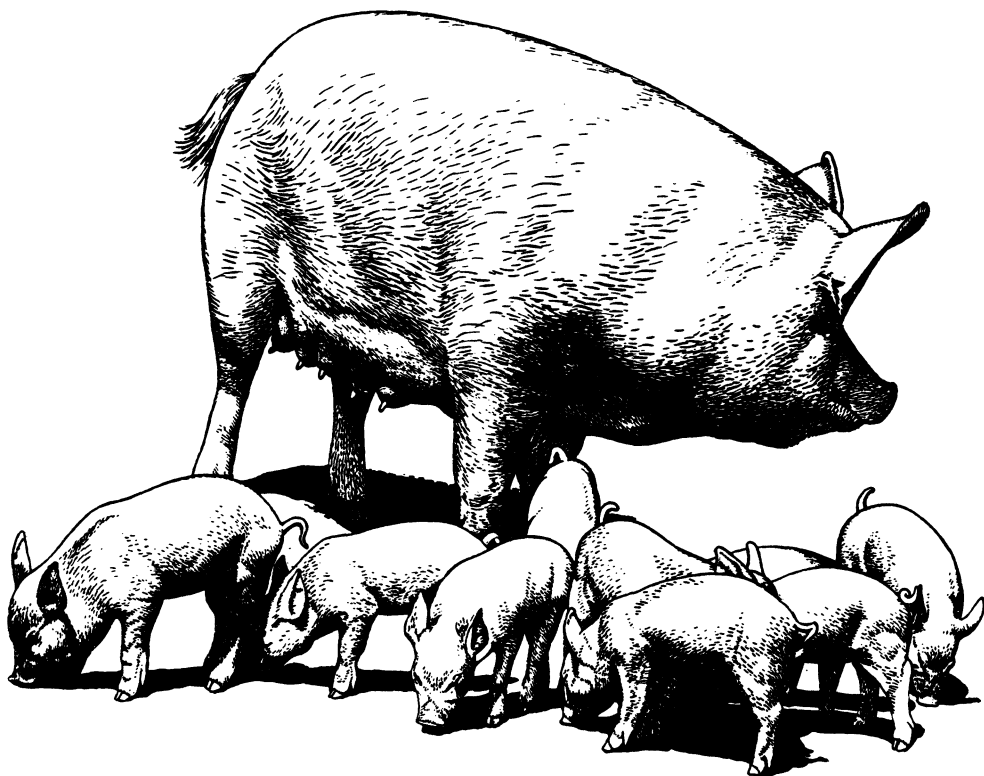


# **An Economic Analysis of a 140 Sow Farrow-to-Finish Swine Operation in Oklahoma**



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# AN ECONOMIC ANALYSIS OF A 140 SOW FARROW-TO-FINISH SWINE OPERATION IN OKLAHOMA

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## Introduction

Any producer wishing to begin pork production or expand an existing production system faces many decisions. The type of system desired, or obtainable, may be the first question to answer. Pork production occurs under a variety of systems in terms of both capital-labor tradeoffs and type of animal produced.

Producers raise pigs from birth to market weight in farrow-to-finish systems. Animals can be held for shorter periods of time by producing feeder pigs, or purchasing feeder pigs and selling market hogs. Within each of these systems, various degrees of capitalization can occur. The animals can be raised in total confinement or raised in pastures. Some producers use a combination of the two systems.

This bulletin describes the economics associated with a 140-sow confinement farrow-to-finish enterprise in Oklahoma. The facilities and the economics, including a detailed budget and start up cash flow analysis for two debt scenarios, of a farrow-to-finish confinement system are detailed. The study concludes with an analysis of the impact of market hog prices on the timing and magnitude of operating capital requirements.

## Advantages of Confinement Systems

The differences between confinement and pasture/dirt lot for farrow-to-finish swine production systems center around production efficiencies and resource requirements and their economic implications. Confinement systems are generally thought to be more efficient than pasture systems. A producer can expect to save as much as 40% on labor in a farrow-to-finish confinement system compared to a pasture system (Bache and Foster). Feeding time is reduced as feeding becomes more automated; breeding time is reduced as breeding becomes more systematized; time spent in helping sows farrow is reduced due to facilities which require less direct supervision of farrowing sows.

Labor savings could be critical for producers contemplating the addition of a swine enterprise to their other enterprises. Producers must determine whether labor or finances are more limiting because the labor efficiencies of confinement come at the expense of costly facilities. Confinement facilities may require fewer hours spent in operating but require the producer to have greater technical and mechanical skills to operate and repair the facilities (Bache and Foster).

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Breeding is more efficient in confinement than on pasture/dirt lots (Spruill and Weathers). The regulated temperatures help sows to farrow more live births and to wean more pigs. Temperature effects are particularly obvious during the summer in Oklahoma when high temperatures adversely affect a sow's reproductive efficiency (Diehl and Thompson). The impact of weather conditions on day-to-day operations of a confinement system are less than on a pasture system. The controlled inside environment may increase worker efficiency through improved working conditions. Workers are generally more content working in a stable environment when the weather is inclement.

Feed efficiency can be greater under a confinement system because regulated temperatures allow the animals to use nutrients for growth rather than stress (Church). If more pigs per sow are raised per year, feeding efficiency will increase as sow ration costs are spread over more market hogs. Confinement systems frequently have automated feed mills which allow the producers to adjust rations for maximum feed cost efficiency. However, pasture/dirt lot systems may allow for feeding of high quality legume forages which can reduce purchased feed costs. Another way that pasture/dirt lot systems can be used to reduce feed costs, which is not available in confinement systems, is to turn hogs out into harvested grain fields to glean residual crops. However, the additional cost of fencing the grain fields may result in this practice not being feasible.

Confinement systems are capital intensive compared to pasture/dirt lot systems. Starting a confinement system or switching an existing pasture system to confinement requires access to large amounts of capital to construct production facilities. Starting production on pasture/dirt lot can be done relatively inexpensively and gradually, as money becomes available.

Because of lower capital commitment, the pasture/dirt lot system allows producers more flexibility in production. In unprofitable times producers can exit production and reenter when markets conditions are more favorable. This flexibility may not be the blessing it appears because many producers exit and enter at inopportune times, causing greater losses than if production had been continuous. The effect of starting production at the wrong time will be illustrated in the cash flow analysis section of this bulletin. Confinement systems, on the other hand, require a commitment by management to efficient, long term, continuous hog production. The manager must continue to produce as long as hog prices cover variable costs in order to recoup as much of the fixed costs as possible.

#### 140 Sow Farrow-to-Finish Confinement Operation

A 140 sow farrow-to-finish confinement operation was modeled and analyzed to determine its potential profitability and feasibility. An enterprise budget and cash flow statements were developed to aid in the analysis.

#### Production Facilities Requirements

The quantity of land required for a 140 sow farrow-to-finish confinement system depends on soil profile, cropping practices and existing environmental constraints and regulations. Approximately eight to ten acres of land are required for production facilities, feed mill, lagoon and surrounding buffer. At least 80 acres of land should be available for waste disposal. A schematic of the production facilities used in this bulletin is presented in Figure 1.

