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MIDWEST PORK PRODUCERS' BUSINESS CHARACTERISTICS, PERFORMANCE AND TECHNOLOGY

by

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Summary

Pork producers in the Southwestern and Southeastern Minnesota Farm Business Management Association (FBMA) were interviewed over the summer of 1989 to gain a better understanding of the condition of swine production facilities in the state, the possible future role of the new growth promoting products such as porcine somatotropin and beta agonists, and the contribution that research and educational programs can make to maintaining and improving the state's competitiveness. The information was intended to help identify applied research and educational program needs in farm management for Minnesota pork producers, as well as to evaluate likely adoption of new technologies such as porcine somatotropin. Eighty five farm operators were interviewed.

The swine enterprises on the surveyed FBMA farms appear to be typical of all midsized Minnesota and U.S. farms with swine, based on number of head sold and litters farrowed per year. A larger proportion of the FBMA farms sell 2,000 head or more per year compared to all U.S. and Minnesota farms. The FBMA farm operators are younger than all U.S. and Minnesota hog farm operators, with a higher percentage falling into the 25 to 44 age brackets. Over 70 percent of the FBMA operators have either graduated from college or have some college coursework. For all residents 25 years of age or older in rural farm portions of U.S. counties, only 10 percent have completed college, and only 6 percent of those in Minnesota. A somewhat higher proportion of the FBMA farms, 22 percent, are organized as partnerships than is true for all Minnesota and U.S. swine operations. Corporations make up about the same proportion of the FBMA farms as for all Minnesota and U.S. swine operations.

Most of the FBMA operations are using central farrowing houses with raised crates or a liquid manure system. Only three farms were farrowing entirely in individual sow houses or huts. A wide variety of finishing facilities are in use. Labor hours devoted to swine on the FBMA farms are generally in line with estimates provided in the Pork Industry Handbook fact sheet PIH-48, "Pork Production Systems with Business Analyses - Selecting the Right System", revised in 1984. Labor efficiency gains show clearly as enterprise size increases from the 50 sow or less category to over 50 sows. For the liquid manure systems, there is a less dramatic improvement in labor efficiency as size increases to the over 200 sow category.

Information was collected on production practices, including breeding, feeding, records and herd health. Two-thirds of the operators described their crossbreeding systems as mainly rotations. The main sources of boars in 1988 were purebred suppliers at 57 percent, but another 36 percent of the boars came from corporate suppliers. Most gilts were chosen from the existing herd. A majority of the farms follow a feeding program combining corn and a complete supplement. More than half of the farms use portable grinder mixers with weigh cells. On-farm computers are common on the farms, with about one-third using them for swine production records and/or to help make decisions about the hog operation. A small number also use mail-in production record systems. However, a majority use neither of these, apparently using manual systems or no formal production record systems.

An environmentally controlled central farrowing house allows year-round farrowing, and in connection with a "hot" nursery, allows earlier weaning for increased litters per sow per year, compared to individual huts. The higher capital investment required for the central facility requires this more intensive use, in fact. This shows up clearly in the survey results, with the enterprises with central farrowing houses farrowing more litters per year along with an increased average litter size. The 13.8 pigs per sow per year with the central farrowing house with raised crates or liquid manure system is 67 percent above the 8.3 pigs average of the three farms using individual huts. Despite this advantage, profitability of mid-sized enterprises with central farrowing houses was less than that for the small

group of three farms in the same size category that used the individual huts. Litters per sow per year increased with enterprise size. Enclosed, partially slatted facilities gave the highest efficiency.

A key issue in the swine industry is quality of the product, and how to improve it most effectively. Related to this is the extent to which producers are marketing on a carcass merit or grade and weight basis. Twenty three percent of the producers reported marketing all of their production on a grade and weight basis. Another 32 percent marketed some hogs on a grade and weight basis and some on a liveweight basis. Enterprises where a higher percentage was marketed in this way, and larger enterprises, received higher prices.

Most were "cautiously optimistic" about adopting porcine somatotropin (PST) assuming a three dollar return and the other information included in the scenario described by the interviewer. Some were "enthusiastic" but more were "skeptical". Most planned to wait and see how it works for others before trying it. If four injections are required, few planned to adopt it immediately, preferring to try it first on a few animals. They were evenly split between those planning to adopt it within a year and those planning to wait one to two years. Eight treatments per pig over the finishing period would deter all but a few producers from adopting it. If only two treatments are required, a much higher proportion would adopt it immediately. A high proportion of the producers seem to believe that leaner pork produced using PST will mean greater consumer demand for pork products, but they are evenly split about whether consumers will substitute pork for beef and poultry. Most feel that PST will make it more difficult for Minnesota farmers to compete against large hog operations in other states, but many feel just as strongly that there will be no adverse impact. They seem to largely have their minds made up on this issue. Most agreed that farmers will have to market on a grade and weight basis to fully benefit from PST, but are divided on the impact on U.S. producers' competitive advantage in the world market. There is substantial agreement that consumers will be wary of pork produced with PST. Most of the producers preferred the beta agonists over PST because injections would not be needed with the former.

Shifts in the structure of the swine industry caused by new technologies have indirect impacts on the rest of Minnesota's economy. For this and other reasons, policymakers and industry leaders often ask how important the swine industry is to the state. An analysis of the industry's impact on the state's economy was done using the USDA Forest Service IMPLAN input-output model. The model estimates total value added and employment by industry group along with a number of other measures. There were 16,500 farms with hogs in Minnesota in 1988, representing about one of every six Minnesota farms. These producers sold 1.72 billion pounds (liveweight basis) of pork that year, with a gross value of $755 million at the farm level. The on-farm labor required to produce this product is equivalent to about 6,650 full-time workers, after adjusting for the fact that swine is a part-time enterprise on many farms. Considering input supply and pork processing as well as on-farm activities, swine probably contributes a total of about 28,500 jobs and $766 million in value added to the state's economy, or about 1.35 percent of the state's gross product.

Minnesota Pork Producers' Business Characteristics, Performance and Technology

Introduction

Competitiveness of the Minnesota swine industry is of keen interest and concern to pork producers, allied industries, policymakers and consumers.[2] Proposed state limitations on livestock feeding and production contracts by processors and feed companies have sparked a lively debate during the past year over the future direction of the industry. The environmental impacts of larger farms are also coming under increased public scrutiny.

Several aspects of the competitiveness question which have been prominent in this debate are the condition of swine production facilities in the state, the possible future role of the new growth promoting products such as porcine somatotropin and beta agonists, and the contribution that research and educational programs can make to maintaining and improving the state's competitiveness. Pork producers in the Southwestern and Southeastern Minnesota Farm Business Management Association (FBMA) were interviewed over the summer of 1989 to gain a better understanding of these aspects of the competitiveness debate. The information was intended to supplement the database of accounting information collected annually by the association fieldmen and published in the associations' annual reports (e.g., Olson et al., 1989a and 1989b). The information is intended to help identify applied research and educational program needs in farm management for Minnesota pork producers, as well as to evaluate likely adoption of new technologies such as porcine somatotropin.

Table 1 characterizes association member farms with swine enterprises and those surveyed over the summer of 1989. There are 135 member farms with accounting records in the 1988 database provided to the University of Minnesota for research use. The swine enterprises were identified by the producers and fieldmen as farrow-to-finish, feeder pig production, finishing, custom feeding, or mixed, as shown. Most farms have only one type of swine enterprise, but some records are broken down into two different enterprises for a total of 155 enterprises.

The fieldmen prepared a list of farms which were contacted for the survey. The list included all member farms with swine enterprises, except for very small enterprises (less than 50 sows or 75 hogs finished) and some with operators close to retirement or expected to exit the business for other reasons in the near future.

