

Lessons from the COVID-19 Pandemic for Food Supply Chains

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Things fall apart...

WHO on Twitter



World Health Organization (WHO) ✓

@WHO

#China has reported to WHO a cluster of #pneumonia cases —with no deaths— in Wuhan, Hubei Province 🇨🇳 . Investigations are underway to identify the cause of this illness.

12:13 PM · Jan 4, 2020 · [Twitter](#) for iPhone

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"Food supply chain is breaking," Tyson Foods chairman warns amid meat plant shutdowns

APRIL 27, 2020 / 7:58 PM / MONEYWATCH



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Low-Frequency/High-Impact Event



Why was COVID-19 so difficult to manage?

- Open-ended timeline (not a discrete event)
 - Ultimate severity of the event was hard to assess in real-time

“In contrast to geographically centered, singular occurrence natural/industrial disasters, a pandemic is not limited to a particular region or confined to a particular time period. Different components of a [supply chain] are affected sequentially or concurrently – manufacturing, distribution centers (DCs), logistics, and ***markets can become paralyzed within overlapping time windows.***” (Ivanov and Das, *Int’l. J. of Integrated Supply Chain Mgt.*, 2020)

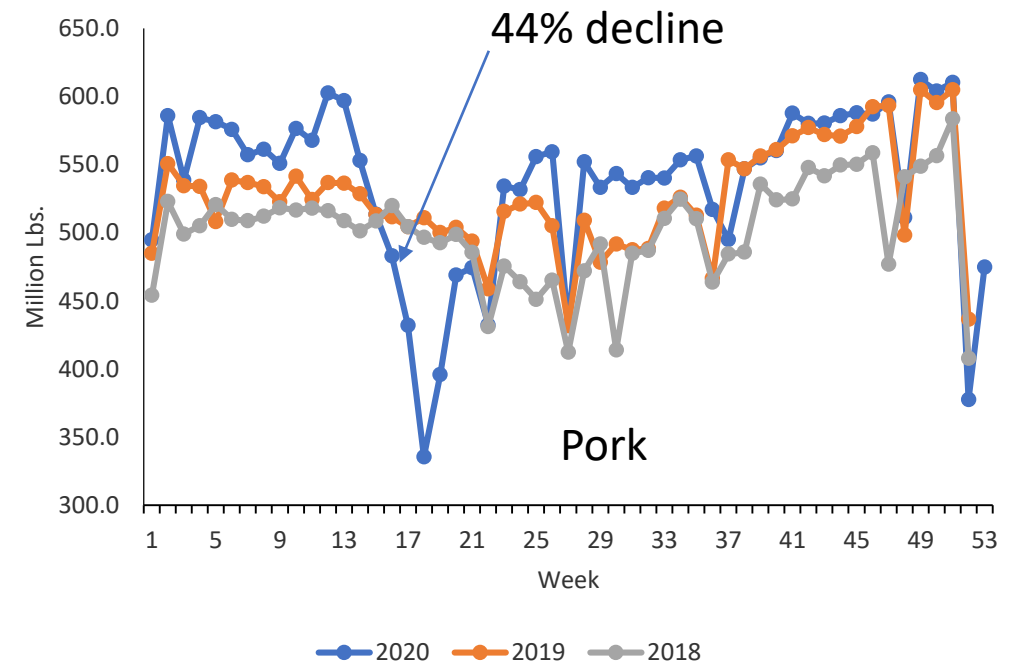
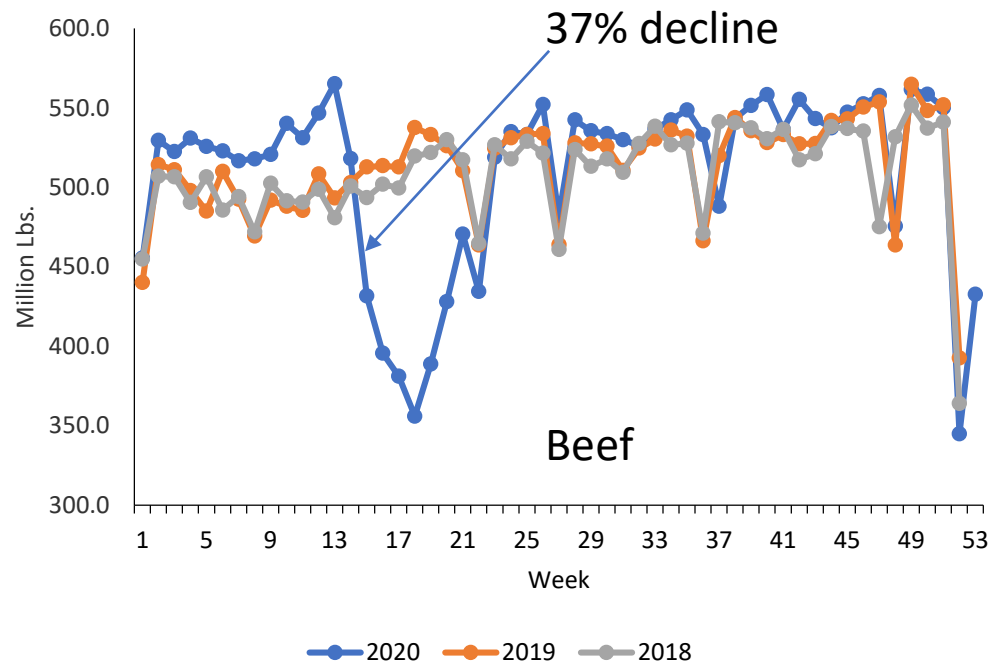
Why was COVID-19 so difficult to manage?

