Cattle Ranching, Fishing, and Ecotourism in the Pantanal

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Embrapa Pantanal

Results from the Virtual Workshop on Fisheries, Cattle Ranching, and Ecotourism in the Pantanal

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Summary

1. Introduction

Humans induced changes in ecosystems dynamics have been dramatically accelerating over the past century with significant and dramatic negative impacts at local and global scales. For example, humans have accelerated the rate of species extinction by 1000 times (Jenkins et al., 2013) which may result in the extinction of a million species over the course of the next century (IPBES, 2019). The human impacts on the climate are further exacerbating negative outcomes for species and ecosystems. An increase of up to 1.50º C in global temperature over the next decades will fundamentally change critical resources that are vital to human well-being and survival (Masson-Delmotte et al., 2019). Moreover, the expected increase in frequency and intensity of extreme climate events, such as droughts, floods, and hurricanes, will incessantly impact resource abundance and distribution, increasing local unpredictability. Innovating sustainable development models is key so that societies can successfully protect biodiversity while providing for their constituent's meet their needs without threatening the availability of natural resources for future generations (Griggs et al., 2013).

The 179,300 km^2 Pantanal wetland is a striking example of sustainable development. The region is one of the most preserved wetlands on the globe, with over 80% of its native vegetation remaining (IBAMA, 2012). It hosts healthy populations of nationally threatened and endangered species such as jaguar (*Panthera onca*) (Cavalcanti et al., 2012), marsh deer (*Blastocerus dichotomus*) (Mourão et al., 2000), and jabiru (*Jabiru mycteria*) (Mourão et al., 2010). Critically, most of the Pantanal (90%) is privately owned by ranchers who raise almost 4 million heads of cattle in the region (Tomas et al., 2019). Also, the local fishing tourism and industry generate millions of dollars and involve thousands of local people, as well as tourists that come to the region every year to fish (Girard & Vargas, 2008), without causing significant negative effects such as overfishing (Chiaravalloti, 2017).

The Pantanal also continues to face serious threats that over time might endanger its ecosystem function and services, biodiversity, and existing sustainable economic activities. While the region has long been touted as a flagship example of sustainable development, increasing overuse, unsustainable cattle ranching techniques, ambitious infrastructure development plans, and cultural changes continue to threaten the Pantanal (Tomas et al., 2019). In this report we examine three aspects of sustainable use of natural resources for the Pantanal: cattle ranching, fishing, and ecotourism. The main goal of this report is to provide an overview of currently ongoing and planned sustainable activities and extract insights about threats, challenges, and opportunities for increasing sustainable use models for the region.

2. Methodology

To examine the possible threats, challenges, opportunities, and solutions for sustainable use of natural resources in the Pantanal, we used secondary information from several official sources, such as the National Forest Service, Environment Rural Dataset, and NGOs data (e.g. Mapbiomas). We also carried out several semi-structured interviews with stakeholders in the region. All interviews were held through virtual platforms to ensure adherence to isolation measures imposed in the country because of the COVI-19 pandemic. We conducted 13 interviews with interviewees from 9 institutions (Association of Professional fishers from the Pantanal, Federal University of Mato Grosso (UFMT), Federal University of Mato Grosso do Sul (UFMS), Brazilian Agriculture Research Company (Embrapa), Refúgio da Ilha (Eco-lodge), Environment Production and Agriculture Secretary of Mato Grosso do Sul (SEMAGRO), Association of Organic Beef (ABPO), 5P and Biofilica.

3. Stakeholder Recommendations

During this workshop, that occurred virtually on August 9th and 10th, 2021, we discussed cattle ranching on the first day; fishing and ecotourism on the second. On the 9th, 44 people from 27 institutions participated, including ranchers, researchers, and people from government and non-government organizations. On the second day, 33 people from 25 institutions participated.

In this report, we present the recommendations first, which are then followed by data summaries and more detailed information on the main themes of the workshop. These summaries provide critical information that further explain and justify recommended actions.

3.1 Cattle ranching

Issue 3.1.1: Scientific and traditional knowledge

- We lack a clear understanding of the native grassland carrying capacity for cattle.

- We lack an integrated and shared vision for the future of the Pantanal in the face of climate change, as well as changing social, economic, and political conditions.

