



SOY ADVANCEMENT AND ADAPTATION STRATEGIES FOR BEEF CATTLE IN SOUTHERN BRAZIL

AVANÇO DA SOJA E ESTRATÉGIAS DE ADAPTAÇÃO DA PECUÁRIA DE CORTE NO SUL DO BRASIL

Received: 07/19/2020

Accepted: 02/25/2023

Juliana Gomes Moreira¹

Alessandra Matte²

Marcelo Antônio Conterato³

Abstract

Changes in production systems are observed in different rural realities in Brazil, markedly identified through the growing advance of monoculture cultivation. In response to these dynamics, local actors adopt diversified strategies for adapting and reacting to changes. Thus, in the face of a context of transformations caused by the advance of soy in typical areas of natural pastures and livestock tradition, of the Brazilian Pampa, the objective of this article was to identify which adaptation strategies have been adopted by two distinct profiles of beef cattle farmers, Livestock farmers Traditional and Cattle Breeders. The main results point to the diversity of strategies adopted by the interviewed ranchers, who now seek to approach the dynamics of agribusiness, through the expansion of soybean crops, especially in the case of soybean farmers. Now they seem to want to distance themselves from the global market's dependence on agricultural commodities, by means of extensive livestock breeding, especially the traditional livestock farmers. It is concluded that the strategies adopted to expand the areas cultivated with soy in the Brazilian Pampa represent a threat to extensive livestock farming, a traditional activity in that territory, as they greatly contribute to the suppression of natural fields in the biome, thus causing the replacement of natural pastures by cultivated ones.

Key words: Livestock, soy, changes, vulnerability.

¹ PhD student in Rural Development (UFRGS). Porto Alegre – RS, Brazil. Email: julianamoreira1985@gmail.com

² PhD in Rural Development (UFRGS). Professor at the Federal Technological University of Paraná. Santa Helena – PR, Brazil. E-mail: alessandramatte@yahoo.com.br

³ PhD in Rural Development (UFRGS). Professor at the Federal University of Rio Grande do Sul. Porto Alegre – RS, Brazil. E-mail: marcelo.conterato@ufrgs.br

Resumo

Mudanças nos sistemas produtivos são observadas em diferentes realidades rurais no Brasil, marcadamente identificadas por meio do crescente avanço do cultivo de monoculturas. Em resposta a essas dinâmicas, os atores locais adotam diversificadas estratégias de adaptação e reação frente às mudanças. Assim, diante de um contexto de transformações provocadas pelo avanço da soja em áreas típicas de pastagens naturais e tradição pecuária, o objetivo deste artigo foi identificar quais estratégias de adaptação vêm sendo adotadas por dois perfis distintos de pecuaristas de corte, Pecuaristas Tradicionais e Pecuaristas Sojicultores do Pampa brasileiro. Os principais resultados apontam para a diversidade de estratégias adotadas pelos pecuaristas entrevistados, que ora buscam se aproximar das dinâmicas do agronegócio por meio da expansão das lavouras de soja, caso principal dos Pecuaristas Sojicultores, ora parecem querer se distanciar da dependência do mercado global de commodities agrícolas por meio da criação pecuária de forma extensiva, caso especial dos Pecuaristas Tradicionais. Conclui-se que as estratégias adotadas para expandir as áreas cultivadas com soja no Pampa brasileiro representam ameaça à pecuária extensiva, atividade tradicional desse território, por contribuírem sobremaneira para a supressão dos campos naturais do bioma, provocando assim aumento de pastagens cultivadas em restingas de soja em detrimento das pastagens naturais.

Palavras-chave: Pecuária; soja; mudanças; vulnerabilidade

Introduction

Complex changes are occurring in the global agricultural scenario, mainly driven by global economic dynamics. In this context, the grain chain has significant prominence, based mainly on entrepreneurial agriculture, implying the progressive introduction and expansion of monocultures in the Brazilian context, especially soybeans. This grain has become one of the most important commodities in the globalized world, serving as the basis for the production of industrialized foods, animal feed, fuel, and hundreds of industrial products, a phenomenon that explains the expansion of agricultural frontiers and the intensification of activity in Brazil. The rapid and significant growth of areas with soybean crops is changing the landscape of various regions of the country. Thus, since the beginning of the 21st century, the typical landscape of the Brazilian fraction of the Pampa biome, composed of vast natural pastures and livestock activity, has been giving way to a predominantly agricultural landscape, with extensive areas cultivated with soybeans.

Restricted only to the southernmost region of the state of Rio Grande do Sul, the Brazilian portion of the Pampa biome extends over 178,000 km² on Brazilian soil. The Brazilian Pampa is part

of an extensive natural region that covers 750,000 km², encompassing the entire Uruguayan territory, part of Argentina and Paraguay, and harboring a unique and diverse wildlife, with species of plants and animals that do not exist anywhere else on the planet.

Extensive livestock farming represents one of the first and main economic, cultural, and social reproduction strategies of local actors, mainly in regions where the Pampa biome occurs, for more than three centuries. Since the 17th century, cattle ranchers in the Pampa, throughout its entire extension, have coexisted with pasture livestock farming, with the sun as the main source of energy and cattle as the central engine of fiber-to-protein conversion, a system that has coexisted, with relative success, with the vulnerable soil of the Pampa in many areas not suitable for agriculture, but which has been the main productive factor for the development of livestock breeding (PILLAR *et al.*, 2009; BORBA; TRINDADE, 2009; ARBELETCHÉ *et al.*, 2010; MATTE, WAQUIL, 2020).

According to the Food and Agriculture Organization of the United Nations (FAO, 2018), livestock is highly versatile, helping hundreds of millions of people to survive in marginal areas, withstand climate shocks, adapt to changing climate conditions, and contribute to maintaining important ecosystem functions, nutrient cycling, organic carbon sequestration in soil, and agricultural landscape maintenance.

Although the global importance of livestock activity is recognized, and the natural pastures of the Pampas provide an efficient food base for cattle breeding, an accelerated process of productive and socioeconomic transformation has been observed in the region, mainly driven by the growth of soybean and forestry areas. These transformations are not limited to the Brazilian portion of the Pampas, as the three countries where the biome occurs have experienced growth in soybean production.

