220

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3R's: Regenerative rangeland ranching in southern north America

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Abstract

Our research team proposes a sea change in southern North American rangeland from ranching solely for production to husbanding for stable, regenerative grasslands. Rangelands in southern North America are too often ecologically, biologically and economically dysfunctional, degenerating ecosystems. Plows, cows and bankers dominate, supported by equally short-sighted, discipline-focused academia and industry. We propose regenerative rangeland ecosystems research based on long-term, multi-functional, flexible-use goals sustained by interdependent hydrology, soil, climate, vegetation and animal components and carried out by multi-disciplinary teams. Flexibility in meeting food, energy and ecosystems service markets can take rangeland systems beyond niche production and its inherent inexorable degradation to stable, multi-functional rangelands in southern North America. Our research and development team brings together social and biological scientists with stakeholders focused on medium and long-term regenerative rangeland management.

Introduction

We propose a sea change in southern North American rangeland research from ranching solely for production to husbanding for stable, regenerative grasslands. We define regenerative ranching (RR) as herbage-based ruminant agriculture that uses resilient, ecologically and economically sustainable grasslands management with minimal environmental disruptions or outside inputs. According to Jayasinghe et al. (2023), regenerative agriculture restores and maintains ecosystem (hydrology, soils, plants, animals etc.) health while still feeding human populations. Our multi-disciplinary team proposes research that focuses on multiple functions within RR (Fig.1).

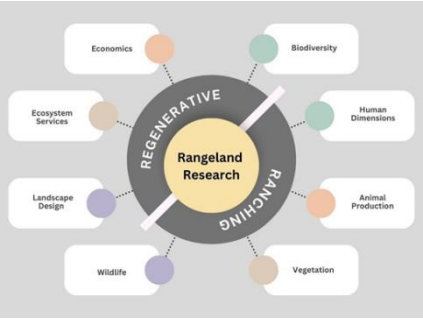

Figure 1. Multi-disciplinary research for multi-functional regenerative ranching.

One of the basic tenets we adopt as a multi-disciplinary approach to regenerative ranching research, outreach and implementation is biodiversity. Biodiverse grassland ecosystems, from soil to vegetation to animals and the human dimension, tend to be more resilient biologically and socioeconomically (Picasso et al. 2022).

Methods

Human dimensions of regenerative rangeland ranching

We have learned the hard way that we are far more successful when we incorporate human dimensions in RR research. These involve the social, cultural, and economic aspects that influence relevance, adoption and success of regenerative practices in rangeland management. These dimensions emphasize the importance of understanding

landowners, communities, policymakers, public perception, and consumers interacting with, and depending on, rangelands (Tolleson and Metman 220; Giwa et al. 2024). Before initiating biological research efforts, we believe we should identify local challenges and priorities through key informant interviews, structured surveys and questionnaires, community meetings, participatory mapping, and data analysis aid in aligning ranching operations with community goals, such as improving soil health, increasing biodiversity, supporting livelihoods, preserving cultural heritage, and ensuring regenerative practices meet both ecological and socio-economic needs (Donaldson and Franck 2016).

The significance of human relationships and connections to the community and ranching itself directly benefits or undermines regenerative rangeland ranching efforts. Humans influence all decisions, and regenerative ranching trajectories starts and ends within communities, organizations, and government, most local to the system of interest (Berkley and Beratan 2021). Any effort at directed system change requires coordinated actions among our diverse participants, academic, management and government. This decision-action context means community and personal relationships are crucial to developing workable, adoptable regenerative ranching solutions (Lu et al. 2024).

Restoring rangeland health

Woody plant cover across semi-arid and sub-tropical grassland savannas is increasing on a global scale; multiple drivers contribute to this encroachment, including, but not limited to, land use changes, fire suppression, cattle grazing practices, and climate change (Archer et al. 1988). Most of these changes involve dramatic increases in native woody taxa that were historically present in low densities.

Such changes in woody cover impact overall system biodiversity, ecosystem function and related ecosystem services, including food production but not always in a negative way, as it can also add resilience. A review by Eldridge et al. (2011) indicated that encroachment had mixed effects on ecosystem structure and functioning at global scales, and that woody plant traits influence the functional outcome of encroachment. A simple designation of encroachment as a process leading to degraded ecosystems is not supported in every instance. The literature on the negative effects of woody encroachment has been strongly influenced by the prevalence of a single land use, for example pastoralism involving grass-feeding livestock. Woody plant expansion will likely continue based on past trends and future projections, especially in arid and semiarid ecosystems (Asner et al. 2004, Van Auken 2009). If animals are matched with the landscape, woody plants may add an aspect of resilience, given their resistance to long-term drought and their resilience with respect to overgrazing (Estell et al. 2012).

