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ORIGINAL

The experience of regenerative livestock farming: an analysis from the point of view of local stakeholders

La experiencia de la ganadería regenerativa: un análisis desde el punto de vista de sus actores locales

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ABSTRACT

Regenerative livestock farming emerges as an alternative to conventional livestock production models that have led to environmental degradation and loss of biodiversity. In Colombia, especially in the department of Caquetá, traditional extensive livestock farming has contributed to deforestation and soil erosion. This research focuses on analyzing the regenerative livestock experience from the perspective of local actors, specifically a producer from the municipality of Florencia. Through a qualitative approach and the use of interviews and data analysis tools, producer perceptions and practices are explored in relation to the implementation of regenerative strategies on his farm. The results reveal that innovation, the adaptation of agroecological practices and the balance between production and conservation are fundamental for the success of this production model. However, widespread acceptance of these methods faces significant barriers, primarily due to resistance to change among traditional producers.

Keywords: Regenerative Livestock Farming; Sustainability; Agricultural Innovation; Environmental Conservation; Agroecology.

RESUMEN

La ganadería regenerativa surge como una alternativa a los modelos convencionales de producción ganadera que han llevado a la degradación ambiental y la pérdida de biodiversidad. En Colombia, especialmente en el departamento de Caquetá, la ganadería extensiva tradicional ha contribuido a la deforestación y la erosión del suelo. Esta investigación se enfoca en analizar la experiencia de ganadería regenerativa desde la perspectiva de los actores locales, específicamente un productor del municipio de Florencia. Mediante un enfoque cualitativo y el uso de entrevistas y herramientas de análisis de datos, se exploran las percepciones y prácticas del productor en relación con la implementación de estrategias regenerativas en su finca. Los resultados revelan que la innovación, la adaptación de prácticas agroecológicas y el equilibrio entre producción y conservación son fundamentales para el éxito de este modelo productivo. Sin embargo, la aceptación generalizada de estos métodos enfrenta barreras significativas, principalmente debido a la resistencia al cambio entre los productores tradicionales.

Palabras clave: Ganadería Regenerativa; Sostenibilidad; Innovación Agropecuaria; Conservación Ambiental; Agroecología.

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INTRODUCTION

Global livestock production is characterized by spatially extensive and extractive activity and production-intensive production, which is adopted mainly by countries such as the United States, Canada, Western Europe, and China. Livestock farming is one of the main economic sectors worldwide. However, at the same time, as indicated by [1], it also represents one of the leading causes of deforestation, contributing to the aggressive expansion of the agricultural frontier, the deterioration of natural habitats and biological diversity, the transformation of the rural landscape, the decline in soil productivity, the elimination of native species, erosion, water pollution, and global warming.

A recent review by Yan et al.[2] indicates that livestock production generates around 18 % of global greenhouse gas (GHG) emissions, including carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), which contribute directly to global warming and climate change.

In Colombia, livestock production is based on an extensive model characterized by thousands of hectares of native or primary forest converted into large areas of pasture managed under a conventional, inefficient model that promotes early degradation, soil compaction, and erosion, among many other associated problems.

In 2023, the total cattle population in the country was 29 642 539, distributed as follows: 88 % dual-purpose systems, 9 % breeding, and 3 % specialized dairy and fattening systems. These figures represent an increase of 1,2 % over the previous year. Furthermore, 69,1 % of cattle are concentrated mainly in the departments of Antioquia (11,1 %), Córdoba (8,1 %), Meta (7,8 %), Casanare (7,7 %), Caquetá (7,2 %), Cesar (5,7 %), Santander (5,7 %), Magdalena (5,7 %), Cundinamarca (5,1 %), and Bolívar (5,0 %).

Bravo[3] points out that in 2019, the national agricultural sector accounted for 6,74 % of the country's GDP, and in turn, the livestock sector contributed 28,9 %. On the other hand, Vallejo et al.[4] indicate that, by 2020, livestock farming contributed to a 2,8 % increase in agricultural GDP, with a 3 % increase in meat production and a 2,9 % increase in milk production.

Bravo[3] and Vallejo et al.[4] agree that this productive activity is of great importance for the development of the Colombian economy, as it generates around 810,000 direct jobs. However, due to a lack of business vision and government support, Colombia's livestock production indices are not ideal and fail to meet national and international marketing requirements.