As soybean cultivation expands throughout the Pampa region over the last three decades, the growing global concern for environmental issues has led to a kind of "blaming" of the livestock industry, initially localized and subsequently globalized. This discourse emphasizes, among the supposed harms of livestock farming, primarily its greenhouse gas emissions with a significant impact on climate change, biodiversity destruction, and the social conflicts that livestock farming can generate, particularly in terms of marginalization and social exclusion of the most vulnerable,

especially in the case of South America (STEINFELD *et al.*, 2006; WOOD, 2015; MORALES *et al.*, 2016; MATTE, WAQUIL, 2021).

In the case of the Pampa biome, livestock farming contributes to the conservation of natural grasslands, as well as the preservation of the way of life based on this activity (PILLAR *et al.*, 2009; BORBA; TRINDADE, 2009; MATTE, SPANEVELLO, ANDREATTA, 2016; MATTE, WAQUIL, 2020). Therefore, given a scenario of productive changes driven especially by agribusiness, significantly modifying the traditional productive systems of the territory of Pampa Gaúcho in southern Brazil, the objective of this article is to analyze which adaptation strategies have been adopted by two distinct profiles of beef cattle farmers, Traditional Livestock Farmers and Soybean Livestock Farmers, in the face of the advance of soybean cultivation in areas of traditional livestock farming.

To achieve this objective, the article is subdivided into three sections. The first presents the productive changes in the state of Rio Grande do Sul; the second discusses how these transformations occurred in the empirical universe of this research; and the third and final section presents some of the strategies adopted by the two profiles of cattle farmers in the municipality of Dom Pedrito, in the state of Rio Grande do Sul, Brazil, where the Pampa biome is present.

Productive changes in southern Brazil: from traditional livestock to the integration of mechanized crops.

Typically composed of fields, animals, and their caretakers, the Pampa landscape has undergone significant transformations, especially since the early 2000s with the increase in the number of hectares devoted to soybean cultivation, which was previously only used for livestock.

Recent data shows that between 2000 and 2017, 1,543,987 hectares were incorporated into soybean cultivation in the Northwestern, Northeastern, Western Central, and Eastern Central regions of Rio Grande do Sul, representing a growth of 54%. In contrast, in the Southwest and Southeast regions of the state, which comprise a large part of the Pampa biome, soybean crops covered 861,601 hectares in the same period, growing by 484%. In the year 2000, only 178,200 hectares were cultivated with the grain in these regions, a number that reached 1,039,801 in 2017 (IBGE/PAM, 2019).

Rio Grande do Sul is the third Brazilian state that exports the most soybeans. In the first quarter of 2018, China was the destination for 2.29 million tons of cargo shipped from the Port of Rio Grande, and soybeans accounted for 87.42% of this movement. The export of soybean meal deserves attention, as it moved 563.9 thousand tons to Slovenia, Spain, Japan, and the United States (EXPORTAÇÕES, 2018). In this scenario, the transformations brought about by soybeans have been directly affecting cattle ranchers. Some of these changes can be observed in the study carried out by Matte (2013) with Brazilian Pampa beef ranchers, in which the author shows that the expansion of silviculture and soybean crops generate situations of vulnerability for beef cattle ranchers.

Although livestock has developed profusely and harmoniously in the natural fields of Pampa, the widespread debate about the damage caused by the activity attributed to all types of livestock, including that practiced in Pampa, has led extensive livestock farming to be seen as one of the villains of agrarian exploitation in the rural world, even though livestock farmers and local actors involved in the activity recognize the productive, environmental, and economic advantages of adequate management and conservation of the natural fields of the biome (MOREIRA; OPPLERT; MACIEL, 2018; SARMENTO; MACEDO; RAMBORGER, 2018).

Beyond the changes in narratives related to livestock, significant technical transformations have also been underway in Brazil since the 1990s. Considering the process of professionalization in Brazilian beef cattle farming and the expressive changes in its production and productivity, this activity has become one of the protagonists of the Brazilian agribusiness, allowing the country to become one of the world's largest exporters of beef by the end of 2003 (BARCELLOS et al., 2004).

However, according to the authors, although the intensification of systems has contributed to better process management, they were only viable when grain and agricultural residue prices were facing a low phase, becoming one of the main short and medium-term strategies to improve efficiency within the farm gates.

In the international scenario, the growth in demand for beef by Asian countries, and at the same time, the decrease in exports to Europe due to the establishment of food safety regulations (especially for beef), had a significant impact on global prices of agricultural products that served as the basis for the improvement of Brazilian livestock systems. These phenomena contributed to the fall in global prices paid for beef, while the growth in demand for vegetable protein caused the price of soybeans to increase (BARCELLOS et al., 2004).

Faced with this conjunctural change with more expensive inputs compared to the prices paid for beef, livestock production systems became vulnerable. However, livestock farmers who intensified their livestock systems supported by crops minimized the impact, considering that the increase in grain prices compensated for the losses generated by beef cattle farming. The same did not happen in livestock systems where cattle farming was the main activity, in which the increase in costs of intensifying technology caused the impoverishment of livestock farmers.

Barcellos *et al.* (2004, p. 7) highlight that "this new conjunctural order configured the so-called agriculturalization of southern Brazil", based on integration with crops, either by the livestock farmers themselves with some agricultural vocation, or by expanding the cultivated areas of those who already practiced some crops with third parties, and also by the possibility of land leasing for farmers who migrated to marginal regions with more accessible land prices.

Before advancing to the Pampa, soy had already been consolidated in other regions of the state of Rio Grande do Sul, mainly driven by land leasing. Andreatta (2009) points out that since the 1950s, the growth of activities related to the wheat-soybean binomial had been causing transformations in the Planalto region, given the advance of this crop over some livestock areas in that region. And in 1985, soy was consolidated in the Center-North and Northwest regions of Rio Grande do Sul, based on the modernization of agriculture in areas previously intended for livestock (ALVES; BEZZI, 2013).

In this context, although livestock farming in the Campanha region has been considered for many decades as a synonym for landowners and unproductive large estates, disregarding the need for larger land areas for beef cattle breeding and the relationship of this activity with the territory, it becomes evident that beef cattle farming was crucial not only for economic purposes, but also for the formation of important social categories in Rio Grande do Sul, such as the ranchers and, although invisible for many decades, the family ranchers. In essence, the family rancher has the tradition of raising animals, holding domain and knowledge of this practice, as recognized by a set of studies developed with this social category (WAQUIL *et al.*, 2016).