Eighty five farms with accounting records were interviewed. Another 12 farms were interviewed for a total of 97. These extra 12 farms are new members of the associations. They do not have 1988 accounting records, but will probably have records for 1989 which will be usable for future analyses. The analysis below will be confined to those 85 farms in both the record database and the survey.

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2 The term *industry* is used broadly in this paper to include swine producers, packers, and input suppliers, as it is commonly used in the popular press. Marketing textbooks define an industry as a group of firms producing a similar product using similar production processes. By that definition, swine producers are an industry, packers are an industry, and feed suppliers are an industry. They use the term swine subsector to encompass producers, packers, input suppliers and allied industries. Swine is a part of the livestock sector, and the food system.

Table 1. Southeastern and Southwestern Minnesota Business Management Association Member Farms With Swine Enterprises, Total and In Survey

Enterprise Type	Total Farms With Swine	Farms Surveyed	Percent Surveyed
Farrow-to-finish	56	49	88
Feeder pig production	4	1	25
Finishing	26	10	38
Custom feeding	10	1	10
Farrow-to-finish plus finishing	4	2	50
Feeder pig production plus finishing	12	9	75
Mixed or other	23	13	56
Total farms with swine enterprises	135	85	63

Representativeness of Surveyed FBMA Farms

Membership in the FBMA is voluntary and not a random sample of the farm population. Olson and Tvedt examined the representativeness of the Southwest FBMA farms based on 1983 data. They found that the FBMA farms were larger in acreage, with less investment in land, buildings, machinery and equipment per acre than Census of Agriculture farms. FBMA farms also had higher debt per acre and higher debt/asset ratios, but also higher rates of return on total assets, than census farms. Farm product sales per acre were higher on FBMA farms, with higher numbers of livestock per farm. Livestock made up a higher proportion of farm product sales on the FBMA farms.

The swine enterprises on the surveyed FBMA farms appear to be typical of all midsized Minnesota and U.S. farms, based on number of head sold and litters farrowed per year (Tables 2 and 3, respectively). About three-quarters of all U.S. and Minnesota farms selling hogs and pigs sold less than 500 head. The proportion of the FBMA farms falling into this smallest size category is less partly because those with very small enterprises were not surveyed. The second panel of Table 2 shows the percentage of farms selling more than 500 head. The number of farms in the 500-999 head category is then about the same for all three groups of farms. More of the FBMA farms sell 2,000 head or more than is typical of all U.S. and Minnesota farms.

The FBMA farm operators are younger than all U.S. and Minnesota hog farm operators, with a higher percentage falling into the 25 to 44 age brackets (Table 4). The FBMA operators averaged 43 years of age. Table 5 shows that the FBMA operators are also better educated than other rural residents either in the U.S. as a whole or in Minnesota. Over 70 percent of the FBMA operators have either graduated from college or have some college coursework. Two producers have advanced degrees or have completed some graduate level work. For all residents 25 years of age or older in rural farm portions of U.S. counties, only 10 percent have completed college, and only 6 percent of those in Minnesota. A somewhat higher proportion of the FBMA farms, 22 percent, are organized as partnerships than is true for all Minnesota and U.S. swine operations. Corporations make up about the same proportion of the FBMA farms as for all Minnesota and U.S. swine operations (Table 6).

Table 2. Number of Farms and Percent by Number of Head Sold Per Year, U.S., Minnesota and FBMA

Number of Head Sold Per Year	U.S.	Minnesota	FBMA
		- - - Percent of Farms - - -	
1-499	78	70	18
500-999	12	16	44
1,000-1,999	7	10	22
2,000 or more	3	4	16
		Percent of Farms Selling 500 Head or More	
500-999	54	54	53
1,000-1,999	32	33	27
2,000 or more	14	13	20
		- - - Number of Farms - - -	
Total Farms	238,819	16,652	85

Source: U.S. and Minnesota from 1987 Census of Agriculture, FBMA from survey

Table 3. Number of Farms and Percent by Number of Litters Farrowed Per Year, U.S. and FBMA

Number of Litters Farrowed Per Year	U.S.	Minnesota	FBMA
		- - - Percent of Farms - - -	
1-49	70	60	9
50-99	14	19	15
100-199	10	14	49
200-499	5	6	19
500 or more	1	1	8
		- - - Number of Farms - - -	
Total Farms	175,248	11,865	75

Source: U.S. and Minnesota from 1987 Census of Agriculture, FBMA from survey

Table 4. Age of Operator, U.S., Minnesota and FBMA

Age Range	U.S.	Minnesota	FBMA
		- - - Percent of Farms - - -	
Less than 25	2.9	3.4	1.2
25-34	17.2	21.2	23.5
35-44	20.2	22.1	36.5
45-54	20.5	20.5	17.6
55-64	23.9	23.4	18.8
Over 65	15.3	9.4	2.4
		- - - Number of Farms - - -	
Total Farms	162,288	13,209	85

Source: U.S. and Minnesota from 1987 Census of Agriculture (operators listing farming as primary occupation and selling hogs and pigs), FBMA from survey

Table 5. Educational Levels of Surveyed Farm Operators Compared to All Persons 25 Years Old and Over Living in Rural Farm Portion of Counties in 1980

Years of Education	U.S.	Minnesota	FBMA
		- - - Percent of People - - -	
Less than high school graduation	38	37	4
Completed high school	40	44	23
Some college	12	12	38
Completed college (BA, BS or 4 yr degree or beyond)	10	6	35
		- - - Number of People - - -	
Total	3,469,743	174,767	85

Source: U.S. and Minnesota from 1980 Census of Population, FBMA from survey

Table 6. Forms of business organization on farms selling $1,000 or more of hogs and pigs, U.S., Minnesota and FBMA

	U.S.	Minnesota	FBMA
		- - - Percent of Farms - - -	
An individual operation (sole proprietorship)	85.6	87.0	76
A partnership (other than husband and wife or limited)	11.1	11.0	22
A corporation	2.8	1.7	2
Family held corporation	(2.6)	(1.7)	[a]
Cooperatives, Estates, Trusts, Institutions, etc.	0.5	0.3	0
		- - - Number of Farms - - -	
Total farms	91,892	6,682	85

Source: U.S. and Minnesota from 1987 Census of Agriculture, FBMA from survey

[a]The FBMA farm survey did not distinguish between family held and other corporations.

Facilities

The type of facilities on the farms is probably the most important factor determining productivity, as well as the ease with which new production practices and technologies such as porcine somatotropin can be adopted. In the longer run, facilities will eventually need to be renovated and perhaps expanded or even replaced with entirely new facilities. At this point, choice of facility type and size, and adoption of new technologies, are important questions to be addressed. There are tradeoffs between capital investment, labor needs and performance in swine production facilities. Experts seldom agree about exactly what these tradeoffs are. Management skill and form of business organization are also important considerations. Recent trends have been toward larger, capital intensive confinement facilities. On the other hand, some producers in the Southeastern U.S. and in England are reconsidering low-investment systems such as pasture farrowing.

The producers were asked to characterize their farrowing, nursery, breeding herd and growing-finishing facilities. Most of the operations are using central farrowing houses with raised crates or a liquid manure system. Only three farms were farrowing entirely in individual sow houses or huts. A wide variety of finishing facilities are in use. More farms have a combination of several types of finishing facilities than have any one type of facility. Open-shelter buildings on drylot are the largest group on farms with only one type of finishing facility (Table 7).

