GTPS

Brazilian Roundtable on
Sustainable Livestock

# BRAZILIAN LIVESTOCK AND ITS CONTRIBUTION TO SUSTAINABLE DEVELOPMENT

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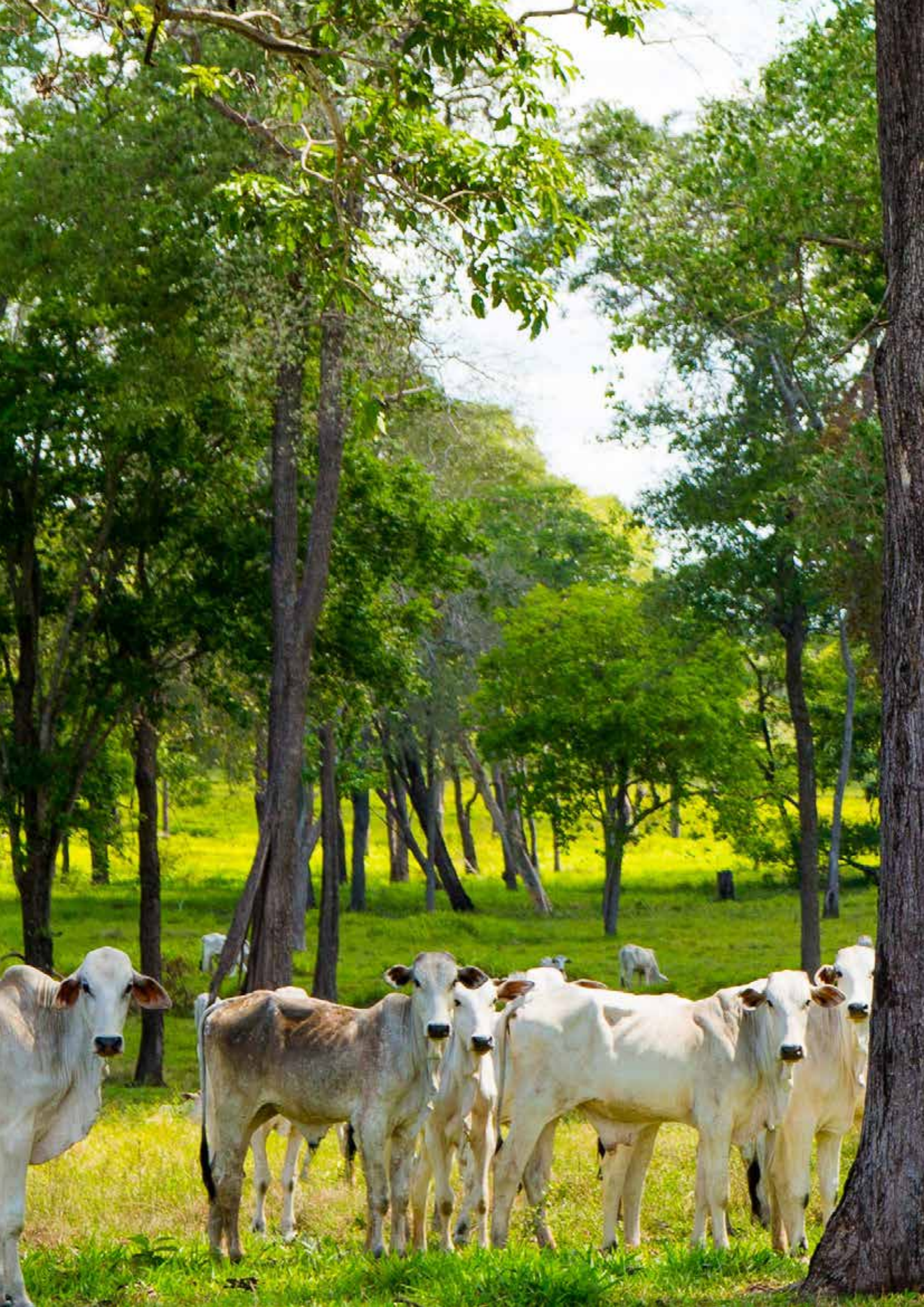
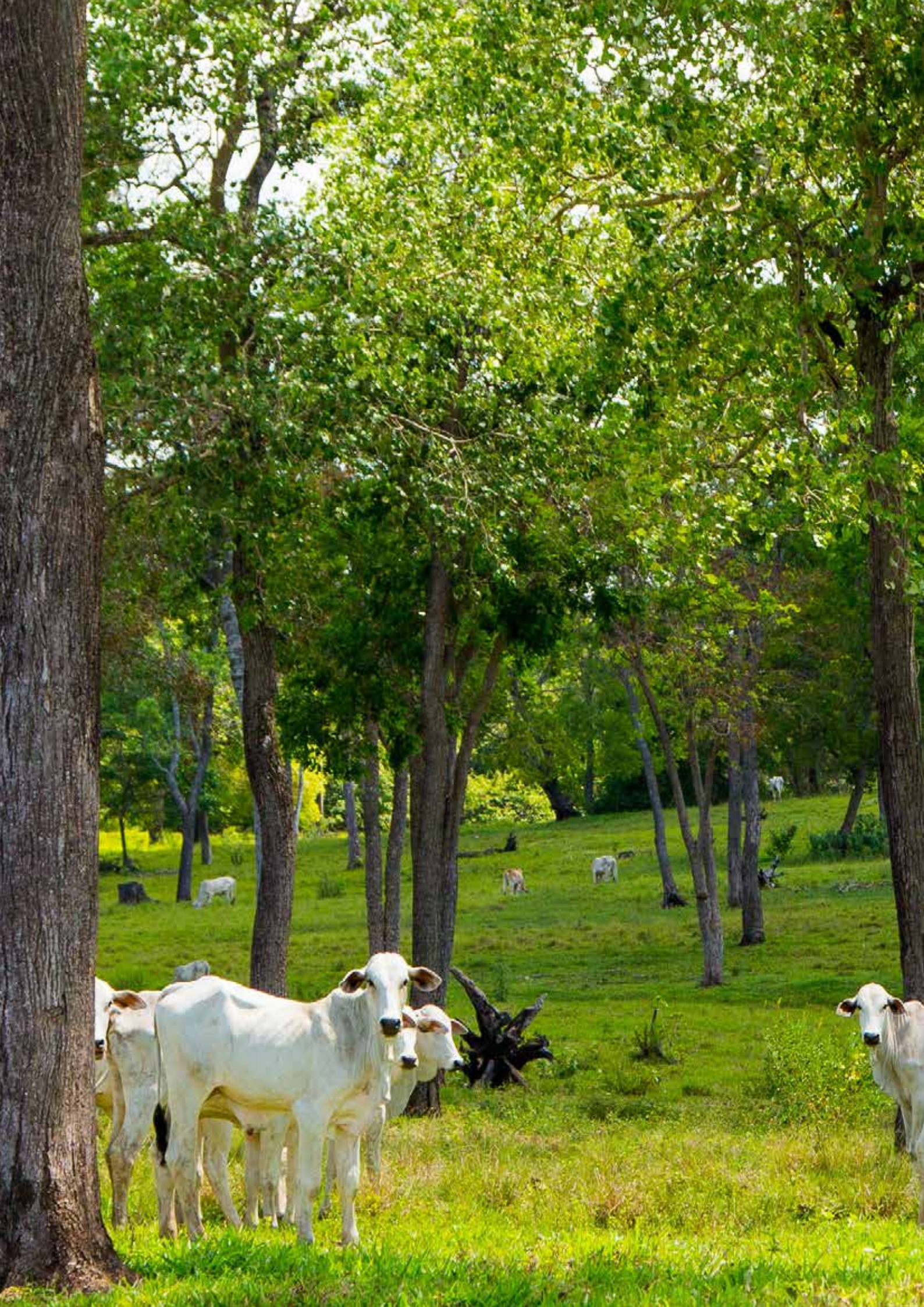
# SUMMARY



