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FEATURE

Well-managed grazing systems: A forgotten hero of conservation

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Ecologically sound grazing management is an underused and underappreciated conservation tool in the eastern United States. We contend that significant policy and educational barriers stand in the way of expanding the use of this conservation tool. Well-managed pasture systems combine vigorous perennial vegetation cover, reduced pesticide and fertilizer inputs, and lower costs of production using ecological approaches to generate ecosystem services for society, as well as economic sustainability for the producer. The majority of currently available conservation policy tools were designed to address either rangeland grazing situations in the western United States or conservation cropping in the eastern United States. To promote well-managed pastures in the eastern United States, resource managers and government agencies struggle to adapt programs that are really designed for annual row crop systems. Additional educational and technical assistance resources are needed for promoting well-managed pasture-based farming in the region. This paper summarizes the potential of well-managed pasture systems to provide ecosystem services, provides thoughts for discussion on the barriers to adoption of such systems in the eastern United States, and offers some solutions to move such systems forward through policy and educational efforts. These ideas were first presented at a symposium as part of the 2011 Annual Conference of the Soil and Water Conservation Society in Washington, DC.

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BENEFITS AND BARRIERS—IF WELL-MANAGED GRAZING SYSTEMS PERFORM SO WELL, WHY DON'T MORE PEOPLE USE THEM?

Our hypothesis is that well-managed pastures are important for the environmental performance of agriculture in mixed land use regions throughout the eastern United States. Perennial grasses, forbs, and legumes have numerous ecological attributes that support robust and resilient ecosystems, whether these occur as native prairies, naturalized grasslands, or managed forage systems. Some of the essential ecosystem services provided by robust and resilient grasslands include soil erosion control, water cycling, nutrient cycling, gas exchange with the atmosphere, climate regulation, food and feed production, and aesthetic experience. However, not all grassland management systems can be considered robust and resilient. Some pasturelands in the eastern United States are overgrazed or poorly managed, resulting in soil compaction, excessive water runoff, gully erosion, persistent weed invasions, poor animal performance and production, and lack of cover to support biodiversity. Thus, how grazing lands are managed can lead to vastly different environmental outcomes. Such divergences in outcomes can even shape preconceived ideas of the inherent value of grazing lands in a broader cultural sense (Janzen 2011). Even the same characteristics can then be viewed as liabilities or assets (table 1).

Benefits of Well-Managed Grazing Lands. Characteristics of robust and resilient grazing lands include (1) forage production and quality that can sustain an optimized stock of grazing animals throughout the year or through a particularly important grazing season for producers' profit; (2) sufficient residual forage mass that can support rapid forage regrowth when growing conditions are good and sustain plant health when growing conditions are not good to sustain long-term productivity; (3) sufficient botanical biodiversity to take advantage of different environmental growing conditions throughout the year and to provide habitat for a diversity of soil microorganisms, beneficial insects, small game, and birds; (4) gradual accumulation of soil organic matter from the balanced input and outputs of carbon exchange from forage and animal excreta to support a multitude of environmental indices related to water cycling, nutrient cycling, and biodiversity; and (5) maintenance of protective plant cover over the land to avoid nutrient losses to the atmosphere and to surface and groundwater sources.

Soil organic matter and its main constituent soil organic carbon (SOC) can be viewed as a key indicator of many of the ecosystem services provided by well-managed pasture-based farming systems (Franzluebbers 2010). Positive relationships have been observed between SOC and plant productivity, water infiltration, and soil biodiversity. Increasing SOC can

Table 1

Issues that lead to characterizing grasslands as a liability or an asset.

Liability	Asset
Competition of land for plant-based foods	Feed for animals from sources not otherwise edible
Excretion of polluting nutrients	Source of fertility to help recycle nutrients efficiently
Suppression of biodiversity	Sustain and enhance biodiversity
Source of greenhouse gas emissions	Sequestration of soil organic carbon

