



# Comparing the Environmental Impact of the U.S. Beef Industry in 1977 to 2007



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## OBJECTIVES

To quantify the effect of improved productivity upon the environmental impact of U.S. beef production in 1977 compared to 2007

## INTRODUCTION

- The global population is predicted to increase from 6.8 to 9.1 billion people by the year 2050
- Livestock producers face the challenge of producing sufficient animal protein to fulfill nutritional needs whilst improving environmental sustainability
- Improving productivity reduces resource use and environmental impact per unit of animal protein
- The 2007 U.S. beef industry produced 11.9 billion kg beef from 33.7 million head slaughtered – a 28% increase in beef yield per animal compared to 1977
- Modern agricultural practices are often demonized, with the popular perception that beef production was more environmentally friendly in the “good old days”

## MATERIALS & METHODS

- A deterministic model based on life cycle assessment principles and founded on the nutrition and metabolism of beef cattle was used to quantify the environmental impact of U.S. beef production systems in 1977 and 2007
- System boundaries extended from cropping input manufacture to animal arrival at the slaughterhouse door
- The functional unit was one billion kg hot carcass weight
- Total beef animal numbers (live and slaughtered) and inputs from the dairy industry (calves, cull animals) were according to USDA data for 1977 and 2007
- The model included all animals (cows, calves, bulls, replacement heifers and bulls, stockers, finishers, cull cows/bulls) within each production system
- All systems employed a pasture-based cow-calf operation, a forage-based stocker operation (where appropriate) and a feedlot finishing system with management practices characteristic of the specific time period
- Animal nutrient requirements and growth rates were calculated and diets for each animal group formulated using commercial nutrition software (AMTS, 2006)
- Feedlot-finished animals were fed a diet containing flaked corn, soybean meal, alfalfa hay and a vitamin/mineral supplement fed ad-libitum
- Resource input data was sourced from time-point appropriate peer-reviewed scientific publications and government data

## REFERENCES

Agricultural Model & Training Systems Ltd (2006) *Cattle Pro* Software. Cornell Research Foundation, Ithaca, NY.  
 USDA (1976) *Livestock Slaughter Summary 1975*. USDA, Washington, DC.  
 USDA/NAASS (2008) *Livestock Slaughter 2007 Summary*. USDA, Washington, DC.

## ACKNOWLEDGEMENTS

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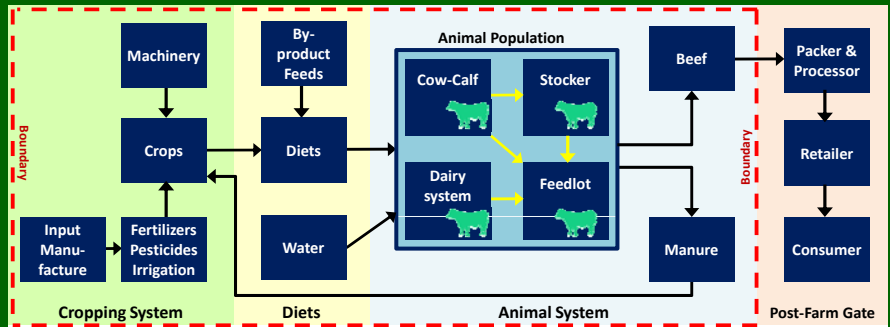


Figure 1. Summary of Model System

## RESULTS

Table 1. Time-Point Specific Performance Data Inputs to the Model

	1977	2007
Beef produced (billion kg)	10.6	11.9
Breeds	Angus (A), Hereford (H), A x H	
Calf birth weight (kg)	33	42
Average slaughter weight (kg)	468	607
Average age at slaughter (d)	608	485
Overall growth rate (kg/d)	0.72	1.16
Average days on feed (d)	164	183
Yearling-fed animals in feedlot (%)	100	72.0
Calf-fed beef breed animals in feedlot (%)	-	15.0
Calf-fed dairy breed animals in feedlot (%)	-	12.9

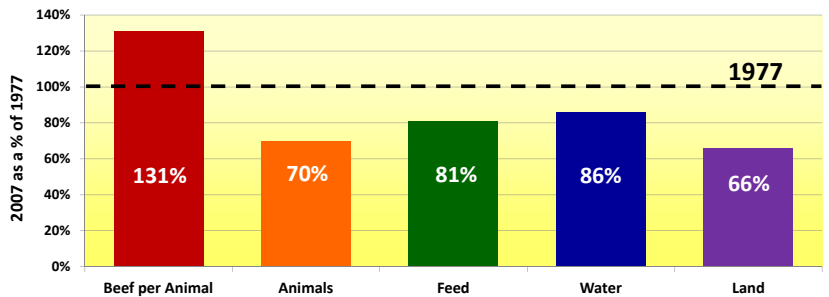


Figure 2. Comparison of Resource Use per kg Beef in 2007 vs. 1977

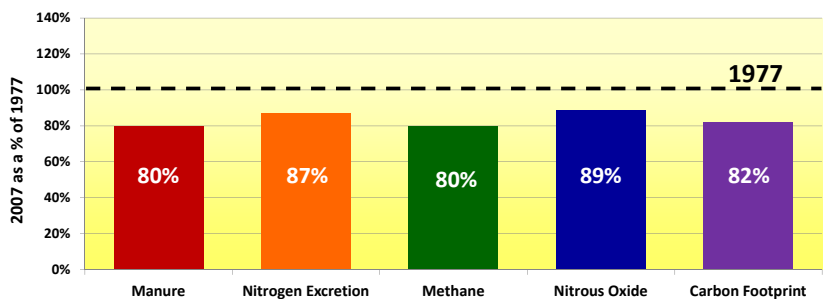


Figure 3. Comparison of Environmental Impact per kg Beef in 2007 vs. 1977

## CONCLUSIONS

- Productivity (growth rate) is a key factor in reducing the environmental impact of beef production
- Improved genetics, nutrition, and management have considerably reduced the environmental impact of modern U.S. beef production
- Environmental impact must be assessed using sound science rather than ideological principles