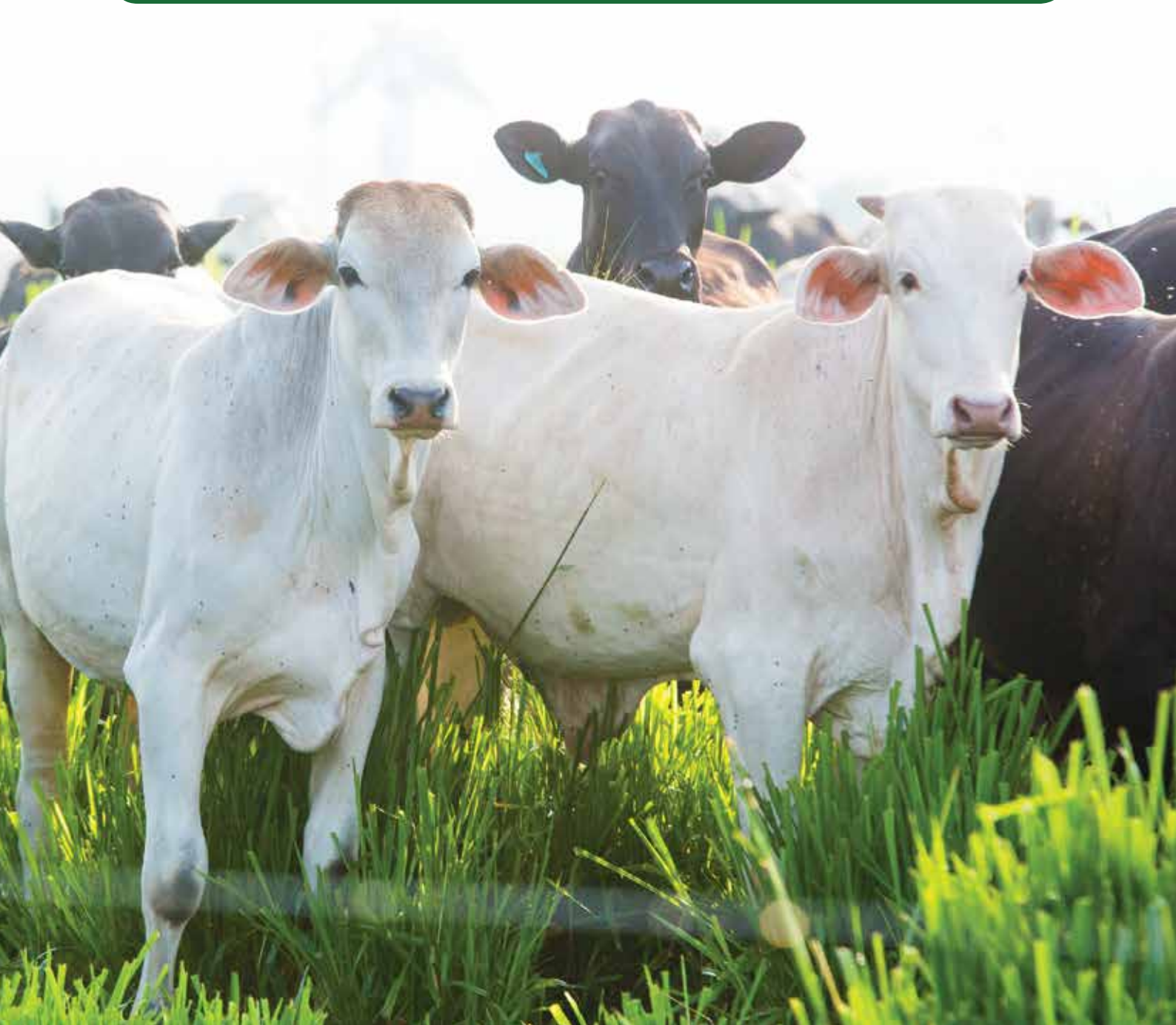


# EXECUTIVE SUMMARY

The challenges to define and promote sustainable livestock in Brazil rely on key environmental concerns. Deforestation, GHGs emissions, pasture degradation, obstacles to intensification, water use and biodiversity loss are some of the most common issues surrounding beef production.

The aim of the Whitepaper is to organize data and reliable information about these topics, assuming the importance of livestock for food security in Brazil and abroad, the need to promote a new land use dynamic based on pastureland restoration and livestock intensification.

In the Paris Agreement, Parties will commit to foster emissions reductions and to promote adaptation and resilience of ecosystems. Brazil's contributions involve not only deforestation reduction but also restoration of 12 million hectares and pasture restoration of up to 15 million hectares, key drivers attached to the debate of sustainable livestock in Brazil.



# KEY MESSAGES

The voluntary commitment to reduce 80% of deforestation in the Amazon until 2020, below 2005 levels, was accomplished by 74% already;

Deforestation drivers rely on multiple factors as illegal logging, lack of land tenure, livestock and agricultural expansion, small areas deforestation and indigenous and rural settlements deforestation;

Land use dynamics in Brazil involves pasture restoration, zero illegal deforestation, livestock intensification, restoration of native vegetation and the competition for land between different agricultural products;

Pastureland restoration is a key driver to promote sustainable livestock in Brazil addressing carbon emissions, reducing the pressure for new deforestation and supporting responsible use of water;

Pasture areas in 2030 are forecasted to reach 161 million hectares, releasing 17 million hectares to other crops, planted forest and restoration under the Law on Protection of Native Vegetation (Federal Law No 12,651/2015);

The compliance and enforcement process under the Law on Protection of Native Vegetation represents a huge opportunity to balance production and protection and will create a restoration agenda of at least 12 million hectares;

The Environmental Rural Registry (Cadastro Ambiental Rural – CAR) reached 244 million hectares from the total 398 million hectares, representing 61,5% of the total area to be registered until October 2015; in the Amazon, the area already registered reached 78,5%;

There are 190 million hectares of protected areas located in farms – Permanent Preservation Areas and Legal Reserve areas which stocks up to 99 billion tons of CO2e and support the achievement of Brazil's biodiversity targets;

The CAR could be used as a tool to monitor environmental compliance and to reach transparent information about deforestation on a farm to farm basis;

Conservation of native vegetation on livestock farms and enhancement of good agricultural practices is a way to promote key biodiversity targets (targets 4, 5, 7, 11 and 15) as well as key Sustainable Development Goals (SDGs 2, 6, 12 and 15);

GHGs emissions and removals balance from livestock must be improved considering pasture sequestration and methodological improvements to follow the Paris Agreement under the UNFCCC;

Methane emissions from livestock using GTP represented 66,350 million tons of CO2e in 2012 compared to 278,670 million tons of CO2e based on GWP;

Pasture recovery and integrated crop-livestock-forestry system, which includes soil carbon stock variation, enteric fermentation, manure and nitrogen fertilization could mean emissions reductions of up to 100 and 25 million tons of CO2e respectively;

Pasture restoration and dissemination of good practices are the most promising actions towards sustainable livestock and the projects building on this through - the Brazilian Roundtable on Sustainable Livestock - are at the forefront of the responsible livestock in Brazil.

# 1.INTRODUCTION

The aim of this whitepaper is to gather the most updated information about the environmental challenges related to livestock production in Brazil and to organize it as a way to inform and promote an open, lively and constructive debate about cross cutting issues of the livestock sector in Brazil.

The imminence of the Paris Agreement to be sealed at the 21st Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC – COP21), as a deal that would commit Parties to reduce and sequester GHGs, adopt adaptation actions and promote the development and use of low carbon technologies, tend to be a turning point addressing production patterns, policies and consumer demands towards building upon sustainability in an economy wide approach.

Moreover, the approval of the Sustainable Development Goals (SDGs) at the Seventieth Session of the United Nations General Session, hold on September 25th, 2015, created a broad and long term agenda for sustainable development, comprising clear goals related to food security and nutrition (SDG 2), and environmental challenges (SDGs 12, 13 and 15) closely related to food production. The SDGs agenda is a multilateral common ground to be tackled as a basis to promote sustainable development.

The challenges of sustainability in food production systems, access to food, availability of nutritious, diverse and healthy foods, relies on multiple factors as water supply, productive land, technology and the possibility to incorporate good agricultural practices. Livestock production in Brazil, as well as other food products, has a key role to play when it comes to nutritious food and food security.

The basis for a reasoned debate about the key environmental challenges of the livestock sector in Brazil must be embedded on reliable data that takes into account the patterns of livestock production today (2015), a brief comparison with the past (2005) and projections to the future (2030).

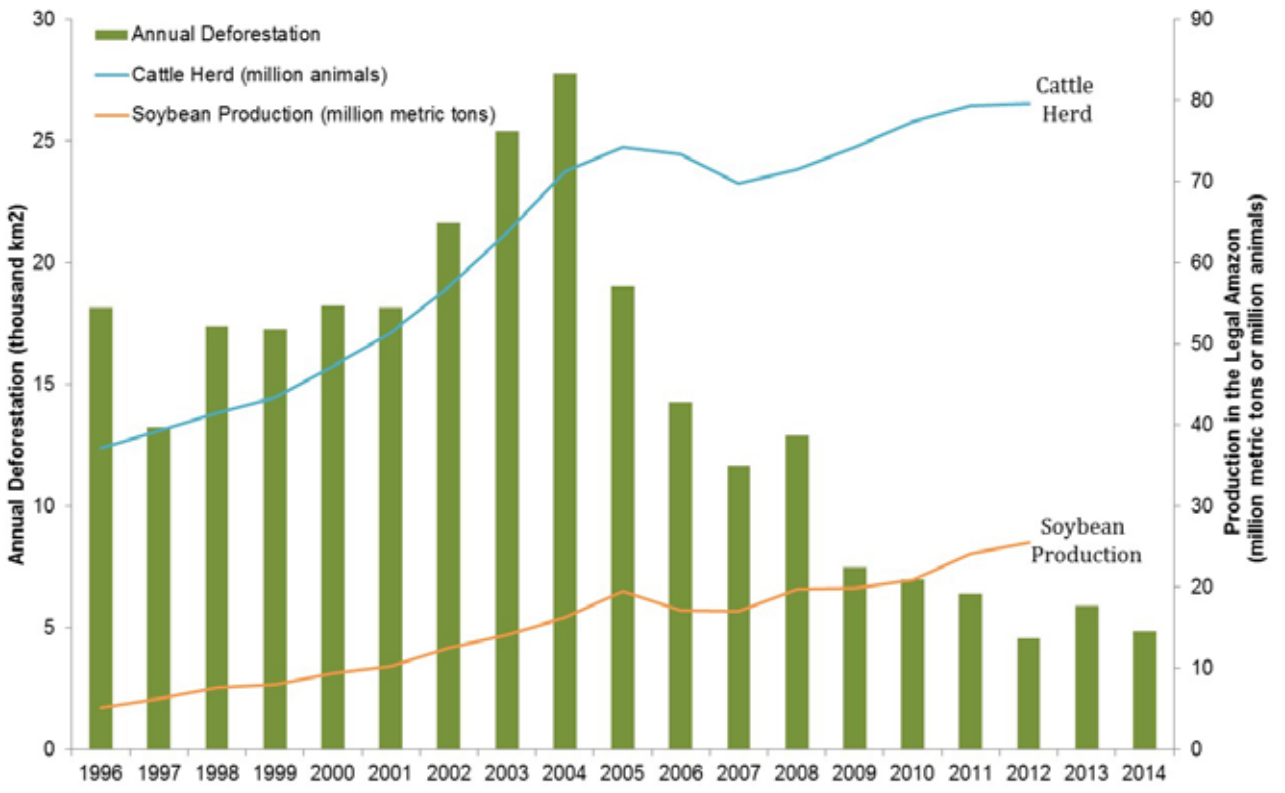
Land use dynamics and policies, deforestation trends, private sector engagement and actions towards addressing key sustainability concerns, GHGs emissions and low carbon practices, pasture recovery and intensification, responsible water use and the continuous improvement approach are some of the tasks the Whitepaper will address.

# 2.PASTURE AND LAND USE DYNAMICS

## DEFORESTATION TRENDS

The past eleven years marked a significant change in the Amazon deforestation rates. In 2014 the annual rate was 5,012 km2 compared to 27,772 km2 in 2004, which meant a reduction of 82%.

### Deforestation and cattle herd in the Amazon




Source: PRODES/INPE, UFG-LAPIG

The deforestation reduction in the Amazon relies on different policies, notably the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm-2004). Private policies, such as Soybean Moratorium and beef industry zero deforestation commitment, launched in 2006 and 2009, respectively, also have important role on targeting deforestation in the Amazon biome.

