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ORIGINAL

Limitations that livestock producers face during the transition from a conventional livestock model to a sustainable livestock approach

Limitantes que enfrentan los productores ganaderos durante la transición de un modelo de ganadería convencional hacia un enfoque de ganadería sostenible

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ABSTRACT

Conventional livestock farming in Caquetá has generated a considerable environmental impact, evidenced in deforestation, loss of biodiversity and soil degradation. In response to this problem, silvopastoral systems are presented as a sustainable alternative. However, its adoption by producers has been slow and complex. An investigation carried out in the region revealed that producers face multiple obstacles to implementing these practices. Among the main challenges are the lack of technical knowledge about the establishment and management of silvopastoral systems, the high cost of implementation, the scarcity of economic incentives and resistance to change. Furthermore, the lack of technical support and the limited availability of inputs make the transition to more sustainable production models even more difficult. It is essential to strengthen the capacities of producers through training and technical assistance programs, as well as to design public policies that encourage the adoption of sustainable practices and facilitate access to financing. Likewise, it is crucial to involve local communities in decision-making and in building solutions adapted to their needs and realities. Only through a combination of efforts will it be possible to promote the transition towards sustainable livestock farming in Caquetá and contribute to the conservation of natural resources.

Keywords: Technical Support; Economic Barriers; Silvopastoral Systems; Sustainability; Agricultural Transition.

RESUMEN

La ganadería convencional en el Caquetá ha generado un impacto ambiental considerable, evidenciado en la deforestación, la pérdida de biodiversidad y la degradación de los suelos. Como respuesta a esta problemática, los sistemas silvopastoriles se presentan como una alternativa sostenible. Sin embargo, su adopción por parte de los productores ha sido lenta y compleja. Una investigación realizada en la región reveló que los productores enfrentan múltiples obstáculos para implementar estas prácticas. Entre los principales desafíos se encuentran la falta de conocimiento técnico sobre el establecimiento y manejo de los sistemas silvopastoriles, el alto costo de implementación, la escasez de incentivos económicos y la resistencia al cambio. Además, la falta de acompañamiento técnico y la limitada disponibilidad de insumos, dificultan aún más la transición hacia modelos de producción más sostenibles. Es fundamental fortalecer las capacidades de los productores a través de programas de capacitación y asistencia técnica, así como diseñar políticas públicas que incentiven la adopción de prácticas sostenibles y faciliten el acceso a financiamiento. Asimismo, es crucial involucrar a las comunidades locales en la toma de decisiones y en la construcción de soluciones adaptadas a sus necesidades y realidades. Solo a través de una combinación de esfuerzos se podrá promover la transición hacia una ganadería sostenible en el Caquetá y contribuir a la conservación de los recursos naturales.

Palabras clave: Acompañamiento Técnico; Barreras Económicas; Sistemas Silvopastoriles; Sostenibilidad; Transición Agropecuaria.

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INTRODUCTION

As an economic and cultural activity, livestock farming plays a crucial role in developing global, national, and local rural communities. However, it faces significant challenges due to its environmental, economic, and social impact. Internationally, the growing demand for animal products, driven by population growth and changes in consumption patterns, has intensified livestock production. This has generated problems such as deforestation, soil degradation, and environmental pollution, compromising the sustainability of production systems.[1] At a national level, conventional livestock farming is one of the most important sectors of Colombian agriculture. However, its predominance in areas such as the Department of Caquetá has accentuated processes of deforestation and loss of biodiversity, putting Amazonian ecosystems at risk.[2]

The departmental context of Caquetá, where livestock farming occupies more than 50 % of the territory in several municipalities, clearly reflects this problem. Extensive livestock farming practices have replaced large areas of natural forest with pastureland, intensifying soil erosion and limiting the possibilities of implementing diversified agricultural systems.[3] Notably, on the El Jardín farm in the Capitolio de Florencia district, implementing a silvopastoral system as a sustainable alternative demonstrates the producer's initial interest in improving soil quality and diversifying production. However, a lack of technical knowledge and loss of motivation hindered the achievement of the expected results, reflecting the common difficulties in the transition to sustainable models.

