The Economic Value of Minnesota Beef Cattle Ranching-Based Ecosystem Services

David T. Taylor, Nicolas Efrain Quintana Ashwell, Kristie Maczko, and John Tanaka
University of Wyoming, College of Agriculture

Introduction

The 2012 Census of Agriculture classified 8,083 agricultural operations in Minnesota as beef cattle ranches (USDA, 2014). These ranches managed 1.4 million acres of land, excluding grazing lands used under government permits if leased on a per Animal Unit Month basis. This land represented about one out of every 28 acres of non-metro, non-urban land in the state and supported more than 142,400 head of beef cows in 2012. The production from these ranches generated $604.9 million of gross revenue. The value of land, buildings, machinery, and equipment associated with beef cattle ranches in Minnesota was estimated to be $4.7 billion. Minnesota beef cattle ranches also employed more than 24,000 workers including operators, hired labor, and unpaid labor in 2012.

However, the economic value of beef cattle production is just one component of the suite of values derived from beef cattle ranching. Beef cattle ranching provides a flow of ecosystem services that may not be available from alternative land uses. Additional economic values associated with beef cattle ranching include ecosystem goods and services such as recreation opportunities, wildlife habitat, and preservation of open space (Maczko and Hidinger 2008). The purpose of this report is to summarize, to the extent possible, the economic value of Minnesota beef cattle ranching-based ecosystem services. This checkoff-funded project was commissioned by the National Cattlemen's Beef Association, a contractor to the Beef Checkoff, and is part of 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 the work by Rashford et al. (2013), it is possible to estimate the economic value of several major aspects of beef cattle ranching-based ecosystem services using readily available 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 Minnesota. 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 from above were translated into ecosystem service estimates for beef cattle ranching based on the acres of pasture and rangeland used in beef cattle production. All dollar amounts are expressed in 2016 dollars. 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.

The following results represent a conservative estimate of the value of ecosystem services from beef production in Minnesota since the USDA Ag Census only considers beef

production on agricultural operations classified as beef cattle ranches. While this represents 40 percent of the beef cows in Minnesota, another 60 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 ranch operations.

Results

Table 1 summarizes the value of Minnesota beef cattle ranching-based ecosystem services. The per-acre economic values of ecosystem services in terms of forage production, general ecosystem services, and wildlife recreation from pasture and rangeland in Minnesota are estimated to be $29.82, $16.46, and $66.59 per acre, respectively. Combining these three values yields an estimated total economic value of ecosystem services for beef cattle ranching of $112.88 per acre of pasture and rangeland. Applying this per-acre value to the 361,306 acres of pasture and rangeland used by beef cattle ranches in Minnesota for beef production results in an estimated $40.8 million in total ecosystem services provided annually. This represents an ecosystem services value of $286.36 per beef cow or $0.34 of ecosystem services per pound of retail beef. In summary, beef cattle ranching in Minnesota is economically important not only from a beef production standpoint but also from the provision of ecosystem services.

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Table 1. Value of Minnesota Beef Cattle Ranching and Farming Ecosytem Services

Forage Production (Per Acre)	$29.82	(NASS Pastureland Rental Rate)
Ecosystem Services (Per Acre)	$16.46	(CRP - Grassland Reserve Rental Rate)
Wildlife		
Hunting Days	5,589,000	(USFWS)
Economic Value Per Day	$176.91	(USFWS)
Hunting Economic Value	$988,776,699	
Fresh Water Fishing Days	20,768,000	(USFWS)
Economic Value Per Day	$61.49	(USFWS)
Fishing Economic Value	$1,276,996,764	
Wildlife Watching Days	6,974,000	(USFWS)
Economic Value Per Day	$46.39	(USFWS)
Watching Economic Value	$323,497,303	
Total Wildlife Value	$2,589,270,766	
Habitat Acres	38,883,086	(EPS - NonMetro & NonUrban)
Wildlife Value Per Acre	$66.59	
Total Value Per Acre	$112.88	
Beef Cattle Ranching (NAICS 1121110)		
Pasture & Rangeland (Acres)	361,306	(2012 Census of Ag)
Total Value Per Acre	$112.88	
Cattle Ranching Economic Value	$40,783,024	
Cattle Ranching Economic Value	$40,783,024	
Beef Cows	142,417	(2012 Census of Ag)
Economic Value Per Beef Cow	$286.36	
LBS of Beef Production Per Cow	840	(LMIC)
Economic Value Per LBS of Beef	$0.34	

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Funded by the Beef Checkoff