Economics of Finishing Pigs
in Hoop Structures and Confinement;
A Summer Group

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Summary and Implications

Results of this trial show a $.50 per pig profit advantage in favor of the hoop system over confinement. Feed efficiency was approximately the same for the two systems. A $.50 per pig difference in profits is a relatively small amount. Average daily gain was better for the hoop system: 1.82 pounds per day compared to 1.69 for confinement. This led to a revenue advantage for the hoop system. This advantage was partially offset by a grade and yield advantage for the confinement pigs. Death loss was slightly higher for the hoop-raised pigs.

Although profits per pig were similar between the two production systems, there were differences in the cost structure. Fixed costs were higher for the confinement system, whereas operating costs were greater for the hoop system. These results are consistent with previous studies and expectations, because confinement systems require large capital outlays for facilities. Hoops require higher operating costs for items such as bedding and feed.

Selection between production systems with comparable levels of profit can be difficult. Management style and personal preferences will play a big part. Other important considerations will be access to resources that differ between the systems, such as bedding, capital for facilities, and labor availability.

Introduction

The evolution of the swine industry has forced producers to reevaluate their operations and use an increasing amount of risk management. The following report is part of an ongoing research project that is being conducted at the Iowa State University Rhodes Research Farm. This research compares two facility types under a wide range of circumstances. This report evaluates profitability and risk for hoop and confinement production facilities for finishing pigs.

Materials and Methods

This report provides information for the fourth group of pigs, which was fed from June 1999 to October 1999. Results will be evaluated using the actual production efficiency numbers and the average or typical costs for feeder pigs, feed, etc., along with the average market hog prices. This allows for comparison of expected costs and returns for normal input costs and hog price conditions. Future reports will examine the risks and efficiency of the use of capital in the two systems. Prior reports have evaluated results for previous groups of hogs raised in hoop and confinement facilities (1,2).

Results and Discussion

Productivity

Production efficiencies have a large effect on the economics of the operation. Important information is the percentage of pigs marketed, feed efficiency, and average daily gain. The percentage of pigs marketed has a direct effect on the systems' returns because the pigs marketed need to cover the entire system's costs. Feed efficiency reflects this by using the weight of the marketed animals (at the plant) and the feed consumed by all pigs fed. During this trial approximately 1% more hogs were marketed for the hoop system compared with the confinement system; 96.53% vs. 95.65%, respectively (Table 1). Feed efficiency was better for the confinement system; 2.92 vs. 2.96 pounds of feed per pound of pork sold.

Pigs fed in hoops had an average daily gain which was more than the confinement pigs: 1.82 vs. 1.69 pounds per day. The hoop pigs started, on average, at a slightly lighter weight (1.5 pounds), averaged fewer days on feed (1.23 days), and weighed 11 pounds more at the plant. The confinement animals, however, averaged a 1.3 percentage point better carcass yield. Due to the yield differential the difference in carcass weight was only 4.67 more pounds (186.41 vs. 181.74 pounds) for hoops vs. confinement. The lean premium was $.43 more per hundred weight for confinement pigs.

Table 1. Productivity.

	Hoop	Confinement	Difference
Total Pigs Started	461.00	138.00	
Start Weight	31.10	32.60	-1.50
Culls	8.00	4.00	4.00
Cull Rate	1.73%	2.90%	-1.17%
Death Loss, Head	8	2	6.00
Death Loss, %	1.73%	1.45%	0.29%
Average Daily Gain*	1.82	1.69	0.13
Feed Efficiency*	2.96	2.92	0.04
Farm Sale Weight	260.29	250.75	9.54
Plant Sale Weight	256.16	245.14	11.04
Yield	72.8%	74.1%	-1.3%
Hot Carcass Weight	181.74	186.41	4.67
Lean Premium Difference (per hot cwt)		$.43	-$.43
Average Days on Feed	123.96	125.20	-1.23
Total Facility Days	140	140	
Pigs Marketed, %	96.53%	95.65%	0.88%
Pigs Marketed, Head	445	132	

*Using plant sale weight.