In this context, there is a need to analyze the limitations livestock producers face in transitioning from conventional livestock farming to a sustainable model. This study identifies the social, economic, and technical factors influencing this process to propose practical strategies to overcome these challenges. The research focuses on characterizing the producers' knowledge of sustainable livestock farming, understanding their perception of technical support, and evaluating the costs associated with implementing sustainable technologies.

The aim is not only to offer recommendations to support local producers in the transition to a more responsible model but also to contribute to the social and environmental well-being of the region, promoting livestock practices aligned with the conservation of the Amazon territory. This effort is part of the urgent need to adopt integrated and sustainable approaches that mitigate the negative impacts of livestock farming and guarantee its long-term viability.

METHOD

Location

This work was carried out on the El Jardín farm, located in the village of Capitolio, municipality of Florencia, Caquetá, Colombia, at an altitude of 242 meters above sea level and a temperature of 24 °C. The department was classified as the strongest in livestock production in the country. In this context, work was done to understand why producers did not opt for a sustainable production system.

Population

This study involved livestock producers to raise awareness of the silvopastoral system's benefits and yields. It also sought to identify the constraints that prevented producers from adopting an alternative system to conventional livestock production. The study used the El Jardín farm as a specific case, with the help of producer Manuel Martínez, who commented on his experience implementing a silvopastoral system.

Methodological approach

The research adopted a qualitative approach with a descriptive design. This approach sought to identify, describe, and understand the limiting factors in the transition of livestock producers to sustainable systems, specifically in the case of the El Jardín farm in Florencia, Caquetá.

The qualitative approach was appropriate because it focused on exploring the subjective experiences, perceptions, and meanings that producers attributed to their current livestock practices and the barriers they faced in adopting sustainable alternatives.[4] Being descriptive, the objective was to offer a detailed characterization of the situations and factors

that impeded the transition based on collecting and analyzing narrative data obtained through interviews, surveys, and participatory workshops.[5] The challenges faced by producers in the process of adopting sustainable practices were contextualized, providing a clear view of the economic, technical, and social aspects involved.

Paradigm

This research was based on the historical hermeneutic paradigm, which involved a deep understanding of livestock producers' experiences, meanings, and limitations when attempting to transition to more sustainable systems. According to Oñate,[6] the historical hermeneutic paradigm sought to interpret the meaning and motivations of social actors, in this case livestock farmers, to understand the structural, economic, and cultural barriers that hindered the shift toward sustainable livestock farming. This approach allowed us to capture producers' narratives and subjective perspectives, facilitating the analysis of how their practices, knowledge, and resistance aligned or did not align with sustainable production models.

Type of Research

The work was part of a qualitative, descriptive, and exploratory research project that sought to analyze perceptions and constraints to implementing sustainable practices, such as silvopastoral systems, in a specific local context.

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Qualitative research

The approach was qualitative because it focused on understanding and describing livestock producers' perceptions, experiences, and barriers in the transition to a sustainable system. Techniques such as interviews and participatory workshops, typical of this approach, were used to delve deeper into the meaning and significance of social phenomena.[4]

Descriptive research

It was descriptive because the objective was to identify and accurately describe the activities, knowledge, and constraints experienced by livestock farmers when adopting or not adopting sustainable practices. According [5] descriptive research focuses on characterizing phenomena in detail, such as, in this case, the factors that influenced resistance to adopting silvopastoral systems.

Exploratory research

It was also exploratory because it sought to discover and better understand the dynamics underlying producers' resistance to sustainable transition. Exploratory research was used when the topic had not been widely studied in a specific context, as in Caquetá, where the relationship between livestock producers and sustainable systems was investigated.[7]

Approach

The study used a mixed approach, combining qualitative and quantitative data collection. The qualitative approach was based on semi-structured interviews and participatory workshops that explored the perceptions and constraints of cattle farmers in adopting sustainable practices. At the same time, quantitative techniques were used to analyze the costs associated with implementing sustainable technologies and their impact on producers' willingness to make the transition.[8] This mixed approach allowed for a more comprehensive view of the issue, considering both the subjective perspectives of the participants and the objective data related to costs.

Various data collection and analysis techniques were implemented to explore the factors that limited the transition from conventional to sustainable livestock farming on the El Jardín de Florencia farm in Caquetá. These techniques included interviews, surveys, and participatory workshops.

