Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 10 *Swine Day (1968-2014)*

Article 968

2009

Economic impact of removing pigs before marketing on the remaining pigs' growth performance

J Y. Jacela

Michael D. Tokach

Joel M. DeRouchey

See next page for additional authors

Recommended Citation

Jacela, J Y.; Tokach, Michael D.; DeRouchey, Joel M.; Goodband, Robert D.; Nelssen, Jim L.; and Dritz, Steven S. (2009) "Economic impact of removing pigs before marketing on the remaining pigs' growth performance," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 10. https://doi.org/10.4148/2378-5977.6808

Economic impact of removing pigs before marketing on the remaining pigs' growth performance

Authors

J Y. Jacela, Michael D. Tokach, Joel M. DeRouchey, Robert D. Goodband, Jim L. Nelssen, and Steven S. Dritz

Economic Impact of Removing Pigs Before Marketing on the Remaining Pigs' Growth Performance[1]

J. Y. Jacela[2], S. S. Dritz[2], M. D. Tokach, J. M. DeRouchey, R. D. Goodband, and J. L. Nelssen

Summary

The economic impact of removing the heaviest pigs (topping) before marketing a finishing group and the effect of topping on performance of the remaining pigs were determined in 2 studies. In Exp. 1, a total of 1,126 pigs (BW = 241 lb; 25 pigs/pen) were randomly assigned to 1 of 3 treatments: topping 0, 2, or 4 pigs/pen 15 d before marketing the remaining pigs in the group. After topping, floor space per pig was 7.2, 7.8, and 8.6 ft^2 for pens with 0, 2, and 4 pigs topped per pen, respectively. Overall (d 0 to 15), increasing the number of pigs topped per pen improved ADG ($P < 0.02$), ADFI (linear; $P < 0.03$), and F/G (quadratic; $P < 0.04$). Revenues were similar ($P > 0.76$) between treatments, but feed usage and cost was reduced (quadratic; $P < 0.01$) as more pigs were topped per pen. However, there was no impact on income over feed cost (IOFC). In Exp. 2, a total of 1,084 pigs (BW = 234 lb; 27 pigs/pen) were assigned to 1 of 5 treatments. On d 0 (20 d before closeout), 2 pigs were topped from each pen excluding the control pens (0 top). Pens that were topped at d 0 had an additional 0, 2, 4, or 6 pigs per pen topped on d 10. Floor space per pig was 6.7 ft^2 in control pens and 7.2 ft^2 for the remaining pens from d 0 to 10. After topping on d 10, floor space per pig was 7.8, 8.6, and 9.5 ft^2 for pens with 2, 4, or 6 more pigs topped, respectively. From d 10 to 20, the remaining pigs had increased (linear; $P < 0.01$) ADFI, which led to a linear increase ($P < 0.01$) in ADG. Overall, ADG and ADFI increased (linear; $P < 0.05$) with increasing number of pigs topped, and F/G improved ($P < 0.01$) in topped pens relative to intact pens. Weight discounts were highest in intact pens ($P < 0.02$) compared to topped pens. Revenue decreased ($P < 0.05$) as additional pigs were topped after d 10 in pens topped at d 0. Feed usage was highest ($P < 0.01$) in intact pens. As more pigs were topped on d 10, IOFC tended to decrease ($P = 0.07$). Topping, regardless of number of pigs, did not affect ($P > 0.23$) any of the carcass traits measured. Topping improves growth performance of the remaining pigs. Based on IOFC, topping 2 pigs once is the most optimal. Improvements in performance from topping more than 2 pigs were not great enough to overcome the reduction in total weight produced by the pen.

Key words: growth, marketing

Introduction

Natural variability exists in pig body weight within a given group. Sources of variability may be classified as intrinsic, which means related to the pig itself (e.g., genetics), or extrinsic, which refers to environmental factors that affect the pig (e.g., stocking density). Variability in weights at market has become increasingly important with the

[1] Appreciation is expressed to New Horizon Farms for use of pigs and facilities and to Richard Brobjorg and Marty Heintz for technical assistance.

