

Economic Analysis of Pharmaceutical Technologies in Modern Beef Production in a Bioeconomy Era

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In an earlier report,² we evaluated the impact on producer costs and resulting beef supplies and prices expected to occur if existing pharmaceutical technologies were no longer used in beef production. The estimates indicated that users of these technologies would have more than a \$430/head increase in cost of production over the lifetime of the animal. Adjusted for existing adoption rate indicated that the industry would experience a 36 percent increase in production costs or approximately \$366/head. When incorporated into an economic model of domestic consumption and international trade, the higher costs resulted in an 18 percent reduction in U.S. beef production, a 180 percent increase in net beef imports and 13 percent higher retail beef prices for consumers. That analysis was based on 2005 prices, before increased biofuel production and before corn and other feedstuffs increased dramatically in price.

This brief article summarizes the impact on the producer-cost estimates when feed prices are higher. The original assumptions of production efficiency changes due to pharmaceutical technologies and their discontinued use are modeled using the same cost-of-production procedure outlined in the original paper. However, feed input and cattle prices are based on average prices from 2007 to more accurately reflect prices expected in the coming years (Table 1).

Table 1: Cost of production (\$/head) differences between 2005 and 2007

Year	Cow-calf		Percent change	Stocker		Percent change	Feedlot		Percent change
	2005	2007		2005	2007		2005	2007	
Feed cost	224	274	22%	66	81	23%	161	277	73%
Other costs	259	309	19%	46	48	6%	123	129	5%
Calf price (\$/cwt)	126	117	-7%						
Feeder cattle cost				675	616	-9%	811	769	-5%
Total cost	483	582	21%	786	745	-5%	1095	1176	7%

There were big changes in beef production costs from 2005 to 2007. For example, cow-calf operation feed and non-feed costs increased by 22 percent and 19 percent, respectively, at the same time that calf prices decreased 7 percent, squeezing producers' profits. Stocker operations benefited from the lower calf prices but their feed costs increased 23 percent and their non-feed costs increased 6 percent. The most significant change was on feedlot's feed costs, which went up 73 percent during this period. This was compensated by a 5 percent decrease in the yearling prices, resulting in only a 7 percent increase in total costs. Feed costs represented 15 percent of the total costs in 2005 for the feedlot operations while it represented 24 percent of the total costs in 2007. Feeder cattle purchase value as a share of total costs decreased from 74 percent to 65 percent for the same period. It is important to review the effects of pharmaceutical technologies in the costs of production under this new prices scenario.

Cow-calf operations

Table 2 shows that the breakeven price (BEP) for cowherds increased from \$125/cwt in 2005 to \$151/cwt in 2007 and the cost per head increased from \$483 to \$582. The analysis only considers effects on weaning rate and weaning weight for the cow-calf operations. Therefore, the cost change due to

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pharmaceutical technology use comes from the effect on the total pounds of calves to sell after keeping sufficient heifer calves to maintain herd size. Even though the effect of pharmaceutical technologies expressed as a percent increase in the breakeven price didn't change, the effect on the cost per head increased approximately 21 percent for each technology because of the higher starting breakeven price. The result is that the use of each technology brought about higher returns in 2007 than in 2005 before counting any change in the pharmaceutical product price during that period.

Table 2: Impact on breakeven price & cost per head when pharmaceutical technologies are not used in cow-calf operations

Technology	Breakeven price (\$/pound)		Breakeven price effect		Cost of production (\$/head)		Value of technology (\$/head)	
	2005	2007	2005	2007	2005	2007	2005	2007
Year	2005	2007	2005	2007	2005	2007	2005	2007
Breakeven price, original	1.25	1.51			483	582		
Growth-promotant implants	1.32	1.59	5.8%	5.8%	511	616	28	34
De-wormers	1.68	2.03	34.4%	34.6%	649	783	166	201
Flies control	1.29	1.55	3.1%	3.1%	498	600	15	18
All technologies	1.84	2.22	46.8%	47.2%	709	857	226	274

