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Pork Production Systems with Business Analyses 9 Groups of 24 Sows, Farrow-to-Finish
– Pork Industry Handbook

Michigan State University Extension Service

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pork industry handbook

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Pork Production Systems with Business Analyses 9 Groups of 24 Sows, Farrow-to-Finish (Keywords: Economics, Production, Sows)

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Environmentally Controlled Systems

Modern environmentally controlled hog production systems require large initial capital investments. These systems work best for producers who have a long term commitment to hog production as a major enterprise and who are willing to weather unfavorable commodity price cycle swings.

The size of this environmentally controlled system (216 sows) is ideal for producers who can devote most of their time to pork production and are willing to employ a small labor force or utilize additional family labor. The owner can probably manage this facility by hiring only one employee.

This system is of a size that a producer can get into the business and expand as opportunity and capital become available. Economic literature indicates the production system described in this publication may not be the most efficient size possible. It is of a size that under reasonable production and marketing assumptions can provide a positive net income and a cashflow, and provide valuable production and management experience required before expanding production. The economies of size achievable by larger units can partially be offset by considering possibilities associated with producer networking.

In this fact sheet, replacement breeding stock are purchased rather than raised. The impact of purchasing replacement breeding stock on the economics of pork production are not considered in any other Pork Industry Handbook Fact Sheet.

Advantages of this size system

1. High labor efficiency allows the production of more pigs with few employees.
2. Labor needs are consistent from month to month so that employees can be hired permanently and develop regular work routines.
3. Labor can specialize sufficiently to gain efficiencies yet remain appropriately general so that the temporary absence of one worker does not cause a significant problem in the production process.
4. The confinement system provides an environment for improved hog and labor productivity.
5. Intensive use of facilities lowers the investment and production costs per cwt of pork produced.
6. After the initial start-up period, expenses and income occur regularly so that cash flow is more predictable. The long-run impact of seasonal swings in hog market prices is minimized.
7. Scheduling of breeding, farrowing and movement of pigs is easier.
8. Purchasing replacement gilts allows maximum hybrid vigor to be achieved in the breeding herd.

Disadvantages of this size system

1. This system requires a large capital outlay at the beginning.
2. Assuming limited initial equity and operating capital, cash flow may be negative for 2 to 3 years until full production levels are attained and initial operating loans required for purchase of livestock and other start-up expenses are repaid.

3. It requires that the employees be skilled in pork production and have mechanical abilities to maintain and repair the facilities.

4. The size is not generally considered adequate for retaining replacement gilts. It is probably necessary to purchase replacement gilts to obtain the production efficiency discussed in this fact sheet.

5. The facility size and production schedule do not allow certain events (i.e., farrowing and weaning) to occur on the same day of the week.

Production Assumptions

Careful scheduling of the facilities to allow all of the production activities to occur at their proper time intervals is essential for this integrated system. Table 1 gives the facilities' use schedule for the analysis contained in this fact sheet. The system's economics, input requirements and production levels are based on this schedule.

Whole herd feed conversion is estimated to be 3.6 pounds of feed per pound of gain. Estimated yearly feed requirements for the 216 sow farrow-to-finish system are 1755 tons. All feed, except starter ration, is assumed to be mixed on the farm.

Farrowing facilities for this 216 sow farrow-to-finish operation consist of 2 rooms with 20 farrowing crates per room. Sows are divided into 9 groups of 24 sows each.

Sows are moved into the farrowing room 4 days before farrowing. Weaning occurs when the pigs are from 21 to 28 days old. One day is allowed to clean the farrowing house before another group of sows enters.

With an assumed farrowing rate of 83%, 20 sows will farrow per group. Assuming 2.1 litters per inventoried sow per year and 9 pigs per litter, over 4100 pigs are weaned annually.

At weaning, 180 pigs from each sow group are moved to the nursery at one time. Pigs stay in the nursery for about 31 days until they weigh approximately 45 pounds.

