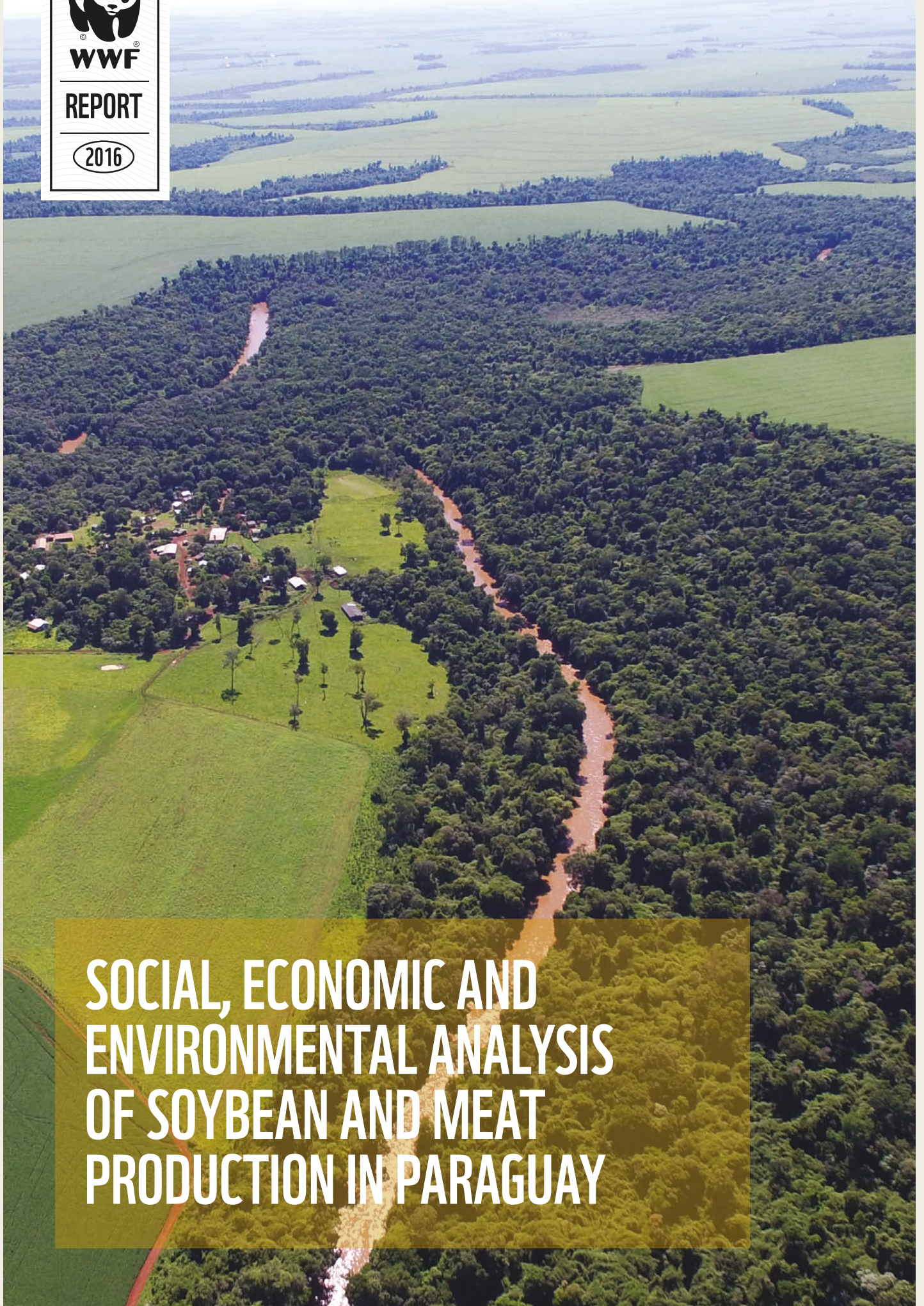




WWF

REPORT

2016



SOCIAL, ECONOMIC AND ENVIRONMENTAL ANALYSIS OF SOYBEAN AND MEAT PRODUCTION IN PARAGUAY

SOCIAL, ECONOMIC AND ENVIRONMENTAL ANALYSIS OF SOYBEAN AND MEAT PRODUCTION IN PARAGUAY

WWF-Paraguay

WWF established an office in Paraguay in 2000 with the objective of carrying out programs for the recovery, conservation and sustainable management of the Atlantic Forest of Paraguay. Currently, WWF is working on implementing local environmental projects that involve community leaders, government representatives and producer unions.

WWF (World Wildlife Fund) is a private environmental organization that works globally and locally for conservation worldwide. It has offices in over 100 countries and has the support of millions of members. Its mission is to stop the degradation of the planet, with the idea that humans live in harmony with nature.

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ACRONYMS

APS	Association of Soybean, Grains and Oilseed Producers of Paraguay
ARP	Rural Association of Paraguay
BAP	Best Agricultural/Livestock Practices
BCP	Central Bank of Paraguay
CADAM	Chamber of Automotive and Machinery Distributors
CADEP	Center for Analysis and Dissemination of the Paraguayan Economy
CAH	Approved Agricultural Credit
CAN	National Agricultural/Livestock Census
CAPECO	Paraguayan Chamber of Grains and Oilseeds Exporters and Traders
CAPPRO	Paraguayan Chamber of Processors of Oilseeds and Grains
CYTASA	Colonization and Agrarian Reform S. A.
DGEEC	Department of Statistics, Surveys and Censuses
EAP	Economically Active Population
FAO	Food and Agriculture Organization of the United Nations
FECOPROD	Federation of Production Cooperatives
FF	Family Farming
GDP	Gross Domestic Product
GVP	Gross Value of Production
IARC	Agency for Cancer Research
IDEA	Institute for Environmental Law and Economics
IICA	Inter-American Institute for Cooperation on Agriculture
IMAGRO	Income Tax for Agricultural Activities
INBIO	Institute of Agricultural Biotechnology
INDERT	National Institute of Rural and Land Development
INFONA	National Forestry Institute
ISCC	International Sustainability and Carbon Certification
MAG	Ministry of Agriculture and Livestock
MERCOSUR	Southern Common Market
MLP	Medium and Large Producers
MSPBS	Ministry of Public Health and Social Welfare
MTI	Market Transformation Initiative
NJP UN-REDD+	National Joint Project UN-REDD+
OAS	Organization of American States
PNT	National Wheat Plan
REDD+	Reduction of Emissions from Deforestation and Forest Deterioration
RTRS	Round Table on Responsible Soy
SAC	Southern Agricultural/Livestock Council
SEAM	Secretariat of the Environment
SENACSA	National Service for Animal Quality and Health
SENAVE	National Service for Plant and Seed Quality and Health
STP	Ministry of Technical Planning
UGP	Trade Union Production
UPAF	Upper Paraná Atlantic Forest
USDA	United States Department of Agriculture
UTEPI	Technical Unit for Industry Studies
VAT	Value Added Tax
WB	World Bank
WWF	World Wildlife Fund

PROLOGUE

WWF is pleased to present the report *Social, economic and environmental analysis of soybean and meat production in Paraguay*, conducted by the Institute Investigación para el Desarrollo within the framework of the Market Transformation Initiative by WWF-Paraguay.

With population growth and the substantial increase in demand for food, seeds, fibers and fuels, we could be facing a food security crisis much faster than we first thought.

The effects of climate change we are experiencing today may irreversibly damage the natural resource base, on which the agriculture and livestock production depends on.

The following report seeks to reflect and analyze the situation in Paraguay with respect to the production of soybeans and meat.

At the same time, the report shows quality examples of sustainable production, where companies use their resources to move forward, creating alternatives that foster economic development, respect the socio-environmental area and are therefore long lasting.

We live in a complex, but familiar environment; weather patterns are constantly changing, due to not only natural factors, but also human-generated changes. The increase of greenhouse gas emissions by pollution and deforestation impact weather patterns and affect valuable ecosystem services.

Humanity is running out of time to respond to environmental problems, climate change in particular. The consequences of our inaction are being felt with increasing strength, as longer droughts, floods and other extreme phenomenon have increased.

The document *Social, economic and environmental analysis of soybean and meat production in Paraguay*, allows us to visualize the information gaps; gaps we need to fill to provide alternatives to the future of our region. However, what we do with the information it provides us with, is directly dependent on us.

The actions planned ten years ago, today translate into facts that affect the very survival of humankind. The commitment and the solution are in our hands. We must be able to provide guidelines to our representatives and decision makers, influencing decisions regarding our future and that of future generations. We cannot continue in a state of denial towards environmental decline. We must act now.

Luca Eufemia
WWF-Paraguay

MARKET INITIATIVE

The exponential increase of the world population, and therefore the demand for raw materials, places great pressure on the natural resources of our planet.

The impacts and consequences can be positive or negative, depending on the management of natural resources and the distribution of the wealth generated. Today, the natural balance of our planet largely defines our future and our survival. The expansion of the boundaries of production and unsustainable production practices can generate devastating impacts, especially in developing countries.

Taking this problem into account, WWF promotes practices that help companies improve the production of commodities without affecting forests, fresh water, oceans and global climate. Together we can transform the global market and produce the goods and services we need without damaging the natural systems. The Market Transformation Initiative (MTI) is a global program launched by WWF to reduce the human footprint.

The case study of Paraguay is a concrete example of how natural resources have historical, economic, social and democratic implications. The Paraguayan economy is literally subsidized by nature. The country remains among the five largest producers of soybeans and among the ten largest exporters of beef worldwide. Locally, both production areas constitute 25% of Gross Domestic Product (GDP) and account for 65% of exports, with significant social and environmental implications.

The market vision of WWF-Paraguay is to stimulate economic, social and rural development through sustainable food production and the preservation of natural landscapes, including forests, grasslands and savannas. WWF-Paraguay works with producers, retailers, consumers and markets to encourage conservation that is viable, sustainable and incorporated into the production processes.

Soybean and meat production has been associated with the loss and deterioration of forests, therefore the market strategy of WWF in Paraguay aims to encourage a change in the expansion of traditional agriculture and livestock production, towards an outlook of sustainable farming production, in harmony with the protection and wellbeing of all ecosystems. This objective can be achieved by promoting an integrated and inclusive plan that encourages dialogue among multiple stakeholders through innovation and business models that include all parties. The public and private sector, both locally and internationally, can generate enormous changes by adopting new rules for doing business in the production of soy and beef.

Through business involvement, better practices of food production, sustainable funding and policy, markets can promote sustainability of commodities. This will help avoid deforestation and considerably reduce emissions of greenhouse gases, which will have a positive effect on business, people, natural ecosystems and wildlife.

EXECUTIVE SUMMARY

The creation of new markets, which recognize the importance of sustainable production, opens new possibilities for countries such as Paraguay. Faced with the challenge of development and building a green economy, WWF, through its MTI analyzes the characteristics of two of the main areas of production in the country: soybean and meat. This analysis seeks to contextualize these areas of production, taking into account not only their importance for economic development, but also the social and environmental dimensions in which they develop.

The global demand for commodities like meat and soybean has grown exponentially over the last decade. Paraguay, a country with an economy closely tied to the primary sector, has taken advantage of this demand and significantly contributed to the international market. The country remains among the five largest producers of soybeans and among the ten largest exporters of beef worldwide. Locally, both production areas constitute 25% of GDP and account for 65% of exports. The 2014 data shows that soybeans generated revenue of more than 2.274 billion, while beef exceeded 1 billion.

These data show overall economic importance of both areas, but beyond this significance, analysis of the forms of production in the field becomes necessary. In this context, the study, coordinated by WWF-Paraguay and the institute Investigación para el Desarrollo analyzed different sources of information including the economic spectrum as well as the social and environmental ones. The analysis included data reported by the National Agricultural/Livestock Census (CAN for its acronym in Spanish) for the 1991 and 2008 periods with export, employment and income data from both government sources and various trade unions. In addition, semi-organized interviews were carried out with key industry players who contributed their views on ways of production. For the environmental analysis, literature was reviewed, which was then supplemented with the calculation of the degradation risk for the Western Region.

The data shows a significant increase (210%) of the surface area dedicated to soybean planting in the Eastern Region in the last twenty years. Meanwhile, in the same period, the ranching industry has increased its production area by 43% in the Western Region. According to the analysis of the demand for both grain and meat, there is an assumption that the surface area of both production systems will continue to increase.

The increase of surface area dedicated to soybean and meat production, consequently entails the reduction of surface area dedicated for other uses. Particularly, in the case of soybeans in the Eastern Region, the expansion dynamics has been primarily on pristine forests and then secondly, on farmlands or areas that traditionally were used for ranching. CAN numbers show a noticeable reduction in forest area declared by the landowners between 1991 and 2008, especially in the departments of Canindeyú (58%), Itapúa (31%) and Alto Paraná (19%).

The ranching industry in Paraguay has traditionally developed in areas of natural grasslands, but this dynamic has changed in the last decade with findings during the period mentioned, that there was an increase in deforestation that provided new ranching areas in the Eastern Region. Ranching expansion in the Chaco has raised numerous questions because, in some cases, it was carried out in territories claimed by indigenous peoples or in ecosystems considered to have high biodiversity. This expansion dynamic has highlighted the lack of proper land management and the weakness of public institutions over administrative and legal control.

Together, both soybean and livestock production have had noticeable negative impacts on ecosystems and the way of life of the rural and indigenous communities in these areas. In the particular case of soybeans, there are numerous complaints by local communities relating to the problems caused by the indiscriminate use of agrochemicals, impacts on water quality and the negative effects on human health. However, Paraguayan institutions are not yet prioritizing research on these issues.

Analyzing data from Family Farming¹ (FF), which was also addressed by the CAN, found a noticeable decrease in the number of family farms and an increase in farms held by Medium and Large Producers (MLP), indicating an intensification of land concentration and monocultures. This dynamic in the reduction in FF compared to other types of production, such as agribusiness, has direct negative effects on food security, considering that food production occurs mainly in the sector of FF.

One of the most important aspects when defining public policies is undoubtedly the creation of jobs. In this sense, soybeans and meat present very different realities, directly and indirectly, in terms of the potential for the development and creation of jobs. Even though there is no specific data of the creation of jobs, directly or indirectly, related to the soybean production in Paraguay, some sources that were consulted mentioned the use of one person for every 200 hectares (ha) of crops, which extrapolating the estimated annual surface for 2015, speaks of a direct employment of approximately 15,000 people. The ranching sector in Paraguay, meanwhile, reports that it employs approximately 241,000 people directly and 450,000 indirectly, making the ranching industry an important source of employment. Nonetheless, the annual creation of job of these two sectors does not stop the increasing migration to urban centers, as mentioned above.

1 The National Register of FF considers family farmers those producers whose main source of household income is agriculture, with land of up to 20 ha in the Eastern Region and up to 50 ha in the West.

The interviews carried out showed differences between producers in terms of their motivations to pursue good production practices. To a certain degree, these motivations allowed the placement of producers into three groups:

A first group, consisting of large producers, whose motivation for implementing better practices is to some degree based on the awareness of the importance of maintaining forests and their associated biodiversity, caring for the soil and protecting water resources. It is framed within the need to leave an intact environment for future generations.

A second group, were identified primarily as producers associated with cooperatives and production unions such as the Federation of Production Cooperatives (FECOPROD for its acronym in Spanish), Trade Union of Production (UGP for its acronym in Spanish) and Rural Association of Paraguay (ARP for its acronym in Spanish). For this group, the motivations for implementing better practices lie in the benefits that they represent for production in itself. This group actively implements practices such as direct sowing, crop rotation and silvopastoral plots, motivated by the positive effects of these practices on production.

A third group, are made up of companies, mostly multinationals, which have a clear policy of business management and in some cases social responsibility. This type of management seeks to maximize the benefits and reduce costs, so the inclusion of better practices is done in a standardized manner. The motivation in this case is in its compliance with its own internal standards, which include respect and compliance with national legislation.

Regardless of the motivation for the incorporation of better practices, all producers expressed the need for distinguishable economic incentives. They also recognized that one of the main driving forces for the incorporation of better practices is, without a doubt, the new requirements of the markets, especially the European ones that enforce stricter regulations concerning environmental and social standards. Responding to the demands of consumers who insist on products from sustainably managed systems, numerous global initiatives have emerged, including various certification systems.

In Paraguay, however, these systems are still incipient. The study carried out locally found the International Sustainability and Carbon Certification (ISCC) system, used up to this point by the Round Table on Responsible Soy (RTRS) and the initiative to use the stamp Grassland Meats. Creating consumer awareness has proven to be an essential tool to change the productive paradigms. Markets with increasing demands on compliance with environmental and social standards are essential to bring about changes in production methods.



1. INTRODUCTION

The information contained in this document has been organized in such a way so as to present the main figures of the production of soybeans and meat in Paraguay. We chose to break up the information into sections or chapters, first presenting the data on soybeans and in a subsequent section the data corresponding to beef production. The information compiled includes historical trends based on official information from the CAN, with data provided by the production unions and by different players involved in some way in the production lines of soybeans and meat.

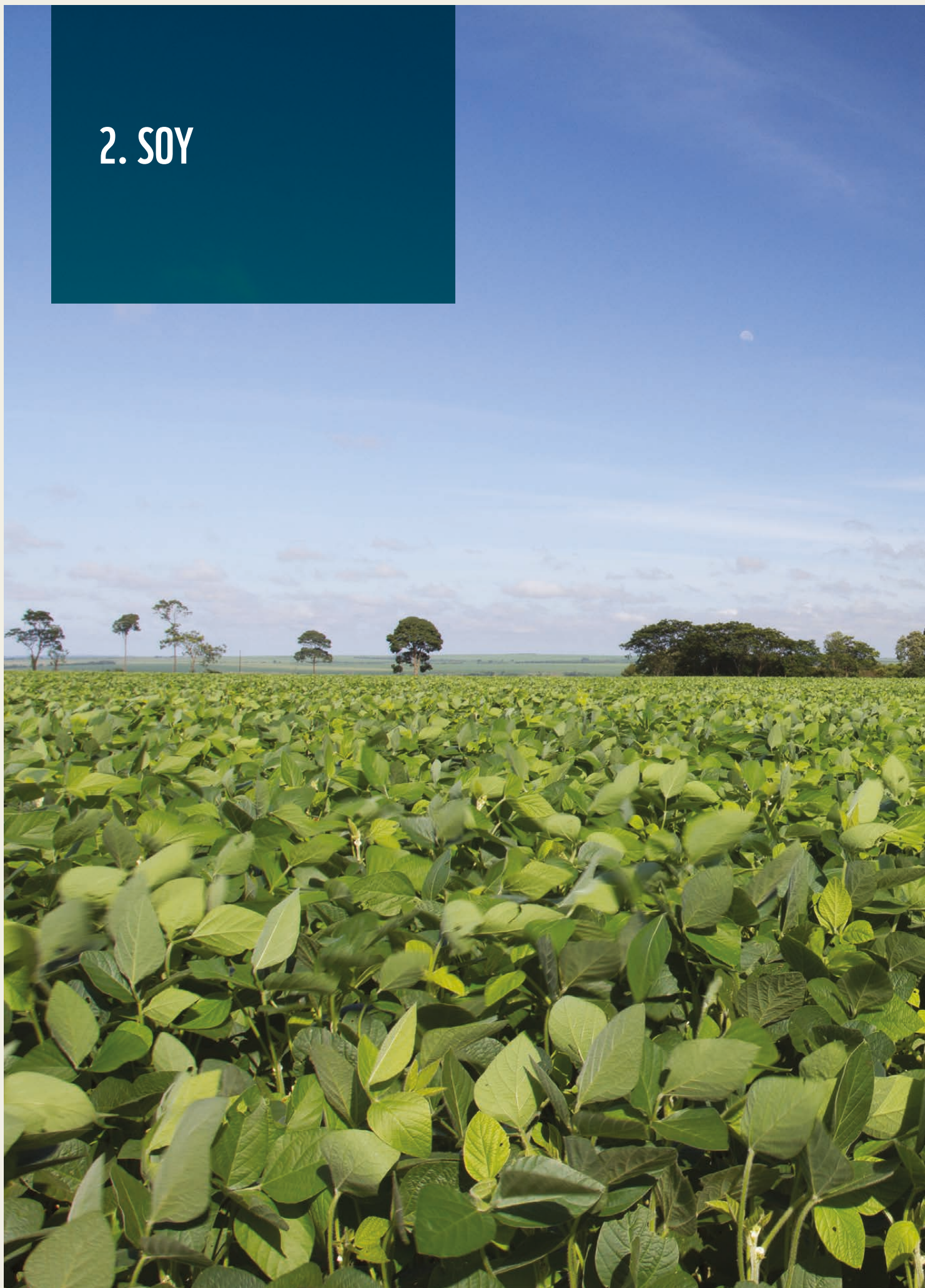
For the particular case of soybeans, data was submitted of the proposed zoning that was used in the document, *Regional Impact Assessment on the Sustainability of the Soybean Production Chain. Argentina - Paraguay - Uruguay* (OAS, 2009). This zoning allows the visualization of the advance of soybeans in the Eastern Region and helps establish potential growth trends on the Departmental level, which could be useful when designing land management policies.

To be able to gauge the diversity of players and the regulatory aspects that are part of the production processes of both categories, a section on institutional and legal aspects was included. This section presents a summary of the primary laws and the roles of different institutions (public, private and civil society) involved in any way in the production chain of soybean and beef.

Producers, who find use Best agricultural/livestock practices (BAP), are promoting the change in productive paradigms at the local level as a solution to many environmental and social problems. Globally, this change is being led by groups of organized consumers who demand to know not only the way food is produced, but also above all, that it is produced while respecting the environmental balance and generating benefits for local communities. In order to highlight these initiatives, a section on BAP has been included; this section presents some global initiatives that are both mandatory and voluntary. In addition, this section includes the results of interviews with representatives of companies as well as of producers that in some way are trying to implement BAP in the country.

The information analyzed confirms once again that there is no single solution to generate the changes necessary to restore the balance between economic, environmental and social benefits. Instead, solutions must be designed taking into account the informed and responsible participation of all players, beginning with local communities and passing through the producer to the last consumer.

2. SOY





2. SOY

Soybean (*Glycine max*), a legume native to Asia, has been gaining cultivation ground in the Americas. This increased cultivation is closely linked to increased meat production globally, especially pork and chicken, considering that 75% of soybean production is used for animal consumption. Meat producers prefer soybean flour as animal feed, given the high protein content of the seed (it has about 40% protein).

In addition to its importance as fodder, soybean is used in human food, especially processed in the form of tofu and soy sauce, although this utilizes only 6% of world production of the grain. Processed grains are used in the manufacture of oils, which in turn serve as an ingredient in making margarines, soaps and cosmetics. Soybean oil is also used as biofuel. Meanwhile, lecithin, a product derived from the processing of soybean oil, is used as an emulsifier in a large number of processed products including ice cream and chocolate.

The Global Soybean Market

The largest expansion of soybean cultivation occurred during the second half of the twentieth century, where production grew tenfold from 27 million tons (MT) to 269 MT. It is expected that by 2050, production will double (WWF, 2014). This exponential growth of soybean cultivation is also related to increased production of meat, especially pork and chicken, as experienced by China and the European Union (primary buyers and producers of soybeans). Thus, between 1967 and 2007, world production of pork meat increased by 294%, egg production by 353% and poultry by 711% (WWF, 2014).

Specifically, with respect to the demand for soybeans in China, consumption has doubled in the last decade from 25.7 MT in 2000 to 55 MT in 2009, of which 41 MT were imported (WWF, 2014).

World production of soybeans in 2012 was approximately 270 MT. Ninety-three percent of the total was produced by six countries: Brazil, USA, Argentina, China, India and Paraguay (WWF, 2014). South America had the fastest expansion of soybean, from 17 million ha in 1990 to 46 million ha in 2010. This makes soybeans one of the most important and profitable agricultural commodities worldwide.

Paraguay plays an important role in the global soybean market. In the 2012/2013 harvest, the country ranked sixth as a world producer of soybean (Figure 1). In addition, the country was the fourth largest exporter of that harvest (Figure 2). In Latin America, Paraguay is ranked third in soybean productivity levels, after Brazil and Argentina.

Figure 1. Principal soy producers for 2012/2013 harvest.

Source: USDA, cited by CAPECO, 2014.