Table 7. Types of Facilities on Surveyed Farms

	Farms	Percent
Farrowing facilities		
Central farrowing house, raised crates or liquid manure system	54	72
Central farrowing house, solid floor, crates or pens, solid manure system	10	13
Individual sow house or hut	3	4
Combination	8	11
Total	75	100
Nurseries		
Enclosed, raised decks, liquid manure	58	82
Enclosed, solid floor, solid manure	7	10
Individual sow house or hut	3	4
Other	2	3
Combination	1	1
Total	71	100
Breeding herd facilities		
Enclosed, total slatted, mechanically ventilated, individually housed (crates/tethers)	11	15
Naturally ventilated but confined in pens	15	20
Open-shelter on drylot, naturally ventilated with access to outside lots	45	60
Combination	4	5
Total	75	100
Growing-finishing facilities		
Enclosed, total slatted, mechanically ventilated	6	7
Enclosed, partial slatted, mechanically ventilated	7	8
Open-shelter, partial slatted, naturally ventilated	6	7
Open-shelter on drylot	28	34
Remodelled barn, solid manure system	5	6
Combination	31	38
Total	83	100

Labor Use

Any comparison of swine facilities and farm sizes requires estimates of labor use. Pork Industry Handbook fact sheet PIH-48, "Pork Production Systems with Business Analyses - Selecting the Right System", revised in 1984, provides estimates by production system but not by enterprise size.

The labor use questions on the survey provide information to check against the PIH-48 estimates for farrow-to-finish enterprises and give a rough estimate of the impact of enterprise size. Producers were asked how many hours per week they worked in the hog enterprise, on average, in 1988 (see Appendix, question 23 on the questionnaire). The responses were multiplied by 52 for annual totals, and divided by the average number of sows for a per sow figure. The results are shown in Table 8 for those facility types and size categories for which there were three or more enterprises among the surveyed farms. Farms with liquid manure systems averaged 23 hours per sow. The PIH-48 estimates for high investment confinement systems are 22 hours of time directly involved in swine production, and 28 hours of total labor including time for planning, keeping records and attending to other overhead items that are part of running a farm business. Our survey shows an average of 34 hours per sow for solid manure systems, compared to 34 hours of direct labor and 45 hours of total labor from PIH-48.

Labor efficiency gains show clearly as enterprise size increases from the 50 sow or less category to over 50 sows. For the liquid manure systems, there is a less dramatic improvement in labor efficiency as size increases to the over 200 sow category.

Table 8. Farrow-to-Finish Labor Hours Per Sow, By Farrowing Facility and Enterprise Size

	Farms	Hours/ Sow/Year
Central farrowing house, raised crates or liquid manure system		
50 sows or less	4	33
51-100	18	22
101-200	7	23
Over 200 sows	5	18
All sizes	34	23
Central farrowing house, solid floor, crates or pens, solid manure system		
50 sows or less	4	43
51-100	3	23
101-200	0	-
Over 200 sows	0	-
All sizes	7	34
All facility types		
50 sows or less	9	40
51-100	25	21
101-200	11	24
Over 200 sows	6	18
All sizes	51	25

The enterprise analyses that have traditionally been published for the associations have included hired labor expenses but not a charge for unpaid operator or family labor (see, for example, Olson et al. Table 11-2). In recent years, the analyses have been based on the FINANX output format. This format is relatively easy for farmers to understand and relate to their accounting records, and has been widely adopted with the use of the FINPACK system nationwide. Estimates of total labor hours were obtained in the survey in order to evaluate the impact of imputing a labor cost by size. Table 9 compares costs and returns by size for the 51 farrow-to-finish enterprises. The proportion of total labor needs which are hired (reported as paid a cash wage) rises with size, from less than one percent in the less than 50 sow category to 76 percent for the group with over 200 sows. The "Total Listed Costs" line of Table 9 shows all costs included in the association summary. The next line shows an unpaid labor charge imputed at a cost of seven dollars per hour. Seven dollars is the rate charged for unskilled labor in recent crop enterprise planning budgets. The reported hired labor expense was also divided by reported hours of hired labor to arrive at a per hour labor cost. This hired labor cost, shown at the bottom of Table 9, averaged slightly over six dollars per hour over the 51 enterprises. The average hired labor cost per hour of $33.33 per hour in the smallest size category appears unrealistic, and may be due to under-reporting of labor hours in the survey.

The imputed unpaid labor cost averaged $7.77 per hundredweight for enterprises of 50 sows or less, dropping to $0.82 per hundredweight for those over 200 sows. The total labor cost including both hired and unpaid labor averaged $8.27 for the small size category and decreased to $3.76 at over 200 sows. The largest two size categories average relatively lower in total cost per hundredweight (listed costs plus the imputed unpaid labor charge) when unpaid labor is included, compared to the smaller sizes. This evidence suggests that leaving the unpaid labor out of listed costs may be distorting cost-size relationships as they relate to long-run competitiveness issues. It also appears that total cost per hundredweight is being underestimated in the association summaries. For typical producers who value their unpaid labor at seven dollars per hour, the underestimate is about 10 percent.

Equity capital and management are two other resources which are not valued in the above cost analysis. Imputing charges on equity capital and management is even more difficult than imputing a labor charge, and so was not attempted in this study.

Table 9. Impact of Including Unpaid Labor Costs in Total Cost and Net Return Calculations, Farrow-to-Finish Enterprises

	Average Number of Sows				
	50 or less	51-100	101-200	Over 200	All Enterprises
Enterprises	9	25	11	6	51
Total Labor Hours Per Sow	40	21	24	18	25
Percent Hired	1.3	15	23	76	21
Hired Labor Hours Per Sow	0.4	3.2	5.5	13.7	5.2
Pork Produced Per Sow (cwt.)	34.6	29.0	32.0	33.6	31.2
		- - - per hundredweight sold - - -			
Labor Hours Per Hundredweight					
Total	1.13	0.77	0.76	0.57	0.81
Hired	0.015	0.12	0.17	0.43	0.17
Hired Labor Expense	$0.50	$0.78	$1.01	$2.94	$1.04
Total Listed Costs (including hired labor)	38.20	40.64	36.22	42.75	39.51
Unpaid Labor Cost (imputed at $7/hr.)	7.77	4.12	3.64	0.82	4.28
Total Labor Cost	8.27	4.90	4.65	3.76	5.32
Total Listed Costs Plus Unpaid Labor	45.97	44.76	39.86	43.57	43.79
Total Return	42.95	40.10	42.16	42.00	41.26
Net Return	-3.02	-4.66	2.30	-1.57	-2.53
		- - - per hour of hired labor - - -			
Hired Labor Cost Per Hour	33.33	6.50	5.94	6.84	6.12

Production Practices

Sixty five percent of the operators described their crossbreeding systems as mainly rotations. Terminal crosses were used by another 23 percent of the group with the other 12 percent following terminal crosses with rotation of breeds in the sow line. The main sources of boars in 1988 were purebred suppliers at 57 percent, but another 36 percent of the boars came from corporate suppliers. Most gilts were chosen from the existing herd, but 21 percent came from the corporate suppliers (Table 10). Feed conversion was the criterion most often cited as most important when purchasing boars. Many producers felt that feed conversion and days to market were closely correlated. Carcass merit or backfat was the second most often cited as the most important criterion. The boar's genetics have a significant effect on litter size, so this criterion was included to help

evaluate the need for educational programs on this topic (Christians and Johnson). A small but significant number of the producers cited litter size as an important criterion (Table 11).

A majority of the farms follow a feeding program combining corn and a complete supplement. Another one-third use a base mix with grain and soybean meal (Table 12). More than half of the farms use portable grinder mixers with weigh cells, but a variety of other mixing equipment is also used (Table 13).

On-farm computers are common on the farms, with 31 percent using them for swine production records and/or to help make decisions about the hog operation. Seven percent use mail-in production record systems. However, a majority (62 percent) use neither of these, apparently using manual systems or no formal production record systems. The two on-farm software packages used to keep hog operation records or to help with decisions about the hog operation are PC Mars, an accounting package supported by the association fieldmen (15 users), and the PigCHAMP production record system which up until recently has been marketed by the University of Minnesota Veterinary College (9 users). PigCHAMP is now marketed by commercial software vendors under license from the University. Two farms reported using other packages.