[2] Food Animal Health and Management Center, College of Veterinary Medicine, Kansas State University.

adoption of all-in-all-out practices. Pigs that fall outside the specified weight ranges of processing plants can have significant economic discounts. Although it may be impossible to eliminate all sources of variation, several approaches can be implemented to effectively manage variation including increasing the growth rate of the whole group during the grow-finish period and sorting finishing pigs at market to fit weight requirements of processing plants.

In the United States, marketing the heaviest pigs several weeks before the expected barn closeout (topping) is a common practice. Previous studies have shown that this kind of marketing strategy can also lead to improved growth performance of the remaining pigs in the pen. The result is that more pigs are marketed within the weight window of a particular processing plant and premiums may be maximized. Topping, however, also can add to overall production costs if topped pigs are not the appropriate market weight and because of the increased labor requirements. Thus, it is necessary to evaluate the economics of removing pigs before barn closeout and determine the economically feasible number of pigs to top. These studies were conducted to evaluate the economic impact of removing the heaviest pigs prior to marketing the whole finishing group and determine the effect of topping on growth performance of the remaining pigs.

Procedures

This study was approved by and conducted in accordance with the guidelines of the Kansas State University Institutional Animal Care and Use Committee. The experiment was conducted in a commercial research finishing barn in southwestern Minnesota. The barns were naturally ventilated and double curtain sided. Pens were 18 × 10 ft with completely slatted flooring and deep pits for manure storage. Each pen was equipped with a 5-hole STACO (Schaefferstown, PA) stainless steel dry self-feeder with a feed pan dimension of 60 × 7 × 5.75 in. (length × width × height). Water was provided ad libitum through a cup waterer installed in each pen. Daily feed additions to each pen were accomplished through a robotic feeding system capable of providing and measuring feed amounts on an individual pen basis.

Two separate experiments were conducted in this study. In Exp. 1, a total of 1,126 pigs (PIC 337 × C22, initial BW = 241 lb) were randomly assigned to 1 of 3 treatments balanced by average BW within gender. There were 25 pigs per pen and 15 pens per treatment (7 pens of barrows and 8 pens of gilts). Treatments were topping 0, 2, or 4 pigs per pen at d 0 (15 d before barn closeout). Pigs selected for topping were visually selected as the heaviest pigs in the pen. The resulting floor space per pig was 7.2, 7.8, and 8.6 ft^2 for pens with 0, 2, and 4 pigs topped per pen, respectively.

In Exp. 2, a total of 1,084 pigs (PIC 337 × C22, initial BW = 234 lb) were randomly assigned to 1 of 5 treatments balanced by average BW. There were 27 pigs per pen and 8 pens per treatment. On d 0 (20 d prior to closeout), all pens had 2 pigs topped per pen with the exception of the control pens (0 topped per pen). All pens initially topped on d 0 were then topped on d 10 with 0, 2, 4, or 6 pigs removed per pen to complete the 5 treatments. As in Exp. 1, pigs selected for topping were visually selected as the heaviest pigs in the pen. Floor space per pig was 6.7 ft^2 in control pens and 7.2 ft^2 for all remaining pens during the first 10 d. After topping on d 10, the resulting floor space per pig was 7.8, 8.6, and 9.5 ft^2 for pens with an additional 2, 4, or 6 pigs topped per pen, respectively.

