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South Dakota's Hog Market: Developments and Prospects

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Raising hogs and pigs tends to be 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 12th in pig crop size in 1999. 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 should bring 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. Producers, lenders, and others have expressed interest in the future profitability of hogs and in marketing issues such as basis and hedging effectiveness. The information in this paper are meant to augment an excellent source of primary data, *South Dakota Agriculture 2000*, published by the South Dakota Agricultural Statistics Service (SDASS, 2000).

Current Scope of Operations

The decline in the number of farms producing hogs represents the most staggering statistic pertaining to the hog market structure. USDA statistics show that in 1994, there were 6,500 farms in South Dakota raising hogs. By 1999 that number dropped to 2,700 farms. The decline in farms was mainly among the smallest sized operations. This trend has seemed too slow, because the change in the number of farms from 1998 to 1999 was relatively small. The 1997 Census of Agriculture shows 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.

South Dakota continues to produce a sizeable number of hogs despite the recent contraction throughout the hog industry. The June 2000 numbers, shown in Table 1, still show an inventory of over 1 million hogs in the state. 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, South Dakota's 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.

The change in the number of operations has influenced the aggregate farrowing pattern in South Dakota. Fewer small operations reduced variability of quarterly farrowing in South Dakota. There used to be a substantial jump in farrowing during the second quarter of the year (March through May). Since the decline in the small operations, the farrowing pattern is more stable from quarter to quarter. Supply still adjusts to price and environmental conditions, but not to the desire to farrow in early spring. The implications of the change are a more stable supply of hogs throughout the year – with perhaps less adjustment for seasonal demand changes.

TABLE 1. SOUTH DAKOTA HOG INVENTORY AND PERFORMANCE INDICATORS

	2000	1995	Change
June 1			
All Hogs (head)	1,230,000	1,570,000	- 22%
Breeding Hogs (head)	125,000	180,000	- 31%
Market Hogs (head)	1,105,000	1,390,000	- 21%
Mar-May			
Sows Farrowed (head)	62,000	100,000	- 38%
Pig Crop (head)	552,000	810,000	- 32%
Pigs Per Litter (number)	8.9	8.1	+ 10%

Source: USDA-NASS.

Despite the decline in the number of sows in South Dakota, the number of hogs marketed has increased. The annual pig crop declined from 2.7 million head in 1995 to 2.0 million head in 1999. However, in shipments during that time, presumably of feeder pigs, made up the difference by increasing from 0.1 to 0.7 million head. Hence, operations have moved toward bringing in feeder pigs to finish instead of being farrow-to-finish operations. 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.

There has been a decline in the number of hogs slaughtered in South Dakota in recent 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. In recent years the average number of head slaughtered per month was 325,000, which largely reflects the closing of Huron's Dakota Pork facility and steady slaughter at Smithfield's Morrell plant in Sioux Falls. Seasonally the number slaughtered declines from May through September, while slaughter weights tend to peak during June.

Hog Prices and Trends

The largest hog market in South Dakota is 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 price outlook for hogs is ever changing. The most transparent source of future information is in the prices of lean hogs futures traded at the Chicago Mercantile Exchange. Regardless of one's attitude toward prices, the interaction of market participants trading futures contracts sends signals to the rest of the market about the future price of hogs. Each month USDA's Economic Research Service (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. As a public source, ERS forecasts would be unbiased, but would not necessarily be accurate.

The trend in lean hogs mirrors Sioux Falls' trend, especially after converting Sioux Falls' price to a lean equivalent by dividing by 0.74. 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.