Thus, cattle breeders and family ranchers represent the traditional social categories of the Pampa, and to a greater or lesser extent, these actors keep alive a way of life associated with traditional livestock farming, contributing to the maintenance of this activity and consequently the conservation of natural pastures in the biome. In addition to landowners and family ranchers,

livestock farmers closer to agriculture, from other regions of the state of Rio Grande do Sul, constitute a new social category that has been gaining visibility in the Gaúcho Pampa for contributing to changes in the Pampean agricultural space.

According to Andreatta (2009), regional peculiarities are capable of influencing individual strategies of livestock farmers, which are reflected in the organization of agricultural establishments and in the regional dynamics itself. Corroborating the author, a study conducted by Moreira (2019) aimed at identifying the changes perceived by livestock farmers in the face of the advancement of soybean crops, indicating significant differences in individual choices regarding productive strategies between livestock farmers from the Pampa region and those from other regions of the state of Rio Grande do Sul who develop their agricultural activities in this territory.

Named Traditional Livestock Farmers, this group of producers is native to the Brazilian Pampa region, where livestock farming is predominantly a family heritage. Taking into account factors such as tradition, preservation of the Pampa biome, and financial security, these actors organize their activities around beef cattle and sheep farming mainly in native grasslands (MOREIRA, 2019).

On the other hand, the so-called Soybean Livestock Farmers migrated from the central region of the state to the Campanha region due to the availability of large land extensions at attractive prices for purchase and leasing, mainly by landowners who became financially weakened during periods of low yields in beef and sheep farming. In general terms, Soybean Livestock Farmers organize their activities around rice and soybean crops, maintaining livestock farming as a secondary activity (MOREIRA, 2019).

Thus, the specificities of cattle farmers according to their regions of origin greatly influence their individual strategies, causing significant changes in the organization of agricultural establishments and consequently in the regional dynamics of the Pampas, as well as in the perception of changes in beef cattle production in the face of the advance of soybean crops (ANDREATTA, 2009; MOREIRA, 2019).

Regarding strategies, Crow (1989) cited by Schneider (2009) points out that, from an analytical perspective, the interpretation of individual or collective action based on the concept of strategy is related to four main levels: the first level refers to the actions of the State or the choices of the power elites in the face of a certain type of project. For example, the author cites the so-

called "development strategies" adopted by different governments or institutions. The second level concerns the strategies of social interaction of groups and classes, such as the political choices and forms of organization of entrepreneurs, workers, among other social categories, including farmers and cattle ranchers. The third level is related to the strategies of families and domestic groups according to their individual and collective interests and reflect their values and beliefs. The fourth sphere refers to individual strategies, resulting not only from personal decisions and desires, but also from broader relations (SCHNEIDER, 2009).

In this sense, the insertion of soybean crops is considered an external intervention, under the aegis of modernization of agriculture, in livestock areas, greatly influencing the traditional way of life of the Pampas, and from this, such insertion has been transformed through the agency capacity of farmers who adopt different strategies in the context of productive changes. Thus, in order to highlight how different actors involved in the productive dynamics of soybeans and livestock react to productive transformations in the Pampas, the next topic is dedicated to presenting the most representative empirical cut of this context.

Research Methodology

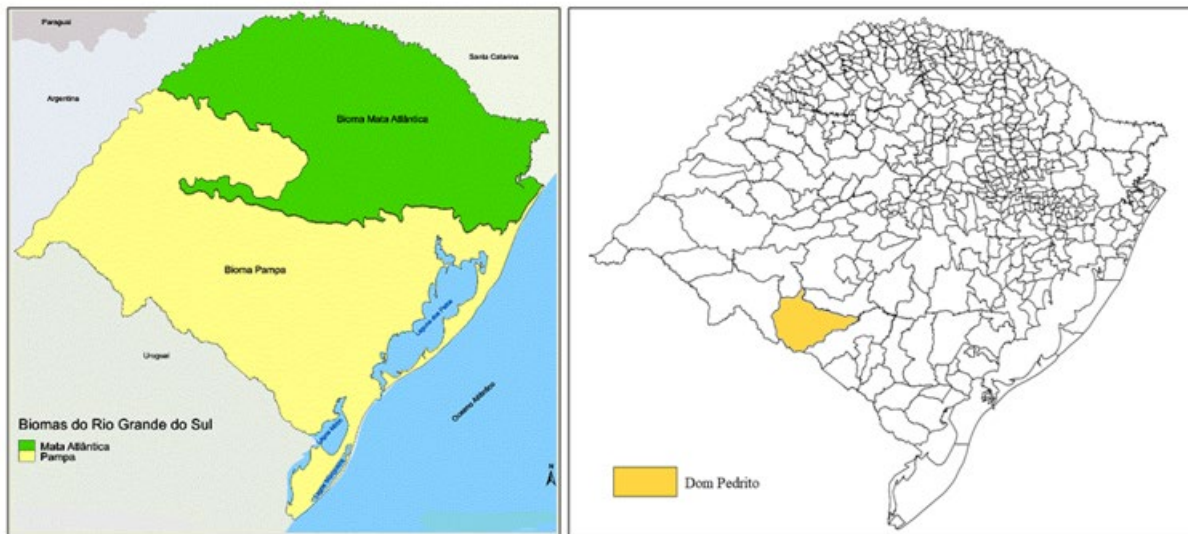
As the empirical focus of this research, the municipality of Dom Pedrito in the southern region of Rio Grande do Sul was chosen. It is located in the microregion of Campanha Meridional, where the Brazilian portion of the Pampa biome is located. The choice of this county is justified by the intense presence of beef cattle farmers and the significant growth of soybean crops in recent years, representing the transformation dynamics in the Brazilian Pampa.

Thus, already in the early 21st century, soybean cultivation has driven a significant change in land use in Dom Pedrito, considering that in a period of just 18 years (2000-2018), the area cultivated with soybeans in the municipality increased from 2 thousand hectares to 100 thousand hectares, while the area of natural grasslands, usually dedicated to livestock activity, decreased by 51,383 hectares in the same period (MOREIRA, 2019).

Although the decrease in natural grassland areas may be an indication of a decrease in beef cattle farming, the number of cattle did not decrease significantly, suggesting a possible intensification in breeding systems. Thus, in the year 2000, the number of cattle in the municipality

of Dom Pedrito was 406,067 heads, and in 2018, it was 317,070, registering a decrease of 88,997 heads in the herd (IBGE/PPM, 2019).