Immediately after topping, pens were weighed again (d 0) to determine the average pig weight in Exp. 1 and 2. All treatment groups were fed similar diets based on corn and soybean meal. Diets contained 5 ppm ractopamine HCl (Paylean; Elanco Animal Health, Greenfield, IN). Pigs from each pen were weighed as a group and feed consumption was determined on d 8 and 15 (off test) in Exp. 1 and on d 10 and 20 in Exp. 2 to measure ADG, ADFI, and F/G. Economic criteria including total revenue (adjusted to 25 and 27 pigs per pen in Exp. 1 and 2, respectively), feed cost, and income over feed cost (IOFC) were calculated on a pen and pig basis. At the end of Exp. 2, pigs were individually tattooed by pen before being transported to JBS Swift and Company (Worthington, MN) for processing and carcass data collection. Standard carcass criteria of loin and backfat depth, HCW, percentage lean, and yield were collected. Fat-free lean index (FFLI) was determined with the following equation: 50.767 + (0.035 × HCW) - (8.979 × backfat).

Statistical analysis was performed by analysis of variance with the MIXED procedure of SAS (SAS Institute, Inc., Cary, NC) to test for the main effects and interactions between number of pigs topped and gender. Data were analyzed as a completely randomized design with pen as the experimental unit. Linear and polynomial contrasts were used to determine the main effects of increasing number of pigs topped per pen. In Exp. 2, controls were excluded when analyzing the linear and quadratic effects of topping. Means for percentage lean, loin depth, backfat, and FFLI were adjusted to a common HCW, which was used as a covariate in the model.

Results and Discussion

In Exp. 1, there was no topping × sex interaction ($P > 0.33$) for any of the criteria measured (Table 1). Average BW was similar ($P > 0.50$) between treatments after topping. From d 0 to 8, ADG and F/G of the remaining pigs improved (quadratic; $P < 0.04$) as more pigs were topped per pen. From d 8 to 15, ADFI increased (linear; $P < 0.01$) with increasing number of pigs topped per pen. Overall (d 0 to 15), increasing the number of pigs topped per pen from 0 to 2 or 4 increased ADG ($P < 0.02$), ADFI (linear; $P < 0.03$), and F/G (quadratic; $P < 0.04$). There were no differences ($P > 0.76$) in revenue between treatments, but feed usage and feed cost on a pen or pig basis was reduced (quadratic; $P < 0.01$) as more pigs were topped per pen (Table 2). The reduction in feed usage and cost did not affect IOFC.

In Exp. 2, there was no difference ($P > 0.24$) in ADG and ADFI from d 0 to 10 (Table 3). There was a linear increase ($P < 0.02$) in F/G that may have been due to random variability. From d 10 to 20, increasing the number of pigs topped linearly increased ($P < 0.01$) ADFI of pigs remaining in the pen, which led to a linear increase ($P < 0.01$) in ADG. This resulted in overall improvements in ADG and ADFI (linear; $P < 0.05$) with increasing number of pigs topped. Overall, F/G improved ($P < 0.01$) in all pens that were topped relative to pens that were not topped. However, topping more than 2 pigs per pen did not result ($P > 0.24$) in further improvement in F/G. This suggests that the linear increase in ADG with increasing number of pigs topped per pen was mainly due to the linear increase in ADFI. At the end of the trial, average BW did not differ ($P > 0.91$) between treatments. Pens that were not topped had the highest weight discounts ($P < 0.02$) compared to pens that were topped (Table 4). However, there were no differences in weight discounts among pens with different numbers of pigs

topped. Revenue, either on a pen or pig basis, decreased ($P < 0.05$) as additional pigs were topped after d 10 in pens that were topped at d 0. Similar to Exp. 1, feed usage was highest ($P < 0.01$) in intact pens. As more pigs were topped on d 10, IOFC tended to decrease ($P > 0.07$). Topping, regardless of number of pigs, had no effect ($P > 0.23$) on any of the carcass parameters measured (Table 5).

