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# Recent Developments in South Dakota's Hog Market

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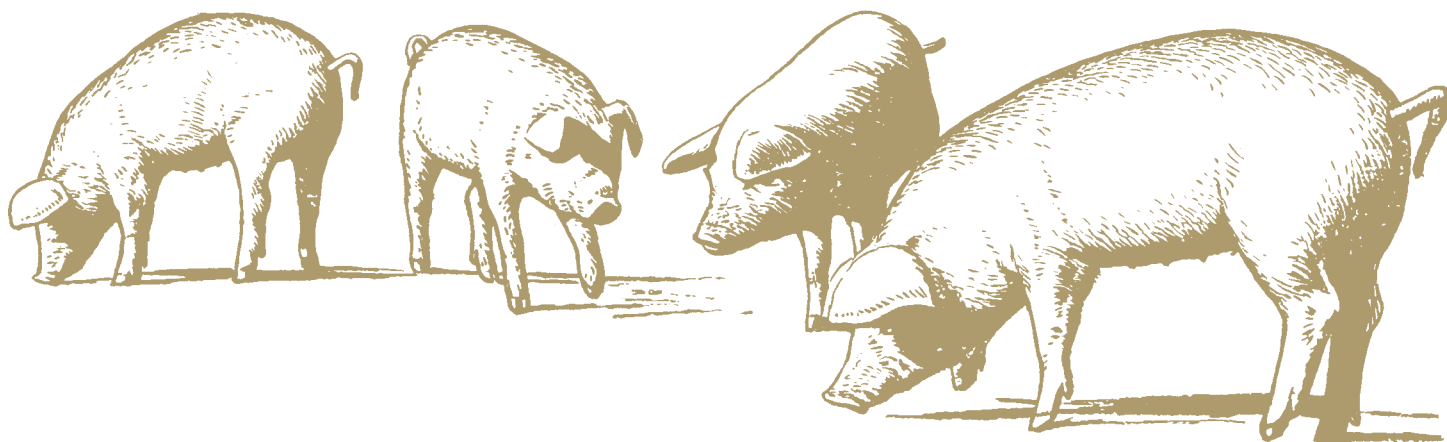
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## Recent Developments in South Dakota's **Hog Market**

by Matthew A. Diersen\*

**R**aising hogs and pigs is generally South Dakota's second largest livestock enterprise. 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 12th in pig crop size in 2000.

In the 1997 Census of Agriculture, the USDA reports that while most South Dakota hog farms are located in the southeast and east central crop reporting districts, all South Dakota counties have some hog farms. 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.

Producers, lenders, and others have expressed interest in the future profitability of hogs and in marketing issues such as basis and hedging effectiveness. This publication seeks to provide insights into the structure, conduct, and performance of South Dakota's hog market. Data and information have been gathered from a variety of sources in an effort to provide an overview of the markets, prices,

and prospects for the future. An excellent source of primary data exists in *South Dakota Agriculture 2000*, published by the South Dakota Agricultural Statistics Service.

The general findings pertain to structural changes observed for South Dakota, continued price variability, and several risk management developments. The number of farms producing hogs has declined in South Dakota with several ramifications. The most notable is the reduced variability in the supply of finished hogs brought to market. Seasonal price and basis variability still exist, indicating that there may be a niche to be served by farrowing on a small scale only during certain periods of the year. Finally, with the general trend toward continuous production by the remaining producers, risk management tactics are needed that accommodate selective hedging. New tools are available to help manage risk in this setting.

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## Structural Changes

The decline in the number of farms producing hogs represents the most staggering statistic pertaining to the hog market structure. 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. In 1995, there were 5,400 farmers 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 (Lawrence and Wang, 1998; and Tongkasame, 1999).

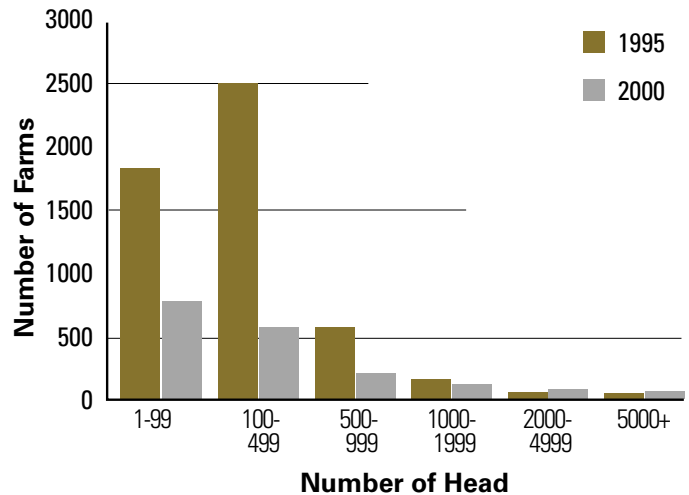
The decline in farms was mainly among the smallest sized operations (Fig. 1). At the same time, the remaining producers have increased the size of their operations, on average. There may be significant economies of size in raising hogs, as the number of large operations has increased.

