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David Brown

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Modeling business performance in live hog production

Tom Stein DVM, MS, PhD
Knowledgeworks, Inc.

Deep thoughts

Here are a few questions to think about before we move into the main body of this paper. For the past year, I've been asking both producers and packers for their answers.

- Mr. Producer, if you could sign a purchase agreement with a packer for all your market hogs, guaranteeing you a reasonable floor price and a margin (net cash over all costs, including principal payments on term debt) of \$10 per head sold, would you sign it?
- Mr. Packer, would you create a market hog purchase agreement that would guarantee hog producers a margin (net cash over all costs, including principal payments) of \$10 per head sold?
- Over the past 10–15 years, what has been the historical profit margin per live hog sold for average hog producers? For the top-third?
- Is live hog production a good business to be in? How do you decide?
- How much money do you want to make from hog production? How much money can you make from hog production?

Introduction

As a veterinarian-pork producer friend likes to say, the live hog production business is a cash flow machine. But over the past year we've learned that we cannot count on uninterrupted cash flow simply by selling to the cash market. Unfortunately, we've also learned that high-efficiency, least-cost operations do not guarantee business success. External factors have become just as important as internal factors.

In the old days, all we had to look at and work on improving was internal productivity (pigs weaned/sow/year, pigs weaned/crate/year, total pounds sold, average daily gain, feed efficiency, feed intake, mortality). Now, external shocks to the system—like very fast and very big increases in corn price (see 1996–1997) and very fast and very big decreases in live hog price (see 1998–1999 for more information) along with lender skittishness and environmen-

tal risk—can put even a well-performing production company out of business.

Investment bankers talk about “collaring the risk” around the corners of a production system. Translated, that means using managed contracts or the futures markets to lock-in feed cost and using market hog purchase agreements (packer contracts) to lock-in a margin. Today, you must ensure cash flow and working capital first, before you do anything else. We have entered the age of risk management.

This presentation's purpose is to shed some light on the new way of managing the business of live hog production, and attempt to answer the five questions I asked above.

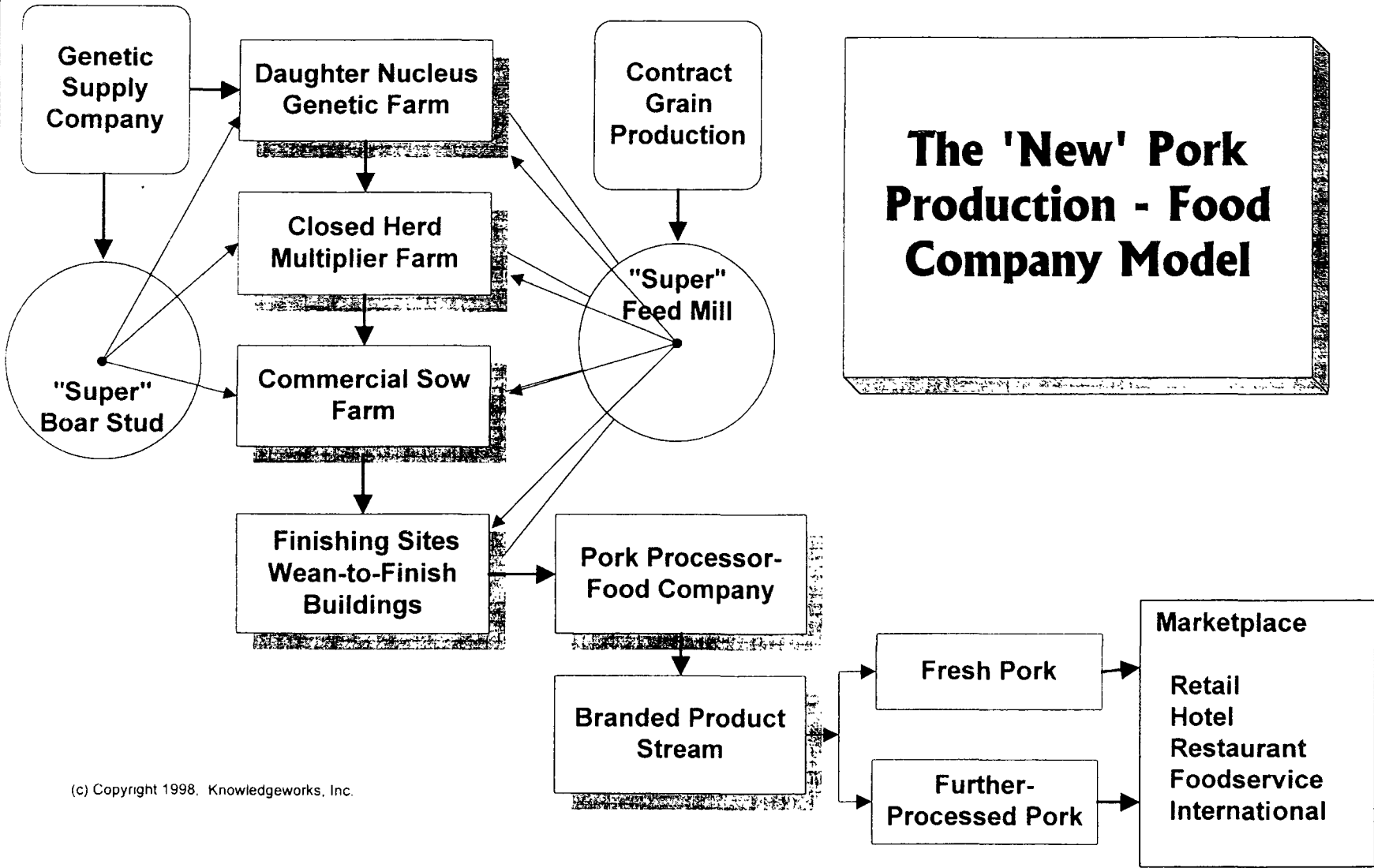
The new business operational model

Let's look at what might be called the new operational business model for the pork industry. (See **Figure 1.**) Conceptually, you can think of this pork production-food company model as a single object or entity. Some companies, like Smithfield, own almost all pieces of the entity. Other companies, like Cargill, own the sows and finishing hogs and use contracts to leverage the bricks and mortar on both the sow side and the finishing side. Some, like Seaboard, use a combination of direct ownership and contracting. And others own one side or the other, like IBP on the processing side or Murphy Family Farms on the production side.

In contrast to companies like Smithfield or Premium Standard, independent, networked pork production companies typically own only the production piece because they tend to be more constrained on investment capital.

How it works

From the point-of-view of the live hog production side, you marry a genetics company for your maternal genetic source. Or, it may be that you own the genetics company, as is the case throughout the poultry industry. In fact, some pork production companies have started to do this, like Bell Farms with Rattlerow Genetics and, to an extent, Smithfield Foods because of their exclusive genetic supply contract with NPD Genetics. Whatever the business relationship, the idea is that you live with—and count on—



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Figure 1

Modeling business performance in live hog production

your genetic supplier to make progress on the maternal side.

Most larger-scale production companies will own both the multiplication and the daughter nucleus level sows, whether or not they own or manage the buildings. It substantially reduces the genetic cost of replacement animals into the commercial sow herd. And it puts leverage and control of expansion and genetic flow directly in the hands of the production company itself.

The “action” today is at the boar stud-terminal sire program. It’s here that production companies create the carcasses (type and quality) that their packer-partner desires. From cut-tests at the packer kill-line come answers on the carcass attributes for terminal-boar lines used on a specific maternal-line base.

On the feed side, most large-scale production systems are built around “super” feed mills, single-purpose mills built for large-volumes and highly-efficient feed manufacturing. The latest addition to the feed manufacturing side is a contract grain production system that supplies the company with identity-preserved grains containing stacked genetic traits such as low phytase or high-energy endosperm. Optimum Quality Grains (the joint venture between Dupont and Pioneer), Monsanto, and Cargill are the big players here, but interesting business models are being built by larger-scale, independent pork producers. A good example is the identity-preserved, contract grain system developed by Oakville Feed and Grain.

The sow farm is a cost-center, supplying weaned pigs to the finishing system at cost. Profit is made (or lost) on the finishing side. High operational productivity—at both the sow farm and the finishing system—is necessary for total system profitability. The variation in breakeven—excluding feed cost variability—is far more attributable to total system productivity than it is to the underlying business cost structure. In other words, relatively minor costs such as insurance will not drive profit margin much one way

or the other, but variation in the number and weights of pigs being produced by the system will have huge effects.

The focus in this presentation will be on the “left” or production side of this new business model.

Live hog cost of production equation

We recently completed an analysis of live hog production costs. Using long-term prices for corn and soybean meal along with average building costs and three productivity levels, we determined the most likely distribution for cost of production (**Table 1**). We built the analysis around a fixed-time production system. In this case, the time component was a 3-week lactation (about 16-day weaning age), 8-week nursery phase, and 18-week finishing phase. Think of these as long-run production costs, using long-run feed ingredient prices. For more details about the methodology, see the endnotes.

The cost for producing weaned pigs clustered around \$34.50. At the extremes, the \$45.45 high cost reflects below-average productivity in the second year after startup for a new-style farrow-to-wean sow farm. The \$24.03 low cost reflects above-average productivity in fully-depreciated and paid-for facilities (years 11–19 after start-up).

The cost added in the nursery phase clustered around \$16.50 per pig moved out. In this case, the extremes reflect low vs. high feed cost and year of facility use (early-after-startup vs. fully-depreciated and paid-for facilities).

The cost added in the finishing phase clustered around \$58.82 per pig sold. Here, the extremes reflect low vs. high feed cost, year of facility use, and growth performance. Production systems with all facilities fully-paid, with excellent growth performance, and averaging \$145.50 per ton for feed cost will add about \$52 in finishing costs. In contrast, production systems with all facilities in year two after start-up, averaging \$170 per

Table 1

Live Hog -- Cost of Production Equation

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Weaned Pig	+	Nursery	+	Finishing	=	Total		
							285	230
\$45.45		\$18.86		\$65.48		\$129.79	\$0.46	\$0.56
\$33.45		\$16.50		\$58.82		\$108.77	\$0.38	\$0.47
\$24.03		\$13.96		\$52.00		\$89.99	\$0.32	\$0.39

ton feed cost and below-average growth performance, will add over \$65 in finishing costs.

When you look at the relative amount of variation in these three cost-centers, it's clear that weaned pig cost and finishing phase costs will have the most influence on the final breakeven cost.

Aside from the costs themselves, we found a very interesting relationship between costs and finishing productivity. In the fixed-time system we modeled, production systems with similar underlying cost structures can produce a wide range of outcomes. At the extremes, the same business model (3-week lactation, 8-week nursery, 18-week finishing) can produce group closeouts that average 235 lb, 47% lean or 285 lb, 55% lean. This highlights the large productivity differences that still exist in live hog production today.

If we accept that businesses with breakeven costs above \$47 are out of business today, then the portfolio of long-term breakeven costs range from \$0.32 to \$0.47, with the highest frequency between \$0.37 and \$0.43 per pound sold.

Is live hog production a good business to be in?

Producers tend to look at the short-term biological performance and direct cost measures of the live hog production business. But by and large they haven't been trained or helped to see the business of live hog production as an analyst for large lenders or investment bankers would. Let's look at it as an analyst might.

The first and most important question is this: Is the business feasible under reasonable, long-term planning prices for raw materials and product prices along with reasonable yield or productivity estimates? Will it cash flow? If the answer is yes—on average and over the long-term—then what's the risk that it won't? If the long-term average cash flow and its sensitivity to key internal and external factors are acceptable, then what about short-term risk to cash flow? What's the risk that the business won't cash flow for some weeks or months, or—given today's business environment—even years? How much protection is built into the business, in terms of production risk, feed price risk, and market price risk? How strong are the owners' balance sheets and net worths?

The next question and the go/no-go decision threshold to investors or owners looking for a return on their investment is: What's the profit potential and how sensitive is it to key performance drivers? In other words, what kind of return can I get on my initial investment in this project?

An investor looks at the project as if he or she is buying a (cash flow) yield stream, just like investing money in stock, bonds, mutual funds, Treasury bills, or other busi-

ness opportunities. Investment analysts look at alternative uses for the initial investment. If a targeted return is not there, why invest in this particular business? There are plenty of other investment opportunities around.

The only effective way of answering sophisticated business management questions like these is to model the business and find out.

