AgriSustainability Matters

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Ambassador's word

Dear friends,

The new year has begun with renewed hopes that the pandemic, along with its economic and social corollaries, will all become history. Environmental sustainability and the fight against global warming, on the other hand, are more pressing than ever - and have already become a top priority of Brazil's new administration.

Brazil has been doing its part: renewable sources account for nearly half of its energy mix, more than four times the OECD average, and its scientists are finding ways to reduce greenhouse gas emissions even further, including sustainable agriculture and soil management.

In the first bulletin for 2023, we bring you a piece by Camila Dias de Sá, a researcher and professor at Insper Agro Global. Prof. de Sá provides us with an insightful analysis of how Brazil has been contributing to climate change mitigation while increasing its food production. As the author highlights in her article, in the Brazilian model of tropical agriculture, sustainability is associated with higher productivity. Agricultural intensification, with up to three annual crops, results in less use of natural resources, especially of land. This contrasts with what we see in Europe, where sustainable practices are related to extensive farming, which tend to be less productive and, overall, more expensive for both producers and consumers.

The adoption of nature-based solutions which increase the potential of agriculture to reduce GHG emissions and sequester carbon will certainly contribute to the efforts to keep global warming in check. As Prof. de Sá warns us, however, we should not lose sight of the fact that energy production and consumption account for three-quarters of GHG released into the atmosphere. Therefore, when it comes to combating global warming, the focus should remain on the carbon-intensive energy mixes of large global emitters. Brazilian agriculture, meanwhile, will continue developing innovative practices and technologies aimed at providing food security and conserving natural resources. Because now, as much as ever, AgriSustainability Matters.

Happy reading.

Fred Arruda
Ambassador of Brazil to the United Kingdom

The other Brazilian carbon sink: combating climate change through agriculture and land management

Camila Dias de Sá

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Natural Climate Solutions (NCS)[1] have been identified as an important means of reducing greenhouse gas (GHG) emissions and storing carbon. It is estimated that Brazil accounts for 21% of tropical NCS potential, or approximately 15% of global potential. Although most of the opportunities are related to Brazil's forest resources, the country also has mitigation options related to agriculture and land management, which represent around 14% of the total [1, 2].

Soil can work as an important CO_2 sink, the annual potential for carbon sequestration of which can account for up to 20% of total annual global emissions [3, 4]. Around 25% of global NCS potential may be in soils, which, in turn, represent 47% of agricultural mitigation potential [5]. Furthermore, several ecosystem services can be provided through interventions and sustainable management, such as integrated systems and agroforestry systems, recovery of degraded pasturelands, no-tillage, and biological nitrogen fixation, amongst others.

"The Brazilian model of tropical agriculture makes it possible to increase, at the same time, both agricultural production and carbon sequestration"