South Dakota farmers continue to produce a sizeable number of hogs despite the recent contraction throughout the hog industry. USDA-NASS reports an inventory of over 1 million hogs in the state. USDA-NASS releases inventory levels quarterly (September, December, March, and June) in the *Hogs and Pigs* report.

The performance of the remaining producers increased when measured using pigs per litter. In 1995, South Dakota's average pigs per litter of 8.10 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 at 8.90.

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. Farmers in all operation size groups increased pigs per litter from 1995 to 2000. Regardless, the largest number of pigs per litter is obtained by the largest operations.

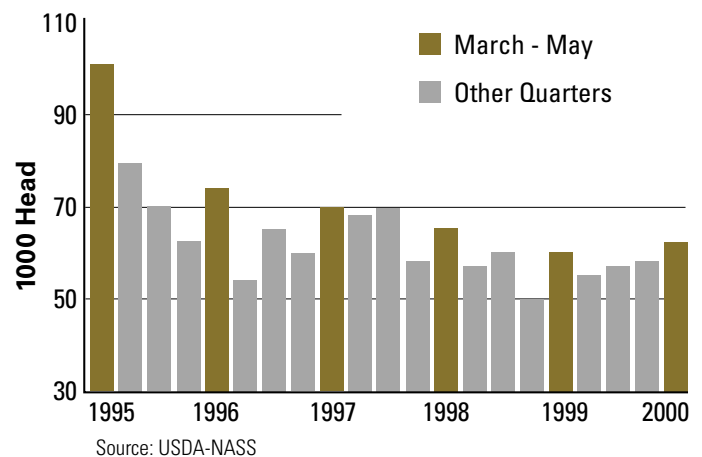
Figure 1. South Dakota hog farms by size.



Source: USDA-NASS

Fewer small operations reduced variability of quarterly farrowings in South Dakota (Fig. 2). There used to be a substantial jump in farrowings from March through May. The spike shown for March-May in 1995 is typical for many earlier years' observations. When small operators left hogs as an enterprise, they stabilized the farrowing pattern from quarter to quarter giving a more stable supply of hogs throughout the year. Supply still adjusts to price

Figure 2. Quarterly South Dakota sow farrowings.



Source: USDA-NASS

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and environmental conditions, with perhaps less adjustment for seasonal demand changes at 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 from 1995 levels, but inshipments, presumably of feeder pigs, has made up the difference (Fig. 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.

USDA-NASS reports the number of hogs slaughtered in South Dakota monthly in *Livestock Slaughter*. South Dakota has seen a decline in the number slaughtered in the last couple of years, in contrast to the increase in the number of marketings. 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 change also reflects the closing of the Dakota Pork facility in Huron and the steady slaughter at Smithfield's Morrell

plant in Sioux Falls. The loss of a slaughter facility has reduced the number of head slaughtered in South Dakota, but seasonal variability remains in both slaughter numbers and weights.

## Farrowing Intentions

The interaction of supply and demand factors ultimately determines prices. Farrowing intentions give some insight into short-run supply changes. USDA-NASS reports farrowing intentions in the quarterly *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.

Actual farrowings in South Dakota changed every quarter during the sample period from December-February 1992 to March-May 2000 (30 observations). To assess how well the intentions perform, the farrowing intentions were mapped against actual farrowings (Fig. 4). Perfect intentions would fall on the 45-degree or diagonal line; that is, the intentions would match the actual farrowings.

Figure 3. South Dakota marketable hogs by year.

