The Impact of Eliminating Antibiotics from U.S. Broiler Production

EXECUTIVE SUMMARY

December 18th, 2015

Elanco

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INTRODUCTION

- Motivation
  - To understand differences between conventional and 100% antibiotic-free (ABF) broiler production in the U.S. and to assess the impact of eliminating antibiotic use on resource utilization and efficiency.
- Methodology
  - A simulation model is developed that estimates the impact from constraining or eliminating the use of antibiotics on feed, land, water utilization, waste/manure generated, and production cost.
- Findings
  - 100% ABF broiler production requires more birds to maintain the same supply of food. Consequences include an increase in the utilization of feed, land, and water, more manure generated, and higher costs.
- Policy Implications
  - Policies aimed at eliminating or banning the use of antibiotics in broiler production may come with potentially negative consequences with respect to resource utilization and cost. Emphasis should focus on consumer and producer choice as well as responsible antibiotic use.

PRIMARY ELANCO WORKGROUP

- Roger Cady, PhD – Sustainability Lead
- Christy Goldhawk, PhD – Animal Welfare & Policy Advisor
- Eric Heskett, DVM – Poultry District Sales Manager
- Matthew Salois, PhD – Economic Research & Policy Advisor (study coordinator)

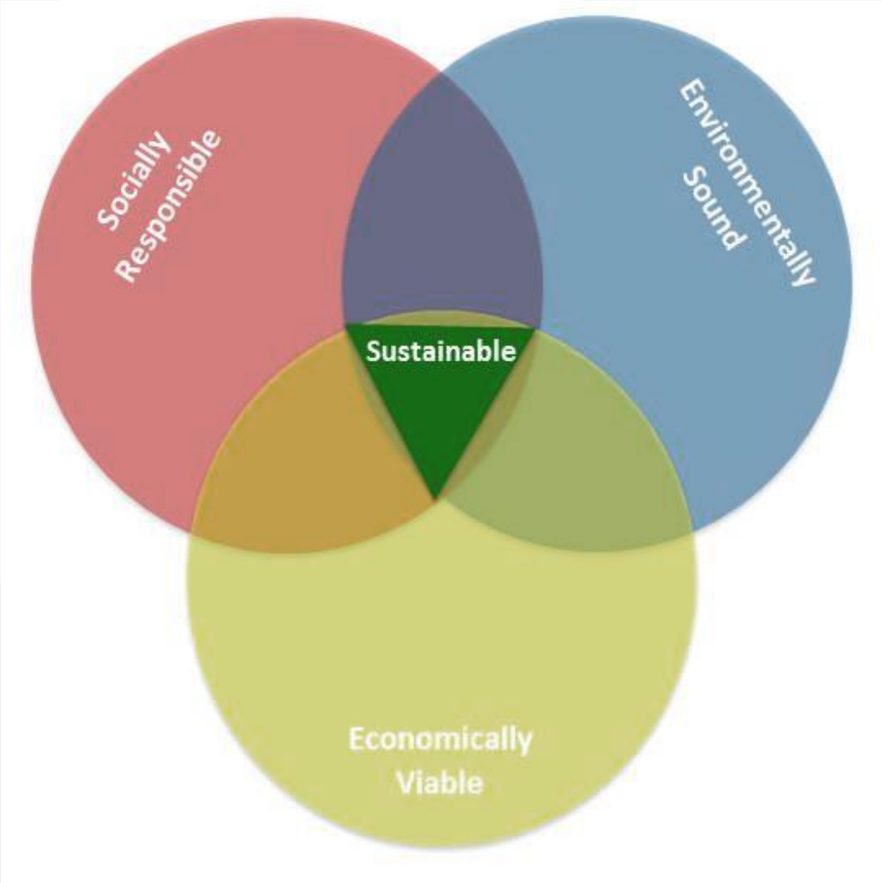
*Numerous internal and external consultations were conducted over the course of the study.

BACKGROUND – Antibiotic Use

- Antibiotic Use in Poultry Production
  - Control, prevention and treatment of diseases
    - Enteric, respiratory, and other systemic disease states
  - Support healthy gut microbiome resulting in effective use of resources for growth
- 100% Antibiotic-Free
  - The complete elimination of antimicrobials from production including animal-only antibiotics and ionophores.

