The actions of the Brazilian agricultural sector in the context of climate change negotiations

As ações do setor agropecuário brasileiro no contexto das negociações sobre mudança do clima

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ABSTRACT

Brazil has always maintained a prominent position in negotiations within the United Nations Framework Convention on Climate Change, playing a major role in setting increasingly ambitious goals and encouraging consensus among Parties. With the purpose of reducing GHG emissions from the agricultural sector and disseminating and financing good agricultural practices, Brazil developed a platform of sustainable technologies and public policies, as the Low Carbon Agriculture Plan (the "ABC Plan"). This article reviews the main milestones of Brazil's role in the international negotiation on climate change, how these factors affected the Brazilian agricultural sector between 2009 and 2018 and the authors' personal view on this context. The objective is to provide an overview of Brazil's actions regarding the agricultural sector which contribute to the voluntary commitment assumed by the Brazilian government at COPs 15 and 21 and to provide a critical analysis of how these actions are being implemented. The main results show that low carbon agriculture has been consolidated as the main Brazilian strategy for sustainable rural development, but it is vital for our country to continue with these actions.

Keywords: Greenhouse Gases; Mitigation; Adaptation; Public Polices.

RESUMO

O Brasil sempre manteve uma posição de destaque nas negociações da Convenção-Quadro das Nações Unidas sobre Mudança do Clima, desempenhando um papel importante no estabelecimento de metas cada vez mais ambiciosas e no incentivo ao consenso entre as Partes. Com o objetivo de reduzir as emissões de Gases de Efeito Estufa (GEE) do setor agrícola e disseminar e financiar boas práticas agrícolas, o Brasil desenvolveu uma plataforma de tecnologias e políticas públicas sustentáveis, como o Plano de Agricultura de Baixo Carbono (o "Plano ABC"). O presente artigo faz uma revisão dos principais marcos da atuação do Brasil no âmbito da negociação internacional sobre mudança do clima, como esses fatores afetaram o setor agrícola brasileiro, entre 2009 e 2018, e a visão pessoal dos autores sobre esse contexto. O objetivo é fornecer uma visão geral das ações do Brasil em relação ao setor agrícola, que contribuem para o compromisso voluntário assumido pelo governo brasileiro nas COPs 15 e 21 e para fornecer uma análise crítica de como essas ações estão sendo implementadas. Os principais resultados mostram que a agricultura de baixo carbono se consolidou como a principal estratégia brasileira para o desenvolvimento rural sustentável, porém é vital que o país continue com essas ações.

Palavras-chave: Gases de Efeito Estufa; Adaptação; Políticas Públicas.

1 INTRODUCTION

Issues related to climate change are gaining increasing prominence and attention in the agenda of governments and society at large. The Brazilian government has always maintained a prominent position in negotiations within the United Nations Framework Convention on Climate Change, playing a major role in setting increasingly ambitious goals and encouraging consensus among Parties. An example of this prominence can be seen in the suggestion of a Clean Development Fund, which later gave rise to the Clean Development Mechanism, which is one of the mechanisms of flexibilization of the Kyoto Protocol.

This protagonism is reflected in the stance the Brazilian government has towards its own agricultural sector. According to FAO and OECD (2015), Brazil will become the world's leading exporter of agricultural goods in 2024, thus consolidating advances made by the sector in recent years. In view of this growth forecast and the climate commitments made by Brazil, the development of more sustainable agriculture is of fundamental importance.

The agricultural sector is both a major contributor to global climate change, and one of the sectors most affected by the adverse effects of climate change (TILMAN et al. 2001; FOLEY et al. 2005; FOLEY, et al., 2011; GODFRAY and GARNETT, 2014; KUYPER and STRUIK, 2014; IPCC, 2014; ROCKSTRÖM et al., 2017; SMITH and GREGORY, 2013).

Agriculture is the strongest sector of the Brazilian economy, contributing 25% of GDP. On the other hand, it exerts strong pressure for land use and emits large amounts of greenhouse gases (around 32% of Brazil's total emissions, according to OBSERVATÓRIO DO CLIMA, 2018).

