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MIDWEST PORK PRODUCERS' CHARACTERISTICS AND
PLANNED USE OF SOMATOTROPIN

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Midwest Pork Producers' Characteristics and Planned Use of Somatotropin

Somatotropin, or growth hormone, is one of a number of new biotechnology products with potentially significant impacts on producers and consumers worldwide. These products are expected to cause changes in farm production costs, management, asset values, processing and supply industry structure, and rural communities that are more rapid and pervasive than in any previous time period (Kalter and Tauer). Within the next two years bovine somatotropin (BST) should be commercially available for dairy cows (to improve lactation). Within five years somatotropin for meat animals is expected to be available to improve feed efficiency and lean meat production (Lemieux and Richardson).

When somatotropin becomes commercially available, it does not appear that it will require major capital investments for its use but will probably require management changes. Injections or implants are the probable means of administration. The frequency of administration in commercial use has not yet been announced by the pharmaceutical firms who manufacture somatotropin. It is likely that administration will require additional labor for handling of the animals. It also seems likely that feeding programs, housing and other aspects of the operation will have to be managed intensively for the potential benefits of somatotropin to be realized.

Lemieux and Richardson analyzed the economic impacts of porcine somatotropin (PST) on Midwest pork producers. They found that the producers are likely to receive increases in income from use of PST, if they receive a premium for the PST-induced improvements in carcass quality. They also found that without a carcass merit premium, the

economic benefits from adoption are merely sufficient to cover the costs of adoption.

A projection of the structural impact of PST use - i.e. the impact on survival and success of hog farms using different types of facilities and different levels of management expertise, as well as different enterprise sizes - requires information on the degree to which producers with these different business characteristics choose to adopt this new technology. While studies such as Lemieux and Richardson's provide estimates of the economic incentive (or lack thereof) for large and small farms to adopt PST when it becomes available, they do not tell us much about the rate to which producers will respond to this incentive and adopt the product.

The literature on adoption of new technologies by individual farmers and the implicit diffusion of the technologies throughout the sector is reviewed by Kalter et al. with respect to BST. Relative advantage, compatibility, complexity, divisibility and communicability are dimensions they find that determine the rate and likelihood of adoption. They predicted the rate of adoption and diffusion of BST based on a mail survey of 1,025 New York dairy producers combined with 40 personal interviews. The procedure used was to provide a fact sheet to the producer outlining the most up-to-date information available on BST including production responses, costs, and overall effects on animal health. An attempt was made to present the material in a format similar to what might actually be used when the product is first marketed and one which was brief and interesting. Respondents were asked how soon after commercial availability they first expected to use BST. Two-thirds anticipated initiating treatment within the first year with over

a quarter planning immediate adoption. One-eighth had no expectation of ever using the compound. Of those who would try the product in their herds, the majority said they would experiment first by treating only a portion of their herd.

They also attempted to relate characteristics of farmers and their farms with their interest in adopting BST. Only two characteristics stood out. Early and middle adopters had significantly larger herds than late adopters. Early adopters were also significantly more likely to have free stall barns rather than stanchions.

Hayenga and others at Iowa State University are using essentially the same procedure to evaluate pork producers' planned adoption of PST. They surveyed representative producers in Iowa and North Carolina, as well as a nationwide sample of the largest pork producers by mail. Results of those surveys are not yet available.

This paper analyzes the impact of pork producers' business characteristics on the probability of using PST. The results are based on a logit analysis of survey results from interviews of 70 Minnesota pork producers during the summer of 1989. The survey respondents are members of the Southeastern and Southwestern Minnesota Farm Business Management Associations (FBMA) who had swine farrow-to-finish or finishing enterprises. This analysis differs from the Hayenga and Kalter studies in that it was possible to gather more detailed information on facilities and production and marketing practices in the personal interviews than would be possible in their mail surveys. It also differs in that profitability information was available from the association record database and was related to producers' adoption plans for PST.

PROCEDURE

The farms on which this analysis is based are members of the Southwestern and Southeastern Minnesota Farm Business Management Associations and are located in southern Minnesota, a major swine producing area. Minnesota is the nation's third largest swine producing state and in 1988 produced 8.5 percent of the slaughter hogs marketed in the United States. Minnesota swine producers have achieved some impressive productivity gains in the last ten years, at least with regard to reproductive efficiency. The ratio of market hogs to breeding stock had increased 29.7 percent by 1988 compared to 1979, a rate of improvement second only to North Carolina's 31.2 percent increase among the major swine-producing states, based on December 1 Hogs and Pigs Reports. We do not know if small and large farms are sharing equally in these productivity gains. Also, how much of the improvement in overall productivity is due to less productive farms getting out, and how much from the continuing producers getting better is unknown.

