



BEEF FACTS: SUSTAINABILITY

BEEF RESEARCH

The Economic Value of U.S. Beef Cattle Ranching— and Farming-Based Ecosystem Services

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Introduction

The 2012 Census of Agriculture estimated that there are nearly 620,000 agricultural operations classified as beef cattle ranches and farms in the U.S. (USDA 2014). These ranching operations use 337 million acres of land to produce \$33.9 billion in gross revenue from the production associated with 20.4 million head of beef cows. Of the 337 million acres, 257 million are classified as permanent pasture and rangeland. The total investment in buildings, land, machinery and equipment for cattle ranches in the U.S. is estimated to be \$523.4 billion (USDA 2014).

The economic value of beef cattle production is just one component of the suite of values derived from beef cattle ranching and farming. Beef cattle ranching also provides a flow of ecosystem services that may not be available from alternative land uses. Additional economic values associated with beef cattle ranching and farming include ecosystem goods and services such as recreation opportunities, wildlife habitat, and preservation of open space (Maczko and Hidinger 2008). Past valuation of ecosystem services in rangeland systems estimated total values to be about twice that of economic output (Costanza et al. 2014); however, ecosystem services either are irreplaceable or difficult to replace with human-made services (Awise 2002, Salles 2011).

The work presented here is intended to document the value of select ecosystem services associated with the conservation of land use for beef cattle production. It also provides quantitative information for use in public policy and planning, such as assessments of potential land use change. A summary of the economic value of beef cattle ranching- and farming-based ecosystem services for each U.S. state, and an estimate of the total values for the U.S. are presented below. However, it is important to note that all figures are conservative, representing just three of the myriad of ecosystem services provided in association with beef production. This checkoff-funded project was commissioned by the National Cattlemen's Beef Association, a contractor to the Beef Checkoff, and is a nationwide analysis of ecosystem services from beef cattle ranching.

Methodology

Ecosystem services are typically grouped into four broad categories: 1) provisioning, such as production of food and water; 2) regulating, such as control of climate and disease; 3) supporting, such as nutrient cycles and crop pollination; and 4) cultural, such as spiritual and recreation benefits (MEA 2005). Pogue et al. (2018) found that beef cattle ranching in Canada's prairie provinces had a positive influence on eight ecosystem services including biodiversity, habitat maintenance, cultural heritage, food production, non-food production, air quality regulations, soil quality regulation, and recreation and tourism. Because many of these ecosystem service attributes are not traded in a formal market, it is difficult to comprehensively quantify the economic values of all of these attributes. However, building on work by Rashford et al. (2013), it is possible to estimate the economic value of several major aspects of beef cattle ranching- and farming-related ecosystem services using readily available federal government payment data.

Specifically, this report provides estimates of the annual ecosystem-service values of forage production, general ecosystem services such as open space, and wildlife-related recreation from pasture and rangeland used for beef cattle production in the U.S. This study assumes that the ecosystem services considered are constant across space. Costanza et al. (2014) also used this approach and argued the appropriateness of this method for assessing land use change scenarios over large areas. Forage production values are based on National Agricultural Statistic Service (NASS) pasture rental rate data (NASS, 2017). General ecosystem services values are based on the United States Department of Agriculture's (USDA) Farm Service Agency Conservation Reserve Program (CRP) – Grasslands annual rental payments to program participants for maintaining ecosystem functions on grasslands (FSA, 2018). Wildlife-recreation values are based on U.S. Fish and Wildlife Service (USFWS) estimates of hunting days, fresh water fishing days (excluding Great Lakes fishing), and wildlife watching days for individual states (USFWS, 2014). These recreation-use estimates were combined with USFWS

estimates of net economic values for wildlife-related recreation (USFWS, 2016) to estimate the ecosystem values of wildlife recreation on a per-acre basis. The estimates of net economic values represent statewide average value to participants from wildlife-related recreation. The combined per-acre value estimates were translated into ecosystem service estimates for beef cattle ranching and farming based on the acres of pasture and rangeland used in beef cattle production. All dollar amounts are expressed in 2016 dollars. cattle ranches and farms. While this represents 70 percent of the beef cows in the nation, another 30 percent of beef cows are found on a variety of other types of agricultural operations. Unfortunately, data limitations precluded the valuation of the ecosystem services from the beef production on these non-cattle ranching operations.

U.S. and Individual State Reports

Along with the above overview, this document introduces individual reports on the value of ecosystem services for the U.S. and each individual state (excluding Alaska and Hawaii). Results are presented in terms of the total value of ecosystem services, as well as values per beef cow and per pound of retail beef. These results represent a conservative estimate of the value of ecosystem services since data limitations precluded valuation of all ecosystem services associated with beef cattle production.

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Forage Production (Per Acre)	\$12.43	(NASS Pastureland Rental Rate)
Ecosystem Services (Per Acre)	\$7.14	(CRP - Grassland Reserve Rental Rate)
Wildlife		
Hunting Days	281,884,000	(USFWS)
Economic Value Per Day	\$94.93	(USFWS)
Hunting Economic Value	\$26,759,214,671	
Fresh Water Fishing Days	443,223,000	(USFWS)
Economic Value Per Day	\$52.50	(USFWS)
Fishing Economic Value	\$23,268,809,061	
Wildlife Watching Days	335,625,000	(USFWS)
Economic Value Per Day	\$38.83	(USFWS)
Watching Economic Value	\$13,033,980,583	
Total Wildlife Value	\$63,062,004,315	
Habitat Acres	1,654,690,539	(EPS - NonMetro & NonUrban)
Wildlife Value Per Acre	\$38.11	
Total Value Per Acre	\$57.67	
Beef Cattle Ranching (NAICS 1121110)		
Pasture & Rangeland (Acres)	256,861,597	(2012 Census of Ag)
Total Value Per Acre	\$57.67	
Cattle Ranching Economic Value	\$14,813,875,051	
Cattle Ranching Economic Value	\$14,813,875,051	
Beef Cows	20,404,406	(2012 Census of Ag)
Economic Value Per Beef Cow	\$726.01	
LBS of Beef Production Per Cow	840	(LMIC)
Economic Value Per LBS of Beef	\$0.86	