The department of Caquetá had a cattle herd of 2 175 065 head in 2022.[5] However, although the department is mainly agricultural, its economy is driven by the livestock sector, which is extensively managed, with low productivity and a deficient animal nutrition model.[4]

Given the current situation at the international, national, regional, and local levels due to the alteration of the abiotic and biotic elements of ecosystems linked to the adoption of livestock production processes managed through conventional models, the implementation of new production strategies is proposed to allow this important economic activity to continue with a different approach, one oriented toward sustainability, research, experimentation, and the recovery of traditional local knowledge.

This alternative is called "regenerative livestock farming" or "sustainable livestock farming," this model seeks to find a point of connection and coexistence between livestock production and ecosystem balance. About the above, Larraín et al.[6] point out that regenerative livestock farming is a set of principles and practices that seek to generate goods and services for humans while increasing biodiversity, enriching soils, and promoting ecosystem services. "In the long run, it is a way of doing livestock farming by working with nature, rather than against it" (p.3).

For their part,[7] indicate that sustainable livestock systems that encompass environmental protection, animal welfare, biodiversity, food security, and socioeconomic promotion could balance production and conservation without affecting rural development.

On the other hand,[8] affirm that in order for livestock farming in the department to truly consolidate itself as a profitable and sustainable activity over time, a series of strategies must be adopted, ranging from training and education, conversion to diverse production systems adapted to the conditions of the region, and the strengthening of production chains, the participation of differentiated markets, and the modernization of production, all to promote sustainable development, food security and sovereignty, and ensure the future of current and future generations.

Discussions about regenerative livestock farming must be based on two types of knowledge: technical-scientific knowledge and, more importantly, local knowledge, which involves producers, those empirical scientists who, through experimentation, trial and error, and resilience, generate a type of knowledge that is valuable and applicable in other contexts. Together, these two types of paradigms are the key to carrying out real support and implementation processes of sustainable agricultural systems.

For the reasons mentioned above, this research's guiding question is: What are the characteristics of a regenerative livestock farming experience from the point of view of its local actors?

METHOD

Location

The department of Caquetá is located in the northwest of the Colombian Amazon region, between 00° 42' 17" south latitude and 02° 04' 13" north latitude, between 74° 18' 39" and 79° 19' 35" west longitude (figure 1).

The municipality of Florencia, capital of the department of Caquetá and known as "The Golden Gate of the Colombian Amazon," is located in the south-central region of Colombia, at coordinates 1°36′51″ north latitude and 75°36′42″ west longitude. It has a land area of 2,292 km2, an average altitude of 242 meters above sea level, an average annual rainfall of 3,840 mm, and an average annual temperature between 28°C and 32°C. It consists of four municipalities in its urban area (figure 2) and seven districts in its rural area (figure 3).[9]

Its economic activity is mainly linked to livestock, trade, agriculture, and ecological tourism services.[10]

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Figure 1. Spatial location and administrative division of the department of Caquetá

Figure 2. Map of municipalities in Florencia (Caquetá)

Figure 3. Map of the districts of Florencia (Caquetá)

Study population

The study to identify and systematize agricultural contexts associated with regenerative livestock farming processes was carried out on the property of the producer Bolaños and his family, which has a total of 110 hectares (ha), of which 42 are dedicated to raising male cattle for fattening and the other 68 ha are in a state of conservation due to their primary forest structure; The farm is located in Vereda La Barrialosa, Corregimiento San Martin, Municipality of Florencia, Caquetá (figure 4). The producer has been engaged in livestock innovation for several years, treating different types of pastures under the "cultivation" model.

A series of criteria were considered to identify potential informants, with the aim of obtaining relevant information about the progress of regenerative livestock farming processes in the region. These guidelines were: direct association with establishing livestock regeneration trials, experience in managing these systems, and ongoing dedication to applying strategies and practices related to incorporating sustainable livestock production models.

Figure 4. Study area: San Martin district, Vda. La Barrialosa

Methodological approach

This research is based on the historical hermeneutic paradigm since, as indicated by Marín Gallego[11] this approach "proposes science as a complex system that sought understandings mediated by language, which led to interpretive processes of social and human reality." (p.20).

This research took a qualitative approach, following a methodology that allowed for the search and subsequent collection of information related to the attitudes, behaviors, and decisions of the subject of study, as well as the causes that motivate and/or justify such behavior. Vera Vélez[12] asserts that this research approach focuses on the study and subsequent holistic description of the quality of activities, relationships, issues, means, materials, or instruments in a given situation or problem. Rather than determining the rational cause-effect relationship between two or more variables, qualitative research is interested in understanding how human dynamics or processes occur from anthropological, ethnographic, and symbolic interactionist foundations.