Additionally, in 2010 Brazil formally submitted to the UNFCCC its voluntary commitment to reduce deforestation in the Amazon by 80% up to 2020, below 2005 levels. Brazil accomplished 74% already, and the target foresees a deforestation rate of 3,900 km2 in the Amazon in 2020.

The patterns of deforestation in the Amazon, considering the scale, shows that conversion of areas smaller than 25 hectares accounts for 60% of the total area deforested in the biome between 2001- 2011, compared to 30% in the early 2000s. Areas from 25 to 500 hectares contributed to 35% (compared to 50%) and areas larger than 500 hectares accounted for 5% of total deforestation (compared to 20%).

[1] PPCDAm, 2012-2015, Junho 2013.

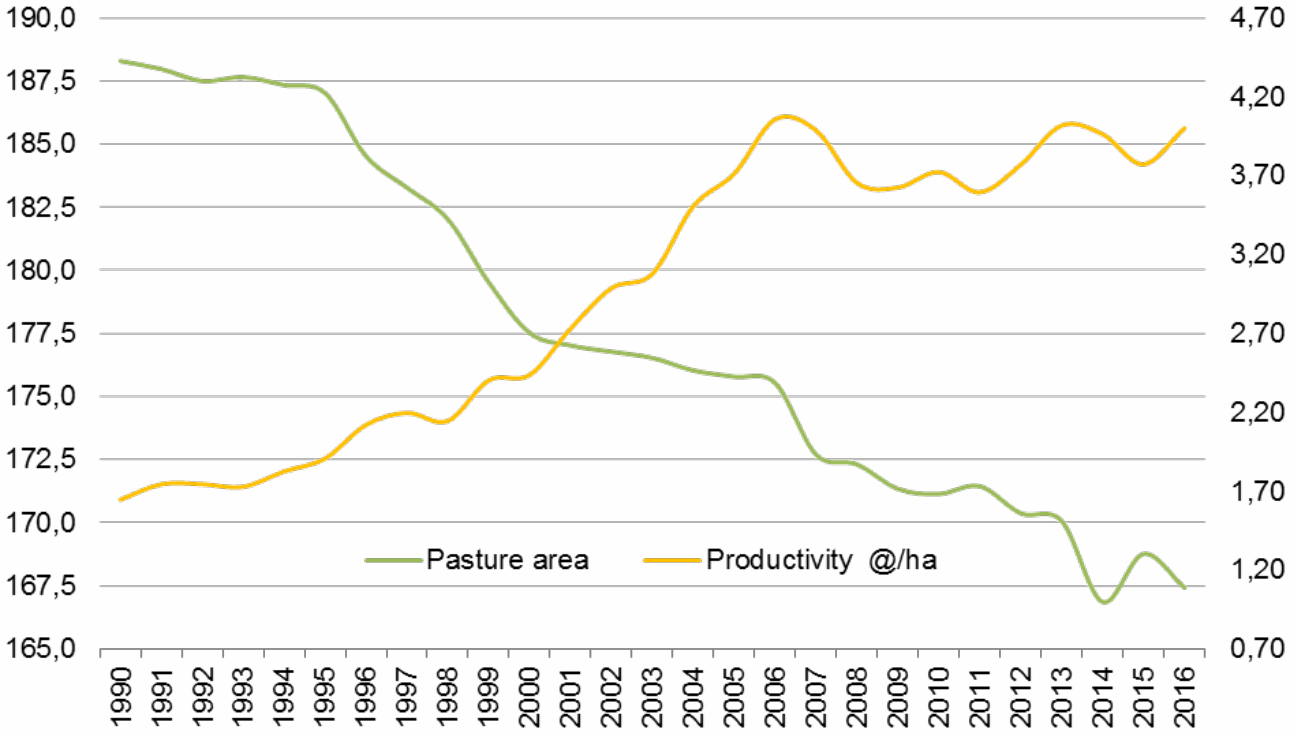
The Real Time Deforestation Detection System (DETER), of the National Institute for Space Research (INPE), launched in 2004, was the key tool to monitor deforestation on areas bigger that 25 hectares using the MODIS (Moderate Resolution Imaging Spectroradiometer) system. However, the new challenge relates to smaller areas.

To tackle this, since 2007 the government publish a list of target municipalities, with huge rates of deforestation. It is also important to mention the deforestation that takes place in agrarian reform areas. From 2001 to 2011 the conversion of forests in these areas represented 19% of the total area converted in the Amazon.

Livestock is usually pointed as the main cause of deforestation in Brazil. In effect, it is not possible to establish a clear and automatic correlation between deforestation and pasture. Actually, there are different deforestation drivers in the Amazon and livestock becomes a natural activity in any area already cleared. Approximately 60% of the area converted until 2008 was occupied by cattle production according to TerraClass.

In the last 10 years, the number of animals increased mostly in the North of Brazil, while stabilized in the South and Southeast. It is important to notice, however, that the pasture area is decreasing while cattle productivity is increasing. Livestock intensification, genetics and good practices are key to a continuous improvement of livestock sustainability in Brazil, having the deforestation reduction and pastureland restoration as a basis.

**Pasture Area (mi ha) X Cattle herd Productivity (@/ha)**




Source: Agroconsult/IBGE.

It is also important to quote that the Brazilian iNDC (intended nationally determined contribution) contemplates zero illegal deforestation in the Amazon up to 2030. The full enforcement of the Law on Protection of Native Vegetation (Federal Law No 12,651/2012), the strict monitoring based on the PPCDAm, the proper management of protected areas, the natural revegetation in the Amazon, comprising 16.5 million hectares in 2010 and the adoption of REDD plus projects form a complex matrix of policies and actions towards curbing illegal deforestation.

[2]PPCDAm, [2012-2015], Junho [2013]

[3]TerraClass [2010].

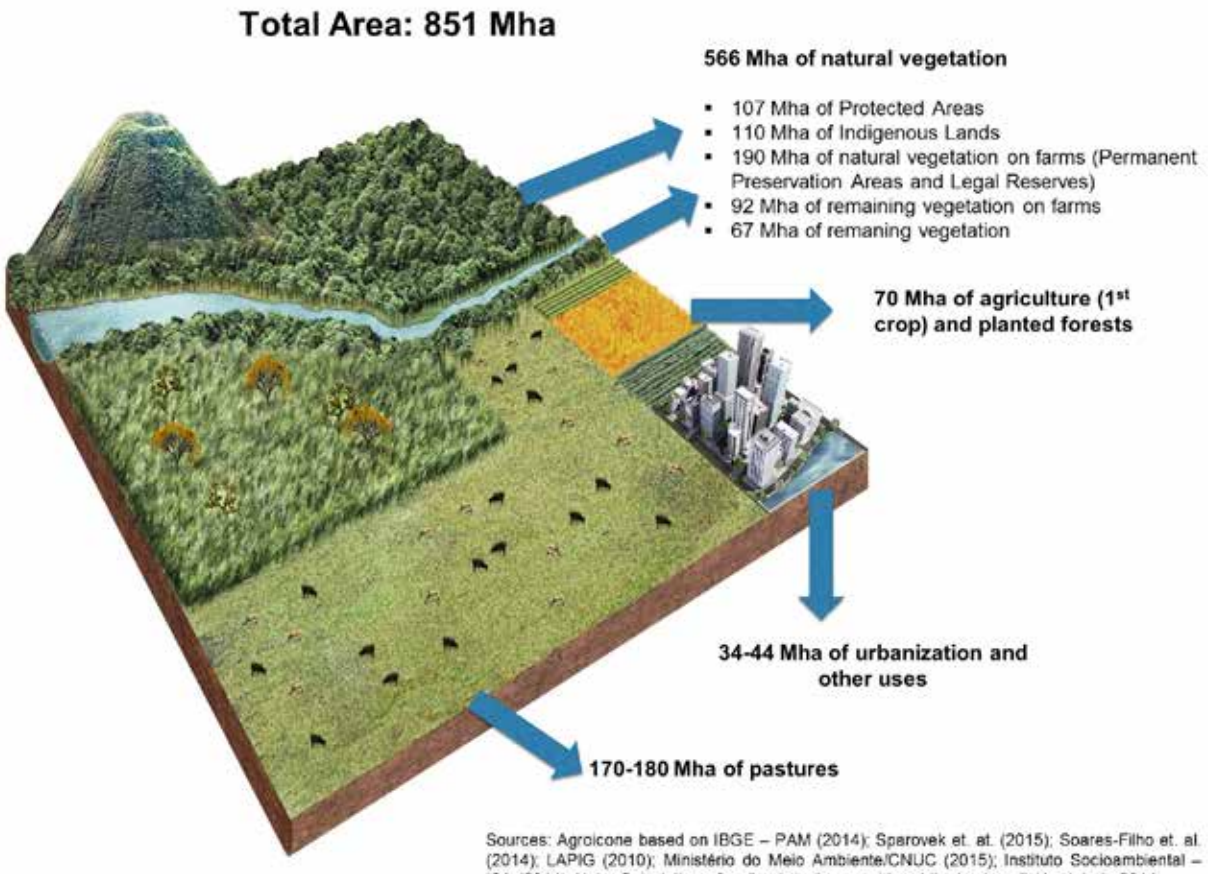
## 2.2 LAND USE AND PASTURE RESTORATION

The interplay between conservation and production policies are at the forefront of the agriculture and livestock sustainability. In one side, conservation policies based on the National System of Protected Areas – SNUC, represents 107 million hectares (Ministry of Environment, February 2015). Add to that, indigenous lands represent 110 million hectares.

Moreover, there are 190 million hectares of natural vegetation protected on farms due to conservation requirements of the Forest Law (Permanent Preservation Areas – APPs and Legal Reserve areas) and 92 million hectares of remaining vegetation not covered by specific conservation policies.

At the other side, agricultural areas comprise 70 million hectares of agriculture (just for the first crop) and 170 to 180 million hectares of pasturelands. Given the amount of available pastureland, the possibility to improve productivity through technology deployment, the availability of degraded areas to be restored and the challenge to promote restoration of native vegetation, land use for agriculture and livestock will pass through an accommodation process in the next decades. The figure below represents Brazil´s land use scenario in 2014.

