Revista ARACÊ
ISSN: 2358-2472

FAMILY FARMING: AND CAP-AND-TRADE, A NEW MARKET TO AGGREGATE

https://doi.org/10.56238/arev6n3-146

Date of Submission: 13/10/2024 **Date of Publication:** 13/11/2024

Fábio José Vieira da Silva[1] and Jorge Madeira Nogueira[2]

ABSTRACT

The research focuses on the opportunity to increase the income of family farmers through their participation in the voluntary greenhouse gas capture market. To clarify the facts found in the study, a bibliographic review was used, covering a global and, later, national context, pointing out the scenarios and highlighting the events that led to the confirmation of the hypothesis. For the central possibility, it is assumed that the participation of family farmers in the greenhouse gas capture market can generate income, therefore, increasing the gains obtained when associated with the crop already established in the agrispace. Another point addressed in the study is how family farmers can participate in this market, offering valuable contributions to aggregate this target audience in this new market, which until now has been little explored.

Keywords: Agriespaço, Capture, Emissions, Income, Territory.

[1] Doctor in Economics, UnB, Brasília – Brazil
E-mail: fabiojvdasilva@gmail.com
ORCID: https://orcid.org/0000-0002-3323-9398
[2] Doctor Professor in Economics, UnB, Brasília – Brazil
E-mail: Jmn0702@gmail.com
ORCID: https://orcid.org/0000-0002-3772-7145

Revista ARACÊ
ISSN: 2358-2472

INTRODUCTION

The world's major economies make economic arrangements with the environment. Companies somehow exploit nature and its natural resources, thus creating the need to balance the environment, something that nature does by providing ecosystem services.[3]

As a way of compensating for environmental degradation, companies help nature. They are responsible for the rate of regeneration of the degraded environment through environmental services. Such situations occur as a consequence of the search for constant economic growth, which generates changes in geographic spaces, whether through urbanization, agribusiness, industrialization, installation of large investment projects, or other contexts not addressed here.

These movements in geographic space alter the dynamics of the location, contributing to the generation of greenhouse gases, reflecting climate change and, on a global scale, increases in sea levels and temperatures, culminating in frequent extreme events (DIAS, 2006). Such actions triggered a global alert, in the sense of an attempt to reduce the stock of greenhouse gases, accumulated in the atmosphere over time. In this scenario, some countries created their market for capturing greenhouse gases.

Given the context, the research aimed to verify the argumentative hypothesis that family farming can obtain income by participating in the market for capturing greenhouse gases. To ensure the veracity of the hypothesis, the specific objectives were outlined: i) describe the global scenario of the agreement to contain emissions, ii) break down the capture market, and iii) introduce family farming to the voluntary capture market. The study was developed in six sections, the first of which is this brief introduction. The second section contains the proposed methodological procedure, which is a bibliographic review. The third section contemplates global conventions and targets. The fourth section addresses the greenhouse gas capture market. The fifth section considers family farming and how to participate in the CO2 capture market. The sixth section covers the conclusions, that is, the findings of the research.

[3] Serviços Ecossistêmicos – Sendo os benefícios tangíveis (alimentos e madeira, por exemplo) e intangíveis (beleza escênica e regulação do clima, por exemplo) obtidos pelo homem através das dinâmicas e complexas interações entre os diversos componentes do capital natural (Andrade & Romeiro, 2009).

Revista ARACÊ
ISSN: 2358-2472

METHODOLOGICAL PROCEDURE

The methodology is based on a bibliographic and exploratory review, aiming to describe the context in which the object is inserted. The focus of the searches was official government websites, books in the area, and scientific articles that make such content openly available. This makes up the set of available information. All the scenarios described underwent a careful analysis, where we sought to verify the veracity of the information collected, for later dissemination. These bases served to expose the robust arguments that validated the research findings. The full description sought a high degree of detail of the contexts addressed for explanatory and clarifying purposes of the facts found in the investigation. These highlighted propositions are of interest to academia, therefore, they directly contributed to science.