BACKGROUND – Sustainability

- The intersection of social (animal welfare), economic and environmental issues:
  - Animal Welfare: good bird health and reduced mortality
  - Environment: Utilization of resources (feed, land, water), manure generated
  - Economic: Impact to cost of food production

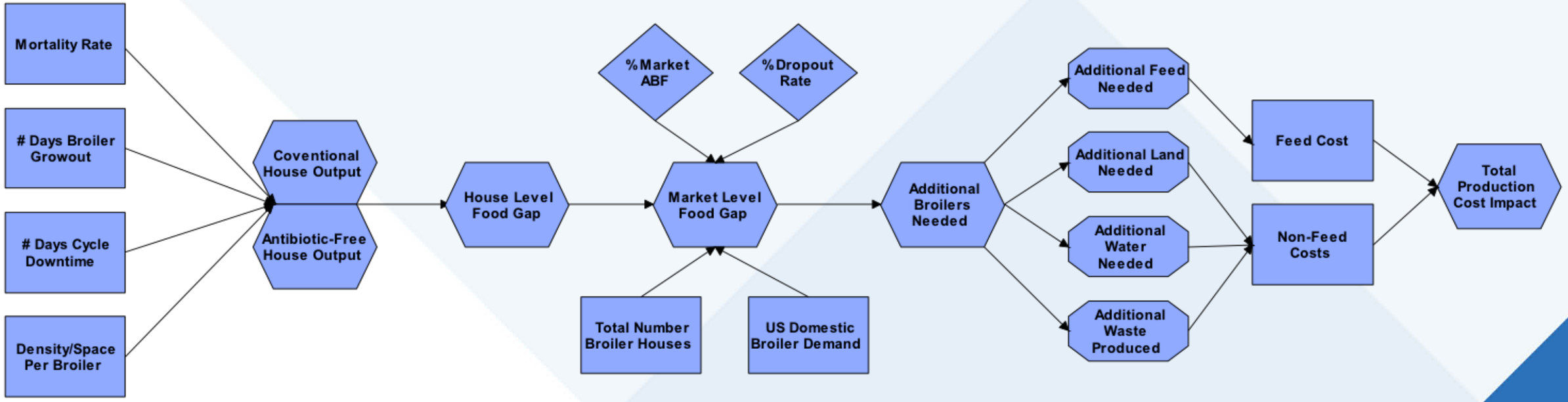


METHODOLOGY

Data on four key production parameters are used to estimate barn-level output between conventional and 100% antibiotic-free.

The estimated house-level food gap is then used to estimate a market-level food gap based on four macroeconomic inputs.

The number of additional broilers needed to close the gap is then estimated along with additional resources utilized and cost impact.



Additional Clarifications

- Certain aspects of production not considered by the model include:
  - Breed/Genetics, Diet/Feed, Geography, Hatchery differences, Management practices, etc.
- Medical treatment given to antibiotic-free birds must be accounted for in the model:
  - Actual industry data is not available but expert consensus places it between 10% – 20%
  - The model uses a diversion rate of 15% based on expert consensus.
- The economic impact is defined as the cost of adding more birds:
  - Costs estimates are tied to changes in performance (mortality, grow-out, density, downtime) and the increase in resources utilized.
  - Several factors are not accounted for, including:
    - Grower pay, ABF premiums, additional costs associated with the hatchery, feed, housing or other elements.
- Accounting for these factors would increase the estimated impact
  - Results are likely conservative.

DATA SOURCES

- Primary data requirements include conventional and ABF values on:
  - Mortality Rate
  - Days Grow-out
  - Flock Cycle Downtime
  - Placement Density
- Other supporting data includes:
  - Feed intake, average house size, per capita meat consumption, prime meat yield, feed composition, feed/non-feed costs, total number of broiler houses.
  - Sources: USDA, Cobb, Ross

- Two sources of primary data
  - Expert consensus (interviews with technical experts)
    - Benefit: Represents industry sentiment and may reflect the reality of specific producers.
    - Limitation: Not verifiable and may reflect individual situation bias.
  - Proprietary industry data (Agri Stats)
    - Benefit: Based on actual data representing 94% of all broilers produced in the U.S.
    - Limitation: Highly aggregated macro-level data reported at the complex-level.
- Data are either from 2012 or are recent 3-year averages.

PRIMARY DATA – AVERAGE OVER ALL BIRD SIZES

	Consensus Model[a]			
Parameter	ABF	Conv.	Diff (Δ)	% Diff
Average Bird Weight (lbs)	5.85		--	
Mortality (%)	5.80%	3.80%	+2.00%	52.63%
Grow-Out Time (Days)	49.00	47.00	+2.00	4.26%
Bird Density (Sqft/Bird)	0.94	0.84	+0.10	11.90%
Cycle Downtime (Days)	18.00	14.00	+4.00	28.57%

[a] Consensus Model is based on data from USDA, EMI, Ross/Aviagen, Cobb/Vantress, and Expert Consensus.