### Land use in Brazil (2014)



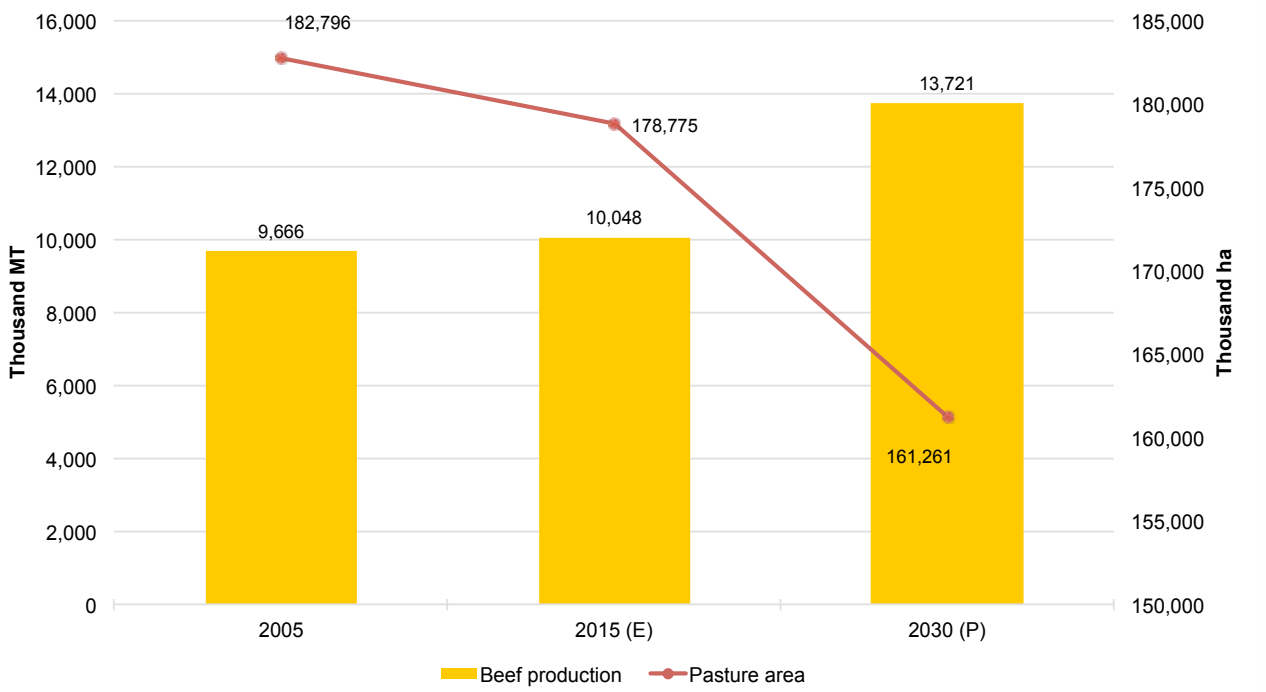

Sources: Agroicone based on IBGE – PAM (2014); Sparovek et. at. (2015); Soares-Filho et. al. (2014); LAPIG (2010); Ministério do Meio Ambiente/CNUC (2015); Instituto Socioambiental – ISA (2014). Note: Calculations for all categories considered the best available data in 2014.

The most relevant aspects of the land use changes for agriculture and livestock in the coming years will come from three sources:

- The amount of pasture area that will be restored (degraded pasture);
- The area of pasture that will be intensified (using different technologies from pasture plantation and management, passing through the use of genetics, crop-livestock rotation and integration of crop, livestock and forest);
- The area that will be released by pasture to other agricultural activities.

The expansion of livestock and agriculture does not rely on deforestation. The land use changes taking place over pasture will be key to allow a more efficient land use, considering productivity gaps. From 178 million hectares in 2014/2015 it is estimated that in 2030 pasture area would comprise 161 million hectares, releasing 17 million hectares of land for crops, planted forest and also restoration under the Law on Protection of Native Vegetation (Federal Law No 12,651/2015).

**Pasture area and beef production in Brazil**




Source: ABIEC and Agroicone.

The livestock intensification and pasture restoration will also increase cattle herd productivity, that is projected to achieve, in average, 6 @/hectare in 2030 (from 4@/ha/year in 2015). However, this process would rely on several issues as, for instance:

- Dissemination of knowledge about cattle herd intensification and its benefits to producers;
- Adoption of good agricultural practices;
- Perform rotational grazing and pasture management;

- Improving access to rural credit enabling the investment of less capitalized producers;
- Contracting technical assistance to implement intensification and provide funding for this type of assistance;
- Encourage producers to make cost and revenue control of their properties;
- Support producers to comply with the Law on Protection of Native Vegetation;
- Improve the use of inputs and genetics.

The private sector compromises to curb and control deforestation, the compliance process under the Law on Protection of Native Vegetation, the strict control over illegal deforestation and the intensification process will be key drivers affecting land use and specifically, pastureland dynamic in the coming years.

## 2.3 LAW ON PROTECTION OF NATIVE VEGETATION (FEDERAL LAW NO 12,651/2015)

The recently enacted Law on Protection of Native Vegetation (formerly known as "Forest Code") reflects a key policy instrument aiming to promote restoration of natural vegetation, curb illegal deforestation and regulate with a great degree of enforcement permitted conversion or legal deforestation.

The 2012 law succeeded the 1965 Forest Code and its several amendments and regulations relate to the obligations to keep and restore Permanent Preservation Areas (so called APPs) and Legal Reserve areas (so called LR).

The APPs are spaces to be preserved both in rural and urban areas and its criteria vary according to the width of the river and water bodies, steep slopes, hilltops and mangroves. On the other hand, the LR means a native vegetation area of 80% in the Amazon (50% in some cases), 35% in Cerrado areas in the North and 20% in other areas that must kept in rural properties.

The new law creates a compliance process considering producers who deforested before and after July 2008, with specific rules for each. Basically, producers will restore APPs and LR areas planting native species, promote natural revegetation if possible and, in the case of LR, compensate in remaining natural vegetation areas that would be legally eligible for deforestation in the same biome and state (compensation in different states would need to take place in priority areas and follow strict criteria).

In this regard, the compensation may become a kind of payment for environmental services, in which the owner will be paid to conserve the natural vegetation. Although the regulation related to the Environmental Reserve Certificates (Cota de Reserva Ambiental – CRAs) is not yet approved, there are different schemes aiming to build compensation markets in many states and promising to become an essential tool for environmental compensation and market incentive in the future.

The first step required by the new law is to enroll the rural property in the Environmental Rural Registry (Cadastro Ambiental Rural - CAR), an electronic registration website platform (SiCAR) that will comprise information about Permanent Preservation Areas, Legal Reserves and if there is a vegetation deficit. Hence, for the first time in history the country will have a reliable and clear source of information describing the real scenario of natural vegetation protected by farms and the debt of APPs and LRs that will need to be restored or pass through revegetation.

In this regard, until October 2015, the rural properties enrolled in the CAR reached an area of 244.67 million hectares from the total 398 million hectares, representing 61.5%. The Amazon reached 78.5%, the Center-West 60% and the South-East 58.5% while in the South 27.5% and in the Northeast 32%. The CAR´s deadline for those producers that want to use the compliance mechanisms will due in May 2016.

The most prominent issue around the CAR is that it may be used as tool for landscape planning, for farm planning and for transparency regarding environmental compliance of Brazilian farms. The usefulness of the CAR in the future given the possibility to pass clear and reliable information about land use situation may become an important instrument for producers, industry, retailers and consumers. Additionally, starting from 2017, producers without CAR will not be eligible for public credit in banks.

As the second step, the law creates the Environmental Compliance Program (Programas de Regularização Ambiental – PRAs) defining specific rules to be followed for those producers that will need to comply with the APPs and/or LRs areas. Thus, restoration is the ultimate goal for compliance, and natural restoration (revegetation) where is possible; the LRs areas could also be compensated and 50% of the LR debt could be planted with exotic species provided some requirements are followed.

Some States already approved PRAs regulations, as is the case of Paraná, Pará, Mato Grosso do Sul for example. In Pará, specifically, producers will have until September 2016 to accede at the State PRA, that actually would lead to the so called Terms of Compromise, containing the compliance actions to be done on a farm by farm basis.

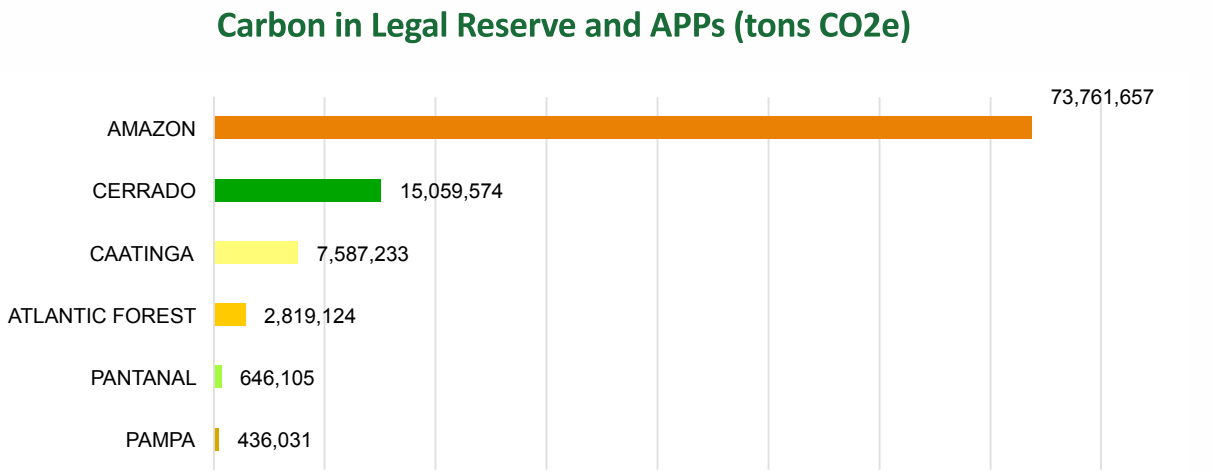
On the other hand, São Paulo approved a PRA Law but the compliance rules are pending, and Mato Grosso has a PRA project about to be approved as well as other States.

While the CAR enrollment is not complete, the estimated deficit for APPs accounts up to 6 million hectares and for LRs up to 19 million hectares. Most of this debt is located in the Amazon (up to 9.1 million hectares), the Cerrado (6.7 million hectares) and the Atlantic Forest (7.4 million hectares).