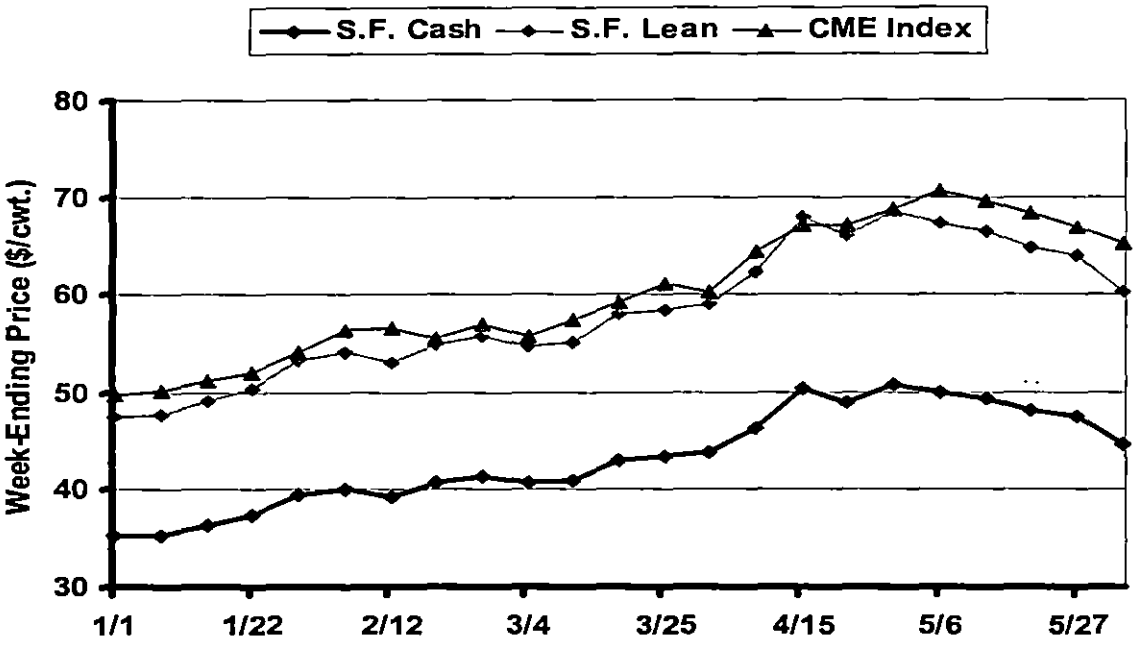

Figure 3. Weekly lean and cash hog prices, 200

The average monthly prices for Sioux Falls' slaughter hogs are shown in Table 2. 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. Seasonally, two factors combine to drive slaughter hog prices higher during the summer months, as shown in Figure 4. 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.

The CME Lean Hog Index is probably the most relevant price series at this time for determining national trends in prices. The monthly average, shown in Table 3, reveals a 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.

TABLE 2. 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						

Source: USDA-AMS.

