

Abstract SPFCIC 2016

Title: **Valuation of grassland ecosystems services for sustainable livestock production**

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Several forms of interrelated ecosystems services are provided by natural and naturalized grasslands, but they are rarely quantified or play only minor roles in the overall economic assessment that prioritizes meat production per unit land area. Services such as carbon sequestration, soil erosion prevention, habitat, and aesthetics may have to be monetarized further in the future to help sustain livestock farming. Four main ecosystems services from grassland have been categorized: (1) provisioning services such as meat, milk, and bioenergy; (2) regulating services such as air quality, water quality, climate regulation, and erosion prevention; (3) habitat services such as wildlife corridors and plant-genetic diversity; and (4) cultural services including recreation and agri-tourism. Carbon sequestration has been identified as a major benefit from grasslands to absorb CO₂ emissions and is relatively easy to quantify. Permanent grassland, when converted from arable land, can increase soil carbon stocks by 450 lb per acre per year on average. In contrast, erosion from grasslands has been considered minor. On average, 580 lb of soil per acre per year is being lost from grasslands compared with $\geq 2,670$ lb per acre per year from arable land. Annual benefits from grass cover to prevent erosion has been estimated at \$120 per acre, although values may vary drastically dependent on region and country. Runoff coefficients in grasslands are low (0.2-0.3) in comparison to arable land (0.4-0.6). Options for deliberate water retention exist in forms of vegetated swales intersecting cropland or temporary water storage in alluvial grasslands (floodplains). These can also help remove nitrates through denitrification by releasing N₂ into the atmosphere, thus reducing leaching. Best-case scenarios estimate nitrate abatement values around \$80 per acre. Aesthetic and recreational opportunities in grasslands are diverse and depend on activities such as hunting and bird-watching. Total services from grasslands average \$1,200 per acre according to a Central-European study, with water filtration services leading in value (65%) followed by livestock production (23%), and soil erosion prevention (6%).

Valuation of Grassland Ecosystems Services for Sustainable Livestock Production

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Challenges:

- Some ecosystems services from grasslands are not valued nor traded in the market place
- This may lead to overproducing market goods and under-producing ecosystems services
- Disconnect between implemented practices and off-farm impact
- Current programs may address on-farm conservation issues but not off-farm ecosystems necessities



Current Environmental Programs:

Land Retirement Program

- Conservation Reserve Program (CRP)
- Wetlands Reserve Program (WRP)

Working-Land Payment Program

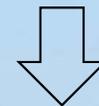
- Environmental Quality Incentives Program (EQIP)
- Conservation Reserve Program (CRP)
- Wildlife Habitat Incentive Program (WHIP)
- Conservation Security Program (CSP)

Agricultural Land Preservation Programs

- Farm and Ranch Lands Protection Program (FRPP)
- Grassland Reserve Program (GRP)

Technical Assistance

- Conservation Technical Assistance Program



Changed Research Focus:

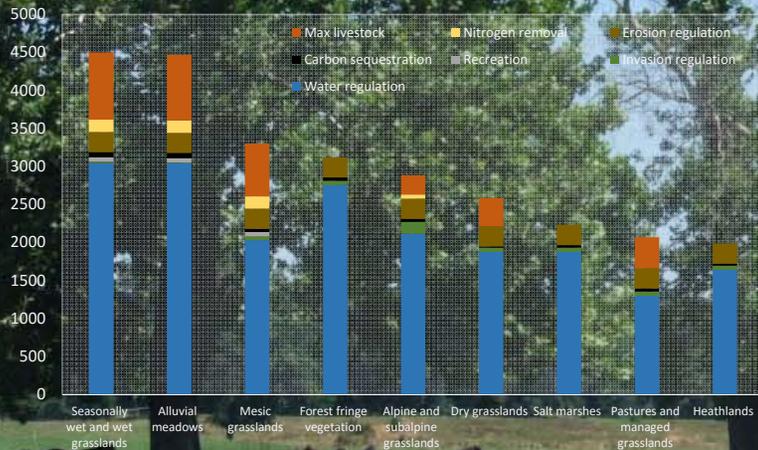
- Modeling tools to evaluate economic, environmental, and regulatory impacts
- Evaluate animal production systems at landscape-level
- Determine fluxes at the systems boundaries to determine interactions between land-use forms



Possible Improvements:

- Quantification of environmental effects of agric. activities
- Establishing a system to pay farmers directly for providing ecosystems services

Approximate Values of Specific Services, \$/ha and year⁽¹⁾



Provisioning Services

- Meat, milk
- Fodder (forage, hay)
- Bioenergy
- Water (groundwater recharge, reduction of nutrient outflow)

Regulating Services

- Air quality, climate regulation, flood prevention
- Drainage and drought prevention
- Erosion prevention and soil fertility
- Pollination, disease, and pest control

Habitat Services

- Bio-corridors, maintenance of life cycles for migratory species
- Genetic diversity

Cultural Services

- Aesthetics, recreation, and tourism
- Bird-watching and hunting
- Social cohesion of rural areas