Sows are returned to pens near the boars to await breeding. Females are bred on first estrous after weaning.

Each time a group of sows farrows, 6 are either culled or die (3% death loss per year). Purchased replacement gilts are added to the group to maintain a group size of 24.

Pigs are moved from the nursery to the growing/finishing facilities for no more than 18 weeks. Assuming a 5% death loss between weaning and market, 3,904 hogs are marketed at 240 pounds in an average of 180 days.

Sow Group	Breeding Begins	Move to farrowing	Farrowing Room	Wean and move to Nursery	Nursery Room	Enter Grow/Finish	Sell by
1	0	110	A	141	A	172	296
2	16	126	B	157	B	188	312
3	32	142	A	173	A	204	328
4	48	158	B	189	B	220	344
5	64	174	A	205	A	236	360
6	80	190	B	221	B	252	376
7	96	206	A	237	A	268	392
8	112	222	B	253	B	284	408
9	128	238	A	269	A	300	424
1	144	254	B	285	B	316	440

Facilities Investment

The investment requirement for and the costs associated with the new facilities are detailed in table 2. The cost of buildings and equipment vary substantially depending on design and contractors. The approximately \$2,100 per sow costs listed are estimates and are not associated with any particular design or builder. Facilities costs could be lowered by purchasing used facilities or equipment, modifying the system design or perhaps by negotiation with the builder.

This investment represents a 100% environmentally regulated facility. Starting production with dirt lot breeding and gestation facilities would reduce the cost of the facilities but would tend to increase both labor and land requirements. Production efficiency might also be adversely impacted by using dirt lot facilities, especially if pen mating (as opposed to hand mating) is utilized.

The decision of whether or not to purchase prepared feed or to mix feed should be based on the availability of feed and ingredients, the relative costs of mixing feed versus purchasing prepared feeds, management skills, and labor restrictions. An operation of this size is sufficient to normally gain considerable savings from operating its own feed mill.

Table 2. Investment and Operating Costs for Facilities, Machinery, and Equipment

Facilities	Purchase Price	Life (years)	Annual Fixed Cost
Farrowing facilities			
Equipment	\$26,000	8	\$4,108
Buildings	58,300	15	5,130
No. farrowing rooms	2		
No. crates per room	20		
Nursery facilities			
Equipment	13,000	8	2,054
Buildings	29,200	15	2,570
Grower/Finishing facilities			
Equipment	36,000	8	5,688
Buildings	144,000	15	12,672
Gestation/Breeding facilities			
Equipment	16,200	8	2,560
Buildings	64,800	15	5,702
Subtotal			
Equipment	\$91,200		\$14,410
Buildings	\$296,300		\$26,074
Support facilities			
Lagoon/Manure Stg.	\$11,000	20	\$693
Manure disposal equipment	35,000	10	\$4,130
Pickup	18,000	5	4,824
Stock Trailer	7,000	20	581
Feed Mill & storage facilities	35,000	15	3,652
Subtotal	\$106,000		\$13,880
Total			
Equipment	\$493,500		\$54,364
Buildings	197,200		28,289
	296,300		26,074

Enterprise Budget

Table 3 is an estimated budget for this system. The enterprise budget is a statement of expected production, receipts from production, operating costs and fixed input costs associated with the enterprise. The costs and revenue items included in table 3 are common among most producers. The budget could be modified to delete costs which might not be incurred by the producer or to include other costs not included, such as insurance costs associated with breeding stock.

The prices used for slaughter hogs, corn and soybean meal are the 1985 to 1994 10-year average price (as reported by the USDA) for each. The annual income assumes that slaughter hogs are sold at 240 pounds for \$47.55 per cwt. Given the production described above, 3,904 animals are sold as market hogs. Nineteen gilts were culled and sold at 300 pounds each; 103 sows, at 425 pounds; 5 boars at 500 pounds. The total cwt of market hogs, cull gilts, cull sows and boars are each multiplied by their respective prices and summed to obtain the total yearly receipts of \$466,482.