○ Actions:

- Expand and consolidate scientific and traditional knowledge regarding the types of forage resources that contribute to cattle grazing.
- Build a local agenda focused on integrating climate change, socioeconomic, and political scenarios.
- Focus research on measuring carbon and other greenhouse gases emissions that are associated with cattle ranching in the Pantanal.

Issue 3.1.2: Market value of Pantanal beef

- Pantanal beef is not considered high quality due to the extensive grazing area which enables cattle to graze over larger areas reducing the quantity of fat and therefore the flavour.

○ Actions:

- Open new markets for Pantanal beef.
- Establish initiatives that aim to make the Pantanal products attractive to new markets.
- Create an “identification of origin”/”chain of custody” (certification, traceability, and transparency) program in the Pantanal showing how the Pantanal beef protects biodiversity.

Issue 3.1.3: Network of ranchers

- There are several initiatives aiming to create a network of ranchers in the Pantanal. However, most of them did not take off and are based on small groups with no clear role in policies focused on sustainability.

○ Actions:

- Create spaces for ranchers that facilitate a dialogue about ranching, sustainability, and conservation and that provides a platform for a common vision shared by ranchers.
- Promote the engagement of networks (5P, ABPO, etc).
- Expand tax incentives (ICMS, ISS) for the creation of sustainable ranching networks.
- Support from non-governmental organizations for the creation of local networks.

3.2 Fishing

Issue 3.2.1: Community territories, participatory monitoring and citizen science

- We lack an understanding of the location and extent of the territories of the traditional communities that live in the Pantanal. This information plays a key role in developing public policies to increase environmental and economic equity, while supporting biological conservation.

○ Actions:

- Create a network of stakeholders (scientists, local people, citizens) that co-create knowledge throughout the entire research process, from project design to data analysis.
- Expand citizen science initiatives helping communities to better understand their territories, governance structure, and management rules.
- Implement knowledge exchange arenas to ensure dialogue, access to basic rights, such as home, food, health, education, among others.

Issue 3.2.2: Local communities' tenure rights

- Most families of traditional communities who live throughout the Paraguay River have no legal ownership or tenure rights over the areas that they live and use. Some of them have experienced a history of displacement during the creation of the Protected Areas.

○ Actions:

- Part of the land where people live belongs to the government; one effective strategy for increasing equity would be to give land tenure to local people, in which they would pay the Rural Land Tax (ITR) in return. There are different legal ways to do that: such as Terms of Authorization for Sustainable Use, Real Concession of Use, among others.
- Negotiate the use of government land for local people with government institutions, such as the National Institute for Colonization and Agrarian Reform (Incra), the Union Heritage Secretariat (SPU), the Federal Public Ministry, and the State Public Ministry of MT and MS.

Issue 3.2.3: Fishing pressure

- The official government data on fish off-take is inaccurate and does not match fish-off take data collected by local forest police.

○ Actions:

- Implement an effective monitoring system to determine fish off-take, fish population size, and number of active fishermen in the Pantanal.
- Support new legislations/rules that requires private and tourist fishing boats to record and report the amount of fish caught, and the number of people on their boats.
- Develop a capacity-building program for boat pilots that teaches them about the importance of biodiversity and conservation.

Issue 3.2.4.: Promote the participation of local populations in decision-making

- There is little involvement of local people in the development of fisheries' policies.

○ Actions:

- Support the creation of a network of organizations where policymakers can hear local people and other stakeholders.
- Reactivate state fisheries councils to discuss fishery management plans in the Pantanal.
- Support fishermen's own unions.
- Discuss possible common actions at the state level for Mato Grosso and Mato Grosso do Sul States.

3.3 Ecotourism

Issue 3.3.1.: Single information platform

- There is no platform aiming to count the number of tourists coming to the Pantanal, their destinations, and activities.

○ Actions:

- Create an integrated database where hotels, tourist lodges, tourist companies, etc. can constantly up-date information about tourists in the Pantanal.
- Integrate information about tourists for the states of Mato Grosso do Sul and Mato Grosso.

Issue 3.3.2.: Training of local guides

- Tourist guides have limited knowledge on the Pantanal, its biodiversity, and existing conservation initiatives.

