



Aerial view of Pilcomayo watershed, Argentina © Proyungas

Argentina Gran Chaco Foodscape

Halt biodiversity loss through mixed land use



LOCATION: Northern Argentina
SIZE: 7 million hectares

ARGENTINA

SYNOPSIS

Argentina Gran Chaco foodscape, part of the larger Gran Chaco region of South America, has long accommodated a mix of uses, including hunting, grazing, and cropping in a region with high endemic biodiversity. Over the last 30 years, however, global demand for soy and beef has driven the destruction of millions of acres of native habitat and forests and led to rapid and large-scale simplification of this vast, complex landscape.

Such land use conversion – driven largely by demand for soy production – has obvious consequences for biodiversity but also creates risk for the production of food. Forest clearing, for example, leads to greater rates of soil erosion, flooding, and salinity in croplands. In Argentina, the national government approved a Native Forest Law that limits where land conversion is allowed, but illegal deforestation still occurs in response to strong market demand.

GRAND CHACO



FIGURE 1. Map of Argentina Gran Chaco foodscape. The bars represent the most extensive foodscape classes within the foodscape. The color of bars indicates the intensity groups corresponding to those classes: intensive production dominant (dark green) and mixed mosaic food cultivation (light green). The other category includes the classes that each made up <5% of the foodscape area.

Nature-based solutions to land conversion, such as the adoption of agrosilvopastoral techniques – the combination of growing trees, crop production, and grazing cattle – offer the potential to protect Gran Chaco’s traditional mixed-use landscape while still producing its economically important commodities and protecting its globally important biodiversity.

Widespread adoption of policies and practices, including nature-based solutions, to protect the integrity of Argentina Gran Chaco foodscape requires partnership with the agribusinesses sourcing commodities from this region. This highlights the greatest

challenge and opportunity for the Argentina Gran Chaco foodscape: the development of coordinated policy and incentive systems that simultaneously promote the use of diverse practices to foster positive environmental, economic, and social outcomes across a diverse, complex landscape.

DESCRIPTION OF FOODSCAPE

The term *chaco* is suggestive of what makes this foodscape unique. In Quechua, *chaku* means vast hunting area, highlighting that the Gran Chaco has long been defined by multiple land uses that had wildlife living side by side with human use. The

Cattle grazing in the
Gran Chaco, Argentina
© Karina Diarte

broader Chaco, encompassing parts of Argentina, Paraguay, and Bolivia, was a politically cohesive entity up until the mid-19th century. The juxtaposition of rich biodiversity, multiple human land uses, and cohesive regional identity is still a key feature of the Chaco region today.

The entire Gran Chaco is vast and contains part of the Chaco-Pampean Plain, one of the biggest plains on Earth. The Chaco's climate gradient gives rise to a diversity of habitats, from humid forest to dry forest, relatively open grassland, wetland areas, and gallery forests. The Chaco owes its long history as a hunting ground to its high faunal diversity and abundance. Because of the diversity of habitats, key species of the Gran Chaco include those common in humid forests, such as jaguar and tapir, and those common in dry areas including armadillos. The Argentinian Chaco – where the Argentina Gran Chaco foodscape is located – is the global peak of armadillo diversity, with some species only found within the foodscape boundary.

Alongside a diversity of habitats, the larger Gran Chaco landscape includes production systems that range from smallholders focused on local consumption to the large-scale production of grains and animal feed for export markets. However, until relatively recently, large-scale agriculture had historically been pursued primarily in a small area.

But starting in the mid-1990s, growth in local and global demand for beef, feed grain, and biofuels resulted in a dramatic acceleration of agricultural expansion. The Argentina Gran Chaco foodscape represents the most active area of land conversion and includes the boundaries of Argentina's Santiago del Estero, Chaco, and Santa Fe Provinces (FIGURE 1).

CHALLENGES

Since 1976, more than 26% of the dry Chaco has been deforested – an area of around 12 million ha. An additional 1 to 2 million hectares of new conversion are projected to occur by 2030. The majority of land conversion is due to soy expansion. Cattle production has also increased steadily with the majority being cow-calf operations that supply finishing operations farther south, outside of the foodscape. The expansion of livestock has led to forest cover loss as well as degradation of grassland and savanna zones.