The operating inputs are those items or charges that vary with the number of animals. The feed costs are the combined cost of corn, soybean meal and base mix used in the diets plus starter ration purchased for the nursery pigs. An estimated 5 young boars and 139 replacement gilts are purchased yearly. Estimated utilities and labor are \$36/sow and 22 hours/sow, respectively. Estimated marketing and medicine charges are on a per animal-marketed basis. The 12% interest charge on operating capital is based on having an operating loan for six months of the year.

The operating inputs of this budget include replacement gilts. On an income statement, ownership costs associated with breeding stock are normally considered fixed costs. Due to the nature of a continuous livestock production system, where the number of females culled and gilts purchased yearly remain relatively constant, this is not necessary in the budget. By considering the annual cost of replacement gilts as an operating expense, the revenue from the sale of all females can be listed under production. The accounting technique of considering net gains or losses from the sale of breeding livestock is unnecessary when breeding stock purchases and sales are being recorded in revenues and costs sections. The only long-term cost associated with the breeding herd in this budget is the interest on animals over 1 year old.

Feed costs per cwt of total sales is \$22.40. This is 55% of the total cost or 66% of total operating costs. Feed is the major cost of producing hogs. Management of feed purchase price and feed conversion are crucial to minimize feed costs and to economically produce hogs.

Fixed costs include interest, depreciation, taxes and insurance on the facilities and breeding livestock over 1 year old. The interest charge is the average interest expense per year on borrowed and equity capital. The interest cost for breeding livestock is calculated as the average value of sows and boars over 1 year old present in the herd multiplied by the interest rate of 10%. Breeding herd interest costs are \$.19 per cwt of production. The total fixed cost of owning the buildings and machinery for this system is \$7.09 per cwt of total sales.

Return above total operating costs is calculated by subtracting operating costs from total receipts. This return represents the best estimate of return above variable costs. If a producer already owns the facilities and animals, production would continue as long as this return is greater than zero. For example, if total receipts are only \$375,000 while total operating costs are \$350,000, the producer should still produce. The \$25,000 return above total operating costs helps to pay for the approximately \$72,000 of fixed costs. If the producer stops producing, none of the fixed costs are regained. As long as variable costs are covered and there is income remaining to cover some of the fixed costs, production is more profitable than letting the facilities lay idle.

For long-range planning, a producer must determine what return on investment and management is sufficient to encourage (or continue) production. The return to management and risk gives this value, and is obtained by subtracting total all costs from total receipts. If this return is zero, the owner would make a return on the capital invested in facilities and livestock and earn a wage for labor used but would not receive any compensation for management or the risk of doing business. Over time, the return to management and risk should be large enough to appropriately compensate the owner for management and risk.

Table 3. Enterprise Budget for a Farrow-to-Finish Swine Production System

Items	Total quantity	Price per unit	Total value	Value per cwt marketed
Production				
Receipts				
Slaughter hogs	9369.85cwt.	\$47.55	\$445,536	\$45.05
Non-breeder gilts	58.3cwt.	42.80	2,496	0.25
Sows	437.38cwt.	40.42	17,678	1.79
Boars	25.00cwt.	30.91	773	0.08
Total sales	9890.54cwt.		\$466,482	\$47.17
Total Receipts				
Operating Inputs				
Corn	26,483cwt.	\$3.93	\$104,080	\$10.52
Soybean meal (44%)	5,769cwt.	13.14	75,798	7.66
Base mix	935cwt.	20.00	18,693	1.89
Starter ration	1,922cwt.	12.00	23,061	2.33
Utilities	217sows	36.00	7,807	0.79
Hauling and marketing	4,031hd.	3.00	12,094	1.22
Vet medicine	4,031hd.	2.00	8,063	0.82
Fuel/tube/repair			8,929	0.90
Labor	3,960hr.	9.00	35,640	3.60
Young boars	5hd.	650.00	3,250	0.33
Replacement gilts	139hd.	200.00	27,800	2.81
Annual operating capital	162,607dols.	12%	9,756	0.99
Total Operating Cost			\$334,971	\$33.87
Fixed Costs				
Interest				
Buildings		10%	\$14,815	\$1.49
Equipment		10%	9,860	1.00
Breeding stock (over 1 year old)		10%	1,882	0.19
Depr., Taxes, Insurance				
Building			22,124	2.24
Equipment			23,311	2.36
Total Fixed Costs			\$71,992	\$7.28
Total All Costs			\$406,963	\$41.15
Returns Above Total Operating Costs			131,511	13.30
Returns To Management and Risk			59,519	6.02