Despite this seemingly incompatible relationship, increasing agricultural production is necessary to meet the challenge of the UN Sustainable Development Goals of eradicating hunger and securing food for a growing world population expected to reach 9–10 billion by 2050. This population may require an increase in global food production of between 60 and 110% (Foley et al. 2005; Foley, et al., 2011; IAASTD, 2008; Tilman et al. 2011; Pardey et al. 2014) at a time when the consequences of climate change are affecting agricultural producers around the world. As described by Smith and Gregory (2013) and Foley et al. (2011), whilst ensuring food security, there is an urgent need to reduce the impact of food production on the climate (Smith et al., 2008), and to improve the resilience of food production to future environmental changes (SMITH et al., 2013a; SMITH 2015; FOLEY et al., 2011).

Despite the critical role the sector plays in current and future emissions, in many countries action to reduce emissions related to agriculture has lagged behind other sectors (Richards, et al., 2018). Brazil and others countries however, has undertaken strong measures to reduce emissions from the agricultural sector and land use change.

France, like Brazil, has been working on the theme, such as the proposed 4:1000 Initiative. Based on strong scientific foundations and concrete field actions, this initiative aims to show that food security and combating climate change are complementary and that agriculture can bring solutions (4p1000, 2019).

According to Richards, et al. (2018), for countries with high agricultural emissions, the challenge is to increase the ambition of mitigation targets for the agricultural sector over time. Mitigation options currently available are based on improved efficiency and better agricultural practices such as improved nutrition and ruminant health management (Gerber et al., 2013), the more efficient use of nitrogen fertilizers (Gerber et al., 2016), and the implementation of Integrated Livestock Crop and Forest systems (ICLF) and the no-tillage system, which not only reduce GHG emissions, but can also contribute to soil carbon storage.

The objective of this article is to provide an overview of Brazil's actions regarding the agricultural sector which contribute to the voluntary commitment assumed by the Brazilian government at COPs 15 and 21 and to provide a critical analysis of how these actions are being implemented.

2 THE BRAZILIAN VOLUNTARY COMMITMENT AND THE ABC PLAN

During COP15, Brazil submitted a voluntary commitment to reduce GHG emissions. Brazil's position in the negotiation motivated other developing countries to also submit voluntary commitments. The Brazilian Nationally Appropriate Mitigation Actions (NAMAs), foresaw a reduction of 36.1% to 38.9% of projected emissions for 2020, thus avoiding the emission of about 1 billion tons of CO2 equivalent (tCO2e) (Brazil, 2010). This was the largest effort to reduce emissions on the planet.

The proposals presented in Copenhagen were internalized through Law 12,187/2009, which instituted the National Policy on Climate Change. In 2010, in order to reach this voluntary commitment, Sector Plans were created, including the Low Carbon Agriculture Plan (ABC Plan, from the acronym in Portuguese).

2.1 THE ABC PLAN

With the purpose of reducing GHG emissions from the agricultural sector and disseminating and financing good agricultural practices, the Federal Government launched the ABC Plan in 2012.

The nationwide ABC Plan has a period of validity from 2010 to 2020. Revisions and updates were planned at regular intervals, not exceeding two years, in order to adapt the plan to the demands of society, the arrival of new technologies and to incorporate new actions and goals if necessary. The Plan is composed of seven programs, six of them related to mitigation technologies, and one program related to climate adaptation (BRASIL, 2012):

- Program 1: Recovery of Degraded Pastures;
- Program 2: Integration of Crop-Livestock-Forest (ICLF) and Agroforestry Systems;
- Program 3: No-tillage System;
- Program 4: Nitrogen Biological Fixation (NBF);
- Program 5: Planted Forests;
- Program 6: Animal Waste Treatment;
- Program 7: Adapting to Climate Change.

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The GHG emission reduction potential of the Plan is estimated at approximately 150 million Mg CO_2e, not counting the potential for CO_2 sequestration by forest plantations. Each program proposes the adoption of a series of actions, such as strengthening technical assistance, training and information, technology transfer strategies (TT), field days, lectures, seminars, workshops, the implementation of Technological Reference Units, publicity campaigns and public calls for the contracting of technical assistance and rural extension services (BRASIL, 2012).