Analysis of livestock farmers' knowledge of sustainable livestock farming

Semi-structured interviews with eight questions were used to collect information from livestock farmers on the El Jardín farm. The interviews focused on identifying the farmers' level of knowledge about sustainable practices and the barriers they perceived to their adoption.

Technical support for livestock farmers in the process of adopting sustainable livestock farming practices

A structured survey with 12 questions was administered to livestock farmers who had received technical support during the transition process. The survey evaluated the effectiveness of technical advice regarding technology adoption and changes in production practices.

Analysis of the costs associated with the implementation of sustainable technologies and their influence on producers' willingness to make the transition

A participatory workshop was held with livestock producers using the participatory cost analysis technique. During the workshop, the costs of adopting different sustainable technologies and perceptions of their profitability and viability were identified.

This methodological approach allowed for a comprehensive assessment of the constraints livestock farmers face on the El Jardín property in their transition to sustainability from the perspective of knowledge, technical support, and associated costs.

RESULTS



Figure 1. Limiting word clouds during the transition from conventional to sustainable livestock farming.

The results of this research reveal that livestock producers' adoption of silvopastoral systems is not solely conditioned by factors related to the landscape unit. In other words, the particular characteristics of the land or region are not decisive when deciding whether or not to implement this technology.

However, when analyzing the perceptions and beliefs of producers, a wide range of factors were identified that influence the transition to more sustainable systems. These perceptions were grouped into several categories, highlighting those related to concepts, constraints, and transition. These constraints, which act as barriers to adopting silvopastoral systems, become the central focus of this discussion (figure 1).

The concept of silvopastoral systems

Silvopastoral systems are presented as a key alternative for improving livestock farming practices and promoting long-term benefits. This system is not only part of natural resources. However, it is also closely linked to sustainability, as it seeks to optimize the use of the environment in a responsible and balanced manner. According to [9] silvopastoral systems integrate trees, pastures, and livestock into a model that promotes productivity and environmental conservation, offering a sustainable strategy for livestock areas.

As a central objective, sustainability is directly related to the benefits offered by silvopastoral systems, including ecological and productive improvements. These benefits are also associated with generating positive results that impact both the environment and society, highlighting their long-term focus. In this way, improvement becomes essential, as it reflects progress toward more responsible and efficient practices in livestock production. According to [6] agroforestry systems, including silvopastoral systems, increase land productivity and contribute to soil regeneration and carbon sequestration, which are essential elements for sustainable development.

The system also includes fundamental components such as trees, which are an integral part of its structure and provide multiple benefits, such as ecological balance and the regeneration of natural resources. In turn, land and humans are closely related, as proper soil management is a direct responsibility of human actions. This link underscores the importance of conscious resource management to ensure sustainability and availability for future generations. According to [10] agroecological practices that integrate elements such as trees and sustainable resource management promote ecosystem resilience and reduce the negative impacts of agricultural activities.

On the other hand, livestock farming, traditionally linked to conventional systems, finds an opportunity to integrate ecological practices in silvopastoral systems. This not only reduces the environmental impact of livestock activities but also reinforces the commitment to natural resource conservation. The ecological approach, present throughout the network, is cross-cutting and connects elements such as benefits, resource generation, and sustainability, consolidating the idea that these practices are necessary to face the current challenges of the agricultural sector.

Finally, it highlights how all these elements are interrelated, showing that the success of silvopastoral systems depends on a comprehensive vision that considers environmental, social, and economic factors. This holistic approach ensures that the benefits of implementing these practices are immediate and long-lasting, guaranteeing sustainable improvements and a positive long-term impact (figure 2).