The data were collected in an interview with the producer and then processed using ATLAS qualitative data software. Ti version 2023, resulting in the generation of a deductive analysis based on a word cloud, a network diagram corresponding to the deductive analysis, and a sandkey representing an inductive analysis. Based on the above, a series of results were obtained that made it possible to establish the relationship between the codes and the triangulation and promote the analysis and writing of the findings obtained during the research.

RESULTS

This research obtained results from an interview with a producer conducting a regenerative livestock trial on his farm. The interviewee's responses were initially processed, yielding an exploratory analysis (word cloud), a deductive analysis (network diagram), and, finally, an inductive analysis (Sankey diagram).

Perception of innovation in regenerative livestock farming – Exploratory analysis

The producer associates the livestock production process with the need to seek and implement strategies that make these conventional models more efficient and in line with the context of the region. In this sense, we were able to identify a series of variables associated with their livestock system, including "livestock," "forest," "ecosystem," "system," "knowledge," "balance," "research," "implementation," "time," "production," and "acceptance."

Indirectly, and about the work being carried out by the producer, a concept that has a very significant impact is that of "regenerative livestock farming," a perception associated with the process of soil and environmental recovery, which contributes to the "improvement" of "pastures." He understands that these results can only be obtained through theoretical research and the subsequent replication of innovative techniques that allow for the synergistic and balanced association of production systems and environmental conservation to achieve a "transition" to more sustainable models and additionally "projecting" his experiences to contribute to changing perceptions in the region.

In line with the producer's thinking [13] clarify that there is no single model of regenerative or sustainable livestock farming, no recipes or technology packages. It is governed by principles that aim at the "balance" of its dimensions (social, economic, environmental, and institutional political governance) and the strengthening of the soil-plant-animal-human relationship.

In addition to the above, Borrelli[13] states that regenerative livestock farming turns pastures into veritable "carbon bombs," asserting that if about 40 % of these could be regenerated, net agricultural emissions would decrease considerably.

There is consistency between the interviewee's statements and those of [13], as farmers must independently and consciously assess what is available, what is native, what is adapted (adaptation is saving), and incorporate agroecological and regenerative technologies into production, harmonizing animal requirements with the ecosystem and considering the infrastructure and equipment available to implement the farming model that best suits their possibilities and expectations, always within the framework of sound environmental practices and taking into account the fact that this livestock alternative is a dynamic model. However, they also

highlight that regenerative livestock farming processes require much experimentation and a higher percentage of acceptance.

In addition to the above, the producer interviewed identifies as one of the main limitations when making social projections the issue of "acceptance" by other producers who prefer to continue using conventional techniques instead of exploring and innovating with different alternatives that make their production systems more efficient, which represents a real challenge to the "implementation" and adoption of these unique livestock production models (figure 5).

Despite the benefits of regenerative livestock farming in various dimensions (environmental, economic, and social), few livestock producers adopt this type of agroecological production practice, as there are enormous barriers to "acceptance," which translates into a slow transition from a conventional model to a regenerative one. Larraín et al.[6] reflect on the following: "The main barrier to entry has to do with the mindset of producers" (p.13), as it is undeniable that the vast majority of producers have been educated under a conventional livestock model that has given them "results."

Understandably, there is some skepticism on the part of livestock farmers about the transition to systems linked to regenerative livestock farming, as this is a relatively recent innovative form of production that requires a willingness and desire for paradigm change on the part of producers, which is generated mainly through three phases: knowledge, understanding, and subsequent adoption.

Promoting and transferring knowledge related to environmental education, success stories, and commercial incentives is necessary. However, Larraín et al.[6] emphasize that "these incentives will have little effect in the long term if the producer does not first change their way of thinking" (p.15)).

Figure 5. Exploratory analysis – Word cloud

Deductive analysis – Network Diagram

In addition, the interview with the producer resulted in a network diagram (figure 6) focused on the key aspect of "innovation," as this is the determining factor when designing and implementing regenerative livestock farming as an alternative strategy.

Deductive coding yielded analysis codes that show that the producer sees the need to make his livestock process demonstrative, influencing both directly and indirectly the transformation of regional livestock systems, since only by perfecting techniques through innovation and experimentation can the quality of these processes be improved, along with their optimization and permanence over time, which translates directly into efficiency and quality in the production system.

Teague[14] asserts that to ensure the long-term sustainability and ecological resilience of agricultural landscapes, crop, and grazing management protocols are needed to regenerate soil systems and ecosystem functions that have been lost or are being lost through neglect and destructive management practices. Healthy grassland ecosystems are more productive, stable, and resilient than those that subsist in poorer conditions and provide higher incomes for households and more abundant ecosystem services for society. Therefore, implementing innovative practices for pasture recovery reduces production costs and provides high-quality plant and animal products.

