



BEEF FACTS: SUSTAINABILITY

BEEF RESEARCH

Fact Sheet 2 in the Series: Tough Questions about Beef Sustainability

Does Beef Really Use That Much Water?

Ashley Broocks, Justin Buchanan, Sara Place, Megan Rolf, and Michelle Calvo-Lorenzo
Oklahoma State University

When looking for an answer to the question, “How much water is required to produce beef?” one may find a variety of answers. Water use estimates, or water footprints (defined as the amount of water used per unit of product), are available in the scientific literature and indicate that water footprints range from 317¹ up to 23,965² gallons per pound of boneless beef.

Why is the range so large? The range in estimates is mostly due to the methodology used by researchers. For example, some have counted all precipitation that falls on croplands, pastures, and rangelands towards the total water use of beef. Others have left out precipitation as it would fall on the land regardless of whether it was used for beef production or not. However, irrigation water use is always considered towards the total water use of beef.

Regardless of methodology, the production of feed for cattle is the single largest source of water consumption in the beef value chain (~95% of the water used to produce a pound of beef). The relative importance of this water use is highly dependent on location, because unlike greenhouse gas emissions, water use and access is a highly regionalized environmental issue. For example, in the southern High Plains approximately 30% of cropland is irrigated with water from the Ogallala aquifer.³ In some, but not all cases, water is being drawn from the aquifer at a faster rate than it is being recharged.³ Clearly, the use of a unit of water in such an area would be viewed and valued differently than a unit of water used in an area that primarily relies on precipitation water for agricultural production. As a result, one must be cautious about generalizing water footprints for beef or any other product on a national scale.

However, there are examples of innovative systems that integrate beef and crop production in the southern High Plains to more efficiently use water. In a four-year experiment, researchers compared a wheat-cotton crop rotation with one that integrated beef cattle, rye, wheat, and old world bluestem (a perennial warm season grass) in the High Plains of Texas. They found that the integrated beef cattle and crop system used 23% less irrigation water than the system with crops only.⁴ The increase in irrigation water use efficiency was mostly due to the incorporation of perennial warm season grass into the farming system.⁴ Perennial grasses would not be as valuable to sustainable farming systems without cattle that have the ability to digest such grasses because humans cannot directly consume and digest grass. While this is one example, it demonstrates that beef cattle can play a key role in water conservation.

Though the U.S. beef industry reduced its water use by 3% from 2005 to 2011,⁵ many opportunities exist to further improve water use across the beef value chain (**Figure 1**). One area that is often overlooked and is important to all aspects of sustainability, not just water use, is reducing food waste. Food waste has an impact on the amount of water required to produce food for the nourishment of people. If prepared beef is thrown away and not consumed, all of the water use from feed production, cow-calf and stocker operations, feedlots, packing plants, retailers, foodservice, and the consumer has been used but has not contributed to human nourishment. Reducing food waste can help reduce the water footprint of beef and all other foods.

