U.S. Cattle & Hog Sectors

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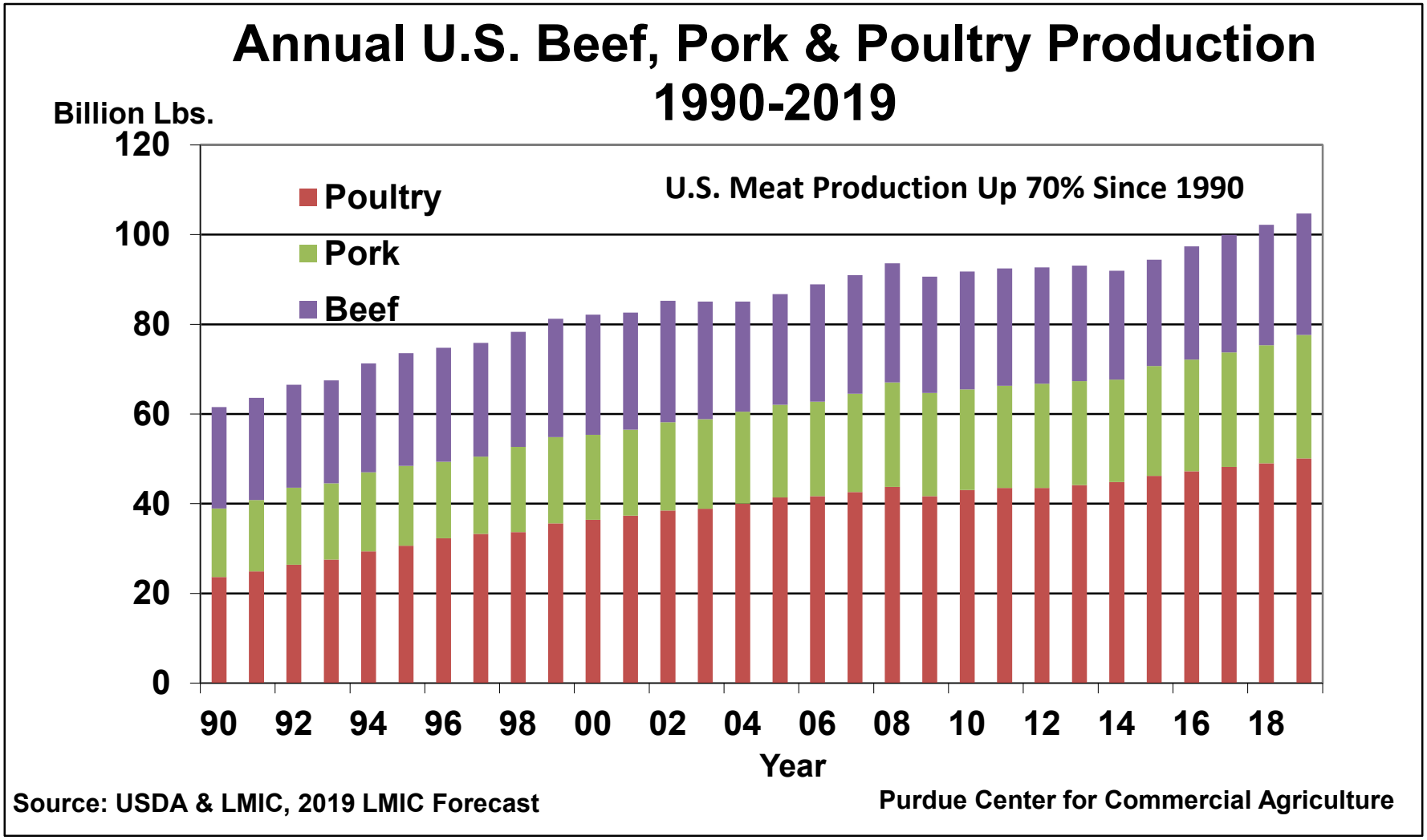
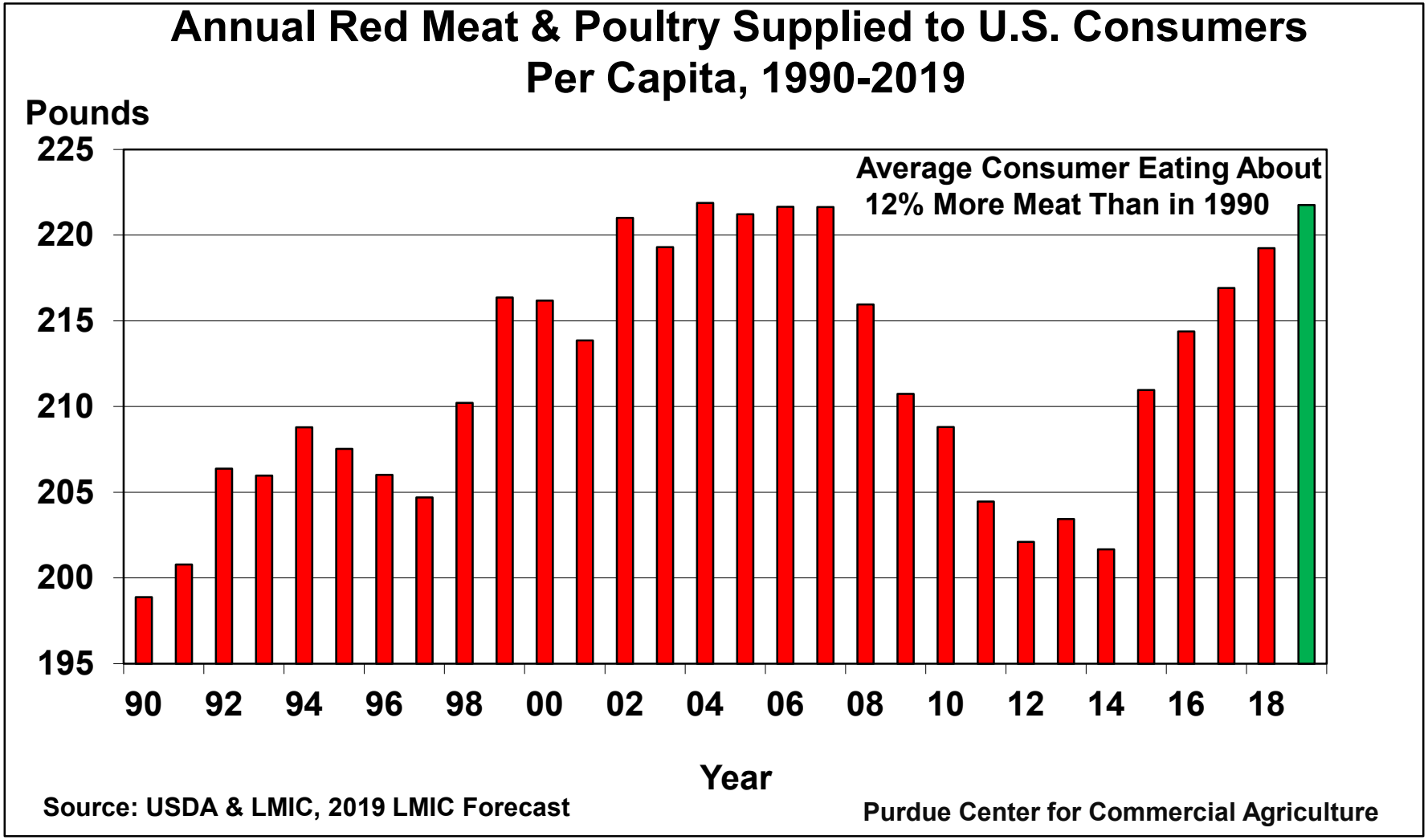
U.S. Animal Ag Is a Large Industry & It's Getting Bigger

