to Reduce Volatility

- Remove/reduce policies that somehow restrict production and market flexibility, create thinner or more balkanized markets
 - These point are mostly about making sectoral efficiency gains in policies, regulations, and competition to better accommodate increased volatility; adds income buffer, highly relevant to LDCs
 - Reduce gatekeepers and rent extraction
 - Add competition and diversification of production and marketing options
 - Reduce NTMs, especially those regulation based that are used deliberately to disrupt trade, making those markets more vulnerable to shocks and volatile
 - Avoid blunting incentives, filling information gaps, etc

Conclusions: Many Options

- *Great variety of options* to make ag-food system more resilient to recent price volatility, covering *all levels of supply chain*; many components should included
 - Some to be initiated by *private* actors as well as *public policy and investments* or spending initiatives
 - Some can be done *nationally*, or other with *international cooperation and coordination*
 - Includes *risk-reducing measures, risk adaption measures*, as well as *income enhancing, sector efficiency measures*
- Most of these are *familiar agriculture policy arguments* at any time, but now require renewed emphasis
- Some more specific to current high volatility environment
- This is largely a survey of options; most policies require more careful, critical appraisal before being accepted