GLOBAL CONVENTIONS AND GOALS

The stock of greenhouse gas emissions has been expanding as a result of society's demand for products and services that, over time, have culminated in the accumulation of pollutant emissions that contribute to the context. Such actions have increased the stock in the atmosphere, which has caused atypical phenomena in several places around the world. Examples of these events include: torrential rains, tsunamis, sudden changes in temperature, extreme cold, melting of polar glaciers, and floods, among other catastrophes attributed to climate change. Given this scenario, the governments participating in the United Nations (UN) signed the KYOTO PROTOCOL, which presents the guidelines for the existence of a market for capturing greenhouse gases worldwide.

After the Kyoto Protocol, there was a need for actions that could control changes in geographic space to reduce greenhouse gas emissions. And, consequently, stabilize and reduce the phenomena that contribute to catastrophes resulting from climate change. The Kyoto Protocol establishes in Article 2 the obligation:

> Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol, taking into account their commitments under relevant international environmental agreements; promotion of sustainable forest management, afforestation, and reforestation practices (UN, 1997, p. 2, our translation)[4].

[4]*"Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol, taking into account its commitments under relevant international nvironmental agreements; promotion of sustainable forest management practices, afforestation and reforestation".*

Revista ARACÊ
ISSN: 2358-2472

This approach presents one of the ways that governments currently have to reduce emissions. This mechanism is the greenhouse gas capture market, which transforms the sequestration of gases into the provision of a service. The actions used by the countries that signed the Kyoto Protocol, because they committed to reducing emissions, proposed avoiding or sequestering gases in a given period, were “to reduce their overall emissions of these gases by at least 5% below 1990 levels” UN (1997, p. 4, our translation)[5].

GREENHOUSE GAS CAPTURE MARKET

The greenhouse gas capture market is made up of suppliers of gas capture services and demanders of such services. In this context, the government plays the role of regulator, where it determines the amount of gases to be removed in aggregate. It is up to each supplier company to inform its capture offer limit. On the demand side, the demander acquires credit according to its need, which is to neutralize its emissions. Given the above, it is observed that the capture market is a way found by society to balance emissions because the “effects of climate change can be mitigated by promoting the transition to a low-carbon economy” (CUPERTINO; COSTA, 2023, p. 1043).

From the perspective of investors in the segment, who trace their profits to the provision of greenhouse gas capture services, profitability is provided by technology. Therefore, when combined with technology and an economy that prioritizes low carbon, profitability can compensate in terms of payback[6] in the short term. Therefore, the “formulation of public policies that encourage a low-carbon economy can generate economic profits” (CUPERTINO; COSTA, 2023, p. 1043). This point of view shows that, currently, social awareness on the part of the UN and other global institutions has led to the emergence of companies willing to pay for this type of service. When considering the government's perspective, the interest is in reducing emissions in aggregate, contributing to the fulfillment of the goals stipulated in the conventions.

In comparison with what was agreed in the conventions, Brazil emitted 1.6 billion - (see Chart 1), on average, gross tons discounting the removals of greenhouse gases, between 2018 and 2022, according to data made available by the Greenhouse Gas Emissions and Removals Estimation System - SEEG. This information from the Climate