Many veterinarians in Minnesota and other states have been moving toward a greater consulting role, and away from visiting farms only to treat disease outbreaks. However, only 13 percent of the farms reported having contractual arrangements for regularly scheduled veterinarian visits.

Table 10. Sources of breeding stock in 1988, farms farrow-to-finish, feeder pig or mixed enterprises

	Percent from source	
	Boars	Gilts
Purebred suppliers	57	3
Corporate suppliers	36	21
Other commercial breeders	4	4
Own herd	3	72
Total from all sources	100	100

Table 11. Most important criteria when purchasing boars

	Times ranked[a]		
	1	2	3
Carcass merit or backfat	26	20	16
Days to market	13	22	29
Feed conversion	28	21	20
Litter size	11	8	7

[a](1 = most important, 2 = next most important, 3 = third most important)

Table 12. Feeding programs used

	Farms	Percent
Purchase complete mixed, non-pelleted feed	4	5
Combine corn and a supplement	48	57
Combine a base mix (or premix) with grain and soybean meal	29	34
Combine separate premix, lime, dical, salt, grain and soybean meal	2	2
Feed or corn bank	2	2
Total farms	85	100

Table 13. Type of feed mixing equipment

	Farms	Percent
Portable grinder mixer, no weigh cell	9	11
Portable grinder mixer with weigh cell	44	53
Continuous meter type mixer (automatic electric mill)	13	15
Stationary batch mixer, vertical type, not automatic	2	2
Automatic stationary batch mixer	2	2
Custom, feed or corn bank	13	15
None or no response	2	2
Total farms	85	100

Productivity and Efficiency

An environmentally controlled central farrowing house allows year-round farrowing, and in connection with a "hot" nursery, allows earlier weaning for increased litters per sow per year, compared to individual huts. The higher capital investment required for the central facility makes the more intensive use critical to the economic viability of the enterprise. This shows up clearly in the survey results, with the enterprises with central farrowing houses farrowing more litters per year along with an increased average litter size. The smaller litter sizes on the farms with individual sow huts may be due to using a higher proportion of gilts. The 13.8 pigs per sow per year with the central farrowing house with raised crates or liquid manure system is 67 percent above the 8.3 pigs average of the three farms using individual huts (Table 14). Despite this advantage, profitability of mid-sized enterprises with central farrowing houses was less than that for the small group of three farms in the same size category that used the individual huts (Table 15). There were not enough enterprises outside this size range for comparison. An imputed charge on unpaid labor was subtracted to get the net returns shown in Table 15.

Table 16 shows a steady increase in litters per sow per year as enterprise size increases. The trend in pigs weaned per litter is less clear. The number of pigs weaned per litter is largest on the smallest farms. The

increased number of litters roughly offsets the smaller litter size for the mid-sized farms, but for farm over 200 sows the net effect is to increase pigs per sow per year over the smaller sizes.

Table 17 compares pre-weaning mortality by type of farrowing facility for the farrow-to-finish and feeder pig enterprises. The three enterprises using individual sow houses weaned a surprising 95 percent of the pigs born. A few of the larger farms with central farrowing houses and liquid manure systems suffered disease problems in 1988, which probably contributed to the low 83 percent average in this group. It is typically more difficult to determine how many pigs are born alive in outdoor farrowing systems. Perhaps the farms with central farrowing houses did a better job of accounting for dead pigs, because of easier access to the pigs, biasing the mortality figures. The conventional wisdom is that death losses should be lower in a central farrowing house system. These results show that it is possible, at least on these three farms, to minimize death losses in individual sow houses, a finding which should be useful given the current interest in improving animal welfare.

Feed conversion efficiency in different types of finishing facilities is compared in Table 18. Enclosed, partially slatted facilities gave the highest efficiency for the farrow-to-finish enterprises. Many of the finishing enterprises used a combination of different facilities, making the results difficult to interpret.

Table 14. Sow Productivity by Type of Farrowing Facility, Farrow-to-Finish and Feeder Pig Enterprises

Facility type	Enterprises	Litters/ Sow/Year	Pigs/ Litter	Pigs/Sow/ Year
Central farrowing house, raised crates or liquid manure system	43	1.78	7.75	13.8
Central farrowing house, solid floor, crates or pens, solid manure system	8	1.61	8.26	13.3
Individual sow house or hut	3	1.33	6.24	8.3
Combination	8	1.59	7.67	12.2
All enterprises	62	1.71	7.78	13.3

Table 15. Profitability Comparison of 51-200 Sow Farrow-to-Finish Enterprises, by Farrowing Facility

Facility type	Farms	Net Return/ Cwt.
Central farrowing house, raised crates or liquid manure system	25	$-3.54
Central farrowing house, solid floor, crates or pens, solid manure system	3	-0.98
Individual sow house or hut	3	1.41
Combination	5	-0.82
All Enterprises	36	-2.54

Table 16. Sow Productivity by Enterprise Size, Farrow-to-Finish and Feeder Pig Enterprises

Average Number of Sows	Enterprises	Litters/ Year	Pigs/ Litter	Pigs/Sow/ Year
50 or less	12	1.65	8.36	13.8
51-100	29	1.67	7.30	12.2
101-200	14	1.72	8.14	14.0
Over 200	7	1.96	7.81	15.3
All enterprises	62	1.71	7.78	13.3

Table 17. Pre-weaning Mortality by Type of Farrowing Facility, Farrow-to-Finish and Feeder Pig Enterprises

Facility type	Farms	Weaned Pigs as Percent of Born
Central farrowing house, raised crates or liquid manure system	42	83
Central farrowing house, solid floor, crates or pens, solid manure system	8	87
Individual sow house or hut	3	95
Combination	9	83
All Enterprises	62	84

Table 18. Feed Efficiency by Type of Finishing Facility, Farrow-to-Finish and Finishing Enterprises

Facility type	Farrow-finish Enterprises	Farrow-finish Lbs. Feed/ Lb. Gain	Finishing Enterprises	Finishing Lbs. Feed/ Lb. Gain
Enclosed, total slatted, mechanically ventilated	6	4.08	0	-
Enclosed, partial slatted, mechanically ventilated	7	3.58	0	-
Open-shelter, partial slatted or on drylot, naturally ventilated	20	3.97	8	4.13
Remodelled barn, solid manure system or combination	18	3.98	14	3.59
All enterprises	51	3.93	22	3.79

Marketing Practices

A key issue in the swine industry is quality of the product, and how to improve it most effectively. Related to this is the extent to which producers are marketing on a carcass merit or grade and weight basis. Twenty three percent of the producers reported marketing all of their production on a grade and weight basis. Another 32 percent marketed some hogs on a grade and weight basis and some on a liveweight basis. The percentage marketed grade and weight was 38 percent when averaged across the 72 farrow-to-finish and finishing enterprises represented (Table 19). Hogs marketed grade and weight must be delivered directly to the packing plant, which may involve longer hauling distances. Larger producers who can deliver in truckload lots may find it more cost-effective to market over these longer distances, which may explain in part why farrow-to-finish enterprises with over 200 sows market over twice as high a percentage of their hogs grade and weight, compared to smaller operations.

The merged survey and accounting summary database allowed analysis of average price received by percent marketed grade and weight and by enterprise size. Table 20 shows the preliminary result of an ordinary least squares regression of price on percent marketed grade and weight and on number of litters farrowed in 1988, for the 51 farrow-to-finish enterprises in the group. Enterprises where a higher percentage was marketed in this way, and larger enterprises, received higher prices. A typical producer marketing 100 percent grade and weight and farrowing 200 litters received $1.65 more per hundredweight than someone of the same size marketing liveweight. A producer four times as large received a predicted $2.31 more:

Percent Grade/Weight	Litters in 1988	Predicted Price/cwt.
0	200	$42.99
100	200	44.64
100	800	46.95

The price difference for grade and weight marketers may be due to their knowing they have better quality hogs, and choosing this marketing method as a result. It may also be due in part to a correlation with general management ability, i.e. someone with better quality hogs may also be better at timing sales to hit price peaks. The higher prices for larger enterprises may be due to their ability to have someone specialize in marketing. They may also be due in part to volume premiums paid by the packers.