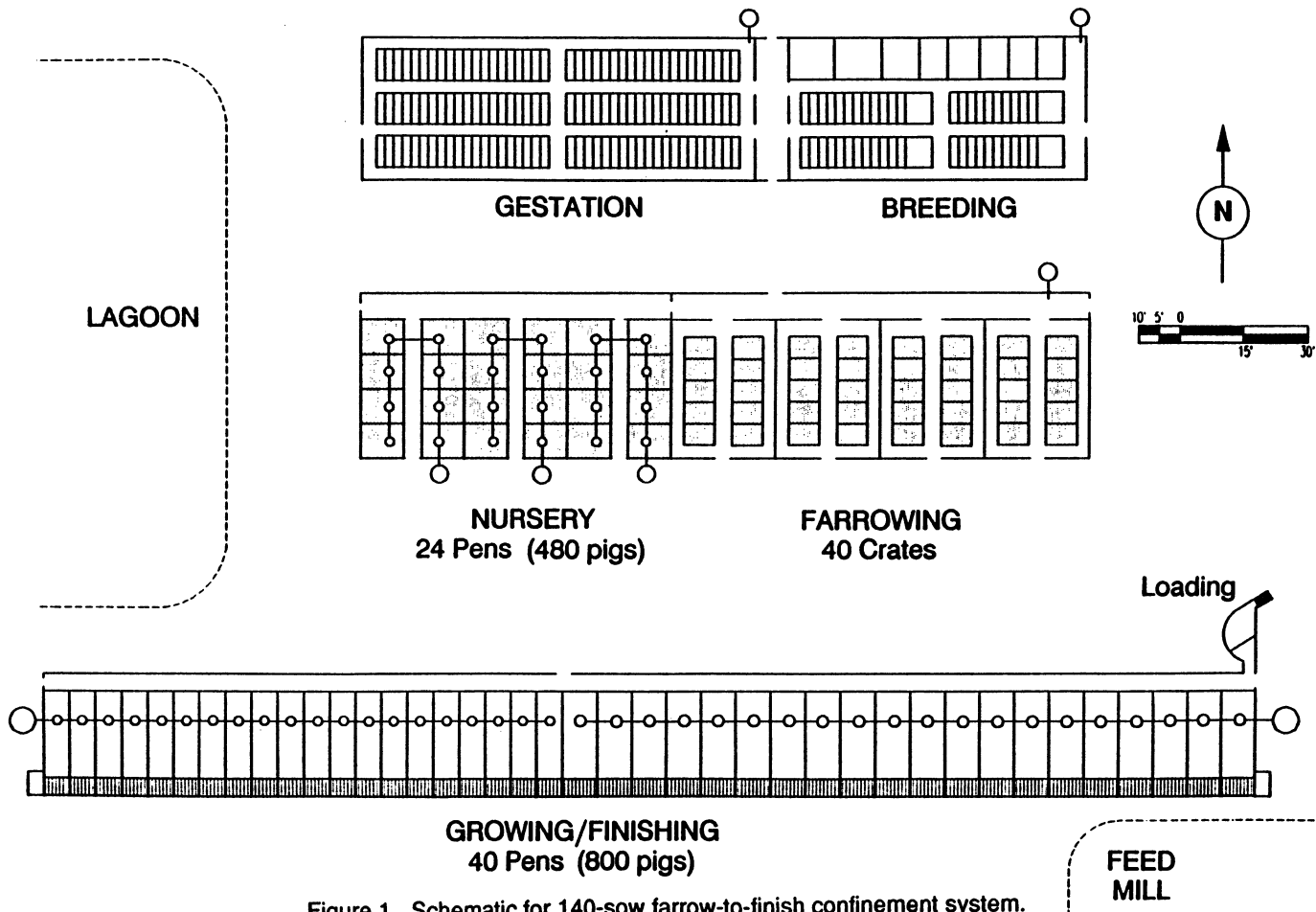


Figure 1. Schematic for 140-sow farrow-to-finish confinement system.

Table 1 lists the various components of the complete complement of facilities, the capacities of each facility and an estimate of respective investment requirements. The investment figures represent a facility where the breeding and gestation facilities are in complete confinement. Many producers start confinement operations with the breeding and gestation pens on dirt lots. Dirt lot breeding and gestation facilities save on costs of facilities but often increase both labor and land requirements.

The system described includes feed storage facilities and an automated feed mill. The decision between purchasing prepared feed or to mixing feed should be based on the availability of feed and ingredients, the expected savings of mixing feed over prepared feeds, management skills and labor restrictions.

### Operations Summary

Sows are divided into seven groups of 20 farrowing sows. Each sow group occupies two farrowing rooms. Sows are moved into the farrowing rooms 110

Table 1. Facilities, machinery, and equipment investment for a 140 sow farrow-to-finish confinement operation.

Facilities	Rooms (number)	Capacity per room (head)	Total Cost (dollars)
<b>Farrowing Facilities</b>			
Equipment			19,200
Buildings	4	10	44,800
<b>Nursery Facilities</b>			
Equipment			9,360
Buildings	3	160	21,840
<b>Finishing Facilities</b>			
Equipment			17,600
Buildings	5	160	70,400
<b>Gestation/Breeding Facilities</b>			
Equipment			12,600
Buildings	1	180	50,400
<b>Subtotal</b>			
Equipment			58,760
Buildings			187,440
<b>Support Facilities</b>			
Lagoon			7,500
LP Supply			1,000
Water Delivery System			3,000
Loading Chute			500
Pickup			12,000
Stock Trailer			4,000
Generator			4,000
Sprayer-cleaner			800
Feed Mill and Storage			30,000
<b>Subtotal</b>			
			62,800
<b>Total</b>			<b>309,000</b>

days after introduction to the boars for breeding and are expected to farrow within ten days after arrival. Weaning occurs when the pigs are from 28 to 35 days old. Sows are then returned to pens near the boars to await breeding. Weaned pigs are moved to the nursery.

All weaned pigs from one group of 20 sows are moved into a nursery at the same time. Pigs stay in the nursery for about 56 days and reach an approximate weight of 75 pounds. Pigs are then moved to the growing/finishing facilities for about 95 days, reaching a market weight of about 230 pounds.

There is a seven to ten day clean up period available for each of the facilities after one group of pigs is removed and before another group enters. An example of a production schedule is given in Figure 2.

### Production Assumptions

The basic production assumptions used in this study are incorporated into tables for easy referencing and understanding. Table 2 gives a breeding and production summary for each group of 20 sows. Fractions are shown in this table and should be interpreted as "on the average" numbers. Twenty three sows and gilts are required to obtain 20 bred sows based on an average conception rate of 87%. These 20 farrowing sows then produce approximately 158 weaned pigs of which 148 will be marketed at 230 pounds. It is assumed that three of the weaned pigs die before market (2% death loss) and seven will be used for replacement gilts. Each time a group of 23 sows and gilts is bred, seven females are culled from the herd. Each group of females is expected to farrow 2.42 times per year.

All feed, except the starter ration, is assumed to be mixed on the farm. Yearly feed requirements for a 140 sow farrow-to-finish confinement system are estimated at 1240 tons. The cost of delivered ingredients compared to the delivered cost of complete rations can be \$12 to \$25 less per ton (Bloome). This savings must cover the costs of owning and operating a feed mill. In this research, the per ton fixed and variable cost, excluding labor, of owning and operating the feed mill is \$2.52. Table 3 gives the ration requirements and the amounts of sorghum grain, soybean meal and base mix necessary for each ration. Overall feed conversion for the whole operation is four pounds of feed per pound of gain.

Table 2. Composition, production and sales of the breeding herd for each farrowing group (7 groups) for a 120 sow farrow-to-finish confinement operation.

Item	Sow litter				Totals
	Gilts	Second	Third	Fourth	
Number bred	7.3	5.8	5.2	4.7	23.00
Conception rate	0.8	0.9	0.9	0.9	0.87
Number farrowing	5.8	5.2	4.7	4.2	20.00
Pigs weaned per litter	7.0	8.0	8.5	8.5	7.93
Total pigs weaned	40.7	41.9	40.0	36.0	158.70
Death loss (2%)					-3.20
Replacement gilts					-7.30
Market hogs sold					148.20
Breeding stock sold	1.5	0.6	0.5	4.7	7.30
Total hogs sold					155.50

B = Breeding G = Gestation F<sub>A,B</sub> = Farrowing in Room A,B N<sub>A,B, & C</sub> = Nursery in Room A,B, & C GF = Growing/Finishing