Association members receive an annual farm business analysis; on-farm instructional visits; end-of-year income tax planning and preparation; periodic meetings, tours and seminars; a monthly newsletter; and other managerial and educational assistance. There were 135 association member farms in the database of 1988 database of accounting records who had swine enterprises. Farms with very small swine enterprises (less than 50 sows or 75 hogs finished) were not considered in the analysis because their decisions regarding PST are not likely to have much impact either on their profitability or on total pork supplies. Some other farms with operators close to retirement or

expected to exit the business for other reasons in the near future were also dropped from the list. Eighty-five swine producers were interviewed. Current plans are for PST to be used in the finishing stage of production, not farrowing, so only 51 farms with farrow-to-finish enterprises and another 19 with finishing enterprises are included in this analysis, for a total of 70 farms. The other 15 farms produced feeder pigs or had mixed enterprises which were not comparable to the farrow-to-finish or finishing enterprises.

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 FBMA farms included in the present study appear to be typical of all midsized Minnesota and U.S. farms, based on number of head sold and litters farrowed per year. 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 number of farms in the 500-999 head category is 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. The FBMA operators averaged 43 years of age. 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.

The information collected in the interviews 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 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.

In the part of the interviews dealing with biotechnologies, the interviewer presented a scenario to each producer outlining potential advantages and disadvantages of PST use and comparing it to the beta agonists, another class of swine growth promotants which may be

commercially available soon (see Appendix). The advantages of PST were listed first for half of the interviews and the disadvantages first for the other half. The order did not appear to affect responses. A series of questions were then asked about attitudes and plans regarding PST.

This analysis focuses on the question, "Based upon the PST scenario, what will be your likely response when PST becomes available?" The respondents were asked to choose one of the responses: 1) Will probably adopt this product immediately, 2) Will probably experiment by trying it first on a few animals, 3) Will probably wait to see how it works for others, 4) Will probably not adopt it, 5) Will definitely not adopt it, 6) The adoption decision will be made by someone else, or 7) Other.

It was hypothesized that producers with enclosed finishing facilities would be more likely to use PST because the animals, being more confined, would be easier to inject or implant with the product. It was hypothesized that producers with formal records would be in a better position to predict and monitor the effects of PST on efficiency and productivity, and thus would be more likely to use PST on their herds, assuming it provides positive net benefits as outlined in the scenario.

Another question dealt with whether the producers planned to: 1) expand the size of their hog operations over the next five years, 2) maintain roughly its present size (+/- 5 percent), 3) decrease its size or get out of hog production. It was hypothesized that producers planning to expand would be more likely to adopt PST as another means of improving profitability.

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. 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 scenario stated that leaner PST-treated hogs could bring higher market prices, especially if marketed on a grade/weight basis. It was thus hypothesized that producers marketing on a grade/weight basis would be more likely to use PST. It was also hypothesized that younger or more highly educated producers might be more innovative in general and would be more likely to adopt or experiment with PST.

Net return per hundredweight of pork produced is a measure of profitability which was available for the farms from the association record database. It is not clear what impact profitability might have on the adoption decision. It seems likely that more profitable operations achieved the higher profit levels by judiciously adopting new technologies, and so might be more likely to adopt PST given the positive net benefits indicated in the scenario. On the other hand, less profitable producers might feel under more pressure to improve efficiency and profitability through means such as PST.

Logistic regression was used to test these hypotheses. The dependent variable was the response to the question, "Based upon the PST scenario, what will be your likely response when PST becomes available?" The two producers planning to adopt PST immediately were grouped with

the 30 planning to experiment first on a few animals, because of the small number in the former group and the similarity in the responses. A (0,1) variable was assigned where one indicates plans to adopt or experiment and zero indicates that the producer will wait to see how it works or probably or definitely will not adopt. The binary qualitative nature of the dependent variables dictated the choice of analysis technique.