Modeling business performance in live hog production

Using MBAJ 4.0, our proprietary financial and production modeling software program for live hog production, we created a model for a nominal 400,000-head wean-to-finish production system. This system would support the weaned pig flow from a 20,000-sow system. It's composed of 52 finishing sites, with four 960-head finishing buildings on each site. Each building flows two complete finishing groups per year, with each group on a 26-week schedule. Because of a 2-day cleaning and drying timeout, pigs are in the finisher for no more than 180 days. See the Appendix below for the model's details and a complete set of model reports.

After establishing a starting-point base model, we then created a portfolio of 72 possible business performance levels for the same physical production system (**Table 3**). We used this raw data to discover how sensitive this business is to the drivers of net cash flow. Net cash flow is the business' bottom-line, sometimes called free or excess cash flow. It represents the actual dollars, either before- or after-tax, that the owners have in their hands at the end of the year.

For this analysis, we took the point-of-view as the owner of the finishing side of the production system. It does not take into account ownership of the sow side in terms of investment in production system assets. It simply takes weaned pig cost as a fixed item. The returns are to owners of the finishing side. However, if you look at the sensitivity of net cash flow, it's clear that one of the best ways to reduce breakeven and improve returns is to reduce weaned pig cost. Without ownership of the sow side, you give up the ability to take advantage of sow farm productivity gains. (But you also reduce the risk of productivity losses on the sow farm side, resulting in a higher weaned pig price). Also, you give up pig throughput increases associated with more pigs being produced from the sow side.

(By the way, we believe the best business model is ownership of both the sow side and the finishing side. How you structure the ownership is a critical question, but retaining ownership of the breeding stock, weaned pigs, and finishing pigs will give you the most long-term profit if you can achieve above-average productivity. Or, maybe a better way to say it is that it gives you the opportunity

Comparison of Alternative Investments (Before-Tax Cash Flow)

Initial Investment = \$11,225,465

Interest Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total Value	Ratio
1.0%	112,255	113,377	114,511	115,656	116,813	117,981	119,161	120,352	121,556	122,771	\$12,399,897	1.1046
2.0%	224,509	228,999	233,579	238,251	243,016	247,876	252,834	257,891	263,048	268,309	\$13,683,779	1.2190
3.0%	336,764	346,867	357,273	367,991	379,031	390,402	402,114	414,177	426,602	439,401	\$15,086,086	1.3439
4.0%	449,019	466,979	485,659	505,085	525,288	546,300	568,152	590,878	614,513	639,093	\$16,616,430	1.4802
5.0%	561,273	589,337	618,804	649,744	682,231	716,343	752,160	789,768	829,256	870,719	\$18,285,100	1.6289
6.0%	673,528	713,940	756,776	802,183	850,313	901,332	955,412	1,012,737	1,073,501	1,137,911	\$20,103,098	1.7908
7.0%	785,783	840,787	899,642	962,617	1,030,001	1,102,101	1,179,248	1,261,795	1,350,121	1,444,629	\$22,082,189	1.9672
8.0%	898,037	969,880	1,047,471	1,131,268	1,221,770	1,319,511	1,425,072	1,539,078	1,662,204	1,795,181	\$24,234,937	2.1589
9.0%	1,010,292	1,101,218	1,200,328	1,308,357	1,426,109	1,554,459	1,694,361	1,846,853	2,013,070	2,194,246	\$26,574,758	2.3674
10.0%	1,122,547	1,234,801	1,358,281	1,494,109	1,643,520	1,807,872	1,988,660	2,187,526	2,406,278	2,646,906	\$29,115,965	2.5937
11.0%	1,234,801	1,370,629	1,521,398	1,688,752	1,874,515	2,080,712	2,309,590	2,563,645	2,845,646	3,158,667	\$31,873,821	2.8394
12.0%	1,347,056	1,508,702	1,689,747	1,892,516	2,119,618	2,373,973	2,658,849	2,977,911	3,335,261	3,735,492	\$34,864,590	3.1058
13.0%	1,459,310	1,649,021	1,863,394	2,105,635	2,379,367	2,688,685	3,038,214	3,433,182	3,879,495	4,383,830	\$38,105,597	3.3946
14.0%	1,571,565	1,791,584	2,042,406	2,328,343	2,654,311	3,025,914	3,449,542	3,932,478	4,483,025	5,110,649	\$41,615,283	3.7072
15.0%	1,683,820	1,936,393	2,226,852	2,560,879	2,945,011	3,386,763	3,894,777	4,478,994	5,150,843	5,923,470	\$45,413,267	4.0456
16.0%	1,796,074	2,083,446	2,416,798	2,803,485	3,252,043	3,772,370	4,375,949	5,076,101	5,888,277	6,830,401	\$49,520,410	4.4114
17.0%	1,908,329	2,232,745	2,612,312	3,056,405	3,575,993	4,183,912	4,895,177	5,727,358	6,701,008	7,840,180	\$53,958,884	4.8068
18.0%	2,020,584	2,384,289	2,813,461	3,319,884	3,917,463	4,622,606	5,454,675	6,436,517	7,595,090	8,962,206	\$58,752,238	5.2338
19.0%	2,132,838	2,538,078	3,020,312	3,594,172	4,277,064	5,089,707	6,056,751	7,207,534	8,576,965	10,206,588	\$63,925,474	5.6947
20.0%	2,245,093	2,694,112	3,232,934	3,879,521	4,655,425	5,586,510	6,703,812	8,044,574	9,653,489	11,584,187	\$69,505,120	6.1917
21.0%	2,357,348	2,852,391	3,451,393	4,176,185	5,053,184	6,114,353	7,398,367	8,952,024	10,831,949	13,106,658	\$75,519,315	6.7275
22.0%	2,469,602	3,012,915	3,675,756	4,484,422	5,470,995	6,674,614	8,143,029	9,934,496	12,120,085	14,786,504	\$81,997,884	7.3046
23.0%	2,581,857	3,175,684	3,906,091	4,804,492	5,909,526	7,268,717	8,940,521	10,996,841	13,526,115	16,637,121	\$88,972,430	7.9259
24.0%	2,694,112	3,340,698	4,142,466	5,136,658	6,369,456	7,898,125	9,793,675	12,144,157	15,058,755	18,672,856	\$96,476,423	8.5944
25.0%	2,806,366	3,507,958	4,384,947	5,481,184	6,851,480	8,564,350	10,705,438	13,381,797	16,727,246	20,909,058	\$104,545,290	9.3132
26.0%	2,918,621	3,677,462	4,633,603	5,838,339	7,356,307	9,268,947	11,678,874	14,715,381	18,541,380	23,362,138	\$113,216,517	10.0857
27.0%	3,030,876	3,849,212	4,888,499	6,208,394	7,884,660	10,013,519	12,717,169	16,150,804	20,511,521	26,049,632	\$122,529,751	10.9153
28.0%	3,143,130	4,023,207	5,149,705	6,591,622	8,437,276	10,799,713	13,823,633	17,694,250	22,648,640	28,990,259	\$132,526,899	11.8059
29.0%	3,255,385	4,199,446	5,417,286	6,988,299	9,014,906	11,629,228	15,001,704	19,352,199	24,964,336	32,203,994	\$143,252,247	12.7614
30.0%	3,367,640	4,377,931	5,691,311	7,398,704	9,618,315	12,503,810	16,254,953	21,131,438	27,470,870	35,712,131	\$154,752,568	13.7858
31.0%	3,479,894	4,558,661	5,971,846	7,823,119	10,248,286	13,425,254	17,587,083	23,039,078	30,181,193	39,537,363	\$167,077,242	14.8838
32.0%	3,592,149	4,741,636	6,258,960	8,261,827	10,905,612	14,395,408	19,001,938	25,082,559	33,108,977	43,703,850	\$180,278,382	16.0598
33.0%	3,704,403	4,926,857	6,552,719	8,715,117	11,591,105	15,416,170	20,503,506	27,269,663	36,268,651	48,237,306	\$194,410,962	17.3187
34.0%	3,816,658	5,114,322	6,853,191	9,183,276	12,305,590	16,489,491	22,095,918	29,608,530	39,675,430	53,165,076	\$209,532,948	18.6659
35.0%	3,928,913	5,304,032	7,160,443	9,666,599	13,049,908	17,617,376	23,783,458	32,107,668	43,345,352	58,516,225	\$225,705,439	20.1066
36.0%	4,041,167	5,495,988	7,474,543	10,165,379	13,824,915	18,801,885	25,570,563	34,775,966	47,295,313	64,321,626	\$242,992,810	21.6466
37.0%	4,153,422	5,690,188	7,795,558	10,679,914	14,631,483	20,045,131	27,461,830	37,622,706	51,543,108	70,614,058	\$261,462,863	23.2919
38.0%	4,265,677	5,886,634	8,123,555	11,210,505	15,470,498	21,349,287	29,462,016	40,657,582	56,107,463	77,428,298	\$281,186,978	25.0490
39.0%	4,377,931	6,085,325	8,458,601	11,757,456	16,342,863	22,716,580	31,576,046	43,890,704	61,008,079	84,801,230	\$302,240,280	26.9245
40.0%	4,490,186	6,286,260	8,800,765	12,321,070	17,249,499	24,149,298	33,809,017	47,332,624	66,265,674	92,771,943	\$324,701,801	28.9255

to capture productivity gains on the sow side and drive breakeven costs down. On the other hand, if sow-side productivity falls apart, you have the opportunity to drive breakeven costs up. But our analysis shows that the upside potential is much greater than the downside risk.)

The base model produces a 10-year Net Cash Flow of \$42,205,579, before-tax. This is the excess cash available to pay dividends to owners, to pay profit-sharing to employees, to re-invest in business growth and expansion, or to support other investment activities. Adding Net Cash Flow to the ending Animal Inventory Value and the ending Bldg/Eqpt Value (at book values) determines the ending Project Cash Value (also called residual value). Think of the Project Cash Value as the amount of money you would receive at the end of Year 10 if you kept all the excess cash generated over the 10 years (at an interest rate of 0!) and sold the business for the value of the animal inventory and the building and equipment assets.

The base model—with a breakeven of \$42.51 on a market price of \$0.45 per lb liveweight plus \$4 per head lean premium—cash flows nicely. Under our assumptions, this business produces a margin of \$10.73 over the 10 years of the analysis. The ending project value of \$68,222,740 is equivalent to putting the initial investment (\$11,225,465) in an investment vehicle with a ten-year, fixed annual interest rate of 20%.

(If you think a long-term \$0.45 market price is too high, remember we've also got a \$34.50 weaned pig cost and \$155 feed cost built in to the model. There's room to move on both. If we take weaned pig cost to \$31 and the feed cost to \$140, both reasonable assumptions, it moves the breakeven cost to \$39.76, the profit per pig sold to \$10.06, produces about the same net cash flow (\$65,554,281), and yields an equivalent investment interest rate of 19.5%)

As a lender or investment analyst, the first thing you do is scan the table for where the business does not cash-flow. As an owner-investor, the first thing you do is scan the table for the profit potential. You must be able to cash-flow the business to keep lenders and other financial investors (like yourself) happy. If you're strictly a lender rather than an investor-owner, you care most about the downside risk, or the negative cash flow numbers. As business owners and investors, you care most about the upside profit potential.

As you scan the table, you can identify the long-run downside risk potential. It's associated with below-average growth performance and lower-than-projected market prices. More downside risk comes from degradation in daily gain than in market prices or feed conversion. Changes in any other assumption—although having substantial effects on net cash flow—do not threaten the ability of the business to survive.

(What we're doing here is making one-at-a-time changes in underlying assumptions. In a full risk analysis, you would want to change several assumptions at the same time. For example, below-average growth performance coupled with lower-than-projected market prices and higher animal health costs will create a negative net cash flow and cause business failure. You would then attach a probability or likelihood estimate for that particular scenario. Doing this for all expected outcomes will give you a risk-adjusted overall expected outcome.)

Although financial analysts have fancier ways of evaluating a project's feasibility and return—measures like internal-rate-of-return and net present value—a simple and understandable way to assess returns is to look at equivalent investment yield streams. In **Table 3**, you'll find a set of ten-year, before-tax, cash flow yield streams at interest rates from 1% to 40%. To determine the equivalent investment interest rate for the various business scenarios, we compared the ending project value to the yield streams in **Table 3**.