Adapting ranching to landscape rather than landscape to animal production

As an essential part of RR, we propose adapting extractive or environmental management goals to the ranch ecosystems rather than the other way around. Instead of manipulating grasslands to fit unsuitable agricultural practices, we seek to research and support land managers to utilize what the ecosystem is best adapted to producing for human needs. For example, if browse dominates plant populations in a ranch ecosystem, then manage for ruminants that prefer converting dicots into consumable products (Irob et al. 2021). This is far more regenerative than manipulating vegetation, at high economic and environmental costs, to favor monocots for mono-specific grazing ruminant herds.

On the animal side, we propose adapting ruminant species, both domesticated and native, to ranch soil and vegetation strengths (Muir et al. 2015). If Eurasian cattle, for example, prove detrimental to RR ecosystems, then we will consider non-traditional domesticated ruminants from Asia, Africa and the Americas. If quasi-domesticated species, both native and introduced, are best suited to an ecosystem, then these will replace cattle, goats or sheep. Likewise, if native bees are best adapted to a biodiverse rangeland, for example, then European bees will not be purposely introduced. If native wildlife are better adapted to the ecosystem, then white-tailed deer, elk and bison can replace cows, sheep and goats.

No matter how much we would like to think the contrary, native wildlife and domesticated animal grazing are not always compatible on North American Rangelands (McGinn et al. 2022). There is a preponderance of evidence, however, that well-managed domesticated livestock herbivory can contribute to regenerative rangeland conditions that favor a return to complex, native animal trophic levels based on healthy soils and diverse native plant communities (Gordon et al. 2021), by replacing extirpated native bulk grazers and browsers. Wildlife resources, whether as primary land-management efforts (e.g. food harvest) or secondary (e.g. conservation and ecosystems services), are a priority in regenerative ranching in southern North America.

Ecosystems services and other economic incentives

Ecosystem services (ES) are generally categorized as: a) provisioning, b) cultural, c) supporting, and d) regulating. Rangeland based examples of each are: a) animal source protein, b) open space, c) biodiversity, and d) pollination (SRM 2023). Modern ranchers not only produce food and fiber, but they also support wildlife habitat, enable watershed function, provide recreational opportunities, mitigate wildfires, and address their operation's impacts on climate change. And they do so under increased scrutiny from a public that typically does not understand who they are and what they do (Nolte 2021).

Fortunately, ecosystem goods and services are what "good" ranchers have always done. They have long understood that ranching begins with taking care of the soil, which retains the water and produces the vegetation that feeds and shelters the animals (Lien et al. 2017). Many have known that a variety of plants are required to keep rangelands, especially in drier climes, healthy. An appreciation for wild places and wild things has always been an integral part of their culture.

However, as with any human undertaking, not all ranchers have been good stewards (Angerer et al. 2023). Additionally, ranching is changing. New ownership demographics are evolving (Lopez et al. 2023). These new ranch owners may vary from large investors or companies who want to improve their "green" footprint, the next generation in a ranching family that has moved back to the ranch, or to new landowners who may or may not have the required knowledge and experience to effectively manage a ranch and often have different motivations for land ownership than traditional ranchers.

It is therefore incumbent on the scientific community to address the challenges facing modern ranchers, regardless of goals, background, and experience. Rangeland-based ranching decisions in North America have historically been driven by manager demographics and economic necessities (Peterson and Coppock 2001). More recent data indicate that public (economic incentives) as well as changing private (cultural priorities) initiatives factor into environmental concerns in some regions such as California, especially in regard to ecosystems services and conservation (Oyama and Huntsinger 2019) inherent in regenerative ranching approaches. If researchers have any chance of convincing rangeland managers to implement regenerative ranching in southern North America, we must be at the forefront of designing, testing and promulgating novel economic and cultural motivations.

Conclusions

Our proposed multidisciplinary, multi-objective and flexible approach to RR ultimately seeks to restore and maintain ranching sustainability while maximizing outputs. Through research and education, we hope to diversify management goals and socioeconomic outputs to include not just the traditional domesticated ruminants but flexible goals such as bioenergy, wildlife, ES, and human dimensions.

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