PARAGUAY

TEKOHA HA AKÁRAPU'Á KATUIRÃ Mokomondaha
Ministerio del AMBIENTE Y DESARROLLO SOSTENIBLE

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Paraguay de la gente

UNDP

NDC PRIVATE SECTOR ENGAGEMENT PROJECT

Engaging private sector in NDC implementation – Assessment of private sector investment potential in the agriculture sector

September 2020

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Authors:
Samuel Alterescu, Deloitte Tohmatsu Financial Advisory LLC
Raymond Caguioa, Deloitte Tohmatsu Financial Advisory LLC

Reviewers:
Michael Comstock, UNDP
Ryo Tsujimoto, Deloitte Tohmatsu Financial Advisory LLC

Technical oversight and guidance:
Alexandra Soezer, UNDP

Technical support and contributions:
Louis Nunes Da Costa, UNDP

Editor:
Leah Brumer

Produced by:
Deloitte Tohmatsu Financial Advisory LLC

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Jason T Quirk

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ACRONYMS

BAU	Business as usual
BUR	Biennial Update Report
CAPPRO	Paraguayan Chamber of Processors of Oilseeds and Grains (Cámara Paraguaya de Procesadores de Oleaginosas y Cereales)
CO_2	Carbon dioxide
ESG	Environmental, social and governance
GDP	Gross domestic product
GHG	Greenhouse gas
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
LULUCF	Land use, land-use change and forestry
MAG	Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganadería)
MERCOSUR	Southern Common Market (Mercado Común del sur)
MNC	Multinational corporations
MSMEs	Micro, small and medium enterprises
N_2O	Nitrous oxide
NDC	Nationally Determined Contributions
NPL	Non-performing loans
PND	National Development Plan (Plan Nacional de Desarrollo)
PPP	Public-private partnership
PYG	Paraguayan guaraní
SME	Small and medium enterprises
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
US$	United States dollar
VAT	Value-added tax
VRA	Valuable rate application

1. INTRODUCTION

Transforming Nationally Determined Contributions (NDCs) into tangible actions that lead to long-term zero-carbon and climate-resilient development requires financing. Access to finance is fundamental to realize the objectives set by the NDCs. However, countries continue to face challenges in securing the financial resources needed to achieve their NDC targets.

To support the transition to low-emission and climate-resilient development, private sector resources must be mobilized to address the shortfall in public investment. The adoption of the Paris Agreement provided a strong policy signal for private sector investment in climate finance. The development of NDCs has also provided numerous investment opportunities for the private sector. In 2015, private sector investment reached US$299 billion, before falling to $242 billion in 2016 as a result of both reduced technology costs and lower capacity additions in some countries.[1] Of this amount, project developers are by far the largest provider of climate finance, with investments totalling $125 billion in 2016.

Broader-scale investment is are needed to achieve the objectives in the NDCs and the Paris Agreement. For example, estimates project that $23 trillion in public and private investment will be required. Given the magnitude of financing needed, the majority must come from the private sector.[2] Ensuring the transition to low-carbon agriculture, forestry, water and waste sectors, among others, will require additional capital. Global estimates of cost climate change adaptation could rise to between $280 billion and $500 billion per year by 2050, with higher costs possible under higher emission scenarios.[3]

To bridge this financial gap, it is important to understand the private sector stakeholders engaged in markets and industries and which financial instruments and services are available to technology providers, technology users and capital providers.

Private sector players have a significant potential to participate in climate finance and climate actions in developing countries and emerging economies. These players include multinational corporations (MNC) and financial institutions. Small and medium enterprises (SME) will also be mobilized in these countries. However, these players face a number of barriers to investing and engaging in climate actions, such as financial barriers, technical limitations and regulatory barriers.

This report estimates the private sector investment potential for delivering NDC sectoral targets for the agriculture sector in Paraguay. Section 2 of the report assesses greenhouse gas emissions and climate targets in relation to the agriculture sector. It also presents the importance of the agriculture sector for emission reductions in Paraguay and targets. Section 3 focuses on the enabling environment, providing an overview of the main policies relevant to private sector investment and agriculture, and assesses the macroeconomic risks and business environment.

Section 4 assesses investments in Paraguay's agriculture sector and provides an overview of the main challenges for private sector investment in the soybean and cattle value chains. Section 5 analyses private sector investment potential in the agriculture sector in Paraguay by value chain. Section 6 presents the reporting framework to align business opportunities with Paraguay's NDC targets in the agriculture sector and the SDGs.

1 Climate Policy Initiative. October 2017. *Global Landscape of Climate Finance 2017.*
2 NDC Partnership. *Unlocking private finance to help governments achieve their climate goals.* **http://ndcpartnership.org/unlocking-private-finance-helps-governments-achieve-their-climate-goals**.
3 Sustainable Development Goals. 2016. *UNEP: Cost of adapting to climate change could hit $500B per year by 2050.* **https://www.un.org/sustainabledevelopment/blog/2016/05/unep-report-cost-of-adapting-to-climate-change-could-hit-500b-per-year-by-2050/.**

2. GREENHOUSE GAS EMISSIONS AND CLIMATE TARGETS

Paraguay is a relatively low emitter of greenhouse gas (GHG) emissions, with total emissions estimated at 51,293.28 gigagrams of carbon dioxide equivalent (Gg CO_2e) in 2015. The country's contribution to global emissions is also relatively low, at 0.09 percent of total emissions in 2012.[4] This is a very small share of total emissions from the Latin America and Caribbean region, which represented 10.74 percent of global emissions in 2012.

Despite that low contribution, emissions from specific sectors, such as agriculture, have been increasing since 1990. Paraguay submitted its NDC in October 2016 and is committed to prepare, publish and update its GHG emissions inventory as part of its national communications every three years. The inventory is essential to understand the current state of emissions, compare the results at both regional and international levels, and assess the evolution over the years.

Emissions from Paraguay's agriculture sector represented approximately 53 percent of total emissions in 2015, making it the country's highest emitting sector, and those emissions have been rising steadily. This correlates with increasing soybean production and production in the cattle value chain. Achieving emission reductions in the agriculture sector is therefore essential to achieving Paraguay's climate objectives.

This section presents Paraguay's GHG emission profile and those emissions from the agriculture sector. It also details the agriculture sector objectives included in the NDC and other climate policies.

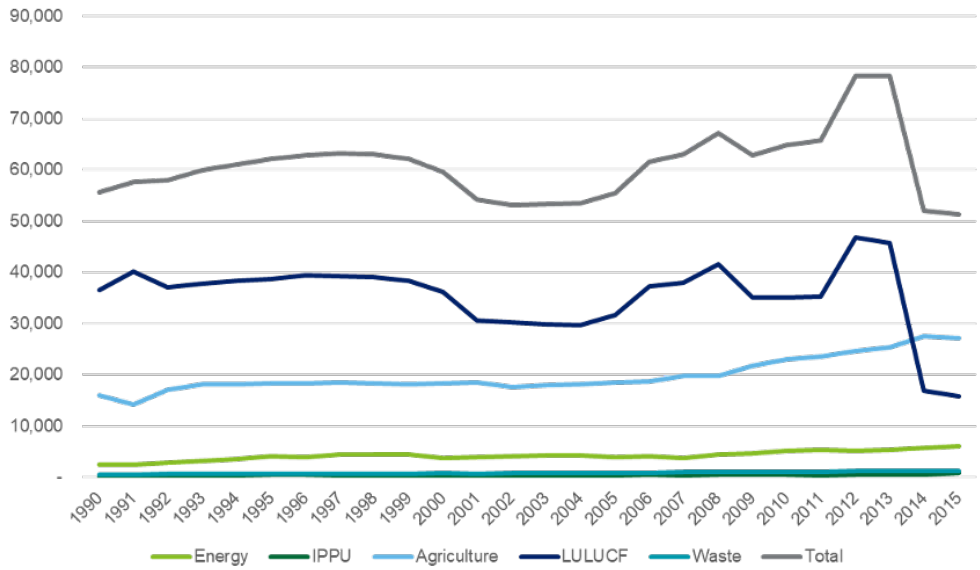
2.1 OVERVIEW OF PARAGUAY'S GHG EMISSION PROFILE

Paraguay's National Greenhouse Gas Inventory was conducted for the period 1990-2015 using the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines.[5] The inventory includes anthropogenic emissions by source and removals by sinks of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorocarbons (F-gases) and sulphur dioxide (SF6) in the land use, land-use change and forestry (LULUCF), agriculture, energy, industrial processes and product use (IPPU), and waste sectors. It is important to note that the GHG inventory, as presented in the biennial report, reports agriculture, forestry and other land uses (AFOLU) as two separate sectors: LULUCF and agriculture.

Total net national greenhouse gas emissions were estimated at 51,293.28 Gg CO_2e in 2015, or 8 percent below emissions reported in 1990. This represents emissions of 0.9 tons CO_2e per capita, which is considerably lower than the 3.1 tons CO_2e per capita average in Latin America and Caribbean countries.[6] This emissions decrease is due primarily to decreasing estimated emissions in the LULUCF sector, which fell by more than half from 2013 to 2014.[7] However, emissions in the agriculture, energy, IPPU and waste sectors have increased since 1990. Figure 1 provides details of the changes in GHG emissions between 1990 and 2015.

4 The World Bank Group, 2020. World Bank DataBank, Total greenhouse gas emissions (kt of CO_2 equivalent), 2012 data.
5 Republica del Paraguay, 2018. *Segundo Informe Bienal de Actualización Sobre Cambio Climático Ante la CMNUCC.*
6 The World Bank Group, 2020. World Bank DataBank, CO_2 emissions (metric tons per capita), 2014 data.
7 The decrease in the LULUCF sector is due to a change in the calculation method and to recalculations of emissions in the sector.

Figure 1: GHG emissions in Paraguay (Gg CO_2e) by sector (1990-2015)



The agriculture sector is the most significant source of greenhouse gas emissions in Paraguay. In 2015, it generated 52.90 percent of total national emissions, followed by LULUCF, with 30.72 percent, and the energy sector, with 12.03 percent. The remaining two sectors represent less than 5 percent of the country's total greenhouse gas emissions. Table 1 provides details of GHG emissions and sectoral percentages in 2015.

Table 1: Paraguay's GHG emissions (2015)

SECTOR	TOTAL EMISSIONS IN Gg CO_2e	PERCENTAGE
ENERGY	6,171	12.03
IPPU	931	1.82
AGRICULTURE	27,133	52.90
LULUCF	15,755	30.72
WASTE	1,303	2.54
TOTAL EMISSIONS	**51,293**	**100**

Source: Republica del Paraguay, 2018. Segundo Informe Bienal de Actualización Sobre Cambio Climático Ante la CMNUCC

Emissions from the LULUCF sector are due primarily to emissions and removals from croplands (arable and tillage land, rice fields, and agro-forestry systems), and totaled 37,226.36 Gg CO_2e in 2015, or 94 percent of gross emissions from the LULUCF sector.[8] These emissions, combined with those from the agriculture sector, show the importance and potential of the agriculture sector for climate change mitigation in Paraguay.

2.2 PARAGUAY'S AGRICULTURE SECTOR AND ITS GHG EMISSIONS

Paraguay's landscape combines plains with slight hills, with the highest elevation barely reaching 780 metres over sea level.[9] The country is divided into an eastern and a western region. The eastern includes 39 percent of the land and is home to 97 percent of the population. Most of the country's agriculture activity is based there.[10] The western region is home to the Chaco dry forest, the largest reserve of ecological resources in Paraguay. Livestock is the dominant activity in the west.

The value chain structure in Paraguay is defined by the amount of land that farmers own. Law 2419, which created the National Institute of Rural Development and Land, defines family agriculture as conducted primarily for own consumption and to supplement other sources of incomes. Commercial agriculture is defined as aiming exclusively at commercial profit. Producers who own fewer than 50 ha of land are usually

8 Forest land accounts for -23,780.60 Gg CO_2, which reduces the overall amount of emissions in the LULUCF sector.
9 World Bank Group, 2015. Paraguay Agricultural Sector Risk Assessment. *Identification, prioritization strategy and action plan.*
10 Ibid.

defined as family producers.[11] According to the latest agricultural census, conducted in 2008, more than 90 percent of producers held less than 50 ha of land. The remaining producers – less than 9 percent – owned more than 90 percent of the land.

The same holds for cattle. Small livestock producers, or small livestock farmers, represent 83 percent of total producers and provide 13 percent of total production. Their herds usually number fewer than 100 head and produce primarily dairy products, rather than meat. Medium-sized livestock farmers represent 14 percent of all farmers and generate 15 percent of production. Their herds number between 100 to 500 head. The largest producers represent only 3 percent of total livestock farmers, but supply 61 percent of total production, with herds of more than 500 head.[12]

Paraguay's agriculture sector represents 18 percent of the national economy and, after adding its contribution to other sectors – such as agroindustry - more than 41 percent. In 2018, the agriculture and livestock sectors represented more than 51 percent of the country's exports, with agricultural products representing the largest share, followed by meat products and processed oils (composed largely of soybean oil). Table 2 shows the main export products.

Table 2: Paraguay's main exports by value (2018)

CATEGORY	VALUE OF EXPORTS (US$ MILLION)	% OF TOTAL EXPORTS
Meat products	1,178.251	13.03%
Dairy products	13.181	0.15%
Other products from animal origin	72.788	0.80%
Agricultural products	2,857.910	31.61%
Oils	511.223	5.65%
Of which soybean oil	469.237	5.19%
TOTAL EXPORTS	**9,042.141**	**100.00%**

Source: Paraguay Central Bank's statistics for commerce, accessed December 2019

According to data from the Agriculture Census and Statistics Directorate (DCEA) of the Ministry of Agriculture and Livestock (MAG), most agriculture production is concentrated in three crops: soy, maize and wheat. Between 2009/2010 and 2011/2012, they occupied, on average and respectively, 56 percent, 18 percent, and 12 percent of planted area with seasonal crops. These crops are cultivated in rotation and may therefore be planted on similar areas, highlighting their importance for Paraguay. This information is also in line with the latest data provided by FAOSTAT for 2017, detailed in Table 3.

Table 3: Main crops harvested in Paraguay (2017)

CROP	AREA HARVESTED (HA)	% OF AREA HARVESTED	PRODUCTION (TONS)	% OF PRODUCTION
Soybeans	3,380,000	58.66%	10,478,000	36.11%
Maize	940,000	16.31%	5,155,900	17.77%
Wheat	510,000	8.85%	1,020,000	3.52%
Cassava	182,000	3.16%	3,166,800	10.91%
Rice	140,000	2.43%	924,000	3.18%
TOTAL	**5,761,956[13]**	**100.00%**	**29,016,133**	**100.00%**

Soybean production is highly mechanized and is grown on medium-sized and large plots of land. More than 44 percent of farms are larger than 1,000 ha, 43 percent are between 100 ha and 1,000 ha, and only

11 International Food Policy Research Institute, 2018. *Agricultural Growth, Efficiency, and Family Agriculture in Paraguay.*
12 World Bank Group, 2015. Paraguay Agricultural Sector Risk Assessment. *Identification, prioritization strategy and action plan.*
13 As these crops are cultivated in rotation, their combined production area is higher than the available agricultural production area in Paraguay.

13 percent are smaller than 100 ha.[14] Most cultivated areas are planted using the direct seeding technique, which was introduced in Paraguay on medium-sized and large mechanized farms in 1990.[15] In good years, soy productivity is high and comparable to the other major soy-producing countries in South America. In 2017, productivity stood at around 3,100 kg/ha in Paraguay, close to the yields obtained in Argentina (3,171 kg/ha) and Brazil (3,377 kg/ha).[16]

Beef production in Paraguay has increased significantly in recent years due to substantial improvements in animal genetics, which have allowed entry into new markets and the sale of beef export products at better prices.[17] Paraguay's cattle is raised on pastures and natural fields; feedlots are almost never used.

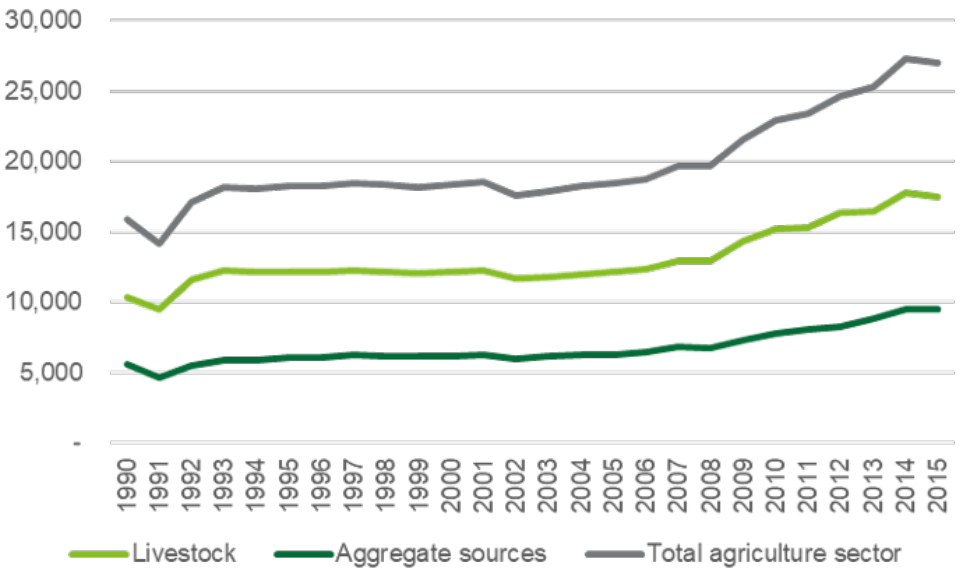
Given the importance of the soy and cattle value chains in Paraguay's agriculture sector, this report will focus on them.

2.2.1 GHG EMISSIONS FROM THE AGRICULTURE SECTOR

Emissions from Paraguay's agriculture sector include primarily those generated by cattle production and direct N_2O emissions from managed soils. Indirect N_2O from managed soils and manure management, as well as rice cultivation and urea application, represent additional minor sources.

Figure 2 shows changes in GHG emissions in the sector between 1990 and 2015.

Figure 2: GHG emissions in Paraguay (Gg CO_2e) from the agriculture sector (1990-2015)



While emissions have increased over the period, increasing by 70 percent in the sector and for both subcategories, the agriculture sector has experienced both sharp increases and stagnation. Emissions from this sector were lowest in 1991 due to the impacts of El Niño, including floods and high winds. This strongly impacted crop production. In 1991, the number of cattle also fell, compared to 1990.

In 2002, the number of cattle and pigs declined, due to the spread of the bovine spongiform encephalopathy (mad cow disease) and foot-and-mouth disease in a number of markets, which had an impact on demand for Paraguayan livestock.

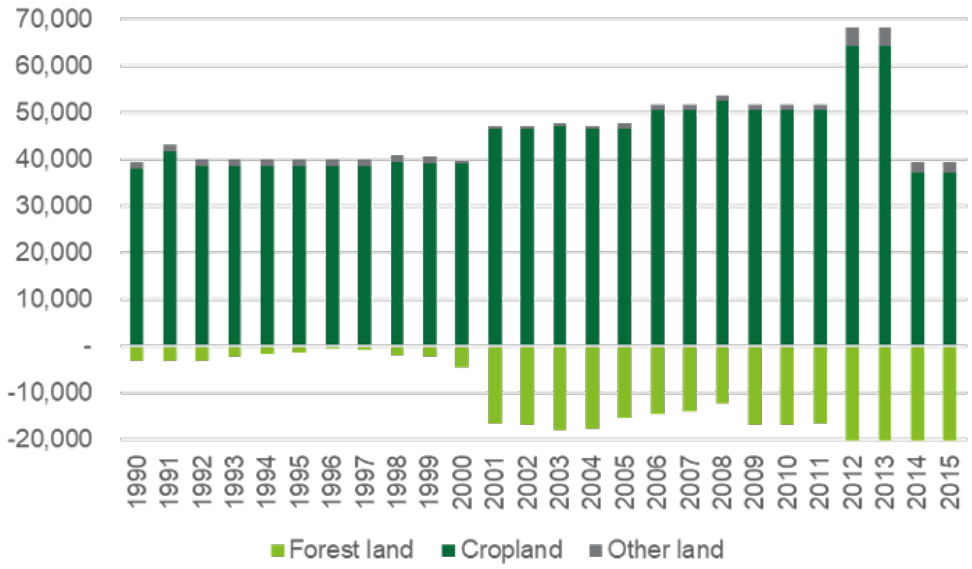
Between 2003 and 2014, livestock-related emissions rose steadily, due to the number of herds in Paraguay during that period and the success of the meat sector. In 2014, Paraguay increased its meat exports to markets such as Russia, Chile and Brazil, consistent with the country's status as a cattle meat-exporting country. In 2014, it was the fifth-leading cattle meat exporter, sending more than 275,000 tons abroad.[18]

14 World Wildlife Fund (2016). *Social, economic and environmental analysis of soybean and meat production in Paraguay. Asunción, Paraguay: WWF-Paraguay.*
15 Ibid.
16 FAOSTAT
17 World Wildlife Fund (2016). *Social, economic and environmental analysis of soybean and meat production in Paraguay. Asunción*, Paraguay: WWF-Paraguay.
18 FAOSTAT: In 2017 Paraguay was the 8th exporting country worldwide, with more than 267,000 tons exported during the year.

Concerning aggregate sources, emission increases follow the expansion of areas harvested and production increases. Soybeans are a major crop and follow a similar pattern. In the same period, areas planted for soybeans increased from nearly 900,000 ha in 1990 to 3,540,000 ha in 2015,[19] or a nearly three-fold increase in 25 years. Over the same period, soybean productions rose from approximately 1.8 million tons to nearly 8.9 million in 2015. This is close to a five-fold increase in 25 years, showing the intensification of production over the same period.

While Paraguay accounts for agriculture and LULUCF separately, cropland clearing is the primary source of gross LULUCF emissions. Changes in emissions from this sector are shown in Figure 3.