In terms of upside potential, or total business profit, the business is most sensitive to ADG, FCR, weaned pig cost, feed cost, market price, lean premium, and initial equity level. The same reasoning holds for upside potential as for downside risk—we're making one-at-a-time changes in the assumptions. If you change several to above-base levels, you get an upside multiplier effect. As a simple illustration (**Table 4**), we made multiple changes in the underlying assumptions to create a comparison of a high-to a low-performing business. No surprises here, except to note the huge premium for doing a number of things well and the clear risk of business failure by doing a number of things poorly.

Live hog production margins in context

In **Table 2**, you can see margins per head sold clustered around \$10-\$12. How do these compare with historical profit margins in live hog production?

Using the Iowa State model, economist John Lawrence has estimated returns per head sold for farrow-to-finish production in Iowa. The 1982-1999 average return was \$5.71 per head; from 1990-1999 it was \$2.23 compared with \$10.05 from 1982-1989. We could say this is the return for the smaller-scale, non-intensive, independent Iowa pork producer.

More representative of larger-scale, intensively-managed, weekly-breeding-weekly-farrowing production systems are data from analysts at Sparks Companies (**Figure 2**). The 1990-1999 average return per head (\$14.10) was 6.3 times that of the Iowa State model (**Table 5**). This is the return to productivity and economies of scale.

Sensitivity of Business Performance Level for the Same Live Hog Production System									
		Actual	Inventory	Bldg/Eqpt	Project	BreakEven	Profit Per	Equivalent	
		Net Cash Flow	Value	Value	Cash Value	ROE	Per Cwt Live	Pig Sold	Investment
**** BASE ****	1.45 / 2.62	\$42,205,579	\$12,557,376	\$13,459,785	\$68,222,740	9.1%	\$42.51	\$10.73	20.0%
ADG/FCR	1.55 / 2.45	\$73,297,223	\$12,557,376	\$13,459,785	\$100,078,160	12.2%	\$39.93	\$18.56	24.5%
ADG/FCR	1.50 / 2.53	\$57,264,407	\$12,557,376	\$13,459,785	\$83,640,992	10.8%	\$41.21	\$14.52	22.5%
ADG/FCR	1.40 / 2.71	\$25,206,936	\$12,108,096	\$13,459,785	\$50,774,817	6.6%	\$44.06	\$6.45	16.0%
ADG/FCR	1.35 / 2.81	\$9,812,887	\$11,703,744	\$13,459,785	\$34,346,415	3.1%	\$45.63	\$2.41	12.0%
ADG/FCR	1.30 / 2.92	(\$6,837,559)	\$11,299,392	\$13,459,785	\$17,921,618	-3.0%	\$47.33	(\$1.63)	4.5%
ADG/FCR	1.25 / 3.04	(\$22,853,968)	\$10,895,040	\$13,459,785	\$1,500,857	-28.4%	\$49.15	(\$5.67)	0.1%
FCR	2.34	\$64,534,406	\$12,557,376	\$13,459,785	\$90,551,567	11.6%	\$40.42	\$16.36	23.2%
FCR	2.48	\$53,369,992	\$12,557,376	\$13,459,785	\$79,387,153	10.5%	\$41.47	\$13.54	21.5%
FCR	2.76	\$31,041,165	\$12,557,376	\$13,459,785	\$57,058,326	7.5%	\$43.55	\$7.92	17.9%
FCR	2.90	\$19,876,751	\$12,557,376	\$13,459,785	\$45,893,912	5.5%	\$44.59	\$5.10	15.0%
FCR	3.03	\$8,712,338	\$12,557,376	\$13,459,785	\$34,729,498	2.9%	\$45.63	\$2.29	12.0%
FCR	3.17	(\$2,452,076)	\$12,557,376	\$13,459,785	\$23,565,085	-0.8%	\$46.68	(\$0.53)	7.5%
Mortality + Culls	5%	\$34,999,006	\$12,557,376	\$13,459,785	\$61,016,167	8.1%	\$43.11	\$9.10	18.5%
Mortality + Culls	7%	\$27,792,433	\$12,557,376	\$13,459,785	\$53,809,594	7.0%	\$43.74	\$7.40	17.0%
Mortality + Culls	9%	\$20,585,861	\$12,557,376	\$13,459,785	\$46,603,022	5.7%	\$44.40	\$5.63	15.2%
Mortality + Culls	11%	\$13,379,288	\$12,557,376	\$13,459,785	\$39,396,449	4.1%	\$45.08	\$3.78	13.3%
Weaned Pig Cost	\$26.50	\$74,932,379	\$12,557,376	\$13,459,785	\$100,949,540	12.5%	\$39.45	\$18.98	24.5%
Weaned Pig Cost	\$28.50	\$66,750,679	\$12,557,376	\$13,459,785	\$92,767,840	11.8%	\$40.22	\$16.92	23.5%
Weaned Pig Cost	\$30.50	\$58,568,979	\$12,557,376	\$13,459,785	\$84,586,140	11.0%	\$40.98	\$14.85	22.5%
Weaned Pig Cost	\$32.50	\$50,387,279	\$12,557,376	\$13,459,785	\$76,404,440	10.1%	\$41.74	\$12.79	21.2%
Weaned Pig Cost	\$36.50	\$34,023,879	\$12,557,376	\$13,459,785	\$60,041,040	8.0%	\$43.27	\$8.67	18.5%
Weaned Pig Cost	\$40.50	\$17,660,479	\$12,557,376	\$13,459,785	\$43,677,640	5.1%	\$44.78	\$4.54	14.5%
Bldg Cost	\$155	\$48,829,105	\$12,557,376	\$11,259,285	\$72,645,766	10.5%	\$41.89	\$12.40	20.5%
Bldg Cost	\$166	\$46,621,263	\$12,557,376	\$11,992,785	\$71,171,424	10.0%	\$42.10	\$11.84	20.2%
Bldg Cost	\$177	\$44,413,421	\$12,557,376	\$12,726,285	\$69,697,082	9.6%	\$42.30	\$11.29	20.0%
Bldg Cost	\$198	\$39,997,737	\$12,557,376	\$14,193,285	\$66,748,397	8.7%	\$42.71	\$10.17	19.5%
Bldg Cost	\$208	\$37,789,895	\$12,557,376	\$14,926,784	\$65,274,055	8.2%	\$42.92	\$9.62	19.4%
Bldg Cost	\$219	\$35,582,053	\$12,557,376	\$15,660,284	\$63,799,713	7.8%	\$43.13	\$9.06	19.0%
Feed Cost	\$2.00 / \$141	\$60,381,097	\$12,557,376	\$13,459,785	\$86,398,258	11.2%	\$40.81	\$15.31	22.7%
Feed Cost	\$2.25 / \$148	\$51,293,338	\$12,557,376	\$13,459,785	\$77,310,499	10.2%	\$41.66	\$13.02	21.3%
Feed Cost	\$2.75 / \$161	\$33,117,820	\$12,557,376	\$13,459,785	\$59,134,980	7.8%	\$43.36	\$8.44	18.2%
Feed Cost	\$3.00 / \$167	\$24,030,060	\$12,557,376	\$13,459,785	\$50,047,221	6.3%	\$44.20	\$6.15	16.1%
Feed Cost	\$3.25 / \$174	\$14,942,301	\$12,557,376	\$13,459,785	\$40,959,462	4.5%	\$45.05	\$3.86	13.8%

Table 2

Sensitivity of Business Performance Level for the Same Live Hog Production System									
		Actual	Inventory	Bldg/Eqpt	Project		BreakEven	Profit Per	Equivalent
		Net Cash Flow	Value	Value	Cash Value	ROE	Per Cwt Live	Pig Sold	Investment
**** BASE ****	1.45 / 2.62	\$42,205,579	\$12,557,376	\$13,459,785	\$68,222,740	9.1%	\$42.51	\$10.73	20.0%
Market Price	\$0.40	(\$11,364,102)	\$12,557,376	\$13,459,785	\$14,653,059	-5.5%	\$42.51	(\$2.77)	2.5%
Market Price	\$0.41	(\$650,166)	\$12,557,376	\$13,459,785	\$25,366,995	-0.1%	\$42.51	(\$0.07)	8.5%
Market Price	\$0.42	\$10,063,770	\$12,557,376	\$13,459,785	\$36,080,931	3.3%	\$42.51	\$2.63	12.5%
Market Price	\$0.43	\$20,777,706	\$12,557,376	\$13,459,785	\$46,794,867	5.7%	\$42.51	\$5.33	15.3%
Market Price	\$0.44	\$31,491,643	\$12,557,376	\$13,459,785	\$57,508,803	7.6%	\$42.51	\$8.03	17.8%
Market Price	\$0.46	\$52,919,515	\$12,557,376	\$13,459,785	\$78,936,676	10.4%	\$42.51	\$13.43	21.5%
Market Price	\$0.47	\$63,633,451	\$12,557,376	\$13,459,785	\$89,650,612	11.5%	\$42.51	\$16.13	23.2%
Lean Premium	\$2.00	\$34,269,330	\$12,557,376	\$13,459,785	\$60,286,491	8.0%	\$42.51	\$8.73	18.6%
Lean Premium	\$3.00	\$38,237,454	\$12,557,376	\$13,459,785	\$64,254,615	8.6%	\$42.51	\$9.73	19.2%
Lean Premium	\$5.00	\$46,173,703	\$12,557,376	\$13,459,785	\$72,190,864	9.6%	\$42.51	\$11.73	20.5%
Lean Premium	\$6.00	\$50,141,828	\$12,557,376	\$13,459,785	\$76,158,989	10.1%	\$42.51	\$12.73	21.3%
Lean Premium	\$7.00	\$54,109,952	\$12,557,376	\$13,459,785	\$80,127,113	10.5%	\$42.51	\$13.73	21.8%
Lean Premium	\$8.00	\$58,078,077	\$12,557,376	\$13,459,785	\$84,095,238	10.9%	\$42.51	\$14.73	22.4%
Lean Premium	\$9.00	\$62,046,201	\$12,557,376	\$13,459,785	\$88,663,362	11.3%	\$42.51	\$15.73	23.0%
Lean Premium	\$10.00	\$66,014,326	\$12,557,376	\$13,459,785	\$92,031,487	11.7%	\$42.51	\$16.73	23.5%
Interest Rate	6%	\$45,649,875	\$12,557,376	\$13,459,785	\$71,667,036	9.6%	\$42.19	\$11.60	20.3%
Interest Rate	7%	\$43,946,365	\$12,557,376	\$13,459,785	\$69,963,526	9.3%	\$42.35	\$11.17	20.0%
Interest Rate	9%	\$40,428,518	\$12,557,376	\$13,459,785	\$66,445,679	8.9%	\$42.67	\$10.28	19.5%
Interest Rate	10%	\$38,616,206	\$12,557,376	\$13,459,785	\$64,633,367	8.6%	\$42.84	\$9.82	19.2%
Interest Rate	11%	\$36,769,683	\$12,557,376	\$13,459,785	\$62,786,844	8.4%	\$43.02	\$9.36	18.8%
Interest Rate	12%	\$34,890,003	\$12,557,376	\$13,459,785	\$60,907,164	8.1%	\$43.19	\$8.86	18.5%
Initial Equity	10%	\$31,062,679	\$12,557,376	\$13,459,785	\$57,079,840	10.5%	\$42.85	\$9.81	17.8%
Initial Equity	20%	\$36,634,129	\$12,557,376	\$13,459,785	\$62,651,290	9.7%	\$42.68	\$10.27	18.8%
Initial Equity	40%	\$47,777,029	\$12,557,376	\$13,459,785	\$73,794,190	8.6%	\$42.34	\$11.19	20.6%
Initial Equity	50%	\$53,348,479	\$12,557,376	\$13,459,785	\$79,365,640	8.2%	\$42.17	\$11.65	21.8%
Initial Equity	60%	\$58,919,929	\$12,557,376	\$13,459,785	\$84,937,090	7.9%	\$41.99	\$12.12	22.4%
Initial Equity	70%	\$64,491,379	\$12,557,376	\$13,459,785	\$90,508,540	7.6%	\$41.82	\$12.58	23.3%
Animal Health	\$0.50	\$44,428,399	\$12,557,376	\$13,459,785	\$70,445,560	9.4%	\$42.30	\$11.29	20.2%
Animal Health	\$2.00	\$37,759,937	\$12,557,376	\$13,459,785	\$63,777,098	8.5%	\$42.93	\$9.61	19.0%
Animal Health	\$3.00	\$33,314,296	\$12,557,376	\$13,459,785	\$59,331,457	7.9%	\$43.34	\$8.49	18.3%
Animal Health	\$4.00	\$28,868,655	\$12,557,376	\$13,459,785	\$54,885,815	7.2%	\$43.75	\$7.37	17.2%
Animal Health	\$5.00	\$24,423,013	\$12,557,376	\$13,459,785	\$50,440,174	6.4%	\$44.17	\$6.25	16.2%
Animal Health	\$6.00	\$19,977,372	\$12,557,376	\$13,459,785	\$45,994,533	5.5%	\$44.58	\$5.13	15.0%
Animal Health	\$7.00	\$15,531,731	\$12,557,376	\$13,459,785	\$41,548,891	4.6%	\$45.00	\$4.00	14.0%

