



# BEEF FACTS: SUSTAINABILITY

# BEEF RESEARCH

*Fact Sheet 7 in the Series: Tough Questions about Beef Sustainability*

## If we fed corn to humans instead of cattle, would land use be more sustainable?

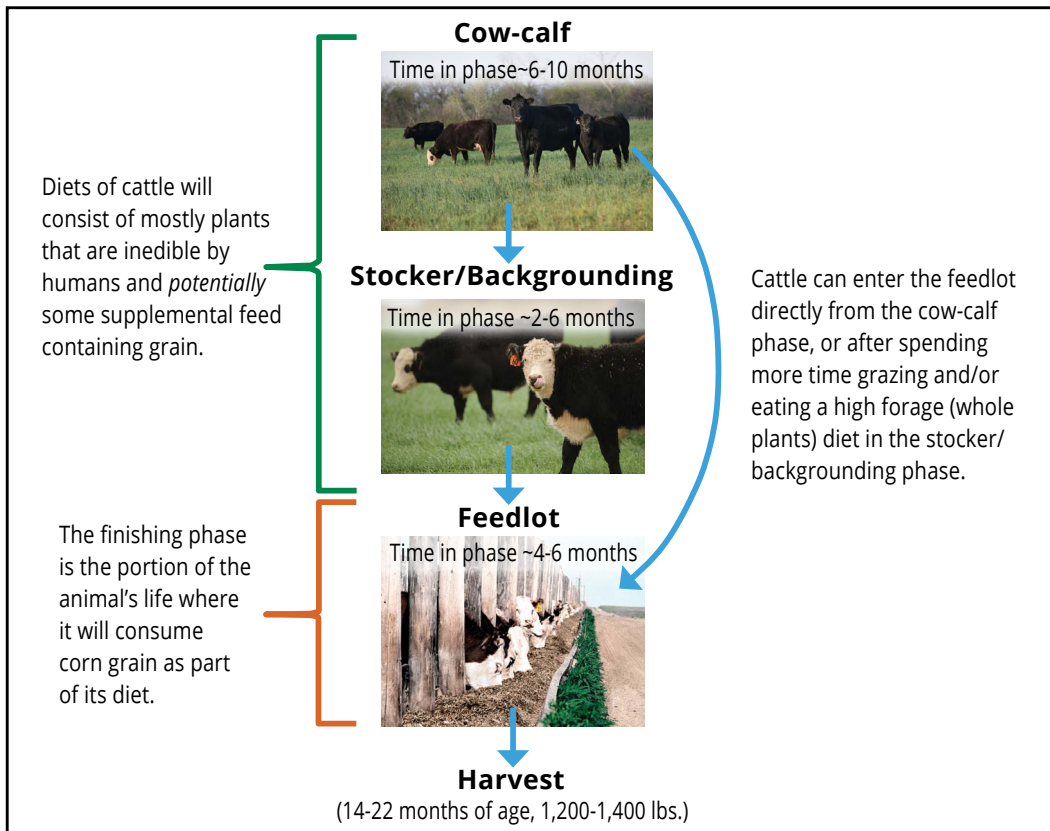
**Ashley Broocks, Megan Rolf and Sara Place**  
*Oklahoma State University*

Corn grain is used in beef cattle production because of its advantages in improving the efficiency of growth.<sup>1</sup> However, corn grain typically does not make up a large portion of cattle diets until the end of their life cycle in a period called “finishing” when cattle are often housed in a feedlot (**Figure 1**). The majority of a beef animal’s life in the U.S., regardless of whether they are grain- or grass-finished, will be spent on grass consuming forages (whole plants). Depending on the region of the country and the

prices and availability of different feeds, corn grain may make up 50-85% of a grain-finished animal’s diet during the finishing phase. The other 15-50% of the animal’s diet will be made up of forages or roughages (e.g., hay), by-products (e.g., distiller’s grains), and minerals and vitamins. In addition to improving growth efficiency, corn grain is fed to cattle in the finishing phase because it increases carcass quality grades by increasing fat deposition (especially intramuscular or “taste” fat), which results in a more desirable product

for consumers. Cattle on grass, including grass-finished beef, can also require supplementation of energy or protein-dense feeds that may contain corn grain in order to meet their nutrient requirements when the nutritional quality of the grass is low.