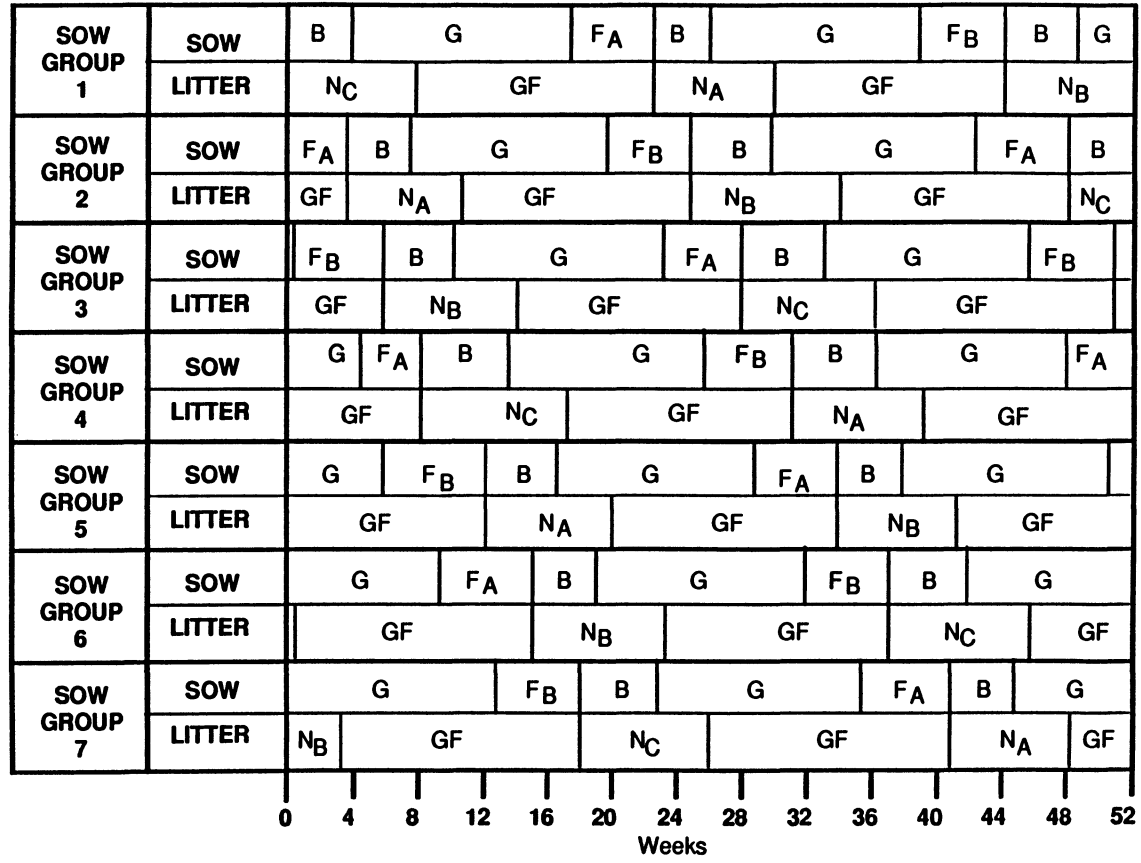


Figure 2. Production Schedule for a 140 Sow Farrow-to-Finish Confinement System.

Table 3. Annual feed consumption and composition for a 140 sow farrow-to-finish confinement system.

Animal type	Ration (% protein)	Feed per animal (lbs.)	Animals per year (head)	Composition			Total Consumption (cwt.)
				Sorghum (cwt.)	(SBM 44%) (cwt.)	Base mix (cwt.)	
Farrowing pigs (20-40 lbs.)							34
Starters (40-75 lbs.)	18	142	2,685				3,824*
Growers (75-125 lbs.)	16	207	2,658	4,235	990	275	5,499
Finishers (125-230 lbs.)	14	450	2,631	9,719	1,541	593	11,852
Gilts (230-275 lbs.)	14	198	123	200	32	12	244
Sows							
Early gestation	14	245	390	773	134	48	955
Late gestation	14	350	338	959	166	59	1,184
Lactation	14	324	338	888	154	55	1,096
Boars	14	1,825	11	163	28	10	201
<b>TOTAL</b>				<b>16,937</b>	<b>3,043</b>	<b>1,052</b>	<b>24,889</b>

\*Total consumption may not equal 100% due to rounding.



## Enterprise Budget

The enterprise budget is a statement of the expected production, the receipts from production and the costs of fixed and operating inputs associated with the enterprise. Table 4 presents an enterprise budget for the system described in this report, assuming an established enterprise.

The operating inputs are those items or charges that vary with the number of animals handled. The feed costs are expressed as the combined cost of sorghum grain, soybean meal and base mix used in the rations, as shown in Table 3. Eleven young boars are purchased yearly. Boars are included as an

Table 4. Enterprise budget for a 140 sow farrow-to-finish confinement system.

Items	Units	Quantity	Price/unit (dollars)	Total value* (dollars)	Per sow value* (dollars)
<b>OPERATING INPUTS</b>					
Grain sorghum	cwt.	16,937	2.53	42,849	306
Soybean meal	cwt.	3,043	8.50	25,869	185
Base mix	cwt.	1,052	27.00	28,392	203
Starter ration	cwt.	3,858	11.10	42,824	306
Young boars	hd.	11	450.00	4,950	35
Utilities	hd.	140	36.00	5,040	36
Hauling and marketing	hd.	2,642	1.75	4,624	33
Vet medicine	hd.	2,642	1.00	2,642	19
Labor	hr.	2,100	4.50	9,450	68
Annual operating capital	dols.	0	0.13	0	0
Equipment fuel/lube/repair	dols.			4,594	33
<b>Total Operating Costs</b>				<b>171,234</b>	<b>1,223</b>
<b>FIXED COSTS</b>					
<b>Buildings</b>					
Interest at 13%				12,184	87
Depr., Taxes, Insurance				10,872	78
<b>Equipment</b>					
Interest at 13%				7,901	56
Depr., Taxes, Insurance				10,607	76
<b>Sows</b>					
Interest at 13%				1,082	8
<b>Total Fixed Costs</b>				<b>42,645</b>	<b>305</b>
<b>PRODUCTION</b>					
	Units	Quantity	Prices	Receipts	
Slaughter hogs	cwt.	5,769	50.00	288,440	2,060
Non-breeder gilts	cwt.	80	45.00	3,598	26
Sows	cwt.	394	42.50	16,729	119
Boars	cwt.	47	32.50	1,519	11
<b>Total Receipts</b>				<b>310,286</b>	<b>2,216</b>
<b>Returns Above Total Operating Costs</b>				<b>139,052</b>	<b>993</b>
<b>Returns Above All Costs Except Overhead, Risk and Management</b>				<b>96,407</b>	<b>689</b>

\*Total value and per sow value columns may have rounding discrepancies.

operating input rather than as a capital asset because they remain in the breeding herd for only one year. Utilities and direct labor are estimated at \$36/sow and 15 hours/sow, respectively. Marketing and medicine charges are estimated on an animal-marketed basis rather than a sow-unit basis. Since cash flow from sale of market hogs at the assumed price (\$50 per cwt.) is adequate to meet all operating expenses, it is not necessary to borrow capital for operating purposes. Therefore the annual operating capital costs are zero. A summary of the equipment fuel, lube and repair cost is shown in Table 5.

Fixed costs include interest, depreciation, taxes and insurance on the facilities and breeding stock. Interest charge is the average interest charge per year on capital invested. Interest charge for sows is calculated as the value of sows present in the herd over 1 year old (sows in herd minus sows sold per year at a value of \$200 per sow) multiplied by the interest rate of 13%. A detailed listing of annual depreciation, taxes, and insurance is shown on Table 5.

Table 5. Annual fixed costs of facilities for a 140 sow farrow-to-finish confinement system.

Facilities	Life Years	Repair Cost	Depreciation Dollars	Taxes	Insurance	Total
<b>Farrowing Facilities</b>						
Equipment	15	256	1,280	58	96	1,690
Buildings	20	448	2,240	134	224	3,046
<b>Nursery Facilities</b>						
Equipment	15	125	624	28	47	824
Buildings	20	218	1,092	66	109	1,485
<b>Finishing Facilities</b>						
Equipment	15	235	1,173	53	88	1,549
Buildings	20	704	3,520	211	352	4,787
<b>Gestation/Breeding Facilities</b>						
Equipment	15	168	840	38	63	1,109
Buildings	20	504	2,520	151	252	3,427
<b>Subtotal</b>						
Equipment	15	783	3,917	176	294	5,171 <sup>†</sup>
Buildings	20	1,874	9,372	562	937	12,746
<b>Support Facilities</b>						
Lagoon	20	38	375	23	38	473
LP Supply	20	10	50	3	5	68
Water Delivery	20	30	150	9	15	204
Loading Chute	8	13	63	2	3	79
Pickup	5	720	2,400	36	60	3,216
Stock Trailer	10	200	400	12	20	632
Generator	20	20	200	12	20	252
Sprayer-cleaner	10	16	80	2	4	102
Feed Mill	15	500	2,000	90	150	2,740
<b>Subtotal</b>		1,936*	5,718	188	314	8,156
<b>Total</b>		4,594	19,007	927	1,545	26,073

\*Includes \$390 for power costs not included in other costs.