Table 19. Percent of Production Marketed on a Grade and Weight Basis

	Percent
	average of percentages reported by farms
Farrow-to-finish enterprises	
100 sows or less	33
101-200 sows	32
Over 200 sows	70
All farrow-to-finish	37
Finishing enterprises	39
Both farrow-to-finish and finishing	38
	percent of total production
Total production marketed (mill. lbs.)	21.1
Production marketed grade and weight (mill. lbs.)	10.8
Percent of production marketed grade and weight	51%

Table 20. Impact of Grade and Weight Marketing and Enterprise Size on Average Price Received

	Coefficient	Standard Error
Constant	0.422	
Percent grade and weight	0.000164[a]	0.000066
Number of litters farrowed per year	0.000038[a]	0.000016
N = 51	R^2 = 0.257	

[a]Less than 5 percent chance that true value of the coefficient is zero.

Expansion Plans

A majority of the producers plan to maintain their operations at their present sizes over the next five years, but 28 percent plan to expand. Only a few plan to decrease in size. However, operators identified by the fieldmen as planning to exit in the next year or two were not surveyed, so only two producers of those surveyed indicated that they planned to get out of hog production (Table 21). Ten farms planned expansions in the 10 to 25 percent range, with another nine planning to double in size.

Table 21. Plans for hog operation for next five years

	Farms	Percent
Expand the size of your hog operation	24	28
Maintain roughly its present size (+/- 5%)	54	64
Decrease its size	5	6
Get out of hog production[a]	2	2
Total farms	85	100

[a]Operators expected to exit in the next year or two were not surveyed.

Attitudes About Biotechnology Adoption

Two-thirds of the 85 producers (57) reported attending meetings, conferences or seminars in the past year where scientific advancements and/or management strategies in pork production were the principal topic of discussion. Three-quarters of the producers (65) reported having heard of porcine somatotropin (PST) before the interviews. Of the 65 producers who had heard of PST, 52 percent reported hearing "some" information about it, with 28 percent hearing "a great deal" and 20 percent hearing "very little". Farm magazines and conferences seem to be the main sources of information on PST. Twenty seven producers reported receiving "a great deal" of information from magazines, with 30 receiving "some". Eleven received "a great deal" from conferences, seminars or workshops, and 19 received "some" (Table 22). Most were "cautiously optimistic" about it assuming a three dollar return and the other information included in the scenario described by the interviewer. Some were "enthusiastic" but more were "skeptical" (Table 23). Most planned to wait and see how it works for others before trying it. Only a few of the producers planned to have a veterinarian participate in the decision (Table 24). If four injections are required, few planned to adopt it immediately, preferring to try it first on a few animals (Table 25). They were evenly split between those planning to adopt it within a year and those planning to wait one to two years (Table 26). Eight treatments per pig over the finishing period would deter all but a few producers from adopting it. If only two treatments are required, a much higher proportion would adopt it immediately (Table 27).

A high proportion of the producers seem to believe that leaner pork produced using PST will mean greater consumer demand for pork products, but they are evenly split about whether consumers will substitute pork for beef and poultry. Most (47) feel that PST will make it more difficult for Minnesota farmers to compete against large hog operations in other states, but many (27) feel just as strongly that there will be no adverse impact. They seem to largely have their minds made up on this issue. Most agreed that farmers will have to market on a grade and weight basis to fully benefit from PST, but are divided on the impact on U.S. producers' competitive advantage in the world market. The information presented to the producers in the

interview does not clearly spell out assumptions about whether producers in other countries will adopt before or after U.S. producers, which may account for some of the divided opinions on this question. There is substantial agreement that consumers will be wary of pork produced with PST (Table 28).

Most of the producers preferred the beta agonists over PST because injections would not be needed with the former. It is interesting to note that when the interviews were started in early summer, the first few producers largely preferred PST. Opinion switched toward the beta agonists later in the summer, which may have been due to publicity that came out around that time that was favorable to the beta agonists (Table 29). Early indications were that use of the beta agonists in finishing hogs would require a withdrawal period. It would be very difficult if not impossible to feed finishing hogs a different feed without the additive over the last week or two of finishing on most of these farms, given the feeding systems now in place. Recently announced beta agonist products do not require a withdrawal period. This change should greatly improve acceptability with these producers.

Questions on attitudes toward risk seemed to indicate that the producers generally viewed themselves as conservative. They did not generally feel that the hog operations were secondary to the other enterprises on the farm (Table 30). Responses to another question seem to indicate that the producers are satisfied with the University of Minnesota's activities related to biotechnology. Substantially more producers (46 percent) thought the University should be doing more than thought it should do less in this area (5 percent). Forty nine percent preferred about the same level of activity as at present. No one responded that the University should do no research at all in this area.

The relationship between the producers' business characteristics and their plans to adopt PST was also analyzed. The details of the analysis are presented in Lazarus. The three factors that were positively related to adoption were computerized records, enclosed finishing facilities and completion of college.

Table 22. Information Received about PST From Different Sources

	great deal	some	very little	none
	number of responses			
Mass media (radio, TV, newspapers	1	9	16	39
Farm magazines	27	30	6	2
Commercial dealers/salespersons	1	10	14	40
Friends and neighbors	0	8	13	44
Extension specialists	2	14	9	40
Conferences/seminars/workshops	11	19	9	26

Table 23. Reactions to PST Based Upon the Scenario Provided

	Farms	Percent
Enthusiastic	8	9
Cautiously optimistic	58	69
Skeptical	14	16
Opposed	3	4
Indifferent	2	2
Total farms	85	100

Table 24. Participants in the Decision to Use PST

	Responses	Percent
Self	78	59
Spouse	23	18
Other family members	10	8
Owner(s)	2	2
Partner(s)	14	11
Veterinarian	2	2
Total responses	129	100

Table 25. Likely Responses When PST Becomes Available

	Farms	Percent
Will probably adopt this product immediately	3	4
Will probably experiment by trying it first on a few animals	33	39
Will probably wait to see how it works for others	43	50
Will probably or definitely not adopt it	6	7
Total farms	85	100

Table 26. Timing of PST Adoption

	Farms	Percent
Immediately	5	6
Within a year	36	42
From 1 to 2 years	36	42
More than 2 years	4	5
Not adopt or no response	4	5
Total farms	85	100

Table 27. Likely Use of PST if Eight or Two Injections are Required Instead of Four

	immed-iately	within 1st year	1-2 years	more than 2 years	will not adopt	decision made by others
				number of responses		
8 injections	0	7	6	7	64	0
2 injections	24	41	13	1	5	0

Table 28. Expected Likely and Unlikely Outcomes from Farmers' Use of PST

	likely	unsure	unlikely
	number of farms		
Leaner pork produced using PST will mean greater consumer demand for pork products.	56	21	8
Use of PST will encourage consumers to substitute pork for beef and poultry.	28	28	29
As a result of PST, Minnesota farmers will find it more difficult to compete against large hog operations in other states.	47	11	27
To fully benefit from PST, farmers will have to market their hogs on a grade and weight basis.	74	10	1
U.S. hog producers will likely gain a competitive advantage in the world pork market by using PST.	20	34	31
Consumers will be wary of pork produced with PST.	66	18	1

Table 29. Preferences for PST and the Beta Agonists

	Farms	Percent
Prefer PST over beta agonists	13	15
Prefer beta agonists over PST	56	67
Use both of them together, if this is feasible	13	15
Not likely to use either one of them	2	2
No response	1	1
Total farms	85	100