Land use conversion threatens biodiversity as well as the productivity of agriculture itself. On the sandier, arid soils of the western Chaco, soil erosion is a major issue. Deforestation also leads to greater soil flooding and increased salinity; native vegetation is lost and evapotranspiration rates decrease, which increases the height of the water table. In some cases, this leads





Livestock in the shade in the Gran Chaco, Argentina
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to greater accumulation of salts in surface soils, with severe negative impacts on crop productivity. Flooded and salty areas are increasing inside the cropped zones, and farmers are more aware of this problem.

Only about 3% of the Argentinian Gran Chaco foodscape is part of formally protected areas, making conventional environmental protection a limited mechanism for addressing land conversion. The main effort to reduce land conversion is the Native Forests Law, national legislation developed by a consortium of partners and adopted in 2007 to regulate deforestation. This law does not ban forest conversion; instead, it limits conversion in certain areas while allowing it in others.

This means that many landowners have the legal right to carry out further land conversion. In addition to legal land conversion, illegal deforestation still occurs, mainly driven by demand for agricultural commodities such as soy. Because of this ongoing deforestation, current laws alone are insufficient to halt and reverse land conversion in Argentina's Gran Chaco foodscape.

BENEFITS AND VALUE OF NATURE-BASED SOLUTIONS IN ARGENTINA'S GRAN CHACO FOODSCAPE

The challenges within Argentina's Gran Chaco foodscape reflect similar challenges in other parts of the Gran Chaco as well as other parts of the world where increasing profits from commodities drive more and faster land conversion. The adoption of nature-based solutions, such as sustainable cropping and ranching practices, can mitigate biodiversity loss associated with land conversion by incorporating native vegetation into production landscapes. These practices can also help restore land that has been

degraded through long-term production.

In grazing systems, incorporating rotational and/or silvopastoral grazing into grasslands increases livestock productivity and minimizes land degradation. Within Argentina's Gran Chaco foodscape, such practices could increase profits by an additional \$3,550 per year for an average farm of 700 ha (Supplementary Material, Archetype A).

In mixed livestock-cropping systems, adding forest buffers and silvopasture to cropped areas – as well as adding cover crops to fields – creates an opportunity to increase net production and provide habitat value. Such a system could increase farm profits two-fold, from \$278,000 per year for a 2,000 ha farm to \$557,000 per year (Supplementary Material, Archetype B).

There is also opportunity for additional revenue streams from the incorporation of natural vegetation, such as carob flour and honey production. Doing so could increase revenue by 50% for small livestock farms that diversify from grazing only to mixed grazing, silvopasture, and honey production in restored forests (Supplementary Material, Archetype C).¹

Across the Argentina Gran Chaco foodscape, mixed land use practices could nearly double farm income, though the costs of transition would be more than current farm profit and would thus require new sources of farm capital (FIGURE 2, p). Efforts to expand adoption of these nature-based solutions within the foodscape are ongoing with a primary focus on providing technical support to farmers and ranchers who may be unfamiliar with these practices.

¹ Simons, Rupert *et al.* foodscapes : Economic Methodology. (2021) doi:10.5281/ZENODO.5550292.

On the policy side, strengthening legislation may also help reduce illegal conversion, but this will likely not halt it entirely, especially since illegal conversion remains profitable and enforcement across such a vast area is extremely difficult. Nature-based solutions that create a productive mixed-use landscape at the foodscape level - including biodiversity protection - offer the potential for a productive agriculture system that also creates habitat for the Chaco's plants and animals, from the abundant to the rare.

Enacting this vision requires collaboration with the private sector, which shapes its sourcing approach to create an economic signal for land managers using sustainable practices. The Vision Sectorial para el Chaco is an example of such an approach where environmental nonprofits and soy traders have collaborated on a vision of how to reduce deforestation.



AGGREGATION OF ARCHETYPES TO THE FOODSCAPE LEVEL



FIGURE 2. Summary of economic analysis for Argentina's Gran Chaco Foodscape. Disaggregated costs & benefits toward \$216 million net benefits from several farm archetypes: Starting with baseline current farm profits (grey, far left), the diagram shows proposed future on farm benefits and costs (dark blue), totaling farm net benefits of \$US 216.65 million (light blue, middle). Additional public off farm benefits and costs (light green) added

to and subtracted from farm net benefits equals \$US 216.77 million total net benefits (light blue, far right). Other impacts are qualitative assessments of other ecosystem service benefits. The change in area of nature-based solutions associated with the farm archetypes is represented in the boxes. See Supplementary Material for a description of methods.¹

Giant anteater pup at La Paya National Park, Argentina
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