U.S. Animal Ag Is a Large Industry & It’s Getting Bigger

Annual U.S. Beef, Pork & Poultry Production
1990-2019

Billion Lbs.

Poultry
Pork
Beef

U.S. Meat Production Up 70% Since 1990

Source: USDA & LMIC, 2019 LMIC Forecast

Purdue Center for Commercial Agriculture
American’s Meat Consumption Has Been Rising Recently
But It’s Just Getting Back to Levels Reached from ‘02 to ’07

Annual Red Meat & Poultry Supplied to U.S. Consumers
Per Capita, 1990-2019

Average Consumer Eating About
12% More Meat Than in 1990

Source: USDA & LMIC, 2019 LMIC Forecast

Purdue Center for Commercial Agriculture
Exports Have Become A Big Driver of Growth in Meat Production

Net U.S. Beef, Pork & Poultry Exports
1985-2019

U.S. Shifted From A Net Importer
to a Large Net Exporter

Source: USDA, 2019 LMIC Forecast

Purdue Center for Commercial Agriculture
Beef, Pork & Poultry Net Exports Combined as % of Total Production, 1985-2018

Year

Source: USDA, LMIC
Domestically, A Big Increase in Poultry Consumption
A Shift That Has Been Underway for Decades

Poultry's Share of U.S. Meat Supply
Retail Weight, Annual, 1960-2019

Source: USDA & LMIC, 2019 Projected

Purdue Center for Commercial Agriculture
Shares of Total U.S. Meat Supply
By Commodity, Retail Weight, Annual, 1960-2019

% of Total

% Poultry
% Pork
% Beef

Source: USDA & LMIC, 2019 Projected
Purdue Center for Commercial Agriculture
Beef Industry Can Be Divided Into Sectors
It Starts with the Cow-Calf Sector
Cattle Are Produced Throughout the Nation, But Are Most Heavily Concentrated in the Nation’s Mid-Section

TOTAL CATTLE JANUARY 1, 2019 (1000 Head)

Source: USDA-NASS, Livestock Marketing Information Center

The U.S. Cattle Industry

US Total 94760
# Beef Production Is Intertwined with Cropping Patterns

## Distribution of U.S. Planted Acreage By Crop, 2019

<table>
<thead>
<tr>
<th>Rank</th>
<th>Crop</th>
<th>Million Acres</th>
<th>% of Total Acreage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Corn</td>
<td>90.0</td>
<td>29%</td>
</tr>
<tr>
<td>2</td>
<td>Soybeans</td>
<td>76.7</td>
<td>25%</td>
</tr>
<tr>
<td>3</td>
<td>All Hay</td>
<td>52.8</td>
<td>17%</td>
</tr>
<tr>
<td>4</td>
<td>All Wheat</td>
<td>45.6</td>
<td>15%</td>
</tr>
<tr>
<td>5</td>
<td>Cotton</td>
<td>13.9</td>
<td>5%</td>
</tr>
<tr>
<td>6</td>
<td>Sorghum</td>
<td>5.3</td>
<td>2%</td>
</tr>
<tr>
<td>7</td>
<td>Rice</td>
<td>2.8</td>
<td>1%</td>
</tr>
<tr>
<td>8</td>
<td>Oats</td>
<td>2.5</td>
<td>1%</td>
</tr>
<tr>
<td>9</td>
<td>Barley</td>
<td>2.9</td>
<td>1%</td>
</tr>
<tr>
<td>10</td>
<td>Canola</td>
<td>2.0</td>
<td>1%</td>
</tr>
<tr>
<td>11</td>
<td>Rye</td>
<td>1.9</td>
<td>1%</td>
</tr>
<tr>
<td>12</td>
<td>Dry Edible Beans</td>
<td>1.3</td>
<td>0.4%</td>
</tr>
<tr>
<td>13</td>
<td>Peanuts</td>
<td>1.4</td>
<td>0.4%</td>
</tr>
<tr>
<td>14</td>
<td>Sunflowers</td>
<td>1.4</td>
<td>0.5%</td>
</tr>
<tr>
<td>15</td>
<td>Sugarbeets</td>
<td>1.1</td>
<td>0.4%</td>
</tr>
<tr>
<td>16</td>
<td>Dry Edible Peas</td>
<td>1.0</td>
<td>0.3%</td>
</tr>
<tr>
<td>17</td>
<td>Potatoes</td>
<td>1.0</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

