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

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Summary and Implications

Two types of pork grow-finish production facilities are hoop and total confinement. Results of this study of a group of hogs showed profit to be $3.46 per pig greater for the confinement-raised pigs. However, there were tradeoffs between the systems. As with previous group comparisons, confinement pigs had better feed efficiency, whereas the hoop pigs had lower fixed costs. The hoop pigs gained more weight per day but consumed more feed per pound of gain. A confounding factor in this study is that the confinement pigs were on feed for approximately 10 days longer than the hoop pigs.

The advantage of the hoop system is it low fixed costs, which were $5.78 lower than the confinement system. The results of this trial also suggest that the length of the trial may influence the results due to the difference in fixed costs. Average daily gains, which also may have been influenced by the disparagement of starting weights, favored the hoops.

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 is aimed at comparing two facility types under a wide range of circumstances, and evaluates hoops vs. confinement in a comparison of profitability and risk. This report provides results from a group of pigs finished during the winter season.

Materials and Methods

The following is a report that details a group of hogs that were on test from December 1999 to April 1999. Results are evaluated by using the actual production numbers while using the average or typical costs for feeder pigs, feed, etc. along with 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 the hoop and confinement facilities (1,2).

Results and Discussion

Productivity

Production efficiencies have a large effect upon the economics of the operation. Important information would be the percentage of pigs marketed, feed efficiency, and average daily gain. The percentage of pigs marketed has a direct effect on system returns because they need to cover the entire systems costs. Feed efficiency reflects this by using the weight of the marketed animals (at the plant) and the feed consumed by the group on test. During this trial approximately 2% more hogs were marketed from the hoop system compared with the confinement system; 98% vs. 96.2%, respectively (Table 1). Feed efficiency was better for the confinement system; 2.85 vs. 3.05 pounds of feed per pound of pork sold.

Pigs fed in the hoops had an average daily gain greater than the confinement pigs by six hundredths of a pound per day. The hoop pigs started, on average, 8.05 pounds heavier, and averaged 10.05 fewer days on feed, with a 10.5 day difference in facility days. The confinement hogs weighed 2.72 pounds more at the plant with a 1.2% improvement in carcass yield. Due to the yield differential the difference in carcass weight was 5.05 more pigs (192.41 vs. 187.36 pounds) for the confinement.

The distribution of average daily gains by using the farm weights is shown in Figure 1. The graph demonstrates that there was a slightly wider distribution of gain in the hoop system. Hoop pigs were marketed during three time periods, whereas confinement pigs were marketed in two groups. This is reflected by the marketing information that is provided in Table 2. It should be noted that this marketing schedule resulted in the confinement reducing the difference

Table 1. Productivity.

	Hoop	Confinement	Difference
Total pigs started	302	130	
Start weight	40	31.9	8.05
Culls	1	0	
Cull rate	.33%	0%	1.17%
Death loss, head	5	5	
Death loss, %	1.66%	3.85%	-2.19%
Average daily gain*	1.83	1.76	0.06
Feed efficiency*	3.05	2.85	0.20
Farm sale weight	250.75	260.29	-9.54
Plant sale weight	248.1	250.8	(2.72)
Yield	75.5%	76.7%	-1.2%
Hot carcass weight	187.36	192.41	-5.05
Lean premium difference (per hot cwt)		$.88	-$.88
Average days on feed	113	123.46	-10.05
Total facility days	117.5	128	10.50
Pigs marketed	98.0%	96.2%	1.9%
Pigs marketed, head	296	125	

*Using plant sale weight.