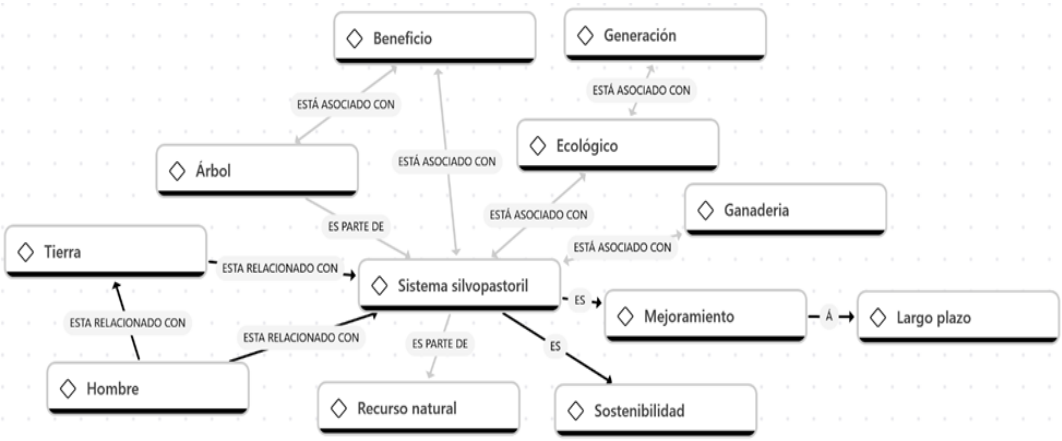


Figure 2. Codes (networks) Concept of SSP

Limitations that prevent transition

The limitations that hinder the transition to sustainable models in the context of traditional production systems encompass the concept of limitations, such as the various factors that interfere with developing projects to generate structural and sustainable changes. Among these factors, change is directly related to the expectations generated by the projects but is also conditioned by challenges associated with adaptation. This adaptation process often becomes a complex challenge for producers, as it involves changing established practices and taking on economic and social risks.[10]

One of the central aspects hindering this adaptation is a lack of knowledge, which leads to a tendency to maintain traditional practices. Deeply rooted in production dynamics, these practices are reinforced by the search for immediate results and often contradict sustainable models' long-term vision. Thus, immediacy and lack of information limit interest in adopting structural

changes.[6] Another relevant element is discouragement, which arises from several interrelated factors. Among them, due to inadequate planning and insufficient support, the debt generated by projects amplifies the perception of risk among producers. This lack of support includes institutional assistance, lack of investment, and weak infrastructure. The absence of solid government backing and policies that encourage this transition reinforces discouragement, making it even more difficult to implement sustainable projects.[11]

Cost is another factor that exacerbates these constraints. The initial investments required to adopt new practices are often high, and producers do not always perceive the long-term benefits as immediate or guaranteed. In this sense, the relationship between discouragement, lack of infrastructure, and the need for investment highlights the importance of financing strategies and government support. (figure 3).

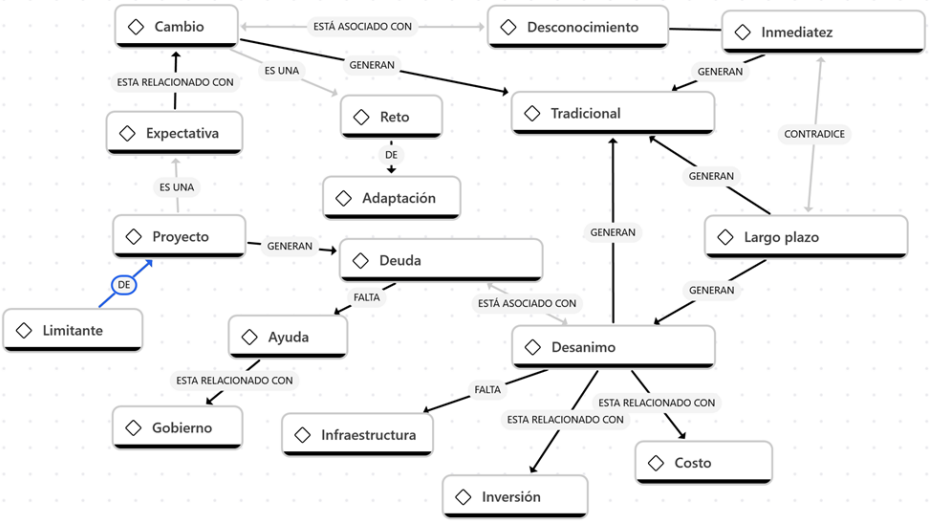


Figure 3. Limiting codes (networks) that prevent the transition from occurring

Elements and interactions necessary for a transition

In this context, motivation is a key factor arising from expectations generated regarding the project's impact. Motivation is directly related to conviction, which is strengthened through appropriate implementation strategies. According to studies, motivation and expectations are essential for overcoming initial barriers in sustainable agricultural projects, especially when these strategies generate a sense of belonging and commitment among those involved.[10] These strategies can generate a continuous improvement process, a central component that includes sacrifice, love, passion, and time. Although intangible, these factors represent the dedication and commitment necessary for progress.

