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South Dakota's Hog Market: Developments and Prospects

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South Dakota's Hog Market: Developments and Prospects

by Matthew A. Diersen*

Economics Staff Paper 2001-2

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South Dakota's Hog Market: Developments and Prospects

Matthew A. Diersen

Abstract

This paper examines the developments that have occurred in South Dakota's swine industry and offers insights into its future prospects. Data, trends, and literature related to this market were gathered in an effort to fill in specific gaps about South Dakota's market. Nationally and in South Dakota there are fewer producers raising hogs. The exit of relatively small producers from the industry reduced a seasonal spike of farrowings during the March-May quarter in recent years. A growing trend of inshipments, where feeder pigs are brought into South Dakota, finished, and marketed, has partially offset the reduction in farrowings. An analysis of a longstanding indicator of supply, farrowing intentions, reveals that the closer intentions reported were more accurate than the distant intentions and that the overall accuracy is impressive. The general price level for market hogs at Sioux Falls follows a similar pattern to U.S. prices. A seasonal trend exists at Sioux Falls, with prices higher from May through August. Analysis of location basis, the difference between the CME Lean Hog Index and the cash price at Sioux Falls, also reveals a seasonal trend and substantial variability across different months. Knowledge of basis is necessary when comparing different markets and when determining the effectiveness of risk management tools.

Matthew A. Diersen

Raising hogs and pigs is generally South Dakota's second largest livestock enterprise based on sales revenue of about \$200 million in 1999. Although it lags substantially behind raising beef cattle, hog production continues to contribute to South Dakota's economic base. South Dakota ranked 11th among U.S. states in hog inventory and ranked 16th in pig crop size in 2000. Production practices vary from farrow-to-finish to specialization in farrowing, growing, and finishing. Based on inventory numbers, hogs consume a substantial portion of the corn and soybean meal produced in South Dakota. The year 2000 brings about the first increase in the size of South Dakota's pig crop since 1997.

This paper seeks to provide insights into the structure, conduct, and performance of South Dakota's hog market. For a historical perspective on the structure of the market, see Janssen (1983). Producers, lenders, and others have expressed interest in the future profitability of hogs and in marketing issues such as basis and hedging effectiveness. An excellent source of primary data exists in *South Dakota Agriculture 2000*, published by the South Dakota Agricultural Statistics Service (SDASS, 2000). While their data are used in this paper, it is assumed that readers have access to the source, i.e., the data is generally not reported here. Other data and information has been gathered from a variety of sources in an effort to provide a comprehensive overview of the markets, prices, and prospects for the future. The information should be of use for producers, supporting industries, and those in the marketing channel.

Current Scope of Operations

Before examining prices, it is instructive to assess the current scope of operations in South Dakota. In recent years, a large number of producers in South Dakota have stopped raising hogs as an enterprise. Many of those who stopped had relatively small operations so their effect on overall state inventory levels was mitigated. At the same time, the remaining producers have increased the size of their operations, on average. Performance has also improved across all operations and the prospects are for an increase in the pig crop for the first time in three years.

The decline in the number of farms producing hogs represents the most staggering statistic pertaining to the hog market structure. In 1995, there were 5,400 farms in South Dakota raising hogs. By 2000 that number dropped to 1,900 farms. Lower (and perhaps more volatile) prices, changing farmer demographics, and marketing difficulties hastened the exit from hog farming (Klein, 1998; Lawrence and Wang, 1998; and Tongkasame, 1999). The decline in farms was mainly among the smallest sized operations as shown in figure 1. There may be economies of size in raising hogs, as the number of large operations has increased. December issues of the *Hogs and Pigs* report from USDA-NASS contain the number and size of operations for the U.S. as a whole and for individual states. The 1997 Census of Agriculture shows that while most South Dakota

Other principal supply indicators are the number of sows farrowed and pig inventories. As shown in table 1, the number of sows farrowed dropped substantially from 1995 taking the pig crop lower with it. At the same time, the performance of remaining producers increased when measured using pigs per litter. In 1995, South Dakota's average pigs per litter trailed the U.S. average of 8.32. While U.S. operations increased productivity to 8.89 pigs per litter in 2000, S.D. operations closed the gap and ended ahead of the U.S. average.

Given that South Dakota has moved toward fewer, but larger operations, the trend to higher productivity is expected to continue at a slower pace or to level off. Nationwide, there is a positive relationship between the size of an operation and pigs per litter. As shown in table 2, all size groups saw an increase in pigs per litter from 1995 to 2000. Note that the numbers reflect March through May inventories and the average for the 2000-4999 and 5000+ size groups is used for the 2000+ observation for the year 2000. Regardless, the largest number of pigs per litter is obtained by the largest operations.

Table 2. U.S. Pigs Per Litter by Operation Inventory Size

Year	Size Group (head)				
	1-99	100-499	500-999	1,000-1,999	2000+
1995	7.2	7.9	8.1	8.4	8.6
2000	7.8	8.0	8.4	8.6	8.8

Source: USDA-NASS.

Other Supply Indicators

The change in the number of operations has influenced the aggregate farrow-to-finish pattern in South Dakota. A longstanding seasonal spike in farrowings is no longer as prevalent, thus smoothing the supply of hogs produced. Operations have also moved toward bringing in feeder pigs to finish instead of being farrow-to-finish operations. The slaughter situation has also changed. The loss of a slaughter facility has reduced the number of head slaughtered in South Dakota, but seasonal patterns remain in both farrowings and slaughter numbers and weights.

Fewer small operations reduced variability of quarterly farrowings in South Dakota. As shown in figure 2, there used to be a substantial jump in farrowings during the second quarter of the year (March through May). The spike shown for March 1995 is typical for many earlier years' observations. Since the decline in the number of small operations, the trend shows a more stable farrowing pattern from quarter to quarter, resulting in a more stable supply of hogs throughout the year. Supply still adjusts to price and environmental conditions, with perhaps less adjustment for seasonal demand changes than in the past. The production level.

Despite the decline in the number of sows in South Dakota, the number of hogs marketed has increased. The pig crop declined, but in shipments, presumably of finished pigs, has made up the difference as shown in figure 3. The ability to use existing facilities and relatively inexpensive feed are potential causes. An industry-wide trend toward specialization is perhaps another factor explaining the trend. USDA-NASS

annually reports numbers such as inshipments, farm slaughter, and deaths in the *Meat Animals Production, Disposition, and Income* report.