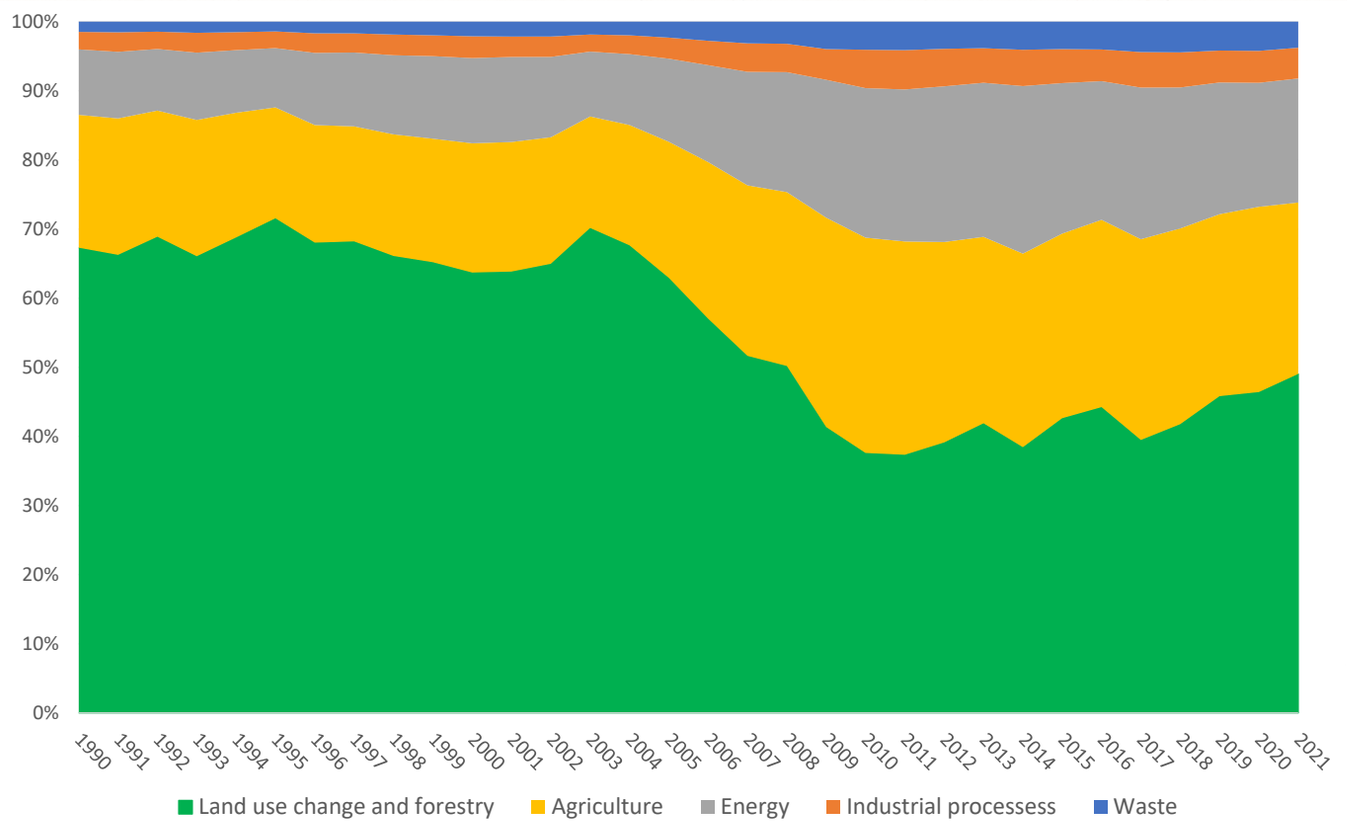
[1] As a variety of an ecosystemic approach, Nature-Based Solutions (NbS) refer to the management and sustainable use of natural resources and processes to face socio-environmental challenges. NCS, in turn, belong to the umbrella concept of NbS, but explicitly refer to initiatives that reduce GHG emissions from ecosystems and take advantage of their carbon-storing potential.

Photo 1: Wenderson Araujo/Trilux - ICLF: eucalyptus and maize. Photo 2: Tony Oliveira – "Dia de Campo" ICLF on Santa Brígida farm, Ipameri - GO.

It is estimated that Crop-Livestock-Forestry integration (CLFi) accounts for approximately 20 million hectares in Brazil [6]. Integrated systems have a positive effect on soils, increasing nutrient cycling and retention, carbon and nitrogen content, water retention and reduction of soil loss due to erosion. Trees also provide thermal comfort for animals and promote the economic diversification of farms. CLFi is seen as a promising option to recover degraded pasturelands and has the potential to reduce the carbon footprint of beef and dairy production.

According to the Food and Agriculture Organization of the United Nations (FAO), one of the greatest soil carbon-storage potentials in the world is in Brazil – more precisely, 12.7% of the total yearly relative potential of soil organic carbon sequestration at a depth of 30cm (sustainable management scenario with high carbon inputs) [7]. The UNFCCC has examined the climate mitigation potential of soils and agriculture, including soil organic carbon strategies. Such opportunities meet the need to mitigate the unwanted effects of agriculture and land use change on global warming – without losing sight of the fact that energy production and consumption are the main factors responsible for this phenomenon, accounting for approximately three-quarters of GHG released into the atmosphere on a global scale. Worldwide, agriculture and land-use change and forestry represent around 20% of emissions [8], and in Brazil, both account for 74% of emissions [9]. Therefore, Brazil's actions are globally relevant in either exacerbating or mitigating the climate crisis.

Emission sector shares in Brazil's GHG emissions



Source: SEEG (2022) [9]

Ensuring global food security is a core function of agriculture that can be impacted by the effects of climate change. Therefore, a transition to low-carbon agriculture is an essential component, not only of efforts in combatting global warming, but also in achieving food security, a primary requirement for political and institutional stability and a precondition for socioeconomic development.