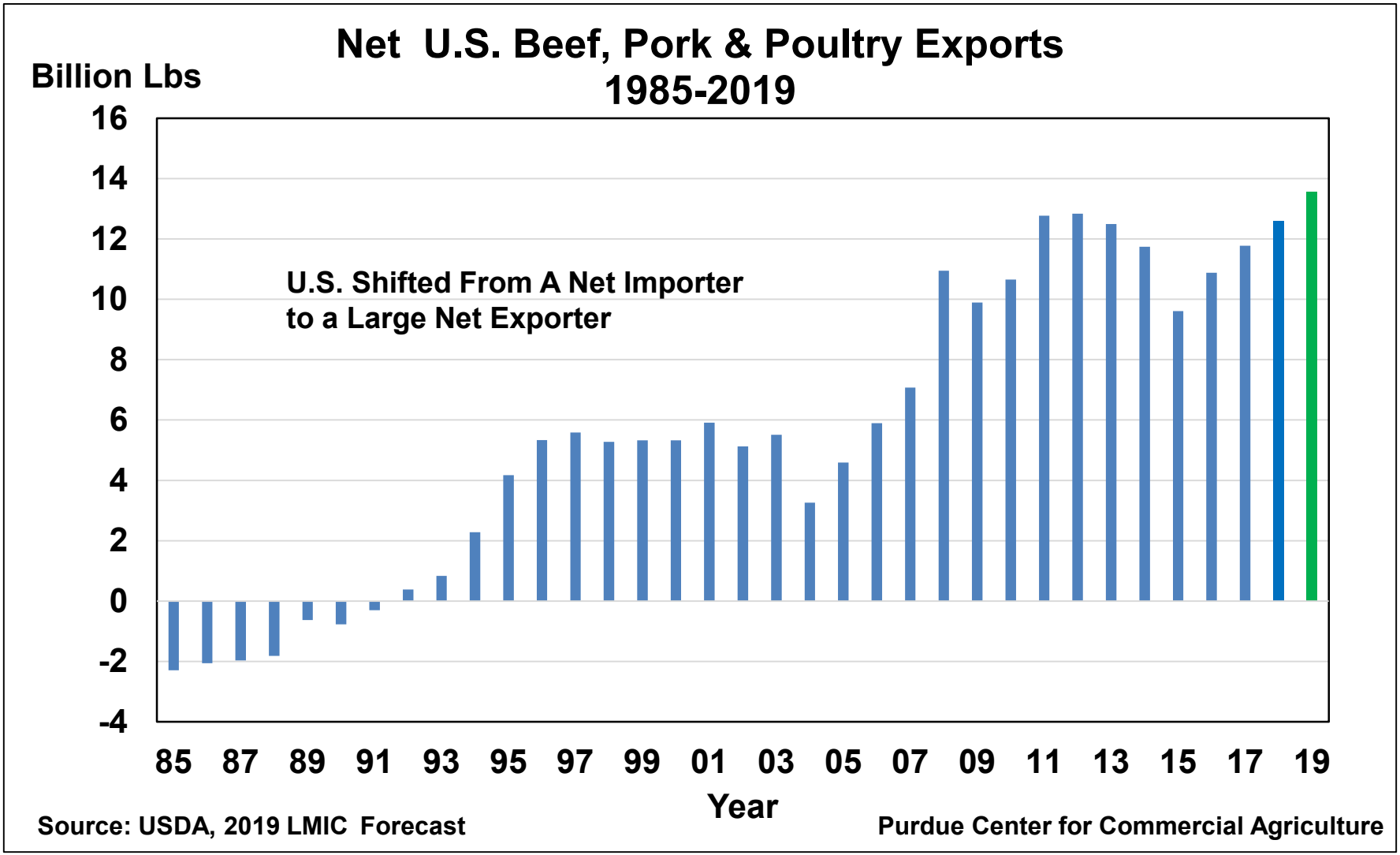


American's Meat Consumption Has Been Rising Recently

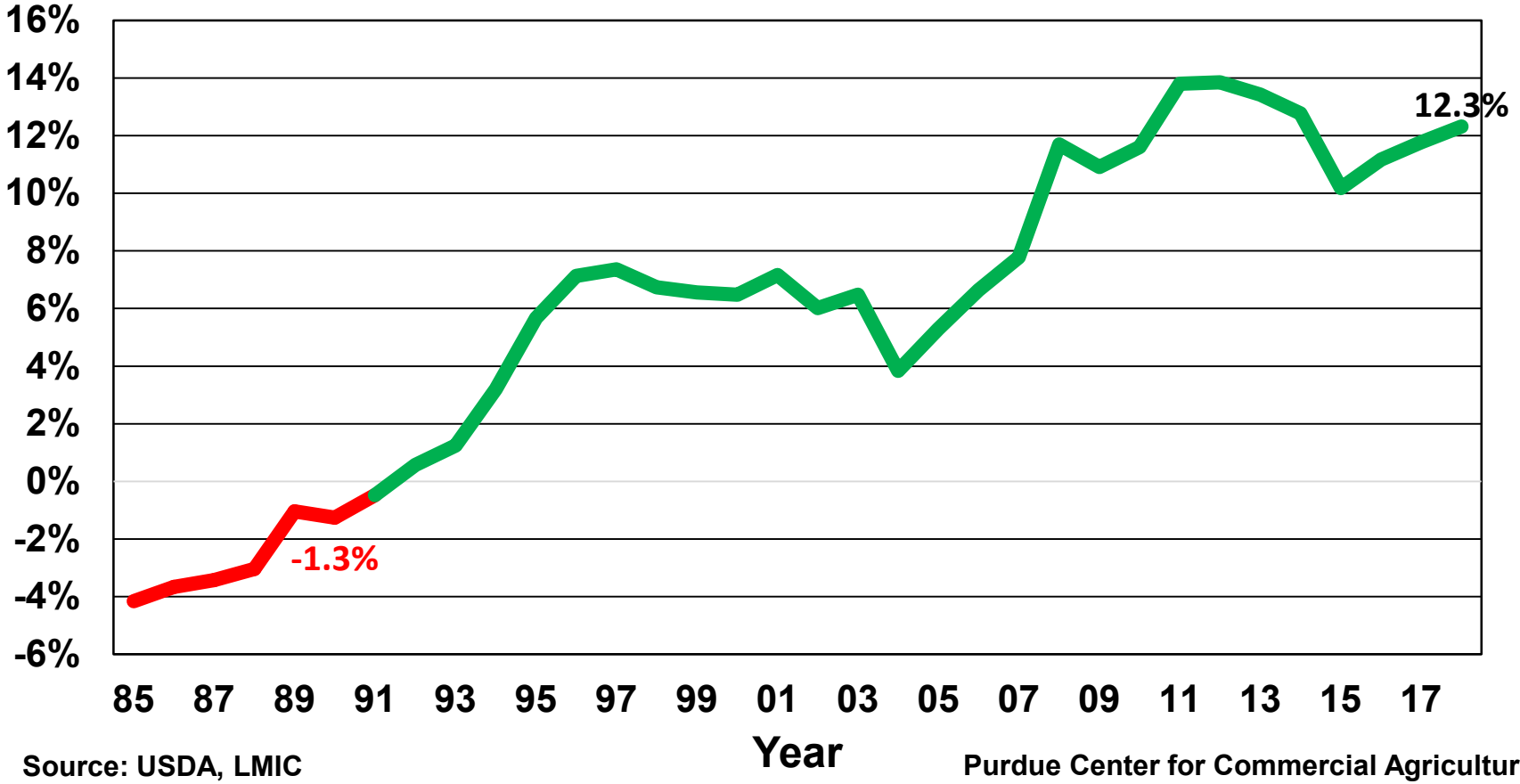
But Its Just Getting Back to Levels Reached from '02 to '07