Figure 1 - Location of the municipality of Dom Pedrito - RS.



Source: Developed by the authors based on IBGE (2019).

Regarding the transformations in the socio-economic profile of the producers in the microregion of Dom Pedrito (Campanha Meridional), a study conducted by Andreatta (2009) pointed to the predominance of Consolidated Livestock Farmers and Stationary Livestock Farmers (referred to as Traditional Livestock Farmers in this work) in the region. However, in a recent study on livestock farming in the municipality of Dom Pedrito, Moreira (2019) revealed two types of producers with a profile called Soybean Livestock Farmers (SLF) and Traditional Livestock Farmers (TLF). We chose to use this designation for the selection of interviewees, so three Soybean Livestock Farmers and 11 Traditional Livestock Farmers were interviewed.

This study is characterized as both quantitative and qualitative. The quantitative data consisted of data obtained from secondary sources and the characterization of the interviewees through the use of descriptive statistics. The main instrument for collecting qualitative data was the semi-structured face-to-face interview. According to Gerhardt et al. (2009), the interview is an alternative data collection technique for undocumented data on a certain topic, a social interaction technique used to collect essentially subjective data related to the values, attitudes, and opinions of the interviewed subjects.

The interviews were conducted with a group of livestock farmers that includes establishments of various sizes and organizational forms. In total, 14 interviews were conducted with livestock farmers in the municipality of Dom Pedrito-RS, with the support of EMATER/ASCAR-RS and the Association of Farmers, in the year 2018. A portion of the interviews is part of the data collection for the Global-Rural project - Rural Change and Development in Globalization, coordinated by the Department of Geography and Earth Sciences at Aberystwyth University (UK).

The asymmetry, in terms of volume, between the two groups interviewed in the study is justified by the greater incidence of Traditional Livestock Farmers in the studied microregion, as pointed out by Andreatta (2009), but it highlights the transformation in the socio-economic profile of livestock farmers in this region. Therefore, it was considered that Soybean Livestock Farmers are important agents in the change of the agricultural space of the Brazilian Pampas, which requires a more in-depth analysis. For the analysis of the results, the content analysis method was used, which made it possible to understand the strategies of these producers through the analysis of their responses to the guiding questions.

Adaptation strategies of cattle ranchers facing changes in the Brazilian Pampa.

Given the main characteristics described in section 2, it was possible to identify that the two groups develop distinct strategies in the face of soybean expansion. Therefore, this section is dedicated to the presentation and analysis of results, organized into two subsections, each dedicated to the two types of cattle ranchers analyzed. For both sections, the strategies adopted by producers are presented, demonstrating how ranchers react and relate to the productive and environmental changes generated by the advancement of soybean cultivation in the Pampa biome. Specifically, the study privileged the analysis of how strategies for allocating work and resources are carried out within the two social groups, Soybean Ranchers and Traditional Ranchers, which are guided by moral and cultural values that materialize in various forms and meanings, as pointed out by Schneider (2009).

Adaptation strategies of Soybean Ranchers

Agricultural activities are related to the social identity of Soybean Livestock Farmers (SLFs), as it is through these activities that they self-recognize and are recognized, considering the

socioeconomic profile of these ranchers. Therefore, adaptation strategies revolve around grain crops. However, the Integrated Crop-Livestock System (ICLS), previously considered the most successful strategy by SLFs for optimizing land use by improving feed availability for animals, especially during the winter season, is starting to lose importance due to the high price paid for soybeans.

A study conducted by Andreatta (2009) indicated a trend of intensification of crop activities by the profile of Specialized Crop Ranchers, mainly because, in the period from 2003/2004, the conjuncture was favorable, and the activity largely remunerated the invested capital. The author observes that prices of products derived from crops were favorable, and weather conditions contributed to significant productivity and yield.

In the perception of SLFs, intensification of soybean cultivation has become more viable than livestock activity. The following statements corroborate this argumentation:

It doesn't match soybeans with cattle here in this region [...] You harvest more soybeans, what you gain in cattle you lose in soybeans" (SLF1, 2018).

[...] In recent years, livestock has decreased a lot. Only the more traditional ones remained, those who are really passionate about livestock. Those who didn't have much attachment are switching to soybeans" (SLF2, 2018).

Today the more traditional rancher, he is almost out, he's off. Today we have properties here that we are managing the entire property for the guy, and he is at home receiving payments every two months, he doesn't even know how much I harvest, I'm already paying for the property's control, because doing this, planting, is not for everyone, it's very complicated" (SLF3, 2018).

Among the factors present in the statements of SLFs, it is possible to identify that not only are the properties of these actors being reconfigured to increase the areas dedicated to soybean cultivation, but there is also greater availability of areas for rent by Traditional Ranchers.

Interviewees in this group seek to emphasize the significant financial return from land rental for landowners. However, this reconversion of areas previously destined for livestock activity to soybean cultivation becomes a significant factor contributing to the advance of grain crops, causing a reconfiguration in the agricultural space of the Brazilian, Argentinean and Uruguayan Pampa.

According to Vélez-Martin et al. (2015, p. 130), "due to monetary income obtained in years of favorable weather, many rural landowners have been replacing livestock farming with agriculture", a statement that can help explain the intention of these cattle farmers to invest in crops. What our research results allow us to add is that not only financial aspects determine this

choice, but also the historical relationship with agriculture, a condition that may be facilitating the advancement of this grain cultivation in the region.

However, although the Soybean Farmers claim that there is no process of reducing the areas dedicated to rice cultivation to increase the areas cultivated with soybeans on their properties, the data regarding the production of these two grains draws attention in the municipality of Dom Pedrito. The following statements illustrate the perception of the SLFs:

Soybean doesn't replace rice cultivation. I have rice seedlings, so one year I plant soybeans, and the next year I plant rice, so I keep changing, the area remains the same for both soybeans and rice. In the past, it was only rice, rice, and cattle in the rest." (SLF1, Dom Pedrito, 2018).

Soybeans did not occupy the rice area, on the contrary, they made rice cultivation viable." (SLF2, Dom Pedrito, 2018).

Although the statements claim otherwise, while there was a growth of 98,000 hectares in the area cultivated with soybeans, the increase in the number of hectares destined for rice cultivation was much less significant, expanding by only 10,490 hectares, indicating a possible substitution not only of livestock activity but also of rice cultivation.

