

The Food System in a Volatile Environment

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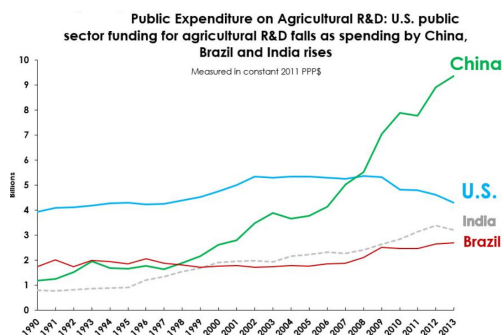
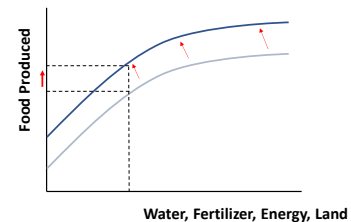
Agricultural Innovation

- Public investments in U.S. agricultural research slowing
- Private investments remain strong
- Focus on food security is shifting to focus on sustainability and quality
- Returns to research investments are slowing

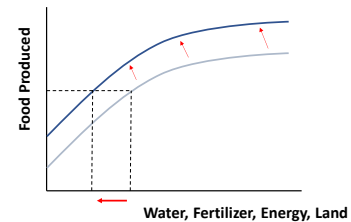
Dynamic Food System

- Margins remain low for commodity agricultural producers and traditional food processors
- Food system is experiencing rapid change – vibrant and tumultuous
- Change is being driven by
 - agricultural and food tech innovations
 - food system re-alignments
 - consumer trends, both retail and regulatory
 - COVID-19

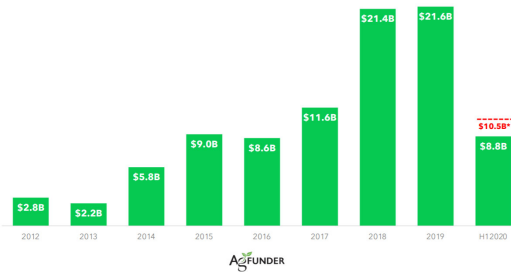
The “Old” Promise of Ag Research



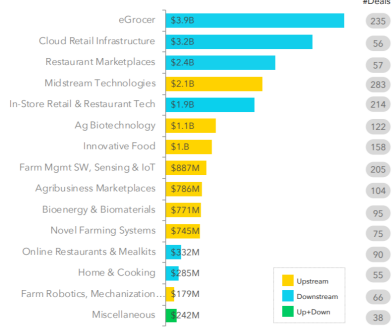
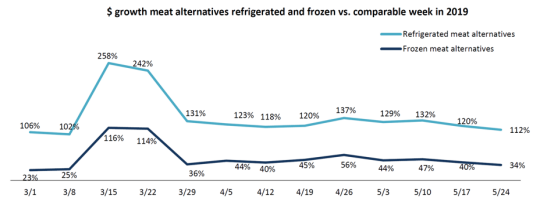
The New Promise of Ag Research



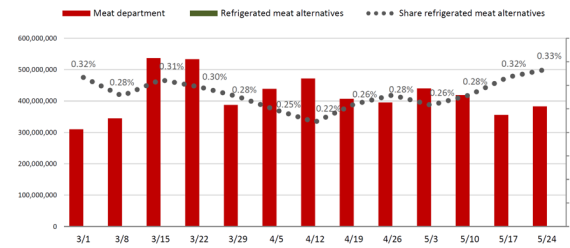
Investment in AgriFood Tech startups



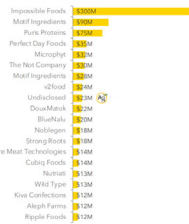
Curious trends in plant-based meat sales



Lbs sales meat department versus refrigerated plant-based meat alternatives



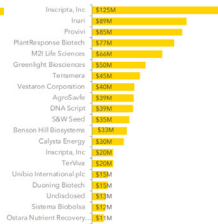
Top Food Deals



Top Farm System Deals

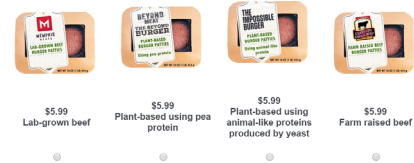


Top Ag Biotech Deals



A Pre-COVID Study

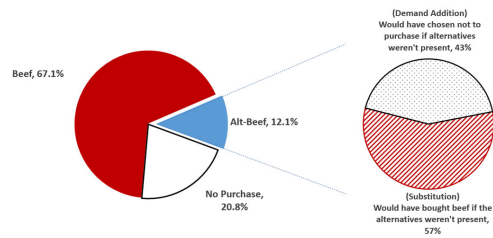
Which burger option would you buy?



