



Analysis & Comments

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Pandemic Effects to Hog Slaughter Supplies

The U.S. hog industry was dealt a blow when the pandemic related impacts to slaughter capacity severely limited hog processing capabilities. As plants closed or operated at reduced capacity, producers were left with limited options to market hogs. This supply disruption created a challenge for the hog industry that resulted in 2020 having a 1.7 million head increase in hog death loss over 2019 as reported by the USDA NASS releases the Meat Animals Production, Disposition, and Income Annual Summary (PDI) report. The actual death loss due to the pandemic related impacts may never be fully quantified as some hogs were euthanized or sent to various marketing channels that were not accounted for. This analysis used historical supply trends to estimate a range of potential hog loss as a result of the pandemic related disruptions to the hog industry. Based on historical relationships between the 120-179 pounds, and 180 pounds and over market hog categories in the USDA Hogs and Pigs report and reported Federally Inspected barrow and gilt slaughter suggests that 2.7 to 3.0 million head of market ready hogs were lost in 2020. Although the full extent of hogs lost during the pandemic may never be entirely quantified, based on historical trends the number was likely much higher than was reported.

Pandemic Impacts to Hog Slaughter and Dressed Weights

As the pandemic started to unfold during the latter part of the first quarter of 2020 and into the second quarter, weekly hog slaughter declined significantly. In late March, weekly Federally Inspected (F.I.) hog slaughter peaked at nearly 2.8 million head, an abnormally large weekly level for that time of year. Likely packers were working to slaughter as many hogs as possible to meet a surge in consumer panic buying at retail stores prior to the onset of the pandemic. Over the next five weeks, as pandemic related lockdowns were issued, weekly slaughter tumbled 44.7% to a low of 1.55 million head the first week of May. As the hog industry worked through the initial impacts of the pandemic weekly slaughter steadily increased 70.2% over eight weeks to 2.63 million head by the end of June. As slaughter facilities adapted workspace to limit workers exposure to the virus, weekly slaughter recovered to more typical levels for the remainder of 2020.

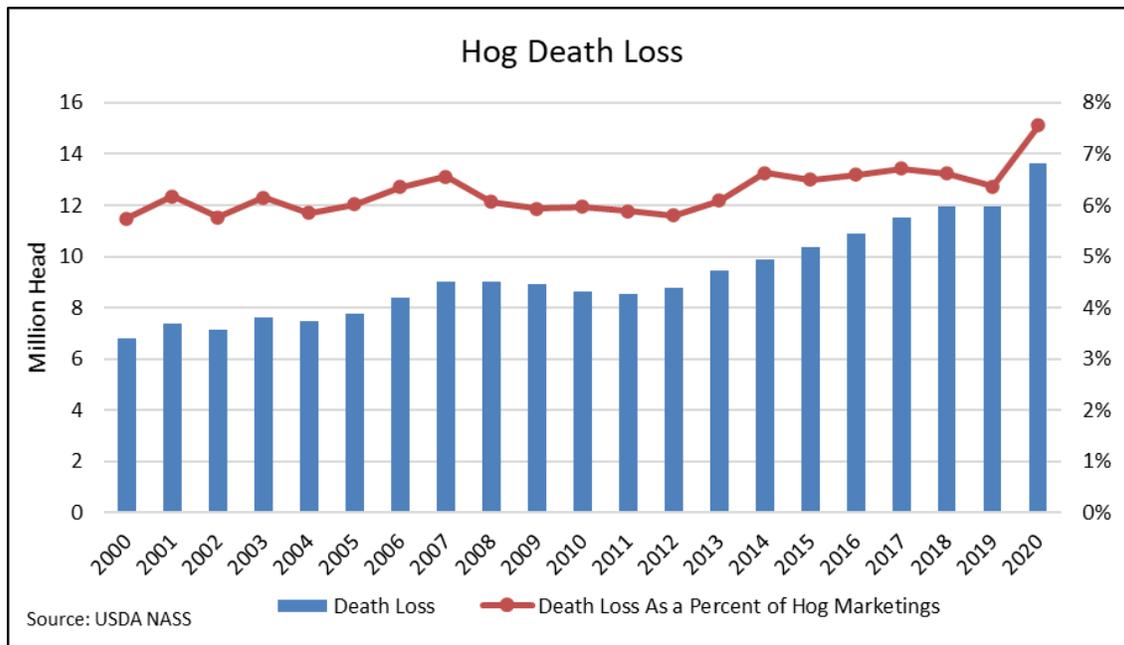
The significant decline in weekly slaughter during the peak impacts from the pandemic led some producers to make difficult decisions regarding market ready hogs. Many producers were forced