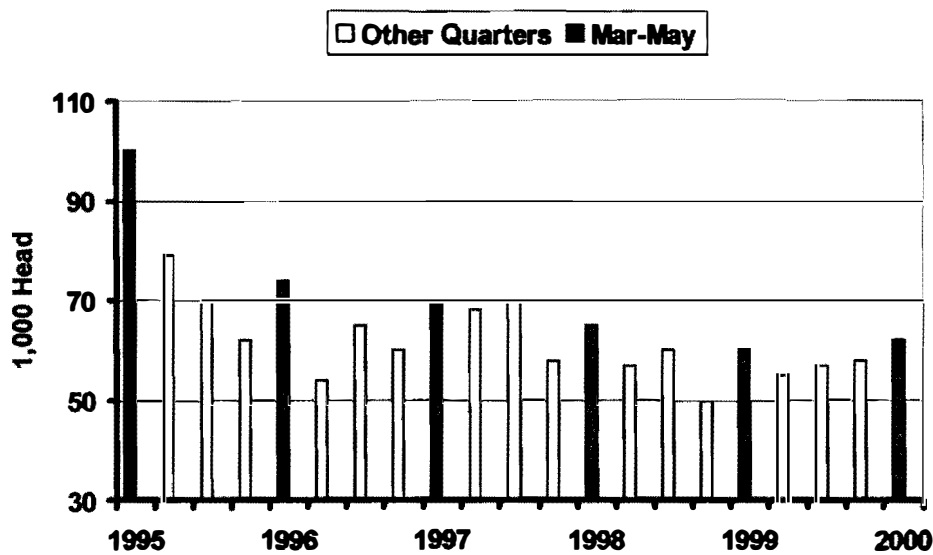


Figure 2. Quarterly S.D. sow farrowings

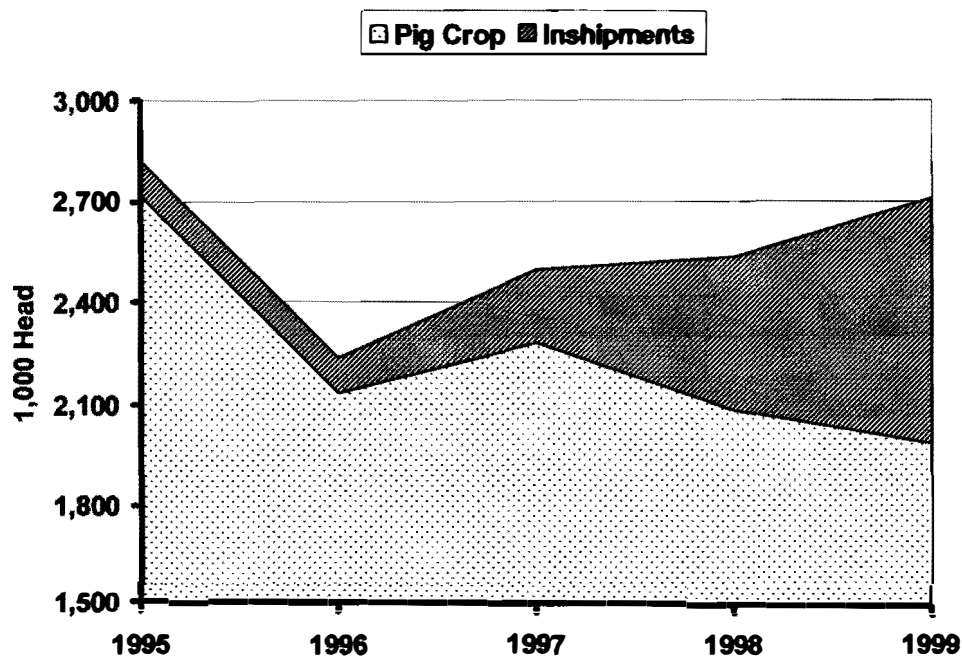
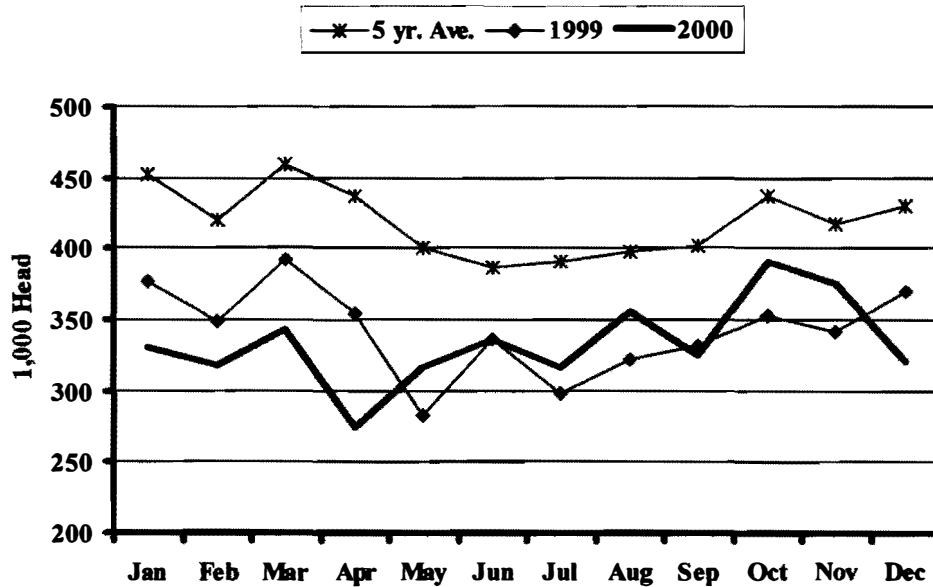


