Is the Grass Always Greener? Comparing the Environmental Impact of Conventional, Natural and Grass-Fed Beef Production Systems

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Abstract

This study compared the environmental impact of conventional, natural and grass-fed beef production systems. A deterministic model based on the metabolism and nutrient requirements of the beef population was used to quantify resource inputs and waste outputs per $1.0 \times 10^9$ kg of hot carcass weight beef in conventional (CON), natural (NAT) and grass-fed (GFD) production systems. Production systems were modeled using characteristic management practices, population dynamics and production data from U.S. beef production systems. Increased productivity (slaughter weight and growth rate) in the CON system reduced the cattle population size required to produce $1.0 \times 10^9$ kg of beef compared to the NAT or GFD system. The CON system required 56.3% of the animals, 24.8% of the water, 55.3% of the land and 71.4% of the fossil fuel energy required to produce $1.0 \times 10^9$ kg of beef compared to the GFD system. The carbon footprint per $1.0 \times 10^9$ kg of beef was lowest in the CON system ($15,989 \times 10^3$ t), intermediate in the NAT system ($18,772 \times 10^3$ t) and highest in the GFD system ($26,785 \times 10^3$ t). The challenge to the U.S. beef industry is to communicate differences in system environmental impacts to facilitate informed dietary choice.

Animals 2012, 2, 127-143; doi:10.3390/ani2020127

The study reported here in this Research Brief was not funded by the beef checkoff, but is made available to expand the usefulness of this checkoff-funded website for those interested in beef sustainability.