However, without the adoption of modern technologies employed in soybean cultivation, the historical relationship with agriculture and the capital available for leasing and buying land in the Pampa would not be sufficient on their own to constitute adaptation strategies to the scenario of soybean cultivation growth.

In this sense, according to Escher (2016), a set of production technologies such as plant breeding with new transgenic seed varieties, soil fertility and management techniques with no-tillage planting, and weed, pest, and disease control with the use of agrochemicals, among others, contributed to the expansion of soybeans in Brazil. However, there is no doubt that the incorporation of more land into soybean production was a decisive factor, as in 2014, the harvested area increased from 14 to 30 million hectares, growing at a rate of 4.3% per year, well above the productivity growth rate. Based on the interviews, it was possible to identify that seed technology, for example, contributed significantly to the expansion of areas cultivated with soybeans. The following statements corroborate this argument:

[...]In the past, this region was not a soybean-growing area. It was a marginal area for soybean cultivation, but as technology advanced, soybeans were planted and it was discovered that they could be produced (SLF1, 2018).

Transgenic crops entered Brazil around 10 years ago, before which there were no transgenic materials available[...]. They were smuggled in from Argentina and were known as "Maradona soybeans". The first transgenic crops to be

cultivated, mainly in Rio Grande do Sul and Paraná, were of Argentine transgenic soybeans until they were approved by the Ministry (SLF2, 2018).

The introduction of transgenic soybeans was what kickstarted development in this region, because before that, there was not much soybean cultivation due to difficulties in controlling invasive plants. [...] Glyphosate was already available at that time as a total herbicide, which effectively cleaned the crops. This was a wonderful development, as soybean production increased and it became economically viable to plant transgenic soybeans (SLF3, 2018).

Corroborating the statements of the SLFs, Oliveira and Hecht (2016) assert that genetically modified (GM) soybean varieties were approved in Argentina in 1995 and smuggled into Brazil, Paraguay, and Bolivia until these governments also approved them between 2003 and 2005. During this period, a set of transnational agrochemical companies began to dominate the soybean seed and agrochemical markets.

According to the authors, the fundamental transformation in technologies and techniques began with GM soybean varieties that were resistant to glyphosate-based herbicides (originally patented by Monsanto as RoundUp and RoundUp-Ready or RR soybean seeds). Thus, the agribusiness of agrochemicals and soy claimed that the RR technological package would simplify production practices, reducing chemical pesticide applications, and increase productivity, thereby reducing production costs and increasing farmers' profits.

Currently, the three main companies - Monsanto, Syngenta, and DuPont/Pioneer - control over 55% of the global soybean seed markets, and this concentration is even greater in South America, where GM varieties predominate. Therefore, the SLFs are also part of the global market for seeds, inputs, machinery, and financial resources employed in the soybean production and distribution system, since their production systems incorporate these production goods.

In addition to seed, fertilizer, and chemical pesticide technologies, SLFs invest considerable amounts in machinery and process technologies, such as precision agriculture. Some of these equipment include irrigation pivots, drones, tractors, and harvesters equipped with autopilot and even laser sensors to measure soil depth, which aids in leveling the soil to standardize the amount of water required for rice and soybean production.

SLFs claim that technology investments do not generate immediate returns, and crop costs have been increasing significantly, which increases the need to seek credit from banks or grain processing industries. Andreatta (2009), analyzing this profile of livestock farmer, highlights that

Specialized Crop-Livestock Farmers, who approach the profile of Soybean Farmers, tend to rely more on credit and financing, whether for working capital or for investment and financing of their activities, which increases the degree of indebtedness.

In this sense, according to Wesz Junior (2014), in addition to concentrating the soybean crushing stage, companies such as Bunge, Cargill, ADM, Dreyfus, and Amaggi have also begun to invest in other stages of the production chain, such as production and sale of inputs, offering financing, technical advice, grain purchase, processing, export of raw soybeans, and sale of goods ready for consumption, a strategy known in the literature as "verticalization of production," which has as its main characteristic the appropriation of the different stages of the chain by the same company. Thus, the SLFs present in the Brazilian Pampas are also part of the long, complex, and globalized soybean chain.

In light of the above, in general, the adaptation strategies adopted by Soybean Farmers are designed to increase soybean areas and productivity at the expense of livestock farming, which is seen as less profitable by these actors. Furthermore, there are indications of a decrease in rice areas in favor of soybean cultivation.

Strategies of adaptation by Traditional Livestock Farmers

In contrast to the previous profile, beef cattle farming is closely linked to the social identity of Traditional Livestock Farmers, as it is through this activity that they recognize themselves and are recognized by others.

Traditional Livestock Farmers organize their productive activities around beef cattle farming, either in combination with agricultural activities or as a standalone operation. Of the 11 farmers interviewed, five have a connection to soybean production, while six exclusively focus on livestock farming. The connection to soybean production for the five farmers is either through leasing their own land for soybean cultivation or leasing land from third parties with soybean residue pastures. These are therefore the main adaptation strategies among producers with this profile. However, with the significant increase in the area of crop production, these strategies are becoming a vulnerability factor for livestock farmers.

A study conducted by Matte (2013) in the municipalities of Dom Pedrito, Bagé, Piratini, and Pinheiro Machado with 60 beef cattle farmers identified that for 57% of the interviewees, the

expansion of activities such as soybean cultivation and forestry over native grassland areas makes it difficult to find temporary areas for livestock, creating a situation of vulnerability for farmers. Therefore, just as Gédouin et al. (2013) found a situation of dependency among producers on the resources provided by leasing small and medium-sized properties in Uruguay, to the detriment of livestock farming, the same context is observed by some livestock farmers in Dom Pedrito.

However, a study conducted by Piccin (2016) in the municipality of São Gabriel, neighboring Dom Pedrito, highlights beef cattle as the main generator of net income for landowners, considering that until the mid-1970s, the sale of sheep wool alone covered all the monetary costs necessary for livestock systems. However, the decline in wool and cattle prices has increased pressure for new alternatives to generate revenue, as the "cow no longer pays the bill," and it is necessary to "increase agriculture" to supplement the household budget, meaning increasing areas designated for commercial crops (PICCIN, 2016).

According to the author, in general, one of the main strategies adopted by landowners during periods of crisis in livestock farming is to sell their land assets and establish themselves in urban jobs or increase crop areas, either through leasing or personal cultivation. In this scenario, due to the need for tenants to increase crop areas, there has been a reconfiguration in power relations between them and landowners, so that landowners have become more dependent on the income from land rental and/or cheap winter grazing.