Exports Have Become A Big Driver of Growth in Meat Production



Beef, Pork & Poultry Net Exports Combined as % of Total Production, 1985-2018



Source: USDA, LMIC

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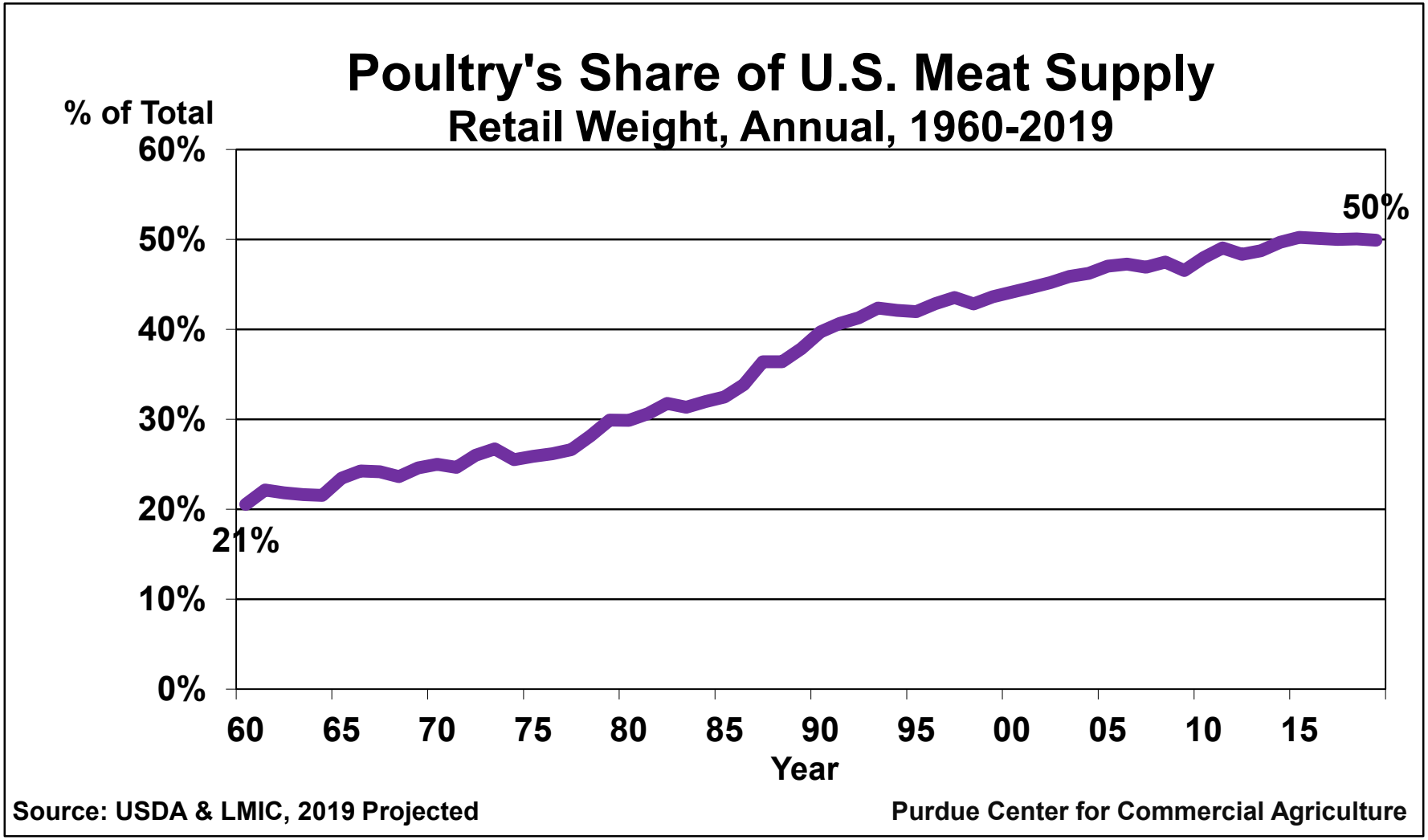
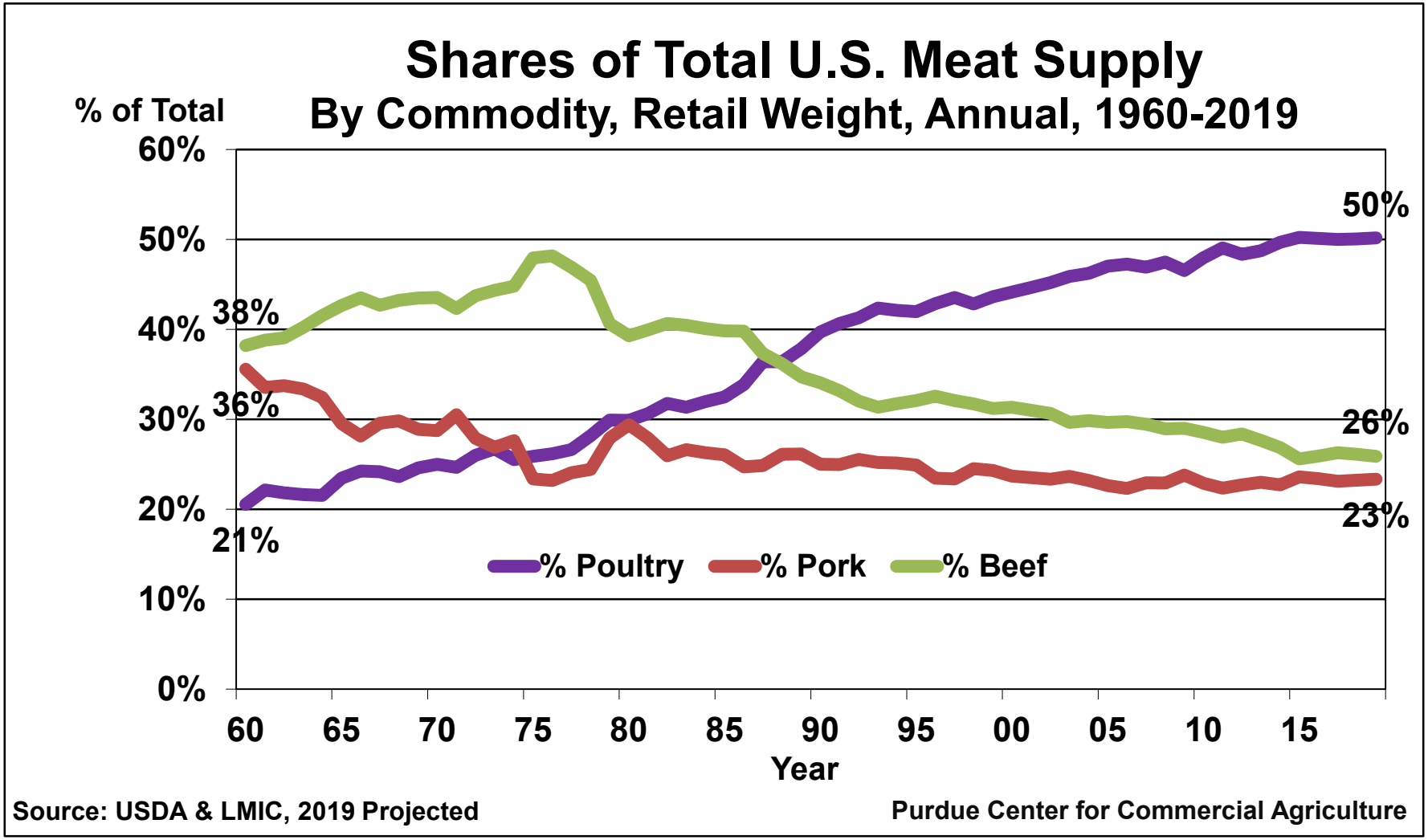
Domestically, A Big Increase in Poultry Consumption