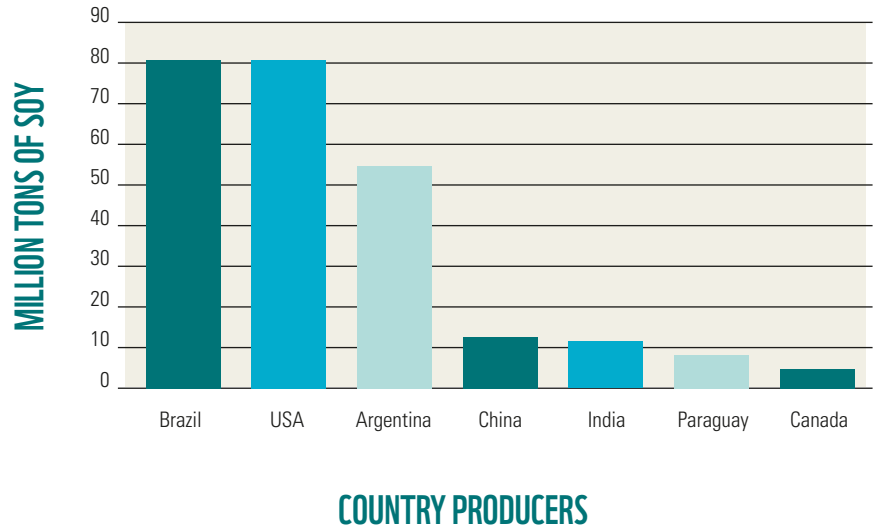
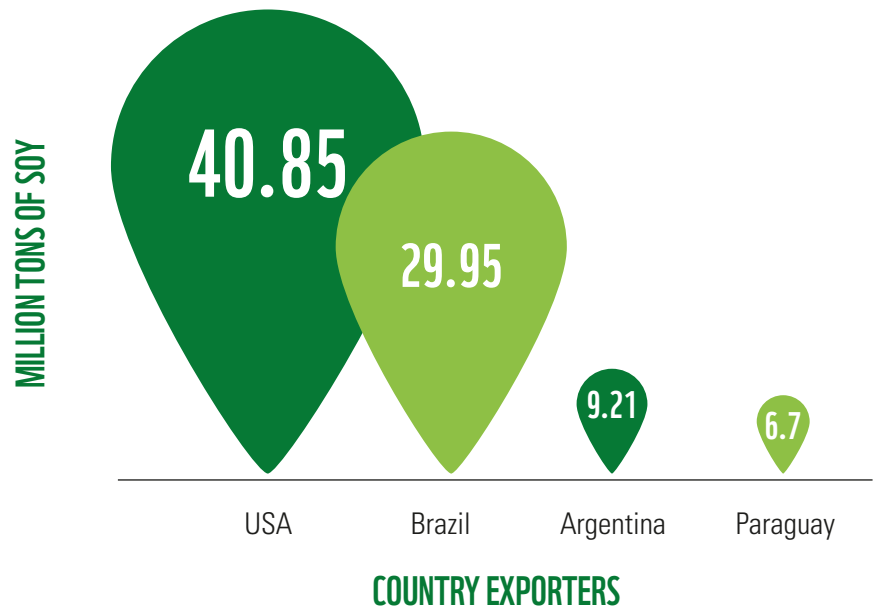


Figure 2. Principle exporters of soy 2012/2013 harvest.

Source: IICA-Observatorio.



Expansion of the Soybean Cultivation in Paraguay

Soybean production in Paraguay began in the sixties. The crop was promoted as part of the National Wheat Plan (PNT for its acronym in Spanish). This plan was primarily aimed at increasing wheat production in the country, to meet the demand of the domestic industry. Within the PNT was the supplementary soybean summer crop², with wheat being the winter one. To promote the PNT, financial incentives, technical support and fiscal stimuli were contemplated, with the result that many agricultural companies joined in. While the PNT did not have the expected effect of increasing wheat production, it brought about the expansion of soybean cultivation. Currently, crop rotation areas are formed by soybeans/black oats (28%), soybeans/wheat (27%), soybeans/no crop (21%) (OAS, 2009).

Among the factors that have boosted the expansion of cultivation are: the high prices for the grain in the 70s and 80s (Inter-American Institute for Cooperation on Agriculture [IICA], Southern Agricultural/Livestock Council [SAC], & Network Agricultural Policy Coordination [RDPA], 2009) and the development of the technological production package (improved seeds, fertilizers and agrochemicals for weed and pest control).

The development of new soybean varieties, which adapt to different soil and temperature conditions, have greatly benefitted the increased cultivation. Although about 90% of soybeans planted still belong to the genetically modified variety Roundup Ready³, with its resistance to glyphosate (Secretariat of the Environment [SEAM], 2004). The commercial use of genetically modified varieties, such as Roundup Ready soybean, was approved in 2004 with a ministerial resolution that provided for the registration of marketable seeds of the AW7110, AW5581, M-soy7878 and M-am 8080 varieties. The four varieties of transgenic seeds Roundup Ready, are marketed by the US Company Monsanto.

Soybean production is highly mechanized. It is grown in medium and large tracts of land in Paraguay, where 44% of the farms have more than 1,000 ha, 43% have between 100 and 1,000 ha, and only 13% have less than 100 ha (WWF, 2014). Approximately 50% of the total land surface area in the hands of MLP, belongs to foreigners (IICA et al., 2009). Soybean producers, according to the last agricultural/livestock census in 2008, totaled 27,735 producers, which represents less than 3% of the economically active rural population (IICA et al., 2009).

Soybean production was originally centered in the Departments of Alto Paraná and Itapúa. However, cultivation has expanded at an accelerated pace in the Departments of Caaguazú and Canindeyú. Currently these four Departments

- 2 The soybean crop cycle is generally from September to February and the harvest season depends on the variety; early maturing varieties mature in 130 days, while late-maturing varieties are harvested in 150 days.
- 3 The Roundup Ready is a soybean variety resistant to the herbicide glyphosate, it has been modified by genetic engineering techniques to express genes from other organisms in order to tolerate the herbicide, be resistant to bugs or changes in properties and nutrients.

contain almost 80% of the cultivated area. Likewise, soybeans have made their way into Departments that have traditionally focused on ranching, such as Misiones and Concepción. In the study called *Regional Impact Assessment of the Sustainability of the Soybean Production Chain -Argentina - Paraguay - Uruguay* (OAS, 2009), the expansion of soybean production in the Eastern Region was classified by zones:

- 1) Traditional Zones (Departments of Itapúa, Alto Paraná and Canindeyú), which historically have had the largest amount of soybean production.
- 2) Less Traditional Zones (Departments of San Pedro, Caaguazú, Amambay and Caazapá), has soybean producers but on a smaller scale.
- 3) New or Expansion Zones (Departments of Concepción, Guairá and Misiones), where soybean is gaining land surface area.

Using this zoning and comparing it with data from the CAN, the large increase in agricultural land in all areas during the period of 1991-2008, has been verified (Figure 3), making the soybean compound the crop that uses more agricultural land in 8 of the 10 departments under study (Figure 4). Soybeans occupy almost the entire land surface area devoted to agriculture in the Departments of Alto Paraná (94%), Canindeyú (81%) and Itapúa (80%).

Figure 3. Percentage of land used for agriculture in respect to total region (ha). Data inter-census 1991-2008.

Source: WWF elaboration based on CAN 1991 and CAN 2008.

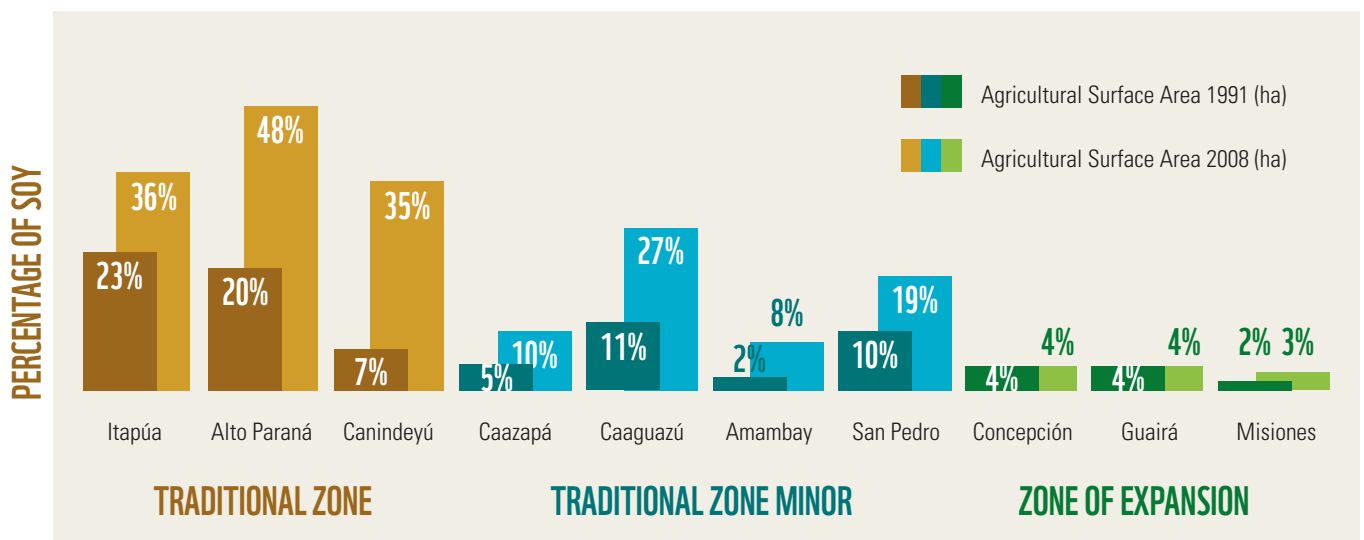
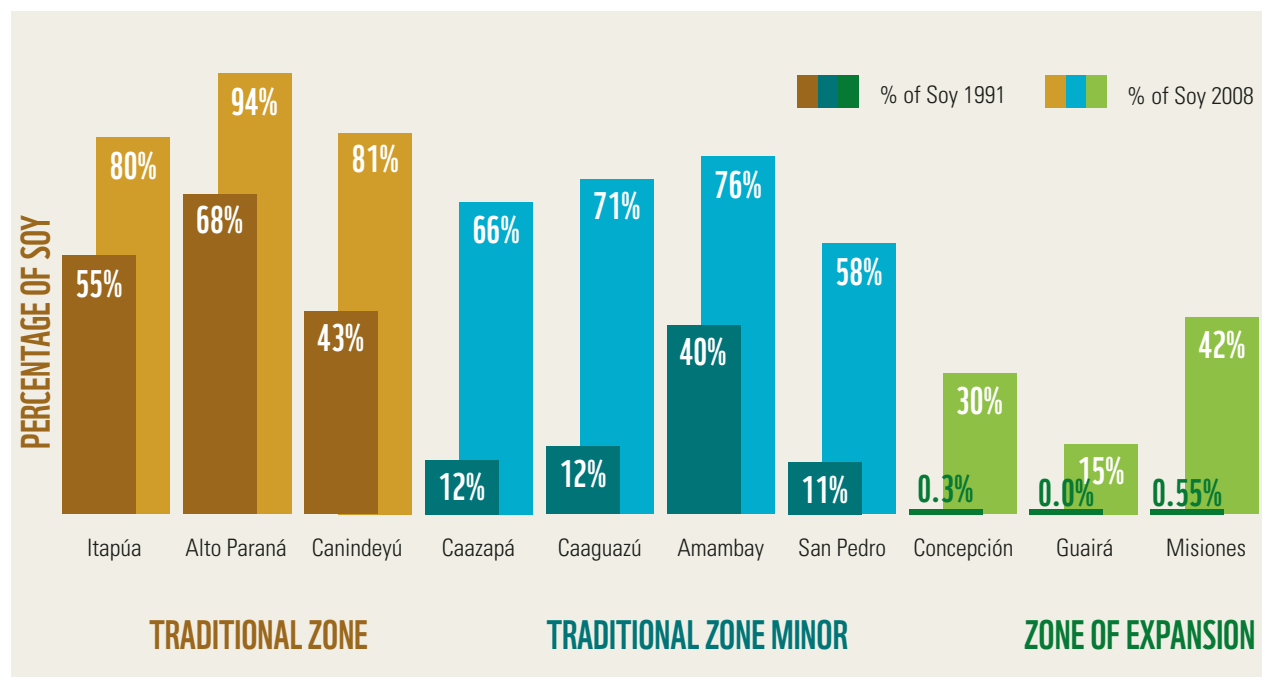


Figure 4. Percentage of soy cultivated in respect to agricultural land surface. Data inter-census 1991-2008.

Source: WWF elaboration based on CAN 1991 and CAN 2008.



The analysis of data shows continued growth of cultivated soy in all the regional zones starting in 2009 (Table 1).

Table 1. Surface area of planted soy 2009-2015.

Source: CAPECO.

AREAS	SURFACE AREA OF SOY (ha)						
	2009	2010	2011	2012	2013	2014	2015
Traditional zones							
Itapúa	486,142	480,748	504,940	586,683	554,351	643,470	632,236
Alto Paraná	761,450	756,086	794,132	860,845	868,678	918,282	896,053
Canindeyú	442,507	508,496	534,083	527,380	586,347	602,313	619,524
Traditional zone minor							
Caazapá	169,562	132,535	139,204	169,292	152,826	186,528	176,552
Caaguazú	339,075	347,418	364,900	384,386	400,609	404,167	396,169
San Pedro	207,490	250,931	263,557	234,303	289,348	263,736	288,022
Amambay	107,745	122,262	128,414	129,408	140,980	159,032	169,628
Zone of expansion							
Concepción	20,171	29,780	31,279	16,647	34,340	16,682	22,571
Guairá	12,950	12,295	12,913	14,273	14,177	14,805	14,540
Misiones	22,809	30,457	31,990	34,191	35,120	45,967	49,158
Total	2,569,901	2,671,008	2,805,412	2,957,408	3,076,776	3,254,982	3,264,453

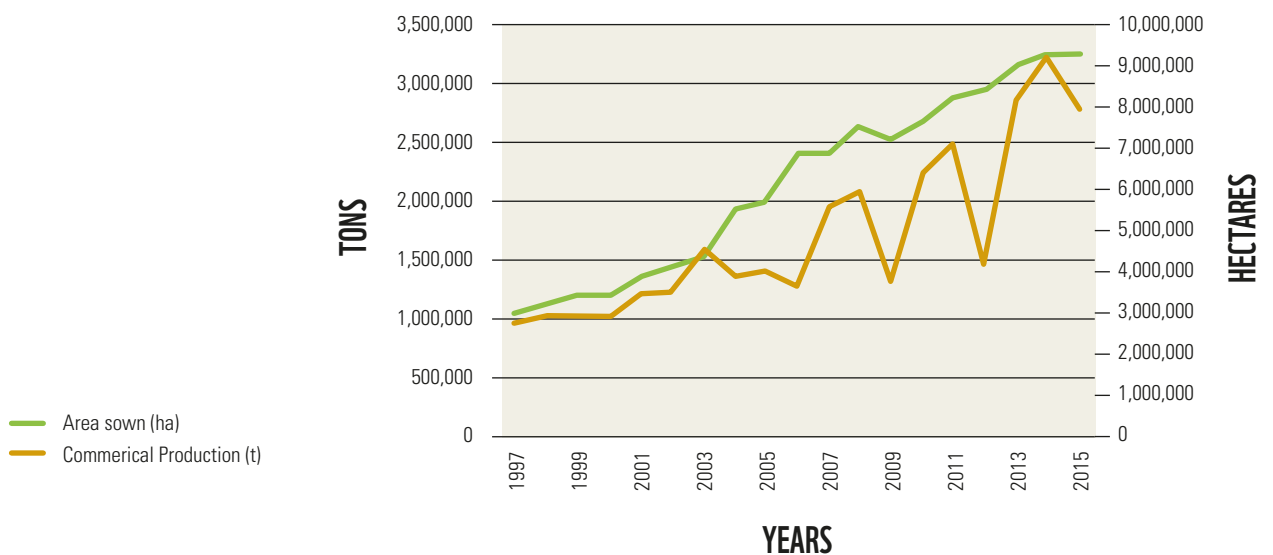
The technological capacity of soybean producers is reflected in increasing production and productivity (with the best of yields approaching 2,800 kg/ha). Most of the cultivated land surface area uses the technique of direct seeding, introduced in medium and large mechanized farms of Paraguay in 1990. Paraguay is currently the country with the highest proportion in the world, of direct seeding of the total cultivated area, which in the agricultural period from 2005-2006 totaled 1,800,000 ha, which is equivalent to 85% of the soybean surface area planted (OAS, 2009).

The continued growth of the area under soybean cultivation is seen in the reports of the Agricultural/Livestock Census, that for 1991 reported the cultivation of 552,657 ha of soybean, with a production of 1,032,676 tons (t). In 2008 the planted area rose to 2,436,510 ha and the production to 6,311,794 t, representing an increase of 511.2% in production and an increase of 345.8% in the cultivated area. In the same period, the average yield moved from 1.87 t/ha to 2.59 t/ha due to direct seeding and chemical fertilizers. The 2013 harvest estimated the planting of 3,157,600 ha and the production of approximately 9,367,298 t, which means that in just over 2 decades, the planting area increased 5.7 times, while production increased 9 times (Figure 5, Map 1). This data shows an average yield of 2.9 t/ha, similar to yields in Argentina and Brazil.

Soybean cultivation represents nearly 35% of the national agricultural production and about 40% of total agricultural exports, including grains, flour, cakes or pellets and soybean oils (IICA et al., 2009).

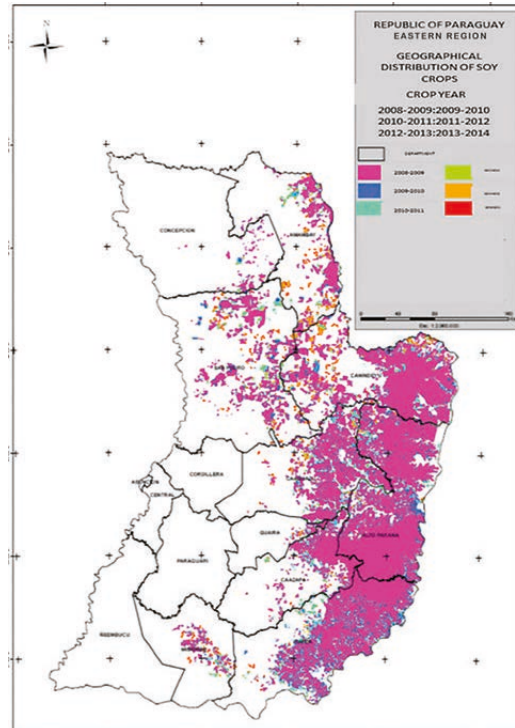
Figure 5. Evolution of area's planting and production of soy.

Source: CAPECO.



**Map 1: Eastern Region.
Expanding soy cultivation
2008-2014.**

Source: CAPECO.



The soybean compound (soybeans, corn, and sorghum) has begun to expand into the Western Region of Paraguay, although still in an incipient stage. According to Carlos Passerieu, of the agriculture/livestock company Cresca S.A., during the 2013/2014 season, the soybean compound in the Western Region planted 4,400 ha with a harvest of more than 10,500 t. As for the average yield per hectare, Passerieu said that in terms of previous years there was a parameter of 2,400 kilos per hectare (kg/ha) for soybeans and 3,500 kg/ha for corn. The last soybean season 2015/2016 aims to improve performance to compensate for low international prices and to meet Government expectations that the production will reach 10 MT⁴.

High temperatures and lack of rainfall in the Western Region have prevented the spread of the soybean crop in the area, although the Mennonite Colonies of the Central Chaco and the National University of Asunción are working to develop varieties that are more adapted to the climate of the Chaco. Likewise, the Association of Soybean, Grains and Oilseed Producers of Paraguay (APS for its acronym in Spanish), through an existing agreement between the Paraguayan Chamber of Grains and Oilseeds Exporters and Traders (CAPECO for its acronym in Spanish) and the United States Department of Agriculture (USDA), are studying the conditions of the Western Region in order to develop potential seed varieties adapted to high temperatures. In this regard, in August 2014,

4 Paraguay inicia la campaña sojera [Paraguayan soybean season begins]. (November 10, 2014). Newspaper La Nación.

technicians from USDA visited the trial soybean plots that the Fernheim Menonite Colonies have in Filadelfia. According to Agricultural Engineer Luis Cubilla, agricultural adviser of CAPECO, “this production has 500 varieties of soybean lines that have been developed for climates with high temperatures. This would help maintain the stable performance of soybeans in the Western Region and with other joint efforts of other projects would aim to improve the rotation crop with crops such as corn, sorghum or wheat”.

According to Agricultural Engineer Francisco Regis Mereles⁵, president of the APS, the region of the Upper Paraguayan Chaco, which borders with Bolivia and Brazil, could become a potential agricultural area, with the capability of producing soybean and corn.

Bringing to Market and Processing

The market of soybean (where over 70% is sold as grain), follows a simple circuit: it originates from the producer, who generally sells the grains to multinational commodity buyers or traders, and to a lesser degree to the cooperatives, who then industrialize them. In addition, a smaller portion can be marketed to other industries that are not associated with cooperatives.

Institutionally, the agents involved in marketing can be grouped into cooperatives, oil industries and agro-exporting businesses. From the point of view of resource capital, there are businesses with national resource capital, joint ventures and transnationals. Ninety-eight percent of soybean is produced for export in the form of grains or for the local oil industry. The remaining 2% is used as seed. On the other hand, 85% of the industry production is dedicated to the international market, and the remaining 15% for domestic consumption (OAS, 2009). Figure 6 illustrates the main links in the chain, type of participating companies and organizations, as well as the roles played by different parties in the process.

5 La soja se expande hacia nuevos horizontes [Soybeans expand towards new horizons] (February 17, 2013). Newspaper ABC Color.

Figure 6. Value chain of produced grains in agricultural business.

Source: Risk analysis of agricultural sector in Paraguay. World Bank, 2014.

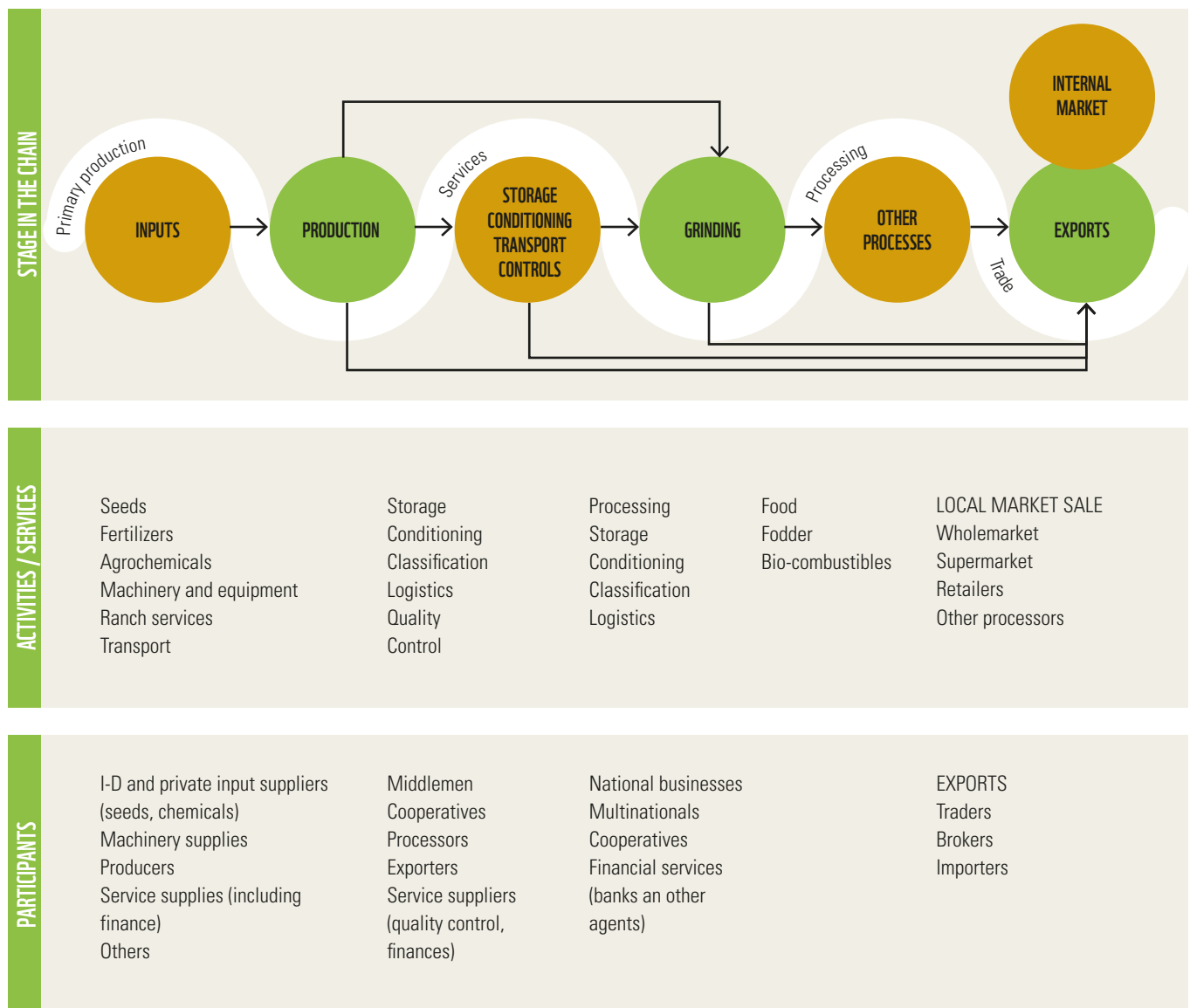
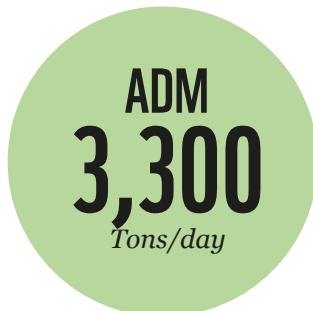


Table 2. Industrialization capacity of businesses associated with CAPPRO, 2014.

Source: <http://cappro.org.py/la-camara>.



One of the ironies of the soybean processing industry is that it is outfitted with large modern factories, with high performance and maximum utilization of raw materials, while alongside them are small industries which are lacking adequate facilities and have old machinery that prevents them from obtaining adequate returns.

Among the primary companies that produce and market soybeans is the Fave-ro Group, made up of a combination of seven companies, strategically located in the most productive regions of the country. The company covers all stages of production and market-chain including: production, storage, marketing, grain export, production and market of seeds, rental, purchase and sales of machinery and agricultural land, the logistical operations, grain freight and loading in its own port, as well as the import of raw materials, and the production and market of phytosanitary products. It is also involved in raising cattle.

Other companies with significant presence in Paraguay are Vicentín, PAYCO S.A., Agrotec, Agrofertil and Ciabay.

In 1993, there were 31 processing plants in Paraguay. In terms of performance, soybeans produces 0.74 t of soy flour, 0.2 t of oil, 0.05 t of shell and 0.01 t of loss.