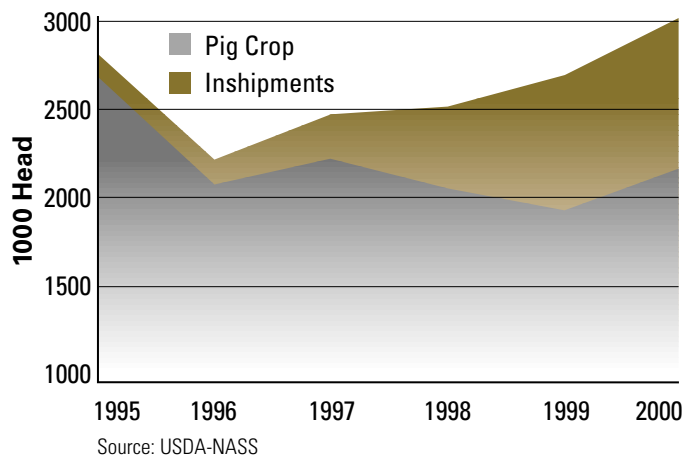
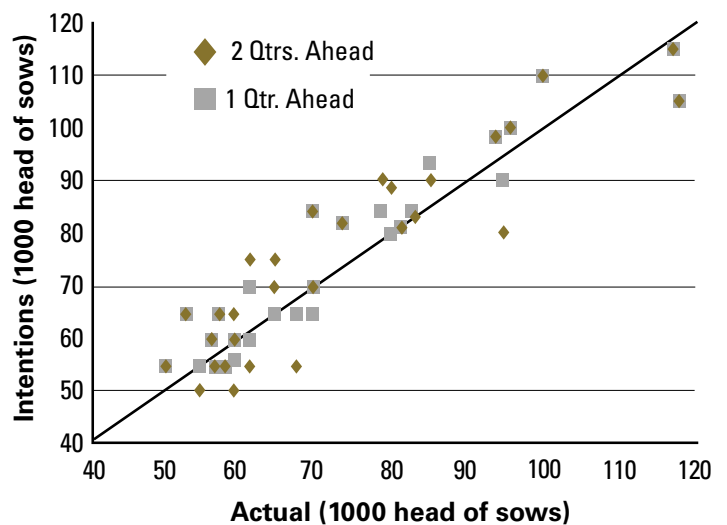


Figure 4. Quarterly South Dakota intended and actual farrowings.



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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.

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, producers' either intended to increase farrowings when actual farrowings went up or intended

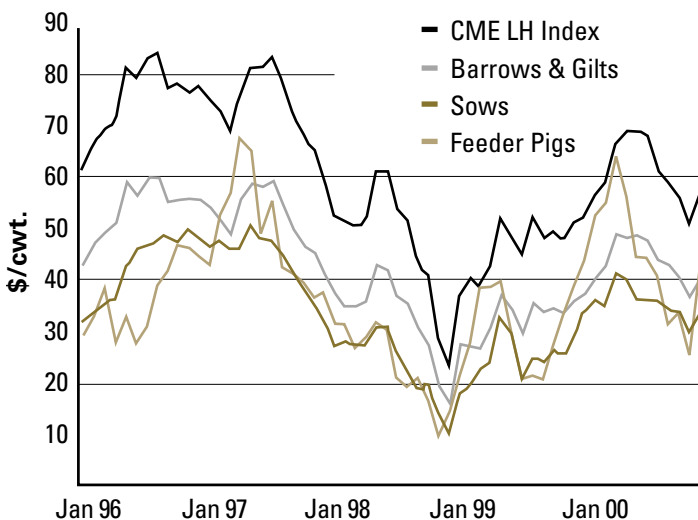
to decrease farrowings when actual farrowings went down. There were three observations where no change was predicted and the farrowings changed. Three other observations predicted the wrong direction. For the two-quarters-ahead intentions, the performance was similar as 25 of the 30 observations predicted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

### Price Trends and Basis

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).

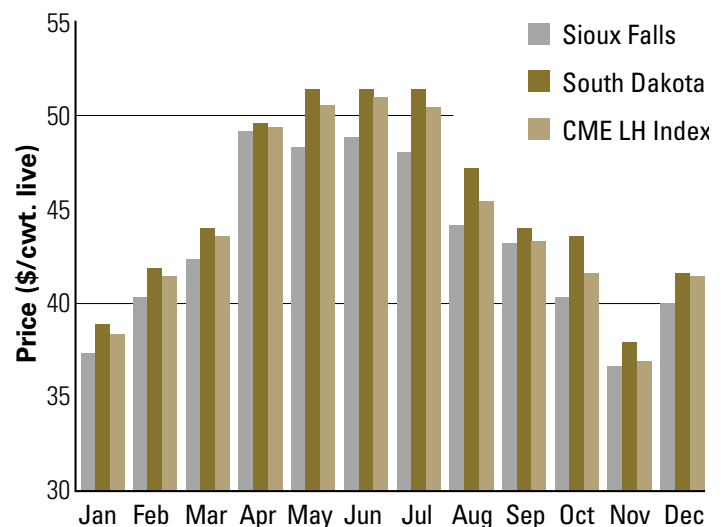
The primary Sioux Falls prices are shown in Figure 5. The overall price trend has been moving steadily upward since early 1999. Also shown in Fig. 5 is the monthly average of the CME Lean Hog Index. The CME index is generally

**Figure 5. Monthly Sioux Falls' and CME hog prices.**



Source: Chicago Mercantile Exchange and USDA-AMS  
Note: The feeder pig price is in \$/head

**Figure 6. Comparison of Sioux Falls' cash price, South Dakota price received by farmers, and CME Lean Hog Index converted to a live-equivalent.**



Source: USDA-AMS, USDA-NASS, and Chicago Mercantile Exchange

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the highest observed price. Its pattern is closely matched by the Sioux Falls' barrows and gilts price. The sow price is consistently lower than the barrows and gilts price.