To reach the objectives set forth in the ABC Plan, in the period between 2011 and 2020, it was estimated that resources of the order of R$ 197 billion would be needed, financed through budgetary sources or agricultural credit lines.

According to data on agricultural credit from the MAPA (2019), from 2010 to January 2010, over 34 thousand contracts were executed, with a disbursement of more than R$ 17 billion, totaling an average of around R$ 504 thousand per contract. The total available for the credit line in this period was R$ 27.67 billion. The number of capacity building events related to the low carbon emission technologies outlined in the Plan carried out between 2011 to 2017 was 40,484, occurring in the 940 Demonstration Units that the Plan has implemented throughout the country.

Data related to the area with these technologies implemented, as well as their respective mitigation potentials, are presented in Table 1.

Table 1 | Adapted from: Adoption and mitigation of greenhouse gases by the technologies of the Sectoral Plan for Mitigation and Adaptation to Climate Change (ABC Plan).

	Commit (until 2020)		*Achievement*		
	Expansion Area	Mitigation Potential (million Mg CO_2 eq)	Period	Expansion Area	Mitigation Potential (million Mg CO_2 eq)
DEGRADED PASTURES RECOVERY	15.0 million ha	83 to 104	2010 to 2018	4.46 million ha, representing 30% of goal achievement	16.9, representing 18% of target set
INTEGRATED CROP-LIVESTOCK-FOREST	4.0 million ha	18 to 22	2010 to 2016	5.83 million ha, representing 146% of goal achievement	22.11, representing 111% of goal achieved
NO-TILLAGE SYSTEM	8.0 million ha	16 to 20	2010 to 2016	9.97 million ha, representing 125% of goal achievement	18.25, representing 101% of goal achieved
BIOLOGICAL NOTROGEN FIXATION	5.5 million ha	10	2010 to 2016	9.97 million ha, representing 181% of goal achievement	18.25, representing 182% of goal achieved
PLANTED FORESTS	3.0 million ha	8 to 10	2010 to 2018	1.10 million ha, representing 37% of goal achievement	2.01 million Mg CO_2 eq
ANIMAL WASTE TREATMENT	4.40 million ha	6.9	2013 to 2018	1.70 million m^3, representing 39% of goal achievement	2.67, representing 39% of goal achieved
TOTAL OF ALL TECHNOLOGIES	35.5 million ha	132.9 to 162.9	2010 to 2018	27.65 million ha, representing 77% of goal achieved	100.21, representing 68% of goal achieved

Source: MAPA, 2018.

According to Table 1, the technologies implemented over the largest area were ICLF systems, biological nitrogen fixation and the no-tillage system. These technologies were also responsible for the largest emissions reductions. This is due to the fact that the cultivation of many crops in Brazil, mainly soybeans, can already be done with biological nitrogen fixation and in a no-tillage system. In addition, with regard to ILCF technology, its success is largely due to the private sector alliance with the productive sector.

Gil et al. (2015) present an overview of integrated land-use systems in Mato Grosso and investigate the determinants of their adoption. In this paper cultural aspects play a major role in farmer decisions to adopt integrated systems, credit provision has not been relevant for adoption, and a broader dissemination of integrated systems may occur as land transitions continue. In addition, farm size, cultural preferences and know-how are major determinants for this technology adoption. The credit offered by the government has had limited influence on integrated systems adoption.

In addition, accordingly to Gil et al. (2016), from the farmer perspective, there is evidently a high degree of uncertainty regarding the synergy effects of integrated systems as well as their economic performance. Adopters of integrated crop-livestock systems are better educated and have greater access to technical assistance than specialized producers.

On the other hand, the areas in which recovery of degraded pastures, planted forests and manure management had been implemented, were far below the proposed goals. However, the area with recovered pasture was probably underestimated. The recovery of degraded pasture is not exactly a technology. Pasture degradation can be defined as the gradual loss of vigor, productivity and natural capacity for recovery to sustain the production and quality of feed and to withstand detrimental effects from insects, diseases and weeds (MACEDO AND ZIMMER, 1993).