While the diet provided to finishing cattle in feedlots relies on some human-edible inputs (i.e., corn grain), the forages and by-products fed to cattle throughout their lives are largely inedible to humans.<sup>2</sup> For example, once the entire lifetime feed intake of cattle is accounted for (meaning all the feed they consume from birth to harvest), corn only



**Figure 1.** Typical life cycle of beef cattle in the United States.

accounts for approximately 7% of the animal's diet.<sup>3</sup> The other 93% of the animal's lifetime diet will consist largely of feed that is inedible to humans, and thus not in direct competition with the human food supply. Unlike humans, cattle can efficiently digest fiber and convert human-inedible feeds into nutritious, human-edible foods.

One of the major human-inedible by-products fed to beef cattle is distiller's grains, which is a by-product of alcohol production from corn (either for fuel or human consumption). The amount of distiller's grains fed to beef cattle has increased in recent years as the production of fuel from corn has increased. As **Table 1** demonstrates, the proportion of corn used for fuel production in the United States relative to animal feed has dramatically increased in recent years. In contrast, the percentage of corn used for human food has been relatively unchanged.

**Table 1.** Domestic uses of U.S. corn grain as a percentage of total domestic use in recent decades.

Year	Human food, seed, and industrial uses	Alcohol for fuel use (Ethanol)	Animal feed* and residual use
1980	12.8%	0.7%	86.5%
1990	18%	6%	76%
2000	17%	8%	75%
2010	13%	45%	43%
2015	12%	44%	45%

\*Animal feed includes all types of domestic animals in the U.S., not just beef cattle (e.g., dairy cattle, swine, chickens, turkeys, horses, etc. ). Data from USDA-ERS, 2015.<sup>4</sup>

Using recent data as a guide, one can predict that land used to grow corn for animal feed would likely be shifted to grow corn for fuel use if less corn grain were fed to beef cattle, and would not shift towards human

consumption. Altering the lifetime consumption of corn grain by cattle, which is only approximately 7% of an average animal's total lifetime feed intake,<sup>3</sup> would likely have a very minor impact on the sustainability of land use.

Corn production, like all crop production, does have an environmental sustainability impact. Thus, reducing corn's environmental impact through better production practices and using new technologies would improve land use sustainability regardless of the corn's end use (human food, animal feed, or fuel). Such improvements include no-till or conservation tillage practices to reduce soil erosion and increase soil organic carbon,<sup>4</sup> winter cover crops to reduce nutrient run-off,<sup>5</sup> and precision agriculture techniques to apply fertilizer at variable rates across a field to minimize nutrient emissions to the environment while improving corn yields. Indeed, past improvements in crop yields, including corn, have contributed to reducing environmental impacts per unit of beef 12% from 1970 to 2011.<sup>7</sup>

**Bottom Line: Regardless of the type of beef production system, the majority of beef cattle's nutrient requirements over a lifetime are met with human inedible feeds. Only 7% of beef cattle's lifetime feed intake is corn grain. Improvements in corn production efficiency (minimizing environmental impacts relative to corn yield) will help improve land use sustainability regardless if corn is used for human consumption, beef cattle consumption, or fuel use.**

## Literature Cited

- <sup>1</sup>Bradford, G.E. 1999. Contributions of animal agriculture to meeting global human food demand. *Livest. Production Sci.* 59:95-112.
- <sup>2</sup>Council for Agricultural Science and Technology (CAST). 1999. Animal agriculture and global food supply. Task Force Report. No. 135.
- <sup>3</sup>Capper, J.L., L. Berger, M.M. Brashears, and H.H. Jensen. 2013. Animal feed versus human food: Challenges and opportunities in sustainable animal agriculture toward 2050. *CAST.* 53:1-16.
- <sup>4</sup>USDA-ERS. 2015. Corn – Background. Accessed December 10, 2015 from <http://www.ers.usda.gov/topics/crops/corn/background.aspx>.
- <sup>5</sup>Kumar, S., A. Kadono, R. Lal and W. Dick. 2012. Long-term no-till impacts on organic carbon and properties of two contrasting soils and corn yields in Ohio. *Soil Sci. Soc. Am. J.* 76(5):1798-1809.
- <sup>6</sup>Dabney, S.M., J.A. Delgado, and D.W. Reeves. 2001. Using winter cover crops to improve soil and water quality. *Commun. Soil Sci. Plan.*32(7-8):1221-1250.
- <sup>7</sup>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.

*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© 2016 Cattlemen's Beef Board and National Cattlemen's Beef Association.  
All rights reserved.



BeefResearch.org



303.694.0305



Funded by the Beef Checkoff.