In 2002, there were 29 companies, 18 of which had the capacity to refine oil. Currently there are 26 plants producing edible soybean oils, which are modern units with high efficiency and utilization of raw materials. Meanwhile, with regard to storage, until 2004, the CAPECO recorded a total of 550 silos with a capacity of 5,100,000 t, mainly distributed in Itapúa and Alto Paraná.

According to the Paraguayan Chamber of Processors of Oilseeds and Grains (CAPPRO for its acronym in Spanish), the capacity (2014) of companies in Paraguay associated with CAPPRO (Table 2) in the industrialization (crushing) of the oil seeds is about 4.5 MT per year. This would represent the processing of close to 45% of all soybeans produced in Paraguay, thus increasing the added value incorporated into domestic production.

Impact on the Economy

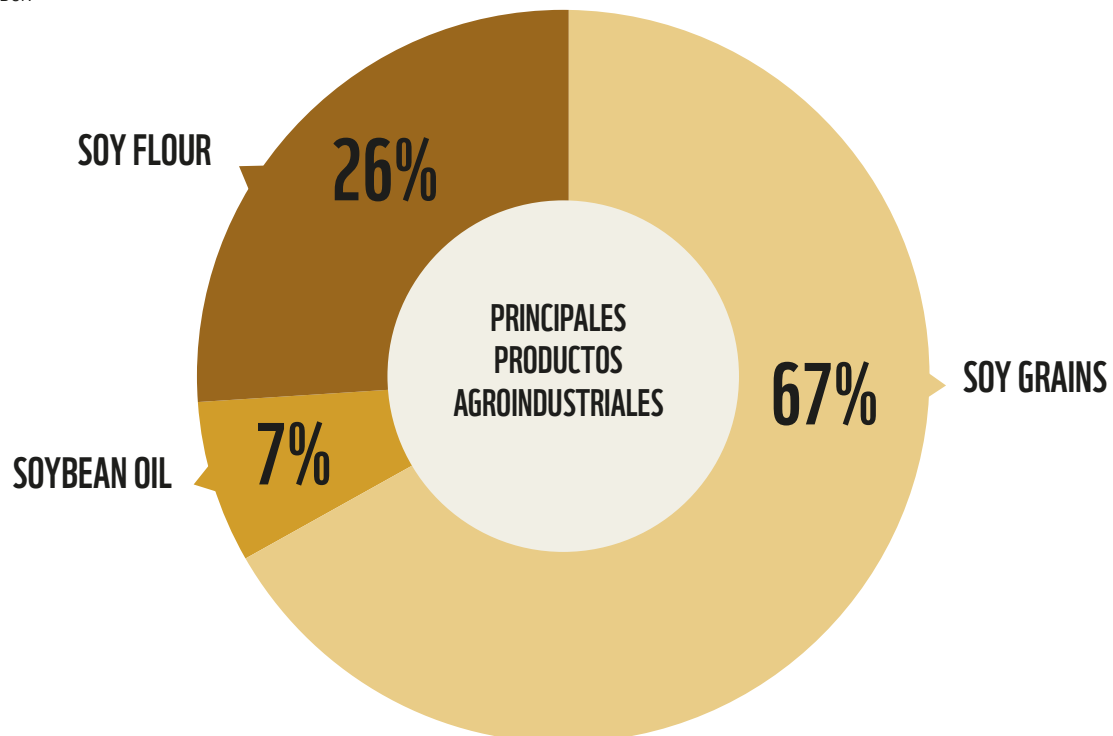
Gross Domestic Product

The percentage share of agriculture in the GDP has remained around 18% between 2011 and 2015. This percentage is largely from the soybean compound, which became notorious in reducing 5.1% in 2012, mainly due to the poor soybean crop. Soybeans are characterized by strong investment and according to CAPECO, it is the sector that generates the most foreign exchange for the country, representing 23.6% of the total value.

Figure 7 shows the export of soybeans and its byproducts. In 2013, 67% was exported as grain, 7% as oil and 26% as soybean flour.

Figure 7. Exportation of soy and its derivatives in percentage 2013.

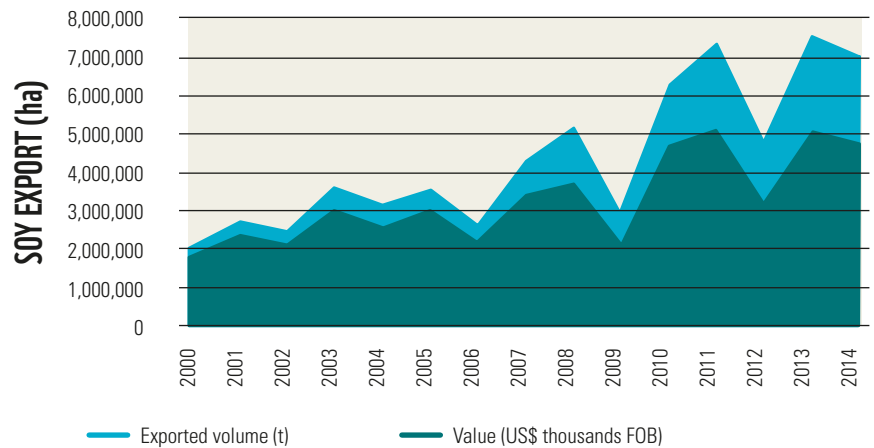
Source: Elaboration of CAPPRO based on statistics from BCP.



The soybean export volume increased steadily from 2000 through 2014, increasing by 168%. The value of soybean exports in 2012 represented 31% of the total value of exports (US\$ 5,087 million). Figure 8 shows the volume and value of Paraguayan soybean exports for the past 15 years. The decrease in soy export in 2009 and 2012 were caused by the international trading prices and climate conditions. Significant drops in exports in 2009 and 2012 were caused by variations in international prices and weather conditions.

Figure 8. Soy exports from Paraguay.

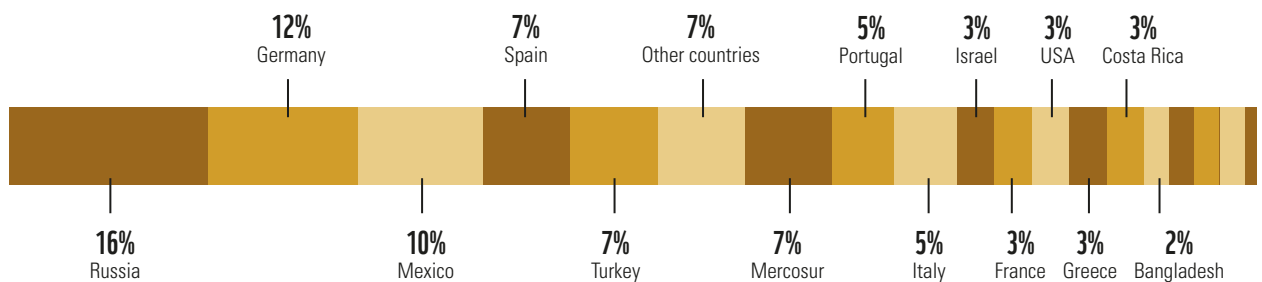
Source: IICA-Observatorio.
Corresponding to the period January-August.



In terms of the destination of soybeans (Figure 9), the principle buyer of the 2013 harvest was Russia, with 811,563 t, followed by Germany and Mexico with 595,879 t and 511,983 t respectively. Southern Common Market (MERCOSUR for its acronym in Spanish) countries received 332,007 exported tons, and other buyers participate in smaller percentages ranging from 2% to 7% of the total exported. In the category of others who have been considered but not exhaustively, are Egypt, Tunisia, South Korea, Bangladesh, Peru, United Arab Emirates and Japan.

Figure 9. Principal destination of soy exports 2013.

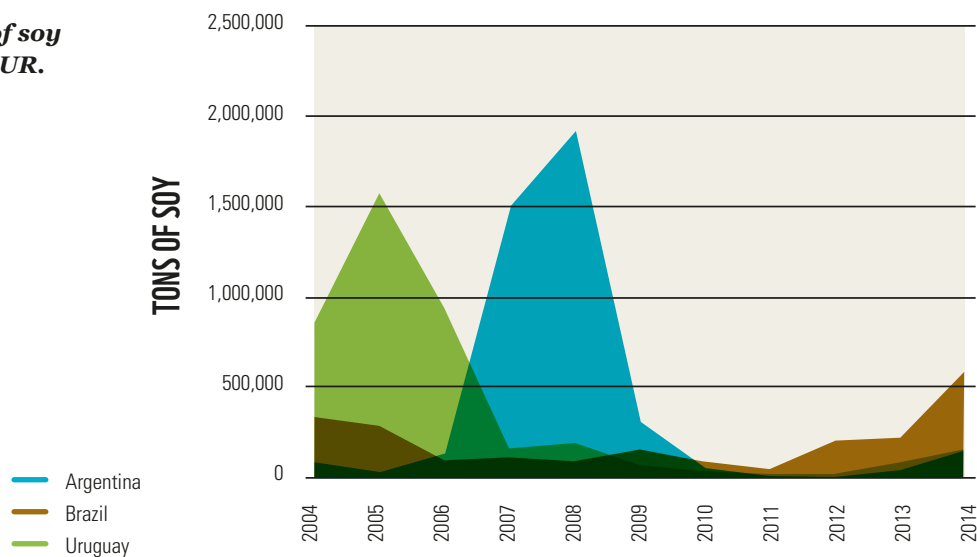
Source: IICA-Observatorio.



In terms of MERCOSUR partners (Figure 10), from 2004 to 2006, Uruguay⁶ was the main destination, with 31% of total exports. It was subsequently displaced by Argentina, which remained as the main buyer of soybeans until 2009 with 41% of total exports, with Brazil finally positioning itself as the leading buyer until the 2014 harvest with 16% of purchased soybeans with 567,446 t of the 3,382,172 t exported to MERCOSUR.

Figure 10. Volume of soy exports to MERCOSUR.

Source: IICA-Observatorio.



Investment in the agricultural sector

CAPECO reported that investment in the sector is about US\$3 billion. Meanwhile, data from the Chamber of Automotive and Machinery Distributors (CADAM for its acronym in Spanish) shows the amount of imported agricultural machinery, with a decline equivalent to 9.1% between 2013 and 2014, with 3,331 and 3,029 machines being imported respectively (Table 3). These machines are primarily used in the production of soybeans, corn and wheat.

With respect to the value of imports, the Central Bank of Paraguay (BCP for its acronym in Spanish) stated that in 2014 it amounted to US\$241 million, showing an increase of 11% compared to 2013 (US\$217 million), even though there was a decline in imports of physical units of capital goods for agriculture. This means that imported goods in 2014 had a greater valuation than those of 2013.

⁶ However, this data would not be correct in terms of Uruguay being a major destination, since according to the Single Window Exporters, soybeans sent to this country would be in transit through the Nueva Palmira Port, with the final destination being other countries.

Table 3. Import of new agricultural machinery (units).

Source: CADAM.

TYPES	2013	2014	VAR. %
Tractors	2,531	2,154	-14.9
Harvesters	475	504	6.1
Pulverizers	325	371	14.2
Total agricultural machinery	3,331	3,029	-9.1

Tax contribution

According to Itriago (2012), the value-added tax (VAT) generated by the agro-soybean sector accounted for less than 5% of total revenue from VAT in 2010.

In calculating how much agro-exporting companies contribute to the country, Deputy Minister of Taxation⁷, Gerónimo Bellasai mentioned that US\$1.8 billion dollars in foreign currencies was received for grain exports in 2010. The deputy minister stated that even assuming that the difference in price was only 10%, the losses incurred in 2010 would total US\$54 million: US\$18 million for tax on corporate income, US\$9 million for the 5% tax on distribution of utilities and US\$27 million for the 15% from the tax on transfer of profits abroad (Itriago, 2012).

This situation led to work being done on changing the tax structure, and thus the Law 5061/2013 “Agricultural Income Tax” (IMAGRO for its acronym in Spanish), was instituted and became effective on January 1, 2014. This law unified the tax base of the agricultural sector with that of commercial and services, with taxation being on profits. Prior to this law, taxation was done on a presumptive basis (calculation on the number of hectares owned and possible production), resulting in a very subjective calculation which yielded very low tax revenues.

Marco Elizeche⁸, from the Bureau of Macroeconomic Policy of the Ministry of Finance, in an interview, said that currently there could be some 150,000 agricultural/livestock farms of which 50% are being effectively taxed, resulting in the treasury doubling in 2014 all of the proceeds from the six years of the IMAGRO.

In addition, the new law extends the VAT to all agricultural products in their natural state, with a rate of 5%. With this, you must pay VAT on sales of cattle and agricultural products in their natural state. It is anticipated that the State may increase the VAT rate from 5% to 10% if necessary.

⁷ Year 2012.

⁸ Personal Communication. April 2015.

Another aspect of the law is the possibility of all exporters to recover the VAT Tax Credit by 50%, regardless of whether exported products are in their natural or processed state.

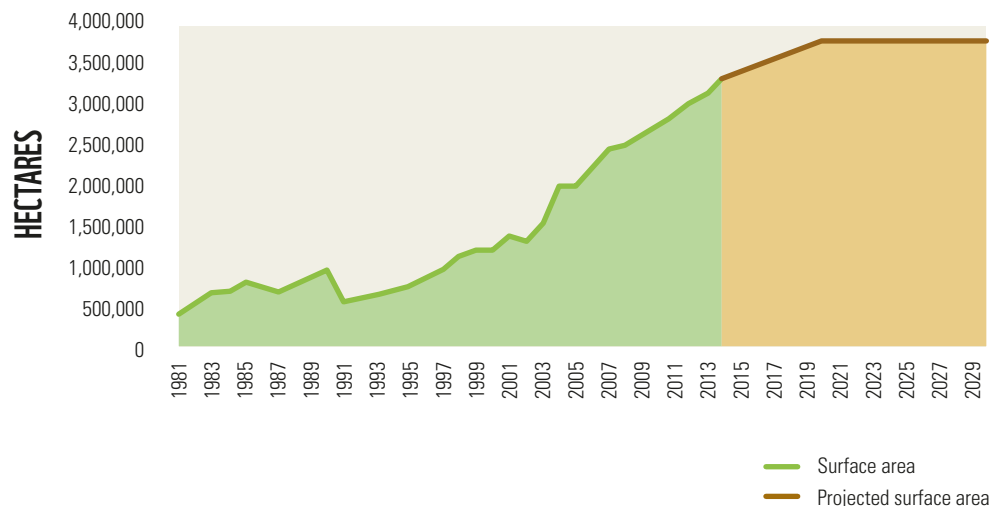
While the tax issue was effective in making the contributions of the productive sectors more equal, it will continue to be the subject of long political debates; for example the tax on exports of products in their natural state, which could not be applied and ended up favoring only one segment. On the other hand, the Personal Income Tax which recently went into effect (2012), is expected to contribute to reducing the tax gap between the economic parties (including commodity producers).

Projection of the expansion of soybean cultivation

Using data from the Ministry of Agriculture and Livestock (MAG for its acronym in Spanish), the Institute of Agricultural Biotechnology (INBIO for its acronym in Spanish) and the CAPECO the results show (Figure 11) that until 2020 an increase in planted areas is expected equivalent to 14%, from 3,264,480 ha in 2014 to 3,736,623 ha in 2020⁹; while production is expected to increase by 17% from 8,004,505 t in 2014 to 9,393,497 t in 2020. By 2030, production is expected to increase due to technological improvements, to 10,432,278 t, while maintaining the same land surface area in 2020, during the 2020-2030 decade. (Figure 11 and 12).

Figure 11. Surface area of observed and projected soy.

Source: WWF elaboration based on secondary information.

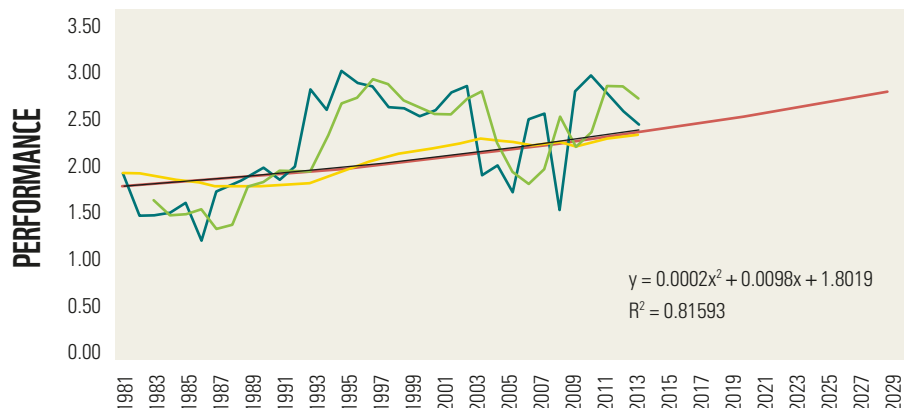


9 Projected data from the MAG data base: 1981-2010.

Figure 12. Performance of observed and projected soy.

Source: WWF elaboration based on secondary information.

— Soy Rend
— Smoothed
— MA (2)
— Prognostic Rend
— Polynomial (smoothed)



Analyzing the expected evolution of the surface area and production of soybean cultivation area by 2020, it is expected that the greatest relative growth of the planted areas will be in non-traditional areas. While for the traditional areas (Itapúa, Alto Paraná and Canindeyú), it is expected that production levels will be around the current numbers since the resting land areas will limit the expansion. These results can be observed in the following table (Table 4).

Table 4. Soy projection and production by cultivated area.

Source: WWF elaboration, from CAN data.

AREAS	SURFACE AREA (ha) 2013/14	SURFACE AREA (ha) 2020	PRODUCTION (t) 2013	PRODUCTION (t) 2020	PRODUCTION (t) 2030
Traditional Zone	2,037,881	2,105,355	6,083,098	5,407,747	6,040,347
Itapúa	554,351	584,998	1,604,292	1,510,289	1,679,354
Alto Paraná	881,853	888,511	2,678,134	2,222,877	2,368,593
Canindeyú	601,677	631,846	1,800,672	1,674,581	1,992,400
Traditional Zone Minor	1,002,047	1,178,595	2,768,395	3,006,324	3,715,452
Caazapá	176,723	179,608	427,454	446,757	541,949
Caaguazú	402,336	459,001	1,178,191	1,327,110	1,686,966
San Pedro	263,331	370,439	748,833	831,784	1,023,301
Amambay	159,657	169,547	413,917	400,673	463,236
Zone of Expansion	76,837	184,644	223,835	351,539	420,974
Concepción	16,674	84,734	92,478	171,832	204,116
Guairá	14,767	30,758	37,130	58,096	70,214
Misiones	45,396	69,152	94,227	121,611	146,644

As an example, one of the figures shows the data of the Department of Concepción, yields can be observed from 1981 until 2013 (Annex I).

Environmental Analysis

Loss of forests and biodiversity

The rapid expansion of soybean cultivation in the Eastern Region of the country, beginning in the sixties, became one of the direct causes of deforestation in the region. In the Departments of Itapúa and Alto Paraná, wooded landscape was quickly transformed by crops. This accelerated process of transformation reached historical peaks, placing Paraguay among the countries with the highest rates of deforestation in Latin America. In the Eastern Region, the forest area decreased dramatically in the period between 1960 and 2003 with deforestation rates that reached 300,000 ha per year. Since 2004 and the enactment of the Law 2425, known as “Zero Deforestation Law”¹⁰, prohibiting the transformation and conversion of forest areas in the Eastern Region of Paraguay, the deforestation rate has decreased by 80-90%¹¹.

The exponential growth during the first few decades of soy planting in Paraguay has been related to the massive deforestation of the Upper Paraná Atlantic Forest (UPAF), especially in the traditional areas of Alto Paraná, Itapúa, and Canindeyú. Currently, much of the surface area for agricultural use in these Departments belongs to the soybean compound. Deforestation has meant, without a doubt, the loss of biodiversity, and changes in the microclimate and water cycle.

The most recent expansions have been more discreet on the forest mass, although statistics do show the existence of deforestation and degradation of forests (WWF, 2012); assuming therefore, that expansion has migrated over grazing land, farmlands of small farmers and over resting fallow land.

CAN data allows for the visualization of part of the changes in forest cover in the inter-census period of 1991-2008. In this period, the forest area declared by landowners was reduced in all the Departments, in areas corresponding to soybean cultivation (Table 5). The largest reduction occurred in the traditional area (44%), followed by the expansion zone (32%). Comparing the land surface area of soybean cultivation, with forest areas (Figure 13-15), increased cultivation is noticeable at the expense of forest area. In the traditional area, for example, the largest reduction in forest area occurred in Canindeyú (58%) where soybean cultivation grew significantly (858%).

In the less traditional area, the largest reduction in forests occurred in the Department of Caaguazú (35%) coinciding with further expansion of soybeans. The exception was found in the expansion zone where the largest percentage of forest reduction was in the Department of Concepción, while most soybean expansion occurred in Misiones, although increases in soybean land surface were seen in all areas (Figure 15).

10 Law 2425, Prohibition of activities in the eastern region with transformation and conversion of areas with forest cover.

11 WWF, 2012.

Table 5. Variation of privately owned land cultivated by soy and covered by forest.

Source: WWF elaboration based on data from CAN 1991 and CAN 2008

AREAS	Forested land (ha) 1991	Forested land (ha) 2008	Var. of forested land (%) 1991-2008	Land cultivated by soy (ha) 1991	Land cultivated by soy (ha) 2008	Var. of land cult. by soy (%) 1991-2008
Traditional Zone	936,575	529,099	-44	488,057	1,692,397	247
Itapúa	207,072	143,184	-31	210,523	480,721	128
Alto Paraná	202,772	164,789	-19	228,504	741,842	225
Canindeyú	526,731	221,126	-58	49,030	469,834	858
Traditional Zone Minor	1,019,413	752,032	-26	63,385	717,230	1,032
Caazapá	123,162	110,364	-10	8,931	110,314	1,135
Caaguazú	216,473	140,227	-35	21,799	318,664	1,362
Amambay	264,180	224,785	-15	17,367	185,463	968
San Pedro	415,598	276,656	-33	15,288	102,789	572
Zone of Expansion	425,940	291,359	-32	583	53,840	9,135
Concepción	360,056	233,300	-35	187	21,198	11,236
Guairá	31,729	26,423	-17	237	10,054	4,142
Misiones	34,155	31,636	-7	159	22,588	14,106

These data corroborate the above, that despite the existence of the Law 2425 “On prohibition in the Eastern Region of activities of transformation and conversion of areas with forest cover,” deforestation on the farms of producers has continued.

Figure 13. Traditional Zone: land covered by forest or cultivated by soy. Inter-census period 1991-2008.

Source: WWF elaboration based on CAN.

- Surface Area - Forested 1991 (ha)
- Surface Area - Forested 2008 (ha)
- Surface Area - Soy 1991 (ha)
- Surface Area - Soy 2008 (ha)

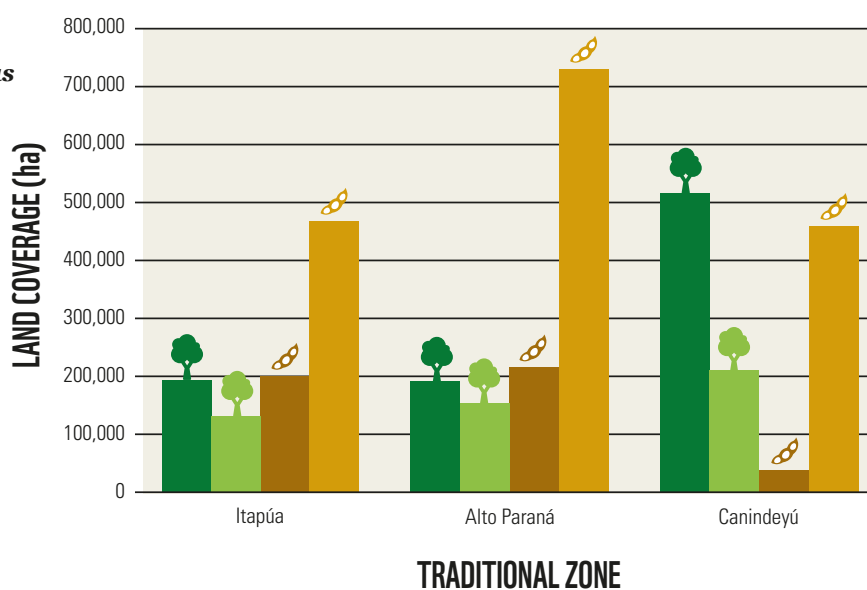


Figure 14. Traditional Zone Minor: land covered by forest or cultivated by soy. Inter-census period 1991-2008.

Source: WWF elaboration based on CAN.

