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RESUMEN: Desde los años 70, la inmigración brasileña de tipo comercial para producción de soja fue parte de una masiva deforestación del bosque atlántico en la región oriental del Paraguay. Hoy Paraguay sufre uno de los daños ecológicos mayores y que ha exacerbado el problema de los campesinos sin tierra y la pobreza rural de los pequeños agricultores, quienes han sido removidos por la agricultura comercial mecanizada de gran escala. En contraste, la región occidental o Chaco, de tipo semi-árida, que ocupa el 60% del territorio nacional pero solamente el 2% de la población, se mantuvo en estado natural o relativamente natural básicamente debido a su relativo aislamiento. Este trabajo hace un análisis de los cambios de la tierra en el pasado reciente y actualmente, y propone algunas medidas para proteger la parte occidental del Paraguay o Chaco.

PALABRAS CLAVE: Deforestación, Agricultura, Agronegocios.

ABSTRACT: From the 1970s the immigration of Brazilian commercial farmers producing soybean for export led to massive deforestation of the Atlantic forest in the eastern region of Paraguay. Paraguay suffers major ecological damage and had exacerbated the problem of landlessness and rural poverty as small farm holdings were increasing squeezed out by large-scale commercial agribusiness. By contrast, until recently the semi-arid western Chaco region, comprising 60% of the national territory but only 2% of the national population, had for centuries been largely protected by its relative isolation. This paper makes an analysis of the land-use changes in the recent past and during current days, proposing measures to protect the western part of Paraguay or Chaco.

KEY WORDS: Deforestation, Agriculture, Agribusiness.

Paraguay is one of those unique ecologically countries located at the confluence of six eco-regions: the Atlantic Forest, the Humid Chaco, the Chaco Woodland or Dry Chaco, the Pantanal, the Southern Grasslands and the Cerrado. This gives the country a rich biodiversity in a relatively small territory. The River Paraguay divides the country into two distinctive ecological regions. To the east of the river are the remnants of the Alto Paraná Atlantic Forest, an ecological region containing many endemic subtropical tree species as well as some tropical and some Cerrado and Pampas species. To the west of the river are vast alluvial plains supporting the Chaco Woodland, a habitat for many tree species rarely seen in other eco-regions and home to many endangered animal species. For instance, a reportedly extinct mammal, *Catagonus wagneri*, which is a third species of peccary, was discovered in the Dry Chaco of western Paraguay in 1975 (Wetzel *et al.* 1975). In fact, the Chaco is perhaps one of the most unknown remaining wildernesses on our planet in which one of the last un-contacted group of human beings are remaining.

Rapid forest loss is a major threat to Paraguay's rich biodiversity. The country has experienced a massive reduction in forest cover over the last several decades due to different reasons, but mainly development to offer the world with commodities, agriculture products which in turn benefit the socio-economic increase rates of the country. High rates of forest loss have been reported by international organizations including WWF, TNC and CI. In 1973, 73,4% of the Atlantic Forest region was covered by forest, which was quickly reduced to 40,7% by 1989 and further down to 24,9% by 2000 (Huang *et al.* 2007). By 2010, only around 10% remained, according to Guyra Paraguay and WWF-Paraguay.

Two competing deforestation processes contributed to this rapid forest loss, the first being driven by settlers and the second by large private land owners. During the period 1989–2000, 80% of deforested areas were cleared by private land owners and 20% by settlers. Protected areas did slow

down forest loss within their own boundaries but not in the areas surrounding them, buffer zones have remained in most of cases agriculture with no production restriction limits and a radical boundary between the protected area and the buffer zone, this resulting in non follow-up of international recommendations.

Besides, the protected areas in most of cases have been degraded, most from illegal extraction of natural resources but also some expected from natural degradation because of the isolation effect. The average percentage forest loss in the area within 5 km from the boundary of Paraguay's major protected forested areas was 39% during the 1989–2000 (*op. cit.*). This high rate of forest loss in the areas surrounding the protected areas left the protected areas highly isolated as ecological "islands" but also served as precursors to rapid forest loss within the protected areas themselves. These protected areas are critical to the conservation of the many species that are endemic to or limited to the Atlantic Forest region and surrounding areas.

Despite the dramatic situation described above, an encouraging reversal of this trend has occurred since 2004 as a result of a series of actions taken by the Government of Paraguay with the support of civil society organizations. These actions included: the adoption of a National Environmental Policy, which prioritized the conservation of natural resources; the passage of a Zero Deforestation Law in 2004; and the strengthening of the Environmental Protection Agency (SEAM). As a result of these actions, the rate of deforestation was significantly reduced in 2005 and 2006. The aforementioned Zero Deforestation Law prohibited any land use change and/or conversion of areas with forest cover in eastern Paraguay. Furthermore, the law provides a more conducive environment to continue implementing programs that supports biodiversity conservation in the Atlantic Forest.