Figure 3: GHG emissions (Gg CO_2e) from the LULUCF sector (1990-2015)



2.3 NDC AND SECTORAL TARGETS

The agriculture sector represents 18 percent of Paraguay's economy and is closely linked with other sectors, such as logistics, transport and food industries. Combining its contribution to these sectors and to forestry, agriculture contributes 41 percent to the economy as a whole.[20] According to the latest household survey, conducted in 2018, 54.54 percent of Paraguay's poor live in rural areas and work in agriculture, indicating the sector's importance to the country and its economy.

As described in the previous section, agriculture is a major contributor to Paraguay's GHG emissions via livestock production and fertilizer management. However, agriculture is also highly vulnerable to the impacts of climate change, such as increased rainfall, increased extreme weather events and higher temperatures.

In its NDC, Paraguay describes its objectives in terms of climate change mitigation, aiming to reduce GHG emissions by 20 percent compared to 2030 projections. The country has committed to reduce half of its emissions unilaterally, while the other half is conditional on international support. This represents a total of 429 $MtCO_2e$ avoided by 2030. Starting in 2030, Paraguay aims to avoid annual emissions of 83 $MtCO_2e$.

Paraguay specifies that the NDC targets all sectors under the IPCC guidelines for climate change mitigation. The agriculture sector should therefore aim to reduce its emissions by 10 to 20 percent by 2030. Mitigation actions considered under the agriculture sector are discussed further in the following section, specifically regarding climate policies and communications to the United Nations Framework Convention on Climate Change (UNFCCC).

19 Ibid.
20 Republica del Paraguay, 2018. *Segundo Informe Bienal de Actualización Sobre Cambio Climático Ante la CMNUCC.*

2.3.1 SECTORAL TARGETS IN THE AGRICULTURE SECTOR

Sectoral objectives in the agriculture sector relate primarily to sustainable resource management, including soil and land use. They also include adaptation to the impacts of climate change. Overall, Paraguay aims at improving the competitiveness of its value chains, while at the same time improving sustainability.

The 2017 National Climate Change Mitigation Plan and Programmes of Action presents the sectoral objectives. The action plan was developed within the framework of the country's National Environmental Policy (PAN) and National Climate Change Policy and is aligned with its Climate Change Mitigation Strategy. The plan aims to promote implementation of mitigation actions that reduce GHG emissions and increase carbon sinks, while considering market opportunities for the introduction of technologies, investment and access to the carbon market.

This plan addresses 10 strategic actions:

- Optimize sustainable use of biomass;
- Diversify the energy mix and energy efficiency;
- Increase the use of renewable energy;
- Promote cleaner production through innovation;
- Improve air quality by improving fuel quality;
- Decrease the use of fossil fuels through the uptake of biofuels;
- Improve the public transportation system;
- Optimize forest resources through improved forest plantations and forest management;
- Reduce GHG emission through the uptake of agro-silvo-pastoral practices; and
- Reduce and reuse waste through sustainable waste management.

The strategy related to agro-silvo-pastoral practices aims at decreasing GHG emissions by implementing sustainable practices in the agriculture sector. Table 4 shows agriculture sector substrategies and actions.

Table 4: Agriculture sector mitigation strategies

SUBSTRATEGIES	ACTIONS AND REQUIREMENTS
IMPLEMENT GOOD AGRICULTURAL PRACTICES (CROP MANAGEMENT)	Apply good practices in fertilizer management and irrigation for rice production
	Use tractors and mobile equipment efficiently, manage irrigation and water efficiently
	Improve farmland management to increase soil's carbon storage
	Use agro-chemicals responsibly
	Decrease the use of slash-and-burn practices for agricultural purposes
	Introduce technologies with mitigation co-benefits
	Encourage the sustainable modernization of farms
	Improve forest management and soil management
	Develop financial incentives for producers based on sustainable practices implemented
IMPLEMENT GOOD LIVESTOCK MANAGEMENT PRACTICES	Strongly encourage the implementation of silvo-pastoral production systems
	Use natural resources carefully by measuring the impacts of livestock and agricultural production on resources
	Increase productivity per unit of surface area
	Improve forest management
	Develop financial incentives for producers based on sustainable practices implemented
	Develop a "brand" aligned with the sustainability of practices and incentives
PROVIDE TECHNICAL ASSISTANCE TO PRODUCERS, AUTHORITIES AND GROUPS	Promote and create conditions for the development of organic agriculture
	Train producers in sustainable production techniques, such as direct sowing
	Train producers in the safe use of pesticides
	Build capacity in soil analysis prior to applying phytosanitary products or chemical fertilizers

It is important to emphasize that the plan details both strategies and detailed actions for most of the actions detailed in table 4. However, there is no detailed action plan for the strategy related to agro-silvo-pastoral practices. Details related to specific targets and costs are therefore unavailable for the agriculture sector. In addition, no actions and targets are available for specific value chains.

These actions are aligned with Paraguay's previous climate policies and communication documents, such as its Third National Communication on Climate Change to the UNFCCC, which mentions actions related to decreasing the use of nitrogen-based fertilizers, as well as reducing methane emissions.

Paraguay also submitted its second biennial update report (BUR) to the UNFCCC in 2018. It includes updates related to mitigation actions taken and an overview of the measurement, reporting and verification system for specific sectors under the NDC. Table 5 provides an overview of agriculture-related mitigation measures and components.

Table 5: Agriculture sector mitigation strategies proposed in the BUR

SECTOR	MITIGATION STRATEGY	ACTION PROPOSED
AGRICULTURE AND LULUCF (EXCLUDING FOREST LANDS)	**Reduce emissions from greenhouse gases**	Manage crop nutrients
		Improve the use of fire
		Improve livestock diet
	Conserve carbon sinks	Manage, conserve and improve pastures
		Manage soil (reduced tillage, waste retention, use of organic fertilizers)
	Increase the reserves of carbon sinks	Introduce agroforestry systems and silvopastoral systems
		Manage and promote perennial crops

In the context of this report, the analysis will focus on actions that can catalyse private sector investment in the soybean and cattle value chains. While these are further detailed in section 5, Table 6 provides an overview of actions relevant to private sector investment in both value chains.

Table 6: Mitigation actions relevant to the soybean and cattle value chains based on Paraguay's sectoral objectives

VALUE CHAINS	ACTIONS BASED ON THE BUR AND NATIONAL CLIMATE CHANGE MITIGATION PLAN AND PROGRAMMES OF ACTION
SOYBEAN VALUE CHAIN	Manage crop nutrients
	Manage soils (reduced tillage, waste retention, use of organic fertilizers)
	Use tractors and mobile equipment efficiently, manage irrigation and water efficiently
	Introduce technologies with mitigation co-benefits
	Encourage the sustainable modernization of farms
	Develop financial incentives for producers based on the sustainable practices implemented
CATTLE VALUE CHAIN	Improve livestock diet
	Increase productivity per unit of surface area
	Develop financial incentives for producers based on the sustainable practices implemented

The agriculture sector presents significant challenges to Paraguay in the climate change context. While the sector is a key driver of growth, it is also the largest GHG-emitting sector, generating more than half of the country's emissions. To achieve Paraguay's NDC objective of reducing its GHG emissions by 10 to 20 percent requires mitigation options. The cattle and soybean value chains are significant sources of emissions within agriculture. Although Paraguay does not provide sectoral targets for the sector or specific value chains, actions included in its climate policies target the agriculture sector and provide guidance for private sector involvement. It is important to note that the private sector is a key stakeholder in the sector. Both large producers and smallholders lead the sector, so involving both will be crucial in achieving significant GHG emission reductions. The following sections address the enabling environment for private sector investment, as well as the sector's key challenges and overall potential.

3. ENABLING ENVIRONMENT

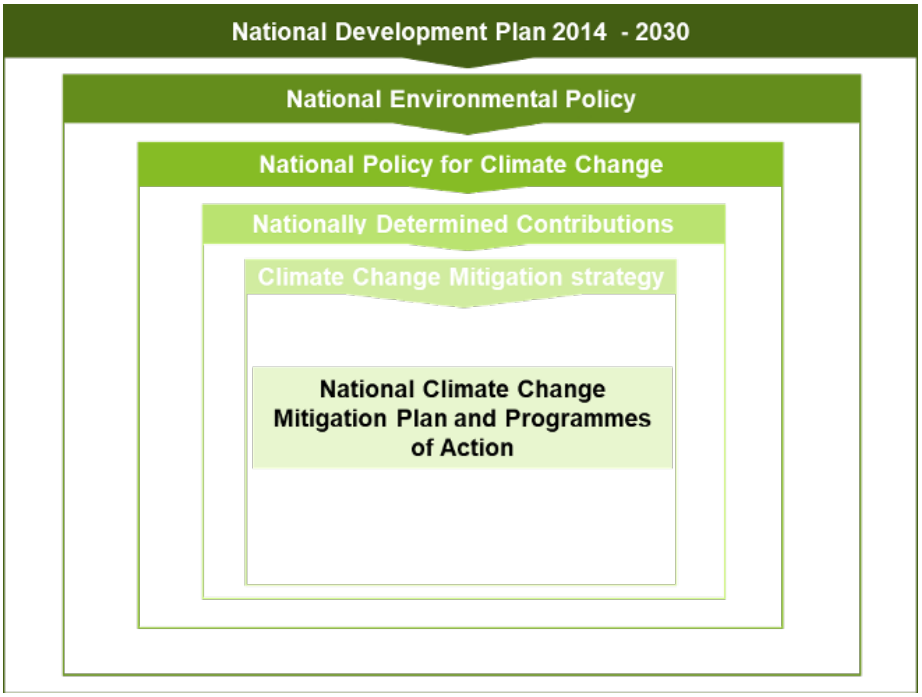
The existence of an enabling policy environment, including related legislation, laws, programmes and plans, is crucial to achieve the sustainable development targets in any country. Paraguay's overall development policy is governed by a long-term vision to 2030 under which sectoral policies are developed. This section presents the country's current enabling policy environment, including climate policies, agriculture policies and the ease of doing business.

3.1 POLICY ENVIRONMENT IN THE AGRICULTURE SECTOR

3.1.1 CLIMATE-CHANGE RELATED POLICIES

Paraguay has delivered its National (2001), Second (2011) and Third (2016) National Communications, Intended Nationally Determined Contributions (INDC) (2015), and Second BUR (2018) to the UNFCCC. The country has also developed national climate change-related policies. Figure 4 describes the relationship among all national plans and policies and international communications.

Figure 4: Relationship among Paraguay's climate change policies



Although section 3.1.3 addresses the policies that are relevant and important from the perspective of private sector investment potential in the agriculture sector, the country's overall climate change- and sustainability-related framework should also be mentioned. While Paraguay's National Environment Policy[21] does not directly address private sector investment, it details a set of environmental protection objectives, principles and general guidelines to guarantee, to current and future generations, that development is sustainable.

Paraguay also detailed mitigation actions for the agriculture sector in its policies and documents, including the National Plan for Climate Change Mitigation and Programmes of Action and the BUR, which were noted in section 2. In the 2014 National Plan for Climate Change, Phase I: Climate Change Mitigation Strategy,[22] Paraguay also explicitly refers to conservation agriculture as a way to mitigate agriculture sector emissions.

21 Ministry of Environment and Sustainable Development, Paraguay's Secretariat of the Environment. Accessed: **http://mades.gov.py/sites/default/files/politica_ambiental_Nacional.pdf.**

22 Ministry of Environment and Sustainable Development, Paraguay's Secretariat of the Environment, 2014. Accessed: **http://dncc.mades.gov.py/wp-content/uploads/2018/11/Estrategia-de-Mitigaci%C3%B3n-2016.pdf**

3.1.1.1 NATIONAL CLIMATE CHANGE POLICY, 2016 (*POLÍTICA NACIONAL DE CAMBIO CLIMÁTICO, 2016*)

POLICY OBJECTIVE	POLICY RELEVANCE TO THE PRIVATE SECTOR	POLICY IMPLICATIONS FOR THE PRIVATE SECTOR
To provide a general framework to address climate change- related challenges in Paraguay	Identification of the agriculture sector as a priority for Paraguay, as well as emphasis on mobilizing private sector investments	General framework for incentivizing and mobilizing private sector investments for climate change action

Paraguay developed a National Climate Change Policy in 2016. It seeks to place climate change issues on the national agenda and encourage implementation of actions to combat it. The policy recognizes the importance of climate change mitigation and adaptation actions for Paraguay and includes five strategic pillars: strengthening institutional capacities; financing; education, communication and participation of civil society; knowledge management and technology; and climate change mitigation.

The policy mentions food security and the agriculture sector as priority sectors for Paraguay. It also explicitly mentions the importance of mobilizing private sector investments by developing public-private-partnerships (PPPs), such as leasing, concessions and joint ventures.

3.1.1.2 PARAGUAY'S THIRD NATIONAL COMMUNICATION ON CLIMATE CHANGE TO THE UNFCCC (*TERCERA COMUNICACIÓN NACIONAL DE PARAGUAY, 2016*)

POLICY OBJECTIVE	POLICY RELEVANCE TO THE PRIVATE SECTOR	POLICY IMPLICATIONS FOR THE PRIVATE SECTOR
To provide information on the national GHG inventory and a general description of steps taken or anticipated to implement the Framework Convention	Identification of several mitigation actions for the agriculture sector and emphasis on private sector involvement	Potential for the use of new technologies related to decreasing the use of nitrogen-based fertilizers

The Third National Communication to the UNFCCC mentions directions for climate change mitigation actions in the agriculture and land use sectors. They include:

- Decrease deforestation by introducing conservation payment schemes;
- Incentivize new agricultural technologies that make it possible to decrease the use of nitrogen-based fertilizers and slash and burn; and,
- Introduce technologies with climate co-benefits.

The report mentions the following actions that are specific to the agriculture sector:

- Improve cropland and pasture management to improve carbon storage in soils;
- Restore degraded soils;
- Improve farming techniques and cattle and manure management to reduce methane emissions;
- Improve the application of nitrogen-based fertilizers;
- Introduce biofuel crops;
- Improve crop yields;
- Introduce planned grazing;
- Reduce the use of fire and burning; and,
- Use agricultural products to obtain biofuels.

Concrete actions identified for the sector include the efficient use of synthetic fertilizers, efficient management of manure in pastures, and the development and inclusion of fodder/supplements, which allows for the reduction of enteric fermentation. In relation to land use, the Third Communication also encourages sustainable production models for land converted to cropland.

3.1.2 AGRICULTURE-RELATED POLICIES

Paraguay has developed a number of agriculture-related policies that focus directly on the private sector, as their target beneficiaries are crop or livestock producers. The main policies and their implications for the private sector are detailed below. Other policies and laws, such as the Agrarian Statute (Estatuto Agrario,[23] Ley N.1.863), which supports land redistribution in Paraguay, also seek to support private sector development in the agriculture sector.

3.1.2.1 NATIONAL DEVELOPMENT PLAN, 2014-2030 (*PLAN NACIONAL DE DESARROLLO, 2014-2030*)

POLICY OBJECTIVE	POLICY RELEVANCE TO THE PRIVATE SECTOR	POLICY IMPLICATIONS FOR THE PRIVATE SECTOR
To provide general strategies for Paraguay's development, including for the agriculture sector and measures supporting the private sector	Identification of government priorities in the agriculture sector and potential incentives to be developed for the private sector	Potential for the use of new financial incentives, including for MSMEs

The Government of Paraguay's first National Development Plan (PND 2030) identifies priorities and actions to eliminate extreme poverty and promote income growth in Paraguay. The PND is organized around three pillars: 1) poverty reduction and social development; 2) inclusive economic growth; and 3) Paraguay's inclusion in global markets. Each strategic pillar is related to cross-cutting themes, one of which is environmental sustainability. Finally, the Plan includes several guiding strategies under each pillar; they include a sustainable and adequate habitat, valuation of natural capital, and sustainable global habitat. The PND also touches on climate change mitigation and adaptation.

The PND recognizes the importance of the agriculture sector in Paraguay, as well as its dependence on international markets. It also recognizes that the sector remains fragile, given the impact of climate change. Last, it emphasizes the importance of sustainable production, which would take into account the protection of natural resources, such as carbon sinks.

The PND details the importance of enabling the sustainable growth of the agriculture and agribusiness sector. It details the following strategies for agriculture in Paraguay:

- Develop family farming and support food security: encourage access to land and create an enabling environment to improve living conditions for rural communities of family producers;
- Promote irrigated agriculture to mitigate production variability and improve productivity;
- Develop the forestry sector and the provision of environmental services;
- Support the development of the livestock sector: strengthen productivity and competitiveness in the production of meat of different species and dairy, including family farming;
- Manage the risks associated with climate variability and climate change: develop mechanisms for climate forecasting and risk mitigation; and,
- Manage social integration, employability and rural entrepreneurship

Additionally, the PND details its industrial policy, which is mainly based on agroindustry. The PND develops the following strategies:

- Move towards a policy of integration within the framework of the Southern Common Market (MERCOSUR);
- Establish long-term financing lines term for the sector;
- Incentivize entrepreneurship and the development of micro, small and medium enterprises (MSMEs);
- Develop financing lines for MSMEs;
- Develop a guarantee fund for MSMEs; and,
- Support the installation of industrial parks.

23 2002. Accessed: **http://www.bacn.gov.py/leyes-paraguayas/3124/establece-el-estatuto-agrario**.

3.1.2.2 AGRARIAN STRATEGIC FRAMEWORK, 2014–2018 (*MARCO ESTRATÉGICO AGRARIO 2014/2018*)

POLICY OBJECTIVE	POLICY RELEVANCE TO THE PRIVATE SECTOR	POLICY IMPLICATIONS FOR THE PRIVATE SECTOR
To provide general strategies for the agriculture sector and a series of measures aimed at supporting the private sector	Identification of government priorities in the agriculture sector and potential incentives to be developed for the private sector	• Potential for the use of new financial incentives, including for MSMEs • Focus on capacity building for producers to encourage the introduction of new technologies

The Government of Paraguay has adopted the Agrarian Strategic Framework 2014–2018, which follows the framework developed for the period 2010–2018. It provides guidelines for improving the competitiveness of national agricultural products, food security, strengthening family farm management, and measures to counter the impacts of climate change.

The strategy aims at developing an enabling environment for producers so that they can compete in markets by improving productivity and reducing production costs, managing natural resources sustainably, and introducing technical innovations.

The Agrarian Strategic Framework is aligned with the PND 2030 and aims to support both smallholders (family producers) and larger private sector stakeholders by providing an enabling environment for their development. Table 7 details the main points related to private sector development and sustainability.

Table 7: Strategies and actions planned under the Agrarian Strategic Framework

MAIN STRATEGIES	ACTIONS
Develop agricultural competitiveness	• Technology development and transfers • Development of an information management system, including climate-related • Development and strengthening of the value chain • Improvement of infrastructure related to production and communications • Market development
Develop smallholder agriculture (family producers) and food security	• Improvement of family incomes • Sustainable use of natural resources • Food production
Develop the forestry sector and provide environmental services	• Strengthening of reforestation • Access to financing and incentives • Contribute to the competitiveness of forestry related industries
Support the development of the livestock sector	• Technology development and transfers • Diversification of the production and food production
Manage the risks associated with climate variability and climate change	• Strengthening of institutional capacities and producers' capacities • Technology development and transfers • Development of irrigation and water management • Access to instruments enabling to mitigate risks
Manage social integration, employability and rural entrepreneurship	• Development of capacities related to entrepreneurship in agriculture

3.1.2.3 NATIONAL SOIL MANAGEMENT, CONSERVATION AND RECOVERY PROGRAMME (*PROGRAMA NACIONAL PARA LA RECUPERACIÓN Y CONSERVACIÓN DE LOS SUELOS*)

POLICY OBJECTIVE	POLICY RELEVANCE TO THE PRIVATE SECTOR	POLICY IMPLICATIONS FOR THE PRIVATE SECTOR
To provide guidance to encourage sustainable soil management in Paraguay	Identification of potential actions to be introduced by the private sector, including conservation agriculture and nutrient management.	Incentives proposed for smallholders in conservation zones

This law aims to incentivize soil conservation and recovery in Paraguay to guarantee sustainable production. It includes actions that seek to achieve this goal, such as introducing soil conservation technologies and practices for producers. This also includes nutrient management.

The law also details the need for a financial mechanism to encourage implementation of all actions outlined in it, as well as a 10-year incentive system to cover soil management and recovery practices. Those actions include:

- Use of efficient fertilizers;
- Crop rotation;
- Use of minimum tillage;
- Acquisition of technologies for soil conservation; and,
- Soil stabilization.

Smallholders in conservation zones, producers in voluntary conservation zones and indigenous people living in conservation zones are eligible for the incentives.

3.1.2.4 SUSTAINABLE LIVESTOCK DEVELOPMENT POLICY, 2019 - 2023 (*POLÍTICA DE DESARROLLO SUSTENTABLE DE LA PRODUCCIÓN PECUARIA – PERIODO 2019 - 2023*)

POLICY OBJECTIVE	POLICY RELEVANCE TO THE PRIVATE SECTOR	POLICY IMPLICATIONS FOR THE PRIVATE SECTOR
To provide guidance to encourage sustainable soil management in Paraguay	Identification of potential actions to be introduced by the private sector, including conservation agriculture and nutrient management.	Incentives proposed for smallholders in conservation zones

This policy, developed by the MAG, aims at improving the competitiveness of small, medium and large producers in the livestock sector, while simultaneously encouraging a sustainable development approach to production and marketing. Its final objective is to increase the monthly revenues of small and medium producers in Paraguay, mainly from family agriculture.

The policy defines sustainable development as development that meets the needs of the present generation without compromising the ability of future generations to meet theirs, as defined in the 1987 Report of the World Commission on Environment and Development, known as the Brundtland Commission).[24] It further details the social, economic and environmental aspects of sustainability. In the livestock sector, pursuing sustainability involves adopting cross-cutting strategies, such as:

- Eliminating the burning of grasslands and adopting rotation practices;
- Increasing the use of forest species for grazing;
- Adopting silvopastoral practices;
- Using manure as organic fertilizer;
- Increasing reforestation by using natural fences for animals;
- Promoting research on native forage species; and,
- Encouraging the sustainable use of water in animal husbandry.