Table 30. Risk Attitudes

	strongly agree	agree	disagree	strongly disagree
	number of farms			
I like to try new farming methods before they are adopted by my neighbors.	4	41	38	2
I am reluctant to try new ways of doing things until I see how they have worked for others.	1	47	36	1
I take more risks in my hog operation than my other operations.	0	13	65	7
My hog operation is secondary to my other operations.	5	15	44	21

Importance of the Swine Industry to Minnesota's Economy

Shifts in the structure of the swine industry caused by new technologies have indirect impacts on the rest of Minnesota's economy. For this and other reasons, policymakers and industry leaders often ask how important the swine industry is to the state. A number of measures can be used for comparing swine to other agricultural subsectors and to the nonfarm sector of the economy. Farm value of hogs sold is a convenient measure. It has the drawback that it does not tell us how much of this value goes to employee wages, farm operator profits and taxes to the community as opposed to payments for inputs from outside the community or state. Another measure is employment, both directly on the farm, "upstream" in input supply firms, and "downstream" in meat processing and food distribution. A third measure is value added, which is the total of employee compensation, indirect business taxes, proprietary income and other property income such as rental income, corporate profits and net interest received.

Value added is a different concept from the farm value of hogs sold. At the individual farm level, the farm value of hogs sold goes to pay for inputs purchased such as feed and equipment, and the remainder such as wages, profits and taxes remain and are included in value added. Some of the money used to purchase inputs from local input suppliers goes to pay for their inputs, and the remainder is value added as an indirect effect of the farmer selling his hogs. When looking at all of the farms and input suppliers at an aggregated level, then, value added nets out the share of payments going for purchases from outside of Minnesota but adds in multiplier effects from secondary purchases in the community.

It is incorrect to add the farm value to value added, as the reader may be tempted to do. This would be "double counting" because a large share of the farm value goes to pay for purchases included in the value added figure.

An analysis of the industry's impact on the state's economy was done using the USDA Forest Service IMPLAN input-output model. The model estimates total value added and employment by industry group along with a number of other measures. The economy was aggregated into 46 state-

level industry groups for this analysis. The industries are linked by a matrix of multipliers reflecting each industry's purchases from the others as percentages of that industry's output. The IMPLAN model is specified using economic statistics for 1982.

There were 16,500 farms with hogs in Minnesota in 1988, representing about one of every six Minnesota farms. These producers sold 1.72 billion pounds (liveweight basis) of pork that year, with a gross value of $755 million at the farm level. Most of these farms produce crops and may have other livestock as well, so the swine enterprises employ only part of the operator's time. The number of hog farms is down from 24,000 in 1982. However, pork sold is up from 1.58 billion pounds with a farm value of $852 million in 1982.

To put employment on a basis roughly comparable with the non-farm sector, the full-time equivalent of this part-time employment was estimated as follows. Pork Industry Handbook estimates are that a high investment confinement farrow-to-finish facility typically requires about 28 hours per sow. Low investment systems take about 45 hours per sow. Taking the midpoint of 36 hours per sow and assuming 2,500 hours per full-time worker equivalent, the 462,000 sows farrowing in 1988 would require the equivalent of 6,650 full-time workers employed on farms.

IMPLAN calculates impacts of an industry on other industries by means of a set of multipliers. There are two types of multipliers provided. Type I multipliers look only at the business sector. They relate the sum of indirect effects of secondary purchases in "upstream" processing, but excluding wages; plus direct effects of first round purchases, equivalent to gross outlays from the industry but excluding wages; divided by direct effects. Type III multipliers add in household effects. They relate the sum of induced effects of household consumption purchases stimulated by wages; plus indirect and direct effects; divided by direct effects.

"Upstream" effects are the effects in industries that provide inputs purchased by the downstream industry being analyzed. Taking hog farms as the downstream industry, upstream industries would be such industries as feed suppliers and construction firms. The type multipliers give a measure of the upstream effects.

A summary of the IMPLAN output is as follows:

Total 1982 Minnesota Employment	1,813,784
Direct Hogs, Pigs and Swine Employment	6,630
Indirect Hogs, Pigs and Swine Employment	10,680
Induced Hogs, Pigs and Swine Employment	6,659
Total	23,969
Percent of State Employment Related to Hogs	1.32
Total 1982 MN Value Added (Gross State Product, millions)	$56,834.3
Direct Hogs, Pigs and Swine Value Added (millions)	6,630
Indirect Hogs, Pigs and Swine Value Added, millions)	10,680
Induced Hogs, Pigs and Swine Value Added, millions)	6,659
Total	23,969
Percent of State Value Added Related to Hogs	1.18

For the hogs, pigs and swine industry, direct employee compensation in 1982 was $51.8 million, indirect business taxes were $17.7 million, proprietary income was $19.3 million and other property income was $7.9 million. The values above do not include effects downstream from the farm such as in the meat processing industry. These downstream effects are difficult to estimate because pork processing is grouped with cattle and lambs. Direct employment in meatpacking was 7,418, with value added of $161.0 million. How much of this is related to pork? One way to arrive at pork's share is to use its proportion of total livestock cash receipts, assuming that the labor hours and cost for processing is proportional to value. In 1988, cash receipts from hogs were $750 million, or 44 percent of the total for hogs, all cattle and calves, and lambs of $1,719 million. Assuming 44 percent of the employment and value in meatpacking is for pork, its employment would be 3,264 with value added of $70.8 million. Production of sausages and other prepared meats is a separate industry group, and its direct employment is 1,276 with $23.5 million in value added. There would be some additional employment and value from the next step in the chain, food distribution and retailing, but no attempt was made to add that in.

The summary with adjustments for downstream pork processing impacts is then:

Total 1982 Minnesota Employment	1,813,784
Direct Hogs, Pigs and Swine Employment	6,630
Indirect Hogs, Pigs and Swine Employment	10,680
Induced Hogs, Pigs and Swine Employment	6,659
Direct Downstream Employment:	
Meatpacking, 44 Percent	3,264
Sausages and Other Prepared Meats	1,276
Total	28,509
Percent of State Employment Related to Hogs	1.57
Total 1982 MN Value Added (Gross State Product) (millions)	$56,834.3
Direct Hogs, Pigs and Swine Value Added (millions)	96.8
Indirect Hogs, Pigs and Swine Value Added, millions)	363.6
Induced Hogs, Pigs and Swine Value Added, millions)	211.1
Direct Downstream Value Added:	
Meatpacking, 44 Percent	70.8
Sausages and Other Prepared Meats	23.5
Total	765.8
Percent of State Value Added Related to Hogs	1.35

It must be kept in mind that these numbers are only rough estimates. The IMPLAN model requires a considerable database of coefficients, not all of which are as precise as one would like. It does seem safe to say that the swine industry is an industry worth roughly three-quarters of a billion dollars either measured by farm value of hogs sold or as value added to the state's economy, and it employs somewhere between 20 and 30 thousand people.

REFERENCES

Carley, D. and S. Fletcher. "An Evaluation of Management Practices Used by Southern Dairy Farmers." Journal of Dairy Science 69(1986):2458.

Christians, C. and R. Johnson. "Crossbreeding Programs for Commercial Pork Production." Extension Folder 361, Agricultural Extension Service, University of Minnesota, St. Paul, December 1987.

Hayenga, M. Department of Economics, Iowa State University, personal communication, April, 1989.

Kalter, R., R. Milligan, W. Lesser, W. Magrath, L. Tauer and D. Bauman. "Biotechnology and the Dairy Industry: Production Costs, Commercial Potential and the Economic Impact of the Bovine Growth Hormone." Agricultural Economics Research 85-20, Department of Agricultural Economics, Cornell University, Ithaca, New York, 1985.