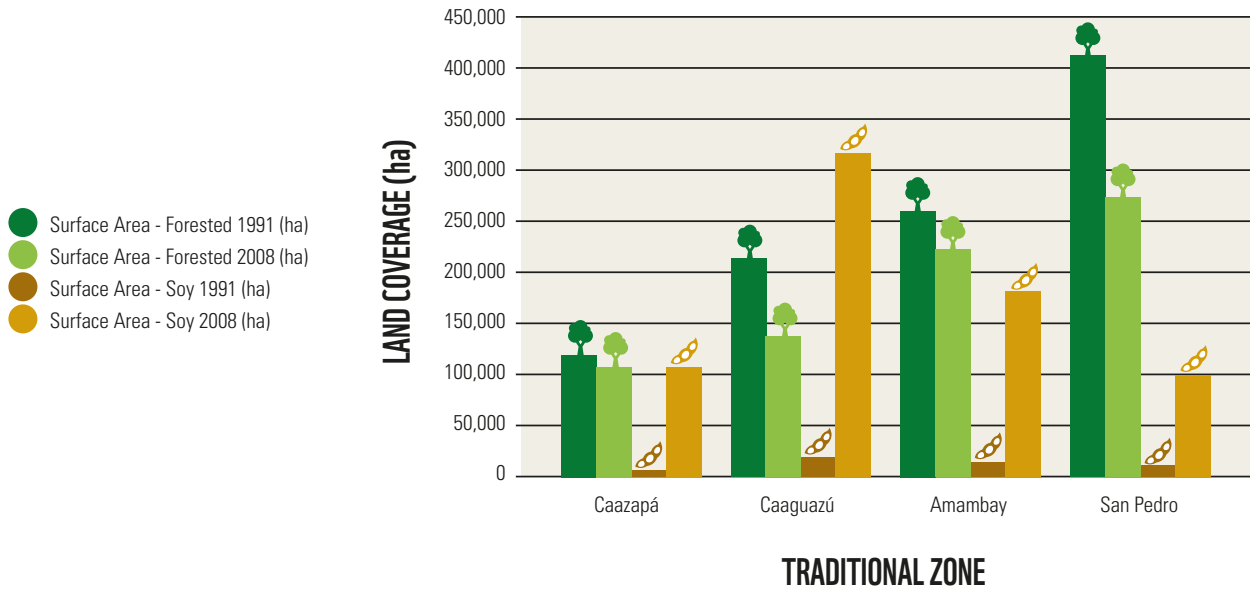
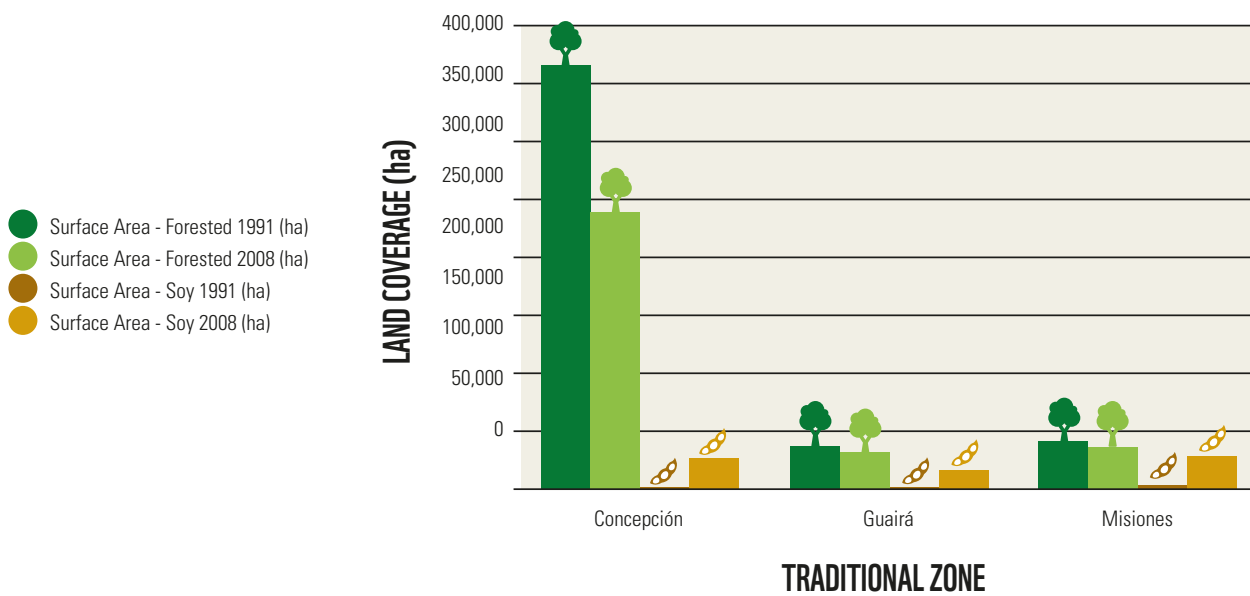


Figure 15. Zone of Expansion: land covered by forest or cultivated by soy. Inter-census period 1991-2008.

Source: WWF elaboration based on CAN.



Without taking into account the “Zero Deforestation Law”, you could expect that with good pricing conditions in the soybean sector, thousands of hectares used for ranching in the Eastern Region, with soils suitable for mechanized agriculture, would become part of the soybean compound (Melgar & de Melo Benitez, 2011). The advance of soybeans on other ecosystems besides forests, such as natural grasslands, has an important impact, which is not covered specifically in the legislation, so the possibilities of short-term restoration of these ecosystems would be very limited.

Official data available through the UN REDD+ National Joint Program (2015) speak of a deforestation rate of 30,185.24 ha/year for the Eastern Region for 2013-2015.

Within the system of soybean expansion in the Eastern Region, there are still original remnants of the UPAF. These forest remnants, some greatly deteriorated, remain an important source of biodiversity. Considering this, the conservation of these forest remnants becomes increasingly important and the establishment of biological corridors between them.

Effects on water quality and quantity

It is known that forests and natural ecosystems are essential to maintaining water quality and erosion control. In the last thirty years, the advance of the agricultural frontier on forests has heavily affected the quality and quantity of water in the region. While water is a key resource for agriculture, there is no systematic monitoring that shows the status of both surface and underground water resources, especially in agricultural/livestock areas.

One of the few monitors on the subject is the one developed by Facetti (1995), who found that water pollution in Paraguay is anthropogenic. Both in deep water and shallow watercourses, traces of artificial substances such as pesticides and heavy metals (lead tetraedilo) among others, could be detected. Other basins that are purely agricultural produce pressures from different sources: mainly pesticides and nitrogen nutrients. These basins are mostly found in the departments of Itapúa (Pirapó, Ñacunday) and Alto Paraná (Monday, Acaray). These sub-basins correspond to the Paraná River basin.

In a later work, Facetti (2002), goes on to say that the use of pesticides or phytosanitary products in Paraguay is extensive; the farms use fertilizers to improve production and the chemical load in pesticides is absorbed by the agricultural land, leading to traces of toxic products in rivers and streams.

The problem of water pollution is addressed superficially in the Secretariat of the Environment (SEAM for its acronym in Spanish) Project Document (2014), called *Integrating Biodiversity Conservation and Sustainable Land Management in Production Practices in all Bioregions and Biomes in Paraguay*, where it is stated that “runoff of pesticides pollute the waterways”. In the Paraná River tributaries, rivers such as the Pirapó, Tembey and Ñacunday that cross areas where this type of agriculture is predominant have maximum levels of chlorinated products. Also, high levels of heavy metals such as soluble lead, chromium and soluble mercury have been found in the Pirapó River.

IN CANINDEYÚ AND IN A SPRING IN SAN PEDRO, GLYPHOSATE RESIDUES WITH RESPECTIVE VALUES OF 0.114 PPB AND 0.189 PPB WERE FOUND, SUGGESTING THAT SPAYED GLYPHOSATE CAN BE FOUND IN GROUNDWATER AFTER LEACHING.

SEAM (2014) adds that in the area of influence of the Itaipu Hydroelectric Dam, very low transparency values of less than 0.5 m have been reported for some tributaries of the Paraná River (Rivers Piratí and Carapá), while studies in forested areas, such as Itabó and Limoy report transparency values above 2 m.

More recently, a research project developed between December 2010 and January 2011, by Adam, Annett, Bersillon, Payeur, and Piolet of Catholic University Our Lady of Asunción, studied the presence of glyphosate in surface waters of two pilot areas that are characteristic of the development of intensive cultivation of soybeans in the departments of Canindeyú and San Pedro. The study detected the presence of glyphosate with significant values at two points: in drainage waters of a soybean field in Campo Agua'e (Canindeyú) and in the headwaters of the Arroyo Ñequita in Luz Bella (San Pedro), with respective values of 0.114 ppb (parts per billion) and 0.189 ppb.

These results suggest that glyphosate sprayed on crops can be found in groundwater after leaching, in which the soil structure can give way to porous channels that greatly increase the transfer of contaminants (Adam et al., 2011).

These make up the few studies that address water pollution caused by the use of phytosanitary products. The data is insufficient and not very systematic, so it becomes necessary that the authorities include these investigations within the plans of the appropriate institutions.

Social Analysis

Displacement of rural communities, internal migration

While the expansion of soybean land surface in the Eastern Region in the beginning was at the expense of forests, it is now carried out on areas that have traditionally been ranching and FF lands. The small agricultural/livestock producer faced with a lack of financing sees the sale or rental of his or her land to soybean producers as an economically-viable alternative (OAS, 2009). Once the cycle of rental to soy producers begins, it is usually very difficult to break (either due to contamination of the land due to extensive pesticide use, or further reduced funds leaving the farmer dependent on large producers for their income).

According to the CAN, in 1991 there were a total of 307,221 farms, 255,578 of which had less than 20 ha; while the 2008 CAN indicates that the total number of farms that existed in that year was 289,649, of which 241,956 had less than 20 ha (Table 6). In absolute terms, in the inter-census period of 1991-2008, a total of 17,572 farms left the primary production sector (Table 6, Figure 16). Of these farms that left the market, 13,619 (78%) belong to the stratum whose land surface is less than 20 ha; in other words, the FF stratum. As a result, direct employment on farms is decreasing, while indirect employment (e.g. transportation, agrochemical sector, etc.) is increasing.

Table 6. Quantity of farms according to size.

Source: CAN 1991 and 2008.

PARAGUAY	QUANTITY OF FARMS		
	CAN 2008	CAN 1991	Variation in number of farms
Size of farm	289,649	307,221	-17,572
Less than 20 ha	241,959	255,578	-13,619
Less than 1 ha	15,586	21,977	-6,391
From 1 to 5 ha	101,643	92,811	8,832
From 5 to less than 10 ha	66,218	66,605	-387
From 10 to less than 20 ha	57,735	66,223	-8,488
From 20 to less than 50 ha	22,865	31,519	-8,654
From 50 to less than 100 ha	6,879	7,577	-698
From 100 to less than 200 ha	5,234	4,279	955
From 200 to less than 500 ha	5,251	3,503	1,748
From 500 to less than 1,000 ha	2,737	1,525	1,212
From 1,000 to less than 5,000 ha	3,443	2,356	1,087
From 5,000 to less than 10,000 ha	684	533	151
10,000 and more ha	600	351	249

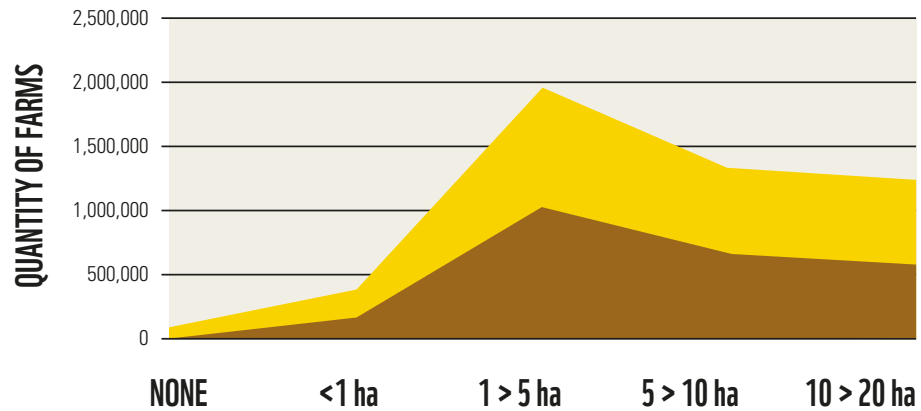
Doing a direct calculation of the number of people who have left the agricultural/livestock production sector of FF in the period 1991-2008, it is about 68,095 people, considering five people per farm. A study called *The impacts of soybean cultivation in Paraguay 2010* prepared by the NGO Repórter Brazil and Base Social Research, has gone even further in terms of numbers. The study indicates that the approximate number of people who have migrated from the countryside to the city in recent years was 90,000 a year (about 18,000 families). The families settle on the outskirts of an urban center, on small plots that do not offer them any possibility to produce food.

While these numbers do not establish a direct causal relationship between migrations, increased soybean farms and decreased FF lands, migration from the countryside to the cities is a reality. This migration is also strongly linked to the lack of public policies that ensure access to education, health and decent employment in rural areas.

Figure 16. Family Farming: quantity of farms according to size.

Source: WWF elaboration based on CAN 1991 and CAN 2008.

● CAN 1991
● CAN 2008



Reduction of the land surface area dedicated to the production of food

In Paraguay, the production of food is tied primarily to FF and to farms of up to 20 ha of land. According to the 2008 CAN, only 4% (1,340,096 ha) of agricultural lands were dedicated to the production of food. In addition, Gattini (2011), states that FF “has been losing ground to other types of production, particularly in regard to the commodities” and that this trend has even been seen in countries belonging to the Organization for Economic Cooperation and Development, with high agricultural subsidies.

One of the factors by which the FF loses production space is the inability to incorporate technologies as well as almost no available capital, which “pushes” these structures to sell their properties to buyers who offer high prices for the land.

Table 7 shows that the proportional share of FF in the Gross Value of Production (GVP), measured in constant 1994 Paraguayan Guaraníes (PYG), was significantly reduced. In 1991, the FF generated 70% of the agricultural GVP while in 2008 it represented only 32% of the agricultural GVP. Typical areas of FF such as beans, cassava, tobacco and peanuts all reduced their participation in the GVP during the comparative years (Figure 17).

IN THE INTER-CENSUS PERIOD 1991-2008, THERE WAS A REDUCTION OF THE AMOUNT OF FARMS THAT PRODUCE PEANUTS (12%) AND CASSAVA (13%), IN THE STRATUM OF PRODUCERS WITH 10 TO 20 HA.

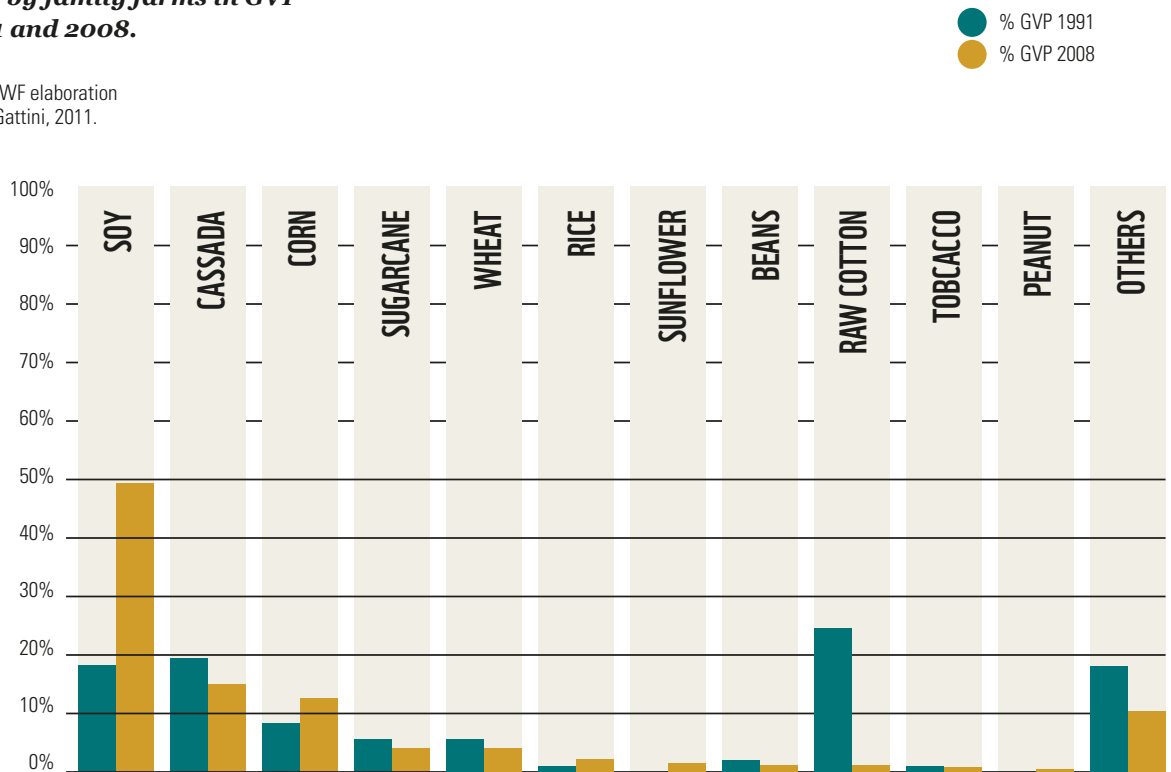
**Table 7. Family Farming:
Gross Value of Production
(in thousands of guaraníes
in 1994)**

Source: Gattini, 2011.

ITEM	YEAR 1991	PART. (%)	YEAR 2008	PART. (%)
Soybean	365,566,950	17.9	2,407,199,879	49.0
Cassava	390,320,806	19.2	724,800,000	14.8
Corn	169,365,459	8.3	601,351,426	12.3
Sugarcane	112,683,640	5.5	193,999,972	3.9
Wheat	54,201,433	2.7	167,200,000	3.4
Rice	16,192,659	0.8	92,124,045	1.9
Sunflower	78,872	0.0	62,701,899	1.3
GVP	35,924,282	1.8	53,409,929	1.1
Raw cotton	493,379,568	24.2	50,204,242	1.0
Tobacco	15,391,875	0.8	28,125,000	0.6
Peanuts	19,569,887	1.0	20,699,748	0.4
Other	365,534,181	17.9	506,039,323	10.3
Total	2,038,209,612		4,907,855,463	

**Figure 17. Percentage of items
grown by family farms in GVP
in 1991 and 2008.**

Source: WWF elaboration
based on Gattini, 2011.



In order to deepen the analysis of the behavior of emblematic subsistence items in FF, such as peanuts, beans and cassava, both the number of farms and the harvested land area of FF are taken into account during the inter-census period 1991-2008. Tables 8 and 9 show that the three items recorded an increase in both the number of farms and harvested land area during the inter-census period, except for the categories of farms with 10 to less than 20 ha, where declines occurred in relation to the number of farms producing peanuts and cassava (12% reduction for peanuts, 13% for cassava).

This is logical based on the fact that the total number of farms from 10 to 20 ha, in the inter-census period 1991-2008, fell by 8,488 farms.

Two scenarios could be expected with this segment that stopped producing cassava and peanuts: 1) was made up of the group of producers who sold their land (as extensions become attractive to the semi-mechanized soybean producer and the mechanized producer who are looking to increase their land surface), and migrated to urban belts; or 2) remained on their farms replacing these items of personal consumption with other crops, by which the family economy could be eroded due to the purchase of products considered Paraguay's food base.

In relation to the surface area sown, it also follows the same pattern observed in terms of the number of farms, except for beans, after having increased by 52% in the amount of farms for the stratum of 10 to less than 20 ha planted, there was a slight decrease of 0.6% (Figure 18).

Table 8. Quantity of subsistence items according to surface area.

Source: WWF elaboration based on CAN 1991 and CAN 2008.

	PEANUT		CASSAVA		BEANS	
	Quantity of farms 1991	Quantity of farms 2008	Quantity of farms 1991	Quantity of farms 2008	Quantity of farms 1991	Quantity of farms 2008
Less than 1 ha	167	405	7,418	8,657	990	8,409
From 1 to less than 5 ha	9,754	15,750	73,875	87,008	28,019	85,791
From 5 to less than 10 ha	12,656	15,076	57,245	58,365	28,273	55,584
From 10 to less than 20 ha	14,299	12,606	56,658	49,016	29,315	44,697

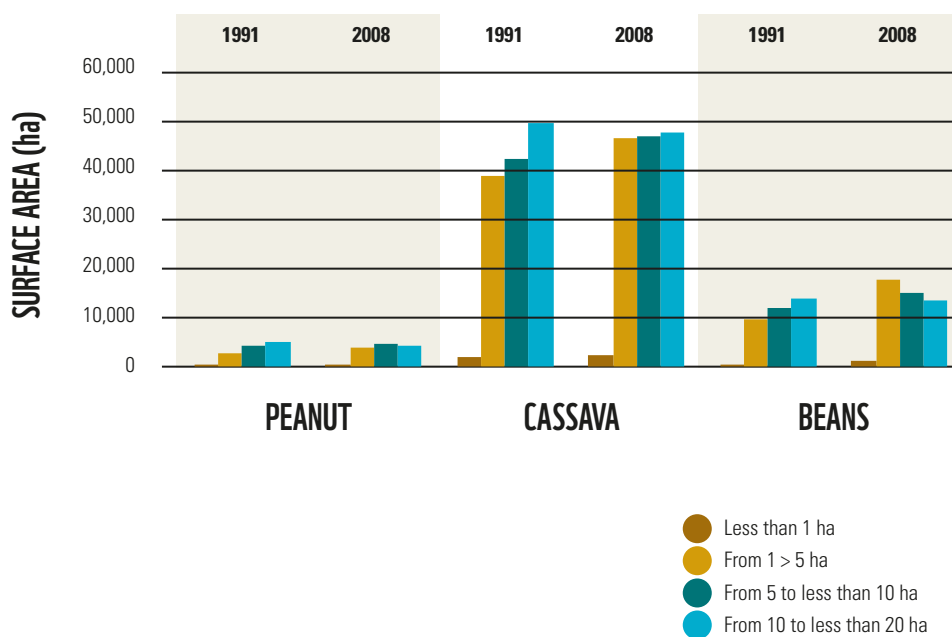
Table 9. Area (ha) of subsistence items according to surface area.

Source: WWF elaboration based on CAN 1991 and CAN 2008.

	PEANUTS		CASSAVA		BEANS	
	Area sown 1991	Area sown 2008	Area sown 1991	Area sown 2008	Area sown 1991	Area sown 2008
Less than 1 ha	30	47	1,953	2,063	173	1,005
From 1 to less than 5 ha	2,709	3,882	38,791	46,485	9,397	17,774
From 5 to less than 10 ha	4,094	4,510	42,198	47,086	11,921	15,100
From 10 to less than 20 ha	4,990	4,058	49,770	47,899	13,703	13,610

Figure 18. Inter-census variation of area of subsistence items.

Source: WWF elaboration based on CAN 1991 and CAN 2008.



Cabello, Vázquez Aranda, Cristaldo, and Jiménez de Recalde (2013) have observed a trend of replacing traditional cash crops of FF¹² such as cotton and sesame for soybean and corn. According to the 2008 CAN, of the total number of farms included in the soybean harvest, more than 70% of them (18,771 of 26,090) are properties of up to 50 ha and for the normal corn harvest, that proportion rises to 96% (119,473 of a total of 124,019 farms).

Table 10. Quantity and surface area size of seasonal crops.

Source: Cabello et al. (2013) based on CAN 2008.

ITEMS	UP TO 50 ha		ALL HECTARES	
	(Family Farming)		(less than 1 to more than 10,000)	
	Farms	Surf. area (ha)	Farms	Surf. area (ha)
Cassava	219,032	161,222	225,327	170,694
Normal soy	18,771	145,795	26,090	2,238,778
Normal corn	119,473	98,009	124,019	296,434
Chipa corn	131,979	74,678	134,835	80,759
Sesame	40,176	60,536	40,869	69,857
Cotton	52,791	60,331	53,474	66,256
Beans	208,655	52,180	213,999	55,424
Small harvest corn	22,220	46,336	25,561	472,469
Sugar cane by industry	19,784	44,864	20,551	81,885
Wheat	2,698	27,441	5,589	381,028
Foraged sugar cane	29,840	15,581	32,498	24,384
Peanuts	47,592	13,886	48,691	24,113
Small harvest soy	1,716	11,294	2,826	224,732
Locro corn	8,842	4,386	9,157	5,356
Spurge	4,655	4,257	4,715	4,828
Sunflower	726	4,218	1,958	99,139
Pichinga corn	5,647	2,543	5,781	3,028
Tobacco	2,545	2,078	2,577	2,220
Rice with irrigation	553	1,405	726	33,870
Upland rice	1,133	491	1,216	1,591

12 Represented here by farms of up to 50 ha.

The impact of the expansion of soybean cultivation over food production lay, according to Itriago (2012), in the emphasis of growth in production and export of this crop controlled by foreigner investors and medium to large land-owners at the expense of the marginalization of others associated with FF. FF is key in the processes of reducing poverty, inequality, and the development of ecologically sustainable production strategies.

Consequences of phytosanitary products

Mechanized farming has been associated, in many cases, with the indiscriminate use of pesticides. According to the SEAM (2004) and the Roundtable for Sustainable Rural Development (2007), Paraguay imports between 25,000 and 30,000 t of pesticides every year, although not all of this amount is used on crops, with some of it going to re-exportation or triangulation. An estimated 12,000 t would be used locally and about 13,000 t exported as contraband into Brazil.

Pereira (2009), in the document entitled *Report on the trip to verify the impacts of transgenic soybeans in Paraguay*, mentions that “during the 2007/2008 agricultural season more than 21 million liters and over 1 million 900 thousand kilograms of phytosanitary products were applied to soybean crops in Paraguay. In previous crop years they have come to pour about 24 million liters of chemicals on soybean crops”. These numbers would not be far from reality, considering that about 90% of the soybeans produced in Paraguay are the genetically modified Roundup Ready, which require up to 2 liters/ha of glyphosate¹³ for weed control.

Controversies regarding the existence or not of scientific evidence on the effects of phytosanitary products on human health, never end and far from coming to agreements, the asymmetry between producers and villagers who in many cases live surrounded by soybeans crops, is becoming more acute. The case, perhaps best known in Paraguay, was that of the child Silvino Talavera that occurred in 2003. Dr. Fatima Insfrán, a doctor who attended to the child before he died and certified his death by “organophosphate poisoning”. He said that the symptoms that Silvino had when he came to the emergency room: “convulsions, fainting, 102.2°F fever, diarrhea, dehydration, in a very serious state of shock and consecutive cardiac arrests that led to the death of the child”. This is the only case where the Paraguayan justice accused the owners of the farm where the spraying occurred and sentenced them to two years in prison (Repórter Brazil & Base Social Research, 2010).

“THERE ARE STUDIES THAT PROVIDE EVIDENCE OF GENETIC DAMAGE IN THE POPULATION POTENTIALLY EXPOSED TO PESTICIDES.”