Corroborating Piccin (2016), the TLF10 asserts that "soybean covers the value [of the lease], they pay more than in livestock, there is a lot of difference, the farmers pay the value that those in livestock do not pay, and end up displacing livestock because of it." In this way, it presents evidence that soybean crops are advancing into areas previously dedicated solely to livestock activities, although the most common narrative on the subject is that crops do not mitigate livestock activity, but rather collaborate with it through cultivated pastures.

In general, the narrative of the asymmetry of profitability between the two activities prevails, since when compared, the profitability of livestock is at a disadvantage, which generates competition in terms of area, leading the livestock farmers of this profile to perceive that they are being "encircled" by soybean crops.

The expression "encirclement by soybean crops" refers to the intention of livestock farmers to express that their properties have as a boundary marker the beginning of the crops. This implies

that the areas adjacent to their property are increasingly cultivating soybeans, so that if before there were fences to limit the crossing of cattle, currently the fence is no longer necessary, although it remains to limit the entry of the crop.

This new productive dynamic results in significant transformations in the productive organization of livestock farmers and directly influences the choice of these actors between remaining only in livestock activity, producing on their own or leasing part of the property area for soybean cultivation, or even replacing livestock activity with grain crops.

The significant growth in the representativeness of soybean-cultivated areas in relation to the total area dedicated to agriculture in Dom Pedrito is capable of offering an indicative of the substitution of other crops, such as rice, denoting a reconfiguration in the relationship between soybean and rice, which was previously complementary and now also becomes a competition. In the perception of livestock farmers, livestock becomes more advantageous if variables such as initial investment cost for soybean cultivation, the risk of crop failure due to the climate in the Pampa region, and especially the loss of quality and the replacement and/or disappearance of natural fields after the removal of soybean areas are taken into account.

In this sense, a study conducted by Ferreira; Andreatta (2011) with the objective of analyzing changes in land use in the municipality of Dom Pedrito-RS showed that even though cattle and sheep prices recovered until 2011, the trend was for an "agriculturalization" of field areas, in which this "migration of areas" for soybean cultivation was largely linked to the expected profitability of the land.

Thus, during favorable crop periods, such as the period from 2001 to 2006, and still unfavorable to livestock, significant rearrangements occurred regarding land use, especially in places where these rearrangements are possible, such as in Dom Pedrito, where livestock has been "relegated" to lower-quality lands (FERREIRA; ANDREATTA, 2011).

Livestock farmers note that cattle farming requires a less significant initial investment than soybean crops, in addition to being an activity that has developed in harmony with the climatic conditions of the Pampa region and contributes to the conservation of the natural grasslands of this biome. Furthermore, the strong connection with the biome is present in the discourse of livestock farmers. The following statements support this argument:

Within the establishment, you won't find soybeans or rice, only native grasslands. That's the important thing about the Pampa Gaúcho, which is being lost[...]What ends up happening is that soybean cultivation requires cultivated pasture (TLF10, 2018).

[...]a little bit because I think (livestock) is a good business. It's not as profitable, but it's also more secure than agriculture. So, you can lose a little bit in terms of price, but it's a product that's in your hands, unlike soybeans that can be affected by drought or other factors, and the investments are much higher, and the production costs are quite scary[...] (TLF2, 2018)."

I used a lot of soybeans for clearing fields for pastures with annone. The advance of annone forced me to take this step of leasing some land for soybeans and then planting pasture after the soybeans[...] I planted soybeans for 5 years and stopped last year. You use very little of the artificial pasture that you make, not to mention that the vegetation you had before is no longer there. So, for this reason, I no longer see any advantage in soybeans, and I don't think it's viable for livestock farmers to switch from cattle to soybeans (TLF4, 2018)."

Regarding the perception of Traditional Livestock Farmers about native grasslands, which are referred to as natural grasslands in this study, Nabinger et al. (2009, p. 175) emphasize that when we talk about the natural pastures of the Pampa, we are referring to "a biome as important as the Atlantic Forest or the Amazon Rainforest," and it is a natural pastoral ecosystem. Thus, its maintenance with livestock represents the best option for sustainable use for food production, especially in areas whose soil use capacity presents high restrictions for use in more intensive agricultural systems, such as annual crops.

From this perspective, the author considers that when the producer opts for leasing for soybeans and does not account for the ecosystem services that are being compromised - because he does not gain financially from maintaining them and, in most cases, does not even know what this means - vegetation and its ecosystem services are unlikely to be maintained.

To obtain a satisfactory financial return from livestock farming, as well as to overcome the lack of land availability, livestock farmers need to adopt strategies that optimize beef cattle production. Some of the strategies adopted by the interviewed Traditional Livestock Farmers are breed standardization - preferably European breeds -, animal load adjustment, and, in some cases, the use of cultivated pastures and/or optimization of the natural pastures of the Pampa biome.

The strategies identified in this research converge with the findings of Matte (2013) in his study conducted in the Brazilian Pampa, which refer to animal management, such as increasing animal stocking rates, maximizing productivity in the areas, traceability, deferred grazing, genetic

improvement of the herd, animal supplementation, and the use of cultivated pastures. Furthermore, for TLFs, the use of natural fields (native fields) in the Pampa is considered one of the most important adaptation strategies to remain in livestock farming, combined with or without cultivated pastures, considering the decrease in feed supply for animals during winter.

The commodity I have is pasture. There have been eight generations on this field, and it's still the same field [...] It hurts me to see these fields. The guys are all deluded with soybeans, but they don't see that their fields will never be the same again" (TLF6, 2018).

I think the main thing for livestock farming would be if there was an incentive, on the part of the government, regarding rational grazing, the Voisin grazing system, which is a cheap technology and yields much better results than traditional grazing technology, which is continuous grazing. I think with Voisin, I can have better profitability than soybeans" (TLF3, 2018).

The traditional livestock farmer [...] is not interested in planting soybeans. He leases an area, outsourcing the planting, as a lease of a specific period of time, and receives a percentage of the soybeans. Then he converts these areas with soybeans into cultivated pastures" (TLF11, 2018).

Thus, the conservation of natural fields on a large scale is only possible with the individual and voluntary decision of each rural landowner, whether small, medium, or large, to continue with pastoral activity (VÉLEZ-MARTIN et al., 2015). In this sense, from a political point of view, the authors observe that in the Brazilian Pampa, concerning extensive livestock farming, it's supposed low productivity and environmental damage on a global scale make the activity unattractive, which, in turn, discourages the creation of public policies for natural fields.