The law was approved to organize the country's national authorities to provide incentives for forest protection and "due to the pending modernization of the forest sector",

as this task was not carried out; the law has been twice renewed. According to Guyra Paraguay, the deforestation in the Atlantic Forest from 2006 to 2008 was at least 55,000 hectares, this representing approximately a 5% of forest loss annually. Other sources indicate this is not the true figure, but they forget to mention the law, does not consider holdings of less than 20 hectares subject to the law. Governmental expropriation of forest cover for the land reform program is partly responsible for transforming extensive tracts of forest into small farms, which in turn means that small farmers clear their forest holdings for agricultural purposes.

The massive deforestation and loss of biological diversity are mainly caused by government policies and a legal system that has provided perverse incentives for deforestation in the past, as well as a lack of measures to counteract increased land clearing for logging, livestock production, and large-scale mechanized soybean farming. This has been exacerbated by weak enforcement of existing laws, a lack of coordination in planning at the national and local level, and the impact of inadequate political and economic policies with regard to the country's natural resource base.

Deforestation is also leading to soil erosion, loss of soil fertility, and a decrease in the quantity and quality of water resources, constraining the livelihoods and economic productivity of farmers within the region. Although deforestation and land degradation has been generalized throughout eastern Paraguay, during the last decade and especially after the introduction of the Zero Deforestation Law, an alarming rate of deforestation is now taking place in the Chaco.

Until very recently, the Chaco and in particular the Western Chaco represented one of the last extensive undisturbed wilderness areas in Latin America, with ecosystem processes intact at a landscape level and relatively modest forest changes. However, former extensive forests near a major population center in the Central Chaco have been converted to non-forest land use (Huang *et al.* 2009). As a result, the situation has radically altered, with a minimum estimate rate of deforestation of around 200,000 – 300,000 hectares per year (2005-2012). Land clearance for ranching is now intense, at rates often exceeding 1,000 hectares/day (Guyra Paraguay's monthly reports, www.guyra.org.py).

By mid-2009, 19,1% of the whole Chaco region had already been converted to pasture and licenses to clear had already

been issued to many other land-owners. A recent analysis of economic drivers indicates the very strong likelihood that all suitable land (i.e. land not located within the national protected area system or reserved for indigenous communities or as private protected areas) will have been transformed for cattle production by 2025. This represents a further 550,000 hectares in the east-central Dry Chaco area alone.

Such a phenomenal rate and scale of land use change carries major environmental consequences. The Dry Chaco currently contains rare and specialized biological communities, with many endemic species and many more to know, there are particular areas which have been opportunistically declared protected areas, such as Cabrera-Timane in the northwestern part of the Chaco and Chovoreca, in the mid northern part of the Chaco, which have never been scientifically visited and by less monitored for biodiversity indicators.

The Chaco supports a range of Important Bird Areas (IBAs), which include but are not limited to, all the protected areas. As the birds indicate wider biological importance, the IBAs are also internationally recognized as Key Biodiversity Areas. As further recognition of this international importance, a significant part of the Chaco has also been designated a Man and Biosphere Reserve, named the Biosphere Reserve of the Great Chaco, with the privately owned areas forming the buffer and transition zones. Within this extensive, dry and homogenous environment, many of its special qualities are a function of its scale. Any reduction in landscape connectivity through habitat loss, degradation and fragmentation fundamentally jeopardizes the entire ecosystem and its biodiversity. And this is happening right now, in the eastern part of the Biosphere Reserve, in the area known as "Agua Dulce", deforestation rates for livestock production are alarming.

The Dry Chaco ecosystem is fragile, with real long-term risks of degradation following clearance of the natural vegetation cover and hydrological modification. Loss of soil fertility and raised salinity are two examples, leading to forms of desertification that are already locally evident. Carbon stocks in the dry forest and thicket formations are not negligible. It is estimated that the further deforestation predicted for the Dry Chaco will result in emissions of around 60 million metric tons of CO₂. This figure ignores carbon sequestered by soils and is thus conservative. It also refers solely to the east-central area of the Chaco Region. The other centre of deforestation, in the south-western Dry Chaco,

carries higher carbon stocks in its natural vegetation and the deforestation process is already much more advanced here.

These environmental issues translate into economic risks for the future, not only for indigenous communities who are losing their cultural and natural heritage but also for main-stream economic actors. The Chaco provides the habitat for one of the last indigenous groups avoiding contact with the outside world, the Ayoreo. The transited areas of these People coincide with those containing the most important wealth of biodiversity and the existence of freshwater, either surface or groundwater. These cultural and biological corridors should be kept free from clearance, or else the traditional habitat of these People and the biodiversity associated with their territories will only remain protected in the National Parks. These Parks also lack financial sustainability and sufficient human resources.