○ Actions:

- Include content related to the Pantanal in the school curriculum, enabling the exchange of popular and scientific knowledge, in order to generate appreciation for the region by people who were born and live in the Pantanal.
- Train local guides to increase:

        - Knowledge about the Pantanal and its ecology, biodiversity, and conservation.
        - Professional skills in guiding tourists (e.g., safety, cultural differences, handling difficult situations).
        - Language skills to increase international ecotourism.
    - Enable guides to have access to local tourism packages so they can explore the various attractions in the Pantanal and have a sense of belonging when communicating about the attractions in the Pantanal.

Issue 3.3.3.: Improving access to the Pantanal for tourists

- The cost to access the Pantanal is high and effectively restricts access for most Brazilians and non-wealthy tourists.

○ Actions:

- Encourage visitation in the areas of Public Conservation Units (UC's) in the Pantanal.
- Promoting community-based tourism as a way to develop a more affordable experiences.
- Develop a program that residents have access to tourist attractions in the Pantanal at a low cost.
- Encourage schools to visit tourist attractions with their students.

4. Cattle Ranching

Cattle production in the Pantanal is a central economic activity dating back to early colonization period in the 16th century, though functioning cattle ranches were only established in the mid 1700s (Abreu et al., 2010). Cattle ranching was significantly expanded after military conflict with Paraguay over ownership of the region between 1860 and 1864. In the early 20th century, during the World Wars I and II the Pantanal became one of the most important sources of jerk beef in the world (Garcia, 2009). However, the Patanal's remoteness and inaccessibility along with several failed attempts to better connect the region to major markets has reduced its international importance for beef production (Wilcox, 2009; Kauffman, 2015). Today, the Pantanal is chiefly known for its ability to produce calves for the cattle industry.

- Cattle ranchers occupy around 88.3% of the Pantanal floodplain.
- There are 3360 cattle ranches in the Pantanal floodplain (1544 in MT and 1816 in MT).
- Over 90% of the cattle ranches in the Pantanal floodplain have zero deforestation.
- Ranchers vary from 0.51 hectares to 133,042 hectares. In MT the average size is 2,885 ± 8,062 ha and in MS 5,141 ± 8,164 ha (Figure 1).
- The cattle population is 3.8 million in the Pantanal floodplain. 1 million calves are born every year in the region.
- Cattle ranching generates US$2.5 billion in MS (17% of the state GDP). No data for MT.