Kalter, R. and L. Tauer. "Potential Economic Impacts of Agricultural Biotechnology." American Journal of Agricultural Economics 69(1987):420-25.

Kauffman, J. and L. Tauer. "Successful Dairy Farm Management Strategies Identified by Stochastic Dominance Analyses of Farm Records." Northeast Journal of Agricultural and Resource Economics 15(1986):168.

Lazarus, W. "Midwest Pork Producers' Characteristics and Planned Use of Somatotropin." Staff Paper P90-35, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul, May 1990.

Lazarus, W. and T. Smith. "Adoption of Computers and Consultant Services by New York Dairy Farmers." Journal of Dairy Science 71(1988):1667-1675.

Lemieux, C. and J. Richardson. "Economic Impacts of Porcine Somatotropin on Midwest Hog Producers." North Central Journal of Agricultural Economics 11(1989):171-182.

Maddala, G.S. Limited dependent and qualitative variables in econometrics. Cambridge University Press, Cambridge, 1983.

Olson, K.D., L.L. Westman and R.R. Loppnow. "Southeastern Minnesota Farm Business Association 1988 Annual Report." Economic Report ER89-1, Department of Agricultural and Applied Economics, Institute of Agriculture, St. Paul, Minnesota 55108, May, 1989.

Olson, K.D., E.J. Weness, D.E. Talley, P.A. Fales and R.R. Loppnow. "Southwestern Minnesota Farm Business Association 1988 Annual Report." Economic Report ER89-2, Department of Agricultural and Applied Economics, Institute of Agriculture, St. Paul, Minnesota 55108, May, 1989.

Olson, K. and D. Tvedt. "On Comparing Farm Management Associations and the Farm Population." Staff Paper P87-29, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul, Minnesota, September 1987.

APPENDIX

PST SCENARIO

Porcine somatotropin (PST) is a product that is being developed for hog production. It is a naturally-occurring hormone that now can be manufactured in large quantities using biotechnology. It should be available to pork producers in a couple of years. It is claimed that PST will make hogs grow faster on less feed while producing a leaner carcass.

> The following information is drawn from current research on PST. The actual performance of the product, when released, may differ from these estimates.

Potential advantages to farmers from using PST include:

* feed efficiency will be improved by about 25%, resulting in a savings of over 100 lb. of feed per hog.
* hogs will display improved average daily weight gains, reaching market weight about 8 days earlier.
* backfat will be substantially reduced (about 1/3). The size of loin eye and other muscles will be increased.
* leaner hogs could bring higher market prices, especially if marketed on a grade/weight basis.
* for every $1 invested in PST, farmers will likely receive a financial return of about $3 (reduced feed costs, carcass merit benefits, etc.)

Potential disadvantages to farmers from using PST include:

* research suggests that hogs will likely have to be injected with PST four times during the last 140 lbs. of growth.
* hogs will have to be fed more nutritious feed (17% crude protein compared to the presently recommended 14%).
* dressing percentage will be reduced by up to 3.4%.
* farmers may have to keep more detailed production and marketing records to take full advantage of PST.
* PST may contribute to a long-term increase in pork production, which could result in lower market prices if not offset by increased consumer demand.
* there could be adverse consumer reaction to pork produced using PST.

Another potential new group of products for pork production are chemical products called **"beta agonists."** A financial return of about 3 to 1 is anticipated from the use of these products.

An important **advantage** of beta agonists is that they can be mixed with feed rations rather than, as with PST, having to be injected in animals. Also, dressing percentage is increased (by up to 1.5%) whereas PST reduces dressing percentage (by up to 3.4%).

A relative **disadvantage** of beta agonists is that they result in smaller increases in feed efficiency than does PST (with PST, animals can be marketed 8 days earlier as compared to 2 days earlier with beta agonists). Also, the reduction in backfat is substantially less with beta agonists than PST (10% and 35%, respectively).

Date _____

Farm no. _____

Management and Technology Survey of Minnesota Pork Producers

The purpose of this questionnaire is to collect supplementary information from pork producers in the Southwestern and Southeastern Minnesota Farm Business Management Association. The information is intended to help identify applied research and educational program needs in farm management for Minnesota pork producers, as well as to evaluate likely adoption of new technologies such as porcine somatotropin. The individual making most day-to-day decisions for the operation will be in the best position to provide this information.

Name and address _____

_____

1. Which of the following best describes your facilities? *(CHECK ALL THAT APPLY)*

<u>Farrowing facilities</u>

_____ Central farrowing house, raised crates or liquid manure system

_____ Central farrowing house, solid floor, crates or pens, solid manure system

_____ Individual sow house or hut

_____ Portable farrowing unit, self-contained manure system

_____ Other (specify) _____

<u>Nurseries</u>

_____ Enclosed, raised decks, liquid manure

_____ Enclosed, solid floor, solid manure

_____ Other (specify) _____

<u>Breeding herd facilities</u>

_____ Enclosed, total slotted, mechanically ventilated, individually housed (crates/tethers)

_____ Naturally ventilated but confined in pens

_____ Open-shelter on drylot, naturally ventilated with access to outside lots

_____ Other (specify) _____

<u>Growing-finishing facilities</u>

_____ Enclosed, total slotted, mechanically ventilated

_____ Enclosed, partial slotted, mechanically ventilated

_____ Open-shelter, partial slotted, naturally ventilated

_____ Open-shelter on drylot

_____ Other (specify) _____

Type of bedding used, if any _____

2. Which of the following best describes your feeding program? *(CHECK ONE ANSWER)*

____ Purchase complete mixed, pelleted feed
____ Purchase complete mixed, non-pelleted feed -|- > **(GO TO QUESTION 4)**
____ Combine corn and a supplement
____ Combine a base mix (or premix) with grain and soybean meal
____ Combine separate premix, lime, dical, salt, grain and soybean meal
____ Other (specify) _____

3. If you mix your own feed, what type of feed mixing equipment did you mainly use in 1988? *(CHECK ONE ANSWER)*

____ Portable grinder mixer, no weigh cell
____ Portable grinder mixer with weigh cell
____ Continuous meter type mixer (automatic electric mill)
____ Stationary batch mixer, vertical type, not automatic
____ Automatic stationary batch mixer
____ Other (specify) _____

4. Do you use an on-farm computer or computerized mail-in swine production record system to keep hog operation records and/or to help make decisions about your hog operation? *(CHECK ALL THAT APPLY)*

____ On-farm computer
____ Mail-in production record system
____ Neither

- - - > **(GO TO QUESTION 6)**

5. What are the primary software packages you use to keep hog operation records and/or to help make decisions about your hog operation?

_____

_____

6. Do you have a contractual arrangement with a herd health or veterinary consultant for regularly scheduled visits?

____ Yes ____ No

(Complete questions 6-8 only if farrowing sows on the farm)

7. What crossbreeding system do you mainly use? *(CHECK ONE ANSWER)*

____ Rotation ____ Rotaterminal (terminal cross with rotation of breeds in sow line)
____ Terminal cross ____ Unplanned

8. What percent of your breeding stock came from the following sources in 1988?

Boars	Gilts	
____	____	Purebred suppliers
____	____	Corporate suppliers (*Circle those used*--Babcock, DeKalb, Farmers Hybrid, PIC, White Diamond or other _____)
____	____	Other commercial producers
____	____	Your own herd

9. Which are the three most important critera to you when purchasing boars? *(1 = MOST IMPORTANT, 2 = NEXT MOST IMPORTANT, 3 = THIRD MOST IMPORTANT)*

____ Carcass merit or backfat
____ Days to market
____ Feed conversion
____ Litter size

10. What percentage of the slaughter hogs that you marketed in 1988 were sold:

____ On a live weight basis? ____ On a carcass merit or grade & weight basis?

11. Did you finish feeder pigs under a contract arrangement during 1988?

____ Yes ____ No - - - > **(GO TO QUESTION 13)**

12. If so, how would you describe the contractor you are working with?

____ Farmer
____ Local elevator or feed company
____ Other (specify) _____

13. Did you farrow pigs under a contract arrangement during 1988?

____ Yes ____ No

14. Did you contract with another farmer to have him finish feeder pigs you farrowed under a contract arrangement during 1988?