A Shift That Has Been Underway for Decades




Shares of Total U.S. Meat Supply
By Commodity, Retail Weight, Annual, 1960-2019
% of Total
60%
50%
40%
30%
20%
10%
0%
38%
36%
21%
50%
26%
23%
% Poultry
% Pork
% Beef
60
65
70
75
80
85
90
95
00
05
10
15
Year
Source: USDA & LMIC, 2019 Projected
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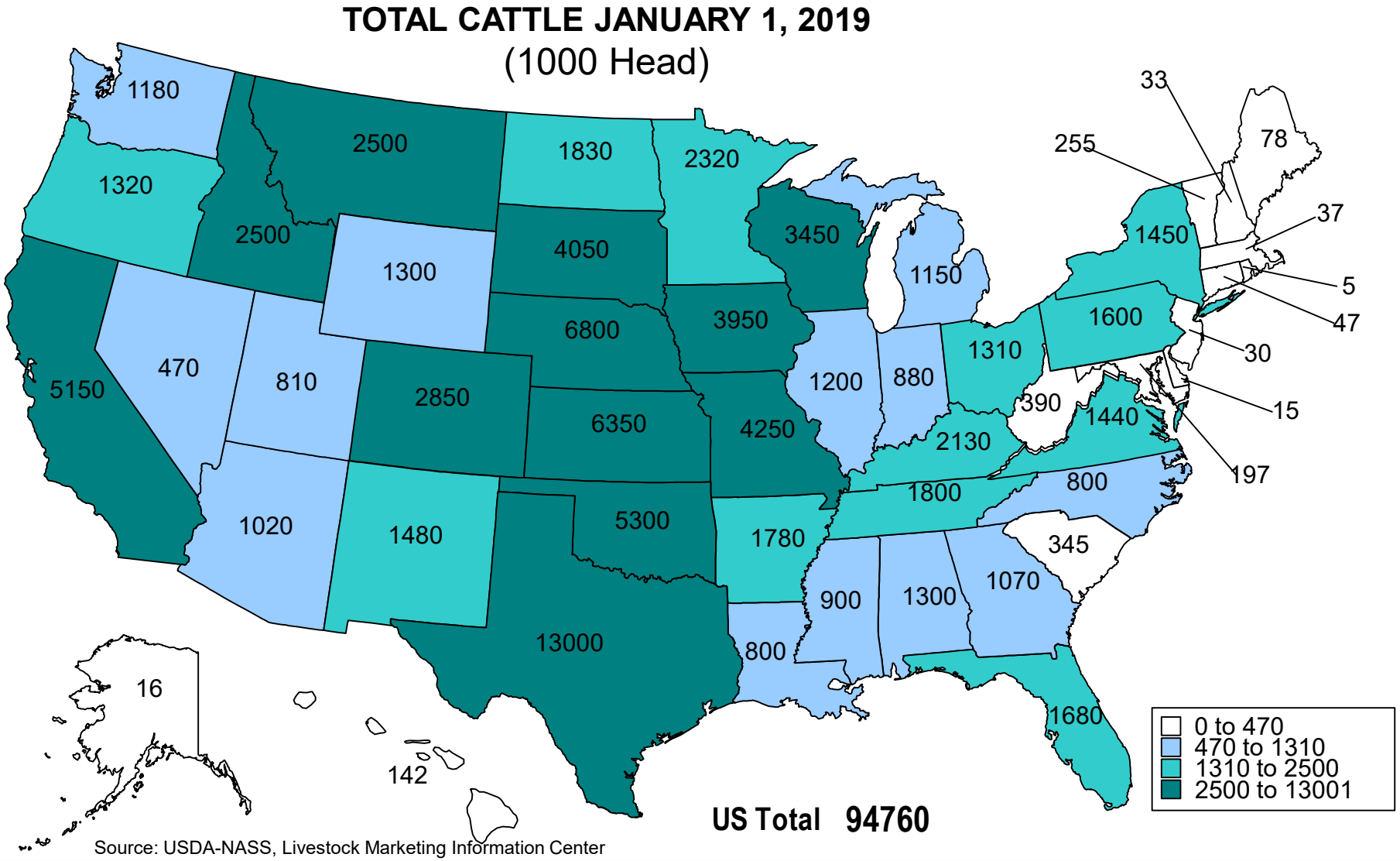
Beef Industry Can Be Divided Into Sectors
It Starts with the Cow-Calf Sector

The U.S. Cattle Industry

Cattle Are Produced Throughout the Nation, But Are Most Heavily Concentrated in the Nation's Mid-Section



Source: USDA-NASS, Livestock Marketing Information Center

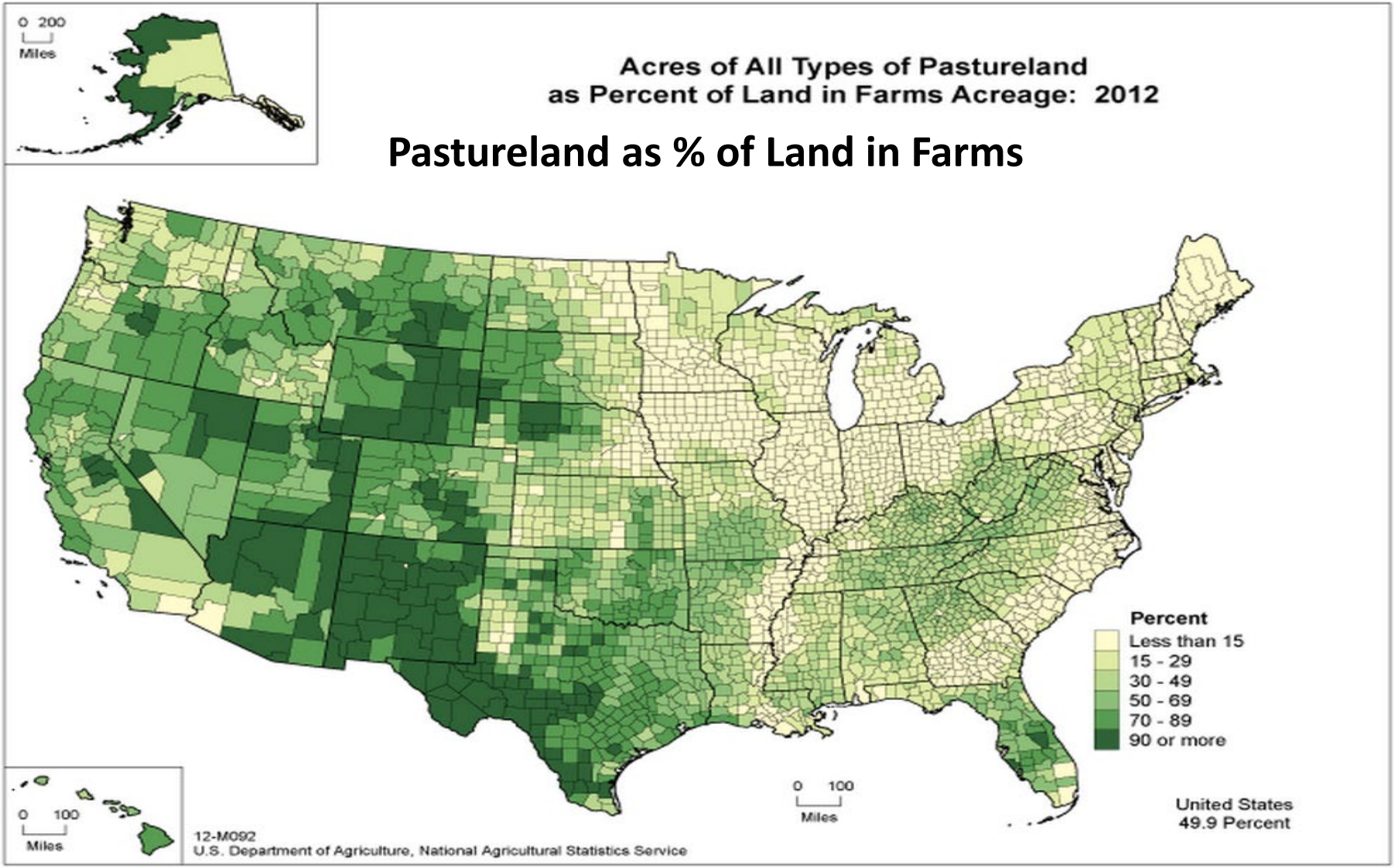
Beef Production Is Intertwined with Cropping Patterns