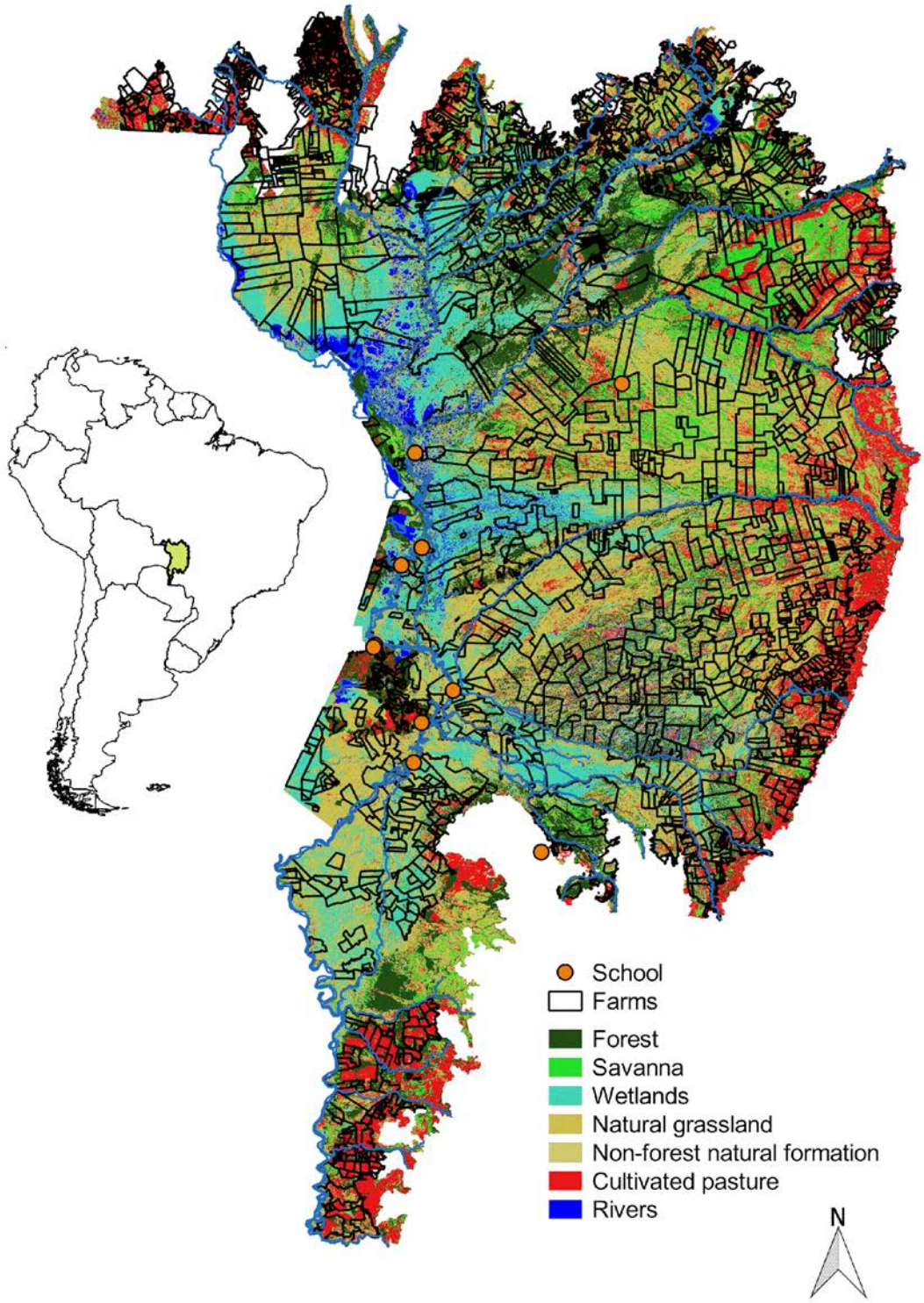

Figure 1: Cattle ranches and land cover in the Pantanal wetland. In red are the areas that were deforested. Data from Mapbiomas Collection 5 2019.

4.1.1. Sustainable cattle ranching

Most of the cattle in the Pantanal is raised over native grasslands. This protects the natural habitats and allows economic development. However, deforestation has accelerated fast in the region, increasing 44% (16,000 ha) by 2020 (Souza et al., 2020). The city of Corumbá, located in the middle of the Southern Pantanal, was among the 50 municipalities in Brazil that saw the highest rate of deforestation in Brazil.

4.1.2. Size of the cattle ranches

During the colonization period, cattle ranches were very large, stretching across millions of hectares. Researchers estimate that the Jacobina ranch, one of the first to Fazendas established in the Pantanal, and Firm ranch, the first cattle ranch created after the war against Paraguay, encompassed over 2 million ha (Garcia, 2009). Over time these large ranches were divided among family heirs at each generation, progressively reducing the average size of cattle ranches in the region. According to some people interviewed, this continued division of ranches among family members has now resulted in ranch sizes that are too small to be economical while following traditional practices of raising cattle on natural pastures. As a consequence, ranchers are forced to intensify their management practices, which frequently means planting exotic grasses to support a larger number of cattle per unit area. To better understand the impact of cattle ranch size on the Pantanal sustainability we analysed temporal changes in cattle ranch size and level of deforestation. We also compared a map of the cattle ranches in the region of Nhecolandia from 1952 to a the current map (2020) of the same region checking whether ranches have reduced the size.

- The size of cattle ranch has no significant effect on the quantity of area deforested within the ranch (p = 0.87).
- In 1952 the region of Nhecolandia encompassed 284 cattle ranches with an average size of 8,378 ha (SD= ± 7,998), in 2000 (current data) there were 405 with an average size of 5,794 ha (SD= ± 6,710 ha) (Figure 2).
- Although our data showed a reduction in the size of the cattle ranches, many of the interview respondents argued that this does not represent the reality, since, currently, many wealthy families and companies are buying-out land and merging small ranches.
- Well-planned management of the cattle ranch might be a more important factor than size in achieving sustainability.