This compliance process creates a great opportunity to balance production and protection, generating a restoration agenda for Brazil. Thus, the iNDC submitted by Brazil foresees the restoration of up to 12 million hectares of forests for multiple purposes, which covers the compliance agenda.

It is essential to mention that besides the restoration agenda brought by the compliance process, the APPs and LRs requirements already protect 190 million hectares under these new rules. The stocks of carbon on this vegetation on farms represent positive externalities of the Brazilian agriculture, despite the fact that until today there are no effective policies to incentive and promote the conservation and increment of carbon stocks regardless the legal requirements.

The figure below represents the amount of carbon stocked in APPs and LRs areas, amounting 99 billion tons of CO2 equivalent. Add to that, the restoration of at least 12 million hectares APPs and LRs can deliver a carbon sequestration of up to 4,5 billion tons of CO2 equivalent, which represents more than 10 times the emissions of agriculture in Brazil based on 2012 figures.




Source: Agroicone based on Soares-Filho et. al. 2014.

[4]Cadastro Ambiental Rural, Boletim Informativo, Outubro 2015. Available at file:///Users/rodrigocalima/Downloads/boletim_informativo_car_out2015.pdf

[5]Soares Filho, B. et al. 2014. Cracking Brazil's Forest Code. Science vol. 344, pp363-364.

It must be highlighted that the compliance agenda is a long-term policy, predicted to last up to 20 years after each producers accede to the compliance process. In light with the CAR process in the states, the approval of PRAs to base the compliance process and the start of restoration will promote a new dynamic on land use.

# 3.BIODIVERSITY AND LIVESTOCK

Considering the extent of pasture areas and the different policies and actions promoting deforestation reduction and zero illegal deforestation, it is important to situate livestock production in the context of biodiversity protection. The map below represent the different Brazilian biomes.

### Carbon in Legal Reserve and APPs (tons CO2e)

It is important to assume that the compliance with the Law on Protection of Native Vegetation Forest Law would promote restoration and a strict control over legal deforestation (only those who are complying with the APPs and LRs criteria that have enrolled the CAR would be eligible to apply for legal deforestation). In parallel, the enforcement of policies against illegal deforestation, and the improvement of conservation policies based on the National System of Protected Areas would have a great impact on deforestation reduction and biodiversity loss.

The reduction of pastureland due to restoration and intensification will also play an important role towards supporting biodiversity values, especially with the conservation of the Permanent Preservation Areas and Legal Reserve Areas, which are protected areas within the Law on the Protection of Native Vegetation. The existing APPs and LR areas sum 190 million hectares, mostly located in the Amazon and the Cerrado.

The Environmental Rural Registry (CAR) would capture geographically the location of these areas in the different biomes, linking it to each farm, which will allow a transparent information about how producers are addressing their conservation obligations.

Naturally, cattle ranching activities ongoing in recently deforested areas have negative externalities considering biodiversity. However, the conservation requirements already in place in farms have an important role in biodiversity conservation, contributing to the Aichi Biodiversity Targets and the Brazilian Biodiversity Targets.

Additionally, the intensification process leading to productivity gains and the restoration of degraded pastureland tend to reduce the need for new converted areas and, therefore, it will have important impacts towards monitoring biodiversity indicators overtime.

The Aichi Biodiversity targets complement the Sustainable Development Goals and advancing sustainable livestock has a key role to play in addressing those targets. For instance, Target 4 (sustainable production and consumption), Target 5 (loss of natural habitats), Target 7 (sustainable agriculture and conservation of biodiversity), Target 11 (protected areas) and Target 15 (ecosystem resilience) are closely related to the development of sustainable livestock and the deployment of best practices considering regional characteristics.

The table below comprises information about indigenous land areas, protected areas based on the SNUC, APPs, LR areas and remaining vegetation areas on farms.

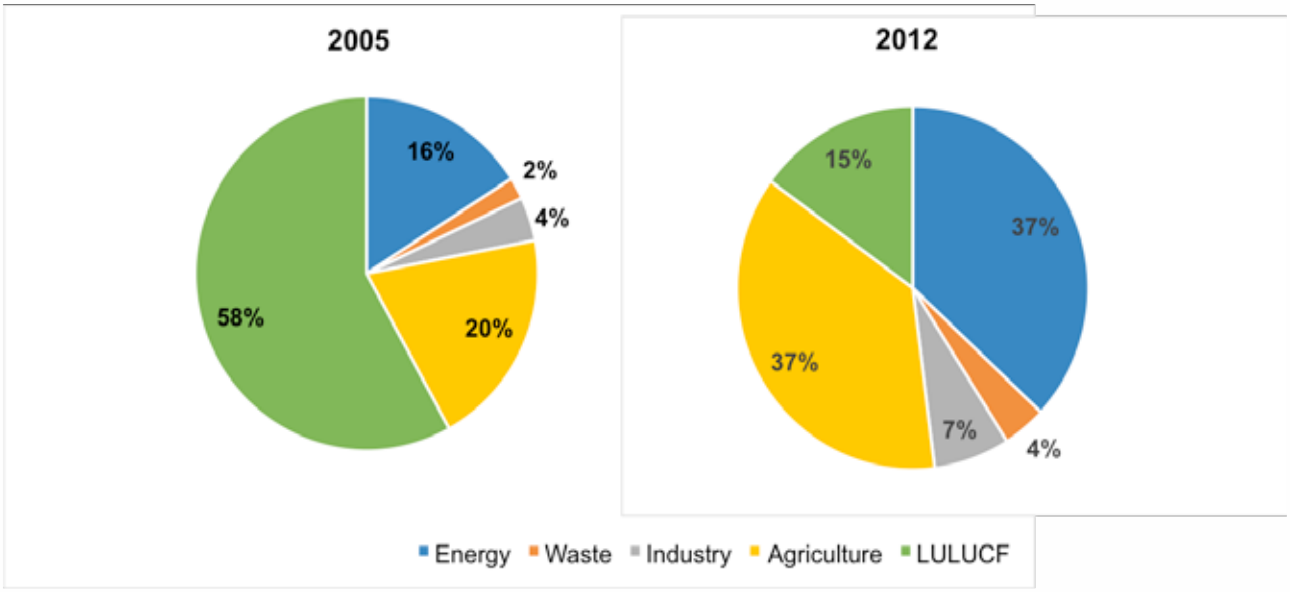
| BIOMES | BIOMES AREA (HECTARES) | REGULARIZED INDIGENOUS LANDS (TIs) | PROTECTED AREAS UNDER THE SNUC (UCs) | PERMANENT PRESERVATION AREAS (APPs) | LEGAL RESERVE AREAS - LR | REMAINING NATURAL VEGETATION ON FARMS | TIs + UCs + APPs + LR - Remaining vegetation/Biome |
|---|---|---|---|---|---|---|---|
| AMAZON | 419,694,300 | 99,983,417 | 96,439,600 | 4,787,361 | 103, 112, 698 | 12, 654, 890 | 76% |
| CAATINGA | 84,445,300 | 266,385 | 1,118,100 | 2,319,642 | 15, 031, 080 | 25, 798, 422 | 53% |
| CERRADO | 203,644,800 | 9,971,023 | 6,585,200 | 3,278, 756 | 43, 977, 095 | 40, 081, 507 | 51% |
| ATLANTIC FOREST | 111,018,200 | 630,013 | 3,096,600 | 787,923 | 11, 200, 514 | 4, 018, 774 | 18% |
| PAMPA | 17,649,600 | 3,232 | 416, 635 | 299, 912 | 2, 543, 675 | 3, 043, 384 | 36% |
| PANTANAL | 15,035,500 | 273,055 | 6,947 | 483, 445 | 2, 534, 544 | 7, 275, 775 | 70% |
| TOTAL | 851,487,700 | 110,227,125 | 107,663,082 | 11, 957, 039 | 178, 399, 606 | 92, 872, 751 | 59% |

Sources: Ministério do Meio Ambiente/Cadastro Nacional de Unidades de Conservação-CNUC (2015); Instituto Brasileiro de Geografia e Estatística (IBGE); Soares-Filho et. al. (2014); Instituto Socioambiental – ISA (2014). Notes: SNUC – National System of Protected Areas does not include Environmental Protected Areas, called APAs.

# 4.GHGS EMISSIONS AND LOW CARBON AGRICULTURE

Brazilian GHGs emissions pattern has shifted in the last years. In 2005 emissions from the land use, land use change and forestry (LULUCF) sectors represented 58% of the total emissions in CO2 equivalent. In 2012, this number shifted to 15% due to deforestation reduction, and the energy and agricultural sector became the most important sector in terms of emissions, representing 37% each.

**Brazilian GHGs Emissions Profile**




Source: MCTI/2014.

Methane (CH4) accounts for 62% and nitrous oxide (N2O) for 38% of the total agricultural emissions (446 million tons of CO2 equivalent). Residue burning, emissions from soils, enteric fermentation as the pushing activity for methane emissions, where enteric fermentation from livestock represents 75%, followed by 12% of dairy cattle and 13% from enteric fermentation of other animals, manure, residue burning from sugarcane e rice. The main emissions of N2O come from agricultural soils due to manure from animals, the use of synthetic fertilizers and animals in pastures.

In the Second Communication to the UNFCCC (2005), Brazil highlighted a methodological aspect related to the accounting based on the Global Warming Potential (GWP) versus the Global Temperature Potential (GTP).

> "The GTP compares greenhouse gas emissions by means of their contributions to the change in the average temperature of the Earth surface in a given future time period and better reflects the real contribution of the various greenhouse gases to climate change. GTP would, thus, allow for more appropriate mitigation policies. GWP does not appropriately represent the relative contribution of the different greenhouse gases to climate change. Its use would overemphasize and erroneously stress the importance of greenhouse gases that remain in the atmosphere for only short periods of time, such as methane, leading to erroneous and inappropriate mitigation strategies in the short and long terms and erroneously driving mitigation priorities. Exaggerated importance has been assigned to methane

[6]MCTI, Estimativas anuais de emissões de gases de efeito estufa - [2]a edição, [2014].

emission reduction and to some industrial gases that remain in the atmosphere for a short period of time, thus shifting the focus away from the need to reduce CO2 emissions from fossil fuels and to control some of the industrial gases that remain in the atmosphere for a long period of time."