The dramatic clearance in the Dry Chaco has prompted widespread concern, both in Paraguay and in the wider world. A series of moratoria on clearance have been proposed but these are only temporary solutions. The general trend, driven by strong economic forces, is inexorable but, depending on the responses adopted, the end-point will be more or less environmentally stressful. The ultimate aim is to promote those measures that produce a land use pattern with a better balance between environmental and economic concerns, to the long-term benefit of all.

To date, the main responses have been legal, especially with some law-enforcement and land use linked to the environmental licensing. The most effective measure, especially when backed by an efficient monitoring system, is the legal requirement to set aside and protect 25% of all forested land on a given land-holding during conversion to cattle-ranching. The selection of the forest so retained is left to the rancher and results in various configurations – e.g. single blocks or geometric strips and patches contributing to stock management. However, this measure is taken at a level of the individual property – it is a clear gain but misses an opportunity for coordination at the landscape scale, something which could vastly increase the environmental benefit without any extra cost to the ranch owner.

Despite the confrontational tone of the debate about deforestation, it must also be recognized that ranchers are not indifferent to environmental arguments. A proposed increase in the set-aside to 40% was rescinded under industry pressure,

perhaps suggesting the limits of regulation, but the 25% legal requirement is now followed scrupulously and indeed often imaginatively. Furthermore individual members of the ranching community are already key co-operators in conserving IBAs on their properties while others have expressed interest in the potential for using carbon credits to maintain more extensive natural cover on their holdings. This raises the possibility of greater use of such incentives as a conservation strategy, in combination with regulatory measures.

Meanwhile, it must also be noted that management funding is seriously deficient for the areas that have already been protected and this is most noticeable in the national protected area system. To be credible, any initiative to decelerate deforestation on private land should be mirrored by improvements in the management of land already conserved. A blanket prohibition on land-use change in the Chaco is not supported by Guyra Paraguay, the leading non-governmental biodiversity organization in Paraguay. Their monitoring has shown that every time an announcement of a particular prohibition, regulation or moratoria for the Chaco has been made, the rate of deforestation has escalated. This suggests that the 2004 zero deforestation law for the Atlantic Forest of Eastern Paraguay may not be applicable for the Chaco.

Without proper control, there is no possibility of advancing towards the sustainable development of the Chaco. The concerns expressed by those with opposing views on what should be done have fed in to a national debate. This debate must ensure the sustainable development of the Chaco and come up with control and monitoring measures that enable key decisions to reduce the rapid deforestation of the Paraguayan Chaco. When it comes to the issue of the economic exploitation of natural resources, it is not permissible to continue the current process without adequate control to ensure the future of the Paraguayan Chaco and thereby of the South American Great Chaco. It is obvious that Paraguay has to develop economically and that there is a lot of potential in the Chaco for producing food, especially beef, to feed our planet.

It is extremely urgent to support sustainable development by a combination of production and conservation of critical areas. Guyra Paraguay has invested significant resources into the generation of fortnightly information on land-use changes in the South American Great Chaco, sharing this information with state authorities and citizens throughout the media. This has generated a broad debate on the future development of the Chaco and has enabled the bringing together of a number

of organizations and groups interested in the development of the Chaco to discuss the matter.

The fact that Guyra Paraguay tracks changes that are taking place does not mean that forest clearances are illegal. The current regulations are a reflection of existing public policy and state action in the Chaco. However, they are insufficient to underpin sustainable development of the Chaco, by which we mean economic growth, improved quality of life, job creation and higher incomes for its entire population, at the same time as protecting the native forest cover that provides the basis for the traditional life of indigenous communities as well as the basis for its rich biodiversity.

There is an urgent need to increase an eco-regional vision in which each case of proposed land development is analyzed and in critical areas to increase the rate of set-aside areas, such as those of bio-cultural importance. There is also the need to immediately implement attractive incentives for forest conservation and all private investment ventures in the Chaco with a corresponding strengthening of monitoring mechanisms.

There is also an urgent need to clearly define procedures to ensure the active participation of forest owners in providing benefits and environmental services for carbon markets and the corresponding payment to them for environmental services rendered. The protection and control of remaining forests, especially in the territories of biological and cultural importance, cannot be underestimated. The rescheduling of the 3001 Law for Payment for Environmental Services (PES) to compensate for the environmental debt of landowners of the Eastern Region may be directed towards the Chaco territory. This could help to conserve the Chaco instead of reforesting the already denuded Atlantic Forest in Eastern Paraguay through plantations, which although of rapid growth, are incapable of recovering the previous wealth of biodiversity. The conservation of forests should become a government priority and the relevant state bodies charged with the conservation and sustainable use of forests should be given the necessary resources to do the job properly. While these changes are taking place and some of these measures are implemented, the existing legislation should be strictly applied.

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