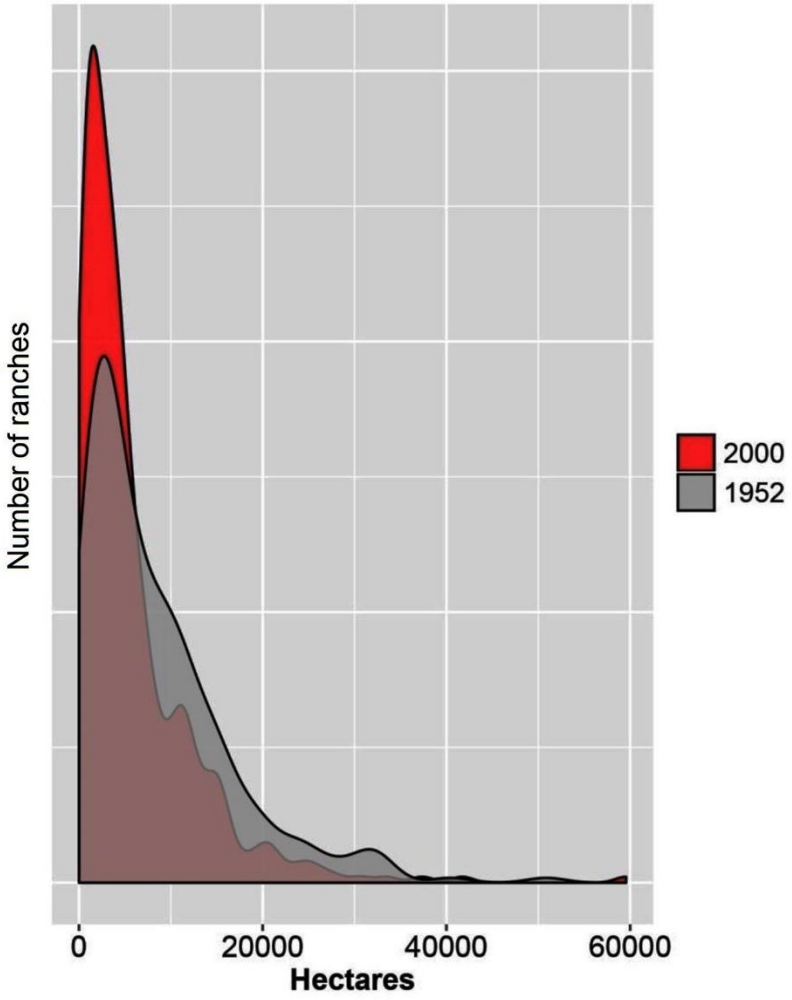

Figure 2: a) Reduction of average ranch size from 1952 to 2000 across the entire Pantanal.

4.1.3. Ongoing sustainable cattle ranching initiatives in the Pantanal

Although, there are growing threats to the sustainability of cattle ranching systems in the Pantanal, there are also several initiatives that promote and celebrate traditional, and more sustainable, practices. Based on interviews with local stakeholders and literature review, we selected some of them:

4.1.3.1. Sustainable Pantanal Ranch (Fazenda Pantaneira Sustentável FPS)

FPS was developed by EMBRAPA with support from universities, research centers, and associations. The main goal is to evaluate ranches based on ecological, economic, and social aspects, identifying where and how ranchers can improve their practices to be more sustainable. To advance this program, Embrapa developed several protocols, that range from the assessing quality of the cattle to measuring landscape diversity (Santos et al., 2017).

Scale of the program

- 15 ranches in Mato Grosso have already incorporated the program and 15 ranches in Mato Grosso do Sul have started to implement.

Advantages

- The program includes ranches that sell the cattle to other ranches and ranches that sell direct to the slaughterhouse[1].
- The program considers social aspects (such as cowboys' well-being and fair contract with employees) in its sustainability index.
- Since most ranches in the Pantanal have no or very little deforestation, the program could be implemented on most properties without the need for large modifications in their production systems.

Challenges

- The program depends on external investors to take off.
- There are no economic benefits in place for ranchers that decide to join the program.
- Some of the protocols may be too complex to be practical, requiring multidisciplinary team of scientists to implement them.

4.1.3.2. Sustainable and Organic Pantanal Beef (ABPO)

The program started with the creation of the Brazilian Association of Organic Producers (ABPO) in 2001 by cattle ranchers in the Pantanal. The main goal was to support ranchers aiming to certify their beef production as organic. In 2018, the state of Mato Grosso do Sul created a program called Support for the Production of Sustainable Beef in the Pantanal (PROAPE) which recognized two types of production: 1) organic beef – beef produced according to the protocols of organic food in Brazil, and 2) sustainable beef – beef produced according to protocols developed by the Brazilian Association of Organic Producers and registered in the National Confederation of Agriculture.