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

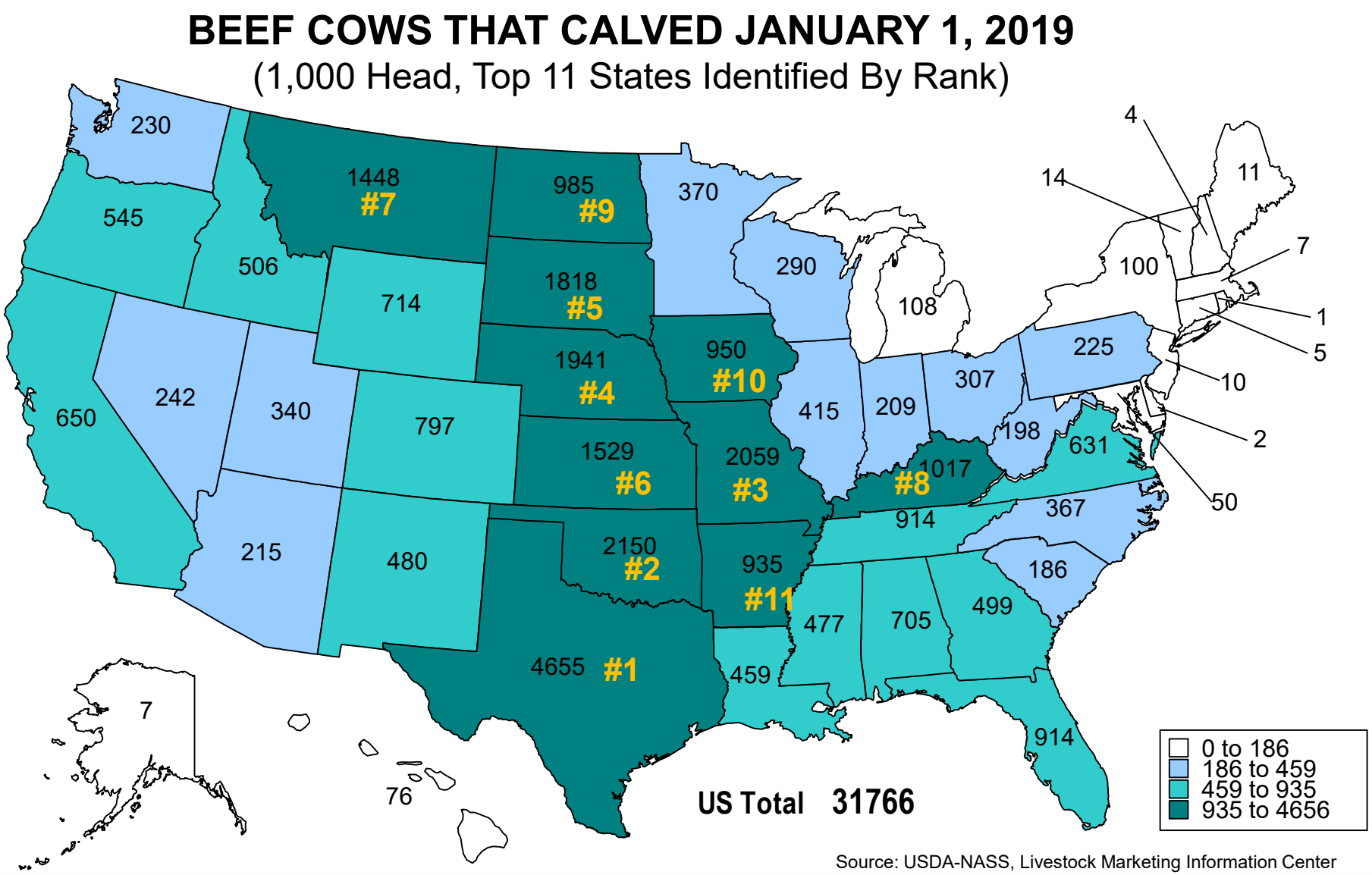
Rank	Crop	Million Acres	% of Total Acreage
1	Corn	90.0	29%
2	Soybeans	76.7	25%
3	All Hay	52.8	17%
4	All Wheat	45.6	15%
5	Cotton	13.9	5%
6	Sorghum	5.3	2%
7	Rice	2.8	1%
8	Oats	2.5	1%
9	Barley	2.9	1%
10	Canola	2.0	1%
11	Rye	1.9	1%
12	Dry Edible Beans	1.3	0.4%
13	Peanuts	1.4	0.4%
14	Sunflowers	1.4	0.5%
15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

Source: USDA-NASS, *Acreage*, June 2019, & *Crop Production*, August 2019

Beef Industry Takes Advantage of Pasture & Hay That Would Otherwise Not Be Utilized



Largest Concentration of Beef Cows Are in the Middle of U.S.



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

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

Source: USDA, *Cattle*, February, 2019.