- Shock to both the supply and demand sides of the market
- Food service vs. grocery retail issues on many products
- Dynamically complex
 - Strong surge in demand due to stockpiling behavior followed by collapse in demand as shutdowns took hold
 - Difficult to discern likely effects on a given sector in real time

“There are obvious concerns about cheese orders regarding the coronavirus outbreak. Expectations are, and some evidence has already shown, that food service orders could take a bearish hit. Retail orders, however, could pick up as more people stock up on food supplies at their local groceries. Cheese production is busy ... Cheese market tones are positive, but with caution.”

USDA-AMS *Dairy Market News*, March 13, 2020.

Weekly FI Beef & Pork Production



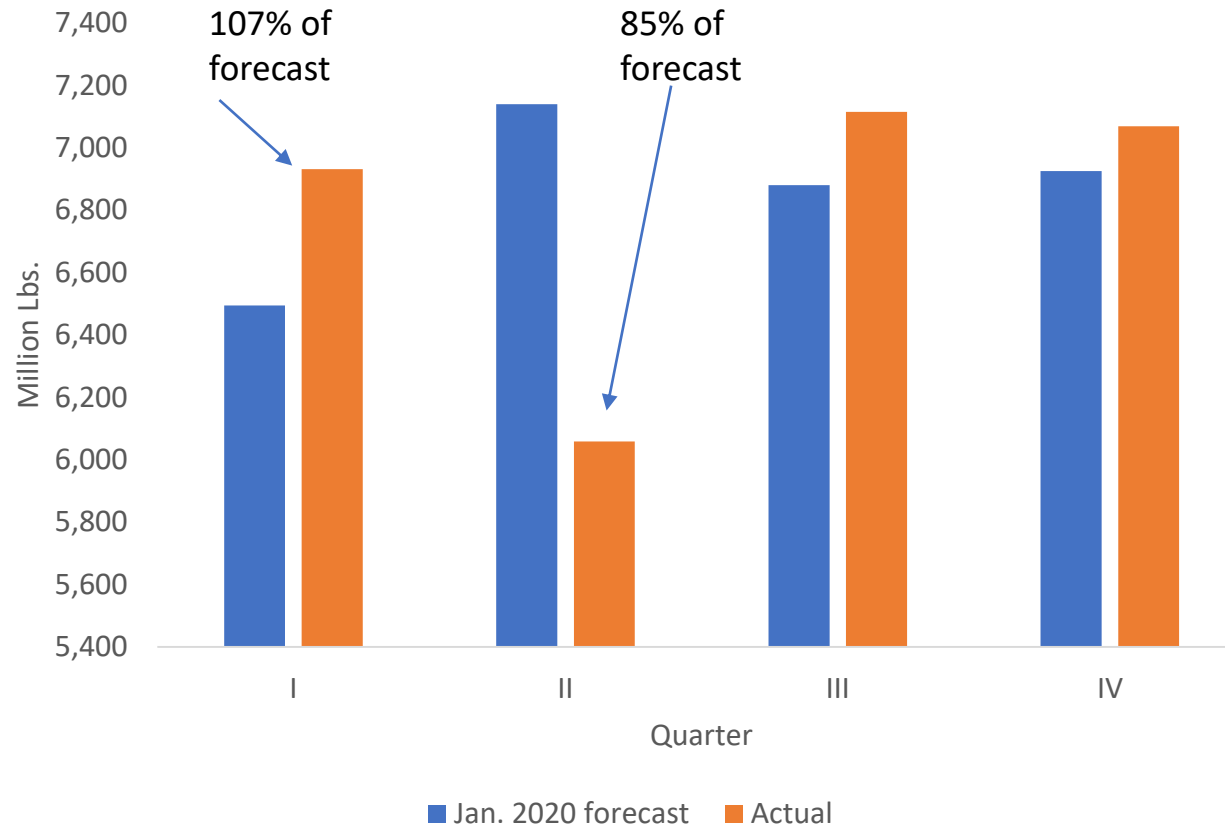
Major COVID Impacts

- Supply chain operations
- Risk
- Marketing Margins

Supply Chains and Risk

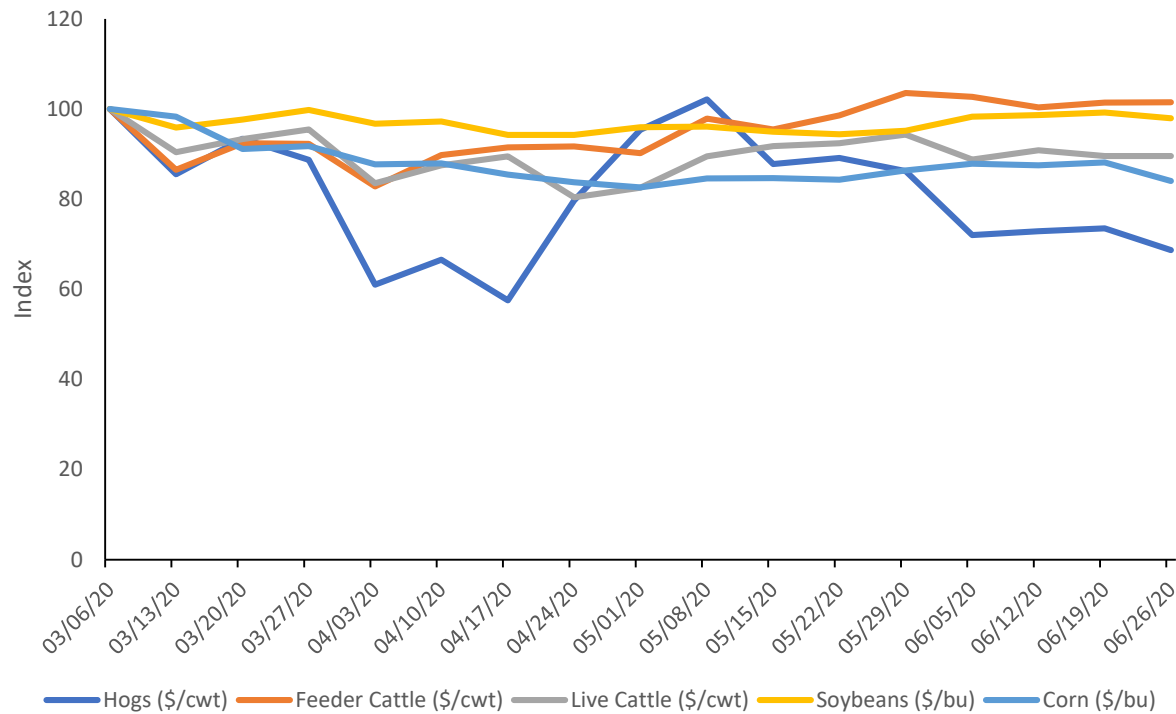
- Production Risk – divergence between expected and actual output
- Price Risk – divergence between actual and expected prices

Beef Production Risk in the Pandemic



Data Source: USDA Economic Research Service: Livestock, Dairy & Poultry Outlook.