<sup>†</sup>Total column may have rounding discrepancies.

Total receipts are shown in the production section of the enterprise budget. The total pounds of market hogs, cull gilts, cull sows and boars are each multiplied by their respective prices and summed to obtain the total yearly receipts. Market weights for slaughter hogs, non-breeder gilts, cull sows and boars are 230, 325, 400, and 425 pounds respectively.

Return above operating costs is calculated by subtracting operating costs from total receipts. This return represents an estimate of return above variable costs. If a producer already owns the facilities and animals, production would continue in the short run if this return is greater than zero. For example, if total receipts were only \$180,000 while total operating inputs were \$170,000 the producer should still produce. The \$10,000 return above operating costs helps to pay for the fixed costs. It does not cover all the fixed costs of \$42,645 but it covers more of the fixed cost than if production were discontinued. As long as variable costs are covered and there is income remaining to cover even some of the fixed costs, production is more profitable than letting the facilities lay idle.

In the long run, the return to overhead, risk and management is important to consider. This return indicates how well the producer will be rewarded for management and the facilities committed to production. A producer must determine what return to overhead, risk and management is sufficient to justify production. The return to overhead, risk and management is obtained by subtracting the sum of total operating costs and total fixed costs from total receipts. This return should be positive and acceptable to the producer over time but may be less than zero and continued production still be the best economic decision in the short run.

The two most important economic variables in determining the profitability of a farrow-to-finish enterprise are price received for market hogs and price paid for feed inputs. The two most important production variables are pigs weaned per litter and feed efficiency. Table 6 shows the effect of changes in these four variables on returns above operating costs.

Slaughter hog price is recorded as the price received for market hogs weighing approximately 230 pounds. The returns computed in Table 6 are based on the assumption that cull gilts are sold at a price which is 90% of market hog prices; cull sows at 85%, and cull boars at 65%. Only the market hog price is needed to use this table.

The feed price listed is the average feed price per hundredweight and is determined by dividing total feed costs by total hundredweight of feed consumed. The conversion rate is an economic indicator of feeding efficiency determined by dividing total feed consumed per year by total weight of all animals sold minus weight of animals purchased. Pigs weaned per litter is obtained by dividing the total number of pigs weaned by the total number of sows farrowed.

For example, from Table 6, if a producer averages \$45 per hundredweight for market hogs sold, produces 7.5 pigs per litter with feed costs of \$7.50 per hundredweight and has a feed conversion ratio of 3.8, returns above total operating costs would be \$64,478. Return above all costs except overhead, risk and management under the same assumptions is \$21,833. This return is obtained by subtracting the total fixed costs of Table 4, \$42,645, from the \$64,478 obtained in Table 6.

Estimated returns for market prices, feed prices, pigs weaned and conversion rates not shown in Table 6, can be derived through extrapolation. In the above example, if feed costs were \$8.00 per hundredweight, average the two returns given at \$7.50 (\$64,478) and \$8.50 (\$41,943) feed to determine return above operating costs:

$$(\$64,478 + \$41,943)/2 = \$53,211.$$

Table 6. Returns above operating costs for selected slaughter hog prices, feed prices, pigs weaned per litter and feed conversion rates for a 140 sow farrow-to-finish confinement system.

Conversion rate:		3.8 lb. feed/lb. gain					4.2 lb. feed/lb. gain				
Feed Price per cwt.		\$5.50	\$6.50	\$7.50	\$8.50	\$9.50	\$5.50	\$6.50	\$7.50	\$8.50	\$9.50
Slaughter Hog Price per cwt.	Pigs Weaned per litter	-----dollars-----					-----dollars-----				
\$30.00	6.5	15,386	(4,250)*	(23,886)	(43,522)	(63,158)	4,018	(17,685)	(39,388)	(61,091)	(82,794)
	7.5	21,416	(1,119)	(23,654)	(46,188)	(68,723)	8,370	(16,537)	(41,444)	(66,351)	(91,258)
	8.5	27,446	2,012	(23,421)	(48,855)	(74,289)	12,721	(15,390)	(43,501)	(71,612)	(99,723)
	9.5	33,476	5,143	(23,189)	(51,522)	(79,854)	17,073	(14,242)	(45,557)	(76,872)	(108,187)
\$35.00	6.5	40,949	21,313	1,677	(17,959)	(37,595)	29,581	7,878	(13,825)	(35,528)	(57,231)
	7.5	50,793	28,258	5,724	(16,811)	(39,346)	37,747	12,840	(12,067)	(36,974)	(61,881)
	8.5	60,637	35,204	9,770	(15,664)	(41,097)	45,913	17,802	(10,309)	(38,420)	(66,531)
	9.5	70,481	42,149	13,816	(14,516)	(42,849)	54,078	22,764	(8,551)	(39,866)	(71,181)
\$40.00	6.5	66,512	46,876	27,240	7,604	(12,032)	55,144	33,441	11,738	(9,965)	(31,668)
	7.5	80,170	57,635	35,101	12,566	(9,969)	67,124	42,217	17,310	(7,597)	(32,504)
	8.5	93,829	68,395	42,961	17,528	(7,906)	79,104	50,993	22,882	(5,229)	(33,340)
	9.5	107,487	79,155	50,822	22,490	(5,843)	91,084	59,769	28,454	(2,861)	(34,176)
\$45.00	6.5	92,075	72,439	52,803	33,167	13,531	80,707	59,004	37,301	15,598	(6,105)
	7.5	109,547	87,013	64,478	41,943	19,408	96,501	71,594	46,687	21,780	(3,127)
	8.5	127,020	101,586	76,153	50,719	25,285	112,295	84,184	56,073	27,963	(148)
	9.5	144,493	116,160	87,828	59,495	31,163	128,090	96,775	65,460	34,145	2,830
\$50.00	6.5	117,638	98,002	78,366	58,730	39,094	106,269	84,566	62,863	41,161	19,458
	7.5	138,925	116,390	93,855	71,320	48,785	125,878	100,971	76,064	51,157	26,250
	8.5	160,212	134,778	109,344	83,910	58,477	145,487	117,376	89,265	61,154	33,043
	9.5	181,498	153,166	124,833	96,501	68,168	165,095	133,781	102,466	71,151	39,836
\$55.00	6.5	143,200	123,564	103,928	84,292	64,656	131,832	110,129	88,426	66,723	45,020
	7.5	168,302	145,767	123,232	100,697	78,162	155,255	130,348	105,441	80,534	55,627
	8.5	193,403	167,969	142,536	117,102	91,668	178,678	150,567	122,456	94,345	66,234
	9.5	218,504	190,172	161,839	133,507	105,174	202,101	170,786	139,471	108,156	76,841

\*Parentheses indicate negative numbers.

To compute expected returns for a 4.0 feed efficiency, average the two returns given at 3.8 and 4.2 conversion rates. For example, to estimate the expected returns above operating costs at \$45 per hundredweight, 7.5 pigs weaned per litter, \$7.50/cwt. feed costs and 4.0 feed efficiency are:

$$(\$64,478 + \$46,687)/2 = \$55,578.$$

It is apparent from Table 6 that returns above operating costs are positively associated with increases in slaughter hog price. Returns above operating costs decrease as feed costs increase or feed efficiency decreases. An increase in the number of pigs weaned per litter can either increase or decrease returns above operating costs, depending on the feed price relative to the market hog price.

## Cash Flow Statement

A cash flow statement can be used to determine if a potentially profitable enterprise is also a financially feasible enterprise. Many operations which can potentially make a profit are not feasible because of cash flow problems--money is not available when needed. A potentially profitable enterprise may never have an opportunity to make a profit if it does not operate long enough to realize the production and economic efficiencies of established systems. For additional information on the development and use of a cash flow plan see OSU Extension Facts No. 751.

The cash flow statement, as shown in Table 7, records cash inflows and outflows on a monthly basis. Cash inflows come principally from receipts from the sale of production. Cash outflows are cash operating expenses and cash paid for capital investments. The cash flow summary on the lower half of the statement presents the cash flow management process. The cash difference is total cash receipts minus total cash expenses. The cash position is the beginning cash balance plus the cash difference for each month. If the cash position is negative, the producer needs to borrow money. If the position is positive, any accrued interest is paid first and then principal on debt, until the cash balance is again \$0. The producer begins each month with a \$0 cash balance until all operating debt is paid off.