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

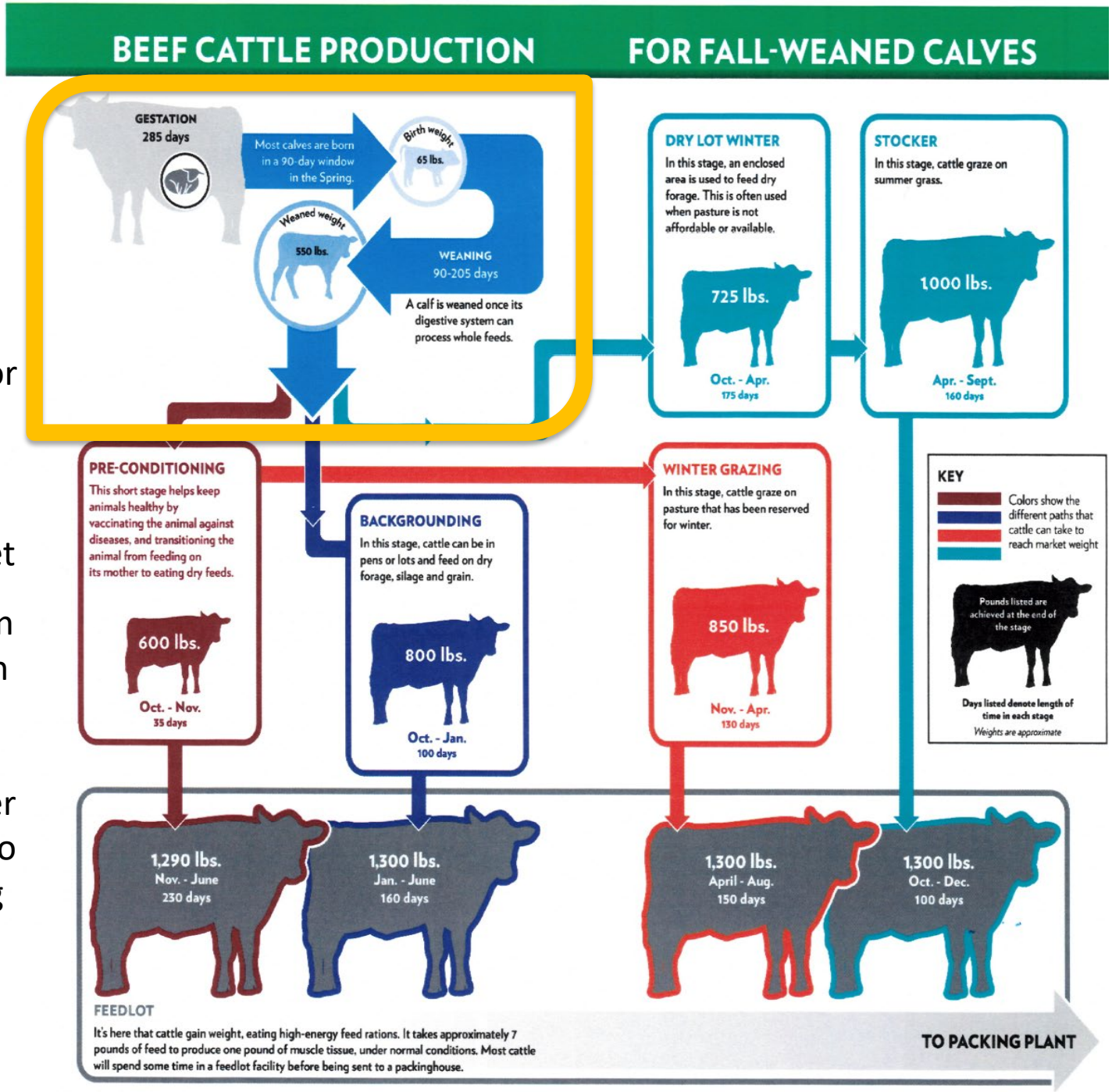
Source: USDA & LMIC

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-WEANED CALVES

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.

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.

Oct. - Apr.
175 days

STOCKER

In this stage, cattle graze on summer grass.

Apr. - Sept.
160 days

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.

Oct. - Nov.
35 days

BACKGROUNDING

In this stage, cattle can be in pens or lots and feed on dry forage, silage and grain.

Oct. - Jan.
100 days

WINTER GRAZING

In this stage, cattle graze on pasture that has been reserved for winter.

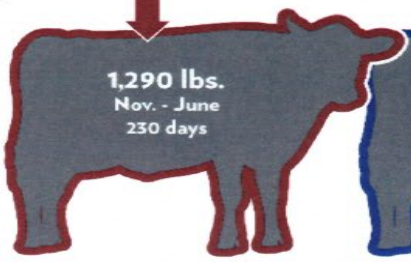
Nov. - Apr.
130 days

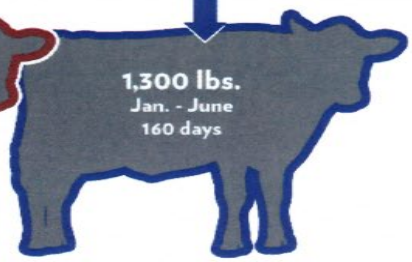
KEY

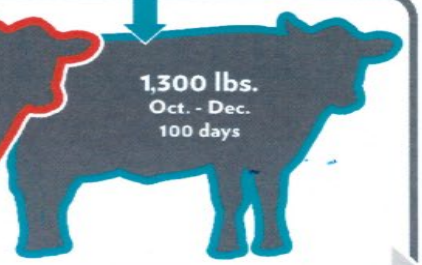
Colors show the different paths that cattle can take to reach market weight

Days listed denote length of time in each stage

Weights are approximate







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.

TO PACKING PLANT

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

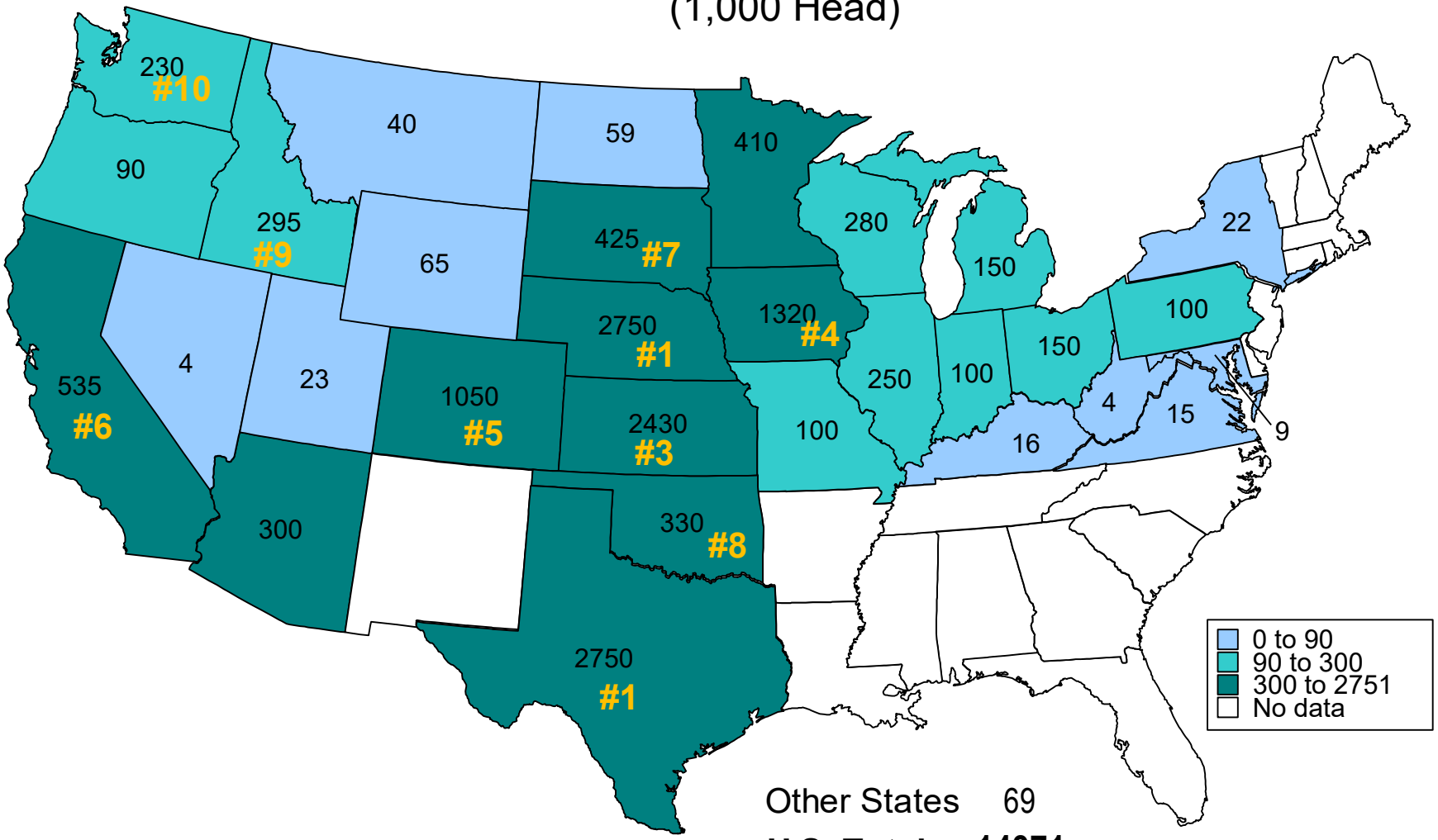
Cattle Feeding Sector

- 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)