to continue feeding hogs in hopes that packers will be able to process hogs in subsequent weeks. This led to a backlog of hogs in the supply chain causing hog weights to rise. Weekly dressed weights took a counter seasonal upward movement in late April 2020 by increasing five pounds. Typically, weights start to decline during the summer months. Once the industry was able to work through the initial impacts from the pandemic, dressed weights moderated lower and followed a more normal seasonal path for the remainder of 2020. The spike in dressed weights highlights the challenges many producers faced when marketing hogs during the pandemic. Media sources reported high stocking densities in hog barns as hog slaughter facilities continued to lack shackle space. Initially, these back-ups would have occurred in finishing barns, but as the pandemic impacts continued through the summer, they effected weaned-to-feeding operations, as well as had implications for sow nurseries.

To address the sheer numbers of hogs that needed to be held on farms, producers were forced to make different management decisions than would be typical. A few of the strategies that were circulated through the industry included selling market-ready hogs at a steep discount, sending market-ready hogs to different marketing channels (smaller state inspected facilities, custom harvesting, rendering plants, etc.) or even euthanizing hogs. Euthanasia was a last resort, but one that was potentially used at the feeder pig, weaned pig, and culling new piglets at times during 2020. The reporting of these measures and why it is difficult to quantify reflects the data system that is built to assess production through the human food chain. Small slaughter facilities that are not F.I. facilities will not be reported in F.I. slaughter data but are reported in Commercial slaughter data. Diversions of hogs to these smaller non-F.I. facilities would change the F.I. percentage relative to Commercial slaughter. The percentage of F.I. to Commercial slaughter data during the second quarter of 2020 showed small changes in the percentage relative to historical levels. Hogs that went into non-human food chains would also not be counted through USDA NASS reports. The death loss reported in the PDI report is one of the few data points available that analysts can use to assess this rather unique situation.

Potential Hog Loss: Historical Relationship Between Hogs and Pigs Report and Federally Inspected Barrow and Gilt Slaughter

One question that emerged from the reduced slaughter levels was how many hogs were actually lost as a result of reduced slaughter capacity during the initial stages of the pandemic? USDA NASS releases the PDI report which includes death loss. From 2000 to 2019, annual hog death loss averaged just over 9 million head which is roughly, on average, 6.2% of the total market hogs according to the report. In 2019, the annual death loss was nearly 12.0 million head and 6.4% of total market hogs. While in 2020, death loss jumped 1.67 million head (14.0%) to over 13.6 million head which was 7.6% of total market hogs. The jump in death loss in 2020 indicates that the pandemic slaughter disruptions led to a significant number of hogs being lost. The PDI report helps tell part of the story as to the number of hogs lost during the pandemic, but further analysis of Hogs & Pigs report data suggests that there were more hogs unaccounted for.



The quarterly Hogs and Pigs report provides details on the number of market hogs in four weight categories: Under 50 pounds, 50-119 pounds, 120-179 pounds, and 180 pounds and over. Usually, the heavy weight categories (120-179 pounds and 180 pounds and over) are assumed to be slaughtered during the next quarter, suggesting a relationship between barrow and gilt slaughter and heavy weight market hogs. Analysis and relationships can be drawn based on dividing the heavy weight hog categories by the barrow and gilt slaughter in the following quarter.

$$Supply\ Ratio_{Q1} = \frac{Heavy\ Weight\ Hogs_{Sep-Nov}}{Barrow\ and\ Gilt\ Slaughter_{Dec-Feb}}$$

For example, using the supply relationship for the first quarter of 2020 would be calculated by dividing the September (2019) to November (2019) heavy weight hog category by the December (2019) to February (2020) barrow and gilt slaughter. Based on data from the June 1, 2021, Hogs and Pigs report (the most recent available) the supply ratio would be 29.072 million head divided by 32.894 million head which equals 88.4%. The same calculation and supply relationship was used for subsequent quarters to analyze supply impacts prior to the onset of the pandemic, during the pandemic, and through the remainder of 2020. The table below summarizes the supply relationship and the calculated supply ratios.