The importance of the debate about measuring carbon balance with GWP and/or GTP is not new in the UNFCCC. The Intergovernmental Panel on Climate Change states "the most appropriate metric and time horizon will depend on which aspects of climate change are considered most important to a particular application. No single metric can accurately compare all consequences of different emissions, and all have limitations and uncertainties".

Therefore, it is important to situate the debate about the most appropriate methodology to account for short-lived GHGs. Livestock methane emissions are highly impacted by the use of GWP considering its emission factor. The table below shows the difference in the GTPs and GWPs emissions factors, and its impact on the total emissions of methane and nitrous oxide from the agricultural sector in 2012.

## GWP vs GTP and Livestock Emissions

| GHG | EMISSIONS (2012) | GWP | GTP | $CO_{2e}$ (GWP) | $CO_{2e}$ (GTP) | VARIATION (GTP/GWP) |
|---|---|---|---|---|---|---|
| $CH_4$ | 13,270 | 21 | 5 | 66, 350 | 24% | 12, 654, 890 |
| $N_2O$ | 541 | 310 | 270 | 146, 070 | 87% | 25, 798, 422 |
| TOTAL | - | - | 446,380 | 212, 420 | 48% | 40, 081, 507 |

Sources: Agroicone based on Estimativas anuais de emissões de gases de efeito estufa no Brasil. Available at: http://www.mct.gov.br/upd_blob/0235/235580.pdf and GTP-100 for CH4 and N2O – SHINE et al. (2005).

The Brazillian iNDC also highlights the importance of capturing the differences of GWP and GTP methodologies. The Third National Communication to the UNFCCC, that is about to be published, will also consider both methodologies.

In parallel, it would be important to follow how Paris Agreement will affect land use, land use change and forestry and the agriculture sectors emissions balance and accounting. It is reasonable to say that in the near future Parties will adopt decisions considering methodologies and rules for detailed carbon accounting, which will cover pastures and livestock production.

In Brazil, it is already possible to notice improvements in methodological aspects related to GHGs in livestock. Data organization and information for integrated analyzes at regional levels, the development of new assessment methods, the methodological standardization and the creation of databases of emission factors for evaluation of life cycle accounting for the carbon footprint in cattle production systems and the Developing applications for production systems in order to allow the assessment of greenhouse gas balance and mitigation strategies of greenhouse gas emissions on farms.

[7]MCTI [2010], Second National Communication of Brazil, page [16].

[8]IPCC, [2013]: Summary for Policymakers. In: Climate Change [2013]: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. SPM D.[2] p.[15].

[9]BARIONI, Luís Gustavo. Pecuária e balanço de carbono. [2015], to be published

Along with the improvement of methodologies and GHGs accounting, it is relevant to quote that the adoption of low carbon practices can have positive impacts on livestock production and other agricultural practices.

Brazil adopted the path towards a low carbon agriculture in 2010, as part of the National Climate Change Policy (Federal Law No 12,187/2009 ), which was enacted after Brazil committed to Nationally Appropriate Mitigation Actions – NAMAs, during the COP15 in Copenhagen.

The ABC Plan (Low Carbon Agriculture) is a sector plan for mitigation and adaptation of climate change, created by the Federal Government and managed by the Ministry of Agriculture. Among its several goals, there are specifically financial incentives for the 6 following most relevant actions :

- Restoration of degraded pastures (15 million hectares);
- No till (8 million hectares);
- Biological nitrogen fixation (5,5 million hectares);
- Integrated crop-livestock-forest - iLPF (4 million hectares);
- Planted Forests (3 million hectares);
- Treatment of animal waste (4,4 million m3).

In order to achieve such goals, it has been created a special incentive/credit line, approved by the Central Bank, for financing sustainable technologies/projects, which offered 4.5 billion Reais in 2014 alone, with 5% annual interest rates. Through the ABC Plan is expected that a total of 197 billion Reais be used to finance low carbon agriculture projects during the time-frame 2011 – 2020, achieving up to 163 million tons of CO2e reductions until 2020.

However, despite the importance of the ABC Plan as a GHG mitigation finance program, it already faces challenges that will need to be overcome in the near future. In this sense, according to the latest regional disbursement/credit assessment concerning the time frame 2014/2015, it than can clearly identified a severe disproportion of disbursement and contracts signed between regions.

The Southeast and CenterWest regions received 958 million Reais and 1 billion Reais respectively, while the North and Northeast, which strongly need more support to develop their economies and reduce poverty, especially concerning rural population, received only 295 million Reais and 311 million Reais respectively.

The improvement of the ABC Plan from 2016 on will rely on the Paris Agreement and the need to create an enabling environment aimed at promoting pasture restoration and good agricultural practices when it comes to livestock. The ability to measure GHGs reductions based on the Plan is also a cross cutting challenge that deserves attention.

Considering a mitigation potential of 6,78 tCO2e/ha for pasture recovery and integrated crop-livestock-forestry system, which includes soil carbon stock variation, enteric fermentation, manure and nitrogen fertilization these actions might mitigate about 100 and 25 million tCO2e, respectively (Observatório ABC, 2013).

[10]Regulated by the Federal Decree No 7,390/2010

[11]Federal Decree No 7,390/2010, Article 6.

[12]BACEN Resolution 3,896 de 17/08/10.

Others studies, such as Economic and Social Implications (IES-Brasil, 2014) has included carbon content of forest in the iLPF system. This would lead an increase in mitigation potential of 106 tCO2e/ha in 20 years. According to Imaflora,

> "With the use of areas of degraded pastures currently existing in Brazil and the adoption of low-carbon practices, by 2030 it will be possible to meet the demand for agricultural products and also reduce by 50% GHG emissions from the agricultural sector, without carrying out deforestation. Moderate intensification of livestock production, the use of no-tillage cultivation system and the implementation of IAFP systems are key to achieving this scenario."

Acknowledging that pasture restoration and livestock intensification are the key drivers towards productivity gains, it is important to consider carbon sequestration from better pasture management, pasture restoration and practices as iLPF as parameters to measure the life cycle of beef production in Brazil.

These figures could be improved if carbon stocks from avoided deforestation due to increase of stocking rate in these areas (pasture recovery and iLPF allow more animals in the same area) are also considered, and also related to restoration under the Law on Protection of Native Vegetation (Federal Law No 12,651/2015). These factors will allow accurate GHGs balances of agricultural production.

# 5.BRAZIL CONTRIBUTIONS TO THE PARIS AGREEMENT

In its recently presented Intended Nationally Determined Contribution-iNDC, Brazil set an absolute GHGs reduction of 37% below 2005 up to 2025, going beyond and achieving 43% in 2030.

It was the first developing country to commit to an absolute reduction. To achieve this reduction, Brazil would adopt measures addressing land use, bioenergy, forest restoration, low carbon agriculture and energy efficiency. The most relevant measures are:

- Strengthening and enforcing the implementation of the Forest Code, at federal, state and municipal levels;
- Brazilian Amazonia zero illegal deforestation and compensating for greenhouse gas emissions from legal suppression of vegetation by 2030;
- Restoring and reforesting 12 million hectares of forests by 2030, for multiple purposes;
- Enhancing sustainable native forest management systems, with a view to curbing illegal and unsustainable practices.

Specifically for agriculture activities, as part of the Low Carbon Emissions Agriculture Program (ABC), Brazil committed to restore an additional 15 million hectares of degraded pasturelands as well as enhancing 5 million hectares of integrated cropland-livestock-forestry systems by 2030.

In addition to these measures, despite having already a successful biofuels program, Brazil wants to improve this energy segment. In other words, the country has the goal to increase by 18% its fuel consumption by 2030 with biofuels, such as ethanol, advanced biofuels (second generation) and increase the share of biodiesel in the diesel mix.

Finally, as to the energy sector as a whole, the country has compromised to continue its efforts to maintain a sustainable matrix, achieving 45% of renewables in the energy mix by 2030, including:

[13]Piatto, Marina. Voivodic, Mauricio; Costa Junior, Ciniro. Perspective Imaflora. The road to Brazilian agriculture: increased production with lower emissions. October [2015].

- Expanding the use of renewable energy sources other than hydropower in the total energy mix to between 28% and 33% by 2030;
- Expanding the use of non-fossil fuel energy sources domestically, increasing the share of renewables (other than hydropower) in the power supply to at least 23% by 2030, including by raising the share of wind, biomass and solar;
- Achieving 10% efficiency gains in the electricity sector by 2030.

Thus, livestock production will play an important role towards Brazil´s contributions to the Paris Agreement. In one side, restoration under the Law on Protection of Native Vegetation could lead to a carbon sequestration of up to 4,5 billion tons of CO2e in the next 30 years. Add to that, the compensation of Legal Reserve areas would work as an avoided deforestation practice and, therefore, storing carbon on natural vegetation that could be legally converted.

The Law on Protection of Native Vegetation enforcement and its compliance process open a huge mitigation and adaptation agenda for Brazil, having the agricultural sector as the main actor. Policies to promote and incentivize not only restoration but also legal deforestation reduction will take part of a next generation of policies linked to land use dynamic in Brazil.

In addition, it is important to cite the restoration of pastures as a key sustainable indicator for livestock production. The increase in restored pasture will allow the increase of production, in short periods with reduced GHGs emissions.

# 6.WATER USE

Water is a scarce natural resource and absolutely necessary for life and food production. The responsible use of water has an intimate relationship with food security and poverty eradication, as well as sustainable patterns of production and consumption.

Climate change tends to increase heat stresses, droughts and floods, creating a competition for water due to population growth, migration flows, urbanization, industrialization, food and energy security and climate impacts events.

As a general figure, agriculture is recognized for consuming 70% of fresh water worldwide, reaching 90% in some developing countries. The livestock sector is labeled as an intense water user, due to deforestation, pasture degradation, impacts from the animals on the soil and water courses and the industry water footprint.

The fact that beef production in Brazil is based on extensive pasturelands, ranging from 170 to 180 million hectares, and pasture degradation involves low productivity pastures and differences in soil degradation, restoration of degraded pastures is a key action aimed at addressing a responsible water use. As well as for carbon and biodiversity, the possibility to restore pasture areas – reaching the 15 million hectares of the ABC Plan plus the 15 million hectares of the Brazil iNDC – will mean a huge achievement to promote sustainable livestock.