Table 2, continued

Modeling business performance in live hog production

Table 4

Comparison Between Hypothetical High-Performing and Low-Performing Businesses

	High	Base	Low
Pigs Entered/Yr	409,085	409,085	409,085
Pigs Sold/Yr	396,812	396,812	396,812
ADG	1.50	1.45	1.40
FCR	2.53	2.61	2.71
Mortality + Culls	3%	3%	6%
Sales Weight	278	270	260
Feed Cost/Ton	\$133.00	\$154.00	\$175.00
Market Price	\$0.45	\$0.45	\$0.45
Lean Premium	\$8.00	\$4.00	\$2.00
Weaned Pig Cost	\$30.50	\$34.50	\$36.50
Expenses	Down 10%	Even	Up 10%
Building Cost	\$150,000	\$158,000	\$164,000
Cap Cost/Pig Space	\$179	\$187	\$194
Finance Level	70%	70%	70%
10-Yr Net Cash Flow	\$114,524,321	\$42,205,579	(\$45,939,928)
Inventory Value	\$12,916,800	\$12,557,376	\$12,018,096
Bldg/Eqpt Value	\$12,872,985	\$13,459,785	\$13,899,850
Project Cash Value	\$151,041,635	\$68,222,740	(\$8,325,530)
Breakeven/Cwt Sold	\$36.49	\$42.51	\$49.17
Profit per Pig Sold	\$31.66	\$10.73	(\$8.83)
Equivalent Investment	29.50%	20%	NA

One of the conclusions to draw from this comparison is the following: In the past, almost all producers could make money in this business, and, in fact, a large number could make a lot of money. But over the past 10 years, that has changed. Now, below-average producers are gone, average producers can make some money, and above-average producers can make a lot of money.

Managing the margin

The real goal in the business of live hog production is to minimize variation around a target margin and the follow-on net cash flow. How do we ensure a target net cash flow?

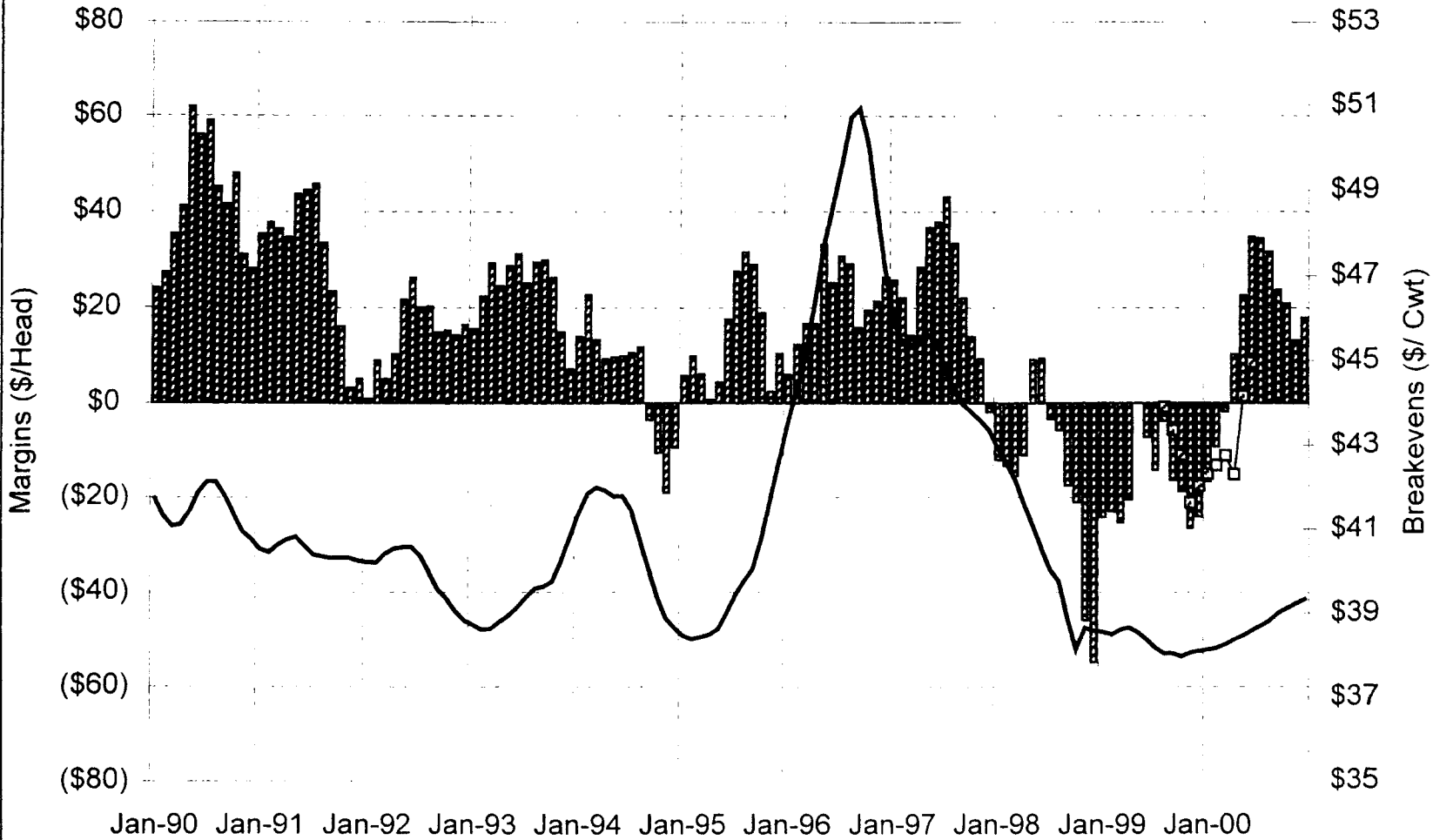
Hog farms are dynamic, with production costs changing all the time. We're most interested in the structural production costs, the production cost bands associated with a given production system. These are the "built-in" costs of production, varying with input costs and internal system productivity. Essentially we want to know where the system is set, what are the upper and lower cost bands. This, and an estimated market price with its attendant variation, will give us what might be called upper and lower margin bands.

Today, owners and managers constantly look at a portfolio of internal and external measures and continuously make business adjustments. There is no one "right" measure but a continuously-managed outcome function. Owners and managers constantly look at a portfolio of internal and external measures

Throughout this paper, we've been using an implied outcome function (again, the point-of-view being owner-of-finishing-side) with the following variables:

- ADG
- FCR
- Mortality + culls
- Weaned pig cost
- Building costs
- Feed cost
- Market price
- Lean premium
- Interest rate
- Leverage

COMMERCIAL FARROW - FINISH HOG PRODUCTION MARGINS & BREAKEVENS*



▨ Margins — Breakevens —□— Hedgeable Comm. Margin

MarginsFromSparks.xls Commercial
8/13/99

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Figure 2

Modeling business performance in live hog production

Table 5

Profit Margins Per Head Sold -- Iowa State v. Sparks Models

Year	Iowa State	Sparks	Top v. Avg
1982	\$29.00		
1983	-\$0.70		
1984	-\$2.20		
1985	-\$0.20		
1986	\$23.40		
1987	\$34.30		
1988	\$0.60		
1989	-\$3.80		
1990	\$29.90	\$41.00	\$11.10
1991	\$15.70	\$30.42	\$14.72
1992	-\$1.50	\$14.50	\$16.00
1993	\$8.50	\$23.17	\$14.67
1994	-\$9.40	\$4.88	\$14.28
1995	\$1.20	\$13.58	\$12.38
1996	\$6.30	\$21.00	\$14.70
1997	\$9.30	\$24.00	\$14.70
1998	-\$26.90	-\$15.42	\$11.48
1999	-\$10.80	-\$16.17	-\$5.37
Avg 82-99	\$5.71		
Avg 90-99	\$2.23	\$14.10	\$11.87
Avg 82-89	\$10.05		

- Other expenses

The “other expenses” function has these variables:

- Electricity
- Propane
- Insurance
- Property taxes
- Repairs and maintenance
- Waste management
- Transport and check off
- Animal health supplies and service
- Management contract
- Miscellaneous

After a production system has been built and is up and running, which components of the outcome function, excluding market price, are most variable? We would suggest the following: ADG, FCR, mortality + culls, weaned pig cost, feed cost, and animal health supplies and service. Weaned pig cost is itself a function of a weaned pig

contract (if you don't own the sow-side) or sow-farm costs and productivity levels. Once a production system is up and running, biological performance in terms of number of pigs moving through the system annually and growth performance will have the biggest effect on breakeven cost of production.

Because biological performance exerts such a powerful influence over business performance, it must be an overriding concern. Within the industry today, Bill Greenley, Steve Dritz, and John Deen, are teaching us how to ensure biological performance within a production system by working with biological variation rather than against it. In particular, Greenley's adaptation of Goldratt's Theory of Constraints will quickly become a standard management technique because it can reduce substantially the risk of inadequate pig flow through a production system.

One of the key ideas in Greenley's work is that of over-configuring a production system to “guarantee” production flow. Using this new management thinking, the kinds of measures that will become important when designing and managing production systems might include the following:

Table 6

Cash Breakeven Cost -- 11 Lb Weaned Pig

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Feed Cost = \$150/ton (gestation/lactation)

10-year depreciation on buildings

Depreciation not included

Interest, Principal payments included

Sow feed cost has little influence on cost per pig weaned

Sow Farm Year in Use	Productivity Level			
	20.4 PWSY 152 PWCY	24.0 PWSY 178 PWCY	17.1 PWSY 127 PWCY	
	Average	Top 10%	Bottom 10%	Average
2	\$33.94	\$28.64	\$43.34	\$35.31
3	\$34.36	\$29.02	\$43.82	\$35.73
4	\$34.80	\$29.42	\$44.31	\$36.18
5	\$35.26	\$29.83	\$44.83	\$36.64
6	\$35.74	\$30.26	\$45.37	\$37.12
7	\$36.23	\$30.70	\$45.94	\$37.63
8	\$36.75	\$31.17	\$46.53	\$38.15
9	\$37.29	\$31.66	\$47.14	\$38.70
10	\$37.86	\$32.16	\$47.78	\$39.27
11	\$26.59	\$22.35	\$34.56	\$27.83
12	\$27.01	\$22.73	\$35.04	\$28.26
13	\$27.45	\$23.13	\$35.54	\$28.71
14	\$27.91	\$23.54	\$36.06	\$29.17
15	\$28.39	\$23.97	\$36.60	\$29.65
16	\$28.88	\$24.42	\$37.16	\$30.15
17	\$29.40	\$24.89	\$37.75	\$30.68
18	\$29.94	\$25.37	\$38.36	\$31.22
19	\$30.50	\$25.88	\$39.00	\$31.79
Avg 2-10	\$35.80	\$30.32	\$45.45	\$37.19
Avg 11-19	\$28.45	\$24.03	\$36.67	\$29.72
Average	\$32.13	\$27.17	\$41.06	\$33.45

- Pr (exceeding breeding targets by x) > 99%
- Pr (exceeding weaned pig targets by x) > 99%
- Pr (exceeding market hog deliveries by x) > 99%
- Pr (exceeding target group market weight by x) > 99%
- Pr (exceeding a target margin by x) > 99%
- Pr (exceeding a target net cash flow by x) > 99%

Other key questions that remain to be answered include:

- How much to over-configure the breeding system?
- How much to over-configure the finishing system?
- How bad does performance need to be before over-configuration becomes unprofitable?
- How much production risk is a function of production system design?