Figure 3. South Dakota marketable hogs by year

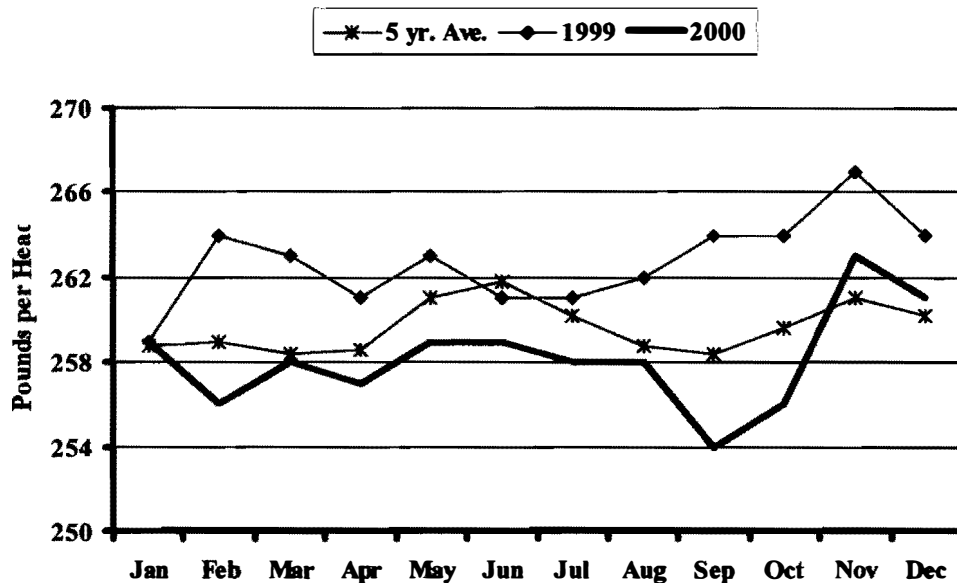
USDA-NASS reports the number of hogs slaughtered in South Dakota monthly in *Livestock Slaughter*. The recent trends in hog slaughter are shown in figures 4 and 5. There has been a decline in the number slaughtered in the last couple of years, in contrast to the increase in the number of marketings reported earlier. The reason for the disparity

is that some South Dakota producers ship hogs to Minnesota or Nebraska for slaughter. Hence, while marketings increased, the number slaughtered (in South Dakota) declined. The pattern shown in figure 4 thus largely reflects the closing of Huron's Dakota Pork facility and the steady slaughter at Smithfield's Morrell plant in Sioux Falls.



Source: USDA-NASS

Figure 4. Monthly S.D. hog slaughter



Sources: USDA-NASS and SDSU

Figure 5. Monthly S.D. hog slaughter weights

Slaughter weights are also reported monthly by USDA-NASS in *Livestock Slaughter*. Figure 5 shows the weights of all hog types, slaughtered in South Dakota only. Variability in weight may reflect changes in the percentage of sows in the slaughter mix. Attempts to explain weight variability using corn and barrow and gilt prices gave inconclusive results. Casual observation suggests that the run-up in weights observed early in 1999 may have been in response to a hesitancy to slaughter animals at low prices. Weights may have climbed later in 1999 as prices returned to profitable levels, prompting producers to add weight to boost revenue. Marsh (1999) provides some evidence that seasonal factors dominate profitability factors when determining slaughter weights for hogs.

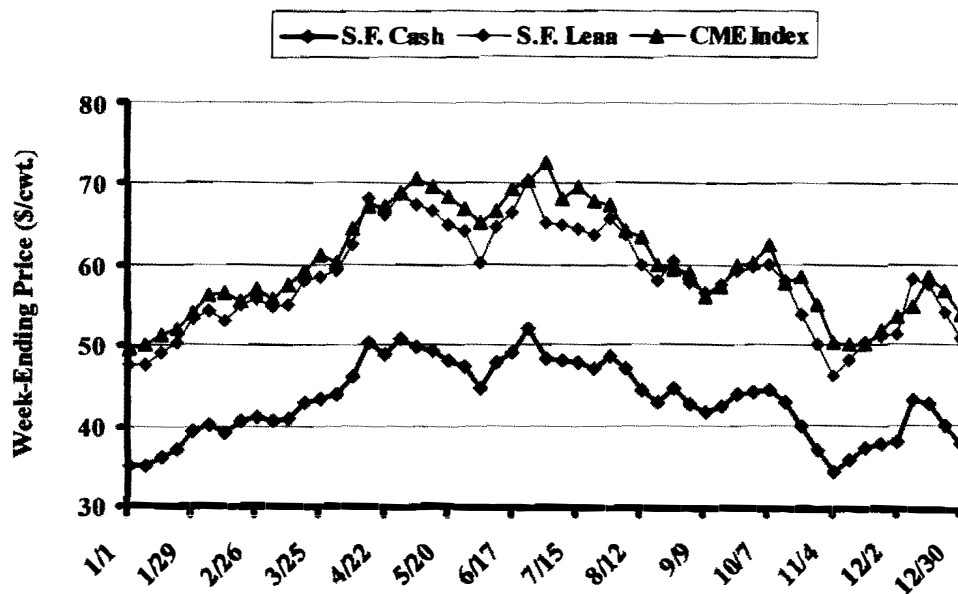
Slaughter Hog Prices and Trends

Prices for S.D. hogs are available from multiple sources for a variety of times. Seasonality, or consistent trends in the data, is still common for many prices. Consistent trends persist in the differences between prices, both within South Dakota and relative to other locations. The largest single markets in South Dakota are located in Sioux Falls for both slaughter hogs and feeder pigs, whose prices are reported by USDA-AMS. In addition, twelve other auction locations in South Dakota sold over 1,000 head of various classes of hogs during fiscal year 2000 (Tri-State Livestock News).

The most relevant price for decision-making depends on the location, type of hog, and frequency of its reporting. Daily price data are available for Sioux Falls' slaughter hogs from USDA-AMS. The Chicago Mercantile Exchange (CME) also reports futures and index prices for lean hogs. However, tracking a cash market on a daily basis exposes one to the danger of making broad inferences based on small fluctuations in prices. Caution should be taken before relying on a single price reported at a high frequency.

Weekly prices are perhaps more informative for decision-making purposes that rely on broader trends in price levels. The weekly cash price of slaughter hogs in Sioux Falls is shown in figure 6. The price trend has been moving steadily upward in this market since early 1999. Also shown in figure 6 is the CME lean hog index from Wednesdays. The trend in the index mirrors Sioux Falls' cash price trend, especially after converting Sioux Falls' price to a lean equivalent by dividing by 0.74 (the index is on a dressed basis and the dressing percentage for butcher hogs is about 74 percent of its live weight). The lean equivalent shows a consistency between Sioux Falls' and national prices with minor occasional disparities based on local supply and demand conditions. The difference between the CME index and the Sioux Falls' lean equivalent is often called the location basis. That basis during the week of expiration is discussed later.

