



RESEARCH BRIEF SUSTAINABILITY

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The environmental impact of beef production in the United States: 1977 compared with 2007

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Abstract

Consumers often perceive that the modern beef production system has an environmental impact far greater than that of historical systems, with improved efficiency being achieved at the expense of greenhouse gas emissions. The objective of this study was to compare the environmental impact of modern (2007) US beef production with production practices characteristic of the US beef system in 1977. A deterministic model based on the metabolism and nutrient requirements of the beef population was used to quantify resource inputs and waste outputs per billion kilograms of beef. Both the modern and historical production systems were modeled using characteristic management practices, population dynamics, and production data from US beef systems. Modern beef production requires considerably fewer resources than the equivalent system in 1977, with 69.9% of animals, 81.4% of feedstuffs, 87.9% of the water, and only 67.0% of the land required to produce 1 billion kg of beef. Waste outputs were similarly reduced, with modern beef systems producing 81.9% of the manure, 82.3% CH₄, and 88.0% N₂O per billion kilograms of beef compared with production systems in 1977. The C footprint per billion kilograms of beef produced in 2007 was reduced by 16.3% compared with equivalent beef production in 1977. As the US population increases, it is crucial to continue the improvements in efficiency demonstrated over the past 30 yrs. to supply the market demand for safe, affordable beef while reducing resource use and mitigating environmental impact.

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