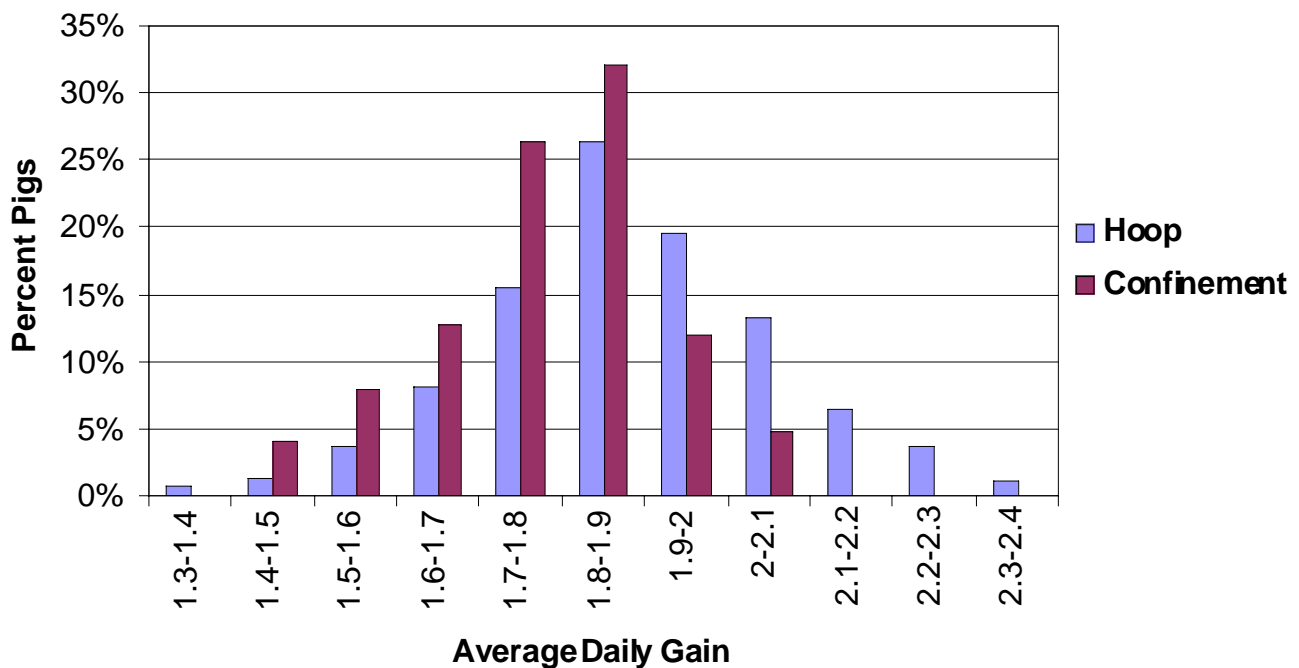**Figure 1. Average Daily Gain Distribution**

Table 2. Marketing information.

Marketing Date	Hoop Number Marketed	Confinement Number Marketed	Hoop Percent Marketed	Confinement Percent Marketed
3/23/00	115		39	
3/30/00	110		37	
4/6/00	71		24	
4/20/00		81		65
4/27/00		44		35
Total	296	125	100	100

in average facility days compared to average days on feed by nearly a half of a day.

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, whereas interest is calculated at 10% interest for both confinement and hoops.

Fuel, repairs, utilities, vet, medical, marketing, and the miscellaneous are based on Iowa State University and Midwest Plan Service, Livestock Enterprise Budgets (3–5). Bedding for this group required 273 pounds of cornstalks per hog marketed with a cost of $20 per 1200-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 set at $.06 per pound, which is an estimated average price with grind mix delivery included. All the feed used was applied only to the pigs that were marketed.

Feeder pig as well as market hog prices were calculated using a rounded average price from the 1990 to 1999 time period. The feeder pig prices then take into account costs for dead and culled pigs as well as a 10% interest rate that is counted against all expenses except labor and marketing costs. Market hog prices were switched to a carcass weight basis to take into account the yield differences and lean premiums. The revenue for the confinement hogs reflects the yield and lean premium received at market. The yield premium for the confinement was 1.32% and the lean premium was $.88 per carcass hundred weight based upon sales to Excel. It should be noted that the lean premium difference could be different if sales were made to a

different packer. The revenue from the culled hogs were estimated as half the revenue from a marketed hog on a cwt live weight basis.

The result of the trial is that, for this winter group, there is a net revenue difference of $3.46 per pig in favor of the confinement system (Table 3). This occurs despite a cost advantage of $1.25 per pig marketed of the hoop operation. This occurs in part due to the hoop hogs being on feed for fewer days and gaining less weight during the trial. The hoop hogs had a $5.48 decrease in fixed costs and $.11 in cull pig revenue offsetting $4.64 per pig higher operating costs. The confinement system received an additional $4.71 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 also had $.88 per carcass weight added due to the lean premium advantage between the systems.