Source: USDA-NASS, *Acreage*, June 2019, & *Crop Production*, August 2019
Beef Industry Takes Advantage of Pasture & Hay That Would Otherwise Not Be Utilized

Pastureland as % of Land in Farms
Largest Concentration of Beef Cows Are in the Middle of U.S.

BEEF COWS THAT CALVED JANUARY 1, 2019
(1,000 Head, Top 11 States Identified By Rank)

Source: USDA-NASS, Livestock Marketing Information Center
Top 5 States Account for 40% of Beef Cow Inventory
Top 10 States Account for Nearly 60% of U.S. Inventory

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Beef Cow Inventory (1,000 head)</th>
<th>% of U.S. Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX</td>
<td>4,655</td>
<td>15%</td>
</tr>
<tr>
<td>2</td>
<td>OK</td>
<td>2,150</td>
<td>7%</td>
</tr>
<tr>
<td>3</td>
<td>MO</td>
<td>2,059</td>
<td>6%</td>
</tr>
<tr>
<td>4</td>
<td>NE</td>
<td>1,941</td>
<td>6%</td>
</tr>
<tr>
<td>5</td>
<td>SD</td>
<td>1,818</td>
<td>6%</td>
</tr>
<tr>
<td>6</td>
<td>KS</td>
<td>1,529</td>
<td>5%</td>
</tr>
<tr>
<td>7</td>
<td>MT</td>
<td>1,448</td>
<td>5%</td>
</tr>
<tr>
<td>8</td>
<td>KY</td>
<td>1,017</td>
<td>3%</td>
</tr>
<tr>
<td>9</td>
<td>ND</td>
<td>985</td>
<td>3%</td>
</tr>
<tr>
<td>10</td>
<td>IA</td>
<td>950</td>
<td>3%</td>
</tr>
<tr>
<td>11</td>
<td>AR</td>
<td>935</td>
<td>3%</td>
</tr>
<tr>
<td>12</td>
<td>TN</td>
<td>914</td>
<td>3%</td>
</tr>
<tr>
<td>13</td>
<td>FL</td>
<td>914</td>
<td>3%</td>
</tr>
<tr>
<td>14</td>
<td>CO</td>
<td>797</td>
<td>3%</td>
</tr>
<tr>
<td>15</td>
<td>WY</td>
<td>714</td>
<td>2%</td>
</tr>
</tbody>
</table>

What Drives The Cattle Industry?

• Economic signals are passed down from consumers to producers
• Industry size decisions are made by cow owners who produce calves that, 1 to 2 years later, provide the nation’s beef
• Long gestation and growth periods slows down responses to economic signals
• Result is a tendency for long cycles
Structure of Beef Cow-Calf Industry

• Over 700,000 operations with beef cows in the U.S.

• Large number of small operations
  – About 90% of operations have less than 100 cows
  – Over 40% of the beef cow herd is on operations that have 100 or fewer cows

• Small number of large operations
  – About 1% of operations have 500 or more cows
  – Less than 20% of the beef cow herd is on operations that have over 500 cows

• Result: Most beef cow operations have other enterprises in addition to beef

Source: USDA & LMIC
Beef Cattle Production:

Most calves born in the spring & sold in the fall

Calves weaned in the fall & grazed or backgrounded over the winter with a grain supplemented diet

Finished on a grain concentrate ration supplemented with hay to be ready for slaughter and processed into beef the following late spring, summer or fall
**BEEF CATTLE PRODUCTION FOR FALL-WEEANED CALVES**

**GESTATION**
- 285 days

Most calves are born in a 90-day window in the Spring.