Table 7

Nursery Cash Production Cost -- (8-Wk Nursery Phase, 9.5 Lb Pig)

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Average Productivity

Productivity has little effect on cost per pig produced

Average Daily Gain = 0.85 lb/day

Feed Intake = 1.40 lb/day

Feed Conversion = 1.65

Mortality & Culls = 3.5%

Average Weight Out = 52 lb.

Feed Cost

Year in Use	\$2.25 Corn \$160 Conc \$145.50/ton		\$2.50 Corn \$260 Conc \$188.50/ton		\$2.80 Corn \$300 Conc \$210.50/ton		\$3.00 Corn \$400 Conc \$251.50/ton		Average
2	\$	15.57	\$	17.10	\$	17.90	\$	19.35	\$ 17.48
3	\$	15.79	\$	17.32	\$	18.12	\$	19.57	\$ 17.70
4	\$	16.02	\$	17.55	\$	18.35	\$	19.80	\$ 17.93
5	\$	16.26	\$	17.79	\$	18.58	\$	20.04	\$ 18.17
6	\$	16.51	\$	18.04	\$	18.83	\$	20.28	\$ 18.41
7	\$	16.77	\$	18.30	\$	19.09	\$	20.54	\$ 18.67
8	\$	17.03	\$	18.56	\$	19.36	\$	20.81	\$ 18.94
9	\$	17.31	\$	18.84	\$	19.63	\$	21.09	\$ 19.22
10	\$	17.60	\$	19.13	\$	19.92	\$	21.38	\$ 19.51
11	\$	11.46	\$	12.99	\$	13.79	\$	15.24	\$ 13.37
12	\$	11.68	\$	13.21	\$	14.01	\$	15.46	\$ 13.59
13	\$	11.91	\$	13.44	\$	14.23	\$	15.69	\$ 13.82
14	\$	12.15	\$	13.68	\$	14.47	\$	15.93	\$ 14.06
15	\$	12.40	\$	13.93	\$	14.72	\$	16.17	\$ 14.31
16	\$	12.66	\$	14.19	\$	14.98	\$	16.43	\$ 14.57
17	\$	12.92	\$	14.45	\$	15.25	\$	16.70	\$ 14.83
18	\$	13.20	\$	14.73	\$	15.52	\$	16.98	\$ 15.11
19	\$	13.49	\$	15.02	\$	15.81	\$	17.27	\$ 15.40
Avg 2-10	\$	16.54	\$	18.07	\$	18.86	\$	20.32	\$ 18.45
Avg 11-19	\$	12.43	\$	13.96	\$	14.75	\$	16.21	\$ 14.34
Average	\$	14.49	\$	16.02	\$	16.81	\$	18.26	\$ 16.39

- Using portfolio analysis, can we quantify production risk at various production unit configurations?
- Does the likelihood of production risk approach zero as the portfolio of individual production units increases?

- What are the financial tradeoffs between production system design and biological performance?

Conclusions

We've provided the background detail so that you can answer for yourselves the questions we started with. The

Table 8

Finishing Cash Production Cost -- (18-Wk Finishing Phase)

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Average Productivity

Average Daily Gain = 1.60 lb/day

Feed Intake = 4.60 lb/day

Feed Conversion = 2.88

Mortality & Culls = 2.0%

Average Weight Out = 252 lb.

Total Feed per pig = 581 lb

Feed Cost

Year in Use	\$2.25 Corn	\$2.50 Corn	\$2.75 Corn	\$3.00 Corn	\$3.26 Corn	\$3.50 Corn	Average
	\$172 Conc \$120/ton	\$187 SBM \$130/ton	\$200 SBM \$140/ton	\$218 SBM \$150/ton	\$230 SBM \$160/ton	\$246 SBM \$170/ton	
2	\$54.68	\$57.60	\$60.39	\$63.51	\$66.31	\$69.22	\$61.95
3	\$55.09	\$58.01	\$60.79	\$63.91	\$66.71	\$69.62	\$62.36
4	\$55.50	\$58.42	\$61.21	\$64.33	\$67.13	\$70.04	\$62.77
5	\$55.93	\$58.85	\$61.64	\$64.76	\$67.56	\$70.47	\$63.20
6	\$56.38	\$59.30	\$62.08	\$65.21	\$68.00	\$70.91	\$63.65
7	\$56.84	\$59.76	\$62.55	\$65.67	\$68.46	\$71.37	\$64.11
8	\$57.31	\$60.23	\$63.02	\$66.14	\$68.94	\$71.85	\$64.58
9	\$57.81	\$60.73	\$63.51	\$66.64	\$69.43	\$72.34	\$65.08
10	\$58.32	\$61.24	\$64.02	\$67.15	\$69.94	\$72.85	\$65.59
11	\$48.05	\$50.97	\$53.76	\$56.88	\$59.68	\$62.59	\$55.32
12	\$48.45	\$51.38	\$54.16	\$57.28	\$60.08	\$62.99	\$55.72
13	\$48.87	\$51.79	\$54.58	\$57.70	\$60.50	\$63.41	\$56.14
14	\$49.30	\$52.22	\$55.01	\$58.13	\$60.93	\$63.84	\$56.57
15	\$49.75	\$52.67	\$55.45	\$58.58	\$61.37	\$64.28	\$57.02
16	\$50.21	\$53.13	\$55.91	\$59.04	\$61.83	\$64.74	\$57.48
17	\$50.68	\$53.60	\$56.39	\$59.51	\$62.31	\$65.22	\$57.95
18	\$51.17	\$54.10	\$56.88	\$60.00	\$62.80	\$65.71	\$58.44
19	\$51.68	\$54.61	\$57.39	\$60.51	\$63.31	\$66.22	\$58.95
Avg 2-10	\$56.43	\$59.35	\$62.13	\$65.26	\$68.05	\$70.96	\$63.70
Avg 11-19	\$49.80	\$52.72	\$55.50	\$58.63	\$61.42	\$64.33	\$57.07
Average	\$ 53.11	\$ 56.03	\$ 58.82	\$ 61.94	\$ 64.74	\$ 67.65	\$60.38

answer to one question in particular—Is the live hog production business a good one to be in?—we believe is a resounding yes *if* you can play the game according to the new rules. There is a lot of money to be made in live hog production, but it's not as easy as it used to be.

End notes

For weaned pig cost, we ran a 3- by 18-level analysis (56 models), using three levels of productivity and 18 years of facility use, creating 60 observations. We held feed cost constant at \$150/ton, which was a blended gestation-lactation diet cost. For the nursery phase, we ran a 4- by 18-level analysis, using one level of productivity, four levels of feed cost, and 18 years of facility use. Let me

anticipate a question about why only one level of nursery productivity. Nursery growth performance has a much narrower relative range than either finishing performance or sow farm performance. As such, it has a much lower relative effect on nursery production cost. (However, it's not insignificant, because poor growth performance will influence subsequent finishing performance. In our analysis, we assumed independence between nursery and finishing performance, to simplify. But if we were to be true to the real world, we should model reduced finishing performance associated with below-average nursery performance.) For the finishing phase, we followed the same format, but we added three productivity levels and another feed cost level to create a 3- by 5- by 18-level model. For the overall live hog cost of production equation, we took the average across all levels stratified on productivity level. Weaned pig cost ranged from \$45 to \$24, and clustered around \$33.45. Nursery cost ranged from \$13.96 to \$18.86, clustering around \$16.50. And finishing cost ranged from \$65.48 to \$52.00, clustering around \$58.82. Remember that these costs are based on long-term feed cost prices, not extremes. Long-term feed cost average for the nursery phase was \$210.50 per ton. For the finishing phase it was \$140/ton, using \$2.75/bushel for corn and \$187/ton for soybean meal. For the finishing phase, we used the following poor and excellent performance levels. (The average levels are reported in **Table 8**).

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Table

	Poor	Excellent
Average Daily Gain	1.45	1.90
Feed Intake	4.60	4.60
Feed Conversion	3.17	2.42
Mortality & Culls	5.0%	2.0%
Average Weight Out	230 lb	285 lb
Total Feed Per Pig Sold	580 lb	570 lb

Appendix

Base model: Setup

This section provides the details behind the base model we used in our analysis of Total Company Performance. We used the same generic model to determine our Live Hog Cost of Production Equation. We performed much of the modeling using MBA 4.0, our proprietary financial and production modeling software program for live hog production. For more information about this software, contact Knowledgeworks (612-948-1980).

In the base model, pigs move into the finishing buildings at 9.5 lb and are sold at an average group close-out weight of 270 lb. Growth performance is slightly better-than-average. These performance levels (1.45 ADG, 3.80 ADFI, and 2.62 FCR) will support a long-term group closeout-weight average of 270 lb.

We based the average feed cost (\$154.22 per ton) on long-term feed ingredient prices of \$2.50/bushel price for corn and \$185/ton soybean meal. This represents the as-delivered-to-pigs feed cost, including grind, mix, pelleting, and delivery charges.

We built the base model using an effective market price of \$45/cwt live, with a \$4 lean premium per head sold.

Total project capital cost for buildings and equipment is \$187 per pig space (\$37,384,883). We assumed the project would be financed at the 70% level, requiring an up-front cash investment of \$11,225,465 from the producer-owner.

Base model: Model reports

Production flow model & assumptions for the base model

We've created a model for a nominal 400,000-head wean-to-finish production system. This system would support the weaned pig flow from a 20,000-sow system. It's composed of 52 finishing sites, with four 960-head finishing buildings on each site. Each building flows two complete finishing groups per year, with each group on a 26-week schedule. Because of a two day cleaning and drying timeout, pigs are in the finisher for no more than 180 days. Pigs move into the finishing buildings at 9.5 lb and are sold at an average group close-out weight of 270 lb. Growth performance is slightly better-than-average. These performance levels (1.45 ADG, 3.80 ADFI, and 2.62 FCR) will support a long-term group closeout-weight average of 270 lb.

(Note: This model is static. We assume a close-out strategy that produces an average close-out weight of 270 lb by assuming a distribution of group close-out weights, with a mean of x and a variation of y such that the mean of the distribution $x \pm 3y$ will equal 270 lb. Under this assumption, some groups will close with a weight above 270 lb and some below. We assume a static effective mar-

ket price that captures any discounts for either heavy or light carcasses.)

We based the average feed cost (\$154.22 per ton) on long-term feed ingredient prices of \$2.50/bushel price for corn and \$185/ton soybean meal. This represents the as-delivered-to-pigs feed cost, including grind, mix, pelleting and delivery charges.

Income and cost assumptions

We built the base model using an effective market price of \$45/cwt live, with a \$4 lean premium per head sold. This effective price rolls in all discounts for weight, both light and heavy, along with condemnations. It's designed to model the final price listed on a producer's kill sheets, except for the National Pork Board check-off fee, which we included in the transportation/check-off cost per pig.

We used a conservative assumption for the weaned pig cost and reasonable assumptions for labor rates and the other per-pig costs. The management contract pays for all production record-keeping, payroll, accounting, management reporting, personnel management, other G&A costs, and veterinary service fees.

Project budget

We used industry-average costs for site preparation and wean-to-finish building construction. At two acres per building, we are assuming that manure disposal is handled with easements, at a net zero cost; i.e. land owner trades the value of the manure as fertilizer for the producer's manure handling, delivery, and application. Loan fees and construction period interest levels are typical.

Project financing

We assumed the project would be financed at the 70% level, requiring an up-front cash investment of \$11,225,465 from the producer-owner.

Depreciation & inflation assumptions

We assumed that equipment represented 40% of the total depreciable value while buildings represented 60%. We inflated labor a bit faster than other expenses (5% vs. 2.5% annual increase). We did not inflate feed because cost of feed continues to decrease in real dollars on a year-over-year basis. We appreciated the value of land by 3.5% per year.

Ten-year production budget

This model does not account for start-up effects on pig purchases and pig sales. You can think of it as all pigs starting on January 1 of Year 1, or more

accurately, as a model of a fully-in-production finishing system.

Ten-year projected earnings

This model does not account for start-up effects on cash flow timing, which are significant. It assumes that both the purchased pigs and the purchased feed are financed under an interest-free, deferred-payment plan.

Ten-year projected cash flow and investment analysis

This is the report that all finance people want to see first. After they digest this, they will begin to ask for the supporting detail. To help you understand the analysis, we'll take Year 1 as an example to work through.

Net cash flow is the business's bottom-line. It represents what's sometimes called free or excess cash flow (although this stretches the formal definition of cash flow). It represents the actual dollars, either before- or after-tax, that the owners have in their hands at the end of the day (or month, quarter, year, etc.).