24 United Nations. 1987. Report of the World Commission on Environment and Development: Our Common Future. Accessed: **https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf.**

Paraguay's policy emphasizes a number of strategies to improve productivity. Some are linked closely to climate change mitigation and adaptation, such as improving fodder, which is one of the main causes of low productivity and also a main driver of enteric fermentation in livestock production. Thus, one of the actions proposed is to introduce silvopastoral systems. The policy also seeks to improve the value added of meat products sold on domestic and international markets; one option is to develop an eco-label programme.

3.1.2.5 NATIONAL PLAN TO DEVELOP BOVINE MEAT VALUE CHAIN IN PARAGUAY, 2016 – 2021 (*PLAN NACIONAL PARA EL DESARROLLO DE LA CADENA DE VALOR DE LA CARNE BOVINA EN PARAGUAY – PERIODO 2016 - 2021*)

POLICY OBJECTIVE	POLICY RELEVANCE TO THE PRIVATE SECTOR	POLICY IMPLICATIONS FOR THE PRIVATE SECTOR
To promote the sustainable production and productivity of bovine products in Paraguay	General guidance provided to improve productivity at sector level	Strategies to be leveraged by the private sector as the sector's primary stakeholders

The national plan to develop bovine meat value chains in Paraguay seeks to promote the sustainable production and productivity of the country's bovine products.

The plan recognizes Paraguay's climate change mitigation objectives as defined in its NDC. It also discusses the cost of implementing mitigation actions and emphasizes that adaptation measures will be the focus for the country's livestock sector.

One of the strategies to improve the sector's productivity addresses potential sustainability actions, including improving forage use, increasing water use efficiency, implementing silvopastoral systems and integrating forestry and livestock production. The plan also details a strategy for developing advanced cold chain technologies, although it does not outline potential climate mitigation actions.

3.1.3 PRIVATE SECTOR POLICY ENVIRONMENT

The policy framework supporting private sector development in Paraguay is limited. The country adopted a Public-Private Partnership (PPP) law in 2013[25] and regulations were issued in 2014[26]. Although PPPs are traditionally leveraged for infrastructure, they can also be used in agriculture to provide information and advisory services to producers, particularly in connection with technologies such as remote sensing.

Paraguay has also developed a law that regulates foreign investment[27].

3.2 AGRICULTURE SECTOR INSTITUTIONS AND INSTITUTIONAL FRAMEWORK

Paraguay's agriculture sector is composed of several key institutions. The table below summarizes the government institutions that shape the sector's overall direction.

25 Paraguay, 2013. Law No. 5102 Investment Promotion in Public Infrastructure, expansion and improvement of goods and services provided by the State. Accessed: **http://www.stp.gov.py/v1/?wpfb_dl=173.**

26 Ministry of Finance, Paraguay, 2014. Decree No. 1350. Accessed: **https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/documents/Decree%201.350-2014%2C%20PPP%20Regulation%20%28English%29.pdf.**

27 Paraguay, 1992. Ley No. 117/91 de Inversiones. Accessed: **http://www.bacn.gov.py/leyes-paraguayas/785/ley-n-117-de-inversiones.**

Table 8: Government institutions and institutional framework in the agriculture sector

INSTITUTION	DESCRIPTION
Ministerio de Agricultura y Ganadería	The Ministry of Agriculture and Livestock (MAG) is responsible for agriculture and livestock policy formulation, implementation, monitoring and evaluation.
Instituto de Desarrollo Rural y de la Tierra	The Institute of Rural and Land Development encourages the economic integration of producers by, among others, supporting access to land and regulating its ownership.
Instituto Paraguayo de Tecnología Agraria	The Paraguayan Institute for Agricultural Technologies encourages technology transfers that can increase sector productivity.
Servicio Nacional de Sanidad Vegetal	The National Service for Plant Health is responsible for improving quality, phytosanitary conditions and genetics in agriculture.
Servicio Nacional de Calidad y Sanidad Animal	The National Service of Animal Quality and Health is responsible for protecting the quality of animal products.
Banco Nacional de Fomento	The National Development Bank, the Agricultural Loan Facility and the Livestock Fund provide financing to smallholders in Paraguay.
Crédito Agrícola Habilitación	
Fondo Ganadero	
Secretaría del Ambiente	The Environmental Secretariat formulates policies and coordinates environmental- and climate change-related actions. Its actions involve the agriculture sector, specifically in relation to its mandate related to protecting natural resources.
Ministerio de Industria y Comercio - Red de Inversiones y Exportaciones de Paraguay (REDIEX)	REDIEX, the Paraguayan Network for Investments and Exports, operates under the Ministry of Industry and Commerce. The Network seeks to promote local and foreign investments that advance the country's social and economic development and support exports from Paraguay's most productive sectors.

3.3 OVERALL BUSINESS ENVIRONMENT

3.3.1 MACROECONOMIC ENVIRONMENT

Paraguay grew rapidly over the last 15 years, with 4.5 percent growth per year on average (2004-2017), faster than most of the other countries in the region.[28] This was driven by good macro-policies, such as inflation targeting and more prudent fiscal policy, as well as by increased agricultural commodity prices,[29] which led to a sharp expansion of agricultural exports. The economic outlook changed in 2019, with Paraguay headed towards recession following poor agricultural production and weakening economies in neighbouring Argentina and Brazil. Economic forecasts estimated that gross domestic product (GDP) would fall by 1.1 percent,[30] while the International Monetary Fund (IMF) estimated growth to be near zero. The IMF projected that the economy would resume 4 percent growth in 2020.

However, the COVID-19 pandemic disrupted the positive outlook for 2020. The Paraguayan economy is now expected to plunge into a full-year recession and contract by 3.1 percent.[31] Compared to its neighbours, Paraguay has been more successful in containing the economic impact of the pandemic and the agriculture sector is less affected than others. While Paraguay's economy had already shown signs of recovery in May 2020,[32] the impacts of the negative performances of Brazil and Argentina, Paraguay's main commercial partners, are likely to continue. GDP should start to recover and increase in 2021 at an expected average annual rate of 3.3 percent until 2024, assuming that the pandemic is under control worldwide.

Agricultural production should remain strong in 2020, despite logistical disruptions. Demand for food remains stable. Paraguay received a $300 million loan support package from the World Bank to foster a more resilient economy and boost rural productivity, including $100 million directly aimed at financing productive agricultural activities that will benefit around 170,000 small and medium-size farmers and indigenous agricultural producers.[33]

28 World Bank, 2019.
29 International Monetary Fund, 2019. 2019 Article IV Consultation, Paraguay.
30 Oxford Economics, 2019. Country Economic Forecast: *Paraguay*.
31 The Economist Intelligence Unit Limited, 2020. Paraguay Country Risk Service August 2020.
32 Ibid.
33 **https://www.worldbank.org/en/news/press-release/2020/03/19/paraguay-economia-resiliente-productividad-campo**

The current monetary policy stance remains expansionary, which should help mitigate the economic slowdown and maintain domestic demand as the economy reopens slowly. The Central Bank of Paraguay (BCP) cut benchmark interest rates to 0.75 percent in June.[34] As emphasized throughout this report, the agriculture sector's share of exports remains significant. However, it will be difficult to maintain the expansion of those volumes. Much of the expansion has been driven by an increase in sowing areas, rather than an increase in yields per hectare.[35] This also means that volatile commodity prices pose a threat to Paraguay. China's growing demand for soybeans is now showing signs of slowing. However, the agriculture sector is also a strong asset, as it has been spared the impacts of the COVID-19 pandemic, relatively speaking.

Before the pandemic, IMF expressed approval of Paraguay's prudent fiscal policy stance. Public debt remained low by international standards and is expected to remain stable over the medium term. However, while revenue and expenditure levels in Paraguay remain low, infrastructure spending needs are substantial. Limited fiscal capacity suggests that Paraguay may need to rely increasingly on PPPs.

The fiscal deficit is expected to widen, as the Government of Paraguay unveiled a $2.5 billion economic recovery programme, the Ñapu'ã Paraguay plan in 2020. It includes $1.37 billion in infrastructure investment for the second half of this year and $676 million in business loans aimed at small and medium-sized companies. The government is unlikely to meet its fiscal deficit limit of 1.5 percent of GDP in 2020.[36] Overall, the fiscal deficit should drive public debt to 29 percent of GDP in 2020, a sharp increase from 23.5 percent in 2019, but lower than most of its regional counterparts.

Paraguay faced challenges prior to the COVID-19 crisis. However, its economy is still supported by sound monetary and fiscal policies that seek to foster recovery. The agriculture sector has been an important pillar of the economy throughout the crisis and is expected to remain a key sector. Additional private sector involvement will be required to bridge the country's fiscal capacity gaps. As the has crisis weakened its economic and fiscal outlook, recovery could be achieved by steadily mainstreaming climate action into fiscal policies, as proposed by the Coalition of Finance Ministers for Climate Action, whose principles Paraguay has endorsed. The Coalition recently proposed a set of principles for stimulus packages that would provide the right balance between sustainability and investment strategy.

Coalition of Finance Ministers for Climate Action and recovery principles

In April 2019, governments from over 20 countries launched the Coalition of Finance Ministers for Climate Action, which recognizes the challenges posed by climate change, the unique capacity of the world's finance ministers to address them, and the ways in which collective engagement could strengthen these efforts. The Helsinki Principles recognize the importance of finance to achieve climate action goals.

In July 2020, the Coalition published guidance related to climate action for the post-pandemic future.[37] It emphasizes the importance of finance for recovery and long-term transformation, while recognizing that macro-fiscal contexts are more complex than before the crisis. The document acknowledges the need for emerging economies to anticipate the substantial investments needed to drive the transformation to a low-carbon climate-resilient economy.

In this context, leveraging international climate finance to unlock fiscal space and leverage private finance will be crucial to achieve the goals set by the Paris Agreement and all NDCs. Efforts to shift the financial system, including on reporting (Task Force on Climate-Related Financial Disclosures), green taxonomies, risk management and returns.

Aligning national priorities and economic and fiscal policies on these principles could help Paraguay attract private sector investment and achieve its climate goals in the agriculture sector. The country's detailed performance is presented in the following subsections.

34 The Economist Intelligence Unit Limited, 2020. Paraguay Country Risk Service August 2020.
35 International Monetary Fund, 2019. 2019 Article IV Consultation, Paraguay.
36 The Economist Intelligence Unit Limited, 2020. Paraguay Country Risk Service August 2020.
37 The Coalition of Finance Ministers for Climate Action, 2020. Better Recovery, Better World: Resetting climate action in the aftermath of the COVID-19 pandemic.

3.3.2 COUNTRY RISK

Based on the November 2019 and May 2020 risk assessments performed by the Economist Intelligence Unit (EIU), Paraguay has a BB- rating for overall country risk. While the country's performance remains stable despite the COVID-19 crisis, it faces increased fiscal pressure in 2020 and still requires significant investments to diversify its economy. Paraguay's risk profile is detailed in Table 9.

Table 9: Paraguay's risk profile

	SOVEREIGN RISK	CURRENCY RISK	BANKING SECTOR RISK	POLITICAL RISK	ECONOMIC STRUCTURE RISK
NOVEMBER 2019	BB	BB	BB	B	BB
MAY 2020	BB	BB	BB	B	BB

3.3.3 SOVEREIGN RISK

Paraguay has limited sovereign risk, thanks to strong soybean production and careful fiscal policy. Paraguay was hit by flooding in early 2019 and wildfires in the Chaco region in the second half of 2019, impacting its GDP. The 2019 fiscal deficit stood at 2.8 percent of GDP, exceeding the revised 2 percent threshold of the Fiscal Responsibility Law of 2013.[38] In 2020, the deficit is expected to exceed this threshold, which has been suspended because of the COVID-19 crisis. However, negative impacts on sovereign risk were partly offset by the government's borrowing from multilateral sources and issuing bonds, which were also subscribed by foreign investors, which illustrates the country's creditworthiness.[39]

3.3.4 CURRENCY RISK

The guaraní remains sensitive to seasonal pressures and global commodity prices. As mentioned above, flooding hit soybean and agricultural production, weakening export performance and, therefore, foreign reserves. The currency also lost 7 percent of its value in 2019.[40] This continued in the first quarter of 2020, with a 7.6 percent fall. The COVID-19 pandemic also had a negative impact on international investor appetite. However, broadly speaking, the currency risk remains limited, mitigated by a comfortable level of foreign currency reserves. The Central Bank has also lowered interest rates, as mentioned in 3.3.1.

3.3.5 BANKING SECTOR RISK

Banking sector risk increased in 2019. This was due to weaker-than-expected GDP growth and weaker export performance. The rise in the non-performing loan (NPL) ratio - to 3.2 percent in August – constitutes another risk driver.[41] Banking sector dollarization remains a source of risk, although most loans are provided to agricultural exporters whose revenues are denominated in foreign currencies, which mitigates the risk. The situation improved in early 2020, with NPL ratios falling below 3 percent in February. However, credit growth slowed to 8.1 percent in February, which should be offset by the Central Bank's policies on minimum reserve requirements. The government has also allowed banks to automatically refinance loans to private sector companies that are facing repayment difficulties due to the current crisis.[42]

Although profitability indicators are weaker than in 2019, with average returns on equity of 14 percent in February 2019 compared to 23.4 percent in August 2019, the capital adequacy ratio stood at 18.8 percent in February, which is more than sufficient.

Paraguay's negative net foreign asset position has stabilized and the credit growth trend is more sustainable.[43]

38 The Economist Intelligence Unit Limited, 2019. Paraguay Country Risk Service February 2020.
39 The Economist Intelligence Unit Limited, 2020. Paraguay Country Risk Service August 2020.
40 The Economist Intelligence Unit Limited, 2019. Paraguay Country Risk Service November 2019.
41 Ibid.
42 The Economist Intelligence Unit Limited, 2020. Paraguay Country Risk Service August 2020.
43 Ibid.

3.3.6 POLITICAL RISK

Political risk is still affected by the country's poor record in addressing corruption and a history of political instability. Its recent political leaders, including former President Fernando Lugo and current President Mario Adbo Benitez, have either been impeached or are subject to impeachment. Internal conflicts in the ruling party over the nomination of a candidate for the next 2023 presidential election also contribute to instability.

3.3.7 ECONOMIC STRUCTURE RISK

The public debt-to-GDP ratio remains low, forecasted at 29 percent of GDP in 2020, despite an increase due to the COVID-19 crisis. Paraguay is now able to leverage international bond markets on terms similar to similarly-rated economies. Although exports have diversified recently, especially in agro-industry, economic activity remains based on agriculture, particularly soybeans and cattle.

3.4 EASE OF DOING BUSINESS

The ease of doing business in a country is an important decision-making factor for both local and foreign investors. Foreign investors may choose to invest in a different country with different opportunities if it is significantly easier to conduct business. Indicators such as the number of administrative procedures, the time and cost required to conduct and fulfil administrative duties, taxes, and quality of the legal system must be considered.

Through its Doing Business project, the World Bank Group provides objective measures of business regulations and their enforcement across 190 economies and selected cities at the subnational and regional levels. The study captures several important dimensions of the regulatory environment. An economy's ease of doing business score is measured on a scale from 0 to 100, where 0 represents the lowest-ranked performance and 100 represents the highest.

Paraguay ranked 125th out of 190 in the 2020 report. Although its ranking declined, Paraguay has scored consistently between 59 and 60 in the last five years. Paraguay's scores and ranking over the last five years are detailed in Table 10.

Table 10: Paraguay's Doing Business score and ranking (2016 – 2020)

YEAR	SCORE	RANK
2020	59.1	125
2019	59.40	113
2018	59.18	108
2017	59.03	106
2016	60.19	100

This section provides an overview of important indicators related to doing business in Paraguay, as captured in the Doing Business 2020 report.[44]

3.4.1 STARTING A BUSINESS

This indicator measures the number of procedures, time, cost and paid-in minimum capital requirement for a small- to medium-sized limited liability company to start up and formally operate in the largest business city of each economy. It is relevant to Paraguay's agriculture sector as smallholders constitute the sector's main workforce. Smallholders are expected to drive the introduction of small-scale technologies for climate mitigation.

Paraguay ranks 160th and scores lower than the average for the Latin America and Caribbean region. It is less competitive than its neighbours, such as Argentina (141st), Brazil (138th), Peru (133rd), Uruguay (66th) and Chile (57th). The main issues are the time and cost of starting a business.

44 World Bank Group, 2019. Doing Business 2020, Economic Profile Paraguay.

3.4.2 DEALING WITH CONSTRUCTION PERMITS

Paraguay ranks 75th in terms of procedures and time required to deal with construction permits, scoring higher than the average in the Latin America and Caribbean region. The country performs better than OECD high-income countries in most of the subcategories, with less time required and less-costly procedures.

3.4.3 GETTING ELECTRICITY

Getting electricity is an important indicator for doing business as it is crucial to support a business' development. This indicator measures the procedures, time and cost required for a business to obtain a permanent electricity connection for a newly constructed warehouse. Additionally, the reliability of supply and transparency of tariffs index measures reliability of supply, transparency of tariffs and the price of electricity. Paraguay is close to the regional average, ranking 109th overall, and has good scores in terms of procedures and time required compared to other countries. Although costs remain significant, they are lower than the regional average.

3.4.4 REGISTERING PROPERTY

This indicator examines the steps, time and cost involved in registering property, assuming the standard case of an entrepreneur who wants to purchase land and a building that is already registered and free of title dispute. This is a crucial indicator for Paraguay and the agriculture sector.

Paraguay ranks higher than the regional average, at 80th overall, and has good scores in terms of time required compared to other countries. Although the time required remain significant, it is lower than the regional average.

3.4.5 GETTING CREDIT

This indicator explores the strength of credit reporting systems and the effectiveness of collateral and bankruptcy laws in facilitating lending. It is important to measure this in Paraguay as local private sector stakeholders require credit to invest in agriculture-related technologies. Paraguay ranks significantly lower than the regional average, at 132nd. It scores low in terms of strength of legal rights, especially compared to other countries in the region. For example, Paraguay does not have a clear legal framework for non-possessory security rights or an operating collateral registry indexed by debtor's name. Secured creditors are not guaranteed repayment priority.

3.4.6 PROTECTING MINORITY INVESTORS

This topic indicator the strength of minority shareholder protections against directors' misuse of corporate assets for personal gain, as well as shareholder rights, governance safeguards and corporate transparency requirements that reduce the risk of abuse. This is important to encourage investments and foreign investments in the country.

Paraguay is one of the lowest-ranking countries in the region and ranks 143rd worldwide. Specifically, Paraguay underperforms in term of shareholder rights, ownership and control, and corporate transparency.

3.4.7 PAYING TAXES

This indicator measures the taxes and mandatory contributions that a medium-size company must pay or withhold in a given year, as well as the administrative burden of paying taxes and contributions and complying with post-filing procedures (value-added tax (VAT) refund and tax audit). Paraguay ranks above the regional average on this indicator. However, it remains low, at 126th. Payments in Paraguay take twice the amount of time needed in OECD high- income countries, which is a determining factor in the country's ranking.

3.4.8 TRADING ACROSS BORDERS

This indicator measures the time and cost associated with the logistical process of exporting and importing goods. It is important for the agriculture sector in Paraguay, which is an export industry, particularly of soybeans and meat products.

However, Paraguay ranks below the regional average, at 128th, due primarily to the time and cost associated with border compliance.

3.4.9 ENFORCING CONTRACTS

This indicator measures the time and cost to resolve a commercial dispute in a local first-instance court and the quality of judicial processes index, which evaluates whether each economy has adopted a series of good practices that promote quality and efficiency in the court system.

Paraguay ranks higher than the regional average, at 72nd. While the time required to enforce contracts is in line with OECD high-income countries average, cost is the main issue.

3.5 ENABLING ENVIRONMENT FOR CROSS-BORDER AND FOREIGN INVESTMENTS

The enabling environment for cross-border and foreign investments constitutes another important factor in investment decisions for foreign investors. They may perceive risks to be higher in some countries if regulations pertaining to foreign investment are considered to be unfavourable. For example, some investors may perceive restrictions on the payment of dividends to foreign investors, repatriation of funds and tax issues as constraints.

This section provides an overview of important laws and regulations pertaining to investment and foreign investment in Paraguay, as well as an analysis of gaps and challenges for foreign investments.

3.5.1 REGULATIONS RELATED TO DIRECT FOREIGN INVESTMENT IN PARAGUAY

The main policies related to direct foreign investment in Paraguay include the Investment Law, the Investment Tax Incentives Law, and the Law on Investment Guarantees, Promotion of Job Creation, and Economic and Social Development. The maquila industry law is also an important factor in foreign investment decision. However, it targets primarily the manufacturing sector and is unlikely to be leveraged by agribusinesses.

OBJECTIVES OF THE REGULATIONS	IMPLICATIONS FOR FOREIGN INVESTMENT
• To provide the overall framework for foreign investment in Paraguay	• Equal treatment of foreign investments.
• To provide the regulatory framework for company incorporation	• No pre-authorization required for foreign investment

INVESTMENT LAW - LAW 117/91 (*LEY 117/91 DE INVERSIONES*)

Investment activities in Paraguay are regulated by the Investment Law, which seeks to promote local and foreign investment in the country. It guarantees equal treatment of foreign investors and the right to own real property. Foreign investment in Paraguay is not subject to pre-authorization or registration with a public authority.

The law guarantees free exchange of currency, as long as operations comply with national law. It also guarantees freedom of production and sales of goods and services, as well as freedom to import and export goods and services.

It also provides for international arbitration to resolve disputes between foreign investors and the Government of Paraguay.

INVESTMENT TAX INCENTIVES LAW - LAW 60/90 (*LEY 60/90 – RÉGIMEN DE INCENTIVOS FISCALES A LA INVERSIÓN DE CAPITAL DE ORIGEN NACIONAL Y EXTRANJERO*)

This law grants tax benefits for investments of national or foreign capital. To qualify for these benefits, investments by a Paraguay-based investor must align with the country's national social and economic policy and must contribute to:

- Increasing the provision of goods and services;
- Creating additional permanent jobs;
- Increasing exports/substitute for imports;
- Introducing technologies to increase efficiency and enable better use of raw materials, labour and national energy resources; and,
- Investment and reinvestment of earnings on capital.