**WEANING**
- 90-205 days

A calf is weaned once its digestive system can process whole feeds.

**PRE-CONDITIONING**
- This short stage helps keep animals healthy by vaccinating the animal against diseases, and transitioning the animal from feeding on its mother to eating dry feeds.
- 600 lbs.
- Oct. - Nov.
  - 35 days

**BACKGROUNDING**
- In this stage, cattle can be in pens or lots and feed on dry forage, silage and grain.
- 800 lbs.
  - 100 days

**DRY LOT WINTER**
- In this stage, an enclosed area is used to feed dry forage. This is often used when pasture is not affordable or available.
- 725 lbs.
  - 175 days

**STOCKER**
- In this stage, cattle graze on summer grass.
- 1000 lbs.
- Apr. - Sept.
  - 160 days

**WINTER GRAZING**
- In this stage, cattle graze on pasture that has been reserved for winter.
- 850 lbs.
- Nov. - Apr.
  - 130 days

**FEEDLOT**
- It's here that cattle gain weight, eating high-energy feed rations. It takes approximately 7 pounds of feed to produce one pound of muscle tissue, under normal conditions. Most cattle will spend some time in a feedlot facility before being sent to a packinghouse.
- 1,290 lbs.
- Nov. - June
  - 230 days

- 1,300 lbs.
- Jan. - June
  - 160 days

- 1,300 lbs.
- April - Aug.
  - 150 days

- 1,300 lbs.
  - 100 days

**TO PACKING PLANT**

**KEY**
- Colors show the different paths that cattle can take to reach market weight
- Pounds listed are achieved at the end of the stage
- Days listed denote length of time in each stage
- Weights are approximate
Getting Cattle Ready for Finishing in a Feedlot
Multiple Options Performed By A Disaggregated Industry of Farmer/Feeders

- Pre-Conditioning
- Backgrounding
- Dry-Lot Wintering
- Winter Grazing
- Stocker Operations

Goal of these programs is to put weight on cattle at lower cost per pound of gain than on a feedlot ration and take advantage of forages and other feedstuffs that would not be used (or would have low value), if not fed to cattle
Cattle Feeding Sector
Last Step Before Processing Into Beef
Cattle Feeding Sector

- Cattle placed on a high grain concentrate ration and fed until ready for processing into beef

- Age and weight placed on feed varies

- When cost per lb. of gain using a grain ration is low relative to forage based programs, it tends to favor calf feeding programs

- When cost per lb. of gain using forages is low relative to grain based programs, it tends to favor placing older, heavier cattle on feed

- Returns to cattle feeders are extremely variable and can expose cattle feeders to significant risk

- Cost of feeder cattle placed on feed and feed prices, especially corn, are big risks for cattle feeders
Great Plains States Dominate the Cattle Feeding Sector
CATTLE ON FEED JANUARY 1, 2019
(1,000 Head)

Other States  69
U.S. Total  14371

Source: USDA-NASS, Livestock Marketing Information Center
Top 3 States Market Nearly 70% of Fed Cattle
Top 5 States Market 83% of Fed Cattle

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>2018 Marketings of Fed Cattle (1,000 Head)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NE</td>
<td>5,610</td>
<td>25%</td>
</tr>
<tr>
<td>2</td>
<td>KS</td>
<td>5,010</td>
<td>22%</td>
</tr>
<tr>
<td>3</td>
<td>TX</td>
<td>4,870</td>
<td>22%</td>
</tr>
<tr>
<td>4</td>
<td>CO</td>
<td>1,920</td>
<td>9%</td>
</tr>
<tr>
<td>5</td>
<td>IA</td>
<td>1,103</td>
<td>5%</td>
</tr>
<tr>
<td>6</td>
<td>CA</td>
<td>668</td>
<td>3%</td>
</tr>
<tr>
<td>7</td>
<td>OK</td>
<td>625</td>
<td>3%</td>
</tr>
<tr>
<td>8</td>
<td>SD</td>
<td>492</td>
<td>2%</td>
</tr>
<tr>
<td>9</td>
<td>ID</td>
<td>457</td>
<td>2%</td>
</tr>
<tr>
<td>10</td>
<td>WA</td>
<td>411</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: USDA, *Cattle on Feed*, various issues, 2018
Cattle Feeding Sector Structure