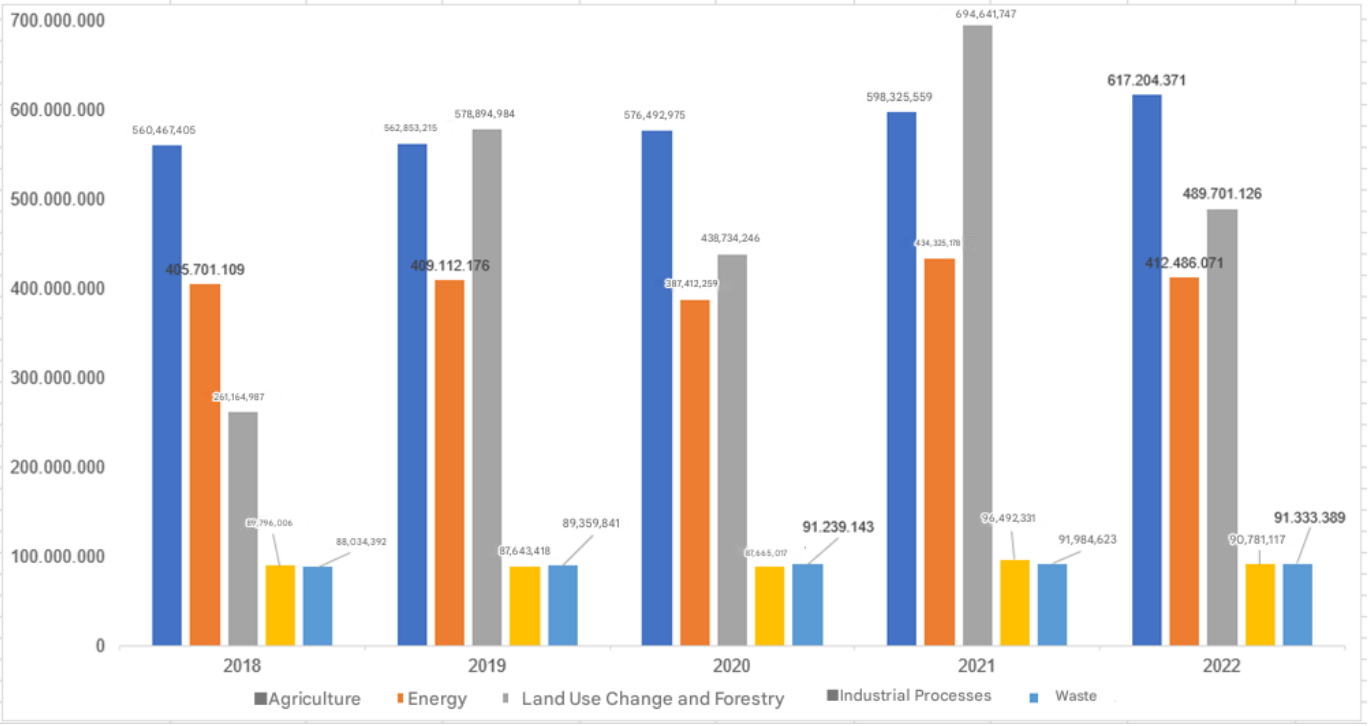
[5] *“with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels”*
[6] Payback: É o período necessário para que o fluxo operacional de caixa do projeto recupere o valor a ser investido no projeto (LIMA, 2019).

Revista ARACÊ
ISSN: 2358-2472

Observatory gives an idea of the number of gases that need to be removed from the atmosphere and, generates an estimate, of how much service needs to be contracted in the country. This perspective guides the size of the market to be explored by interested parties who are willing to perform the capture service, noting that these gases will increase over time, as the activities that generate emissions do not stop.

Committed to meeting the targets, Brazil, between 2018 and 2022 contributed significantly to gas emissions, due to the size of its economy, as shown in Chart 1 below, the Total Balance of Emissions Discounted from Removals.

GRAPH 1 - TOTAL BALANCE OF GROSS EMISSIONS DISCOUNTING REMOVALS, ANALYZED BY EMISSION SECTOR BETWEEN 2018 AND 2022 IN BRAZIL.



SOURCE: SEEG (2024)

In Graph 1, it can be seen that Agriculture grew successively in all periods, from 2018 to 2022. For the behavior of Energy, there was growth in 2019 when compared to 2018, but there was a reduction in 2020, then it resumed growth above the level of previous years in 2021 and, later, a slight downward trend began in 2022. When considering Land Use Change and Forestry, it can be seen that the cycle starts low in 2018, and later, there is an exponential growth in the volumes accumulated in 2019, however, in 2020 there is a reduction, but, in 2021, it reaches the highest peak of all the categories studied, an overwhelming growth, then a moderate reduction is noted in 2022. For the Industrial Processes variable, it is noted that the cycle presents the reference value in 2018, followed

Revista ARACÊ
ISSN: 2358-2472

by a slight drop in 2019, but in 2020 and 2021, growth was operationalized, and then a downward trend in the volumes recorded in 2022 began. For the Waste element, constant growth was observed from 2018 to 2021, and a slight drop in the level in 2022.