Investments are defined as:

- Financial, in equity, debt or other financial instruments;
- Capital, such as raw materials, equipment and infrastructure;
- Trademarks, patents, and other forms of technology transfer susceptible to licensing;
- Technical assistance; and
- Leases.

The beneficiaries of this law may take advantage of tax exemptions, such as total exemption from tax and municipal taxes levied on the creation, registration and records of companies and enterprises, total exemption from customs duties, and other similar benefits on other taxes, including internal taxes that apply specifically to the import of capital goods, raw materials and inputs for local industry. When the investment is financed through an overseas bank institution, no taxes are imposed on payments to the banking institution for investments greater than $5 million.

Law on Investment Guarantees, Promotion of Job Creation, and Economic and Social Development- LAW 5.542/15 (*LEY 5.542/15 DE GARANTÍAS PARA LAS INVERSIONES Y FOMENTO A LA GENERACIÓN DE EMPLEO Y EL DESARROLLO ECONÓMICO Y SOCIAL*)

This law protects the investment of national or foreign capital to establish factories or other productive activities in the country, provided that these establishments employ Paraguayan workers and contribute to the country's social and economic development.

The law strengthens the rights of foreign investors to transfer their capital and profits. It also guarantees income tax stability for a fixed 10-year term, which may be extended to 15 years for investments of between $50 million and $100 million and to 20 years for investments exceeding this threshold.

LAW N° 1183/85 - PARAGUAYAN CIVIL CODE (*LEY N° 1183/85 – CÓDIGO CIVIL DEL PARAGUAY*)

The Paraguayan Civil Code and related decrees provide the regulatory framework for company establishment. Paraguayan law recognizes joint stock companies, limited liability companies, general and limited partnerships, partnerships limited by shares and branch offices. Foreign companies are not subject to restrictions on establishment or on their operations.

While there are no capital requirements for companies incorporated in Paraguay, branch offices are subject to some restrictions. Branch offices are used by companies established abroad that wish to operate in Paraguay. They must be incorporated in Paraguay and have at least two shareholders, one of whom should be a Paraguayan resident. Branch offices are subject to a $25,000 minimum capital requirement.

BILATERAL INVESTMENT TREATIES

Paraguay has also signed and ratified bilateral investment treaties with many countries. As of August 2020, they are Austria, Belgium, Bolivia, Chile, Costa Rica, Cuba, Czech Republic, Denmark, Ecuador, El Salvador, France, Germany, Hungary, Korea, Luxembourg, the Netherlands, Peru, Portugal, Qatar, Romania, Spain, Switzerland, Taiwan, the United Kingdom, United Arab Emirates and Venezuela. These treaties establish the terms and conditions for private investment by nationals and companies of one state in another state and provide guarantees for investors, such as protection from expropriation.

3.5.2 CAPITAL MARKET LAWS AND REGULATIONS

Capital markets are important for foreign investment, as they facilitate the buying and selling of securities. In Paraguay, the National Securities Commission (CNV) is the capital market regulatory authority. Founded in 1977, the Asunción Stock Exchange (BVPASA) is the country's main stock exchange. Paraguay's capital markets are regulated by laws related to the securities market and investment funds and by regulations issued by the CNV, such as the regulation approving the stock market general regulations.

OBJECTIVES OF THE REGULATIONS	IMPLICATIONS FOR FOREIGN INVESTMENT
• To provide the overall framework for foreign investment in capital markets in Paraguay	• Listing regulations and framework, approval process detailed by the stock market rules • Non-residents allowed to participate in the stock market

LAW N° 5810/17 ON THE SECURITIES MARKET - (*LEY 5810/17 DEL MERCADO DE VALORES*)

This law establishes the overall regulatory framework for the securities market in Paraguay. It regulates publicly-traded securities, issuers, the assigned values for publicly-traded securities, the operations of brokerage firms, and all participants in the stock market.

Legal persons incorporated abroad intending to issue publicly-traded securities in Paraguay are subject to this law. Authorizations for public offering from international investors are subject to authorization of the CNV, and are based on reciprocity with the securities regulator of the international investor's country of origin, except for MERCOSUR-based investors, whose listings are regulated by their own country.

LAW N° 5452/15 ON INVESTMENT FUNDS (*LEY 5452/15 QUE REGULA LOS FONDOS PATRIMONIALES DE INVERSIÓN*)

This law regulates investment funds. Funds must obtain prior approval from the CNV for public offerings. Investment funds are managed by special purpose entities (*Sociedad Administradora de Fondos Patrimoniales de Inversión*) that must be incorporated as a company and registered at the CNV.

The CNV has recently authorized private offerings. Under such offerings, issuers and securities are exempt from the prior registration requirement. Foreign investment funds may be offered to investors under this scheme.[45]

LAW N° 1163/97 ON COMMODITY EXCHANGES

This law regulates the country's commodity exchanges. Commodity exchanges in the agriculture sector are important tools to formalize the sector and mitigate the challenges that its stakeholders face. The law recognizes the existence of physical commodities and futures contracts. It does not differentiate between national and foreign operators.

The first national commodity exchange was launched in late 2017 managed by BVPASA.[46]

45 Chambers and Partners, 2019. Alternative Funds 2019, Paraguay.
46 **https://www.lanacion.com.py/negocios_edicion_impresa/2017/12/13/lanzan-la-primera-bolsa-de-productos-de-paraguay/.**

GENERAL REGULATION FOR THE STOCK MARKETS (*REGLAMENTO GENERAL DEL MERCADO DE VALORES*)

In its Resolution 1/19, the CNV approved the Stock Market General Regulation. The regulation applies to all participating agents in the stock market, such as stock exchanges, brokerage firms, issuing entities, investment funds, risk assessment companies and commodity exchanges. The regulation provides a clear framework for foreign investors wishing to participate in Paraguay's stock market.

Non-residents whose investment portfolio value exceeds the total amount paid monthly to a workforce of 500 full-time employees may participate in the market. Issuers listed on foreign stock exchanges may also be listed in Paraguay if they are based in member countries of the International Organization of Securities Commissions (IOSCO), the Ibero-American Institute of Securities Markets (*Instituto Iberoamericano de Mercados de Valores*) and/or MERCOSUR. In that case, issuers based outside Paraguay must indicate if they have issued similar securities abroad and the conditions for their issuance.

Similarly, operators listed in Paraguay must inform CNV that they will proceed to issuance outside of the stock market, such as private securities or public issuances in foreign markets. The amount, location and other details of issuances shall be provided to CNV.

The regulations allow investors with CNV authorization to invest in the following products:

- Sovereign or quasi-sovereign securities issued in the local market;
- Paraguayan sovereign bonds issued in international markets;
- Municipal bonds and other public bonds;
- Central Bank securities;
- Securities issued by local entities authorized by the Central Bank with BBB rating or above;
- Securities issued by financial entities authorized by the Central Bank with BBB rating or above issued abroad;
- Mortgage-backed securities;
- Shares issued with A rating or above; and,
- Securities titles with BBB rating or superior;
- Foreign countries' securities with BBB rating or above;
- Foreign issuer securities with A rating or above, where the issuance amount is greater than$100 million;
- Resale or repurchase of securities; and,
- Open-end or closed-end funds participation.

The regulations provide that closed-end funds may invest in other types of assets, provided that such possibility is contemplated in their by-laws and other documents as applicable.[47]

3.5.3 BANKING SUPERVISION LAWS AND REGULATIONS AND OTHER REGULATIONS RELATED TO THE FINANCIAL SECTOR

The banking and financial sector is regulated by laws and regulations, including the general law on banks, financial institutions and other credit institutions and the law on modernization and strengthening of Paraguayan financial system regulations.

Providing financing to a company incorporated in Paraguay does not require authorization.[48] However, recurrent transactions could trigger regulation by the Central Bank based on the volume of transactions and a registration requirement with the anti-money laundering authority.

47 Chambers and Partners, 2019. Alternative Funds 2019, Paraguay.
48 Chambers and Partners, 2019. Banking & Finance 2019 Second Edition, Paraguay.

OBJECTIVES OF THE REGULATIONS	IMPLICATIONS FOR FOREIGN INVESTMENT
• To provide the overall framework for banking services in Paraguay	• Minimum capital requirements for banks and financial institutions are provided, and similar conditions apply to foreign banks

GENERAL LAW N° 861 ON BANKS, FINANCIAL INSTITUTIONS AND OTHER CREDIT INSTITUTIONS (*LEY N° 861 GENERAL DE BANCOS, FINANCIERAS Y OTRAS ENTIDADES DE CRÉDITO*)

The objective of the law is to provide the legal framework for the banking and financial sector, including the requirements, rights and obligations of and guarantees provided to organizations in the sector. It regulates Paraguay's banking sector, which includes all financial institutions providing deposit, savings and credit services. It does not regulate entities that provide direct financing using their own capital and that are not involved in intermediation.

LAW N° 5787 ON MODERNIZATION AND STRENGTHENING OF PARAGUAYAN FINANCIAL SYSTEM REGULATIONS AMENDED GENERAL LAW N° 861.

Under Law N° 5787, the BCP shall authorize national and foreign banks and financing institutions to operate in the country. Operators shall also seek pre-authorization from BCP to modify their operations or their structure, including the nature of their activities, location of their offices (including abroad), and reductions in capital.

Law N° 5787 establishes the following capital requirements for banks and financial institutions:

- Banks: Gs 50,000 million (approximately $7 million)
- Financial institutions: Gs 25,000 million (approximately $3.500,000)

Similar conditions apply to local branches of foreign banks and financial institutions. Foreign and national capital in financial entities are guaranteed equal treatment.

3.5.4 INSOLVENCY AND BANKRUPTCY-RELATED REGULATIONS AND PROCEEDINGS

The bankruptcy law provides the overall legislative framework for insolvency and bankruptcy of limited liability companies operating in Paraguay. Other regulations provide a specific insolvency framework for financial institutions, such as Law N° 861.

OBJECTIVES OF THE REGULATIONS	IMPLICATIONS FOR FOREIGN INVESTMENT
• To provide the overall framework for insolvency procedures in Paraguay	• Companies facing voluntary or official liquidation should first pay the company's debts and liabilities in Paraguay

BANKRUPTCY LAW N° 154/69 (*LEY DE QUIEBRAS, N°. 154/69*)

This law was enacted in 1969. It includes provisions for reorganization and liquidation and applies to both individuals and incorporated entities. Reorganization is conducted through meetings of creditors, while liquidation procedures require a declaration of bankruptcy.

Only the debtor may request a meeting of creditors and only the company, not the creditors, may initiate reorganization. Both creditors and debtors may request a declaration of bankruptcy. The courts of first instance of the civil and commercial courts have jurisdiction over insolvency proceedings.

To request a declaration of bankruptcy creditors must meet the following conditions:

- Have a non-contingent obligation;
- Demonstrate default on one or more obligations; and,
- Submit evidence of default to prove insolvency.

If, at the meeting of creditors, the debtor fails to prove its ability to reorganize, then a declaration of bankruptcy is issued. For a restructuring plan to be approved, two-thirds of the present creditors must vote in favour and the creditors present at the meeting must represent at least 75 percent of the total amount of claims allowed by the court.[49]

The law includes specific sections relating to cross-border insolvency. It establishes that even if bankruptcy has been declared in another country, creditors in Paraguay retain their rights and agreements reached in Paraguay remain valid. Local creditors have priority over foreign creditors. Foreign proceedings may be recognized in the country if they are aligned with the process set out in the Code of Civil Procedure.[50]

3.5.5 FOREIGN EXCHANGE

The Investment Tax Incentives Law 60/90 authorizes the repatriation of capital and profits. There are no controls on foreign exchange transactions, though transactions exceeding $10,000 are subject to reporting requirements.

OBJECTIVES OF THE REGULATIONS	IMPLICATIONS FOR FOREIGN INVESTMENT
• To provide the overall framework for foreign exchange in Paraguay	• Proceeds and interests in foreign currencies may be transferred abroad through authorized banks

3.5.6 TAX FRAMEWORK

Law N° 6.380/19 on Modernization and Simplification of the National Taxation System (*Ley N° 6380/19 de Modernización y Simplificación del Sistema Tributario*) establishes a more unified structure in terms of direct taxes, simplifying the process of determining business taxes.

Table 11 provides details of relevant taxes.

Table 11: Private sector investment in machinery and equipment

NAME	DETAIL	% APPLICABLE
Business income tax	Replaces the Income Tax for Commercial, Industrial and Service Activities (IRACIS); the Income Tax for Agricultural Activities (IRAGRO) and the Income Tax for Small Taxpayers (IRPC)	10%
Tax on dividends	Tax on dividends varies based on the beneficiary's residence	8% for residents 15% for non-residents
Personal income tax	Imposed on income from capital gains and the provision of personal services	8% (capital gains) 8% to 10% on personal services
Tax on the income of non-residents	Imposed on income, profits or benefits obtained by individuals, corporations and other non-resident entities in Paraguay from the provision of services or investments	15%
VAT	Levied on the supply of goods and services and the import of taxable goods and services. A lower rate is applicable to raw farm products.	10% (5% for raw farm products)

The law also includes transfer pricing standards that seek to adapt to the requirements of international organization to ensure greater transparency in transnational operations. The transfer pricing standards follow those established by the OECD.

49 INSOL International, 2015. *A Guide to Select Latin American Insolvency Systems - Special Report.*
50 Ibid.

3.5.7 DISPUTES AND ARBITRATION

OBJECTIVES OF THE REGULATIONS	IMPLICATIONS FOR FOREIGN INVESTMENT
• To provide the overall framework for arbitration and litigation in Paraguay	• International arbitration follows international standards, both between private sector parties and between the government and private sector parties

Paraguay is a signatory to the New York Convention, one of the key international arbitration instruments. It is also a member of the International Center for the Settlement of Investment Disputes (ICSID) and a party to the Inter-American Convention on International Commercial Arbitration and the Inter-American Convention on Extraterritorial Validity of Foreign Judgments and Arbitral Awards. As a MERCOSUR member, Paraguay has ratified the MERCOSUR International Commercial Arbitration Agreement.

Arbitration is an important tool for dispute resolution. It is flexible and confidential and often faster than litigation, which makes it an important criterion for international investors. Law N° 1879/2002 on Arbitration (*Ley N°1879/2002 de arbitraje y mediación*) regulates arbitration in the country. Disputes are considered international or cross-border when the parties are located in different countries or if the place of the dispute is located in a foreign country.

The Investment Law also guarantees equal treatment for foreign investors. It provides for international arbitration for the resolution of disputes between foreign investors and the Government of Paraguay. Foreign decisions and awards are enforceable in Paraguay.

3.5.8 SUMMARY OF FINDINGS FOR FOREIGN INVESTMENT REGULATORY ENVIRONMENT

Overall, the regulatory environment for foreign investment in Paraguay is supportive and does not discriminate against foreign-owned businesses. There are no restrictions on foreign investment in specific sectors and no capital requirements to invest in the country. Paraguay guarantees free exchange of currency and provides incentives for foreign investors.

Investment in the banking sector, while subject to specific requirements such as obtaining a license for banking and financial activity in the country, prior consent from BCP and capital requirements, does not prohibit foreign investors. Foreign investors may also provide credit to other entities without specific constraints. No limitations on paying dividends to foreign investors, including in foreign currency, were identified.

Last, the country has established a framework for disputes and arbitration. Paraguay has signed several conventions related to the validity of foreign judgements. It also adheres to international arbitration frameworks, paving the way for settlements recognized by international investors.

The overall enabling environment for private investment in the agriculture sector in Paraguay is fairly strong. Despite an economic outlook disrupted by the COVID-19 pandemic, the country remains fairly stable in terms of its macroeconomic outlook, with monetary and fiscal policies that support growth in the medium and long term. Compared to neighbouring countries, Paraguay has been more successful in containing the economic impact of the pandemic and the agriculture sector is less affected than others. Agricultural production should remain strong in 2020, despite logistical disruptions. Demand for food remains stable and Paraguay has received international support to boost rural productivity. As the private sector leads in the agriculture sector, the enabling environment therefore affects the private sector in terms of regulations and restrictions or when incentives are provided to encourage the adoption of new practices.

Paraguay also provides a strong regulatory environment for foreign investors, providing favourable conditions for foreign direct investment and cross-border investment in agriculture. Its policies support the growth of the agriculture sector, provide incentives to the private sector and offer guidance to mitigate and adapt to the impacts of climate change. However, it is unclear how Paraguay has implemented these to date. To further understand how the private sector can contribute to climate change action in agriculture requires an analysis of the status of private investment in the sector and sectoral investment gaps.

4. PRIORITIZED SECTOR CONTEXT

Multiple barriers and challenges constrain Paraguay's agriculture sector, preventing investment from scaling up in the country. This subsection presents the structure of each commodity and analyses its ecosystem and value chain, the status of private sector engagement and investment, and investment barriers and critical gaps for the sector.

The ecosystem analysis provides an overview of the relationship between inputs and products for specific subsectors and explains the business environment for private stakeholders in each subsector. The value chain analysis builds on the ecosystem analysis, providing an illustrative representation of the identified chain actors, their functions and an analysis of their relationships.

The combination of both analyses provides a better understanding of how and where stakeholders and organizations are positioned within the ecosystem and value chain and identifies opportunities and engagement points for decision-makers in the public and private sectors.

Box 1: Private sector investment in agriculture

To understand private sector investment in Paraguay's agriculture sector requires clarifying what constitutes an investment in agriculture. This usually requires distinguishing between investments that will generate returns over several years and expenditures made in one year that generate a return during the same crop cycle. For example, investing in fertilizer for soybeans may not be considered an investment in general terms.

Perspective is also important. Farmers and large companies are the main investors in the sector in Paraguay. Land purchases constitute important investments that may generate significant returns. However, they do not increase the capital stock, constituting only a change of land ownership.

Additionally, investments related to, but not directly in, agriculture are also important. They may include energy sources for a farm, livestock feed and nutrients, and ecosystem services, such as weather forecasting services. However, these investments are more challenging to capture. Similarly, investments in good agricultural practices, such as the introduction of silvopastoral systems, the decreased use of inputs and the use of conservation agricultural practices, are not covered under this section.

This report thus disaggregates private sector investment in the soy and cattle value chains in Paraguay into the following categories for each value chain.

Soy:

- Land development, understood as the results of actions that transform land for soy production from one year to the next;
- Machinery and equipment, which includes tractors, harvesters and others. This is understood as imported machinery only; and,
- Processing industry (soybean oil industry).

Cattle:

- Fixed assets, understood as breeding stock and inventories;
- Ranches
- Machinery and equipment; and,
- Cold chain industry.

The limited availability of aggregate and consistent data on private sector investment in both value chains constitutes a significant limitation for this report. When available, data from 2018 is used. However, when unavailable, the latest data is used and referenced. In general, as investment prices are usually not publicly available, this report will refer primarily to private sector investments in new equipment and land, among others.

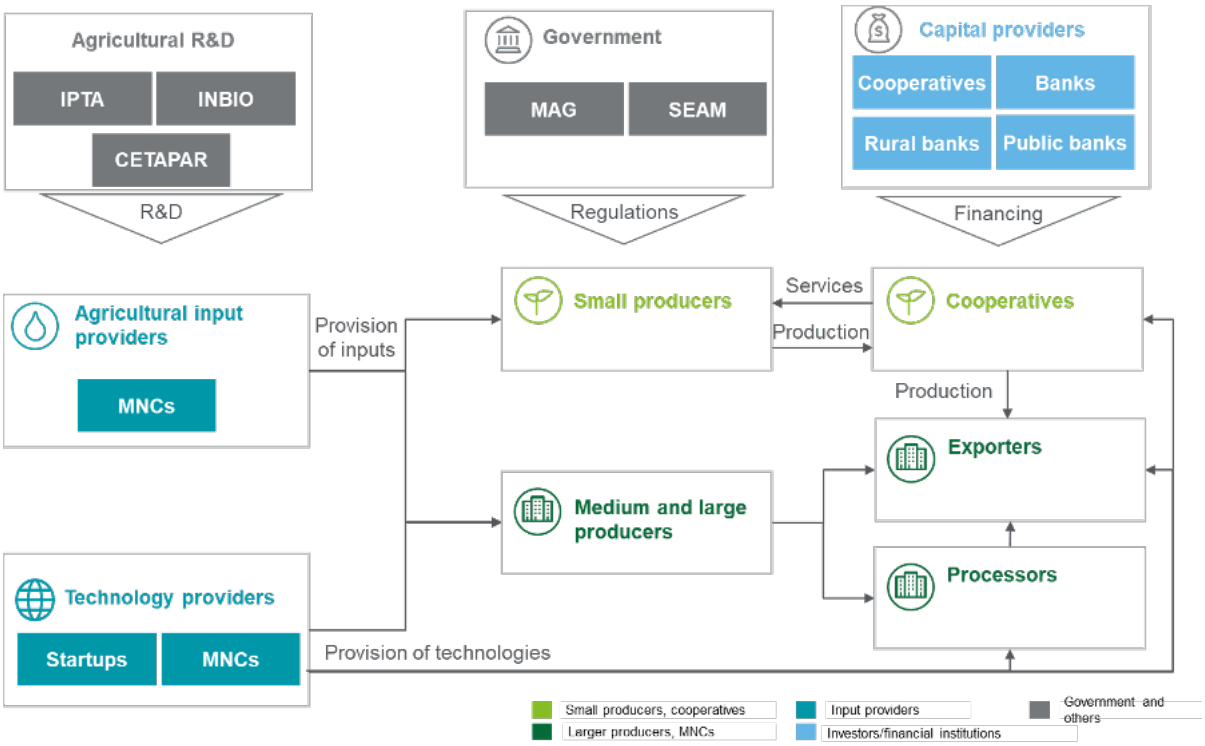
4.1 SOYBEANS

Mitigation actions in Paraguay's agriculture sector include improved nutrient management for crops and soils, the efficient use of tractors and equipment, and farm modernization. These actions have an impact primarily on providers and producers in the soybean production ecosystem. However, the ecosystem also includes other stakeholders, such as oil producers. It is also important to understand the markets for Paraguay's soybeans. This subsection analyses the ecosystem and value chain for soybean production and processing in Paraguay.

