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Valuating the externality promoted by natural pollinators in agricultural crops of Permanent Preservation Areas (PPA) restored by Brazil Mata Viva® Program

EXECUTIVE SUMMARY

BASF is a German chemical company operating in Brazil, in the following states: Sao Paulo, Paraná, Rio Grande do Sul, Bahia and Pernambuco. Since 2008, BASF, with the support of Espaço Eco Foundation, is implementing the Mata Viva® program for Education and Environmental Conservation. One of its fronts is the support to rural producers for the environmental compliance of its proprieties, through studies that quantify and shows, technically, how to solve these liabilities for the restoration of Permanent Preservation Areas (PPA) and Legal Reserve (LR). Since the beginning of the program, studies have been carried out on the environmental compliance of rural properties in more than 30 thousand hectares; and about 710 hectares were restored with the planting of more than 1,1 million seedlings of native species.

In order to understand the consequences of the restoration activities, in 2014, an inventory was carried out to evaluate the biodiversity and the abundance of bees in three properties that had its areas restored by the program for, at least, five years, located in the municipalities of Bebedouro, Tanabi e Araraquara, all in the state of Sao Paulo. In this case study, the importance of ecological restoration for recovery of bee biodiversity seeks to be understood by the evaluation of the ecosystem service of pollination regulation.

The three restored areas are located in municipalities with low percentage of native vegetation cover and with agricultural development, technified for a long time. In this way, it was emphasized the relevance of ecological restoration to increase agricultural productivity in properties owned by third parties – externality aspect – due to increase of the number of native bees. Considering that the crops cultivated in the three properties is the sugarcane, which does not depend on pollination, scenarios were assumed regarding the contribution of the increase of bees and consequent increase of agricultural productivity in coffee and orange cultivation, because they are agricultural crops practiced on a large scale in the region.

For the valuation of the externality generated by the pollination ecosystem service, the Marginal Productivity Method (MPM) was used, estimating the economic value associated to the portion of third-party production, which varies according to the availability of pollinators from the restored areas. The valuation was carried out for the year 2016.

The study identified that the investment made by the company, for the forest restoration in the PPA of agricultural properties of these partner rural producers, contributed to generate a positive externality, respectively, for each of the properties, in the order of R$ 20,8 thousand, R$ 19,5 thousand and R$ 55,9 thousand per year (considering the orange cultivation); and of R$ 36,6 thousand, R$ 32,5 thousand and R$ 98,5 thousand per year (considering the coffee cultivation).

The result of the study supports the company's strategy to develop with sustainability-oriented management and, consequently, makes tangible the results of effort and dedication, encouraging the development of new initiatives.

Reporting of dependencies, impacts and externalities

Responsible for completing: Tiago Egydio Barreto

Project drivers

Objectives: Estimate total value and/or net impact; and understand the company's relationship with the ecosystem services.

Description: In 2008, BASF, with the support of Espaço Eco Foundation, created and, since then, is implementing the Mata Viva® Program for Education and Environmental Conservation. An important area of action of the program is to support the rural producers to adapt their properties environmentally through studies that quantify and technically show how to solve their liabilities; and by restoration of Permanent Preservation Areas (PPA) and Legal Reserve (LR). The Mata Viva® program has already promoted studies for environmental compliance of rural properties in more than 30 thousand hectares and restored about 710 hectares by planting more the 1,1 million seedlings of native species. In order to understand the consequences of the restoration activities, in 2014, an inventory was carried out to assess the biodiversity and the abundance of bees in three properties restored five years ago by the Program.

Project scope

Object of the project analysis: Project.

Description: After nine years after the beginning of the Mata Viva® Program, which restored more than 710 hectares and with data on species diversity and abundance of bees of three restored areas, we intent to understand the importance of ecological restoration for biodiversity recovery of bees from the perspective of ecosystem services valuation, assessing the externality of pollination regulation. These three restored areas are located in municipalities with low percentage of native cover and "technified" agricultural development for a long time. We seek, with this study, to understand the relevance of ecological restoration to increase agricultural productivity, bringing to this the approach of ecosystem services economic valuation.

Geographic Area: municipalities of Bebedouro, Tanabi and Araraquara, in Sao Paulo state.