Table 4 shows the effect of changes in 2 economic variables (market hog and feed prices) and 2 production efficiency variables (feed conversion and pigs weaned per litter) on returns above operating costs. Market hog price records the price received for market hogs weighing 240 pounds and assumes cull gilts are sold at 90% of market hog prices; cull sows at 85%; cull boars at 65%. Only the market hog price is needed to use this table.

Feed price is determined by dividing total feed costs by total cwt of feed consumed. The feed conversion rate is determined by dividing total feed consumed per year by total weight of all animals sold minus weight of livestock purchased. This provides an economic indicator of feeding efficiency and takes into account weight of animals not sold as a result of death loss. Obtain pigs weaned per litter by dividing the total number of pigs weaned by the total number of litters farrowed.

For an example of how to use table 4, assume a producer averages \$45 per cwt. for market hogs sold, weans 9 pigs per litter with average feed costs of \$7.00 per cwt. and has a feed conversion ratio of 3.8. Returns above total operating costs would be \$67,942. Return to management and risk under the same assumptions is -\$4,050. The -\$4,050 is obtained by subtracting the total fixed costs of \$71,992 found in Table 3 from the \$67,942 obtained in Table 4.

Extrapolate the returns in table 4 to determine returns on market prices, pigs weaned and conversion rates not shown in the table. For example, to determine return above operating costs for \$45 per cwt. market price, 9 pigs weaned per litter, 3.8 feed efficiency and \$7.50 feed/cwt., average the two returns given at \$7.00 and \$8.00 feed to arrive at \$48,857 $((\$67,942 + \$29,772)/2)$.

Monthly Cash Flow

The estimated monthly cash flow in table 5 shows the start up phase of production. It is assumed that the first group of gilts is purchased on the first day of the first month and bred near the end of the second month (PIH-8; PIH-74).

Livestock sales consists mainly of cull breeding stock for the first 11 months. In the twelfth month, market hogs will begin going to market and give the first major influx of cash. Full production should be reached during the first part of year two.

Feed is purchased as needed during the year to meet the requirements of the animals present. Because feed is often purchased in bulk, this may not accurately reflect the true outlays of cash for feed. Other cash expenses are based on a percentage of full production. As different facilities are opened (i.e., the first time the nursery or