Seasonally, two factors combine to drive slaughter hog prices higher during the summer months. 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.

Feeder pig prices are relatively variable. 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.

The CME index is probably the most relevant price series at this time for determining national trends in prices. The CME index is reported daily, but the monthly average is perhaps more informative for discerning trends. The index prices peak during the summer for most recent years (Table 1). 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. For other South Dakota price and basis tables, see May and Diersen (2001).

South Dakota prices compare mixed relative to U.S. prices as reflected by the CME index. The price received by farmers in South Dakota tends to exceed not only the Sioux Falls price for slaughter hogs, but also the CME index (Fig. 6). The index is shown converted to a live price equivalent by multiplying it 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.

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. The pattern could be explained if South Dakota

**Table 1. Monthly Average of CME Lean Hog Index Values**

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

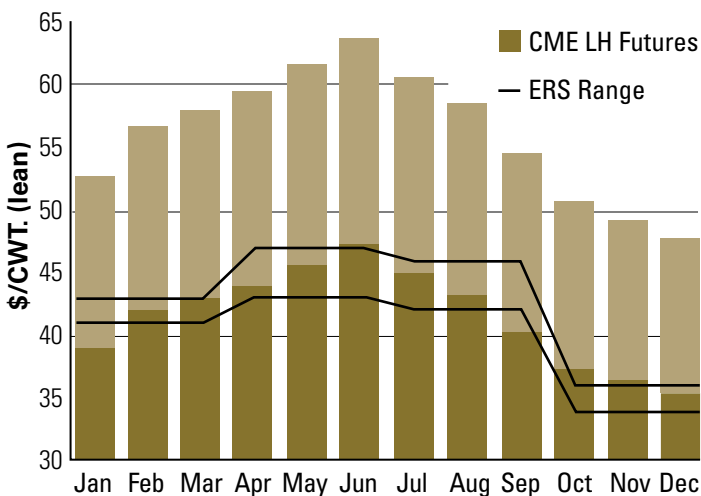
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raises higher valued hogs than other states. Prices received by farmers for all hogs, barrows and gilts, and sows are reported monthly and feeder pig prices are reported quarterly by USDA-NASS in *Agricultural Prices*.

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. Market participants trading futures contracts interact to signal 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. Routine hedging using futures 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 Fig. 7. The color 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 index on January 9, 2001. Because the futures prices reflect lean hog values, the shading change on the color bars, reflect 74% of the lean price. This converts the lean price to a live price. Hence, the levels of the shading change would be the implied forward cash prices.

**Figure 7. Lean hogs futures and USDA-ERS price forecasts for 2001.**



Source: Chicago Mercantile Exchange and USDA-WASDE

At that time, the outlook was for prices to increase until June and then to 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 forward live prices that correspond to the observed futures prices. (The forecasts are also given in the *World Agricultural Supply and Demand Estimates* reports.)

The forecasts from January 2001 are shown as the dark lines in Fig. 7. The range of forecasted prices (high and low range) encompasses the forward live price 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 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 2, the basis in Sioux Falls was usually negative but ranged from -\$7.27 to \$4.22.

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. While not shown, the CME index and futures prices tend to come quite close together on expiration dates. However, there can be substantial divergence during the expiration month.

# Recent Developments in South Dakota's Hog Market

## Management Developments and Conclusions

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 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 are 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 CME Rulebook.

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 of pork 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.

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 hog finishing comparative advantage South Dakota may have relative to other states.

Proximity to slaughter capacity is a comparative advantage South Dakota has over other states. Production and slaughter continue to be centered near Iowa. The number

**Table 2. 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)												
<b>1997</b>	-2.11	-5.81	-1.68	-0.51	-1.92	-7.27	3.17	4.22	2.30	-5.40	-4.21	-3.74
<b>1998</b>	-0.83	-2.87	-4.20	-4.23	-3.99	-4.62	-3.63	-3.42	0.09	-2.52	-0.14	-7.21
<b>1999</b>	-3.73	-3.71	-1.95	-2.37	-3.28	-4.20	-3.93	-5.13	-3.12	-0.83	-2.57	-1.88
<b>2000</b>	-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.



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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.

With improved prices and larger pig crop and inshipments, revenue from hogs in South Dakota climbed back to

around \$280 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. Additional research and analysis is needed into different factors that influence the hog markets in South Dakota.

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