Stocker operations

The stocker operations' analysis considers the effects of pharmaceutical technologies on average daily gain, leaving unchanged starting weight and finish weight; therefore, a decrease in average daily gain results in keeping cattle more days on the operation, resulting in higher feeding costs, as well as higher operation and labor costs. The breakeven price went from \$105/cwt in 2005 to \$99/cwt in 2007 and the cost per head decreased by \$41 from 2005 (Table 3) due to 9 percent lower calf costs, which more than compensates for the 23 percent increase in feed costs. The cost savings associated with using pharmaceutical technologies increased from \$81/head to \$95/head due to higher feed costs. The result is that the use of each technology led to higher returns in 2007 than in 2005 before counting any change in the pharmaceutical product price during that period for the stocker operations as well.

Table 3: Impact on breakeven price & cost per head when pharmaceutical technologies are not used in stocker operations

Technology	Breakeven price (\$/pound)		Breakeven price effect		Cost of production (\$/head)		Value of technology (\$/head)	
	2005	2007	2005	2007	2005	2007	2005	2007
Year	2005	2007	2005	2007	2005	2007	2005	2007
Breakeven price, original	1.05	0.99			786	745		
Growth-promotant implants	1.07	1.02	2.3%	2.9%	804	766	18	21
Ionophores	1.06	1.01	1.5%	1.8%	798	759	12	14
Antimicrobial therapy	1.06	1.01	1.2%	1.5%	796	756	10	11
De-wormers	1.08	1.03	2.7%	3.3%	807	769	21	24
Flies control	1.06	1.00	0.8%	1.0%	792	752	6	7
All technologies	1.16	1.12	10.4%	12.7%	867	840	81	95

Feedlot operations

Ionophores, antimicrobials, beta-agonists and dewormers improved the average daily gain and/or feed efficiency for feedlot cattle, while growth-promotant implants also allowed the producers to finish cattle to a higher weight without affecting the carcass fat percent. The breakeven price went from \$83/cwt in 2005 to \$89/cwt in 2007 and the cost per head increased by \$81 between 2005 and 2007 (Table 4). Even though feed efficiency and average daily gain improve with the use of growth-promotant implants, the cattle are reaching heavier market weights, resulting in a similar feed cost per head. The lower feeder cattle price resulted in lower opportunity cost of cattle in 2007, which compensated for some of the effect of growth-promotant implants in a time of higher feed costs. The result was a decrease on the effect of

growth-promotant implants expressed as the percent increase in the breakeven but a similar effect on the cost per head on both periods. Similar results were observed for the use of beta-agonists. The effect on the cost-per-head finished increased by approximately 50 percent for ionophores, antimicrobials and dewormers. The effect of discontinuing the use of all five technologies on the percent increase in the breakeven price increased from 12.0 percent to 13.2 percent, while the effect of all the five technologies on the cost per head increased from \$131/head to \$155/head for the same period.

Table 4: Impact on breakeven price & cost per head when pharmaceutical technologies are not used in feedlot operations

Technology	Breakeven price (\$/pound)		Breakeven price effect		Cost of production (\$/head)		Value of technology (\$/head)	
	2005	2007	2005	2007	2005	2007	2005	2007
Breakeven price, original	0.83	0.89			1095	1176		
Growth-promotant implants	0.88	0.94	6.5%	6.1%	1167	1248	71	71
Ionophores	0.84	0.90	1.2%	1.7%	1108	1196	13	20
Antimicrobial therapy	0.83	0.89	0.6%	0.8%	1101	1185	6	9
Beta-agonists	0.84	0.90	1.2%	1.2%	1109	1191	14	15
De-wormers	0.84	0.91	2.1%	2.9%	1118	1211	23	35
All technologies	0.93	1.01	12.0%	13.2%	1227	1332	131	155

Industry Impact

The impact of eliminating pharmaceutical technologies on cost of production and beef production was run as a scenario through the Food and Agricultural Policy Research Institute (FAPRI) model of the agriculture and food sector. The analysis compares the discontinued use of pharmaceutical technologies to the current baseline with existing technologies and holds other factors constant. The underlying assumption is that the discontinued use of pharmaceutical technologies, while significant to the beef sector, is not large enough to impact the macro-economy or corn and other input markets. It does include the market interactions with pork and poultry markets and beef trade.