4.1.1 ECOSYSTEM ANALYSIS

Figure 5 describes the soybean production and processing ecosystem.

Figure 5: Soybean production and transformation ecosystem in Paraguay



The soybean production and processing ecosystem in Paraguay can be divided among input providers, producers, middlemen, transformative industries and exporters. It is defined largely by the presence of MNCs, which are involved as input providers and, at the other end of the ecosystem, as exporters and processors.

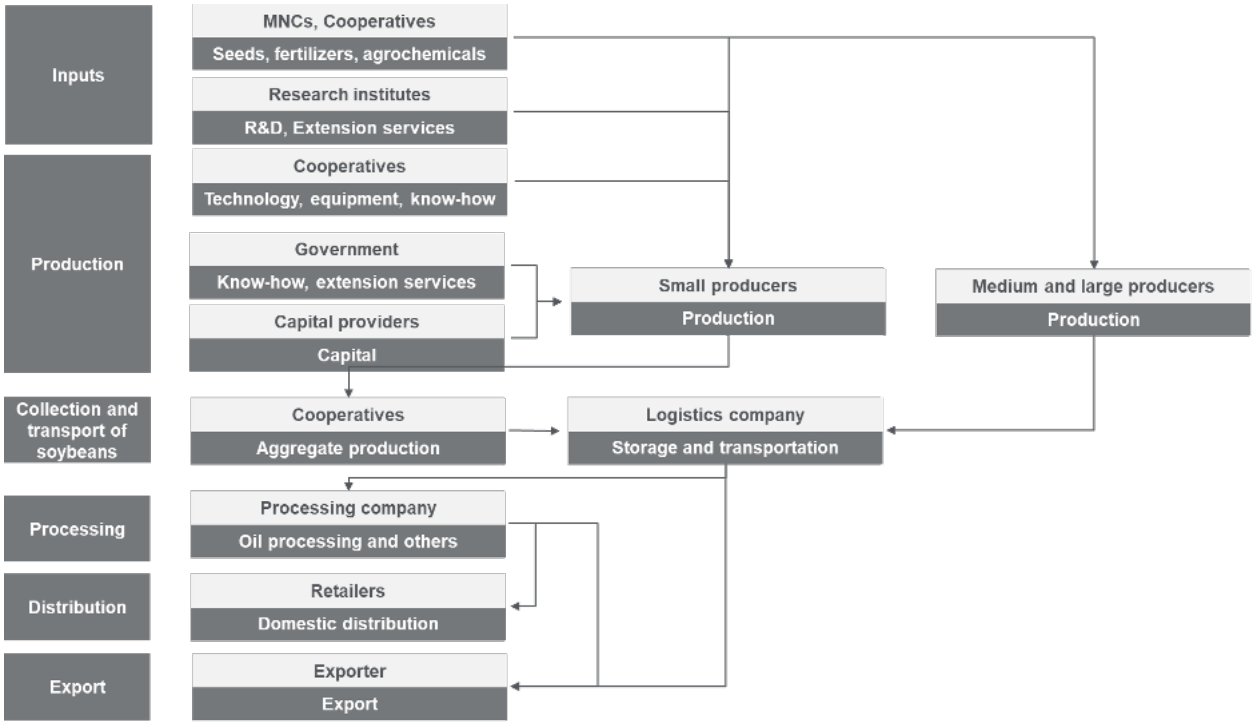
Input providers include multiple stakeholders, including providers of seeds, fertilizers, agrochemicals and other agricultural inputs and of machinery and equipment. Producers can be divided between medium and large producers (MLPs) and small producers. MLPs are largely integrated within this ecosystem, as they can purchase inputs from MNCs. Their products meet exporters' standards and they are able to provide the quantities that exporters require. Small producers are likelier to sell their products to cooperatives or on alternative markets.

MNCs spearhead agricultural innovation, particularly the development of new seeds. Research centres such as the Paraguayan Institute for Agricultural Technology (*Instituto Paraguayo de Tecnología Agraria*, IPTA), the National Institute for Agricultural Biotechnology (*Instituto de Biotecnología Agrícola*, INBIO) and the Technological Centre for Agriculture in Paraguay (*Centro Tecnológico Agropecuario del Paraguay*, CETAPAR), also conduct soybean research programmes and provide services to farmers. For example, INBIO and IPTA co-develop soybean varieties, including the Sojapar variety, adapted to Paraguay.

4.1.2 ANALYSING THE VALUE CHAIN, MAPPING PRIVATE SECTOR ACTORS AND IDENTIFYING BARRIERS TO SOYBEAN PRODUCTION IN PARAGUAY

Figure 6 illustrates the soybean production value chain analysis of soybean production in Paraguay.

Figure 6: Value chain for soybean production in Paraguay



The soybean production value chain is structured around producers, who are the main drivers for the adoption of low-carbon technologies. Production in Paraguay is defined by the area of land of available to farmers, including smallholders and larger producers.

Among larger producers, significant stakeholders often participate in more than one stage of the value chain, reflecting a high level of vertical integration. Some exporters and processing industries may also be involved in transportation, aggregation and production. Because of their size, smallholders must rely on cooperatives for multiple functions. For example, cooperatives may provide agricultural inputs, technical assistance and financial services. They may also aggregate production and become intermediaries for storage, processing and export.

INPUT PROVIDERS

Companies in the soybean value chain provide different types of inputs, such as seeds, fertilizers and agrochemicals, as well as machinery and equipment.

Seed suppliers

Seed suppliers are organized through the Seed Producers Association of Paraguay (APROSEMP).[51] They provide the country's producers with seeds for soybean production. Seeds are developed by major foreign players, such as Monsanto and Syngenta, or by local research centres, such as INBIO and ITPAR, in the case of Sojapar. Local companies, including Agrotec and Agrofertil, are also major seed providers.

Seeds are also produced locally in nurseries certified by the National Service for Plant and Seed Quality and Health (SENAVE), which maintains a registry of these producers.[52]

51 http://www.aprosemp.org.py/asociados.
52 https://www.senave.gov.py/mapa-registro-de-semillas.

Fertilizer and agrochemical suppliers

Fertilizers and agrochemical suppliers support soybean producers. Fertilizers provide some of the nutrients required for plants to grow efficiently, while agrochemicals can protect against pests and other threats. The market is dominated by foreign companies, such as Bayer and Dow, which import and distribute their products in-country. Some local players, including Tecnomyl and Chemtec, are involved in the production and retailing of phytosanitary products.

Some of these providers belong to the Crop Protection and Fertilizer Chamber (CAFYF).[53]

Machinery and equipment suppliers

Machinery and equipment suppliers provide tractors, harvesters and other equipment. Table 12 presents current investments, defined as imported machinery only.

Table 12: Private sector investment in machinery and equipment

ITEM	UNIT	ANNUAL INVESTMENT IN NEW EQUIPMENT
Tractors[54]	# of machines	2,095
Harvesters	# of machines	367
Pulverizers	# of machines	263

Service providers and traders

Service providers offer services ranging from financing to trading, transportation and storage. They are important players in the soybean value chain as most small-scale producers lack the financial capacity to buy inputs and kickstart production every year. Service providers usually play roles as well, including supplying seeds and phytosanitary products. Large agricultural commodity trading groups, such as ADM, Favero, Cargill, Louis Dreyfus and Bunge, are involved as traders and in other steps of the value chain.

PRODUCERS

In Paraguay, producers are usually defined either as commercial producers, with more than 50 ha of land or family producers (smallholders), with less than 50 ha. The soy value chain is characterized by large farms. According to the last agriculture census, plantations of more than 100 ha represented more than 88 percent of the area cultivated and those greater 1,000 ha represented almost half the area farmed.[55]

Commercial producers usually have access to their own planting and harvesting equipment. Commercial grain producers typically rotate their crops, planting soybeans, maize, wheat and sunflowers. Few smallholders own their own equipment and, instead, rent from input providers. Because of the small scale of their production, family producers must rely on cooperatives and local intermediaries in order to participate in the export value chain. In 2017, 30 percent of land used to grow soybeans was rented by producers.[56] Some smallholders have also decided to rent their land to larger producers, as renting provides a guaranteed income without the risks of agriculture production.

Producers also invest in land. This can be translated into yearly investments in land expansion, as shown in table 13.

53 **https://www.cafyf.org/camara-de-fitosanitarios-y-fertilizantes**
54 CADAM, 2018. Estadisticas de importaciones, automotores y maquinarias.
55 Republica Del Paraguay. 2008. Censo Agropecuario Nacional 2008. Volumen I. Accessed: **http://www.arp.org.py/images/files/CENSO%20AGROPECUARIO%202008.pdf.**
56 USDA, 2019. *Paraguay Oilseeds and Products Annual.*

Table 13: Private sector investment in land expansion for soy production

ITEM	UNIT	ANNUAL INVESTMENT IN NEW EQUIPMENT
Land expansion[57]	Ha	22,102

Soybeans are largely an export crop in Paraguay, as domestic consumption is insignificant. A small share of soybean production is processed and those by-products are addressed in a subsection below.

Sustainable soybean production initiatives have been launched in Paraguay to encourage producers to adopt the sustainability standards developed in importing countries. Adopting these standards allows exporters and producers to sell soybeans at a higher price on importing markets. Investments are required to align with national laws and the good practices in the standard. Certification, which can cost more than $10,000, is a key investment cost and may be prohibitive for small producers.[58]

Producers are organized into cooperatives and larger organizations. Representative associations include the Federation of Producers' Cooperatives (FECOPROD),[59] which is composed of 34 cooperatives and provides technical assistance to producers, and the Association of Soy Bean, Oil Seed and Cereal Producers of Paraguay (APS),[60] whose members include large soybean producers, among others. Exporters, who also include producers, are addressed in a subsection below.

The Association of Production Unions (UGP)[61] federates these associations in a larger organization, which encourages policies supporting agricultural production and supports the sector overall.

PROCESSING INDUSTRIES

According to the 2011 economic census, Paraguay is home to 33 companies that produce oil from soybeans. Additionally, according to the Paraguayan Chamber of Processors of Oilseeds and Grains (CAPPRO), the capacity of its member companies in the oil seed processing industry totalled approximately 4.5 MT in 2014. Paraguay also produces soybean meal in-country.

The major players in Paraguay's processing industry include ADM, BUNGE, Cargill, Copagra, Louis Dreyfus and RAATZ, which are CAPPRO members.

The BCP also tracks FDI in oil processing. While this also includes crops other than soybeans, FDI in 2017 was estimated at $33.198 million and $168.529 million in 2018.

EXPORTERS

Paraguay is a leading soybean exporter. Export projections for 2019/2020 totalled 6.2 million tons,[62] up from 5.1 million tons the previous season. Leading importers are Argentina, Russia, the European Union and Brazil. Argentina was by far the largest importer in 2018, with more than 4 million tons imported from Paraguay.[63]

Processed products are also exported from Paraguay to the European Union, Peru, Chile and Argentina. New players, including Indonesia, are among the main importers of soybean meal produced in Paraguay (2.71 million tons forecast for 2019/2020). India, Argentina, Bangladesh and the European Union imported most of Paraguay's soybean oil (672,000 tons forecast).

57 CAPECO, 2019. *Situación de la cosecha, producción de soja de la campaña 2018-2019 y sus implicancias.*
58 Proyecto Paisajes de Producción Verde – Commodities Sustentables, 2017. *Producción de Soja Sostenible en Paraguay, Beneficios Económicos, Sociales y Ambientales Asociados.*
59 **http://www.fecoprod.com.py/portal/es-py/about-us?section=top.**
60 **https://www.aps.org.py/es/sobre-la-aps/.**
61 **https://www.ugp.org.py/quienes-somos/.**
62 Ibid.
63 Ibid.

The export industry is composed of both multinational companies, such as Cargill, ADMI, Bunge, Louis Dreyfus, Unilever, and locally-based large companies, such as the Favero Group. These companies belong to the Paraguayan Grains and Oilseed Traders Association (CAPECO).[64]

Exporters are often involved in other sectors of the value chain. Some are input providers that also produce and process. For example, the Favero Group is composed of seven companies that cover all stages of the value chain, including production, storage, marketing, export, provision of seeds, rental, purchase and sales of machinery and agricultural land, and logistics.

Figure 7 presents the main players in the soybean value chain.

Figure 7: Players in the soybean value chain

GAPS AND CHALLENGES FOR THE SOYBEAN VALUE CHAIN

Nitrous oxide (N_2O) emissions from soybean production

Multiple factors have an impact on N_2O emissions and reducing them is a complex undertaking. Those factors include fertilizers applied to soils, non-adapted irrigation techniques and soil composition. Major sources of N_2O emissions in soybean production include fertilizer use and plant decomposition. Recent research suggests that depending on the nitrogen available in soils, using nitrogen fertilizer may generate only marginal benefits.[65] While neither clear proof from the scientific literature nor consistent anecdotal evidence from growers exists to identify the conditions under which soybeans will respond to nitrogen, estimates find that nitrogen fertilizer is still required for soils with less endogenous nitrogen and where higher yields are sought.

Recent research also suggests that emissions can be reduced significantly through better management of fertilizer use.[66] Precision agriculture techniques, such as variable rate technologies and the optimization of agricultural nitrogen efficiency, may help reduce N_2O emissions by 19 percent to 40 percent. To minimize the impact of applying nitrogen to the soils and mitigate N_2O emissions, inputs must be applied precisely.

RECOMMENDATION AND POINT OF ENTRY 1

Support to precision agriculture

Precision agriculture is a data-based management practice that aims to apply the appropriate amounts of agricultural inputs, such as water, pesticides and fertilizers, to a specific area. Precision agriculture thus combines technologies that make it possible to apply precise amounts of inputs using area/site/lot-specific data analysis. For example, the amount of nitrogen in one parcel's soil may differ from that in another, so the amount of nitrogen fertilizer to be applied will differ as well. Developing lot-specific management zones for nitrogen on the basis of historical data trends related to yield, soil sampling and experience can help increase yields.

64 **http://capeco.org.py/en/.**
65 Pioneer research, Nitrogen Fertilizer for Soybean?
66 Wilfried Winiwarter, Lena Hoglund-Isaksson, Zbigniew Klimont, Wolfgang Schopp and Markus Amann, 2017. Technical opportunities to reduce global anthropogenic emissions of nitrous oxide.

For nutrient management, precision agriculture will typically combine variable rate application (VRA) controllers, which enable producers to apply different amounts of inputs, with guidance technologies, such as GPS and sensor kits, to map and analyse soil content.

Best practice example: Introducing precision agriculture to New Zealand

New Zealand is a small country where agriculture is a main driver of economic growth. It has led several feasibility studies on introducing applications of precision agriculture, including VRA technology, leveraging drones and variable rate irrigation.

Specific feasibility studies examined the use of VRA technology for ground-spreading fertilizer vehicles. The study used a GPS autosteer guidance on the fertilizer spreader and a nutrient plan. A range of VRA fertilizer applicators are now available in New Zealand.[67]

Main implementer	Private sector will be the main implementer through the introduction of the equipment and material. Government and international partners may support by financing feasibility studies.
Private sector involvement	The private sector will be the main implementer of precision agriculture, as it owns the fields where this would be applied.
Financial benefits	Precision agriculture produces a more reasonable consumption of inputs for agricultural production, which eventually leads to lower production costs.
Mitigation outcomes	Decreased GHG emissions from improved nitrogen efficiency, reducing N_2O emissions.

Recent research has shown also how soybean nodule decomposition contributes to N_2O emissions.[68] Nodule decomposition is the main source of N_2O in the soybean rhizosphere. Research suggests that using rhizobial inoculants is a potential mitigation strategy, which could be achieved through genetic modification of local varieties. Local research centres, such as INBIO and IPTA, should thus leverage the results of this research and provide producers with improved varieties.

Lower yields in family agriculture

Soybean yields are lower among family-based producers than commercial producers. Family-based producers' yields vary between 2,300 and 2,700 kg/ha[69], which are lower than the average yields on areas of more than 50 ha, where yields can exceed 2,900 kg/ha. The factors that explain these lower yields include low levels of technical assistance and/or extension services and limited availability of credit for smallholders. While commercial farmers have access to knowledge through multiple channels, family farmers often rely on extension services and other farmers.

Access to agricultural credit is crucial for all producers and allows them to finance inputs such as fertilizers and high-quality seeds. Inputs are significant determinants of yield. However, family agriculture producers often have limited access to credit, which limits their capacity to buy sufficient quantities of high-quality inputs.

In addition, family farmers are not as well organized as commercial farmers. Farmer organizations and cooperatives could support the development of credit schemes, access to inputs and the expansion of technological support.

Poor access to mechanization and technologies for smallholders

Family agriculture is characterized by limited access to mechanization, new technologies and innovation. Ultimately, this leads to soil degradation. Farmers cannot manage inputs efficiently and avoid fertility losses. However, commercial producers in industrialized countries have been the main adopters of precision agriculture approaches. Adoption by smallholders is low because of capital requirements and the lack of services that target them.

67 C. Hedley, 2014. *The role of precision agriculture for improved nutrient management on farms.*
68 C. Sanchez, K. Minamisawa, 2019. *Nitrogen Cycling in Soybean Rhizosphere: Sources and Sinks of Nitrous Oxide (N2O).*
69 Centro de Analisis y Difusion de la Economia Paraguaya, 2013. *Estudio de Potencialidad de Desarrollo de la Cadenas de Valor.*

The lack of access to long-term credit, as explained in further sections, and the lack of innovative agricultural services provided to farmers, help explain this low adoption. Cooperatives can play a major role in improving farmers' access to better equipment and innovation as they have greater financial capacity to purchase and lease equipment to smallholders when required. The financing section discusses this at greater length.

Farmers' access to precision agriculture mapping-related services should be improved. Smallholder farmers could benefit from improved management of nitrogen application, including reducing fertilizer costs. For example, domestic companies could extend their services to smallholders or foreign companies and start-ups could bring their services to Paraguay.

RECOMMENDATION AND POINT OF ENTRY 2

Tailoring precision agriculture to smallholders

Precision agriculture, especially the variable use of fertilizers, usually relies on the intensive use of technology, machinery and equipment. However, tailored solutions for improving fertilizer application could also be provided to smallholders. For example, very small landowners could apply fertilizer manually, using microdosing. Larger smallholders, who may already use some equipment to apply fertilizer, could rely on remote precision agriculture services offered by third-party providers.

Best practice example: Enabling access to precision agriculture through mobile phones and sensors

Mobile phones are an important tool for introducing smallholders to precision agriculture. They provide easier access to early warning systems, climate information and potential extension services, which are essential in understanding and applying precision agriculture principles.

UjuziKilimo, a Kenyan start-up, provides smallholders a holistic solution: a data platform accessible from a mobile phone. The company helps farmers optimize crop yields through soil analysis and farming recommendations. UjuziKilimo uses sensor technology to measure soil characteristics, relay information in real time to an analysis centre that includes a comprehensive database, and relay information back to the farmer in real time on crop variety, fertilizer required, pest control, markets and other farm management tools.

Main implementer	Private sector will be the main implementer through the introduction of innovative platforms and services to smallholders.
Private sector involvement	The private sector will be the main implementer, through the services provided by start-ups and other enterprises.
Financial benefits	Precision agriculture can achieve more reasonable consumption of agricultural production inputs, which eventually reduces production costs. The services that precision agriculture services deliver may offer significant benefits if scaled up.
Mitigation outcomes	Decreased GHG emissions from improved nitrogen efficiency, reducing N_2O emissions.

Vulnerability to drought

Paraguay is prone to droughts during the summer months (December to February), especially in soybean-producing regions. Some production areas have sandy soils that retain less water, which can aggravate the impacts of droughts. While droughts could be mitigated through complementary irrigation, this option is not viable due to energy supply shortfalls.[70]

Market risks

Paraguay's soybean producers continue to face export price volatility. Domestic prices are defined by differentials (price discounts) based on the Chicago futures market, where variations can be significant for Paraguay. Variations are usually associated with local demand and supply conditions and are linked with the trading market during harvest.[71]

70 World Bank Group, 2015. Paraguay Agricultural Sector Risk Assessment. Identification, prioritization strategy and action plan.
71 Ibid.

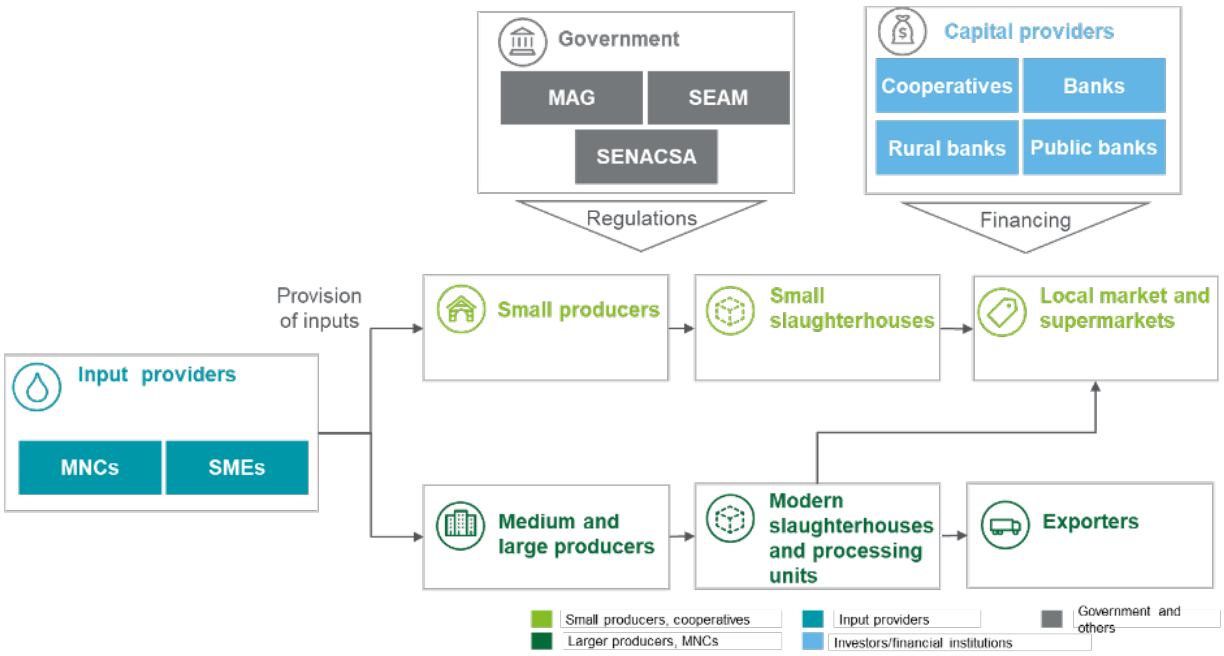
4.2 CATTLE

Mitigation actions in Paraguay's agriculture sector include improving livestock diet, increasing cattle productivity and providing greater financial support to producers so that enteric fermentation-based emissions can be reduced. Although mitigation actions target cattle producers, it is also important to understand the other stakeholders in the ecosystem, such as slaughterhouses and end users. This subsection analyses the ecosystem and value chain for cattle production and export in Paraguay.