Figure 1. Average Daily Gain Distribution.
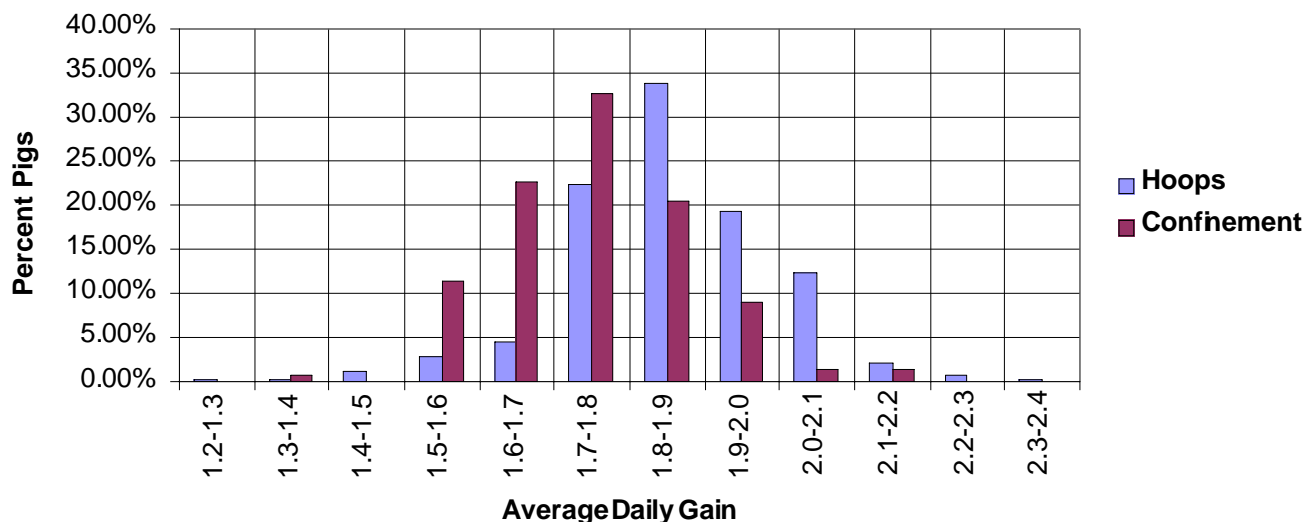
The distribution of average daily gains by using the farm weights is shown in Figure 1. The figure demonstrates that there were a larger percentage of hogs with higher ADG in the hoop system. The hoop ADG distribution lies to the left of the confinement ADG distribution. The hoop hogs tended to be sold at an earlier date and at heavier weights. Because both groups were sold on the same marketing dates this caused the 1.23-day difference in the average number of days on feed. This is reflected by the marketing information in Table 2, which shows that 65% of the hoop pigs were sold at the first marketing date. The confinement system had 12% fewer pigs (55%) marketed during the first marketing. This could allow the hoop facilities to be emptied at a faster rate, potentially increasing turnover and decreasing fixed costs. Or it may allow the hoop pigs to be taken to a heavier weight, which would reduce the fixed costs per pound of pork produced.

Table 2. Marketing information.

Marketing Date	Hoop Number Marketed	Confinement Number Marketed	Hoop Percent Marketed	Confinement Percent Marketed
09/30/99	297	72	67	55
10/12/99	148	60	33	45
Total	445	132	100	100

Economic Results

Economic results provide a comparison of costs and returns of the two production systems. Sensitivity tables will provide information showing the impact of changes in selected costs, revenue, or production efficiencies such as feed price, feeder pig price, etc.

Facility costs are budgeted at $180 per pig space for a confinement operation and $55 per pig space for the hoop system (Table 3). Fixed costs were calculated at 13.2% of the investment for confinement and 16.5% for hoops. The confinement facilities are depreciated over 15 years, whereas the hoops are depreciated over 10 years. Insurance and taxes represent 1.5% of the fixed investment while interest is calculated at 10% interest for both confinement and hoops. Both groups have 2.6 turns per year.

Table 3. Group four swine grow finish production budget.