In this case, the producer is prominent that soil is a determining factor in producing balanced pastures with their surrounding environment. Based on this premise, he has strengthened his experience through automated experimentation, that is, through trial and error, thus generating an innovative and demonstrative process that brings about a series of transformations to the ecosystem of his farm and traditional processes, achieving production improvements and, at the same time, generating quality in the product to be marketed, as well as a process of social extension through teaching about his process, management, and results.

- Currently, experimental processes are being developed worldwide based on implementing innovative practices related to regenerative livestock farming. Some success stories that serve as demonstrations in terms of quality and efficiency are:
- Rancho Michapan in Acayucan, Veracruz, Mexico: It has 400 hectares, of which 150 are planted with Mombasa grass, under a Voisin rational grazing model that houses 411 head of cattle.[15]
- In Colombia, by 2020, approximately 22,406 hectares distributed across 170 farms associated with regenerative livestock farming processes: in Magdalena Medio, in the municipality of Puerto Triunfo, one of the country's leading

regenerative livestock farms is located: Hacienda El Pajuil.[16]

- The "Nueva Palmira" cattle breeding demonstration unit of INTA Rafaela, Santa Fe, Argentina: applied regenerative management of natural grasslands. This strategy increased soil biodiversity, fertility, water infiltration rates, carbon sequestration, productivity, and profitability, among other benefits.[17]
- Agroparque Biosuroeste: This 600-hectare experimental forest is located in the Cartama River basin between the municipalities of Támesis and Valparaíso. A demonstration model of regenerative livestock farming is being created based on experimentation, research, and training to discover how profitable, viable, and complex this livestock farming model.[18]

Figure 6. Deductive analysis diagram – Innovation

Inductive analysis – Sankey diagram

For the inductive analysis, rapid coding was carried out, highlighting terms of interest and measuring the level of co-occurrence between primary and secondary aspects. The most co-occurring codes are mainly related to social and environmental processes, from which another series of terms emerge, with the following variables standing out as core: "environment," "economy," and "society," followed by codes such as "transition," "innovation," "adaptation," "diversification," "exchange," "roots," "dependence," and "evidence." economy," 'education,' and 'society,' followed by codes such as 'transition,' 'innovation,' 'adaptation,' 'diversification,' 'exchange,' 'roots,' 'dependence,' and 'evidence' (figure 7).

These results showed how the interviewed producer associates his livestock conversion process with a series of central variables that link education and the social paradigm with environmental balance and economic benefit. If this is viewed from the agroecological dimensions (environment, society, economy), it can be deduced that this producer has been advancing an agroecological transition process based on experimentation and the application of innovative techniques that are closely linked.

Based on inductive analysis, regenerative livestock farming was identified as a holistic and innovative process that brings together and balances empirical knowledge gained from experience and constant trial and error, linking sustainable development and giving rise to the formation of sustainable and demonstrative production systems that serve as objective evidence for subsequent replication in other areas, thus avoiding dependence on external agents and inputs.

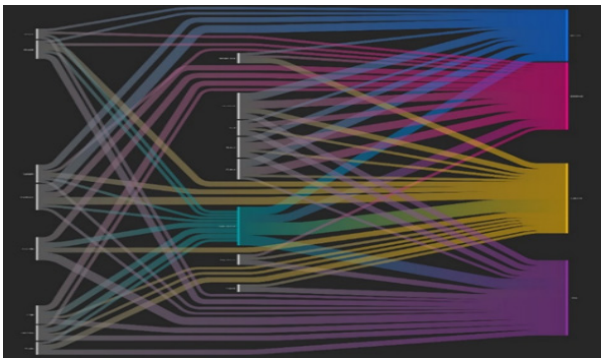

Figure 7. Inductive analysis – Sandkey diagram

CONCLUSIONS

The experience of regenerative livestock farming in Caquetá, Colombia, highlights the importance of integrating technical knowledge and local wisdom to promote sustainable practices. Research shows that although regenerative livestock farming offers environmental, economic, and social benefits, its widespread adoption is limited by a lack of acceptance among conventional producers. Experimentation and education are essential to overcome these barriers and foster a transition to more sustainable production systems. Successful cases in other regions indicate that regenerative livestock farming can be profitable and beneficial, but they require a paradigm shift and a commitment to long-term sustainability.

This research highlights the importance of technical and scientific knowledge. Above all, it highlights the importance of local actors in adopting regenerative practices, thus promoting balanced rural development and ecosystem conservation.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

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