Removing the heaviest market-ready pigs prior to marketing all pigs in a group provides an opportunity for producers to potentially maximize revenues. Pigs that have already reached market weight can be sold earlier, providing additional days for the rest of the group to reach target weights. As shown in this experiment, the remaining pigs in the pen have increased floor space and, consequently, increased access to feed and water. This could explain the resulting post-topping increase in growth performance of the remaining pigs in both experiments. As expected, total feed usage was reduced as a result of a lower number of pigs on feed. However, the removal of additional pigs after d 10 led to a decreasing revenue and IOFC as a result of decreasing total weight of pigs sold per pen as more pigs were removed. Thus, it was most economical to top 2 pigs once prior to the final marketing of all pigs. It should be noted, however, that Exp. 2 was conducted during the winter months when floor space could possibly have less impact on growth. Therefore, the effects of marketing strategies used in Exp. 2 should also be investigated during the summer months.

Another advantage of topping appears to be a reduction in variability as indicated by less weight discounts from pigs that came from topped pens than from pigs from non-topped pens. This supports the results from previous research that suggest topping is an effective tool to manage variability in finishing systems.

In conclusion, removing the heaviest pigs before marketing the entire group improved growth performance of the remaining pigs compared to pigs from pens that were left intact. Producers should evaluate topping procedures on an IOFC basis for optimal economic returns. Topping at least 2 pigs twice before marketing improved growth performance the most, but topping 2 pigs only once was optimal based on IOFC. Topping more than 2 pigs provided continual improvements in performance; however, the benefits were not great enough to overcome the reduction in total weight produced by the pen.

Table 1. Effect of sex and marketing strategy on growth performance (Exp. 1)[1]

	Treatment[2]				Probability, $P <$	
Item	None	2 pigs	4 pigs	SEM	Linear	Quadratic
Weight, lb						
d 0 (before topping)	240.6	241.5	241.6	2.29	0.81	0.82
d 0 (after topping)	240.6	238.8	236.6	2.38	0.58	0.29
Tops	---	271.9	267.0	2.79	---	---
d 8	260.0	259.9	259.5	2.39	0.99	0.90
d 15	275.0	276.9	275.6	2.26	0.56	0.95
d 0 to 8						
ADG, lb	2.41	2.62	2.83	0.120	0.19	0.04
ADFI, lb	5.89	6.31	5.93	0.168	0.10	0.39
F/G	2.60	2.47	2.11	0.131	0.43	0.01
d 8 to 15						
ADG, lb	2.10	2.40	2.30	0.127	0.12	0.70
ADFI, lb	6.62	7.14	7.11	0.131	0.01	0.19
F/G	3.52	3.08	3.14	0.239	0.22	0.57
d 0 to 15						
ADG, lb	2.26	2.52	2.58	0.068	0.01	0.02
ADFI, lb	6.23	6.70	6.48	0.138	0.03	0.97
F/G	2.81	2.67	2.52	0.085	0.24	0.03

[1] A total of 1,126 pigs, initially 241 lb, were used with 22 to 27 pigs per pen and 15 replications per treatment.

[2] None = topped 0 pigs/pen, 2 pigs = topped 2 pigs/pen, 4 pigs = topped 4 pigs/pen on d 0.

Table 2. Economic impact of gender and marketing strategy (Exp. 1)[1]

	Treatment[2]				Probability, $P <$	
Item	None	2 pigs	4 pigs	SEM	Linear	Quadratic
Total pig weight produced, lb/pen	6,865	6,905	6,850	53.9	0.60	0.65
Revenue[3]						
Low, $/pen[4]	3,089	3,107	3,082	24.3	0.60	0.65
High, $/pen[4]	4,119	4,143	4,110	32.4	0.60	0.65
Low, $/pig[5]	123.57	124.29	123.30	0.972	0.60	0.65
High, $/pig[5]	164.76	165.72	164.40	1.295	0.60	0.65
Total feed consumption						
Feed usage, lb/pen	2,336	2,310	2,040	47.6	0.66	<0.0001
Feed usage, lb/pig	93.4	92.4	81.6	1.90	0.66	<0.0001
Feed cost[6]						
Low, $/pen	233.6	231.0	204.0	4.76	0.66	<0.0001
High, $/pen	303.6	300.4	265.2	6.19	0.66	<0.0001
Low, $/pig[7]	9.34	9.24	8.16	0.190	0.66	<0.0001
High, $/pig[7]	12.15	12.01	10.61	0.247	0.66	<0.0001
IOFC, $/pen[8]						
LowRev-LowFeed	2,856	2,876	2,878	22.0	0.50	0.57
HighRev-HighFeed	3,815	3,843	3,845	29.4	0.50	0.59
LowRev-HighFeed	2,786	2,807	2,817	21.4	0.47	0.37
HighRev-LowFeed	3,885	3,912	3,906	30.0	0.52	0.77
IOFC, $/pig[8]						
LowRev-LowFeed	114.23	115.05	115.14	0.879	0.50	0.57
HighRev-HighFeed	152.61	153.71	153.79	1.175	0.50	0.59
LowRev-HighFeed	111.42	112.28	112.69	0.858	0.47	0.37
HighRev-LowFeed	155.42	156.48	156.24	1.199	0.52	0.77