Degraded pastures can be recovered with different technologies, including almost all other technologies proposed in the ABC Plan, except for the waste management technology. Thus, the real area of degraded pastures that have been recovered is certainly much larger than the area presented by MAPA.

This low adherence may be associated with aversion to inherent risk among producers in relation to liabilities, lack of skilled labor and bureaucracy linked to ABC credit (Latawiec et al., 2017). This includes ownership requirements, alternative land use implications, and emission reporting (SILVA, et al., 2018).

According to Carauta et al. (2018), specific credit conditions might speed up the diffusion of low-carbon agricultural systems. This study suggests that with ABC credit the adoption of integrated systems more than doubled, reaching an agent land-use share of 27% in Mato Grosso State. Credit from the ABC program has not been regarded as a crucial determinant of the adoption of integrated systems in Mato Grosso. In fact, only a small share of current integrated systems adopters has used the ABC credit lines so far (GIL et al. 2015; OBSERVATÓRIO ABC 2015).

The results reached by Carauta et al. (2018), suggest that ABC credit substantially increased the integrated system area in Mato Grosso and thereby highlight the importance of understanding farmer adoption decisions and responses to changes in financing conditions, especially in situations with high rates of interest and inflation which Brazil currently faces. Transaction and learning costs associated with adopting new agricultural practices and on-farm technologies influence farmer land-use decisions. Such barriers, economic benefits of innovation and externally provided economic incentives (i.e., ABC credit) altogether constitute the factors determining the actual diffusion of agricultural innovations (LEE, 2005).

In order to improve the functioning of the ABC Plan, some obstacles need to be overcome, such as technical training, bureaucracy to access the ABC Program, as well as the improvement of its rules and the speed of project implementation (ABC OBSERVATORY, 2013; PINTO et al., 2015). Problems with the dissemination of the Program and the lack of interest from higher schools in research and extension were also reported in another study (SCHEMBERGUE et al., 2017). For Barbanti et al. (2015), the main reasons for the low performance are the lack of technical assistance, rural extension and regularization of rural properties.

According to Martins et al. (2018), the potential to mitigate GHG emissions by the Brazilian agricultural sector is more than ten times the target set by the ABC Plan. Between 2012 and 2023, it may be possible to reach 1.8 billion tCO2 eq, incorporating the avoided emissions and carbon stored in the soil, through the adoption of just two technologies of the ABC Plan (pasture recovery and integration of crop-livestock-forest) in 52 million hectares of degraded pasture.

3 THE BRAZILIAN NDC

In 2015, Brazil submitted to the UNFCCC its intended Nationally Determined Contribution (iNDC), in the context of negotiations on a protocol, other legal instrument or outcome legally agreed upon under the Convention, applicable to all Parties.

In its iNDC, Brazil proposed actions to mitigate GHG emissions and adaptation actions to the effects of climate change, as well as ways to implement these actions in Brazil and in other developing countries, through South-South cooperation, based on solidarity and common priorities for sustainable development, with cooperation in the area of resilient and low carbon agriculture playing a prominent role.

Regarding mitigation, Brazil committed to reduce GHG emissions by 37% below 2005 levels by 2025, in addition to a subsequent indicative contribution to reduce GHG emissions by 43% below 2005 levels by 2030. The reference year 2005 uses the emissions as calculated in the inventory in Brazil's Second National Communication to the UNFCCC, which was the official document lodged with the United Nations when the iNDC was announced in September 2015 (BRAZIL, 2015).

Within the NDC actions, we will highlight those related to the agricultural sector, including the strengthening of the strategy for the sustainable intensification of agriculture, including, by 2030, the restoration of an additional 15 million hectares of degraded pasture and increasing, by 5 million hectares, the area with productive systems using crop-livestock-forest integration (ICLF) (BRASIL, 2015).