Economic Effects of Production Efficiency Sensitivity

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 the market weight. It however does not a perfectly reflect ADG due to differences in starting weight and days on feed.

Tables 4 and 5 are most effectively used to measure the effects of varied average daily gain, feed costs, and feed efficiency. Table 4 provides the total pounds of feed needed for selected marketing weights and feed efficiencies. The starting feeder pig weight was based on 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 250-pound pig at a 2.9 feed efficiency would require 638 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. However, at $.07 it would be $45 or a $13 increase.

Table 3. Group five 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	
Total initial investment	$91.00	$216.00	($125.00)
Turns/Year Final Day out + 7 days	2.91	2.68	$0.23
Total initial investment per turn	$31.29	$80.48	($49.19)
% Interest taxes, depreciation, insurance	16.5%	13.2%	3.3%
Fixed Cost			
Facility cost per hog marketed	$5.27	$11.05	($5.78)
Fixed cost/cwt marketed	$2.12	$4.41	($2.28)
Operating Costs			
Feeder pigs	$38.00	$38.00	
Feeder pig death loss	$0.77	$1.52	($0.75)
Interest on feeder pig	$1.31	$1.32	($0.02)
Fuel repairs utilities	$1.04	$1.57	($0.54)
Bedding	$4.55		$4.55
Feed ($.06/LB)	$37.95	$37.23	$0.72
Vet/medical	$1.53	$1.56	($0.03)
Interest on mixed costs	$0.77	$0.70	$0.07
Marketing costs	$1.53	$1.56	($0.03)
Labor	$2.75	$2.08	$0.67
Total operating cost	$90.17	$85.53	$4.64
Operating costs/cwt marketed	$36.35	$34.10	$2.24
Total cost (per pig marketed)	$95.43	$96.58	($1.14)
Total cost/cwt*	$38.47	$38.51	($0.04)
Revenue from cull pigs per head	$0.11	$0.00	$0.11
Net cost (per pig marketed)	$95.32	$96.58	(1.25)
Net cost per cwt*	$38.42	$38.51	(0.08)
Revenue from $60 carcass weight**	$112.42	$117.14	($4.71)
Net revenue per hog marketed	$17.10	$20.56	($3.46)

* Uses plant sale weight.

**Confinement revenue includes the $.88 per carcass hundred weight lean premium as well as the yield premium.

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

	Market Weight							
Feed Efficiency	240	250	260	270	280	290	300	310
2.7	567	594	621	648	675	702	729	756
2.8	588	616	644	672	700	728	756	784
2.9	609	638	667	696	725	754	783	812
3.0	630	660	690	720	750	780	810	840
3.1	651	682	713	744	775	806	837	868
3.2	672	704	736	768	800	832	864	896
3.3	693	726	759	792	825	858	891	924
3.4	714	748	782	816	850	884	918	952

Based on a 30-pound feeder pig.

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

	Pounds of Feed									
Feed Price	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 feed cost per hundred weight gain for selected feed efficiencies and 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 feed cost of gain. 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 since 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.

A large difference in market weight can have a huge effect on the comparison of systems. For example, if the groups had been sold at the same number of days the result could have been 10 to 20 pounds difference in weight. Although as previously shown this has some effect upon the breakeven or 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 ten 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.

Table 6. Sensitivity of the feed cost per hundred weight gain by market weight and feed efficiency.

	Market Weight							
Feed Efficiency	240	250	260	270	280	290	300	310
2.7	$14.18	$14.26	$14.33	$14.40	$14.46	$14.52	$14.58	$14.63
2.8	$14.70	$14.78	$14.86	$14.93	$15.00	$15.06	$15.12	$15.17
2.9	$15.23	$15.31	$15.39	$15.47	$15.54	$15.60	$15.66	$15.72
3.0	$15.75	$15.84	$15.92	$16.00	$16.07	$16.14	$16.20	$16.26
3.1	$16.28	$16.37	$16.45	$16.53	$16.61	$16.68	$16.74	$16.80
3.2	$16.80	$16.90	$16.98	$17.07	$17.14	$17.21	$17.28	$17.34
3.3	$17.33	$17.42	$17.52	$17.60	$17.68	$17.75	$17.82	$17.88
3.4	$17.85	$17.95	$18.05	$18.13	$18.21	$18.29	$18.36	$18.43

Based on $.06 per pound of feed.