Table 4. Returns above operating costs under different assumptions

Market Hog Price	Pigs Weaned per Litter	3.4 lb. feed per lb. gain Price per cwt. of feed					3.8 lb. feed per lb. gain Price per cwt. of feed				
		5	6	7	8	9	5	6	7	8	9
\$35	7	\$35,106	\$8,403	(\$18,300)	(\$45,004)	(\$71,707)	\$19,399	(\$10,446)	(\$40,291)	(\$70,136)	(\$99,981)
	8	50,688	20,260	(10,168)	(40,596)	(71,024)	32,789	(1,219)	(35,226)	(69,234)	(103,242)
	9	66,269	32,117	(2,036)	(36,188)	(70,341)	46,180	8,009	(30,161)	(68,332)	(106,502)
	10	81,851	43,974	6,097	(31,780)	(69,658)	59,570	17,237	(25,096)	(67,429)	(109,763)
	11	97,432	55,831	14,229	(27,373)	(68,974)	72,961	26,465	(20,031)	(66,527)	(113,023)
\$48	7	73,747	47,044	20,341	(6,363)	(33,066)	58,039	28,194	(1,650)	(31,495)	(61,340)
	8	94,534	64,106	33,678	3,250	(27,178)	76,635	42,628	8,620	(25,388)	(59,395)
	9	115,321	81,169	47,016	12,864	(21,289)	95,231	57,061	18,890	(19,280)	(57,450)
	10	136,108	98,231	60,354	22,477	(15,400)	113,827	71,494	29,161	(13,172)	(55,505)
	11	156,895	115,293	73,692	32,090	(9,512)	132,423	85,927	39,431	(7,065)	(53,560)
\$45	7	112,388	85,685	58,981	32,278	5,575	96,680	66,835	36,990	7,145	(22,700)
	8	138,381	107,953	77,525	47,097	16,669	120,482	86,474	52,466	18,459	(15,549)
	9	164,373	130,220	96,068	61,915	27,763	144,283	106,113	67,942	29,772	(8,399)
	10	190,365	152,488	114,611	76,734	38,857	168,085	125,751	83,418	41,085	(1,248)
	11	216,358	174,756	133,154	91,553	49,951	191,886	145,390	98,894	52,398	5,902
\$50	7	151,029	124,326	97,622	70,919	44,215	135,321	105,476	75,631	45,786	15,941
	8	182,227	151,799	121,371	90,943	60,515	164,328	130,320	96,313	62,305	28,297
	9	213,425	179,272	145,120	110,967	76,815	193,335	155,165	116,994	78,824	40,653
	10	244,623	206,745	168,868	130,991	93,114	222,342	180,009	137,675	95,342	53,009
	11	275,820	234,219	192,617	151,015	109,414	251,349	204,853	158,357	111,861	65,365
\$55	7	189,670	162,966	136,263	109,560	82,856	173,962	144,117	114,272	84,427	54,582
	8	226,073	195,645	165,217	134,789	104,361	208,174	174,167	140,159	106,151	72,144
	9	262,476	228,324	194,171	160,019	125,866	242,387	204,216	166,046	127,875	89,705
	10	298,880	261,003	223,126	185,249	147,371	276,599	234,266	191,933	149,600	107,266
	11	335,283	293,681	252,080	210,478	168,876	310,812	264,316	217,820	171,324	124,828
\$60	7	228,311	201,607	174,904	148,201	121,497	212,603	182,758	152,913	123,068	93,223
	8	269,919	239,491	209,064	178,636	148,208	252,021	218,013	184,005	149,998	115,990
	9	311,528	277,376	243,223	209,071	174,918	291,439	253,268	215,098	176,927	138,757
	10	353,137	315,260	277,383	239,506	201,629	330,856	288,523	246,190	203,857	161,524
	11	394,746	353,144	311,543	269,941	228,339	370,274	323,778	277,282	230,786	184,290

grower/finishing facilities are used) expenses are gradually increased to reflect the cost of operating the facility at capacity. This is based on the assumption that although the facility may not yet be full, a partially full facility has about the same expenses as a totally full one.

Gilts are initially purchased in 9 groups of 24 each. Replacement gilts are purchased as needed to keep the groups at 24 females. Boars are purchased in month 1. Replacement boars are purchased during the second half of the year.

Labor costs are estimated at \$1,500 per month during the first six months then increase to \$3,000 per month for the remainder of the year. This reflects the increased labor requirements as sows farrow and feeding begins. The availability of unpaid family members may impact labor costs significantly.

The difference between the cash inflow and the cash outflow is borrowed each month from a line of credit. As the cash inflow exceeds the cash outflow the line of credit is repaid. Interest is paid first. After all accumulated interest has been paid, the principal is repaid. The end of the year shows accumulated borrowing of \$144,837. This is the maximum operating debt the operation should experience as long as expected production is maintained

and prices are sufficient to meet the cash operating expenses.