Item	Hoop	Confinement	Difference
Facility Investment			
Building (per pig space)	$55.00	$180.00	($125.00)
Feed & manure handling	$36.00	$36.00	$0.00
Total initial investment	$91.00	$216.00	($125.00)
2.6 Turns/year final day out + 8 days	2.6	2.6	
Total initial investment per turn	$35.00	$83.08	($48.08)
% Interest taxes, depreciation, insurance	16.5%	13.2%	(4%)
Fixed Cost			
Facility cost per hog marketed	$5.98	$11.46	($5.48)
Fixed cost per cwt marketed	$2.34	$4.68	($2.34)
Operating Costs			
Feeder pigs	$38.00	$38.00	
Feeder pig death loss	$1.38	$1.73	($0.35)
Interest on feeder pig (10% - 4 months)	$1.31	$1.32	($0.01)
Fuel repairs utilities	$1.04	$1.57	($0.53)
Bedding	$3.76		$3.76
Feed ($.06/LB)	$39.95	$37.18	$2.77
Vet/medical	$1.55	$1.57	($0.01)
Interest on fuel, feed, etc. (10% - 2 months)	$0.80	$0.70	$0.10
Labor	$1.55	$1.57	($0.01)
Marketing costs	$2.80	$2.09	$0.71
Total operating cost	$92.14	$85.73	$6.41
Operating costs/cwt marketed	$35.97	$34.97	$1.00
Total cost (per pig marketed)	$98.13	$97.19	$0.93
Total cost per cwt*	$38.31	$39.65	($1.34)
Revenue from cull pigs per head	$0.60	$1.18	($0.58)
Net cost (per pig marketed)	$97.53	$96.02	$1.51
Net cost per cwt*	$38.07	$39.17	($1.10)
Revenue from $60 carcass weight**	$111.85	$109.83	$2.01
Net revenue per hog marketed	$14.32	$13.82	$0.50

 *Uses plant sale weight.

**Confinement revenue includes the $.43 per carcass hundred weight lean premium as well as the yield premium.

Fuel, repairs, utilities, vet, medical, marketing, and miscellaneous are based on Iowa State University and Midwest Plan Service, Livestock Enterprise Budgets (1,2). Bedding for this group required 225 pounds of cornstalks per hog marketed with a cost of $20 per 1,200-pound bale. Labor was valued at $10.00 per hour with .2 hours per head required in the confinement and .27 hours per head for the hoop hogs. Feed prices were six cents per pound, an average price with grind mix delivery included. All the feed used was applied to the pigs that were marketed.

Feeder pig as well as market pig prices were calculated using a rounded average price from the 1990 to 1999 time period. Feeder pig death loss includes cull pigs with the revenue from cull pigs added in at the bottom of the budget. Interest is 10%. Market pig prices were calculated on a carcass weight basis to account for the yield differences and lean premiums. The revenue for the confinement pigs reflects the yield and lean premium received at market. The yield premium for the confinement was 1.3% and the lean premium was $.43 per carcass hundred weight based upon sales to Excel. It should be noted that the lean premium difference may be different if sales were made to a different packer. The revenue from the culled hogs was projected at $.30 per carcass weight or roughly half the revenue per pound of a market hog.

The result of this trial shows that, for this summer group, there is a net revenue difference of $.50 per pig in favor of the hoop system. This occurs despite a cost advantage of $1.66 per pig marketed from the confinement operation due largely to the hoop hogs gaining at a faster rate; and being heavier when marketed. The confinement had $6.41 per pig lower operating costs and a $.58 increase in cull pig revenue offsetting a $5.48 increase in fixed costs.

However, the hoop system received an additional $2.01 per pig in revenue. The revenue was calculated by using the carcass weight of the average pig on trial and multiplying it by the average value per carcass weight received from 1990 to 1999; $60 (rounded down to the nearest dollar). The confinement system also had $.43 per carcass hundred weight added due to the lean premium advantage between the systems.

Economic Effects of Production Efficiency

As shown in Table 1 there are production efficiency differences between the two systems. The following sensitivity tables focus on feed efficiency and average daily gain, which is shown by market weight. The market weight accurately shows average daily gain in this situation because the final marketing occurred on the same dates. This marketing schedule would reflect an all-in/all-out system of pig placement and marketing.

The first two tables are most effectively used together to measure the effects of varying average daily gain, feed costs, and feed efficiency. The first table provides the total pounds of feed needed for selected marketing weights and feed efficiencies. The starting feeder pig weight was a 30-pound pig.

By using the total pounds of feed, shown in Table 4, Table 5 can be used to determine the total feed costs under different feed prices, feed efficiencies, and market weight. For example, producing a 255 pound pig at a 2.9 feed efficiency would require 653 pounds of feed. By rounding the feed to 650 pounds you can determine the effects of feed price on total feed costs. If the feed price was $.05, the total feed cost would be roughly $32.50. However, at $.07 it would be $45.50 or a $13 increase.

Table 4. Sensitivity of total pounds of feed needed by feed efficiency and market weight.