Scale of the program

- 4 properties are registered as organic beef and 12 as sustainable beef in the state of Mato Grosso do Sul.
- Between 250-300 cattle are send to slaughterhouse as organic and around 20,000 as sustainable per year.

Advantages

- Producers of organic or sustainable beef have discounts in the ICMS tax[2]. Organic beef producers have a discount up to 67% and sustainable beef producers of up to 50%.
- The program is part of state political agenda, which increases the chance for the creation of new economic benefits.
- The state government is producing a software to simplify the certification process for both organic and sustainable beef.

[1] most ranches in the Pantanal produce calves and sell then to ranchers outside the Pantanal.

[2] Ranchers pay several taxes. ICMS taxes the trade of goods. Ranches pay 12% of ICMS tax for each cattle sold.

Challenges

- The program is restricted to Mato Grosso do Sul.
- The economic benefit (discount on tax) only directly benefits the beef producers but not the ranches that produce calves.
- The quantity of organic and sustainable beef produced is low, which makes it difficult to sign contracts with large companies to export the beef to Europe or USA.
- The quality of the beef in the Pantanal is not considered “very high” by consumers. According to people interviewed the low-impact nature of traditional cattle ranching in the Pantanal reduces fat and flavor in the beef.
- According to scientists the environmental protocols for sustainable beef are not based on scientific studies.
- The program does not consider social aspects, such as the well-being of the gauchos.

4.1.3.3. Legal Reserve Quotas

According to the Brazilian legislation all landowners must set aside a portion of their properties as a Legal Reserve. This percentage varies from 80% in the Amazon to 20% in the Atlantic Forest. In the Pantanal, the percentage varies because of differences in the legislation between Mato Grosse State (MT; northern Pantanal) and Mato Grosso do Sul State (MS; southern Pantanal). In MT, ranchers have to protect 20% of their properties and in MS the percentage depends on the type of ecosystems. In cases where the landowner has a legal reserve with no native vegetation and does not want to reforest the area, in the State of Mato Grosso do Sul, s/he can buy or rent it from someone else who has more than is required by the legislation. Landowners can buy or rent areas with the same ecosystem characteristics and it does not need to be within the same biome. For instance, someone who has an area in the biome Cerrado can buy / rent an area in the Pantanal as long as both areas are classified as savanna.

Scale

- The program started recently and only few deals have been done.

Advantages

- The Pantanal has most of its native vegetation remaining and a large portion of the region could be sold out or lent to landowners in Cerrado. In other words, it would mean more area is conserved in the Pantanal
- The legislation is already in place and currently does not depend on political will to happen.
- There are a few agrobusiness companies already negotiating legal reserves (e.g. Biofilica)

Difficulties

- The price paid to rent or buy Legal Reserves is considered low by ranchers.
- Only the state of Mato Grosso do Sul has approved the Legal Reserve market.
- There are not many ranchers seeking to buy Legal Reserves.

4.1.3.4. Ranchers Alliance (5P)

Expanding networks of ranchers to support common agendas, organize meetings, and connect legal reserves is key to increasing local sustainability. We highlight the 5P project (Pantanal, Preservation, Ranching (Pecuária), Productivity and Partnerhip). The project started with the purchase of the ranch Santa Sofia with 34,000 ha. Neighbouring ranchers also joined the program, such as the Caiman ranch in Miranda (53,000 ha) and Fazendinha Ranch in Aquidauana (33,000 ha).

The main goal of the 5P alliance is to create an ecological corridor of private ranches focused on the sustainability of the Pantanal. They merge cattle ranching with ecotourism and other sustainable activities. Their aim is to scale their project up, aggregating other ranches in the alliance.

Scale

10 ranchers participate (e.g., BTG pactual, Onçafari, Caiman), 14 properties and over 500,000 ha—an area larger than Grand Canyon National Park in the USA.

Advantages

- Together ranchers have more political power.
- The alliance does not depend on government actions.
- The alliance could be easily scaled up.

Difficulties

- Ranchers that started the alliance are not from the region, and some local ranchers see it with suspicious.
- There is no economic incentive to those that decide to participate.