A similar technique was used to study adoption of computers and consultant services by dairy farmers (Lazarus and Smith). Ownership of a computer, use of the computer as the primary accounting system and use of a veterinarian's services in routine monthly or biweekly visits, and use of consultant services were the four information sources analyzed. Younger, more highly educated operators were more likely to use the three information sources. Producers with larger herd sizes were more likely users of all three information sources. A freestall barn also increased the probability of computer ownership. The technique was also used to study use of DHI records, artificial insemination and feeding practices (Carley and Fletcher). Kauffman and Tauer used the technique to predict dairy farm survival over a 10-year period.

Limited dependent variable problems can be analyzed by means of linear probability models, linear discriminant functions, probit and logistic regression models. Linear probability models have several drawbacks including the fact that they can predict probabilities of use and non-use that lie outside the (0,1) limits (Maddala). A linear discriminant function is a function, say g'x, of k explanatory variables, that provides the best discrimination between the two groups corresponding to dependent variables of one and zero. Discriminant

functions are not unique and thus cannot be interpreted individually nor tested for individual significance. Logistic regression offers the advantages of allowing more than two values for the dependent variable, restricting predicted probabilities to the (0,1) interval, and being readily available in commercial statistical computer programs.

The logistic regression model was specified as

$$P_i = \frac{\exp(b'x_i)}{1+ \exp(b'x_i)}$$

where P_i was the probability of farm i planning to adopt or experiment with PST, b was a vector of estimated parameters, and x_i was a vector of business characteristics for farm i.

The likelihood function for the logistic regression model is nonlinear in the coefficients. It is solved using an iterative procedure rather than ordinary least squares. Goodness of fit of the overall model is evaluated using a likelihood ratio statistic having a chi-square distribution. The estimated coefficients for the individual variables are asymptotically normal, enabling a chi-square test to be used to indicate significance level of each coefficient. The derivatives for the probability of the dependent variable equalling one are given by differentiating the likelihood function with respect to the independent variables,

$$\frac{f}{fx_{ik}} L(x_i b) = \frac{\exp(x_i'b)}{[1 + \exp(x'_i b)^2]} b_k \qquad (1)$$

for the k^{th} business characteristic and the i^{th} farm (Maddala). The derivatives vary with x_{ik}, and should therefore be calculated at different levels of x_{ik} to determine the degree of variability.

RESULTS

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 reported having heard of PST before the interviews. Most reported hearing "some" information about it. 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". Most (58) were "cautiously optimistic" about it assuming a three dollar per head return and the other information included in the scenario described by the interviewer. Some (8) were "enthusiastic" but more (14) were "skeptical".

Only two of the 70 farrow-to-finish and finishing producers planned to adopt PST immediately. Thirty planned to experiment by trying it first on a few animals. Another 34 producers planned to wait and see how it works for others before trying it, while the other four indicated that they either probably or definitely would not adopt.

Responses to another question indicated that 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 seemed to believe that leaner pork produced using PST will mean greater consumer demand for pork

products, but they were evenly split about whether consumers will substitute pork for beef and poultry. Most (47) felt that PST will make it more difficult for Minnesota farmers to compete against large hog operations in other states, but many (27) felt just as strongly that there will be no adverse impact. They seemed 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 were 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 was 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. It is interesting to note that when the interviews were started in early summer, the first few producers largely preferred PST. Opinion seemed to switch 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. 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.

The producers were asked to characterize their farrowing, nursery, breeding herd and growing-finishing facilities. The analysis of PST adoption focused on the growing-finishing facilities because of the need to inject or implant the pigs during finishing. A wide variety of growing-finishing facilities were in use. More farms had a combination of several types of finishing facilities than had any one type of facility. Open-shelter buildings on drylot were the largest group on farms with only one type of finishing facility. The facilities were classified into enclosed growing-finishing facilities with either total or partial slatted floors, as one group, or open-shelter, combinations or other types such as remodelled barns as a second group. Thirteen of the 70 farms had enclosed growing-finishing facilities, with 57 having other types of facilities. On-farm computers were common on the farms, with 20 farrow-to-finish producers using them for swine production records and/or to help make decisions about the hog operation. One reason for the widespread use of on-farm computers may be that the association fieldmen promote and support use of accounting software. Five producers used mail-in swine production record systems. However, a majority used neither of these, using either manual systems or no formal swine production record systems at all. The most common on-farm swine production record software package in use on the farms was PigCHAMP, which up until recently has been marketed by the University of Minnesota Veterinary College. Twenty of the 70 farrow-to-finish and finishing

producers planned to expand. Five planned to decrease and two planned to get out. Forty-three planned to remain the same size. Producers who had indicated to the fieldmen their plans to get out of production had not been interviewed, accounting for the small number in this category. 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 70 farrow-to-finish and finishing operations represented. Hogs marketed grade and weight must be delivered directly to the packing plant, which may involve longer hauling distances. The operators averaged 43 years of age. The educational levels of the group were high. Over 70 percent of them have either graduated from college or have some college coursework. The farrow-to-finish producers in the group lost an average of $2.89 per hundredweight in 1988. This is an accrual measure which includes inventory adjustments as well as a charge of seven dollars per hour as an opportunity cost on unpaid labor.

