

Fact Sheet:

Tough Questions about Beef Sustainability

Project Title:	Do Growth Promotants Reduce Environmental Impact?
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Increasing the efficiency of beef production is one way to reduce environmental impact. Growth promotants (GP) play an important role in increasing the efficiency of beef production through increasing the conversion of the feed cattle eat into beef. While some types of growth promotants can be utilized earlier in an animal's life, they are primarily utilized during the finishing phase, which is approximately the last 120-140 days before the animal is harvested. Three commonly used types of GPs in beef production are: growth implants, ionophores, and β -adrenergic agonists (β AA). Beef production systems that use GP technologies are typically referred to as "conventional," whereas production systems that never use any of the three technologies are usually referred to as "natural" beef production systems.

Growth implants are small capsules that are placed in the backside of the animal's ear, which release a small amount of either natural or synthetic hormones over time. They work in conjunction with the animal's natural hormones to increase growth and typically consist of synthetic estrogen, testosterone, or progesterone.

Ionophores are feed additives used to alter rumen bacterial fermentation, allowing for improved feed efficiency and decreased methane (a greenhouse gas, or GHG) emissions. Ionophores can be utilized in any phase of the beef animal's life cycle (e.g., when they are raised on grass or in the feedlot during finishing), and can often be found in protein or energy supplements provided to beef cows to help them meet their nutrient requirements while grazing low-quality grasses.

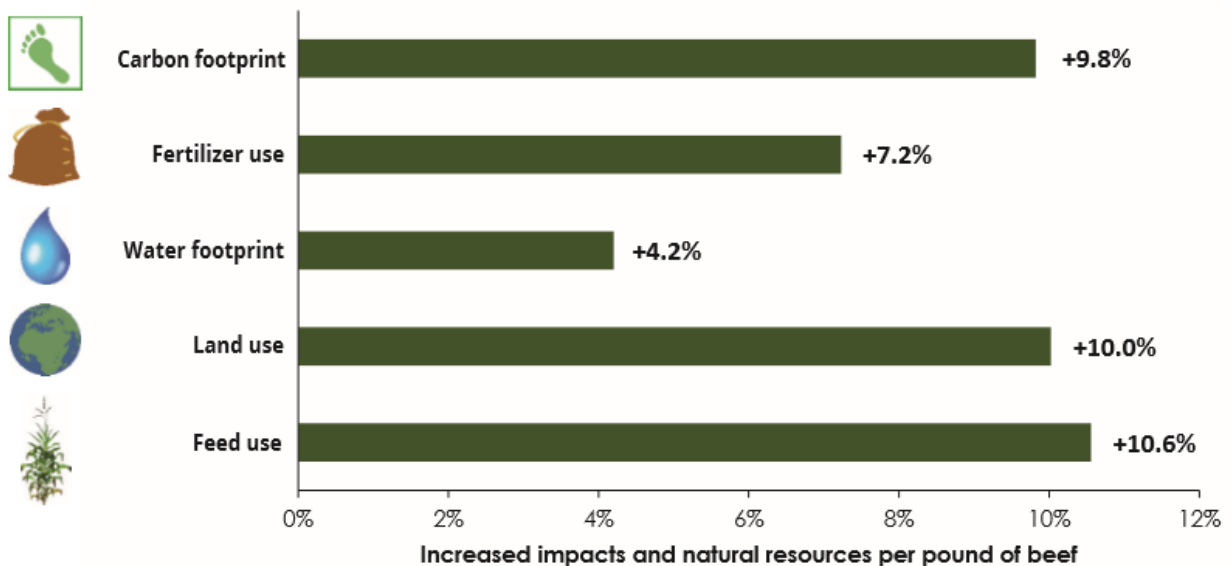


Figure 1. Increase in environmental impacts per unit of beef if no growth promoting technologies were used in U.S. beef production systems.

Finally, β AA are also a feed additive, but are restricted to the final 20-40 days of finishing. β -adrenergic agonists increase lean muscle mass while decreasing fat deposition, which means for every pound of body weight an animal gains when fed β AA, a higher proportion of the body weight gain will be protein than a similar animal not fed β AA¹. Each GP works individually to improve feed efficiency but combining the three GPs can dramatically improve production efficiency, especially during the finishing phase, and can decrease GHG emissions per pound of body weight gain by 28% when compared to beef production systems not using GPs².