The data show that, in 2021, the sector that grew its emissions the most was Land Use Change and Forestry, that is, an association that family farmers know well, noting that the greatest opportunity for profit lies in this sector. From this perspective, it is pointed out that in Brazil, only the voluntary carbon credit market is fully operational, as part of the emissions market, since the focus is only on removing Carbon Dioxide (CO2) from the atmosphere and the capture of the gas is carried out through small projects. Such initiatives aim to meet the characteristics of the voluntary market, with standards certified by third parties, which stipulate standards for the implementation and operation of projects (PAIVA et al., 2015). The person responsible for guaranteeing the certification of carbon credits originating from the projects is the National Secretariat for Environmental Sanitation (SNSA), which:

> Defines Certified Emission Reduction Certificates (CERs) as documents issued by the Executive Board of the UNFCCC under the Kyoto Protocol. These documents prove that a given project has resulted in the sequestration or absorption of carbon dioxide or the reduction of greenhouse gas emissions through the Clean Development Mechanism (CDM).)[7] (MACIEL *et al.* 2009).

Participants in the carbon credit market dynamics, in possession of the CRE, can trade their carbon credits on the voluntary market. As for the regulated market, in this context, Bill 528/2021 is currently being processed in the National Congress, which aims to create a regulated emissions market in the country. The bill provides for the creation of government institutions with the function of registering projects to reduce or remove greenhouse gases. With a commitment to ensuring the credibility of asset transactions, also complying with the national accounting of national and international transactions of carbon credits of national origin, which are accounted for as follows:

> A tradable carbon credit is equal to one tonne of carbon dioxide or the equivalent amount of a different greenhouse gas that has been reduced, sequestered, or avoided. When a credit is used to reduce, sequester, or avoid emissions, it becomes an offset and is no longer tradable (UNDP, 2022, p. 1).

[7] Mecanismo Desenvolvimento Limpo MDL: Consiste no desenvolvimento de projetos que reduzam a emissão de gases de efeito estufa (MCTI, 2024).

Revista ARACÊ
ISSN: 2358-2472

Carbon credits arise from capture and become financial income that can be converted into investment or savings. When viewed from the perspective of small rural businesses, depending on entrepreneurship, participation in the greenhouse gas capture market can be considered an alternative to increase income, since their activities can be carried out in parallel with their main duties. It is observed that there is a perception built by family farmers that the voluntary carbon market is something far from their reality, due to the level of complexity of the measurements. However, to solve this "setback", it is pointed out that:

> Strategic alliances can be defined as voluntary short- or long-term collaboration or cooperation between organizations involving the exchange, sharing, or co-development of products, technologies, and services to achieve a common set of objectives or meet critical business needs. (ZILBER; KOGA, 2011).

Such an alliance can be established between the family farmer and consultancies established in the country, which carries out the capture measurement work, for a small portion, that is, a commission on the income values obtained from the sale of carbon credits, considering that the farmer will adopt a project that requires these measurements..

FAMILY FARMING AND THE CATCH MARKET

A family that is willing to earn income from the plantation now has the opportunity to add a new type of business to its activities in the agri-space.[8], resulting in the possibility of increasing income. This eventuality is the participation of family farmers in the greenhouse gas capture market. This opportunity arises from the voluntary market present in Brazil. This market can be explored in several ways by family farmers, consequently, the results can increase income.

One way for farmers to participate in the greenhouse gas capture market is by supplying seeds, a simple process that can be scaled up, without the need for high investment values, with satisfactory profit margins and a quick return on invested capital. Because, for this market, the availability of native species seeds in nurseries is important, the use of such species in environmental recovery projects is of fundamental importance (MARCON, 2017).

[8] Agriespaço: Em síntese, é a parte da propriedade do agricultor, ou seja, o local onde são realizadas as atividades relacionadas às culturas e o próprio plantio.