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

Fixed Cost/Hog	Market Weight							
	240	250	260	270	280	290	300	310
5	$2.08	$2.00	$1.92	$1.85	$1.79	$1.72	$1.67	$1.61
5.5	$2.29	$2.20	$2.12	$2.04	$1.96	$1.90	$1.83	$1.77
6	$2.50	$2.40	$2.31	$2.22	$2.14	$2.07	$2.00	$1.94
6.5	$2.71	$2.60	$2.50	$2.41	$2.32	$2.24	$2.17	$2.10
7	$2.92	$2.80	$2.69	$2.59	$2.50	$2.41	$2.33	$2.26
7.5	$3.13	$3.00	$2.88	$2.78	$2.68	$2.59	$2.50	$2.42
8	$3.33	$3.20	$3.08	$2.96	$2.86	$2.76	$2.67	$2.58
8.5	$3.54	$3.40	$3.27	$3.15	$3.04	$2.93	$2.83	$2.74
9	$3.75	$3.60	$3.46	$3.33	$3.21	$3.10	$3.00	$2.90
9.5	$3.96	$3.80	$3.65	$3.52	$3.39	$3.28	$3.17	$3.06
10	$4.17	$4.00	$3.85	$3.70	$3.57	$3.45	$3.33	$3.23
10.5	$4.38	$4.20	$4.04	$3.89	$3.75	$3.62	$3.50	$3.39
11	$4.58	$4.40	$4.23	$4.07	$3.93	$3.79	$3.67	$3.55
11.5	$4.79	$4.60	$4.42	$4.26	$4.11	$3.97	$3.83	$3.71
12	$5.00	$4.80	$4.62	$4.44	$4.29	$4.14	$4.00	$3.87
12.5	$5.21	$5.00	$4.81	$4.63	$4.46	$4.31	$4.17	$4.03
13	$5.42	$5.20	$5.00	$4.81	$4.64	$4.48	$4.33	$4.19

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. For example, at a 250-pound market weight a $35 feeder pig needs $14 cwt in order to cover the cost of the feeder pig. If the market weight was decreased by 10 pounds to 240, then it would require an additional $.58 per hundred pounds of sale weight to cover the cost of the feeder pig. Selling at heavier weight spreads the cost of the feeder pig over more pounds.

Table 8. Market hog price needed to cover feeder purchase cost.

Feeder Pig Cost	Market Weight							
	240	250	260	270	280	290	300	310
$20	$8.33	$8.00	$7.69	$7.41	$7.14	$6.90	$6.67	$6.45
$25	$10.42	$10.00	$9.62	$9.26	$8.93	$8.62	$8.33	$8.06
$30	$12.50	$12.00	$11.54	$11.11	$10.71	$10.34	$10.00	$9.68
$35	$14.58	$14.00	$13.46	$12.96	$12.50	$12.07	$11.67	$11.29
$40	$16.67	$16.00	$15.38	$14.81	$14.29	$13.79	$13.33	$12.90
$45	$18.75	$18.00	$17.31	$16.67	$16.07	$15.52	$15.00	$14.52
$50	$20.83	$20.00	$19.23	$18.52	$17.86	$17.24	$16.67	$16.13
$55	$22.92	$22.00	$21.15	$20.37	$19.64	$18.97	$18.33	$17.74
$60	$25.00	$24.00	$23.08	$22.22	$21.43	$20.69	$20.00	$19.35
$65	$27.08	$26.00	$25.00	$24.07	$23.21	$22.41	$21.67	$20.97
$70	$29.17	$28.00	$26.92	$25.93	$25.00	$24.14	$23.33	$22.58
$75	$31.25	$30.00	$28.85	$27.78	$26.79	$25.86	$25.00	$24.19

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 in different tables. Table 9 is the revenue received by the pigs from the hoop buildings using the yield from the trial and the selected carcass weights.