The costs of purchasing and/or financing facilities are not included in table 5. Several possible repayment alternatives exist. Some producers might have to borrow the entire cost of the facilities whereas another producer may borrow only a small portion or none for the facilities. Any debt repayment associated with fixed facilities would need to be added to the cash flow presented in table 5.

If 100% of the cost of facilities and equipment are debt financed over a 10 year note at 10% interest, the annual principle and interest payments would be over \$80,000. If only 50% of the cost of facilities and equipment are financed under the same conditions, the annual payment would be \$40,000. Total cash outflows in table 5 would increase by the payments, causing even greater negative cash flows in the start-up years.

The cash flow in subsequent years should result in more cash available for debt reduction. This would allow for the repayment of any loans associated with fixed facilities. Depending on net cash flow from operations, debt structure and initial equity in fixed facilities, it may require several years before cash inflows are sufficient to retire all debt obligations.

Table 5: Projected cash flow (dollars) for a 140 sow farrow-to-finish confinement operation, Year 1.

Item	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Total
Estimated Cash Receipts													
Market Hogs	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$41,040	\$41,040
Cull Gilts	0	0	1,350	1,350	1,350	810	135	270	270	270	270	270	6,345
Cull Sows	0	0	0	0	0	813	813	1,626	1,626	1,626	1,626	1,626	9,754
Cull Boars	0	0	0	0	0	0	163	163	163	163	163	163	975
Total Estimated Cash Receipts	0	0	1,350	1,350	1,350	1,623	1,110	2,058	2,058	2,058	2,058	43,098	58,114
Estimated Cash Expenses													
Grain	\$215	\$545	\$747	\$921	\$986	\$925	\$854	\$1,215	\$1,391	\$4,340	\$9,807	\$15,013	\$36,960
Soybean Meal	135	342	469	578	618	580	535	762	872	2,721	6,148	9,412	23,171
Base Mix	68	173	238	293	314	294	272	387	443	1,380	3,119	4,775	11,756
Starter ration	0	0	0	0	0	0	114	2,519	3,434	3,434	3,434	3,434	16,371
Vet., Med., Supplies	100	100	100	100	325	325	325	325	325	325	325	325	3,000
Utilities, Fuel, Repairs	200	200	200	200	400	400	600	700	780	800	800	800	6,080
Marketing	100	100	100	100	100	100	400	400	400	400	400	400	3,000
Taxes and Insurance	1,500											2,500	4,000
Breeding Stock Purchases													
Boars @ \$650/head	6,500	0	0	0	0	650	650	650	650	650	650	650	11,050
Gilts @ \$200/head	10,000	10,000	10,000	10,000	6,200	2,400	1,200	2,400	2,400	2,400	2,400	2,400	61,800
Labor	1,500	1,500	1,500	1,500	1,500	1,500	3,000	3,000	3,000	3,000	3,000	3,000	27,000
Total Cash Outflows	20,319	12,960	13,354	13,692	10,444	7,174	7,950	12,357	13,695	19,450	30,083	42,709	204,187
Cash Flow Summary													
Net Monthly Cash Flow	(\$20,319)	(\$12,960)	(\$12,004)	(\$12,342)	(\$9,094)	(\$5,551)	(\$6,840)	(\$10,299)	(\$11,637)	(\$17,392)	(\$28,025)	\$389	(\$146,074)
Operating Loans													
Money Borrowed This Period	20,319	12,960	12,004	12,342	9,094	5,551	6,840	10,299	11,637	17,392	28,025	0	146,462
Accrued Interest @ 12%	0	203	538	996	1,582	2,265	3,011	3,832	4,764	5,822	7,065	8,600	8,600
Accumulated Borrowing	20,319	33,279	45,283	57,625	66,718	72,269	79,109	89,409	101,046	118,438	146,462	146,462	146,462



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