13 Glyphosate is a nonselective broad-spectrum herbicide, developed for removal of herbs and shrubs, especially perennials; kills growing vegetables that do not have a modified variety of EPSP synthase enzyme.

Scientific researches regarding the implications of the derivatives of chemicals on human health in Paraguay are still scarce and require systematic monitoring. But some encouraging steps are being taken. A study done in 2010, at the School of Medical Sciences of the National University of Asunción, by Dr. Stela Benítez, inquired as to whether there was damage to the DNA (DNA damage means greater risk of chronic diseases and cancer) of children attending a school located 50 m from a factory that processed, prepared and handled pesticides, compared to children attending another school located 5 km from the same factory.

The percentage of greater damage was found in children exposed, in the vicinity of the factory, and a greater proportion of respiratory symptoms and skin lesions was also found (a higher average of micronucleus (5.1 ± 2.9 vs 1.8 ± 2.0 ; $p < 0.0001$), a higher average of bi-nucleate cells (3.5 ± 2.7 vs 1.4 ± 1.4 ; $p < 0.0001$), increased frequency of cariorrexis (18.2 ± 5.8 vs 18.4 ± 18.4 ; $p < 0.004$) and pyknosis (24.8 ± 18.0 vs 17.1 ± 8.3 ; $p < 0.03$).

Forty percent of children potentially exposed to pesticides had an exposure time of 6 years, with which research provides evidence of genetic damage in the population potentially exposed to pesticides in the environment (Benítez et al., 2010).

Another investigation in 2009 by the same author, Stella Benitez Leite, in collaboration with Maria Luisa Macchi and Matilde Acosta, aimed to study the association between exposure to pesticides and congenital malformations in infants born at the Regional Hospital of Encarnación, Itapúa, Paraguay. Cases were considered of all newborns with congenital malformation, and controls were done of all the healthy children of the same sex, born immediately afterwards. Exposure to any contact with phytosanitary products was considered, as well as other known risk factors for congenital malformation.

Fifty-eight cases and 87 controls were analyzed and found that pregnant women living less than 1 km from fumigated fields and that stored pesticides at home, had twice the risk of having children with congenital malformations; (living near fields sprayed OR = 2.46, CI95% 1.09 to 5.57, $p < 0.02$, housing located less than 1 km OR = 2.66, CI95% 1.19 to 5.97, $p < 0.008$, storage of pesticides in the home OR 15.35, CI95% 1.96 to 701.63, $p < 0.003$). The results show an association between exposure to pesticides and congenital malformations (Benitez et al., 2009).

Likewise, regarding inquiries at the Ministry of Public Health and Social Welfare (MSPBS for its acronym in Spanish) on cases of poisoning or medical treatment that may be related to phytosanitary products, data from the Director General of Strategic Health Information recorded five deaths in 2013, stating they were caused by pesticide poisoning. The government institution does not have time series data due to shortcomings in health posts in rural areas, where the information taken at the time of patient visits is not done exhaustively.

According to Dr. Jose Luis Insfrán, 2nd Chair of the Hospital of Clinics, it is difficult to attribute the complaints to pesticides or phytosanitary products, because they do not develop as a “disease” but are risk factors for other diseases, such as cancer and leukemia. In this context, he said that beds presently occupied by patients with these pathologies, increased from 15% to 20% in comparison to 15 years ago. In regard to Glyphosate as possibly carcinogenic as reported by the World Health Organization, Dr. Insfrán said that the Precautionary Principle should be applied in the absence of scientific certainty and the existence of evidence of the effects of this product on human health¹⁴.

The findings presented in March 2015 by the International Agency for Research on Cancer (IARC) based in Lyon-France and gathered by the World Health Organization, open the debate again about the link between Glyphosate and cancer diseases. The agency reported the results of a review of five agricultural chemicals, the organophosphates. Two of the pesticides (tetrachlorvinphos and parathion) were classified as “possibly carcinogenic to humans” or category 2B, and three of them (Malathion, diazinon and glyphosate) were rated as “probably carcinogenic to humans” or category 2A¹⁵.

The review of the IARC notes that there is limited evidence of a link to cancer in humans, but other tests, including animal studies, where glyphosate has been linked to tumors in mice and rats, led the IARC to classify the product as “probably carcinogenic” (Guyton et al., 2015).

Finally we can mention the study by Aris and Leblanc (2011) in Canada, whose objective was to evaluate the correlation between maternal and fetal exposure and determine exposure levels of herbicides like glyphosate (GLYP) its amino-methyl metabolite phosphoric acid (AMPA), and glufosinate protein (GLUF) with its metabolite 3-methylphosphinopropionic acid (3-MPPA) and Cry1Ab, (a Bt toxin-Bacillusthuringiensis).

The same study analyzed the blood of 30 pregnant women and 39 non-pregnant women. GLYP and GLUF serum were detected in non-pregnant women and were not detected in pregnant women. Serum 3-MPPA and CryAb1 toxin were detected in pregnant women, their fetuses and in non-pregnant women. This is the first study to reveal the presence of pesticides associated with genetically modified foods (PAGMF)¹⁶ in women with and without pregnancy, paving the way for a new field of reproductive toxicology, including nutrition and utero-placental toxicities.

Considering the complaints from the public regarding the effects of massive spraying of soy plantations on health, crops and neighbor’s animals, it is important that the State take reasonable steps to comply with the Law 3742/09 “Control of Phytosanitary Products for Agricultural use”. This law stipulates the need for live protective barriers with a minimum width of 5 m and a height of 2 m.

14 Dr. José Luis Insfrán. Hospital de Clínicas. Personal interview. March 31, 2015.

15 The IARC classifies compounds in a decreasing scale of certainty: group 1 is for agents that are definitely carcinogenic to humans; 2A, probably carcinogenic to humans; 2B, possibly carcinogenic to humans; 3, not classifiable; and 4, probably not carcinogenic to humans.

16 Pesticides Associated to Genetically Modified Foods.

Use of labor and job creation

Another social issue, often attributed to the soybean industry is the low level of use of local labor, thus the overflow effect of income is reduced. The study by Repórter Brazil and Base Social Research (2010) indicates that when the technology for growing soybeans is mechanized, job creation is low because a single person can handle 200 ha and his salary could reach a maximum of Gs. 1,500,000. The same report goes on to say that, according to an official of Minga Pora, “before mechanization, 25 years ago, 100 ha meant hoeing for 100 people, but today no one will be hoeing, so those people have no more work”.

In addition to the underutilization of labor that is caused by the agribusiness production model, there is a concentration of wealth in a very small percentage of the population. In the Municipality of Minga Pora for example, the benefits generated by the soybean crop are monopolized by a few farmers (mostly Brazilian) and the silos in the area (which belong mostly to multinational companies), resulting in the increased emigration due to a lack of job opportunities. The official of Municipality says, “silos employ temporary labor, which does not mean a lot of work for people in the district. Soybean is the main financial contributor to the district, but that fact does not imply creation of jobs” (Repórter Brazil & Base Social Research, 2010).

People, who are excluded from this primary productive system, generally have no other job prospects than to migrate to the cities or migrate to other countries in the region, (particularly Argentina). There has not been a systematic and effective program at the level of public policies that seeks to retrain the workforce, which is accustomed to primary productive work, towards other (secondary or tertiary) production systems.

Data from the Institute of Studies on Argentina and Latin American Reality (IERAL for its acronym in Spanish) show that considering the value chain of soybeans has the following activities: production of seeds, fertilizers and agrochemicals; production machinery, spare parts and accessories; primary production; provision of various services (packaging, transportation, harvesting and others) and the production of oils and flour, it is estimated that the soybean chain would have generated about 277,000 jobs in 2009-2010, with a multiplier of 0.015 per planted ha. This multiplier would indicate that 1,000 ha of planted soybean generates approximately 15 jobs in different sectors of the chain (IERAL, 2011). Other studies however mention that the soybean growth would generate a positive effect on total employment, as it would provide job opportunities in services and other sectors in the economy (Regional and Sectoral Economic Studies, 2009).



3. BEEF





3. BEEF

The Global Beef Market

On a global level, livestock contributes 15% of the calories and 25% of the proteins of the world's diet. Livestock and derived products provide essential micronutrients that are not easily obtained through vegetables and their derived products (Food and Agriculture Organization of the United Nations [FAO], 2009). Livestock production plays a fundamental role in the development of rural areas.

Steady population growth and rising incomes generate greater worldwide demand for beef (FAO, 2014). The average annual per capita consumption worldwide is estimated at 42.9 kg, with developed countries consuming 76.2 kg, while for developing countries it would be around 33.7 kg¹⁷. Improvements in revenue, especially the middle class globally, translate into increases in beef consumption. In the Middle East and North Africa, for example, it increased from 17.9 kg/person/year in 1980 to 27.3 kg/person/year in 2005 (Chemnitz & Becheva, 2014; FAO, 2009).

From 1960 to 1978, beef was the most consumed meat in the world, with 43.3% of total consumption, followed by pork with 42.8% and poultry with 13.9%. At present (2016), the types of meat consumed worldwide are pork, poultry and beef, in that order. Current beef consumption is in the order of 238 MT (Puricelli, 2011). With regard to trade, The Food and Agriculture Organization of the United Nations (FAO) statistics for 2012 (Table 11) show poultry maintaining leadership, pork leadership loses (-2.1%) in production, being surpassed by the beef trade (increased by 3.5% from 2013 to 2014).

Table 11. Global production and commercialization of meat (in MT).

Source: FAO, 2014.

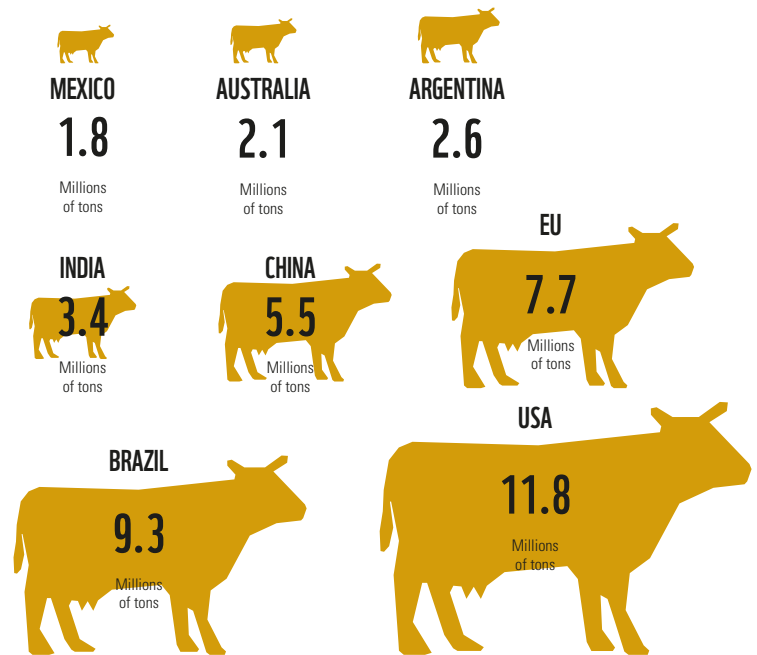
WORLD BALANCE	YEAR 2012	YEAR 2013 ESTIMATED	YEAR 2014 PROGNOSIS	VARIATION (%) 2013-2014
Production	304.2	308.5	311.8	1.1
Beef	67.0	67.7	68.0	0.5
Chicken	105.4	107.0	108.7	1.6
Pork	112.4	114.3	115.5	1.1
Lamb	13.7	13.9	14.0	0.5
Commerce	29.7	30.9	31.3	1.4
Beef	8.0	9.1	9.4	3.5
Chicken	13.0	13.2	13.5	2.4
Pork	7.5	7.4	7.2	-2.1
Lamb	0.8	1.0	1.0	-3.7

17 Data is for the Year 2012.

With regards to the biggest beef producers worldwide, (Figure 19) those who continue to lead are the United States, Brazil, the European Union, China, India, Argentina, Australia and Mexico primarily, which together produced 44 MT of beef in 2012.

Figure 19. Production of meat according to principal producers (in MT) 2012.

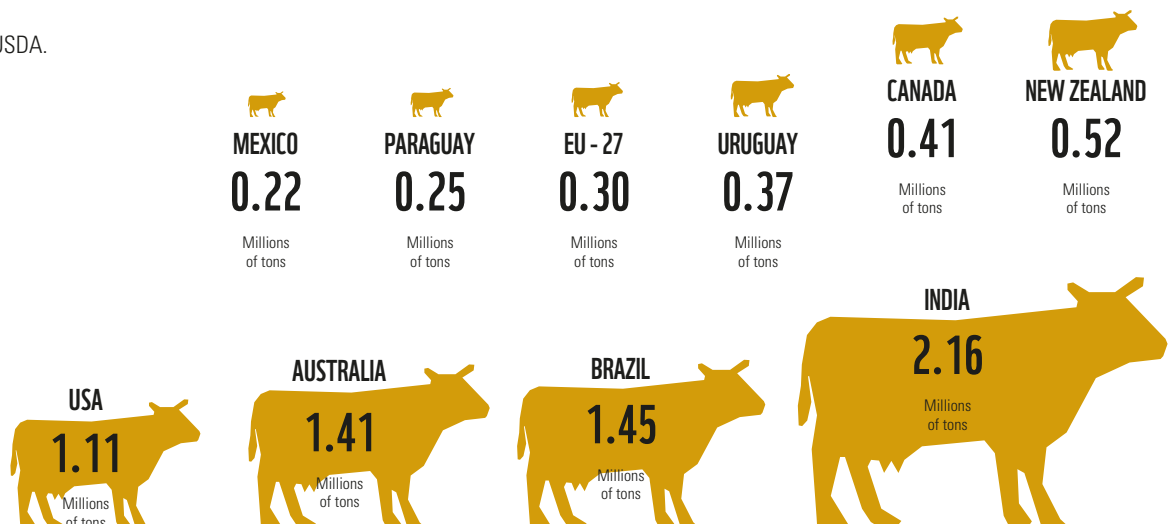
Source: USDA.



Analyzing exports, specifically beef, globally the list of major exporters was led in 2012 by India who exported 2.16 MT, representing 26% of the total exports, displacing Brazil and Australia (1.45 and 1.41 MT exported). Paraguay appeared in ninth place as an exporter of beef in 2012, with 250,000 t sold, which represents 3% of the total (Figure 20).

Figure 20. Exported beef 2012 (in MT)

Source: USDA.



Beef Production in Paraguay

The growth of beef production in Paraguay has been significant in recent years due to the substantial improvement in animal genetics, which has allowed entry into new markets and the sale of beef export products at better prices.

Paraguayan cattle (intensive, semi-intensive and extensive), is characterized by being developed on pastures and natural fields, where feedlot fattening is almost never used, and because of this, it gives Paraguayan beef a distinctive and unique flavor. This key feature also provides Paraguay with an opportunity to position its beef as “all natural” which means very little use of antibiotics and growth hormones (Stevens & Koontz, 2012).

The structure of cattle production is classified into small, MLP who are characterized as follows:

Small cattle producers (including FF) account for 83% of the total and contribute 13% to total cattle production. They are characterized by low productivity, empirical knowledge, little or no contact with the other links in the market chain and low participation in health awareness campaigns. These producers are mainly engaged in milk production and eventually sell the discarded cattle. They are considered small when they have less than 100 heads (World Bank [WB], 2014).

The **medium producers** represent 14% of the total and contribute 26% of total production. They are concentrated mainly in farms with 100-500 heads. The indicators are better than the previous category, having access to some kind of technical advice and to formal credit. Production levels are higher, being more integrated into the agribusiness chain, even though they also supply slaughterhouses providing for local or regional markets.

Finally, **large producers** are only 3% of the total but contribute 61% of production and have farms of more than 500 heads. They have a good supply of capital resources, are involved in animal health campaigns and are fully integrated into the agro-industrial chain. There is, however, a great diversity among major producers in their degree of technological development (WB, 2014).

Moreover, taking into account the production practices, ranching can be classified as traditional or business. Traditional production is characteristic of the ranches located in the older areas of natural grasslands and wetlands, clinging to traditional extensive production systems and low productivity. Business production, on the other hand, is characterized by modern standards, being the most dynamic sector of the cattle industry and being responsible for the progress in production modernization, which positions business production competitively in the best international markets (WB, 2014).

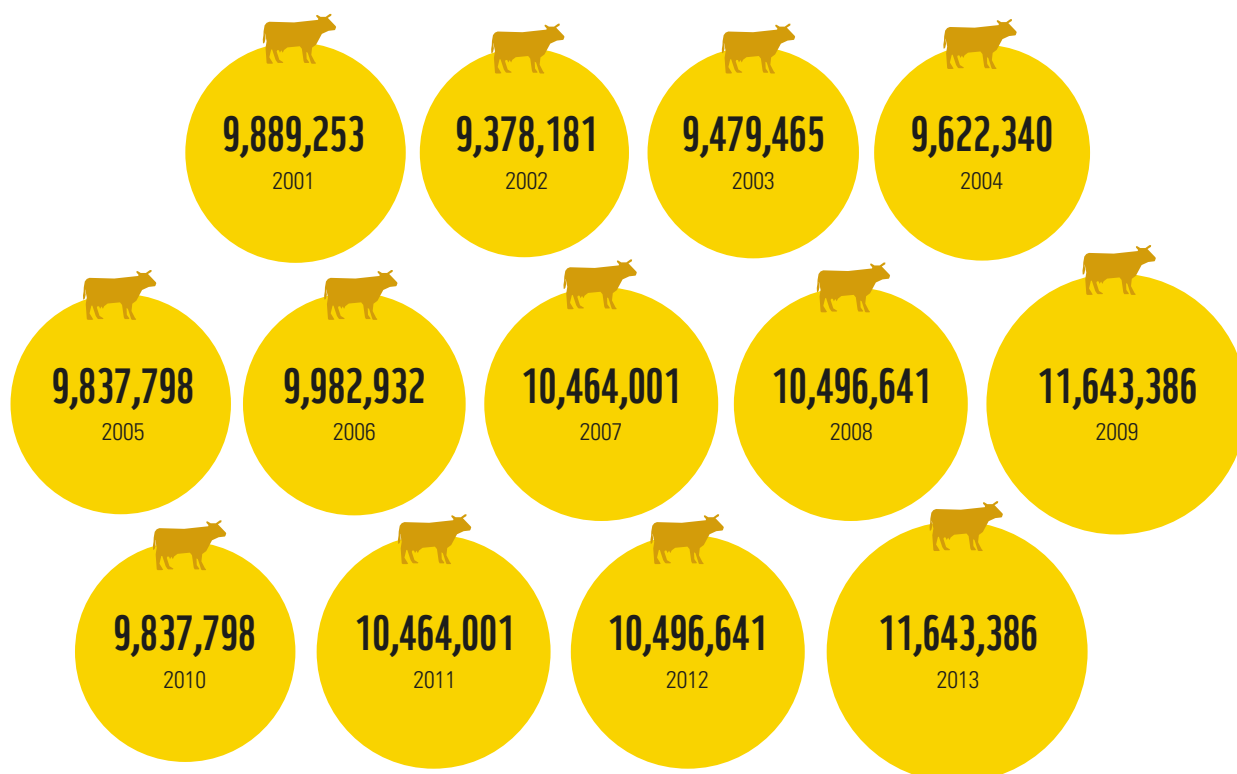
The bovine population recorded by The National Service for Animal Quality and Health (SENACSA for its acronym in Spanish), in the first quarter of the 2014 vaccination against hoof and mouth disease, was 14,465,581 cattle (with distribution a little over 60% in the Eastern Region), which indicates that for every inhabitant there are two heads of cattle (considering the Paraguayan population of almost 7 million). One of the most suitable areas for ranching is the Central Chaco in the Western Region of the country, which stands out for its rich soil nutrients such as phosphorus and potassium, its high potential forages for this activity and with production systems that now allow the production and processing of premium beef (SENACSA, 2015).

The national cattle herd experienced an increase of 46.3% between 2001 and 2014 (Table 12). In terms of levels in regions during the same period, there was an increase of 36.1% in the Chaco and 24.5% in the Eastern Region (SENACSA, 2015).

In the Eastern Region, the Departments that have the largest number of cattle are San Pedro, Concepción and Amambay, totaling 44% of the heads of cattle in the Eastern Region. In the Western Region, the largest number is in the Department of Presidente Hayes, representing 52% of the region.

Table 12. Existence of cattle.

Source: Livestock Statistics 2014. SENACSA, 2015.



Beef Production and Consumption

Data on meat production and domestic consumption in Paraguay is fragmented and differs depending on the sources and even differs within the same source. USDA data indicates that the Paraguayan beef production, up to October 2015, was 550,000 t, of which 71.8% (395,000 t) was exported with the rest being earmarked for internal or domestic consumption (192,000 t). These figures coincide with what was said by Stevens and Koontz (2012), who claim that about 60% of the beef production is earmarked for export (Table 13).

Table 13. Production, consumption, and export of Beef (in t) in Paraguay.

Source: USDA¹⁸.

YEAR	2013	2014	2015 (October)
Production	500,000	540,000	550,000
Export	326,000	375,000	395,000
Domestic Consumption	176,000	192,000	192,000

* Please note that the total domestic consumption and export differ in quantity produced due to information provided from 2 difference sources that are generated from the same institution; this data was used because it was the most disaggregated data available.

Processing and Sale of Beef

Generally speaking, there are two main channels for the sale, processing and distribution of beef: local consumption (country level) and export. The animals consumed in the country can be sold at fairs, which in turn are sold to slaughterhouses and butcher shops, or they can be sold by the producer to slaughterhouses and butchers directly. The slaughterhouses and butchers then sell them either directly or through a distributor to supermarkets and other buyers, who in turn sell to consumers. Meanwhile, those animals whose meat will eventually be distributed to export markets are normally sold directly for packaging in refrigeration plants, which are prohibited from buying at animals fairs (Stevens & Koontz, 2012).

18 USDA. Paraguay Livestock and products Annual. Gain Report. Global Agricultural Information Network.

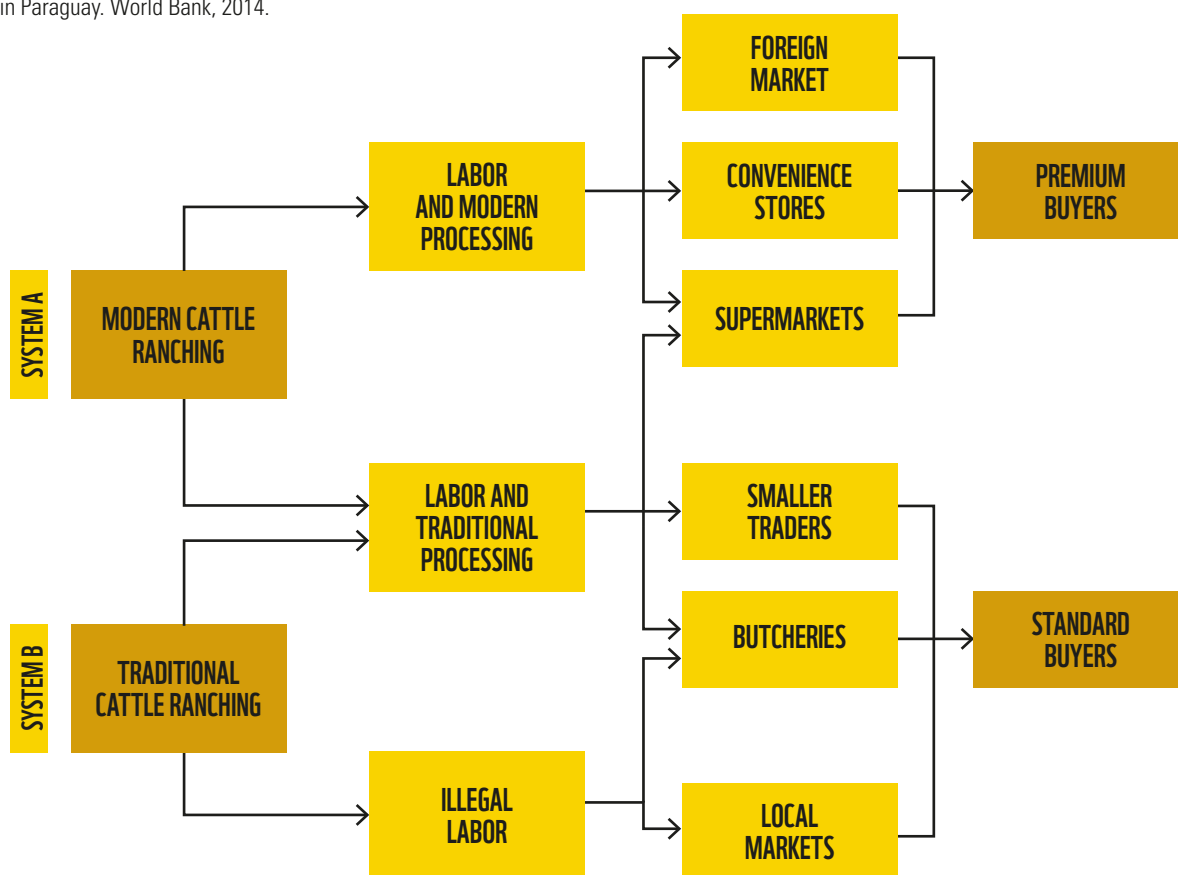
The beef chain can be divided into two systems (Figure 21). In system A, there are modern companies, with significant investments in physical infrastructure, improved genetic breeding and health. Most of the cattle have adequate quality standards for the international market. The slaughtering process is performed in modern refrigeration industries, most of which meet the requirements and controls of official veterinary services and are approved for international and domestic markets. Refrigeration industries cater mainly to foreign demand and what cannot be exported is placed in the domestic market. Beef products of this system are aimed at premium niche markets (WB, 2014).