Monthly cash flow statements for a three year start-up period were developed for the 140 sow farrow-to-finish confinement system. The amounts of cash needed and received each month were estimated. Ten different scenarios were simulated using 2 different financing plans, each with 5 different pricing schemes.

For purposes of illustration, the cash flow statements shown in Table 7, 8, and 9 were developed assuming 50% of the facilities are purchased with borrowed capital, a constant market hog price of \$45 per hundredweight and that all costs, including feed, were constant throughout the three year period. Years 1 and 2 are considered start up years. Year 3 shows expected cash flow under normal, full operating conditions.

In Year 1, the \$154,500 needed to finance 50% of the facilities cost of \$309,000 were received as long term debt. The long term loan is for 15 years with an interest rate of 10.5% per year. No principal or interest payments are due until one year later. Payments on long term debt are required every month thereafter.

The gradual purchase of breeding stock in Year 1 was financed via an intermediate term line of credit for \$43,450. As boars and gilts were purchased interest began to accrue on the amount of debt used. The interest rate was

Table 7. Projected cash flow (dollars) for a 140 sow farrow-to-finish confinement operation, Year 1.\*

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<b>Operating Receipts</b>													
1. Livestock Receipts	0	658	1,316	1,316	658	1,031	372	372	745	14,314	14,679	14,306	49,769
2. Total Receipts	0	658	1,316	1,316	658	1,031	372	372	745	14,314	14,679	14,306	49,769
<b>Operating Expenses</b>													
3. Feed & Ingrid. Purchased	301	481	670	887	5,724	3,541	8,497	7,698	11,867	10,519	10,792	12,353	73,330
4. Vet., Med., Supplies	61	25	50	25	180	155	155	310	155	310	155	155	1,736
5. Utilities, Fuel, Repairs	200	200	200	200	400	400	600	700	780	800	800	800	6,080
6. Marketing	0	18	9	18	9	13	4	4	9	240	245	240	809
7. Taxes and Insurance	1,545											952	2,497
8. Labor	375	375	375	375	375	375	788	788	788	788	788	788	6,975
9. Total Operating Expenses	2,482	1,099	1,304	1,505	6,688	4,484	10,043	9,500	13,598	12,657	12,780	15,288	91,427
<b>Capital and Other Expenses</b>													
10. Breeding Livestock	14,950	5,000	10,000	5,000	5,500	500	500	1,000	500	500			43,450
<b>Scheduled Debt Payments</b>													
11. Intermediate: interest													0
12.       principal													0
13. Long Term: interest													0
14. Long Term:principal													0
15. Total Cash Outflows	17,432	6,099	11,304	6,505	12,188	4,984	10,543	10,500	14,098	13,157	12,780	15,288	134,877
<b>Cash Flow Summary</b>													
16. Beginning Cash Balance	0	0	0	0	0	0	0	0	0	0	0	(0)	0
17. Cash Difference (2-15+10)	(2,482)	(441)	12	(189)	(6,030)	(3,454)	(9,671)	(9,127)	(12,853)	1,657	1,899	(981)	(41,659)
18. Cash Position (16+17)	(2,482)	(441)	12	(189)	(6,030)	(3,454)	(9,671)	(9,127)	(12,853)	1,657	1,899	(981)	
19. Operating Loan This Period	2,482	441	0	189	6,030	3,454	9,671	9,127	12,853	0	0	981	45,227
20. Principal-Operating Loan	0	0	0	0	0	0	0	0	0	224	1,420	0	1,643
21. Interest-Operating Loan	0	0	12	0	0	0	0	0	0	1,434	479	0	1,925
22. Ending Cash Balance	0	0	0	0	0	0	0	0	0	0	(0)	0	
<b>Debt Outstanding</b>													
23. Operating Principal	2,482	2,922	2,922	3,111	9,141	12,594	22,265	31,393	44,246	44,246	44,246	45,227	
24. Operating Interest	0	27	59	79	113	214	352	597	944	1,434	479	479	
25. Intermediate Principal	14,950	19,950	29,950	34,950	40,450	40,950	41,450	42,450	42,950	43,450	43,450	43,450	
26. Long Term Principal	154,500	154,500	154,500	154,500	154,500	154,500	154,500	154,500	154,500	154,500	154,500	154,500	

\*Hog prices are based on a \$45 per cwt. slaughter hog price.

Feed ingredient costs average \$5.62 per cwt.

Interest: ST=13; IT=11.5; LT=10.5

Table 8: Projected cash flow (dollars) for a 140 sow farrow-to-finish confinement operation, Year 2.

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<b>Operating Receipts</b>													
1. Livestock Receipts	29,980	14,306	30,497	16,203	16,203	32,406	16,203	35,325	21,536	19,897	35,846	21,536	289,939
2. Total Receipts	29,980	14,306	30,497	16,203	16,203	32,406	16,203	35,325	21,536	19,897	35,846	21,536	289,939
<b>Operating Expenses</b>													
3. Feed & Ingred. Purchased	8,551	13,258	11,289	11,831	12,984	8,895	13,827	11,540	12,219	13,177	8,934	13,886	140,390
4. Vet., Med., Supplies	220	220	220	220	220	220	220	220	220	220	220	220	2,640
5. Utilities, Fuel, Repairs	803	803	803	803	803	803	803	803	803	803	803	803	9,636
6. Marketing	481	240	513	273	273	545	273	586	337	320	591	337	4,769
7. Taxes and Insurance	1,545												952
8. Labor	788	788	788	788	788	788	788	788	788	788	788	788	9,450
9. Total Operating Expenses	12,388	15,309	13,612	13,914	15,067	11,251	15,910	13,936	14,366	15,308	11,336	16,986	169,382
<b>Capital and Other Expenses</b>													
10. Breeding Livestock	4,950												4,950
<b>Scheduled Debt Payments</b>													
11. Intermediate: interest	4,304												4,304
12. principal	14,483												14,483
13. Long Term: interest	16,223	1,311	1,308	1,304	1,301	1,297	1,294	1,290	1,286	1,283	1,279	1,275	30,450
14. Long Term: principal	4,658	395	398	402	405	409	412	416	420	423	427	431	9,195
15. Total Cash Outflows	57,006	17,015	15,318	15,620	16,773	12,957	17,616	15,642	16,072	17,014	13,041	18,692	232,765
<b>Cash Flow Summary</b>													
16. Beginning Cash Balance	0	0	0	(0)	0	0	0	0	0	(0)	0	2,707	5,551
17. Cash Difference (2-15)	(27,026)	(2,708)	15,179	583	(570)	19,450	(1,413)	19,684	5,464	2,883	22,805	2,844	57,175
18. Cash Position (16-17))	(27,026)	(2,708)	15,179	583	(570)	19,450	(1,413)	19,684	5,464	2,883	22,805	5,551	
19. Operating Loan This Period	27,026	2,708	0	0	570	0	1,413	0	0	0	0	0	31,717
20. Principal-Operating Loan	0	0	12,580	0	0	17,990	0	18,689	5,164	2,639	19,883	0	76,944
21. Interest-Operating Loan	0	0	2,599	583	0	1,460	0	995	300	244	215	0	6,396
22. Ending Cash Balance	0	0	(0)	0	0	0	0	0	(0)	0	2,707	5,551	
<b>Debt Outstanding</b>													
23. Operating Principal	72,253	74,961	62,382	62,382	62,952	44,962	46,375	27,686	22,522	19,883	0	0	
24. Operating Interest	974	1,768	2,599	676	769	1,460	487	995	300	244	215	0	
25. Intermediate Principal	28,967	28,967	28,967	28,967	28,967	28,967	28,967	28,967	28,967	28,967	28,967	28,967	28,967
26. Long Term Principal	149,842	149,448	149,049	148,648	148,242	147,834	147,421	147,005	146,586	146,163	145,736	145,305	

\*Hog prices are based on a \$45 per cwt. slaughter hog price.

Feed ingredient costs average \$5.62 per cwt.

Interest: ST=13; IT=11.5; LT=10.5

Table 9: Projected cash flow (dollars) for a 140 sow farrow-to-finish confinement operation, Year 3.