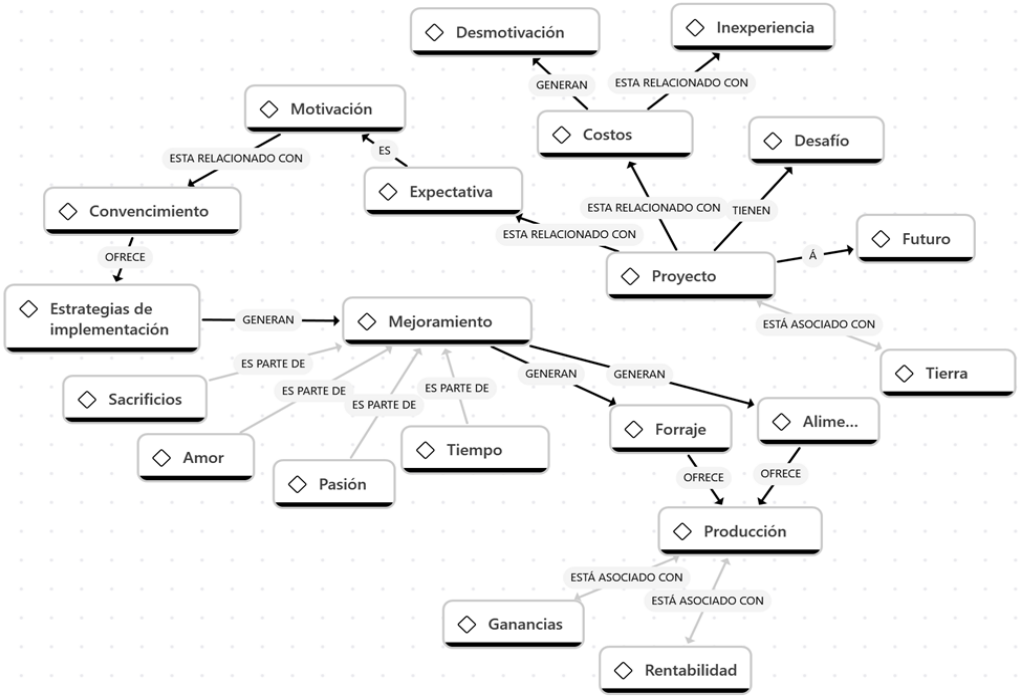


Figure 4. Codes (networks) Elements and interactions necessary for a transition.

On the other hand, implementation faces challenges associated with costs linked to inexperience and demotivation, elements that complicate the development of initiatives. As [6] pointed out, initial costs are often a significant challenge, but they can be mitigated through access to training and adequate financing. Costs are also linked to the challenges inherent in the projects, which affect the relationship with the future and sustainable land use. However, a proper approach to these issues can transform challenges into opportunities.

Improvements include the production of fodder and food, which contribute directly to production. As a result, production is associated with economic gain and profitability, which are fundamental factors in ensuring the sustainability of production systems. In this regard, authors such as [4] emphasize the importance of integrating sustainable production with economic profitability, which improves the quality of life of producers and ensures the conservation of natural resources. In this way, the project positions itself as a link connecting efforts and investments with tangible long-term benefits.[12]

CONCLUSIONS

The transition from a conventional livestock model to a sustainable approach faces multiple internal and external constraints. Internally, producers' lack of experience and technical knowledge, as well as low motivation in the face of the process's challenges, highlight the need to strengthen training and personalized support strategies. These constraints show that, although some producers are interested in adopting more sustainable systems, this interest does not translate into concrete actions due to the lack of adequate tools to address operational and economic challenges.

Externally, the costs associated with implementing sustainable technologies represent a significant barrier, especially in rural contexts with limited financial resources. This creates uncertainty about long-term benefits, making it difficult for producers to commit to sustainable practices. In addition, the lack of infrastructure, clear public policies, and incentive programs exacerbate this situation, reflecting a disconnect between producers' needs and government strategies for sustainable rural development.

In conclusion, the transition to sustainable livestock farming should not be seen solely as a technical challenge but as an opportunity to transform production systems and build a more resilient model that combines financial resources, technical support, and social awareness so that producers can perceive the added value of sustainability in terms of profitability, quality of life, and environmental conservation.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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