5. Fishing

Fishing is an important activity in the Pantanal. Archaeological records show that fishing has been practiced in the region since the early occupation by indigenous tribes about 6,000 years ago (Bespalez, 2015). Today most communities that live in the rural areas of the Pantanal practice fishing as their main economic activity. Also, fishing is an important activity for tourism. Thousands of people come to the Pantanal, every year, for sport fishing in the rivers of the Pantanal. Some communities are also part of this activity, providing bait for tourists.

Fishing can be divided into three main categories:1) artisanal and professional fishers who fish to eat and sell fish in markets in the cities, 2) sport fishers who come to the Pantanal to fish, and 3) sporadic fishers (diffuse fishers) who live in cities in the Pantanal and sometimes fish to eat.

There has been a heated debate around sustainability of fishing. In the early 1980s, the fishing sector in the Pantanal was regulated by government policy and several incentives were put in place to support fishers in the region (e.g., fish canneries, support for cooperatives). However, after the mid-1980s most of the support for professional fishers was withdrawn because of worries that these activities had led to overfishing and depletion of wild fish populations. New policies were focused on restricting artisanal and professional fishers (Chiaravalloti, 2017). In Mato Grosso do Sul (MS), Southern

Pantanal, three different laws were passed between 1983 and 1994 forbidding the use of all fishing nets. In the Northern Pantanal, Mato Grosso state (MT) banned fishing nets in 1987 (Albuquerque et al., 2011). In face of the new restrictions, local fishermen were driven to seek alternative livelihoods in the nearby cities or locally, with many starting to work for the tourism trade, as fishing guides (piloteiros) or bait suppliers (Catella et al., 2014). During this period, a new tourism fishing business emerged in the region, rapidly becoming one of the most important engines for the local economy. By 1999, in MS (the only state where they record annual data), 59,000 tourists per year were coming to fish in the region (Catella et al., 2014). However, in the mid-2000s, the number of tourists started to drop (numbers dropped to roughly 15,000 people/year by 2006 in MS). Local companies claimed that there were no tourists because there were no fish, reviving the narrative of local small-scale commercial fishermen's overfishing (Chiaravalloti, 2017). Policy makers supported tougher enforcement, especially for some big fish species and over the use of different fishing gear by local people. Currently there is a debate around completely forbidding fishing the Pantanal, allowing only sport fishing in the region. Below we present the main features of the fishing sector in the Pantanal, the scientific findings about sustainability, possible challenges and initiatives that could support sustainability.

Artisanal / Professional fisher

- There are 9,663 artisanal professional fishers registered in the Pantanal, 6,326 in Mato Grosso and 3,337 in Mato Grosso do Sul
- There are 18 professional fishers' colonies in the Pantanal. They work as fisher's unions and help them with their fishing rights and paperwork to register their catch.
- The artisanal professional sector captured 5 million tons of fish, generating around US$14 million in 2018.

Sport fishing

- There are 92 lodges in Mato Grosso and 50 in Mato Grosso do Sul to host sport fishers coming to the Pantanal.
- Annually there are around 120,000 tourists coming to fish in the Southern Pantanal (Mato Grosso do Sul), and around 100,000 tourists coming to fish Northern Pantanal (Mato Grosso).
- The sport fishing sector generates around 700 direct jobs, from pilots to cooks.
- The sport fishing sector generates around US$16.8 million in the in the Southern Pantanal (Mato Grosso do Sul), and around US$6.5 million in the Northern Pantanal (Mato Grosso).
- Official data in Mato Grosso do Sul point out that sport fishers capture 211 tons per year (Catella et al., 2020). No data for Mato Grosso.

Sporadic fishers

- There are 1.4 million people who practice sporadic fishing, generating around US$270 million per year.

5.1.1. Sustainability

- The most extensive, large-scale study about sustainability of fish population in the Pantanal was conducted between 1994 and 1999 and showed possible signs of over-exploration for Pacu (*P. mesopotamicus*) (Catella et al., 1995). Other studies confirmed these findings (Mateus et al., 2011).

- More localized studies showed no signs of overfishing. In the Amolar region (Alto Pantanal), where both professional and sport fishers are present, the biological integrity index showed a high-level protection (Polaz et al., 2017).
- Studies focused on governance of fishing strategies have shown that communities organize themselves in a way that protect their region from free-riders and overfishing (Chiaravalloti et al., 2021).