In system B, the medium and small producers, with medium and low technology levels, who do their business in approved and non-approved slaughterhouses. The latter has no records and no control system. Slaughterhouses that are not approved only cater to the domestic demand (WB, 2014). It is estimated that refrigeration industries process 60% of total production, while slaughterhouses do the remaining 40% (Stevens & Koontz, 2012).

As far as authorized refrigeration plants, there were 30 in 2010, of which 15 were authorized by the European Union, 9 by Chile and 6 by other countries. During the same year, there were 71 open markets and 55 operational markets (ARP, 2008; MAG, 2013).

Figure 21. Structure of the cattle ranching chain in Paraguay.

Source: Risk analysis of agricultural sector in Paraguay. World Bank, 2014.



Although beef is the main product of livestock in Paraguay, milk is also gaining market. CAN data available from 2008 mentions that there are about 380,710 heads of dairy cattle. The dairy industry is made up of cooperatives and private equity firms engaged in the production of milk, cheeses, butter, yogurt and others. These companies are located in the Central Chaco area (Western Region) as well as in the central and southern area of the Eastern Region.

One of the characteristics of this industry is its high concentration, with a few companies having the highest percentages of production. The Paraguayan Chamber of Dairy Industry mentions that in 2011, 7 dairy companies out of a total of 58 (IICA, 2004) controlled 51% of the raw milk production in the country, equivalent to about 380 million liters. These companies in order of importance are: Cooperative La Holanda Ltda (36%), the Cooperative Chor-titzer Komitee (33%), Cooperative Colonias Unidas (8%), Co-op (7%), Parmalat (6%), La Pradera (5%) and Doña Angela (5%) (SENACSA, 2015).

The other companies stockpile the remaining 14% of raw milk produced in the country, equivalent to 106 million liters. The remaining 35% of production of raw milk, 256 million liters, was sold informally in 2011 (SENACSA, 2015).

Another by-product of cattle in Paraguay is leather. In 2007, 83.3% of exports of the value chain of this product corresponded to raw hides, leather, semi-finished and finished products, being lower on the added value chain, where the main markets were: Brazil, Italy, Argentina and Uruguay (Technical Unit for Industry Studies [UTEPI], 2008).

In this context, Paraguay occupies the 11th place in competitive ranking among exporters of raw hides, leather, semi-finished and finished products. The countries with the greatest participation in global exports of these products are Italy, Brazil and the United States.

Growth Dynamics of Production

The trend seen in the agricultural sector is repeated in some ways in the livestock sector, with a decrease of 16.5% in the number of farms, while the number of cattle increased by 37.6% (Table 14).

Montes (2011) mentions that there is also a slight improvement in production efficiency in terms of the stocking rate, so the number of cattle per hectare in 2002 was 2.68 and in 2010 it was 2.48.

Table 14. Inter-census variation of cattle.

Source: CAN 2008.

	Quantity of farms with cattle and buffalo	Number of head of cattle and buffalo
Paraguay 2008	191,689	10,496,641
Paraguay 1991	229,478	7,626,617
Variation (%)	-16.5	37.6

Land surface area used for ranching

The land area used by cattle has varied, with a general decrease having been noted in the area devoted to ranching in the Eastern Region of around 2.7% for the inter-census period between 1991-2008. While the traditionally ranching Departments such as Caazapá, Concepción and Misiones experienced a slight increase in the area devoted to livestock (not exceeding 10%), Departments that primarily grow soybeans such as Itapúa and Alto Paraná reduced the area devoted to ranching by 34% and 25% respectively (Table 15).

Table 15. Land used for cattle ranching in Eastern Region (ha). Inter-census period 1991-2008.

Source: CAN 1991 and CAN 2008.

AREAS	(A) AGRICULTURE (ha) 1991	(B) AGRICULTURE (ha) 1991	(A-B) CATTLE RANCHING (ha) 1991	(C) AGRICULTURE (ha) 2008	(D) AGRICULTURE (ha) 2008	(C-D) CATTLE RANCHING (ha) 2008	AGRICULTURE- CATTLE RANCHING VARIATION (%) 1991-2008
Traditional zone	2,756,076	830,630	1,925,446	3,657,236	1,975,861	1,681,375	-12.68
Itapúa	1,151,393	381,696	769,697	1,109,085	603,101	505,984	-34.26
Alto Paraná	829,674	334,743	494,931	1,161,404	791,494	369,910	-25.26
Canindeyú	775,009	114,191	660,818	1,386,747	581,266	805,481	21.89
Traditional zone minor	3,173,059	427,193	2,745,866	3,657,435	934,377	2,723,058	-0.83
Caazapá	638,652	77,488	561,164	768,220	165,942	602,278	7.33
Caaguazú	897,045	186,920	710,125	1,149,983	447,279	702,704	-1.05
San Pedro	1,637,362	162,785	1,474,577	1,739,232	321,156	1,418,076	-3.83
Amambay	1,049,062	42,231	1,006,831	1,217,077	134,925	1,082,152	7.48
New zone	2,588,753	154,274	2,434,479	2,702,304	194,428	2,507,876	3.01
Concepción	1,552,121	59,866	1,492,255	1,619,416	71,431	1,547,985	3.73
Guairá	250,020	65,295	184,725	230,447	68,710	161,737	-12.44
Misiones	786,612	29,113	757,499	852,441	54,287	798,154	5.37

At the same time of the decrease in the area devoted to ranching in the Eastern Region, there has been a significant increase (43%) of the ranching area in the Western Region in the period 1991-2008 (Table 16).

Table 16. Land used for cattle ranching in Western Region (ha). Inter-census period 1991-2008.

Source: WWF elaboration from CAN 1991 and CAN 2008.

12,388,987	45,818	12,343,169	17,644,612	23,252	17,621,360	43
(A) AGRICULTURE (ha) 1991	(B) AGRICULTURE (ha) 1991	(A-B) CATTLE RANCHING (ha) 1991	(C) AGRICULTURE (ha) 2008	(D) AGRICULTURE (ha) 2008	(C-D) CATTLE RANCHING (ha) 2008	AGRICULTURE-CATTLE RANCHING VARIATION (%) 1991-2008

The importance of ranching in the Western Region is reflected not only in the large increase in land surface, but especially in the number of cattle produced. According to the ARP, 60% of the exported beef comes from the Western Region.

Economic Analysis

Gross Domestic Product

The participation of ranching in the GDP remains constant at around 5% but with a bullish projection for 2015 (Table 17).

Table 17. Paraguay: national GDP and percentage from cattle ranching sector.

Source: WWF elaboration based National Accounts of the BCP.

	2011	2012	2013	2014	Projection 2015
Constant GDP					
(millions of US\$)	25,100	24,595	28,900	30,718	31,014
Cattle ranching sector/ GDP	4.8%	5.2%	5.0%	5.4%	5.8%

Foreign trade

In the last 11 years, the beef export volume has experienced a substantial increase of 294% from 50,587 t in 2003 to 199,070 t in September 2014, in an amount that exceeded US\$1 billion (Table 18).

Table 18. Volume and value of meat exports.

Source: SENACSA, 2015. IICA
January to September.

YEAR	VOLUME (TONS)	VALUE (THOUSANDS OF US\$)
2003	50,587	57,108
2004	81,770	136,717
2005	126,381	246,432
2006	154,218	402,196
2007	136,462	367,058
2008	155,755	626,597
2009	163,230	565,132
2010	170,344	807,872
2011	142,520	801,178
2012	165,215	904,261
2013	191,993	1,089,340
2014	199,070	1,004,451

The primary market for Paraguayan beef is Russia. In 2013, it was the recipient of 53% of beef exports. The second largest market is Brazil, accounting for 10% of total exports. Chile is very close, with 9.8% of the total, the latter paying the best prices for Paraguayan beef (Table 19).

Table 19. Destination of meat and offal exports 2013.

Source: SENACSA, 2015. IICA
January to September.

COUNTRY	VOLUME		VALUE	
	Tons	Percentage (%)	Thousands of US\$	Percentage (%)
Russia	115,777	53.47	571,713	52.48
Brazil	21,744	10.04	113,214	10.39
Chile	21,311	9.84	127,721	11.72
Hong Kong	17,529	8.1	88,327	8.11
Israel	12,933	5.97	70,614	6.48
Others	14,117	6.52	62,433	5.73
Georgia	5,309	2.45	20,039	1.84
Angola	4,217	1.95	19,444	1.78
Kuwait	3,592	1.66	15,836	1.45
Total	216,529	100	1,089,341	100

Investment

Ranching is one of the sectors that recorded the most investment in Paraguay in recent years. Thus, the aggregate investment in ranching and beef is nearly US\$20 billion, considering all the items mentioned in the following table:

Table 20. Aggregate investment of beef.

Source: WWF elaboration based National Accounts of the CAN 1991 and CAN 2008.

CONCEPTS	QUANTITY	AVERAGE PRICE IN US\$	INVESTMENT (millions of US\$)
Estate	26,000,000	500	13,000
Animals ¹	4,363,500,000	1	5,407
Industry ²	17	10,000,000	170
Machinery ³	3,086	150,000	463
Operating Capital ⁴	8,618,422	100	862
Total			19,902

1 Cattle herd in existence (10.5 million head) by the average weight (387 kg) and by the average price (Gs. 5,745 x Average TCN kg to 2008 Gs. 4,348 per US\$) according to the SENACSA 2008 Yearbook.

2 Number of refrigerated industries based on the average cost of installation.

3 Number of establishments with more than 500 head of cattle by the average estimated value of a tractor with attached implement.

4 Cattle herds of establishments with more than 100 head (approx. 8 million cattle) by the annual cost of vaccination, sanitation and other expenses, which was estimated at US\$ 100 per animal.

Job creation

It is estimated that about 9.4% (241,248 people) of the economically active population are involved in ranching directly, in both the dairy and beef production (ARP, 2008, Table 21). Given the different links in the production chain of milk and beef, job creation indirectly reaches 17.6% (447,625 people).

Table 21. Estimated employment created by the dairy and meat chain.

Source: ARP, 2008.

	RANK	
	MINIMUM	MAXIMUM
FAMILY CATTLE RANCHING (<100 HEADS MEAT AND MILK)		
Small producers of meat and milk (1-99 heads)	112,237	264,705
Commerical cattle ranching (>100 heads meat and milk)		
Ranch staff	17,874	50,512
Administrative officials	6,168	11,288
Internal transport (meat and milk) *	1,480	3,250
International Transport (meat and milk) *	222	1,625
Fencing contractors	10,458	10,500
Contracted janitors	5,977	6,000
Other contractors	N/A	10,000
Commerce **	9,735	38,000
Government	1,352	2,500
Slaughterhouses	7,745	7,745
Industries (refrigerators 4500) (creameries 4000)	4,000	9,500
Sub industries	N/A	8,000
Others (poultry farming, swine farming, beekeeping, small equine ruminants)	N/A	20,000
Professionals directly linked to cattle production (dependent or independent)	N/A	4,000
Others	64,000	N/A
SUBTOTAL COMMERCIAL CATTLE RANCHING	129,011	182,920
Total including small producers	241,248	447,625
Economically Active Population (EAP)		2,556,642
% of employees in the EAP (2.7 Mill)	9.40%	17.60%

* Cattle movement is approx. 3 million heads/yr. 1 cage truck x 40 animals x 146 days of work = 513 trucks x 3 work posts. Meat transport = 40% milk = 60% international transport (meat and milk. International transport represents 50% of internal transport).

** Every 500 heads generates business sales of supplies, food, warehouses, tire facilities, eaters, etc.

Each trade generates 2 work posts on average. Every 300 liters of milk 1 work post.

Social and Environmental Aspects

Ranching and the risk of land degradation

Socio-economic and geographical aspects have been closely related to environmental deterioration. Considering the large development in ranching in the Western Region of Paraguay and the average deforestation of up to 1,400 ha/day (Guyra Paraguay, 2015), an analysis has been established of the risks of land degradation for this region (see full methodology in Annex II). For the analysis, a regression model was developed that allows for parameters to be obtained so as to be able to calculate the probability of an occurrence of deterioration, with deforestation being the major component and taking into account the independent variables such as: primary and secondary roads, populated area and productive area.

The results are taken from a base situation where the average distances are taken of the sample grids in relation to the variables considered; from this, the change is observed in the probability of risk modification, as a land surface approaches a primary or secondary road, a productive area or population center. The base situation shows a probability of occurrence or risk of modification of 51%.

It should be mentioned that the variables are not necessarily independent of each other, because a grid, selected randomly, can be configured at the intersection of a main road with a secondary road and at the same time be in a populated area, since we are dealing with a spatial model.

- **Main road** (distance in meters from the sample grid to a main road). The results show that if a surface area nears about 10,000 m to a main road, keeping all other factors constant, the risk of deterioration increases by 2% compared to the average base situation, **reaching a 53% probability of occurrence.**
- **Secondary road** (distance in meters from the sample grid to a secondary road). If a surface area is about 5,000 m from a side road, keeping all other factors constant, the risk increases by 3.7% compared to the average base situation, **reaching a 55% probability of occurrence.**
- **Productive area** (distance in meters from the sample grid to a productive area). If a surface area is about 10,000 m from a productive area, keeping all other factors constant, the risk increases by 8.7% compared to the average base situation, **reaching a 60% probability of occurrence.**
- **Population centers** (distance in meters from the sample grid to a population center). If a surface area is about 10,000 m from a population center, keeping all other factors constant, the risk increases by 0.7% compared to the average base situation, **reaching a 52% probability of occurrence.**

In addition to the results presented, it should be mentioned that the “dummy” variables (modified/unmodified) introduced to identify periods of observations of the grids, show that there was an 8.3% higher risk of modification in 2011 than in 1990. Taking into account that the productive activity par excellence in the Western Region is ranching, it can be assumed that it increases the risk of deterioration in the region.

Ranching and indigenous peoples

The indigenous peoples of the Western Region depend on forests and natural resources for their survival. According to the 2012 Census, the Western Region has an indigenous population of 53,879 people, distributed as follows: Alto Paraguay 4,140 people, Boquerón with 23,950 people and Presidente Hayes with 25,789 people (Department of Statistics, Surveys and Censuses [DGEEC], 2013). The numbers of people groups living in the Western Region belong to five linguistic families: zamuco, matabo, maskoy, guaycurú and guarani (Zanardini & Biedermann, 2001).

There are several effects of ranching on the way of life of indigenous peoples, from the loss of their territories, sources of food, water and medicine to the disappearance of their sacred sites. There are presently several complaints in the court system brought about by indigenous peoples against ranching enterprises because of the appropriation of indigenous territory. To this we must also add that ranching enterprises keep their property lines and pasturelands fenced, making it impossible for indigenous communities to have access to their sacred territories, limiting the provision of goods and services for their livelihoods, including access to raw materials for making crafts and medicinal products.

The loss of forests and natural grounds surrounding indigenous communities leads to the loss of key aspects of the culture of indigenous peoples, which are closely linked to the natural landscape.



4. INSTITUTIONAL AND LEGAL ASPECTS





4. INSTITUTIONAL AND LEGAL ASPECTS

There are several public, private and civil society institutions that somehow work or seek to influence the production system of soybeans and beef. Figure 22 outlines the participation of these institutions based on their roles within the production system.

Figure 22. Institutional inter-relations between productive, environmental, and economic areas.

Source: WWF elaboration based on available information.



Administrative and Control Institutions

The leading institutions, meaning those with direct interference in the productive activities of the primary sector are the MAG, the National Institute of Rural Development and Land (INDERT for its acronym in Spanish), the National Service for Plant and Seed Quality and Health (SENAVE for its acronym in Spanish), and the SENACSA.

In the environmental sector, the competent authorities are the SEAM, created in 2000, and the National Forestry Institute (INFONA for its acronym in Spanish), the successor institution of the National Forest Service, created by Law 3464/2008. Both institutions have shared competence in relation to forests, which in practice has resulted in overlapping functions and problems to carry out control and monitoring activities.

The SENACSA is responsible for the sanitation and vaccination programs. SENACSA is the benchmark authority in terms of data and statistics on ranching.

The MSPBS, through the Department of Health Surveillance, develops the processes of monitoring, control and research in public health.

Institutions Related to Production

Associations and Labor Unions for both soybean and beef are another group of players with significant presence in the country. Thus, in the case of soybeans, the CAPECO is a trade union formed to represent the production and marketing chain of grains and oilseeds that since 1980 has brought together producers and exporters. Union members handle 90% of the total amount of grain and by-products sold abroad.

In the beef sector, the ARP stands out, a private nonprofit entity that brings together agriculture/livestock farmers from across the country. It aims to make livestock production a developmental tool of Paraguay, with social responsibility and in harmony with the environment.

Also, with a strong presence, is the UGP, consisting of approximately 15 unions: such as the FECOPROD, CAPECO, the Chamber of Pesticides and Fertilizers (CAFYF), the Paraguayan Chamber of Agricultural Health (CAPASAGRO), the Paraguayan Wood Federation (FEPAMA) and the APS, among others.

In the industrial sector, and for oilseeds and grains, CAPPRO can be mentioned, operating since 2006 and is comprised of ADM, ALGISA, BISA (vegetable oil factory), CONTI Paraguay and Oleaginosa Raats S.A. The Chamber brings together the leading processors of oilseeds, whose production amount accounts for 90% of oils and flour produced and exported by the country.

In addition to the aforementioned unions, multinational enterprises such as ADM, Bunge, Cargill, Dreyfus and Noble are key players in the production chain of grains and oilseeds, and handle 80% of exports of soybeans produced in Paraguay.

Some respected businesses in the sector are Colonization and Agrarian Reform S.A. (CYTASA for its acronym in Spanish), Paraguayan Agricultural Development (DAP) and Agropeco.

Institutions of Logistical Support, Supplies and Research

The Paraguayan Institute of Agricultural/Livestock Technology (IPTA) aims to strengthen and improve the country's research system and respond efficiently and effectively in relation to the technical/scientific development of the agricultural/livestock and forestry sectors.

The National University of Asunción is the state institution of tertiary education that stands as a national and international reference in terms of research for sustainable development.

The INBIO aims to promote the development of national biotechnology research, promote adequate access to products derived from agricultural/livestock biotechnology and their incorporation into the domestic production.

The Inter-American Institute for Cooperation on Agriculture (IICA) is a specialized agency of the Inter-American System, belonging to the Organization of American States (OAS). Its aims are to encourage and support efforts to achieve sustainable development of agriculture and the welfare of rural populations. Among the organizations of the United Nations, the FAO can be mentioned.

Some of the credit institutions related to the agricultural/livestock sector is the Approved Agricultural Credit (CAH for its acronym in Spanish) that provides financial services to the rural productive sector and promotes technical assistance and organization through public-private partnership. The National Development Bank (BNF for its acronym in Spanish) provides loans for operating capital in the agricultural/livestock sector which are intended for crop labor expenses and technical supplies. The Ranching Fund (FG for its acronym in Spanish) works to achieve sustainable development of the livestock value chain through financing activities that can impact it. The Financial Development Agency (AFD for its acronym in Spanish) is a second-tier bank that channels a number of financial products to promote investments through public and private financial institutions.

Other institutions participating indirectly in the production structure are the Ministry of Industry and Commerce (MIC for its acronym in Spanish) responsible to formulate plans and programs for industrial and commercial development. The Ministry of Finance (MH for its acronym in Spanish), which is responsible for managing the assets and the budget process of the Paraguayan State, and the formulation and management of fiscal policy and internal and external debt. The BCP an autonomous technical agency that serves as the Central Bank of the Paraguayan State.

Civil Society Organizations

The presence of leading players of civil society to support, monitor and participate in the management of sustainable productive development should be noted, such as: Guyra Paraguay whose mission is to conserve and promote sustainable use of biological diversity; with an emphasis on birds with active and responsible participation of society. The Moises Bertoni Foundation, working on innovative mechanisms that address sustainable development through conservation, while addressing social responsibility and active par-

ticipation of the population. WWF's commitment is focused on ensuring the ecological integrity of priority ecosystems while promoting sustainable social and economic development and reducing the ecological footprint. Alter Vida, Sobrevivencia, Environmental Management (GEAM for its acronym in Spanish), among others could also be mentioned.

Legal Aspects

The agricultural/livestock production is governed by a series of regulations. Table 22 summarized the laws and decrees that are directly related to the production systems of soybean and beef.

Table 22. Summary of laws and decrees that have influence over soy and meat production.

AMBIT	LAW No./YEAR	OBJECTIVE / GENERAL DESCRIPTION
Economic	Law 125/91 Law 2421/04	Monitors what is related to the tax regime. In this sense, that they can identify 4 types of tax: 1) Income Tax, 2) Capital Tax, 3) Consumer Tax, 4) Acts and Documents Tax.
Economic	Law 117/92	Stimulates and guarantees total equality in national and foreign investments to promote social and economic development in Paraguay.
Economic	Law 60/90, regulated by the Decree 22031/03	Establish a series of tax breaks for those who opt to undergo the regimen. Investment of capital in the soy chain is included as an activity susceptible to receiving incentives.
Economic	Decree 20753/98	Regulates the provision of specialized services in the territory. In the case of investment projects exceeding US\$5 million, those that are interested in obtaining benefits of the law must issue a mandate of their projects to technical or consulting firms registered in the National Registry of Service Companies.
Economic	Law 5061/13 that modified Law 125/91	Establish a tax for the rental of Agricultural Activities (IRAGRO).

Economic	Decree 8279/2012	Whereby the Income Tax on Agricultural Activities (IRAGRO) is regulated.
Environmental	Law 422/73 Decree regulation 18831/86	Establish a percentage of legal reserve of natural forests that must maintain rural properties. Regarding the percentage of legal reserve of natural forests that must maintain rural properties (Art. 42), in the regulatory decree 18831/86 establishes: a) conservation practices, b) maintain riparian forest and reforest in the case that there are none (Art. 7), and c) avoiding use of agricultural or ranching means that could implicate the degradation of land adjacent to the highway and other public means of transportation (Art 8).
Environmental	Law 385/94	Seeds and Cultivation Protection. Seeks to promote an efficient means of obtaining and protecting the right of creators, as well as promoting production, circulation, commercialization, and quality control of seeds in to order to ensure farmers and general users of the seed identity and quality.
Environmental (land use)	Law 1863/01	The Agrarian Statute establishes the conditions for considering land to be rationally used. Including the compliance of environmental laws currently enforced.
Environmental	Law 294/93	Declares obligation to perform environmental impact studies that conform to specific legislation.
Environmental	Law 352/94	Protected Wilderness Areas. Establishes “the preservation and management of watersheds and wetlands” and the control of erosion and sedimentation as one of the objectives of National System of Protected Areas.
Environmental	Law 3001/2006	“Valuation and payment for environmental services”, which arises as a necessity and complement to Forest Law 422/73.
Environmental	Law 5045/13 Zero Deforestation Law	The modification of the 2nd and 3rd article of Law 2524/04 that prohibits, in the Eastern region, alteration and modification of forested areas, as modified by the Law 3139/06 and extended by Law 3663/08 prohibiting alterations of forest in the Eastern Region.

Water resources	Law 3239/07	Water Resources of Paraguay. Regulates water management and production territories in Paraguay.
Water resources	Law 580/95	Ratifies the Agreement establishing the Tri-National Commission for the Development of the Pilcomayo Basin.
Water resources	Law 1074/96	Ratifies the Convention on Conservation and Development of the fish resources in neighboring sections of the rivers Paraná and Paraguay.
Use of agrochemicals	Law 836/80	Sanitary Code. Prohibits in Art. 66 all action that deteriorates the natural environment, diminished its quality, rendering it a health risk.
Use of agrochemicals	Law 123/91	Adopts new forms of plant protection. According to the law the MAG should coordinate with the MSPBS concerning the a) control of plant protection products for agricultural use; b) provision of technical services and information on methods of preventing, combating, and safely and effectively managing agricultural pests and pesticide; c) monitoring and control; and d) application of penalties for infractions.
Social	Decree 14390/92	Approves the General Technical Regulation of Safety, Hygiene and Medicine at Work.
Social	Law 992/64	Ratifies the Convention 78 on the Medical Exam for Youth (Non-industrial employment)
Social	Law 1235/67	Ratifies the Convention 81 on Work Inspection.
Social	Law 66/1968	Ratifies the Convention 117 Relative to the Norms and Basic Objectives of the Social Policy.

In the annex section there are tables with greater details having to do with institutional and legal aspects (Annex III).

5. BEST AGRICULTURAL/ LIVESTOCK PRACTICES





5. BEST AGRICULTURAL/LIVESTOCK PRACTICES

Global Initiatives

The production of healthy and safe food for human consumption has become a growing concern globally. The knowledge of the effects of the system of food production on ecosystems, as well as the possible consequences of indiscriminate use of agrochemicals on human health has awakened in consumers the need to know the origin and method of production of food arriving to their table.

In this context, BAP emerge as alternative production options. These practices involve the application of available knowledge to ensure sustainable use of natural resources for the production of safe and healthy food, while seeking to maintain economic viability and social stability (Regional Office of FAO for Latin America and the Caribbean, 2004).

In order to ensure the origin, quality and method of food production, developed countries, in particular, have incorporated a number of production standards and certification. Some of these rules and control systems or certifications are compulsory while others are voluntary.

Among the mandatory control systems of better practices, Hazard Analysis and Critical Control Point (HACCP) stands out. HACCP is science-based and systematic. It identifies specific hazards and measures for their control to ensure food safety. It is a tool to assess hazards and establish control systems that focus on prevention rather than relying on end product testing. Any HACCP system is subject to changes that may result from advances in equipment design, processing procedures or technological developments.

HACCP can be applied throughout the entire food chain from the primary producer to the final consumer. The application is based on scientific tests that measure the risk to human health, in addition to improving food safety (FAO). USDA established that HACCP be mandatory for poultry and beef while the European Union established that all food industries must implement systems to ensure the quality and safety based on HACCP.