However, it is known that it is in these moments of crisis that the political factor can be very efficient and give strength and weight to influence or even change a dynamic. Therefore, specific policies to support sustainable livestock farming and strengthen the production chain of beef from native fields should be established, ensuring economic, social, and environmental benefits at the same time (MOREIRA; OPPLERT; MACIEL, 2018; VÉLEZ-MARTIN et al., 2015; SEVERO, MATTE, 2020; MATTE, WAQUIL, 2021).

Final Considerations

Although this study was conducted in only one municipality in the Brazilian Pampas, the results achieved point to important indications of significant transformations in beef cattle production in the face of the advance of soybean crops, and that this dynamic is not restricted to

the local level, being part of a global context of disputes over natural resources that transform agricultural spaces, especially those where natural fields are involved.

The strategies adopted by Soybean Livestock Farmers are designed to fit into the dynamics of agribusiness and present a significant degree of homogenization of productive activities, although it is considered that diversifying the range of strategies allows for reducing the instability of the reproduction process caused by possible failures in one of the incomes (crop loss, for example) or by the variability and seasonality of incomes throughout the year.

In the strategies adopted by Traditional Livestock Farmers, a certain degree of production diversification is identified, but they are designed to distance themselves from the dynamics of agribusiness, seeking to decrease dependence on resources controlled by external actors, as well as the conservation of the Pampa biome and the way of life constituted from cattle farming activity.

The main difference in the adaptation strategies adopted by the two profiles is the pursuit of insertion in the international soybean commodity market by Soybean Livestock Farmers, while Traditional Livestock Farmers seem to want to distance themselves from the instabilities of the soybean market and avoid the need to suppress natural fields to increase areas of grain crops, seeking to partially combine cattle farming activity with grain cultivation through land leases and/or use of cultivated pastures in areas previously occupied by crops. Thus, it is considered that there are two main types of adaptation strategies between the two groups, strategies that are constituted based on their socioeconomic profiles.

It is understood as one of the main contributions of this research to highlight the perspective of cattle farmers on the productive transformations in the Brazilian Pampa, given that few studies are dedicated to understanding how the advance of soybean is influencing the strategies adopted by cattle farmers, as well as the social dynamics linked to beef cattle production in this context. In summary, it was possible to identify that cattle farming in the Brazilian Pampa establishes a relationship of either complementarity or competition with soybean crops, but remains resilient to the new dynamics of the Pampas agricultural space.

References

- ALVES, A. L. P.; BEZZI, M. L. A organização espacial da microrregião geográfica da Campanha Meridional/RS: Novas cadeias produtivas na dinamização do espaço. *Caminhos da Geografia. Uberlândia*. V.14, n.48. p 14-26. 2013. Disponível em: <<http://www.seer.ufu.br/index.php/caminhosdegeografia/>>.
- ANDREATTA, T. *Bovinocultura de corte no Rio Grande do Sul: um estudo a partir do perfil dos pecuaristas e organização dos estabelecimentos agrícolas*. 2009. Tese de Doutorado. Universidade Federal do Rio Grande do Sul, Porto Alegre, 2009.
- ARBELETCHÉ, P.; LITRE, G.; H., Morales. *Ganaderia familiar y transformaciones territoriales: El impacto del avance de las monoculturas en el Bioma Pampa*. Disponível em <http://www.augm-cadr.org.ar/archivos/8va-bienal/rm3_rm22i.html>. Acesso em: 26 mar. 2018.
- BARCELLOS, J. O. J. *et al. A bovinocultura de corte frente a agriculturização no sul do Brasil*. Disponível em: <http://www.nespro.ufrgs.br/sysdownloads/arquivos/outros/a_pecuaria_de_e_expansao_da_agricultura.pdf>. Acesso em: 19 jan. 2019.
- BORBA, M. F.; TRINDADE, J. P. P. Desafios para conservação e valorização da pecuária sustentável. In: Pillar, Valério De Patta; Müller, Sandra Cristina; Castilhos, Zélia Maria de Souza; Jacques, Aino Victor Ávila (Org.). *Campos Sulinos – Conservação e uso sustentável da biodiversidade*. Brasília: Ministério do Meio Ambiente, 2009. p. 391-403.
- ESCHER, Fabiano. *Agricultura, alimentação e desenvolvimento rural: Uma análise institucional comparativa de Brasil e China*. 2016. Tese (Doutorado em Desenvolvimento Rural)– Universidade Federal do Rio Grande do Sul. Porto Alegre, 2016.
- EXPORTAÇÕES para a China pelo Porto de Rio Grande crescem 66%: Destaque foi para a soja em grão, que correspondeu a 87,42% da movimentação no primeiro trimestre. Disponível em: <<https://gauchazh.clicrbs.com.br/economia/noticia/2018/04/exportacoes-para-a-chinapelo-porto-de-rio-grande-crescem-66-cjgzpx2043401qolxs3ewg5.html>>. Acesso em: 26 ago. 2018.
- FAO - FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. *Shaping the future of livestock: sustainably, responsibly, efficiently*. Berlin, 2018, 18p.
- FAOSTAT. *Estatística do cultivo da soja*. 2019a Disponível em: <<http://www.fao.org/faostat/es/#data/QC>>. Acesso em: 05/01/2019.
- FAOSTAT. *Estatísticas do rebanho bovino*. 2019b. Disponível em: <<http://www.fao.org/faostat/es/#data/QA>>. Acesso em: 05/01/2019.
- FERREIRA, J. L.; ANDREATTA, T. Mudanças no uso da terra no município de Dom Pedrito – RS. *Anais do Salão Internacional de Ensino, Pesquisa e Extensão*. Resumo expandido. V.3 N. 2. 2011. Disponível em: <<http://seer.unipampa.edu.br/index.php/siepe/article/view/3142>>.
- FONTOURA, L. F. M.; PIZZATO, F. Recordações do Pampa - estudo das transformações da atividade pecuária no Rio Grande do Sul. In: *12 Encuentro de Geografos de América Latina*, 2009, Montevideo Uruguay. *Anais do 12 Encuentro de Geografos de America Latina*, 2009. Disponível em: <<http://www.observatoriogeograficoamericalatina.org.mx/egal12/Geografiasocioeconomica/Geografiaeconomica/81.pdf>>.