Revista ARACÊ
ISSN: 2358-2472

Another way to participate in the capture market is by supplying seedlings to meet the capture project models called forestry projects and reforestation of degraded areas. In both, the need for seedlings for the project to be carried out is a source of financial income for the family farmer. Depending on the size of the project, the volume can be significant. For example, the Pamine Reforestation Project has planted almost 200,000 seedlings. Every year, 2,000 to 3,000 seedlings are planted. But before, it was 10,000 to 15,000 seedlings per year (SILVESTRE et al., 2022, p. 12).

Organic fertilizers produced by farmers and supplied to projects are also an option for participating in the capture market, through composting and/or other processes that generate the organic fertilizer necessary for the development of seedlings and/or crops chosen for CO2 sequestration. Because, in addition to being an important tool for soil regeneration, organic fertilizers can also be used in degraded soils and in techniques that involve the sustainable and rational use of all these areas (MARIANO et al., 2022).

Another form of participation is the leasing of part of the agri-space for the installation of carbon capture projects, generating profitability for the family farmer, and an increase in income that can contribute to the expansion and/or increase in the variety of crops. It is common in forestry projects for the land to be leased, mainly in the “production of eucalyptus with land leasing: an investment model where the investor is required to lease an area of land for planting” (COPETTI, 2007, p.14).

Another type of participation in the carbon market occurs when the family farmer, instead of opting for leasing, plants trees that are suitable for capturing CO2 in a portion of the agricultural space. This converts part of the crop into a reserve for capturing carbon dioxide. This action has been gaining momentum and has become known as crop-forest integration – ILF or Silviagrícola, which are production systems that integrate the forestry and agricultural components by combining tree species with crops (annual or perennial) (NOERNBERG, 2023, p. 17).

In another model of participation, it can be seen that, when viewed from the perspective of changing the way the land is fertilized, to retain CO2 and fix it in the soil before planting, it can become a source of income. Because such a change in the plowing of the land, through the incorporation of organic matter (vegetable or animal) or through the biological fixation of nitrogen in the soil, can cause CO2 stock, and can thus become carbon credit. This action is seen from the perspective of avoided emissions. Because the

Revista ARACÊ
ISSN: 2358-2472

mitigation of the effects of agriculture on the environment and climate change is related to its ability to avoid greenhouse gas emissions (MADARI, 2018).

CONCLUSION

Given the above, it was noted that the world's interests are focused on reducing greenhouse gases, mainly the removal of carbon dioxide and CO2. Several countries are creating their carbon credit markets and regulating existing ones. All efforts are focused on meeting the reduction targets agreed upon in the Kyoto Protocol in 1997. Among these countries seeking to reduce their emissions is Brazil, which still emits an average of 1.6 billion gross tons after removals are discounted, therefore, a promising market for the participation of family farming in the CO2 capture sector. Such an opportunity can increase the farmer's income and bring benefits capable of adding to the cultivation and/or variety of production. How family farmers can participate in the market for capturing gases, especially CO2, by providing seeds, tree seedlings capable of capturing large amounts of CO2, organic fertilizer, leasing part of the land for the installation of projects, or the farmer himself implementing the project by adopting crop-forest integration. He can also change the way he plows the land, switching to a model that can retain CO2 before planting, thus helping to avoid emissions. These ways of participating in the CO2 capture market are beneficial to family farmers and have a greater chance of success, as they do not vary much from the activities already carried out in the agri-space.

When listing the possibilities that family farmers have to participate in the voluntary carbon credit market, the strength of the field is noted. These available forms of action do not require major acquisitions of technology; only interaction with the community itself can allow families to develop the necessary skills for involvement in the voluntary market for the removal and containment of greenhouse gas emissions without much effort. It is also important to emphasize that there is no need for advanced technical support, since some of the forms of exploitation of the capture market, that is, the options offered to family farmers, do not require high levels of knowledge, because they are commonly known management practices in agricultural communities. However, it is essential to exchange experiences between the community and to seek suppliers that offer quality inputs. Thus, this interaction provides the strengthening of the local rural production chain, stability, and security in the participation of small producers in the greenhouse gas capture market.

Revista ARACÊ
ISSN: 2358-2472

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