Feed Efficiency	Market Weight							
	235	245	255	265	275	285	295	305
2.7	554	581	608	635	662	689	716	743
2.8	574	602	630	658	686	714	742	770
2.9	595	624	653	682	711	740	769	798
3.0	615	645	675	705	735	765	795	825
3.1	636	667	698	729	760	791	822	853
3.2	656	688	720	752	784	816	848	880
3.3	677	710	743	776	809	842	875	908
3.4	697	731	765	799	833	867	901	935

Based on a 30-lb. feeder pig.

Table 5. Sensitivity of the total feed cost by pounds of feed and feed price.

Feed Price	Pounds of Feed									
	500	550	575	600	625	650	675	700	725	750
$0.0450	$22.50	$24.75	$25.88	$27.00	$28.13	$29.25	$30.38	$31.50	$32.63	$33.75
$0.0475	$23.75	$26.13	$27.31	$28.50	$29.69	$30.88	$32.06	$33.25	$34.44	$35.63
$0.0500	$25.00	$27.50	$28.75	$30.00	$31.25	$32.50	$33.75	$35.00	$36.25	$37.50
$0.0525	$26.25	$28.88	$30.19	$31.50	$32.81	$34.13	$35.44	$36.75	$38.06	$39.38
$0.0550	$27.50	$30.25	$31.63	$33.00	$34.38	$35.75	$37.13	$38.50	$39.88	$41.25
$0.0575	$28.75	$31.63	$33.06	$34.50	$35.94	$37.38	$38.81	$40.25	$41.69	$43.13
$0.0600	$30.00	$33.00	$34.50	$36.00	$37.50	$39.00	$40.50	$42.00	$43.50	$45.00
$0.0625	$31.25	$34.38	$35.94	$37.50	$39.06	$40.63	$42.19	$43.75	$45.31	$46.88
$0.0650	$32.50	$35.75	$37.38	$39.00	$40.63	$42.25	$43.88	$45.50	$47.13	$48.75
$0.0675	$33.75	$37.13	$38.81	$40.50	$42.19	$43.88	$45.56	$47.25	$48.94	$50.63
$0.0700	$35.00	$38.50	$40.25	$42.00	$43.75	$45.50	$47.25	$49.00	$50.75	$52.50
$0.0725	$36.25	$39.88	$41.69	$43.50	$45.31	$47.13	$48.94	$50.75	$52.56	$54.38
$0.0750	$37.50	$41.25	$43.13	$45.00	$46.88	$48.75	$50.63	$52.50	$54.38	$56.25

Table 6 demonstrates the effects on break even of different feed efficiencies at different weights. The table is based on a $.06 cost per pound of feed at different market weights and feed efficiencies. It provides information on how the weight and feed efficiency affects the final breakeven. With a feed cost of $.06 a one-tenth drop in feed efficiency can lower the breakeven by $.52-$.54 per cwt of pork. At lighter weights there is a lower breakeven relative to feed costs with the same feed efficiency because a larger proportion of weight is purchased in the initial feeder pig weight. However, the reduction of sale weight can be detrimental in respect to other costs as far as the breakeven price is concerned.

The largest difference shown in this group was the market weight. Although as previously shown this has some effect upon the breakeven of feed use, it has the largest effect upon fixed and sunk costs. Table 7 demonstrates the effects on the break even of market weight vs. varied fixed costs. It should be noted that at higher fixed costs there is an amplifying effect of the varied weights. Thus, at $12 of fixed costs for the confinement there is nearly a $.20 difference in breakeven per 10 pounds of body weight. At $6 fixed cost of hoops there is only a $.10 difference. This amplifies the sensitivity of the confinement to decreased average daily gain and adds risk to operations whose marketing is controlled by pig flow.

Although feeder pig prices are not considered a fixed cost, they are a sunk cost after purchase. They again reflect an increase in sensitivity at higher prices, which increases the risk of poor performance. For example, at a 255-pound market weight a $35 feeder pig needs $13.73 cwt to cover the cost of the feeder pig. If the market weight was decreased by 10 pounds, to 245, then it would require an additional $.54 per hundred pounds of sale weight to cover the cost of the feeder pig. Thus, the breakeven of the hogs in this trial was effected by $.56 to $.64 per cwt because the feeder pig cost was $38 and the difference in weights was roughly 255 in the hoops vs. 245 in the confinement.

Table 6. Sensitivity of the feed cost per cwt. sensitivity by market weight and feed efficiency.