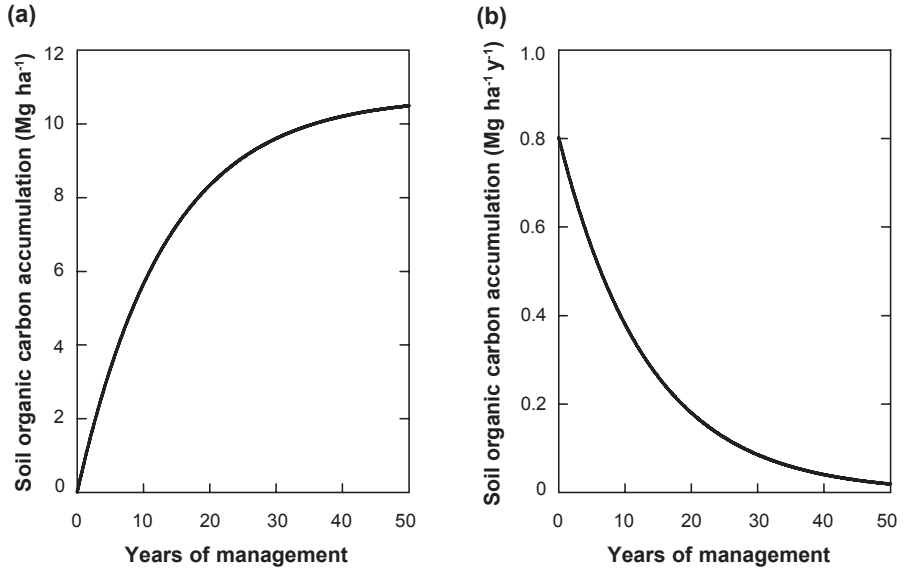
also limit soil loss, water and nutrient runoff, and net greenhouse gas emissions. The rate of SOC accumulation under well-managed grazing land can be very high during initial years, but its magnitude diminishes with time due to saturation of the soil, a process that may be determined by various environmental factors, including climate and soil type (figure 1).

Well-managed grazing systems can be more profitable than the two common methods of animal agriculture production often practiced in US agriculture today (Winsten et al. 2011), i.e., (1) a commonly observed or traditional grazing method in which livestock are simply turned out in the spring and gathered in the fall and (2) confined animal feeding operations in which all feed and forage are brought to livestock (USDA NRCS 2007). Associated positive environmental impacts of well-managed pasture-based livestock production include (1) the possible reduction of greenhouse gas emissions and/or sequestration of SOC with high-quality forage and deposition of manure on the land (Rotz et al. 2009), (2) reduction of annual cropland and the potential environmental concerns that accompany the production of concentrated feed for animals, and (3) potential reduction of water quality concerns due to improved forage stand density and cover. Pasture-based livestock production systems also support healthy animals and production of high quality foods (Clancy 2006). Further, pasture-based livestock production creates an aesthetic agricultural landscape that is not only pleasing to the local community but can attract ecotourism to a region. All of these attributes and more were addressed at the Soil and Water Conservation Society Farming with Grass Conference in 2008 (Franzluebbers 2009; Steiner and Franzluebbers 2009).

Barriers to Adoption of Well-Managed Grazing Systems. Agriculture in the United States is certainly different than it was a century ago—many producers have abandoned diversified farming with numerous crops, grazing livestock, and managed woodlands for an industrial model based on specialization of a few crops if land were available or large confined animal feeding operations if land were limiting (Winsten et al. 2010; Nelson et al. 2012). Nearly 80% of US beef producers have a herd size of <50 head, and 76% of dairy producers have a herd size of <100 head (USDA NASS 2011). These small-scale livestock producers face decisions as to whether they will "get big or get out" (the two options most producers have taken in the past several decades) or possibly develop an ecologically based management approach that can help them serve their families, their communities, their pocketbook, and their ethos. Barriers to adoption of well-managed pasture-based livestock systems have been investigated (Winsten et al. 2011). Producers may be

Figure 1

Soil organic carbon (a) accumulation and (b) yearly rate of accumulation under pasture management. Data derived from two sites in Georgia (Franzluebbers et al. 2000) and one site in Texas (Wright et al. 2004).



Grazed pastures established on eroded cropland can be an effective conservation management approach at the rural-urban interface.

reluctant to make radical changes in their operation because the changes may be a source of risk. Reducing risks for producers exploring more sustainable agricultural operations should be a priority for publicly supported incentive programs.