The average monthly prices for Sioux Falls' slaughter hogs are shown in table 3. Six months of very low prices for slaughter hogs at the end of 1998 and beginning of 1999 reflect the large oversupply of hogs nationwide and the impacts of straining the existing slaughter capacity. For a discussion of the market at that time, see Murra (1999). Seasonally, two factors combine to drive slaughter hog prices higher during the summer months, as shown in figure 7. Demand tends to be higher during the summer as more pork is consumed. Supply is also relatively small during the second quarter of the year.



Sources: USDA-NASS, Chicago Mercantile Exchange, and SDSU

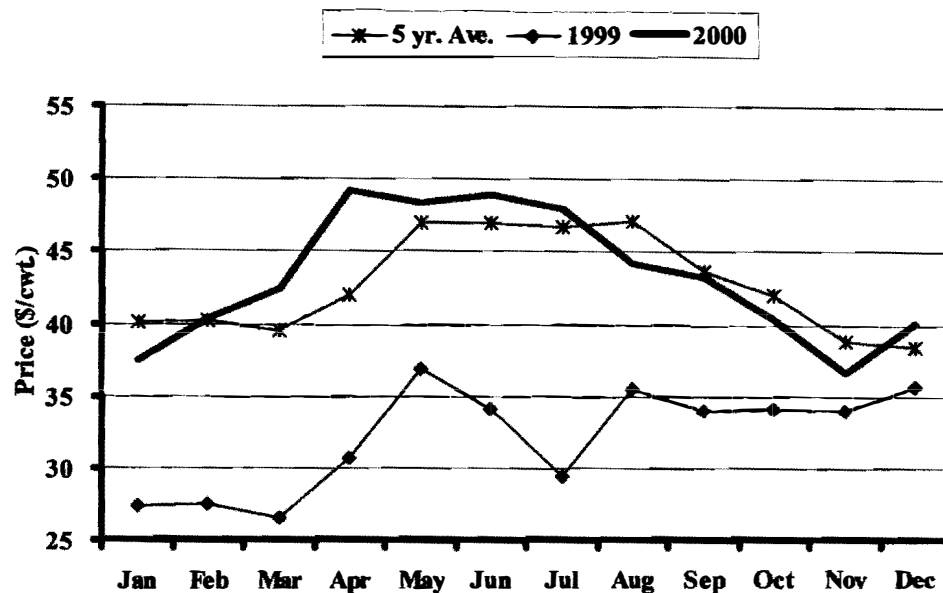
Figure 6. Weekly lean and cash hog prices, 2000

Table 3. Sioux Falls' Slaughter Barrows and Gilts Price (U.S. 1-2, 230-250#)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	(\$/cwt.)											
1995	38.49	39.40	38.32	36.39	38.10	43.82	47.81	49.86	48.96	45.78	40.46	44.66
1996	43.19	47.18	49.19	51.21	58.64	56.61	60.05	60.05	55.30	55.73	55.68	55.72
1997	53.99	52.15	49.16	55.62	58.53	58.39	59.52	54.70	49.84	46.88	45.11	41.23
1998	37.24	34.93	34.76	35.81	42.56	42.02	36.72	35.15	30.58	27.43	19.00	15.02
1999	27.39	27.47	26.46	30.69	36.83	34.11	29.44	35.56	33.96	34.18	34.00	35.65
2000	37.38	40.39	42.40	49.14	48.39	48.86	48.01	44.24	43.20	40.37	36.68	40.01

Source: USDA-AMS.

The CME Lean Hog Index is probably the most relevant price series at this time for determining national trends in prices. The CME Lean Hog Index is reported daily, but the monthly average is perhaps more informative for discerning trends. Shown in table 4, the index prices peak during the summer for most recent years. Index prices, as well as live prices, hit recent lows during December of 1998. The seasonal price pattern across the U.S. is somewhat less pronounced than that in Sioux Falls.



Sources: USDA-AMS and SDSU

Figure 7. Sioux Falls' slaughter barrows and gilts prices (U.S. 1-2, 230-250#)

Table 4. Monthly Average of CME Lean Hog Index Values

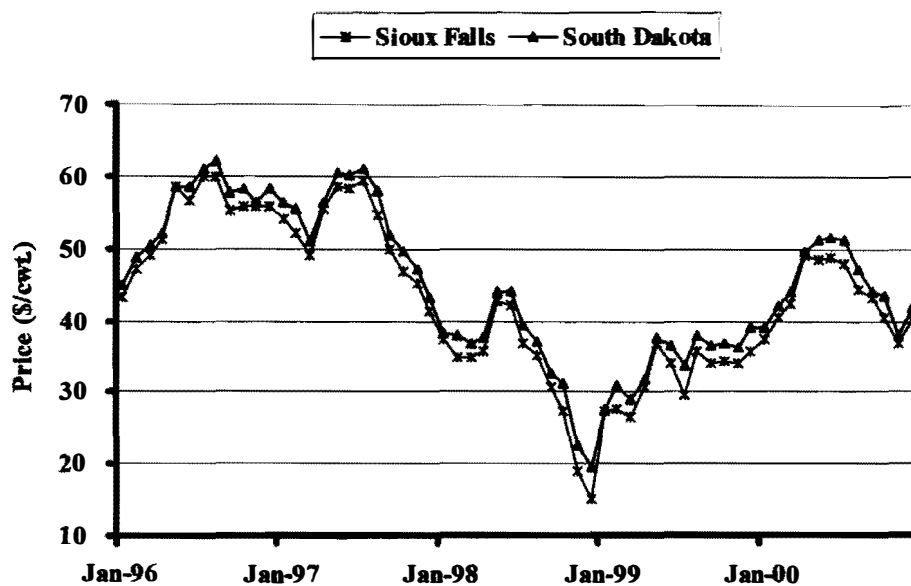
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	(\$/cwt. lean)											
1996	61.16	66.40	69.13	70.86	81.22	79.00	82.75	83.95	76.79	77.82	76.24	77.31
1997	74.82	72.65	68.38	75.79	81.26	80.95	83.20	78.03	71.54	67.39	64.92	59.79
1998	51.79	51.62	50.25	50.92	60.94	61.09	53.47	51.25	43.05	40.73	27.24	22.21
1999	37.63	40.09	38.08	42.23	51.97	48.35	44.30	51.90	47.79	48.71	47.96	51.12
2000	51.82	56.18	58.90	66.78	68.46	68.89	68.16	61.42	58.60	56.34	50.02	56.06

Source: Chicago Mercantile Exchange.