Source: USDA-NASS, Livestock Marketing Information Center

Top 3 States Market Nearly 70% of Fed Cattle

Top 5 States Market 83% of Fed Cattle

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

Source: USDA, *Cattle on Feed*, various issues, 2018

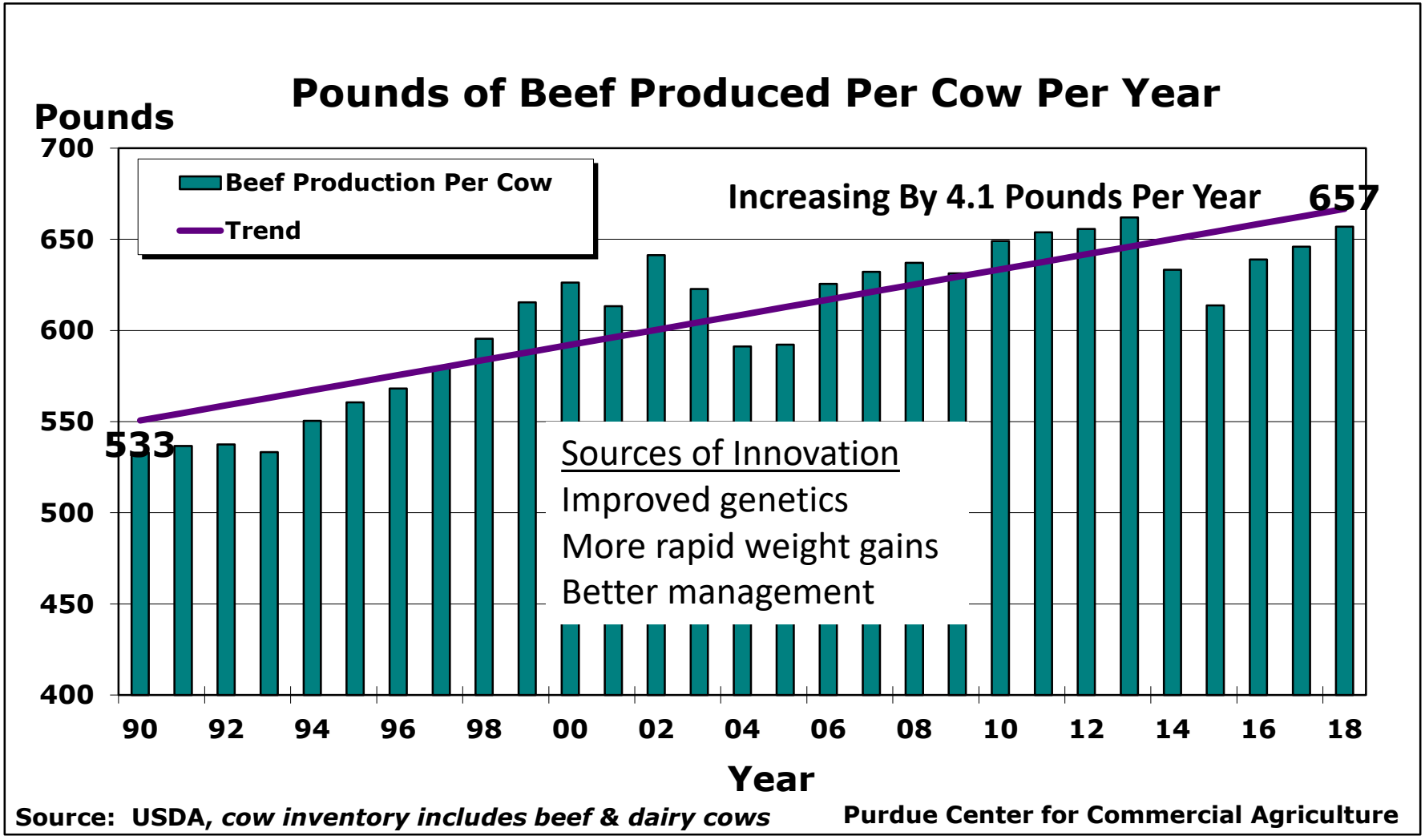
Cattle Feeding Sector Structure

- 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



Source: USDA, *cow inventory includes beef & dairy cows*

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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

Source: J.L. Capper, *Journal of Animal Science*, 2011

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%)

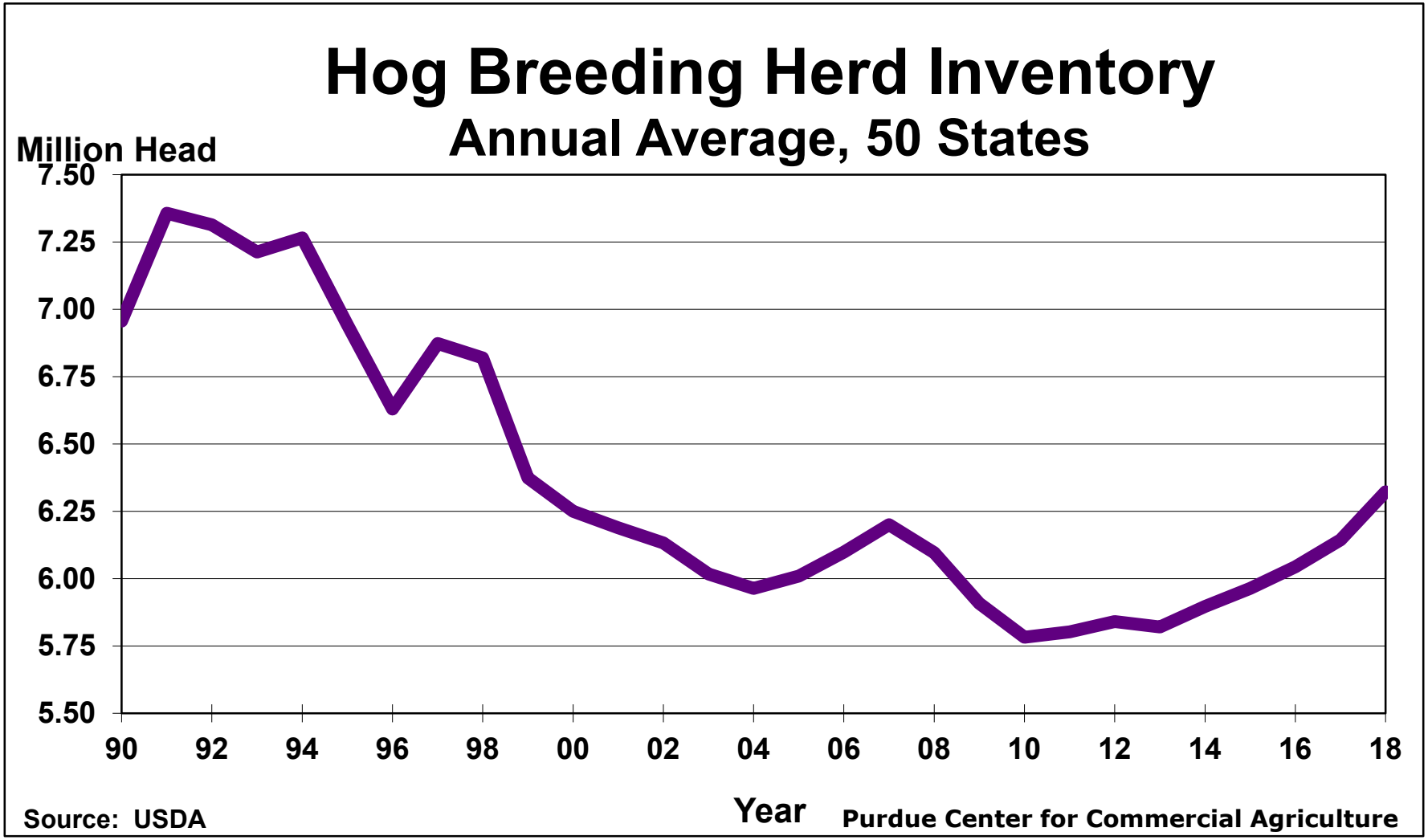
Top Five States Account for 67% of Total Market Hog Inventory