Quarterly Heavy Weight Market Hogs to Barrow and Gilt Slaughter

	Q1 ^A	Q2 ^B	Q3 ^C	Q4 ^D
2020	88.4%	100.2%	89.7%	84.7%
Average (2015-2019)	90.1%	91.0%	89.5%	83.4%
Standard Deviation (2015-2019)	0.7%	0.4%	0.5%	0.4%

^ASep-Nov Heavy Weight Market Hogs to Dec-Feb Barrow and Gilt Slaughter

^BDec-Feb Heavy Weight Market Hogs to Mar-May Barrow and Gilt Slaughter

^CMar-May Heavy Weight Market Hogs to Jun-Aug Barrow and Gilt Slaughter

^DJun-Aug Heavy Weight Market Hogs to Sep-Nov Barrow and Gilt Slaughter

Hogs and Pigs Report and Slaughter Data Supply Relationship by Quarter in 2020

First Quarter 2020 –The supply relationship of September (2019) to November (2019) heavy weight hogs to December (2019) to February (2020) barrow and gilt slaughter was 88.4% which is slightly lower than the five-year average of 90.1%, according to the most recent Hogs and Pigs report data. Based on the supply relationship, this implies that there were more hogs slaughtered during the December-February period of 2020 than the Hogs and Pigs report heavy weight hog category would suggest. This is supported by record large barrow and gilt slaughter for the December-February 2020 period of 32.894 million head.

Second Quarter 2020 – Leading up to the pandemic there was a surge in retail purchases as consumers rushed to stock up on food supplies. This led to a rise in hog slaughter in March which was a record for the month. Even though March was record large, slaughter plant closures during April and May led to fewer hogs slaughtered during the period and a backlog of heavy weight market hogs in the supply chain. The supply relationship of 100.2% indicates that there were more heavy weight hogs from the December (2019) to February (2020) period in the supply chain than were slaughtered during the March (2020) to May (2020) period. This indicates that market ready hogs were potentially lost during the period because of the pandemic.

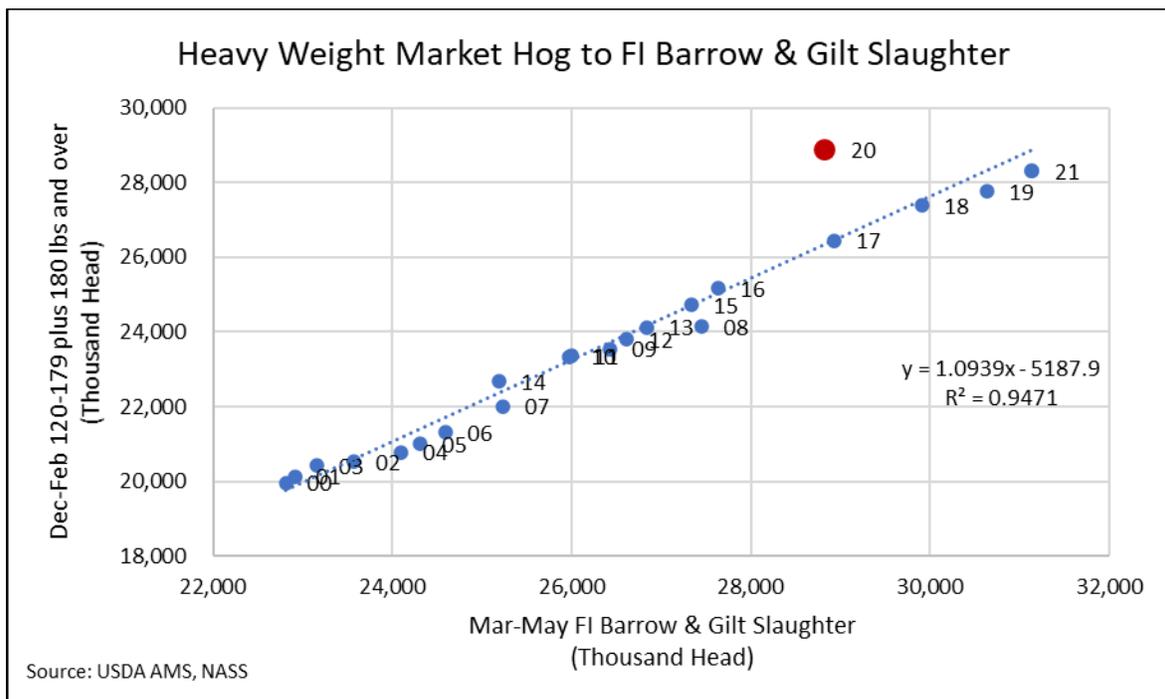
Third Quarter 2020 – During the third quarter of 2020 the supply ratio of 89.7% followed the trend line and was just above the five-year average of 89.5%. The March-May heavy weight category was the largest on record for the quarter at 29.037 million head according to the Hogs and Pigs report. This indicates that there were a substantial number of hogs backlogged in the supply chain. As a result, barrow and gilt slaughter during the June-August period was also record high at 32.385 million head. Although there were plenty of hogs in the supply chain slaughter facilities were able to process hogs at a strong pace and work through supplies.