PRIMARY DATA – AVERAGE OVER ALL BIRD SIZES

	Consensus Model[a]				Industry Model[b]			
Parameter	ABF	Conv.	Diff (Δ)	% Diff	ABF	Conv.	Diff (Δ)	% Diff
Average Bird Weight (lbs)	5.85		--		6.49		--	
Mortality (%)	5.80%	3.80%	+2.00%	52.63%	4.25%	3.43%	+0.82%	23.81%
Grow-Out Time (Days)	49.00	47.00	+2.00	4.26%	46.89	45.59	+1.30	2.85%
Bird Density (Sqft/Bird)	0.94	0.84	+0.10	11.90%	0.96	0.92	+0.05	5.36%
Cycle Downtime (Days)	18.00	14.00	+4.00	28.57%	18.89	16.57	+2.32	21.32%

[a] Consensus Model is based on data from USDA, EMI, Ross/Aviagen, Cobb/Vantress, and Expert Consensus.
[b] Industry Model is based on data from USDA, EMI, Ross/Aviagen, Cobb/Vantress, and Agri Stats.

RESOURCE UTILIZATION: MARKET-LEVEL

The U.S. market-level impact per year when 100% antibiotic-free.

Gap Analysis ABF vs. Conventional	Consensus Model	
	Diff (Δ)	% Diff
Additional placed birds necessary annually to fill gap:	883,374,000	9.9%
Increase in bird deaths/losses per year:	229,535,000	67.8%
Number of birds diverted to conventional per year:	1,384,505,000	15.0%
Additional feed required including shrink (tons/yr):	7,261,000	14.2%
Additional land needed for growing feed (ac/yr):	3,324,000	14.2%
Additional water consumed (gal/yr):	3,012,438,000	14.9%
Additional manure produced (tons/yr):	6,174,000	14.2%
Additional production cost prime meat ($/yr):	$3,847,515,000	13.5%

RESOURCE UTILIZATION: MARKET-LEVEL

The U.S. market-level impact per year when 100% antibiotic-free.

Gap Analysis ABF vs. Conventional	Consensus Model		Industry Model	
	Diff (Δ)	% Diff	Diff (Δ)	% Diff
Additional placed birds necessary annually to fill gap:	883,374,000	9.9%	683,735,000	8.5%
Increase in bird deaths/losses per year:	229,535,000	67.8%	94,440,000	34.4%
Number of birds diverted to conventional per year:	1,384,505,000	15.0%	1,247,834,000	15.0%
Additional feed required including shrink (tons/yr):	7,261,000	14.2%	5,446,000	12.1%
Additional land needed for growing feed (ac/yr):	3,324,000	14.2%	2,493,000	12.1%
Additional water consumed (gal/yr):	3,012,438,000	14.9%	1,963,289,000	11.4%
Additional manure produced (tons/yr):	6,174,000	14.2%	4,631,000	12.1%
Additional production cost prime meat ($/yr):	$3,847,515,000	13.5%	$2,960,161,000	11.6%

RESOURCE UTILIZATION: HOUSE-LEVEL

The impact per broiler house per year when 100% antibiotic-free.

Gap Analysis ABF vs. Conventional	Consensus Model	Industry Model
Annual shortage in prime meat (lb/yr):	98,900	52,500
Annual shortage in prime meat (# 3 oz. servings/yr):	527,200	279,800
Decrease in the number of people fed (persons/yr):	1,200	650
Additional placed birds necessary annually to fill gap:	32,600	15,400
Increase in bird deaths/losses per year:	1,900	620
Additional feed required including shrink (lb/yr):	392,000	195,900
Additional land needed for growing feed (ac/yr):	90	45
Additional water consumed (gal/yr):	78,200	33,500
Additional manure produced (lbs/yr):	333,400	166,600
Additional production cost prime meat[a] ($/yr):	$108,700	$54,900

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[a] Prime meat is about 55% carcass weight (breast, wings, thighs, and legs).

EFFICIENCY ANALYSIS – BIRD BASIS

Changes to production efficiency when 100% antibiotic-free on a bird basis.