Furthermore, grazing and mixed farming systems, based on the adoption of good practices as crop-livestok rotation, integration of crop-livestock-forest, quality of pasture, reducing heat stress and shortening the termination of the animals can reduce the impact of livestock production on water.

Moreover, the restoration of Permanent Preservation Areas is a critical aspect that may bring positive impacts to water protection on rivers, water basins and water springs. The restoration of Legal Reserve areas in degraded and low productivity pastureland is also another way of improving water protection and creating positive carbon and biodiversity indicators.

The water footprint to produce beef – known as 15,500 l/kg – is heavily reliant on green water (rainfall water) – 93%, blue water (surface and ground water) – 4%, and gray water (water required for the dilution of effluents in the production process) – 3%.

In Brazil, green water represents the water necessary to produce pasture and grains and is directly linked to the challenge to increase beef and grains productivity in relation to land use, reduce the pasture degradation, curb deforestation, promote manure treatment and other actions. The improvement of metrics used to calculate beef water footprint in Brazil must consider regional characteristics and specific production patterns. Broad metrics tends to create unbalanced results and to generalize beef production as one standard model.

It is also important to consider that adaptation actions in harmony with the ABC Plan and the future Adaptation Plan to be approved in Brazil should address the use of water and its availability in order to minimize effects of climate change and the impacts on food production. Among the ABC Plan adaptation actions, some are directly related to water use:

- The development of priority maps for water conservation;

  Systematize regional capacities for the implementation and adaptation of different systems of diversified use of natural resources (biodiversity, water and soil);

- To develop research projects on the conservation and sustainable use of water resources, soils, the flow of gases and nutrients including diverse and productive natural systems directly related aiming their adaptation and resilience to climate change.

Where as the relation about rational use of water, irrigation, sustainable livestock, food security and poverty eradication can generate economic, environmental and social benefits, it is important to consider the potential to restore pasture areas and preservation areas, increasing cattle productivity while decreasing the use of land as a way to address water in a responsible manner in the Brazilian livestock.

# 7.SUSTAINABLE LIVESTOCK AND THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

The Sustainable Development Goals (SDGs) approved by the United Nations Parties in September 2015 supersedes the Millennium Development Goals (MDGs), a set of targets promoting sustainable development and poverty eradication, adopted in 2000. Thus, the SDGs are an intergovernmental set of 17 goals with 169 targets aiming to promote concrete steps towards sustainable development up to 2030 that go much further than the MDGs, addressing not only the subjects previously mentioned, but also the root causes of poverty and the universal need for development.

In this sense, it is substantial to quote among its 17 goals, the SDGs that are closely related to the debate of sustainable livestock.

**A]** SDG2: “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”

SDG2 is profoundly important, once its tackles one of humanity’s most severe and oldest problems - hunger. It is known and also stated by the Food and Agriculture Organization of the United Nations (FAO) that presently the world has 805 million famines, mostly located on the African continent, especially in rural areas, in which 90 million children under the age of five are dangerously underweight and one person in every four is hungry.Therefore, increasing food supply, making it more accessible and affordable for the poor is key challenge in order to achieve this objective.

Likewise, it must be highlighted that the world population is constantly growing, thus, food production must not only address the global population today, especially those who do not have access to it, but also plan itself to support a much larger number, in this case 8.5 billion people by 2030 and 9 billion by 2050 , mostly from poor and developing countries.

Moreover, the concentration of population growth in the poorest countries presents its own set of challenges, making it more difficult to eradicate poverty and to combat hunger, which are crucial to the success of the SDGs (e.g. by some 31 million annually in 2050 in Africa and South and Western Asia together ).

Lastly, in order to feed this larger and growing population by 2050, "food production (net of food used for biofuels) must increase by 70 percent. Annual cereal production will need to rise to about 3 billion tons from 2.1 billion today and annual meat production will need to rise by over 200 million tons to reach 470 million tons ".

In this regard, since SDG2 has as main core three interrelated components (i) ending hunger, (ii) food security and (iii) improved nutrition, expecting that those demands be matched, it targets the following:

- By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round (SDG2 target 2.1);
- By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons (SDG2 target 2.2);
- By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment (SDG2 target 2.3);
- By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality (SDG2 target 2.4);
- By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed. (SDG2 target 2.5).

**B)** SDG12: "Ensure sustainable consumption and production patterns"

In the same rationale to eradicate poverty and promote sustainable development, SDG12 has the role to ensure sustainable consumption patterns by 2030. This is extremely relevant because it raises attention to the wise use of limited natural resources and how economic activities can be strengthened, creating more jobs, boosting the economy, but also allied with environmental protection.

However, since sustainable consumption and production implies a broad societal changes which requires a systematic approach to human development based on ecological, social and economic dimensions, its targets and results can be more difficult to achieve or more likely to fail, unless an industry restructure is effectively fomented.

Finally, since the SDG 12 has the purpose to develop an improved and sustainable matter of production, it also requires the preservation of biodiversity, which is directly linked with the Convention on Biological Diversity, specifically its Aichi target 7 , hence, strengthen existing best practices of production is not only a positive approach to the issue, but also an imperative one.

[14]FAO, FIDA e PMA. 2014. FAO, FIDA e PMA. 2014. O Estado da Insegurança Alimentar no Mundo, 2014. Fortalecimento de um ambiente favorável para a segurança alimentar e nutrição. Roma, FAO

[15]Id., Supra.

[16]FAO report "How to Feed the world in 2050".High Level Expert Forum, Rome, October 2009. Available at: http://www.fao.org/wsfs/forum2050/wsfs-forum/en/

[17]World agriculture: towards 2030/2050 Interim report Prospects for food, nutrition, agriculture and major commodity groups. Global Perspective Studies Unit Food and Agriculture Organization of the United Nations, Rome, June 2006. Available at: http://www.fao.org/es/ESD/gstudies.htm

[18]FAO study "How to Feed the world in 2050". Available at http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf

**C)** SDG 15: "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"

Concerning SDG 15, it addresses the environmental protection perspective of eradicating poverty and sustainable development, ensuring the preservation of ecosystems as well as biodiversity. In this regard, as also stated in SDG 12 supra, new methods of food production on a sustainable manner are vital in the future, since a poorly managed food production or farming can cause severe damages to the environment and biodiversity, both strictly linked mainly to deforestation.

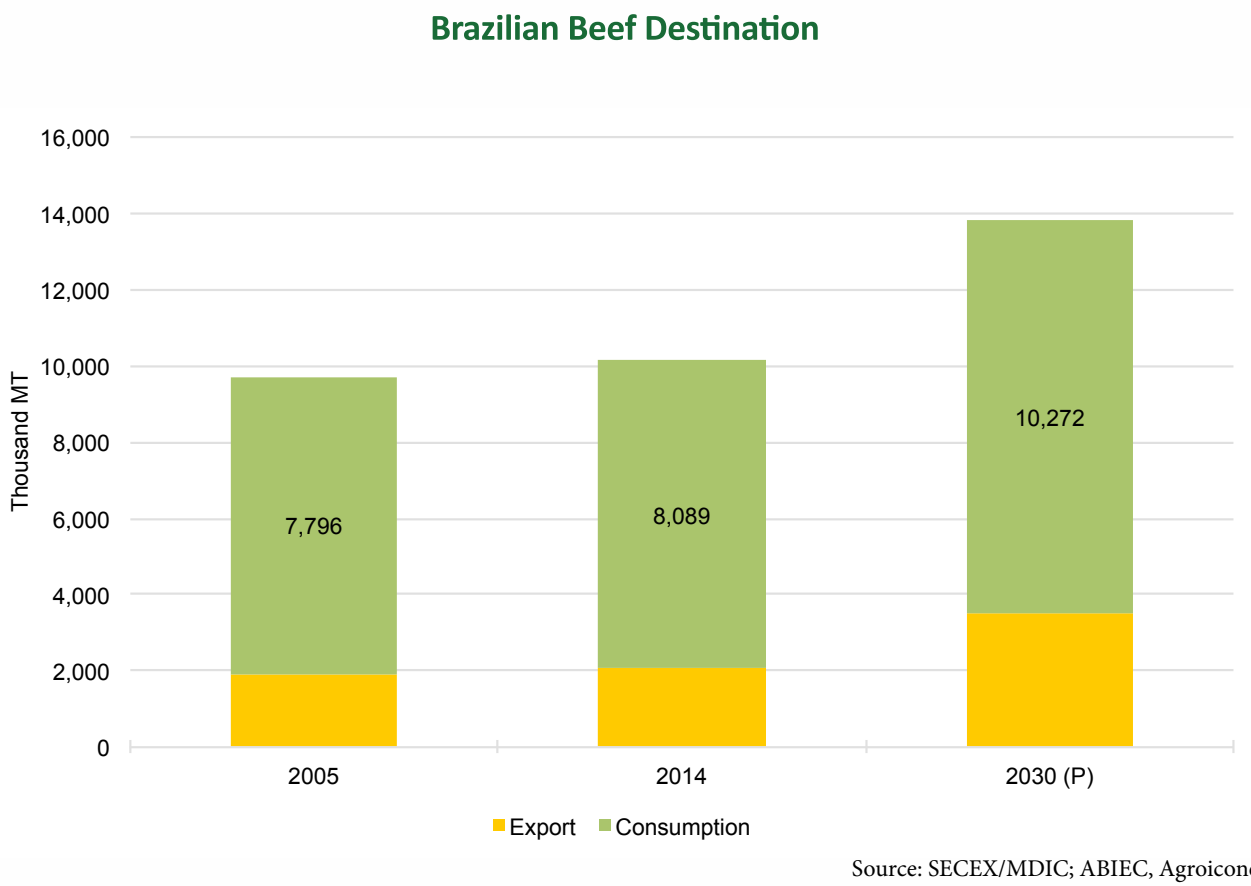
Therefore, increasing food production is essential, but do it on a sustainable, productive and planned manner is extremely important for the future and for human health.

In this sense, the challenges towards promoting sustainable livestock in Brazil, which has the restoration of degraded pastures, comprising intensification and the increase of productivity, the compliance process towards the Law on Protection of Native Vegetation and reduce deforestation are key factors for scaling up good practices and more sustainable patterns of production.

