The Food System in a Volatile Environment

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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

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

The "Old" Promise of Ag Research

The New Promise of Ag Research
Investment in AgriFood Tech startups

Curious trends in plant-based meat sales

Top Food Deals

Top Farm System Deals

Top Ag Biotech Deals

A Pre-COVID Study

Source: IRI

Source: Van Loo, Caputo, Lusk, Food Policy, 2020
Who wants alt-meat?

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Beef Buyers (% N=1360)</th>
<th>Alt Beef Buyers (% N=470)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarian</td>
<td>1.9%</td>
<td>23.6%</td>
<td>-21.7%</td>
</tr>
<tr>
<td>% with Children under 12</td>
<td>25.8%</td>
<td>36.8%</td>
<td>-11.0%</td>
</tr>
<tr>
<td>% with BA/BS degree or higher</td>
<td>33.4%</td>
<td>40.0%</td>
<td>-6.6%</td>
</tr>
<tr>
<td>% Female</td>
<td>47.1%</td>
<td>46.2%</td>
<td>0.9%</td>
</tr>
<tr>
<td>% with Household Income &lt; $40,000</td>
<td>19.5%</td>
<td>18.1%</td>
<td>1.4%</td>
</tr>
<tr>
<td>% with Household Income between $40,000 and $80,000</td>
<td>33.5%</td>
<td>31.9%</td>
<td>1.6%</td>
</tr>
<tr>
<td>% with Household Income &gt; $120,000</td>
<td>8.2%</td>
<td>12.3%</td>
<td>-4.1%</td>
</tr>
<tr>
<td>Average age in years</td>
<td>48.04</td>
<td>40.33</td>
<td>7.70</td>
</tr>
<tr>
<td>% younger than 30 years</td>
<td>18.6%</td>
<td>17.2%</td>
<td>1.4%</td>
</tr>
<tr>
<td>% people in household</td>
<td>3.08</td>
<td>3.17</td>
<td>-0.07</td>
</tr>
<tr>
<td>% residing in Northeast</td>
<td>17.7%</td>
<td>21.3%</td>
<td>-3.6%</td>
</tr>
<tr>
<td>% residing in Midwest</td>
<td>22.0%</td>
<td>17.4%</td>
<td>4.6%</td>
</tr>
<tr>
<td>% residing in South</td>
<td>38.6%</td>
<td>39.1%</td>
<td>-0.5%</td>
</tr>
<tr>
<td>% residing in West</td>
<td>20.6%</td>
<td>22.3%</td>
<td>-1.7%</td>
</tr>
</tbody>
</table>

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 goes directly to animals
  - Another 20% indirectly reaches animals via distillers grains
- $35 billion soybeans (9.4%)
  - About 85% soybean meal goes to animals
Dry pea acres needed to produce enough protein for 12 billion lbs. of plant-based meat

US Dry Pea Acres

Source: Statistics Canada

Food System Re-alignments

- Mergers of input suppliers

Food System Re-alignments

- New "outside" investors and startups

Food System Re-alignments

- Acquisitions by incumbents or new entrants

Food System Re-alignments

- Backward and forward integration

- 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

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Drivers

- Pressure from investors to meet sustainability initiatives
- Attempt to control supply and quality of inputs
- Perception of agriculture as “analog”
  - Lack of internal innovation
- Attempts to acquire informational advantages
  - Digital agriculture
  - Blockchain
- Be more responsive to consumer demands

Consumer Drivers

Food Need Hierarchy

- Broad disagreement among people about needs
- Broad agreement among people about needs
- Change in opinions and values among people

Food consumption as a form of self expression and actualization

Instrumental Food: Consumed to “achieve a desired physical, cognitive, or spiritual outcome … These instrumental reasons may or may not be rational or supported by scientific inquiry.” (Satter, 2007)

World Engel Curve

U.S. Consumers’ Food Values
Food Values of the U.S. Rich

Food Values of the U.S. Poor

COVID19
Challenges to the Food System

Retailer Regulation

Shocks as seen through wholesale prices
### Consumer Spending

**Percent Change in All Consumer Spending**

Source: https://www.tracktherecovery.org/

### Vulnerabilities

**Vulnerabilities to farm workers**

<table>
<thead>
<tr>
<th>Type</th>
<th>Cases</th>
<th>Incidence Rate</th>
<th>Deaths</th>
<th>Death Incidence Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producers</td>
<td>102,546</td>
<td>2.97%</td>
<td>1,895</td>
<td>0.050%</td>
</tr>
<tr>
<td>Hired Workers</td>
<td>55,765</td>
<td>3.05%</td>
<td>1,008</td>
<td>0.055%</td>
</tr>
<tr>
<td>Unpaid Workers</td>
<td>61,947</td>
<td>2.87%</td>
<td>1,172</td>
<td>0.054%</td>
</tr>
<tr>
<td>Migrant Workers</td>
<td>9,198</td>
<td>3.04%</td>
<td>174</td>
<td>0.058%</td>
</tr>
</tbody>
</table>

- Incidence rate among the general population on 11/5 was 2.94%
- An estimated 0.0017% reduction in annual labor supply
- A loss of $98 million in agricultural output

Source: https://ag.purdue.edu/agecon/Pages/FoodandAgVulnerabilityIndex.aspx

### Annual Change in Retail Food Prices

**Source:** Bureau of Labor Statistics

### Vulnerabilities to farm workers

as of November 5, 2020

**Vulnerabilities to farm workers**

- The vulnerability index among farm workers is higher than other workers.
- A significant drop in food prices has led to surplus amidst retail stockouts.
- Food is not easily fungible across different markets.

Source: Malone, Schaefer, Lusk

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**Food is not easily fungible across different markets**

- Malfunctioning of the food supply chain.
- The vulnerability index among farm workers is higher than other workers.
- A significant drop in food prices has led to surplus amidst retail stockouts.
- Food is not easily fungible across different markets.

Source: Malone, Schaefer, Lusk
Meat packing is concentrated
• 10 plants slaughter 63% of all cattle
• 15 plants slaughter 59% of all hogs

Red Meat Production Disruptions during COVID

Increased resiliency – no easy answers
• More small and medium processors?
• More local/regional?
• Excess capacity
• Increased redundancy

Weekday Processing Volumes

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

Hog Slaughter Disruptions during COVID

Source: Lusk calculations based on USDA data; change in April and May 2020 relative to April and May 2019.
What Does it Mean to be Resilient?

Size and Resiliency

Comparison of Hog Slaughter in April and May

Hog Processing during COVID

Backlog
12/1/2020

What’s ahead?

- Recession will affect food purchases and food security

![Graph showing changes in spending on various food items](source: Lusk calculations based on BLS data)

Backlog

![Graph showing backlog trends](source: Lusk calculations based on US data)

Food insecurity trends and projections

Food insecurity trends and projections

Source: https://www.feedingamerica.org/sites/default/files/2020‐04/Brief_Impact%20of%20Covid%20on%20Food%20Insecurity%204.22%20%28002%29.pdf

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Source: USDA data

894,000 more hogs 180lbs+ in June 2020 than June 2019 (USDA Inventory)

8,224,360 more hogs 180lbs+ in June 2020 than March 2020 (USDA Inventory)

Backlog

12/1/2020

What’s ahead?

- Recession will affect food purchases and food security

- 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

Source: Lusk calculations based on US data

Source: USDA data

1.67 million more hogs 180lbs+ in June 2020 than June 2019 (USDA Inventory)

8,224,360 more hogs 180lbs+ in June 2020 than March 2020 (USDA Inventory)