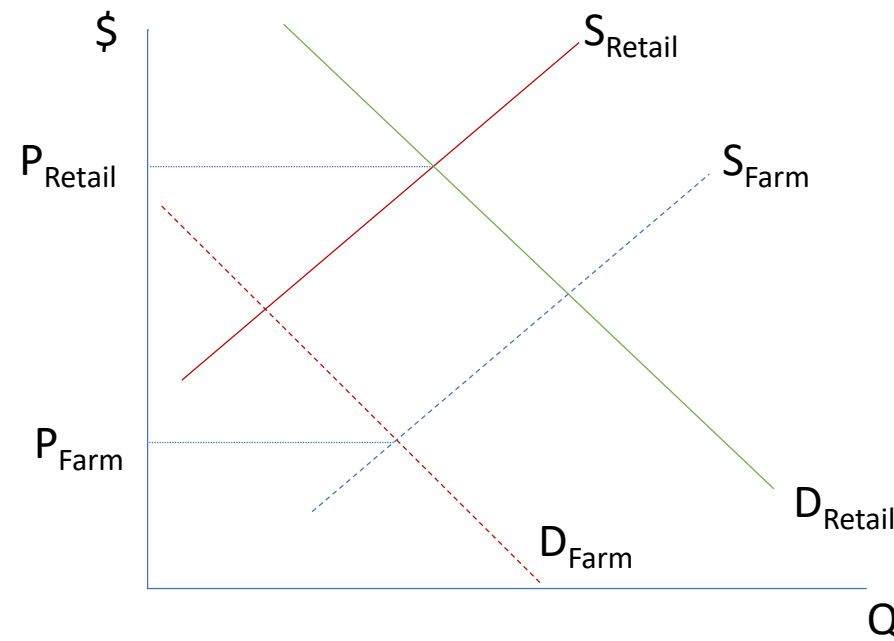
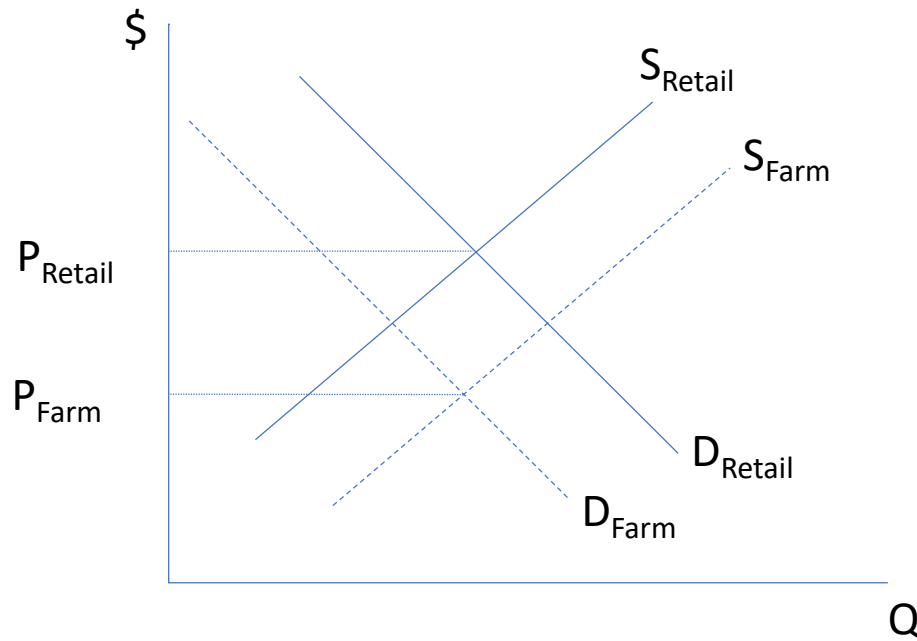
Price Risk in the Pandemic



Index of Friday Settlement Prices for the Nearby Contract of Select Commodities, Base = March 6, 2020.