To determine net cash flow, you take earnings and add back depreciation, then subtract principal payments and income tax. We did not enter an income tax rate, so the results from this modeling exercise are in before-tax dollars. You add back depreciation because it's a non-cash expense; it's included in a P&L or Earnings Statement and is deductible as a business expense, but the owner keeps the cash represented by depreciation.

The running cash balance is a straightforward calculation, but note that we assume all cash accumulates in the business over the ten year period. In other words, we assume no cash dividends to owners, no additional capital expenditures, and no re-investment in other businesses or expansion in this one.

The residual value of the project equals the depreciated value of the buildings and equipment and the appreciated value of the land. It represents the money you would receive if you could sell the buildings, equipment, and land at the end of ten years. It is a net amount because it include the costs of selling the business. It may include the animal inventory, although this model does not.

To determine the Project Cash Value and calculate the Internal Rate of Return and Net Present Value, we take the accumulated net cash flow, add the value of the animal inventory, and add the residual value of the bricks and mortar.

Borrowed capital repayment schedule

We assumed conventional financing at an 8% interest rate.

Ten-year projected balance sheet

We assume that all excess cash accumulates in the business over the project's ten year life.

Income and expenses per hog sold & per pound sold

No additional assumptions were made for these reports.

Financial & production efficiency analysis

- Gross Revenues is the same as Market Hog Income/Year as reported on the Projected Earnings report.
- Net Income is the same as Earnings Before Income Tax as reported on the Projected Earnings report.
- Total Assets, Total Liabilities, and Total Equity comes from the Projected Balance Sheet.
- Owner Equity % = Total Equity / Total Liabilities

- Working Capital = (Total Current Assets – Principal + Interest Payments on Term Debt)
- Current Ratio = (Total Current Assets / (Principal + Interest Payments on Term Debt))
- Working Capital: Gross Revenues = Working Capital / Gross Revenues
- Return on Equity = Net Income / Total Equity
- Return on Assets = (Net Income + Interest) / Total Assets
- Operating Profit Margin = (Net Income + Interest) / Gross Revenues
- Net Profit Margin = Net Income / Gross Revenues
- Asset Turnover Ratio = Gross Income / Total Assets
- Leverage = 1 / (Total Equity / Total Assets)



Appendix continues...

Wean-to-Finish Model — Conventional Financing (20,000-sow System)

Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site

(c) 1999, Knowledgeworks, Inc

SITE DESIGN, PRODUCTION EFFICIENCY ASSUMPTIONS

PRODUCTION FLOW MODEL & ASSUMPTIONS

Finishing Inventory

No sites	52
No buildings per site	4
Pig spaces/bldg	960
Pig spaces/site	3,840
Theoretical Annual pig flow — Pigs entered	399,360
Theoretical Annual pig flow — Pigs sold	387,379
Actual annual pig flow — Pigs entered	409,085
Actual annual pig flow — Pigs sold	396,812

Finishing Targets

Weight into finisher	9.5
Age into finisher (weeks)	2.6
Weeks in finisher	26.0
Average weight out	270.0
ADG — target	1.45
Finisher mortality + culls (%)	3.0%
Finisher feed intake (lb/day)	3.80
Finisher feed cost/ton	\$154.22

Finishing Performance, Calculated

Calculated weight out	270
Turns/building/year	2.00
Days in finisher — actual	179.7
Days in finisher — theoretical	182.0
Calculated down-time between groups (days)	2.3
Finishing utilization %	98.71%
Feed conversion	2.62
Pigs into finisher	409,085
Pigs out of finisher	396,812
Ave finisher inventory	201,474
Net gain (lbs per market hog)	260.5
Total gain (lbs)	104,968,143
Total pigdays	72,391,823
Total weight sold (lbs)	107,139,362
Total feed/yr (lbs)	275,088,926
Total feed/yr (tons)	137,544
Total feed cost	\$21,212,386
Feed (lbs) per market hog sold	693
Feed cost per market hog sold	\$53.46
Feed cost per lb gain	\$0.2021

Contract finish model - Grower Perspective (Yes/No) no

Wean-to-Finish Model — Conventional Financing (20,000-sow System) Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site

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INCOME, COST ASSUMPTIONS

This Model:

INCOME ASSUMPTIONS

Number market hogs sold	396,812	
Market price/lb liveweight	\$0.4500	0.45
Lean value premium/hd	\$4.00	4
Total income per hog sold	\$125.50	

Market hog income/yr**\$49,799,962**

Base price income \$48,212,713

Lean value income \$1,587,250

WEANED PIG COST ASSUMPTIONS

Cost per weaned pig	\$34.50	34.5
Total costs for weaned pigs	\$14,113,433	

LABOR COST ASSUMPTIONS

Hours per building per day	1.28	1.28
Number buildings/site	4	
Total daily hours - site	1868.8	
Hours for load out, cleaning, filling per turn	15	15
Number of turns/building	2.00	
Number of turns/site	8.00	
Total load out, clean, fill hours	120	
Total labor hours/site	1,989	
Total labor hours — all sites	103,418	
Total labor — Full-time-equivalents (@2000 hrs/year)	52	
Labor charge per hour	\$15.00	
Total labor costs	\$1,551,264	

CONTRACT PRODUCER PAYMENTS

Total number of buildings	208	
Pig spaces/bldg	960	
Total number of pig spaces	199680	
Contract producer payment per pig place	\$0.00	\$0
Total annual contract payment	\$0	

OTHER PER-PIG COST ASSUMPTIONS

Electricity	\$442,446	\$1.12
Propane	\$333,322	\$0.84
Insurance	\$277,769	\$0.70
Taxes (Property)	\$388,876	\$0.98
Repairs & Maintenance	\$107,139	\$0.27
Waste management	\$198,406	\$0.50
Transport & checkoff	\$595,219	\$1.50
Animal Health Supplies/Services	\$396,812	\$1.00
Miscellaneous & Other	\$396,812	\$1.00
Management Contract	\$793,625	\$2.00

**Wean-to-Finish Model — Conventional Financing (20,000-sow System)
Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site**

(c) 1999, Knowledgeworks, Inc.

PROJECT BUDGET

This Model:

Number of Sites	52
Buildings per Site	4
Total Number of Buildings	208

	Total Cost		Per...
Permitting	\$208,000	1000	Building
Excavation	\$2,340,000	11250	Building
Electrical to building	\$104,000	500	Building
Well, well wiring and fresh water to building	\$390,000	1875	Building
LP tank and vaporizer	\$10,400	200	Site
Outside gas piping	\$26,000	500	Site
Pressure washer	\$182,000	3500	Site
Alarm system	\$15,600	300	Site
Dead cart	\$14,300	275	Site
Phone and service hookup	\$10,400	200	Site
Fax machine	\$15,600	300	Site
Desk and chair	\$20,800	400	Site
Sub-total, site prep and site equipment	\$3,337,100		
Building construction	\$32,864,000	158000	\$158,000 for a free-standing 960-head wean-to-finish
Land — Number of acres	416	2	2 acres per building
Land — Value per acre	\$1,300		
Total land cost	\$540,800		
Sub-total capital cost	\$36,741,900		
Loan fees and closing costs	\$183,710	0	Loan fees at 0.5% of total loan; closing costs \$300
Construction period interest	\$459,274		50% of capital cost, 90 days at 10%
Total capital cost	\$37,384,883		
Total capital cost per pig space	\$187		

Wean-to-Finish Model — Conventional Financing (20,000-sow System) Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site

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PROJECT FINANCING

Owner's Equity (Cash Contribution)

Number of shares	1
Cash per share	\$11,225,465
Contribution — Bldgs, Land, Eqpt	\$11,215,465
Contribution — Start-Up Operating Capital	\$10,000
Contribution — Other	\$0
Total owner's cash contribution	\$11,225,465

Buildings/Equipment/Land Capital Costs

Total capital cost (Bldgs, Land, Eqpt)	\$37,384,883
Percent financed	70.0%
Total amount financed	\$26,169,418
Interest rate, annual	8.00%
Term, in years	10
Annual payment	\$3,900,015
Owner's contribution	\$11,215,465

Operating Capital

Total start-up financing	\$10,000
Percent financed	0.0%
Total amount financed	\$0
Interest rate, annual	10.00%
Term, in years	10
Annual payment	\$0
Owner's contribution	\$10,000

Additional Capital/Operating Requirements

Total additional capital/operating costs	\$0
Percent financed	80.0%
Total amount financed	\$0
Interest rate, annual	10.00%
Term, in years	10
Annual payment	\$0

Total Project Budget	\$37,394,883
Total Amount Financed	\$26,169,418
Percent of Project Financed	69.98%

Wean-to-Finish Model — Conventional Financing (20,000-sow System)
Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site
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DEPRECIATION, INFLATION ASSUMPTIONS

		This Model: Typical Values:	
DEPRECIATION FACTORS			
Total depreciable value	\$36,844,083	Excludes the value of land	
Equipment, as % of total cost	40%		
Equipment, original cost	\$14,737,633		
Equipment, useful life in years	10		
Equipment, annual depreciation	\$1,473,763		
Buildings, as % of total cost	60%		
Buildings, original cost	\$22,106,450		
Buildings, useful life	20		
Buildings, annual depreciation	\$1,105,322		
Total depreciation per year	\$2,579,086		
ANNUAL INFLATION MULTIPLIERS			
Labor	5 00%	5 00%	5 00%
Feed	0 00%	0 00%	0 00%
Electricity	2 50%	2 50%	3 50%
Propane	2 50%	2 50%	3 50%
Insurance	2 50%	2 50%	3 50%
Taxes	2 50%	2 50%	3 50%
Repairs & Maintenance	2 50%	2 50%	3 50%
Waste management	2 50%	2 50%	3 50%
Transport & checkoff	2 50%	2 50%	3 50%
Animal Health Supplies/Services	2 50%	2 50%	3 50%
Miscellaneous & Other	2 50%	2 50%	3 50%
Management Contract	2 50%	2 50%	3 50%
Land (Project Site)	3 50%	3 50%	3 50%

Wean-to-Finish Model — Conventional Financing (20,000-sow System)

Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site

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10-YEAR PROJECTED EARNINGS

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
INCOME										
Number market hogs sold	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812
Market price/lb liveweight	\$0.4500	\$0.4500	\$0.4500	\$0.4500	\$0.4500	\$0.4500	\$0.4500	\$0.4500	\$0.4500	\$0.4500
Lean value premium/hd	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00
Market hog income/yr	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962
Contract producer payment	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
EXPENSES (Inflation-adjusted)										
Feed	\$21,212,386	21,212,386	21,212,386	21,212,386	21,212,386	21,212,386	21,212,386	21,212,386	21,212,386	21,212,386
Weaned pig costs	\$14,113,433	14,113,433	14,113,433	14,113,433	14,113,433	14,113,433	14,113,433	14,113,433	14,113,433	14,113,433
Contract payment	\$0	0	0	0	0	0	0	0	0	0
Labor	\$1,551,264	1,628,827	1,710,269	1,795,782	1,885,571	1,979,850	2,078,842	2,182,784	2,291,923	2,406,520
Electricity	\$442,446	453,507	464,845	476,466	488,377	500,587	513,102	525,929	539,077	552,554
Propane	\$333,322	341,656	350,197	358,952	367,926	377,124	386,552	396,216	406,121	416,274
Insurance	\$277,769	284,713	291,831	299,127	306,605	314,270	322,127	330,180	338,434	346,895
Taxes	\$388,876	398,598	408,563	418,777	429,247	439,978	450,977	462,252	473,808	485,653
Repairs & Maintenance	\$107,139	109,818	112,563	115,377	118,262	121,218	124,249	127,355	130,539	133,802
Waste Management	\$198,406	203,366	208,451	213,662	219,003	224,478	230,090	235,843	241,739	247,782
Transport & Checkoff	\$595,219	610,099	625,352	640,985	657,010	673,435	690,271	707,528	725,216	743,347
Animal Health Supplies/Services	\$396,812	406,733	416,901	427,324	438,007	448,957	460,181	471,685	483,477	495,564
Miscellaneous & Other	\$396,812	406,733	416,901	427,324	438,007	448,957	460,181	471,685	483,477	495,564
Management Contract	\$793,625	813,466	833,802	854,647	876,013	897,914	920,362	943,371	966,955	991,129
Depreciation	\$2,579,086	2,579,086	2,579,086	2,579,086	2,579,086	2,579,086	2,579,086	2,579,086	2,579,086	2,579,086
Interest — Bldg, Eqpt, Land loan	\$2,093,553	1,949,037	1,792,958	1,624,394	1,442,344	1,245,730	1,033,388	804,057	556,381	288,890
Interest — Start-Up Financing loan	\$0	0	0	0	0	0	0	0	0	0
Interest — Other loan	\$0	0	0	0	0	0	0	0	0	0
Total expenses	\$45,480,149	\$45,511,456	\$45,537,536	\$45,557,720	\$45,571,276	\$45,577,402	\$45,575,225	\$45,563,789	\$45,542,053	\$45,508,879
EARNINGS BEFORE INCOME TAX	\$4,319,813	\$4,288,506	\$4,262,426	\$4,242,242	\$4,228,687	\$4,222,560	\$4,224,738	\$4,236,173	\$4,257,910	\$4,291,083

Wean-to-Finish Model — Conventional Financing (20,000-sow System)
Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site
 (c) 1999, Knowledgeworks, Inc.