The monthly Sioux Falls price is compared to the price received by farmers in South Dakota for slaughter barrows and gilts in figure 8. The prices are not mutually exclusive as not all South Dakota hogs are marketed at Sioux Falls and not all Sioux Falls hogs originate from South Dakota sources. The price received by farmers tends to be higher than that paid in Sioux Falls. The difference may reflect contract prices received, better markets (based on higher prices), differences in weights and/or quality, and transportation costs to other markets. Prices received by farmers for all hogs, barrows and gilts, and sows are reported monthly and feeder pig prices are reported quarterly by USDA-NASS in *Agricultural Prices*.

A similar pattern emerges when South Dakota prices are compared to U.S. prices as reflected by the CME Lean Hog Index. Shown in figure 9, the price received by farmers in South Dakota tends to exceed not only the Sioux Falls price for slaughter hogs, but also the index price. The index is shown converted to a live price equivalent by multiplying it by 0.74. While only shown for 2000, the pattern has held for a majority of

months in recent years. The pattern could be explained if South Dakota raises higher valued hogs than other states.



Sources: USDA-AMS and USDA-NASS

Figure 8. Comparison between Sioux Falls' and South Dakota slaughter hog prices

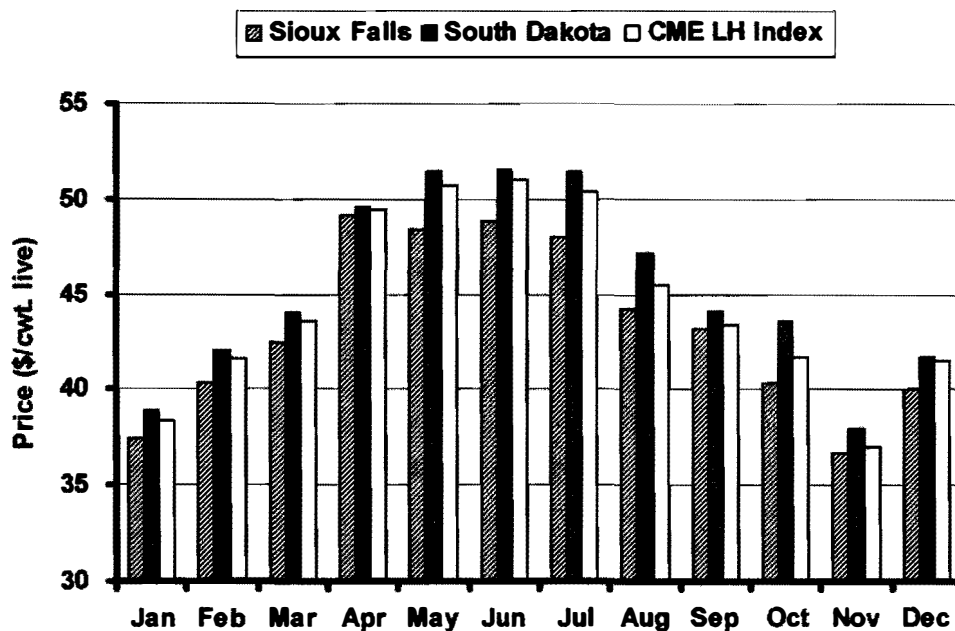


Figure 9. Comparison of Sioux Falls' cash price, South Dakota price received by farmers, and CME Lean Hog Index converted to a live-equivalent.

Sow and Feeder Pig Prices and Trends

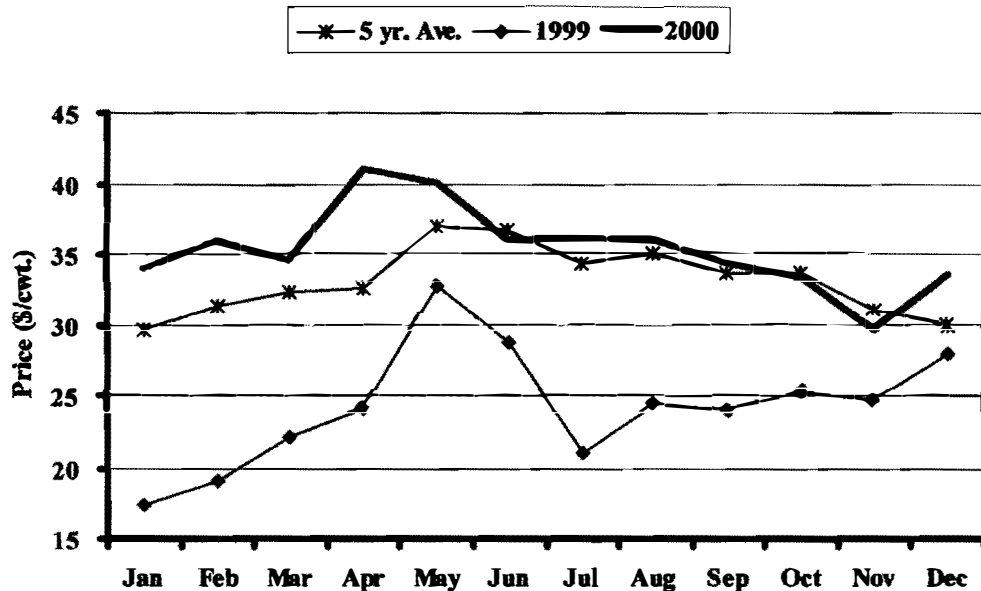
Prices for other classes of hogs are relatively difficult to obtain, as even the Sioux Falls market is thin relative to the slaughter hog market. USDA-AMS reports the prices of sows and feeder pigs weekly, but the price series often lacks observations for different weights. Thus, only monthly aggregated trends are analyzed. Sow prices show a seasonal trend, largely mirroring the pattern observed in slaughter hogs. Feeder pig prices do not have as clear of a trend, perhaps reflecting the decline in supply swings from smoothed farrowings in South Dakota.