5.1.2. Challenges

- In the 1980s and 1990s several Fishing Committees were created to gather scientists, local people, and policy makers to discuss possible government initiatives around sustainability of fishing. However, all committees have ceased to exist, and, currently, public policies do not incorporate suggestions from local groups or scientists.
- The planned construction of over 140 small hydroelectric dams in areas surrounding the Pantanal may drastically impact fish population in the Pantanal.
- Strictly Protected Areas impose severe barriers to fishers' mobility and adaptation. These barriers jeopardize people's livelihoods and food security (Chiaravalloti, 2019)
- Long-term fishing capture data is only available for Mato Grosso do Sul.
- Catch estimates are probably too low. Officially recorded catch data probably represent less than 10% of the actual total catch (personal communication A. Catella).

5.1.3. Solutions

- Replicate fishing monitoring protocols that can fill the information gap in the official fishing data (Amazonas et al., 2020).
- Alliances of fishers and local stakeholders are already in place to stop the constructions of small hydroelectric dams, and they could be scaled up and supported.
- Support critically-needed scientific studies evaluating fish populations, governance structure and impact on local sustainability.

6. Ecotourism

Tourists came to the Pantanal since the end of the 19th century. After the war against Paraguay in 1864, several ranches were set aside in the Pantanal and family members or friends of the local landowners frequently visited the region. In most cases these tourists were after game, aiming to hunt large mammals such as jaguar and giant otter. During this period, tourism was not formalized. In 1964, hunting in Brazil became an illegal activity, ceasing most of the hunting tourism in the Pantanal.

In the mid-1970s and 1980s, with the growing interest in the natural world and the concern about the future of the planet, nature-based tourism or ecotourism started to grow. Around the globe it became one of the most successful business sectors, and, today, some countries heavily depend on the income from ecotourism activities (Lindsey et al., 2020). The Pantanal, however, only slowly started to receive ecotourist. During the 1980s and 1990s most people came to the Pantanal for recreational sport fishing. One of the first ecotourism lodges created in the region was Refugio Caiman, established in late 1980s within the boundaries of Caiman Ranch. However, before the 2000s, ecotourism in the Pantanal did not take off in a major way.

It was only in the early 2000s that new ranches started to engage with ecotourists. In the Northern Pantanal (Mato Grosso) several tourist operators in the Jofre region created one of the most popular spots for jaguar sightseeing. After habituating jaguars to tourists, these ranches now sell "jaguar guaranteed" tourist packages. These three-night stays guarantee the buyer that they will not leave the region without seeing a jaguar. Other regions also saw growth in ecotourism. In the Amolar Mountain range, every year, the landowners organize a competition named Pantanal Extreme during which people must cross the mountain range on foot in a five-day period. Below we present some important information about ecotourism in the region, some challenges, and possible opportunities.

- Ecotourists represents 15.3% of all tourists that come to the Southern Pantanal and 22.4% of all tourists that come to the Northern Pantanal.
- Only 10% of all tourists that arrive in Campo Grande airport go to the Pantanal.
- Only 4.6% of all tourists in the Pantanal come from other countries.
- Jaguar and birdwatching tourism in the Pantanal generate US$6.8 million per year (Tortato et al., 2017).

6.1.1. Challenges

- Ecological dynamics (e.g., mosquitos, flood) create some barriers for tourists to come to the region.
- The National Parks and most Protected Areas (RPPNs) that could receive tourists do not have appropriate infrastructure to facilitate, manage, or guide tourism. However, other areas in Brazil have been successful in doing this, such as the Iguazu National Park in Parana.
- Most tourist packages are expensive and are not attractive to the general public.
- Conflict with large animals (e.g., jaguars) is still present in several regions, may jeopardize animal sightseeing.

6.1.2. Solutions

- Ecotourism lodges located in Southern Pantanal and Jofre generate high income and similar business models could be implemented in other ranches in the Pantanal.
- Awareness about the Pantanal is increasing (e.g., new soap opera named Pantanal will be on the T.V. soon) which will increase the demand for lodges in the region.
- 5P Alliance is already connecting different owners of lodges and could be scaled up or replicated in other regions of the Pantanal.

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