4.2.1 ECOSYSTEM ANALYSIS

Figure 8 describes the cattle production and export ecosystem.

Figure 8: Cattle production and export ecosystem



Paraguay's cattle ecosystem can be divided among input providers, producers, processing industries and exporters. This ecosystem is defined largely by the ability of slaughterhouses to process products of export quality. Modern slaughterhouses usually follow stricter sanitary protocols and integrate traceability processes within their operations, while smaller slaughterhouses tend to meet lower standards. Medium and large producers, who can supply large numbers of cattle and meet modern slaughterhouse standards, usually work with such facilities, while smaller producers work with smaller ones.

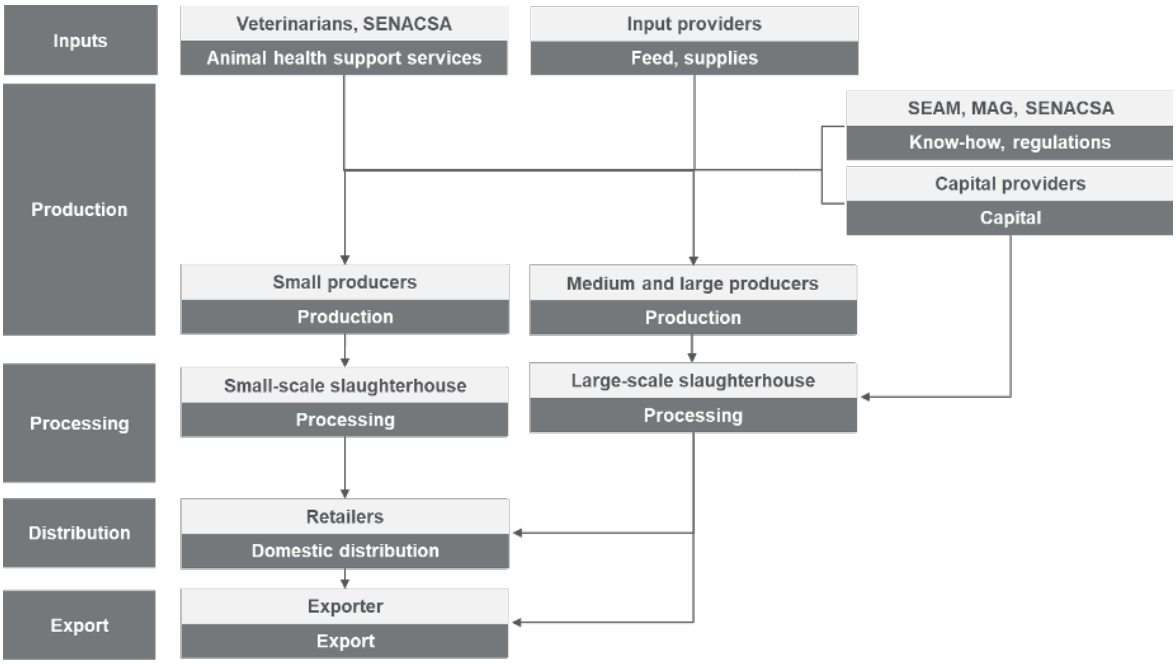
Smaller slaughterhouses target local markets and supermarkets, while modern slaughterhouses usually aim at producing high value-added products for export. Some also distribute their products to niche customers in local supermarkets.

Input providers include a variety of stakeholders, such as animal health service providers, including veterinary services, silage, feed and other supplies.

4.2.2 ANALYSING THE VALUE CHAIN, MAPPING PRIVATE SECTOR ACTORS AND IDENTIFYING BARRIERS TO CATTLE PRODUCTION IN PARAGUAY

Figure 9 presents the value chain analysis of cattle production in Paraguay.

Figure 9: Cattle production and export value chain



The cattle supply chain can be categorized based on the volume of production and the quality standards followed throughout production. Small producers are usually integrated in small-scale, informal value chains, in which slaughterhouses usually target local markets and supermarkets and are therefore less likely to comply with sanitary norms.

Larger producers usually target the export market. The value chain for these markets is structured to minimize costs, while at the same time ensuring that sanitary and quality standards are complied with.

INPUT PROVIDERS

In cattle production, the provision of inputs relates primarily to animal health services, including veterinary services and feed. Small producers can rely on the services offered by cooperatives. Rural cooperatives provide animal health services, including veterinary services, and feed. For example, Cooperativa Colonias Unidas[72] and the agricultural cooperatives of Naranjal[73] and Naranjito,[74] among others, provide animal health services, including vaccinations and animal medicines, to their members.

72 http://colonias.com.py/home/.
73 http://www.copronar.com.py/.
74 http://www.coopnaranjito.com.py/.

Figure 10: Cooperatives involved in cattle production

The National Service for Animal Health and Quality (SENACSA) regulates animal health and quality in Paraguay. SENACSA provides technical assistance to organizations, such as two of the country's major cooperatives, FECOPROD and ARP, on animal health matters. SENACSA has also signed conventions with third-party organizations, such as the Foundation for Animal Health Services (FUNDASSA), to provide vaccination services.[75]

Larger producers are more likely to rely on individual veterinarians and source their own feed directly. Feed production includes silage and feedlot rations, with sugarcane by-product, soybean meal and hulls, ground corn, and corn silage.[76] Providers thus include grain producers and processing industries.

PRODUCERS

Cattle producers in Paraguay are usually considered commercial producers, with more than 500 head of cattle, or family producers (smallholders), who own fewer than 500. According to the last agricultural census, 98 percent of producers are family producers, while the remaining 2 percent represent approximatively two-thirds of total cattle production.

Smallholders are characterized by low productivity and lack of integration into the overall value chain. Rather than producing cattle for meat production, smallholders usually use cattle for dairy production and sell the cattle for meat when they are no longer productive.[77] Meat is thus destined for the local market. Medium-size family producers, at the higher end of those producers, have some access to technical assistance and credit. Although the meat produced is still intended for local consumption, these producers supply local and regional slaughterhouses.

Larger producers are characterized by the larger number of cattle available and their ability to comply with sanitary requirements. They are better integrated into global value chains and usually supply modern slaughterhouses. Most still use extensive production and low-productivity, grazing-based systems, while some farms have begun using feedlots and more modern techniques to improve efficiency.

Cattle farming is one of the sectors that is the focus of significant investment in Paraguay. Table 14 provides details on producers' investments.

Table 14: Private sector investment in cattle production

ITEM	UNIT	NEW INVESTMENT (ANNUAL)
Cattle[78]	Head	62,731
Cold chain industries[79]	# of industries	17

The productivity of the value chain, which is based on its feed, is an important factor in enteric emissions from the cattle sector. Ruminant production systems with low productivity lose more energy per unit of animal product than those with high productivity. Although more effective farming systems have higher methane

75 **https://www.fundassa.org/#/**
76 U.S. Meat Export Federation. Paraguay Becoming "Rising Star" In Beef Exports.
77 World Bank Group, 2015. Paraguay Agricultural Sector Risk Assessment.
78 FAOSTAT, Difference between number of cattle slaughtered in 2016 and 2017.
79 As of 2014, World Wildlife Fund (2016). *Social, economic and environmental analysis of soybean and meat production in Paraguay*. Asunción, Paraguay: WWF-Paraguay.

emissions, they have much lower emission intensity. Improving feed is thus of significant importance, even if it requires additional investment.

Paraguay's production system is based primarily on grazing. In the last few years, the use of feedlots and grain has started to gain traction.[80] Agricultural by-products, such as soybean cake produced after soybeans are processed into oil, can also be used as feed, providing significant opportunities for both value chains. However, the proportion of producers who have adopted such practices is unknown.

Investing in manure management can also produce significant climate mitigation benefits. Compost and biogas production constitute potential mitigation options for the sector. Some bio-digesters have been installed in Paraguay, such as a PPP project providing energy to a cold storage enterprise, Frigorífico Bertín S.A.[81]

PROCESSING INDUSTRIES

Processing industries include slaughterhouses, butchers and other related industries that play a role prior to final consumption and retail sale. In Paraguay, there is a clear distinction between the structure of the markets for cattle aimed at local consumption and cattle aimed at export. Animals consumed in Paraguay are usually sold by the producers to fairs and/or directly to slaughterhouses and butchers. Informal, non-refrigerated slaughterhouses handle 40 percent of production, which is mainly aimed at the domestic market.[82]

Refrigerated slaughterhouses process the remaining 60 percent, which is produced primarily for the international market. Most processing plants meet the requirements of official veterinary services and are approved to handle exports.[83] Refrigerated meat production processing units belong to the Paraguayan Chamber of Meat (CPC). Some slaughterhouses are affiliated with and owned by cooperatives, such as FrigoChorti, which is owned and operated by the Cooperative Chortizer, and Frigorifico Neuland, owned by the Neuland Cooperative. Others, such as Athena Foods and Guarani, are independent processing units. Some of these companies are also exporters (see figure 11). Other major companies, such as Frigomerc and Bertin, do not belong to the CPC.

Table 15 provides estimates of new yearly investments in cold chain industries.

Table 15: Private sector investment in cold chain industries

ITEM	UNIT	NEW INVESTMENT (ANNUAL)
Cold chain industries[84]	# of cold chain storage units	17

The BCP also tracks FDI in meat production. While this encompasses other industries, such as poultry, FDI was estimated to total $47.144 million in 2017 and $15.774 million.

EXPORTERS

Exporters represent the final stage of the value chain. Most are involved in meat processing. The Chamber of Paraguayan Exporters (CAPEX) represents the export industry and its members include Chortizer, Frigorifico Concepcion and Neuland.

Figure 11: Selected list of companies involved in meat processing and export

80 Beef2Live, 2018. Paraguay Beef & Cattle Outlook 2018, **http://beef2live.com/story-paraguay-beef-cattle-report-0-107341**, accessed December 2019.
81 GAHB - Mercosur Ad Hoc Group on Biofuels - Vol. 1, n. 1 (2017) ClBiogás: Foz do Iguaçu, 2017. *Mercosur Biogas and Biomethane Report.*
82 World Wildlife Fund, 2016. *Social, economic and environmental analysis of soybean and meat production in Paraguay*. Asunción, Paraguay: WWF-Paraguay.
83 Ibid.
84 As of 2014, Ibid.

Diet and availability of fodder

Commercial beef cattle production can be divided into three phases:

1. The cow-calf phase, when feeder calves are weaned and ready for grazing/feeding;
2. The backgrounding/stocker phase, when recently weaned calves add body weight; and,
3. The finishing phase, when cattle are fattened for slaughter; this generally takes place on feedlots.

Paraguayan cattle are usually fed on pasture forage, which is available in quantity. Although feeding cattle on grass is common and profitable, compared with other diets, it results in low productivity and increased enteric fermentation. In recent years, cattle producers have increasingly chosen to use feedlots, which represented 15 percent of the total slaughter supply in 2018.[85]

If grassland management techniques, improved pasture species and forage are not introduced, grazing will remain a low-productivity system that generates significant methane emissions. This is related to the digestibility of feed, which is lower in grazing systems than in other improved feeding systems. Digestibility is directly linked to methane emissions from enteric fermentation.

RECOMMENDATION AND POINT OF ENTRY 3

Improving cattle production diets

Feed is an important factor in enteric fermentation as it relates directly to the efficiency of animal production. Thus, the less feed used to raise animals of a weight and quality desired for slaughter, the less enteric fermentation is produced.

In mixed dairy cattle systems in East Africa, the potential GHG reduction resulting from improved feed quality is estimated at between 12 and 19 percent.[86] Paraguay should consider similar initiatives, such as introducing hay, fertilizing pastures and introducing feedlots.

Best practice example: Potential to mitigate enteric fermentation in Argentina

In Argentina, individual mitigation actions related to improved feed offer significant potential and are associated with improved production. Table 16 presents those proposed actions.[87]

Table 16: Mitigation actions proposed for the livestock sector in Argentina

MITIGATION ACTION	ARGENTINA	
	Reduction in enteric CH_4 emission intensity (%)	Percentage change in production (live weight) relative to baseline (%)
Use of deferred forage (50% sorghum silage + 50% oats)	23.4 to 39.1	30.5 to 65
Use of conserved fodder (silage + cotton seed)	3.3 to 4.2	3.4 to 4.3
Use of conserved fodder (hay + cotton seed + maize)	3.8 to 4.9	3.8 to 4.9
Fertilization of pastures	3.4 to 7.9	14.2 to 17.4
Sowing/ seeding pastures	7.4 to 9.4	6.5 to 8.4

85 United States Department of Agriculture, 2018. Paraguay, Livestock and Products Annual.
86 Food and Agriculture Organization, 2017. *Reducing enteric methane for improving food security and livelihoods.*
87 Food and Agriculture Organization, 2017. *Low-emissions development of the beef cattle sector in Argentina.*

Main implementer	Private sector, through the introduction of new feed practices, equipment and material. Government and international partners may support by financing feasibility studies.
Private sector involvement	The private sector will be the main implementer, as it owns the cattle to which this would be applied.
Financial benefits	Improved feed results in more efficient cattle. Cattle may reach the slaughterhouse faster, thereby decreasing running costs, or produce higher yields, thereby increasing selling prices.
Mitigation outcomes	Decreased GHG emissions from improved efficiency, decreasing enteric fermentation.

Paraguay could also consider introducing grain diets for finishing. Beef and soybean value chain stakeholders could explore how to best leverage soy by-products for feed, such as soybean meal from oilseed crushing and soybean hulls.

Need to improve animal health

Paraguay's cattle industry is also characterized by high losses in the rate of calves born and a significant rate of reproductive disease.[88] Reproductive diseases reduce the fertility of infected animals or cause losses (abortions) resulting in fewer calves born and a lower calving percentage. Improving the survival rate of calves born and successful reproduction through improved breeding management are effective actions to mitigate enteric fermentation. Enhancing animal productivity would decrease methane emissions. Improving the delivery of veterinary services and animal health management, especially to smallholders, is therefore crucial.

Potential to improve cold chain management

Meat exporters in Paraguay already use cold chains extensively that meet industry standards. Cold chains are energy intensive; specific temperatures must be maintained to preserve a product's quality and avoid food waste. The carbon footprint of large cold chain industries can be reduced by using more efficient technologies or by replacing the energy source used to power cold chains. The private sector could, for example, consider renewable energy-based industrial solutions. Other solutions could include leveraging biogas power generation, which could, in theory, leverage the methane produced from treating cattle waste.

In lower-quality systems, where meat is sent to local slaughterhouses and butchers, cold chain management may not be as advanced as that applied to cattle for export. While this means fewer emissions from energy generation, it also means more food waste as a result of the lack of cold chain management and, thus, more GHG emissions from food waste. Technologies adapted to small processors are available for cold chain management. They enable processors to reduce food waste, while simultaneously reducing the emissions generated. For example, the IceBattery[89] solution makes it possible to store and transport the product for a specific amount of time without a permanent power source.

Vulnerability to climate variability

The cattle value chain in Paraguay is vulnerable to both drought and flood. Drought occurs throughout Paraguay, with severe impacts in the western region (Chaco) from June to September. Cattle are sensitive to drought, which is a factor in lower pregnancy and birth rates, weight loss and reduced meat output.[90] Floods occur between December and March in the western region and can lead to animal death, weight loss and pasture loss.

Lack of centralized quality control

Quality control and laboratory testing are not centralized. Beef exporters must therefore rely on beef farmers and processors to self-enforce in terms of hygiene and quality control standards throughout the supply chain.

88 **https://beef2live.com/story-paraguay-beef-cattle-report-0-107341.**
89 **https://icebattery.jp.**
90 Ibid.

In Paraguay, private sector stakeholders already lead the agriculture sector with significant investments in both soybean and cattle value chains. These value chains are characterized by levels of investment that differ between smallholders and larger producers/companies. Larger producers have greater capacity to invest in new technologies enabling them to improve productivity, if necessary. Although the private sector plays a leading role in terms of investment, the agriculture sector still faces barriers, such as lower yields for family agriculture and low productivity in general in the cattle value chain. Although these constitute significant barriers, they could also constitute opportunities for potential in both value chains. The private sector investment potential analysis will thus focus on improving productivity, while providing mitigation options for the soybean and cattle value chains.

4.3 FINANCIAL INSTITUTIONS PROVIDING GREEN FINANCING RELEVANT TO THE AGRICULTURE SECTOR

Access to financing is critical for the agriculture sector. Short-term financing allows smallholders to buy the inputs required to sustain production, while medium- and long-term financing provides producers and enterprises the capacity to increase investments in equipment, infrastructure and technology. Investing in additional production assets is essential to reducing GHG emissions in the agriculture sector. Those additional assets include automated equipment and GPS and VRA systems, as well as others that can improve cattle nutrition, such as improved pastures and feedlots,

Given agriculture's position as one of Paraguay's main economic sectors, several institutions provide financing to producers and large companies. As of May 2020, the regulated financial system in Paraguay included 17 banks and eight non-bank financial institutions.[91] This does not include cooperatives, although they do provide financial services. Other stakeholders, such as microfinance institutions, also provide financing for smallholders.

Table 17 lists the institutions that provide finance to Paraguay's agriculture sector and the financial products and services they offer.

Table 17: Financial institutions providing financing to the agriculture sector

FINANCIAL INSTITUTIONS		SUBSECTOR SERVED	PRODUCTS AND SERVICES	DETAILS
Type	Example			
PUBLIC CREDIT INSTITUTIONS AND BANKS	*Crédito Agrícola de Habilitación* (Agricultural Loan Facility, CAH)	Agriculture	Short-term credit	Mainly for operating capital Interest rate (IR): 8% Up to PYG54.5 million (US$8,000) Tenor: up to 2 years
			Investment	Project financing and purchase of innovative technologies Up to PYG50 million (US$7,500) Tenor: up to 7 years
	Agencia Financiera de Desarrollo (Financial Development Agency, AFD)	Livestock	PROCAMPO	Line of credit to intermediary financial institutions (IFIs) for livestock investment IR: 7% + margin Tenor: up to 12 years
		Agriculture	FIMAGRO	Line of credit to IFIs for equipment investment IR: 8% + margin Tenor: up to 6 years
			PROCOOP	Line of credit to cooperatives for agricultural project investment IR: 5.75% to 7.25% + margin Tenor: up to 12 years

91 Central Bank of Paraguay.

FINANCIAL INSTITUTIONS		SUBSECTOR SERVED	PRODUCTS AND SERVICES	DETAILS
Type	Example			
	Fondo Ganadero (Livestock Fund, FG)	Livestock	Short-term credit	Primarily for operating capital IR: 9% to 10% Tenor: up to 3 years
			Long-term credit	Primarily for new animals and equipment IR: 11% Tenor: up to 6 years, up to 1-year grace period
			Value chain development	Equipment, cold chain, commercial equipment and other IR: 14% to 16% Tenor: 3-4 years
COMMERCIAL BANKS	See table 18	Livestock and agriculture	Short-term (less than a year) and longer-term credit (more than a year)	See table 18
COOPERATIVES	*Cooperativa Fernheim, Cooperative Colonias Unidas* and others	Livestock and agriculture	Mostly short term	Typically, seasonal loans
IMPACT INVESTORS, VCS AND CVCS	Arbaro Fund	Forestry	Equity investments	Investment in Forestal Apepú
DFIS	Inter-American Development Bank	Agriculture	Financing for the Improvement of Research, Innovation, and Transfer of Agricultural Technology in Paraguay	Technology transfer and development
		Livestock	Project to Improve and Expand Animal Health Services in Paraguay	Expand the coverage of veterinary services
	World Bank	Agriculture	Market access for agriculture products	Promote the development of organizations serving small and medium-size farmers and indigenous communities participating in productive alliance
			Sustainable Agriculture and Rural Development Project	Develop a sustainable rural development fund; improve animal health

4.3.1 PUBLIC CREDIT INSTITUTIONS AND BANKS

The Agricultural Loan Facility (CAH),[92] the Financial Development Agency (AFD)[93] and the Livestock Fund (FG)[94] are also important stakeholders. While these are led and capitalized by the government and, therefore, are not commercial banks or private financial institutions, they constitute important sources of finance in the country for the agriculture and livestock sectors.

CAH provides financial services to the rural productive sector at preferential rates, including a line of financing for the purchase of equipment and innovative technologies, project financing and related operating capital. However, financing amounts remain limited, with an upper limit of $7,500, so it targets primarily smallholders.

Most of these institutions provide short- and long-term financing, as well as technical assistance. For example, FG provides long-term financing for the purchase of new animals and equipment, with four- to six-year tenor.

92 http://www.cah.gov.py/product.
93 https://www.afd.gov.py/.
94 http://www.fondogan.gov.py/.

FG has also developed lines of credits in cooperation with AFD, designed to introduce new infrastructure, equipment and other assets. These lines have longer tenors, from five to 12 years, and interest rates between 9.5 and 13 percent.