Both perceived and real barriers that may limit adoption of pasture-based livestock systems include the following:

- Debt load—concerns about reduced production per cow, investment in infrastructure, and ability to service debt
- Land availability—concern about whether there will be enough to meet feeding requirements
- Measures of success—concern for production per cow, rather than profit per cow or per unit of land area
- Practicality and lifestyle—concerns about lack of time for moving cattle or how daily routines would fit lifestyle needs

Similar and more extensive perceived barriers were outlined in a technical note describing pasture-based dairy systems (USDA NRCS 2007), some of which included physical location of milking barn and outlying pastures, management skills, animal adaptation, equipment requirements, land suitability, and pasture quality. In a survey of dairy farmers in the northeastern United States, Winsten et al. (2011) found that there were greater concerns regarding the adoption of management-intensive grazing among those invested in confinement feeding than mixed grazing–confined feeding in the following areas: decrease in milk production, decrease in farm profits, decrease in cash flow, difficulty producing enough winter feed, lack of land for grazing, and amount of work to start and to manage rotational grazing. No difference was observed between producer groups in terms of need for on-farm technical assistance, need for information on pasture management, skepticism from other farmers, or skepticism from family. Winsten et al. (2011) also found that income-related barriers (i.e., decrease in milk production, decrease in farm profit, and decrease in cash flow) might be more perceived than actual since these concerns were greatly reduced in a postadoption survey compared to preadoption survey. The concern of skepticism from family also declined postadoption.

Grazing of well-managed pastures is beneficial to herd health, to the environment, and to farmers interested in more natural methods of production. Photo credit: John Andrae, Clemson University, Clemson, South Carolina.

In a 2011 survey of agency staff by the Michael Fields Agricultural Institute, half of 64 respondents felt that major obstacles to adoption of well-managed pasture-based farming systems were perceived and/or social constraints (Merrill 2006). Other, more tangible obstacles were financial constraints (20% of respondents), lack of knowledge/skills (20%), and land costs/availability (8%).

THE FUTURE IS GREEN—EXPLORING POLICY OPTIONS FOR PROMOTING WELL-MANAGED PASTURE-BASED FARMING SYSTEMS

A number of voluntary conservation programs provide some support for grazing land managers, including those currently offered by the USDA:

- Grassland Reserve Program—emphasizes support for working grazing operations, enhancement of plant and animal biodiversity, and protection of grassland under threat of conversion to other uses
- Farm and Ranch Land Protection Program—provides matching funds to help purchase development rights to keep productive farmland and ranchland in agricultural uses
- Conservation Stewardship Program—encourages producers to address resource concerns in a comprehensive manner by (1) undertaking additional conservation activities and (2) improving, maintaining, and managing existing conservation activities (including on grasslands and improved pastures)
- Environmental Quality Incentives Program—provides financial and technical assistance to agricultural producers through conservation program contracts to help plan and implement conservation practices that address natural resource concerns and that improve soil, water, plant, animal, air, and related resources on agricultural land (including grasslands and improved pastures)

In addition, opportunities to improve environmental outcomes through improved management of grazing systems will likely occur with the greater technical knowledge gained in the joint USDA Natural Resources Conservation Service (NRCS) and USDA Agricultural Research Service (ARS) partnership in the Conservation Effects Assessment Project (Sanderson et al. 2011).

The Grazing Lands Conservation Initiative (GLCI) provides technical assistance on privately owned grazing lands on a voluntary basis and helps to increase awareness of the importance of grazing land resources (www.glci.org). For 20 years, GLCI assistance has been carried out through coalitions of individuals and organizations functioning at the local, state, regional, and national levels. The coalitions include livestock producer organizations, scientific and professional grazing resource organizations, conservation and environmental groups,

and state and federal natural resource and agriculture agencies. For example, in Wisconsin, GLCI membership includes Wisconsin Farm Bureau, Wisconsin Farmers Union, Wisconsin Cattlemen's Association, GrassWorks, The Nature Conservancy, Resource Conservation and Development Association, Land and Water Conservation Association, Wisconsin Land Conservation Employees Association, Wisconsin Department of Agriculture, Trade and Consumer Protection, Wisconsin Department of Natural Resources, University of Wisconsin College of Agriculture, University of Wisconsin Extension, USDA NRCS, and USDA ARS. The Wisconsin GLCI has supported education through grazing networks and grazing schools and research through partnerships among University of Wisconsin, USDA NRCS, county agencies, and Resource Conservation and Development councils. Long-term goals of the Wisconsin GLCI are to increase the number of well-managed pasture-based livestock farms through widespread availability of consistent, information-rich educational opportunities.