Increasing food, fibre and energy supply whilst mitigating climate change is a potential that few countries in the world have. The Brazilian model of tropical agriculture – which keeps the soil in use all year round, with up to three annual crops (in 2022, the 2nd and 3rd grain crops were estimated at 18 million hectares [11, 12]) – makes it possible to increase, at the same time, both agricultural production and carbon sequestration [10]. Unlike in the temperate regions, in the tropical and subtropical ones, there is the possibility of increasing soil carbon inputs through improved productivity and greater crop frequency (several crops throughout the year) on no-till. Brazil's technological model of cultivation – greater crop rotation given the frequency of cultivation – thus increases productivity and, consequently, provides a faster accumulation of carbon in the soil. The extensive area of no-tillage – greater than 35 million hectares [13] – also contributes to the improving of soil quality and adaption to climate change. Given this, the size of the area dedicated to crops, pastures and planted forests in Brazil – approximately 240 million hectares – represents an enormous opportunity for the implementation of high-impact decarbonisation schemes.

“In the case of tropical agriculture adopted in Brazil, sustainability is associated with practices that make it possible to produce more in a smaller area”

The possibility of integrating the low-carbon production model into the carbon credits market exists and can be seen as a form of financing, or even as an additional incentive for the adoption of NCS practices. Nevertheless, for this to happen, one of the main challenges is the need to move forward in terms of measurement, reporting and verification (MRV) to give credibility to initiatives. Cover crops and integrated agricultural systems management is a major challenge when considering the heterogeneity of soils and climates in Brazil. The different practices of NCS also vary in terms of mitigation estimates, co-benefits and trade-offs. Practices such as cover cropping, no-till farming, crop rotation and pasture management have different levels of viability, potential impacts on soil organic carbon and nitrous oxide emissions. Strategies to increase organic carbon in one soil type may be ineffective in another. Furthermore, levels tend to reach a steady state after 20 to 30 years of proper management, which may change again if different practices are adopted.

For all of these reasons, it is necessary to ensure the integrity of the results obtained with the interventions - especially when one takes into account that the organisations that govern the building of international standards are largely embedded in environments whose notion of sustainability differs greatly from that practised in Brazil . In the case of tropical agriculture adopted in Brazil, sustainability is associated with practices that make it possible to produce more in a smaller area, thus sparing the use of natural resources, mainly land. This implies intensifying production through more technology and greater efficiency to improve productivity. Meanwhile, in Europe, in general, efforts are being made to preserve landscaping through more extensive practices, with low use of inputs and technologies, resulting in lower production efficiency and productivity stagnation. The European model, therefore, requires strong government subsidies and consumer willingness to pay more for food.

In the tropical conditions of Brazil, there are several particularities of carbon strategies in the soil, as well as the complexities associated with the measuring of such, as is illustrated by some examples below:

(i) In Brazil, it makes sense to measure carbon at a depth of one metre [14]. However, digging trenches to collect samples in different soil layers consumes time and resources, in addition to problems for mechanisation. A more cost-effective option, satellite imaging, still cannot detect carbon fluxes in layers beyond topsoil.

(ii) Previous estimates would suggest that the loss of carbon in soils converted into forest plantations would be close to 33%, but a recent review carried out by the Brazilian Agricultural Research Corporation (Embrapa) concluded that the Brazilian average value was 5% [15, 16].

(iii) Initial evidence - not yet published - from a carbon farming pilot initiative points to an average carbon footprint of 783 kg CO_2eq per tonne of soya, a value that would represent a reduction of about 80% in relation to the international average [17].

Such conditions therefore require improved and calibrated MRV procedures and technologies to corroborate all of these aspects of Brazilian agriculture. Widespread adoption of MRV systems depends on their design being sufficiently democratic to allow wide adoption, but also scientifically robust to inspire market confidence. The integration of Brazilian agriculture into the carbon market is still in its infancy. However, the need to increase funding for research is evident, as well as the coordinated effort of Brazilian representatives in international forums to disseminate essential information about the concepts of NCS developed in tropical conditions - which, it should be noted, differ from the concepts of NCS applied to temperate regions.

The fight against illegal deforestation, which is by far the largest source of Brazilian GHG emissions, is also an essential condition in giving credibility to the NCS related to agriculture and soil management, eventually allowing Brazil to transform its comparative advantages into a leadership position amongst low-carbon economies. Nevertheless, it is essential that enthusiasm for NCS is not used as a pretext to ease the pressure for a rapid reduction in the burning of fossil fuels around the world. The NCS market should not be used to support the continued use of obsolete energy systems by major global emitters, but rather to promote the adoption of technical advances that ensure mitigation and potential co-benefits in the regions where projects are implemented.

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