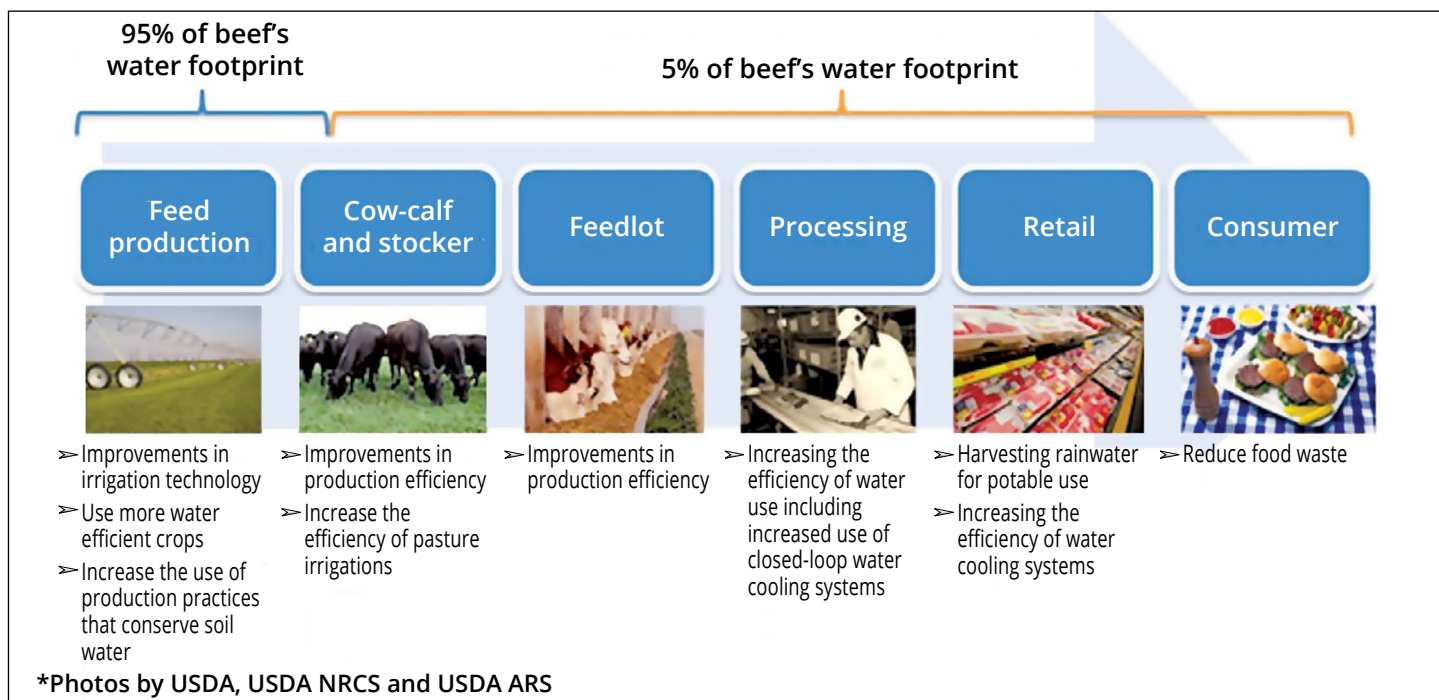


Figure 1. Examples of opportunities to reduce the water footprint of beef throughout the beef value chain.*

Bottom line: The estimated water required for beef production greatly depends on the methodology used in scientific calculations, especially when considering whether or not precipitation water is included in water footprints. U.S. specific estimates put beef water use at 317¹, 441⁶ and 808⁷ gallons per pound of boneless beef when precipitation water is not accounted for in calculations.

Additionally, the water footprint of beef greatly depends on the amount of feed consumed by cattle because of the reliance on irrigation to produce crops (~95% of beef's water footprint). As with all food production, reducing food waste and efficiently utilizing irrigation water, particularly in water-stressed regions, is an important aspect of beef sustainability and water use.

¹ Capper, J.L. 2011. The environmental impact of beef production in the United States: 1977 compared with 2007. *J. Anim. Sci.* 89:4249-4261.

² Pimentel, D. J. Houser, E. Preiss, O. White, H. Fang, L. Mesnick, T. Barsky, S. Tariche, J. Schreck, and S. Alpert. 1997. Water resources: Agriculture, the environment, and society. *BioSci.* 47: 97-106.3

³ Scanlon, B.R., C. C. Faunt, L. Longuevergne, R. C. Reedy, W. M. Alley, V.L. McGuire, and P.B. McMahon. 2012. Groundwater depletion and sustainability of irrigation in the US High Plains and Central Valley. *Proc. Natl. Aca. Sci.* 109: 9320-9325.

⁴ Allen, V. G., C. P. Brown, R. Kellison, E. Segarra, T. Wheeler, P. A. Dotray, J. C. Conkwright, C. J. Green, and V. Acosta-Martinez. 2005. Integrating cotton and beef production to reduce water withdrawal from the Ogallala aquifer in the Southern High Plains. *J. Agron.* 97: 556-567.

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.

⁶ Beckett, J.L. and J.W. Oltjen. 1993. Estimation of the water requirement for beef production in the United States. *J. Anim. Sci.* 71:818-826.

⁷ Rotz, C.A., B.J. Isenberg, K.R. Stackhouse-Lawson, and E.J. Pollak. 2013. A simulation-based approach for evaluating and comparing the environmental footprints of beef production systems. *J. Anim. Sci.* 91(11):5427-5437.

For more information, contact:

National Cattlemen's Beef Association
 Contractor to the Beef Checkoff Program
 9110 East Nichols Avenue
 Centennial, CO 80112
 303.694.0305

Copyright © 2015 Cattlemen's Beef Board and National Cattlemen's Beef Association.
 All rights reserved.