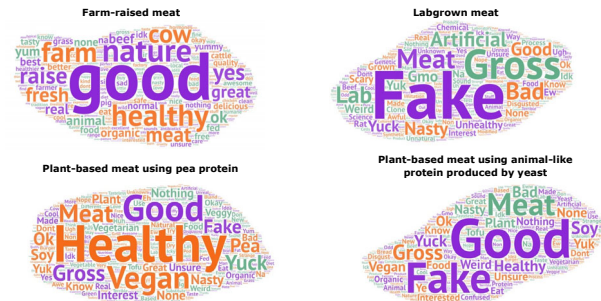
If these were the only options, I would not buy any

Source: Van Lee, Capello, Lusk, Food Policy, 2020

Demand Addition or Substitution?



Who wants alt-meat?



Who wants alt-meat?

Characteristic	Beef Buyers (N=1360)	Alt-Beef Buyers (N=470)	Difference
% Vegetarian	1.9%	25.5%	-23.6%
% with Children under 12	25.8%	36.8%	-11.0%
% with BS degree or higher	33.4%	40.0%	-6.6%
% Female	47.1%	46.2%	0.9%
% with Household Income < \$40,000	19.5%	18.1%	1.4%
% with Household Income between \$40,000 and \$80,000	33.5%	31.9%	1.5%
% with Household Income between \$80,000 and \$120,000	13.5%	15.3%	-1.9%
% with Household Income > \$120,000	8.2%	12.3%	-4.1%
Average age in years	48.04	40.33	7.70
% younger than 30 years	18.6%	37.2%	-18.6%
# people in Household	2.49	2.57	-0.07
% residing in Northeast	17.7%	21.3%	-3.6%
% residing in Midwest	22.9%	17.4%	5.4%
% residing in South	38.6%	38.1%	0.5%
% residing in West	20.8%	23.2%	-2.4%

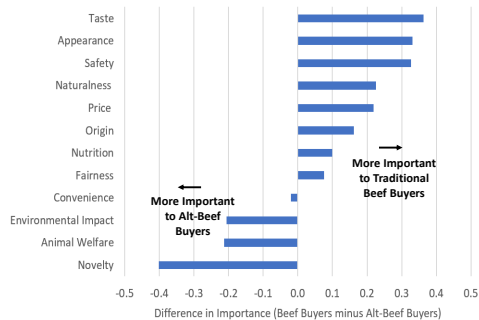
Why Meat Matters

- 2019 Total U.S. Farm Receipts = \$374 billion
 - \$177 billion of animal products (47%)
 - \$59 billion of feed grains (15.8%)
 - 43% of domestic corn use goes directly to animals
 - Another 20% indirectly reaches animals via distillers grains
 - \$35 billion soybeans (9.4%)
 - About 85% soybean meal goes to animals

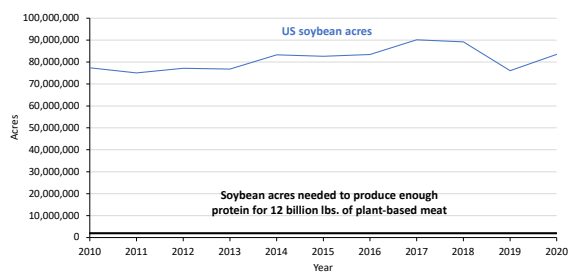
Source: USDA ERS and USDA NRESE reports

How important are the following items to you when purchasing food?