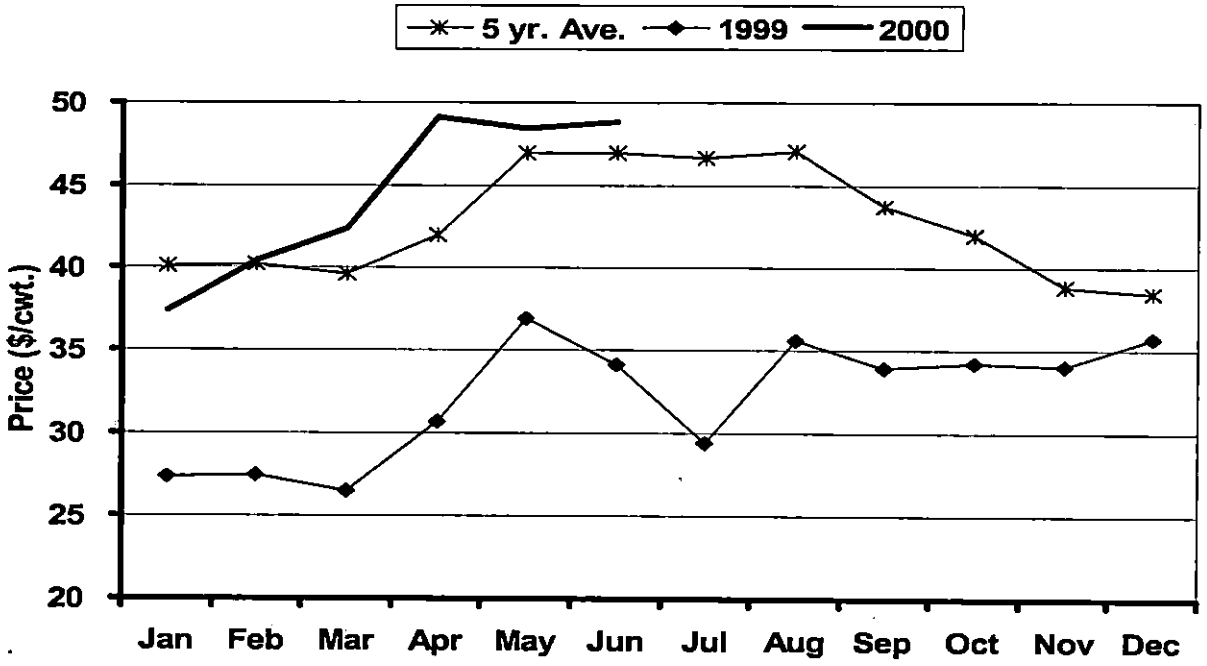

Figure 4. Sioux Falls' slaughter barrows and gilts prices (U.S. 1-2, 230-250#)

TABLE 3. 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						

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 5. 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.

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 5, 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 July 1999 to June 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.

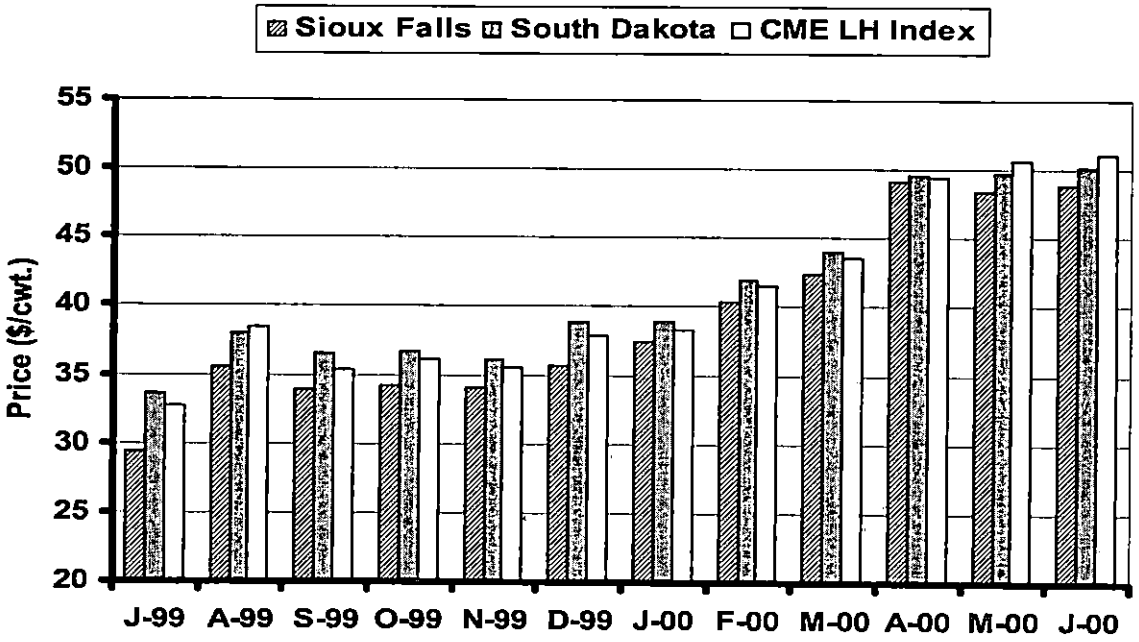

Figure 5. Comparison of Sioux Falls' cash price, South Dakota price received by farmers and CME Lean Hog Index converted to a live equivalent.

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 6, 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 6. 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						

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

Aggregated monthly, sow prices show a seasonal trend, largely mirroring the pattern observed in slaughter hogs. 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 4. Seasonally slaughter sow prices peak during late spring to early summer. 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 4. 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						

Source: USDA-AMS.

Feeder pig prices do not have as clear of a trend; perhaps reflecting the decline in supply swings from smoothed farrowing in South Dakota. 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 Table 5. Seasonally feeder pigs reach a price peak in March through May. 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.