____ Yes ____ No

If you answered yes to questions 10, 11 or 12, that you were involved in contract hog production in 1988, what were the terms of the contract you operated under? (Largest contract, if more than one)

_____

_____

15. During the next five years, do you plan to: *(CHECK ONE ANSWER)*

_____ Expand the size of your hog operation - - - > **(GO TO QUESTION 17)**

_____ Maintain roughly its present size (+/- 5%)

_____ Decrease its size

_____ Get out of hog production

16. Which of the following reasons, if any, are important to your decision not to expand your hog operation? *(CHECK ALL THAT APPLY)*

_____ Insufficient capital

_____ Insufficient labor

_____ Limited capacity of hog facilities

_____ Low profits in hog production

_____ More extensive management requirements

_____ Preparing for retirement

_____ Content with present size of operation

_____ Other (specify) _____

17. (If you plan to expand) Which of the following reasons, if any, are important to your decision to expand your hog operation? *(CHECK ALL THAT APPLY)*

_____ Better opportunity than crops or other enterprises

_____ Bring another person into the operation

_____ Cut back on off-farm work

_____ Other (specify) _____

18. How much do you plan to expand, as a percent of your present size? _____%

19. How would you describe your operation's business organization?

_____ An individual operation (sole proprietorship)

_____ A partnership (other than husband and wife or limited)

_____ A limited partnership

_____ A corporation

_____ A cooperative

_____ Combination or other (specify) _____

20. What is your age? _____

21. What is the highest grade in school you have completed? *(CHECK ONE ANSWER)*

_____ Less than high school graduation

_____ Completed high school

_____ Some college

_____ Completed college (BA, BS or 4 yr degree)

_____ Beyond college

22. If using pasture, how many acres of land are used for hog buildings, drylot and pasture? _____

Labor Use in the Hog Enterprise

23. On the average, how many HOURS PER WEEK did you (the operator), other household members or employees work with or without pay in the hog enterprise during each month of 1988?

-- average hours per week --

____ Jan.	____ July
____ Feb.	____ Aug.
____ March	____ Sept.
____ April	____ Oct.
____ May	____ Nov.
____ June	____ Dec.

24. What percent of these hours in 1988 was paid a wage included in your hired labor expenses? ____

Biotechnology

25. During the past year, have you attended any sessions at meetings, conferences, or seminars where scientific advancements and/or management strategies in pork production were the principal topic of discussion?

____ Yes

____ No

A new group of agricultural products called "porcine somatotropin" (PST) which promote animal growth, will likely become available to pork producers in the next few years.

26. Had you heard about PST before this interview?

____ Yes ____ Unsure

____ No - - - > **(GO TO QUESTION 29)**

27. How much have you heard or read about this new product?

____ A great deal

____ Some

____ Very little

28. How much information about PST have you received from each of the following sources -- A GREAT DEAL, SOME, VERY LITTLE, or NONE? *(CIRCLE YOUR ANSWERS)*

		great deal	some	very little	none
a.	Mass media (radio, TV, newspapers	GD	S	VL	N
b.	Farm magazines	GD	S	VL	N
c.	Commercial dealers/salespersons	GD	S	VL	N
d.	Friends and neighbors	GD	S	VL	N
e.	Extension specialists	GD	S	VL	N
f.	Conferences/seminars/workshops	GD	S	VL	N
g.	Other (specify) _____	GD	S	VL	N

29. (Refer to PST scenario) Based upon the likely return of $3 per dollar invested and other information in the PST scenario, what is your reaction to PST? *(CHECK ONE ANSWER)*

____ ENTHUSIASTIC -- excited about the likely benefits of PST to pork producers

____ CAUTIOUSLY OPTIMISTIC -- feel this product may be worthwhile, but probably will take a "wait and see" attitude

____ SKEPTICAL -- don't feel it will be worthwhile

____ OPPOSED -- it is likely to cause farmers more harm than good

____ INDIFFERENT -- don't have an opinion about PST, for or against

____ OTHER (specify) _____

30. Who will probably participate in the decision of whether or not you use PST in your farming operation? *(CHECK ALL THAT APPLY)*

____ Self
____ Spouse
____ Other family members
____ Owner(s)
____ Partner(s)
____ Other (specify)_____

31. Based upon the PST scenario, what will be your likely response when PST becomes available? *(CHECK ONE ANSWER)*

____ Will probably adopt this product immediately
____ Will probably experiment by trying it first on a few animals
____ Will probably wait to see how it works for others
____ Will probably not adopt it
____ Will definitely not adopt it
____ The adoption decision will be made by someone else
____ Other (specify)

_____ --> **(GO TO QUESTION 34)**

32. Based upon the PST scenario, how soon after it becomes available do you think you will adopt it in your hog operation? *(CHECK ONE ANSWER)*

____ Immediately

____ Within a year

____ From 1 to 2 years

____ More than 2 years

33. How soon might you adopt PST of, instead of 4 injections during the last 140 lbs. of growth, it required: *(CIRCLE YOUR ANSWERS)*

	immed-iately	within 1st year	1-2 years	more than 2 years	will not adopt	decision made by others
8 injections	1	2	3	4	5	6
2 injections	1	2	3	4	5	6

34. In your opinion, is each of the following a LIKELY or UNLIKELY outcome from farmers' use of PST? *(CIRCLE YOUR ANSWERS)*

	likely	unsure	unlikely
Leaner pork produced using PST will mean greater consumer demand for pork products.	1	2	3
Use of PST will encourage consumers to substitute pork for beef and poultry.	1	2	3
As a result of PST, Minnesota farmers will find it more difficult to compete against large hog operations in other states.	1	2	3
To fully benefit from PST, farmers will have to market their hogs on a grade and weight basis.	1	2	3
U.S. hog producers will likely gain a competitive advantage in the world pork market by using PST.	1	2	3
Consumers will be wary of pork produced with PST.	1	2	3

35. (Refer to beta agonist scenario) Given the relative advantages and disadvantages of PST and the beta agonists, would you: *(CHECK ONE ANSWER)*

_____ Prefer PST over beta agonists

_____ Prefer beta agonists over PST

_____ Use both of them together, if this is feasible

_____ Not likely to use either one of them

36. How do you feel about each of the following statements? Do you strongly agree, agree, disagree, or strongly disagree? *(CIRCLE YOUR ANSWERS)*

	strongly agree	agree	disagree	strongly disagree
I like to try new farming methods before they are adopted by my neighbors.	1	2	3	4
I am reluctant to try new ways of doing things until I see how they have worked for others.	1	2	3	4
I take more risks in my hog operation than my other operations.	1	2	3	4
My hog operation is secondary to my other operations.	1	2	3	4

37. The University of Minnesota is doing a small amount of research on PST and related biotechnology products. There are some feeding trials going on with a pharmaceutical company. A group of faculty are studying changes in production practices that producers would need to make, and impacts on profitability, pork supplies and prices that may occur if PST is used widely. Would you like to see the university do more than at present, about the same, less or no research in this area in the future?

_____ More than at present

_____ About the same level of activity

_____ Less than at present

_____ No research at all in this area

38. Do you have any concerns about PST or biotechnology that were not covered in this questionnaire?

_____

_____

39. May we contact you again in the future to discuss whether and to what extent you have started to use PST or other new technologies and how they have worked out for you?

_____ Yes _____ Unsure

_____ No