Step(s) of the value chain included: Own operations.

Type of approach: Retroactive.

Time Horizon: One year (2016).

Ecosystem Services: Pollination Regulation.

Pollination regulation

Ability of ecosystems to regulate the populations of animal species that promote the pollination of various vegetal species, specially agricultural crops.

Method(s) used: Marginal Productivity Method (MPM).

Resultados

Dependency: not calculated

Impact: not calculated

Externality: between R$ 19,5 thousand and R$ 55,9 thousand per year (orange cultivation); and between R$ 32,5 thousand and R$ 98,5 thousand per year (coffee cultivation)

Data used	Type of data
Agricultural crops: coffee and orange (both hypothetical)	
Dependency of pollination by bees: 33% (coffee) and 31% (orange).	Primary (bees inventory); and secondary (distance between the wings base).
Area of the agricultural crop considered in the analysis: *Santa Julia* Farm, 535,25 hectares; *Sao Jose* Farm, 149,82 hectares; and *Ouro Verde* Farm, 190,96 hectares.	
Wild pollination (method 2)	
Number of areas considered as suppliers of pollinators and size: Permanent Protection Area (PPA) of each of the three properties evaluated (68,05 hectares of PPA, *Santa Julia* Farm – 11,2% of the property total area; 12,40 hectares of PPA, *Sao Jose* Farm – 7,6% of the property total area; 15,16 hectares of PPA, *Ouro Verde* Farm – 7,35% of the property total area).	
Areas in which the field diagnosis of bee diversity was carried out, and the percentage they represent in relation to the total area considered as pollinators suppliers: Transects that covered one hectare in each property.	
Further information	
Results of the physical indicators: The externality generated in the pollination for the orange cultivation was 1,67% to 5,63% per year and 0,89% to 6% per year for the coffee cultivation.	
Assumptions adopted in the valuation estimates: Considering the agricultural crop cultivated in the three properties is sugarcane, which does not require pollination to obtain the product generator of economic value, we assume fictional scenarios and adopted coffee cultivation and citrus production for the study.	
Adjustments or derivations applied to methods and tools used: N/A.	
Others: The study carried out to inventory the bees' diversity did not intent to produce a study of ecosystem services valuation. Because of this, no information was collected about the flight distance and the distance between the wings base. That's why we turned to literature for this information. When no specific information was found about the existing species in the inventory, we adopted data from other species, if they were of the same gender or family.	
Explanatory Notes: N/A.	

Analysis of the results

The present study contributes to nurture important environmental and economic issues, highlighted bellow:

- The environmental law which falls on rural properties (Brazil's Forest Code) considers mandatory the restoration of stretches classified as Permanent Preservation Areas (PPA) that are deprived of native vegetation. Rural producers have postponed the restoration of these stretches, either due to lack of definition of legal aspects, or economic reasons. This report reinforces that the recovery of degraded areas can, besides protecting the soil and the water resources, reestablish bees' population that will bring economic benefits due the effective pollination and its consequences in the qualitative and quantitative improvement of the agricultural crops.
- Another important point is the reduction of pollinators that has been detected all over the world, triggered by several factors, such as global warming, overuse of pesticides, diseases and habitat reduction and destruction. Loss of bees can have economic and environmental negative impacts, either because the lack of agricultural crops pollination, or because the essential role that bees have in cross-pollination of native plant species. Emphasize solutions that contribute to restore bees population and with possibilities of economic gains is important to highlight natural capital as a strategic subject to be evaluated in business management.

Management of ecosystem services

Use of ecosystem service valuation results: Definition of strategic goals and progress monitoring; environmental management; social and environmental impact assessment; and reporting.

Description: Studies like this, that demonstrate positive externalities results through investments in natural capital, specifically pollinators, are seen as of great value to the company's business. The valuation of this ecosystem service in forest restoration projects that BASF promoted through Mata Viva® Program is extremely important for the company's internal management system because of its certifications, besides bringing positive results of investments made that can boost new initiatives for projects with similar focus.

The support that these results bring to other areas in the company (i.e. the environmental stewardship team) is also important, as these areas have been undertaking several initiatives related to pollinators.