TABLE 5. 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						

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. 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. For the intentions (or forecasts) of farrowing 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 farrowing 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 farrowing in Figure 6. Perfect intentions would fall on the 45-degree or diagonal line; that is, the intentions would match the actual farrowing. The intentions indicate the general level of actual farrowing 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 farrowing than are the two-quarters-ahead intentions. The correlation between the two-quarters-ahead intentions and actual farrowing was 0.91. The correlation between the nearby intentions and actual farrowing was even higher at 0.95. Several

times, the intentions did not change, resulting in an overlap of the observations. The correlation between the nearby and two-quarters-ahead intentions, at 0.96, implies that the intentions have less of a tendency to differ from quarter to quarter than from actual farrowing.

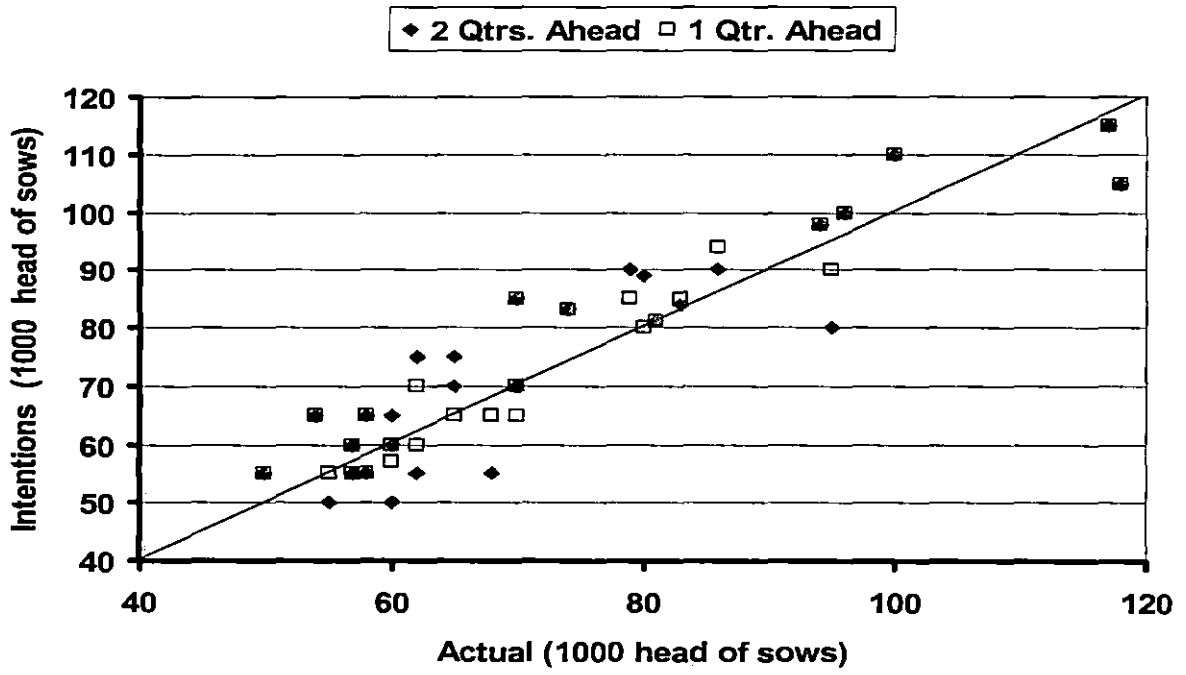

Figure 6. Quarterly S.D. farrowing intentions and actual farrowing

Intentions were further assessed by looking at their turning-point forecasting ability. The intentions and actual farrowing 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 farrowing went up or predicted down when actual farrowing went down. There were three observations where no change was predicted and the farrowing 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.

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 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.

Enterprise budgets are available to give a current assessment and for making projections (Pflueger et al., 1999). In addition, a study of the national farrowing intentions and actual farrowing would give an indication of the performance of that measure of supply.

Is there room for growth in South Dakota's hog markets? While the market structure is not well understood, recent growth has come from in shipments 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 in eastern South Dakota. However, feed availability could be 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) point to the importance of slaughter capacity in recent years. USDA reports the number of slaughter facilities 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 in shipments, 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.

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.

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