AFD works exclusively with lines of credits. It provides financing to commercial banks, financial institutions and cooperatives, which then offer specific products to their own clients. AFD has developed several agriculture- and livestock-related products, such as PROCAMPO and FIMAGRO, which are accessible through commercial banks, and PROCOOP, which is accessible through cooperatives. Intermediary financial institutions take a fee related to the AFD's base interest rate.

None of these institutions provide green financing for the agriculture sector explicitly. However, their current products could accommodate climate action projects in the agriculture and livestock sectors.

4.3.2 COMMERCIAL BANKS AND NON-BANK FINANCIAL INSTITUTIONS

Most commercial banks and other financial institutions provide credit to the agriculture sector. The AFD extends lines of credit to most commercial banks and non-bank financial institutions for specific agriculture-related programmes, as shown in table 18.

Table 18: Commercial banks and non-bank financial institutions that provide financing to the agriculture sector through AFD financing

BANKS/NON-BANK FINANCIAL INSTITUTIONS	PROGRAMME PARTICIPATION	INTEREST RATE AS OF JUNE 2020*
Banco Continental S.A.E.C.A.[95]	PROCAMPO/FIMAGRO	11-26% (PYG) 7-13% (US$)
Banco BASA[96]	PROCAMPO/FIMAGRO	17-24% (PYG) 11-13% (US$)
Banco Itaú Paraguay S.A.[97]	PROCAMPO/FIMAGRO	18-31% (PYG) 12% (US$)
Banco Regional S.A.E.C.A.[98]	PROCAMPO/ FIMAGRO	9-30% (PYG) 6-13.75% (US$)
Banco Bilbao Vizcaya Argentaria Paraguay S.A. (BBVA)[99]	PROCAMPO/ FIMAGRO	21-26% (PYG) 12-14.75% (US$)
Banco GNB[100]	PROCAMPO/ FIMAGRO	7-20% (PYG) 6.9-12% (US$)
Sudameris Bank S.A.E.C.A.[101]	PROCAMPO/ FIMAGRO	10.75-27% in (PYG) 6.8-13.5% (US$)
Banco para la Comercialización y la Producción S.A. (Bancop S.A)[102] **	PROCAMPO/ FIMAGRO	8.50-25% (PYG) 7.5-14.4% (US$)
Banco Atlas S.A.[103]	PROCAMPO/ FIMAGRO	16.22-31.35% (PYG) 11.24-14.56% (US$)
Banco Rio S.A.E.C.A[104]	PROCAMPO/ FIMAGRO	18-31.36% (PYG) 8-14.57% (US$)
Banco Familiar S.A.E.C.A[105]	PROCAMPO/ FIMAGRO	15-31.30% (PYG) 6-14.5% (US$)

95 https://www.bancontinental.com.py/.
96 https://www.bancobasa.com.py/tarifarios/
97 https://www.itau.com.py/.
98 https://www.regional.com.py/.
99 https://bbva.com.py/
100 https://www.bancognb.com.py/
101 https://www.sudameris.com.py/
102 https://www.bancop.com.py/
103 https://www.bancoatlas.com.py/web/
104 https://www.rio.com.py/
105 https://www.familiar.com.py/

BANKS/NON-BANK FINANCIAL INSTITUTIONS	PROGRAMME PARTICIPATION	INTEREST RATE AS OF JUNE 2020*
Financiera Paraguayo Japonesa S.A.E.C.A[106]	PROCAMPO/ FIMAGRO	14-33.48% (PYG) 8-14% (US$)
Visión Banco S.A.E.C.A.[107]	FIMAGRO	18-31% (PYG) 10-14.04% (US$)
Interfisa Banco[108]	FIMAGRO	6.50-31.35% (PYG) 6-14.55% (US$)
Fic de Finanzas[109]	FIMAGRO	12-31.17% (PYG) 10-14.35% (US$)
Crisol y Encarnación Financiera (CEFISA) S.A.E.C.A[110] ***	FIMAGRO	20 to 31.91% (PYG) 11-14.78% (US$)
Financiera El Comercio S.A.E.C.A.[111]	FIMAGRO	15-31.36% (PYG) 10.50-14.57% (US$)
Solar S.A. de Ahorro y Préstamo[112]	PROCAMPO	22-31.36% (PYG) 12-14.57% (US$)

* Nominal rate for commercial and development credits.
** Rate for services targeted at agriculture sector.
*** Rates as of March 2020.

Few of these institutions provide details concerning the possible use of the loans. Table 19 presents examples.

Table 19: Loan coverage for the agriculture sector

BANK	SECTOR	COVERAGE
Banco Regional S.A.E.C.A.	Agriculture	• Silo construction • Agricultural input imports (seasonal loans) • Reforestation • Mechanization • Advanced payment for production (grain – seasonal loans) • Soils improvement (soil management)
	Livestock	• Operating capital (seasonal loans) • Fattening • Breeding • Infrastructure • Land purchase
Banco GNB	Agriculture	• Harvest support (pre-payment, seasonal loans) • Stocking support • Asset purchases (equipment) • Other types of investments
	Livestock	• Production support (pre-payment, seasonal loans), including breeding, fattening and other inputs • Infrastructure • Land purchase • Equipment and vehicles

Although commercial banks provide credit for agricultural activities, 80 percent of their loan portfolios are short term (up to one year), 12 percent are medium term (one to three years), and approximately 8 percent offer a tenor of over three years.[113] The commercial banking system thus does not offer adequate conditions to commercial producers and family farmers to make larger investments in equipment, land and innovative technologies. Access to longer-term credit is crucial if producers are to make the necessary investments and adjust their production processes by adopting low-carbon practices throughout the value chain.

106 **https://www.fpj.com.py/**
107 **https://www.visionbanco.com/**
108 **https://www.interfisa.com.py/index.php**
109 **https://www.fic.com.py/fic/index.php**
110 **https://cefisa.com.py/**
111 **https://www.elcomercio.com.py/?radius=25**
112 **https://www.solar.com.py/**
113 Inter-American Development Bank, 2018. Access to financing for Investments in Paraguay's agriculture sector – Loan Proposal.

Regarding green investments, the banking sector does not provide information on specific products that align with low-carbon and resilient practices in the agriculture sector. However, the banking sector has started to develop sustainability guidelines for agriculture (see box 2). Several banks in Paraguay are members of the country's Sustainable Finance Board (*Mesa de Finanzas Sostenibles*), including Sudameris, Continental, Banco Regional, BBVA and GNB.

Box 2: Sustainable finance guidelines

The members of the Sustainable Finance Board of Paraguay have developed financing guidelines for Paraguay's agriculture sector in Paraguay that are aligned with environmental and social considerations.

Banco Regional has also developed environmental and social guidelines for the financing of agricultural activities in Paraguay. The guidelines include a list of activities that should be ineligible for financing and regulatory considerations, including preventing deforestation, soil management, and the use of chemicals and water.

Sudameris Bank and Banco Continental have developed similar guidelines for the livestock and agro-industrial sectors, respectively.

However, producers, especially smallholders, have a limited understanding of environmental regulations and are not well informed about recommended sustainable practices in their sector or the productive and economic benefits such practices could generate.

Several factors may explain the lack of specific "green" products for the agriculture sector. First, banks make investment decisions based on risk assessments that already consider several sustainability practices, such as preventing deforestation. Second, commercial banks already provide products that could help Paraguay's agriculture become low carbon and more resilient. For example, automated equipment and precision application of fertilizers may fall under equipment financing, while providing more efficient silage may be covered under agricultural inputs. Green investments in agriculture are therefore subject to the same financing conditions and assessment criteria as a business-as-usual (BAU) investment.

Additional regulations may be required to provide more regulatory incentives to commercial banks to make green investments. This may lead banks to revise their risk review procedures to align with the regulations and best practices.

RECOMMENDATION AND POINT OF ENTRY 4

Encouraging green investments in Paraguay

Investments in climate change impact mitigation are similar to traditional investments, as they relate to financing equipment, machinery and inputs. However, "green" investments are considered to be more sustainable in the long term. They increase producers' and industry's climate resilience and their ability to reduce their contribution to climate change. This lowers the risk of investments. Some investors have integrated these environmental criteria into their investment framework, encouraged to do so because such investments present fewer risks than traditional investments. Several environmental, social and governance (ESG) rating agencies rate portfolios and companies on their performance in these areas, which is increasingly driving such investments. The development of guidelines and guidance formalizing green investments has also encouraged these investments. If the Sustainable Finance Board of Paraguay formalized definitions for green investments, this could encourage additional investment by the financial sector in sustainable agriculture.

Best practice example: EU Taxonomy[114]

The European Commission has published its sustainable finance taxonomy, a classification instrument to help financial players and companies determine which activities qualify as sustainable. This is part of the EU's push to support development of a low-carbon economy. The taxonomy will underpin new regulations, which will regulate disclosures for ESG investment and protect against "greenwashing."

114 European Commission, 2020. *Taxonomy: Final report of the Technical Expert Group on Sustainable Finance.*

Main implementer	The government should take the lead in formalizing definitions for green practices in Paraguay and encouraging green finance.
Private sector involvement	The private sector will be involved in defining what constitutes green finance and in mainstreaming it in their operations (risk management and/or products directed at green investments).
Financial benefits	More sustainable investments carry less long-term risk and are expected to offer a return similar to that of traditional investments.
Mitigation outcomes	Indirect decrease of GHG emissions from investment directed at low-carbon actions in the agriculture sector.

In addition, improved traceability is essential to determine whether soybeans and beef are sustainable. Although soybean production in Paraguay has expanded most recently on grazing land, farmlands and fallow land, in past decades, its production has been linked to deforestation.[115] While some soybean traders and end users would like to eliminate deforestation from their supply chain, implementation of such commitments still lags. Because of limited traceability, the origin of soybean products cannot be established. Without this data, it is very difficult to assess forest-related risks and opportunities in trade in the soybean industry.

Paraguay developed its beef production traceability system, SITRAP, in 2014. However, as of 2017, only 419 out of 148,000 beef producers had registered.[116] Thus, most of the industry operates outside of this hygiene monitoring system.

4.3.3 COOPERATIVES

In 2016, the National Institute of Cooperatives in Paraguay (INCOOP) identified 610 credit cooperatives in the country. They are important stakeholders in Paraguay for achieving financial inclusion. Some also receive financing from the PROCOOP programme, which aims to support agricultural projects. Loans cover equipment purchases, infrastructure investments, breeding/genetics improvements and the purchase of breeders. As of 2019, the following cooperatives had access to this line of credit:

- Cooperativa Fernheim Ltda.;[117]
- Cooperativa Colonias Unidas Ltda.;[118]
- Cooperativa Naranjal Ltda.;[119]
- Cooperativa Raúl Peña Ltda.;[120]
- Cooperativa Neuland Ltda.;[121] and,
- Cooperativa Chortitzer Ltda.[122]

Similar to commercial banks, cooperatives usually provide financing on a short-term basis,[123] which creates similar challenges in terms of equipment investments.

RECOMMENDATION AND POINT OF ENTRY 5

Providing equipment and machinery to smallholders at a lower cost

Agriculture, as well as precision agriculture, often requires equipment and machinery, such as tractors. Precision agriculture also relies on GPS and automated solutions. Such equipment and machinery remain expensive for smallholders. Access to equipment and machinery is usually facilitated by improving access conditions to agricultural credit. However, access can also be improved by reducing their up-front cost.

Leasing may offer smallholders an appropriate financial solution. For example, leasing does not require collateral, as the asset leased becomes the collateral. When the lease ends, the lessor may retain legal

115 World Wildlife Fund (2016). *Social, economic and environmental analysis of soybean and meat production in Paraguay.* Asunción, Paraguay: WWF-Paraguay.
116 Carlos Agustin RAMIREZ PASTORE and Jason WEST, Studies in Agricultural Economics 121, 2019. *Competition Barriers to Paraguayan Beef Exports: An Economic Review.*
117 **https://www.fernheim.com.py/en/.**
118 **http://colonias.com.py/home/.**
119 **http://www.copronar.com.py/.**
120 **http://www.coorpena.com.py/.**
121 **http://www.neuland.com.py/.**
122 **http://www.neuland.com.py/.**
123 UNDP Paraguay, 2010. *Microfinanzas en Paraguay: Análisis de la Oferta y la Demanda.*

ownership of the asset, thereby reducing the credit risk for the financial service provider.

Lending assets on a short-term basis offers another solution to address access to credit. Some start-ups and companies already lend agricultural equipment and machinery on a short-term basis.

Best practice example: Rent to Own[124]

Farmers and rural business owners in Zambia lack access to affordable, available and appropriate equipment for key business ventures, such as farming and food production. Without productive assets, these entrepreneurs cannot realize their business potential.

Founded in 2010, Rent to Own is a social business that seeks to provide high-impact assets to micro-entrepreneurs in rural Zambia. These assets (such as refrigerators, hammer mills and irrigation pumps) help catalyse business growth and increase income for smallholders who lack access to equipment because of high up-front costs. The company's business model focuses on providing equipment, plus a set of services that includes tailored financing, delivery and training on equipment maintenance and repair. This ensures that all clients have the comprehensive skills and knowledge to use the asset to catalyse their business growth.

Best practice example: Connecting tractor owners and users - Hello Tractor[125]

Hello Tractor supports smallholder farmers in sub-Saharan Africa by connecting them to tractor owners via an app that promotes mechanization by reducing transaction costs. The Hello Tractor platform enables farmers to request affordable tractor services, allowing them to plant 40 times faster and 2.5 times less expensively than conventional manual methods.

Main implementer	Private sector, through cooperatives, financial institutions or other innovative businesses, is the main implementer.
Private sector involvement	The private sector should lead the development of the business model and operate the business.
Financial benefits	Additional revenue streams can be expected from renting equipment and/or providing leasing to smallholders. Smallholders would not be burdened by credit.
Mitigation outcomes	Decreased GHG emissions from investment directed at low-carbon actions in the agriculture sector.

4.3.4 IMPACT INVESTORS, VENTURE CAPITAL FIRMS AND PRIVATE EQUITY FUNDS

Only a limited number of impact investors, venture capital (VC) funds and private equity (PE) funds are based and/or active in Paraguay. In the agriculture/forestry sector, the Arbaro Fund[126] invested in Forestal Apepú, a timber production business. The company acquired land previously used for agriculture that now produces high-quality timber for local sawn wood and plywood markets. One-quarter of the company's land is home to natural forest, which is protected to ensure regeneration. The remaining pasture land is leased to local cattle farmers. The Green Climate Fund recently invested in the Arbaro Fund to scale up its operations.[127]

RECOMMENDATION AND POINT OF ENTRY 6

Fostering innovation in climate-smart agriculture

Innovative enterprises also require adequate financing conditions to further support innovation in climate-smart agriculture businesses. Agtech and cleantech ventures, social ventures and enterprises require capital early to develop their business model, proof of concept and prototypes and to grow at scale. In addition to capital, they also need technical support.

In 2019, the government launched working groups to develop a national innovation strategy. The Ministry of Information and Communications Technology also launched an incubator, InnovandoPy, which aims at

124 https://rtoafrica.com/about-us/.
125 https://hellotractor.com/about-us/.
126 https://www.arbaro-advisors.com/investments/.
127 https://www.greenclimate.fund/project/fp128.

fostering innovation in Paraguay. In 2019, PuraRaza, a start-up that is developing a livestock management platform, was one of the programme's beneficiaries.

Private service providers, such as Koga Impact Lab[128], an incubator and accelerator for local entrepreneurs addressing social and environmental issues, also exist in Paraguay. However, the country's innovation ecosystem remains nascent, and support and capital are limited.

Providing additional support to entrepreneurs, based on incubation and acceleration agtech and cleantech services, could help drive innovation and strengthen Paraguay's innovation ecosystem. Given its status, the innovation ecosystem needs pre-seed and seed funding. This can be achieved by providing grants or other concessional finance to acceleration services and/or investors (impact investors and VCs).

Best practice example: Impact investors and GCF

GCF has provided financing to Acumen, an impact investment fund, to develop an investment fund, KawiSafi, to drive off-grid solar power in East Africa. KawiSafi aims to advance a low-carbon paradigm shift and leapfrog fossil fuel grids to clean energy, using equity capital from GCF to leverage investment and grant capital to set up a technical assistance facility.

Best practice example: Acceleration services and funding throughout the investment cycle

The Kenya Climate Innovation Center (KCIC) provides holistic, country-driven support to accelerate the development, deployment and transfer of locally relevant climate and clean energy technologies. KCIC provides incubation, capacity-building services and financing to Kenyan entrepreneurs and new ventures that are developing innovative solutions in energy, water and agribusiness to address climate change. KCIC was the first incubation centre under the infoDev Climate Technology Program.

KCIC also provides a number of financing options throughout the investment cycle. At seed level, it provides grants to entrepreneurs. After this stage, it provides loans. When companies become investable, KCIC can also invest through its venture capital firm, Kenya Climate Ventures (KCV).

Brazil launched a similar initiative in 2018, its Nucleus for Technological Innovation for Family Agriculture (NITA). NITA supports small businesses developing and marketing climate-smart solutions for family farmers in Santa Catarina[129].

Main implementer	The government and the private sector could collaborate to foster innovation. In the short term, the government could kickstart the ecosystem before private-led accelerators and incubators take over.
Private sector involvement	The private sector should lead the provision of acceleration and incubation services.
Financial benefits	Providing financing to innovative enterprises can lead to significant financial returns. For innovative enterprises, venture capital may be the only option to grow initially.
Mitigation outcomes	Decreased GHG emissions from investment directed at low-carbon actions in the agriculture sector.

Paraguay's agriculture sector already includes many stakeholders, particularly in the soybean and livestock value chains. Commercial producers and MNCs are involved at all stages of production in both. Smallholders also participate actively in soybean and meat production. However, agricultural production remains carbon intensive and requires more investment in low-carbon technologies and practices.

In the soybean value chain, the private sector should focus on variable rate fertilizer application technologies, which would make it possible to better manage nitrogen and potentially avoid N_2O emissions. However, both commercial and smallholder producers will require longer-term debt financing or innovative solutions, such as

128 https://koga.com.py.
129 http://www.infodev.org/articles/new-climate-center-brazil-brings-together-entrepreneurs-and-farmers.

leasing, to acquire the equipment and machinery required. Technical assistance, especially for smallholders, is also crucial. As research shows that genetically-improved soybean seeds could reduce N_2O emitted post-harvest, public research centres could also support private stakeholders by developing new seeds.

In the livestock value chain, private sector investment should focus on improving the efficiency of cattle production. This means improving feed and breeding techniques, as well as providing better animal control. Improving feed also requires medium- to long-term investment, as feedlots and improved pastures may be necessary. Improving financing conditions on long-term credit is thus crucial.

Innovation can support initiatives in low-carbon agriculture and livestock. Paraguay should increase its support for innovation by providing an enabling environment in terms of acceleration services and seed funding to innovative ventures in agriculture technologies. Finally, to further support the private sector and leaders in low-carbon development, green financing schemes should be supported through additional sustainable investment initiatives and commercial banks should be encouraged to further integrate ESG in their investment decisions.

5. PRIVATE SECTOR INVESTMENT POTENTIAL

Paraguay set an ambitious target in its NDC: to reduce its emissions by 20 percent relative to the BAU scenario by 2020. Although the NDC does not provide details on how to achieve this objective, the National Plan for Climate Change Mitigation and Programmes of Action provides a list of strategic actions and substrategies for each sector. Tables 4, 5 and 6 in section 2 provide details on the substrategies and actions.

To understand which actions offer potential for private sector investment requires identifying those actions that can provide financial benefits to producers over time. For example, it is well understood that encouraging alternative methods to slash and burn may require financial incentives because changing the practice will have limited direct financial benefits. The overall production structure of the soybean and cattle value chains must be considered when selecting relevant actions. To achieve greater and more significant impacts, mitigation measures in the soybean value chain should target large-scale producers, which represent most of the production and producers. Measures in the cattle value chain that target both large-scale and smaller producers can be effective.

The actions included in the National Plan for Climate Change Mitigation and Programmes of Action have therefore been analysed further based on these considerations and their potential for climate mitigation.

5.1 DATA SOURCES

This subsection presents detailed information on the data sources for the targets adopted under this report, as well as the data sources for investment costs.

5.1.1 TARGETS

The Government of Paraguay included mitigation actions in its National Plan for Climate Change Mitigation and Programmes of Action. In 2015, enteric fermentation, which produces methane, accounted for 63 percent of agriculture sector emissions and direct N_2O application from managed soils accounted for 27 percent. Given the structure of emissions in the agriculture sector, mitigation actions in the soybean and cattle value chains should focus on reducing these emissions.

5.1.2 SOYBEAN VALUE CHAIN

The soybean value chain should focus on reducing emissions from direct N_2O application from managed soils. The Government of Paraguay has also set a target of a 20 percent reduction across the economy. Although N_2O emissions contribute to more CO_2-equivalent emissions than other GHGs, for this report, the investment potential will be considered across the value chain. All soybean producers, except smallholders, will be assumed to be able to introduce this measure. This is because precision management of fertilizer may achieve important economies of scale in terms of cost savings for fertilizer use. Thus, investing in precision agriculture technologies may be a financially sound choice for larger producers.

For this report, the technologies considered will focus on variable rate fertilizer application, based on nitrogen analysis on soybean farms. This mitigation strategy aligns with Paraguay's National Plan for Climate Change Mitigation and Programmes of Action, with actions such as implementing good practices in fertilizer management and introducing technologies with mitigation co-benefits.

5.1.3 CATTLE VALUE CHAIN

Improving the productivity of ruminants is key in reducing methane emissions in the livestock value chain. The chain should focus on measures to reduce GHG emissions in enteric fermentation. This can be achieved through mitigation strategies such as improving feed and nutrition, animal health and husbandry, and breeding.

Most cattle production systems in Paraguay are grazing-based. Only a small proportion of farms use feedlots for finishing. Improving feed and nutrition can contribute to the objectives outlined in Paraguay's National Plan for Climate Change Mitigation and Programmes of Action, such as increasing productivity per unit of surface area. For this report, private sector investment potential will thus be estimated based on the potential for feed improvement. Mitigation actions will include introducing hay and feedlots and fertilizing pastures.