Slaughter sows are not immune to extreme price fluctuations, as their price dipped to below \$10/cwt. during December of 1998 as shown in table 5. Seasonally slaughter sow prices peak during late spring to early summer as shown in figure 10. Culling patterns show that sow slaughter tends to increase throughout the year. However, the price peak comes during the seasonal low in barrow and gilt slaughter numbers.

Table 5. Sioux Falls' Slaughter Sows Price (U.S. 1-2, 400-500#)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	(\$/cwt.)											
1995	26.37	29.57	30.99	29.39	28.82	30.01	30.17	35.20	35.84	37.49	31.42	31.59
1996	31.55	33.17	35.48	36.41	42.40	46.04	46.51	48.02	48.45	47.47	50.01	47.98
1997	46.07	47.25	45.56	45.88	50.35	47.62	47.36	44.63	40.56	38.83	35.41	32.20
1998	26.96	27.58	27.24	27.14	30.49	30.89	26.16	22.59	18.71	19.15	13.51	9.81
1999	17.43	19.05	22.21	24.16	32.74	28.86	21.03	24.49	24.07	25.27	24.74	28.00
2000	33.97	36.03	34.63	40.99	40.01	35.99	36.09	35.92	34.32	33.26	29.60	33.53

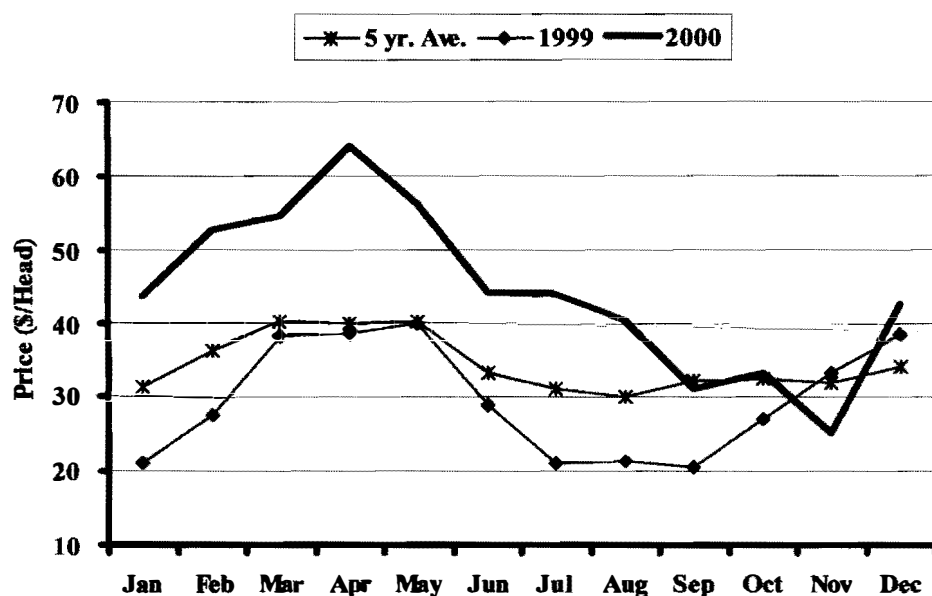
Source: USDA-AMS.



Source: USDA-AMS

Figure 10. Sioux Falls' slaughter sows price (U.S. 1-2, 400-500#)

Feeder pig prices show substantial variability – as any price changes for slaughter animals are quickly passed on to the farrower-grower segment, as shown in figure 11 and table 6. Seasonally feeder pigs reach a price peak in March through May. The seasonal peak in prices is evident in figure 11. In recent years, the correlation between the number of head sold and the price received has been negative at -0.11 , but quite low. This relationship implies that demand for feeder pigs may drive its market more than supply conditions.



Source: USDA-AMS

Figure 11. Sioux Falls' feeder pig price (U.S. 1-2, 40-45#)

Table 6. Sioux Falls' Feeder Pig Price (U.S. 1-2, 40-45#)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(\$/head)												
1995	32.69	36.88	41.19	36.83	31.20	31.38	28.13	30.81	37.75	33.50	35.10	36.00
1996	29.25	33.00	38.13	27.83	32.05	27.33	30.94	38.44	41.56	46.67	46.38	44.69
1997	43.00	52.75	56.67	67.67	65.75	48.88	55.00	42.00	41.13	39.63	36.17	37.63
1998	31.00	31.00	26.50	28.38	31.75	30.42	20.94	18.50	20.63	16.25	9.25	13.88
1999	21.13	27.75	38.33	38.50	39.75	28.88	21.00	21.33	20.63	27.00	33.42	38.55
2000	43.67	52.75	54.50	64.13	56.08	44.33	44.00	40.33	31.21	33.25	25.25	42.50

Source: USDA-AMS.

Note: The December prices in 1996 and 1999 are an average of the surrounding months.

Farrowing Intentions

The interaction of supply and demand factors ultimately determines prices. The demand side is beyond the scope of this report, thus the focus on price will be from the supply side. Farrowing intentions give some insight into short-run supply changes. USDA-NASS reports farrowing intentions quarterly in the *Hogs and Pigs* report. Intentions are for the next quarter and two quarters ahead. Actual farrowings, in number of head, were discussed earlier. For the intentions (or forecasts) of farrowings to be

useful from a supply-forecasting perspective, the intentions should indicate the actual farrowing levels. While Runkle (1991) argues that producers fail to account for all available information when reporting their intentions, the accuracy of the intentions does not seem to have been addressed.

Actual farrowings in South Dakota changed every quarter during the sample period from Dec-Feb 1992 to Mar-May 2000 (30 observations). To assess how well the intentions perform, the farrowing intentions were mapped against actual farrowings in figure 12. Perfect intentions would fall on the 45-degree or diagonal line; that is, the intentions would match the actual farrowings. The intentions indicate the general level of actual farrowings as most of the intentions observations lie close to the diagonal line. Casual observation also suggests the nearby (one-quarter-ahead) intentions are closer to the actual farrowings than are the two-quarters-ahead intentions. Several times, the intentions did not change, resulting in an overlap of the observations.