(1=very unimportant; 5 = very important)

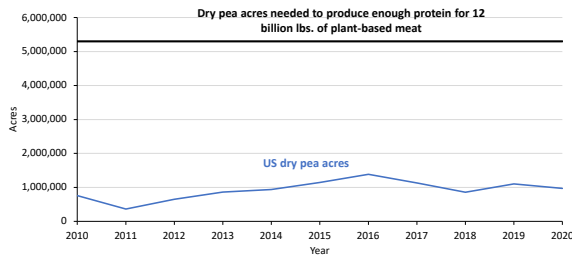


US Soybean Acres



Source: USDA NASS, Nathan Thompson calculations

US Dry Pea Acres



Source: USDA NASS, Nathan Thompson calculations

Food System Re-alignments

- Mergers of input suppliers



Food System Re-alignments

- New “outside” investors and startups



Food System Re-alignments

- Backward and forward integration

DROVERS
Walmart Enters The Beef Business With Packing Facility In Georgia

Greg Henderson
January 10, 2020 10:07 PM

THE WALL STREET JOURNAL
Tyson, Grappling With Covid-19, Promotes Former Tech Executive to CEO

WALLSTREETJOURNAL
Updated Aug 3, 2020 11:01pm ET

Food Business News
Perdue Farms launches direct-to-consumer platform

01.07.2020 By Sam Denley



Costco Builds Nebraska Supply Chain For Its \$5 Rotisserie Chickens

October 29, 2019 4:04 PM ET

Food System Re-alignments

- Acquisitions by incumbents or new entrants



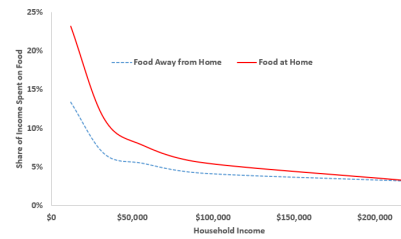
Food System Re-alignments

- Institutional investment in farming
 - In Midwest US, only 53% of farmland is operated by owner
 - About half of non-operator land in Midwest is owned by partnerships, corporations, or trusts
 - Theoretically, returns to innovation accrue to owners of fixed assets

Drivers

- Pressure from investors to meet sustainability initiatives
- Attempt to control supply and quality of inputs
- Perception of agriculture as “analog”
- Falling returns from traditional core businesses
 - Lack of internal innovation
- Attempts to acquire informational advantages
 - digital agriculture
 - blockchain
- Be more responsive to consumer demands

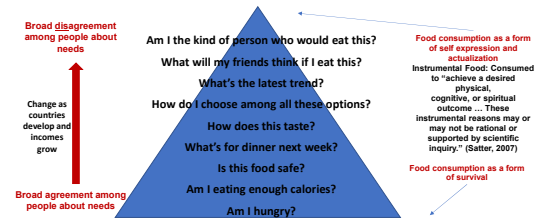
U.S. Engel Curve



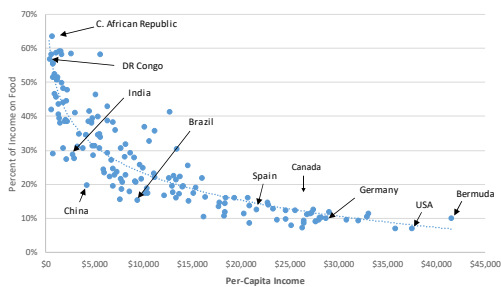
Source: Lusk calculations based on BLS Consumer Expenditure Survey Data for 2019

Consumer Drivers

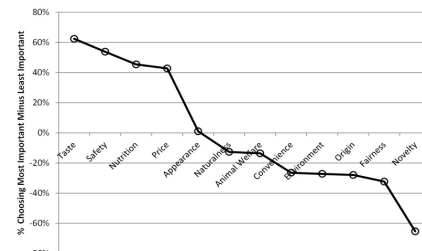
Food Need Hierarchy



World Engel Curve



U.S. Consumers' Food Values



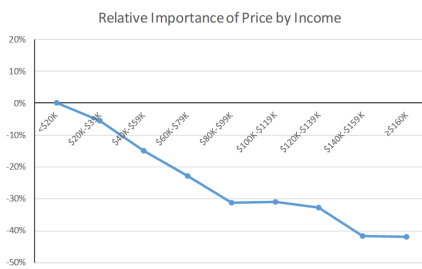
Source: Food Demand Survey (FoodD)