Based on the facts mentioned above, eradicating poverty, ensuring food security in a sustainable manner and preserving biodiversity is vital in order to achieve the SDGs and fulfill its results within the deadline agreed in its targets. Fact clearly stated on SDGs 2, 12 and 15, in which all people by 2030 must have access to affordable and nutritious food, sustainably produced, along with environmental protection and preservation of ecosystems and biodiversity.

Moreover, it is relevant to cite Target 6, aimed at ensuring availability and sustainable management of water and sanitation for all. The proper use of water in the beef sector requires not just technological improvements at the industry side, but principally the adoption of good practices in the field. Pasture management and specifically pasture restoration are key activities to promote SDG 6 in the livestock sector in Brazil.

In this sense, the promotion of sustainable livestock practices will play an important role in providing a stable and nutritious source of protein worldwide. The graph below presents the consumption and exports of beef overtime, highlighting the role of Brazil as a leading source of beef.




Source: SECEX/MDIC; ABIEC, Agroicone.

# 8.INITIATIVES PROMOTING SUSTAINABLE LIVESTOCK

The promotion of a positive agenda towards sustainable livestock practices is a central pillar of the long-term goal to disseminate and change the paradigm of Brazilian livestock. Enhancing productivity, restoring degraded pastures, promoting crop and livestock rotation, the adoption of integrated crop livestock and forest projects and other actions like improving genetics are key challenges.

Aimed to work with this agenda, the Brazilian Roundtable on Sustainable Livestock (Grupo de Trabalho da Pecuária Sustentável – GTPS) founded in 2007 and officially launched in 2009, was created involving key public and private stakeholders of the Brazilian beef market, aiming to build principles and standards to support sustainable livestock practices.

Among its several actions, the group has strongly focused on the assistance of small producers and rural owners to improve their practices, making them more sustainable, productive and using natural resources wisely, also reducing poverty. In this sense, it must be underscored its 12 projects currently ongoing in Brazil, as presented below:

| PROJECT | FACTS |
|---|---|
| **Terra Certa** | **Organizations:** EMBRAPA, Amazônia Oriental, MPEG, CIRAD, CIFOR |
| | **Municipality:** PARAGOMINAS/PARÁ |
| | **Time Frame:** 03.01.2015 - 02.28.2019 |
| | **Goal:** Improve sustainable livestock best practices with local ranchers. Also consolidate public-private partnerships on the issue. |
| **Projeto Pecuária Sustentável - São Felix do Xingu** | **Organization:** The Nature Conservancy (TNC) |
| | **Municipality:** São Felix do Xingu/Pará |
| | **Time Frame:** 2014 – 2017 |
| | **Goal:** Increase productivity through the appropriate management of soil, animals and establishing credit lines. |

| | |
|---|---|
| **Novo Campo Program[20]** | **Organization:** Instituto Centro Vida (ICV) |
| | **Municipality:** Alta Floresta/Mato Grosso |
| | **Time Frame:** 10.28.2014 – 10.28.2016 |
| | **Goal:** Promotes sustainable practices improving their economic, social and environmental performance, with the aim of reducing deforestation, conserving or restoring natural resources, and strengthening the local economy. |
| **Pecuária Sustentável na Prática - Rondônia** | **Organization:** IMAFLORA |
| | **Municipality:** Rolim de Moura, Cacoal, Alta Floresta do Oeste and Pimenta Bueno/Rondônia |
| | **Time Frame:** 2013 on |
| | **Goal:** Install unities to demonstrate and disseminate livestock good practices in combination with low environmental impact and GHG emissions reductions. |
| **Pecuária Sustentável na Prática - Barreiras** | **Organization:** ACRIOESTE |
| | **Location:** Alto da Serra Farm (State of Bahia) |
| | **Time Frame:** 2014 – 11.2015 |
| | **Goal:** Access the ranchers' profiles in order to elaborate individual reports and recommendations for improvement. |

[19]Recently, GTPS along with Gordon and Betty Moore Foundation issued a map with the [12] projects for sustainable livestock practices in Brazil. Available at http://www.pecuariasustentavel.org.br/en/map-of-initiatives/

[20]Available at: http://www.icv.org.br/site/wpcontent/uploads/[2014]/[10]/Apresentacao_Programa_Novo_Campo.pdf

| | |
|---|---|
| **Intensificação na Produção e proteção a pequenos proprietários e reservas indígenas na Amazônia** | **Organization:** Fundação Solidariedad Latino Americana |
| | **Location:** Novo Santo Antônio/Mato Grosso |
| | **Time Frame:** 2012 – 06.2015 |
| | **Goal:** Reduce poverty, protect the environment and improve productivity of local ranchers and small producers. |
| **Piloto Pecuária Sustentável no Vale do Araguaia** | **Organization:** Grupo Roncador |
| | **State:** Mato Grosso |
| | **Time Frame**: 2015 - 2020 |
| | **Goal:** Replace local traditional ranching with modern and sustainable livestock practices and monitor GHGs emissions based on the GHG Protocol Agricultural Guidance. |
| **Pecuária Neutra em Metano** | **Responsible/Assigned:** Leonardo de Oliveira Resende |
| | **Municipality:** Coronel Pacheco/Minas Gerais |
| | **Time Frame:** 2007 on |
| | **Goal:** Adoption of techniques and practices of clean development and low environmental impact. |

| | |
|---|---|
| **Sistema de Monitoramento e Gestão de Riscos Sociais da Cadeia de Pecuária Bovina no Bioma Amazônia** | **Organization:** Walmart Brazil |
| | **Location:** Undetermined (Amazon Biome) |
| | **Time Frame:** 2011 – 2015 |
| | **Goal:** Develop a monitoring system to access deforestation areas in the Amazon Biome, collect and use data in order to track the origin of its products and suppliers. |
| **Pecuária Sustentável na Prática – Mato Grosso do Sul** | **Organization:** Novilho Precoce |
| | **Location:** Mato Grosso do Sul |
| | **Time Frame:** 05.2013 – end of 2015 |
| | **Goal:** Implement the EMBRAPA's Boas Práticas Agropecuária – BPA[16] (plan to improve best and sustainable practices of livestock). |
| **Projeto Pecuária Sustentável na Prática - "Carne Sustentável do Pantanal"** | **Organization:** Associação Brasileira de Produtos Orgânicos (ABPO) |
| | **State:** Mato Grosso do Sul |
| | **Time Frame:** 12.2013 |
| | **Goal:** Elaborate due diligence standards for the certification of the rural properties. |

It is worth noting that the initiatives mentioned are not exhaustive. There are plenty of different actions and projects in Brazil, adopted by NGOs, associations of producers, rural syndicates, cooperatives, and federations of agriculture, banks, and different public actors. The key aspects underlying livestock projects are pastureland and technical assistance related to the application of good practices. These two drivers will play a heavy influence not only on the reduction of pasture area in the future, but mainly in the ability to produce more meat using less pastures, reducing GHGs emissions and water use and aggregating quality to the Brazilian beef.

# 9. CONCLUSIONS

The underlying conclusion is that pastureland restoration and livestock intensification are the most important drivers affecting livestock sustainability. The possibility to curb deforestation, comply with the Law on Protection of Native Vegetation (Federal Law No 12,651/2015) and bring degraded area to a high productivity area are the cornerstones of the sustainable livestock sector in Brazil.

The reduction of pasture is about to reach 161 million hectares in 2030, releasing up to 17 million hectares to other crops, planted forest and also for restoration under the Law on Protection of Native Vegetation compliance process. It is worth noting that restoration of degraded pastures can mean a cost efficient way to comply with Legal Reserve requirements given the fact that in some cases the low productivity easily justifies the conversion of the area for conservation purposes.

- To address deforestation it is important to combine different sorts of policies:
- Cutting down to zero illegal deforestation;
- Promote the environmental compliance under the Law on Protection of Native Vegetation creating incentives to promote restoration and revegetation of natural vegetation and compensation of LR areas;
- Push the Rural Environmental Registry – CAR in the whole country as a tool to allow land use management and a strict control over legal deforestation in specific cases;
- Enforce the PPCDam as well as ecological economic zoning;
- Create payment for environmental services schemes as a way to avoid legal deforestation and incentivize conservation of natural vegetation and water.

Brazil's contribution to the Paris Agreement encompasses pasture restoration and low carbon practices as key activities. During 2016 and 2019 Brazil will need to build on its National Policy of Climate Change, its ability to measure and improve its national inventories, especially considering agriculture and the land, land use and forestry sectors. Along with the negotiations of methodologies and metrics related to land use and agriculture that probably will take place in the scope of the Paris Agreement from 2016 on, it will be critical to assess and promote the dissemination of detailed data about emissions from livestock in Brazil.

Only the restoration of 12 million hectares under the Law on Protection of Native Vegetation could create a carbon sequestration up to 4,5 billion tons of CO2e. The compensation of Legal Reserve areas as an avoided deforestation alternative will also work as a sink option keeping carbon stocks.

The livestock intensification is a natural process given the restrictions to convert new areas and the extension of pastureland. The main barriers to it are access to credit, resistance for taking credit and

[21]More information available at: http://cloud.cnpgc.embrapa.br/bpa/

risk, lack of knowledge about the correct practices to adopt in each case and the unfair competition with animals created without legal compliance.

Pasture restoration can have huge positive externalities comprising carbon emissions, biodiversity conservation and water use. Due to the increase of productivity that is predicted to reach 6 @/hectare in 2030, to deforestation reduction and the possibility to slaughter animals in 2 to 3 years, improving carbon and water balance, the dissemination of sustainable livestock practices are key to promote the achievement of the Sustainable Development Targets.

There is a clear link between an intensified and pasture optimized livestock and reduced impacts to the environment. The ability to create policies for the promotion of good practices, the increasing of cases trying to support producers with pasture restoration and intensification actions are at the forefront of creating a new paradigm to Brazilian livestock.

While pasture areas are forecasted to drop, beef production is supposed to reach 13,7 million tons in 2030, allowing Brazil to export up to 3,5 million tons of beef. In light of the SDGs and the biodiversity targets, livestock improvements can support not only economic benefits to producers, but more importantly, resilient practices and environmental sound production patterns. This is the way the Brazilian livestock sector is approaching the climate change and the 2030 agenda for sustainable development.

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