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<b>Operating Receipts</b>													
1. Livestock Receipts	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	279,257
2. Total Receipts	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	23,271	279,257
<b>Operating Expenses</b>													
3. Feed & Ingrid. Purchased	11,666	11,666	11,666	11,666	11,666	11,666	11,666	11,666	11,666	11,666	11,666	11,666	139,992
4. Vet., Med., Supplies	220	220	220	220	220	220	220	220	220	220	220	220	2,640
5. Utilities, Fuel, Repairs	803	803	803	803	803	803	803	803	803	803	803	803	9,636
6. Marketing	385	385	385	385	385	385	385	385	385	385	385	385	4,620
7. Taxes and Insurance	1,545												2,497
8. Labor	788	788	788	788	788	788	788	788	788	788	788	788	9,450
9. Total Operating Expenses	15,407	13,862	13,862	13,862	13,862	13,862	13,862	13,862	13,862	13,862	13,862	14,814	168,835
<b>Capital and Other Expenses</b>													
10. Breeding Livestock	4,950												4,950
<b>Scheduled Debt Payments</b>													
11. Intermediate: interest	3,331												3,331
12. principal	14,483												14,483
13. Long Term: interest	1,271	1,268	1,264	1,260	1,256	1,252	1,248	1,244	1,240	1,236	1,232	1,228	14,999
14. Long Term:principal	434	438	442	446	450	454	458	462	466	470	474	478	5,472
15. Total Cash Outflows	39,877	15,567	15,567	15,567	15,567	15,567	15,567	15,567	15,567	15,567	15,567	16,519	212,070
<b>Cash Flow Summary</b>													
16. Beginning Cash Balance	5,551	0	0	4,197	11,901	19,605	27,309	35,013	42,717	50,421	58,125	65,830	72,582
17. Cash Difference (2-15)	(16,605)	7,704	7,704	7,704	7,704	7,704	7,704	7,704	7,704	7,704	7,704	7,704	67,188
18. Cash Position (16+17)	(11,054)	7,704	7,704	11,901	19,605	27,309	35,013	42,717	50,421	58,125	65,830	72,582	
19. Operating Loan This Period	11,054	0	0	0	0	0	0	0	0	0	0	0	11,054
20. Principal-Operating Loan	0	7,584	3,470	0	0	0	0	0	0	0	0	0	11,054
21. Interest-Operating Loan	0	120	38	0	0	0	0	0	0	0	0	0	157
22. Ending Cash Balance	0	0	4,197	11,901	19,605	27,309	35,013	42,717	50,421	58,125	65,830	72,582	
<b>Debt Outstanding</b>													
23. Operating Principal	11,054	3,470	0	0	0	0	0	0	0	0	0	0	
24. Operating Interest	0	120	38	0	0	0	0	0	0	0	0	0	
25. Intermediate Principal	14,483	14,483	14,483	14,483	14,483	14,483	14,483	14,483	14,483	14,483	14,483	14,483	
26. Long Term Principal	144,871	144,432	143,990	143,544	143,095	142,641	142,183	141,721	141,255	140,786	140,312	139,833	

\*Hog prices are based on a \$45 per cwt. slaughter hog price.

Feed ingredient costs average \$5.62 per cwt.

Interest: SI=13; IT=11.5; LT=10.5



11.5% for a three year loan with equal annual principal payments. Interest is computed on the unpaid balance.

If sufficient cash was unavailable to make the long term and intermediate term loan payments, an operating loan was obtained to pay these scheduled debt reductions. The operating loans had an interest rate of 13%. Payments on the operating loan were made as detailed in the paragraph describing the cash flow summary.

In Year 1, gilts were periodically purchased and bred in a manner which fits the production schedule (Figure 2). During both years, the number of breeding and market animals were tracked monthly and the receipts and costs were based on the number of animals present.

Livestock receipts were credited to the month in which animals were expected to be sold. Non breeder females were sold approximately one month after breeding; cull sows were sold after producing four litters. Boars were sold once a year in January--the same month in which replacements were purchased. Market hogs were sold in the month they were expected to reach 230 pounds--180 days after birth.

For sows and boars, their monthly feed requirement was charged to that month. For pigs, total starter ration needed for a litter was charged in the month farrowed; total grower ration was charged in the month expected to leave the nursery; total finishing ration was charged in the month pigs were expected to reach 125 pounds.

Veterinary medicine expenses were charged to the pigs in the month they were weaned or purchased. Utilities, fuel and repair were charged at \$200 per month during the first four months of Year 1 while the gilts were present but no farrowing to finishing facilities were being used. In Year 1 May and June utilities were \$400 per month while gestation, farrowing and nursery facilities only are being used. When the first group of market pigs was moved into the growing facility (July), utilities were raised to \$600. Utility costs were increased to \$800 per month when the finishing barn began to be used. In Years 2 and 3, a constant charge of \$803 per month is assumed since all physical facilities were in use.

Marketing charges were recorded in the month which animals were expected to go to market. Insurance was paid in January; taxes, in December. Labor charges for the hog enterprise were \$4.50 per hour. During the first six months of Year 1, only one half of the full production labor requirements are used.

The third year cash flow statement assumed that all start up irregularities are past and both production inflows and outflows occurred on a regular, systematic basis. The yearly total obtained from the enterprise budget (Table 4) was divided by 12 to determine the monthly amounts for livestock receipts and related production expenses.

### Cash Flow Analysis

The cash flow statements discussed in the previous section were prepared for illustrative purposes assuming 50% debt on facilities and a constant market price of \$45/cwt. for the entire three years. However, financing options vary from producer to producer; market hog prices generally fluctuate from year to year. Several researchers give evidence for a four-year cycle in market hog prices (Franzman). The timing within a hog price cycle that a producer initiates production is very important.

The number of financing options available to swine producers are numerous. Some may have adequate cash reserves and need no financing while others would need to borrow all or part of the cash needed to construct the necessary production facilities. To illustrate the effect of financing on cash flow, two different financing plans were simulated. The first plan required 50% of the money needed for facilities be borrowed; the second 100% of the money. Both plans assume a fixed interest rate of 10.5% on a 15 year note. The repayment schedules are similar.

Within each financing plan, five different market hog price scenarios were considered assuming different combinations of \$35, \$45 and \$55 per hundredweight market hog prices. These scenarios were:

1. constant \$45/cwt. for the entire three years (45-45-45),
2. a rising market starting with an average price of \$35/cwt for the first year, \$45/cwt. for the second year and \$55/cwt. for the third year (35-45-55),
3. a falling market with average prices of \$55, \$45 and 35 per hundredweight for the first, second and third years, respectively (55-45-35),
4. a market which peaks in the second year with average prices of \$45, \$55 and \$45 for the three respective years (45-55-45),
5. a market which decreases in the second year with average prices of \$45, \$35 and \$45 for the three respective years (45-35-45).

The ten combinations of financing and market hog prices should give adequate information about the effect of both debt and price variations on the feasibility of starting a 140 sow farrow-to-finish confinement operation. For ease of comparison, the accumulated net cash flow (defined as ending cash balance minus accumulated operating principal) for each of the above scenarios and debt structures was plotted on Figures 3 and 4.

Referring to Figure 3, the producers' accumulated net cash flow for each price scenario during the first year were almost identical--regardless of the market price. An operating loan was required to meet operating expenses, particularly feed purchases. This occurred because under good management a producer purchasing unbred gilts, breeding them and raising their offspring until market will not have any significant sales for 10 months. The culled breeding animals sold during that 10 months contributed very little to income. The assumption used was that regardless of market price, boars and unbred gilts were purchased at \$450 and \$200 each, respectively. More realistically, when market prices are high, breeding stock would be more expensive. Thus, higher market prices in Year 1 might actually result in greater cash deficiencies than if lower market prices had prevailed. The conclusion is that the market price of the first year had little effect on cash flow.

The divergence in accumulated cash positions associated with the price combinations results from the direction the market prices move in the second and third years of production. Insights regarding the best time to begin or expand production can be gained by looking at each scenario individually.

Examine the scenario for a producer who starts a swine enterprise when market hog price decreases in year two and then rebounds in year three. This is depicted in Figure 3 by the line for 45-35-45. The producer's accumulated cash position at the end of the first year is similar to the other scenarios. A credit line of \$45,227 is needed in the first year. In the second year accumulated operating debt reaches to \$86,057. The amount of credit needed and the duration for which it is needed cause this scenario to have the highest amount of operating interest charges (\$18,072) of all the scenarios depicted. The high amount of interest charges for the 45-35-45 scenario can be seen in Figure 5.