[1] A total of 1,126 pigs, initially 241 lb, were used with 22 to 27 pigs per pen and 15 replications per treatment.
[2] None = topped 0 pigs/pen, 2 pigs = topped 2 pigs/pen, 4 pigs = topped 4 pigs/pen on d 0.
[3] Based on $45/cwt for Low and $60/cwt for High.
[4] Adjusted to 25 pigs/pen and calculated as:
None = [(avg. wt at d 0 × 25) + (ADF × 15 × 25)] × 0.45 or 0.60.
2 Pigs = Total top wt + [(avg. wt after Top × 23) + (ADF × 15 × 23)] × 0.45 or 0.60.
4 Pigs = Total top wt + [(avg. wt after Top × 21) + (ADF × 15 × 21)] × 0.45 or 0.60.
[5] Revenue/pen divided by 25 pigs/pen for all treatments.
[6] Based on diet costs of $200/ton for Low and $260/ton for High.
[7] Feed cost per pen divided by 25 pigs/pen for all treatments.
[8] Income over feed cost; calculated as revenue - feed cost.

Table 3. Effect of different marketing strategies on growth performance of remaining pigs (Exp. 2)[1]

	No. of pigs topped per pen						Probability, $P <$	
d 0:	0	2	2	2	2			
d 10:	0	0	2	4	6	SEM	Linear	Quadratic
Weight, lb								
d 0 (before top)	234.0	234.0	234.0	234.1	234.0	1.83	0.99	0.96
d 0 (after top)	234.0	231.5	231.2	231.4	231.5	1.92	1.00	0.92
d 0 (top pigs)	---	264.0	270.0	268.6	265.1	3.12	---	---
d 10 (before top)	259.9	257.9	257.5	258.7	258.3	2.17	0.83	1.00
d 10 (after top)	259.9	257.9	255.3	253.9	250.8	2.39	0.07	0.93
d 10 (top pigs)	---	---	283.4	283.0	281.1	2.77	---	---
d 20	275.8	277.7	275.5	274.8	274.3	2.65	0.39	0.76
d 0 to 10								
ADG, lb	2.45	2.57	2.60	2.53	2.52	0.053	0.32	0.75
ADFI, lb	5.99	5.96	6.28	6.39	6.28	0.121	0.24	0.29
F/G	2.45	2.32	2.41	2.53	2.49	0.043	0.02	0.29
d 10 to 20								
ADG, lb	1.59	1.91	2.02	2.08	2.28	0.093	0.01	0.63
ADFI, lb	5.65	5.86	6.31	6.69	6.72	0.098	<0.0001	0.13
F/G	3.65	3.20	3.14	3.32	2.95	0.163	0.53	0.42
d 0 to 20								
ADG, lb	2.02	2.24	2.32	2.32	2.42	0.052	0.03	0.88
ADFI, lb	5.82	5.91	6.30	6.52	6.47	0.085	0.01	0.17
F/G	2.90[a]	2.66[b]	2.71[bc]	2.82[c]	2.67[bc]	0.052	0.68	0.24

[1] A total of 1,084 pigs, initially 234 lb, were used with 27 pigs per pen and 8 replications per treatment.
[abc] Within a row, means without a common superscript differ ($P < 0.05$).