Feed Efficiency	Market Weight							
	235	245	255	265	275	285	295	305
2.7	$14.13	$14.22	$14.29	$14.37	$14.43	$14.49	$14.55	$14.61
2.8	$14.66	$14.74	$14.82	$14.90	$14.97	$15.03	$15.09	$15.15
2.9	$15.18	$15.27	$15.35	$15.43	$15.50	$15.57	$15.63	$15.69
3.0	$15.70	$15.80	$15.88	$15.96	$16.04	$16.11	$16.17	$16.23
3.1	$16.23	$16.32	$16.41	$16.49	$16.57	$16.64	$16.71	$16.77
3.2	$16.75	$16.85	$16.94	$17.03	$17.11	$17.18	$17.25	$17.31
3.3	$17.27	$17.38	$17.47	$17.56	$17.64	$17.72	$17.79	$17.85
3.4	$17.80	$17.90	$18.00	$18.09	$18.17	$18.25	$18.33	$18.39

*Based on $.06 per pound of feed.

Table 7. Sensitivity of fixed costs per cwt. by market weight and fixed costs.

Fixed Cost/Hog	Market Weight							
	235	245	255	265	275	285	295	305
$ 5.00	$2.13	$2.04	$1.96	$1.89	$1.82	$1.75	$1.69	$1.64
$ 5.50	$2.34	$2.24	$2.16	$2.08	$2.00	$1.93	$1.86	$1.80
$ 6.00	$2.55	$2.45	$2.35	$2.26	$2.18	$2.11	$2.03	$1.97
$ 6.50	$2.77	$2.65	$2.55	$2.45	$2.36	$2.28	$2.20	$2.13
$ 7.00	$2.98	$2.86	$2.75	$2.64	$2.55	$2.46	$2.37	$2.30
$ 7.50	$3.19	$3.06	$2.94	$2.83	$2.73	$2.63	$2.54	$2.46
$ 8.00	$3.40	$3.27	$3.14	$3.02	$2.91	$2.81	$2.71	$2.62
$ 8.50	$3.62	$3.47	$3.33	$3.21	$3.09	$2.98	$2.88	$2.79
$ 9.00	$3.83	$3.67	$3.53	$3.40	$3.27	$3.16	$3.05	$2.95
$ 9.50	$4.04	$3.88	$3.73	$3.58	$3.45	$3.33	$3.22	$3.11
$10.00	$4.26	$4.08	$3.92	$3.77	$3.64	$3.51	$3.39	$3.28
$10.50	$4.47	$4.29	$4.12	$3.96	$3.82	$3.68	$3.56	$3.44
$11.00	$4.68	$4.49	$4.31	$4.15	$4.00	$3.86	$3.73	$3.61
$11.50	$4.89	$4.69	$4.51	$4.34	$4.18	$4.04	$3.90	$3.77
$12.00	$5.11	$4.90	$4.71	$4.53	$4.36	$4.21	$4.07	$3.93
$12.50	$5.32	$5.10	$4.90	$4.72	$4.55	$4.39	$4.24	$4.10
$13.00	$5.53	$5.31	$5.10	$4.91	$4.73	$4.56	$4.41	$4.26

Table 8. Feeder pig cost/cwt. sensitivity using market weight and feeder pig costs.

Feeder Pig Cost	Market Weight							
	235	245	255	265	275	285	295	305
$20	$ 8.51	$ 8.16	$ 7.84	$ 7.55	$ 7.27	$ 7.02	$ 6.78	$ 6.56
$25	$10.64	$10.20	$ 9.80	$ 9.43	$ 9.09	$ 8.77	$ 8.47	$ 8.20
$30	$12.77	$12.24	$11.76	$11.32	$10.91	$10.53	$10.17	$ 9.84
$35	$14.89	$14.29	$13.73	$13.21	$12.73	$12.28	$11.86	$11.48
$40	$17.02	$16.33	$15.69	$15.09	$14.55	$14.04	$13.56	$13.11
$45	$19.15	$18.37	$17.65	$16.98	$16.36	$15.79	$15.25	$14.75
$50	$21.28	$20.41	$19.61	$18.87	$18.18	$17.54	$16.95	$16.39
$55	$23.40	$22.45	$21.57	$20.75	$20.00	$19.30	$18.64	$18.03
$60	$25.53	$24.49	$23.53	$22.64	$21.82	$21.05	$20.34	$19.67
$65	$27.66	$26.53	$25.49	$24.53	$23.64	$22.81	$22.03	$21.31
$70	$29.79	$28.57	$27.45	$26.42	$25.45	$24.56	$23.73	$22.95
$75	$31.91	$30.61	$29.41	$28.30	$27.27	$26.32	$25.42	$24.59

Tables 9 and 10 demonstrate the effects of the revenue differences at the different market weights. Because the two groups were marketed at different weights they are shown on different tables. Table 9 is the revenue received by the pigs from the hoop buildings using the yield from the trial at different weights.