While ionophores can directly reduce methane emissions produced by individual beef cattle, in general, GPs reduce both GHG emissions produced and natural resources required per unit of beef (Figure 1) by decreasing the length of time required for an individual animal to reach harvest and the number of animals required to produce a given amount of beef.^{2,3} For example, research has shown that in beef production systems using GP technologies, each animal will produce enough beef to feed approximately 1.66 more U.S. citizens as compared to animals in beef production systems that do not use those technologies (Figure 2).⁴ Research utilizing both live animals^{1,2,4} and computer models^{3,5} has consistently shown a decrease in the environmental impact of beef production with the use of GP technologies. Some consumers prefer to purchase beef not produced in systems that use GP technologies (i.e., “natural” beef), which is a recognized food choice; however, there are negative environmental sustainability consequences for not using GP technologies in U.S. beef production.

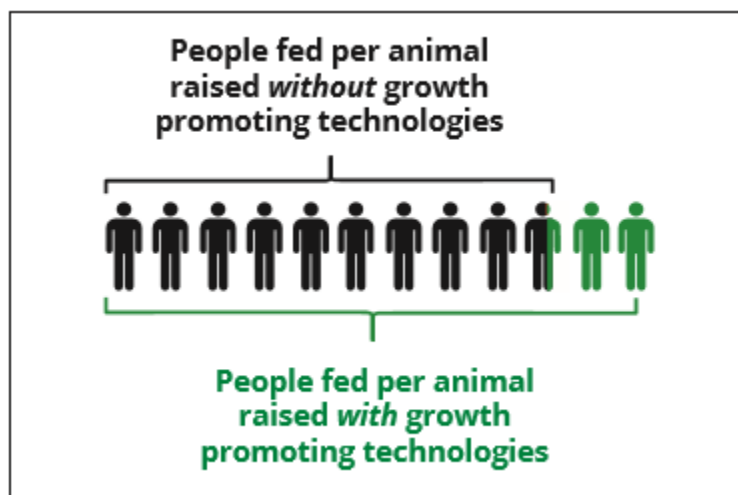


Figure 2. People fed per beef animal for one year per animal for beef production systems that use no growth promoting technology (black) as compared to beef systems that use growth promoting technology (black plus green).

Bottom line: Growth promoting technologies can reduce the environmental impact of beef production by decreasing the number of cattle required to produce a given amount of beef. Additionally, growth promoting technologies allow farmers and ranchers to feed more U.S. citizens with each beef animal that is raised under their care.

Literature Cited

1. Stackhouse-Lawson, K.R., M.S. Calvo, S.E. Place, T.L. Armitage, Y. Pan, Y. Zhao, and F.M. Mitloehner. 2013. Growth promoting technologies reduce greenhouse gas, alcohol, and ammonia emissions from feedlot cattle. *J. Anim. Sci.* 91:5438-5447.

2. Coopridge, K.L., F.M. Mitloehner, T.R. Famula, E. Kebreab, Y. Zhao, and A.L. Van Eenennaam. 2011. Feedlot efficiency implications on greenhouse gas emissions and sustainability. *J. Anim. Sci.* 89:2643-2656.
3. Capper, J.L. and D.J. Hayes. 2012. The environmental and economic impact of removing growth-enhancing technologies from U.S. beef production. *J. Anim. Sci.* 90:3527-3537.
4. Maxwell, C.L., C.R. Krehbiel, B.K. Wilson, B.T. Johnson, B.C. Bernhard, C.F. O'Neill, D.L. VanOverbeke, G.G. Mafi, D.L. Step, and C.J. Richards. Effects of beef production system on animal performance and carcass characteristics. 2014. *J. Anim. Sci.* 92:5727-5738.
5. Battagliese, T., J. Andrade, I. Schulze, B. Uhlman, C. Barcan. 2013. More sustainable beef optimization project: Phase 1 final report. BASF Corporation. Florham Park, NJ.