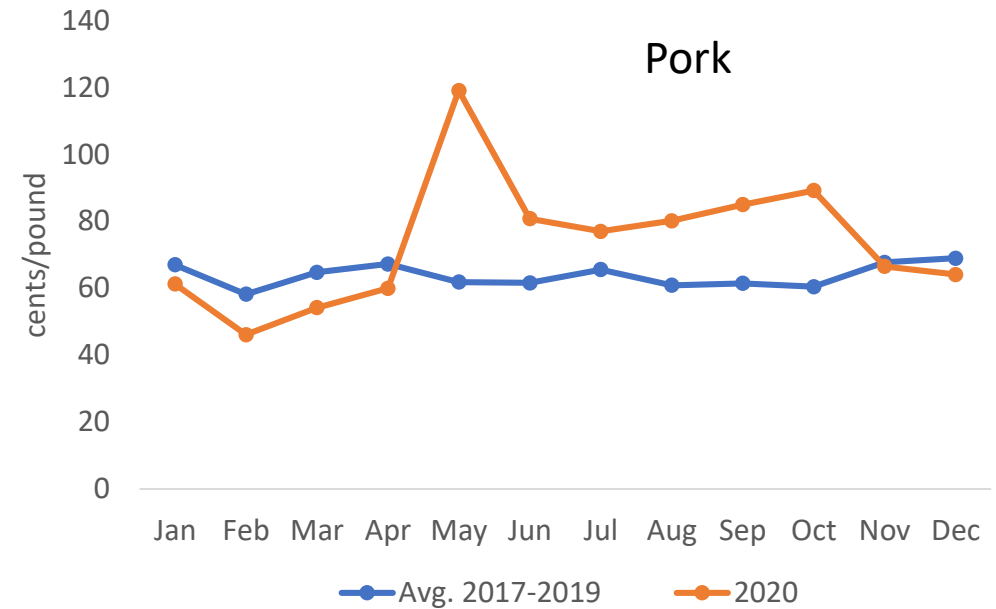
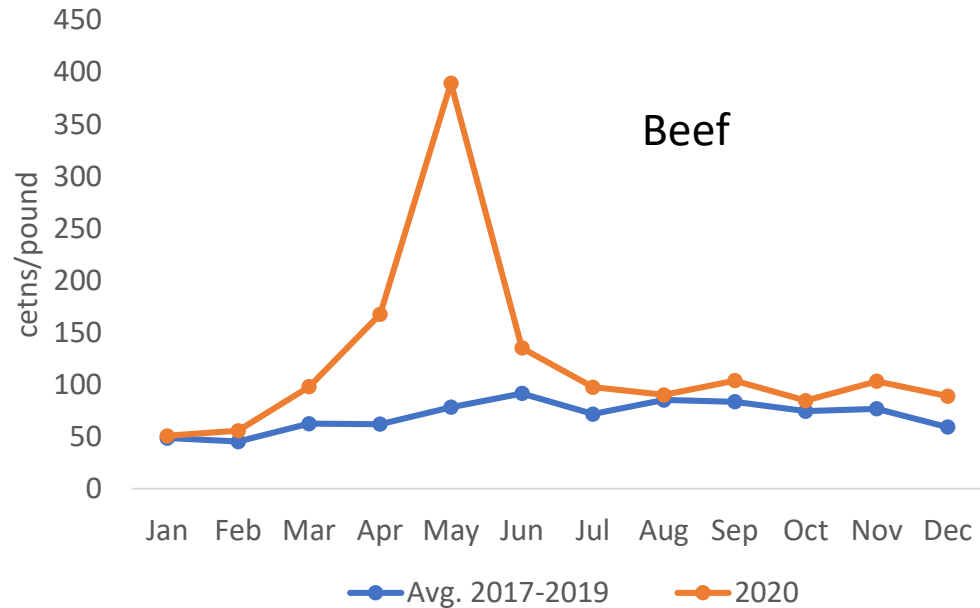
Meat Price Spreads

- Production disruptions and demand shocks led to unusual spreads between prices at different market levels



Positive shock to retail demand;
Negative shock to farm demand;
Negative shock to retail supply.

Farm-Wholesale Margins: Beef & Pork



Supply Chain Resilience

- Classifying supply chain reaction to disturbances
 - Stability: ability to recover from a shock
 - Robustness: ability to withstand a shock while maintaining performance
 - Resilience: a combination of stability and resilience, this is the ability to withstand a shock and recover performance post-shock
 - Viability: a supply chain's ability to survive in a changing environment over a long period of time through adaptation



Network Reliability

- Supply chain networks often fail due to underloading (Wang & Zhang, 2018)
 - Resilience results from improving core competence and maintaining spare capacity
- Importance of 'strong' components (Gertsbakh, Shpungin, and Vaisman, 2018)
- Supply chain mapping with contingency identification and planning (Norwood and Peel, 2021)