Table 10 also uses yield values from the trial but it also has the lean premium differential of $.43 (confinement vs. hoop). By rounding the actual number, the hoops at $60 per hundred pounds of carcass weight and 255 pounds result in $111.33 per hog. For the confinement for the same price

with a 245-pound weight results in $109.86 per hog, or a difference of $1.47. By rounding in this manner we demonstrate that the sensitivity of market weight vs. revenue would erase the added profit shown by the hoop of $.50 and results in the confinement having a $.04 advantage.

Table 9. Hoop revenue per hog using price cwt. and market weight.

Price per Carcass Weight	Market Weight								
	235	245	255	265	275	285	295	305	315
$25	$ 42.75	$ 44.57	$ 46.39	$ 48.21	$ 50.03	$ 51.85	$ 53.66	$ 55.48	$ 57.30
$30	$ 51.30	$ 53.48	$ 55.67	$ 57.85	$ 60.03	$ 62.21	$ 64.40	$ 66.58	$ 68.76
$35	$ 59.85	$ 62.40	$ 64.94	$ 67.49	$ 70.04	$ 72.58	$ 75.13	$ 77.68	$ 80.22
$40	$ 68.40	$ 71.31	$ 74.22	$ 77.13	$ 80.04	$ 82.95	$ 85.86	$ 88.77	$ 91.68
$45	$ 76.95	$ 80.22	$ 83.50	$ 86.77	$ 90.05	$ 93.32	$ 96.60	$ 99.87	$103.14
$50	$ 85.50	$ 89.14	$ 92.78	$ 96.41	$100.05	$103.69	$107.33	$110.97	$114.60
$55	$ 94.05	$ 98.05	$102.05	$106.05	$110.06	$114.06	$118.06	$122.06	$126.07
$60	$102.60	$106.96	$111.33	$115.70	$120.06	$124.43	$128.79	$133.16	$137.53
$65	$111.15	$115.88	$120.61	$125.34	$130.07	$134.80	$139.53	$144.26	$148.99
$70	$119.70	$124.79	$129.89	$134.98	$140.07	$145.17	$150.26	$155.35	$160.45
$75	$128.25	$133.71	$139.16	$144.62	$150.08	$155.54	$160.99	$166.45	$171.91
$80	$136.80	$142.62	$148.44	$154.26	$160.08	$165.90	$171.73	$177.55	$183.37

Table 10. Confinement revenue per hog using price cwt. and market weight.

Price per Carcass Weight	Market Weight								
	235	245	255	265	275	285	295	305	315
$25	$ 44.39	$ 46.28	$ 48.17	$ 50.06	$ 51.95	$ 53.84	$ 55.73	$ 57.62	$ 59.51
$30	$ 53.10	$ 55.36	$ 57.62	$ 59.88	$ 62.14	$ 64.40	$ 66.66	$ 68.92	$ 71.18
$35	$ 61.82	$ 64.45	$ 67.08	$ 69.71	$ 72.34	$ 74.97	$ 77.60	$ 80.23	$ 82.86
$40	$ 70.53	$ 73.53	$ 76.53	$ 79.53	$ 82.53	$ 85.53	$ 88.53	$ 91.54	$ 94.54
$45	$ 79.24	$ 82.61	$ 85.98	$ 89.35	$ 92.73	$ 96.10	$ 99.47	$102.84	$106.21
$50	$ 87.95	$ 91.69	$ 95.44	$ 99.18	$102.92	$106.66	$110.41	$114.15	$117.89
$55	$ 96.66	$100.77	$104.89	$109.00	$113.11	$117.23	$121.34	$125.45	$129.57
$60	$105.37	$109.86	$114.34	$118.82	$123.31	$127.79	$132.28	$136.76	$141.24
$65	$114.08	$118.94	$123.79	$128.65	$133.50	$138.36	$143.21	$148.07	$152.92
$70	$122.80	$128.02	$133.25	$138.47	$143.70	$148.92	$154.15	$159.37	$164.60
$75	$131.51	$137.10	$142.70	$148.29	$153.89	$159.49	$165.08	$170.68	$176.28
$80	$140.22	$146.18	$152.15	$158.12	$164.09	$170.05	$176.02	$181.99	$187.95

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