Currently there are several voluntary certification systems, which have been developed according to consumer requirements. Thus, a voluntary certification recognized in Europe is EUREPGAP, a relatively new private program created by 24 large supermarket chains that operate in different Western European countries and have organized the European Retail Group (Euro-Retailer Produce Working Group - EUREP). The purpose of EUREP is to increase consumer confidence in food safety, developing BAP to be adopted by producers. Unlike other certification programs, EUREP emphasizes food safety and product traceability to their place of origin. So far, EUREP has developed a set of BAP for the production of fresh fruits and vegetables.

While the emphasis of the rules of EUREPGAP is not in the environmental or social aspects but in food safety and product origin from the farm plot where it was produced, tracking food requires the producer to establish a comprehensive control system, so that all products are registered. In addition, they must keep records on the specific use given to the land, treatments with pesticides and crop rotation over time. EUREP requirements are relatively flexible in soil fumigation, the use of fertilizers and crop protection, but they are strict on the storage of pesticides and the need to document and justify the way in which the product was grown and what use the land was given (FAO).

Another voluntary initiative is called RTRS. This international initiative was created in Switzerland in 2006 to promote responsible soybean production through collaboration, dialogue and consensus among the different groups that are directly or indirectly involved in the chain of soybean. The principles of the RTRS are based on compliance with national laws, good relations with local communities, monitoring of BAP and compliance with environmental criteria.

According to Jaap Petraeus, Corporate Director of Environment and Sustainability of Friesland Campina, which is part of RTRS, adhering to a quality system or certification of production of low socio-environmental impact that is recognized worldwide, gives companies certain plus factors such as:

- Contributes to the value of the brand, not in monetary terms but in considering the reputation among consumers.
- Establishes links with non-governmental organizations (NGOs), which are beneficial.
- Strengthens its business reputation in terms of sustainability ¹⁹.

Along this same line, David Pendlington of Unilever International says: *“there is no single way to end environmental damage by farming practices in soybean production, however, there are ways to work in harmony with the economic and environmental aspects and one of those ways is what drives the Round Table on Responsible Soy (RTRS) which provides an opportunity to start improving industry and thus minimize the social and environmental impact”*.

19 www.responsiblesoy.org

Best Agricultural/Livestock Practices in Paraguay

In Paraguay, most soybean farmers do direct seeding and promote only this as a good agricultural practice. However, in Paraguay, BAP are not included in the production system. There is no regulation and governance to protect the natural resources (soil, water and biodiversity). There is misuse of agrochemicals, no safety of personnel and increasing land use change in forest reserves. There is almost no restriction and governmental activity to stop or even to reduce these practices.

While there is no regulation for better practices that includes aspects of ecosystem conservation, landowners have options to integrate this aspect into the production system on their property, for example, by using private conservation tools. This can be achieved by including a portion of their land under any of the categories of existing management (for example: private nature reserves, environmental easements, comodato or usufruct), although the benefits of being included in any of these management categories do not always result in direct economic incentives (Stevens & Koontz, 2012).

As for the certification of better practices in both the production of oils and meat, Paraguay has little experience, however, and especially for the meat sector, there is great potential for certification of beef produced, especially in the Western Region. The few existing certifications are generally granted to refrigerated meat industries (for example, vacuum sealed cuts stamped with the name of the farm as a seal of origin) and associations of individual farmers (for example, Brangus or Braford beef). This type of certification generates a slight price difference in some cases for farmers (Stevens & Koontz, 2012).

Specific experiences that can be mentioned for the meat sector are the Grasslands Meat Seal and the Landscapes for Green Production Project - Green Commodities. In the case of soybeans, there is the RTRS and the ISCC certification.

Grasslands Meat is a seal launched by Grasslands Alliance and is a production process certification in private and rural areas, with voluntary characteristics of application on an individual farm level. The Grasslands Alliance is made up of cattle producers in Argentina, Uruguay, Brazil and Paraguay.

The aim of Grasslands Meat is to produce meat with a responsible process with nature and biodiversity. The fundamental condition for certification is that more than 50% of the property has natural grasslands (including natural fields, as well as improved and naturalized fields). In addition, among other requirements, the animals must have access to sufficient sources of water and shade, the establishment must comply with national regulations, including employees and health plans. Animals that are operating under the certification of Grasslands Meat may receive up to 30% of concentrates or equal to 1% of live weight in the diet (Carriquiry, Preliasco, Evia, Queirolo, & Parera, 2010).

In Paraguay, the NGO Guyra Paraguay, as a member of the Alliance of Grasslands, is the institution that has the representation of the seal. Establishments that conform to the standards of the Alliance can obtain the logo for their products. This would inform consumers that the meat comes from managed grasslands.

The Landscapes for Green Production Project – Sustainable Green Commodities, which began recently (2015), aims to protect biodiversity and the functions of the Eco-region of the Alto Paraná Atlantic Forest against existing and emerging threats of multi-sectoral production practices (soybean and cattle production). Financed by the Global Environmental Facility (GEF), directed by the SEAM and the MAG, it is coordinated by the United Nations Development Programme (UNDP) and co-funded by the INFONA, Solidarity Foundation, the Bureau of Sustainable Finance and ADM Paraguay.

Regarding soybeans, the voluntary certification initiative that is slowly being introduced among agricultural producers is the seal of the RTRS. Companies that are part of RTRS are: Agricultural Development of Paraguay, CYTASA and Agrosoy. During the 2014/2015 agricultural season, together they certified 26,000 ha and 74,000 t of soybeans, with the target for the 2015/2016 season to reach a certification of 100,000 t.

Another voluntary certification initiative in Paraguay that is just beginning and can also be mentioned is the ISCC, considered a leading certification system that allows you to check compliance with the legal requirements of sustainability bioenergy markets and document the sustainability and traceability of raw materials in the food, feed and chemical industries²⁰.

In 2011, Agropecuaria Busanello S.A. received a certification from ADM Paraguay, recognizing it as a Sustainable Soybean provider, under the criteria of the ISCC 202 Sustainability Requirements standard for biomass production. During the agricultural harvest from 2013/2014, the company awarded the same certificate of recognition to producer Beate Veronika Holtker of the Beate Ranch. In addition to this, ADM promoted the ISCC certification of the soybean production company PAYCO S.A.

Challenges and Lessons Learned

In order to know the benefits, motivations, links to sustainability and the potential of the domestic market to produce within a system of better practices, interviews with role models were conducted concerning programs that encourage these certifications, producers who have already achieved certification and finally with producers who wish to obtain certification and are currently implementing better practices.

The interviews showed that there is a growing group of producers and companies interested in developing more sustainable production systems. Respondents who are already familiar with some of the production systems and certification, like Enrique Molas, representative of the RTRS in Paraguay, stated that *“the benefits are many and not just economic, since the cost that*

20 <http://www.iscc-system.org/es/sistema-iscc/sobre-iscc/>

non-action would represent becomes a savings for companies". In this context, Bruno Boff, of the company AGROSOY S.A., said that achieving RTRS certification allowed them to improve the quality of life for all those who are directly and indirectly related to the company, by meeting the standards of best practices at work, such as hygiene, compliance with environmental regulations and the development of consciousness to care for the environment.

Overall, the interviews showed differences between producers in terms of their motivations to pursue better production practices. These motivations, to a certain degree, allowed the grouping of producers into three groups:

A first group, consisting of large producers whose motivation for implementing better practices is in some degree awareness of the importance of maintaining forests and their associated biodiversity, soil care and protecting water resources. It is framed in the need to leave a quality environment for future generations.

A second group, which were identified primarily as producers associated with cooperatives and production unions such as FECOPROD, UGP and ARP. For this group, the motivations for implementing better practices lie in the benefits that they represent for the production itself. This group actively implements practices such as direct-seeding, crop rotation and silvo-pastureland systems, motivated by the positive effects of these practices on production.

A third group, made up of companies, mostly multinationals, which have a clear policy of business management and in some cases social responsibility. This type of management seeks to maximize the benefits and reduce costs, so the incorporation of better practices is done in a standardized manner. The motivation in this case is compliance with its own internal standards, which include respect and compliance with national legislation.

Regardless of the motivation for the incorporation of better practices, all producers expressed the need for market economic incentives. It also recognized that one of the main engines for the incorporation of better practices is, without doubt, the new demands of the markets, especially Europe. In this regard, Gloria Hellman²¹, from the PAYCO Company, stated "*the international market will increasingly ask for responsible beef and soybean production. Therefore, Golondrina is starting the process to certify cattle since soybeans are certified under the seal of ISCC, wood under the FSC seal, seeds under ISO 9001 and all that is missing is the beef. Production under the better practices approach is a challenge, a constant one. The level of Best Practices requirements is still far superior to what we are accustomed to in Paraguay*".

In Figure 23, the main variables can be seen that were mentioned in a reiterative way by respondents. The market is a primary motivator, as it increas-

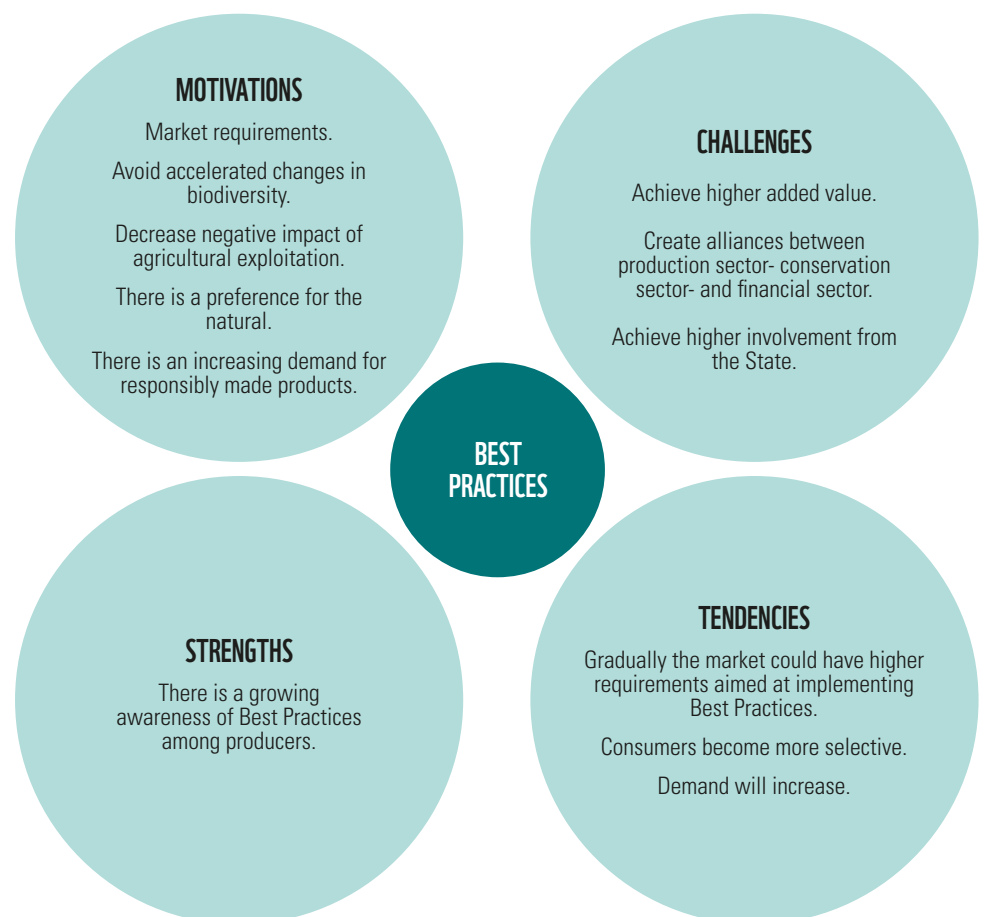
21 Interview with Gloria Hellman. April, 2015.

ingly demands responsibly produced products. In addition, however, people recognize the difference in taste from what is natural or not. Lastly, it was recognized that in order to involve more producers, there needs to be a greater value-add, such as benefits recognition by the government in showing commitment to best production practices.

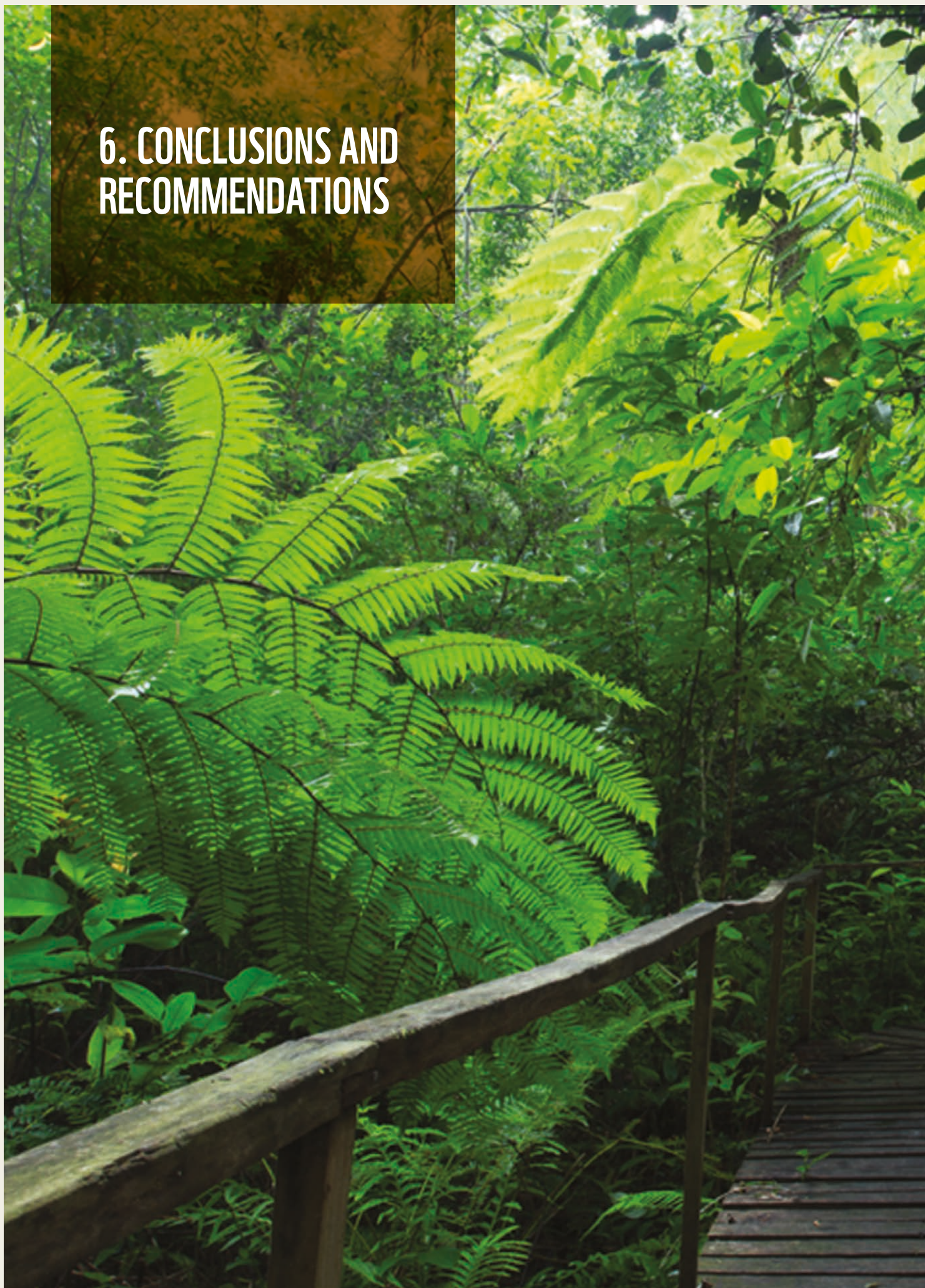
What can be mentioned as a strength is the awareness of producers concerning the usefulness of best practices and the recognition of the need for greater involvement by the State, and the promotion of cooperation and networking among players who are currently implementing production under the model of best practices.

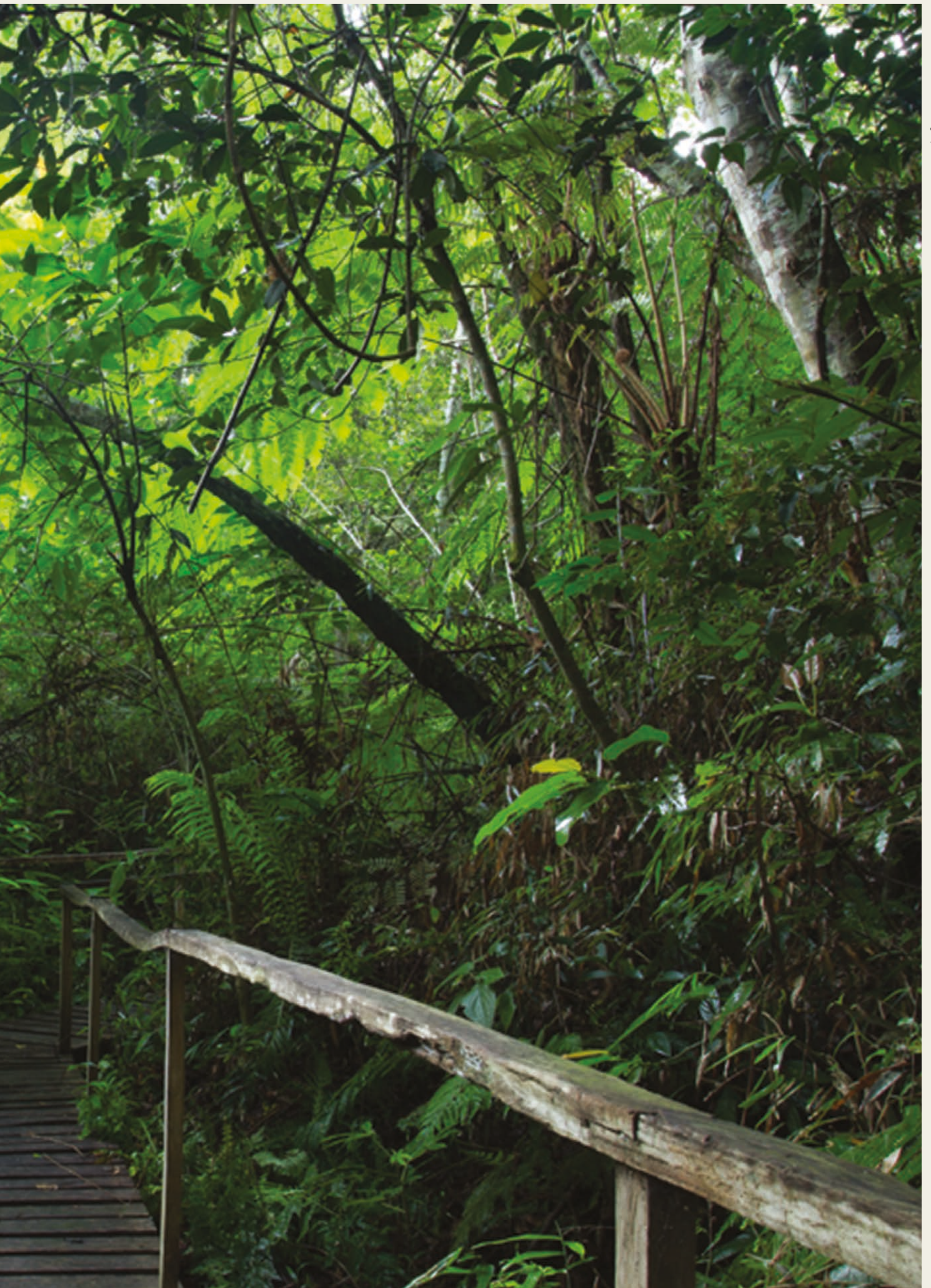
Figure 23. Principle variables in Best Practices.

Source: WWF elaboration based on interviews.



6. CONCLUSIONS AND RECOMMENDATIONS





6. CONCLUSIONS AND RECOMMENDATIONS

The expansion of soybean cultivation and the development of cattle in Paraguay have a strong impact on the national economy. Both areas represent more than 30% of foreign exchange earnings in recent years, occupy much of the agricultural/livestock land area, are generating direct and indirect jobs and promote the inclusion of the latest technology in production. This economic development, however, has neglected the principles of sustainability by not recognizing the importance of balancing economic benefits with environmental and social aspects.

Among the direct effects of the rapid expansion of soybean cultivation in the Eastern Region and the growth of ranching in the Western Region are deforestation and deterioration of ecosystems. This, coupled with the lack of BAP, has had a strong effect on water sources, threatening the resilience of ecosystems.

While soybean production and export-oriented meat increases, production expectations of FF based on crop diversity decrease. This has a negative impact on the availability of resources for food production, given that the FF units are the vital link in the production of food for human consumption at the national level.

According to the data presented in this document, the global demand for soybeans and beef will continue to rise. In this context, it is not difficult to conclude that if the current pattern of production and consumption continues, social and environmental problems caused by the production of these commodities will intensify. Reversing this situation would involve working together with stakeholders from local communities who suffer the effects of production systems, passing through national levels and reaching the global level by working with the end users of these products.

Locally, it is important that the social problems and environmental deterioration caused by the production systems of soybeans and beef be directly attacked. For this, the incorporation of BAP that minimize the effects of production systems on the environment and local communities becomes fundamental.

It is important that the Paraguayan Central Government and its extension and control agencies (MAG, SEAM, INFONA, SENAIVE, SENASA, MP, MSPBS, MEC) agree on strategies for joint work to maximize the available resources for the promotion and incorporation of BAP, the compliance with legislation and creation of opportunities for health, education and decent employment. Moreover, from the local level, participatory consultation processes should be initiated for the development and implementation of real territorial planning and land use to ensure that all components of productive and natural landscapes are considered.

At the national level, it is important to consolidate the tools and incentives for conservation such as Payment for Environmental Services and work with the various unions to strengthen and promote the existing certification systems that are emerging. It is at the national level that the joint and coordinated work of organizations of civil society (environmental, indigenous, rural) are essential, in order to positively affect the development of public policies that help improve the living conditions of rural communities.

As seen throughout the document, the regional and global market, prices and requirements of the final consumer are the factors that have the greatest influence on the forms of production. It is in this context that regional and global initiatives such as Grasslands Meat seal and the Round Table on Responsible Soy constitute reference tools for achieving change of the productive paradigms.



ANNEX

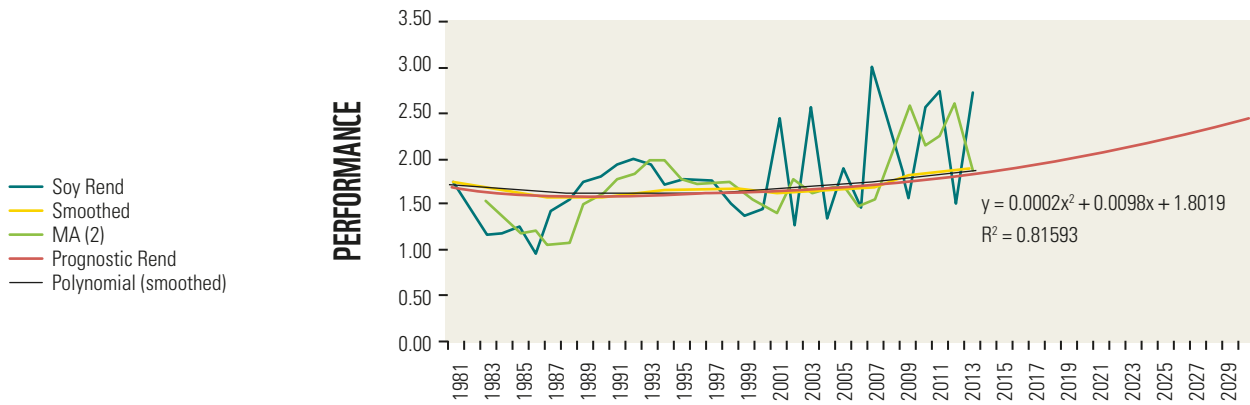
ANNEX I

EXAMPLE. OBSERVED AND PROJECTED PRODUCTION

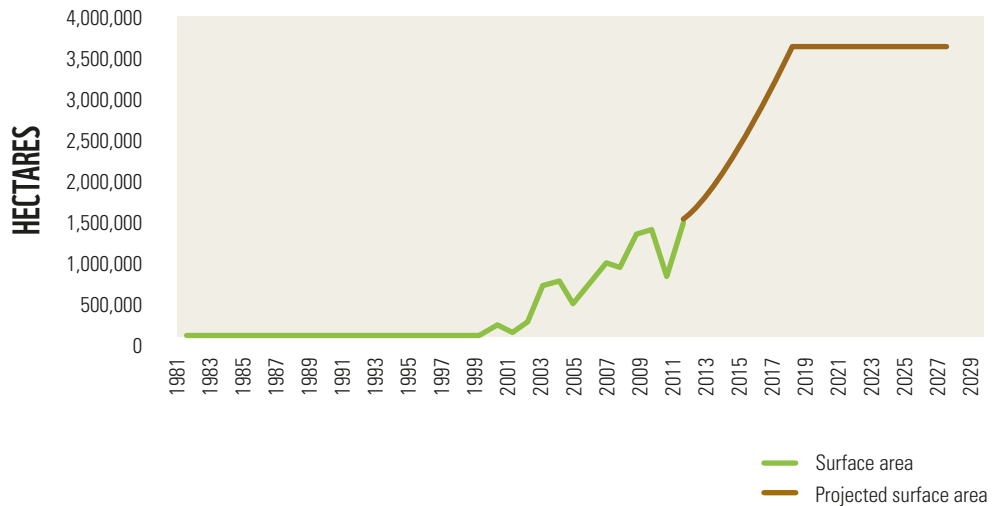
Source: WWF elaboration, from Agricultural Census data.