Food Values of the U.S. Rich

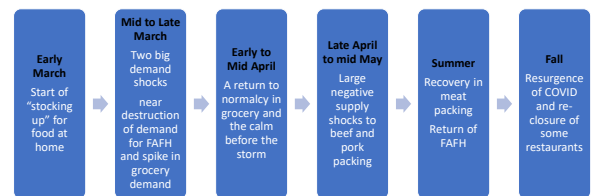


COVID19 Challenges to the Food System

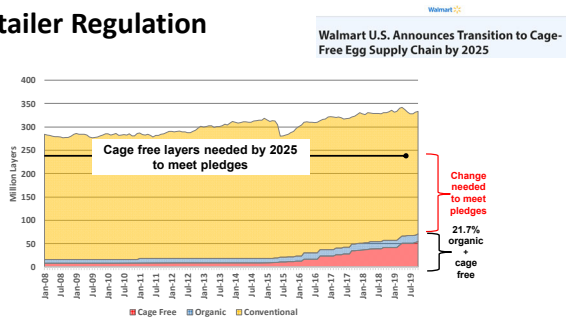
Food Values of the U.S. Poor



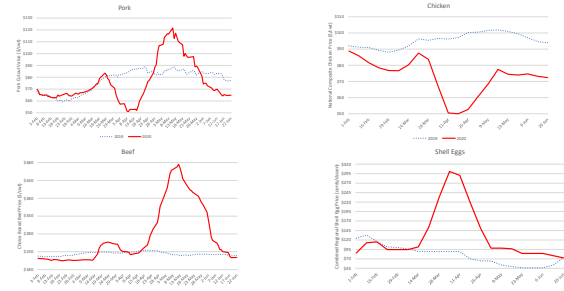
COVID19



Retailer Regulation



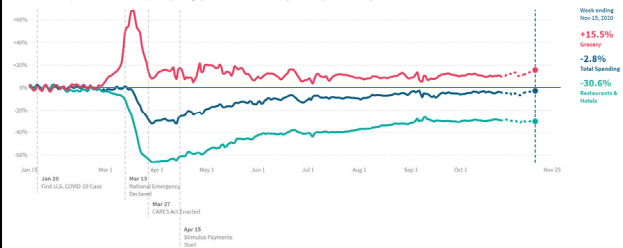
Shocks as seen through wholesale prices



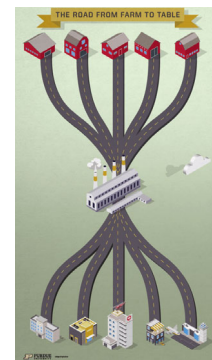
Consumer Spending

Percent Change in All Consumer Spending*

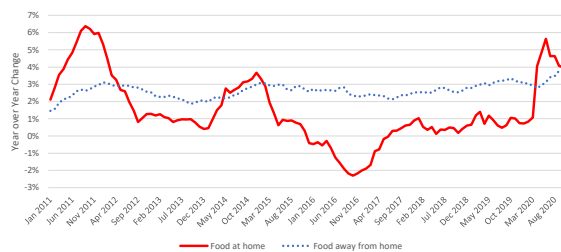
In the United States, as of November 13 2020, total spending by all consumers decreased by 2.8% compared to January 2020.



Vulnerabilities



Annual Change in Retail Food Prices



Source: Bureau of Labor Statistics

Asset fixity leads to farm surplus amidst retail stockouts



Vulnerabilities to farm workers

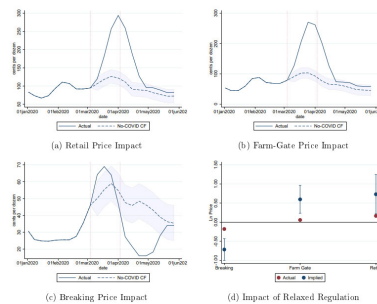
as of November 5, 2020

Type	Cases	Case Incidence Rate	Deaths	Death Incidence Rate
Producers	102,546	2.97%	1,895	0.055%
Hired Workers	55,765	3.05%	1,008	0.055%
Unpaid Workers	61,947	2.87%	1,172	0.054%
Migrant Workers	9,198	3.04%	174	0.058%