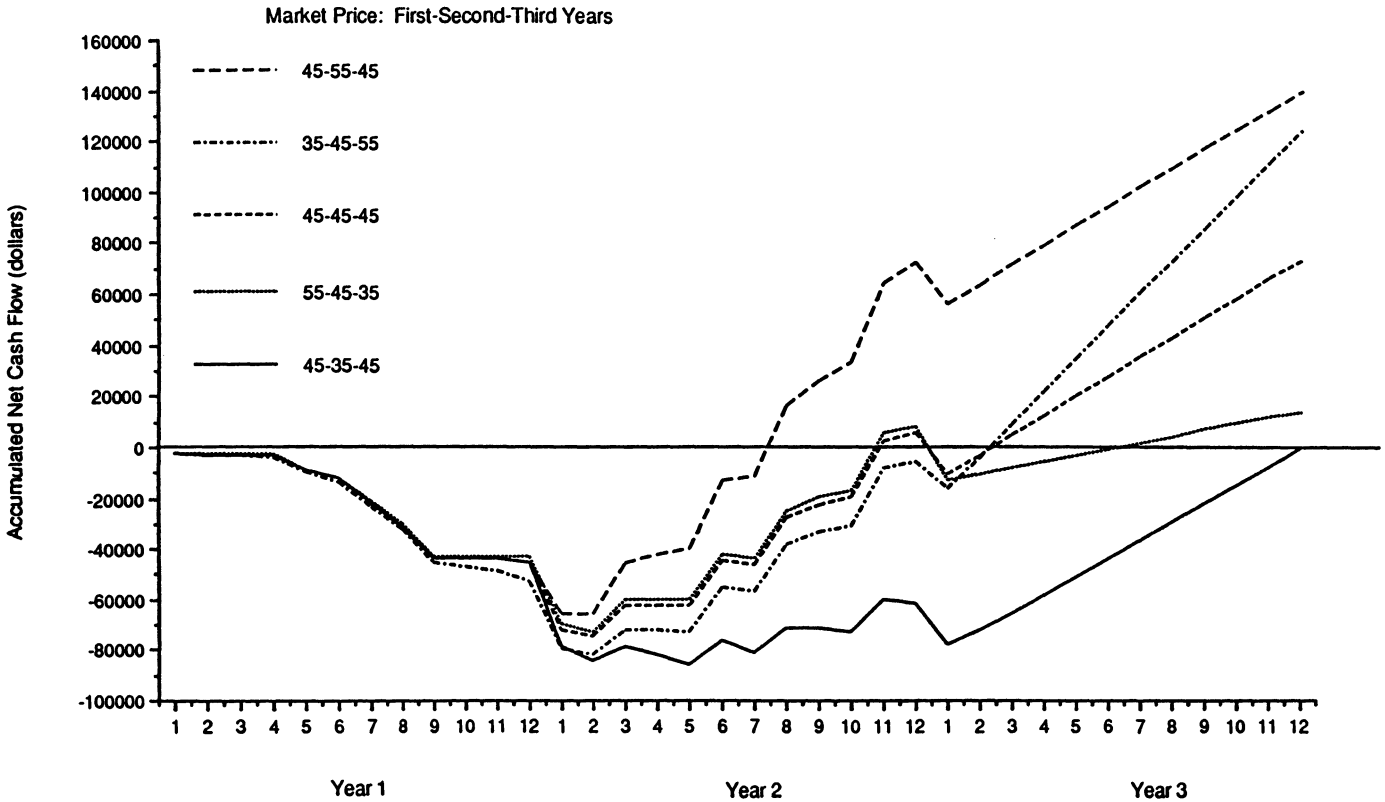


Figure 3. Accumulated Net Cash Flow for Start Up of a 140 Sow Farrow-to-Finish Swine Enterprise Assuming 50% Debt on Facilities and Five Different Price Scenarios.

Market Price: First-Second-Third Years

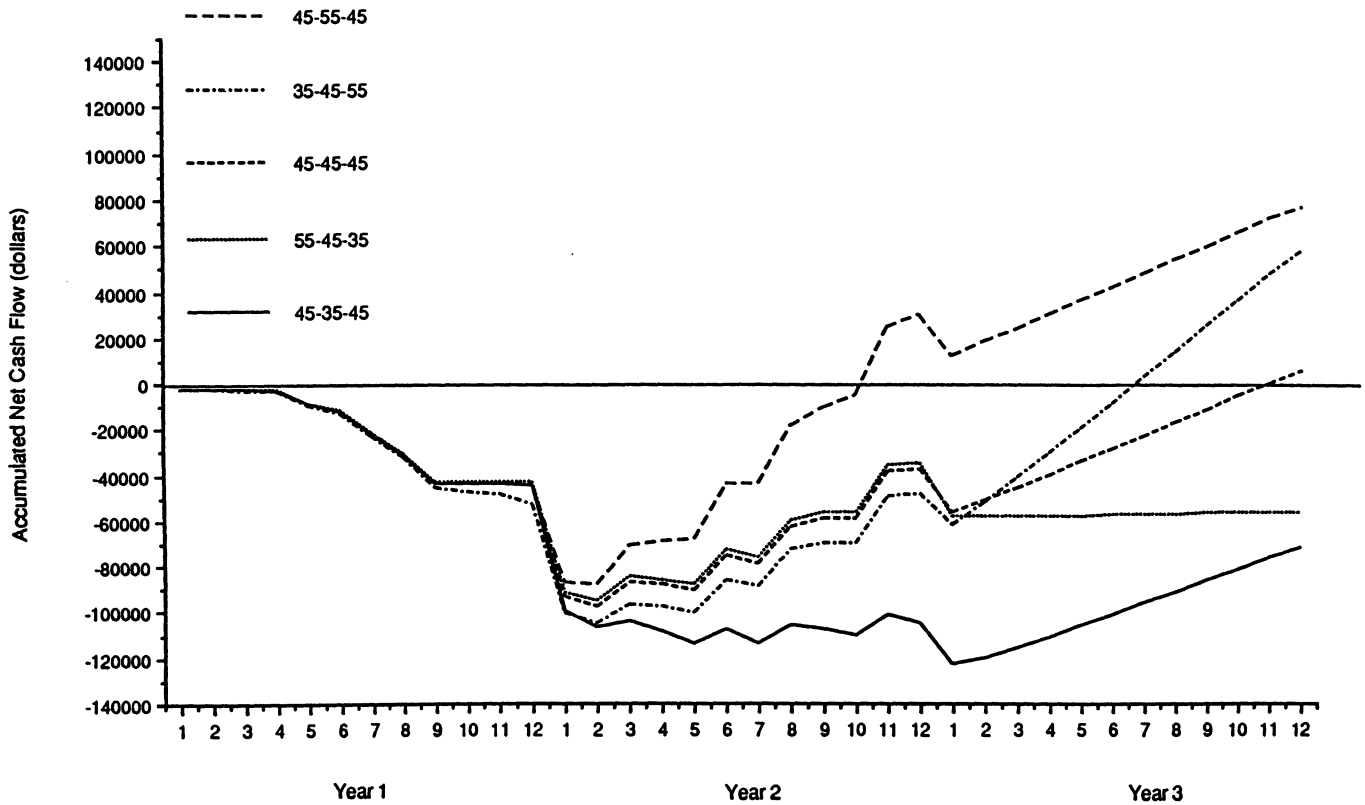


Figure 4. Accumulated Net Cash Flow for Start Up of a 140 Sow Farrow-to-Finish Swine Enterprise Assuming 100% Debt on Facilities and Five Different Price Scenarios.