Fourth Quarter 2020 – The fourth quarter of 2020 supply ratio of 84.7% was higher than the

five-year average of 83.4% but still similar to historical trends. The slightly higher supply ratio was due to a record large number of heavy weight hogs at 27.936 million head for the June-August period. Barrow and gilt slaughter were 32.988 million head during the September-November period, second highest to 2019. Based on the supply ratio during the fourth quarter hog supplies were still back logged but processing facilities continued to slaughter at a strong pace and work through supplies.

Second Quarter Heavy Weight Market Hogs to Barrow and Gilt Slaughter and Potential Hog Loss

Looking at the supply relationship on a quarterly basis highlights the pandemic induced impacts to the hog industry as events started to unfold and the lingering impacts from the backlog of hog supplies. The second quarter supply ratio of 100.2% further exemplifies the significant supply disruption that occurred when plants closed during the pandemic. Historical comparisons of the December-February heavy weight category and March-May F.I. barrow and gilt slaughter yields a five-year average of 91.0% (2015-2019), far lower than the 2020 ratio. The 2020 ratio of 100.2% is much higher than historical levels and the graph below highlights that 2020 was an outlier according to the graphical trend. The higher ratio of December-February heavy weight market hog categories to the March-May F.I. barrow and gilt slaughter in 2020 suggests that there were more hogs in the supply chain prior to the onset of the pandemic than were slaughtered. This points towards additional market ready hogs being lost from the supply chain than were reported.



Taking the historical relationship between December-February heavy weight market hog categories and the March-May F.I. barrow and gilt slaughter can be used to estimate potential hog loss due to the pandemic. Based on the 28.879 million head of market hogs during the December-February period and the five-year average historical ratio of 91.0% would suggest that actual F.I. barrow and gilt slaughter during March-May 2020 should have been just over 31.7 million head. Subtracting the implied F.I. barrow and gilt slaughter of 31.7 million head from the actual F.I. barrow and gilt slaughter of 28.828 million head gives a difference of just under 2.9 million head. This is about 1.2 million head higher than what was reported in the USDA NASS Meat Animals PDI report. Using one standard deviation from the mean and the historical relationship of 91.0%, the number of hogs lost could have ranged from about 2.7 to 3.0 million head, about 1.1 to 1.4 million head above the 1.674 million head death loss reported in the Meat Animals PDI report. The ratio of commercial slaughter to F.I. slaughter indicates that although more hogs moved through smaller slaughter facility in the second quarter of 2020, it was likely only about 50-60,000 head more than normal. Subsequent quarters did not appear to have a larger proportion through smaller facilities than normal. That is a large discrepancy and suggests that more market ready hogs were lost due to the pandemic related slaughter disruptions than were reported in the Meat Animals PDI report, severely impacting slaughter hog supplies during the March-May period of 2020.

Potential Hog Loss: Heavy Weight Market Hogs to F.I. Barrow & Gilt Slaughter	RATIO RANGE		
	Average	+1 Standard Deviation	-1 Standard Deviation
Ratio	91.0%	91.5%	90.6%
Estimated Mar-May 2020 Slaughter (1,000 Head)	31,720	31,573	31,868
Potential Hogs Lost Mar-May 2020 (1,000 Head)	2,892	2,745	3,040
PDI Annual Death Loss 2020 (1,000 Head)	1,674		
Difference from PDI (1,000 Head)	1,218	1,071	1,366

Comments and Discussion

There could be a myriad of possibilities as to the discrepancy between reported death loss and the implied hog loss presented in this analysis. Anecdotal reports suggested that as many as one million head of market ready hogs were sent to rendering plants during the pandemic due to a lack of sufficient slaughter capacity which could explain part of the loss. Potentially market hogs were diverted to other marketing channels for processing that may not be captured in slaughter data or hogs were euthanized and not reported. It is also important to keep in mind that this analysis uses data available from the June 1, 2021, Hogs and Pigs report and any prior data revisions from past reports. Also, the analysis looks specifically at the hogs lost during the second quarter of 2020 while the USDA NASS PDI reported death loss is an annual statistic.

Based on the supply relationships following historical trends during the third and fourth quarters of 2020 suggests that the bulk of the supply disruptions and hogs lost likely occurred during the second quarter. Likely the full extent of the pandemic impacts to the hog industry will never fully be quantified but this analysis showed that based on historical trends as many as 1.1 to 1.4 million head of market ready hogs were lost above the 2020 death loss reported by the USDA NASS PDI report.

The uptick in the 2020 death loss reminds us that death percentages are not static. Hogs and other industries face disease pressure from other events as well such as PRRS, and PEDv. What was unique about 2020 was that the depopulation was not animal disease induced. It's important to remember that the data available for analysis can only provide certain contexts for information, and although the U.S. has one of the best agricultural data systems in the world, large scale disruptions can have impacts that at times are difficult to quantify and capture.