- the incidence rate among the general population on 11/5 was 2.94%
- An estimated 0.0217% reduction in annual labor supply
- A loss of \$98 million in agricultural output

Source: <https://ag.purdue.edu/agcon/Pages/FoodandAgVulnerabilityIndex.aspx>

Food is not easily fungible across different markets



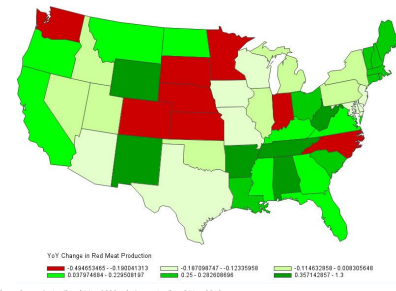
Source: Malone, Schaefer, Lusk https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3672018&download=yes

Meat packing is concentrated

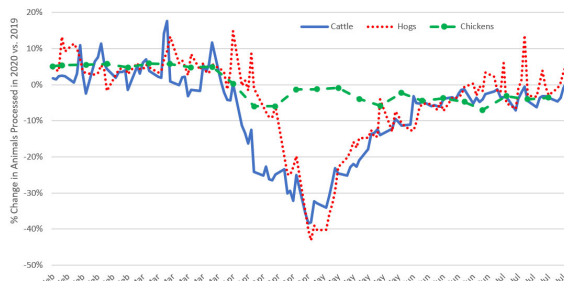
- 10 plants slaughter **63% of all cattle**
- 15 plants slaughter **59% of all hogs**



Red Meat Production Disruptions during COVID

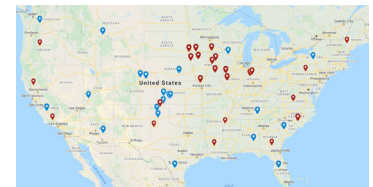


Weekday Processing Volumes

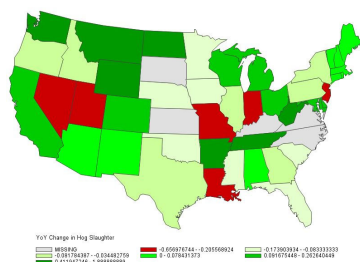


Increased resiliency – no easy answers

- More small and medium processors?
- More local/regional?
- Excess capacity
- Increased redundancy



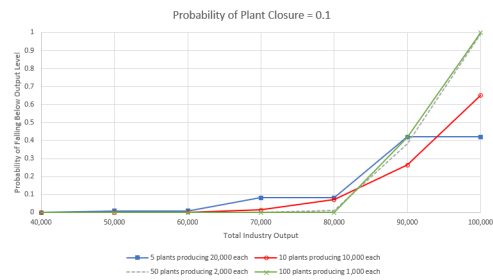
Hog Slaughter Disruptions during COVID



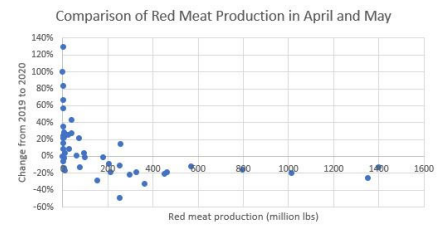
Increased resiliency – no easy answers

- Processing flexibility
- Just-in-time vs. emergency store-house
- Legal and regulatory barriers preventing free-flow of food
- Market-mechanisms to facilitate re-allocation
- Automation

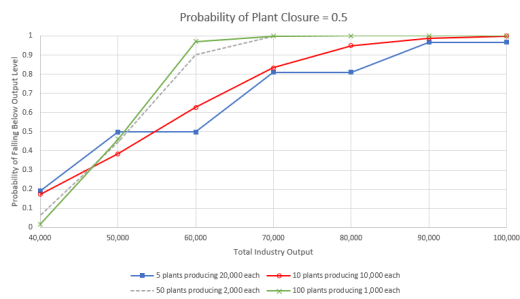
What Does it Mean to be Resilient?