PRODUCTION FLOWS & EFFICIENCIES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
No. buildings per site	4	4	4	4	4	4	4	4	4	4
Pig spaces/bldg	960	960	960	960	960	960	960	960	960	960
Pig spaces/site	3,840	3840	3840	3840	3840	3840	3840	3840	3840	3840
Annual pig flow	409,085	409085	409085	409085	409085	409085	409085	409085	409085	409085
Weeks in finisher	26	26	26	26	26	26	26	26	26	26
Days in finisher	180	180	180	180	180	180	180	180	180	180
Average weight out (lbs)	270	270	270	270	270	270	270	270	270	270
Turns/building/year	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
ADG	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Feed conversion	2.621	2.621	2.621	2.621	2.621	2.621	2.621	2.621	2.621	2.621
Finisher mortality + culls (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finisher feed intake (lb/day)	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
Finisher feed cost/ton	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22
Weight into finisher	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
Age into finisher (weeks)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Pigs into finisher	409,085	409085	409085	409085	409085	409085	409085	409085	409085	409085
Pigs out of finisher	396,812	396812	396812	396812	396812	396812	396812	396812	396812	396812
Ave finisher inventory	201,474	201474	201474	201474	201474	201474	201474	201474	201474	201474
Net gain (lbs)	261	261	261	261	261	261	261	261	261	261
Total gain (lbs)	104,968,143	104968143	104968143	104968143	104968143	104968143	104968143	104968143	104968143	104968143
Total weight sold (lbs)	107,139,362	107139361.5	107139361.5	107139361.5	107139361.5	107139361.5	107139361.5	107139361.5	107139361.5	107139361.5
Total pigdays	72,391,823	72391823	72391823	72391823	72391823	72391823	72391823	72391823	72391823	72391823
Total feed/yr (lbs)	275,088,926	275088926	275088926	275088926	275088926	275088926	275088926	275088926	275088926	275088926
Total feed/yr (tons)	137,544	137544	137544	137544	137544	137544	137544	137544	137544	137544
Feed cost/yr	\$21,212,386	\$21,212,386	\$21,212,386	\$21,212,386	\$21,212,386	\$21,212,386	\$21,212,386	\$21,212,386	\$21,212,386	\$21,212,386
Feed (lbs) per market hog sold	693	693	693	693	693	693	693	693	693	693
Feed cost per market hog sold	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46
Feed cost per lb gain	\$0.2021	\$0.2021	\$0.2021	\$0.2021	\$0.2021	\$0.2021	\$0.2021	\$0.2021	\$0.2021	\$0.2021

Wean-to-Finish Model — Conventional Financing (20,000-sow System)
Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site

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10-YEAR PROJECTED CASH FLOW & INVESTMENT ANALYSIS

WILL BE USED FOR BEFORE-TAX COMPARISON	YES	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
NET CASH FLOW											
Earnings before income tax		\$4,319,813	4,288,506	4,262,426	4,242,242	4,228,687	4,222,560	4,224,738	4,236,173	4,257,910	4,291,083
Plus Depreciation (Equipment)		\$1,473,763	\$1,473,763	\$1,473,763	\$1,473,763	\$1,473,763	\$1,473,763	\$1,473,763	\$1,473,763	\$1,473,763	\$1,473,763
Plus Depreciation (Buildings)		\$1,105,322	\$1,105,322	\$1,105,322	\$1,105,322	\$1,105,322	\$1,105,322	\$1,105,322	\$1,105,322	\$1,105,322	\$1,105,322
Minus Principal Payments (Bldg. Eqpt. Land loan)		\$1,806,462	1,950,978	2,107,057	2,275,621	2,457,671	2,654,285	2,866,627	3,095,958	3,343,634	3,611,125
Minus Principal Payments (Start-up Financing loan)		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Minus Principal Payments (Other loan)		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Minus Income Tax (36% Fed + State)		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net cash flow											
	(\$11,225,465)	\$5,092,438	\$4,916,614	\$4,734,455	\$4,545,707	\$4,350,101	\$4,147,361	\$3,937,196	\$3,719,302	\$3,493,361	\$3,259,044
CUMULATIVE CASH POSITION											
Beginning Cash Balance		\$0	5,102,438	10,019,051	14,753,506	19,299,213	23,649,314	27,796,676	31,733,872	35,453,173	38,946,535
Plus Total Start-Up Cash (Owner + Start-up loan)		\$10,000									
Plus Owner's Cash Contribution for Bldg, Eqpt, Land		\$11,215,465									
Minus Owner's Payment (Bldg, Eqpt, Land)		\$11,215,465									
Plus Net Cash Flow		\$5,092,438	4,916,614	4,734,455	4,545,707	4,350,101	4,147,361	3,937,196	3,719,302	3,493,361	3,259,044
Ending Cash Balance		\$5,102,438	10,019,051	14,753,506	19,299,213	23,649,314	27,796,676	31,733,872	35,453,173	38,946,535	42,205,579
RESIDUAL VALUE AT END OF 10 YEARS											
Equipment (40%)		\$14,737,633	13,263,870	11,790,107	10,316,343	8,842,580	7,368,817	5,895,053	4,421,290	2,947,527	1,473,763
Buildings (60%)		\$22,106,450	21,001,127	19,895,805	18,790,482	17,685,160	16,579,837	15,474,515	14,369,192	13,263,870	12,158,547
Land (Project Site)		\$540,800	559,728	579,318	599,595	620,580	642,301	664,781	688,049	712,130	737,055
Total Project Value		\$37,384,883	\$34,824,725	\$32,265,230	\$29,706,420	\$27,148,320	\$24,590,955	\$22,034,350	\$19,478,531	\$16,923,527	\$14,369,366
Costs of Sale											\$909,581
6% realty fee; .33% deed tax; \$300 closing											
Net Selling Price											\$13,459,785
BEFORE-TAX INVESTMENT ANALYSIS											
Net Cash Flow, Year 10											\$3,259,044
Animal Inventory, Year 10											\$12,557,376
Net Selling Price, Year 10											\$13,459,785
IRR Cash Flow											
	(\$11,225,465)	\$5,092,438	\$4,916,614	\$4,734,455	\$4,545,707	\$4,350,101	\$4,147,361	\$3,937,196	\$3,719,302	\$3,493,361	\$29,276,205
PROJECT INTERNAL RATE OF RETURN											
											43.6%
PROJECT NET PRESENT VALUE (Excluding the initial investment)											
											\$36,921,055

**Wean-to-Finish Model — Conventional Financing (20,000-sow System)
Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site**

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BORROWED CAPITAL REPAYMENT SCHEDULE

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
Term loan — Bldgs, Eqpt, Land										
Amount	\$26,169,418									
Interest Rate, annual	8.00%									
Term (years)	10									
Annual payment, interest	\$2,093,553	1,949,037	1,792,958	1,624,394	1,442,344	1,245,730	1,033,388	804,057	556,381	288,890
Cumulative interest paid	\$2,093,553	4,042,590	5,835,548	7,459,942	8,902,286	10,148,016	11,181,404	11,985,461	12,541,842	12,830,732
Annual payment, principal	\$1,806,462	1,950,978	2,107,057	2,275,621	2,457,671	2,654,285	2,866,627	3,095,958	3,343,634	3,611,125
Cumulative principal paid	\$1,806,462	3,757,440	5,864,497	8,140,118	10,597,789	13,252,074	16,118,701	19,214,659	22,558,293	26,169,418
Balance	\$24,362,957	22,411,978	20,304,921	18,029,300	15,571,629	12,917,344	10,050,717	6,954,759	3,611,125	0
Term loan — Start-up Operating Capital										
Amount	\$0									
Interest Rate, annual	10.00%									
Term (years)	10									
Annual payment, interest	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cumulative interest paid	\$0	0	0	0	0	0	0	0	0	0
Annual payment, principal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cumulative principal paid	\$0	0	0	0	0	0	0	0	0	0
Balance	\$0	0	0	0	0	0	0	0	0	0
Term loan — Other loan										
Amount	\$0									
Interest Rate, annual	10.00%									
Term (years)	10									
Annual payment, interest	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cumulative interest paid	\$0	0	0	0	0	0	0	0	0	0
Annual payment, principal	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cumulative principal paid	\$0	0	0	0	0	0	0	0	0	0
Balance	\$0	0	0	0	0	0	0	0	0	0

Modeling business performance in live hog production

**Wean-to-Finish Model — Conventional Financing (20,000-sow System)
Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site**

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10-YEAR PROJECTED BALANCE SHEET (End-of-year)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
Current Assets										
Cash	\$5,102,438	10,019,051	14,753,506	19,299,213	23,649,314	27,796,676	31,733,872	35,453,173	38,946,535	42,205,579
Animal Inventory (@ \$0.45/lb)	\$12,557,376	\$12,557,376	\$12,557,376	\$12,557,376	\$12,557,376	\$12,557,376	\$12,557,376	\$12,557,376	\$12,557,376	\$12,557,376
Total Current Assets	\$17,659,814	\$22,576,427	\$27,310,882	\$31,856,589	\$36,206,690	\$40,354,052	\$44,291,248	\$48,010,549	\$51,503,911	\$54,762,955
Long-Term Assets										
Buildings	\$22,106,450	\$21,001,127	\$19,895,805	\$18,790,482	\$17,685,160	\$16,579,837	\$15,474,515	\$14,369,192	\$13,263,870	\$12,158,547
Equipment	\$14,737,633	\$13,263,870	\$11,790,107	\$10,316,343	\$8,842,580	\$7,368,817	\$5,895,053	\$4,421,290	\$2,947,527	\$1,473,763
Land	\$540,800	559,728	579,318	599,595	620,580	642,301	664,781	688,049	712,130	737,055
Total Long-Term Assets	\$37,384,883	\$34,824,725	\$32,265,230	\$29,706,420	\$27,148,320	\$24,590,955	\$22,034,350	\$19,478,531	\$16,923,527	\$14,369,366
Total Assets	\$55,044,697	57,401,153	59,576,112	61,563,009	63,355,011	64,945,006	66,325,597	67,489,080	68,427,438	69,132,320
Current Liabilities	0	0	0	0	0	0	0	0	0	0
Long-Term Liabilities										
Term loan — Start-Up Financing	\$0	0	0	0	0	0	0	0	0	0
Term loan — Bldg, Eqpt, Land	\$24,362,957	22,411,978	20,304,921	18,029,300	15,571,629	12,917,344	10,050,717	6,954,759	3,611,125	0
Total Liabilities	\$24,362,957	\$22,411,978	\$20,304,921	\$18,029,300	\$15,571,629	\$12,917,344	\$10,050,717	\$6,954,759	\$3,611,125	\$0
Equity										
Total Owner's Equity	\$30,681,740	\$34,989,174	\$39,271,191	\$43,533,709	\$47,783,381	\$52,027,662	\$56,274,880	\$60,534,321	\$64,816,313	\$69,132,320

Wean-to-Finish Model — Conventional Financing (20,000-sow System)
Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site