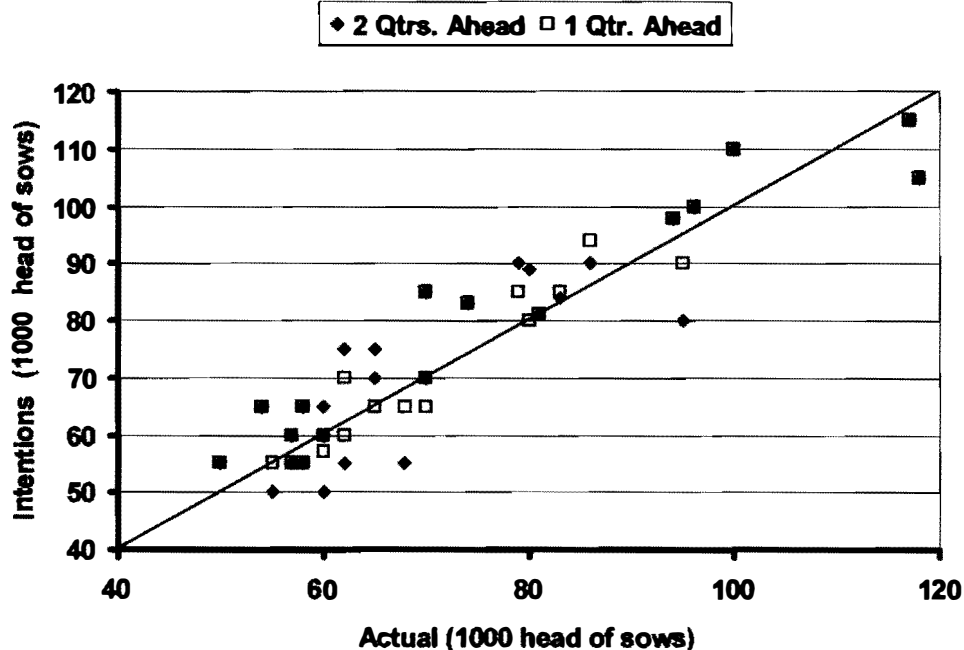


Figure 12. Quarterly S.D. farrowing intentions and actual farrowings

The intentions were highly correlated with the actual farrowings. The correlation between the two-quarters-ahead intentions and actual farrowings was 0.91. The correlation between the nearby intentions and actual farrowings was even higher at 0.95. The highest correlation, surprisingly, was between the nearby and two-quarters-ahead intentions. At 0.96, the correlation implies that the intentions have less of a tendency to differ from quarter to quarter than from actual farrowings.

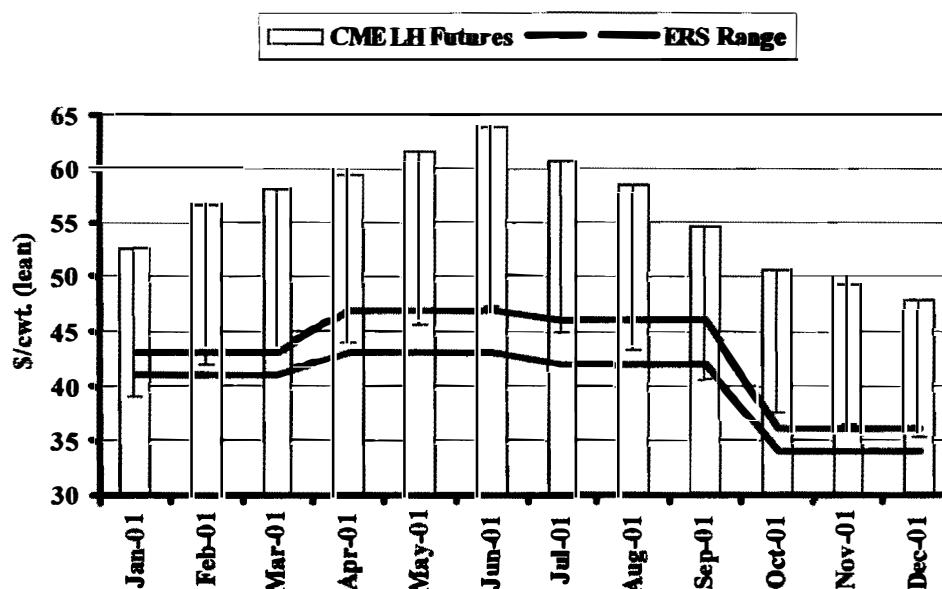
Intentions were further assessed by looking at their turning-point forecasting ability. The intentions and actual farrowings were cross-tabulated based on whether they were up or down relative to the previous quarter's actual farrowing number. For the

nearby intentions, 24 of the 30 observations either predicted up when actual farrowings went up or predicted down when actual farrowings went down. There were three observations where no change was predicted and the farrowings changed. Three other observations predicted the wrong direction. For the two-quarters-ahead intentions, the performance was similar as 25 of the 30 observations predicted direction changes correctly. Four observations incorrectly predicted direction changes, and one observation had an intention of no change when a change was observed.

Futures Prices and Basis

The price outlook for hogs is ever changing. Rather than give a forecast or projection, the sources and tools for price outlook are outlined. The most transparent source of future information is in the prices of lean hogs futures. The interaction of market participants trading futures contracts sends signals to the rest of the market about the future price of hogs. The futures market may not always be right, but it is the place where prices are discovered and mistakes corrected. There is some evidence that producers do not look to futures prices enough when making decisions (Chavas, 1999). At the same time, routine hedging is unlikely to be profitable (Kee and Kenyon, 1999), but selective hedging may increase profitability.

The futures prices, as of January 11, 2001, are shown in figure 13. The clear bars reflect futures prices. As not every month has a contract, the intermittent months reflect the average of the surrounding futures prices. The January bar reflects the CME Lean Hog Index on January 9, 2001. Because the futures prices reflect lean hog values, error bars or drop bars are added to each month, reflecting 74% of the lean price. This converts the lean price to a live price. Hence, the bottoms of the error bars would be the implied forward cash prices.



Sources: Chicago Mercantile Exchange and USDA

Figure 13. Lean hogs futures and USDA-ERS price forecasts

At that time, the outlook was for prices to increase until June and to then decrease until December. The implied forward prices coincide with prices forecasted by USDA's Economic Research Service (ERS). Each month the ERS reports price forecasts for three or four quarters ahead in their *Livestock, Dairy and Poultry Situation and Outlook* report. The report also contains information on retail prices of pork and other meats, trade, and cold storage amounts. ERS forecasts live prices, which are comparable to the drop bars that correspond to the observed futures prices. The forecasts from January 2001 are shown as the dark lines in figure 13. The range of forecasted prices (high and low range) encompasses the drop bar levels for most of 2001. Hence, there was agreement between ERS's and the trade's outlook. As a public source, ERS forecasts would be unbiased, but would not necessarily be accurate.