A summary of the results are shown in Table 5 and assumes that the use of pharmaceutical technologies was discontinued in 2000. It also shows the percent change and the difference from the baseline with technology and the scenario without pharmaceutical technologies. The percentage change and actual difference are based on a three-year average in years 6 through 8 after use was discontinued, rather than only one year.

The results indicate that the U.S. beef market adjusts to a new equilibrium without pharmaceutical technologies as a smaller industry with higher beef and cattle prices. The model estimated that the number of beef cows is unchanged, but there are 14 percent fewer calves weaned and carcass weights decline, reducing beef production 19 percent or 5 billion pounds annually. There are fewer total cattle, fewer cattle on feed and fewer cattle harvested. Net imports of beef increase dramatically, 247 percent or more than 2.6 billion pounds. Consumers eat less of a higher-priced product. Domestic per-capita beef consumption declines 8.6 percent while retail prices increase 11 percent.

Cattle prices increase along with retail prices. Nebraska fed-cattle prices increase 20 percent or more than \$20/cwt without the technologies. However, cattle weight is reduced and feed required per pound of gain increases, meaning that feedlots cannot bid as aggressively for feeder cattle. Feeder cattle prices do increase approximately \$30/cwt for Oklahoma City 600- to 650-pound steers, but not as much as they would if feedlots had better efficiency. Cull cow prices increase \$13/cwt.

However, the higher feeder cattle and cull cow prices only partially offset the higher cowherd cost due to the reduced weaning rate. Cowherd returns increase approximately \$4/head without the use of pharmaceutical technologies. Thus, the industry reaches new equilibrium with cow-calf returns slightly higher than before the use of technologies was discontinued, but the industry is smaller with fewer cattle on feed, reduced number of cattle harvested and more beef imports.

Table 5. Summary of model of U.S. beef sector with & without pharmaceutical technologies for 2007, 7 years after ban initiated in 2000

	Values after 7 years		Average years 6, 7, 8	
	With technology	Without technology	Percent change	Difference
Inventory (million head)				
Beef cows, Jan 1	32.9	33.2	0.9	0.3
Total calf crop	37.4	32.3	-13.6	-5.1
Steer and heifer slaughter	28.1	23.7	-15.5	-4.3
Cattle and calves, Jan 1	97.0	88.5	-8.8	-8.5
Cattle on feed, Jan 1	14.3	12.1	-15.2	-2.2
Beef supply and use (million lbs)				
Production	26,523	21,462	-19.0	-5040.7
Net imports	1,618	4,292	247.0	2643.9
Retail consumption (lbs)	65.1	59.6	-8.6	-5.5
Prices and returns (\$/cwt)				
Nebraska 11-13 cwt steers	91.82	111.53	22.0	19.85
OKC 6-6.5 cwt steers	115.48	145.62	26.7	30.48
Utility cows, Sioux Falls	52.12	65.77	26.5	13.65
Retail beef (\$/lbs)	4.16	4.61	10.9	0.45
Cow-calf returns (\$/cow)	40.09	43.44	0.7	4.15

Source: Food and Agricultural Policy Research Institute

Summary

Not surprisingly, pharmaceutical technologies that improve feed efficiency and/or increase pounds of gain have a larger economic impact when feed prices are higher than when they are lower. The value of these technologies for the individual farm increased from approximately \$430/head in 2005 to \$524/head in 2007, a 22 percent increase. While the market price for calves and feeder cattle going into feedlots has decreased as feed costs have increased, the price decline would have to be larger if stocker operations and feedlots did not use efficiency-improving technologies. The higher cost of production resulting from not using pharmaceutical technologies leads to a smaller cattle and beef industry with a smaller calf crop, fewer cattle on feed, fewer cattle harvested and more beef imports. U.S. consumers eat less of the higher-priced product. Cattle prices are higher, offsetting part of the higher cost of production.