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OPERATING INCOME & EXPENSES PER MARKET HOG SOLD

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
INCOME FROM MARKET HOG SALES	\$125.50	\$125.50	\$125.50	\$125.50	\$125.50	\$125.50	\$125.50	\$125.50	\$125.50	\$125.50
INCOME FROM CONTRACT PRODUCER PAYMENT	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
EXPENSES (Inflation-adjusted)										
Feed	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46	\$53.46
Weaned pig cost	\$35.57	\$35.57	\$35.57	\$35.57	\$35.57	\$35.57	\$35.57	\$35.57	\$35.57	\$35.57
Contract producer payment	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Labor	\$3.91	\$4.10	\$4.31	\$4.53	\$4.75	\$4.99	\$5.24	\$5.50	\$5.78	\$6.06
Electricity	\$1.12	\$1.14	\$1.17	\$1.20	\$1.23	\$1.26	\$1.29	\$1.33	\$1.36	\$1.39
Propane	\$0.84	\$0.86	\$0.88	\$0.90	\$0.93	\$0.95	\$0.97	\$1.00	\$1.02	\$1.05
Insurance	\$0.70	\$0.72	\$0.74	\$0.75	\$0.77	\$0.79	\$0.81	\$0.83	\$0.85	\$0.87
Taxes	\$0.98	\$1.00	\$1.03	\$1.06	\$1.08	\$1.11	\$1.14	\$1.16	\$1.19	\$1.22
Repairs & Maintenance	\$0.27	\$0.28	\$0.28	\$0.29	\$0.30	\$0.31	\$0.31	\$0.32	\$0.33	\$0.34
Waste management	\$0.50	\$0.51	\$0.53	\$0.54	\$0.55	\$0.57	\$0.58	\$0.59	\$0.61	\$0.62
Transport & checkoff	\$1.50	\$1.54	\$1.58	\$1.62	\$1.66	\$1.70	\$1.74	\$1.78	\$1.83	\$1.87
Animal Health Supplies/Service	\$1.00	\$1.03	\$1.05	\$1.08	\$1.10	\$1.13	\$1.16	\$1.19	\$1.22	\$1.25
Miscellaneous & Other	\$1.00	\$1.03	\$1.05	\$1.08	\$1.10	\$1.13	\$1.16	\$1.19	\$1.22	\$1.25
Management Contract	\$2.00	\$2.05	\$2.10	\$2.15	\$2.21	\$2.26	\$2.32	\$2.38	\$2.44	\$2.50
Depreciation	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50
Interest — Bldg, Eqpt, Land loan	\$5.28	\$4.91	\$4.52	\$4.09	\$3.63	\$3.14	\$2.60	\$2.03	\$1.40	\$0.73
Interest — Start-Up Financing loan	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Interest — Other loan	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Expenses	\$114.61	\$114.69	\$114.76	\$114.81	\$114.84	\$114.86	\$114.85	\$114.82	\$114.77	\$114.69
NET INCOME PER MARKET HOG SOLD	\$10.89	\$10.81	\$10.74	\$10.69	\$10.66	\$10.64	\$10.65	\$10.68	\$10.73	\$10.81
+ Principal Payments	\$4.55	\$4.92	\$5.31	\$5.73	\$6.19	\$6.69	\$7.22	\$7.80	\$8.43	\$9.10
- Depreciation	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50	\$6.50
= Total Cash Cost	\$112.67	\$113.11	\$113.57	\$114.04	\$114.54	\$115.05	\$115.58	\$116.13	\$116.70	\$117.29
Cash Breakeven / Lb	\$0.4173	\$0.4189	\$0.4206	\$0.4224	\$0.4242	\$0.4261	\$0.4281	\$0.4301	\$0.4322	\$0.4344

**Wean-to-Finish Model — Conventional Financing (20,000-sow System)
Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site**

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OPERATING INCOME & EXPENSES PER POUND SOLD

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
INCOME PER POUND FROM MARKET HOG SALES	\$0.4648	\$0.4648	\$0.4648	\$0.4648	\$0.4648	\$0.4648	\$0.4648	\$0.4648	\$0.4648	\$0.4648
INCOME PER POUND FROM CONTRACT PAYMT	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000
Number market hogs sold	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812
Average weight per market hog	270.00	270.00	270.00	270.00	270.00	270.00	270.00	270.00	270.00	270.00
Total pounds liveweight sold	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362
Pounds feed per hog sold	693	693	693	693	693	693	693	693	693	693
EXPENSES PER POUND SOLD (Inflation-adjusted)										
Feed	\$0.1980	\$0.1980	\$0.1980	\$0.1980	\$0.1980	\$0.1980	\$0.1980	\$0.1980	\$0.1980	\$0.1980
Weaned pig cost	\$0.1317	\$0.1317	\$0.1317	\$0.1317	\$0.1317	\$0.1317	\$0.1317	\$0.1317	\$0.1317	\$0.1317
Contract producer payment	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000
Labor	\$0.0145	\$0.0152	\$0.0160	\$0.0168	\$0.0176	\$0.0185	\$0.0194	\$0.0204	\$0.0214	\$0.0225
Electricity	\$0.0041	\$0.0042	\$0.0043	\$0.0044	\$0.0046	\$0.0047	\$0.0048	\$0.0049	\$0.0050	\$0.0052
Propane	\$0.0031	\$0.0032	\$0.0033	\$0.0034	\$0.0034	\$0.0035	\$0.0036	\$0.0037	\$0.0038	\$0.0039
Insurance	\$0.0026	\$0.0027	\$0.0027	\$0.0028	\$0.0029	\$0.0029	\$0.0030	\$0.0031	\$0.0032	\$0.0032
Taxes	\$0.0036	\$0.0037	\$0.0038	\$0.0039	\$0.0040	\$0.0041	\$0.0042	\$0.0043	\$0.0044	\$0.0045
Repairs & Maintenance	\$0.0010	\$0.0010	\$0.0011	\$0.0011	\$0.0011	\$0.0011	\$0.0012	\$0.0012	\$0.0012	\$0.0012
Waste Management	\$0.0019	\$0.0019	\$0.0019	\$0.0020	\$0.0020	\$0.0021	\$0.0021	\$0.0022	\$0.0023	\$0.0023
Transport & Checkoff	\$0.0056	\$0.0057	\$0.0058	\$0.0060	\$0.0061	\$0.0063	\$0.0064	\$0.0066	\$0.0068	\$0.0069
Animal Health Supplies/Services	\$0.0037	\$0.0038	\$0.0039	\$0.0040	\$0.0041	\$0.0042	\$0.0043	\$0.0044	\$0.0045	\$0.0046
Miscellaneous & Other	\$0.0037	\$0.0038	\$0.0039	\$0.0040	\$0.0041	\$0.0042	\$0.0043	\$0.0044	\$0.0045	\$0.0046
Management Contract	\$0.0074	\$0.0076	\$0.0078	\$0.0080	\$0.0082	\$0.0084	\$0.0086	\$0.0088	\$0.0090	\$0.0093
Depreciation	\$0.0241	\$0.0241	\$0.0241	\$0.0241	\$0.0241	\$0.0241	\$0.0241	\$0.0241	\$0.0241	\$0.0241
Interest — Bldg, Eqpt, Land loan	\$0.0195	\$0.0182	\$0.0167	\$0.0152	\$0.0135	\$0.0116	\$0.0096	\$0.0075	\$0.0052	\$0.0027
Interest — Start-Up Financing loan	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000
Interest — Other loan	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000	\$0.0000
Total Expenses	\$0.4245	\$0.4248	\$0.4250	\$0.4252	\$0.4253	\$0.4254	\$0.4254	\$0.4253	\$0.4251	\$0.4248
NET \$ PER POUND FROM MARKET HOG SALES	\$0.0403	\$0.0400	\$0.0398	\$0.0396	\$0.0395	\$0.0394	\$0.0394	\$0.0395	\$0.0397	\$0.0401

Wean-to-Finish Model — Conventional Financing (20,000-sow System)**Finishing Site Design — 52 Sites @ 4 x 960-head Building per Site**

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FINANCIAL & PRODUCTION EFFICIENCY ANALYSIS**REVENUE / ASSETS / LIABILITIES**

Gross Revenues	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962	\$49,799,962
Net Income	\$4,319,813	\$4,288,506	\$4,262,426	\$4,242,242	\$4,228,687	\$4,222,560	\$4,224,738	\$4,236,173	\$4,257,910	\$4,291,083	\$4,291,083
Total Assets	\$55,044,697	\$57,401,153	\$59,576,112	\$61,563,009	\$63,355,011	\$64,945,006	\$66,325,597	\$67,489,080	\$68,427,438	\$69,132,320	\$69,132,320
Total Liabilities	\$24,362,957	\$22,411,978	\$20,304,921	\$18,029,300	\$15,571,629	\$12,917,344	\$10,050,717	\$6,954,759	\$3,611,125	\$0	\$0
Total Equity	\$30,681,740	\$34,989,174	\$39,271,191	\$43,533,709	\$47,783,381	\$52,027,662	\$56,274,880	\$60,534,321	\$64,816,313	\$69,132,320	\$69,132,320
Owner Equity %	55.74%	60.96%	65.92%	70.71%	75.42%	80.11%	84.85%	89.69%	94.72%	100.00%	100.00%

WORKING CAPITAL / LIQUIDITY

Working Capital (Current P&I on term debt)	\$13,759,798	\$20,626,912	\$25,517,445	\$30,231,716	\$34,763,867	\$39,107,842	\$43,257,381	\$47,206,013	\$50,947,051	\$54,473,586	\$54,473,586
Current Ratio	4.53	5.79	7.00	8.17	9.28	10.35	11.36	12.31	13.21	14.04	14.04
Working Capital:Gross Revenues	27.63%	41.42%	51.24%	60.71%	69.81%	78.53%	86.86%	94.79%	102.30%	109.38%	109.38%

PROFITABILITY EFFICIENCY

Return on Equity (ROE)	14.08%	12.26%	10.85%	9.74%	8.85%	8.12%	7.51%	7.00%	6.57%	6.21%	6.21%
Return on Assets (ROA)	11.65%	10.87%	10.16%	9.53%	8.95%	8.42%	7.93%	7.47%	7.04%	6.62%	6.62%
Operating Profit Margin	12.88%	12.53%	12.16%	11.78%	11.39%	10.98%	10.56%	10.12%	9.67%	9.20%	9.20%
Net Profit Margin	8.67%	8.61%	8.56%	8.52%	8.49%	8.48%	8.48%	8.51%	8.55%	8.62%	8.62%
Asset Turnover Ratio	0.90	0.87	0.84	0.81	0.79	0.77	0.75	0.74	0.73	0.72	0.72
Leverage	1.79	1.64	1.52	1.41	1.33	1.25	1.18	1.11	1.06	1.00	1.00

PRODUCTION EFFICIENCY

Total pigs sold	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812	396,812
Total pounds sold	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362	107,139,362
Labor (as FTE's)	52	52	52	52	52	52	52	52	52	52	52
Pigs sold / FTE	7,674	7,674	7,674	7,674	7,674	7,674	7,674	7,674	7,674	7,674	7,674
Pounds sold / FTE	2,071,975	2,071,975	2,071,975	2,071,975	2,071,975	2,071,975	2,071,975	2,071,975	2,071,975	2,071,975	2,071,975
Number of sites	52	52	52	52	52	52	52	52	52	52	52
Buildings per site	4	4	4	4	4	4	4	4	4	4	4
Total number of buildings	208	208	208	208	208	208	208	208	208	208	208
Building design - Number of pig places	960	960	960	960	960	960	960	960	960	960	960
Building design - Gross square feet / pig place	8	8	8	8	8	8	8	8	8	8	8
Building design - Total number of pig places	199,680	199,680	199,680	199,680	199,680	199,680	199,680	199,680	199,680	199,680	199,680
Gross (total) square footage/building	7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680
Gross (total) square footage — all sites	1,597,440	1,597,440	1,597,440	1,597,440	1,597,440	1,597,440	1,597,440	1,597,440	1,597,440	1,597,440	1,597,440
Pounds sold / sq-ft / year	67.1	67.1	67.1	67.1	67.1	67.1	67.1	67.1	67.1	67.1	67.1
Pounds sold / pig space / year	537	537	537	537	537	537	537	537	537	537	537
Profit / pig space / year	\$21.63	\$21.48	\$21.35	\$21.25	\$21.18	\$21.15	\$21.16	\$21.21	\$21.32	\$21.49	\$21.49
Pigs sold / pig space / year	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99
Feed cost per ton	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22	\$154.22
Profit per pig sold	\$10.89	\$10.81	\$10.74	\$10.69	\$10.66	\$10.64	\$10.65	\$10.68	\$10.73	\$10.81	\$10.81

Modeling business performance in live hog production