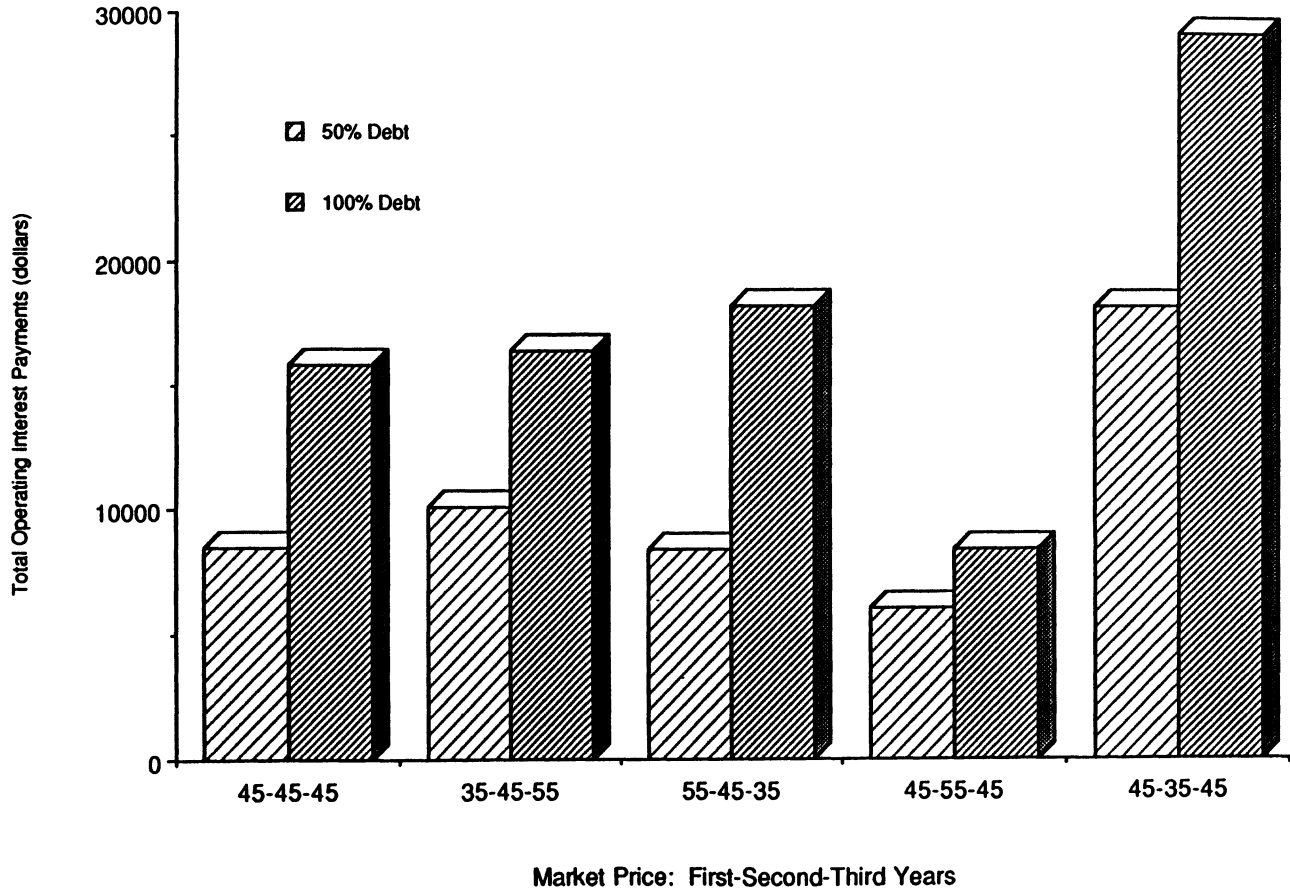


Figure 5. Total Operating Interest Charges for the Three-Year Start Up Period.

Figure 5 shows the total amount of interest paid on operating loans in the different scenarios over the three year period. Little debt reduction occurs in Year 2 because the \$35 per cwt. is barely above the break-even price on operating costs. The producer's financial position does not become positive. The accumulated cash position at the end of Year 3 is -\$1,139. The long and intermediate term loan payments in the first month of Year 4 would necessitate the need for another operating loan.

Producers may observe rising current prices for hogs and envision a profit potential. However, by the time financing can be obtained, facilities prepared and production started, the market price may have peaked and started to decline. The 55-45-35 scenario depicts this situation. In this case, production is started when market hog prices are high but decline during Years two and three. During Year 1 when hog prices are \$55/cwt, nothing is available to sell and the producer is not able to realize the benefit of high market prices. The second year market price of \$45/cwt (descending from the \$55/cwt peak) allows the producer to make an operating profit and pay off most of the operating debt incurred in the first year. The third year market hog price of \$35/cwt allows the producer to pay all expenses but accumulate very little cash. Year 3 ends with a positive cash position of \$13,021.

The 45-45-45 scenario is the scenario already discussed in CASH FLOW STATEMENT portion of this bulletin. The constant average \$45/cwt market price for three years gives the median amount of debt and interest and the median end of third year cash position.

The 35-45-55 scenario is ideal if the producer has the foresight to anticipate it and the financing necessary to operate. The facilities are ready when the market is at its lowest point. Since little production is sold the first year this has little long term effect. The accumulated debt at the end of the first year is the highest at \$52,719. However, Year 2 has income above expenses of such a magnitude that most of the debt is liquidated. The high third year market price of \$55/cwt. results in cash income far exceeding cash outflow so that an ending cash position of \$123,599 is reached.

The 45-55-45 scenario has the benefits of the highest cash position at the end of the third year (\$139,184) and the smallest total operating interest payments (\$6,003). The first year is characterized by production with few sales at \$45/cwt. The second year sales at \$55/cwt allow the operating loan to be paid off quickly so that interest charges are minimized. The third year production is sold at an average price of \$45/cwt. which is sufficiently above cash costs to accumulate substantial savings.

The results of the analysis using 100% debt to finance the facilities reveal many of the same observations except for magnitude. The ranking of the price scenarios by ending cash balance is the same across financing plans. The price scenarios with the highest and lowest amounts of operating interest paid are the same for the 50% and the 100% debt plans. However, when 100% of the facilities are debt financed, two of the price scenarios (55-45-35 and 45-35-45) result in the producer not obtaining a positive cash flow within three years. Another price scenario (45-45-45) will require a new operating loan to make payments on long and intermediate term debt in the first month of Year 4. The 140 sow farrow-to-finish pork production enterprise would be difficult to manage due to cash flow problems.

Conclusion/lessons to be learned from the above discussion regarding farrow-to-finish swine operations were:

1. the start up year's market price is not as important as the following years' market prices,

2. producers need to plan and attempt to start selling hogs when the market is past its low point and starting to rise,
3. an operating line of credit should be arranged so that no payments on operating debt are expected to be generated from swine production during the first 12 to 16 months. It may be necessary to use borrowed operating capital for intermediate and long term note payments.
4. a sufficient down payment should be made on the facilities in order to make the long term debt payments low enough to facilitate a positive cash flow.

### Summary

This research was designed to provide information useful to producers, potential producers and creditors concerning economic aspects of a 140 sow farrow-to-finish swine production system. Information concerning types of production facilities required and investment requirements were presented. An enterprise budget was developed for the 140 sow system in total and on a per sow basis. The economic implications of changes in feed costs and hog prices on returns above operating costs were presented. In addition the economic impact of improving feed conversion rates and the number of pigs weaned per litter was presented.

The timing in which a producer starts producing hogs or expands an existing swine enterprise is important. If entry or expansion occurs when hog prices are at a peak level or top of a price cycle then a greater period of time is required to eliminate the need to borrow operating capital and start reducing any indebtedness associated with production facilities. A producer benefits financially by starting to produce hogs at the bottom of a price cycle. A comparison of five different hog price scenarios assuming two different debt levels was made to determine the amounts and timing of required operating capital.

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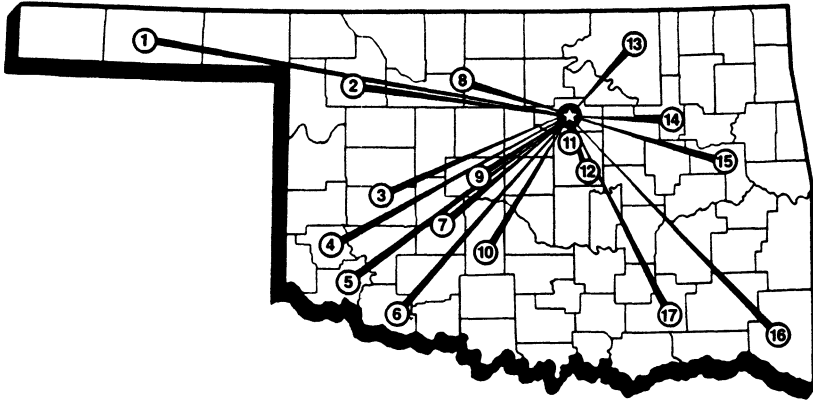
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