Table 4. Effect of different marketing strategies on various economic parameters (Exp. 2)[1]

	No. of pigs topped per pen							
d 0:	0	2	2	2	2		Probability, $P <$	
d 10:	0	0	2	4	6	SEM	Linear	Quadratic
Total pig weight produced, lb/pen	7,448	7,471	7,443	7,440	7,429	64.1	0.67	0.90
Weight discount, $/pen	68.8[a]	37.0[b]	32.6[b]	38.2[b]	28.7[b]	8.46	0.61	0.76
Revenue, $/100 lb	55.8	56.6	56.5	56.4	56.3	0.43	0.59	1.00
Revenue, $/pen	3,115	3,178	3,146	3,094	3,095	33.2	0.05	0.61
Revenue, $/pig	115.37	117.71	116.54	114.58	114.64	1.228	0.05	0.61
Feed usage, lb/pen	3,141[a]	2,954[bc]	3,022[c]	3,002[c]	2,849[b]	41.8	0.32	0.14
Feed usage, lb/pig	116.3[a]	109.4[bc]	111.9[c]	111.2[c]	105.5[b]	1.55	0.32	0.14
Feed cost[2]								
Low, $/pen	314.1[a]	295.4[bc]	302.2[c]	300.2[c]	284.9[b]	4.18	0.32	0.14
High, $/pen	408.4[a]	384.0[bc]	392.9[c]	390.3[c]	370.3[b]	5.43	0.32	0.14
Low, $/pig	11.63[a]	10.94[bc]	11.19[c]	11.12[c]	10.55[b]	0.155	0.32	0.14
High, $/pig	15.13[a]	14.22[bc]	14.55[c]	14.45[c]	13.72[b]	0.201	0.32	0.14
IOFC[3]								
At low feed cost, $/pen	2,801	2,883	2,844	2,794	2,811	31.1	0.07	0.39
At high feed cost, $/pen	2,707	2,794	2,754	2,703	2,725	30.6	0.08	0.34
At low feed cost, $/pig	103.73	106.77	105.34	103.46	104.10	1.153	0.07	0.39
At high feed cost, $/pig	100.24	103.49	102.98	100.12	100.93	1.134	0.08	0.34

[1] A total of 1,084 pigs, initially 234 lb, were used with 27 pigs per pen and 8 replications per treatment.
[2] Used standard values of $0.10/lb for Low and $0.13/lb for High feed cost scenarios.
[3] Income over feed cost.
[abc] Within a row, means without a common superscript differ ($P < 0.05$).

Table 5. Effect of different marketing strategies on carcass characteristics (Exp. 2)[1]

	Number of pigs topped per pen								
d 0:	0	2	2	2	2		Probability, $P <$		
d 10:	0	0	2	4	6	SEM	Treatment	Linear	Quadratic
Carcass weight, lb	206.4	208.8	208.1	205.6	205.8	2.40	0.78	0.23	0.70
Yield, %	76.6	76.4	76.3	75.5	75.8	0.41	0.23	0.13	0.66
Lean[2], %	56.4	56.1	57.5	56.4	56.6	0.62	0.54	0.97	0.50
Loin depth[2], in.	2.48	2.48	2.61	2.53	2.54	0.051	0.36	0.60	0.35
Backfat[2], in.	0.61	0.60	0.60	0.62	0.64	0.018	0.29	0.19	0.84
Fat-free lean index[2]	51.3	51.3	51.4	51.1	50.9	0.20	0.32	0.25	0.78

[1] A total of 1,084 pigs, initially 234 lb, were used with 27 pigs per pen and 8 replications per treatment.
[2] Values adjusted to a common carcass weight.