This new commitment, made in addition to the one proposed by Brazil at COP15, reinforces the consolidation of low carbon agriculture and, in particular, the recovery of degraded pastures and ICLF as a real way to achieve the sustainable intensification of agricultural production. These technologies contribute to the mitigation of GHG emissions, increase productivity and income, improve social benefits to producers and consolidate sustainable development.

According to Silva et al. (2018), among the actions of the NDC, emissions related to deforestation control and changes in land use are among the most important. As such, agricultural intensification is a key component in the fulfillment of this new commitment, potentially allowing the country to undertake long-term mitigation commitments that are aligned with a national development strategy to increase sustainable agricultural production (SILVA et al., 2018).

Integrated Crop-Livestock-Forest is a sustainable production strategy that is consolidating in Brazil as an important option for the agricultural sector. According to data from the ICLF Network Association, the area with this technology adopted is 11.5 million hectares, twice the NDC target. According to this Association, among the main obstacles identified to the further adoption of ICLF are: the need to improve knowledge among researchers as well as the training of consultants; the need for interaction to build capacity to work with ICLF systems; insufficient institutional integration with the involvement of agents from funding institutions, government managers (MAPA, MMA, MDA), public and private technology transfer agents and others; and the lack of communication and marketing actions.

Given the low adherence to the recovery of degraded pasture, much needs to be done in order for the NDC agreed target to be met. Credit lines with lower interest rates and greater disclosure of this technology may help increase technology adherence.

4 CONCLUSIONS

After the ratification of the Kyoto Protocol, Brazil assumed, in 2009, a voluntary commitment to reduce GHG emissions and with the Paris Agreement in 2016, made another commitment to further reduce GHG emissions in some sectors. All this effort shows Brazil's commitment and important role in promoting actions aimed at reducing global warming and developing a more sustainable economy.

Results show that the ABC Plan has already mitigated between 100.21 and 154.38 million Mg CO2 eq. in the period from 2010 to 2018, indicating that the voluntary targets for reducing GHG emissions, agreed at COP15, are already being met. The data presented further demonstrate the country's potential to implement its Nationally Determined Contribution under the Paris Climate Agreement for the period 2020-2030, reinforcing the need for continuity in efforts to promote low carbon agricultural technologies and in capacity building for the adoption of practices that increase resilience and improve sector productivity.

The implementation of low carbon emission technologies that promote the sustainable intensification of Brazilian agriculture will be essential for the achievement of commitments and contributions assumed by Brazil, not only because of their strong potential for mitigation, but also for their potential to increase the resilience of agricultural productivity in the face of a changing climate.

Also, in this context, the dissemination of these technologies in rural areas may contribute to reducing pressure for deforestation. The increase in productivity derived from integrated systems implies that they require less space to produce the same amount of food and can be implemented in areas of degraded pasture, reducing the need for agricultural expansion. It is also worth noting that these technologies, besides promoting an increase and diversification of production, enhance carbon stocks and soil fertility and also contribute to the maintenance of water resources, with a consequent reduction in the need for water in crop production.

The actions reported here demonstrate not only the commitment Brazil has to contribute to the negotiations within the framework of the Climate Change Convention, but also the interest in making the agricultural sector of this country a world reference, based on the sustainable use of natural resources and optimization processes involving all stages of agricultural production.

However, all this effort made by Brazil over the last decades, may be with the days numbered. The president, Jair Bolsonaro, is turning his environmental policies toward a milder and more permissive regime. Through the legislation that weakens the institutional and legal framework that helps fight deforestation and other environmental offenses, as well as reforms that substantially weaken the participation of civil society, including pro-environment groups, in policymaking and in oversight of policy implementation.

While it is difficult to predict the long-term effect of these regulatory changes on emissions, it can be predicted that much of these effects have the potential to increase illegal deforestation and other environmental violations. Given the important role of NDC's Land Use and Forests sector and the enormous global importance of its forests for environmental services, biodiversity and carbon sequestration, the Brazilian government urgently needs to strengthen mitigation actions in this sector - rather than weaken it. The current government has also not implemented any new policy to halt emissions growth in other sectors. Bolsonaro's environmental agenda is at odds with the urgent need for climate action that Brazil had been presenting in previous governments.

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