Potential Program/Policy Options to Encourage Adoption of Well-Managed Grazing Systems. A variety of policy instruments could be used to encourage well-managed pasture-based farming systems that are productive, profitable, people-supporting, and protective of the environment. Some options might include the following (Merrill 2006; Winsten et al. 2011):

- Training programs—coordinated partnerships among land-grant university extension, technical colleges, nongovernment organizations (NGOs), and state and federal agencies could create adequately funded training programs to educate producers and university students in achieving optimum productivity, extending the grazing season, designing appropriate supplemental feeding, as well as adopting other regionally important strategies. An innovative example is Wisconsin's new Dairy Grazing Apprenticeship program, sponsored by the farmer organization GrassWorks and the state's Department of Workforce Development. The program involves a two year apprenticeship, including classroom training and on-farm, real world experience, giving the student not only the skills needed to run a dairy farming business but potentially also the opportunity to build equity in cattle or to transition into partnership or ownership with the host farmer. Another long-standing program from Wisconsin is the School for Beginning Dairy and Livestock Farmers.
- Grazier mentoring—state agriculture departments and/or NGOs could create a program to pair beginning graziers with experienced graziers to gain practical experience in reducing risk and providing feed options during adverse weather events. Financial compensation could be offered to the experienced graziers for mentoring.
- Demonstration programs—successful producers within a state or region could be showcased and exposed to on-farm research and beginning grazier mentoring. Distribution of producers within a state could be encouraged. Compensation could be provided for time and effort, and rewards given for special recognition.
- Information and technology transfer programs—collaboration among USDA NRCS, land-grant universities, USDA ARS, technical colleges, and/or NGOs could implement a state-of-the-art equipment and infrastructure research and demonstration site for exhibiting ecologically sound pasture-based farming systems. In addition to modern fencing and water systems, the site could include a high-throughput milking parlor to increase labor efficiency or a small-scale butchering facility to develop local supplies, depending on interest of a location. Public visibility and technical assistance to all producers could be essential. Several universities have developed research stations that use well-managed pasture-based systems for dairy and livestock, including University of Missouri, Michigan State University, and University of Vermont.
- No-interest loans—the government could create a revolving loan fund for those producers transitioning to well-managed pasture-based farming systems.
- Revenue assurance—USDA Risk Management Agency could create a program to guarantee a level of net farm income to producers transitioning to well-managed grazing, based on current herd size, for a fixed (e.g., three-year) period. The baseline could be calculated from accounting and Schedule F tax records of the past (e.g., previous 5 years). Incentivizing producers to cut costs could be important.
- Crop insurance for pasture—USDA Risk Management Agency could treat forages and hay crops as important feedstuffs, equal in value to grains and other crops currently insured. Insurance could guard against weather-related losses.
- Green payments—federal or state agencies, in conjunction with local and state conservation districts, could pay producers to meet resource conservation goals to produce environmental benefits valued by society. One or several different current programs (e.g., Environmental Quality Incentives Program and Conservation Stewardship Program) could be developed further. Specific environmental benefits could be targeted locally (such as improving water quality or encouraging wildlife habitat), but global issues, such as greenhouse gas emissions and climate change, could be universally included.
- Debt restructuring/forgiveness—the government could provide compensation to lenders for increasing the term of debt (or reducing principal) for producers to adopt well-managed pasture-based farming systems. This could lower monthly payments and help producers make the transition to well-managed grazing systems.
- Debt for carbon swaps—debt could be reduced for producers who adopt ecologically sound, pasture-based farming systems that sequester SOC.
- Flexible land retirement—USDA Farm Service Agency could amend Conservation Reserve Program rules to allow farmers to use ecologi-

cally sound grazing management on land currently enrolled in the program. Land in Conservation Reserve Program requires that a dense cover be present to prevent soil erosion and provide wildlife habitat, an outcome consistent with well-managed grazing. However, strict conditions would need to be ensured so that degradation can be avoided.

SUMMARY

Well-managed pasture-based farming systems provide society-wide environmental services while offering productivity and profit to individual producers. Small-scale farms are supplying local communities with food and aesthetic, yet functional, landscapes. While some barriers to greater adoption of well-managed pasture-based farming systems are real, surveys suggest that many barriers are perceived and could be overcome with education. Grazing networks and on-farm demonstrations are separating what is real from perceived. Local, state, and federal programs to support well-managed grazing systems need to be organized into coordinated action. New comprehensive research investigations need to be designed so that ecologically sound, pasture-based farming systems can be adopted and adapted using a firm scientific basis for greater understanding of the broad biogeochemical and socioeconomic considerations. New and existing policy options should be further developed to encourage adoption of well-managed pasture-based livestock production as one of several agroecological approaches to meet the current and future demands of a robust production system without harming the ecosystem that supports it.

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