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

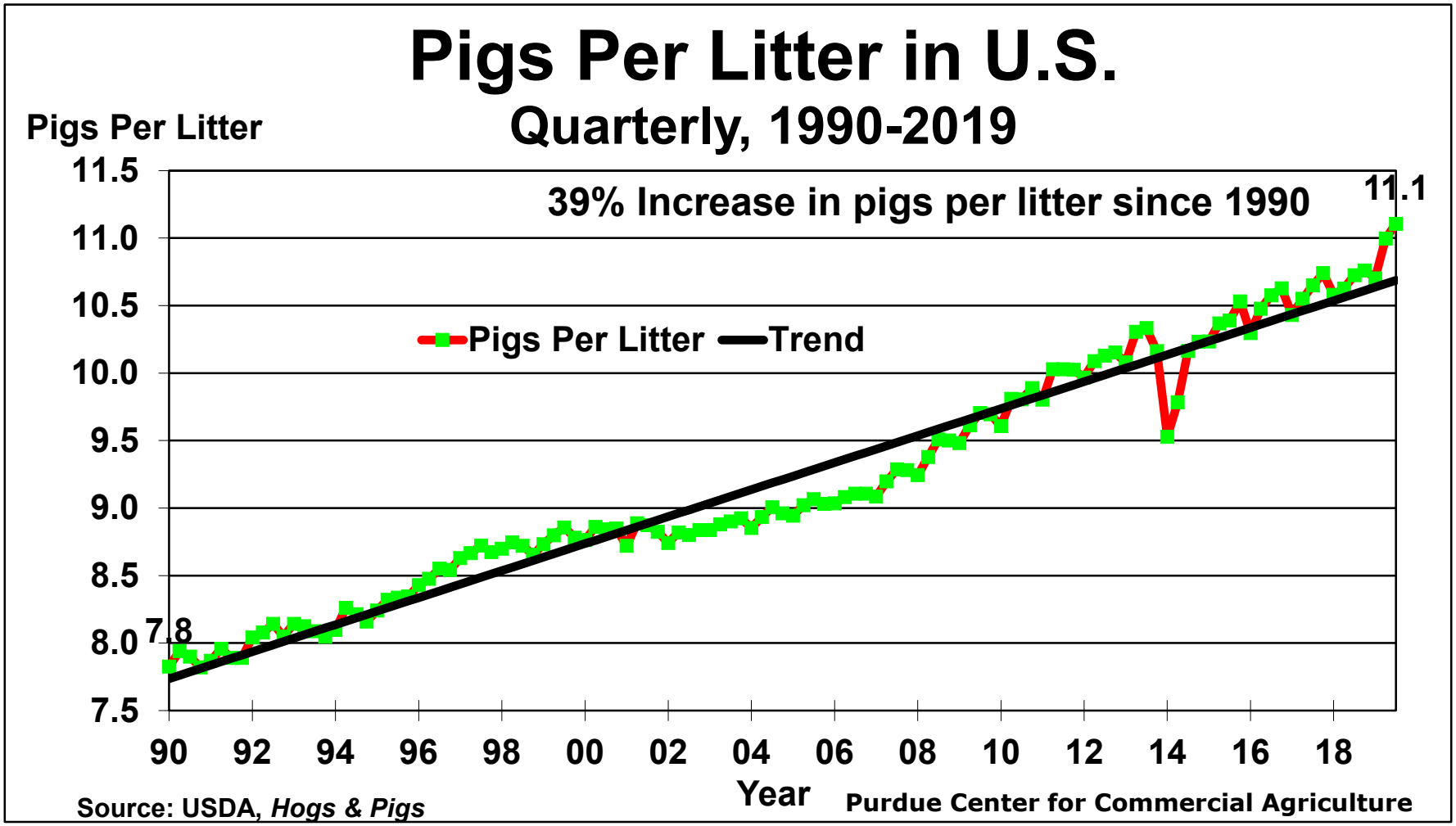
Top Ten States Account for 80% of Breeding Herd Inventory

Source: USDA, Dec. 1, 2018 Market Hog Inventories

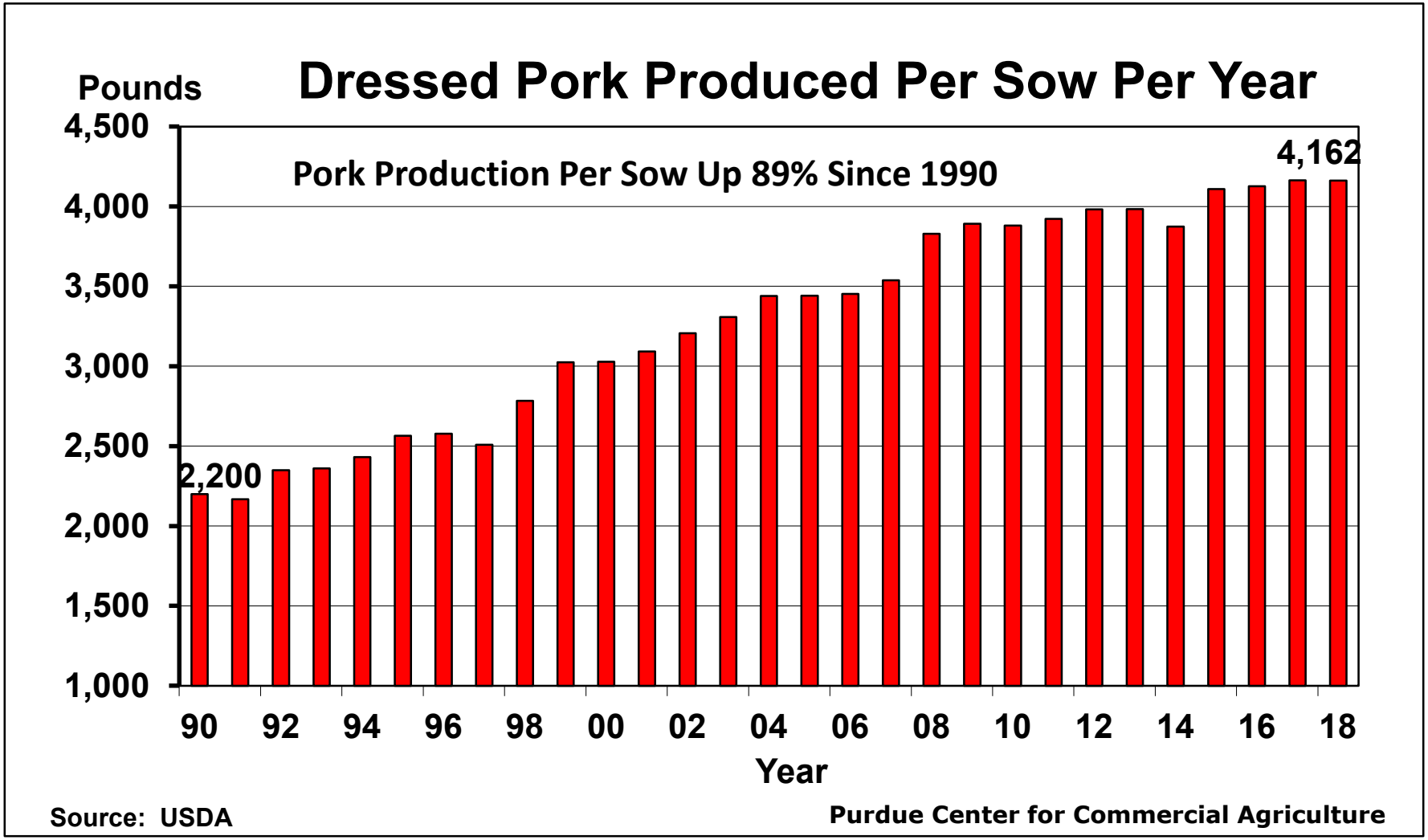
Breeding Herd 9% Smaller Than in 1990
But Pork Production Up Over 70% Since 1990



Shifts In Hog Production Technology & Management Improvements Led to Dramatic Productivity Increases



Dramatic Rise in Output/Breeding Herd Unit Over the Last 3 Decades



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

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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 of 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.

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