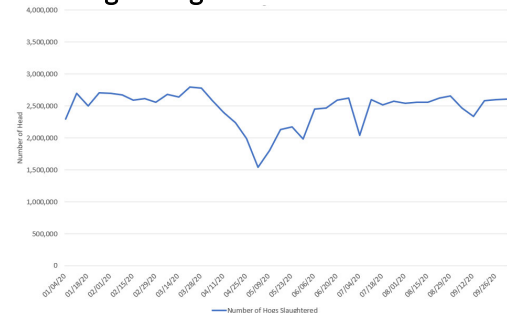
Size and Resiliency



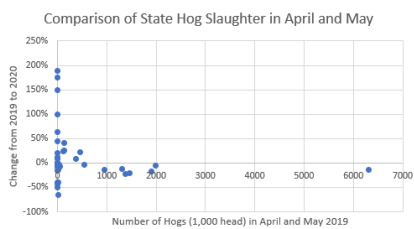
What Does it Mean to be Resilient?



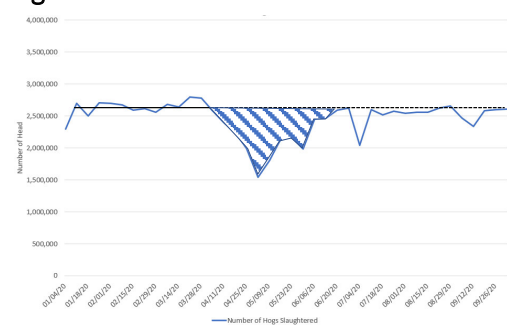
Hog Processing during COVID



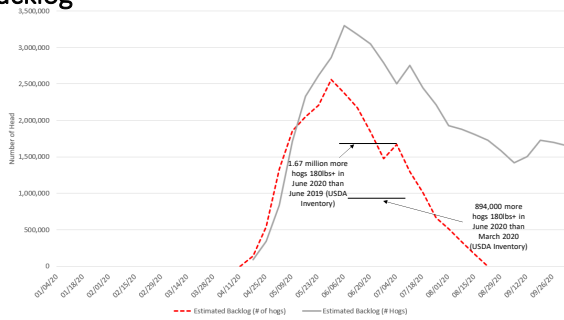
Size and Resiliency



Backlog



Backlog



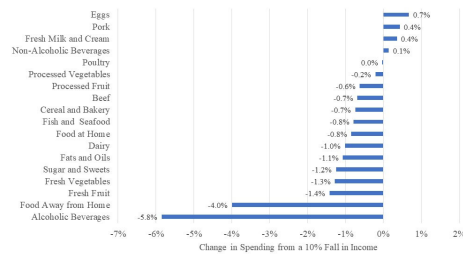
Source: Lusk calculations based on USDA data

What's ahead?

- Ambiguous retail price trends
- Accelerated trend to e-grocery
- More food at home will by-pass the store (micro-fulfillment centers)
- Smaller groceries focused on fresh items
- Labor saving automation
- Increased scrutiny over concentration and anti-competitive behavior
- Shake-up in food service sector
- More ghost kitchens
- Rising interest among some segments in local, direct farm delivery

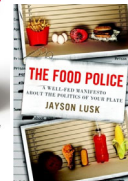
What's ahead?

- Recession will affect food purchases and food security



Source: Lusk calculations based on BLS data

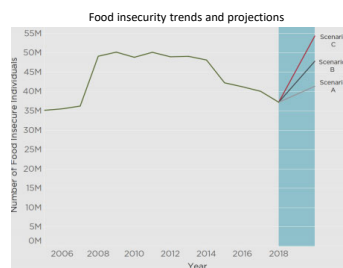
HOW SCIENCE AND TECHNOLOGY ARE SERVING UP SUPER FOODS TO SAVE THE WORLD



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What's ahead?

- Recession will affect food purchases and food security



Source: https://www.feedingamerica.org/sites/default/files/2020-04/food_insecurity_trends_and_projections_2019.pdf