Improving Supply Chain Performance

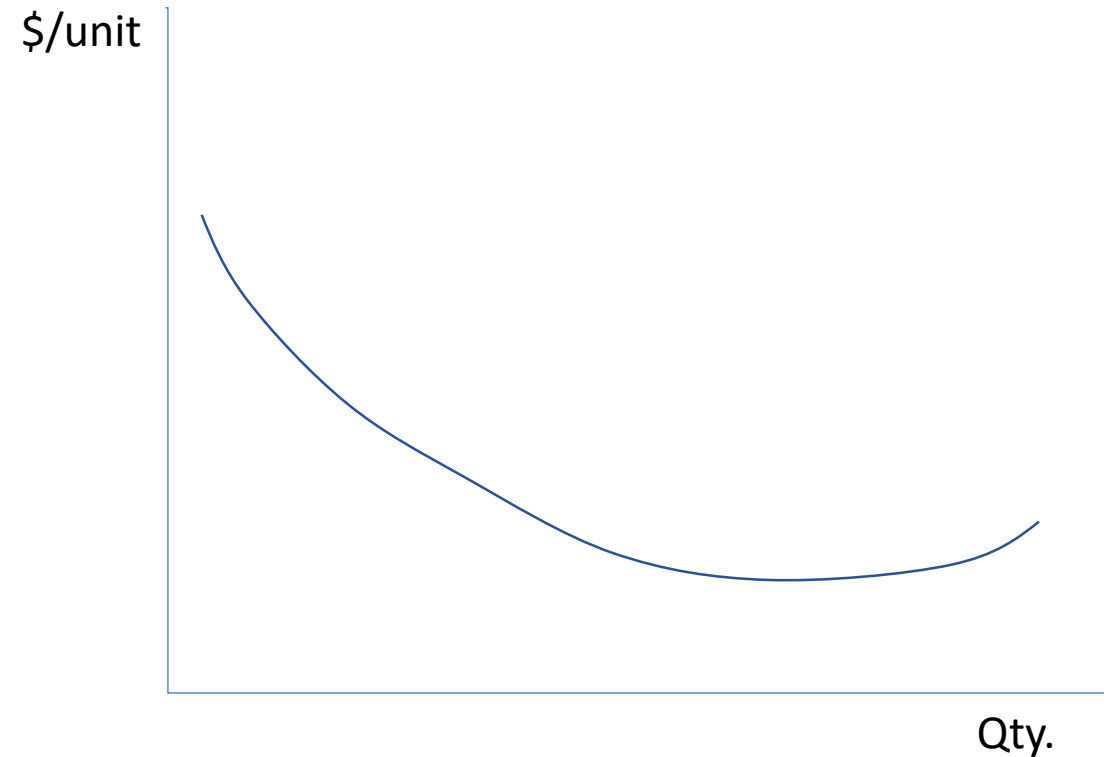
- Two Strategies
 - Alter current supply chain configurations
 - Harden current configurations against future shocks

Alternative Supply Chain Configurations

- Local/regional food systems
 - ‘short supply chains’
 - ‘community marketing’
- More, smaller, less specialized
 - State support of small-scale meat processing: e.g., Arkansas and Kansas CARES Act funds

On the other hand...

- ...specialization and scale have resulted in massive efficiencies and, therefore, cost savings
 - Morrison-Paul (2001): each 1% increase in output results in only a 0.95% increase in costs (i.e., 5% lower per unit cost)
 - MacDonald and Olinger (2005): consolidation in beef packing resulted in 35% reduction in per head processing costs



A Both/And Solution?

- Growth in small, local, diversified production and processing operations
- Further investment in efficiency-enhancing technology in the commercial sector
 - Largely driven by labor-related challenges during the pandemic

CoBank Quarterly: Change is Coming for U.S. Food and Agricultural Businesses

Challenges brought on by COVID-19 will hasten automation throughout supply chains

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Vilsack announces grants for expanded meat, poultry processing capacity

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CoBank Quarterly: Change is Coming for U.S. Food and Agricultural Businesses

Challenges brought on by COVID-19 will hasten automation throughout supply chains

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What could go wrong?

- Small/local operations will face competition from commercial sector likely to be more efficient (i.e., lower-cost) than ever before.
 - How durable is the pandemic-fueled demand for small/local food sources?
 - How durable is the pandemic-fueled political will to support small/local operations from the public fisc?

Summary

- COVID pandemic has led to a wide-ranging discussion of our modern, commercial food supply chain
- Pandemic highlighted vulnerabilities created by scale and specialization
- Currently great interest in developing small/local/diversified production and processing operations
- Economies of scale associated with size and technology remain a formidable feature of food markets (especially in the protein sector)
- Unless pandemic has created a long-term change in consumer preferences, small/local operations will face a major challenge in competing with the commercial sector in the post-pandemic world

Thank You!

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