Efficiency Parameter – Bird Basis	Consensus Model			
	ABF	Conv.	Diff (Δ)	% Diff
Cycles/yr:	5.50	6.00	-0.54	-9.0%
Feed/meat (lb/lb):	2.03	1.91	0.12	6.3%
Birds marketed/ac:	341	367	-25.49	-7.0%
Water/market bird (gal):	2.6	2.4	0.19	8.2%
Manure/market bird (lb):	10.89	10.13	0.76	7.5%

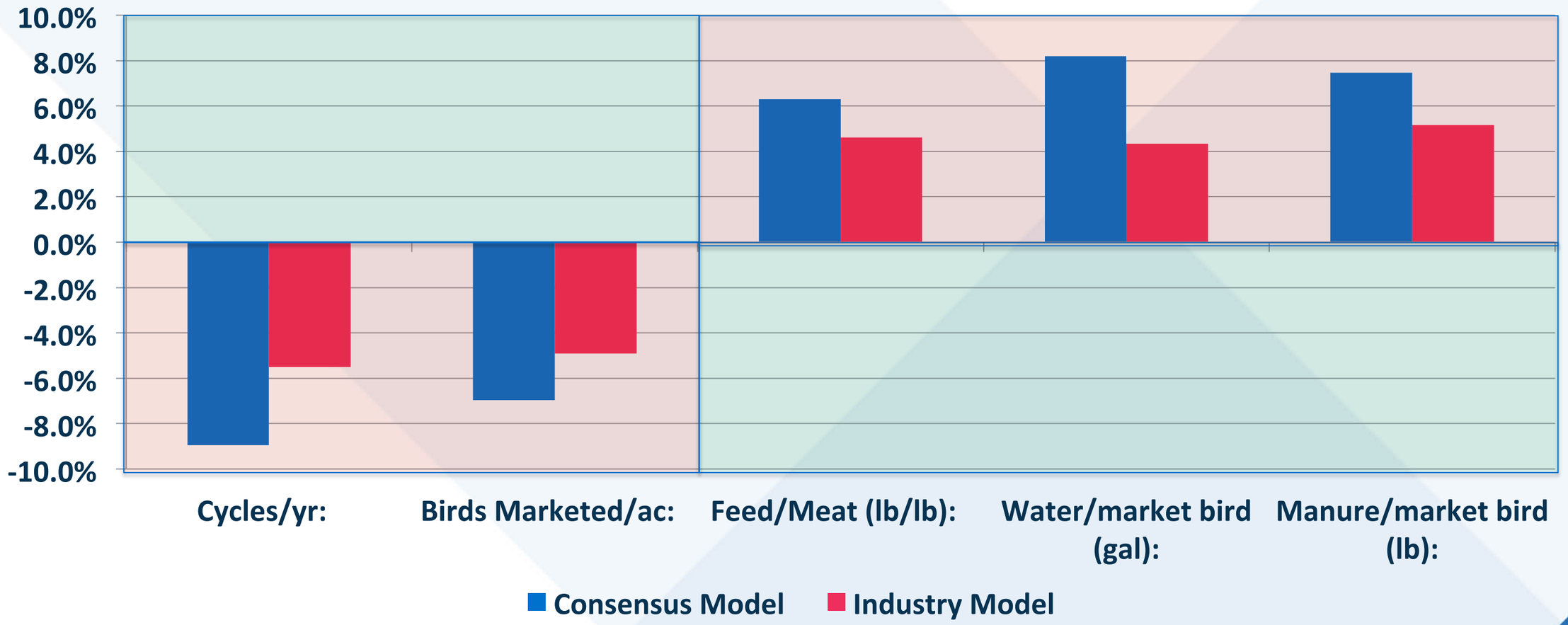
EFFICIENCY ANALYSIS – BIRD BASIS

Changes to production efficiency when 100% antibiotic-free on a bird basis.

Efficiency Parameter – Bird Basis	Consensus Model				Industry Model			
	ABF	Conv.	Diff (Δ)	% Diff	ABF	Conv.	Diff (Δ)	% Diff
Cycles/yr:	5.50	6.00	-0.54	-9.0%	5.56	5.89	-0.32	-5.5%
Feed/meat (lb/lb):	2.03	1.91	0.12	6.3%	1.92	1.84	0.08	4.6%
Birds marketed/ac:	341	367	-25.49	-7.0%	327	344	-16.84	-4.9%
Water/market bird (gal):	2.6	2.4	0.19	8.2%	2.3	2.2	0.10	4.3%
Manure/market bird (lb):	10.89	10.13	0.76	7.5%	11.36	10.80	0.56	5.2%

EFFICIENCY ANALYSIS – MODEL COMPARISON

% Difference in Production Efficiency Measures by Data Source (*ABF vs. Conventional – bird basis)*



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EFFICIENCY ANALYSIS – PRIME MEAT BASIS

Changes to production efficiency when 100% antibiotic-free on a meat basis.