A tabular analysis of the 70 farrow-to-finish and finishing farms is shown in Table 1. The "Adopters" column shows statistics for those 32 farms who planned to adopt PST immediately or who planned to at least experiment on a few animals. The "Non-Adopters" planned to wait to see how it works or probably or definitely will not adopt. The farrow-to-finish farms were more likely adopt (over half adopters) compared to the finishers (only five of 19 planning to adopt). The adopters were more likely to have enclosed finishing facilities, have computerized records and to be college graduates. Expansion plans do not seem to differ between the adopters and non-adopters. Also, producers with some

college but not four-year degrees did not seem to be more likely to adopt.

The adopters sold a higher percentage of their animals on a grade and weight basis. Somewhat surprisingly, the adopters were three years older on average than the non-adopting group. The adopters received 27 cents per hundredweight more per pound for their animals on average than did the non-adopters. This was the only difference in the means of the adopters and non-adopters that was statistically significant at the five percent level. None of the other differences in means was significant even at the 10 percent level.

Performance information was analyzed separately for the 51 farrow-to-finish farms and the 19 farms who only finished. Pigs weaned per sow per year and pounds of feed per pound of gain were examined as indicators of production efficiency. Overhead costs (utilities, real estate taxes, insurance, hired labor, lease payments, interest on debts and depreciation were considered as measures of efficiency of capital use. Average price received in 1988 for hogs sold indicated marketing efficiency. Among the farrow-to-finish farms, the adopters averaged 26 more sows but weaned fewer pigs per sow per year. Feeding efficiency (feed per pound of gain) and overhead costs per hundredweight were higher for the adopters. Net return per hundredweight was negative on average for the group in 1988. The losses over five dollars per hundredweight for the adopters, while the non-adopters about broke even. This difference in profitability is apparently due to lower production performance and a higher cost structure for the adopters, and despite a slightly higher price received. Feed efficiency was the only difference in means here that was significant at the 10 percent level.

Among the farms that only finished hogs, again the adopters were larger. In this group, the five adopters were more efficient in feed use than the non-adopters. Neither of these differences was statistically significant, however. Overhead costs and profitability information are not given for the finishers because of the small number of farms.

Table 2 shows the results of the logit analyses for the combined group of farrow-to-finish farms and finishers in the left column and the farrow-to-finish farms only on the right. The likelihood ratio test showed the overall relationships to be significant at the one percent level. The use of records was positively related to adoption and statistically significant at the five percent level. Net return per hundredweight was also significant, and was negatively related. The use of enclosed finishing facilities was positively related to adoption and significant at the 10 percent level for the combined group but not the farrow-to-finish farms only. The relationship between a college degree and adoption was also positive and significant at the 10 percent level, for both groups.

While the finishers were less likely to adopt than the farrow-to-finish farms, the difference was not significant. Use of grade and weight marketing is positively associated with adoption, as expected, but the impact is not significant. Expansion plans, age and college education below the four-year degree level were also not significant.

Table 3 shows the changes in probability of adoption associated with the individual variables, as implied by the coefficients in Table 2. The probabilities were calculated with all variables at their means. Computerized records, college graduation and the type of finishing

facility have the greatest impacts. Use of computerized records is associated with an increase of 37 to 51 percent, respectively, in the probability of adoption by the combined group and the farrow-to-finish farms. The college graduation variable and the one for enclosed finishing facilities had impacts on probability of roughly the same magnitude. Because of the non-linearity of equation (1), the effects of the variables are not additive. That is, an operator with a college degree, records and an enclosed facility obviously could not have a probability of adoption of more than one as a simple addition of the values in Table 3 would indicate. Equation (1) can be used to directly calculate the probability of adoption by a given producer with a particular set of characteristics.

The probability derivatives can be used to examine the impacts of changes in the continuous variables, grade and weight marketing, age and returns. For example, a dollar higher return per hundredweight reduces the probability of adoption by about four percent for the farrow-to-finish farms.