• Approximately 95% of feedlots have a one-time capacity of less than 1,000 head

• But the 5% of feedlots with one-time capacity of 1,000 head or more market over 80% of fed cattle

• Large feedlots with one-time capacity of 32,000 head or more market about 40% of fed cattle

• Trend is toward more large-scale feedlots

• But not all cattle in large feedlots are owned by feedlots, some feedlots focus on custom feeding for other cattle owners

Source: USDA
Improved Technology & Management Has Increased Efficiency

*Production per Cow Up 23% Since 1990*

**Sources of Innovation**
- Improved genetics
- More rapid weight gains
- Better management

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**Graph:**
- **Pounds of Beef Produced Per Cow Per Year**
- **Years:** 1990 to 2018
- **Pounds:** 400 to 700
- **Increasing By 4.1 Pounds Per Year**

**Source:** USDA, *cow inventory includes beef & dairy cows*  
**Purdue Center for Commercial Agriculture**
What About More Direct Measures of Beef Production’s Environmental Impact?

*Late 1970s vs. 2000s Beef Industry Comparison*

To produce the same amount of beef as in late 1970s 2000s beef industry technology required just

1. 70% of the animals
2. 81% of the feedstuffs
3. 88% of the water &
4. 67% of the land

What About the Hog Industry?

Market Hog Inventory Rankings, By State

1. Iowa (32%)
2. North Carolina (12%)
3. Minnesota (10%)
4. Indiana (7%)
5. Illinois (6%)
6. Nebraska (5%)
7. Ohio (4%)
8. Kansas (4%)
9. Missouri (4%)
10. Oklahoma (3%)

Top Five States Account for 67% of Total Market Hog Inventory

Top Ten States Account for 86% of Total Market Hog Inventory

Top Ten States Account for 80% of Breeding Herd Inventory

Source: USDA, Dec. 1, 2018 Market Hog Inventories
Breeding Herd 9% Smaller Than in 1990
But Pork Production Up Over 70% Since 1990

Hog Breeding Herd Inventory
Annual Average, 50 States

Source: USDA

Purdue Center for Commercial Agriculture
Shifts In Hog Production Technology & Management Improvements Led to Dramatic Productivity Increases

Pigs Per Litter in U.S. Quarterly, 1990-2019

39% Increase in pigs per litter since 1990

Source: USDA, Hogs & Pigs

Purdue Center for Commercial Agriculture
Dramatic Rise in Output/Breeding Herd Unit Over the Last 3 Decades

Pork Production Per Sow Up 89% Since 1990

Source: USDA

Purdue Center for Commercial Agriculture
Why Do These Efficiency Comparisons Matter?

The ability to produce more beef and pork from smaller cattle and hog herds allows us to

1. Have more food (calories) at lower cost
2. Reduce land use
3. Emit fewer greenhouse gases &
4. Reduce environmental impacts

than would otherwise be the case.

Stated another way,

✓ Ongoing productivity improvements arising from innovation are the foundation of a sustainable food system...and the productivity improvements in the livestock sector have been dramatic!
Where Will Future Innovations Come From?  

*The Promise of Digital Ag*

1. Better data collection
2. Improved data analysis
3. Real time management changes
   - Leading to continuous improvements in
     - Animal health
     - Animal welfare
     - Animal nutrition
     - Waste management
   - Result: An even more productive livestock sector
The Ag Economy Barometer, a collaboration between Purdue University's Center for Commercial Agriculture and the CME Group, is a monthly nationwide survey to measure the health of the US agricultural economy. Together we believe this economic indicator underscores the importance of the agricultural economy and its participants – food producers and agribusinesses – to the overall U.S. and global economies. The Ag Economy Barometer is published the first Tuesday of every month.