GÉDOUIN, Maëlle, et al. Cambios en el sistema agrario y la sociedad rural de una región históricamente ganadera, con la llegada de nuevos usos del suelo. Pampa. n. 9, p.177-205, 2013.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA/ PESQUISA AGRÍCOLA MUNICIPAL – IBGE/PAM. Informações sobre culturas temporárias. Disponível em: < <https://sidra.ibge.gov.br/tabela/1612>>. Acesso em: 12/01/2019.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA/ PESQUISA PECUÁRIA MUNICIPAL – IBGE/PPM. Efetivo de rebanhos por tipo de rebanho. Disponível em: < <https://sidra.ibge.gov.br/tabela/3939>>. Acesso em: 12/01/2019.

MATTE A, WAQUIOL P.D. Changes in markets for lamb in livestock family farming in Brazil. *Small Ruminant Research*, 205, p. 106535, 2021. DOI: <https://doi.org/10.1016/j.smallrumres.2021.106535>

MATTE, A., SPANEVELLO, R.M., ANDREATTAT. Perspectivas de sucessão em propriedades de pecuária familiar no município de Dom Pedrito - RS. *Holos* (Natal. Online), 1, p. 144-159, 2015. DOI: <https://doi.org/10.15628/holos.2015.1964>

MATTE, A., WAQUIL, P.D. Productive changes in Brazilian Pampa: impacts, vulnerabilities and coping strategies. *Natural Hazards*, 101, 2020. DOI: <https://doi.org/10.1007/s11069-020-03934-9>

MATTE, Alessandra. Vulnerabilidade, capacitações e meios de vida dos pecuaristas de corte da Campanha Meridional e Serra do Sudeste do Rio Grande do Sul. 2013. 174 f. Dissertação (Mestrado em Desenvolvimento Rural) – Programa de Pós-Graduação em Desenvolvimento Rural, Universidade Federal do Rio Grande do Sul, Porto Alegre, 2013.

MOREIRA, J. G.; MACIEL R. G.; OPPLERT, M. O. Dilema do Pampa ou Campo Natural/Rangeland: Complexidade do desenvolvimento devido à concorrência pela terra e os recursos naturais. In: *VIII Encontro da Rede de Estudos Rurais, 2018. Anais... Florianópolis, SC: REDES, 2018.*

MOREIRA, Juliana Gomes. Transformações produtivas no Pampa brasileiro: As mudanças na bovinocultura de corte diante do avanço da soja. 2019. 111 f. Dissertação (Mestrado em Desenvolvimento Rural) – Programa de Pós-Graduação em Desenvolvimento Rural, Universidade Federal do Rio Grande do Sul, Porto Alegre, 2019.

NABINGER, C. et al. Produção Animal com base no campo nativo: aplicações de resultados de pesquisa. In: PILLAR, Valério De Patta; MÜLLER, Sandra Cristina; CASTILHOS, Zélia Maria de Souza; JACQUES, Aino Victor Ávila (Org.). *Campos Sulinos – Conservação e uso sustentável da biodiversidade*. Brasília: Ministério do Meio Ambiente, 2009. p. 175-198.

OLIVEIRA, G.; HECHT, S. *Sacred groves, sacrifice zones and soy production: globalization, intensification and neo-nature in South America*. *The Journal of Peasant Studies*, London, v. 43, n. 2, p. 396-418, Mar. 2016.

PESAVENTO, S. J. *História do Rio Grande do Sul*. 4. ed., Porto Alegre: Mercado Aberto, 1985. 142 p. (Série Revisão, 1).

PICCIN, M. B. *Processos sociais de recomposição do patronato rural em terras gaúchas*. In: BÜHLER, E. A.; GUIBERT, M.; OLIVEIRA, V. L. de. *Agriculturas empresariais e espaços rurais na globalização: Abordagens a partir da América do Sul*. Porto Alegre: Editora da UFRGS, 2016. (Série Estudos Rurais).

PILLAR, V. de P. *et al.* (Org.). *Campos Sulinos - conservação e uso sustentável da biodiversidade*. Brasília: Ministério do Meio Ambiente, 2009. 403 p.

SARMENTO, M. B.; MACEDO, I. G.; RAMBORGER, B. M. Serviços Ecológicos e práticas de manejo de campo na visão dos pecuaristas dos Campos Sulinos. In: VII SIMPÓSIO DA CIÊNCIA DO AGRONEGÓCIO, 2018. *Anais...* Porto Alegre, RS, 2018.

SCHNEIDER, S. (2009). *A pluriatividade na agricultura familiar*. Porto Alegre: UFRGS.

SEVERO, C.M., MATTE, A. Políticas públicas para a pecuária no bioma Pampa: análises para Brasil e Uruguai. *Agricultura Familiar (UFPA)*, 14, p. 14-40, 2020. DOI: <http://dx.doi.org/10.18542/raf.v14i1.7732>

STEINFELD, H. *et al.* 2006. Livestock's Long Shadow. Environmental issues and options. FAO Report, 380 p.

VÉLEZ- MARTIN *et al.* *Cobertura e Fragmentação*. In: PILLAR, Valério De Patta; LANGE, Omara (Org.). *Os Campos do Sul*. Porto Alegre: Rede Campos Sulinos, UFRGS, 2015. p. 123-132.

WAQUIL, P. D. *et al.* *Pecuária familiar no Rio Grande do Sul: história, diversidade social e dinâmicas de desenvolvimento*. Porto Alegre: Editora da UFRGS, 2016. (Série Estudos Rurais).

WESZ JÚNIOR, V. J. O mercado da soja e as relações de troca entre produtores rurais e empresas no Sudeste de Mato Grosso (Brasil). 2014. 220 f. Tese (Doutorado em Ciências Sociais) – Universidade Federal Rural do Rio de Janeiro, Programa de Pós-Graduação de Ciências Sociais em Desenvolvimento, Agricultura e Sociedade, Rio de Janeiro, 2014.

WOOD, C. H. Methodological Introduction to the Study of Cattle Ranching, Land Use, and Deforestation in Brazil, Peru and Ecuador. In: Wood, Charles H.; Tourrand, Jean François; Toni, Fabiano (eds). *Pecuária, uso da terra e desmatamento na Amazônia: um estudo comparativo do Brasil, do Equador e do Peru*. Brasília: Editora Universidade de Brasília, p. 15-48.