CONCLUSIONS

It is not particularly surprising that college graduates with good records and modern facilities are more likely to adopt PST when it becomes commercially available. It is useful, however, for modelling efforts to have quantitative measures of the impacts of these variables available. The negative and significant impact of the level of net returns per hundredweight is a bit surprising. Perhaps as the old adage "Necessity is the mother of invention" suggests, producers are more interested in adopting productivity-enhancing technologies when forced

to by economic circumstances, rather than when they are more comfortable financially.

Some of the other variables that might be expected to affect the probability of adoption, such as grade and weight marketing, operator age, and type of enterprise, do not seem to be as important to the adoption decision.

Table 1. Business Characteristics of PST Adopters and Non-Adopters, 70 Minnesota Farrow-to-Finish and Finishing Pork Producers

	All farms	Adopters	Non-Adopters
Farms	70	32	38
	- - - - - Percentage of Farms - - - - -		
Finisher only	27	16	37
Enclosed finishing facility	18	34	5
Computer or mail-in records	36	50	24
Plan to expand	28	28	29
Operator education - college graduate	37	50	26
Operator education - some college	33	31	34
	- - - - - - Mean Across Farms - - - - -		
Percent sold grade/weight	38	52	26
Operator age	43	45	42
Price received/cwt.	$43.32	$43.46[a]	$43.19[a]
Farrow-to-finish:			
Farms	51	27	24
Herd size (sows)	107	119	93
Pigs weaned/sow/year	13.6	13.1	14.2
Feed lbs./lb. gain	3.93	4.00[b]	3.82[b]
Overhead cost/cwt.	$7.55	$8.70	$6.26
Net return/cwt.	-2.62	-5.18	0.26

Table 1. (continued)

	All farms	Adopters	Non-Adopters
		- - - - - - Mean Across Farms - - - - - -	
Finishers only:			
Farms	19	5	14
Hogs sold (cwt.)	2,610	4,586	1,904
Feed lbs./lb. gain	3.81	3.48	3.93

[a] Difference in means of adopters and non-adopters is statistically significant (probability < 0.05)

[b] Difference in means is statistically significant (probability < 0.10)

Table 2. Logit Parameter Estimates Explaining Planned PST Adoption, 70 Minnesota Farrow-to-Finish and Finishing Pork Producers

	Coefficients	
	Farrow-Finish and Finishers 70 Farms	Farrow-Finish Only 51 Farms
Intercept	-3.9098[b] (1.8930)	-5.9019[b] (2.5996)
Finisher Only	-0.7207 (0.7322)	-
Enclosed finishing facility	1.4897[a] (0.8997)	1.7521 (1.0945)
Computer or mail-in production records	1.5102[b] (0.6714)	2.0637[b] (1.0227)
Percent sold grade/weight	0.007457 (0.007900)	0.01212 (0.01222)
Plan to expand	-0.3300 (0.7112)	-1.4769 (1.1674)
Operator education - college graduate	1.4364[a] (0.8338)	2.2187[a] (1.1548)
Operator education - some college	0.6083 (0.7924)	1.1559 (1.0911)
Operator age	0.05072 (0.03382)	0.0695 (0.0477)
Net return per hundredweight	-	-0.1692[b] (0.0664)
Likelihood ratio test with 8 degrees of freedom[c]	24.28	29.56

[a]Less than 10 percent chance that the true value of coefficient is zero. Number in parentheses is the standard error.

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

[c]Less than 1 percent chance that the overall relationship is entirely due to random influences. (Chi-square with 8 degrees of freedom = 20.09.)

Table 3. Probability of Planning to Adopt Immediately or Experiment with Porcine Somatotropin, 70 Minnesota Farrow-to-Finish and Finishing Pork Producers

	Farrow-Finish and Finishers 70 Farms	Farrow-Finish Only 51 Farms
	- - - - Change in probability due to - - - -	
Finisher only	-0.1791	-
Enclosed finishing facility	0.3702	0.4332
Computer or mail-in production records	0.3753	0.5102
Plan to expand	-0.0820	-0.3651
Operator education - college graduate	0.3569	0.5485
Operator education - some college	0.1512	0.2858
	- - - - - Probability derivative - - - -	
Percent sold grade/weight	0.00185	0.00299
Operator age	0.01260	0.01720
Net return per hundredweight	-	-0.04184

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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).