The other issue related to futures prices is basis, the difference between cash prices and futures prices. Basis is important because it determines how the futures prices should be adjusted for planning purposes and for comparing futures and options prices with any forward prices. The weekly average price for market hogs in Sioux Falls, reported by USDA-AMS, was compared to the CME Lean Hogs Index on expiration dates for 1999 and 2000. For months without a contract, the index value was from the 10th business day of the month, the day futures contracts typically expire. As shown in table 7, the basis in Sioux Falls was usually negative, but ranged from -\$4.50 to \$0.50. A basis level of -\$2.00 implies that for any observed futures price, the implied Sioux Falls' cash price is obtained by subtracting \$2.00, then converting to a cash price by multiplying the result by 0.74.

Table 7. Basis at Expiration for Sioux Falls' Cash and CME LH Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(\$/cwt. lean)												
1997	-2.11	-5.81	-1.68	-0.51	-1.92	-7.27	3.17	4.22	2.30	-5.40	-4.21	-3.74
1998	-0.83	-2.87	-4.20	-4.23	-3.99	-4.62	-3.63	-3.42	0.09	-2.52	-0.14	-7.21
1999	-3.73	-3.71	-1.95	-2.37	-3.28	-4.20	-3.93	-5.13	-3.12	-0.83	-2.57	-1.88
2000	-2.43	-0.40	-0.60	-0.43	-2.36	-3.12	-4.46	-3.89	-1.01	-1.55	0.82	-1.26

Note: Cash is lean equivalent of U.S. 1-2, 230-250# slaughter barrows and gilts price.

Management Developments

New CME lean hog contracts are available for use by hedgers that alleviate problems faced in the past. The regular lean hog contracts were not available for every calendar month. Given the shift from seasonal to continuous production, in South Dakota and nationwide, producers face price risk every month. Options contracts that settle to the cash index are now available for months without a futures contract. Hedgers should be readily able to use the index options to hedge their production. The options are European style options, meaning they cannot be exercised before expiration. However, they can be traded at any time and should facilitate hedging when spot sales are anticipated during their expiration months.

The regular futures and options contracts are also of a size that may be too large for the small producer to use effectively in a hedging program. E-mini contracts are now

available to fill that void. While the regular contracts were for 40,000 lbs. of lean hogs, the E-mini contracts are for a fourth of that size. The contract size of 10,000 lbs. of lean hogs translates into about 55 head. The e-mini futures contracts are already trading and the CME has written rules for e-mini options into the latest rulebook. The details of these contracts are available from the CME website.

NASS has added a monthly *Hogs and Pigs* report that gives nationwide numbers typically reported in the quarterly reports. The state-by-state breakdown will still be available quarterly. The report should send more timely signals about the supply-side of the market to market participants. In addition, a study of the national farrowing intentions and actual farrowings would give an indication of the performance of that measure of supply.

A final pricing concern is the volatility of prices. Historic volatility is reported by MRCI (2000). However, little is known about the behavior of the implied volatility, especially during expiration months. Knowledge of the volatility is necessary to evaluate option premiums – and it is imperative when dealing with options in thinly traded markets.

For currently operating farms, a number of tools are available for assessing the profitability of raising hogs. Enterprise budgets are available to give a current assessment and for making projections (Pflueger et al., 1999). Performance benchmarks are also available for comparing single operations to other operations (ERS, 1999). Other considerations, such as feeding practices, have also received research attention (Boland, Foster, and Preckel, 1999). The other production-related concern is also a marketing issue, the choice of contracted production. A variety of contract arrangements is available (Pflueger and Madsen, 1995), and their attributes need to be carefully considered (Hennessey and Lawrence, 1999).

Conclusions

Is there room for growth in South Dakota's hog markets? While the market structure is not well understood, recent growth has come from inshipments of feeder pigs. This implies that South Dakota may have a comparative advantage where finishing hogs is concerned. Feed cost should be relatively low, as the price of corn is typically the lowest in the country along the I-29 corridor in South Dakota. However, feed availability could be a limiting factor to growth. A study of feed availability versus feed use would be beneficial for identifying the comparative advantage.

Proximity to slaughter capacity is a comparative advantage South Dakota has over other states. Production and slaughter continue to be centered near Iowa. Parcell, Mintert, and Plain (2000) and McDonald and Ollinger (2000) point to the importance of slaughter capacity in recent years. The number of slaughter facilities is reported on an annual basis (GIPSA, 1999). However, the numbers are quite dated by release time and only show a historical perspective rather than the current situation. Slaughter capacity and price reporting (GAO, 1999) will likely continue to be hot issues related to hog markets.

Based on estimates of the pig crop and inshipments, revenue from hogs in South Dakota could climb back to around \$300 million in 2000. What that means in terms of profitability is difficult to assess given the equity-draining prices of late 1998. The prospects seem to raise as many questions as answers. However, given the move toward year-round, continuous operations, there is possibly a niche to exploit given the continued seasonal demand fluctuation (and higher prices) for pork. The other aspect is the lack of knowledge concerning economies of size regarding hog production. Are they significant enough to force the small producer the rest of the way out? Alternatively, is it simply an illusion based on lower variable but higher fixed cost?

Additional research is needed into different factors that influence the hog markets in South Dakota. The effects of retail price changes, international trade, and performance issues related to contracts are not well understood. While not shown, the CME Lean Hogs Index and futures prices tend to come quite close together on expiration dates. However, there can be substantial divergence during the expiration month. There is the casual relationship observed between spot feeder pig prices and slaughter prices. Feeder pig prices seem to be more responsive to changes in spot slaughter prices than to changes in futures prices. Those trading feeder pigs may be failing to use all available information when making their pricing decisions. Finally, there is little apparent knowledge or concern about the conversion factor to equate live and dressed prices for slaughter weight hogs. The standard conversion, usually 73%, is the all-hog equivalent from *Livestock Slaughter* reports. However, a more precise number would be useful for comparing live and dressed prices when the difference between them is small.

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