Efficiency Parameter – Prime Meat Basis	Consensus Model			
	ABF	Conv.	Diff (Δ)	% Diff
Cycles/yr:	5.50	6.00	-0.54	-9.0%
Feed/meat (lb/lb):	3.98	3.71	0.28	7.5%
Prime meat (lb)/ac:	1,097	1,179	-82.01	-7.0%
Water/meat (gal/lb):	0.79	0.73	0.06	8.2%
Manure/prime meat (lb/lb):	3.39	3.15	0.24	7.5%

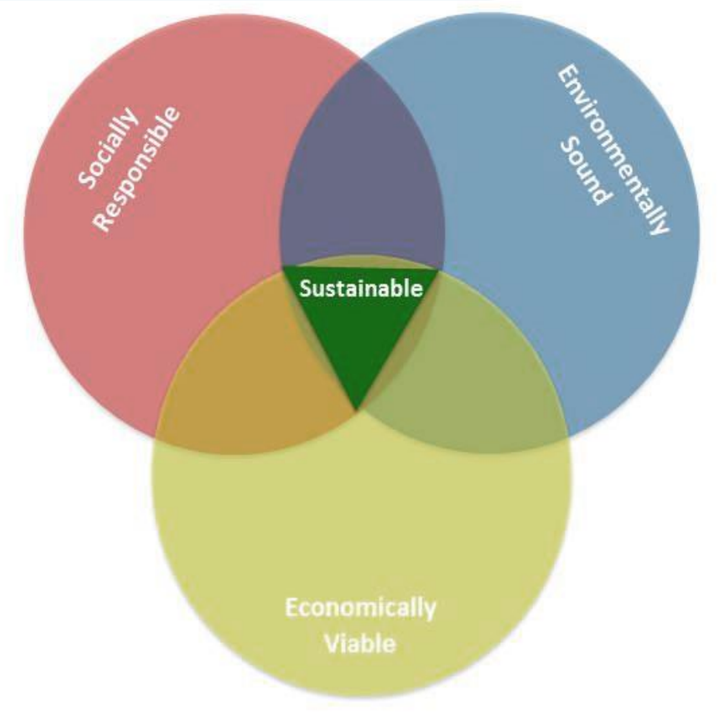
EFFICIENCY ANALYSIS – PRIME MEAT BASIS

Changes to production efficiency when 100% antibiotic-free on a meat basis.

Efficiency Parameter – Prime Meat Basis	Consensus Model				Industry Model			
	ABF	Conv.	Diff (Δ)	% Diff	ABF	Conv.	Diff (Δ)	% Diff
Cycles/yr:	5.50	6.00	-0.54	-9.0%	5.56	5.89	-0.32	-5.5%
Feed/meat (lb/lb):	3.98	3.71	0.28	7.5%	3.74	3.56	0.18	5.2%
Prime meat (lb)/ac:	1,097	1,179	-82.01	-7.0%	1,167	1,227	-60.11	-4.9%
Water/meat (gal/lb):	0.79	0.73	0.06	8.2%	0.64	0.61	0.03	4.3%
Manure/prime meat (lb/lb):	3.39	3.15	0.24	7.5%	3.18	3.03	0.16	5.2%

SUSTAINABILITY CONSEQUENCES

…higher mortality with the risk of poor bird welfare increasing by not effectively treating and preventing diseases, in both current & future populations.



…more birds and houses are required which means more resources such as more feed, more land, and more water consumed, and more waste or manure is produced

…there would be an overall reduction in the available meat supply requiring more birds to produce the same quantity of meat at a higher total cost.

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CONCLUSIONS & IMPLICATIONS

- Commercially raising broilers under a 100% antibiotic-free program is possible:
  - The restriction of antibiotics, however, reduces the overall efficiency of broiler production.
- To maintain the same supply of meat under ABF conditions requires adding more birds:
  - This results in additional costs and resources utilized, leading to more land, feed, and water consumed and more manure produced.
- Results are sensitive to the data and the performance parameters that influence economic costs and total output:
  - Mortality Rate
  - Cycle Downtime
  - Days Grow-out
  - Bird Density
- Policy implications suggest that a ban on antibiotic use would come with negative consequences.
  - Emphasis on consumer and producer choice and responsible antibiotic use.

REFERENCES

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