The figures show, for example, the Department of Concepción where yields can be seen that were observed from 1981 to 2013 and projected production to 2030; according to the lesser trend output, it highlights the forecast of surface expansion from the historical occupied surface.

Concepción: observed and projected production of soy (t)



Concepción: observed and projected land surface area of soy (ha)



ANNEX II

DETERIORATION RISK METHODOLOGY

DETERIORATION RISK

As an important contribution to the environmental segment, there is the calculation of the Risk of Deterioration in the Western Region or Chaco. For this calculation, a spatial model was developed that can predict, with some degree of confidence, the Risk of Deterioration (where deforestation is a fundamental component) in a given area, given certain characteristics or variables that are considered relevant or meaningful, identified as explanatory variables (Table 23).

The prediction was performed using logistical regression and seeks to express the probability of the event in question [$P(Y=1)$ deforestation] as a function of certain variables (main roads, secondary roads, settlements and productive areas) presumed to be relevant or influential. This event we want to model/predict is represented by Y (a dependent variable - deforestation), and the k explanatory variables (independent and of control) are designated by X_1 , X_2 , X_3 and X_4 , so the general equation (or logistical function) is represented as follows:

$$P(Y=1) = \frac{1}{1 + \exp(-\alpha - \beta_1 X_1 - \beta_2 X_2 - \beta_3 X_3 - \beta_4 X_4)}$$

Where

α , β_1 , β_2 , β_3 , β_4 are the parameters of the model
 \exp denotes the exponential function.

This exponential function is a simplified expression for raising the number e to the power contained within the parentheses, e being the Euler number or constant, or base of the natural logarithms (whose value to one thousandth is approximately 2.718).

Table 23. Explicit variables and their operative definition.

Source: Cabello C., Soto C., & Scribano R.

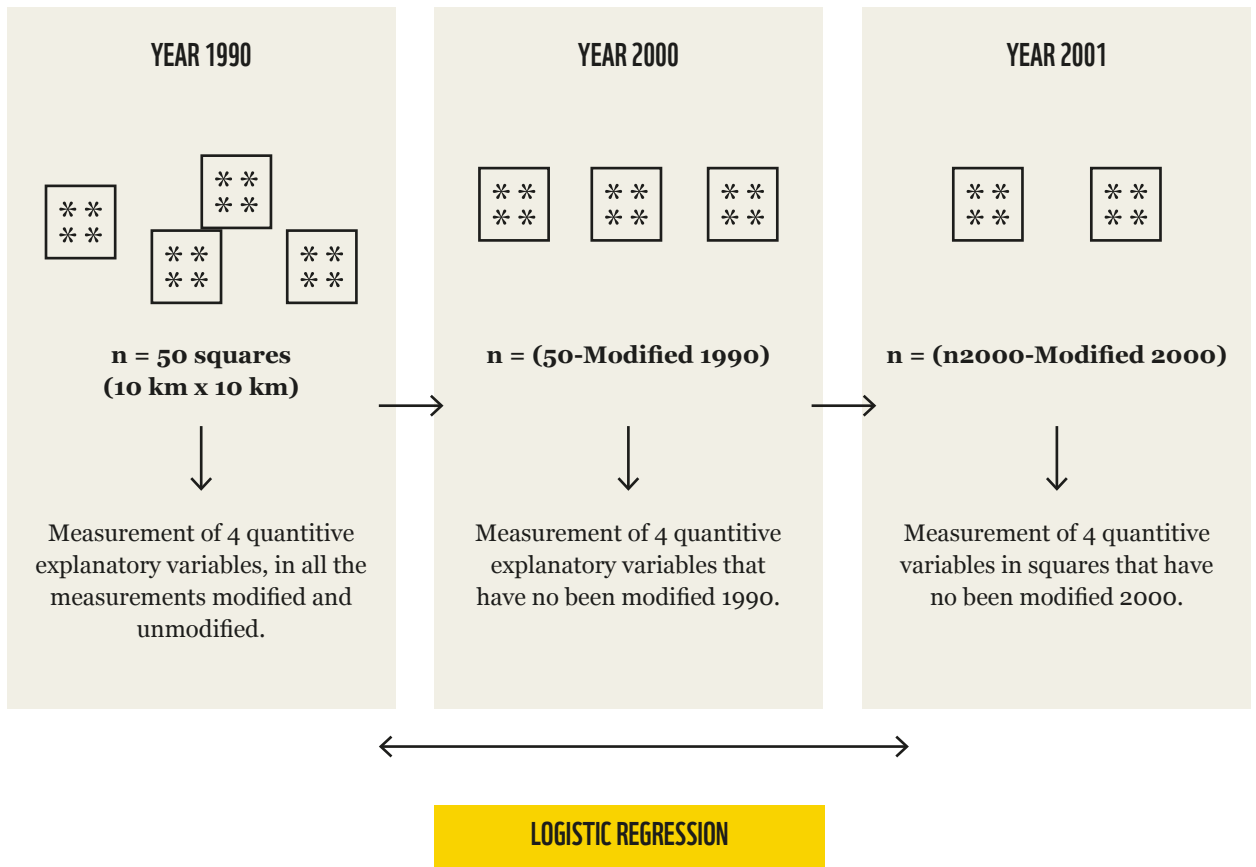
VARIABLE	OPERATIVE DEFINITION
Distance to main road (<i>dist.cam.prin</i>)	The distance that exists between the unit of analysis (grid selected) and the nearest main road.
Distance to secondary roads (<i>dist.cam.sec</i>)	The distance that exists between the unit of analysis (grid selected) and the nearest secondary road.
Distance to productive area (<i>dist.areaproduct</i>)	The distance that exists between the unit of analysis (grid selected) and the nearest production unit (agricultural or cattle ranching).
Distance to the village (<i>dist.pobl.</i>)	The distance that exists between the unit of analysis (selected grids) and the nearest community or village.

Unit of Analysis

From the Military Geographical Institutes map: 1:250,000, 50 grids were selected completely at random in the Western Region, utilizing the ESRI/ARC-GIS method (based on triangulation using “Thiessen polygons”), first generating random “points” and then selecting the “grid” of 10km x 10km. The explanatory variables were measured at three main time-frames: 1990, 2000 and 2011.

For the first year cut, the values of the four variables for all grids were highlighted; for the second year cutting (2000), data was highlighted of only those grids that have not been modified. It was regarded as modified if one (1) single pixel corresponding to the “production” or “roads” or “townships” class, has changed or it already contains it within it (in the case of 1990).

For 2011, third cutting period, once again data was highlighted of the grids that were not modified in 2000. Once all the values are obtained, the logistical regression model is run. Synthesis of the calculation methodology can be seen in figure of Logistic Regression.



Source: WWF elaboration.

ANNEX III

INSTITUTIONAL AND LEGAL ASPECTS

FIP	Financial and Institutional Partners
SE	State Entities
SORS	Social Organizations and Rural Source
P	Producers

INSTITUTION PROFILES	FIP	SE	SORS	P
<p>AGROPECO (Agriculture/Livestock and Commerce S.A.)</p> <p>The mission of Agropeco: Agriculture as a science, a mission that considers the exploitation of agricultural resources not only in its economic aspect, but also as a task that feeds the material progress of civilization. To Agropeco, the ecosystem is not only a factor of production, but also the first and most important asset of our company. Agropeco uses resources, technology and capabilities to the highest degree of modernization, maximizing productivity, quality and environmental care, and at the same time building a bridge to the future food industry. Soybean is the main crop of Agropeco, both in terms of extension and profitability. Agropeco is characterized by conceiving agriculture as a science, combining the most modern production technology along with the most advanced scientific knowledge.</p>	X			
<p>AFD (Financial Development Agency)</p> <p>It is a second-tier State bank of Paraguay, which aims for the economic development of the country, granting credits to the public sector and the private sector. Its vision is to be an institution recognized for its role of high economic and social impact with constant innovation and with competent officials committed to excellence.</p>		X		X
<p>Alter Vida</p> <p>Is an institution whose mission is to generate knowledge, proposals and united and equitable environmental actions for a sustainable Paraguay. The institution has been developing multidisciplinary work in the areas of sustainable agriculture, environmental management, democracy, communication, local development, gender, biodiversity, health, education, decentralization, advocacy in public policy, among others. Alter Vida operates in five programs: agroecology, biodiversity, sustainable rural development, women and environment, health and environment.</p>			X	
<p>APS (Association of Soybean, Grains and Oilseed Producers of Paraguay)</p> <p>It is a Union that gathers Soybean, Oilseeds and Grains Producers of Paraguay. It is a common good, non-profit, industry associated, association to which physical and legal entities who share the same vision, the same goals and objectives, regardless of nationality, religion, creed, opinion or political affiliation, are associated.</p>	X		X	

INSTITUTION PROFILES	FIP	SE	SORS	P
<p>ARP (Rural Association of Paraguay)</p> <p>It is a private, common good, non-profit entity, which brings together farmers from across the country. It was founded in 1885 under the name Ranching Society of Paraguay. In 1938, it takes the current name. The ARP seeks to make cattle ranching an instrument of development of Paraguay, with social responsibility and respect for the environment. Its mission is to unconditionally defend the interests of Paraguay and the ranching sector.</p> <p>The objectives of the ARP are articulated in three main areas:</p> <ul style="list-style-type: none"> • Support, promote and participate in the socio-economic development of Paraguay and particularly the rural sector. • Support its partners in the defense of their professional interests and raising their economic, social and cultural level. • Collaborate with the development and improvement of complementary and related industries, as well as related services. 	X		X	
<p>BCP (Central Bank of Paraguay)</p> <p>It is an autonomous technical agency that serves as the Central Bank of the State, assigned by the Constitution of 1992 and set out in its Law 489/95. To fulfill its objectives, the organic law gives the Central Bank the following functions:</p> <ul style="list-style-type: none"> • Participate with other agencies of the State in the formulation of monetary, credit and exchange rate policy and is responsible for its implementation and development. • Exclusive power to issue coins and currency notes. The legal currency of Paraguay is the Guarani. • To act as banker and financial agent of the State. • Maintaining and managing international reserves. • Act as bank of banks and acting as lender of last resort. • Promoting the efficiency, stability and solvency of the financial system. • Organizational Objective of Continuous Improvement. • Promoting an organization and institutional culture of excellence with social responsibility. • Develop a Comprehensive Risk Management 		X		X
<p>BNF (National Development Bank)</p> <p>Competitive development bank, with efficient banking services and an emphasis on the financing of national production, providing opportunity for progress for all. Its vision is to be the leading National Bank, “recognized for its outstanding management in promoting the socio-economic development of Paraguay”. The Bank offers loans for operating capital in the agricultural/livestock sector, which are used to cover the costs of technical supplies and crop labor.</p>		X		X
<p>CAFYF (Chamber of Pesticides and Fertilizers)</p> <p>It is a non-profit organization, which represents companies whose main activities are: research, development and formulation of their own molecular products for agricultural/livestock and environmental health, and/or fertilizers, manufacturing, local marketing, imports and exports.</p>	X		X	X

INSTITUTION PROFILES	FIP	SE	SORS	P
<p>CAH (Approved Agricultural Credit)</p> <p>It is an autonomous body with legal status, assets, accounting and its own administration. Established on December 21, 1943 and governed by Law 551/75, its mission is to provide financial services mainly to the rural productive sector, and promote technical and organizational assistance through partnerships with public and private sectors, while seeking to improve income, capitalization of production units and market access.</p>		X	X	X
<p>CAPECO (Paraguayan Chamber of Grains and Oilseeds Exporters and Traders)</p> <p>It is a nonprofit trade union that seeks to bring together companies to fully cooperate in the development of their interests, exercising the legal representation in negotiations of collective benefit. It includes the main exporters of grains and oilseeds, whose export volume accounts for 90% of the total amount of grains and byproducts exported in Paraguay. The CAPPRO, which brings together major oilseed producers, is the one that operates in the export sector.</p>	X			
<p>CAPPRO (Paraguayan Chamber of Processors of Oilseeds and Grains)</p> <p>It is a trade union whose aim is to bring together companies engaged in processing oilseeds in order to produce oils and sub-products as well as those enterprises engaged in agricultural exports, fully cooperating in the development of the activities of its members, defending their professional interests, exercising the legal representation in negotiations of collective benefit and contributing to the efforts of producers of raw materials for the oilseed industry; in order to achieve higher quality and volume using the latest technology in increasing its production. Its mission is to promote the industrialization of oilseeds and grains in coordination with the public sector, encouraging the growth of agricultural and industrial production, generating greater foreign exchange earnings and more jobs, with social and environmental responsibility.</p>	X			
<p>CYTASA (Colonization and Agrarian Reform S.A.)</p> <p>It is a Paraguayan corporation, owned 100% by Tragsa, whose social purpose is colonization and agrarian transformation, and any prior or complementary activity related to these purposes. Carries out agricultural and environmental projects geared towards habitat conservation and social development.</p>	X		X	
<p>DAP (Agricultural Development of Paraguay)</p> <p>It is a company that has established itself as a pioneer in the development of new agricultural frontiers in northern Paraguay (San Pedro). This was made possible by the only platform that DAP capitalized since its inception in addition to the business opportunities offered by Paraguay and a top-level management. Its mission is to build and develop a sustainable agro-business in Paraguay, based on high-quality assets and a diversified and integrated business portfolio.</p>	X		X	

INSTITUTION PROFILES	FIP	SE	SORS	P
<p>FAO (United Nations Food and Agriculture Organization)</p> <p>It is an institution that has as its main objectives: eradicating hunger, food insecurity and malnutrition, eliminating poverty and fostering economic and social progress for all. It also seeks sustainable management and utilization of natural resources, including land, water, air, climate and genetic resources, for the benefit of present and future generations.</p> <p>Emphasizes its efforts in areas of great importance for the country, such as family farming, agricultural health, food safety, climate change and environmental sustainability projects. Focused mainly on the development of agricultural competitiveness, strengthening family agriculture, ensuring food security, sustainable forestry development and environmental services as well as livestock/farming development, agro-energy development and institutional adaptation of the agricultural/livestock system.</p>			X	X
<p>FECOPROD (Federation of Production Cooperatives)</p> <p>It comprises 32 member cooperatives, which account for 45% of soybean production nationwide, representing approximately 14,000 associated producers, who effectively contribute to the development of sustainable production in ranching, agriculture, industry and infrastructure.</p>	X		X	
<p>FEPAMA (Paraguayan Federation of Wood)</p> <p>Its objective is to support and promote the articulation of a national policy that allows the sustainable development of the forestry-industrial sector of Paraguay.</p>	X		X	
<p>FG (Ranching Fund)</p> <p>It aims to consolidate the sustainable development of the beef value chain through financing activities that influence it, carrying out best financial practices and giving priority to small and medium producers.</p>		X		X
<p>GEAM (Environmental Management)</p> <p>It is a nonprofit association, with the mission of managing the sustainability of development by integrating economic, social and environmental dimensions and articulating public and private initiatives.</p>			X	
<p>Guyra Paraguay</p> <p>It is a civil society nonprofit organization working in the defense and protection of the biological diversity of our country and the organized action of the part of the population, in order to ensure the vital space needed so that future generations can know representative samples of the natural wealth of Paraguay.</p> <p>The participation of communities and people inside the country, in its research and conservation work, is one of its most valuable tools in achieving the objectives of this organization. Its function is to preserve and promote the sustainable use of biological diversity with the active and responsible participation of society.</p>			X	X

INSTITUTION PROFILES	FIP	SE	SORS	P
<p>IICA (Inter-American Institute for Cooperation on Agriculture)</p> <p>It is the specialized agency for agriculture of the Inter-American system that supports the efforts of Member States to achieve agricultural development and rural welfare.</p> <p>Its mission is to encourage and support the efforts of Member States to achieve their agricultural development and rural welfare through excellence in international technical cooperation.</p> <p>In addition, its vision is to achieve a competitive, inclusive and sustainable Inter-American agriculture to feed the hemisphere and the world, and that in turn generates opportunities to reduce hunger and poverty in the producers and inhabitants of rural areas.</p>			X	X
<p>INBIO (Institute of Agricultural Biotechnology)</p> <p>INBIO is a nonprofit civil association, with the aim of promoting the development of national research biotechnology, promoting adequate access to the country of products derived from agricultural biotechnology and orderly incorporating them into the national production.</p>			X	X
<p>INDERT (National Institute of Rural and Land Development)</p> <p>It is the main public institution responsible for the implementation of land reform. Law 2419 in July 2004 created it. As an institution, its mission is being responsible for promoting the harmonious integration of the rural population to economic and social development of the country. The INDERT should adjust the agricultural structure promoting access to rural land, cleaning up and regularizing tenure, coordinating and creating conditions conducive to development that enables the firm establishment and consolidation of the beneficiary producers, setting strategies that integrate participation, productivity and environmental sustainability.</p> <p>In Paraguay, there is equitable access to land, to a diversified and sustainable agriculture and to the factors that contribute to the achievement of human development, in terms of legal and administrative security, solidarity and committed participation of society.</p>		X	X	
<p>INFONA (National Forestry Institute)</p> <p>It is an autonomous and decentralized State institution whose vision is to be a leader in promoting sustainable forest development, decentralized, systematized and agile services, with qualified, motivated and integral human talent. Its mission is to promote sustainable forest management through participatory policies, plans, programs, projects and services that contribute to national development.</p>		X	X	
<p>IPTA (Paraguayan Institute of Agricultural Technology)</p> <p>It is an autonomous legal institution of public law, which is linked to the executive branch, through the Ministry of Agriculture and Livestock (MAG). It emerged as a response to the progressive weakening of the traditional model to generate and transfer technologies in Paraguayan agriculture.</p> <p>The Institute aims to strengthen and improve the country's research system and respond efficiently and effectively, in terms of the technical-scientific development in the agricultural/livestock and forestry sectors. Its specific objective is the development of research programs and technologies to increase the productivity of agricultural/livestock and forestry products, in order to enhance their competitiveness for the domestic market as well as for the export market.</p>			X	X

INSTITUTION PROFILES	FIP	SE	SORS	P
<p>MAG (Ministry of Agriculture and Livestock)</p> <p>It is the agency responsible for the functions and powers related to the conceptual and physical space within which the State develops the activities of agricultural and livestock nature.</p> <p>Its mission is to promote the competitiveness of the agricultural/livestock and forestry production chain in Paraguay, in free market conditions, social equity and environmental sustainability; in the political framework of a democratic, representative, participatory and pluralistic government. The functions and powers of MAG, conferred by Law 81/92, are related to the agricultural sector, carrying out a technical and operational role at various stages of the production process and the marketing of products of the sectors analyzed. It is structurally composed of two sub-secretariats of eminently technical nature: the Undersecretary of Agriculture and Undersecretary of Ranching. Its preponderant functions are, among others, participation in the formulation and implementation of global politics, in national plans for economic, social and environmental development, and the establishment of macroeconomic policy. MAG is also responsible to develop, coordinate, implement, monitor and evaluate plans, programs and projects to achieve sustainable development and to promote, guide and protect agricultural/livestock, forestry, agro-industrial and other productive activities related to its powers.</p>	X	X		X
<p>MH (Ministry of Finance)</p> <p>Is responsible for managing the assets and the budget process of the Paraguayan State, and the formulation and management of fiscal policy and the internal and external debt of the BCP.</p>	X			X
<p>MIC (Ministry of Industry and Trade)</p> <p>Responsible to formulate plans and programs of industrial and commercial development and to promote and protect industrial activity and the domestic and foreign trade of Paraguay. The duties of the MIC include carrying out studies and economic analysis of the industrial and commercial development of the country and establish with other State and/or private agencies, industrial technical standards and other conditions to be carried out on raw materials and manufactured articles.</p>	X		X	
<p>Moises Bertoni Foundation</p> <p>It is an institution that is committed to the concept of Sustainable Development as the process of creating environmental, social and economic value. It advocates a model of balanced, equitable and inclusive development and assumes that this is a complex issue that integrates multiple elements and dimensions.</p> <p>It works with innovative and participatory ways, creating environmental, social and economic value for a better quality of life.</p>			X	X

INSTITUTION PROFILES	FIP	SE	SORS	P
<p>MSPBS (Ministry of Public Health and Social Welfare)</p> <p>Its mission is to ensure compliance with the functions of leadership, guidance, financing and delivery of health services in order to achieve universal coverage under the social protection approach, within the framework of the National Health System. Develops monitoring, control and research processes in public health to preserve it and reduce the risks of illnesses associated with the determinants of health.</p>		X		X
<p>SEAM (Secretariat of the Environment)</p> <p>It is responsible for formulating policy, coordination, monitoring and implementation of environmental actions and plans, programs and projects under the National Development Plan pertaining to the preservation and conservation, restructuring and management of natural resources. While the creation of the SEAM was a step forward in terms of management efficiency in environmental matters, it failed to achieve the desired rank (Ministry), leaving environmental issues once again with little institutional hierarchy, giving it insufficient political framework for management as well as a complicated, confusing and overlapping institutional framework. This new structure went through a process of adaptation and accommodation that led to the management of natural resources being vulnerable because of the lack of clear definitions of the authorities. On the other hand, there are processes whose executions cannot experience deadlocks because society itself demands them or the requirements of international entities whose benefits are subject to compliance with certain requirements of an environmental nature.</p>		X	X	X
<p>SENACSA (National Service of Quality and Animal Health)</p> <p>It is the national entity responsible for the development, regulation, coordination, implementation and monitoring of the national policy and management of animal quality and health. The institution is concerned with preserving animal health and public health, promoting the competitiveness of the sector for development through quality and safety of products and by-products of animal origin. It has a structure that allows coverage of the entire National territory.</p> <p>Its mission is to support the National Cattle Policy contributing to increased levels of competitiveness, sustainability and equity, by promoting the development of productivity through the protection, maintenance and improvement of animal health and the quality and safety of products and by-products of animal origin.</p>		X	X	
<p>SENAVE (The National Service for Plant and Seed Quality and Health)</p> <p>It is responsible for supporting the agro-productive policy of the State, contributing to increased levels of competitiveness, sustainability and equity in the agricultural sector, through the improvement of the status of productive resources regarding their conditions of quality, plant health, genetic purity and prevention of damages to humans, animals, plants and the environment, ensuring their safety. The Law 986/96 "Approving the International Convention for the Protection of New Varieties of Plants" should be noted.</p>		X	X	X

INSTITUTION PROFILES	FIP	SE	SORS	P
<p>Sobrevivencia</p> <p>It works to promote sustainable societies aiming at conservation, restoration and sustainable management of the environment, in the defense of fundamental rights and the integrity of communities; promoting peace, democracy, equality in diversity and cultural values and ways of being one's self; acting collectively with full respect of environmental and social justice, human dignity and respect for human rights and the rights of peoples; contributing to the empowerment of indigenous peoples, local communities, women, groups and individuals for their full participation in decision-making; establishing equity within and between societies and generations, with creative approaches and solutions; building and strengthening alliances with various social movements; linking the various grassroots struggles, nationally and internationally; inspiring each other; leveraging, strengthening and complementing our respective capabilities; living the change we want to produce and working in solidarity.</p>			X	
<p>UNA (National University of Asunción)</p> <p>It is the oldest state institution of tertiary education in the Republic of Paraguay. It is considered the most recognized Paraguayan university on a national and international level, as well as having the largest student and academic population. Its graduates have had a notable participation in social, political, artistic, cultural and scientific field in the country. Its mission is to train quality professionals with ethical principles, innovative spirit, competitive, critical and socially responsible and contribute to the ongoing search for truth, creation and dissemination of scientific and technological knowledge, and strengthen its national and international prominence in the process of the sustainable development of society.</p>				X
<p>UGP (Trade Union of Production)</p> <p>It aims to identify common interests, agree on policies to promote production that encourage the rational use of natural resources within modern standards of sustainable rural development, the intangibility of forest reserves, rationalizing the use of native forests, promotion and expansion of afforestation and reforestation.</p>	X		X	
<p>WWF (World Wildlife Fund)</p> <p>WWF's commitment is focused on ensuring the ecological integrity of priority ecosystems, while promoting sustainable social and economic development and reducing the ecological footprint.</p> <p>WWF focuses on critical and problematic places while joining with others to achieve a measurable difference in the state of the world.</p> <p>Its mission is to stop the deterioration of the planet's natural environment and build a future in which humans live in harmony with nature:</p> <ul style="list-style-type: none"> • Conserving the world's biological diversity. • Ensuring sustainable use of renewable natural resources. • Promoting the reduction of pollution and wasteful consumption. 			X	X

Table 24. Evolution of soy: area sown and production.

Source: CAPECO.

YEARS	AREA SOWN (ha)	COMMERICAL PRODUCTION (t)	PERFORMANCE (kg/ha)
1997	1,050,000	2,771,000	2,639
1998	1,150,000	2,988,201	2,598
1999	1,200,000	2,980,058	2,483
2000	1,200,000	2,911,423	2,426
2001	1,350,000	3,502,179	2,594
2002	1,445,000	3,546,674	2,454
2003	1,550,000	4,518,015	2,915
2004	1,936,600	3,911,415	2,020
2005	2,000,000	4,040,828	2,020
2006	2,426,000	3,641,186	1,501
2007	2,430,000	5,581,117	2,297
2008	2,644,856	5,968,085	2,256
2009	2,524,649	3,647,205	1,445
2010	2,680,182	6,462,429	2,411
2011	2,870,539	7,128,364	2,483
2012	2,957,408	4,043,039	1,367
2013	3,157,600	8,202,190	2,598
2014	3,254,982	9,285,592	2,853
2015	3,264,480	8,004,858	2,452

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WWF-Paraguay in numbers

1961

WWF was founded in 1961.

2000

WWF established its Asunción, Paraguay office in 2000.



4

WWF-Paraguay works in four ecoregions: Atlantic Forest, Pantanal, Cerrado, and Chaco.

5

The vision of WWF-Paraguay has 5 key pillars: biodiversity, sustainability, society, appropriation, and replicability.



To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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