Table 9. Hoop revenue per hog by using carcass price per hundred pounds and market weight.

Price per Carcass Weight	Market Weight								
	240	250	260	270	280	290	300	310	320
25	$45.32	$47.21	$49.10	$50.99	$52.87	$54.76	$56.65	$58.54	$60.43
30	$54.38	$56.65	$58.92	$61.18	$63.45	$65.71	$67.98	$70.25	$72.51
35	$63.45	$66.09	$68.74	$71.38	$74.02	$76.67	$79.31	$81.95	$84.60
40	$72.51	$75.53	$78.56	$81.58	$84.60	$87.62	$90.64	$93.66	$96.68
45	$81.58	$84.98	$88.38	$91.77	$95.17	$98.57	$101.97	$105.37	$108.77
50	$90.64	$94.42	$98.19	$101.97	$105.75	$109.52	$113.30	$117.08	$120.85
55	$99.71	$103.86	$108.01	$112.17	$116.32	$120.48	$124.63	$128.79	$132.94
60	$108.77	$113.30	$117.83	$122.37	$126.90	$131.43	$135.96	$140.49	$145.03
65	$117.83	$122.74	$127.65	$132.56	$137.47	$142.38	$147.29	$152.20	$157.11
70	$126.90	$132.18	$137.47	$142.76	$148.05	$153.33	$158.62	$163.91	$169.20
75	$135.96	$141.63	$147.29	$152.96	$158.62	$164.29	$169.95	$175.62	$181.28
80	$145.03	$151.07	$157.11	$163.15	$169.20	$175.24	$181.28	$187.32	$193.37

Table 10 also uses yield values from the trial but it also includes the lean premium differential of $.88 (confinement vs. hoop). The difference in revenue reflects the importance of the lean premium and yield difference. This difference varies by both weight and price. As the price of hogs decreases by $5 there is roughly a $.15–$.16 drop in the difference between the hoop and confinement prices. For example, a 250–pound hog at $60/cwt receives $113.30 from the hoop system, whereas the confinement earns $116.77 for a difference of $3.47. At the same weight but a $55 price the revenue differences are $103.86 vs. $107.18; the difference is only $3.32, $.15 closer in revenues between the two systems. At $60 per cwt an increase of weight from 250 to 260 take the hoop from $113.30 to $117.83 and the confinement goes from $116.77 to $121.44 the difference in revenue from confinement to hoop goes from $3.47 to $3.61 or an increase of $.14.

Table 10. Confinement revenue per hog using carcass price per hundred pounds and market weight.

Price per Carcass Weight	Market Weight								
	240	250	260	270	280	290	300	310	320
25	$47.65	$49.64	$51.63	$53.61	$55.60	$57.58	$59.57	$61.55	$63.54
30	$56.86	$59.23	$61.60	$63.97	$66.34	$68.71	$71.08	$73.45	$75.82
35	$66.07	$68.82	$71.57	$74.33	$77.08	$79.83	$82.58	$85.34	$88.09
40	$75.27	$78.41	$81.55	$84.68	$87.82	$90.96	$94.09	$97.23	$100.37
45	$84.48	$88.00	$91.52	$95.04	$98.56	$102.08	$105.60	$109.12	$112.64
50	$93.69	$97.59	$101.49	$105.40	$109.30	$113.21	$117.11	$121.01	$124.92
55	$102.89	$107.18	$111.47	$115.76	$120.04	$124.33	$128.62	$132.90	$137.19
60	$112.10	$116.77	$121.44	$126.11	$130.78	$135.45	$140.13	$144.80	$149.47
65	$121.31	$126.36	$131.42	$136.47	$141.52	$146.58	$151.63	$156.69	$161.74
70	$130.51	$135.95	$141.39	$146.83	$152.27	$157.70	$163.14	$168.58	$174.02
75	$139.72	$145.54	$151.36	$157.18	$163.01	$168.83	$174.65	$180.47	$186.29
80	$148.93	$155.13	$161.34	$167.54	$173.75	$179.95	$186.16	$192.36	$198.57

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