This assessment will also consider introducing grain diets for finishing. Based on the findings of available literature on the cost and methane reduction potential of corn-based silage and fodder,[130] corn has been chosen as the benchmark for this report.

5.1.4 BASELINE DATA FOR MITIGATION ACTIONS

Paraguay's 2008 census provides the most current disaggregated data available. The Food and Agriculture Organization's statistical database, FAOSTAT, provides 2017 aggregated data for area harvested for soybean production and for cattle production (head produced/slaughtered). The number of producers, amount of area covered by production volume, and number of head of cattle have been estimated based on these data and constitute the baseline data. Family producers in the soybean value chain are defined as those who farm fewer than 50 hectares, while commercial producers cultivate areas greater than 50. In the cattle value chain, family producers own fewer than 500 head of cattle, while commercial producers own more than 500.

Table 20 provides details of the baseline data used in this report.

Table 20: Baseline data for mitigation actions

	UNIT	BASELINE DATA
SOYBEAN VALUE CHAIN		
Number of family producers	# of farms	27,585
Number of commercial producers	# of farms	10,469
Area covered by family producers	Ha	215,530
Area covered by commercial producers	Ha	3,164,470
SOYBEAN VALUE CHAIN		
Number of family producers	# of farms	246,922
Number of commercial producers	# of farms	4,582
Area covered by family producers	Ha	1,851,917
Area covered by commercial producers	Ha	11,455,786
Head produced by family producers	# of head	4,540,132
Head produced by commercial producers	# of head	9,268,728
% of cattle finished on grain	%	10 to 15
% of cattle slaughtered/year	%	17

5.1.5 INVESTMENT COSTS

Investment costs have been drawn, to the extent possible, from similar development contexts. The investment costs of soybean-related mitigation actions are based on a combination of actual costs in Australia, the United States and Canada. The cattle value chain uses investment costs provided by the United Kingdom's Agriculture and Horticulture Development Board and includes an example from Paraguay. Table 21 provides the source for each mitigation action.

130 Karen A. Beauchemin and Sean M. McGinn, 2008. *Reducing Methane in Dairy and Beef Cattle Operations: What is Feasible?*; Better Returns Programme, AHDB Beef & Lamb, 2018. *Growing and feeding maize silage for Better Returns.*

Table 21: Sources of investment costs in the soybean and cattle value chain

REDUCTION OPTION	SOURCE
SOYBEAN VALUE CHAIN	
Variable rate controller-monitor	The Economic Benefits of Precision Agriculture: Case Studies from Australian Grain Farms[131]
GPS receiver and antenna	
Conversion of machinery to variable rate capable	
Autosteer	
NDVI sensor kit (2ftx2ft)	'When Does Variable Rate Technology for Agricultural Sprayers Pay? A Case Study for Cotton Production in Tennessee'[132]
Computer and GIS software	
N_2O mapping and management-related services	Precision Agriculture Technologies for Nutrient Management in British Columbia[133]
CATTLE VALUE CHAIN	
Improved feed – improved pastures	Sustainable beef farming, re-engineering of a cow/calf ranch located in Southern Paraguayan Chaco[134] Based on the costs of Pangola grass
Improved feed – maize silage	Growing and feeding maize silage for Better Returns.[135]

5.2 INVESTMENT POTENTIAL

The private sector investment potential for each value chain in the agriculture sector is presented below, along with the calculation assumptions. The potential is based on Paraguay's mitigation targets, reduction options in the agriculture sector, baselines and investment costs.

5.2.1 SOYBEAN VALUE CHAIN

The analysis concludes that the key reduction action in the soybean value chain is the introduction of precision agriculture technologies for nutrient management. Private investment potential is estimated at $690.45 million, with annual investments in services totalling approximately $200,000.

Commercial producers cover most of the soybean production area. They have a greater incentive to introduce precision fertilizer application technologies than smallholders as they can realize cost savings on large production areas. Commercial producers also have a greater incentive to introduce automated or auto-steer technologies, as those would provide additional cost savings while also supporting the variable fertilizer application. For the purpose of this report, it is assumed that 50 percent of Paraguay's commercial producers will introduce VRA technologies for soybeans, representing a potential investment of $501,203,375. Table 22 provides details on the investment potential for the introduction of VRA technologies by commercial producers.

Table 22: Commercial producer investment potential in VRA technologies - calculation details

COST ITEMS	UNIT	BASELINE DATA	TARGET	INVESTMENT COST (US$/FARM)	TOTAL INVESTMENT COST (US$)
Variable rate controller-monitor	Farms	10,469	50%	3,500	18,320,750
GPS receiver and antenna	Farms	10,469	50%	800	4,187,600
Computer and GIS software	Farms	10,469	50%	1,450	7,590,025
NDVI sensor kit (2ftx2ft)	Farms	10,469	50%	60,000	314,070,000
Machine conversion to variable rate capable	Farms	10,469	50%	20,000	104,690,000
Autosteer	Farms	10,469	50%	10,000	52,345,000
TOTAL					**501,203,375**

131 CSIRO Sustainable Ecosystems, 2007. *The Economic Benefits of Precision Agriculture: Case Studies from Australian Grain Farms.*
132 Daniel F. Mooney, James A. Larson, Roland K. Roberts and Burton C. English, 2009. *When Does Variable Rate Technology for Agricultural Sprayers Pay? A Case Study for Cotton Production in Tennessee.*
133 British Columbia Ministry of Agriculture, 2019. *Precision Agriculture Technologies for Nutrient Management in British Columbia.*
134 Global Conference on Sustainable Beef, 2016. *Sustainable beef farming, re-engineering of a cow/calf ranch located in Southern Paraguayan Chaco.*
135 Better Returns Programme, AHDB Beef & Lamb. *Growing and feeding maize silage for Better Returns.*

Although the areas covered by commercial producers exceed those covered by family producers, the latter are also responsible for a significant share of production in Paraguay. However, this report assumes that only family producers with the largest areas would be interested in introducing precision agriculture. This report assumes that the top 20 percent of family producers in terms of production area would be able to invest in equipment and that the remaining family producers would mainly rely on third-party services for data analysis. This report also assumes that auto-steered technologies are not attractive to all family producers. This represents a potential investment of $189,233,100, plus annual investment of approximately $200,000 in services.

Table 23 provides details on the investment potential for the introduction of VRA technologies by family producers.

Table 23: Family producer investment potential in VRA technologies - calculation details

COST ITEMS	UNIT	BASELINE DATA	TARGET	INVESTMENT COST (US$/FARM)	TOTAL INVESTMENT COST (US$)
Variable rate controller-monitor	Farms	27,585	20%	3,500	19,309,500
GPS receiver and antenna	Farms	27,585	20%	800	4,413,600
Computer and GIS software	Farms	27,585	20%	10,000	55,170,000
Machine conversion to variable rate capable	Farms	27,585	20%	20,000	110,340,000
Total equipment					**189,233,100**
Mapping-related services	Ha	215,530	20%	5	198,866
TOTAL					**198,866**

5.2.2 CATTLE VALUE CHAIN

The analysis concludes that the main reduction action in the cattle value chain is the introduction of efficient feed to reduce enteric fermentation. Private investment potential is estimated at $865.42 million.

As in the soybean value chain, it is important to distinguish commercial producers from family producers. For the purpose of this report, it is assumed that commercial producers will have greater capacity to make the initial investment to introduce efficient feed, especially for finishing. Commercial producers are therefore expected to introduce feedlots for finishing and better forage for grazing. This report assumes that 25 percent of commercial producers and 10 percent of family producers will introduce better forage for grazing, while all commercial producers and 50 percent of family producers will introduce grain silage for feedlots.

Tables 24 and 25 present the calculation of investment potential to achieve the targets identified above.

Table 24: Investment potential in improved forage - calculation details

COST ITEMS	UNIT	BASELINE DATA	TARGET	INVESTMENT COST (US$/ha)	TOTAL INVESTMENT COST (US$)
Commercial producers	Ha	11,455,786	25%	248.09	710,516,506
Family producers	Ha	1,851,917	10%	248.09	45,944,202
TOTAL					**756,460,708**

Table 25: Investment potential in feedlots (grain silage) - calculation details

COST ITEMS	UNIT	BASELINE DATA	TARGET	INVESTMENT COST (US$/head)	TOTAL INVESTMENT COST (US$)
Commercial producers	Head (slaughtered)	789,588	100%	54.30	87,522,454
Family producers	Head (slaughtered)	1,611,9523	50%	54.30	21,435,709
TOTAL					**108,958,163**

Private sector investment potential is estimated at $1,555.86 million, most of which will be leveraged from commercial producers for the introduction of VRA technologies for the soybean value chain and for the introduction of improved forage in the cattle value chain.

6. REPORTING FRAMEWORK TO ALIGN BUSINESS OPPORTUNITIES WITH NDC IMPACT TARGETS IN PARAGUAY'S AGRICULTURE SECTOR

Encouraging the private sector to invest in NDC actions is important if Paraguay is to achieve its climate goals. It also constitutes a significant business opportunity for the private sector. Further, the private sector can capitalize on these opportunities by better aligning investments with the objectives of the NDC and SDGs.

This section details the rationale for private sector alignment with NDC targets and the SDGs, and provides a reporting framework for the private sector.

6.1 RATIONALE FOR PRIVATE SECTOR ALIGNMENT WITH NDC IMPACT TARGETS

Governments and international organizations engage the private sector in order to leverage stakeholder investments in the NDC. The NDC can offer the private sector additional business opportunities, but it is often unaware of these opportunities. It is therefore important to highlight and translate them in clear reporting frameworks, which the private sector can then leverage to enhance its understanding of the added value that climate investments bring.

A clear understanding of this alignment, or the extent to which the private sector can align with NDC actions, offers potential merits. First, it enables the private sector to clearly identify actionable actions, which can be translated into business opportunities.

From a longer-term perspective, adopting reporting frameworks is also the first step towards reporting and disclosing impacts on climate objectives and SDGs. For the private sector, this can improve valuation and credit score. Impact investors and climate finance sources may also be more comfortable providing financing to private stakeholders with established reporting frameworks and understanding the impact their business has on the country's climate challenge.

6.2 REPORTING FRAMEWORKS

The NDC and SDGs have been chosen as the main reporting frameworks for this report. Business opportunities in the agriculture sector identified here are linked to NDC objectives and SDG targets in the following tables. To provide businesses more in-depth information, clear metrics representing measurable key performance indicators are also included.

The reporting frameworks are intended to be leveraged and tailored by individual businesses, depending on specific characteristics of each. For example, technology providers providing financial services, such as leasing, may use impact metrics related to access to finance.

6.2.1 SOYBEAN VALUE CHAIN

Producers and technology providers in this value chain have a direct impact on N_2O emissions. Producers have the opportunity to better manage nutrients for their crops, which offers significant economic benefits by reducing production costs. In soybean production, business opportunities can be considered to have a direct impact on and benefit for climate and SDGs, such as improved livelihoods through better income. Therefore, these are considered direct benefits, rather than co-benefits.

BUSINESS OPPORTUNITY	CLIMATE FRAMEWORK		SDG FRAMEWORK		METRICS
	NDC target	Specific action (BUR and National Plan for Climate Change Mitigation and Programmes of Action)	SDGs	Outcomes (SDG target or equivalent)	
CLIMATE-SMART NUTRIENT MANAGEMENT (PRECISION AGRICULTURE AND VARIABLE FERTILIZER APPLICATION)	10-20% emission reduction	Manage crop nutrients Introduce technologies with mitigation co-benefits Encourage the sustainable modernization of farms Develop financial incentives for producers based on the sustainable practices implemented	2 – Zero hunger	2.3 By 2030, increase the agricultural productivity and incomes of small-scale food producers	# and value (US$) of climate-smart equipment and services deployed (to commercial producers and smallholders) Smallholder and commercial producer productivity (tons of soybeans produced/ha) Increased income of smallholders and commercial producers (US$) Decreased cost of fertilizer used (US$)
				2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, help maintain ecosystems and strengthen capacity to adapt to climate change	Volume of nitrogen fertilizer used (tons/output) for soybean production (commercial and smallholders) Direct (estimated) carbon reduction achieved through efficient nutrient management (tCO_2e)
			13 – Climate action	Accelerated decarbonization and resilience of the agriculture sector	
			1 – No poverty	1.4 Ensure that all men and women, in particular the poor and the vulnerable, have equal access to basic services, appropriate new technology and financial services, including microfinance	# and value of loans (US$) developed for precision agriculture (accessed by commercial producers) # and value of loans (US$) developed for precision agriculture (accessed by smallholders)
			8 – Decent work and economic growth	8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all	# and value of leasing agreement (US$) provided by local financing organizations (cooperatives, banks)

BUSINESS OPPORTUNITY	CLIMATE FRAMEWORK		SDG FRAMEWORK		METRICS
	NDC target	Specific action (BUR and National Plan for Climate Change Mitigation and Programmes of Action)	SDGs	Outcomes (SDG target or equivalent)	
				8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services	# of technology providers in Paraguay providing climate smart equipment and technologies to producers, as well as value (USD) provided
			9 – Industry, innovation and infrastructure	9.B Support domestic technology development, research and innovation in developing countries	

KEY

Direct impact | ***Long-term industry impact*** | Co-benefits

6.2.2 LIVESTOCK VALUE CHAIN

Producers and technology providers in this value chain have a direct impact on methane emissions. Producers have the opportunity to improve the productivity of their cattle, which will bring significant economic benefits by reducing production costs.

	CLIMATE FRAMEWORK		SDG FRAMEWORK		
BUSINESS OPPORTUNITY	**NDC target**	**Specific action** (BUR and National Plan for Climate Change Mitigation and Programmes of Action)	**SDGs**	**Outcomes (SDG target or equivalent)**	**METRICS**
IMPROVING THE PRODUCTIVITY OF THE LIVESTOCK HERD	10- 20% emission reduction	Improve livestock diet Increase productivity per unit of surface area Develop financial incentives for producers based on the sustainable practices implemented	2 – Zero hunger	2.3 By 2030, increase the agricultural productivity and incomes of small-scale food producers	# of producers with improved diet management (commercial and smallholders) # of head of livestock benefitting from improved diets Value of investments (US$) in improved diets (improved fodder, improved silage, feedlots) # of producers who have introduced soybean related diets (silage and other) Increased income of smallholders and commercial producers (US$) # of producers and head of livestock benefitting from improved animal health services, including breeding and disease control
				2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, help maintain ecosystems and strengthen capacity to adapt to climate change	# of days until slaughter for livestock benefitting from improved diets Direct (estimated) carbon reduction achieved through productivity improvements (tCO_2e)
			13 – Climate action	Accelerated decarbonization and resilience of the agriculture sector	Direct (estimated) carbon reduction achieved through improvements in the cold chain (tCO_2e)

BUSINESS OPPORTUNITY	CLIMATE FRAMEWORK		SDG FRAMEWORK		METRICS
	NDC target	Specific action (BUR and National Plan for Climate Change Mitigation and Programmes of Action)	SDGs	Outcomes (SDG target or equivalent)	
			1 – No poverty	1.4 Ensure that all men and women, in particular the poor and the vulnerable, have equal access to basic services, appropriate new technology and financial services, including microfinance	# and value of loans (US$) developed for low-carbon practices in the livestock value chain (accessed by commercial producers) # and value of loans (US$) developed for low-carbon practices in the livestock value chain (accessed by smallholders)
			8 – Decent work and economic growth	8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all	
				8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services	# of technology providers in Paraguay providing feed management- and health management-related equipment and technologies to producers and value (US$) provided # of technology providers in Paraguay providing low-carbon cold chain equipment for smallholders as well as value (US$) provided
			9 – Industry, innovation and infrastructure	9.B Support domestic technology development, research and innovation in developing countries	
			3 – Good health	Reduce health hazards from spoiled meat	Meat loss in local value chains (slaughterhouses and butchers) (tons and value – US$)
			12 – Responsible consumption and production	12.3 By 2030, reduce global food waste at the retail and consumer levels and reduce food losses along production and supply chains	

KEY

Direct impact | ***Long-term industry impact*** | Co-benefits

To better leverage the reporting framework, private sector stakeholders are recommended to use additional tools. For example, to calculate GHG emissions reductions and better mainstream the NDC and SDGs into their operations, private companies may consider leveraging the following tools.

Calculating GHG emissions: Greenhouse Gas Protocol[136]

Calculating GHG emissions can be challenging for businesses. It requires following specific and complex methodologies, which may not be easy to approach without appropriate guidance.

The GHG Protocol provides standards, guidance, tools and training for business and government to measure and manage climate-warming emissions. It offers online tools related to measuring and managing GHG emissions, as well as related trainings. The platform builds on a long-term partnership with international stakeholders, including the World Resources Institute and the World Business Council for Sustainable Development.

The Protocol has published the Project Protocol, which provides an accounting tool for quantifying the GHG benefits of climate change mitigation projects. It presents specific principles, concepts, and methods for quantifying and reporting GHG reductions—i.e., decreases in GHG emissions or increases in removals and/or storage—from climate change mitigation projects.

The GHG Protocol also provides extensive guidance on developing business-level emission inventories, measuring emissions from purchased/acquired electricity and estimating avoided emissions.

Aligning with and mainstreaming the SDGs/Sustainability: Impacti Solutions[137]

Aligning with the SDGs and integrating sustainability goals into operations can be an important step for enterprises. The SDGs and sustainability provide new business opportunities that the private sector can explore. However, businesses may find it complex to understand where they fit in the scope of the SDGs.

Impacti Solutions provides tools that can help the private sector understand the SDGs and impact areas where businesses can have the most impact. The Rapid SDG Opportunity Finder Tool provides personalized recommendations on priority SDGs and impact areas suited to specific businesses. After businesses choose their priority SDGs, the tool introduces them to thematic areas within each SDG. Businesses receive a personalized SDG business profile with chosen priorities at the end of the assessment. This supports businesses in identifying strategies to better integrate SDGs in their operations.

Impacti Solutions also provides an online platform to view and update an SDG business profile and connect with like-minded businesses and an Impact Data Management Tool, which makes it possible to streamline data management, track and manage impact, and create reports.

136 **https://ghgprotocol.org/companies-and-organizations.**
137 **https://impacti.solutions/.**

7. CONCLUSION

Paraguay's GHG emissions are relatively low, with total national emissions estimated at 51,293.28 Gg CO_2e in 2015. Although the country's emissions have decreased overall, GHG emissions in the agriculture sector are rising. Emissions from the agriculture sector alone, which do not include land use, represented approximately 53 percent of all emissions in 2015. Most agriculture sector emissions are the result of cattle production and direct N_2O emissions from managed soils, highlighting the importance of better cattle productivity management and better fertilizer management.

In its NDC, the Government of Paraguay presents its objective to reduce GHG emissions by 20 percent compared to 2030 projections. Paraguay detailed mitigation actions for the agriculture sector in the National Plan for Climate Change Mitigation and Programmes of Action, which includes strategies related to good practices in fertilizer management, introduction of technologies with mitigation co-benefits and improvement of productivity per unit of surface area for livestock.

The country's agriculture sector is an important sector of activity. Alone, it represents 18 percent of the national economy. It is also linked closely to other sectors, such as the logistics, transport and food industries. When its contribution to these sectors and to forestry are combined, its total contribution to the economy rises to 41 percent. Most agriculture production is concentrated in three crops, with soybeans representing more than 58 percent of planted area. Beef production is also an important economic subsector. The predominance of these two sectors highlights the importance of their value chains for climate change mitigation and the potential they offer for private sector investment in emission reduction actions.

Private sector investments lead the agriculture sector, with significant investments in both the soybean and cattle value chains. In both chains, investments differ between smallholders and larger producers/companies. The enabling environment affects the private sector in terms of regulations, restrictions and provision of incentives for the uptake of new practices.

The soybean production ecosystem and value chain are aimed primarily at export, with MNCs and large producers leading production, processing and export. Smallholders also participate in the value chain, mainly through cooperatives. The value chain is characterized by vertical integration, with many MNCs and cooperatives involved at several stages of production.

The main source of emissions related to soybean production is direct N_2O emissions from managed soils. Reducing emissions within the value chain will therefore require improving the management of fertilizer application, which should also improve productivity. This report proposes introducing precision agriculture technologies, such as variable fertilizer application. Tailoring precision agriculture to smallholders by enabling access to technology and equipment through digitalization and leasing, among other strategies, could allow precision agriculture to be extended beyond commercial agriculture. Private sector investment potential is estimated at $690.45 million, with annual investment in services of approximately 200,000. To achieve this, the private sector will need to lead the way. The government could support this by conducting feasibility studies. For smallholders, the private sector could take the lead in developing and strengthening extension services related to precision agriculture. The government can support the drive for innovation to some extent by developing incubation and acceleration services.

The cattle production and export ecosystem and value chain can be categorized into exporters, who are bound by high quality and sanitary standards, and smaller producers, aimed at the local market, who follow less strict standards. Enteric fermentation is the main source of emissions in both groups. It is therefore crucial to improve the productivity of the value chain. This report proposes to introduce improved feed by using higher quality forage for grazing and grain silage in feedlots. Private investment potential is estimated at $865.42 million. Others potential measures include introducing low-carbon cold chains and improving breeding techniques and animal health. To achieve this, the private sector must lead the way in introducing new feed, based on studies confirming its feasibility.

Although the private sector leads in terms of investments, the agriculture sector still faces barriers to obtaining financing. Several commercial banks are involved in agricultural credit, but most provide short-term credit, which does not allow producers and companies to introduce better, more efficient productive assets. Green investments should be expanded in Paraguay by encouraging ESG integration into the model provided by the EU and the EU taxonomy. Agricultural leasing and digital solutions to connect farm equipment owners to farmers should also be considered.

Private sector investment potential is estimated to total $1,555.86 million.

UNDP NDC SUPPORT PROGRAMME

United Nations Development Programme (UNDP)
304 E 45th Street, New York, NY 10017
www.ndcs.undp.org
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